

TRIESTE, BACK TO THE SEA. DESIGNING SUSTAINABILITY AND DEVELOPMENT OF LOGISTICS AND INDUSTRIAL PORT AREAS AFTER THE PANDEMIC

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Abstract – This work traces the stages of a long process of safety and industrial reconversion of an iron and steel industry polluted area, a typical “brownfield” [1], within the port of Trieste. Since 2014, a series of phases have followed one another, implementing an articulated and complex process. In recent years, this process has had to deal with events and scenarios on a global scale that have significantly affected the port system of the site, with the logistical and geopolitical aspects, demonstrating the adaptability and dynamism of various subjects in knowing how to combine development and environmental protection. The interest in the case of Trieste, provided for by the 2006 Environmental Code (Codice dell’Ambiente), is the first completed application of this law in Italy. The results obtained include the completion of the environmental safety program, the renewal of the existing industrial plant, the increment in logistics activities and the maintenance of occupational levels. Following these encouraging results, the activation of a new second agreement, currently in progress, demonstrates the effectiveness and repeatability of the procedure.

Introduction

On January 30th, 2014, the Program Agreement (*Accordo di Programma*) of the “Program Agreement for the re-development of industrial and port activities and environmental recovery in the complex industrial crisis area of Trieste” was signed [6]. The aim was to implement an integrated project of safety, industrial reconversion and economic development in a Polluted Site of National Interest (SIN) in order to reuse these areas in conditions of health and environmental safety. Subsequently, on November 21st, 2014, a more specific Program Agreement was signed “for the implementation of the integrated project for safety, industrial reconversion and economic production development in the *Ferriera di Servola* (Servola Ironworks site)” [5].

The significance of this initiative - in addition to its specific contents - lies in the fact that it was the first application of the procedure contained in art. 252-bis “National polluted sites of preeminent public interest for industrial conversion” (*Siti inquinati nazionali di preminente interesse pubblico per la riconversione industriale*) of the Environmental Code. A complex process that saw, among others, the Minister of the Environment and Protection of Land and Sea and the Minister of Economic Development, with the Minister of Labour and Social Policies, in agreement with the Friuli Venezia Giulia Region and the Port Authority of Trieste, enter into an agreement with the Arvedi Group, concessionaire of a large contaminated industrial area of over 270 000m² within the Port of Trieste, that has allowed the re-employment of 400 workers.

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From a historical point of view, the iron and steel plant of the Ferriera was born in the last years of the nineteenth century with the purpose of supplying cast iron and ferroalloys to the Austro-Hungarian Empire. From 1913 onwards, there was a progressive expansion of the plant with the construction of new blast furnaces and foundry areas with gradual implementations up to the second half of the twentieth century. After several decades of stagnation at the end of the 1990s, the plants that had been shut down over the years were restarted: the existing structures were strengthened through the refurbishing of the steel plant, a coke battery was built to replace the existing ones, along with the thermoelectric plant. The first workings on the sea landfill, refer to 1897, but many others followed, including the expansion of the quay (1907), the enlargement of the area adjacent to the *Scalo Legnami* (1931) and the conquest of a further 200 000 square meters of the sea (1960). At the date of the Program Agreement, the steel plant was spread over a total area of 500 000 square meters, partly under state concession as the areas were subject to the administration of the Port Authority System of the Eastern Adriatic Sea (*Autorità di Sistema Portuale del Mare Adriatico Orientale*). The excavations carried out over the years have been achieved with demolition materials from disused activities and with process waste (discards from blast furnaces), often improperly used as aggregates in the past. The “quality” of the waste used to create the landfill is linked to the process line that generated these aggregates. Therefore, the deeper layers that correspond to the older layers are the most polluted ones, as the production process and the quality of materials and additives have improved over time. Hence, it can be deduced that in the more superficial layers it is possible to find presence of a homogeneous mixture of earth and waste, while in the deeper layers, it is possible to find presence of heaps and waste, deposited as is.

The scientific interest of the specific case of Trieste, developed on the basis of a procedure foreseen by the 2006 Environmental Code, is due to the fact that this is the first application of the law completed in Italy. The objectives to be achieved concern environmental safety, the renewal of the industry plant, the increase in port logistics activity and the maintenance of employment. The verification of the achievement of these goals, can verify the effectiveness and repeatability of the procedure in other contexts.

Materials and Methods

This study intends to retrace the main stages of the process that has guided the transformation of the area since 2014, which is still currently ongoing. The meaning of the analysed procedure refers to the requirements of the Environmental Code, as a repeatable process. The sectoral literature does not appear to be particularly up to date, the most complete studies refer at the European level to the CLARINET [4] (Contaminated Land Rehabilitation Network for Environmental Technologies) project concluded in 2001, and to the Proposal for “Guidelines for Environmental Recovery and Economic Enhancement of Brownfields” [2], of the Agency for the Protection of the Environmental and for Technical Services of 2006. However, these guidelines refer to the previous regulatory context regulated mainly by Ministerial Decree 25.10.1999, n. 471, testifying to the need for new, updated insights. The basic materials analysed are the Program Agreements and the related attached documentation. These materials allowed the reconstruction of an administrative and procedural, but also operational path, of transformations and tangible investments.

Furthermore, an integration was added, an enhancement of the latest developments of the project born around the growth actions being applied in Italy in the post-pandemic phase.

An Unprecedented Plan

An annex contained in the Program Agreement of November 2014 illustrates the “intervention strategies” relating to the “Integrated project for environmental safety and reindustrialization” [8]. It is a fundamental document that has acted as a compass during all the phases of the long process, which is still under development today. Starting from the geological and hydrogeological characterization of the area, the project has identified the forms of contamination of both the soil and the aquifer. A risk analysis was carried out on the basis of this data, which made it possible to identify the operational solutions to be applied. In particular, the project has identified: the ways of disposing the so called “historical” heap and other Hot Spots identified in the area, the management plan of the waste present in the area today and of that produced at the time, the safety of the land, both in ownership and in concession, through sanitary prevention measures (capping), and the treatment of discharged groundwater, intended as a link intervention pending the construction of the water treatment plant.

This initial start-up phase was followed on November 2nd, 2015 by the international decree (Ministry of the Environment and Protection of the Sea, Ministry of Economic Development) approving the “Integrated project for safety, industrial reconversion and development economic and productive area of the Ferriera di Servola “pursuant to art.252bis DLGS n.152/2006 [9]. The Decree detailed some aspects of the project in terms of prevention measures, risk analysis, intervention phases, monitoring plans of environmental matrices, even focusing on very minute technical details, such as the methods of connection between the safety floorings, the so-called surface capping, and the foundation structures of the new industrial buildings.

The Technical Solution of “Capping”

The capping solution made it possible to physically isolate the contaminated soil from the external environment in such a way as to eliminate the health risk for users of the area. Furthermore, this solution minimizes the infiltration of rainwater and process water into the polluted soils, it minimizes the consequent washout and the decrease in quality of groundwater, and, in addition to the erosion of the polluted soil itself and the dispersion of contaminants, the new flooring also facilitates cleaning and collection of the materials used on the site. It is an industrial floor, a reinforced concrete hood with a reinforcement mesh, enhanced by a layer of geotextile on the intrados. A form of physical delimitation that, together with the barrier on the seaside, captures polluted soils, preventing the exchange of contaminating elements with the environment. An effective solution, but “hard” and necessary, to respond to the extension of the area and the stages of reuse, which consequently does not leave room for further ecological and landscape integrations (the area is located within a Coastal Territory, protected by law pursuant to rt.142 C.1 letter a) of the Code of Cultural Heritage and Landscape). In fact, in order to ensure the safety of a

heavily polluted industrial area, it was necessary to give up the permeability of the soils and the possibility of using mitigation elements such as tree plantings. The large squares also contribute to the formation of a “heat island” effect, typical of urbanized areas. In terms of land consumption, on the other hand, given that the soil was already compromised by pollution, the balance was unchanged from the execution of the clapping.



Figure 1 – Camouflage studies of the volumes of the Cold Area for the purpose of landscape mitigation (elaboration by the author, 2015).

Results Achieved

On the 18th of July 2019, the Autonomous Region of Friuli Venezia Giulia verified how the environmental activities in the field at the Arvedi Group had been complied with (over 100 activities are mapped with reference to the Program Agreement and the Authorization Decree in the report of the General Management Environment and Energy [10]). The renewal activities of the industrial plant were also put in place, restarting the production of cast iron in accord with what is indicated in the Integrated Environmental Authorization, setting up a new production unit called Cold Area for the pickling and rolling of steel coils from Arvedi plants in Cremona and increasing the railway logistics activity of the Port of Trieste for a total investment of 254 million euros. All while safeguarding the employment levels of the establishment.

A Renewed Plan

Six years later, the aims of the agreement have been achieved, and in June 2020 a new document was signed to give incentive to further transformations in terms of development and sustainability for a total of 100 million euros. The incentive comes from the Region's proposal for the closure of the so-called Hot Area, the production part of the plant that has the most impact from an environmental point of view. It is a large area characterized in particular by blast furnaces, the coking plant and two large size open-air carbon fossil and iron ore parks of a total of 54 000 square meters that the previous agreement envisaged to cover.



Figure 2 – Study of the roof of the fossil and mineral park of the Hot Area (elaboration by the author, 2018).

This is followed by an ambitious industrial plan by the Arvedi Group which provides for the decarbonization and conversion of the Hot Area on the principles of circularity, starting with the production of flat rolled carbon steel (the only European manufacturer) from an electric oven (therefore with lower operating temperatures) based on post-consumer scraps, rather than non-renewable raw materials. The project foresees a line of research and development aimed at reducing to zero the 29 % of cast iron produced at the Trieste site, which is still necessary to integrate 71 % of the waste used in the production processes. The decommissioning of the Hot Area also makes it possible to reconvert the Trieste power plant into a high-efficiency cogeneration (CAR) plant. Where the iron and steel process gases have been substituted by methane gas, with lowered consumption and high environmental performance. Consequently, the strengthening of the Cold Area was envisioned, with a new galvanizing and painting production line along with the relocation of the Hot Area workers.



Figure 3 - The hot area of the Servola ironworks undergoing demolition (author's photo, April 2021).

The First Executed Activities

The Hot Area shutdown procedure was consequently started in April 2020, and a new Program Agreement was signed on June 26, 2020, which aims to convert the part of the decommissioned production site into a logistics area and upgrade the remaining plants [7]. This phase also has a circular nature, the ferrous waste from demolitions will become the material at the base of the steel production cycle of the Arvedi Group, while the aggregates will be reused for the construction of the infrastructures of what will be the expansion of the new logistics platform by a new subject involved, I.CO.P., a group operating in the road construction sector, and special works. The so-called Hot Area with the old blast furnaces will make way for the expansion of the logistics activities of the Port of Trieste. The new cold rolling mill built in 2015, the core of the previous industrial reconversion project, will be doubled.

Planning

To obtain this result, it becomes necessary to reorganize the areas throughout a system of exchanges of lands, both privately owned and under state concession. Also necessary is a remodeling of the planning structures, currently in progress, which presuppose the development of industrial areas owned by the Municipality of Trieste as part of the General Town Plan of the Municipality of Trieste, while the areas under concession will be subject to the regime of the Port Town Plan.

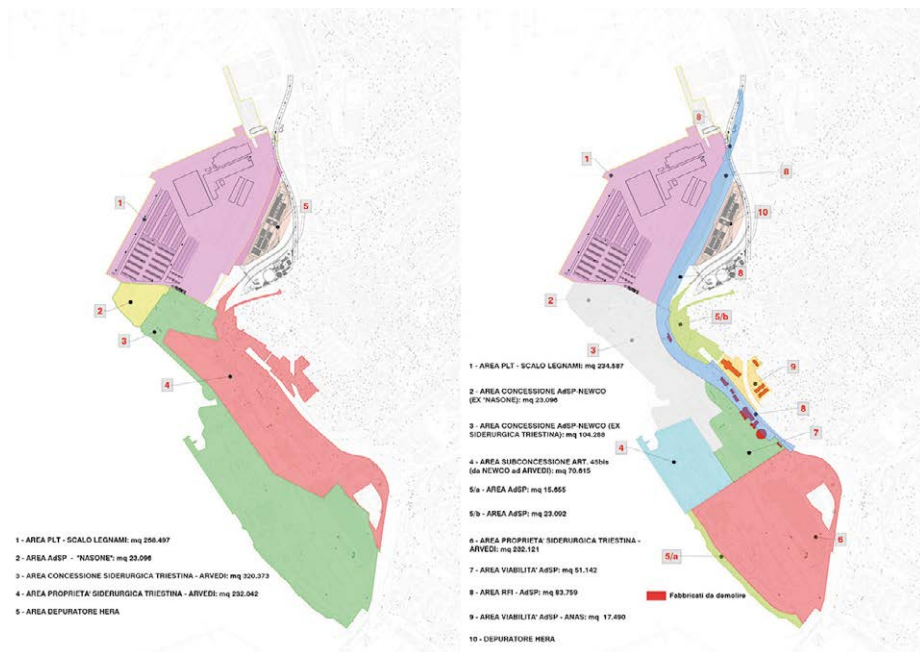


Figure 4 – The current and proposed layout of the areas (Annex 6 [11] to the Program Agreement). Legend on the left: 1) PTL Area – Timbers Shed; 2) AdSP area- “NASONE”; 3) Concession area of Siderurgica Triestina- ARVEDI; 4) Privately owned area by Siderurgica Triestina – AVREDI; 5) Hera depurator area. Legend on the Right: 1) PTL Area – Timbers Shed; 2) Concession area AdSP-NEWCO; 3) Concession area AdSP-NEWCO; 4) Sub-concession area; 5/a) Area AdSP; 5/b) Area AdSP; 6) Privately owned area by Siderurgica Triestina – AVREDI; 7) Viability AdSP area; 8) RF1 area – AdSP; 9) Viability AdSP area - ANAS; 10) Hera depurator.

The new plant will give an ambitious response in terms of eco-sustainable production, aiming at complete decarbonization and low-impact industrial production of the steel plant. Compared to the original contents of the Program Agreement, the energy will also be produced by a hydrogen plant whose electrolysis will be fuelled by the photovoltaic roof of over 95 000 square meters, house of the Cold Area plans building.

The Adriagateway Project

This further integration, the result of an initiative of the Arvedi Group, is in turn integrated with the Adriagateway project of the Port Authority System (*Autorità di Sistema Portuale*) [3]. Added to this scenario is the Port Authority's project: Adriagateway. A strategic plan of coordinated investments for the logistic/industrial relaunch of the port system of the Eastern Adriatic Sea in outlook of green and digital transition (2020-2026).



Figure 5 – Summary graph of the "Adriagateway Project" (AdSP, September 2020).

The Adriagateway Project, developed during the summer of 2020, defines a system of 57 potential actions (project components) to be implemented in the Port System, divided into 6 macro-categories and financed for 385 million Euros by the National Plan for Recovery and Resilience. For example, the electrification of the docks (cold ironing), which will reduce the impact of the generators of moored ships, which remain active during loading and unloading operations, as well as the strengthening of railway logistics, considered in terms of greater sustainability.

Conclusion

The scientific interest for the specific case of Trieste, developed on the basis of a procedure provided for by the 2006 Environmental Code, is due to the fact that it is the first completed application of this law in Italy. The results obtained include the completion of 100 environmental activities, the renewal of the existing industrial plant with a new production unit, the increase of port logistics activity and the maintenance of employment levels. Following these encouraging results, the activation of a second agreement, currently in progress, demonstrates the effectiveness and repeatability of the procedure. Furthermore, the new agreement introduces, compared to the previous one, new principles of "circular

economy”, both with regard to the disposal of existing buildings and plants, and with regard to the new production cycle, which is the subject of a specific research and development activity.

Industrial innovation, logistical implementation, environmental and landscape requirements, social protection and job opportunities, quality of life, ecological transition, are overlapping themes that outline a complex interdisciplinary scenario. The success of these operations is partly due to this holistic character, transversal to the convergence of actions carried out in different areas towards a single objective. What derives from this is also the value of a strategy based on the enhancement of relationships, connections, between different interests that no longer operate separate from each other. The ability to define development projects that also become environmental improvers is a complex vision, in a way, it could also be defined as creative. Time also plays a fundamental role; the effects of these transformations are measured on the passage of years. The process started in 2014, although many consequences are already appreciated, it has not yet been completed in its entirety, it continues to develop, it is progressively integrated. It has a dynamic, adaptable character.

“Bringing industry back to the sea” is a formula that has a precise and extensive strategic and planning significance. Today, logistics chains are getting shorter. This is a reduction of the excesses of globalisation. The pandemic in 2020, the blocking of the Suez Canal in the spring of 2021, and the Ukrainian war of 2022, have demonstrated the need to create regional buffers capable of absorbing interruptions in the distribution of goods and processing them while also creating added value. The case of the Port of Trieste can be a model to be studied in order to understand how to effectively govern these transformations, moving from the global logistics of the “Just in Time” to the more resilient structures that respond to the “Just in Case” logic, where the reuse and optimization of resources ensure achievement of outcomes on several fronts.

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