

## Article

# Dismissed Industrial Areas: The Urban Project of the Montedison Factory of Akragas in Porto Empedocle Between the Past, Present, and Future

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**Abstract:** In recent decades, in Italy, as in the international context, the phenomenon of disused industrial buildings has acquired considerable dimensions, with inevitable social, urban and economic repercussions. At the same time, the cultural debate has increased awareness of the problem and the strategic role that disused industrial sites can play in meeting new needs. This paper provides a comprehensive analysis of the abandoned Montedison industrial complex in Porto Empedocle, Sicily. It examines the history, current state, and potential future uses of this former industrial site. The research is well-documented, incorporating historical context, architectural details, and considerations for urban redevelopment. This paper effectively discusses the broader issues surrounding the reuse of abandoned industrial areas, making it relevant beyond just this specific case study. Insights are drawn from qualitative research, with evidence derived from document sources, archival records, direct participants, and semi-structured interviews. The main objectives achieved are as follows: expanding knowledge of the decommissioned site; proposing; from a quality and sustainability perspective; a model for managing the decision-making process; identifying some project ideas to initiate the decision-making process. The understanding of historical industrial buildings is relevant to the present and enables the implementation of urban transformation processes consistent with contemporary challenges.



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**Keywords:** adaptive reuse; industrial heritage; disused industrial areas; industrial reconversion; Impianto di Akragas—Montedison a Porto Empedocle

## 1. Introduction

Climate change, with rising global temperatures and shrinking ice masses, in Europe and worldwide, means longer summers, scarce rainfall, and extreme events, which leads us to reflect on future options and what we must achieve now. Some possible answers are decreasing land consumption, rethinking architecture and land use planning, considering water as a precious commodity, or reusing abandoned industrial buildings for new uses [1]. The vast majority of cities, large and small, from north to south, face these same problems.

The progressive deindustrialization of many cities has led to the abandonment of entire industrial complexes. The industrial areas of the 19th century, which were great social and economic engines [2], can now become key pieces for sustainable urban development and represent unavoidable economic and social opportunities [3,4]. There is extensive research on industrial heritage and diverse scientific methods and a wealth of perspectives and study content [5–7]. These industrial heritage investigations have become more comprehensive as reuse has become more diversified [8,9]. Industrial buildings, which have mostly become embedded in the urban fabric or waterfronts and affected by processes of functional obsolescence, are reoriented towards local activities, thus ensuring that local urban activity remains in living memory [10–12], contributes to the regeneration of the environment, and becomes elements of opportunity for the balance between quality of life

and sustainability [13]. The adaptive reuse (AR) of industrial heritage plays a strategic role that not only affects buildings but can also stimulate a renewal process in large urban areas [14]. In addition to being a cost-effective strategy, it is a sustainable approach that minimizes energy consumption, transportation costs, and waste generation in all aspects (economic, ecological, social, human, and cultural) [4].

Post-industrial landscapes are crucial landmarks of industrial cultural heritage. Faced with the challenges posed by the incompatibility of traditional industrial uses with modern society, the urban reuse of these post-industrial landscapes emerges as a key issue [15].

Nevertheless, the redevelopment of a former industrial area is a complex operation that involves both knowledge and design requirements as well as the establishment of a constructive relationship between public and private actors, allowing for the overcoming of the challenges and difficulties of a redevelopment project (uncertainty of remediation costs and timelines, administrative procedural complexities, etc.). Redevelopment cannot be resolved through improvised creative gestures but through a structured process oriented towards the resolution of various issues by bringing together diverse knowledge, skills, and interests in accordance with specific technical-administrative and economic-financial procedures. Objectives are to be pursued through specific decision-making processes and, at the same time, through appropriate governance actions aimed at achieving consensus among the various actors on the goals and strategies of the intervention.

There are numerous factors to be taken into account in the adaptive reuse process, such as the location, the importance of the heritage, the architectural assets, the market trends, the people's needs, and the quality of the environment along with the physical conditions of the place in question [10].

In particular, in Italy, about 3% of the territory is occupied by disused or totally abandoned industrial sites [16]. At the same time, this percentage explains how decommissioned industries represent latent resources that can contribute to transforming urban suburbs into attractive places from a social, cultural, and architectural point of view [2].

In this context, a fundamental contribution on issues related to the quality of interventions in the transformation of former industrial areas was made by the Association of Abandoned Urban Areas, which in 2008 presented the Urban Regeneration Charter: an overarching tool that outlines a set of ideas, practices, and quality parameters essential for the development and evaluation of transformation programs. Research indicates that the objectives of redevelopment must be defined within the decision-making process, which, in accordance with the principles of the Audis Charter (AUDIS, Association of Abandoned Urban Areas (<http://audis.it>), accessed on 1 February 2022), must be initiated and led by the administration with the participation of local actors—both economic and collective. Modern urban planning must address the transformation of existing structures, the “building within the built” [17], by seeking new design methods that consider relationships with the context and the specificity of places [18]. Available sources in the literature on the dimensions of the phenomenon in Europe are often inaccurate or outdated. From the report by the European working group CLARINET (Contaminated Land Rehabilitation Network for Environmental Technologies), based on a 2002 study, disused industrial areas occupy approximately 146,000 hectares in Germany, 76,607 in the UK, 26,400 in France, 11,000 in the Netherlands, 14,500 in Belgium, and 1700 hectares in Switzerland [19]. In Italy, in the province of Milan alone, abandoned areas occupied approximately 1260 hectares [19] during the same period.

This research focuses on an area of approximately 115,000 square meters occupied by the former Akragas Montedison Plant in Porto Empedocle. It is an area that has been abandoned for almost thirty years, populated by spontaneous vegetation, abandoned buildings (some in precarious conditions), and reinforced concrete platforms that remain as traces of the buildings demolished during safety operations carried out in 2007.

This research pursues three main objectives:

- To deepen the knowledge of the abandoned site, with reference to its origins, expansion, and decommissioning phases as well as its identity aspects (urban, architectural, environmental, and landscape-related);
- To define the guidelines for the decision-making process, which, in line with certain quality criteria, outline a methodological-operational pathway aimed at identifying a shared redevelopment proposal.
- To develop project ideas as broad scenario alternatives capable of providing directions for the re-functionalization of the site.

These three objectives stem from specific needs. The first aims to fill the gap in knowledge about the site's intrinsic and contextual aspects. The second objective arises from the belief that the reconversion of an abandoned area, such as the one in Empedocle, needs to be framed within decision-making logics that take quality and sustainability as essential goals for redevelopment. The guidelines, therefore, identify a mode of decision-making construction based, from a quality perspective, on managerial approaches and inclusive procedures.

The aim is to encourage the municipal administration to adopt a different approach to the issue, being open to innovative governance methods capable of reducing both the conflict factors among the various actors involved in the process and the risks related to the decision compared to traditional planning procedures. This objective is pursued based on insights drawn from the analysis of exemplary cases and, essentially, from research conducted by the Environmental Protection Agency (APAT) on this topic. Compared to these studies, this research delves into the different phases of the decision-making process, proposing a different articulation of the model according to criteria aimed at ensuring the quality of the process itself.

Finally, considering the medium- to long-term urban development forecasts, the last objective pursued was to provide general indications on the potential re-functionalization of the area.

This paper addresses the topic of the reuse of former industrial areas and issues related to quality in the processes of transforming former industrial sites, starting from the case study of Porto Empedocle and the former Montedison industrial area. After the territorial and urban framework (Section 4), the abandoned site is described in relation to its historical origins (Section 4.1), the development phases of the plant and its decommissioning (Sections 4.2 and 4.3).

Next, the current state of the research area is described, focusing on identity characteristics related to intrinsic aspects (morphological, environmental, architectural, landscape-related) and contextual ones.

A brief discussion clarifies the relationship between the redevelopment project and the decision-making process and how this relationship is decisive for the overall quality of the transformation processes. In this context, two exemplary cases are illustrated, which are similar in architectural characteristics and themes (Francesco Cellini, Project for an urban park in the former Italsider area, Bagnoli, Naples 2006–2009, in progress, and the industrial recovery of the Schöneberger Südgelände urban park in Berlin 2005, almost completed). The results achieved are commented on in the discussion. The case studies are used to provide a series of insights into the identity of the sites, the planning and decision-making processes, and the specificities of the intervention projects. Finally, the conclusion points out the importance of highlighting how adaptive reuse contributes to the three basic pillars of sustainability: (i) social, by preserving the memory of these sites in society; (ii) environmental, by reducing the carbon footprint and regenerating the landscape in which they are located in the context of the contemporary challenges of cities; (iii) economic sustainability, by reducing the high cost of a new building, guaranteeing the life cycle of these buildings, and attracting economic and socio-cultural benefits.

## 2. Literature Review: The Potential for Recovery and Industrial Conversion

Recent decades have witnessed the rapid transformation of many cities from centers of production to centers of consumption on a global scale [20]. Post-industrial landscapes, commonly located near city centers or along waterfronts, consist of obsolescent industrial buildings and infrastructures that need to be returned to productive use and reintegrated into their communities [21,22]. In the case of industrial areas on waterfronts, in addition to constituting an important legacy of their industrial past [23], they also act as a hinge between the waterfront and the city, which is why rehabilitating the connectivity and accessibility between these two enclaves is a key factor in these interventions. Abandoned industrial buildings and their surrounding areas are in a constant state of tension between persistence and change and decay and the potential for redevelopment [24]. Two crucial issues emerge over time: the first concerns the decision on the most appropriate intervention, while the second involves the methods and means necessary to ensure the success of the intervention. Since the 1980s, there has been an intense scientific debate, which is still relevant today, involving various disciplines such as architecture, urban planning, technology, energy, and economic and social sciences. This debate aims to integrate these fields in studying and designing cities for possible urban growth.

### 2.1. Types of Interventions on Abandoned Industrial Buildings

There are various types of interventions possible for an abandoned industrial building:

- Restoration aimed at resuming original productive functions involves adaptation work if market conditions still exist to reactivate such functions.
- Recovery for productive conversion introduces new productive functions different from the original ones.
- Recovery for functional conversion repurposes buildings for new uses (Adaptive Reuse, RA)
- Demolition for building replacement or urban redevelopment may involve demolition and reconstruction or repurposing the spaces for other urban uses.

This contribution illustrates the possibilities of retrofitting industrial buildings for their rational transformation. This potential is closely linked to several typical characteristics of industrial buildings:

- Structural types are often designed to support high static loads and dynamic forces.
- Building envelopes are composed of load-bearing brick walls that provide good thermal inertia; frame structures offer opportunities for experimenting with energy-saving systems and technologies.
- Compact volumes with a low surface-to-volume ratio, expansive spaces with light between vertical supports, and considerable internal height, offer flexibility and adaptability for new uses.
- Glazed surfaces provide good natural lighting.
- Interstices and technical spaces are suitable for housing equipment and plant components, facilitating energy retrofit strategies [25].

### 2.2. Potential for Recovery and Reuse (RA)

The adaptive reuse of industrial buildings is one of the main aspects of the process of converting industrial land for other uses, which has been accentuated by the restructuring of cities from industrial to post-industrial ones [4].

Adaptive reuse seeks to mitigate the negative effects and foster more sustainable construction in the future, but it is also the path to conserving the heritage and those heritage buildings and to driving social change in the environs. Adaptive reuse “avoids demolition waste, encourages reuses of the embodied energy and also provides significant social and economic benefits to the society”, thus embracing the different aims of sustainability [26]. Scholars even consider adaptive reuse as one of the most effective approaches to reducing carbon emissions from the built environment and supporting global climate protection [27].

The recognition of the potential of abandoned industrial buildings highlights their key role in urban regeneration processes, offering numerous benefits.

- Resource savings are useful for new constructions and for reducing land consumption, counteracting the rapid and disorderly processes of building that lead to the loss of urban environments and areas suitable for agricultural production, biodiversity, and landscape quality [28].
- Ecological regeneration through the reuse of previously recovered industrial areas.
- Social reappropriation of urban spaces and preservation of the collective memory of industrial past and present as well as the city's history [29].
- Integration of new functions, which act as a driver for social and economic improvement.

### 2.3. Studies on Conversion

Studies on the conversion of industrial buildings and areas must consider, in addition to the potential architectural and territorial renovation and redevelopment, the issues that may hinder or limit reuse. Amalia Martelli [30] in 2005 conducted research on the most significant “physical-functional” situations necessary for change, such as the following:

- Site remediation costs;
- Characteristics of the property structure;
- Compatibility of new uses with urban planning regulations and their distribution;
- Historical and symbolic value.

These conditions have been analyzed using an experimental approach, referring to various significant case studies differentiated by production sector, area size, location, and ownership structure. Other hindering factors include excessive structural degradation and situations of partial dismantling. The redevelopment must be assessed in light of economic and broader planning considerations, including medium- and long-term effects. All these aspects combine to form a grid of parameters useful for evaluating the transformability of an industrial building and/or abandoned area.

### 2.4. Principles for a Design Approach to Functional Conversion

Examining the immense potential for the recovery and reuse of industrial buildings and their surrounding areas, as well as the critical aspects to be considered, raises the question of what principles should guide a design approach to functional conversion. One answer might come from successful examples recognized by industry critics. However, it seems useful to start with a reflection on the concept of conservation. Conservation, according to a shared and established view, means selecting those characteristics that the community recognizes as part of its identity, values, and history from the heritage of disused buildings and sites. Conservation involves establishing a continuity with the past within an ever-evolving urban system, and it is a prerequisite for a sustainable future that respects environmental and human and social values.

To preserve traces of the past while meeting new needs, conservation must be viewed as a project of the existing—a transformation through the critical selection of what holds collective value. In this sense, conservation and modification become complementary [31]. Vittorio Gregotti stated that “there is no new architecture without modification of the existing [...], every architectural operation is increasingly a partial transformation action; even the urban periphery is a place seeking its identity through modification” [17]. Based on these statements, it is possible to develop a new approach to abandoned industrial buildings, which, along with sites of industrial archaeology such as structures, plants, machinery, and archives, represent an important history of the historical and cultural evolution of Western society over the last two centuries [32]. Federica Piemontese asserts that unused industrial fabric is “an indicator of the cyclical transformation of urban fabrics” [33].

### 3. Materials and Methods

Based on the presentation of the cultural debate on abandoned industrial buildings, the main objectives of this paper are as follows: (i) expanding knowledge of the decommissioned site of Montedison; (ii) from a quality and sustainability perspective, proposing a model for managing the decision-making process; (iii) identifying some project ideas to initiate the decision-making process.

The onion by Saunders et al. [34] is considered as the most interesting model with which to structure the present research. Qualitative research is carried out with an inductive approach. First, a systematic review of the scientific literature is conducted to establish the state of play. In this way, a literature review is used to map the directions of this study and understand the concepts on which the work is based.

From this theoretical framework, this research focuses on the case study of Montedison, proceeding with data collection and data analysis.

The absence of an inventory with detailed information forced a research strategy based on the use of multiple data collection references including bibliographic review, document sources, archival records, a compilation of planning material, direct participants and semi-structured interviews, and photographs and direct data with field visits. It is considered a cross-sectional time horizon, given that the data collection, although taken during different visits, was carried out for data verification but not because the research design required it. Thus, sampling is not carried out to follow up at various stages.

On the basis of the data obtained, the analytical work is supported by primary sources, historical cartography, and the literature that ensure the correct interpretation of the plans. To demonstrate the argument, the author's hand-drawn interpretation plans are prepared, reinforcing the relevant aspects of the evidence in its evolution over time and studying the historical significance and future opportunities. Specifically, it was worked for the case study based on the following: (i) project documents obtained from the archives of the Municipality of Porto Empedocle; (ii) aerial photographs of the study area; (iii) publications about Montedison and Porto Empedocle; (iv) through site visits with visual and photographic inspections (I was able to enter many buildings, but in some, access was not possible due to the ruinous and degraded state of the structures); (v) interviews with three workers who used to work at the former Montedison in Porto Empedocle and who shared their life experiences within the factory (they have since passed away, which enhances the value of their contributions to the research) (see Supplementary Materials).

In undertaking this analysis, the concern is to identify and explore the problems and the forces behind them and to offer solutions. As will be seen, the solutions are still in their infancy and the overriding need at this stage is a deeper understanding of the identity of this place and the forces that may delay and greatly complicate its regeneration. This emphasis on exploring the issues is underlined by the conclusion, in which the case study's findings are used to propose a wider research agenda.

### 4. The Case Study, Montedison Area of Porto Empedocle: Results

The Akragas S.p.A. (Akragas was a joint-stock company based in Palermo. The first stone of the plant was laid on 3 June 1953. A few years later, the industrial complex was acquired by the Montedison group, which managed it until its closure in 1984.) plant is located to the east of the city of Porto Empedocle (Figure 1) in an area mostly reclaimed from the sea with landfill material. The actual construction work began in 1953/55 after a thorough demining and reclamation of the entire stretch of beach involved in the development was carried out in 1952, so that the foundations of all the buildings rested on driven piles. **Montecatini** was founded in 1888 in Montecatini Val di Cecina (PI) to exploit local copper mines. In the 1910s, it entered the chemical sector and, through patents and acquisitions, became Italy's largest chemical company, almost monopolizing some products such as sulfuric acid, fertilizers, and dyes (through its subsidiary ACNA). In 1936, in collaboration with AGIP, it created Anic (National Hydrogenation Fuel Company), aiming to produce synthetic gasoline, which would be the nucleus of the Italian petrochemical

industry. **Edison** was founded in Milan in 1895 and was one of the first Italian companies to utilize hydroelectric power, which was fundamental to Italy's first industrialization, building dams along the Alpine arc, especially in Lombardy. By the early 20th century, Edison was already one of the dominant industrial groups in Italy, sharing control of the electricity market in northern Italy with SIP, concentrated in Piedmont and Liguria, and SADE, strong in the northeast. **Montedison** was formed in 1966 from the merger of Montecatini and Edison. Montecatini Edison S.p.A., from 1966 to 1969, later abbreviated to Montedison S.p.A., was a major Italian industrial-financial group, known by this name until 2002. Primarily active in the chemical sector, it also had interests in numerous other sectors (pharmaceutical, energy, agribusiness, insurance, and publishing). Its history was marked by dualism with the public chemical sector of ENI, the influence of the power block centered around Mediobanca, and a fragmented shareholding structure, often lacking a controlling shareholder and subject to stock market fluctuations. Montedison's trajectory, from being one of the world's largest chemical groups to a gradual downsizing, is seen by many commentators as an example of Italy's industrial "decline", unable to produce multinational corporations of an adequate "size" to compete on global markets. The choice of the site for the Akragas branch in Porto Empedocle, in the Montecatini area was of exceptional importance because it allowed the new site to produce fertilizers using raw materials from the Sicilian subsoil (sulfur—potassium sulfate—rock salt) or otherwise produced in Sicily (Montecatini ammonia—Augusta petrochemicals) and others (phosphorites) from nearby deposits in the Mediterranean basin (Morocco, Jordan, Israel, and Tunisia).



**Figure 1.** Aerial view of Porto Empedocle, with the former Montedison area on the right. Source: IGM Aero Photogrammetry.

Additionally, Porto Empedocle had a port planned for continuous development and a SGES (Società Generale Elettrica Siciliana) power plant. The only issue was the water supply, which faced serious shortages until 1962, when Montedison, with significant economic efforts, installed its own aqueduct in the Margimuto area in the municipality of Santa Stefano di Quisquina (Ag), 80 km from Porto Empedocle.

The plant was commissioned in 1955 and ceased production in 1984.

#### 4.1. The Relationship of the Plant with the Sea and the City

Porto Empedocle (Figure 2) is located two meters above sea level on the slope that descends towards the coast between Punta Piccola and San Leone in the province of Agrigento. The city has a population of 17,587 inhabitants. Porto Empedocle is a commercial city with a well-equipped port. It is also a fishing center, serving as a base for the collection and sale of deep-sea fish. It is rapidly developing as a tourist destination. There are chemical, mechanical, and cement industries.

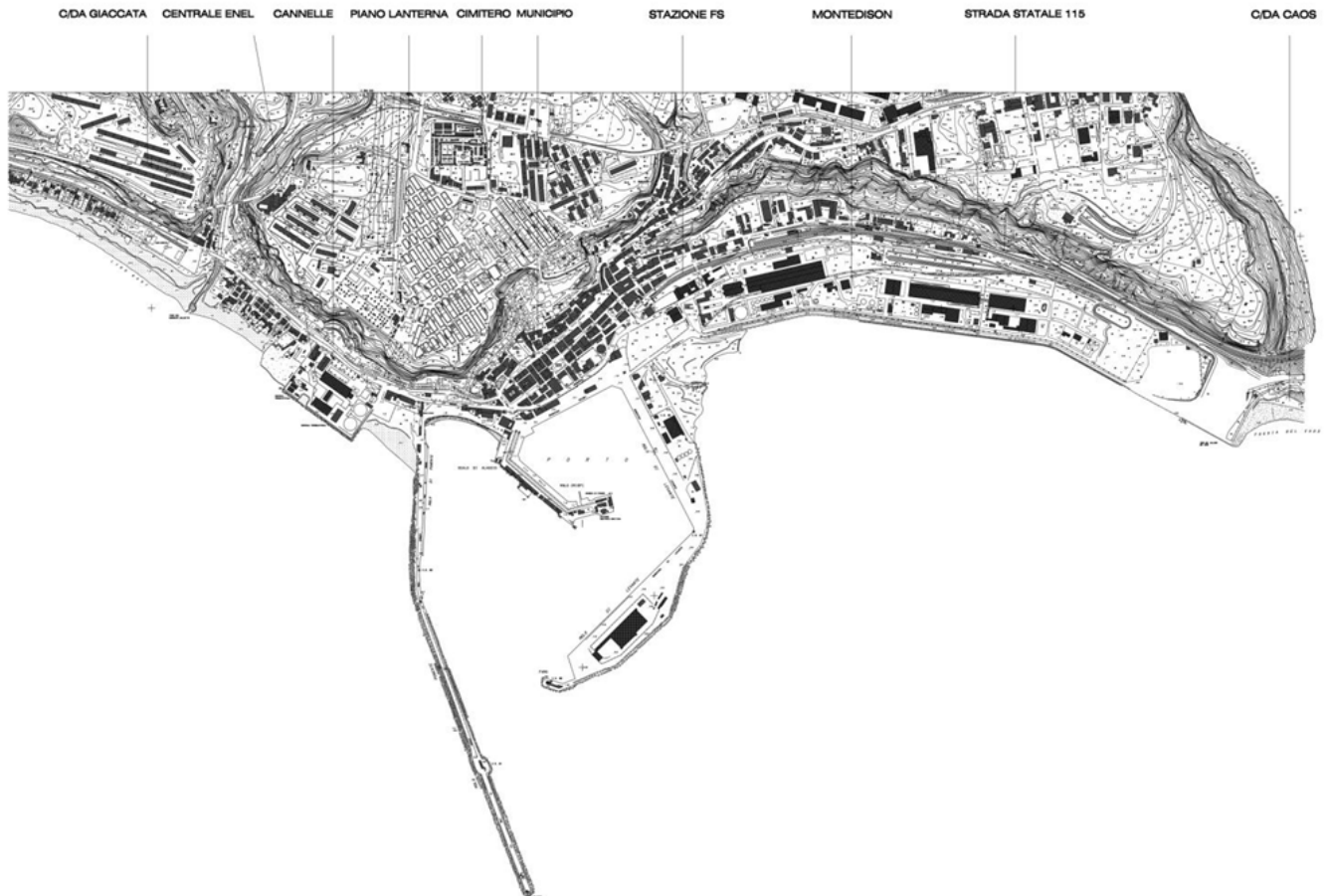


**Figure 2.** Map of Porto Empedocle and, to the right of the port, the former Montedison area. Own processing.

The industrial complex built in the mid-1950s by the Akragas company with the Montedison group covers an area of approximately 115,000 square meters. The area is almost rectangular in shape, with an east–west horizontal span of about 1.4 km and a north–south span of about 240 m. Following the work by the ASI consortium, the space between the breakwater and State Road 640 was filled in.

The end result of this new space is an area abandoned to decay and neglect, which has completely distorted the relationship between the industrial plant and the city with the waterfront. In fact, the shape of the infill has altered the harmony of the waterfront and the port area. Due to its location relative to the urban center of Porto Empedocle and its characteristics, the factory constitutes a separate city that does not have a direct relationship with the urban center.

#### 4.2. Italo Insolera and the Reconstruction Plan of Porto Empedocle

In 1956, a young architect Italo Insolera (1929–2012) (27 years old) was commissioned by the Municipal Administration of Porto Empedocle to draft the reconstruction plan (Figure 3). To fulfill his task, he conducted preliminary studies, created drawings, and carried out a photographic campaign. The photographs depict the industrial activity of Akragas of Montecatini, which was expected to ensure wealth, prosperity, and employment for the local population for decades.

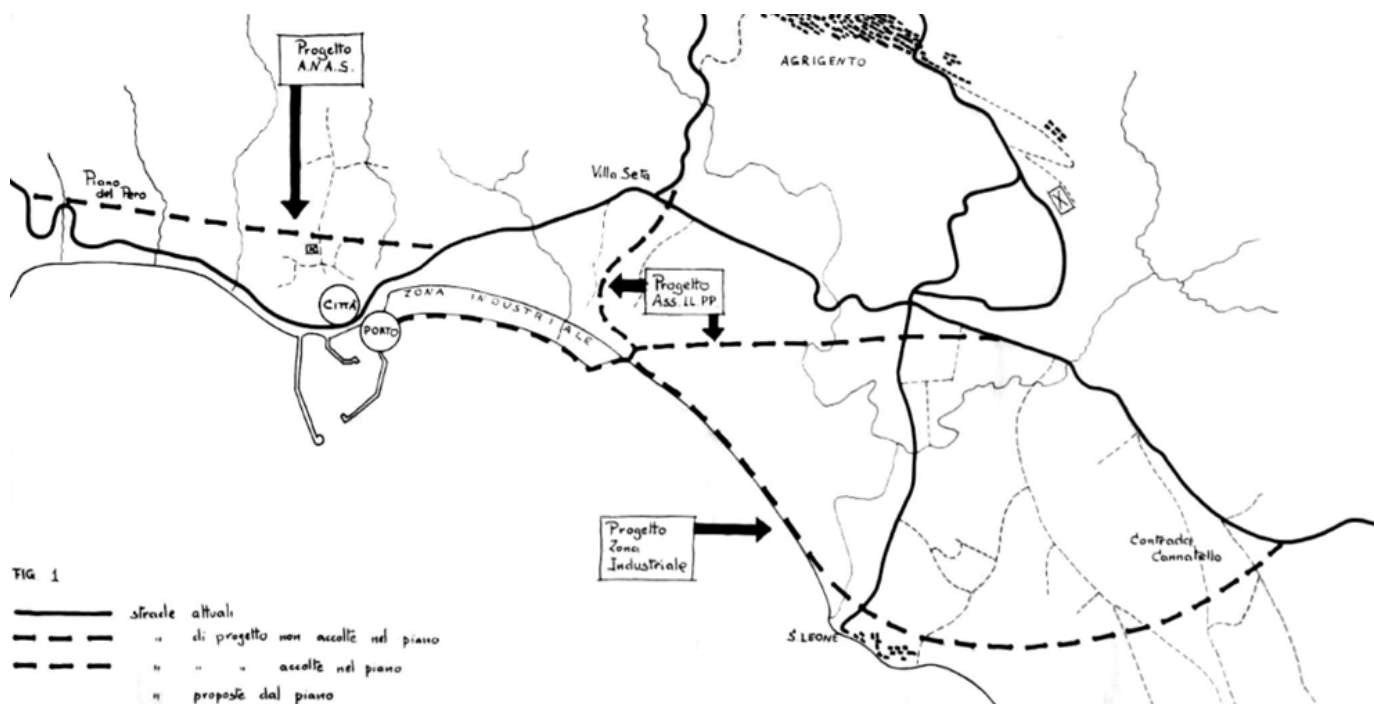


**Figure 3.** A freehand drawing by Italo Insolera of the city of Porto Empedocle, with the disused Montedison industrial area to the right of the port. Source: Italo Insolera archive.

Porto Empedocle can be considered a sort of archetype of 1950s Italy experiencing the post-war period with the most optimistic prospects for economic growth and industrial development of its territory. However, as history has often shown in the following years, these expectations were not always met.

#### The Reconstruction Plans

The urgency to rebuild and provide shelter for thousands of displaced families led to the issuance of urgent regulatory measures, shortly after the last military operations on Italian territory had ended. The main measure was the Legislative Decree Lieutenant No. 154/1945, which introduced the obligation to adopt a specific reconstruction plan for the municipalities included in the lists approved by the Ministry of Public Works. The aim was to expedite the reconstruction of the country and areas damaged by the war with utmost urgency and to simplify building interventions.

The philosophy behind this regulation was not at all aimed at carrying out a philological reconstruction—a sort of urban restoration “as it was, where it was”—but rather looked towards future planning. While the decree intended not to compromise the rational future development of the inhabitants, there was also a certain awareness that the reconstruction of damaged areas provided an opportunity to redevelop many realities. In the vast majority of cases, the inhabited areas affected by the war had a well-established historical nature, and complete reconstruction would have restored urban situations worthy of reconsideration.

Porto Empedocle was included on 14 May 1955 in the 44th list of Italian municipalities required to draft a reconstruction plan pursuant to Legislative Decree Lieutenant No. 154/1945 and Law No. 1402/1951. The task was assigned to architect Italo Insolera by the Civil Engineering Department of Agrigento on 28 April 1956. The plan was approved in 1957.

#### 4.3. The Technical Description of the Buildings and General Works

The description of the buildings and structures (Figure 4) within the plant is based on the site plan of the plant and follows a narrative from west (where the entrance to the plant is located) to east, providing (where possible) the year of construction, whether the structure is still present (or has been demolished), and a brief technical description. The documentation was obtained from the Technical Office of the Municipality of Porto Empedocle. The former Montedison area has undergone demolitions by the Syndial company, as commissioned by the Maritime Property Authority.

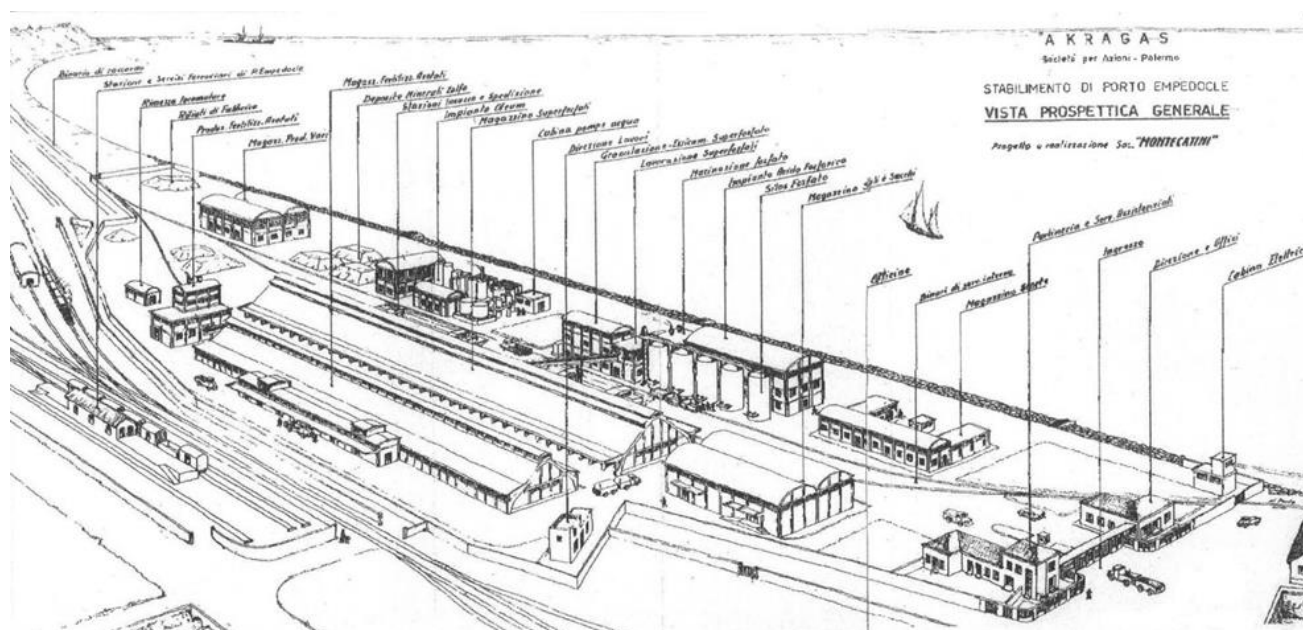


**Figure 4.** A perspective view of the old Montedison plant, dated 1953, courtesy of the Politecnico di Milano, Bovisa Delegation, University History Service, Montedison Historical Library. Contrary to what was built, the project illustrated here proposed the construction of two warehouses with parabolic roofs of the “Montecatini” type—one for phosphate fertilizers (built in different forms) and the other for nitrogen fertilizers (not built). Source: Montedison Technical Office, Montedison Archive Milan.

Map of the former Montedison area Plates AK-SG 0, AK-SG 0-40/3, and PE 16184/6. (Figure 5). The description of the buildings that follows (Table 1) was made possible thanks to the site plans of the former Montedison plant. It is also noted that some of the buildings described below were unfortunately demolished between 2007 and 2010. This has worsened the possibility of recovering the area, which, from an architectural and urban planning perspective, today appears altered compared to the original layout and the logic of the operations and production processes that were carried out.

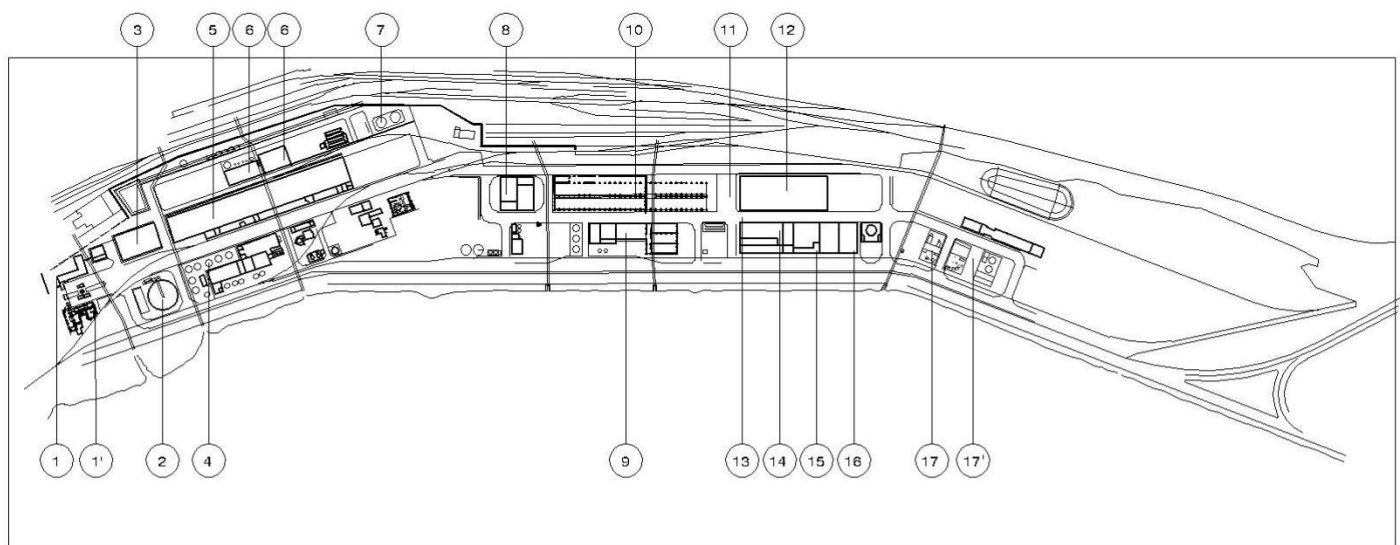


**Figure 5.** Map of Montedison with the buildings. Source: own elaboration.

**Table 1.** Schematic table. Source: own elaboration.

| Name                                                                                                            | Number | State                        | Current        |
|-----------------------------------------------------------------------------------------------------------------|--------|------------------------------|----------------|
| Direction Technical Offices Administrative Offices<br>Chemical Laboratory                                       | 1      | existing building            | good condition |
| Concierge, social services, refectory, changing rooms,<br>and restrooms for workers                             | 1'     | existing building            | good condition |
| Construction and Silos for phosphorite                                                                          | 2      | existing building            | good condition |
| Building—Salt and nitrogen bag storage                                                                          | 3      | existing building            | good condition |
| Seven (currently four) phosphate silos and phosphoric<br>acid plant building                                    | 4      | Part were demolished in 2007 | good condition |
| Nitrogenous fertilizer storage (superphosphate)                                                                 | 5      | existing building            | good condition |
| Potassium nitrate storage                                                                                       | 6      | demolished in 2007           |                |
| Spherical tanks (two) of NH <sub>3</sub> , Ammonia                                                              | 7      | demolished in 2007           |                |
| Workshops building and stock warehouse                                                                          | 8      | existing building            | good condition |
| Complex plant—broth M and B, grinding and<br>kneading                                                           | 9      | existing building            | ruin           |
| Complex plant M. B. C., product storage                                                                         | 10     | demolished in 2007           |                |
| Walkway that connected the M. B. C. complex, the<br>Product Storage, and the Double Exchange Storage<br>(D. E.) | 11     | demolished in 2007           |                |
| Double exchange storage (D. E.)                                                                                 | 12     | existing building            | ruin           |
| Walkway between the double switch plant (D. S.) and<br>the double switch storage (D. S.)                        | 13     | existing building            | ruin           |
| Double exchange system (D. E.)                                                                                  | 14     | existing building            |                |
| Potassium nitrate plant—Building                                                                                | 15     | existing building            | ruin           |
| Potassium nitrate plant—Double storage                                                                          | 16     | existing building            | ruin           |
| Nitrate plant                                                                                                   | 17     | demolished in 2007           |                |
| Water tower                                                                                                     | 17'    | demolished in 2007           |                |

In plate SG 0-40/3, north of the nitric plant and the water tower beyond the internal tracks serving the plant, a water collection basin is shown, which was never built.

1. *Management, Technical Offices, Administrative Offices, and Chemical Laboratory. Plate 3A-380/2. Existing building.* On the west side, adjacent to the square facing the current Via Giuliano Guazzelli, there are two buildings connected by a portico with two entrances, allowing vehicles to enter and exit the plant.

The building located at the bottom (to the south) on the general plan, with a covered area of 240 square meters, housed the plant management, offices, and a small chemical laboratory. It has an almost rectangular shape ( $18 \times 30$  m) and rises over two floors with a pavilion roof. The structure is made of reinforced concrete and dates back to the 1960s. The building is accessible, in good condition, and currently in use by the Carabinieri Station Command.

1'. *Gatehouse, Welfare Services, Cafeteria, Changing Rooms, and Sanitary Facilities for Workers.* Practices 1928 of 28 July 1974 and 35/74 of 29 July 1974. Existing building. Connected by a driveway portico, it continues upward (to the north) from the general plan of the previous building. This is a civil building with an area of 650 square meters, designed to house the gatehouse, welfare services, cafeteria, changing rooms, and sanitary facilities for workers. It has an L shape, with the base facing north, measuring 23.50 m in length, 35.70 m in height, and 9.30 m in depth. It rises over two floors with a pavilion roof. The structure is made of reinforced concrete and was built in the 1960s. The building is accessible and in good condition.

2. *Building and Silos for Phosphorite. Project plans not found. Existing building.* Continuing east along the central driveway, there is a rectangular building measuring  $10 \times 30$  m, with its longer side oriented north to south, rising over two floors with a pavilion roof. The ground floor has large openings for vehicle entry, and the first floor has large windows. This is a building used for material storage. The building is in good condition.

Adjacent to it on the east side is the phosphorite silo, which is a circular reinforced concrete structure with an internal diameter of 36 m. The foundations consist of a circular perimeter ring resting on drilled piles with a diameter of 600 mm and a maximum length of 12 m.

The perimeter wall was built with a constant thickness of 40 cm and a height of 13.90 m above ground level. The upper closure was made with a truncated conical slab varying in thickness from 40 cm to 20 cm. Inside the silos, beneath the floor, there is a diametral tunnel with a net section of  $2.10 \times 2.10$  m and foundations resting on drilled piles with a diameter of 600 mm and a length of 12 m. The building is in good condition.

3. *Building—Warehouse for Nitrogen Salts and Bags. Project plans not found. Existing building.* In front of the silo, toward the top (north side) of the general plan, across the driveway, there is a rectangular building measuring  $30.60 \times 50.00$  m (with the longer side parallel to the road). The building, intended as a warehouse for storing nitrogen salts (30,000 quintals) and bags (10,000 units), is located east of the gatehouse and service building. It rises over two floors and has a flat, non-walkable roof, currently used for solar panels. The structure is made of reinforced concrete and was built in the 1970s. The building is accessible and in good condition.

4. *Seven (Currently Four) Phosphate Silos and Phosphoric Acid Plant Building.* (Figure 6). Project plans not found. Parts of the buildings were demolished in 2007. Next to the large silo mentioned in point 2, on the right (east side), there were seven silos intended to contain phosphate. Three of these silos were positioned perpendicular to the internal driveway, and the other four were parallel to the road, forming an L shape. The silos, with a diameter of 10 m and a height of approximately 21 m, have a reinforced concrete structure and can each hold 2000 tons of phosphate. All the silos were connected at the top by a reinforced concrete walkway with a parapet. Subsequently, the three silos perpendicular to the road were demolished, and currently, four remain parallel to the road. The remaining silos are accessible and in mediocre condition.



**Figure 6.** Entrance to the complex with phosphate silos and warehouses. Source: own elaboration.

Within the L shape of the silos, there were two rectangular buildings, placed adjacent but offset from each other. One, with a rectangular shape of  $75.00 \times 16.50$  m, was intended for the phosphoric acid plant and extended over three floors with a barrel-vaulted roof. The second, placed adjacent and offset relative to the first, had a rectangular shape of  $50.00 \times 16.50$  m and was intended for subsequent processing. Both were demolished in 2007.

5. *Nitrogen Fertilizer Warehouse (Superphosphate). Project plans not found. The building was demolished in 2007.* (Figure 7) Crossing the driveway to the north, with the silos behind, there is a large nitrogen fertilizer warehouse used for storage. Built in 1953, the building is a large common paraboloid with a reinforced key, measuring 145 m in length and 32.50 m in width, and is reached at the top by an aerial walkway connecting to the production plants. In the following three years, the company began producing phosphazote, which is a binary fertilizer with a high phosphoric acid content. Consequently, to increase the storage capacity of the plant, the parabolic silo was expanded with the addition of a second section that was 70 m long, identical to the first, and also connected to the phosphazote plant. Fully completed in 1956, the paraboloid reached a record length of 215 m and a maximum ridge height of 17 m. Particularly interesting is the introduction of automated bagging and distribution stations, consisting of multi-story towers with a base of  $7.50 \times 6.50$  m, positioned along one of the longer sides of the warehouse.



**Figure 7.** The nitrogenous fertilizers warehouse (superphosphate), demolished in 2007. Source: own elaboration.

The design of the superphosphate warehouse in Porto Empedocle, as well as the entire plant, was directly managed by the Technical Directorate of Montecatini and carried out by Borio Mangiarotti of Milan, with contributions from engineer Giuseppe Borio for the construction of reinforced concrete and features very similar to those of Montecatini in Vercelli. Following renovation work, the bagging stations and some of the side canopies were removed, partially altering the building. The building is accessible, currently used as a kennel, and is in a mediocre state of conservation. Solar panels have been placed on the roof.

6. *Potassium Nitrate Warehouses. Plates 2F-353, 2F-354/3, 2B-544, and 2B-542/4. The buildings were demolished in 2007.* Above the nitrogen fertilizer warehouse, also known as the superphosphate warehouse (to the north), there was a structure intended for the storage of potassium nitrate, consisting of two buildings that were structurally independent and separated by 10 cm. The buildings, placed parallel to the superphosphate warehouse, were called Plant 390 (to the west) and Plant 335 (to the east). Plant 390 had a rectangular plan measuring  $43 \times 18$  m with a reinforced concrete frame structure spanning seven bays, rising over four floors above ground with a gutter height of 18.50 m and a barrel-vaulted roof with an overhead skylight. Almost adjoining (at a distance of 10 cm) to the east was Plant 335, which was a rectangular building measuring  $32 \times 24$  m with a reinforced concrete frame structure spanning three bays, rising over three floors above ground with a gutter height of 24 m and a barrel-vaulted roof with an overhead skylight. The buildings were demolished in 2007.

7. *Spherical Tanks (two) for NH<sub>3</sub>, Ammonia. Plate AK 182-15. The buildings were demolished in 2007.* Continuing east, in line with the warehouses for potassium nitrate production and near the perimeter wall of the plant, we find the spherical tanks that contained ammonia. There were two tanks, each with a diameter of 16 m and a height of about 20 m. The structure was made of reinforced concrete and was built in the mid-1960s. The tanks were demolished in 2007.

8. *Workshop and Stock Warehouse Building. Project plans not found. The building is existing.* Continuing east, there was the building designated as a workshop and stock warehouse. This building is located in the area secured in 2007 by the reclamation company Syndial S.p.A. near the border with the area assigned to the Moncada Energy Group and aligned with the slab of the former superphosphate warehouse. Construction was carried out in the second half of the 1960s, placing two sheds measuring  $20 \times 40$  m next to each other. The frame structure is made of reinforced concrete and set on a square plan measuring  $40 \times 40$  m between the axes of the end columns. It has a gutter height of 6.40 m and a vault roof in lightweight SAP with iron chains.

The supporting structures consist of isolated footings resting on precast prestressed concrete piles that were 7 m long and driven in with an appropriate pile driver, reinforced concrete columns all with a center distance of 5 m, connecting beams for footings, roof beams, and overhead crane beams in the carpentry and repair rooms. The perimeter infill walls are made with brick masonry and plastered to a smooth finish inside and with exposed brick on the outside. The building is currently inaccessible but appears to be in good condition from the outside.

9. *Complex Plant—M and B Title, Milling, and Mixing. Plates 2B-548, 2B-555, 2B-546, 2B-550, 2B-551. The building is existing.* Below (to the south) the majestic complex plant—a product warehouse—there is a complex of three buildings, which from west to east are named Complex Plant—M and B Title Milling and Mixing, Complex Plant—M and B Title, and Complex Plant—M and B Title Intermediate Warehouse.

The first is a rectangular building measuring  $24 \times 12$  m (with the longer side parallel to the coastline), with two/three levels, a reinforced concrete structure, and a barrel-vaulted roof with an overhead skylight. The second is a rectangular building measuring  $36 \times 18$  m (with the longer side parallel to the coastline) with four levels, a reinforced concrete structure, and a barrel-vaulted roof with an overhead skylight. The third building has characteristics similar to the second.

The following buildings, 10, 11, 12, 13, and 14, are connected by walkways for material handling.

10. *Complex Plant M. B. C., Product Warehouse. Plate 2B-547/7. The building was demolished in 2007. (Figures 8–10).* North of the double exchange plant was the majestic complex plant—a product warehouse. It was a rectangular building that combined two buildings in continuity. The first building, 18 bays long, was intended for the production of complex fertilizers and was characterized by greater width due to the presence, in contact, and throughout the length, of a structure intended for various warehouses and services. In continuity, for 12 bays, there was the building intended for superphosphate. As a whole, it was a single building, consisting of 30 aligned bays, each 3 m wide, with overall dimensions of  $32 \times 180$  m, and featured a discontinuous arched roof. The building was demolished in 2007.



**Figure 8.** Floor plan of the M. B. C. complex, a product warehouse with the connecting walkway to the double exchange warehouse (I.D.), demolished in 2007. Source: own elaboration.



**Figure 9.** The double exchange warehouse (D.I.). Source: own elaboration.

11. *Walkway Connecting Complex Plants M. B. C., Product Warehouse, and Double Exchange Warehouse (D.S.) Plate 2B-547/7. The structure was demolished in 2007. The walkway was a reinforced concrete structure with pillars, beams, and a slab, extending approximately 28 m, with intermediate support on isolated footing foundations resting directly on the ground. The perimeter closure was made of reinforced concrete, featuring 10 rectangular windows on both sides. The walkway was demolished in 2007.*

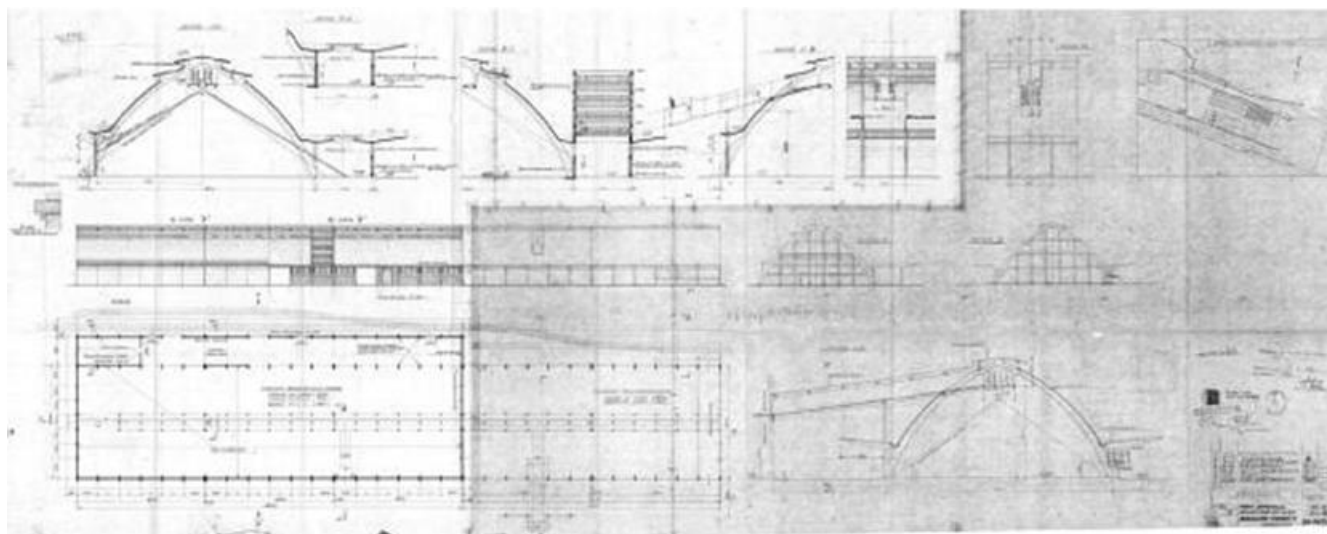


**Figure 10.** Plan of the M. B. C. complex, a product warehouse with a connecting bridge to the double exchange warehouse (I.D.). Source: Comune di Porto Empédocle. Author: Montedison Technical Office.

12. *Double Exchange Warehouse (D.S.). Project plans not found. The building is existing.* East of the complex plant, there is the double exchange warehouse, consisting of a shed measuring  $102 \times 40$  m in the plan, with a maximum height of 20.50 m. The foundations are made with isolated footings resting on precast reinforced concrete piles that are 7 m long and driven in with an appropriate pile driver and perimeter connecting beams.

The supporting structure consists of 18 arches, with a center distance of 6 m, connected by longitudinal beams and two eaves beams at a height of +5.70 m. The roof is made with prefabricated reinforced concrete purlins, on which rests a layer of fiber cement sheets (eternit) and ondulux. The supporting structure is made of pillars, beams, and a brick slab. The perimeter and upper closure were executed with fiber cement and ondulux sheets.

The warehouse, whose connecting roof between the arches has been removed, is currently in an advanced state of decay and is impractical and inaccessible.

13. *Walkway between Double Exchange Plant (D.S.) and Double Exchange Warehouse (D.S.). Project plans not found. The structure exists.* The double exchange plant is associated with a double exchange warehouse, to which it is connected by a walkway, which still exists, measuring 47.30 m in reinforced concrete, supported by pillars founded on footings, and similar to the neighboring buildings. Originally, the passage was protected by sheets of fiber cement (eternit) and ondulux. The structure is in a state of decay.

14. *Double Exchange Plant (D.S.). Plates AK-384-5/4 and AK-384-15/1. The building is existing.* (Figures 9 and 10) Below (to the south) the complex plant, there is the double exchange plant, positioned parallel to the seafront and near the transverse perimeter wall that divides the entire former industrial area into two further compartments. The building complex consists of the D.S. plant building, the filtration plant, and the electrical control and instrumentation cabin.

The first has an L-shaped plan and is a single building block with a reinforced concrete frame structure and plan dimensions of  $46.00 \times 18.00$ – $27.00$  m. The roofs are vaulted in lightweight SAP with iron chains. The perimeter closure (where provided) is made of brick masonry, plastered to a smooth finish on the inside and with exposed brick on the outside.

The filtration plant is a rectangular building measuring  $15.00 \times 8.00$  m (center distance between extreme pillars) with a gutter height of 22.30 m. Here too, the structure is a reinforced concrete frame with two floors at levels +11.55 and +16.00 m and a staircase accessing these floors. The roof vault is in lightweight SAP.

Finally, concluding the previously described group of buildings is the rectangular control and instrumentation cabin, measuring  $10.05 \times 6.40$  m in the plan (center distance between extreme pillars) with a gutter height of approximately +11.50 m. The structure, with pillars and beams, rises over two levels and is supported (similar to the other buildings) on foundations with footings connected by wall beams and resting on precast reinforced concrete piles. The entire complex is in a severe state of decay in both the supporting and non-supporting structures.

15. *Potassium Nitrate Plant—Building.* Plates AK-375-28, plates 5, 6, 7, 8, and file 1783. The building is existing (Figures 11 and 12). The building was constructed in the early 1970s as an extension of the double exchange plant (D.S.). The production cycle was aimed at producing fertilizers with high nitrogen, phosphorus, and potassium content through a complex process of potassium nitrate transformation. This was extracted from the solutions produced in the DS plant and underwent a processing cycle to obtain a product for agricultural use and, alternatively, for industrial use. Constructed as independent from the other buildings, due to the delicacy of the processes that had to be carried out within it, the plant was located between the D.S. plant (to the west) and the double warehouse (to the east) intended for product storage. As reported in the project report, the building was specifically spaced 0.60 m from the D.S. plant and 0.25 m from the warehouse, with some connection points planned.

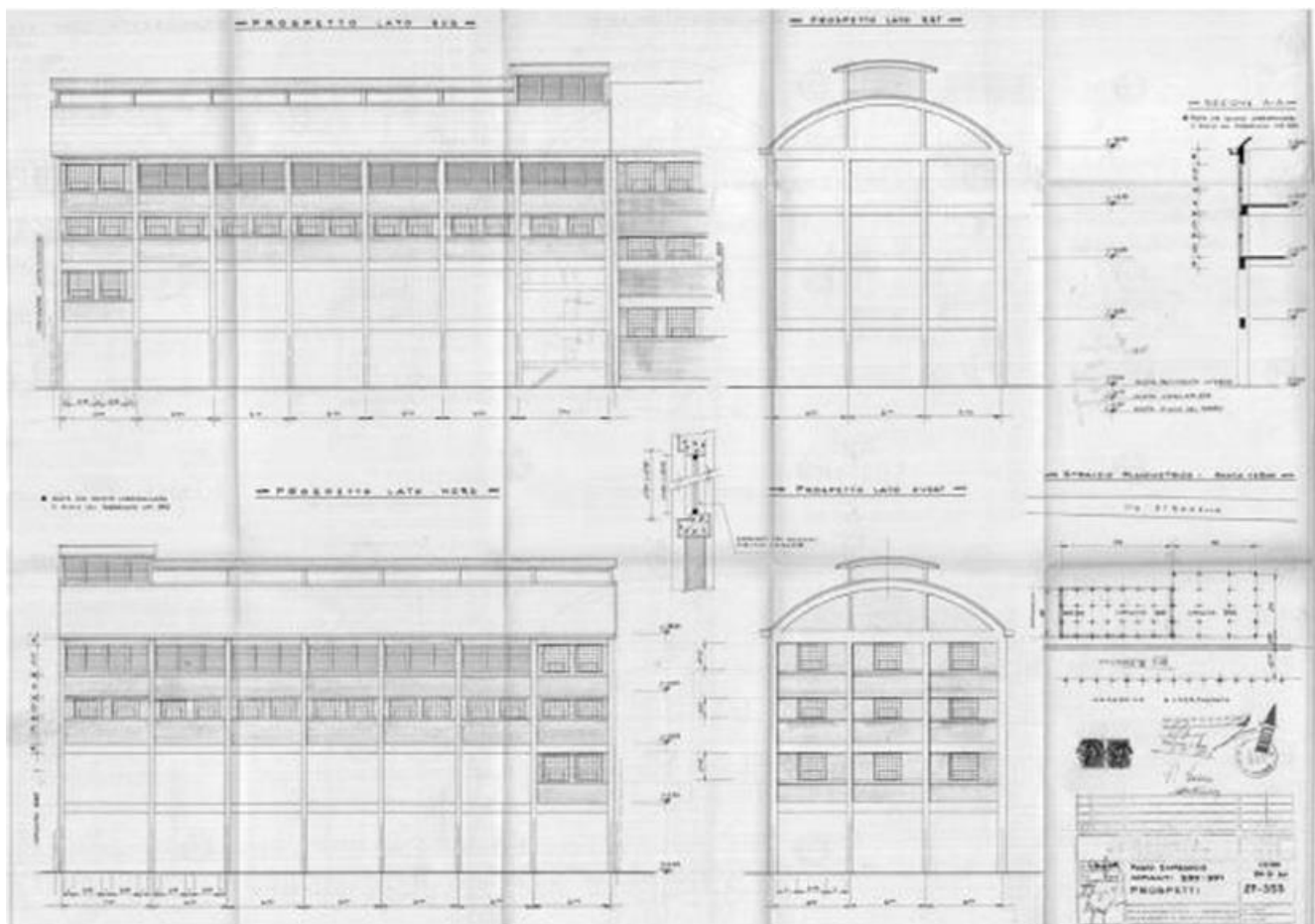


**Figure 11.** Double warehouse and potassium nitrate plant. Source: Montedison Technical Office.



**Figure 12.** Drawing of the double warehouse and the potassium nitrate plant. Source: own elaboration.

The four-story construction has an L-shaped plan, with the front facing the seafront and measuring 30.50 m with a gutter height of 20.10 m. The western part at the front is designated for stairs, while the back houses rooms for command-and-control equipment. It is developed over four floors with a terrace accessed by walkways and iron stairs from adjacent buildings. Currently, only the reinforced concrete structure of the building remains. It is entirely exposed and devoid of any perimeter infill closure. From an outside view, it can be observed that the floors at various levels are extensively degraded and collapsed in several areas.

16. *Potassium Nitrate Plant—Double Warehouse. Plates AK-375-51, plates 1, 2, 3, 4, 9. The building is existing.* (Figure 13) Located east of the potassium nitrate production plant, this rectangular building with dimensions of 45.00 × 36.00 m and a gutter height of 8.50 m was designed to serve the previously described plant. The building is divided into two areas, considering the differentiated storage of products: the west area was intended for products for agricultural use, labeled as raw, while the east area was designated for products for industrial use.



**Figure 13.** Potassium nitrate plant—double storage. Source: own elaboration.

The building was constructed with a reinforced concrete frame structure that supports a metal truss on which sheets of eternit were originally placed. Additionally, on the same roof, there were walkways connecting to the adjacent building (located to the west). The in-fill walls are made of exposed brick. The building is in a fair state of conservation, as it is still the only one that has been recovered and reused by a craft company (Meccanica Martines).

17. *Nitric Plant. Plate 56655/5. The buildings were demolished in 2007.* (Figure 14) The buildings of the nitric plant and the associated water tower, built in the mid-1960s, were located in the southeast at the extreme limit of the former Montedison area and near the Vetem factory. There were three structures in total: two buildings and the water tower. The two buildings are “Plant 200” (to the west) and a building that housed the boiler (to the east). The first is a reinforced concrete and masonry building called “Plant 200” with dimensions of  $35 \times 20$  m and a maximum height of about 13.70 m. The second is a rectangular building with dimensions of  $13.00 \times 20.00$  m and a height to the eaves line of 15.25 m. The supporting frame structure is made of reinforced concrete and was elevated on foundation footings resting on precast reinforced concrete piles that are 7 m long and driven into the ground with an appropriate pile driver. The building, with two floors above the ground, had a trussed roof with a system of five ventilation skylights. The perimeter closures on the first floor were partly made of brick masonry, plastered to a smooth finish on the inside and with exposed brick on the outside, and lightweight materials like ondulux. On the second floor, the perimeter closures were made of solid bricks spaced in horizontal courses to form a perforated wall, allowing ventilation of the floor. The buildings were demolished in 2007.

17'. *Water Tower. Plate 56655/5. The structure was demolished in 2007.* (Figures 15 and 16) Located southeast, at a distance of 16 m from the nitric plant, was the water tower—a particularly beautiful structure standing 15.50 m high. The structure was supported by four pillars around which an external staircase was developed up to a height of 11.95 m. The pillars continued their development, narrowing up to a height of 14.80 m and concluding at the final height of 15.50 m. The building was demolished in 2007.

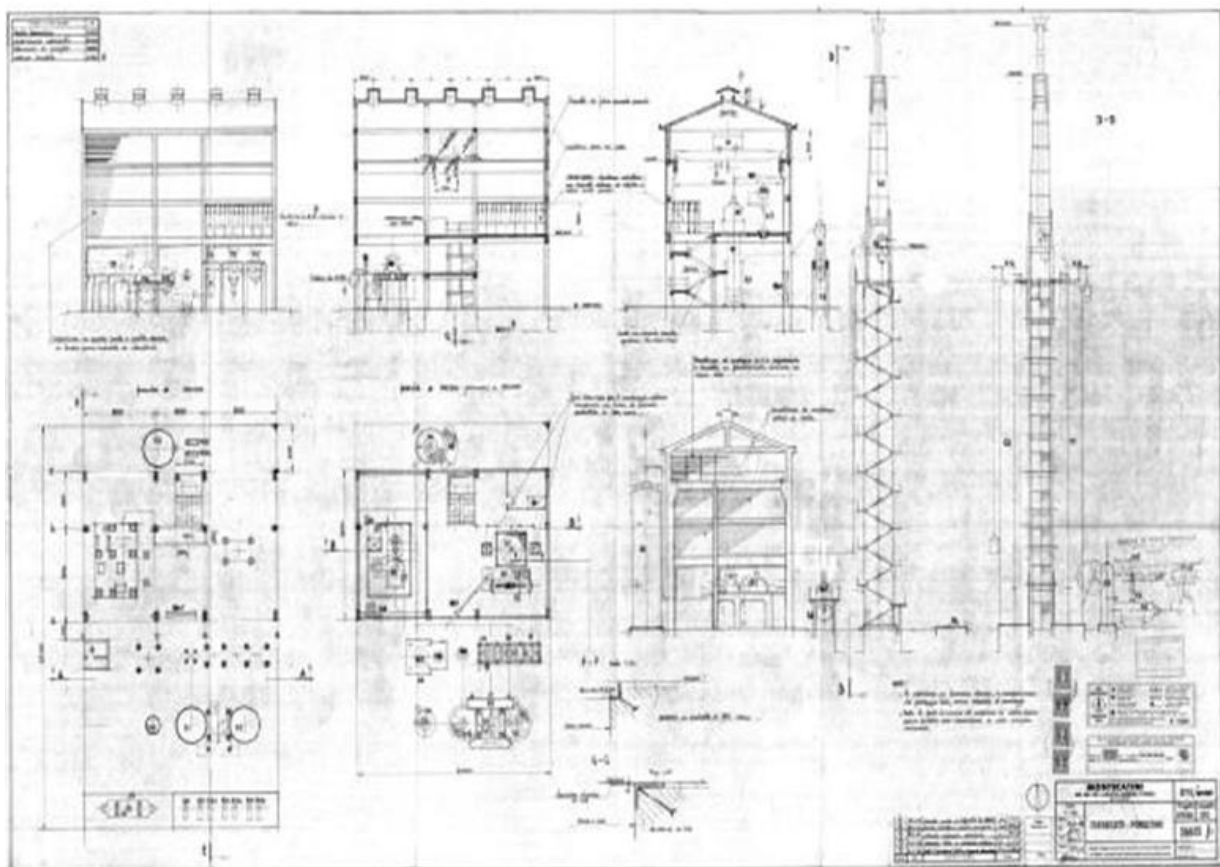


**Figure 14.** Nitrate plant and water tower. The buildings were demolished in 2007. Source: Montedison Technical Office.

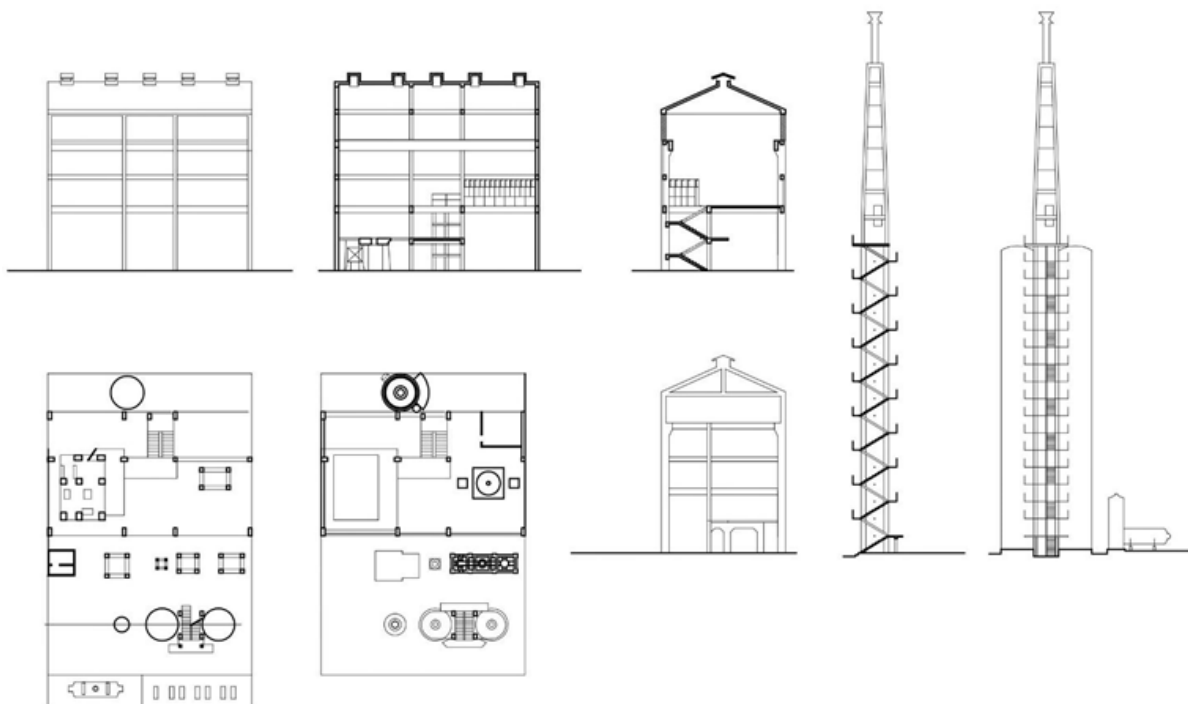


**Figure 15.** M. B. C. complex plant, a product warehouse. The building was demolished in 2007. Source: own elaboration.



**Figure 16.** Water tower, drawing (1966), demolished in 2007. Source: original elaboration.

## 5. Discussion

### 5.1. *The Importance of Transforming Abandoned Industrial Areas*

Cities undergo social and economic changes over time, constantly increasing the need to redesign or regenerate existing spaces so that they remain relevant and meet today's needs. It is impossible to think of cities as static entities; what was perfect yesterday becomes unusable tomorrow. A notable example is former industrial areas whose evolution and subsequent decommissioning result from a history intertwined with economic and business developments where a new world demanded new products, new production methods, and new production sites. Often, industries are closely tied to the regions they occupy, making these areas even more important and deserving of a second life, preferably serving the same region [35]. When a large factory is decommissioned, it presents an opportunity to transform that space and give it a new identity, so it can offer experiences, services, recreational spaces, or, why not, new residences. The redevelopment of abandoned areas can be at the center of a diverse debate involving technicians, designers, administrations, and even the citizens themselves. Regenerating a former industrial area [36] means revitalizing an entire area, enriching the city it is located in, and adding new value to the territory.

### 5.2. *Conversion Policies for Former Industrial Areas*

The choice to implement urban policies aimed at giving new functions to abandoned spaces constitutes a premise for the sustainable regeneration of territories. The redevelopment of neglected areas represents a significant opportunity for transformation and change in our cities, involving various disciplines, experiences, and technologies. This leads to the creation of new and artistic spatial designs, sustainable spaces, and new social and employment opportunities for the cities of the future. There are some noteworthy examples where environmental sustainability in public spaces has achieved impressive results. For instance, Barcelona's photovoltaic plaza and Madrid's Ecoboulevard demonstrate a compelling balance between technical and technological aspects and the quality of spaces and buildings. The current economic and environmental difficulties stimulate research and innovative experimentation to rethink unused spaces and the city/periphery relationship, adding value and significance to these locations. Magnaghi [37] aptly pointed out the

following—“The culture that has interpreted open spaces and historic territories as residual (without value or constraints) has contributed to major territorial and environmental disasters. The reconstruction of cities must proceed from a conceptual reversal (in analysis and design): the ‘voids,’ residual open spaces and remnants, become the generative figures of the new territorial and urban order. Reinterpreted as ecosystems, they organize and return virtuous forms and proportions”.

Bruttomesso [38] states that water cities will be the protagonists of the 21st century. This claim is confirmed by the numerous waterfront regeneration experiences completed—or underway—around the world. There are several similarities between the former Montedison area in Porto Empedocle and the former Italsider area in Bagnoli, which is why it is taken into consideration and is presented here as a case study. The former Italsider area in Bagnoli, Naples [39], was an international two-phase competition, resulting in the winning project of Francesco Cellini (Architect and professor of Architectural and Urban Composition at the Faculty of Architecture, Roma Tre University). The recovery of the former Italsider area cannot proceed without resolving the conflict between the factory, now disused for decades, and the environment in order to return a large system of facilities for leisure, sports, and culture to the territory. This is a form of compensation for a century of pollution damage. The first principle of the project is to preserve the characteristic unity of the whole. Once the industrial fence is removed, the areas can be reconnected into a continuous natural system, which will be the engine of the city’s regeneration. Urban functions are concentrated in three poles that anchor the city to the park. Here, the traces of the factory are more evident. The central area of the park is a large forest, directly connected to the natural system of the Posillipo ridge and Nisida. The beach area is the true attraction, benefiting from its view of the gulf and its connections with the surrounding natural environments. The remediation of the underwater environment suggests the creation of a large scientific marine park, accessible from the recovered piers. The common elements between the Bagnoli and Porto Empedocle areas are as follows: (1) both areas have lost their industrial function; (2) the ground is barren and unpleasant to walk on with traces of grooves, debris, and gigantic structures; (3) there is no internal, architectural, or urban reference system; (4) the factory excluded the city from its perimeter; (5) the coastline has recently undergone modifications and alterations; (6) proximity to the sea and the coastline. The project report, which cites and highlights the points we have previously mentioned, states that “it is necessary to restore a structure to the space, allowing for a new interpretation, a (hopefully more joyful) use, without erasing what remains of the memory of the factory” and further that “some of its characteristics, like clarity, hardness, and imperativeness, must inevitably be inherited” (Francesco Cellini, from the 2006 project report).

Another significant case study is found in Berlin in a disused freight train yard that has been reclaimed by plants and insects. Thus, with minimal interventions, the Schöneberger Südgelände park was born. It received a prestigious award and is much loved by citizens. The idea of working as much as possible with and as little as possible against nature is the great insight of French landscape architect Gilles Clément [40] and formulated in his book *The Moving Garden* as early as 1991. Plants travel through seeds carried by the wind, and the gardener, instead of imposing a pre-designed scheme, can collaborate, adapt, and be surprised by the surprises nature offers, becoming a “guardian of the unpredictable.” In Berlin, there is an urban park that embraces this idea. It is called Natur-Park Schöneberger Südgelände. It occupies about 18 hectares and is a beloved urban oasis for inhabitants. “In 2002, visitors were 18,000 per year; last year, we surpassed one hundred thousand,” said manager Rita Surhoff. This year, the park made headlines as it was the protagonist of the 32nd edition of the Carlo Scarpa International Prize for Gardens, created and organized by the Benetton Foundation for Studies and Research since 1990. Südgelände is part of a vast network of public parks in the German capital, but it boasts a truly unique history compared to the others. And its experience can also be an inspiration for us. Since the late 19th century, this was a railway marshaling yard. The end of World War II and the division of the city with the Wall left this area unused: the last train passed through in 1952. Control

of the land passed to the DDR, and for fifty years, the old marshaling yard became no man's land. Ingo Kowarik, an ecologist and university professor in Berlin, is one of the minds who made the park possible. "I entered this area for the first time in the late 1970s, when I was a student, secretly because it was forbidden," he recalls. "I saw the industrial landscape that had been gradually colonized by plants. I was so fascinated by it that I decided to specialize in Urban Ecology." Little by little, the inhabitants realized that this forbidden place had become a treasure trove of biodiversity just a stone's throw from the center. When, in the early 1980s, there was a proposal for deforestation to reuse the area, a popular movement arose to prevent it. The project was shelved, and a process began that led to the transfer of the land from the railways to the Senate of Berlin, the city's executive body, which then entrusted its management to Grün Berlin—a municipal company responsible for sustainable urban development. "The park was officially born in 1999 thanks to the synergy of three factors: the ecologist who envisioned a new idea of nature, management that collaborated with associations and citizens for a social goal, and a community of artists, Odious, who work with iron and found expressive opportunities here" commented Luigi Latini, president of the Scientific Committee of the Carlo Scarpa Prize and a professor of Landscape Architecture at the IUAV University in Venice. Today, the park is an excellent synthesis of wild urban nature, railway landscape, and recreational projects. The apparent neglect is just an illusion: the vegetation is allowed to grow spontaneously, but there is also cautious and careful human intervention.

These two experiences show us that despite their differences, careful observation and analysis can be the starting point for thinking about the recovery of disused industrial areas to give them new uses and functions and to turn them into spaces usable by citizens.

It is clear that operating and designing in former industrial areas—with the presence of buildings often of considerable size and in a state of severe degradation and abandonment and often built without a general urban logic or plan—represents a great challenge and design commitment for the redeveloping industrial areas sustainably. When discussing the regeneration of disused industrial areas, one cannot avoid mentioning the case of the Ruhr in Germany [41]—the center of the steel and mining industry that experienced years of severe economic and social crisis. This emblematic case, and a model for all urban regeneration policies by the IBA (Berlin Institute of Architecture), did not seek to erase the industrial identity of the place, preserving its original architectural forms while also returning new public spaces to the population. In addition to recovery, many areas have seen new constructions and urban planning experiments, with the design of garden cities and eco-sustainable complexes. The urban landscape [42–46] has played a particularly significant role, transforming a highly degraded territory into a research laboratory for a sustainable future as exemplified by the Emscher Park (Emscher Park is considered an important and ambitious initiative for architectural, urban, structural, creative, and participatory redevelopment of industrial regions in a state of degradation and abandonment. Thus, the IBA has entered the international history of design. However, it is not a transferable operation. This action is and was unique. Nowhere else in the world's old industrial regions could a project so "subversive," envisioning a distant future without concern for immediate commercial success, receive such public support. This was above all the vision and organizational and communicative guideline of its "inventor" and director Karl Ganser. Only by understanding the "soul and spirit" that guided this experience can it be rethought in a new way, experimenting with other utopias). Several professionals collaborated, and the Ruhr case cannot be easily imitated, as its success depended precisely on the deep connection that the experience had with the territory, thanks to thorough analysis and knowledge. In the public debate of recent years, which has focused on the PNRR (National Recovery and Resilience Plan), the topic of reclaiming disused areas constitutes a unique opportunity among project actions to carry out recovery and remediation projects for abandoned or disused industrial areas and to achieve the following objectives: the principle of "do no significant harm" to the environment (so-called do no significant harm, DNSH); initiating the Green Revolution and ecological transition;

advancing the theme of infrastructure for sustainable mobility; implementing the principle of contributing to climate goals in line with the initiatives of Next Generation EU. These actions will move in the direction of creating a circular economy and a development idea that, on the one hand, improves the infrastructure, mobility, logistics, and quality of housing stock, while on the other, will lay the foundations for a more prosperous, equitable, sustainable, and resilient country.

## 6. Conclusions

In a historical moment characterized by public administrations lacking economic resources and the strength to implement complex and forward-thinking territorial planning, by a heterogeneous society increasingly divided by class, ethnicity, and cultural aspects, and by a mistreated and degraded environment, it becomes essential to find a key to rapidly, economically, sustainably, and inclusively reusing existing and functional structures, even if they are abandoned, such as the area of the former Akragas Montedison Plant in Porto Empedocle. The methodological objective is to promote virtuous actions to integrate the disused urban area into the “circular economy” circuit. In summary, the proposed aim is to apply the philosophy of the 4 Rs to the more strictly architectural field: “Reduce, Recycle, Reuse, and Recover.” After developing an initial general functional program derived from the observation of the urban and social fabric of the city of Porto Empedocle and the Province of Agrigento in general, with its unmet demand for collective spaces and facilities, the focus shifted to socio-economic and environmental impacts and the enhancement of benefits for the communities involved. The administrative aspect, with the completion of all bureaucratic procedures, would engage the administration for a long, if not very long, period to define and carry out the traditional restructuring. This would undermine its very preservation, exposing it to the risk of partial and/or total collapses or possible occupations.

Therefore, it is essential that the former Akragas Montedison Plant in Porto Empedocle “come back to life” immediately as an exhibition space for art shows, book presentations, cultural conferences, and other events promoting the territory and short-term experiences before thinking of and implementing medium-term activities. In this way, it becomes part of the virtuous circular economy circuit, transforming from a “waste” (or “burden” or “shame”) for the city into an economic and social “resource.” This choice to use the entire complex immediately and provisionally, except for a particularly degraded sector of the warehouses that requires a more complex intervention, comes from the careful observation of similar interventions carried out by both Italian and foreign public administrations, which, in restoring functionality to abandoned and disused properties, have primarily focused on building restoration without adequately supporting it with a tailored program idea and management model for intervention. Some of these experiences have left administrations struggling to manage the recovered spaces, sometimes of great value, which are underutilized or utilized with critical economic sustainability profiles.

The proposed experiment for the former Akragas Montedison Plant in Porto Empedocle combines the principle of sustainability oriented towards the circularity of the industrial product with the idea of interactive architecture already evoked decades ago by the visionary English architect Cedric Price. The structure of his Fun Palace is not defined in advance but offers a “structural flexibility that constitutes an architecture in continuous evolution, and it is society itself that requires additional activities and functions [...]: the form is determined by the needs of the masses, which influence the designer to create a composition of interactive units that change during the building’s lifespan.” Interactive architecture works on the concept of multi-directional communication between the work, the function, and its user and can be defined as the art of building relationships between people and built components. The resident, the user, the curious onlooker, and the occasional visitor should be unconsciously drawn to this “place” and perceive that the architectural space in which they live their experience is no longer static but changes through the configurability and personalization of spaces that vary according to changing external conditions.

Interactivity in architecture pushes for the search for design tools and construction systems that have intrinsic intelligence, identity, and definition. The purpose of a mutable, temporary, mobile use is to prompt future users with questions: “What is it? How is that building made?” but also “What can I do with it? What does it contain? How can I transform it?” The possible answers arise from the use of the building, from the verification of the quality of its space, from the sensations transmitted and perceived, and from the originality of the functions offered. They are certainly easier to grasp and much more concrete than the theoretical discussions that are organized around a hypothetical working table where the generic “active participation of citizens” is foreseen.

In applying the parameters of sustainable cities, the former Montedison area is conceived as a portion of the city that comes back to life thanks to the active participation of citizens and the reuse/recycling of empty and/or abandoned spaces to transform them into resources. The actions translate into the rediscovery of the existing cultural heritage, the enhancement of its territory, and social innovation. The intervention program and method are inspired by Circular Bioeconomy—that is, the productive model of reuse and recycling of waste and scraps that affects both industry and society on various scales. Firstly, the project foresees the reuse of the entire site and all existing buildings. Secondly, it intervenes by temporarily re-functionalizing both the buildings and the surrounding outdoor spaces. To this end, technologies and materials have been adopted that guarantee environmental sustainability principles.

The application of the “4 Rs” philosophy in the reuse project of the disused complex is made possible primarily by the form, quality, and state of preservation of the pre-existing structures: an almost rectangular area with a horizontal development of approximately 1.4 km from east to west and about 240 m from north to south, containing 19 individual or grouped buildings of various shapes and sizes, capable of offering and hosting all possible types of cultural, research, and work activities. Secondly, it was decided to design each object, volume, setup, furnishing, scenery, etc., predominantly using recovered, recycled, or discarded materials, appropriately transformed and commercially available.

To illustrate the project and present the inseparable and interrelated effects of the 4 Rs, the description has been structured in the first person, embodying a hypothetical visitor arriving for the first time in the area on board an electric train. In fact, the first fundamental step of requalification consists in the re-functionalization of the old railway line, previously used exclusively for loading and unloading goods. To this end, it was decided to use the prototype built in 1945 by Luigi Nervi for a small removable building made entirely of curved ferrocement slabs. The buildings located at the entrance of the former Montedison area are labeled successively as follows: building number 1 (Direction, Technical-Administrative Offices, and Gatehouse) will become the reception and welcome centers for the activities; building number 2 (Building and Silos for Phosphorite) will be dedicated to conferences and exhibitions (silos); building number 3 (Building-Warehouse for Nitrogen Salts) would become a spin-off for new businesses connected to the university; building number 4 (The Silos) will house art installations; building number 5 (Nitrogen Fertilizer Warehouse), 215 m long and 17 m high, could host classes and educational activities for the students of the Faculty of Architecture of Agrigento, offering both indoor and outdoor spaces of great value and importance.

The planting of trees would make the entire external area of the former Montedison buildings livable and pleasant, providing shade during the summer and allowing outdoor activities. Building number 8 (Workshop and Stock Warehouse) would become a space for the promotion and enhancement of the territory and for the study of climate change. Building number 9 (Complex M and B title plants) would be a center for the study of the Mediterranean Sea and the impact of plastic pollutants on the marine ecosystem. Buildings number 12, 13, 14, 15, 16, and 17 will host the cafeteria, library, ATM, bike space, common study areas, computer workstations, and multimedia rooms for conferences, debates, and public meetings.

The general idea is that the project takes shape gradually and starts to live immediately, without waiting for the entire complex to be completed, and can be used at all hours, without closures, transforming from a factory of products into a factory of ideas contributing to the construction of a better world.

In conclusion, the identity of a former industrial area cannot be captured with a single image that is valid once and for all: each area presents specific characteristics that distinguish it from any other situation. The territorial context and the relationships the area establishes with it vary. The ratios between built and unbuilt spaces change, as does the location (in the periphery, on the waterfront, etc.). These different situations are linked to specific opportunities and needs for requalification. Although each recovery intervention is tied to the specificity of the case, some general criteria can be outlined for an appropriate project approach: (1) the need for a multidisciplinary and integrated intervention methodology; (2) involvement and cooperation between various parties (public and private, creation of ad hoc bodies); (3) defining compatible uses in relation to the potential and characteristics of the buildings (to avoid unreasonable adaptations) and with respect to the surrounding context—both physical and social, cultural, economic, and with the existing urban planning instruments; (4) differentiation of uses to counteract monofunctionally and create active and vibrant complexes throughout the day and year; (5) through knowledge and critical selection, conservation of original features, materials, construction systems as well as machinery and other artifacts that constitute a record of industrial civilization; (6) integration of traditional and innovative technologies capable of exploiting the inherent potential of the buildings; (7) experimentation with new technologies and materials for energy efficiency; (8) design oriented to the now fundamental principles of eco-compatibility and sustainability, while also considering the management phase; (9) recognizability of new interventions in relation to pre-existing structures; (10) enhancement of the spaces between industrial buildings that can serve as public spaces, breaking down old fences and allowing direct, daily use by citizens, mobility, and social aggregation. For the various reasons discussed, the reuse and functional conversion can represent a suitable solution both for the recovery of such a valuable industrial heritage and as a catalyst for urban development and regeneration, with the aim of returning these spaces to the community.

The purpose of this research is to emphasize the importance of redeveloping former industrial areas by defining strategies and practices focused on urban ecology. These strategies aim to preserve the functional relationships within the urban system over time, initiating regenerative processes and assigning new meanings to parts of the city. This will involve the use of innovative technologies, materials, and systems capable of radically altering the energy balance of buildings. In this way, abandoned buildings and areas can be transformed from sites of decay and passive consumers of land and environment into efficient systems that simultaneously achieve the preservation, transformation, and enhancement of the built and natural heritage as well as responsible resource management. In this vision, industry and research must commit to finding the best technological and environmental solutions to contribute to a better environment for current and future generations. Key ideas for further research should focus on environmentally innovative building materials, easily recyclable materials, natural and eco-sustainable materials, economical materials, and highly efficient options.

Environmental remediation challenges and strategies for former industrial sites are a topic of great importance today. Environmental cleanups serve as a virtuous example of circularity and territorial enhancement, playing a strategic role in environmental planning as they enable the recovery and revitalization of compromised and polluted areas. Due to past or ongoing human activities, the quality of soil, subsoil, and groundwater environmental matrices may be altered, posing a potential risk to the environment or human health. The economic cost of decontaminating an industrial area is generally very high, and evaluations often consider only the cost without accounting for the social, environmental, and human well-being benefits that remediation can bring in the medium- and especially long-term. In today's interventions, we must operate according to criteria aligned with eco-

sustainable design that is capable of creating an interactive and dynamic system between buildings and their surrounding environment—a design that relies on natural resources and biocompatible materials to promote the physical and psychological well-being of users and ensures thermo-hygrometric, acoustic, and visual comfort as well as energy savings.

The innovative technologies and principles of sustainable design that could be applied in the rehabilitation process reference the use of materials derived from industrial chemistry research with qualities similar to those of biological organisms, such as self-adaptation to microclimatic conditions or varying physical-mechanical stresses. These include smart materials capable of changing shape or state, nano-concretes, nano-insulators, nano-glass, and photocatalytic, antibacterial, and self-cleaning finishes.

The principles of sustainable design are threefold: social sustainability (respect for human beings), environmental sustainability (protection of natural resources), and economic sustainability, which promotes growth that improves the quality of life while respecting the environment. Sustainable architecture means designing buildings to minimize their environmental impact in terms of the materials and construction techniques used, aesthetics, and energy performance. Sustainable architecture should not be identified with a single technology or specific disciplinary field but rather should be considered as a broad cultural approach to the subject.

The adaptive reuse of existing industrial buildings is undoubtedly key in this regard. Therefore, the enhancement of these buildings is crucial for sustainability, including the following: (i) the conservation of the memory of these places in society; (ii) reducing the carbon footprint and regenerating the landscape in which they are located in the context of the contemporary challenges of cities; (iii) reducing the high costs of a new building, guaranteeing the life cycle of these buildings and attracting economic and sociocultural benefits.

Finally, this research contributes to the existing literature that calls for a paradigm shift in the regeneration of industrial areas, aligning it with a more flexible and participatory planning agenda that calls for more socially responsible and committed change.

**Supplementary Materials:** The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/buildings14123895/s1>, Interview Summary.

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