



From Knowledge to Wisdom

ISSN 1934-7359 (Print)
ISSN 1934-7367 (Online)
DOI:10.17265/1934-7359

Journal of Civil Engineering and Architecture

Volume 11, Number 6, June 2017



David Publishing Company
www.davidpublisher.com

Journal of Civil Engineering and Architecture

Volume 11, Number 6, June 2017 (Serial Number 115)



David Publishing Company
www.davidpublisher.com

Publication Information:

Journal of Civil Engineering and Architecture is published monthly in hard copy (ISSN 1934-7359) and online (ISSN 1934-7367) by David Publishing Company located at 616 Corporate Way, Suite 2-4876, Valley Cottage, NY 10989, USA.

Aims and Scope:

Journal of Civil Engineering and Architecture, a monthly professional academic journal, covers all sorts of researches on structural engineering, geotechnical engineering, underground engineering, engineering management, etc. as well as other issues.

Editorial Board Members:

Dr. Tamer A. El Maaddawy (Canada), Prof. San-Shyan Lin (China Taiwan), Dr. Songbai Cai (China), Prof. Vladimir Patricevic (Croatia), Dr. Sherif Ahmed Ali Sheta (Egypt), Prof. Nasamat Abdel Kader (Egypt), Prof. Mohamed Al-Gharieb Sakr (Egypt), Prof. Marina Traykova (Bulgaria), Prof. Olga Popovic Larsen (Denmark), Prof. George C. Manos (Greece), Dr. Konstantinos Giannakos (Greece), Pakwai Chan (Hong Kong), Chiara Vernizzi (Italy), Prof. Michele Maugeri (Italy), Dr. Giovanna Vessia (Italy), Prof. Michele Di Sivo (Italy), Prof. Valentina Zileska-Pancovska (Macedonia), Dr. J. Jayaprakash (Malaysia), Mr. Fathollah Sajedi (Malaysia), Prof. Nathaniel Anny Aniekwu (Nigeria), Dr. Marta Stowik (Poland), Dr. Rafael Aguilar (Portugal), Dr. Moataz A. S. Badawi (Saudi Arabia), Prof. David Chua Kim Huat (Singapore), Dr. Ming An (UK), Prof. Ahmed Elseragy (UK), Prof. Jamal Khatib (UK), Dr. John Kinuthia (UK), Dr. Johnnie Ben-Edigbe (UK), Dr. Yail Jimmy Kim (USA), Dr. Muang Seniwongse (USA), Prof. Xiaoduan Sun (USA), Dr. Zihan Yan (USA), Dr. Tadeh Zirakian (USA), Dr. Andrew Agapiou (UK).

Manuscripts can be submitted via Web Submission, or e-mailed to civil@davidpublishing.com or civil@davidpublishing.org. Submission guidelines and Web Submission System are available at <http://www.davidpublisher.com>.

Editorial Office:

616 Corporate Way, Suite 2-4876, Valley Cottage, NY 10989, USA

Tel: 1-323-984-7526, 323-410-1082 Fax: 1-323-984-7374, 323-908-0457

E-mail: civil@davidpublishing.com; civil@davidpublishing.org; shelly@davidpublishing.com

Copyright©2017 by David Publishing Company and individual contributors. All rights reserved. David Publishing Company holds the exclusive copyright of all the contents of this journal. In accordance with the international convention, no part of this journal may be reproduced or transmitted by any media or publishing organs (including various websites) without the written permission of the copyright holder. Otherwise, any conduct would be considered as the violation of the copyright. The contents of this journal are available for any citation. However, all the citations should be clearly indicated with the title of this journal, serial number and the name of the author.

Abstracted/Indexed in:

Cambridge Science Abstracts (CSA)

Ulrich's Periodicals Directory

Chinese Database of CEPS, Airiti Inc. & OCLC

Summon Serials Solutions, USA

China National Knowledge Infrastructure (CNKI)

Turkish Education Index

Google Scholar

ProQuest, USA

J-Gate

Subscription Information:

\$720/year (print)

David Publishing Company

616 Corporate Way, Suite 2-4876, Valley Cottage, NY 10989, USA

Tel: 1-323-984-7526, 323-410-1082 Fax: 1-323-984-7374, 323-908-0457

E-mail: civil@davidpublishing.com; civil@davidpublishing.org; shelly@davidpublishing.com

Digital Cooperative Company: www.bookan.com.cn



David Publishing Company
www.davidpublisher.com

Journal of Civil Engineering and Architecture

Volume 11, Number 6, June 2017 (Serial Number 115)

Contents

Earthquake Engineering

- 515 **Behaviors of Rural Structures during Destructive Earthquakes**
Cemal Eyyubov, İsa Eyyubov and Mehmet Hasnalbant

Construction Research

- 538 **Radon in Rented Accommodation and Variables Determining Its Level**
Torben Valdbjørn Rasmussen
- 550 **Towards a Methodology for Evaluating Architectural Heritage Preservation Methods**
Alanoud Abdulaziz Alansari
- 559 **The Palmanova Cantonments: Conservation, Value-Enhancement and Transformation for an Integrated and Overall Regeneration**
Maria Paola Gatti, Giovanni Russo and Luca Zecchin

Environmental Research

- 571 **Three-Dimensional Morphodynamic Modelling of Tigris River in Baghdad**
Ammar A. Ali, Nakhir A. Al-Ansari, Qusay Al-Suhail, Sven Knutsson
- 595 **Inversion Precipitable Water Vapor by GPS Observation of CMONOC**
Hongbo Shi, Rui Zhang, Zhaosheng Nie, Yu Li, Zhengsong Chen and Tan Wang

Urban Planning

- 608 **Building Taiwan Aeropolis of Airports through Infrastructuring Care and Integrity**
Li-Yen Hsu

The Palmanova Cantonments: Conservation, Value-Enhancement and Transformation for an Integrated and Overall Regeneration

Maria Paola Gatti, Giovanni Russo and Luca Zecchin

Department of Civil, Environmental and Mechanical Engineering, University of Trento, Trento 38123, Italy

Abstract: Italian military real-estate is highly varied as regards its location, intended uses, its typological, stylistic, and constructive features and its state of conservation. What historical and documental value can we attribute to the typological and technical aspects of military buildings? What problems and strategies have to be studied before such buildings can be repurposed for inclusion into a circuit of social and civil uses? Some attempts were made to answer these questions by analysing the military real estate of Palmanova, the fortress city founded by the Serenissima Republic of Venice in 1593, a city designed by engineers, military analysts, and expert military architects all answerable to the Fortifications Office of Venice. There are a number of barracks situated inside the city's fortified walls, within a somewhat confined area: Montezemolo, Isonzo, Ederle, Filzi, Montesanto and others in outlying villages. Barracks built in different periods (some during the Renaissance, others in the eighteenth century and some even after the Second World War) have been gradually phased out of service. Their restoration and functional leverage, in the early years of this century, were discussed in terms of an economic and cultural strategy that would not upset the city. New regeneration strategies are called for if these abandoned military structures are not to undergo further deterioration. These strategies should be based upon a knowledge of these structures' features—their layout, architecture, technologies—and should also embrace local policies, but first and foremost they require real, contextualized and economically sustainable projects.

Key words: Fortress, decommissioning, securitization, value-enhancement, conservation, regeneration.

1. Introduction

Europe's changed geopolitical condition and the end of national service or conscription led to the decommissioning of a large number of military structures. Unfortunately, failure to put such structures to use turned many of them into unused and empty skeletons.

Attempts to include them into circuits of civilian use have been made, but such re-purposing has encountered a host of problems. In many cases, the military installations were transferred to regional or municipal authorities, but neither were these bodies able to produce practical transformation and/or regeneration measures.

Although one million hectares and about eight

thousand military sites worldwide are in a state of abandonment, very little transformation work has been carried out upon them. The reasons that led to the blocking of such work are various: lack of funding, erroneous economic evaluations, problems inherent to the areas (presence of pollutants and/or unexploded ordinance, the non-recognition of the cultural and social value of the locations, the erroneous evaluations of projects for their re-use in terms of cities' needs, etc.). Now, it has been finally understood that the regeneration [1] of these military areas calls for a multi-disciplinary approach. However, this does not mean that a standard requalification process has been or can be defined because besides being geographically highly diverse, each site and its contexts is, socio-economically, culturally and politically sui generis.

Highly different operations have, for example, been

Corresponding author: Maria Paola Gatti, Prof. Arch.; research field: architecture. E-mail: mariapaola.gatti@unitn.it.

performed on various kinds of structures: from Fort McPherson in Atlanta, Fort Monroe in Hampton, and the Vauban base in Freiburg, to the naval hospital and barracks of Antigones in Cartagena, the Second World War bunker in Wissant and Fort Bard. Such operations include repurposing and, sometimes, careful restoration operations, but it is much more likely that the work will involve demolition and reconstruction. Generally speaking, the attention given to pre-modern military works in Italy was initially directed at their conservation and enhancement, but more recently, it has been supplanted by demolition.

However, the operating approach used will vary according to the size of the military structure. Thus, while something has been done for individual locations, little or nothing has been done for such structured and complex clusters as fortress cities.

In Europe (the French cities of Vitry le François—1544, Phalsbourg—1570, Lixheim—1606, Neuf Brisach, Vauban, etc., the German city of Freudenstadt—1599; the Dutch cities of Corvorden and Hellevoetsluis, the Finish city of Hamina, the Greek city of Rhodes, etc.) and specifically in Italy (Avola, Civitella del Tronto, Corinaldo, Guastalla, Monteriggioni, Montagnana, Sabbioneta, etc.), such cities were situated and built for defensive purposes and for this reason little has been done. In many military cities such as Alessandria, Palmanova, Pizzighettone, Legnago, and Cittadella di Porto, private subjects have gradually appropriated every larger section of the military structures and sometimes at the cost of incongruous adaptations of installations and buildings in terms of the technology and equipment used.

The regeneration of fortress cities is fraught with problems and difficulties [2]. Such cities now count a very high number of military constructions, which, because they no longer serve a specific purpose, have been abandoned and await some new function.

The fortress city of Palmanova [3-5] is an example.

Situated in the low plain of Friuli, it is defensive complex sited on a swathe of land between Udine and Marano Lagunare (an important fortified Venetian city) built at the insistence of the Venetian Republic and wedged into the Hapsburg territory. Its position was determined by the Treaty of Worms that gave rise to a patchwork of shared borders between the Republic of Venice and the Hapsburg Empire, with Venetian enclaves within the German territory and Austrian possessions in the Venetian territory.

Palmanova is a model military city that still retains the exemplary layout of defensive fortifications codified during the Renaissance. The layout has much in common with other military cities such as Pamplona and Jaca in Spain, Vauban in France, Neuf Brisach in Alsace, Fredericia in Denmark, Rhodes in Greece, Nicosia and Famagusta in Cyprus. Moreover, it has undergone minor changes and enlargements because only a few decades ago, it was still being used as a military base.

2. The Fortress City of Palmanova: From Conception to Decommissioning

The design was the work of a team of engineers, scholars, and expert military architects drawn from the Fortifications Office of Venice, among whom the general superintendent Giulio Savorgnan, the principle architect of the fortress. On October 7th, 1593, the construction manager, Vincenzo Smamozzi (1548-1616), laid the first stone for the construction of a fortress that over time was to be reinforced by a number of defensive walls [6].

It was an “invisible” city-fortress, built below the horizon line to hide it from enemies’ eyes. Consequently, its buildings had to be low and its walls covered with earth and vegetation. In a relatively short period of time, a “war machine” was built whose main structures had already been completed by 1599 (the second fortified curtain wall, with embankments, ditches and ravelins, was built between 1658 and 1690; the third curtain wall was built by the French during

their occupation between 1806 and 1814). Its construction was based upon a geometrically perfect layout (Fig. 1), grounded in numerical and rationalistic concepts in vogue in the Renaissance. It comprised a nine-sided polygonal shaped layout based on the number three, with three entry points (Cividale, Udine and Aquileia), whose axes met in the central square (a regular hexagon with a radius of 52 Venetian steps—90 m—and each side measuring 52 Venetian steps).

The main axes determined three separate sectors, each of which subdivided by three main and three secondary streets. Inside the ramparts, the city expanded along six radial roads, each with a

cross-section equal to one fifth of the basic module (14 m). Each of the internal radial circuits was divided by four circular streets, with six squares in the second radial intersection. The buildings were sited in the various concentric rings according to a precise zoning scheme that guaranteed their impregnability. In the various rings—moving towards the interior, there were [7]: first, the walls with the bulwarks and ramparts, ditches, soldiers' quarters, then warehouses and stables, the houses of soldiers' families with gardens, power magazines, and finally the Palazzo dei Provveditori Generali (1598) or the City Manager's Building, the Loggia della Gran Guardia or the Guards' Lodge, the church, the church tower (1776) and



Fig. 1 The plan of Palmanova (Russo, G.).

the well with the underground cistern.

There were nine fortress bastions, eighteen radial roads, eighteen barracks, two for each curtain wall. Twelve soldiers' quarters were built, of which seven still extant and five demolished.

In order to accelerate construction, the barracks were built with local materials and simple technologies. In the seventeenth century, other buildings were added, including a grandiose structure to house an artillery store and arsenal (1632) and three powder magazines. Systematic maintenance was curtailed on military buildings when they no longer served military purposes, and these were subsequently demolished and rebuilt.

As the new constructions were erected on the same sites of the old buildings, the city's planimetry did not undergo major changes.

Up until the seventeenth century, Palmanova was one of the most important military bases, quartering from 1,000 to 2,500 armed men, who were organized into different garrison units and batteries. It was used exclusively as a logistical centre for troops and never sustained direct attack.

From 1797 until 1805, Palmanova was occupied, alternatively, by the French and the Austrians. In this period, Napoleon decided to modernize and fortify the stronghold, entrusting the work to General Jean Baptiste Bernadotte (1763-1844, Bernadotte was first a general and then a Marshal of the first French empire before being made King of Sweden and Norway) and later to General Francois de Chasseloup-Laubat (who was already superintendent of the strongholds of Alessandria, Pizzighettone, Peschiera, Mantova, and Legnago). Numerous reinforcement works were carried out to the existing structures: the open ground around the stronghold was extended with the demolition of the villages of Palmada, Ronchis and San Lorenzo; lunettes and new forts were built in correspondence to the nine bastions with communicating galleries fixed at about 300 m from the Venetian fortified line. Palmanova became

rear logistic and supply centre that would have been of great importance in the event of attacks from Austrian troops.

Improvements in artillery imposed alterations—the reinforcement of the city walls with the construction of a new fortified line with nine lunettes and an underground passage to the ditch that linked the nine bastions. Around the walls, in correspondence to the bastions, nine defensive barracks (to quarter up to 3,500 troops) were proposed but only three were built (those at the Donato, Contarini and Grimani bastions). The French modernization design included the building of three powder magazines (to replace the obsolete and deteriorated Venetian structures) and a 350-400 bed military hospital, numerous warehouses and stables for 600 horses. Construction work was delegated to military engineers, infantrymen and civilian workers.

Archive documents show that by 1811, the new building and modernization work was, for the most part, finished but the battles in the successive years prevented the grandiose plan from being fully completed. The outcome of successive wars brought Palmanova under Austria rule before it finally became part of the Kingdom of Italy in 1866.

After annexation to Italy, Palmanova lost its role as a defensive stronghold to become a frontier city whereupon it was transformed into a logistic supply and hospital centre. Following the defeat at Caporetto, much of the fort was set on fire by the Italian troops to prevent arms and supplies falling into the hands of the Austrians. At the end of the first world war, the stronghold was reconstructed, the damaged barracks rebuilt, new buildings erected for the Italian army and Palmanova continued its vocation as a military city.

After the second world war [8], the decommissioning of the military structures commenced with the “mothballing” of the Montesanto (IX Napoleonic barracks at the Grimani bastion), Monte San Michele (Sant' Ermacora Venetian quarters), Ermanda (San Giovanni and Sant' Andrea

Venetian quarters among the Savorgan and Grimani bastions) barracks. In the 1960s, the first demolition work of military installations began so as to provide space for new constructions (the extension of the Civil Hospital, military residences) and new uses were sought for many other installations. During the Cold War, Palmanova continued to maintain a sizeable garrison and up until the 1990s remained a military city.

The new millennium ushered in a new European geopolitical scenario that entailed the decommissioning of most of the barracks in Palmanova. Only the “Durlì” barracks, housing the 4th Genoa Cavalry Regiment (since 1947), remains operational in the city, although technically situated outside the historic fortified perimeter.

In the city fortress, various vacated buildings have been transformed into habitations, offices for associations of various types, the seat of the municipal Civil Defence Force, a museum (the Museum of the Resistance) and a military equestrian centre. Other buildings await an equally fitting and compatible transformation.

Vast swathes of the inner city (almost all the Venetian quarters and the Napoleonic barracks) and at least two thirds of the bastions remain the property of the military authorities. They are no longer in use and have been allowed to fall into disrepair.

Some of the abandoned buildings have a very high morphological, architectural and constructive value, but it remains uncertain if judicious conservation measures are the best way to leverage their value.

Among the areas of greatest interest, we can mention the Napoleonic barracks: “defensive barracks II” (“Filzi”, at the Donato bastion), “defensive barracks V” (“Gamerra”, at the Contarini bastion), and “defensive barracks IX” (“Montesanto”, at the Grimani bastion) built close to the city walls between 1805 and 1811.

3. The Bastion’s Defensive Barracks

Laurent de Gouvion-Saint Cyr (1764-1830,

engineer, general, Marshal of the Empire and Count of the Empire under Napoleon, Marquis during the reign of Luis XVIII) designed cantonments that also functioned as effective military barriers with elements for active defence. The structures were designed to give a complete curtain protection to each bastion and were endowed with 68 crenels “to cover visually and with musket fire” the entire space between the building and the bastion.

The Napoleonic barracks were simple volumes with a rectangular base (approximately 75 m long) situated at the base of the bastions. They stood on two, above ground, floors, plus attic space, and could be accessed directed from the Venetian city walls. Two of the three cantonments had one underground level. The overall volume was divided into nine rectangular rooms with dimensions of approximately 11 × 6 m (Fig. 2). These units were linked by a longitudinal central corridor. There was another communicating corridor on the first floor, but as it was an external balcony landing, the rooms were rendered independent.

The first floor was accessed by two stone staircases (Fig. 3), one at each end of the building. Two narrow, single-ramp stairs were initially situated in the centre, but later replaced by a structure communicating between the two floors. An external staircase gave access to the basement floor.

The stairwell in the central cell of the building’s block was accessible from outside through two large doorways with massive wooden doors. The dimensions of the doorways were determined by the need to provide passage to heavy artillery pieces for enfilade fire between the cavalier and the orillon or from the bastion’s glacis.

The first floor was also divided into dormitories while the attic, as stated, was only used as a storeroom (Fig. 4).

The longitudinal facades had different configurations.

The facade facing the bastion was punctuated by

The Palmanova Cantonments: Conservation, Value-Enhancement and Transformation for an Integrated and Overall Regeneration



Fig. 2 The façade of the Napoleonic barrack (students: Andreottola, M., Bonadimani, A., Masutti, A., Roman, O., and Tudor, D.).



Fig. 3 The section of the Napoleonic barrack (students: Andreottola, M., Bonadimani, A., Masutti, A., Roman, O., and Tudor, D.).

small rectangular windows. Each room had four crenels, slanted to provide cross fire from four fusiliers and avoid “blind spots” figure. The crenels were later enlarged, most probably after the second world war to afford better lighting and ventilation.

The internal facades giving onto courtyards featured a regular sequence of openings. Each room had two large windows and a central door. In construction terms, the buildings deployed massive

load-bearing stone walls with an approximate 1.2 m cross-section, whose exterior render comprised very large, square stone slabs attached by metallic bracings to the walling underneath, while the interior was covered with thick coats of plaster.

Internal partitioning was also made from stone and mortar and measured between 0.8 and 1 m. The floors had different ceilings.

The basement had brick low-arch ceilings, while



Fig. 4 The room-dormitori of the Napoleonic barrack (Russo, G.).

the ground and first floor had barrel-vaulted stone ceilings. The top ceiling was also covered with a 1.5 m thick earth layer to increase its resistance to artillery fire.

The building's pitched roof was made from a primary structure of wooden beams supported by ogival masonry arches that matched the modular configuration of the rooms below. The beams were placed along the longitudinal axis of the building with rafters supporting battens. The roofing was made from clay tiles. The external balcony landing on the internal facade comprised metal corbels fixed to the walling,

with wooden joists and decking. These were simple buildings in term of their site plan and elevation.

They were made from local materials (sometimes from the demolition of dilapidated structures) and deployed simple construction technologies.

After being exclusively used by military personnel, the buildings were abandoned in the first years of the 1990s and since then regular maintenance—which had always characterized them—was discontinued. Soon after their functional deterioration, physical deterioration set in.

The military property was assigned to the municipal

administration in 2010 and immediately a series of studies were begun to define their repurposing on the basis of restoration projects and funding that in the final analysis were dependent upon state financing.

4. Conclusions

Like many other buildings, the cantonments are the fruit of model types developed by enlightenment culture where the construction of large, built volumes had to meet pre-determined characteristics in terms of urban planning, site-planning and building technology.

A typological study of structures in Palmanova (but presumably also applicable in many cities) has revealed the potentials and limits possibly influencing their hypothetical reuse. The cantonments possess extremely well defined and rigorously organized installations which can be adopted for civilian uses.

The individual buildings, given their simple morphology and elevation (and thus low degree of specialization), lend themselves to various uses. Many blocks making up the barracks could be re-adapted

with minor restructuration work and offer opportunities for a range of different uses.

The functional compatibility of the Palmanova barracks (Figs. 5-7) has already been ascertained as a number of military barracks have already been successfully transformed into schools and residential structures.

It is therefore also important to assess the architectural quality of the buildings, albeit designed by anonymous military engineers. Fact-finding studies able to evaluate the property as a whole and at different levels, can discover its potential and adaptability for being re-purposed.

After numerous suggestions mooted for their radical demolition, the time now seems to be ripe to investigate the possibilities of restoring these real-estate clusters, or at least parts thereof. For the residents of Palmanova, this approach is increasingly important because the restoration of these military structures means paying testimony to their and the city's historical, cultural, economic and organizational heritage.



Fig. 5 The future of the Napoleonic barrack (students: Andreottola, M., Bonadimani, A., Masutti, A., Roman, O., and Tudor, D.).

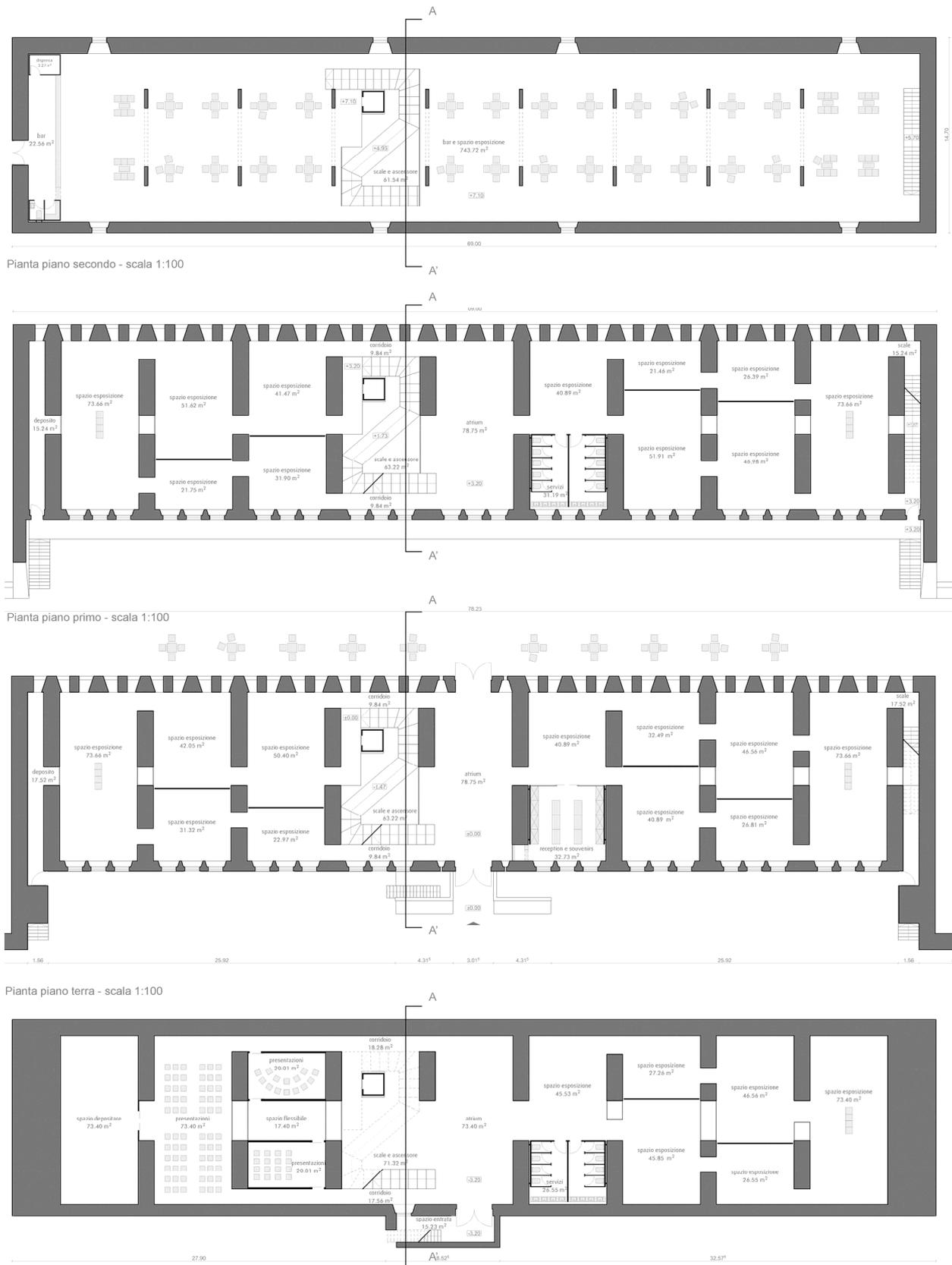


Fig. 6 The regeneration of the Napoleonic barrack (students: Andreottola, M., Bonadimani, A., Masutti, A., Roman, O., and Tudor, D.).



Fig. 7 The regeneration of the Napoleonic barrack (students: Andreottola, M., Bonadimani, A., Masutti, A., Roman, O., and Tudor, D.).

However, the future of these military structures appears ever more problematic. Hitherto only piecemeal type action been undertaken, but which has resulted in the cancellation of proposed zone-based restoration. The difficulties are certainly very many: ranging from town planning, to architectural, cultural and economic questions.

However, an important opportunity for a re-evaluation of Palmanova's military heritage has been presented in the form of the municipal administration's proposal to have the city included among Unesco's world heritage sites. A decision on this application should be forthcoming in July of this year. Together with the Italian cities of Bergamo and Peschiera del Garda, the Croatian cities of Zara and Šibenik, and Kotor in Montenegro, Palmanova is already part of the transnational project entitled "Venetian defence works between the fifteenth and seventeenth centuries".

In cooperation with the Italian Public Property Agency, the municipality has initiated a "comprehensive program of territorial value-enhancement" (PUVaT) (pursuant to Article 15 of Law No. 241/1990 and Article 3 ter of Decree Law 25 September 2001, No. 351, converted with amendments, into Law 23 November 2001, No. 410, and recently modified and supplemented by law of 7 August 2012, No. 135 that converted Decree Law 6 July 2012, No. 95 into statute law). This programme is an important measure, which has been drawn up to regenerate and reutilize buildings by introducing new

economic and social functions in line with the harmonized development of the territory and the rehabilitation of urban fabric.

By being an instrument premised upon the principle of institutional cooperation, and thus of co-planning, it can reach "agreements and understandings" to resolve all the interests involved and achieve a positive final outcome.

In order to achieve conservation, alongside the acquisition of knowledge on architectural, construction matters and the current level of conservation of buildings, a detailed and careful value-enhancement study must, first and foremost, be carried out.

In this manner, spin-offs from rehabilitation work can be specified in social (the public enjoyment of the asset, the improvement in the services offered, the attraction for tourists and citizens, the impact of the measure on the territory at large, etc.) and functional terms, meaning the reversibility and compatibility of the measures envisaged for restoring the building and thus of the entire property cluster, the management measures and budget for the functioning of assets identified for re-utilization. A prior definition of such analyses and studies must indicate simple sources of financing, including private subjects.

The regeneration, conservation and value-enhancement project for individual military structures as also for the entire fortress of Palmanova cannot be exclusively paid for out of the public purse. Proposals for synergies between the public and private

subject to render the investments more sustainable for both parties must be formulated.

One article has, in point of fact, emphasized that in order to achieve the regeneration of military structures [9]: “the central role played by the new function must be fully in line with classical economics and conceptions of value, and where a decisive definition would be one that identifies the private or public nature of the assets by the economic subjects who will use them (rather than in strictly legalistic terms), and whether or not the proposed activity will have an exclusive or a competitive character.

It is essential that the strategic objectives guiding the composition of the scenarios and functional mixes that relate them to potential beneficiaries—who will provide roles, opportunities and needs—should be clearly spelled out: namely, the target subjects, the economic operators and the community groups, all of whom will be drawing different conclusions from the different scenarios in terms of cost/benefits and possible impact. In order to identify functional scenarios for an overall vision of the project and ones that take account of economic and financial aspects, as well as social and multi-criterial questions (with a functional, management, town planning, building environmental, etc. nature), the application of strategic value enhancement methodologies, (i.e., techniques and support for decision-making), can prove to be very useful. Value-enhancement techniques can be deployed in the initial phases of the preliminary projects (ex ante) to guide the contents of strategic pre-feasibility choices, during the preparation of the project in order to monitor its progress and, finally, at the conclusion of the project (ex post) to determine that the expected results correspond to what was actually achieved and to monitor the functioning of the activities put in place”.

Therefore, it must be remembered that architectural design must not be limited to the individual building but must also scale itself up to the city level, and hence be based on the knowledge of the extant built

environment. Furthermore, the project must necessarily be part of an overall vision of the military complex.

No one fixed general rule for re-use, or a fixed reconversion standard, can be defined for regeneration designs. Instead, every rehabilitation design must be examined, imagined and appraised in relation to its setting, and to the specific qualities that it should reveal or interpret, above all by linking formal interior features to the external environment, such as consolidated typical and still meaningful traits, and the deployment of soft spaces (quadrangles, squares, yards, courtyards, terreplains, roads, routes, gardens and allotments) that still symbolize a city’s collective reminiscences as well as the spaces to be reconquered and recreated as a systemic part of the set of public spaces.

Repurposing military structures by the introduction of new and different designations of use, can, therefore, also alter the layout of the land, improving its functionality and anthropic/environmental compatibility, and this can lead to the redesign of cities through their requalification, thereby enhancing the value of the environment by improving the quality of the built landscape.

References

- [1] Gatti, M. P., and Cacciaguerra, G. 2004. “Military Buildings: From Being Abandoned to Reuse.” In *Defence Sites II. Heritage and Future*, edited by Brebbia, C. A., and Clark, C. Southampton: Witpress, 17-28. DOI: 10.2495/DSHF140021.
- [2] Gatti, M. P. 2014. “Trento: La Città e le Caserme.” In *Le Caserme e la Città. I beni Immobili Della Difesa tra Abbandoni, Dismissioni e Riusi*, edited by Storelli, F., and Turri, F. Roma: Palombi Editori, 187-267. ISBN: 9788860604491. (in Italian)
- [3] Damiani, P. 1982. *Palmanova. La Storia*. Vol. 1. Udine: Ed. Istituto per l’enciclopedia del Friuli-Venezia Giulia. (in Italian)
- [4] Damiani, P. 1982. *Palmanova. Da Fortezza Veneta a Fortezza Napoleonica*. Vol. 2. Udine: Ed. Istituto per l’enciclopedia del Friuli-Venezia Giulia. (in Italian)
- [5] Damiani, P. 1982. *Palmanova. Borghi e Monumenti—Grafici*. Vol. 3. Udine: Ed. Istituto per

The Palmanova Cantonments: Conservation, Value-Enhancement and Transformation for an Integrated and Overall Regeneration

l'enciclopedia del Friuli-Venezia Giulia. (in Italian)

- [6] Di Sopra, L. 2014. *Palmanova Città Fortezza—1593-1993*. Udine: Aviani Editore. ISBN: 9788887721839. (in Italian)
- [7] Ferrante, A. 1982. *La Fortezza di Palma: Edifici di Pubblica Ragione: Quartieri Magazzini Polveriere Palazzi case Chiese Terreni Ortivi*. Palmanova: s. ed. (in Italian)
- [8] Pavan, G. 1993. *Palmanova fortezza d'Europa 1593-1993*. Venezia: Marsilio. ISBN: 9788831758260. (in Italian)
- [9] Coscia, C., and Mangialardo, A. 2015. "La Cittadella di Alessandria: Valori e Strategie in Gioco nel Processo di Sdemanializzazione." *Territorio Italia* 1 (1): 67-95. DOI: 10.14609/Ti_1_15_5i. (in Italian)



Journal of Civil Engineering and Architecture

Volume 11, Number 6, June 2017

David Publishing Company

616 Corporate Way, Suite 2-4876, Valley Cottage, NY 10989, USA

Tel: 1-323-984-7526, 323-410-1082; Fax: 1-323-984-7374, 323-908-0457

<http://www.davidpublisher.com>, www.davidpublisher.org

civil@davidpublishing.com, civil@davidpublishing.org, civil_davidpublishing@yahoo.com

ISSN 1934-7359



9 771934 735177