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ANALYSIS OF THE ENVIRONMENTAL, SOCIO-ECONOMIC, LOGISTIC, INFRASTRUCTURE CONDITION AND LEGAL CONSTRAINTS OF THE BROWNFIELD IN VENICE FUNCTIONAL URBAN AREA (FUA)

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1. Functional Urban Area's general features and brownfield map

In order to define the Functional Urban Area (FUA) we refer to the metropolitan City of Venice, an institution established on 7th April 2014 and operational as of 31st August 2015.

The area of responsibility of the Metropolitan City of Venice includes 44 Municipalities with an area of 2,472.91 km^2 with 855,696 inhabitants (ISTAT figures 2016), plus a remarkable number of tourists.

The Functional Urban Area embraces the Venetian Lagoon and all the surrounding inland, which is part of the drainage basin in the Lagoon. The Venetian Lagoon, one of Europe's largest and Italy's largest lagoon with an area of 550 Km^2, has unique ecological characteristics and includes many sites protected by national and European regulations.

The Metropolitan City of Venice is one of the main industrial and economic sites in Europe, with diverse production districts providing high added value. As at 31 December 2015, there are 89.065 active businesses in the Metropolitan City of Venice (with 67,748 corporate offices and 21,317 local units). The economic framework in the area is mainly made up of service industry which, alone, covers more than 62% of sites, followed by the construction industry with 13.56%, manufacturing with 10.06%, primary sector with 9.37% and transports with 4.49%.

Chart no. 1: Figures based on ATECO 2007 classification – Source: elaboration by the Chamber of Commerce of Venice Rovigo Lagoon Delta on Infocamere Stock View data – 12/31/2015

Sectors of economic activity	% distribution
Agriculture, silviculture, fishing	9.37 %
Industry in a strict sense	10.06 %
Constructions	13.56 %
Trade	27.73 %
Transports	4.49 %
Accommodation and catering businesses	11.53 %
Finance and insurance	2.58 %
Services to enterprises	14.18 %
Services to people	6.12 %
Non-classified enterprises	0.39 %

Figure no. 1 – Boundaries of the Metropolitan City of Venice

Within its functions, the Metropolitan City aims at safeguarding and promoting its own territory while enhancing and protecting the features of the single areas through economic, social and cultural integration processes, according to the provisions by the three-year Strategic Plan.

The Strategic Plan is based on appropriate and ascertained items of knowledge and sets the sector and cross-cutting objectives affecting the metropolitan area, identifying intervention priorities, implementation methods and territory allocation criteria of the estimated resources needed to achieve them.

The reuse of brownfields (contaminated sites falling under the urban area or in the immediate suburbs, having already urban works in place) is a pivotal principle to use the "territory" resource in a conscious way, in line with the goal of getting to a "zero balance real estate development" in order to stop land consumption without prejudice to any new settlement needs.

"Contaminated sites" mean areas where, following past or current human activities and according to current regulations, a specific alteration of the natural features of the soil and the aquifer has occurred due to any polluting agent whose concentration exceeds the statutory limits set for a certain use (residential, commercial, industrial as per the Consolidated Environmental Act Legislative Decree no. 152/2006, Part IV, Chapter V).

In particular, this definition includes specific contamination of soil in active or dismissed industrial areas, as well as areas affected by illegal or environmentally improper waste disposal. Widespread contamination due to emissions in the atmosphere and agricultural use are excluded.

Chapter V of part IV of the decree above specifically governs environmental reclamation and redevelopment interventions of contaminated sites and defines the procedures, criteria and methods to perform the operations needed to remove the sources of pollution and, any way, to reduce concentration of polluting substances, in compliance with the Community principles and laws.

The contaminated sites in the Veneto Region are registered in the Regional Registry of Potentially Contaminated Sites[1], excluding the Site of National Interest of Porto Marghera and small-sized sites.

According to the Regional Registry of Contaminated Sites, as at 31 March 2013, there were 109 contaminated or potentially contaminated sites in the Metropolitan City of Venice in addition to the site of national interest of Porto Marghera, for an overall area of 310 ha. The site of national interest of Porto Marghera, as defined by the new delimitation of 2013, covers an area of approximately 1,900 ha.

Porto Marghera is, by extension, environmental critical issues and development potential, the main brownfield located within the FUA.

The registry of contaminated or potentially contaminated sites is an information system which, in the areas of responsibility, allows to know the administrative situation of each characterisation plan and cleanup and safety enhancement projects submitted by the parties concerned, as well as the environmental situation of the sites to be treated, with focus on soil, underground and groundwater environmental matrices.

The information included in the Registry are split into the following five sections:

1. Master data section,
2. Technical section,
3. Procedural section,
4. Cleanup measures and on-site controls section,
5. Economic section.

[1] ART. 251 (census and details of the sites to be reclaimed)

1. The regions, based on the criteria established by the Italian National Institute for Environmental Protection and Research (ISPRA), prepare the registry of the sites to be cleaned up, which has to include:

a) the list of sites under environmental cleanup and redevelopment measures, as well as the interventions performed on the sites;

b) the entities in charge of reclamation;

c) the public entities of which the region wants to avail for ex officio execution purposes, in case of failure by the parties compelled, provided that the necessary works are awarded through public tender or by way of the procedures established by article 242.

2. If the specific site risk analysis shows that risk concentrations have been exceeded, this situation should be reported in the land use certificate, the mapping and the technical implementation rules of the city's general plan, and shall be notified to the State Technical Office in charge.

3. In order to ensure effective collection and transfer of data and information, the Italian National Institute for Environmental Protection and Research (ISPRA) defines, in collaboration with the regions and regional agencies for environmental protection, the contents and the structure of the registry's key information, as well as the methods for entering them in computer systems connected to the National Environmental Information System (SINA).

Figure no. 2 - Registry of contaminated sites' Information System

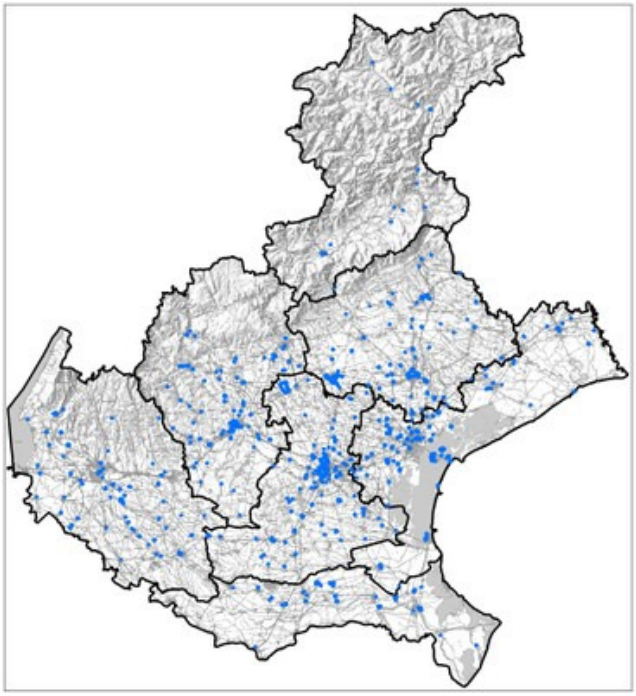

Figure no. 3 - Registry's Information System of contaminated sites

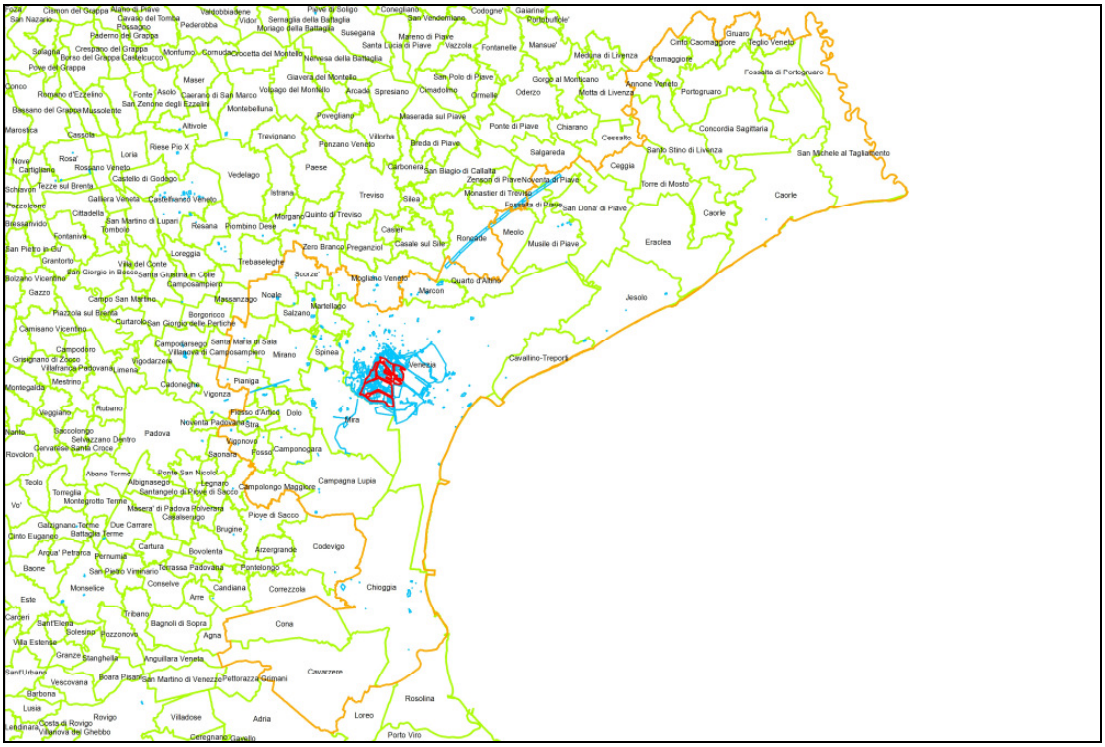

Figure no. 4 - Identification of contaminated sites of the Metropolitan City of Venice

2. Porto Marghera industrial site

The industrial area of Porto Marghera is part of the wider system of the Venetian Lagoon, of the Metropolitan City and the inland which, along with its coastal area, has general favourable conditions due to its geographic location, weather and climate conditions, streams and tides, port accessibility, framework of inner channels and availability of areas. Paragraph *2.1 Porto Marghera – Historical Framework* outlines the historical background where Porto Marghera was founded and the main stages of its development until today.

Figure no. 5 – Venetian Lagoon with the city of Venice, Porto Marghera and Mestre

The settlement layout of Porto Marghera site can be divided into three main areas:

- the **first industrial area**, located north of the industrial area and corresponding to the complex of early settlements which, being older and close to the urban area, were the first to undergo functional conversion interventions;
- the **commercial port** and construction and logistics settlements, which are the most vital production activities in the Porto Marghera area;
- the **second industrial area**, mainly hosting settlements related to the raw chemical industry which, affected by economic and environmental problems of that industry, need a deep requalification or a strong reconversion.

Contamination in the industrial area has caused quality alteration of the main environmental matrices: soil, groundwater, water and sediments of industrial channels and biocoenosis. The

level of contamination in the industrial area is clearly evidenced by the number and extension of the contaminated areas to be cleaned up and rehabilitated.

Paragraph 2.2 *"State of the environment and critical aspects"* covers the most significant aspects of the quality of water, air, surface and groundwater, and soil in Porto Marghera, the natural aspects that can be affected by the negative effects of industrial-generated contamination and some general information on land consumption in Veneto, aimed at providing a general overview on the demand for areas for settlement purposes.

In particular, cleanup and rehabilitation activities concerning the Porto Marghera brownfield directly affect the groundwater and soil environmental matrices: for this reason this will be treated in a wider sub-paragraph 2.2.3 *"Quality of soils and groundwater and state of reclamation procedures initiated pursuant to Legislative Decree no. 152/2006"*.

Venice and its Lagoon are located along routes of significant social and economic interest in the current and future scenario, given their potential of connection among developed, developing and newly developed countries. In this context, the following paragraph 2.3 *"The socio-economic context"* covers the aspects connected to the presence of residential settlements next to the industrial site of Porto Marghera, the employment situation, the economic development and production activities based in the brownfield above.

Paragraph 2.4 includes a brief description of the strategic facilities serving the industrial area (2.4.1 *"Sewage sector"*, 2.4.2 *"Waste treatment facilities" e* 2.4.3 *"Electrical power generation facilities"*), infrastructures (in particular rail connections, the airport, canals and motorways) which make up the dense framework of connections of the Porto Marghera area with Northern Italy and the rest of Europe (2.4.4 *"Transport infrastructures"*), an overview on the main regulatory and planning instruments concerning Porto Marghera (2.4.5 *"Regulations and planning"*) and finally an analysis of the properties divided into categories (2.4.6 *"Ownership of the areas"*).

2.1 Porto Marghera – Historical Framework

At the beginning of the twentieth century, the Port of Venice was Italy's second port after the port of Genoa, but it needed more space to expand. As structural deficiencies became clearer and clearer and due to the increase of trades, a new backup port on the land needed to be built, leveraging on the motorway and rail network that was growing rapidly during that time.

Then, the so-called Bottenighi area (later renamed Porto Marghera) was identified as the location where to host the new port facilities.

The development of the commercial port and the first industrial area, designed by Mr. Enrico Coen Cagli upon assignment by Mr. Giuseppe Volpi Conte di Misurata, took place in various steps.

On 15th May 1917 the project was presented and immediately approved by the Ministry of Public Works. A few months later, on the 23rd July, the Municipality of Venice, the Italian Government and the Syndicate of Studies for Electrometallurgical and Shipbuilding companies in the Port of Venice, signed the construction commencement agreement.

In 1919 the Vittorio Emanuele III Canal, connecting the Giudecca to Marghera, was dug, while the Sade company started building the first thermal power plant.

In 1920, the Società Porto Industriale (Industrial Port Company) was established to build the infrastructures for the industrial and commercial port, the rail and road links needed for transporting the goods and raw materials for the works.

In 1922 the excavation of the Large Navigation Channel connecting Marghera to Marittima was completed, and at that time the excavation of the North Industrial Canal was almost over as well.

Porto Marghera, which was conceived and designed as a coastal industrial area right from the start, experienced a time of notable growth. In 1925 there were 33 companies and 3,440 workers [2].

In 1925 a new Port Master Plan was drawn up providing for the extension of industrial areas up to the establishing that the Brenta canal (Fusina), securing enough space required for the enlargement of the area throughout the sixties.

Starting from the '30s, the metallurgy and non-ferrous material industry (aluminium and its alloys, zinc) flourished and a large plant producing synthetic ammonia for nitrogen fertilizers (using coke oven gas), followed by some food plants.

In 1935 Marghera had Central Italy's most powerful thermal power plant. Parallel to these businesses, many minor productions added up in those years (perfumes and glass lenses, felt weaving and malt processing for beer) and service enterprises (such as transport companies).

This area grew very rapidly until the outbreak of the second world war. In 1940 there were 95 companies with over 17,300 people employed[3]. Almost all the areas covered by the 1917 Master Plan hosted factories which, as warfare orders flourished, aimed at enlarging their facilities in order to increase production and profits.

The growth of Porto Marghera came to an abrupt stop during the second world war: the industrial plants were bombed and devastated.

The plants hit during aerial bombings were rebuilt quickly and the industrial area started to expand again, after the time of post-war adjustment with significant drop in jobs was over.

In the early '50s, because of the saturation of the first industrial area with 128 companies and 22,500 workers [4], the project for a second industrial area was designed, establishing productions of petrochemicals, refractory materials, precision carpentry, power plants and food oil refineries. This second industrial area rose mainly on areas taken away from the Lagoon through fills or embankments of the ground level, using industrial waste and scraps from factories based in the first industrial area and materials from the excavation of canals.

During the post-war period the growth was so fast that in 1960 there were about 200 companies (with over 30,000 people employed), mainly operating in the chemical, non-ferrous metallurgy, construction, steel, ceramic and petrochemical industries. Considering the huge development in the area, the project for a third additional industrial area was set in motion, but later abandoned.

During the '60s, the development of Porto Marghera and the growth of industrial trades required a new stage of interventions. Following the increase in industrial trades, the San Leonardo oil port was built in 1966 and, three years later, the excavation of the Malamocco-Marghera canal was completed, in order to allow all oil tankers to reach the port of San Leonardo and the industrial areas through the Malamocco port entrance, avoiding the San Marco basin and the city's historical centre.

Marghera was one of the major industrial concentrations of the '60s and '70s (in 1965, at the peak of employment, there were 229 companies and about 33,000 people employed[5]) with

[2] Source: Porto Marghera's Industrial Area Agency
[3] Source: Porto Marghera's Industrial Area Agency.
[4] Source: Porto Marghera's Industrial Area Agency.
[5] Source: Porto Marghera's Industrial Area Agency.

capital-intensive plants and a working class who took part in some of the great conflicts between capital and labour that took the stage in the late '60s. Unlike other industrial areas, these plants were not managed by a defined entrepreneurial class: indeed, state owned companies became more and more important.

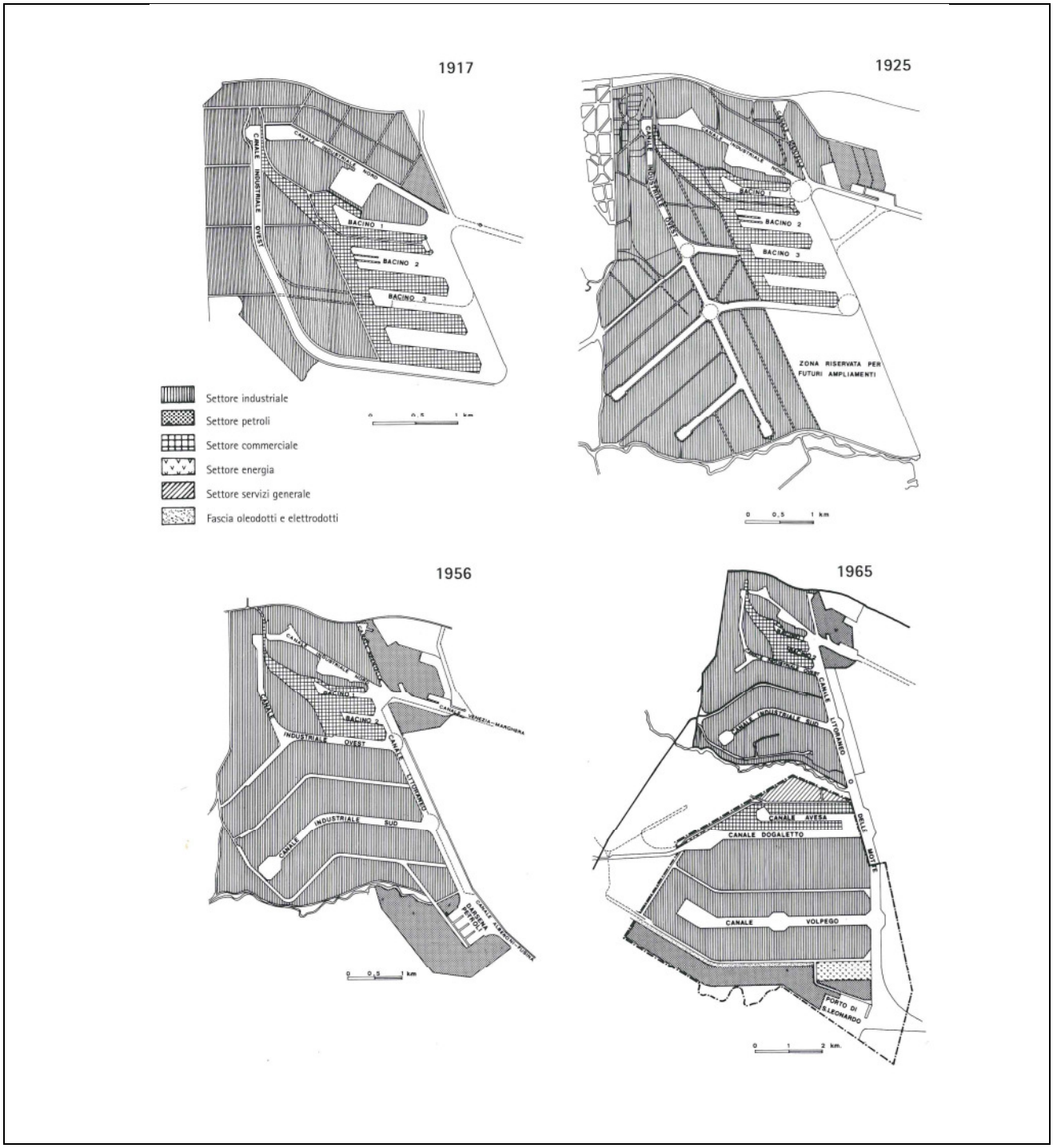

Figure no. 6 - Analysis of the Master Plans for Porto Marghera – Source: Published by the Mandatory consortium for the port and industrial area of Porto Marghera – in INU Urbanistica Quaderni no.9 – 1996 – by Turiddo Pugliese.

Since the '70s, the Porto Marghera area fell into a crisis. The number of companies and people employed started to went down due to different factors: the increasing awareness towards environmental issues (which strengthened and structured after the 1966 flood), the sharp increase in raw material price, especially oil, the decline of the raw chemical industry, led to the need for downsizing many large plants. The period of state's "interventionism" in the economy added up to this. Large enterprises in Marghera, mainly state-owned, began to experience significant losses.

The '80s and '90s were a time of deep crisis for the long-established basic industries, along with the dismissal of production facilities and the consequent decrease of the employment level. In 1990, the number of people employed in Porto Marghera was 18,814, 14,028 in 1995 and 12,727 in 2000. As regards the number of companies, they went from 303 in 1990, to 295 in 1995 and to 289 in 2000[6].

Since the Planning Agreement for Chemistry of Porto Marghera was signed, approved through the Council of Ministers Presidential Decree dated 02/12/1999, public and private parties, both local and international, have fostered a lot of territorial and economic programming instruments which have set out development scenarios and perspectives for the Porto Marghera area.

Today, despite the progressive dismissal of major industrial plants and the gradual decrease in the people employed, Porto Marghera confirms to be strongly geared to industrial and port business and a crucial hub in the economy of Venice and the whole Veneto region. The production and industrial role of Porto Marghera is confirmed by the number of companies and people employed there (780, for a total of 10,060 people employed), but also the many initiatives and projects fostered by public and private entities aimed at the reinforcement, reindustrialisation and regeneration of brownfields.

2.2 State of the environment and critical aspects

With the Planning Agreement for Chemistry of Porto Marghera signed in 1998, the signing entities and companies took on specific tasks both in terms of environmental rehabilitation and transparency of information towards institutions and citizens; so the principles of public access to environmental information were applied, as per legislative Decree no. 195/2005, with constant and progressive actions in order to guarantee and spread the right to access the environmental information held by public authorities.
All Entities have been engaged, each within their own area of responsibility, in the production, assessment and dissemination of accessible data, projects and environmental studies.

Therefore, as of 1998, upon assignment by the Veneto Region, ARPA Veneto has started to draw the annual Area Environmental Report of Porto Marghera.

The Environmental Report is an instrument that the public entities and enterprises have to give the current situation of the environmental pressure of industrial origin, which is helpful to highlight any critical issues in the territory and priority measures, as well as to monitor the effectiveness of the environmental policies adopted.

The first Area Environmental Report of Porto Marghera was published by ARPAV in 2005 and included the environmental data on the factories existing in the Area from 1998 to 2004.

Then, ARPAV presented a second Area Environmental Report, containing data from 2005 to 2007, which was exposed along with the previous data in order to highlight and interpret, on a long period of time, all those "environmental" improvements made to the enterprises in the Porto Marghera industrial site.

[6] Source: Porto Marghera's Industrial Area Agency.

Currently, also because some important businesses closed or were dismissed, the regional Agency took a more active role in the prevention of relevant accidents: ARPAV was given the power to control and supervise on the prevention of relevant accidents through integrated environmental controls, in order to make sure that the safety levels are maintained during the operation of those plants that are still active.

2.2.1 Causes of pressure: air matrix

After the SIMAGE – Environmental Monitoring Integrated System and Disaster Management - was built and made operative, a stable facility for the constant monitoring of an area subject to industrial risk was created in Porto Marghera.

With the SIMAGE, an integrated approach was used for the management of industrial emissions, environmental emergencies and civil protection, by setting up a prevention and intervention system aimed at reducing the risks related to the presence of plants at risk and the reduction of the impacts of possible accidental events on humans and the environment.

The creation of the SIMAGE monitoring network was one of the goals of the SIMAGE I Lot "Monitoring plan on Air Quality in Porto Marghera and the Drainage Basin in the Venetian Lagoon", financed in 2001.

To this purpose, the first step was to have a picture of the monitoring networks existing in this area, which were important because they could be usefully integrated in the system, resulting in lower costs and shorter time to complete the whole project. In particular, the monitoring station of the Industrial Area Agency (EZI) was identified, which also provides weather information and business monitoring stations, which have the great advantage of being close to the potential source of warning. The network made up of business stations and the monitoring stations of ARPAV, which are outside of the industrial area, allows to have an estimate of the effects of polluting agents on the soil.

The warning nature of the network, which is based on the types of plants and polluting agents typical for the area, has required to be designed from scratch. The instrument selection stage was crucial to create an effective and non-ordinary network in relation to the object of monitoring, that is non-traditional industrial pollutants.

The SIMAGE now has different environmental monitoring instruments which, if properly installed in the industrial area and in the immediate proximity, allow to "continuously" control the concentration of a large number of pollutants in the air and to sample air "at will" for later lab analyses while providing useful information on the development and evolution of an emergency situation, if needed.

The instruments located in the industrial area can be divided into:

a) continuously working analysis systems installed within the Petrochemical plant area:
   - 5 DOAS systems for a total of 11 optical paths: spectrophotometers that analyse air along 11 different linear stretches of variable length between 300 and 1500 metres; they can detect 11 substances having particular critical impact on the environment and health: benzene, mercury, dichlorobenzene, styrene, chlorine, hydrogen cyanide, hydrofluoric acid, hydrochloric acid, ammonia, nitrogen oxides;
   - 3 gas chromatographs: they detect the presence of benzene, toluene, styrene, ethylbenzene and xylenes;
   - 3 IPA (polycyclic aromatic hydrocarbon) detectors.

b) continuous analysis systems managed by the SIMAGE working 24/7. These systems measure the concentration of the listed substances in the air and transmit them in real time to the

SIMAGE room, where they are monitored by dedicated software which prompt operators if abnormal or dangerous values are detected.

c) sampling systems that can be activated remotely, installed outside the Petrochemical plant area:

- 6+6 high volume air samplers to measure PM10/PUF;
- 8 cabinets for instant and prolonged sampling of air through "canisters" (5 additional canister cabinets will be installed soon).

These sampling systems are located outside the Petrochemical area in order to allow air sampling in areas that are densely populated but close to the industrial area, if needed. The samples created at will by these systems must then be taken to the laboratory where they are properly analysed.

All monitoring systems are installed inside cabinets located both inside and outside the petrochemical area and managed via dedicated software.

In addition to the SIMAGE system, another atmosphere emission control instrument is the monitoring plan that every company has to submit pursuant to the mentioned regulations on factories which are at risk of relevant accident and subject to the Environmental Integrate Authorization.

As a result of said monitoring plans, the most significant amounts of NOx, SOx and Particulates generated by the companies in the Porto Marghera area are reported below.

Chart no. 2: Nitrogen oxides. NOx (t/year)[7]

	2013	2014	2015	notes
ARKEMA		0		
ENI	579	269	396	
ENEL FUSINA	2528	2766	1235	
EDISON AZOTATI		90		
EDISON LEVANTE		450		
VERSALIS	721	179		NOTE: in 2014, the SA1 power station was stopped from 5/9/2014 to 12/22/2014

Chart no. 3: Sulfur oxides. SOx (t/year)

	2013	2014	2015	notes
ARKEMA				
ENI	760	41	85	
ENEL FUSINA	2019	2019	2435	
EDISON AZOTATI				

[7] Source: ARPAV - Monitoring and control plan of companies subject to AIA (Environmental Integrate Authorization)

EDISON LEVANTE				
VERSALIS	14			NOTE: in 2014, the SA1 power station was stopped from 5/9/2014 to 12/22/2014

Chart no. 4: Total particulate matter. TSP (t/year)

	2013	2014	2015	notes
ARKEMA		0		
ENI	45	4	2	
ENEL FUSINA	1	57	55	
EDISON AZOTATI		-		
EDISON LEVANTE		-		
VERSALIS	11	3		NOTE: in 2014, the SA1 power station was stopped from 5/9/2014 to 12/22/2014

2.2.2 Quality of surface water[8]

The Venetian Lagoon, as it is today, is the result of a set of natural forces that caused its formation and of a series of human actions which deeply changed its natural evolution. Currently, the Venetian Lagoon is located in the northern Adriatic coast and covers an area of about 550 km^2, between the Brenta river to the south and the Sile river to the north. It is connected to the sea by the three port entrances of Lido, Malamocco and Chioggia, and is one of the largest wetlands in Europe and the whole Mediterranean basin, with a rich biological, fauna and flora heritage.

The Venetian Lagoon has a complex morphological structure, consisting of a dense network of canals which originates from the port entrances above and gradually reduces in section. The canal network routes the tide stream up to the most inner parts, faster in the areas that are closer to the entrances, where streams are intense. Instead, the Lagoon's most inner areas have poor hydrodynamics and low water circulation.

The average volume exchanged between the sea and the lagoon during the single tidal stage is around 140 x million m^3 during neap tides and of 260 million m^3 during spring tides.

From an hydrographic and administrative point of view, the Venetian Lagoon is part of the Eastern Alps District. The updated, integrated and organic picture of the basin-related knowledge available (impacts following significant pressures on the district's water bodies and the ecological and chemical status), as well as the action plan identified to achieve environmental quality goals are included in the Eastern Alps river basin management Plan approved on 3rd March 2016, pursuant to directive 2000/60/EC.

This Plan is a strategic instrument to protect and safeguard water. This Plan has identified 11 natural water bodies plus 3 deeply changed water bodies in the hydrographic sub-unit "drainage basin, Venetian lagoon and sea" (see figure no. 7)[9].

[8] Source: Eastern Alps river basin management Plan - Drainage basin, Venetian lagoon and sea hydrographic sub-unit (http://alpiorientali.it/index.php?option=com_content&view=article&id=285&Itemid=264)

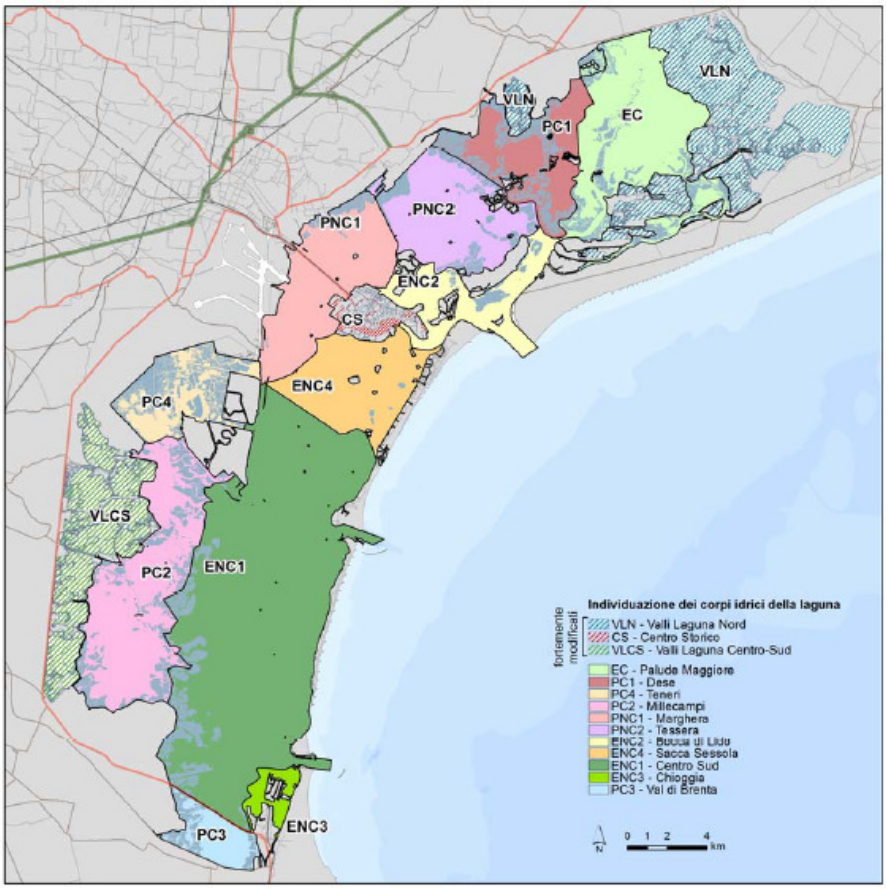

Figure no. 7: Boundaries of water bodies in the Venetian Lagoon

The closest water body to the ReSites Project's area of study is called PNC1 (Marghera) and is of the Polyhaline Non-confined type.

The results of the monitoring campaigns from the first three-year period 2010/2012 available today are included in the Resolution of the Regional Government no. 140 dated 02/20/2014, which approved the first classification of the chemical and ecological status of the lagoon water bodies, according to the standards set by the directive 2000/60/CE and implemented on a national scale by the Legislative Decree no. 152/206 and by the Ministerial Decree no. 260/2010.

Pursuant to the Water Framework Directive (2000/60/EC) and the national implementation legislation (Legislative Decree no. 152/2006 as amended and integrated), the ecological status of water bodies is determined by the lowest class resulting from monitoring data on:

- biological elements (BQE);

[9] As implementation of the Decree of the Ministry of the Environment and Protection of Land and Sea, DM 131/2008, ARPAV with collaboration of ISPRA, have identified the types of water bodies existing in the Venetian lagoon (Figure 1-18), based on the "Guide to the types of water bodies and definition of the reference conditions pursuant to the directive 2000/60/EC" (El-Pr-TW-Tipizzazione_Condizioni di Riferimento-01.01, June 2007) prepared by the ISPRA.

- supporting physical elements and chemicals (except for those specified in Annex 1 of Legislative Degree no. 152/2006 as amended and integrated which are useful for interpretation purposes only);
- supporting chemicals (substances not belonging to the list of priorities).

The Chemical Status was determined using the results of the monitoring executed in the water matrix on the substances listed as priorities in Chart 1/A, annex 1, of DM 260/2010.

The water bodies that meet the environmental quality standards (in terms of yearly average SQA -MA concentrations and the maximum accepted SQA-CMA concentrations) set under paragraph 2, letter A.2.6, chart 1/A of Annex 1 to Ministerial Decree 260/2010, should be classified as in good chemical status; if not, the good chemical status is not achieved.

Based on the synthesis of the evaluations on the Ecological Status on the Venetian Lagoon water bodies, the water body PNC1 (Marghera) should be considered as poor, whose habitats are strongly compromised by anthropic use of the Water Body: this is mainly due to the BQE Macrophytes. The effect of the measures provided for in the Plan is expected on the long run.

As regards the water matrix, the Chemical Status turned out to be good for all the 14 lagoon water bodies monitored: the goal is to keep that condition for the water body PNC1 (Marghera) also in the future.

2.2.3 Quality of soils and groundwater and state of cleanup procedures initiated pursuant to Legislative Decree no. 152/2006

2.2.3.1 Foreword

As implementation of Legislative Decree no. 22/1997, which has disciplined the responsibilities and obligations for the cleanup of contaminated sites, law no. 426/1998 has identified the Site of National Interest of Venice - Porto Marghera in order to allow open competition for environmental cleanup and redevelopment interventions of the contaminated sites falling within it.

The Site perimeter was delimited by the Ministry of the Environment through the Ministerial Decree dated 23 February 2000 and then modified by decree dated 24 April 2013.

This paper on the quality of soils and groundwater focuses on a ground area that is larger than the current Site of National Interest (about 1,828 ha), which includes the Industrial Area of Porto Marghera and is delimited by the Brenta canal to the South, via Fratelli Bandiera to the East, the railway line to the North and industrial channels to the West (Figure no. 8).

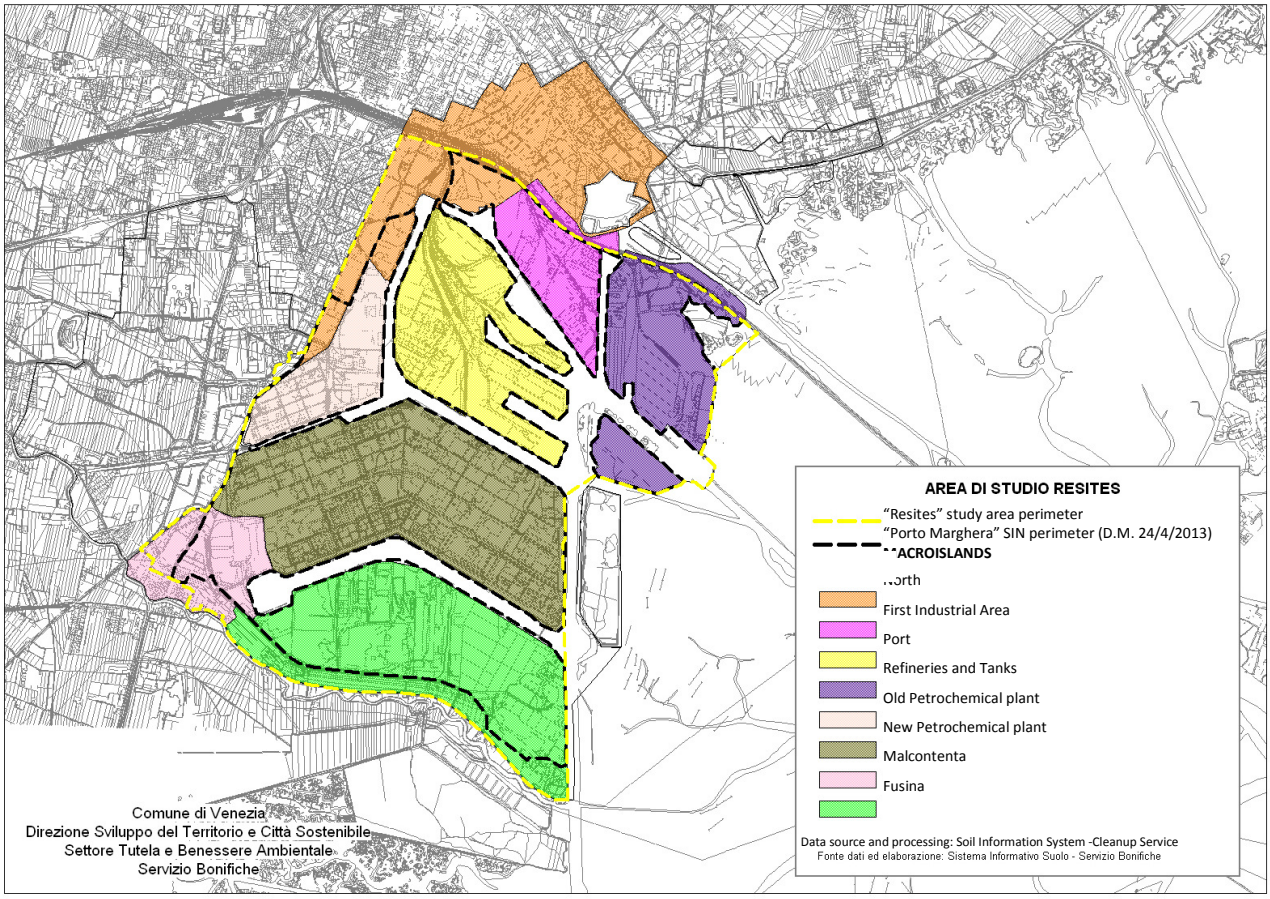

Figure no. 8: Delimitation of the ReSites studio area and identification of the micro-islands concerned

The criteria, procedures and methods for characterisation, safety enhancement and environmental cleanup and redevelopment are established by Chapter V – Party IV of Legislative Decree no. 152/2006.

Specifically, soil and groundwater quality investigation activities - which are mandatory on Sites of National Interest by law since 1999, pursuant to Ministerial Decree no. 471/1999 - are disciplined in Annex 2 of said legislative decree, which specifies all the operations to be performed for sampling environmental matrices, collecting, determining, transporting and conserving the sample and for lab analyses.

Also, in Porto Marghera there are some specific procedures in place set by the so-called "*Operational protocol for site characterization pursuant to Legislative Decree no. 152/2006 as amended and integrated and the Planning Agreement for Chemistry of Porto Marghera*".

In general, the location of sampling points depends on the most likely sources of contamination and the following should be implemented:

- one investigation point of the soil at least every 2,500 m^2;
- homogeneous layers of soil samples under one meter;

- a number of piezometers for water investigation in proportion with the site extension[10];
- an analytical set that can be grouped for soils in 14 families of contaminants (Carcinogenic halogenated aliphatic compounds, Carcinogenic chlorinated aliphatic compounds, Non-carcinogenic chlorinated aliphatic compounds, Other substances, Aromatic amines, Aromatic hydrocarbons, Polycyclic aromatic hydrocarbons, Nitrobenzenes, Chlorobenzenes, Inorganic compounds, Dioxins-furans and PCB, Phytochemicals, Phthalates, Hydrocarbons[11]) and for groundwater in 14 families of contaminants (Carcinogenic halogenated aliphatic compounds, Carcinogenic chlorinated aliphatic compounds, Non-carcinogenic chlorinated aliphatic compounds, Aromatic amines, Aromatic hydrocarbons, Polycyclic aromatic hydrocarbons, Chlorobenzenes, Nitrobenzenes, Inorganic compounds[12], Dioxins-furans and PCB, Etheres, Phenols and Fenoli e Chlorinated phenols, Para-phthalic acid, Hydrocarbons).

The results of chemical analyses carried out on soil and water samples should be then compared with the contamination threshold concentrations (CTC) defined in Annex 5 to Chapter V – Part IV of Legislative Decree no. 152/2006, specifically soils in chart no. 5 and groundwater in chart no. 6.

After the characterisation activity, those sites where one or more concentration values of pollutants detected in environmental matrices exceed CTC values are defined as potentially contaminated.

In these cases, the specific site health and environmental risk analysis procedure is applied, which allows to determine the risk threshold concentrations (RTC): at this point, the sites that show higher contamination concentration values than RTCs after the results of the characterisation plan are defined as contaminated. In this case, cleanup or operational or permanent safety enhancement interventions must be put in place and, where needed, further environmental remediation and rehabilitation measures must be implemented in order to reduce the risk resulting from the site's state of contamination at least up to the acceptable threshold.

Instead, sites are defined as contaminated if the contamination levels detected in the environmental matrices are lower than CTCs or, if higher, are still lower than the RTC values measured following the specific site health and environmental risk analysis.

In Porto Marghera, most of characterisation activities were carried out from 2004 to 2007, thanks to the commitment by public authorities and private owners of the areas, according to the cleanup Master Plan (approved in 2004), which sets the actions to be performed in a systemic way to clean up the whole Porto Marghera site.

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[10] According to the characterisation protocol in force in Porto Marghera, as regards investigation of groundwater, the number of piezometers to be installed in areas smaller than 10,000 m2 cannot be less than 3, and any way should allow to clearly identify the prevailing aquifer flow direction for each aquifer. For areas under 2,500 m2, at least 1 piezometer must be installed for every aquifer to be investigated.

For larger sites, the number of piezometers to be installed on each aquifer will have to meet the following requirements:

- area between 10,000 and 50,000 m2 : at least 4;
- area between 50,000 and 100,000 m2 : at least 6;
- area between 100,000 and 250,000 m2 : at least 8;
- area larger than 250,000 m2: at least one every 25,000 m2.

[11] The family of contaminants called "Other substances" include asbestos and esters of phtalic acid. The family named "Inorganic compounds" includes Antimony, Arsenic, Beryllium, Cadmium, Cobalt, Total Chromium, Chromium VI, Mercury, Nickel, Lead, Copper, Selenium, Organostannic compounds, Thallium, Vanadium, Zinc, Cyanides (free), Fluorides.

[12] The family named "Inorganic pollutants" includes Aluminium, Antimony, Silver, Arsenic, Beryllium, Cadmium, Cobalt, Total Chromium, Chromium (VI), Iron, Mercury, Nickel, Lead, Copper, Selenium, Manganese, Thallium, Zinc, Boron, Free Cyanides, Fluorides, Nitrites, Sulphates. The family of "ethers" includes MTBE and ETBE.

From a procedural standpoint, the characterisation plans and the investigation results should be delivered to the public Authorities responsible by law of the cleanup process.

The results of this intense process are recapped in the following paragraphs and have been organized by macro-islands based on the zoning of Porto Marghera's industrial area adopted in the Master Plan. In particular, as shown in figure no. 8, the area included in the ReSites study falls under 78 macro-islands[13]: Fusina, Malcontenta, New Petrochemical plant, Old Petrochemical plant[14], North, Port, First Industrial Area, Refineries and Tanks.

The division in macro-islands allows to map the territory also based on the type of contamination because, generally, the lands belonging to the same macro-island have a similar origin (lands that were once emerged or cleaned up with filling materials), were settled by companies of the same period and, in some cases, the types of business performed there are similar or connected (such as, for example, the case of the New and Old Petrochemical macro-islands where companies specializing in raw chemistry had their operations and the Refinery macro-island, which has always been used for refining oil and fuel oils).

The data on soil and water quality used in sub-paragraphs 2.2.3.2 and 2.2.3.3 was extracted from the GEOPORTAL of the Veneto Region, which the Entity populates using the characterisation data transmitted by those who submit characterisation procedures. Since not all the companies (especially small ones) transmit their data in a format that is useful for georeferencing, the following paper may underestimate the actual data detected in the area. Also, the data was produced and entered in the regional database according to methods that have evolved in time, so the information associated with each environmental investigation turned out to be inconsistent or poor in some cases. In these cases, this information was integrated with real data or with specific assumptions or, if this was not possible, it was removed, also based on a comparison with the IT system of the Municipality of Venice. This is the case for example of piezometers for which there is no information on the aquifer investigated but on the porous section level only: it was decided to associate porous sections starting from deeper than 4m from the ground level to the backfill aquifer and lower levels to the first aquifer; instead, if no porous section level is provided, that information was searched in the Municipality's information system and, if not available, the piezometer was scrapped from this work.

Finally, it should be stressed that the database used does not contain investigations before 1999, although it is known that data on environmental matrices quality exist before said date.

2.2.3.2 Quality of soils

Since 1999, 4582 boreholes have been drilled in the ReSites area of study; 1956 of these were not compliant with the contamination threshold concentration (CTC) values referring to areas for industrial and commercial use (the so-called column B of chart 1 in annex 5 to chapter V, part IV of Legislative Decree no. 152/06) (see Figure no. 9).

Chart 5 shows a recap, by macro-area, of the number of boreholes that showed exceeding CTC values for each family of contaminants included in the above mentioned chart no. 1 of Legislative Decree no. 152/06 and, as a subset, those which exceed CTCs by more than 10 times. Such high exceedances for persisting, very toxic and/or carcinogenic parameters are considered hot spots (according to the National Institute of Health, with registered note 039021 AMPP/IA.12 of 08/13/2004) and imply the adoption of prevention and emergency safety enhancement measures for human and environmental protection.

[13] In the case of North and Malcontenta macro-islands, the investigated area is smaller than the macro-island area.

[14] It is hereby specified that the portion of the Rural Areas macro-island falling within the studied area was assigned to the Old Petrochemical plant macro-area, given its small size.

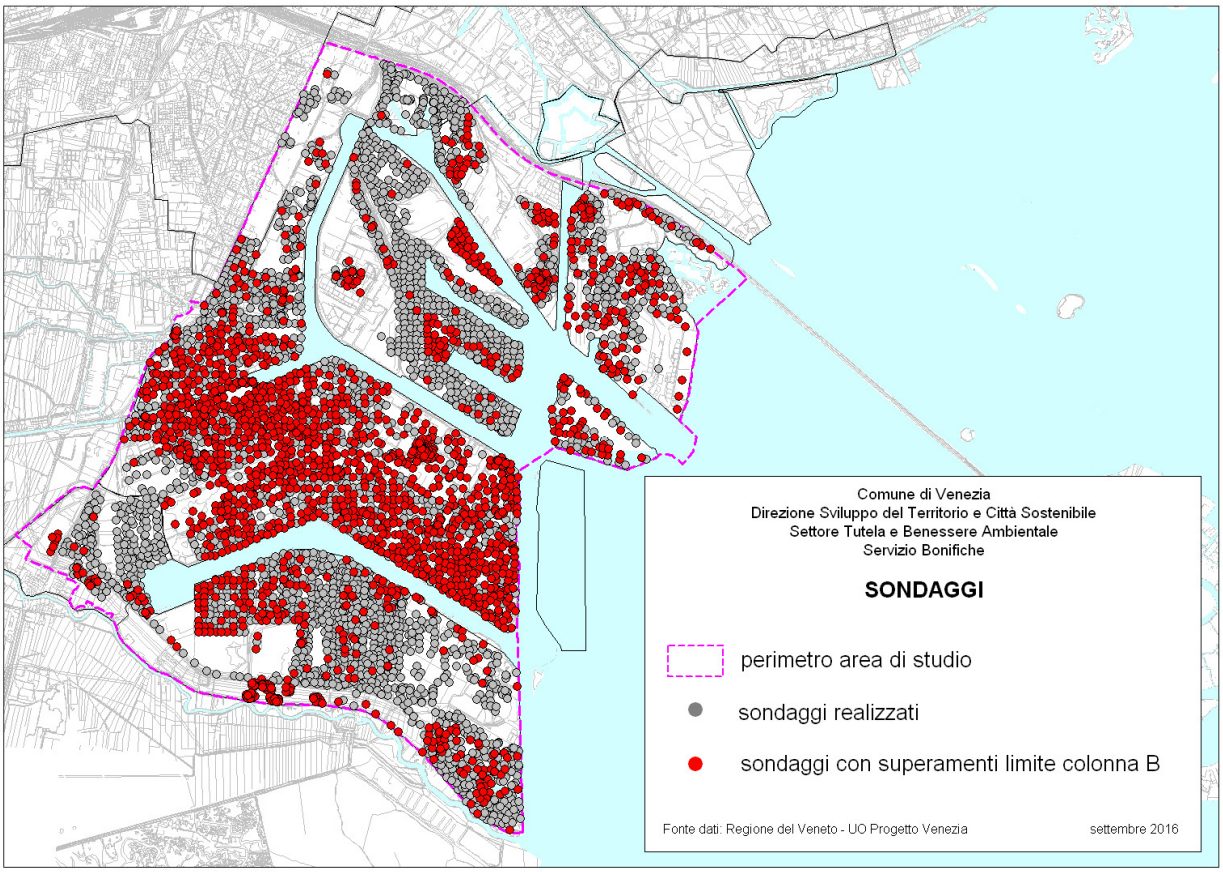


Figure no. 9: Boreholes drilled in the ReSites area for soil quality analysis

The families of contaminants that show the most widespread exceedances:

d) carcinogenic and non-carcinogenic chlorinated aliphatic compounds, including 1,1-Dichloroethane, 1,1-Dichloroethylene, 1,1,1-Trichloroethane, 1,1,1,2-Tetrachloroethane, 1,1,2-Trichloroethane, 1,1,2,2-Tetrachloroethane, Cis-1,2-Dichloroethylene, 1,2-Dichloroethane, 1,2-Dichloroethylene, 1,2-Dichloropropane, 1,2-Trans-Dichloroethylene, 1,2,3-Trichloropropane, Chloromethane, Vinyl chloride, Dichloromethane (Methylene chloride), Tetrachloroethylene, Trichloroethylene, Trichloromethane (chloroform);

e) aromatics (including Benzene, Styrene, Toluene, Xylene);

f) polycyclic aromatic hydrocarbons (such as Pyrene, Chrysene, Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Ddibenzo(a,e)pyrene, Dibenz[a,h]anthracene, Dibenzo(a,h)pyrene, Dibenzo(a,i)pyrene, Dibenzo(a,l)pyrene, Dicyclopentadiene, Ethylbenzene, Indeno(1,2,3-c,d)pyrene, Indenopyrene);

g) inorganic compounds (such as Arsenic, Cadmium, Total Chromium, Chromium VI, Mercury, Nickel, Lead, Tin);

h) dioxines, furans, PCBs;

i) hydrocarbons.

Chart 5: CTC exceedances in soil by family of contaminants

Macro-area			Fusina		Malcontenta		New Petrochemical plant		Old Petrochemical plant		North		Port		I Industrial Area		Refineries and Tanks	
no. of boreholes	Total	4582	1046		190		1557		394		254		616		126		399	
	With exceedance	1956	287	27%	30	16%	1094	70%	166	42%	22	9%	126	20%	68	54%	163	41%
no. of boreholes with exceedances	Families of contaminants	Carcinogenic halogenated aliphatic compounds	1	0%	0	0%	68	4%	0	0%	0	0%	0	0%	0	0%	0	0%
		Carcinogenic chlorinated aliphatic compounds	15	1%	1	1%	408	26%	51	13%	0	0%	0	0%	0	0%	1	0%
		Non-carcinogenic chlorinated aliphatic compounds	3	0%	0	0%	154	10%	19	5%	0	0%	0	0%	0	0%	0	0%
		Other substances	0	0%	0	0%	1	0%	1	0%	0	0%	0	0%	0	0%	0	0%
		Aromatic amines	0	0%	0	0%	1	0%	1	0%	0	0%	0	0%	0	0%	0	0%
		Aromatic hydrocarbons	14	1%	1	1%	79	5%	6	2%	0	0%	0	0%	2	2%	11	3%
		Polycyclic aromatic hydrocarbons	110	11%	4	2%	250	16%	27	7%	4	2%	37	6%	25	20%	13	3%
		Chlorobenzenes	2	0%	1	1%	115	7%	2	1%	0	0%	0	0%	0	0%	0	0%
		Inorganic compounds	172	16%	25	13%	774	50%	76	19%	21	8%	118	19%	48	38%	95	24%
		Dioxines, furans and PCBs	11	1%	2	1%	207	13%	55	14%	1	0%	14	2%	0	0%	12	3%
		Phytochemicals	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	0%
		Phthalates	3	0%	0	0%	12	1%	10	3%	0	0%	0	0%	0	0%	0	0%
		Hydrocarbons	78	7%	7	4%	230	15%	41	10%	2	1%	32	5%	21	17%	82	21%
no. of boreholes with hotspots	Families of contaminants	Carcinogenic halogenated aliphatic compounds	0	0%	0	0%	5	0%	0	0%	0	0%	0	0%	0	0%	0	0%
		Carcinogenic chlorinated aliphatic compounds	7	1%	1	1%	229	15%	31	8%	0	0%	0	0%	0	0%	0	0%
		Non-carcinogenic chlorinated aliphatic compounds	1	0%	0	0%	87	6%	8	2%	0	0%	0	0%	0	0%	0	0%
		Other substances	0	0%	0	0%	0	0%	1	0%	0	0%	0	0%	0	0%	0	0%
		Aromatic amines	0	0%	0	0%	0	0%	1	0%	0	0%	0	0%	0	0%	0	0%
		Aromatic hydrocarbons	2	0%	0	0%	15	1%	4	1%	0	0%	0	0%	0	0%	4	1%
		Polycyclic aromatic hydrocarbons	11	1%	0	0%	57	4%	4	1%	0	0%	14	2%	11	9%	0	0%
		Chlorobenzenes	1	0%	0	0%	28	2%	0	0%	0	0%	0	0%	0	0%	0	0%
		Inorganic compounds	11	1%	0	0%	145	9%	10	3%	5	2%	36	6%	24	19%	18	5%
		Dioxines, furans and PCBs	1	0%	1	1%	34	2%	11	3%	0	0%	11	2%	0	0%	5	1%
		Phytochemicals	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
		Phthalates	1	0%	0	0%	4	0%	1	0%	0	0%	0	0%	0	0%	0	0%
		Hydrocarbons	7	1%	0	0%	32	2%	4	1%	1	0%	3	0%	6	5%	21	5%

The micro-islands that show the most widespread contamination based on the elaboration of the existing data are the Old and the New Petrochemical areas, the Refinery area and the First Industrial Area.

Contamination is mainly due to the presence of inorganic compounds (metals) and IPAs, while the Old and New Petrochemical areas also show a significant presence of halogenated and chlorinated aliphatic compounds, in line with the productions performed there.

Below is a map of the diffusion and concentration of said contaminants (figures from no. 10 to no. 14).

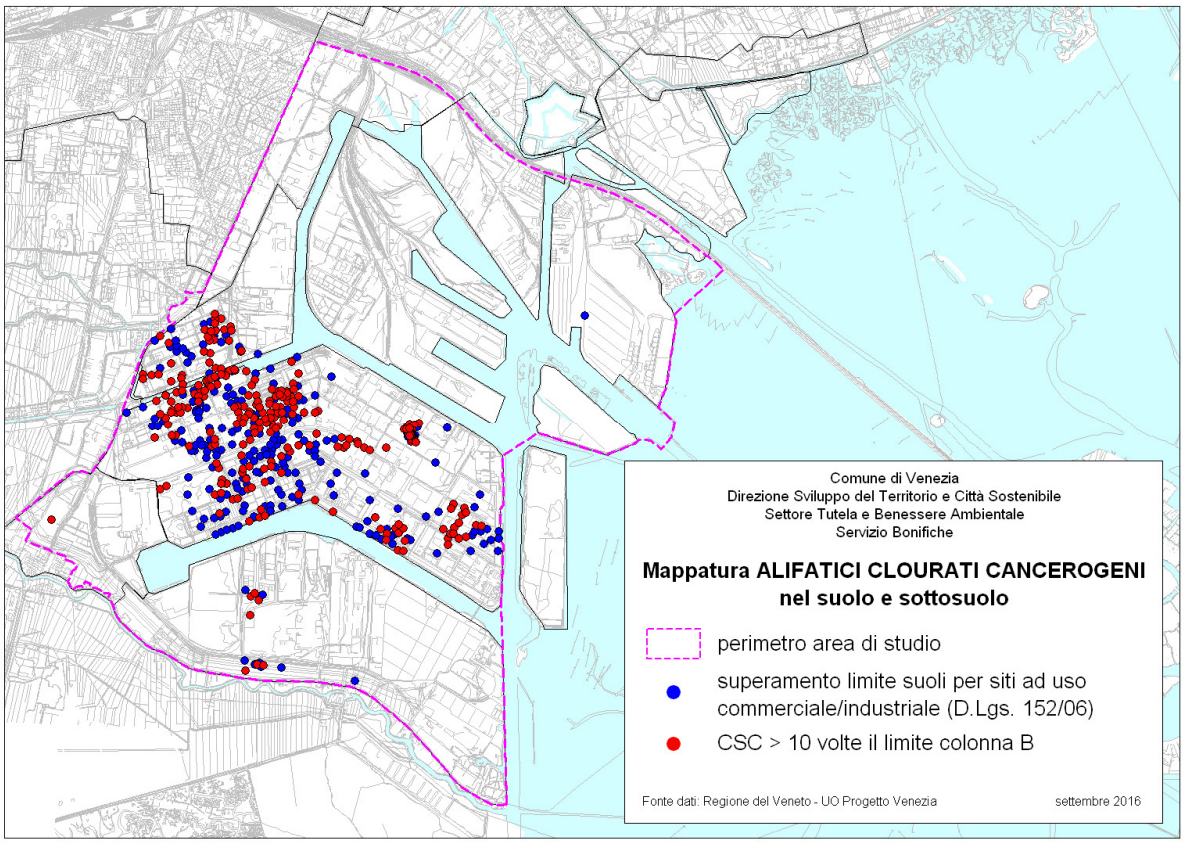
Figure no. 10: Map of carcinogenic chlorinated aliphatic compounds in soil and subsoil

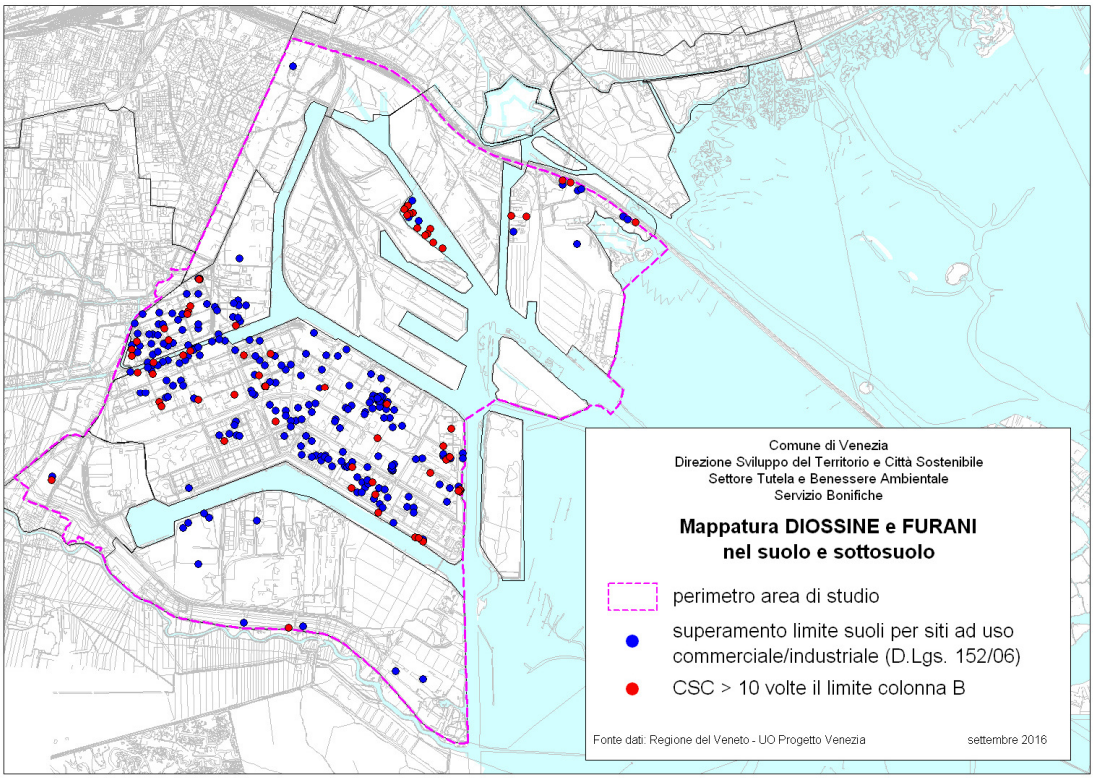
Figure no. 11: Map of dioxines and furans in soil and subsoil

Figure no. 12: Map of hydrocarbons in soil and subsoil

Figure no. 13: Map of inorganic compounds in soil and subsoil

Figure no. 14: Map of polycyclic aromatic hydrocarbons in soil and subsoil

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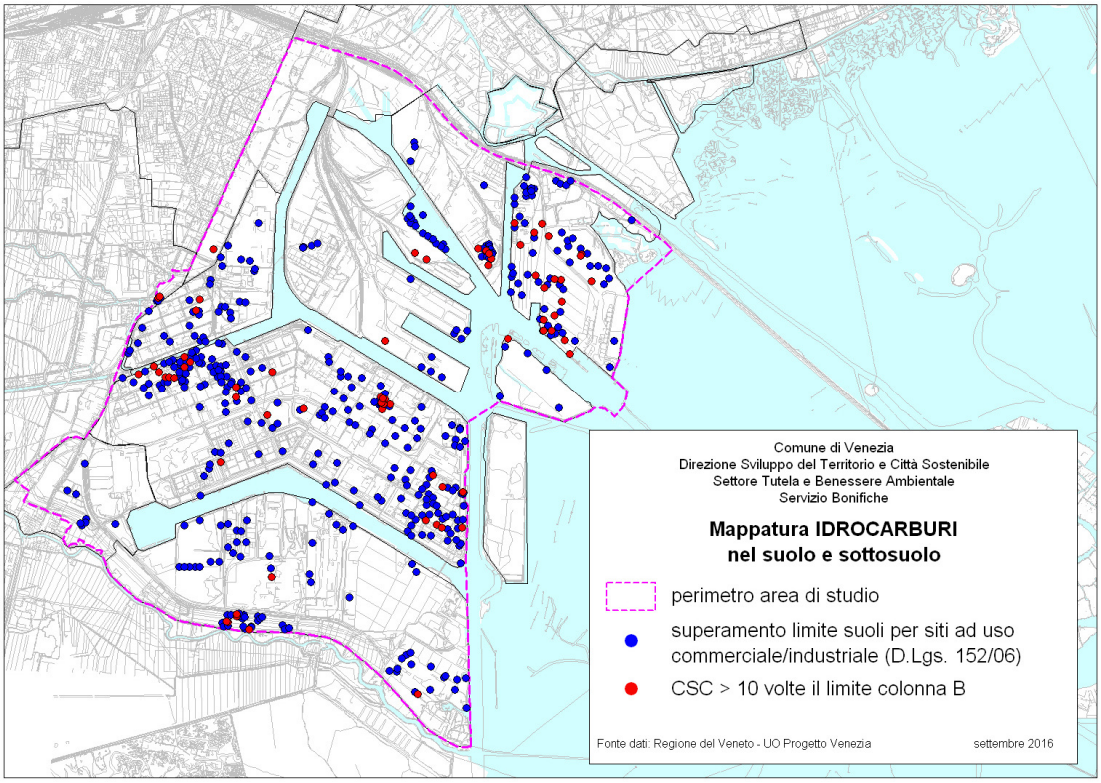
nel suolo e sottosuolo
perimetro area di studio
superamento limite suoli per siti ad uso commerciale/industriale (D.Lgs. 152/06)
CSC > 10 volte il limite colonna B
Fonte dati: Regione del Veneto - UO Progetto Venezia
settembre 2016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Servizio Bonifiche
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nel suolo e sottosuolo
perimetro area di studio
superamento limite suoli per siti ad uso commerciale/industriale (D.Lgs. 152/06)
CSC > 10 volte il limite colonna B
Fonte dati: Regione del Veneto - UO Progetto Venezia
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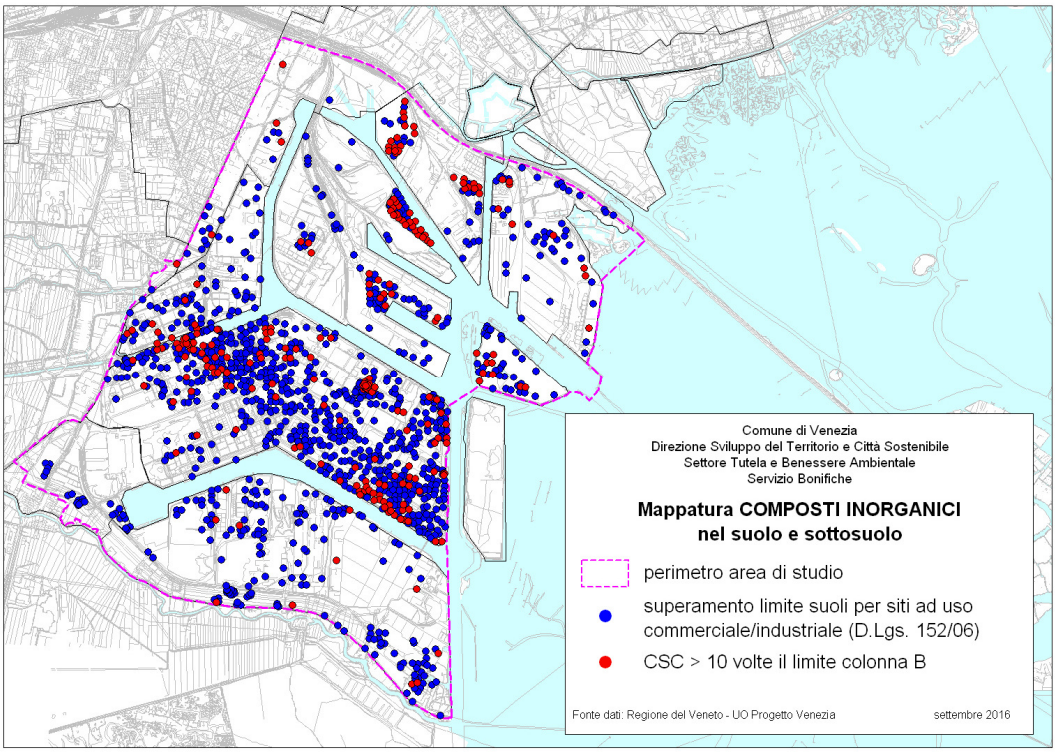
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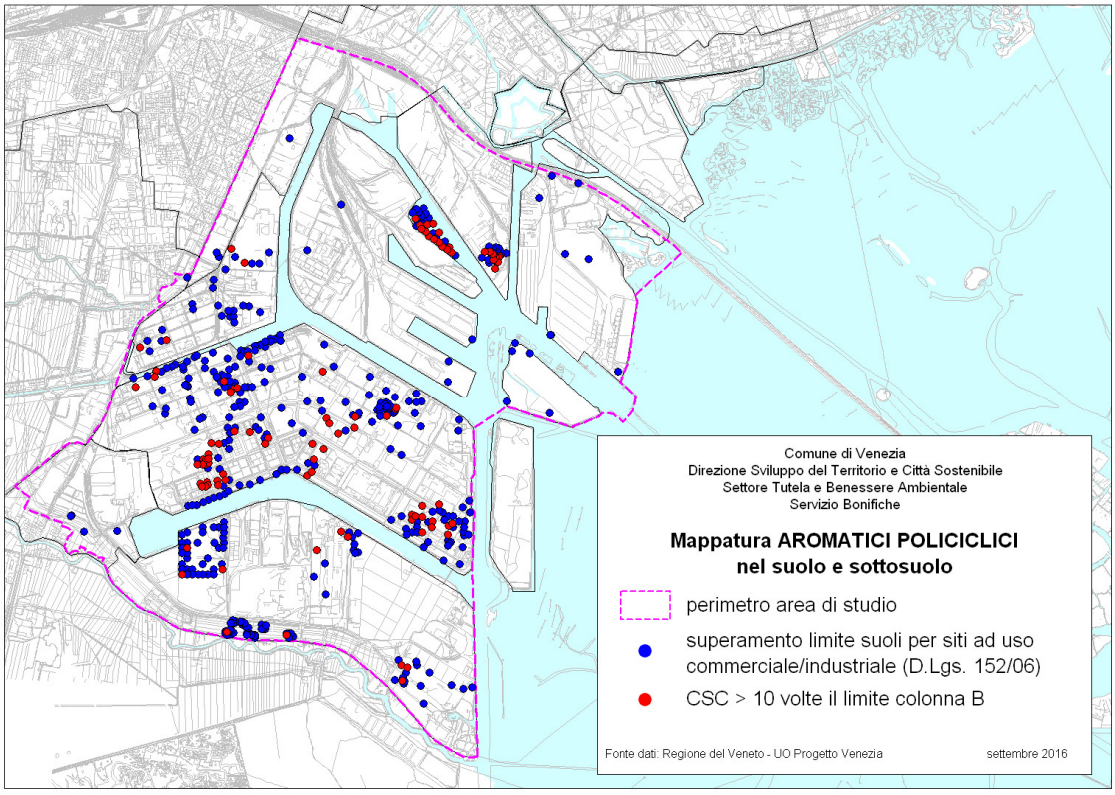
Settore Tutela e Benessere Ambientale
Servizio Bonifiche
Mappatura COMPOSTI INORGANICI
nel suolo e sottosuolo
perimetro area di studio
superamento limite suoli per siti ad uso commerciale/industriale (D.Lgs. 152/06)
CSC > 10 volte il limite colonna B
Fonte dati: Regione del Veneto - UO Progetto Venezia
settembre 2016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perimetro area di studio
superamento limite suoli per siti ad uso commerciale/industriale (D.Lgs. 152/06)
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settembre 2016

2.2.3.3 Quality of underground water

For the analysis of the underground water matrix, the Master Plan's lithostratigraphic and hydrogeological model was adopted, which sets the following succession:

Chart no. 7: Master Plan's lithostratigraphic and hydrogeological model

LITHOLOGY LAYERS	HYDROGEOLOGY SERIES
Backfilling (anthropic raise of the ground level, if needed, made of sand, silt and clay in variable proportions and local presence of cobbles and pebbles, fragments of bricks, scraps from factories and materials from the excavation of canals.	"Aquifer" in backfill
First impermeable layer (Barena/Caranto)	Aquitard-aquiclude
First sandy horizon	First aquifer (average roof depth -5,3 m abs and average thickness of about 5 m)
Second impermeable layer	Aquitard-aquiclude
Second sandy horizon	Second aquifer

For this paper, porous piezometers were used in the backfill aquifer and in the first aquifer.

Since 1999, 819 piezometers have been installed in the ReSites area of study to investigate on the contamination state of the aquifer in the anthropic backfill layer and 761 piezometers for the first aquifer.

No. 767 piezometers in the backfill (94% of total) and 680 piezometers in the first aquifer (89.5% of total) are non compliant with the contamination threshold concentration (CTC) values for underground water (chart 2 in annex 5 to chapter V, part IV of Legislative Decree no. 152/06) (Figure).

Charts 7 and 8 show a synthesis, by macro-island, of the number of piezometers, from the backfill aquifer and the first aquifer respectively, which show CTC exceedances for each of the families of contaminants included in chart 2 of Legislative Decree no. 152/06 and, as a subset, those with exceedances over 10 times CTCs. Such high exceedances for persisting, very toxic and/or carcinogenic parameters are considered hot spots (according to the National Institute of Health, with registered note 039021 AMPP/IA.12 of 08/13/2004) and imply the adoption of prevention and emergency safety enhancement measures for human and environmental protection.

In the backfill aquifer, the families of contaminants with the most widespread exceedances (found in more than 30% of piezometers in at least one macro-area) are:

- carcinogenic halogenated aliphatic compounds;
- carcinogenic chlorinated aliphatic compounds;
- non-carcinogenic chlorinated aliphatic compounds;

- aromatic hydrocarbons;
- polycyclic aromatic hydrocarbons;
- chlorobenzenes;
- inorganic compounds.

Based on the elaboration of the data available, the aquifer in the backfill shows widespread contamination. Contamination is mainly due to the presence of carcinogenic halogenated aliphatic compounds, carcinogenic chlorinated aliphatic compounds, non-carcinogenic chlorinated aliphatic compounds, polycyclic aromatic hydrocarbons and inorganic compounds (mostly metals).

The macro-islands that show the most widespread contamination are the Old and New Petrochemical areas, Fusina and the First Industrial Area.

As for the Old and New Petrochemical areas, there is a notable presence of halogenated and chlorinated aliphatic compounds and of inorganic compounds such as mercury and chromium, in line with the productions performed there.

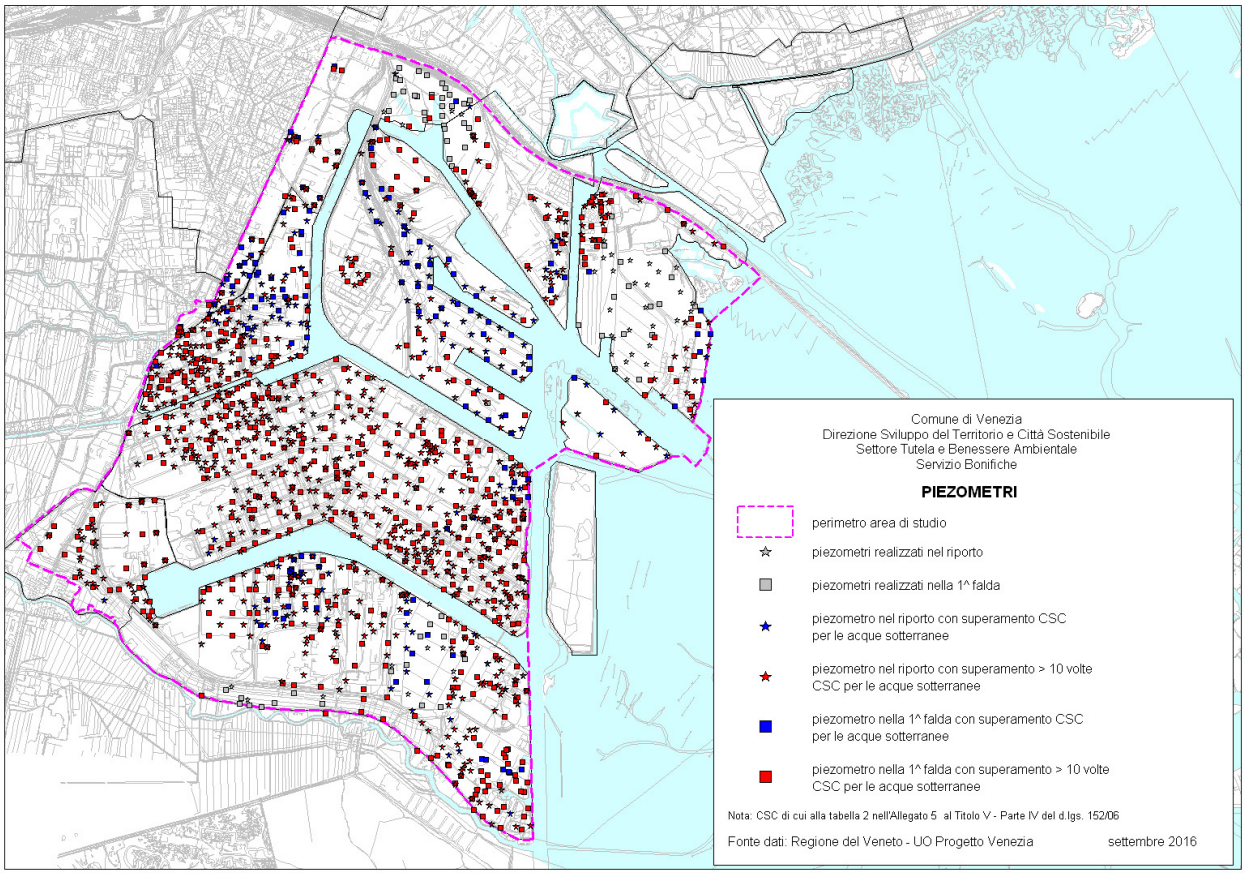


Figure 15: Piezometers installed in the ReSites area of study for the quality analysis of the backfill aquifer and the first aquifer highlighting statutory limits exceedances (CTCs).

In the first aquifer, the families of contaminants with the most widespread exceedances (found in more than 30% of piezometers in at least one macro-area) are:

1) carcinogenic halogenated aliphatic compounds;

2) carcinogenic chlorinated aliphatic compounds;
3) non-carcinogenic chlorinated aliphatic compounds;
4) aromatic hydrocarbons;
5) polycyclic aromatic hydrocarbons;
6) inorganic compounds.

Based on the elaboration of the data available, the first aquifer shows widespread contamination, similar to that in the backfill aquifer. Contamination is mainly due to the presence of carcinogenic halogenated aliphatic compounds, carcinogenic chlorinated aliphatic compounds, non-carcinogenic chlorinated aliphatic compounds, polycyclic aromatic hydrocarbons and inorganic compounds (mostly metals). It should be noted that, compared to the backfill aquifer, the presence of carcinogenic halogenated aliphatic compounds and polycyclic aromatic hydrocarbons is lower, while there is a higher presence of organic aromatic compounds.

The macro-islands that show the most widespread contamination are the Old and New Petrochemical areas.

As for the Old and New Petrochemical areas, there is a notable presence of chlorinated aliphatic compounds and of inorganic compounds such as mercury and chromium, in line with the productions performed there.

Below are some contaminant distribution maps for the main families of contaminants found in underground water, showing the piezometers installed in the backfill aquifer and in the first aquifer (Figures from no. 16 to no. 22).

Chart no. 7: CTC exceedances in the backfill aquifer by family of contaminants

Macro-area			Fusina		Malcontenta		New Petrochemical plant		Old Petrochemical plant		North		Port		I Industrial Area		Refineries and Tanks	
no. of piezometers	Total	819	139		34		323		105		44		77		30		67	
	With exceedance	767	127	91%	33	97%	323	100%	102	97%	37	84%	76	99%	30	100%	39	58%
no. of piezometers with exceedances	Families of contaminants	Para-phthalic acid	0	0%	0	0%	87	27%	0	0%	0	0%	0	0%	0	0%	0	0%
		Carcinogenic halogenated aliphatic compounds	17	12%	26	76%	97	30%	13	12%	4	9%	64	83%	3	10%	11	16%
		Carcinogenic chlorinated aliphatic compounds	39	28%	12	35%	275	85%	72	69%	16	36%	15	19%	4	13%	8	12%
		Non-carcinogenic chlorinated aliphatic compounds	54	39%	30	88%	307	95%	63	60%	11	25%	64	83%	9	30%	17	25%
		Aromatic amines	0	0%	0	0%	217	67%	7	7%	0	0%	0	0%	0	0%	0	0%
		Aromatic hydrocarbons	8	6%	3	9%	165	51%	31	30%	0	0%	3	4%	6	20%	2	3%
		Polycyclic aromatic hydrocarbons	45	32%	9	26%	201	62%	29	28%	2	5%	8	10%	12	40%	19	28%
		Chlorobenzenes	3	2%	2	6%	142	44%	8	8%	0	0%	0	0%	0	0%	4	6%
		Inorganic compounds	125	90%	30	88%	317	98%	95	90%	35	80%	71	92%	28	93%	36	54%
		Dioxines, furans, pcbs	3	2%	0	0%	59	18%	10	10%	0	0%	2	3%	1	3%	5	7%
		Ethers	10	7%	2	6%	0	0%	0	0%	0	0%	0	0%	0	0%	6	9%
		Phenols and Chlorinated phenols	0	0%	0	0%	4	1%	0	0%	0	0%	0	0%	0	0%	0	0%
		Hydrocarbons	6	4%	3	9%	49	15%	4	4%	1	2%	3	4%	11	37%	3	4%
		Nitrobenzenes	0	0%		0%	1	0%	0	0%	0	0%	0	0%	0	0%	0	0%

no. of piezometers with hotspots	Families of contaminants	Para-phthalic acid	0	0%	0	0%	87	27%	0	0%	0	0%	0	0%	0	0%	0	0%
		Carcinogenic halogenated aliphatic compounds	15	11%	26	76%	69	21%	2	2%	4	9%	1	1%	2	7%	11	16%
		Carcinogenic chlorinated aliphatic compounds	8	6%	9	26%	239	74%	55	52%	4	9%	8	10%	0	0%	0	0%
		Non-carcinogenic chlorinated aliphatic compounds	48	35%	30	88%	220	68%	56	53%	10	23%	5	6%	9	30%	17	25%
		Aromatic amines	0	0%	0	0%	22	7%	7	7%	0	0%	0	0%	0	0%	0	0%
		Aromatic hydrocarbons	4	3%	2	6%	67	21%	6	6%	0	0%	1	1%	4	13%	0	0%
		Polycyclic aromatic hydrocarbons	31	22%	1	3%	116	36%	8	8%	0	0%	4	5%	5	17%	8	12%
		Chlorobenzenes	0	0%	1	3%	46	14%	2	2%	0	0%	0	0%	0	0%	1	1%
		Inorganic compounds	74	53%	17	50%	208	64%	29	28%	12	27%	21	27%	14	47%	14	21%
		Dioxines, furans, pcbs	0	0%	0	0%	14	4%	3	3%	0	0%	2	3%	0	0%	3	4%
		Ethers	6	4%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	4	6%
		Phenols and Chlorinated phenols	0	0%	0	0%	2	1%	0	0%	0	0%	0	0%	0	0%	0	0%
		Hydrocarbons	3	2%	0	0%	12	4%	2	2%	0	0%	0	0%	6	20%	0	0%
		Nitrobenzenes	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%

Chart no. 8: CTC exceedances in the first aquifer by family of contaminants

Macro-area			Fusina		Malcontenta		New Petrochemical plant		Old Petrochemical plant		North		Port		I Industrial Area		Refineries and Tanks	
no. of piezometers in first aquifer	Total	761	159		30		246		94		77		72		23		60	
	With exceedance	680	127	80%	30	100%	246	100%	93	99%	47	61%	70	97%	23	100%	44	73%
no. of piezometers in first aquifer with exceedances	Families of contaminants	Para-phthalic acid	0	0%	0	0%	59	24%	0	0%	0	0%	0	0%	0	0%	0	0%
		Carcinogenic halogenated aliphatic compounds	17	11%	23	77%	99	40%	20	21%	14	18%	61	85%	6	26%	18	30%
		Carcinogenic chlorinated aliphatic compounds	39	25%	15	50%	212	86%	76	81%	24	31%	7	10%	9	39%	10	17%
		Non-carcinogenic chlorinated aliphatic compounds	54	34%	29	97%	228	93%	60	64%	22	29%	62	86%	13	57%	23	38%
		Aromatic amines	0	0%	0	0%	154	63%	7	7%	0	0%	0	0%	0	0%	0	0%
		Aromatic hydrocarbons	8	5%	5	17%	117	48%	39	41%	2	3%	4	6%	1	4%	1	2%
		Polycyclic aromatic hydrocarbons	45	28%	1	3%	83	34%	17	18%	2	3%	1	1%	1	4%	7	12%
		Chlorobenzenes	3	2%	3	10%	63	26%	5	5%	2	3%	0	0%	0	0%	1	2%
		Inorganic compounds	125	79%	30	100%	244	99%	90	96%	47	61%	62	86%	21	91%	44	73%
		Dioxines, furans, pcbs	3	2%	0	0%	17	7%	8	9%	0	0%	6	8%	0	0%	8	13%
		Ethers	10	6%	0	0%	0	0%	1	1%	0	0%	0	0%	0	0%	5	8%
		Phenols and Chlorinated phenols	0	0%	0	0%	1	0%	0	0%	0	0%	0	0%	0	0%	0	0%
		Hydrocarbons	6	4%	0	0%	30	12%	15	16%	1	1%	2	3%	2	9%	2	3%
		Nitrobenzenes	0	0%		0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
no. of piezometers in top groundwater with hotspots	Families of contaminants	Para-phthalic acid	0	0%	0	0%	59	24%	0	0%	0	0%	0	0%	0	0%	0	0%
		Carcinogenic halogenated aliphatic compounds	15	9%	23	77%	58	24%	4	4%	12	16%	2	3%	3	13%	13	22%
		Carcinogenic chlorinated aliphatic compounds	8	5%	11	37%	185	75%	55	59%	15	19%	7	10%	3	13%	3	5%
		Non-carcinogenic chlorinated aliphatic compounds	48	30%	28	93%	174	71%	53	56%	18	23%	15	21%	13	57%	23	38%
		Aromatic amines	0	0%	0	0%	33	13%	7	7%	0	0%	0	0%	0	0%	0	0%
		Aromatic hydrocarbons	4	3%	3	10%	51	21%	16	17%	1	1%	0	0%	0	0%	0	0%
		Polycyclic aromatic hydrocarbons	31	19%	0	0%	36	15%	1	1%	0	0%	0	0%	0	0%	2	3%
		Chlorobenzenes	0	0%	1	3%	16	7%	1	1%	2	3%	0	0%	0	0%	0	0%
		Inorganic compounds	74	47%	20	67%	202	82%	47	50%	15	19%	21	29%	14	61%	17	28%
		Dioxines, furans, pcbs	0	0%	0	0%	5	2%	1	1%	0	0%	5	7%	0	0%	0	0%
		Ethers	6	4%	0	0%	0	0%	1	1%	0	0%	0	0%	0	0%	2	3%
		Phenols and Chlorinated phenols	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
		Hydrocarbons	3	2%	0	0%	4	2%	4	4%	0	0%	0	0%	0	0%	0	0%
		Nitrobenzenes	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%

Figure no. 16: Map of carcinogenic halogenated aliphatic compounds in underground water

Figure no. 17: Map of carcinogenic chlorinated aliphatic compounds in underground water

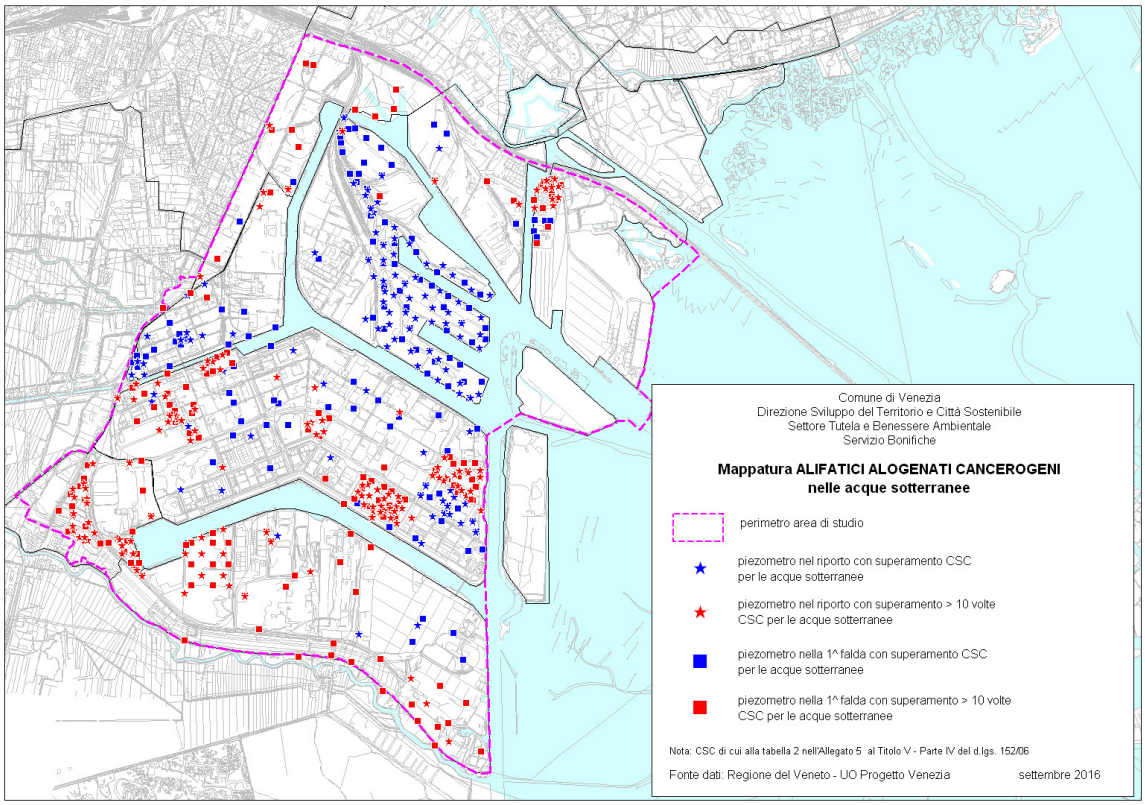
Figure no. 18: Map of non-carcinogenic chlorinated aliphatic compounds in underground water

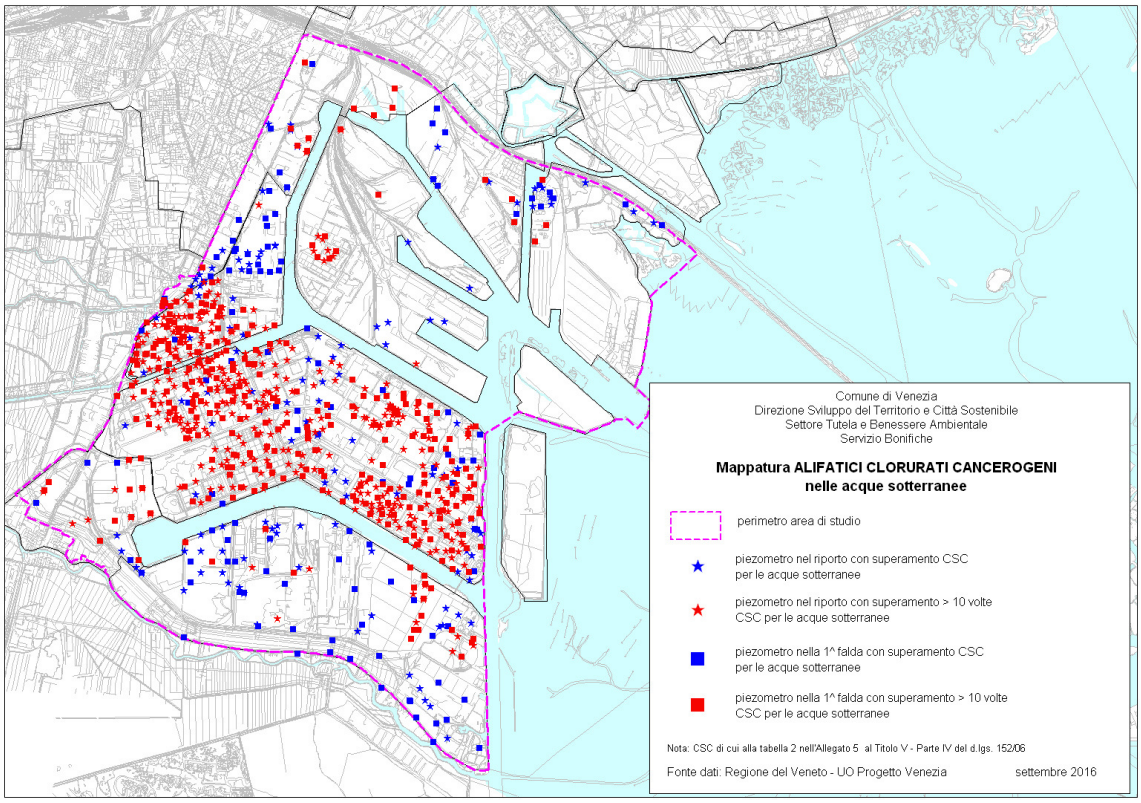
Figure no. 19: Map of aromatic hydrocarbons in underground water

Figure no. 20: Map of polycyclic aromatic hydrocarbons in underground water

Figure no. 21: Map of chlorobenzenes in underground water

Figure no. 22: Map of inorganic compounds in underground water

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Direzione Sviluppo del Territorio e Città Sostenibile
Settore Tutela e Benessere Ambientale
Servizio Bonifiche
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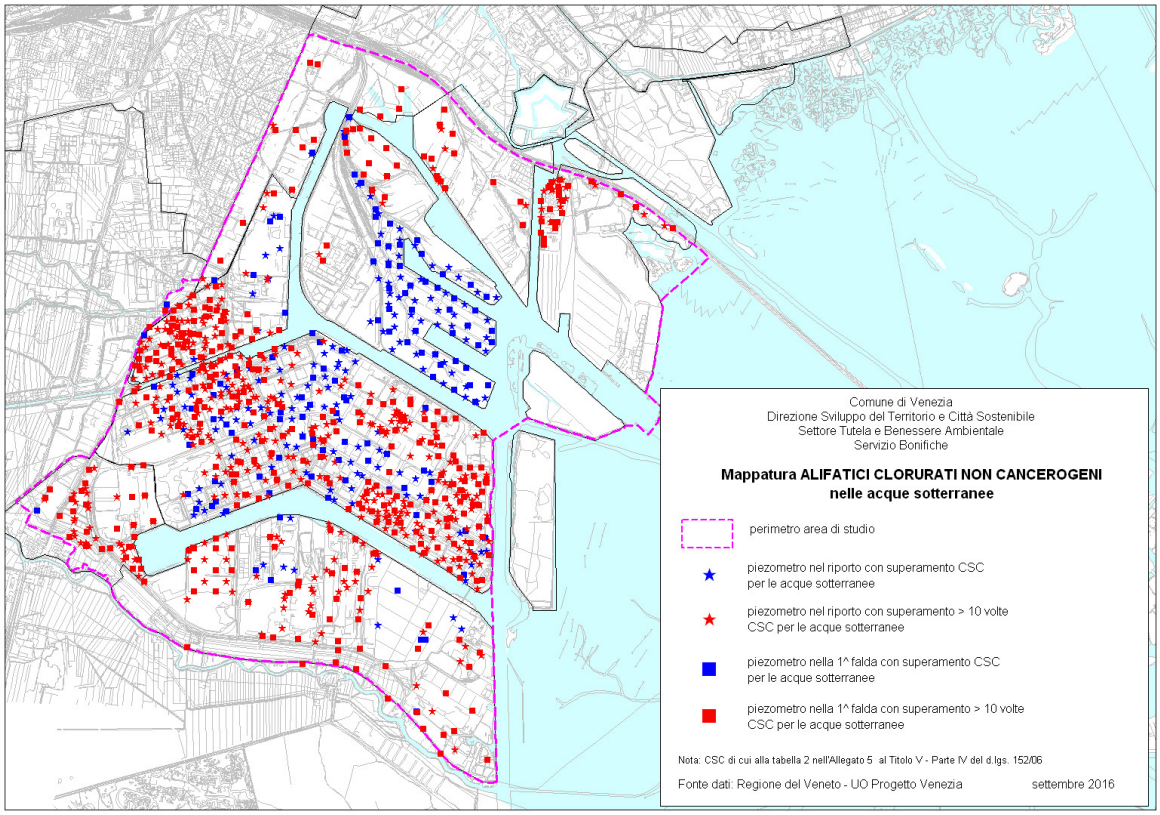
nelle acque sotterranee
perimetro area di studio
piezometro nel riporto con superamento CSC per le acque sotterranee
piezometro nel riporto con superamento > 10 volte CSC per le acque sotterranee
piezometro nella 1^ falda con superamento CSC per le acque sotterranee
piezometro nella 1^ falda con superamento > 10 volte CSC per le acque sotterranee
Nota: CSC di cui alla tabella 2 nell'Allegato 5 al Titolo V - Parte IV del d.lgs. 152/06
Fonte dati: Regione del Veneto - UO Progetto Venezia
settembre 2016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Settore Tutela e Benessere Ambientale
Servizio Bonifiche
Mappatura ALIFATICI CLORURATI NON CANCEROGENI
nelle acque sotterranee
perimetro area di studio
piezometro nel riporto con superamento CSC per le acque sotterranee
piezometro nel riporto con superamento > 10 volte CSC per le acque sotterranee
piezometro nella 1^ falda con superamento CSC per le acque sotterranee
piezometro nella 1^ falda con superamento > 10 volte CSC per le acque sotterranee
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Fonte dati: Regione del Veneto - UO Progetto Venezia
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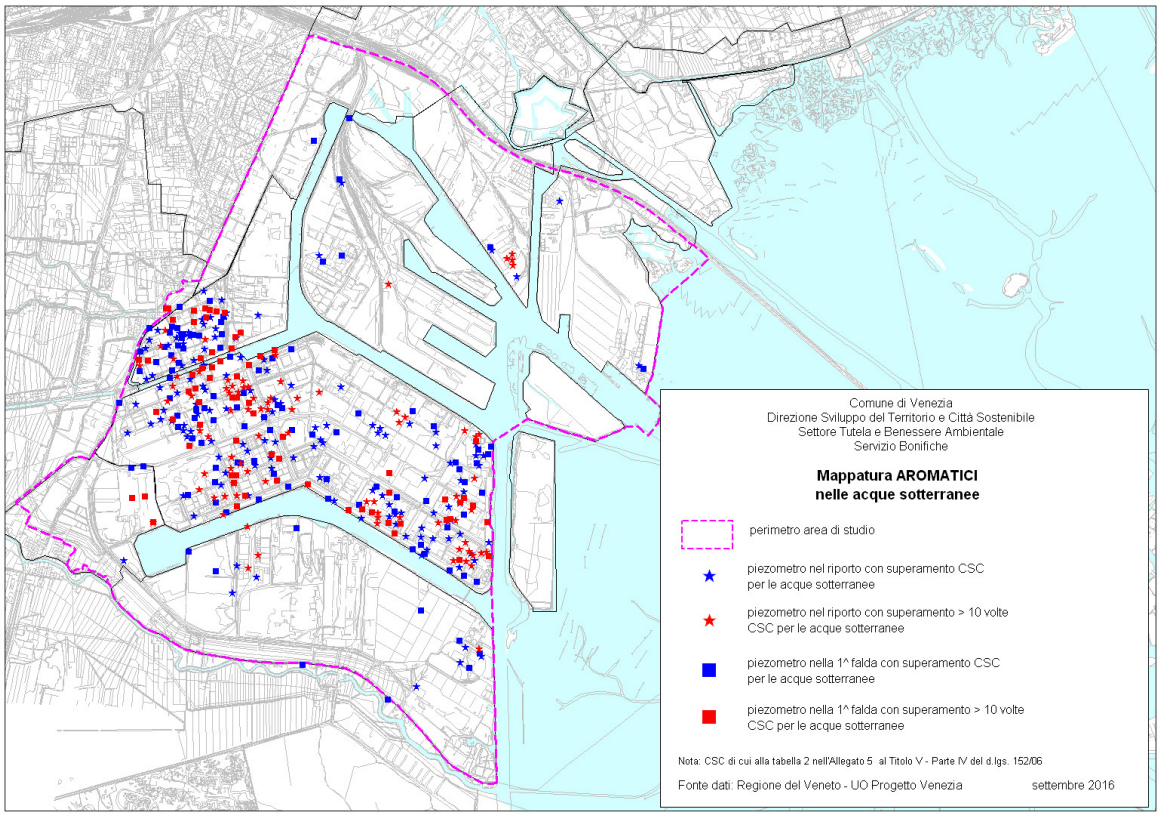
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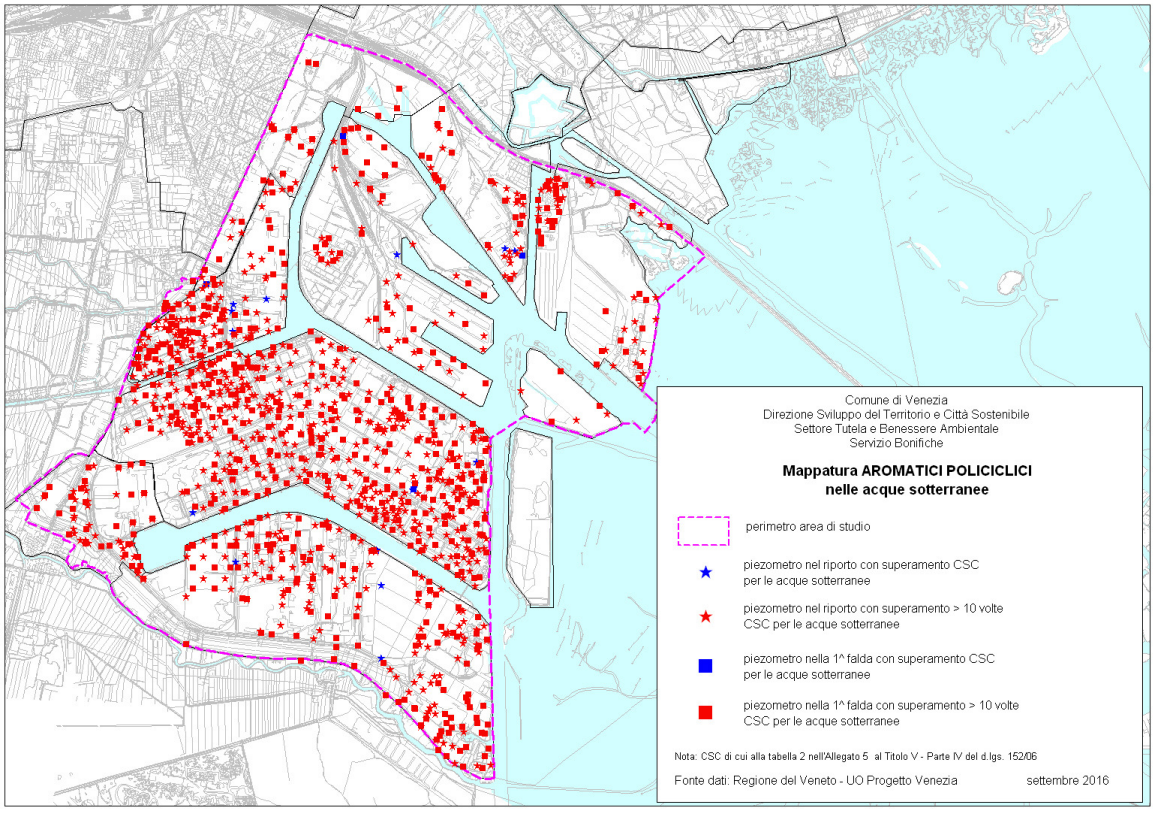
Direzione Sviluppo del Territorio e Città Sostenibile
Settore Tutela e Benessere Ambientale
Servizio Bonifiche
Mappatura AROMATICI
nelle acque sotterranee
perimetro area di studio
piezometro nel riporto con superamento CSC per le acque sotterranee
piezometro nel riporto con superamento > 10 volte CSC per le acque sotterranee
piezometro nella 1^ falda con superamento CSC per le acque sotterranee
piezometro nella 1^ falda con superamento > 10 volte CSC per le acque sotterranee
Nota: CSC di cui alla tabella 2 nell'Allegato 5 al Titolo V - Parte IV del d.lgs. 152/06
Fonte dati: Regione del Veneto - UO Progetto Venezia
settembre 2016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Settore Tutela e Benessere Ambientale
Servizio Bonifiche
Mappatura AROMATICI POLICICLICI
nelle acque sotterranee
perimetro area di studio
piezometro nel riporto con superamento CSC per le acque sotterranee
piezometro nel riporto con superamento > 10 volte CSC per le acque sotterranee
piezometro nella 1^ falda con superamento CSC per le acque sotterranee
piezometro nella 1^ falda con superamento > 10 volte CSC per le acque sotterranee
Nota: CSC di cui alla tabella 2 nell'Allegato 5 al Titolo V - Parte IV del d.lgs. 152/06
Fonte dati: Regione del Veneto - UO Progetto Venezia
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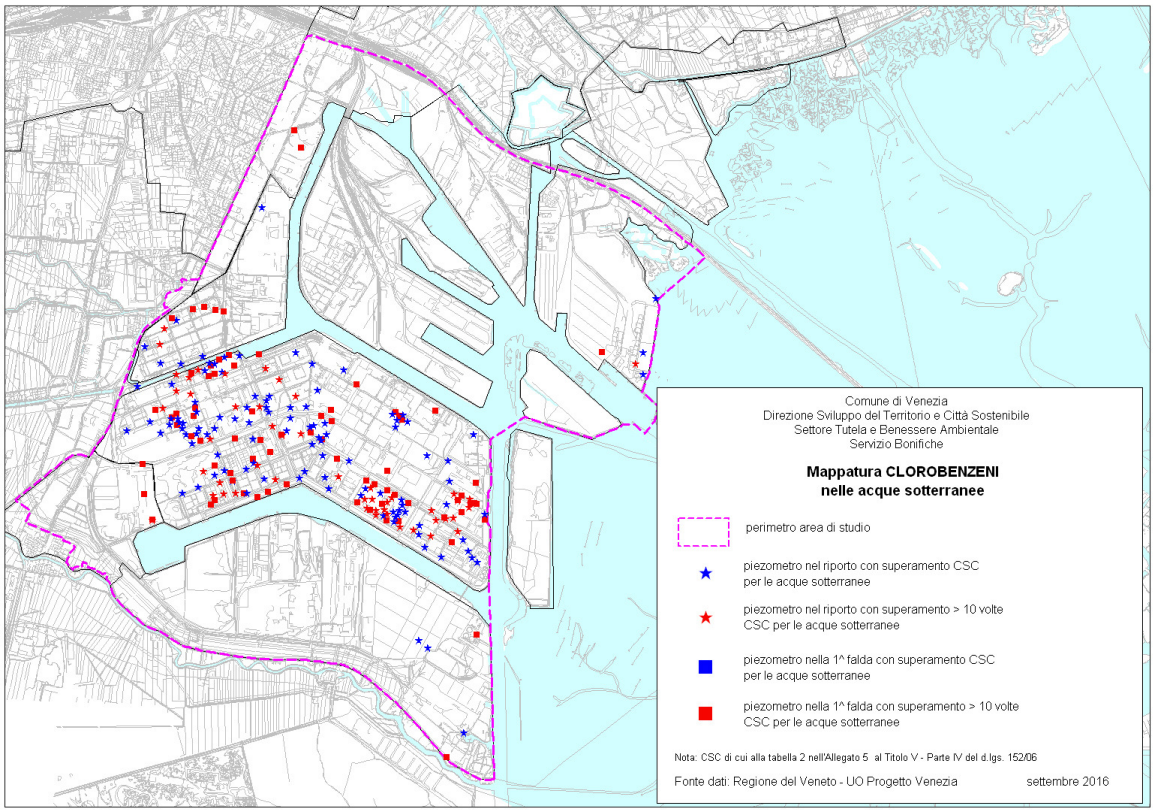
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Direzione Sviluppo del Territorio e Città Sostenibile
Settore Tutela e Benessere Ambientale
Servizio Bonifiche
Mappatura CLOROBENZENI
nelle acque sotterranee
perimetro area di studio
piezometro nel riporto con superamento CSC per le acque sotterranee
piezometro nel riporto con superamento > 10 volte CSC per le acque sotterranee
piezometro nella 1^ falda con superamento CSC per le acque sotterranee
piezometro nella 1^ falda con superamento > 10 volte CSC per le acque sotterranee
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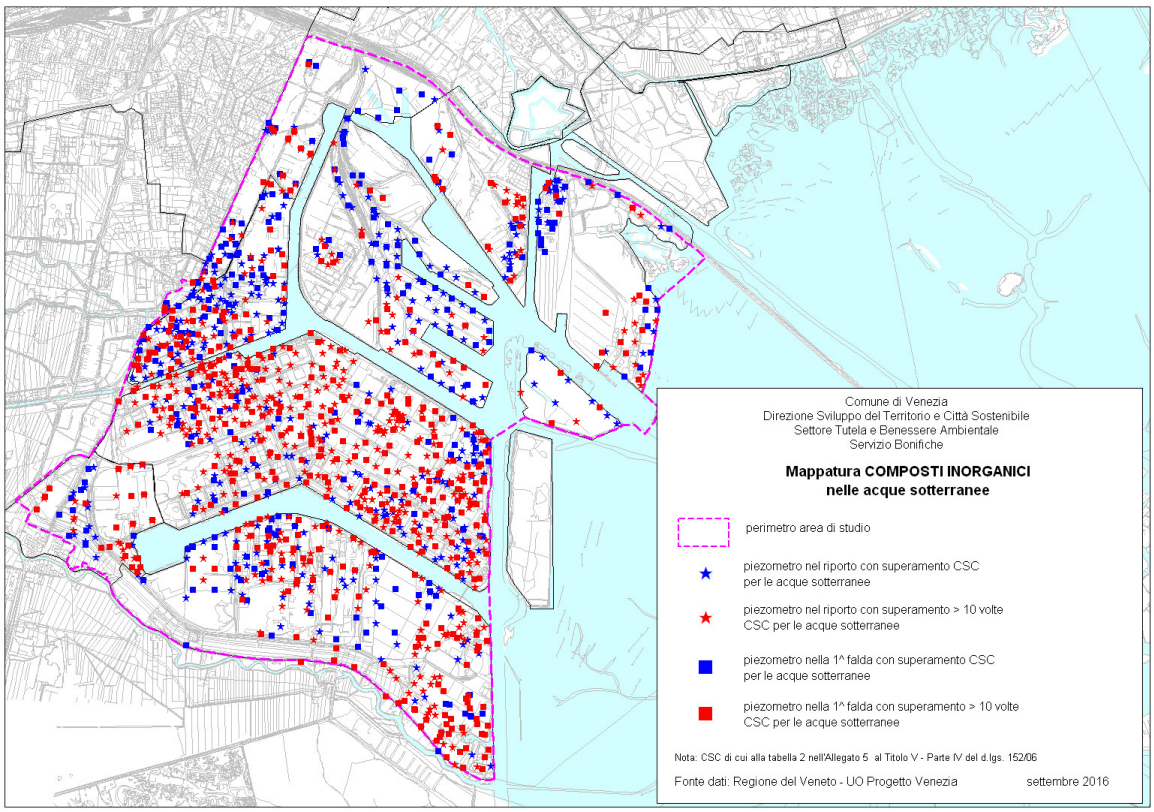
Fonte dati: Regione del Veneto - UO Progetto Venezia
settembre 2016


Comune di Venezia
Direzione Sviluppo del Territorio e Città Sostenibile
Settore Tutela e Benessere Ambientale
Servizio Bonifiche
Mappatura COMPOSTI INORGANICI
nelle acque sotterranee
perimetro area di studio
piezometro nel riporto con superamento CSC per le acque sotterranee
piezometro nel riporto con superamento > 10 volte CSC per le acque sotterranee
piezometro nella 1^ falda con superamento CSC per le acque sotterranee
piezometro nella 1^ falda con superamento > 10 volte CSC per le acque sotterranee
Nota: CSC di cui alla tabella 2 nell'Allegato 5 al Titolo V - Parte IV del d.lgs. 152/06
Fonte dati: Regione del Veneto - UO Progetto Venezia
settembre 2016

2.2.3.4 State of rehabilitation procedures

Based on the widespread contamination found in the area under analysis, the procedure required for contaminated site cleanup under article 242 of Legislative Decree no. 152/06 was activated on 1685 ha (corresponding to 92% of the area under study), while on an additional 22 ha, only preliminary environmental investigations were performed. The following table n. 9 lists the stages of the procedure and the total extension of the sites that have passed their relevant stage (and, consequently, previous stages). The state of cleanup procedures activated pursuant to Legislative Decree no. 152/2006, as results from the Soil Information System of the Municipality of Venice (Department of Territorial Development and Sustainable City, Environmental Protection and Wellness, Cleanup Service) is also shown in Figure no. 23 below.

In particular, on 65 ha only there is no full knowledge on the environmental conditions of the area yet; on 355 ha (19%) the state of contamination is known but no cleanup or release procedures have been initiated yet; on approximately half of the studied area (896 ha, 49% of the whole area) the cleanup project has already been approved by the specific Conference of Services or through Decree by the Competent Authority, while on 241 ha only (14%) cleanup was performed and on 90 ha (5%) it turned out that the site does not need any intervention.

To summarize, you can see that on one hand almost all the Marghera industrial area is involved in the reclamation process started in the early 2000s with the unprecedented engagement of public authorities and the subjects based there; on the other hand, it is difficult to complete that process until the final stage of cleanup, which still covers 14% of the area only.

Of course this is in line with the intrinsic complexity of cleanup technical and administration procedures but we believe that, due to the progressive crisis of the production regeneration system of the industrial site, it is unlikely for it to allow addressing the overall recovery of the areas.

Chart 9: Process stages and total area of the sites that have passed the corresponding stage

Situation of procedures as per Legislative Decree no. 152/06	**ha**	**% out of 1828 ha**
Environmental investigations performed	22	1%
Characterisation plan submitted	2	0%
Characterisation plan approved	41	2%
Characterisation plan executed	355	19%
Cleanup project submitted	27	1%
Cleanup project approved	233	13%
Cleanup project ratified	663	36%
Cleanup project executed	66	4%
Cleanup project certified	175	10%
No intervention needed	90	5%
Landfills after Presidential Decree 915/82	33	2%
Total procedures activated	**1707**	**93%**

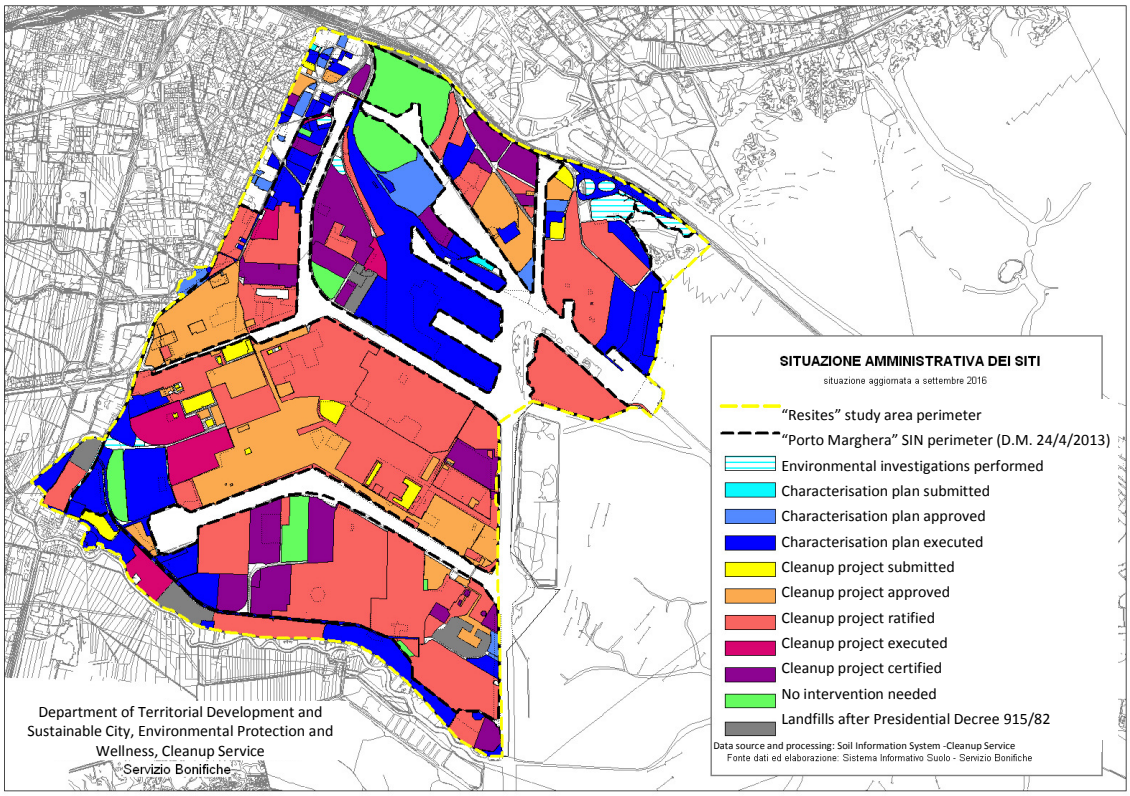


Figure no. 23: State of cleanup procedures activated pursuant to Legislative Decree no. 152/2006

2.2.4. Natural implications and potential impacts[15]

Pursuant to the community Habitats (directive 92/43/EEC) and Birds (directive 79/409/EEC) directives, the Venetian Lagoon was designated as Special Protection Area (S.A.P.).

The S.A.P. IT3250046 "Venetian Lagoon" features a complex system mainly composed of brackish environments, intertidal salt marshes (barene) and tidal flats which emerge with low tides (velme), lagoon islands, sediment reservoirs, mainland sectors, belonging to the lowland, with important rivers (Bacchiglione, Brenta, Dese, Sile) and wide farming areas.

The Venetian Lagoon is located along the coastal strip of the North-Western Adriatic Sea, between the outlets of the Sile river to the North and the Brenta river to the South. It is a complex hydraulic system regulated and characterised by cyclical tidal changes and connected to the Adriatic Sea through three Port Entrances: Lido, Malamocco and Chioggia. It is physically separated from the sea by barrier islands ("lidi"), long sand strips stretching for about 50 km (Lido di Jesolo, L. di Venezia, L. di Pellestrina and L. di Sottomarina).

It is Italy's largest lagoon covering a surface of 55,000 ha, with the lagoon basin split by three watersheds into 4 wide sub-basins: Treporti (150 km2) and Lido (100 km2) to the North, Malamocco (170 km2) at the centre and Chioggia (130 km2) to the South.

Each sub-basin is in constant communication with the sea through the port entrances, from which originate deep navigations which gradually branch out into smaller and shallower canals, ending up in a network of tidal creeks (ghebi).

[15] Source: Venetian Lagoon Management Plan - Preliminary Document – Review of 29th July 2009.

The overall maximum flow rate of the three port entrances totals approximately 1900 m3/s. More than four fifths of the lagoon's water surface are affected by the tidal excursion, which is the biggest in the Mediterranean, with changes between the maximum and minimum levels of about 1 m (Umgiesser et al., 2004).

About 80% of the whole lagoon area is made up of water bodies, the rest consists of emerged lands and marshes (barene).

The lagoon's current morphology is the result of multiple anthropic activities that changed its natural evolution during time. The main works made in the past on the Venetian Lagoon were the diversion of the Sile and Brenta river flows away from the lagoon basin to flow directly into the Adriatic Sea, the protection of the coastal zone with coast consolidation works (seawalls - murazzi), the construction of a mole to prevent port entrances from being filled up, the cleanup of large areas, the excavation of the Petroli canal, etc.

Emerged lands, represented by islands, are just 5% of the lagoon's total area since almost 60% is covered by water and 17% by fish farms (valli da pesca), while the remaining 18% consists of swamps with salt marshes (barene), which are “water level” lands covered by halophytic vegetation.

The 24 banked fish farms in the lagoon cover a a surface of about 9,000 ha and, in addition to being used for extensive farming of many fish species, represent an environment of high naturalistic interest.

The depth of the lagoon is extremely variable according to the areas: 15-20 m in the major canals (ex: Canale dei Petroli and Port Entrances), generally under one metre in swamps (palui) and 1-3 m in the remaining areas.

The hydrodynamic conditions in the lagoon are complex and depend on the periodic tidal oscillations, the rivers flowing from the inland and the water exchange through Port Entrances, which together make up the whole lagoon morphology.

The Venetian Lagoon has a large variety of sediments in it (sand, loam and clay), caused by the hydrodynamic features of the specific area. The distribution of surface sediments shows a progressive decrease in the size of particles, starting from the Port Entrances towards the most inner areas. It is possible to see an accumulation of coarser materials (sand and silty sand) in proximity of the Port Entrances where the tide currents are high and depositions of the fine fraction (silt and clay) in the innermost areas with weaker hydrodynamic conditions.

The lagoon bed has a pretty constant depth, 1.5 m in average, and is partly covered by underwater meadows of marine phanerogams. Recent studies (Curiel and Rismondo, 2006) show that their distribution is more concentrated in the central-southern lagoon basin, while it is more fragmented in the northern sector of the Lagoon.

According to recent investigations, the community of Zostera noltii, previously the most common one (Caniglia et al., 1990), has been significantly reducing in the last years, while the populations of Zostera marina and Cymodocea nodosa have increased (Curiel and Rismondo, 2006). These three species play a very important role in bed stabilisation and consolidation thanks to the development of a strong rhizome system. Even if they coexist, their distribution is connected to different ecological factors, the main of which are: depth, sediment grain size, water turbidity, hydrodynamic conditions.

The barene (salt marshes) are flat tabular areas of amphibious nature regularly submerged during very high tides and with a clayey and silty substrate. They represent the most typical environment of the Lagoon and are covered by halophytic vegetation suitable for living on salted soils. The repeated cycles of emersion and immersion, which are more evident during certain times of the year, create a complex system of micro-environments, with soils having different

salinity rates and the development of a complex of different plant communities, despite a very low general specific diversity. The first communities to colonise brackish muds are the Salicornietum venetae, which settle in the most protected sectors with low water heads, while in areas where tidal dynamics develop more energy, the mud stabilisation function is entrusted to the efficiency of the root system of the Spartina maritima, whose reference associates are the Limonium narbonense-Spartinetum maritimae, which are physiognomically represented by a dense meadow dominated by the spartina. Both associations are endemic to the northern-Adriatic. The first one is normally composed of pure populations of the annual Venice Salicorne, an endemic species listed as priority species of community interest.

Higher and yet wet lands are covered by the Limonium narbonense-Puccinellietum festuciformis, an association which can be clearly seen on late summer when the common sea lavender (Limonium narbonense) with its exuberant flowering creates special colour effects.

The sarcocornietum (Puccinellio festuciformis-Sarcocornietum fruticosae), in the normal vegetation sequence, succeeds to the limonieto in higher areas and on soils that tend to desiccate on surface during summer. The associates' physiognomy is determined by the large coverage of Sarcocornia fruticosa, a densely branched low-shrub species.

Accumulations of organic substances mostly composed of plant residues deposited by tides, are often covered by dense formations of halophyte species such as the Halimione portulacoides, a boxwood species with excellent ability to absorb large amounts of nitrates. Other species located in compartments less affected by tidal dynamics, occupy a similar ecological niche and tend to form pure populations. Among these, the most common ones are the Suaeda maritima, the Salsola soda and the Atriplex latifolia.

In salt marsh areas towards the inland, between the halophytic and the lagoon edge environments, where salinity decreases and soils are influenced by the presence of freshwater aquifers, vegetation is characterised by rush meadows. The most common one is the Juncus maritimus which forms dense populations. Smaller in size and slender is the Juncus gerardii; it grows in salt marsh sectors closer to the mainland too, and normally covers very small areas.

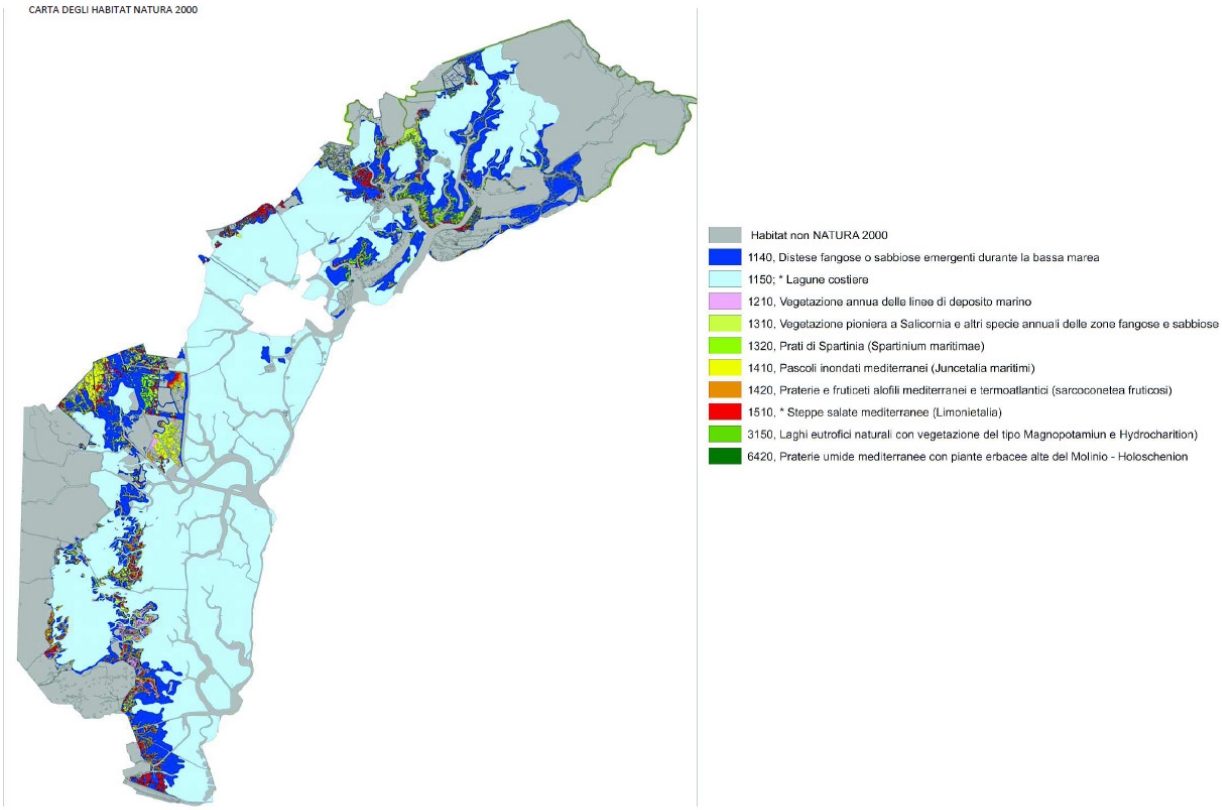


Figure no. 24: Charter of habitats Natura 2000

Rushes are especially located in proximity of the outlets of the streams flowing into the lagoon. The typical freshwater rush is the Phragmitetum australis. As salinity increases, this reed enriches with halotolerant species which make up a different association: Puccinellio festuciformis-Phragmitetum australis. As salinity progressively increases, the size and competitiveness ability of the Phragmites australis decrease, and the halophyte reed is succeeded by the scirpeto (Puccinellia palustris-Scirpetum compacti).

Annex II of Directive 92/43/EC includes one species only belonging to the Lagoon flora, the Salicornia veneta Pign. et Lausi, which is marked as priority by an asterisk. Like most of halophytes, the Salicornia veneta belongs to the Chenopodiaceae family, similarly to the Halimione Aellen, Salsola L., Arthrocnemum Moq., Suaeda Fosskål genera, which are very common in environments with high salinity.

In the S.A.P. IT3250046 "Venetian Lagoon", a lot of different precious habitats can be found, which are listed in the annex I of Directive 92/43/EEC and require special protection measures. Below are some brief notes describing the general and ecological features of each of the habitats existing in the Venetian Lagoon.

Chart no. 10: Habitat's general and ecological features

NATURA 2000 HABITAT CODE	NAME	DESCRIPTION	PICTURE
1140	Mudflats and sandflats not covered by seawater at low tide	This habitat refers to coastal and lagoon sands and muds which emerge at low tide. The morphology of this habitat is generally devoid of vascular plants, but usually coated by blue algae and diatoms. This type is associated with the velme (shoals), areas that are strongly affected by the hydrodynamic conditions which, during emersion times, appear as soft sandy or silty banks of variable shape. They are crossed by an intricate system of canals that flow into a main canal. It is a very dynamic habitat: due to the effect of tides or currents, the velme can be quickly reshaped or demolished and recreated somewhere else. In general they are not very suitable for vegetaion	
1310	Salicornia and other annuals colonising mud and sand	This habitat refers to succulent annual halophyte formations of the class Thero-Salicornietea Pign. 1953 em. R.Tx. 1974, dominated by species of the Salicornia genus (Chenopodiaceae family). Represented in Italy by one order only (Biondi, 1999) and in the Veneto region by one single alliance, it includes communities colonising brackish environments, where salinity is connected to periodical supplies of sea water. There are a few species that tolerate the challenging conditions of these habitats, with a high salinity rate and a cyclical alternation between submersion and extreme dry-up periods, which lead to the formation of surface salt crystals, therefore communities are mono- or paucispecific.	
*1150	Coastal lagoons	The 1150 priority habitat refers to lagoon environments, shallow coastal basins with variable salinity originated from sand barriers or islands which have caused partial isolation from the open sea. The variable change in freshwater supply from rivers or salt water with tides, the sediment grain size, the hydrodynamics and geomorphology contribute to create heterogeneous ecological conditions that are favourable to several hydrophyte species. Among these, the marine phanerogams are the dominating species. These are vascular plants with small flowers that form submerged meadows, featuring a very poor flora where the neat dominance of one species can result in monophytic environments. Phanerogams play a crucial role in bed consolidation due to their complex root system, which is composed of an extremely dense system of horizontal rhizomes to protect the substrate against erosion due to waves, in addition to anchoring the plant firmly. According to the description in the Natura 2000 habitat	

		interpretation manual (The Interpretation Manual of European Union Habitats - EUR27), lagoon sectors devoid of submerged meadows should be included in 1150 habitat, too.	
1210	Annual vegetation of drift lines	This habitat is distributed along Mediterranean sedimentary coasts and normally occupies accumulations of drift material rich in nitrogenous organic matter. It can be found in lagoon environments where it typically colonises the upper edges of salt marshes, but also along the first vegetation strip of the beaches. From a soil point of view, this habitat is very rich in nutrients and has a high salinity, which allow a few annual halo-nitrophilous species to develop. The most typical species are the Suaeda maritima, Atriplex latifolia, Salsola soda which make paucispecific communities, often with monodominated, belonging to the class Tx. et Prsg. 1950.	
1320	Spartinia swards (Spartinion maritimae)	This habitat regards all Spartina pioneer grasslands falling within the Spartinion maritimae alliance which characterises cordgrass of European salt muds. Within the lagoon, this habitat is identified with the Spartina maritima community, which colonises high-salinity silty and clayey soils. Mainly distributed in Atlantic areas, the northern Adriatic is the only area in the Mediterranean where this species can be found. Some have assumed it was possibly introduced during the time of the Republic of Venice (Géhu et. al. 1984a). The Limonio- Spartinetum maritimae association, which is endemic to the northern Adriatic and vicariant of the Atlantic Spartinetum maritimae (Emb. et Regn. 1926) Corillon 1953, is the first colonising community to occupy depressed stations affected by dynamic tidal fluctuations on soils that are generally submerged almost throughout the whole year. From a composition perspective, they are meadows physiognomically represented by a high coverage of Spartina marittima, which thanks to its efficient root system, contributes to consolidate brackish muds. This species has an Amphi-Atlantic distribution, and the Northern-Adriatic region is a discontinuation of its range. Among the most frequent accompanying species we have the Limonium narbonense and the Puccinellia palustris. Limonio-Spartinetum maritimae.	

1410	Mediterranean salt meadows (Juncetalia maritimi)	This habitat includes different communities falling within the Juncetalia maritimi Br.-Bl. 1931 order, which includes Mediterranean and Mediterranean-Atlantic salt and brackish meadows dominated by hemicryptophytes, on wet soils with different salinity which are periodically flooded and are never completely desiccated during summer.	
1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	This habitat is identified by formations dominated by perennial succulent halophyte species falling within the Sarcocornietea fruticosae R. Tx. & Oberd. 1958 class. The syntaxonomic interpretation of the cenosis that belongs to this class is made particularly difficult by the existence of different syntaxonomy patterns, which are further complicated by nomenclature problems regarding the species involved. With distribution in the Mediterranean and Atlantic regions, physiognomically they are suffrutices, dominated by the biological forms of succulent chamaephytes and rosulate hemicryptophytes. They grow on silty soils with even higher salinity than sea water, where flooding phases alternate with long desiccation periods in summer.	
*1510	Mediterranean salt steppes (Limonietalia)	This habitat features communities rich in perennial, rosette-forming, especially species of the Limonium. genus, growing along the Mediterranean coasts and along the fringes of the Iberian salt basins. They occupy soils temporarily permeated though not inundated by saline water and subject to extreme summer drying, with formation of salt efflorescence.	
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation	This habitat can be found in streams around the lagoon included in the S.A.P. It includes the system of secondary streams, especially ditches and channels spreading within agricultural environments and main rivers such as Dese and Sile. From a vegetation standpoint, the Hydrocharition Rübel 1933 includes communities of pleustophytes, while the Magnopotamion (Volmann 1947) Den Hartog et Segal 1964 includes underwater and rooting hydrophytes. The complex vegetation and flora's composition are largely conditioned by the geographical location in the low plain and the farming territorial matrix where streams flow, which determine a heavy and widespread presence of nutrients (eutrophication). Additionally, in most of minor streams, the periodical mowing and hoeing of the bed cause fragmentation and consequent reduction of the coverage of the	

		communities involved; therefore, vegetation recovery is detrimental to the species that are weaker against these operations, and guarantees the selection of the stronger ones. Species like the Ceratophyllum demersum and Myriophyllum spicatum, which are the most widespread especially in secondary streams, seem to respond quicker. The coverage of underwater hydrophytes almost never represents dynamic and natural evolutionary conditions, rather is the result of management.	
6420	Mediterranean tall humid herb grasslands of the Molinio-Holoschoenion	This habitat includes tall humid herb grasslands widespread on coastal dunes of the Mediterranean. The reference association, Eriantho ravennae-Schoenetum nigricantis (Pign. 1953) Géhu in Géhu, Costa, Scoppola, Biondi, Marchiori, Peris, Géhu-Franck, Caniglia et Veri 1984, generally occupies humid interdunal depressions on compact silty-clayey soils, with moderate or very low salinity flooded during winter and dry in summer, where the surface level of groundwater guarantees decent availability of water. The association is very rich in flowering and is physiognomically characterised by the Erianthus ravennae, big-sized grass which forms in large clumps and is accompanied with other smaller grass often growing in clumps, such as Schoenus nigricans, Juncus litoralis and Phragmites australis. Their flora is composed of species of high naturalistic value, such as the Epipactis palustris, which is listed in the "Regional Red Lists of Italian flora" (Conti et al., 1997) under the "threatened" category in Veneto.	

2.2.5 Land consumption in urban areas [16]

Land consumption has to be considered as a phenomenon associated with the loss of a primary environmental resource, due to the occupation of originally farming, natural or semi-natural areas, and refers to an increase of the artificial coverage of land connected to settlement dynamics. This process is mainly related to the construction of new buildings, plants and settlements, the expansion of cities or land conversion within an urban area, as well as the creation of road and rail infrastructures.

So, the concept of land consumption has to be defined as the change of an non-artificial coverage (non-consumed land) into an artificial coverage of land (consumed land). The most typical representation of land consumption is the growing number of areas covered by buildings, plants, asphalt or unpaved roads, mining areas, dump sites, construction sites, gardens, yards and other paved or ground areas, greenhouses and other permanent covers, airports and ports, impermeable areas and sports centres, railways and other infrastructures, solar panels and all the other areas made impermeable, not necessarily urban. Therefore, this definition extends to

[16] Source: ARPAV - http://www.arpa.veneto.it/arpavinforma/indicatori-ambientali/indicatori_ambientali/geosfera/uso-del-territorio/consumo-di-suolo/view

farming and natural environments as well, while it excludes natural and semi-natural outdoor areas in an urban centre (ISPRA, 2013).

No reference threshold exists to evaluate the indicator's current status; the progress of land consumption during time can be measured by taking the territories of the provincial capitals with more than 75,000 inhabitants as the most meaningful ones (Padua, Treviso, Venice, Verona and Vicenza).

As regards the percentage of consumed land on the total municipal surface, in 2015 the highest value was detected in Padua with 49.0%, followed by Venice (44.0) and Treviso (39.0), then Vicenza (31.9) and Verona (28.2), a large part of whose territory is on the hills though, which are less affected by urbanisation. Verona showed the slowest transformations (+2.3% in the last 8 years) while Treviso and Padua (both with +7.6% in the last 8 years) are the cities where land consumption has increased the most. But, as an absolute value, considering the whole period (27 years), the cities where consumed land has increased the most are Padua (about 1.300 ha), Venice (about 1.650 ha) and Verona (about 1.450 ha).

Considering per-inhabitant land consumption, in 2015 the highest value was found in Venice (263 sqm), followed by Treviso (258), Vicenza (226), Verona (216) and Padua (206).

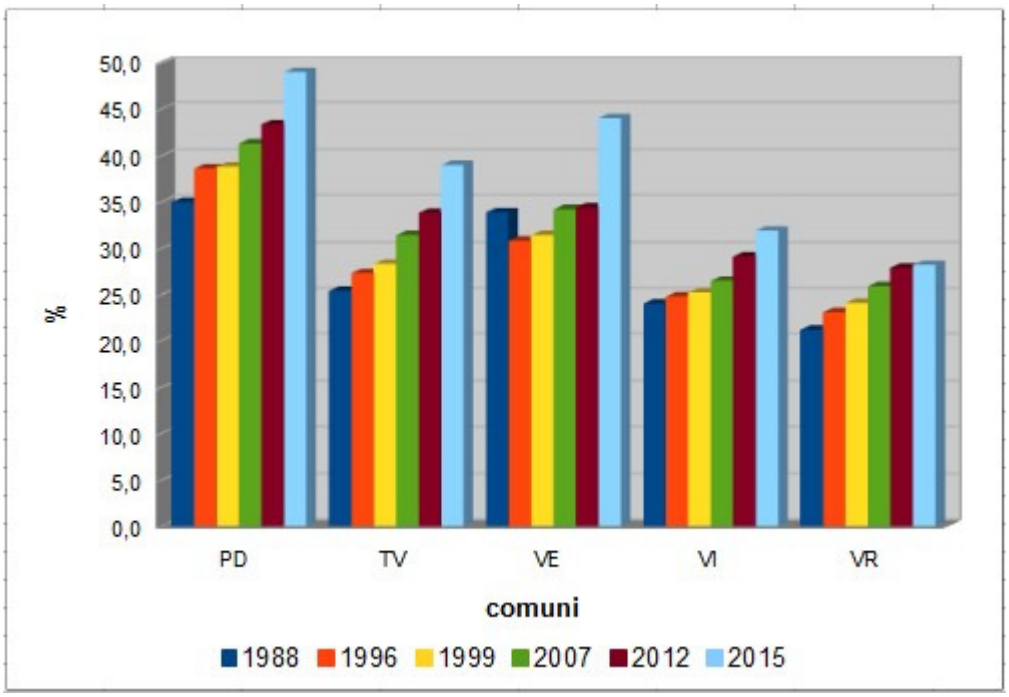


Figure no. 25: Land consumption in urban areas: estimated percentage of consumed land over the total municipal area

2.3 The socio-economic context [17]

As at 31st December 2014, Veneto's residing population was 4,927,596, hardly one thousand units more than the previous year. This was mainly due to a drop in the birth rate that has been going on for three years now (-10.5%), which was unseen since the late Nineties.

[17] Source: Veneto Region – Statistical report 2016

There are 511,558 foreign residents, 10.2% of foreign nationals in Italy, and represent 10.4% of Veneto's population, which is significantly higher percentage than the whole national territory (8.2%).

In the second quarter of 2016, the dynamics of international economy [18] showed a widespread slowdown in growth. This was a weak driver of foreign demand for the Italian economy.
According to Istat's early estimates (released on 12th August 2016) the Italian GDP will go up by 0.7% in 2016, definitely lower than expected; forecasts for the next quarters confirm this clear slowdown.
Veneto's foreign demand, which is structurally crucial, almost stopped: Istat figures on the first quarter of 2016 registered a +0.3% growth trend (on the same quarter 2015), the weakest result in many quarters.
Despite a slowdown, the enterprise selection process continues, with closures prevailing over openings: active enterprises at the end of the second quarter 2016 (436,836) decreased by 0.5% on the same period of the previous year; this streak of negative results is lasting since 2008. In the second quarter 2016, 332 proceedings for bankruptcy and agreement among creditors were commenced (320 in the second quarter of 2015).
As regards the employment relations as a whole, the balance between hiring and terminations registered in the second quarter of 2016 was positive overall – as it would be natural to expect in the first part of the year, which is the time preferred for starting a lot of employment contracts, especially fixed term contracts – totalling +24.500 units.
These results (which are still partial therefore subject to review) confirm the persistence of a positive employment trend, although under the outstanding performance posted in the corresponding period of the previous year (+34.400 units), when growth was driven by the generous program of pension contribution exemptions for new permanent contracts (Law no. 190/2014) and the introduction of new regulations on employment relations included in the Jobs Act (Law no. 183/2014).
In 2016, also due to the reduction in benefits for permanent contracts, but mostly because of a natural and expectable contraction in the hiring flow after the exceptional performance in the previous year, the period end employment balance turned out to be slightly lower; however, the positive employment trend occurring since early 2015 is still confirmed.
If we look at the balances on a yearly-basis, there were 28.200 more job positions over June 2015; even if this is slightly under the results from the previous quarter (+38.100 units), the important trend leading to recovery of the jobs lost during the crisis continues.

2.3.1 Potential impacts on the population

Since its origins, Porto Marghera has been hosting industrial activities and productions that use hazardous substances which can therefore be a danger for human health and the environment.

Currently, there are 12 companies based in Porto Marghera that are subject to the "Seveso" law according to the regulations in force [19]. However, it should be underlined that the real level of

[18] Source: Veneto Lavoro – Observatory & Research – La Bussola, September 2016.
[19] The analysis and regulations on major-accident hazards in the European Community first began with the Directive 82/501/EC (called the "Seveso Directive"), following the accident occurred at ICMESA's facilities in Seveso (Mi) in 1976, when dioxine was released in the atmosphere. In Italy, that directive was implemented with the Presidential Decree no. 175 dated 17th May 1988, as amended and integrated.
During the following years, the application of the community directive caused it to be reviewed, and the Directive 96/82 (called "Seveso Bis") was passed, and implemented in Italy with the Legislative Decree no. 334 of 17th August 1999, which fully abrogated the Presidential Decree 175/88. A lot of application decrees are connected to the Legislative Decree 334/99, such as the Legislative Decree no. 238 of 21st September 2005, which implemented the directive 96/82/EC as amended by the directive 2003/105/EC (called "Seveso Ter").
The European Parliament and the Council of the European Union passed the new directive 2012/18/EU on the 4th July 2012 (called "Seveso III") on the control of major-accident hazards involving dangerous substances. That directive was implemented in Italy with the legislative decree no. 105 of 20th June 2015, and fully replaced the previous

hazard of each company does not only depend on the amount of hazardous substances stored, but also on the prevention and safety measures adopted in them.

Chart no. 11: Companies at risk of major accident according to the legislative Decree no. n. 105/2015

ENTERPRISE	Stored substances threshold (Legislative Decree no. 105/2015)	TYPE
SAPIO Produzione Idrogeno Ossigeno Srl	Lower threshold	Chemical of petrochemical plant
DECAL-DEPOSITI COSTIERI CALLIOPE SPA	Upper threshold	Storage of toxic substances
PETROVEN SRL	Upper threshold	Storage of mineral oils
SAN MARCO PETROLI SPA	Upper threshold	Storage of mineral oils
ENI SPA - REFINING & MARKETING DIVISION	Upper threshold	Oil refining
VERSALIS SPA (FORMER POLIMERI EUROPA)	Upper threshold	Chemical of petrochemical plant
ARKEMA SRL	Upper threshold	Chemical of petrochemical plant
CHIMICA PORTO MARGHERA SPA	Upper threshold	Chemical of petrochemical plant
SOLVAY SPECIALITY POLYMERS ITALY SPA	Upper threshold	Chemical of petrochemical plant

In order to establish proper safety measures and define appropriate intervention procedures to deal with and limit harmful effects on the population and the environment in case of industrial emergency,

the local Institutions and competent entities[20] have updated the External Emergency Plan for industrial plants at risk of major accident in the Porto Marghera area.

More specifically, the External Emergency Plan includes the following:

- alarm systems to alert the population and the rescue units of the danger (Sirens, SIMAGE - SMS, Rialto System, variable message displays, Internet);
- information to population;

directive 96/82/EC (so-called "Seveso II"), implemented in Italy with the Legislative Decree 334/99 and 2003/105/EC, implemented with the Legislative Decree 238/05, as of 1st June 2015.
The evolution of the statutory framework is a clear sign of the changed approach that the European Commission and the scientific community have outlined. The concept of safety switched from involving industrial installations and workers mainly, to one which looked at the production activities as part of the territorial, urban and environmental context they are based in, with a focus on the protection of the population and the surrounding environment.
For more information: http://www.arpa.veneto.it/servizi-ambientali/rischio-industriale/impianti-industriali-e-rischio

[20] In order to draw up the Plan, a specific technical work group was set up, composed of representatives from the Veneto Region, Province of Venice, Municipality of Venice, Fire Department Provincial Station, Regional Agency for Environmental Protection and Prevention of the Veneto (ARPAV), Police Forces, Medical Urgency and Emergency Service (SUEM), Port Authority, Port Captaincy of Venice and the Industrial Area Authority.

- description and subdivision of the territory in areas, based on the risk scenarios identified.

In particular, according to the External Emergency Plan, there are 3 different areas at risk:

- FIRST ZONE or severely impacted area. It is the area in the immediate proximity of the plant and is generally exposed to severe and irreversible health effects.

- SECOND ZONE or damaged area. It is an area where the accident consequences are still severe, especially for some categories at risk (children, elderly or people who are ill, pregnant women).

- THIRD ZONE or warning area: this can possibly suffer from mild effects and reversible damage, generally non-severe even for those who are particularly vulnerable, or of physiological responses which can cause upset to such an extent that even public order interventions may be needed. This area corresponds almost exclusively with the areas of Malcontenta and the Municipality of Marghera [21].

Overall, the identified area covers the whole industrial area with more over 10,000 people employed, Marghera's and a large part of Malcontenta's built-up areas with over 28,000 inhabitants.

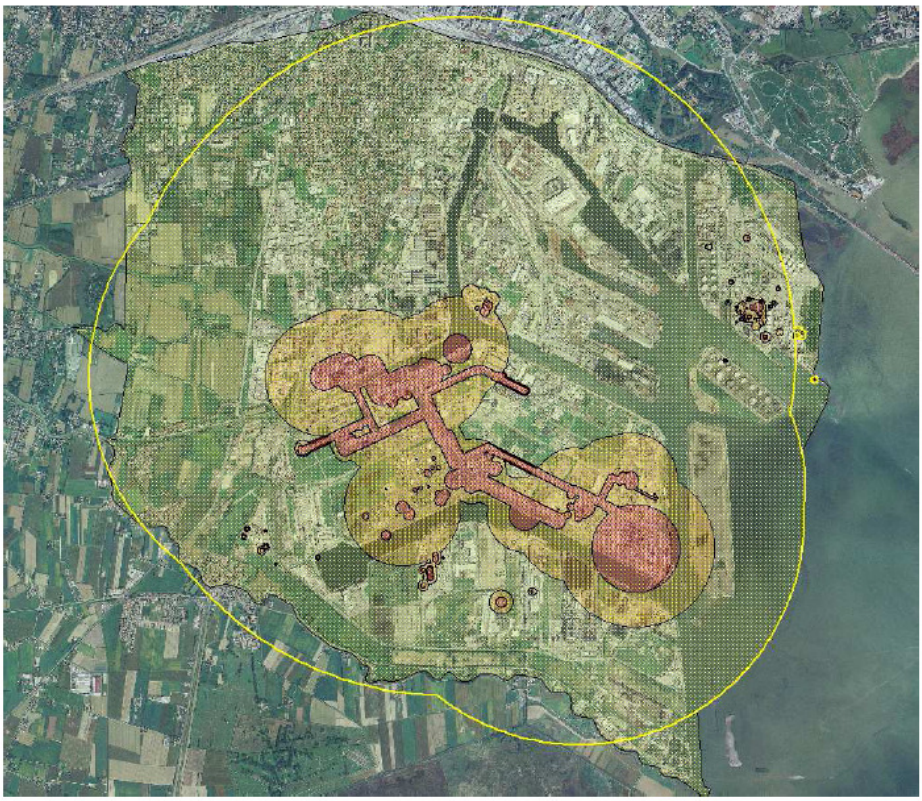


Figure no. 26: The three different areas at risk – External Emergency Plan for industrial plants at risk of major accident in the Porto Marghera area – Annex K

[21] In this area, information campaigns are promoted on a regular basis in order to educate the population on safe behaviours during emergencies, for a better protection of the exposed population.

2.3.1.1 Information on enterprises based in Porto Marghera subject to obligations set by the "Seveso" law.

SAPIO Produzione Idrogeno Ossigeno s.r.l.

This plant produces, sells and distributes technical gases. Its primary production consists of oxygen and nitrogen (gas and liquid) and liquid argon by extracting them from the air.

Part of the products is stocked at liquid state in out-of-ground tanks and poured into tank trucks for distribution to customers or, at gas state, through pipes to the utilities of the industrial hub. Also, the plant compresses and bottles technical gases or their mixtures in cylinders.

DECAL

It sells services relating to bulk handling and storage of oil products, petrochemicals and chemicals at liquid state.

PETROVEN

This plant engages in activities regarding liquid hydrocarbon storage, tank ship unloading, receiption through pipelines from ENI refinery, storage, transfer of additives and colours, loading on tank trucks.

SAN MARCO PETROLI

This plant engages in the storage and marketing of petroleum products and bitumen (both on its own and third parties' behalf). The products are received by sea and land (rail tank cars and tank trucks), stored in tanks, any required mixtures are made and then they are shipped by land or sea.

ENI – Refining & Marketing Division Venice Refinery

The Refinery processes oil to extract fuels mainly and in particular:

- propane, butane and LPG mixture;
- unleaded gasoline;
- petroleum for aviation and heating;
- diesel fuels for traction and heating;
- fuel oils;
- bitumen;
- sulfur.

It is divided into three main areas:

- petroleum terminal: equipped for crude oil storage, it is connected by the sub-lagoon oil pipeline to the San Leonardo Jetty for crude oil supply vessel mooring;
- refinery: this is where different products such as gasoline, petroleum, diesel fuels, bitumen, fuel oils, LPG stocks and all process installations are;
- North-East area: equipped for storage and shipment by land of finished products such as LPG, gasoline, petroleum, diesel fuels and fuel oils, as well as reception by land of national crude oil.

VERSALIS former POLIMERI EUROPA

This plant produces raw materials: ethylene, propylene, butadiene, starting from naphta cracking in 15 furnaces, for the production of plastic materials.

The plant is interconnected to the SOUTH Tank Field for logistic activities; it supplies the plants in Ferrara, Mantova and Ravenna by sea, trucks, rail tank cars and through a pipeline.

ARKEMA

This plant engages in the production of acetone cyanohydrin which is transported to the ARKEMA plant in Rho to produce methyl methacrylate and poly(methyl methacrylate) starting from hydrogen cyanide (produced by synthesis from ammonia, methane and oxygen) and acetone in presence of acetone in sodium hydroxide. The plant covers an area of 28,700 m2

CHIMICA PORTO MARGHERA – former 3VCPM

It synthesises chemicals mainly used in the coloring industry as additives to plastic materials and fine chemistry. The production cycles involve 2 plants: CPM 1 and CPM 3.

SOLVAY FLUOR ITALIA

The plant engages in the following activitites:

- production and storage of hydrofluoric acid;
- production of aluminium polychloride;
- production of catalyst;
- cleanup of mobile containers;
- water neutralization and treatment.

2.3.2 Employment situation in Porto Marghera

In April 2015, the Municipality of Venice, the Veneto Region, the Industrial Area Agency and Port Authority of Venice released the latest version of the Survey on Economic Activities based in Porto Marghera, which consisted of a thorough and detailed analysis on the employment situation in the whole industrial site. This study investigates this phenomenon from different perspectives and provides a complex and detailed picture of the situation.
From a topographical point of view, the whole area was divided into 8 sub-areas, grouped by homogeneous production and settlement characteristics. These are:

1. Refineries;
2. First Industrial Area;
3. North;
4. Port;
5. Old Petrochemical plant;
6. New Petrochemical plant;
7. Malcontenta;
8. Fusina.

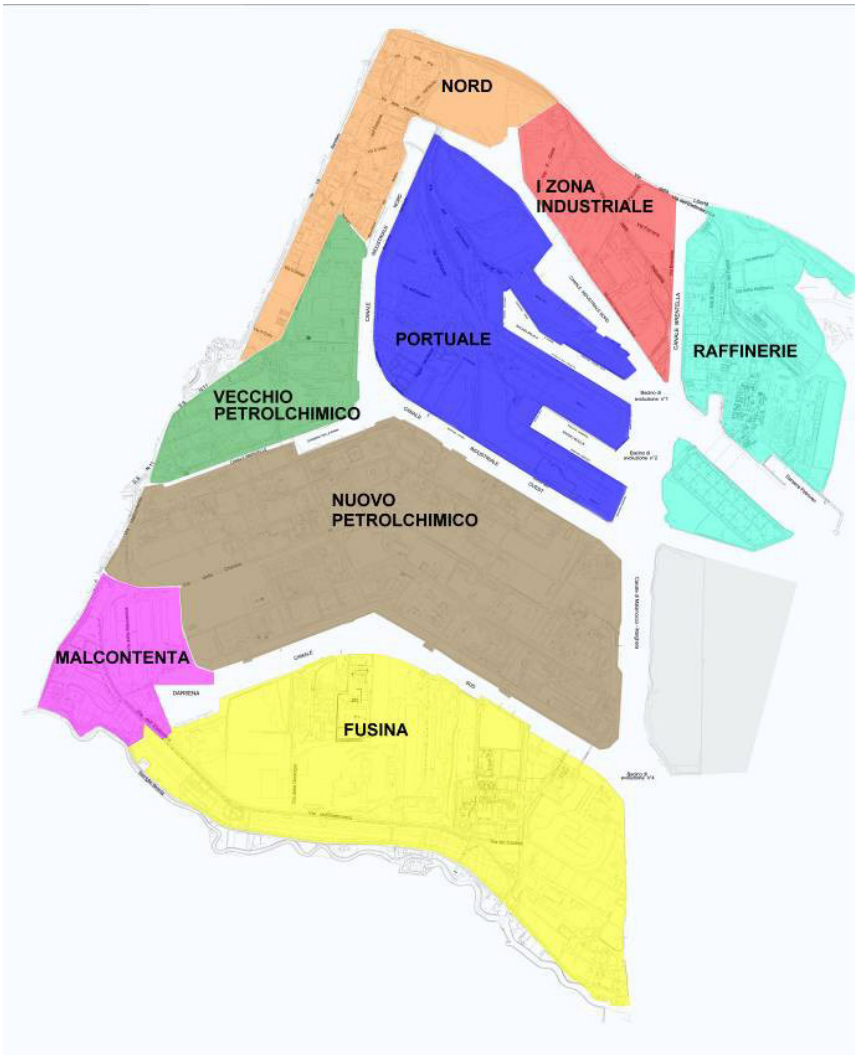


Figure no. 27: Subdivision of the Porto Marghera industrial site in macro-areas

This territorial subdivision allows to analyse the occupied area with a higher degree of detail, in order to understand what are the areas and production industries where people are employed in the Marghera's industrial site.
Overall, the whole area hosts about 800 companies for a total of over 10,000 people employed.

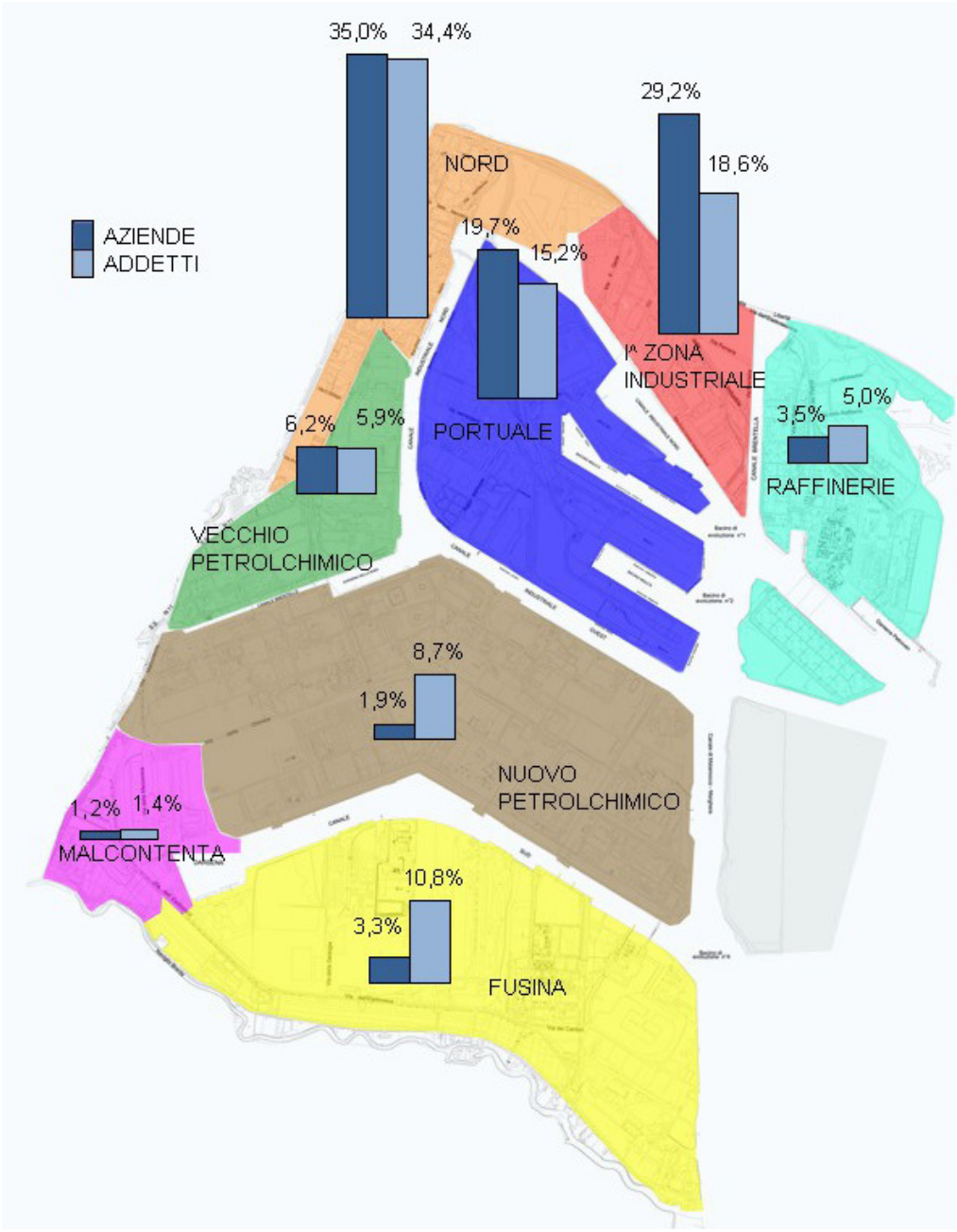


Figure no. 28: Percentage distribution of companies and workers by macro-area

As shown here, most of the workers are concentrated in the north of the area and are distributed on the port, the management area (VEGA) and the area adjacent to the urban zone of Marghera and Mestre.
The chart below shows distribution of people employed and the companies by main businesses based on the ATECO classification.

MACROSETTORE ATECO 2007	DESCRIZIONE	AZIENDE			ADDETTI		
		2014	2013	VARIAZIONE	2014	2013	VARIAZIONE
A	Agricoltura, silvicoltura e pesca	0	1	-1	0	0	0
B	Estrazione di minerali da cave e miniere	1	1	0	0	0	0
C	Attività manifatturiere	113	137	-24	4011	4138	-127
D	Fornitura di energia elettrica, gas, vapore e aria condizionata	9	9	0	347	410	-63
E	Fornitura di acqua; reti fognarie, attività di gestione dei rifiuti e risanamento	15	21	-6	523	563	-40
F	Costruzioni	48	60	-12	272	577	-305
G	Commercio all'ingrosso e al dettaglio; riparazione di autoveicoli e motocicli	77	96	-19	312	338	-26
H	Trasporto e magazzinaggio	182	197	-15	1731	2028	-297
J	Servizi di informazione e comunicazione	46	58	-12	410	586	-176
K	Attività finanziarie e assicurative	16	16	0	104	51	53
L	Attivita' immobiliari	42	47	-5	191	200	-9
M	Attività professionali, scientifiche e tecniche	133	157	-24	1037	927	110
N	Noleggio, agenzie di viaggio, servizi di supporto alle imprese	28	34	-6	424	541	-117
I	Attività dei servizi di alloggio e di ristorazione	22	25	-3	110	179	-69
O	Amministrazione pubblica e difesa; assicurazione sociale obbligatoria	10	9	1	377	342	35
P	Istruzione	7	11	-4	51	61	-10
Q	Sanita' e assistenza sociale	4	6	-2	35	20	15
R	Attività artistiche, sportive, di intrattenimento e divertimento	5	9	-4	19	15	4
S	Altre attività di servizi	19	17	2	104	98	6
U	Organizzazioni ed organismi extraterritoriali	3	3	0	2	5	-3
nd	Dati non disponibili	0	39	-39	0	38	-38
TOTALE		780	953	-173	10060	11117	-1057

Figure no. 29: Distribution of people employed and the companies by main businesses based on the ATECO classification.

These data refer to the years 2013-2014 and show a decrease of people employed and the companies they work in, due to the general crisis the economy is currently going through. Between 2013 and 2014, the number of people employed dropped by over 1000 units (about 10%) while the number of companies went down by 173 (-18%).
Important information is provided by the employment analysis based on the size of companies, too. The vast majority of companies is concentrated in the 0-15 employee category, while there is a wider distribution of workers among the categories. Here is the distribution:

CLASSE DI ADDETTI	AZIENDE		ADDETTI	
	2014 (%)	2013 (%)	2014 (%)	2013 (%)
da 0 a 15	80,72%	79,80%	20,77%	20,20%
da 16 a 50	13,30%	13,10%	25,46%	22,30%
da 51 a 100	3,59%	4,30%	17,26%	19,40%
da 101 a 250	1,79%	2,10%	16,83%	16,70%
da 251 a 500	0,45%	0,60%	9,85%	12,10%
più di 500	0,15%	0,10%	9,84%	9,20%

Figure no. 30: Employment analysis based on the size of companies - years 2013-2014

As a whole, the Porto Marghera area still plays a leading role in the economic structure of our territory. The number of people employed, which has decreases a lot compared to the times of maximum growth (mid '60s), still represents a paramount pool for the area.

2.3.3 Economic development in the Porto Marghera area

Despite progressive dismissal of important industrial plants and the gradual decrease in the people employed, it is hard not to acknowledge that Porto Marghera is a crucial hub in the economy of Venice and the whole Veneto region.
In a province and region with poor land availability, an ever-increasing demand for areas for production facilities, landscape degradation and environmental imbalance, the heritage of areas and infrastructures of Porto Marghera become a strategic element for the development of Venice and the whole North-East area.
The changed market conditions - which is more and more set up on economy globalization processes – the industrial policies of the past years, the growing importance of industrial business sustainability in urban areas, and the outcome of the environmental rehabilitation and industrial reconversion plan put in place back in the early 90s, have deeply changed its layout and features, as follows:

- higher presence of innovative businesses (the Science and Technology Pole);
- increased importance of port activities (enhanced port and service function, acknowledgement of the freight terminal, …);
- progressive reconversion of fringe areas to urban uses (via Fratelli Bandiera, 1st Industrial Area);
- higher specialisation of the industrial businesses based in the pole (constructions, aluminium, glass, …);
- progressive contraction but also functional and process reorganisation of petrochemical businesses (Refinery, Petrochemicals, green economy);
- intensification of the environmental rehabilitation processes of industrial sites and water protection interventions (embankment of port canals);
- functional enhancement of services (Railway, dock activities, transhipment port);
- widespread distribution of the broadband connection network;
- qualification of environmental services as part of an ecologically-equipped area.

This is where the initiative by the Ministry of Economic Development kicks in. It has proposed to local institutions, the Veneto Region, the Municipality of Venice and the Venice Port Authority a specific Planning Agreement for the industrial development and reconversion of Porto Marghera. This Agreement grants a funding of about 102 million euro in addition to the funds that were already allocated to local Authorities.
In general, it was considered necessary to strengthen the existing industrial businesses while encouraging new investments directed to the industrial reconversion of facilities and enhancement of the skills existing in the area, by means of a public intervention aimed at creating, improving or restoring support infrastructures (both tangible and intangible).
Based on the considerations made on the future of the industrial pole, while calling into question the sustainability of the petrochemical businesses based in its areas, the need for opening the way for new strategies for the reconversion of Porto Marghera came up, starting from land remediation, the implementation of safety measures in the hydraulic system, as well as the recovery and strengthening of the existing infrastructures (road and railway network, ICT, docks, which provide added value to the areas in Marghera).

2.3.4 Production activities in Porto Marghera

During time, there has been a deep review of the characteristics of Porto Marghera site, which has evolved from a quantity and quality standpoint, losing its distinctive industrial inclination towards a more diversified structure of value-added services and activities. The port and management area of VEGA are those whose importance has been increasing the most, to the detriment of areas that were more linked to traditional productions and activities, such as the refinery and the petrochemical peninsula.
Indeed, if we look at the evolution of the production structure in our Country and the Veneto Region, the Marghera hub has progressively changed from being a metal and chemicals production site to one more engaged in processing and high added-value businesses, as well as services related to the port and tertiary industries.
In particular, logistics was the most dynamic sector for the area's businesses. This is due to the growth to a global scale of port trades, with land trades reaching out beyond national borders and sea trades beyond continental borders. The integration of different economic systems has indeed cemented the role of ports as gates for the movement of goods between these areas. The port, which plays a pivotal role in these extended and complex logistic chains, boosted the development of all those industries that work with and for the port, transporting goods, providing light-duty processing services and accessory logistic activities.
The second sector that has experienced an expansion in size and a very fast development is that of services and intangible high value-added activities. The VEGA area, which was created to meet the companies' demand for locations where they could work in contact with Marghera manufacturing and industrial world, is an example of business incubator which mixes up well with the development philosophy that marked the reconversion of Porto Marghera in the last years. That development needs to continue in order to complete this process, leveraging on companies deeply integrated with the local production system and possessing the skills and expertise that allow to switch from a production-type approach related to factories, which are now almost completely disappeared, to one focusing on networks, connections and skills existing here.

2.4 Infrastructures, logistics and legal framework

2.4.1 Sewage sector

The interventions on the sewage system of Porto Marghera industrial site aim at reducing direct discharges into the Lagoon and the streams of the Drainage Basin, through the completion of sewage systems, the separation of urban and industrial water from rainwater, the elimination of contaminated water and the construction of first flush diverters. These measures are part of a broader strategy for the reclamation of the basin water flowing into the Venetian Lagoon imposed by the so-called "Master Plan 2000"[22].

[22] According to Article 3 of the Regional Law no. 17 of 02/27/1990 "Rules for the execution of functions in regional jurisdiction issues pursuant to Law 798 of 11/29/1984 – New measures for the protection of Venice", the Veneto Region must adopt a "Plan for prevention of pollution and reclamation of the drainage basin water flowing directly into the Venetian Lagoon" known as "Master Plan".
On the basis of said law and based on the environmental knowledge gained on the lagoon's ecosystem, the Regional Council has approved the latest planning and scheduling document called "Plan for prevention of pollution and reclamation of the drainage basin water flowing directly into the Venetian Lagoon - Master Plan 2000" by resolution no. 24 of 1st March 2000.
The "Master Plan 2000", which is currently in force, identifies a set of quality goals for the environmental components, with reference to the knowledge on the lagoon's status, based on the provisions of Interministerial Decrees 1998-1999. Also, it sets the general criteria to reduce the pollution load; provides guidelines on water pollution prevention and reclamation, by identifying the single fields of intervention (civil, widespread urban, industrial, farming,

The drainage basin area partially covers four Veneto provinces. Venice, with 28 municipalities; Treviso, with 22 municipalities; Padua, with 54 municipalities and Vicenza, with 4 municipalities, for a total of 108 municipalities, on a total area of 2,068 Km2.

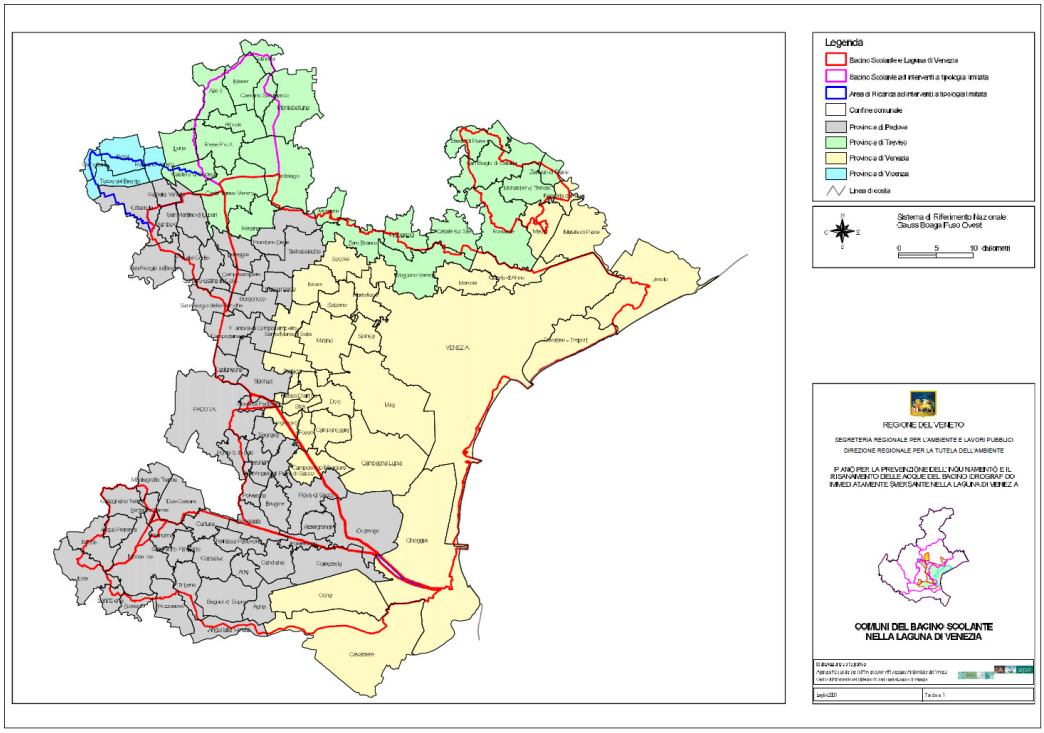


Figure no. 31: Municipalities on the Drainage Basin in the Venetian Lagoon

The Master Plan also includes interventions in the purification sector. These can be basically divided into measures to streamline purification processes and align the quality of discharges to statutory standard (especially the Environmental Ministerial Decree 07/30/1999) and actions to enhance the potential in terms of population equivalent, as well as connection of smaller plants to larger plants, for better management of costs and the streamlining of the purification system.

A specific goal of the "Master Plan 2000" strategy is removing or adjusting industrial discharges of the Porto Marghera site, to be achieved through the so-called "Progetto Integrato Fusina" (P.I.F.) The P.I.F. is a multifunctional plant for the treatment of civil discharges and first flush water of Mestre, Marghera, Porto Marghera and Mira area (Wastewater A), industrial discharges of Porto Marghera (Wastewater B1+B2), as well as contaminated groundwater drained during cleanup operations performed in the Porto Marghera area (Wastewater B3), which also allows reuse of purified industrial wastewater. The wastewater collection and reused water distribution networks, as well as the plant layout are shown in the following figures.

zootechnical), specifying the strategies and actions to take in relation to the goals o achieve; finally, it estimates the budget needed to perform the interventions, deciding a series of priority works.

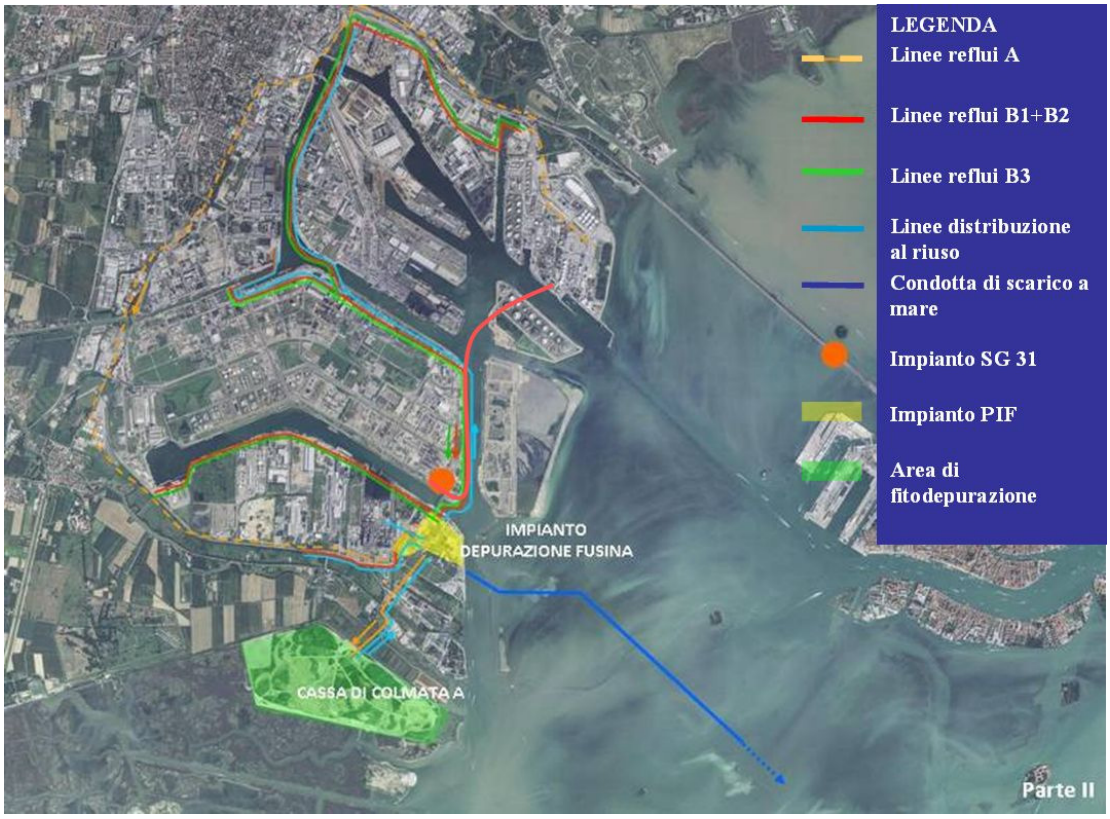


Figure no. 32: Fusina – Water line integrated project

The P.I.F. is the basic infrastructure to transform the Site of National Interest (SIN) of Venice – Porto Marghera in an "ecologically-equipped area", able to provide services connected to the different cleanup and regeneration needs of industrial areas.

As at today, most of the works for industrial wastewater and ground- and rainwater treatment have been completed, and some sections of the whole plant have been activated, even for functional testing purposes.

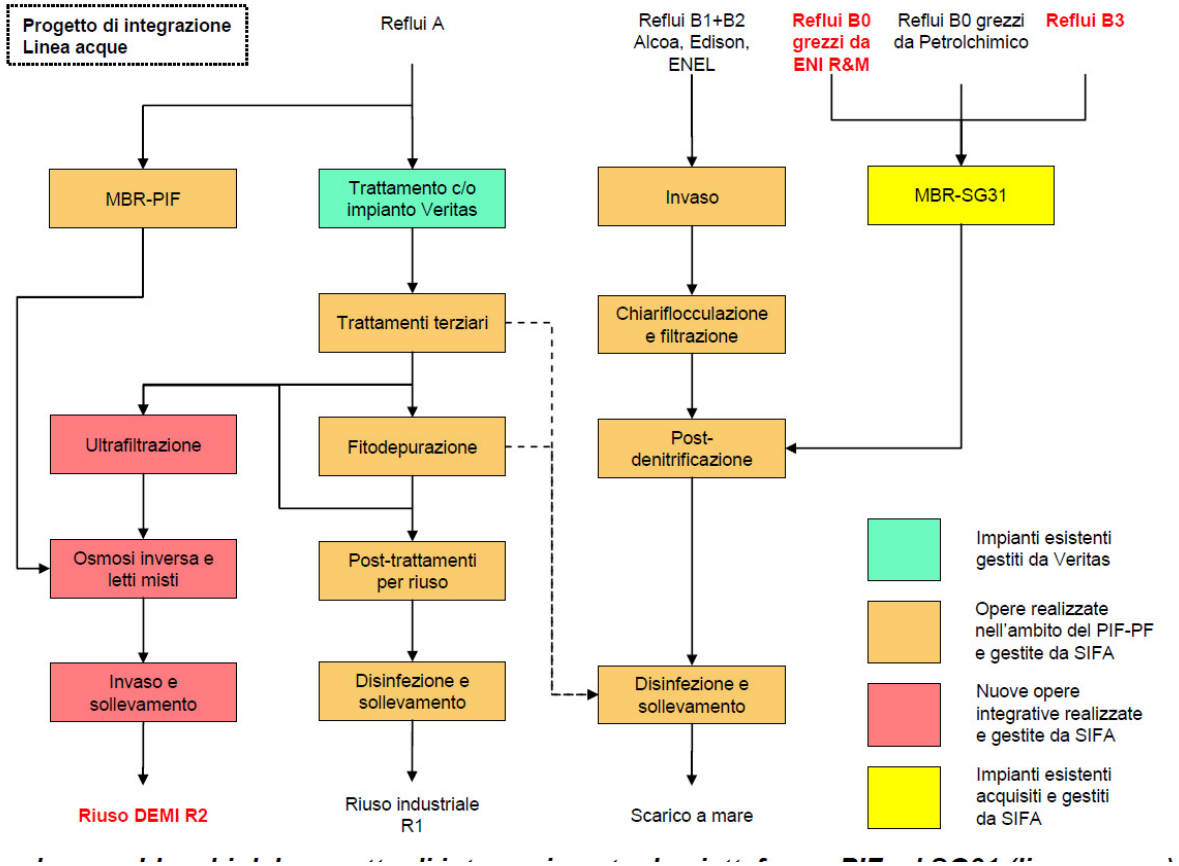


Figure no. 33: Block diagram of the PIF water line after integrating the Environmental platform SC 31

In the last years, the Porto Marghera industrial site has experienced a decrease in the site's production areas, which caused smaller volumes of wastewater to be collected, treated and reused and consequently lower revenues for the PIF.

The most important goal is to define a set of actions to ensure that the plants for the treatment and distribution of purified water are managed based on a long-term business plan, able to enhance their potential, including through synergies with the Integrated Water Service, and ensure their affordability.

2.4.2 Waste treatment facilities

The Porto Marghera industrial site hosts a network of waste treatment plants which meet the needs of the production activities, at least in part.

SG 31

The environmental platform called "SG31" is located in the New Petrochemical plant peninsula, and was acquired as part of the current configuration of the P.I.F., and consists of:

- the chemical-physical-biological treatment plant (TAS)

- the mud and liquid waste incinerator.

The consortium plant receive wastewater coming from the plants based in the Petrochemical area (Arkema, Versalis, Solvay, SAPIO).

The activities of the incinerating furnace has been discontinued since September 2012.

ECOPROGETTO VENEZIA S.r.l. and Transfer Station of the Fusina Integrated Hub

The waste treatment Integrated Hub is located next to the Porto Marghera's South Industrial Canal and is equipped with a dock for the mooring of barges transporting the waste produced in Venice's Old Town and Estuary.

Next to the dock there is the waste Transfer Station; this plant stocks the different types of waste coming from the city in order to make homogeneous loads of waste to be shipped to their specific treatment plants.

Currently, the Transfer Station, which was enlarged as provided for in the project approved in August 2005, consists of a yard of approximately 11,100 m2. All yards are completely paved in cement and are equipped with surface water drains connected to the internal sewage system, which directs all the rainwater to a special tank, and then sent to the consortium sewage system for treatment.

The waste derived fuel (CDR) production plant became functional with line no. 1 (CDR1) in 2002, and is authorised to a maximum quantity of urban and non-hazardous special waste of 160,000 tons.

During 2010 the second operational line was started up, called CDR2, following the revamping of the previously existing compost plant. The plant's current overall capacity is 267,000 t/year.

The CDR production process consists in putting the waste received (dry waste from sorted collection) into the so-called bio-cells, where the organic part still in it is dehumidified, sanitised and stabilised; this process lasts from six to eight days. An IT system allows to automatically adjust the process inside the bio-cells. Then, the stabilised material is transferred to systems for further treatment and separation, which allow to obtain the actual fuel fraction (CDR), mainly composed of stabilised organic substance, paper, cardboard, wood, plastic, textiles, the different recoverable fractions (ferrous and non-ferrous materials) and scraps (aggregates such as gravel, sand, glass, ceramic, etc.).

The CDR, which is mostly used to power ENEL's thermal power plant in Fusina, undergoes packaging processes which make it available for the customer in different forms, according to the transportation or use needs, in particular:

- in the form of "bales", easy to load onto trucks;
- in the form of briquettes (densified material) of a few cm of length for use in bulk containers;
- in the form of fluff (same size) for bulky transportation.

The finished product, according to its size and physical shape, is stocked in different and properly equipped areas, before it is transferred to the plants of destination.

The system used in Fusina ensure 53% CDR output and creates a product with low humidity, poor ash content and high calorific value (>17.000 kJ/kg).

As at today, in its Palladio thermal power plant, Enel uses 70,000 tons of Waste-Derived Fuel, thus replacing 5% of coal used to fire burners (this is the first case in Italy and one of the major case histories in Europe).

Co-firing of Waste-Derived Fuel in coal fired thermal power plants is indeed a very appealing opportunity, not only due to the excellent compatibility of Waste-Derived Fuel in industrial plants, but mostly because of its high energy performance, which guarantees an extremely positive environmental balance.

RTN waste deactivation plant in the Municipality of Venice

The RTN - VERITAS plant in Fusina is authorised to treat different types of special, hazardous and non-hazardous waste. In 2010 this plant has received ashes/dusts mainly, (classified as "hazardous") coming out of the fumes treatment of the urban waste (RU) incinerator in Fusina and "excavation soil and rocks" (generally "non-hazardous") coming from excavation and/or cleanup works of the site of national interest of Porto Marghera.

The deactivation plant consists of an unloading and premixing pit for solid waste equipped with an overhead crane with grab, storage silos (for dusty waste and reagents) and a mixing drum where waste is mixed with water and binders in different proportions, according to whether waste is hazardous or not.

Mixtures are extracted from the mixing drum using a belt-conveyor and are carried to the maturation pit; then, after having stayed there for some days needed for the binder to kick in, they are picked up using the grab and loaded on the vehicles to carry them to authorised dump sites. Operations are conducted discontinuously, thus keeping batches of hazardous waste separated fro non-hazardous ones. Waste inbound and outbound of tanks and storage silos are tracked.

The result of deactivation operations is controlled on the matrices coming out of the mixer through lab tests, in order to ensure waste can be accepted by the dump sites they are directed to.

Soil/rocks and muds are carried to the plant on trucks and then are unloaded into the reception and storage pits.

In order to prevent any possible leakage, incinerator ashes/dusts are carried to the Fusina plant in tight containers called "onions" because of their shape, and are discharged into silos using a pneumatic conveyor system; then they are taken to the mixing drum with a screw conveyor. Containers are handled by operators equipped with proper protection equipment.

2.4.3 Electrical power generation facilities

"Andrea Palladio" thermal power plant in Fusina

The Fusina thermal power plant, which became operational in 1964, is located in the ,Porto Marghera Second Industrial Area, Municipality of Venice, in the central section of the lagoon edge; it borders with the Southern Industrial Canal of the Industrial Port to the north; with a free area owned by the Company ALCOA to the west; with a power station's access road to the south; to the east with the area of a power plant acquired by ENEL in 1990, now Section 5, and that of the municipal water treatment plant managed by the Veritas Group (state-owned company engaging in environmental management).

The plant covers an area of approximately 446,112 m2, of which 68,359 m2 are indoor areas and 22,884 m2 are granted under concession by the maritime state property agency and falls within the Porto Marghera industrial area.

This plant was designed for continuous operation and contributes to cover the demand for basic electrical power for civil and industrial uses. The Fusina thermal power plant produces electrical power through burning of coal and waste derived fuel (CDR). It consists of four thermal power sections of different sizes and built in different times, as follows:

Chart 12: "Andrea Palladio" thermal power plant in Fusina: power of sections and start-up year

Sections	Power (MW)	Start-up year
Section 1	165	1964
Section 2	171	1969
Section 3	320	1974
Section 4	320	1974

The overall nominal installed capacity is 976 MWe.

As regards the systems for the control and reduction of atmospheric pollutants, the fumes derived from combustion are conveyed to installation for the suppression of dust (electrostatic precipitators), sulfur oxides (de-SOx), nitrogen oxides (de-NOx)

Constant monitoring of S02, NOx, PST, CO, COT and HCI occurs in groups 3 and 4 and of S02, NOx, PST and CO in groups 1 and 2.

Industrial use of co-firing CDR with coal in in groups 3 and 4 has also required installation in groups 3 and 4 of continuous dioxin and furan samplers and, since 2009, following the release of the Environmental Integrated Authorisation (AIA), continuous monitoring of mercury.

The plant has two condensation water uptake systems: one is used in the plant's main body for sections 1-2-3-4.

In both cases, the water uptake systems are located along the South Industrial Canal and the cooling water is discharged in the Brenta canal. The drain in section 5 is not active.

In order to improve the production plant's efficiency in the summer while reducing the amount of heat discharged into the lagoon, twelve closed-loop wet towers were commissioned in sections 1 and 2, (six for each section) functioning with the water coming from the Veritas company's treatment plant in Fusina, which manages Venice's public water supply and treatment service. The towers use forced draught technology, which means they are equipped with fans. The closed loop is partly constituted by the current sea water circuit and a newly-built section.

During 2012, the management and formal procedures for the definitive dismissal of the OCD came to a conclusion. The supply of fuel is guaranteed as follows: coal by sea, natural gas through a gas pipeline, hydrogen through a special pipeline and diesel fuel by trucking.

Over the years, major interventions to the installations have been made, which have reduced the environmental effect of fine coal particle dispersion during discharge, storage (wind-barriers) and transportation of the fuel.

The Fusina plant has managed the co-firing of coal and CDR in sections 3 and 4 from 2006 until the end of the authorisation process which has involved Local Authorities, the Ministry of the Environment and the activity Ministry of Productive Activities. Then, this activity was authorised by the AIA for 70,000 t/year of CDR.

The CDR reception plant was built inside a metal frame industrial shed, properly ventilated and kept slightly depressurised, in order to avoid leakage of dusts and bad smells.

Co-firing in existing plants is one of the most effective methods for waste energy recovery to generate electricity, with no need for new industrial settlements and with limited interventions on the existing installations. Co-firing of CDR in the Fusina plant's 320 MW burners allows to

obtain about 38% of energy transformation efficiency, while ensuring the highest environmental protection standards in terms of reduction of air pollutants and discharge in water.

Co-firing of coal with CDR in the Fusina thermal power plant allows to keep local waste management companies (Veritas) from disposing of the waste in dumps or transporting it to other waste-to-energy plants.

So, the exploitation of co-firing waste with coal for energy purposes plays a strategic role in the waste management plan implementation, opening up to new perspectives for the use of waste-derived fuels starting from unsorted urban waste on the Venetian territory. The use of waste-derived fuel in place of the share of coal for thermal power is something that contributes to the reduction of greenhouse gas emissions, which is required to EU countries by the Kyoto Protocol.

Marghera Levante Edison Thermal Power Plant

The Marghera Levante Power Plant is located within the perimeter of the Site of National Interest of Porto Marghera and uses combined cycle technology.

Since 2001, following the Power Plant repowering, the overall electricity generation capacity went from about 587 MW to 766 MW in a cogeneration configuration with supply of steam to the plants in the Petrochemical area.

The Power Plant was build in the Porto Marghera Second Industrial Area and developed since 1960.

The Marghera Levante Power Plant functioning is based on three gas turbines (TG 3-4-5), two of which became operational in 1992 and one in 2001, all natural gas-powered, coupled to their respective electricity generators.

Chart 13: Marghera Levante Edison Thermal Power Plant: power of sections and start-up year

Sections	Power (MWe)	Start-up year
TG3	128	1992
TG4	128	1992
TG5	160	2001

The overall nominal installed capacity is 416 MWe

The technology used for the reduction of NOx nitrogen oxides is based on the injection of steam into the burning chamber.

The water used for steam condensation and machinery cooling comes from the lagoon (West Industrial Canal), while water for technological uses (demi water production, purge cooling and resupply to evaporative towers) is distributed by the SPM Consortium and taken from the Brenta Canal.

The demi water used for steam generation is produced by a demi water system.

The generated electricity is fed in the National Transmission Network.

Marghera Azotati Edison Thermal Power Plant

The Marghera Azotati Power Plant is located in the Marghera port area in the Municipality of Venice and uses combined cycle technology with an overall electricity power of approximately

MW in a cogeneration configuration, with supply of steam to the plants in the Petrochemical area up to a maximum of 50 t/h.

Since May 2008, the supply of steam to the petrochemical area ceased based on the structural reduction of consumptions by the companies in the industrial hub.

The construction of the Power Plant started in 1950 in the Porto Marghera's First Industrial Area, which was developed since 1917. The Marghera Azotati power plant is located inside the Site of National Interest of Porto Marghera.

The functioning of the power plant is based on the use of two gas turbines TG3 and TG4, which have been completely replaced with next-generation turbines equipped with water injection combustors and a compressor equipped with an intermediate air cooling system.

The technology used for the reduction of NOx nitrogen oxides is based on the injection of demi water into the burning chamber.

The water used for condensation and for cooling open circuit machinery comes from the lagoon. Condenser cooling for the new intercooling systems of turbogas assemblies is ensured by a closed-loop circuit system with evaporative towers.

The water for cooling purges and machinery and resupply to evaporative towers is taken from the Brenta river and then is conveyed by Syndial S.r.l.

The demi water used in the production of steam is supplied by the Marghera Levante Power Plant.

Giuseppe Volpi thermal power plant in Porto Marghera

The Porto Marghera thermal power plant was built in 1926, when the S.A.D.E. (Società Adriatica di Elettricità) constructed the Venetian industrial area.

At first, two 15.4 MW groups were built. Porto Marghera's thermal power plant is located in Porto Marghera first industrial area, in the municipality of Venice and borders with the Adriatic Intermodal Centre (freight handling and storage) to the north, with Transped (industrial logistics) to the south, with the West Industrial Canal to the east, and to the west, about 1 Km away, there are the first houses of Marghera urban area, and covers an area of about 112,000 sqm, anout 25.000 of are covered.

Currently, this plant is not active anymore. Transped, together with C.i.t.i. from Dalmine and Simic have formed a consortium which, in December 2013, has purchased the former Volpi power plant from Enel, in order to reconvert the area to the logistics business.

2.4.4 Transport infrastructures

2.4.4.1 Port terminals

The Marghera freight port features 1,447 hectares of port and industrial operational areas - plus an additional 662 hectares of canals, water bodies, roads, railways and other utilities - served by 12 kilometres of active docks; the docks can be reached by ships having draft up to -11.5 metres and are structured in tenths and tenths of lots, all equipped with approximately 40 km of road links and 70 km of rail links as well as 7 km of optical fibre.

There are 1,034 companies operating in Marghera totalling 13,560 workers, divided as follows: 4,220 workers engaged in typical port businesses, 1,580 workers employed in port industrial businesses, 1,466 workers in industrial businesses and 1,198 in other port-related business.

In the Fusina area a ferry terminal was recently created to specifically meet the need for an all-round intermodal transport. It has been operational since June 2014, and covers an area of 36

ha, 5 minutes away from the national and European road network; at full capacity, it will be able to serve 1,200 ferries a year, thanks to 4 operational moorings and 4 500-700 m long rail tracks.

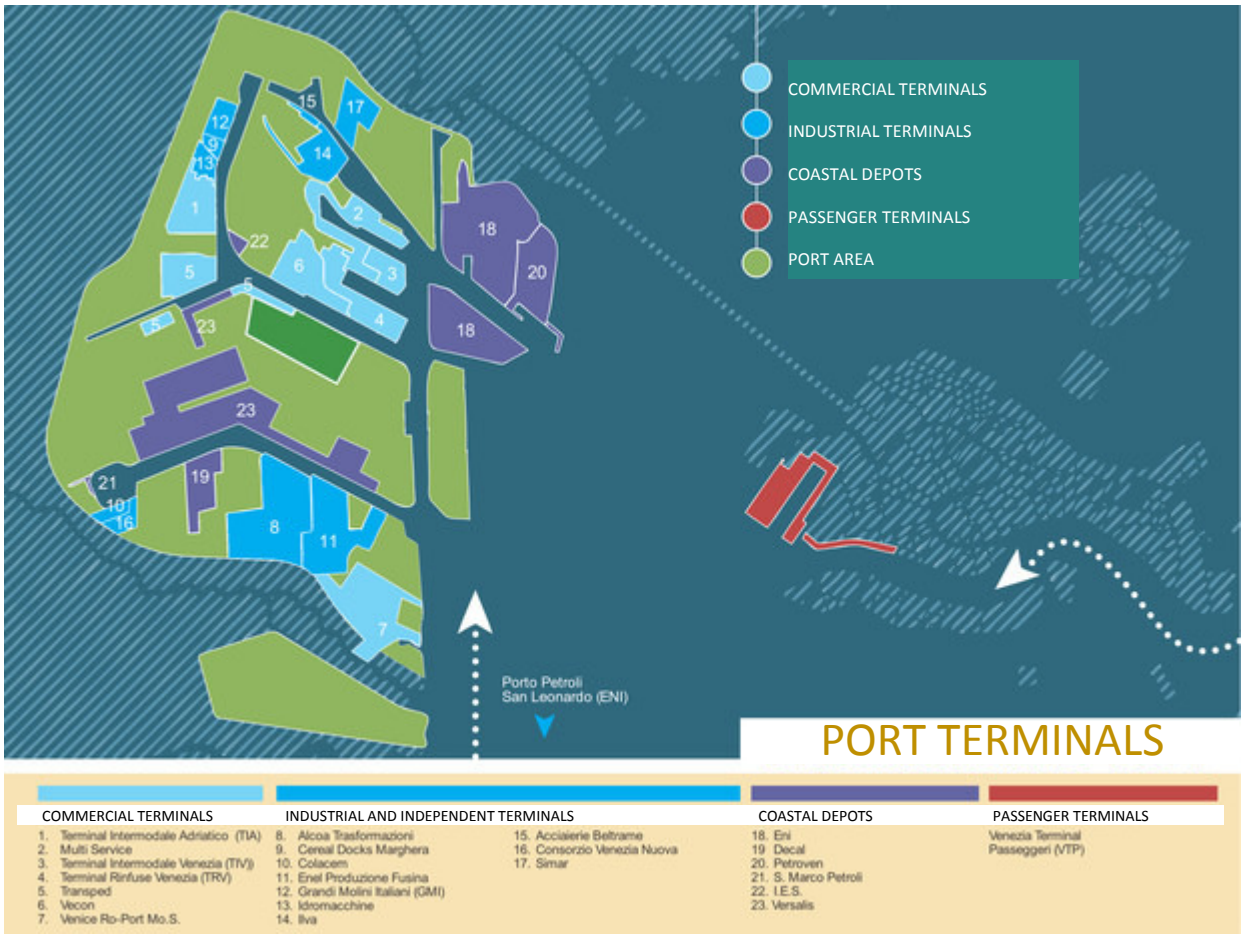
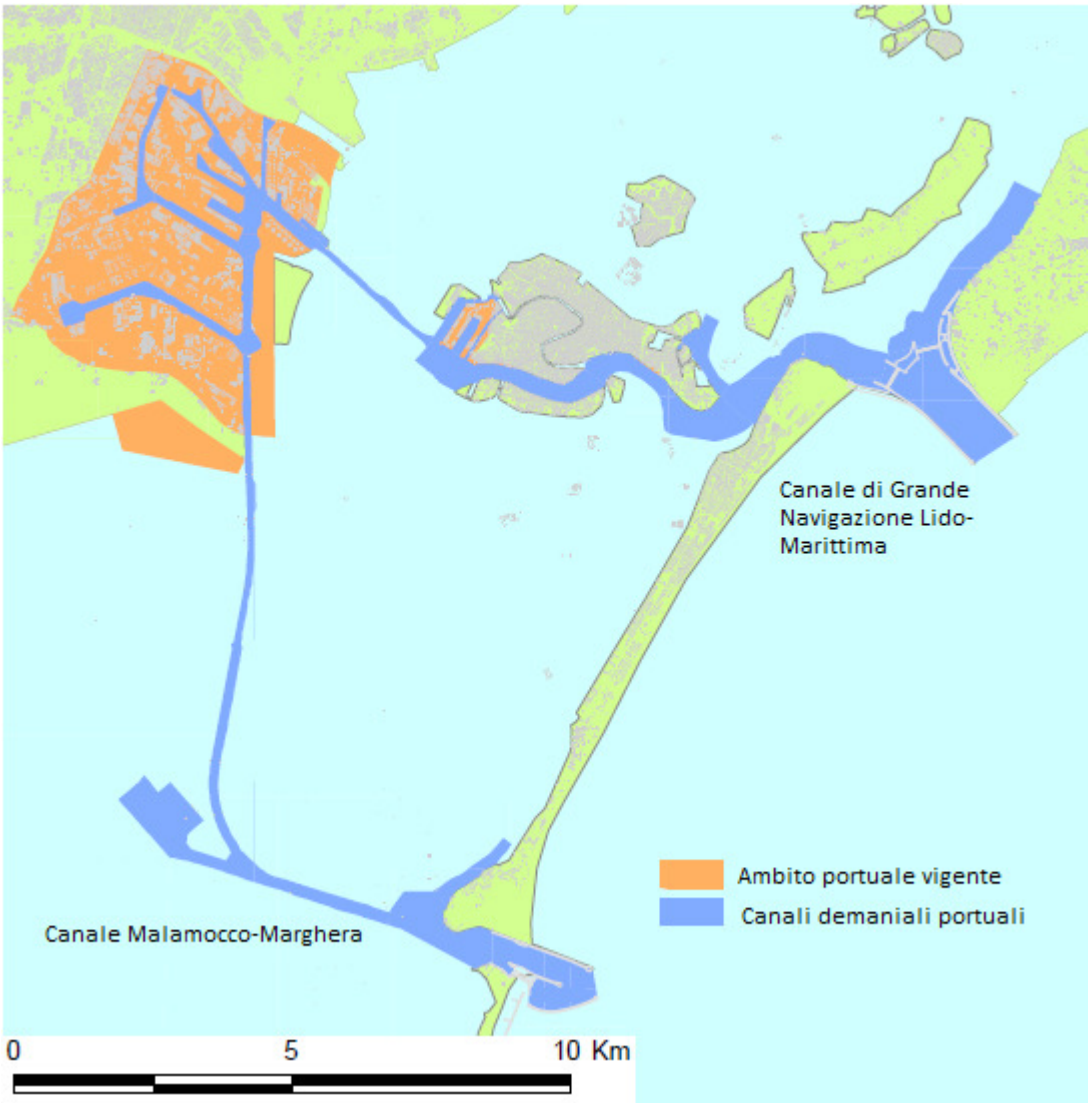


Figure no. 34: Port terminals

2.4.4.2 Nautical accessibility

Nautical access to port areas is ensured by the Canale Malamocco-Marghera large waterway, which allows access to ships having draft up to -11.5 m. The area is equipped with more than 100 operational moorings.



Voci figura:
Canale di Grande di navigazione Lido Marittima= Canale Malamocco-Marghera large waterway
Ambito portuale vigente=Current port area
Canali demaniali portuali=State owned port canals
Canale Malamocco-Marghera=Malamocco-Marghera canal

Figure no. 35: Nautical accessibility to the Port of Venice

2.4.4.3 Railway accessibility

The Port of Venice is one of the 12 Italian and 83 European ports recognised as maritime ports of the Trans European Network (TEN-T) priority network.

The Port of Venice position in the European transport system is extremely favourable in maritime flows via the Suez canal and in those to/from Central and Eastern Europe, and may experience positive evolution if railway links will be developed. The Port of Venice is at the junction of two European transport corridors.

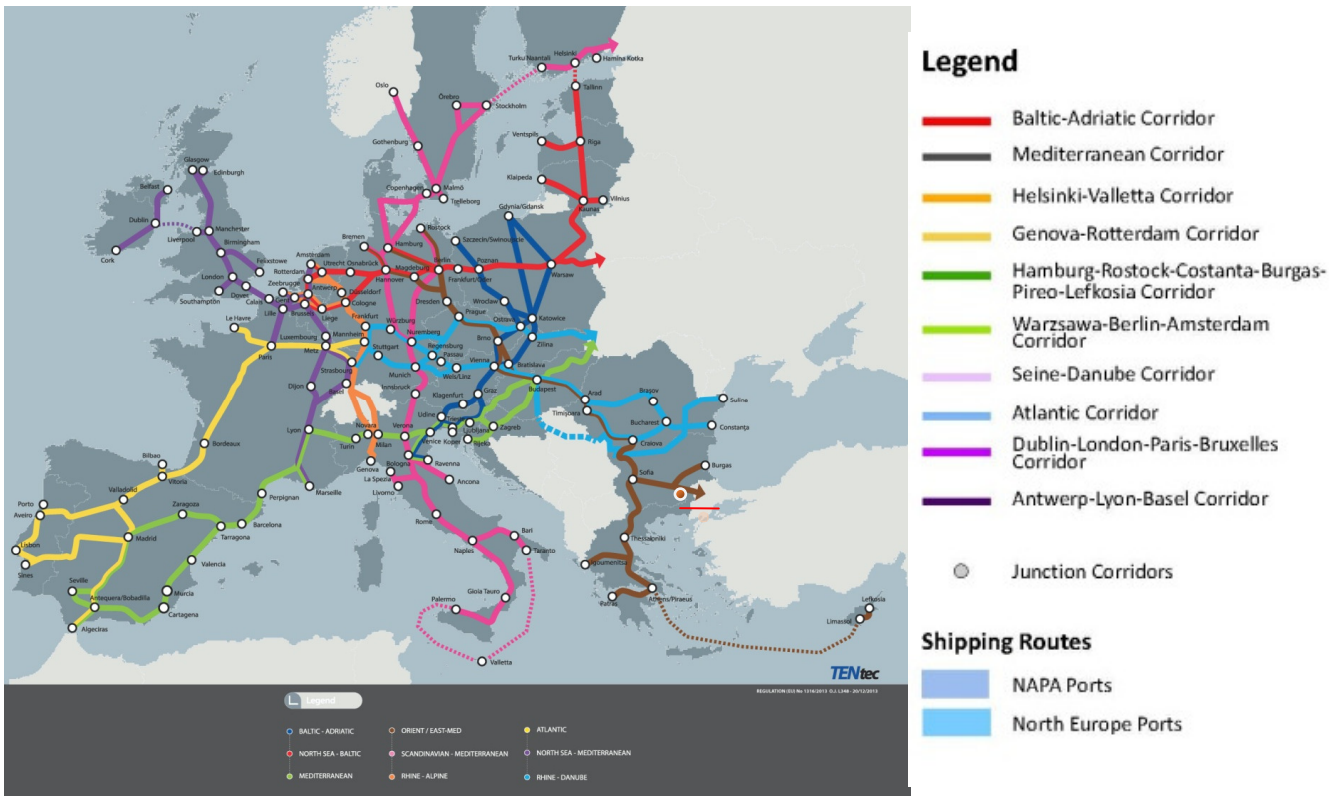


Figure no. 36: TEN-T Corridors

The national and international train traffic regarding Venice port areas weighs on the Venezia Mestre station.

The rail infrastructure servicing the port area of Marghera consist of the following line and point elements:

- the Venezia Mestre rail station;
- the Venezia Marghera Scalo rail freight station;
- the Venezia Mestre - Venezia Marghera Scalo railway line;
- sets of tracks of Parco Breda (entrance and exit area serving the north/north-east industrial area of Porto Marghera);
- sets of tracks of Parco Nuovo (entrance and exit area from and to the west and south sidings);
- sets of tracks of Parco Petroli;
- basic siding, branching off the Venezia Marghera Scalo station;
- specific sidings, with linking tracks and sets of tracks, within each area of the port.

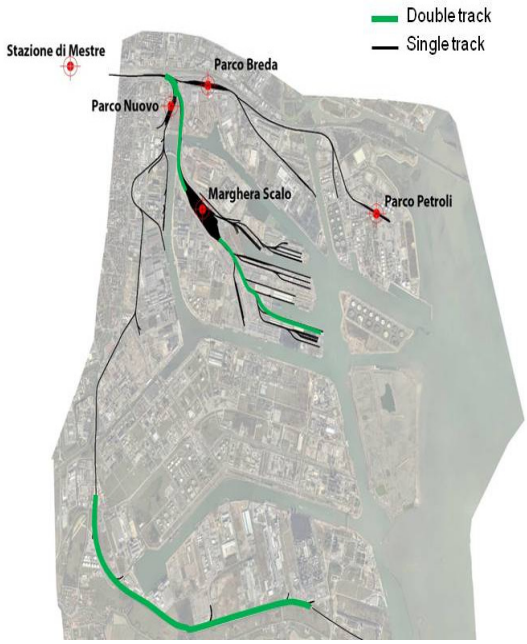


Figure no. 37: Rail infrastructures serving Marghera's port areas

Overall, the network managed by ERF (Esercizio Raccordi Ferroviari owned by Porto Marghera S.p.A.) extends for about 70 km covering part of the area of the Municipality of Venice, approximately 16.5 km, part of maritime state property under the Venice Port Authority (APV) jurisdiction, approximately 14.6 km if we include the 13 non-electrified tracks and the 7 new tracks of the new set in the VE Marghera Scalo station.

From an infrastructure standpoint, significant interventions were planned to enhance rail accessibility to the different areas of:

- Marghera Commercial Port Island,
- New Container Terminal and Distripark in the ex-Montefibre and Syndial compartment,
- New Fusina/Autostrade del Mare terminal,
- New rail link to the network.

2.4.4.4 Road accessibility

The Port of Venice is connected to the state's and European road network (Mediterranean, Baltic - Adriatic and Scandinavian - Mediterranean corridors).

Port of Venice accessibility to the local level is ensured by a good highway network directly connected to port terminals.

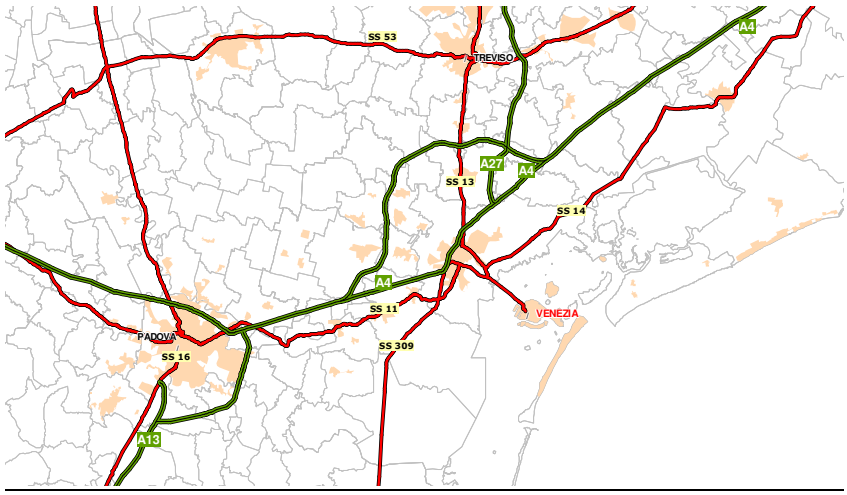
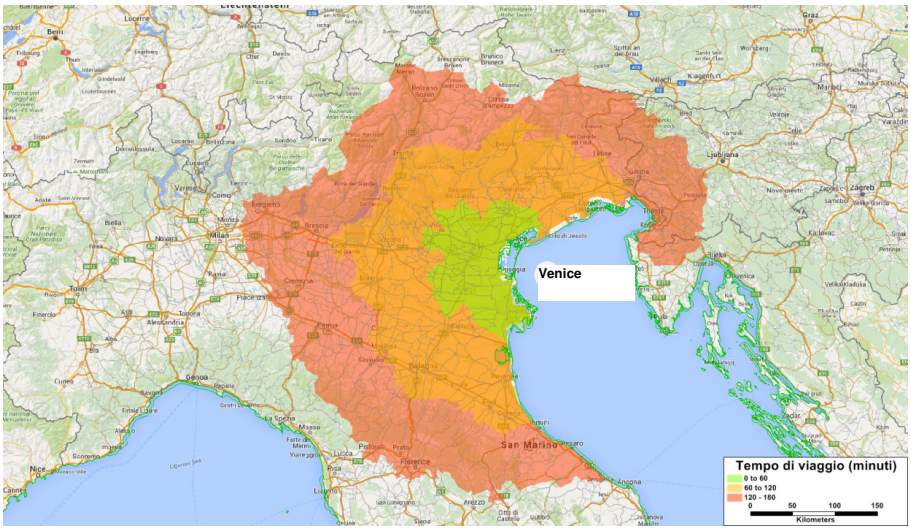


Figure no. 38: Highway network serving Venice

A good network of state and regional roads adds to the highway network, which guarantee low transit times towards the main hinterland locations.

Figure no. 39 shows isochrone maps on travel times on the different routes connecting the Port of Marghera to Northern Italy and the adjacent European Countries. For isochrone map calculation, time intervals of 60', 120' and 180' were used. This figure allows to highlight the different travel speeds on the different routes.



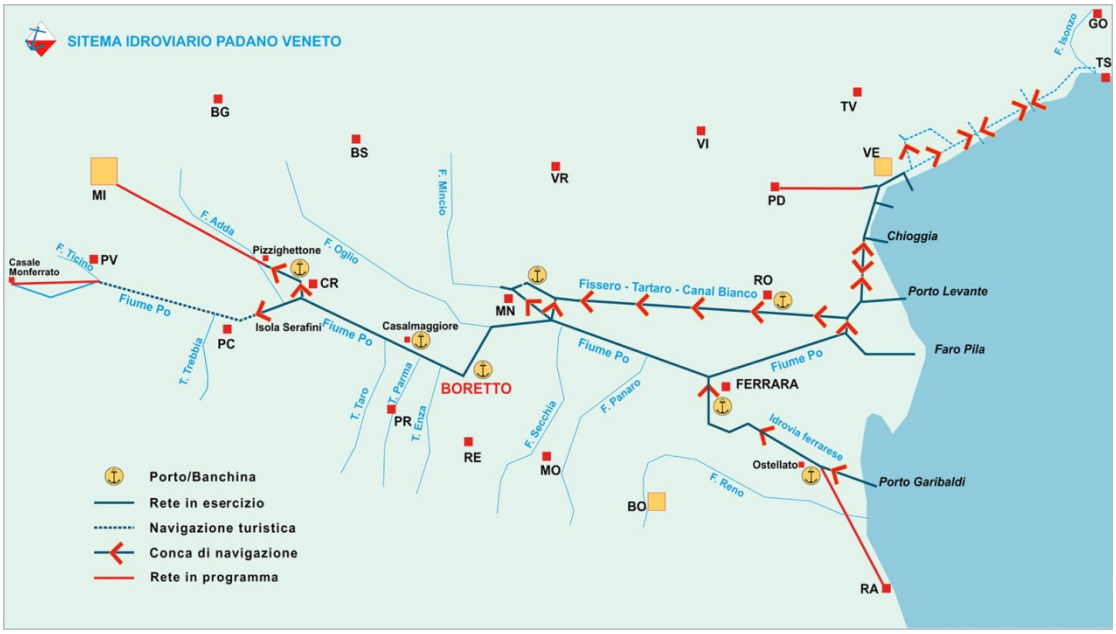
Voce figura: Tempo di viaggio (minuti)=Travel time (minutes)

Figure 39: Isochrone maps of road links with the port of Venice

2.4.4.5 Canal accessibility

North-East Italy is the only Southern Europe region equipped with a system of waterways able to get to the core of the national economic system. That waterway network allows navigation of class V barges able to carry goods in bulk or containers; the network allows to reduce traffic on road infrastructures.

The Veneto region boasts a true European-type canal network suitable for navigation of class Va trade vessels (according to CEMT classification). The network is directly connected to the Port of Venice-Marghera.



Voci figura:
PADANO VENETO CANAL NETWORK
Porto/Banchina=Port/Dock
Rete in esercizio=Operational network
Navigazione turistica=Tourist navigation
Conca di navigazione=Navigation basin
Rete di navigazione=Waterway network

Figure no. 40: Padano-Veneto canal network pattern

2.4.4.6 Airport accessibility

The Porto Marghera area can count on an efficient airport system which includes two of the three airports in the Veneto Region. The first and most important one is the Marco Polo airport in Venice (VCE), located in the municipality of Tessera, 13 kilometres away from Venice, 12 from Mestre; the second one is the Treviso-Sant'Angelo (TSF) airport, three kilometres away from the centre of Treviso.

Below are the distances and travel times to reach the closest airports to the Marghera port.

Chart no. 14: Distances and travel times to reach the closest airports to the Marghera port.

Departure	Destination	Distance (km)	Times (min.)
Marghera port	Venice airport	8.7	15
	Treviso airport	37.4	35
	Verona airport	127	85
	Trieste airport	122	80
	Milan Linate airport	250	160

Times and distances of Marghera port from the main airports

The following image, taken from the Veneto Regional Transport Plan, shows the distances that can be covered in a 4-hour time frame at an average speed of 600Km/h, starting from one of the airports in the Venice airport system.

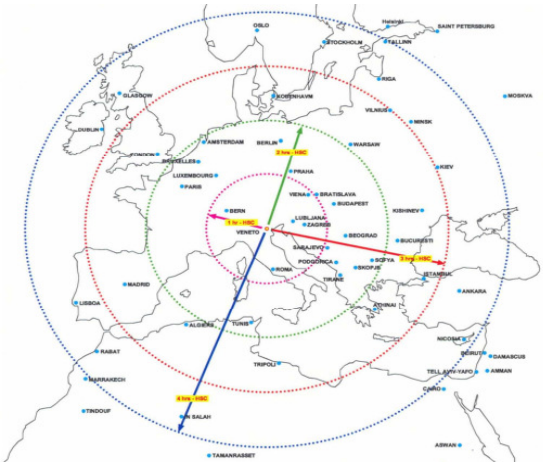


Figure no. 41: Locations that can be reached from the Venice airport (average speed 600 Km/h)

This image shows that the main locations of Central Europe can be reached in 2 hours maximum, and in a maximum 4 hour time frame all the main European capital cities and the Mediterranean Countries (from Tallin to Marrakech, from Glasgow to Cairo).

2.4.5 Regulations and planning

Porto Marghera, Site of National Interest[23] and Area of Complex Industrial Crisis[24], is an ever-changing production area which is becoming more and more a possible large construction site that is strictly connected to and integrated with the Marghera and Mestre area, but also Venice, through the lagoon canals. Therefore this area is of particular interest because it is close to the urban centre and due to the presence of industrial businesses that can encourage new

[23] The "New environmental interventions" law dated 9th December 1998, provided for the open competition to perform environmental cleanup and redevelopment interventions of the contaminated sites and identified the Porto Marghera industrial area as a site at high environmental risk.
The decree of the Ministry of the Environment dated 23rd February 2000 has outlined the perimeter of the Site of National Interest (S.I.N.) and has established the criteria, procedures and methods for safety enhancement and environmental cleanup and redevelopment.
By decree dated 24th April 2013 of the Ministry of the Environment and Protection of Land and Sea, published on 14th May 2013 on the Official Journal no. 111, general series, the new perimeter of the Site of National Interest was approved.

[24] Pursuant to decree of the Ministry of Economic Development dated 24th March 2010, the decree of the General Manager of the General department for industrial policy and competitiveness, dated 5th May 2011, approved the conditions for acknowledging the complex crisis status having a significant impact on the national industrial policy of the Porto Marghera area and adjacent areas which are functional to its development.

investments aimed at the industrial reconversion of facilities and the enhancement of the skills existing in the area.

Over time, full knowledge of the "Porto Marghera issue" was gained even due to significant nation-wide attention to environmental cleanup and rehabilitation of contaminated sites; so the need for adopting policies and planning and technical instruments for environmental rehabilitation and upgrade was acknowledged.

The signing of the Planning Agreement for Chemistry of Porto Marghera on 21st October 1998 at the Ministry of Industry, Commerce and Craftsmanship, later approved through Council of Ministers Presidential Decree dated 12th February 1999, was an extremely significant event which has actually started the preparation of said instruments.

The Agreement's deed of addition signed on 15th December 2000 (later approved through Council of Ministers Presidential Decree dated 15th November 2001), having evaluated the nature and complexity of the problems regarding the cleanup of the Porto Marghera site, also established the preparation of a Master Plan for cleanups "in order to direct the drawing up of projects consistent with an environment requalification of the whole area covered by the Agreement, having general and consistency characteristics and which ensures the preparation of the most suitable and prompt solutions according to the specific characteristics of locations".

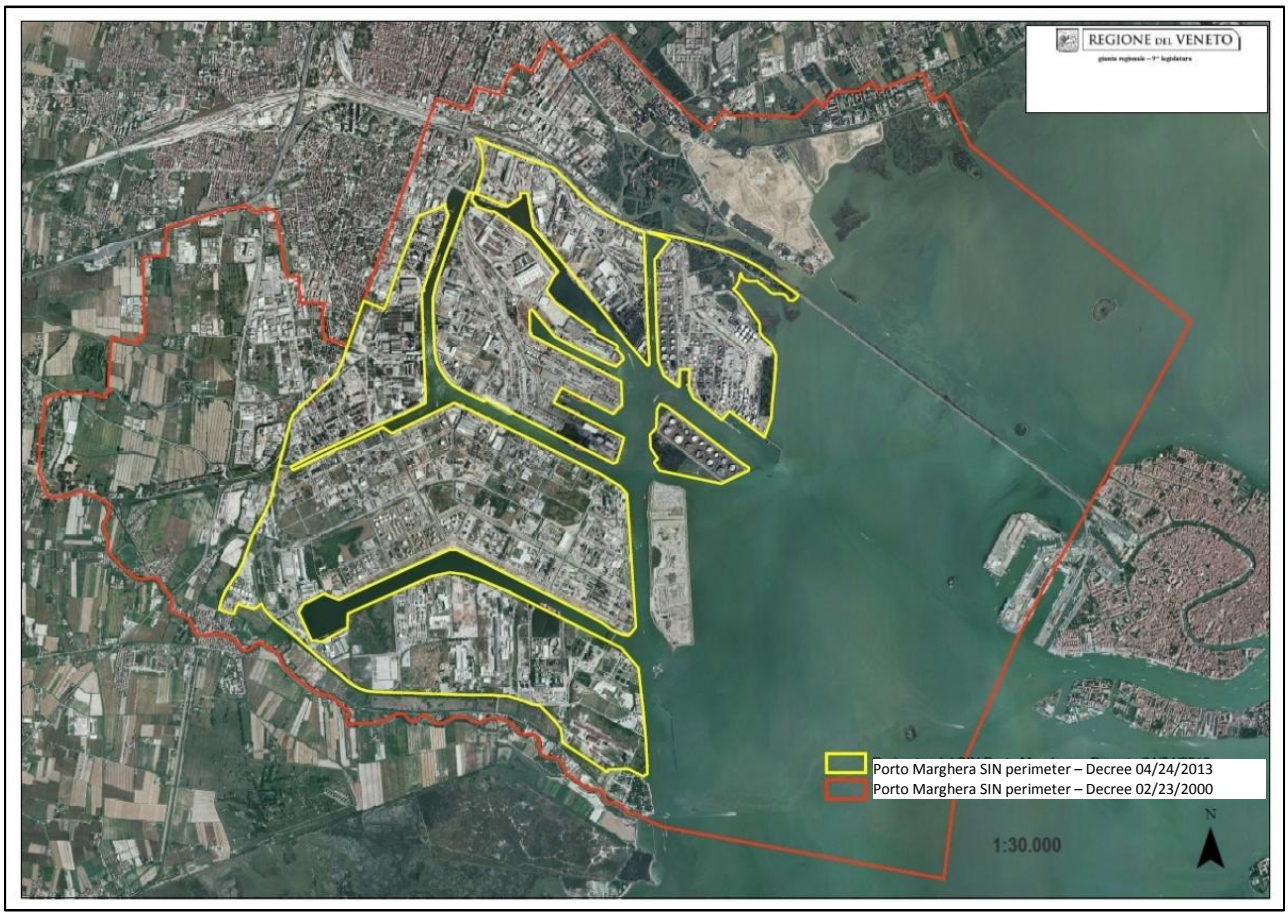


Figure no. 42: Perimeter of the Site of National Interest (S.I.N.) of Venice-Porto Marghera

2.4.5.1 Remediation Master Plan

The Master Plan for the remediation of Porto Marghera brownfields[25] is an instrument to identify and plan the reclamation interventions for the Porto Marghera industrial area. As a Plan of Interventions, the Master Plan's analysis and intervention strategies focus on a system-based approach, as it considers the industrial area of Porto Marghera, and in general the whole Site of National Interest, in its entirety, although it recognises there are some contaminated areas which therefore pose different problems, and provides different solutions for those areas.

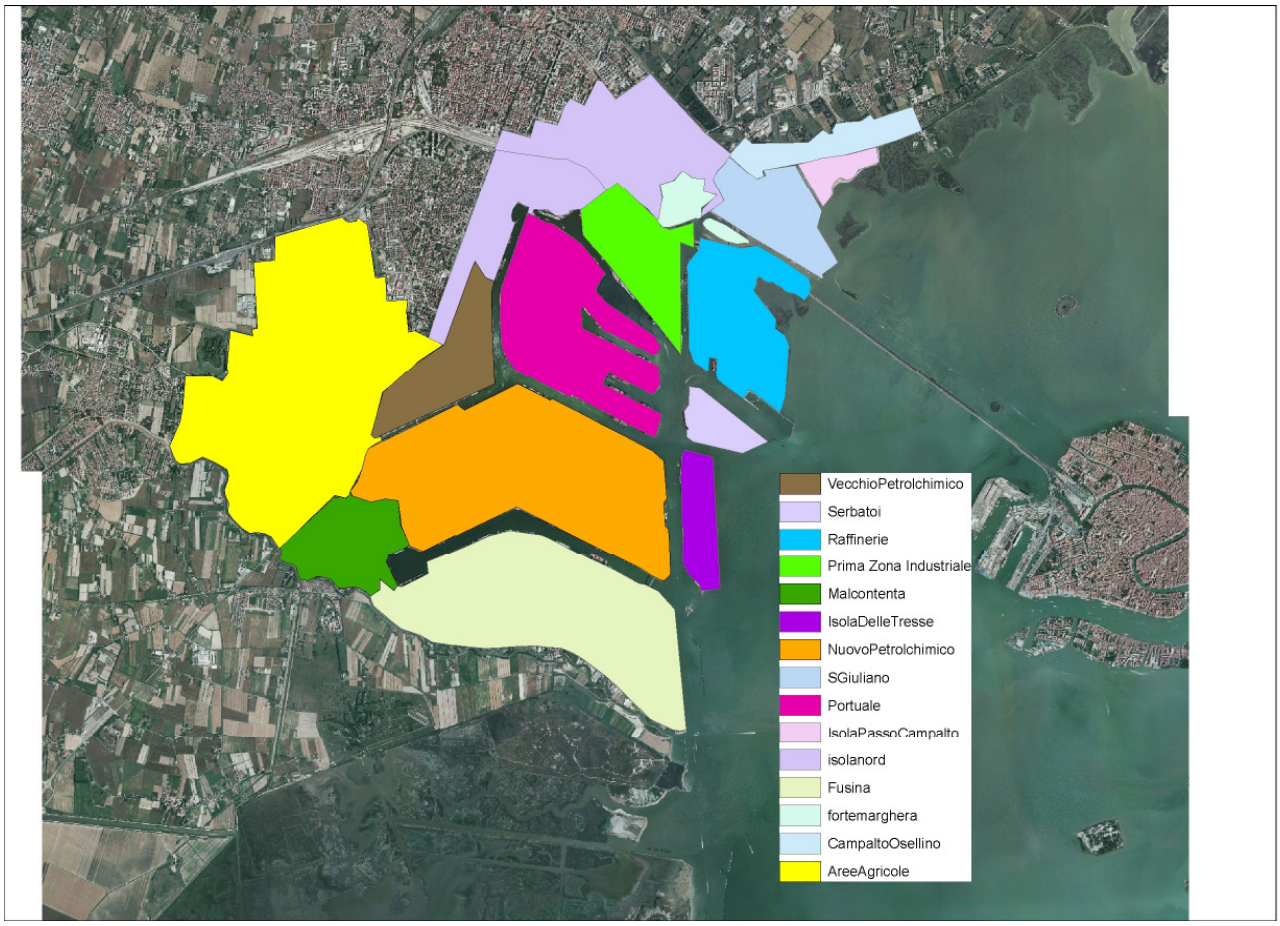


Figure no. 43: Subdivision of the Site of National Interest (S.I.N.) of Venice-Porto Marghera in macro-areas

The conceptual model for the definition of the Master Plan's environmental framework was developed using the European Environment Agency's DPSIR framework. According to this, the environmental framework is described using a simplified chain of information which, starting from the analysis of drivers and pressures that affect the environment, gets to the evaluation of the effects on the system analysed, that is on the states and the problems resulting from these effects (impacts). The model then completes with finding responses, those actions aimed at preventing, limit or remove impacts on the environment.

[25] The Master Plan was adopted by the Supervising Committee on the Agreement for Chemistry on the 22nd December 2003 and approved with amendments and integrations by the Agreement Conference of Services on the 22nd April 2004.

2.4.5.2 "Moranzani" Planning Agreement

On the 31st March 2008 the "Planning Agreement for managing sediments dredged from the major navigation canals and the environmental, landscape, hydraulic and road repurposing Venice - Malcontenta – Marghera area" called "Moranzani Agreement", was signed by twelve Signatories which were able to share a series of actions that have allowed and will allow to regenerate one of today's most depressed areas in Venetian mainland.

This Planning Agreement originated from the need to find a definitive site for the disposal of sediments dredged from Port Canals. So a project proposal was submitted for the construction of a dump site in the "Moranzani" area in Malcontenta in order to enhance safety measures and enlarge existing dumps, which would then receive the contaminant sediments above the column "C" in the 1993 Protocol, after proper deactivation. In connection with the Planning Agreement implementation, a lot of interventions for environmental redevelopment of the Malcontenta area, in Venice, were planned, as a compensation for the construction of the Vallone Moranzani dump.
Below are the interventions designed for environmental reclamation of the area concerned, aimed at creating a physical separation between the area South-West to Marghera's built-up area, included between Fusina, Malcontenta's built-up area and the Venice - Padua motorway, as well as other measures to remove and/or mitigate causes of environmental pressure:

1. the streamlining of the road system concerned by the future Moranzani dump and by pre-treatment plants, as well as the road system supporting the logistic and port businesses based and to be based in the area between Fusina and Marghera, with separation of through traffic flows from local traffic flows;
2. interventions on the hydraulic reclamation network, by creating basins and areas for controlled flooding of rainwater, before they flow into the lagoon;
3. construction of urban parks in the area between Fusina, Malcontenta and Lusore; the displacement of the San Marco Petroli company to a different site farther from Malcontenta built-up area;
4. undergrounding of high, medium and low voltage power lines outbound ENEL's "Palladio" power plant in Fusina, with consequent landscape redevelopment;
5. environmental reclamation and/or enhancement of safety measures in areas where waste was already buried, sometimes in an uncontrolled way;
6. environmental enhancement intervention along the lagoon edge, through the ecological restoration of a wide agricultural land;
7. creation of cycling infrastructures;
8. undergrounding of the overhead power line in the lagoon stretch between Fusina and Sacca Fisola and creation of a new underground line between Sacca Serenella and Cavallino.

2.4.5.3 The Land Development Plan of the Municipality of Venice

The PAT and the PI (Plan of Interventions) are part of the new PRC (Municipal Master Plan) introduced by the Town Planning Regional Law no. 11 of 2004, which forces all the Municipalities of the Veneto region to adjust their town planning instruments.

The PAT is a "framework plan", meaning a planning document that:

- outlines the major decisions on the territory and sustainable development strategies;
- defines the functions of the different parts of the municipal territory;
- identifies the areas to be protected and developed due to their environmental, landscape, historical and architectural value;

- implements the general directives of higher level instruments (PTRC, PTCP, PALAV) and the municipal instruments related to the wide area (Strategic Plan, Urban Plan for Mobility).

As application of the directive 2001/42/EEC, implemented by the Regional Law 11/2004, all the steps for the drawing up of the PAT are subject to VAS (Strategic Environmental Assessment), in order to ensure that the decisions in the plan are sustainable.

During the deliberation conference of 09/30/2014, the Land Development Plan of the Municipality of Venice was approved. The deliberation by the Government of the Province of Venice no. 128 dated 10/10/2014 ratified its approval.

The PAT has confirmed Porto Marghera's production-industrial function, defining the uses and the functions to develop in the single areas of the industrial port.

The Plan of Interventions (PI), following and as implementation of the PAT's strategic choices, details the changes to be made on the territory over a specific period, through direct actions or through PUAs (Urban Implementation Plan).

Basically, the PI has the contents of traditional Master Plans and their Variations (zoning for example), but with two major innovations:

- within the PAT's coherent framework, the PI is determined and managed in complete autonomy by the Municipality, with no need for authorisations on a region or province level;
- it has limited time validity (typically five years) and is linked to the Municipality's multiannual financial statements, the three-year public works plan and the other municipal sectoral instruments imposed by state and regional laws, and the creation of new settlements is coordinated and subjected to the feasibility of the infrastructures and town planning works.

The "Mayor's Document for the intervention plan" submitted, pursuant to Veneto Regional Law of 23rd April 2004 no. 11, to Venice's Municipal Council in the session of 15th June 2016, considering Porto Marghera one of the strengths of Venice's and the whole Veneto's economic system, proposes strategies and policies of interventions aimed at the economic and functional reconversion of the industrial area. Also, it would be the perfect location to develop manufacturing, integrated industrial logistics and research and innovation activities.

2.4.5.4 Port master plan

The current Master Plan of the Port of Venice (PRP) dates back to 1965 (map, read the report) for the Porto Marghera area and to 1908 (map - read the report) for the Marittima, Santa Marta and San Basilio areas.

Considering the evolution of the economic and maritime scenarios, Venice's Port Authority has felt the need to adopt a town planning instrument to meet the new needs, by starting the Master Plan review process.

These scenarios involve deep revolutions in unitised trades (containers and Ro-Ro), the trades related to industrial transformation, the transformation of the port model connected to the canal (naviglio) evolution, historical processes such as the creation of a common market in a Europe expanded to 28 countries and the switch of trade focus towards the eastern Mediterranean and Asia.

The main changes already occurring at a very early stage in the Port of Venice and which have to be developed in the new Master Plan involve the following:

- industry: the traditional industrial productions that have boosted Marghera's development also in the second half of the past century, have now been replaced by activities more related to logistics, transports and light duty manufacturing;
- the influence pool/demand: the development and concentration of production activities to the East gave the northern Adriatic and therefore Venetian port system a new central role;
- oil industry: switching from oil to its products, from refining plants to distribution and LNG plants;
- chemistry: from traditional to green;
- agri-food industry: organizational adjustment of the companies based in Port Marghera with a port-centric approach;
- the project cargo compartment: the idea for the future is to develop areas on the back of docks suitable for assembling exceptional products and packages for later boarding;
- increased environmental awareness and attention to Venice and its lagoon.

The new Port Master Plan will have to consider these deep changes, as a planning instrument that will reshape the port's development strategy over a time frame of at least 20-25 years; also, the new Port Master Plan will ensure the organised growth of the port and a rational urban development.

Additionally, following the port legislation reform in force since the 15th September 2016, the Port Master Plan will also concern the areas of the Port of Chioggia, in order to comply with the reviewed provisions of the Law 84/94, according to which the Port of Venice has become part of the Port System Authority of the Northern Adriatic Sea – Port of Venice and Port of Chioggia.

2.4.5.5 Three-year Operational Plan

The Three-year Operational Plan, which is a programming document drawn up on a three-year basis and reviewed annually, in compliance with the Law 84/94, article 9, paragraph 3, defines the development strategies for the activities in the port and the actions aimed at ensuring the achievement of said goals.

Here is a list of the current goals:

- the possible development of logistic-port and transformation activities;
- the regeneration of the commercial terminal supply;
- relaunching trade of goods in packaging and in bulk;
- developing a new logistic-port function at the service of the territory;
- strengthening the coordination role of the Port Authority;
- better functioning of the port in terms of safety, at all levels;
- investments in infrastructures to increase broadband diffusion in the port areas;
- enhancing Information and Communication Technology (ICT);
- displacement of Porto Marghera Transshipment Port;
- integration of the Fusina terminal;
- interventions in the MonteSyndial area for reconverting it to logistic/port activities;
- design and construction of two new port docks;
- finding a new location for tugboat moorings;
- state acquisitions in Porto Marghera;

- enhancement of San Leonardo moorings;
- regeneration of Santa Marta and San Basilio areas;
- developing state properties and areas in Venezia Marittima and the Old Town;
- creation of new spaces for leisure boats in Cavallino-Treporti
- mitigation of the Mo.S.E. system's interferences on port operations;
- measures in order to define the "standard ship" for access to Porto Marghera;
- access of cruise ships to Marittima;
- roads;
- rail infrastructures;
- study of new technologies able to allow environmental and energy sustainability of port activities;
- project for the new offshore multimodal terminal of the Port of Venice;
- streamlining of customs procedures.

2.4.6 Ownership of the areas

The deep functional transformations occurred over the last decades on the Porto Marghera area and the substantial changes involving the structure of the companies based there, produced significant effects on the ownership of lands.

Functional restructuring, downsizing and reorganisation processes put in place by the industrial sector, especially by companies in the chemical industry, have caused fragmentation of the area's ownership system.

In general, today we can distinguish between publicly-owned areas - which include areas belonging to both the necessary state heritage and the available state properties, which are therefore disposed of - and areas owned by third parties.

Using a simple classification of privately-owned areas, the properties in the area are split down as follows in percentage:

Total public areas 35% of which:

- Municipality of Venice - 3%
- Venice Port Authority - 16%
- Interregional Public Work Supplies Department of Veneto, Trentino Alto Adige, Friuli Venezia Giulia - 7%
- Veneto Region - 8%
- Rete Ferroviaria Italiana (RFI) - 1%

Total private areas 65%

Failure to complete the construction of the second industrial area and the progressive dismissal of the industrial favored the availability of areas the use of which may be one of the cornerstones of the reconversion process and functional transformation that the involved administrations intend to promote.

In April 2014, in order to promote this reconversion process and the economic requalification of the area, the City od Venice and the Veneto Region signed a preliminary sale agreement with Syndial Spa (company of the ENI group) for the purchase of about 110 hectars of industrial areas in Porto Marghera owned by Syndial. Once the purchase procedures will be finalised these areas

will be let to business companies interested in setting new industrial activities in Porto Marghera.

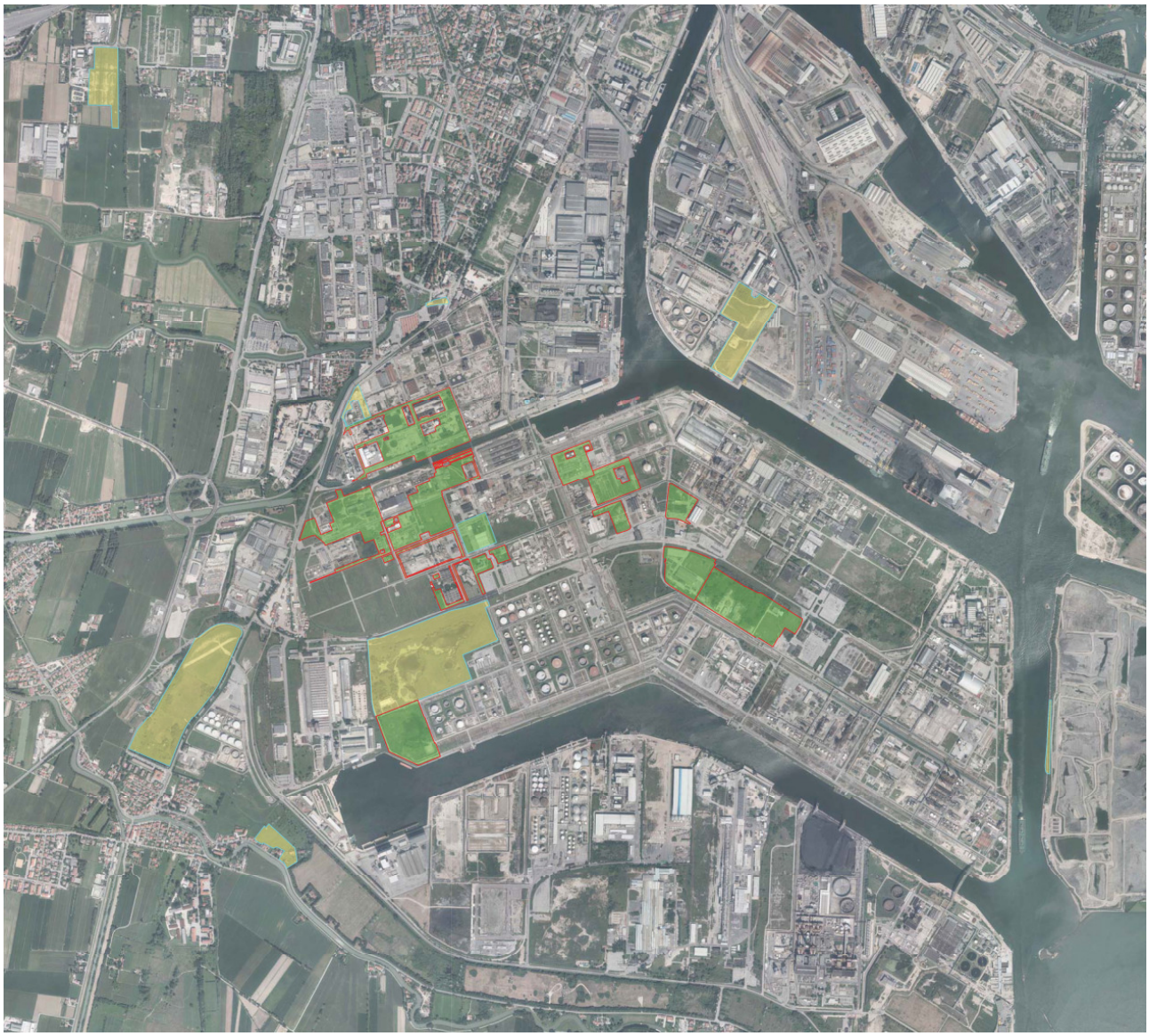


Figure n. 44: areas included in the preliminary sales Agreement

3. Conclusions: the main challenges for reconverting the Porto Marghera industrial pole

For many years, environment requalification and economic regeneration of Porto Marghera have been a focal point of national and local policies on land management and support and development to the production fabric.

Over the years, there have been a lot territorial and economic programming instruments, which set out alternatives scenarios and perspectives for basic production, and are aimed at economic and functional reconversion of the industrial area.

The historic start-up of the requalification and conversion process was the signing - on 21st October 1998 - of the Planning Agreement for Chemistry of Porto Marghera referred to in the Council of Ministers Presidential Decree dated 12th February 1999.

By decree of the Minister of the Environment dated 23rd February 2000, the perimeter of the Site of National Interest (S.I.N.) was then outlined and the criteria, procedures and methods for safety enhancement and environmental cleanup and redevelopment were established.

By decree dated 24th April 2013 of the Ministry of the Environment and Protection of Land and Sea, the new perimeter of the Site of National Interest was approved. The responsibility for the necessary verification and any cleanup operations on the portion of territory already falling under the previous perimeter of the S.I.N was assigned to the regional administration authority.

By implementation of the decree dated 5th May 2011 of the General Manager of the General department for industrial policy and competitiveness of the MiSE, the conditions for acknowledging the complex crisis status with a significant impact on the industrial policy of the Porto Marghera area and adjacent areas which are functional to its development, were approved.

With the "Planning Agreement for environment cleanup and requalification of the S.I.N. of Venice - Porto Marghera and adjacent areas" signed on 16th April 2012 and the relevant implementation Protocols, the actions aimed at making the procedures for characterisation plans and cleanup projects quicker and easier, which allow a sensible reduction in the time required for cleanup procedures and a significant cost saving.

The proposal of the Industrial reconversion and upgrade project (PRRI) regarding the Area of Complex Industrial Crisis of Porto Marghera and adjacent areas, approved by the Decree of the Regional Government 749 dated 27th May 2014 and presented by the Veneto Region[26] to the MiSE, included, among other things:

- an overview of the shut down or crisis cases for the sectors and enterprises located in the industrial area (such as chemistry, metalworks, transports and third industry)
- an indication of the production sectors towards which the area of crisis should be reconverted to, with regard to the Planning Agreement dated 16th April 2012 on the simplification of cleanup procedures (article 8, paragraph 4), given the evolution occurring in the area, through which it was agreed that the action of the parties involved in the Agreement should be combined towards the following sectors, in order to promote investment plans:

1. sustainable chemistry;
2. energy;
3. industry;
4. logistics;
5. port activities;
6. boating;
7. constructions;
8. innovation/research;
9. the list of updated projects for the private sector and the public sector (APV);
10. the indication of the instruments and the national financial resources available.

[26]The proposal was agreed by the Permanent Table for Porto Marghera, established by the President of the Region on 12th October 2010, as per article 69 of Regional Law dated 16th February 2010, no. 11.
The Permanent Table consists of the representative of the Veneto Region, the Province of Venice, the Municipality of Venice, the Venice Port Authority, the Venice Chamber of Commerce, Industry and Craftsmanship, Confindustria, Apindustria and CGIL, CISL and UIL unions, and is where the issues regarding Porto Marghera are discussed. It is structured in Work Groups for the topics "Cleanup"; "Intended use of the areas"; "Investment projects"; "Employment".

In order to boost traffic, the presence of a "free port" inside the Port of Venice was considered an aspect to be enhanced, considering the tax exemption scheme applied to the goods entering the free port may allow those companies willing to leverage on its services to market, transform and handle the goods without it resulting in a tax charge, with an obvious and clear competitive edge.

On the 8th January 2015, a new Planning Agreement for relaunching Porto Marghera was signed. It contains investments for about 152 million euros for the industrial area. This Agreement was signed by the MiSE, the Veneto Region, the Venice Port Authority and the Municipality of Venice, and provides for the allocation of resources (about 102 million euro) by the Ministry mostly, deriving from refunds of State Aids non compatible with the common market. In addition to these, there are the amounts already allocated by local authorities for territorial rehabilitation interventions and implementation of safety measures in the hydraulic system, as well as the recovery and strengthening of the existing infrastructures.

The Agreement provides for the implementation of 23 interventions identified among those at the most advanced project stage with declared operational goals, in order to achieve industrial reconversion and requalification of the Area of Complex Industrial Crisis of Porto Marghera.

In addition to this rich programme framework, Porto Marghera features a wide and stratified set of economic initiatives and investments fostered by different parties, both public and private, which confirm the great potential for development of the area.

However, the economic development and regeneration process of Porto Marghera is still affected by some factors which have been in the limelight for a long time at a city and national level, both from a political and a technical standpoint, in particular:

7) the governance of Porto Marghera: it is necessary to overcome the current fragmentation of competences and to encourage coordination among the different levels of governance involved in the area's reconversion process;

8) industrial site cleanup: it is necessary to guarantee quick approval times and certain methods to execute the projects, in order to foster the industrial use of dismissed areas;

9) **the completion of some major interventions on infrastructures** aimed at improving the area's environmental conditions (lagoon front embankment of the industrial area for the implementation of safety measures and cleanup of the underlying contaminated acquifer, Moranzani Agreement Projects, PIF);

10) the failure to **enhance free areas** even based on a different economic connotation of the Porto Marghera area which includes production businesses and specialisations different from the past, and more and more diverse entrepreneurship featuring new business categories and new professional figures;

11) the lack of an **aiding system** appealing for the companies which are willing to get established in Porto Marghera. It is necessary to promote an action plan which includes the following, among other things:

- the enlargement and enhancement of the free port existing in Porto Marghera;
- the definition of the methods and tools aimed at making the authorization procedures easier from a planning, building and environmental standpoint;
- the conclusion of the procedure for the recognition of Porto Marghera as an Area of Complex Industrial Crisis, according to three alternatives and the approval of the Industrial reconversion and upgrade project (PRRI), in order to allow the companies having industrialization projects to access the funds allocated by the Ministry of Economic Development through the Law no. 181/89;

- the creation of the conditions to appeal new investments and new business initiatives aimed at developing the industrial area and the employment.

The challenge for all the actors, both institutional and non-institutional, involved in the tough production and functional upgrade process going on in Porto Marghera is to overcome said critical conditions and weaknesses, in order to enhance the potential and specific features of the area in as part of a rebalancing of the territory and the reduction of the environmental impact.