



MAP-Marginal Asset Project

*Decisional Method for Adaptive Reuse of Disused Powerplants*

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## Team Members



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## PROJECT DESCRIPTION

Marginal Assets Project (MAP) has the aim to propose practices and recommendations for converting disused thermoelectric power plants maintaining their industrial heritage. In order to do so, the team committed to the project has been structured by choosing students owning different backgrounds and skills, thus allowing to cover all the fundamental aspects required to achieve satisfying results. However, throughout the whole duration of the project, each team member not only has provided contributions related to his/her academic background, but has also shown interest in enriching his/her personal skills by constructively interacting with the other team members in each step. Here follows the detailed description of MAP team members:



*Figura 1. Team members during on site visit*

- Francesca Villa (Politecnico di Milano – Architectural Design): team controller of the group. She has successfully organized the group's activities and maintained contacts between the team and the academic tutors. She has contributed to all aspects of the project, from the phase of the analysis of both sites and then moving to designing the alternatives and evaluating them through ANP methodology.
- Sergei Bukreev (Politecnico di Torino – Petroleum Engineering): he has given his contribution through the whole project, especially helping in the understanding of all the plants' components which should have been subjected to adaptive reuse.
- Betsabea Bussi (Politecnico di Torino – Architettura Costruzione e Città): she has been present in all phases of the project, exploiting her knowledge in the stage of the analysis and design of the alternatives, as well as during application of ANP methodology.
- Daniel Cadoni (Politecnico di Milano – Management Engineering): he has taken part to the project particularly giving his contribution in the definition of the stakeholders and the definition of the economic aspects related to the proposals.
- Patrizia Dessì (Politecnico di Torino – Planning for the Global Urban Agenda): she has taken part in all phases of the project, by giving her contribution in both the analysis, ANP methodology and design of the alternatives by also producing their renderings.
- Paolo Palmieri (Politecnico di Milano – Environmental and Land Planning Engineering): he has given continuous contribution in all stages of the project. In particular, his skills have been necessary to provide environmental assessments and feasibility studies for the designed alternatives.
- Luca Teofani (Politecnico di Milano – Architecture): he has been present in all phases of the project, especially in the analysis of the world case studies, as well as in the definition of the reuse alternatives.

Overall, MAP team has worked as a tight-knit group, providing interesting reuse alternatives for both Bari and Campomarino sites. Indeed, the effectiveness of the work has been confirmed by the final rank of the alternatives proposed as final outcome of the project, since the top-ranked functional mix has resulted to be exactly the alternative proposed by the team.

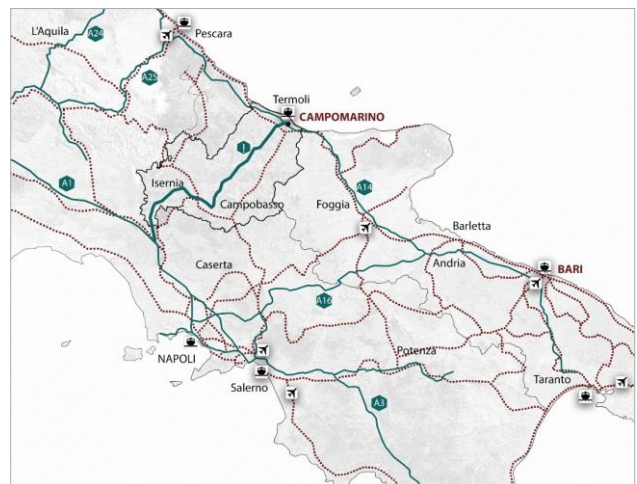
## ABSTRACT

The main issue addressed by MAP team is related to the adaptive reuse of thermoelectric power plants owned by ENEL, fallen into disuse due to their low level of efficiency compared to the alternatives available in the

current electricity production scenario. As project outcome, a complete set of recommendations and best practices has been provided, as well as proposals of adaptive reuse which have been carefully evaluated. In order to develop the work, the team has started with a collection of information, strengthened by an on-site workshop taken place at the two plants object of study (Bari and Campomarino). Subsequently, the analysis and organization of the data acquired has allowed to evidence strengths and weaknesses of both sites. Moreover, the individuation of the main stakeholders who could be involved in a potential project, has enabled to produce the first ideas of adaptive reuse. Indeed, the successive phase of the work has been focused on the elaboration and development of the proposals, evidencing a wider range of reuse opportunities (translated into functional mixes) in the urban context of Bari with respect to the rural area of Campomarino. As a consequence, it has been decided to compare and evaluate the alternatives only for the Apulian capital city. This task has been accomplished through the utilization of a multi-criteria decision analysis (Analytic Network Process), which has required to structure a decision problem as a dynamic model connecting the goal, the decision criteria and the alternatives. After imposing constraints and performing a first evaluation of the alternatives, the final step has involved mathematical algorithms used to weight the decision criteria and finally rank the alternatives (this final task has been performed by Prof. Salvatore Greco and Dott. Salvatore Corrente). The outcome of such procedure has highlighted a top ranked alternative, which resulted to be the functional mix proposed by the MAP team.

#### UNDERSTANDING THE PROBLEM

The aim of MAP project is to propose innovative and sustainable solutions to perform an adaptive reuse of thermoelectric power plants, fallen into disuse due to scarce efficiency both in economic and environmental terms. The work has been carried out in the context of “Futur-e Project”, through which ENEL wishes to redevelop 23 power plants in Italy by maintaining their industrial heritage, and also strengthening the Company’s relation with local communities. In fact, such initiative has been based on the “shared value approach”, which consists in a close analysis of the context and direct involvement of local population.



*Figura 2 Powerplants localization*

The first project phase has consisted of a survey of such industrial sites, subsequently resulting in the choice of Bari and Campomarino as case studies. These two plants have been selected to have the opportunity to analyse and compare two extremely different contexts: indeed, Bari power plant is characterized by a large size and is located in an industrial neighbourhood of the Apulia capital city, while Campomarino is smaller and situated in a rural area, far from any built-up area.



*Figura 3 Bari Wet Cooling Towers*

Subsequently an in-depth analysis and interpretation of the two sites have been carried out, focusing on the study of their characteristics (both structural and environmental), localization, accessibility and overall context. Moreover, a complete socio-economic analysis has allowed to have a full picture of the areas' potentialities. In order to perform an efficient work, a design workshop on both sites (performed during two days) has been conducted with the contribution of the external tutor ENEL, and it has been coupled with an inspection of the surroundings. During this phase, the attention has been focused also on the collection and classification of worldwide comparables, so as to start producing ideas applicable to the plants object of study.

#### EXPLORING THE OPPORTUNITIES

The second phase has exploited all the data obtained and organized in the previous step, by producing a SWOT analysis and a flowchart summarizing all the relevant information regarding the two sites, as well as regrouping the main stakeholders involved in a potential redevelopment project. Regarding Bari, it has been possible to recognize a favourable position of the plant in terms of accessibility and connections to the city centre, even though the immediate surroundings (being an industrial neighbourhood) appeared deteriorated and lacking of urban standards. The buildings of the project area were kept in discrete conditions, except for the northern part belonging to the gas tanks: indeed, this area has been highlighted as the main question mark of the site, due to absence of historical documentation (the plant area used to belong to a refinery before its opening in the mid '50s), unclear management of coal storage in the first years of activity and absence of environmental surveys. Overall, considering that Bari is a growing International reality (especially thanks to the International airport), with a great academic reputation and good touristic fluxes, the potentialities of the dismissed plant have been considered as quite high, since its renewal could include also a relaunch of the entire neighbourhood.

On the other hand, Campomarino has presented a completely different scenario. The disused plant has a relatively recent history (its operation started in the mid '80s), all machineries and buildings have been kept in satisfying conditions and environmental surveys have ensured the absence of any form of compromising pollution. However, the site suffers of a precarious accessibility and complete absence of any relevant neighbourhood, with rural landscape dominating all the surroundings. Consequently, local trends have been studied in order to provide a solution, trying to go beyond the most trivial solution coming from an agricultural reuse.



*Figura 4 Campomarino water tanks*



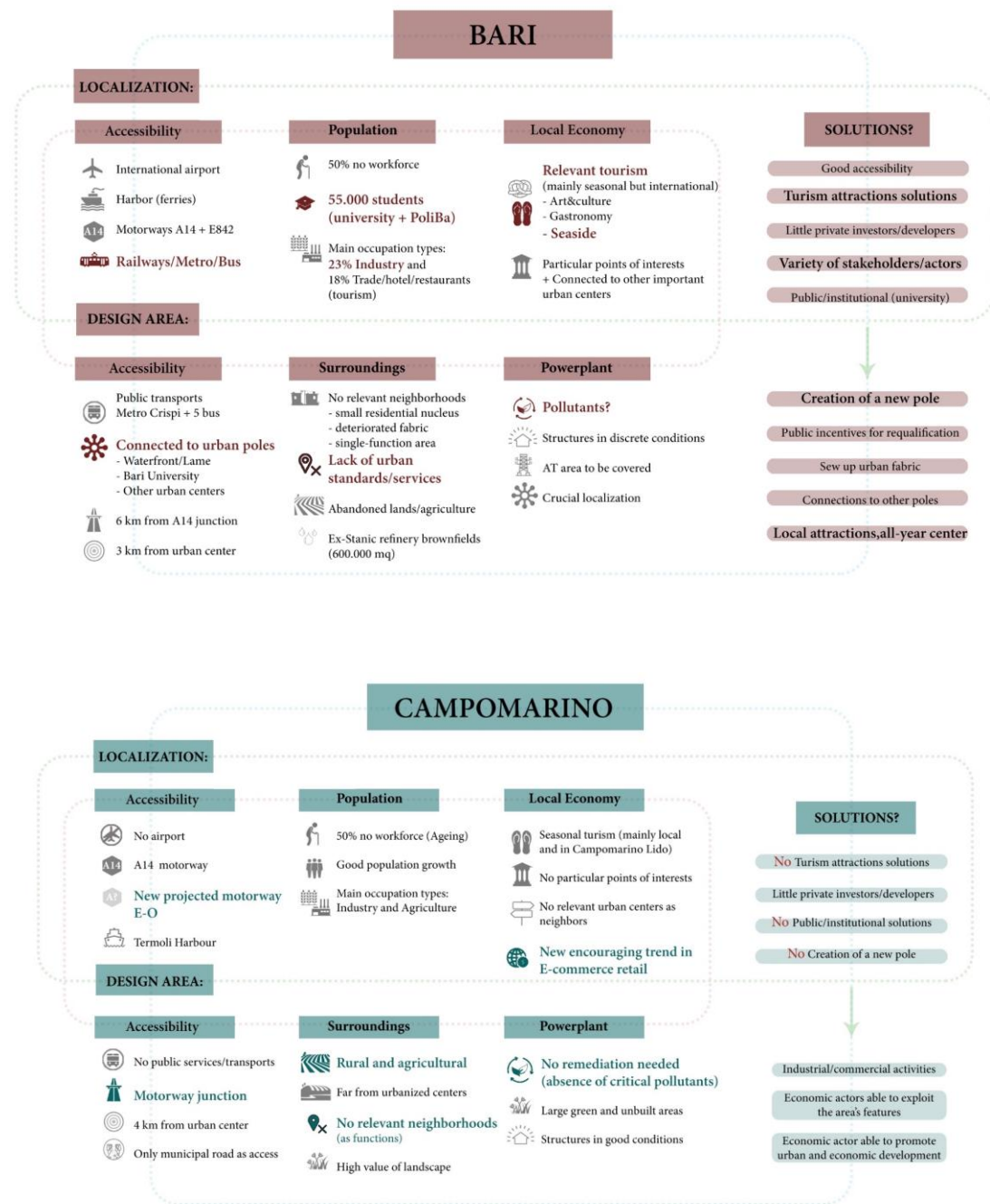


Figura 5 Bari and Campomarino flowcharts

## GENERATING A SOLUTION

As a result of the third phase, three solutions have been implemented for Bari plant, while two for Campomarino.

In the case of Bari, three different multifunctional centres have been proposed:

- (A)mare Sea Centre-education and culture: a functional mix with education and local culture as main pillars. The figure of the sea, which is the main attraction of the city, is exalted in all the designed activities of the plant;
- (A)mare Sea Centre-production and sale: a functional mix with production and sales as main pillars. This solution still keeps the sea as the main subject, but it is more oriented to maintaining the industrial identity of the area;
- Bari Instant Centre: a more simple functional mix, characterized by the availability of huge free spaces for a more immediate restart of the activities.

For what concerns Campomarino, the two proposed alternatives are:

- E-Commerce Warehouse: analysis of local trends has shown an encouraging trend for the e-commerce retail, so this solution tries to exploit all the buildings and spaces available in the plant. This proposal is more market-oriented and does not exploit the agricultural potential of the area;
- Food Storage and Market, Consortium Headquarter: this solution aims to bring together the food consumers and producers. It exploits the agricultural potential of the area and performs a more consistent diversification of building functions.

After evaluating the potential impacts on the local economies and communities, a deeper study has been conducted in order to evaluate the alternatives proposed for Bari thermoelectric plant. It has been decided to focus on Bari since it has been recognized as the only site between the two which was actually capable of offering a functional mix. Moreover, the more appealing context has made more interesting the utilization of the following methodology implemented in this last step of the project.



*Figura 6 (A)mare Sea Center, education and culture*



*Figura 7 (A)mare Sea Center, production and sale*



*Figura 8 Bari Instant Center*



The Analytic Network Process (ANP) is a multi-criteria decision analysis, which structures a decision problem as a network connecting the goal, the decision criteria and the alternatives. Pairwise comparisons are then used to weight the components of the structure and finally rank the alternatives. In the case of this project, the structuring of the problem and the criteria has been performed by defining a dynamic model. Such model has been defined thanks to the help of ENEL's spokesperson and the academic tutors, after



Figura 6 Campomarino Food Market and Storage

a preliminary analysis in which the main components constituting the problem have been highlighted.

The alternatives object of this study have been produced by dividing the site into six areas and then generating all the possible functional mixes, considering that each area could serve as free space, artisanal/commercial, services, housing or industrial. After imposing constraints and performing a first evaluation of the alternatives, only 19 of them reached the final stage, consisting in application of mathematical algorithms which have permitted to weight the decision criteria and finally rank the alternatives. This final fundamental step has been completed thanks to the precious help of Prof. Salvatore Greco and Dott. Salvatore Corrente from Catania University.

Figura 10 Campomarino E-Commerce warehouse

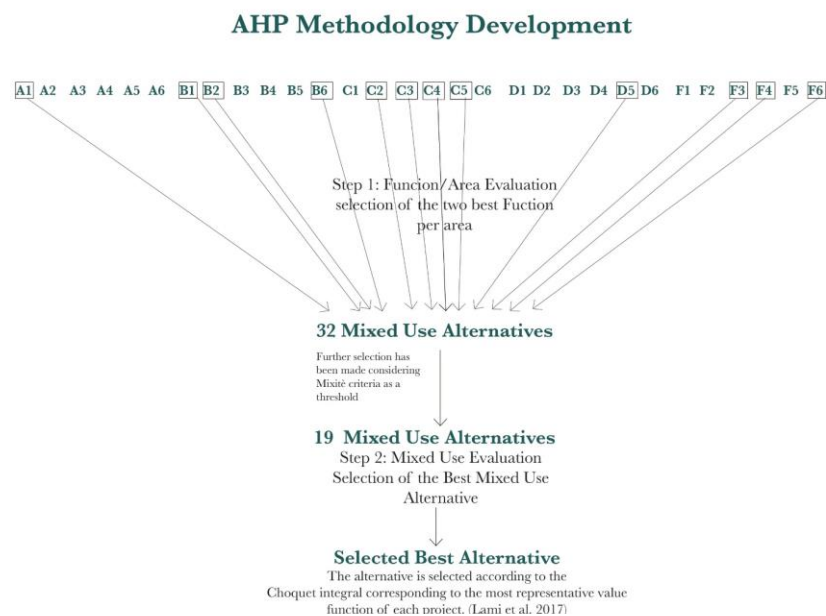


Figura 7 Methodology development Step by Step



As a conclusion and satisfying outcome, the top-ranked alternative has resulted to be really similar to the first (A)mare Sea Centre (centred on education and local culture) proposed by the team as adaptive reuse solution, thus reinforcing the quality and accuracy of the studies carried out in the area, which have led to the definition of such alternative.

#### MAIN BIBLIOGRAPHIC REFERENCES

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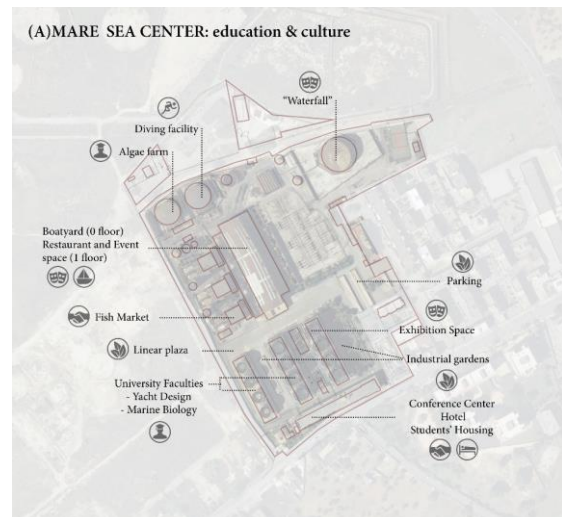


Figura 8 Top Ranked alternative