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Three sustainable residential neighborhoods in South Italy

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Abstract

In this study, we examine three social housing case studies in the Campania region. The projects have been made with the aspiration to be sustainable residential neighborhoods. The Region, indeed, proposed a pilot program to test an innovative model of the design and construction of social housing. The topic of this program is the spreading of urban quality and construction, the culture energy conservation, the reduction of the construction impact activities on the environment and the offering to lower classes proper housing. This program was created to implement new guidelines referring to ITACA protocol. The cases involve three medium-small municipalities: one in the province of Avellino-Mirabella Eclano, one in the province of Salerno - Castelnuovo Cilento and the last one in the province of Naples - Nola. The first case was concluded, the second one is almost completed and the last one is still in progress. These are three different cases by geographical location and contextual conditions. Mirabella Eclano has a land area of 34 sq km and a population of just 8000 inh., with a population density of 230 inh. per sq km; Castelnuovo Cilento, however, has an area of only 18 sq km and a population of about 2,500 inh. Nola, finally, is a city of the province of Naples, with a land area of 39 sq km and about 33,000 inh., located in the eastern part of the plain to the north of Vesuvio. In all three cases, however, despite the obvious differences, the projects presented have tried to entrust the leadership to public housing in research and dissemination of new sustainable urban models. The paper will describe in detail all the sustainable urban and building elements.

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Keywords: sustainable neighborhood; ITACA; south Italy; pilot project.

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1. The ITACA protocol

The Institute for Innovation and Transparency of Procurement and Environmental Compatibility (ITACA) together with the iiSBE Italia Academy[2] (International Initiative for a Sustainable Built Environment) and the Institute for Construction Technologies of the National Research Council (ITC CNR) drew up the ITACA Protocol, approved by the Conference of Presidents of the Italian Regions in January 2004 and subsequently updated as a result of the legislative evolution of the sector[3].

The Italy ITACA Protocol is an assessment system of the environmental sustainability level of buildings which provides both a complete version and a synthetic version aimed at making the implementation simpler (Novi, 2007). The protocol is based on the SBMethod methodology (defined in 1996 as R&D process) which uses as an operational tool the SBtools[4], (Reeder, 2010), with the aim of establishing an international multi-criteria standard to assess the energetic and environmental quality of buildings, categorized in relation to the characterization of the different geographical areas. The SBMethod involves the construction of a hierarchical framework inherent to evaluation areas, categories and criteria/requirements, for which a scoring system is used where points are added according to a weighed modality in order to assess the environmental performances of buildings with different uses[5] and geographic locations, comparing them with benchmarks. 13 of the 20 Regions and one of the two Italian Autonomous Provinces have contributed to the creation of the document; several Regions (Piedmont, Liguria, Marche, Tuscany, Lazio, Puglia) have adopted the ITACA Protocol while other Regions have produced derivations of it (Umbria-VSA, Friuli -VEA- e Veneto -Biover).

1.1 ITACA 2004-2015

The ITACA protocol in its original version of 2004 is a document of over a hundred pages, organized in tables and cards (Cumo, Di Matteo, & Burlandi, 2012). There are 7 Assessment Areas, 27 Requirements Categories, 65 Requirements and 59 Under Requirements, all of them descended from the master list of the international SBTool.

The Requirements describe schematically the construction process in its entirety: from tracking up to maintenance procedures. For every requirement, with any attached sub-requirements, a card is associated, accompanied by related national legislative references and European directives and recommendations. In the first part of the board are made explicit: Need, Performance Indicator, Unit of measure (when possible), Method and verification tools, Reference Strategies. In the second part of the card it is reported the scale of Performance (quantitative or qualitative) that varies from -2 to +5; the weighed scores of Requirements contribute to the formation of the Categories score that, in turn, form the score of the evaluation Areas. The overall rating indicates the performance of environmental sustainable energy of the construction. The paper concludes with the tables relating to the characteristics of different building materials and related necessary calculations.

In the latest version of 2015 for residential buildings[6] (ex-novo or to be renovated), including the area of relevance, the protocol has been divided into two sections.

Section 0 (17pp.), after an introduction on the course of the ITACA Protocol, shows the general framework and methodological principles and procedures underlying the system of multi-criteria analysis for the purposes of

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[2] The iiSBE (International Initiative for a Sustainable Built Environment) is a non profit international organization with legal headquarters in Toronto in Canada and operational headquarters in Paris, at the Centre Scientifique et Technique du Bâtiment; it was founded in 2000 to build a composite network of organizations, institutions, researchers, freelancers, etc. that, from over twenty different countries, aims to define and disseminate standards, methodologies and tools for sustainable construction, coordinating the international search "Green Building Challenge" (Yang, Brandon, & Sidwell, 2005). The iiSBE Italy was established in 2005.

[3] The latest update for residential buildings dates back to January 30, 2015.

[4] The SBTool is an operational international tool, developed within the Green Building Challenge. The first Italian version of SBTool was established in 2002 and, essentially, is the matrix of the ITACA Protocol.

[5] The covered types of use are: home, office, business, school, industry, each of which will be applied for both new buildings and for renovations.

[6] If the building has more uses, we will operate by combining the procedures of individual uses.

classification by a score of performance, applicable only to executive projects[7]. Section 1 (150pp.), instead, specifies criteria for the evaluation of environmental sustainability and scoring performance calculation; the evaluation criteria for scoring performance calculation have been organized into "cards criterion" and grouped by reference category.

In this new version, the multi-criteria analysis is organized into three hierarchical levels (areas, categories and criteria). The Evaluation Areas (macro themes with details of the main objectives and strategies) have been restructured into five (site Quality; resources Consumption; Environmental burdens; indoor environmental Quality; Quality of Service) and include a total of 24 categories (specific thematic belonging to the area) and 37 Criteria (evaluation items for the calculation of performance through the use of quantitative and qualitative indicators).

The scale of performance in the 2015 version varies from -1 to +5 and the calculation of the score comprises a step of characterization (building performances for each criterion are quantified through specific indicators); a phase of normalization of the indicators (with three possible methods: HIB -High is Better; LIB -Lower is Better; qualitative criteria) and a phase of aggregation of criteria to combine the different normalized scores and define the final score of the building and the area of relevance.

Even the operation Card was restructured in relation to the different method of weighing; indeed the entries card must now refer to: Need (quality target expected), Criterion Weight (in the Category and the Complete System), Performance Indicator (with its unit) with a scale of four steps (-1 Negative, 0 Sufficient, +3 Good, +5 Excellent) [8].

For buildings designated to be offices, schools, industrial and commercial spaces (always providing the ex-novo and renovation and also including the area of relevance) the ITACA protocol was drafted in 2011[9], with updates in 2012. The principles and the procedure are basically the same as for residential destination but the number of guidelines is different for calculating environmental energy efficiency: 36 criteria for office buildings; 41 for school buildings; 36 for factories and 33 for commercial buildings.

1.2 ITACA Campania

In line with the overall objectives, the Campania Region has also turned its attention to saving natural resources, reducing environmental burdens (especially greenhouse gases), raising the quality of life of the inhabitants and to the promotion of technological innovation within the construction system. In Campania[10] with DGR 145/2011 the "Guidelines for the evaluation of environmental energy sustainability of buildings in implementation of LR n. 1/2011[11] for the amendment of L.R. n. 19/2009. ITACA Protocol - Campania Concise " have been approved.

The ITACA Protocol Campania Synthetic, adapted to the climatic conditions of the Campania Region, structured in five areas of evaluation of the 2014 version, uses ten categories and fifteen criteria:

1. Quality of the site
   1.1 Conditions of the site
      1.1.2 Level of urbanization of the site
2. Consumption of resources
   2.1 Primary non-renewable energy expected during the life cycle
      2.1.2 Thermal transmittance of the building
      2.1.4 Primary energy for heating
      2.1.5 Control of solar radiation
      2.1.6 Thermal inertia
   2.2 Energy from renewable sources

[7] In Italy, the executive project is governed by Sect. IV of Presidential Decree October 5, 2010, n. 207; the other phases of the plan are the preliminary draft (sect. II) and the final project (sect. III).

[8] To allow a uniformity of procedures was also produced a special software available (through accreditation) on the corporate website (http://www.proitaca.org/).

[9] Even for residential, on the same date, a protocol update had been drawn up, later replaced by that of 2015.

[10] In accordance with Directive 2002/91 / EC, implemented in Italy with Legislative Decree 192/2005 (amended by Decree 311/2006) and Decree n. 59/2009.

[11] This law, commonly called "Housing Plan" (*Piano Casa*), provides the opportunity to expand the space requirements and the surfaces of existing buildings, to demolish and reconstruct, notwithstanding existing planning instruments and interventions designed to save energy, natural resources and environmental burdens.

2.2.1 Thermal energy for ACS
2.2.2 Electricity
2.3 Eco-friendly materials
2.3.1 Materials from renewable sources
2.3.2 Recycled / recovered materials
2.4 Drinking Water
2.4.2 Drinking water for domestic use
3. Environmental burdens
3.1 Emissions of CO2 equivalent
3.1.2 Emissions provided in the operational phase
4. Indoor Environmental Quality
4.2 Thermo hygrometric wellbeing
4.2.1 Air temperature
4.3 Visual wellbeing
4.3.1 Natural lighting
4.5 Electromagnetic pollution
4.5.1 Magnetic fields at industrial frequency (50Hertz)
5. Quality of service
5.2 Maintenance of performances in operational stage
5.2.1 Availability of the technical documentation of the buildings.

The criteria are weighted -1 to +5 (in comparison to the average practice of construction used in the region): -1 = performance inferior to the standard and the current practice; 0 = minimum acceptable performance defined by current standards, or if absent, the level of current practice; +1 = slight improvement in performance compared to existing regulations and the current practice; +2 = significant improvement in performance compared to existing regulations and common practice; +3 = remarkable improvement in performance compared to the current standards and the current practice, is to be considered as the best practice; +4 = significant increase in performance of the current best practice; +5 = considerably advanced performance compared to the current best practice, of experimental character.

As with the national protocol, even for the use of the synthetic regional protocol a software was developed for the energetic and environmental assessment of the building, called Proitaca and accessible via the website http: //www.proitaca.com/Campania/.

2. Pilot projects

In most of the countries of the world the creation of districts 'declared' sustainable is conspicuous, (Petrella, & de BIASE, 2013), in Italy the experiences are limited and sometimes sectorial. In 2006, “Area 16 Government of the Territory, EPA Sector” of the Region of Campania launched a pilot program of the region that, with reference to the ITACA protocol of 2005, has set itself the aim of creating public and/or social building characterized by urban and architectural quality, energy savings and minimizing environmental impact. In other words, the experimental program applies the principles of sustainability in building rehabilitation, urban regeneration and the construction ex-novo of residential public housing. This experimental program is also meant to reassign to IACP (Istituto Autonomo Case Popolari)[12] the leadership role that had marked their activities in the early years of the twentieth century. Especially after the war, they had contributed (with INA-Casa[13], first, and GESCAL[14] later) to create settlements of public housing (in the past called ‘affordable and popular housing’) whose models became reference

[12] The IACP (corporate body for public house building in Italy) started their own business in the early twentieth century, when by Law 251/1903 provides for the possibility to set up public bodies for the construction of houses for the less affluent (previously the public housing were built on the initiative of individual municipalities). The first Institute was in Rome, while the one in Naples was established in 1907 and those of the other provinces of Campania were founded between the 1920’s and 30’s.

[13] INA-Casa was the managing body of the "Measures for increasing employment working, facilitating the construction of houses for workers" (Law 43/1949) financed by the funds of the ‘Marshall Plan’ for Europe's economic recovery after World War II.

[14] GESCAL (Management Houses for Workers) was established in 1963, in line with INA-Casa (operational since 1949 to 1962), for the financing of public housing, whose rules were changed over time.

for the private initiative (Petrella, 1989).
In 2008 (DGR 231), Campania Region approved the "Guidelines for programming in the field of Housing ...". This guidance explains the framework of public housing in the Campania Region (68,392 inh. in accommodation owned by the IACP), setting out those principles that should guide public and private intervention in the residential-building area, it says that the recovery and redevelopment of existing assets will be privileged together with the eco-sustainable development[15]. Thanks to the articulated illustration of the qualitative factors that should guide the actions of integrated social housing, in listing the requirements that the interventions must have, the obligation of compliance with the Protocol ITACA-Italia is underlined.[16]
It should be specified that the testing of the pilot projects had been started when the Region of Campania was ruled by a council of the centre-left, in which the city planning commissioner (Member of the "Federation of the Greens") was very sensitive to the environmental policies of sustainability. In Italy, unfortunately, it is common practice that when the government “changes colour” those initiatives taken previously are not pursued with the same logic with which they were set out.
This, in part, explains the confusion arose between those that initially meant to be social housing interventions[17] (regulated by Law 80/2014) and, instead, are ERP interventions to all effects (ruled by a set state laws and regional regulations)[18]. This also explains why certain actions were not completed in the common areas reserved for services or for the arrangement of open areas and other ones have not even been launched.
Originally, five pilot projects were planned,[19] one for each of the provinces of Campania, but the interventions carried out are only three. The intervention of Mirabella Eclano (Avellino) is the only one really brought to an end; in Castelnuovo Cilento (Salerno) residential buildings were completed but the common areas only partially, while the intervention of Nola (Naples) completed the acquisition of the areas (however, disputes are still open) and has prepared the ‘definitive project’ of the intervention.
Before moving on to illustrate case studies, there is a need to clarify that, while not formally activating the ITACA procedure, the respect for national and regional laws still leads to a result of sustainability falling within parameters established by ITACA. In any case, in an annex to the memoranda of understanding, they fully listed the scope, design features, architectural quality and environmental, social and economic requirements to which the planned works must adapt. Finally, it should be emphasized that the administrative process had also set up a regional commission of assessment (which was attended also by academics) which had been given the role of support and evaluating of the achievement of objectives.
Finally, I would like to quote of the Enciclica, Laudato si’, of Pope Francis: ‘… 180. There are no uniform recipes, because each country or region has its own problems and limitations. It is also true that political realism may call for transitional measures and technologies, so long as these are accompanied by the gradual framing and acceptance of binding commitments. At the same time, on the national and local levels, much still needs to be done, such as

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[15] Among the objectives of increased sustainability, as enshrined in the Campania Regional Planning, it is also provided a more balanced distribution of the population, now concentrated in the low-lying coastal areas at the expense of internal, mostly mountainous and economically depressed.

[16] It should be remembered that in 2008 the Region of Campania had not yet developed the specific synthetic protocol that would be drawn up only three years later.

[17] The social housing previously defined by DM 22 April 2008 (housing unit used for residential use in permanent lease that acts in the public interest, the safeguarding of social cohesion, to reduce the housing problems of disadvantaged individuals and families who aren't able to access the location of housing in the free market) it is currently defined by Law 80/2014 (social housing is considered the housing unit used for residential, made or recovered by public and private ... ... which may be rented to reduce the housing problems of disadvantaged individuals and families who aren't able to access the rental housing market conditions, as well as women who are guests of refuges and safe houses ... ... considering also the social housing unit assigned to the lease, with constraint of use, not less than fifteen years, to university agreement building or to lease with deal of future sale or assignment …).

[18] ERP (Edilizia Residenziale Pubblica) is the equivalent of Council housing. At first Building Act in 1903, there are numerous laws which, over time, change the way of funding, the types of housing (over time: economic, popular, public) and interventions (construction, maintenance, recovery, etc.) and the categories of people who may access the assignment..

[19] Other interventions were provided in Montesarchio (Benevento) and in Santa Maria Capuavetere (Caserta) and, during 2008, the Municipality of Montella (Avellino) asked to be included among the pilot projects.

promoting ways of conserving energy. These would include favouring forms of industrial production with maximum energy efficiency and diminished use of raw materials, removing from the market products which are less energy efficient or more polluting, improving transport systems, and encouraging the construction and repair of buildings aimed at reducing their energy consumption and levels of pollution. Political activity on the local level could also be directed to modifying consumption, developing an economy of waste disposal and recycling, protecting certain species and planning a diversified agriculture and the rotation of crops. Agriculture in poorer regions can be improved through investment in rural infrastructures, a better organization of local or national markets, systems of irrigation, and the development of techniques of sustainable agriculture. New forms of cooperation and community organization can be encouraged in order to defend the interests of small producers and preserve local ecosystems from destruction. Truly, much can be done!' (Pope Francis, 2015).

2.1 Mirabella Eclano (Avellino)

The DGR 1959 of November 30, 2006 approved the Memorandum of Understanding (signed in April of that year with the municipality of Mirabella Eclano and the Avellino IACP) and the necessary funding was provided for the project actions feasibility. In particular, 6 million euros were allocated to: replacement of 4 flats; construction of 9 flats of ERP and 5 foster homes for disabled users; restructuring and/or functional adaptation of 55 ERP accommodations owned by IACP and involvement of the owners of the remaining 61; construction of a district heating plant; sustainable urban regeneration; removal of architectural barriers; activation of an experimental program for the collection of waste; raising awareness of the inhabitants to sustainability. 36,000 Euros were allocated to university departments to support the Regional Commission of Rating, for which an additional 10,000

Euros were provided.

Fig.1 (a) General Plan of Mirabella Eclano pilot project; (b) on the aerial view (taken from Google Earth) the light blue dashed line indicates the area committed by the original PEEP, the numbers identify the lots into which the intervention was organized.

The intervention was designed by the working group of the IACP Avellino (completed in 2007): it is only partly inspired by the Protocol ITACA but it did not apply the procedure for the bureaucratic and economic reasons already explained in the introduction.

Mirabella Eclano (370 m.a.s.l. and about 8,000 inh.) is a small town in Irpinia of the middle valley of the Calore River. The town suffered the effects of emigration that, in the last century, saw people emigrating to the Italian 'industrial triangle', to northern Europe and the Americas. In addition to the economic depression, a further migratory influx was caused by the earthquakes that hit the area in 1962 and in 1980.

The project (which in the initial phase involved the residents) has completed and improved an area of public housing. It, with the successive assistance (in the early eighties) of the different bodies in charge and of the various laws, a residential neighbourhood was created and located in the north-east of the town. Over three hundred people are now living there. The overall project has been organized into five lots, and, as we shall see, was partially overturned by the management of the new municipal administration, which modified some of the expected uses.

The first lot was carried out in an open area of the south-west. The popular district had previously housed the prefabricated buildings installed for the earthquake emergency in November 1980. It was also used as a car park and weekly market. The intervention included the realization of a slightly angled townhouse, with structure in reinforced

concrete: two double-storey houses of 77sq m and four single storey apartments of 47sq m were made in the building. Part of the construction had been planned for a community and recreation center for young people, because the small town does not offer much in the way of leisure. The new municipality has partially changed the original use of the rooms, and now they are used as: chapel and Catholic activities, Carabinieri club association and as home to a charity for public assistance. Above its roof a small pedestrian square was placed; it is equipped with lighting but no shelter from sun and rain and, at present, the only furniture consists of some benches along the sides.

Fig.2 (a,b) Mirabella Eclano, the collective building, with the small square on the roof; (c,d) some of the existing buildings on which action was taken with the energy savings and the thermal ventilated cladding; (e,f) the market square with the arcade; the pedestrian walkways; (g,h) views of the former social-housing for elderly people.

The second lot, in the north-west of the district, has developed a new house, separated by walkways covered by the existing ERP terraced house (to the east) and by another private house to the north. The original purpose of the project was a kind of co-assisted housing, consisting of four apartments of 55sq m (two downstairs and two upstairs) to accommodate people over 65 (singles or couples) with a share kitchen, rooms for socialization and a surgery also accessible to visitors. In the building there are some cellars (for storage of furniture and anything else coming from former homes) and a room for the staff who would have to provide assistance; floor heating powered by a condensing boiler for all rooms has been planned and on the pitched roof facing south two sets of photovoltaic panels have been set. Exposed surfaces are divided into ramps and footpaths partially permeable and small public gardens; furthermore there is a private garden for guests on the ground floor, while the first-floor apartments have small balconies.

The subsequent management (also because of bureaucratic problems due to the different regulatory system governing the ERP and social housing) has changed radically what had been provided by the project and the assisted living for older people has been transformed into housing units for traditional families. The restructuring required for the new use has been only partially realized, both for economic reasons and for the limited flexibility of the structure, made with cement-wood thermal blocks together with incorporated graphite, chosen for the ecological characteristics of the material and for its good energy performance of acoustic insulation and seismic response.

At present, three of the four rooms have been partially modified, but there is still need to work on the large rooms originally intended to support health services, while the large corridors (that result as totally oversized for current uses) will remain unchanged.

Lot 3 covered the building renovation and energy retrofit of 24 apartments (20 owned by the IACP and redeemed by 4 private) distributed between two townhouses, with arcades and built on three storeys with funding under Law 166/1975 (Urgent assistance for the construction industry). The intervention of adjustment was massive: the fixtures, the electrical and heating system have been replaced and facades were insulated. In particular, the plant for domestic water was produced by condensing boilers and with a solar thermal kit installed on the pitched roofs exposed to the south and including two photovoltaic panels for each of the fourteen pressurized tanks with natural circulation. On the facades an outer skin in buchtal has been realized (for the facades to the south and south-west) and a coat tarred glass wool (of 11cm to the north and northeast and 8cm to the south and south-west). A further intervention for indoor comfort provided by the mechanical ventilation (not well accepted by tenants), interior shutters with insulated rolled-shutter box elements blackout. Even for the porches and the roofing insulation in coat glass wool have been provided. The set of measures meant that the energy performance of buildings has passed from class ‘G’ (the worst) to class ‘B’.[20]

Lot 4 also involved a lot of work on heat loss of a building consisting of four apartments of 95sq m built based on the Law 422/1968 (Rules on subsidized housing); in this case coats for the insulation of attics were made together with a new plant for the production of hot water with a system similar to the previous one.

Lot 5, because of the fragmentation of property, involved only 11 apartments (out of 36) of buildings ex-GESCAL. The type of building is inspired by the typical English terraced house with small areas uncovered on both sides and with minor setbacks to break the monotony of the very long building. The terraced houses, built in the early sixties, are in modules of four apartments, each of about 90sq m. The emergency maintenance has been limited to the amount of condensing boilers, to the replacement of part of the fixtures and to the financial involvement of private property for the unified re-painting of the building. It should also be pointed out that the improvements to public housing stimulated 50% of private owners who have taken steps to renovate their own homes.

[20]Pursuant to the EU Directive 2002/91, the national standard of reference is Legislative Decree no. 192/2005, amended and supplemented by a series of subsequent laws. Since December 2013, in Italy, for the deeds of sale and for the rent of the property it is necessary to produce the Energy Performance Certificate (EPA). Since July 2015, the classification provides ten classes (from ‘A4’ to ‘G’) while previously there were seven classes (‘A’ to ‘G’).

The last lot concerned the requalification of the neighbourhood realized with a series of specific interventions. In particular, in addition to realizing some stalls for street level parking and pavements, the road paving has been rearranged (in part, made with self-locking blocks), along with the creation of draining areas and the adjustment of the sections, in order to make perceptible the different role played by each axis. Furthermore, with purposes of general security, the public lighting has been solved using lamps with chip-LED with photosensitive sensors and cat's eyes for pedestrian walkways. The architectural barriers have been removed and where there are still some paths with steps there is always an alternative walkway. Always for safety, in terms of 'spontaneous control', a cutting section (only minimally realized) was also provided to increase the visibility both on public spaces and in terms of landscape (Jeffrey, 1971). The existing square has been expanded and redesigned (by removing a previous prefabrication) providing it with garden and an area with two side porches (possessing the necessary connections for the market) with benches, perimetral flowerbeds and equipped with a drinking water dispenser for removal. A small area of terraced garden (not yet available) with benches and lighting elements was made for social locations.

2.2 Castelnuovo Cilento (Salerno)

According to DGR n. 1957 of November 30, 2006, the Memorandum of Understanding between the Region of Campania, the IACP of Salerno and the municipality of Castelnuovo Cilento (AB 2600) was approved (Volla, & Schiavone, 2010). With it was possible to define the pilot project goals and to provide the necessary funding of 5 million euros[21] (plus 10,000 euros to the Regional Evaluation Commission and 36,000 euros for the contribution of the university departments) for the construction of approximately forty ERP accommodations (which then became 34) to serve a consortium formed by the municipalities of Casalvelino (5,000 inh.), Ceraso (2,500 inh.), Vallo della Lucania (8,700 inh.) and Castelnuovo Cilento, located on their border. To date, residential buildings have been completed and most of the uncovered surface has been arranged while the site is still open for the completion of the buildings for social services, for restaurant and the overlooking square.

Fig.3 (a) Castelnuovo : general plan of pilot project; (b) the aerial view taken from Google Earth.

The district, located in the National Park of Cilento, covers 1,760 hectares and consists of the small town, set on a ridge near the medieval castle (about 300 m.a.s.l.), scattered houses and some villages, Vallo Scalo, Pantana, Salicuneta and Velina, located in flat areas (between 10 and 30 m.a.s.l.) where the majority of inhabitants live.

The location of the new ERP intervention was determined to complete a PEEP[22] area (only 40% of the surface is urbanized), located in the hamlet "Tempone Chiarasso" of Velina suburb (12 m.a.s.l.). Velina village (860 inh.), where two factories (bricks and tobacco) and the agricultural consortium are located, is the communal area in which,

[21] The business plan provides for a total expenditure of about 8 million euros.
[22] The PEEP (Plan for Economic and Popular Construction) is a detailed plan, introduced by Law 167 in 1962.

since 1970, there has been the greatest construction activity both private and public. The PEEP area was already provided for PdF[23] (1976) confirmed by the PRG and the next variant of it and validated by the PUC[24] (adopted in 2014). It is located in the buffer zone of the station and the SR already SS267 (connecting to the Pantana hamlet), in an area adjacent but outside the National Park. Despite being motivated by what has been expressed here and the duty of positioning it in a comfortable way for all the municipalities of the consortium, the choice of location penalized the historic town center that continues to lose population.

Fig. 4 Castelnuovo Cilento: the images show the variety of types of residential buildings, the organization of outdoor spaces and a glimpse of the building intended for community services.

The pilot project prepared by IACP of Salerno (in compliance with the implementing rule of PRG) was inspired by the types of housing recurring within the context of the intervention, which include single-family homes and more recent buildings of 2/3 floors with commercial activities on the ground floor and usually set back from the

[23] Before it was established the requirement to have the PRG, some municipalities could opt for the simplest Building Program.
[24] The City Urban Planning is the current name of the general instrument that the Campania Region has introduced with the LRC 16/2004.

street line. Although the compliance with the ITACA Protocol and, more generally, with the paradigm of sustainability, participatory processes are not activated as it does not appear the evidence of economic sustainability.

The urban plan provided that the all buildings (with a total volume of approx 16,500 cu m) were arranged respecting the morphology of the area which is situated on a gentle slope from north to south; in relation to the climatic parameters of the location (cold winters, hot summers with mitigating sea breezes), the buildings are oriented to maximize the solar thermal axis and arranged with staggered alignments for making the best use of shading and ventilation. The internal paths for access to residential buildings are pedestrian (mostly protected by pergolas) and the overcoming of the steepness is solved by ramps with a maximum gradient of 7%, although the choice of flooring (in small irregular slabs of Centola stone)[25] it is not really ideal for those who are forced to use a wheelchair, those who want to move around by bicycle, etc. A parking area equipped with grill save lawn is located at the north-east of the area, while at the south of the settlement the square which include the complex for collective facilities and a bar has been placed.

Residential buildings (13 thousand cubic meters per 144 inh.) despite their homogeneity, have been designed in nine different types that vary in number of floors (from 1 to 3 floors), type of accommodation (simplex and duplex), number of flats (2 to 6) and size (from 2 to 5 rooms and from 50 to 101sq m of net usable surface). In addition to the continuity given by walkways linking the several bodies, resolved by wooden pergolas, the common aesthetic denominators are: the pale yellow color and the stone skirting of facades; wooden roofs hipped or hut, on which are allocated the solar thermal collectors like vacuum tubes (for buildings of collective use photovoltaic panels have been chosen instead); the fixtures, including shielding sliding louvers of the thermal buffer room.

The common functional denominators are: the facility drain-back for the production of domestic water, integrated with condensing boilers for the combined production of electric and thermal energy (the plants are centralized); the radiant floor heating; recovery and accumulation of rainwater (after filtering), covering an area of about 5,500sq m (roofing, residential parking area and walkways) intended for flushing the toilets and watering plants; the thermal buffer zone that is glazed environments that, bordering the living room, serve as verandas during the winter and as screened terraces in the summer. This passive technology, to direct solar winter gain, contributes to thermal comfort and energy savings for winter heating and summer cooling.

Additional measures taken with regard to the social dimension and the environmental sustainability are: the buildings are in bearing masonry with poris and the façade finished with plaster in 'coccio pesto'[26] (while the other two buildings are in reinforced concrete), the isolation of shells (with planking and waterproofing cloth), the albedo effect is controlled by the jogs volumes, with appropriate shielding and vegetation of the buildings with flat roofs.

The acoustic requirements have been obtained with the frame insulation and intermediate floors (panels of hemp fiber and aluminate sheets), with the soundproofing of columns and outlet boxes and technical rooms while a tree-lined band dampens noises and dust produced by rail traffic. The management and maintenance plan, among other measures, also provides for a user manual in order to ensure that users are actively contributing to the proper maintenance of their own house as well as the common parts and the district as a whole.

2.2 Nola (Napoli)

Even for the experimental ERP intervention to be implemented in Nola the Memorandum of Understanding between the Region, IACP and Municipalty was signed in April 2006 (DGR 1960) and the necessary funding for the activities planned by the feasibility study have been provided. 5 million euros[27] have been allocated by the Region for the construction of about 30 ERP accomodations,[28] 10 thousand euros have been allocated to the Regional Commission of rating and 36 thousand euros have been provided for the work of the University Departments (Colonna, 2010).

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[25] The flooring of the uncovered areas are different depending on the function: detritus of concrete, solid brick stabbed and 'sestini in cotto' (special bricks baked).

[26] Very small pieces of tiles and bricks minutely fragmented.

[27] About 8.6 million in the last update of the final draft.

[28] The construction of thirty public housing accomodations had already been foreseen in 2003.

Nola is a town of about 35,000 inh. (in constant slight growth) located to the immediate north of the metropolitan area of Naples, to the extreme north-east slopes of Vesuvius. The main economic activity is due to the linked activities of CIS (Centro Ingrosso e Sviluppo Campania, 1986), the intermodal and logistics centre of Campania (1998) and 'Vulcano Buono' (2007, designed by Renzo Piano), one of the liveliest shopping centers in the area.

As stated in the introduction, the site has not yet been started due to the length of time taken for the variant procedure of the current PRG (approved in 1995)[29] and the procedures for acquiring the public property of the area (amounting to a cost of about 1,100,000 euros). Currently, the area has been fully acquired (although some disputes are still open for the amount of compensation for public utility expropriation)[30], the final draft has been prepared[31] (in 2008, with three subsequent updates) and the executive project is ready to be launched. Just like for the other pilot projects, also for Nola, the preparation of the project was entrusted to the IACP of Naples and, in particular, the architecture aspect has been edited by architect Angelo Colonna, functionary of the technical structure of IACP.

The project for 29 housing units will be realized in the locality of Masseria Sarnella[32], in the northeast of the municipality, in an almost flat area of about 12,500 sq m. It is located in the south of the A16 motorway, contiguous with a previous district of public housing (GESCAL)[33] and not far from the sport field and the eighteenth-century barracks "Prince Amedeo" (now in decay), whose former parade ground is used as a market area. Again, in the Memorandum of Understanding the reference to the ITACA Protocol is expected but not the "formal" application of it. In fact, the necessary hydro-geomorphological and climate investigations on the traditional architecture of the area have been carried out, the project has been set on the principles of sustainability and therefore of the ITACA Protocol, starting from the protection of environmental pre-existence, continuing with the orientation of buildings, community facilities, etc. but neglecting the activation of participatory processes.

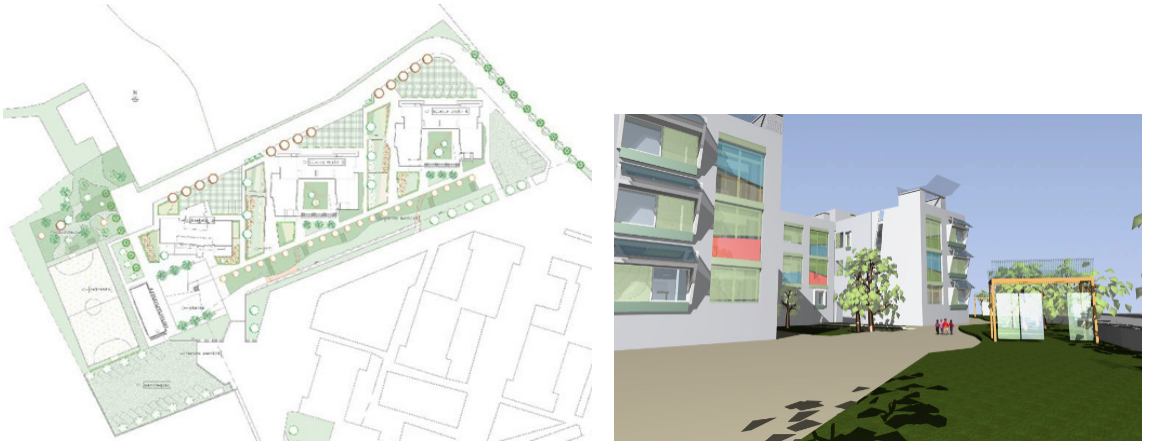


Fig. 5 (a) Nola: the plan of the pilot project; (b) The rendering image of the court, where are visible the architectural solutions for hygrothermal comfort and energy saving.

[29] In the area called 'Sarnella' , based on the urban plan, the surface was destined to the manufacture of equipment for the community (Decree 1444/1968) and, therefore, it was necessary to change the intended use in that of neighbourhood of public housing: the variant has been defined in September 2010.

[30] In Italy, the compensation of eminent domain is regulated by Presidential Decree 327/2001 and subsequent amendments providing for a compensation equal to the market value.

[31] The final project, prepared in 2008 has been updated three times, especially for the regulatory changes on the seismic, energy, health and safety aspect of the workplaces and the regional rate of prices.

[32] Indeed an intervention of 30 ERP accommodations in this area had already been provided by the A.C. in 2003 with a commitment of 6.544sqm surface to which, following the memorandum of understanding, were added additional 5,925sq m, for a total of 12.469sq m.

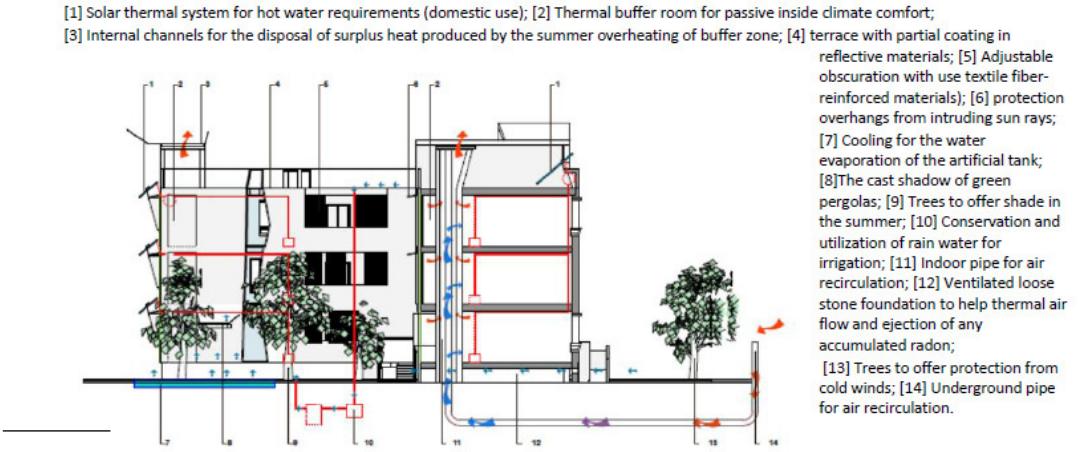
[33] The neighborhood was built in the mid-eighties, under the L.457 / 1978 (Standards for residential buildings); the management of Houses for Workers (GESCAL) was established in 1963, in line with INA-Casa (operative from 1949 to 1962), for financing accomodations of affordable and popular housing, for which the rules had been changed over time.

The area has a T-shape, with a southwest-northeast trend; the urban plan foresaw a residential lot (about 50% of the area), a small lot for a community center, sport equipment, equipped green areas, small areas for recycling, rest areas and the arrangement of roads. The residential lot, which occupies the entire stem of the T, on the two long sides is bordered by trees that work as sound barrier and on the south side a green viable belt has been provided, partly devoted to small vegetable gardens and partly dedicated to children's play. Residential buildings (for a total of 12.000 cubic metres), all consisting of three floors, are three: one block in line and two buildings in open court on the south side (the court is partially screened by pergolas with climbing vegetation that allow the meeting and relax). The apartments are 29 for 156 rooms. Six different sizes (from 46 to 101 sq m) have been provided, two apartments on the first floor (accessible via ramps) have been prepared for the disabled and, in order to vary the housing supply, in one of the court-buildings were prepared two duplex apartments; all units are equipped with basement storage rooms. The residential block ends on the short side with a tree-lined and equipped square on which appear the volume destined to be the community centre. Behind the latter, where the area is larger, a street level parking (lawn driveway with honeycomb geocells structure) for 20 cars, a football field for few players and a surface of equipped green (the permeability of the soil includes 50% of the land area) have been placed; for the road is expected a flooring in Levocell-Chromofibre VBA. Trees (maple, willow, Atlantic cedar and Arizona cypress, hazelnut, olive, citrus trees, etc.) to be implanted in different areas have been chosen to perform, in addition to the aesthetic function, to those of summer shading and solar radiation during the colder season , noise barriers, references to the native landscape, etc.

Pursuing energy efficiency, the units have been arranged in order to optimize to the maximum the incidence of the solar thermal axis, as well as the glass windows (insulating 4+16+4 with a transmittance of 1.3 W/m2K) have different surfaces in relation to exposure. With the attachment of insulation panels in wood mineralized fiber (from 6-8cm) on the external walls and floors of support and coverage, steps were taken to the isolation of the structure in reinforced concrete[34] and for the external envelope has been provided a masonry in brick blocks with insulating recesses (36.5cm thickness and transmittance U = 0,28 W/mqK).

In addition, a crawl space, in volcanic stones and equipped with ventilation corridors, provides for the insulation of buildings above the ground while a power ventilation system guarantees the thermal comfort of the living spaces. Part of glazed surfaces facing south include the creation of thermal buffer areas that regulate the indoor climate. The project energy classification for residential buildings is the 'A+' while the volumes for communal activities was planned the B class.

Fig. 6 Nola pilot project: solution to manage the microclimate



[34] In relation to the O.P.C.M. 20/03/2003 n. 3274. The town of Nola is filed under Seismic Zone 2 (zone with seismic hazard average, where can occur earthquakes strong enough.) while soil characteristics of the intervention area place it in the C category (Deposits of coarse-grained soils usually quite thickened or fine grained soils usually quite consistent with thicknesses greater than 30 m, characterized by a gradual improvement in mechanical properties with depth and by values of Vs30 comprised between 180 m / s and 360 m / s (15 <NSPT, 30 <50 in coarse-grained soils and 70 <cu, 30 <250 kPa in fine grain soils).

Pursuing energy saving, 85% of the required hot water is provided by solar storage collectors while a photovoltaic system works to produce electricity. The heating of housing units was expected under the floor, since the technical characteristics of such radiant systems (which provide the temperature of the circulating water of 30-35 °) enable a significant economic saving, slash the internal circulation of powders, reduce the release of pollutants into the atmosphere and, at the same time, contribute to the thermal insulation of intermediate floors. Against this solution there are the extra costs of construction and repair in case of damage.

To complete the work that the IACP of the province of Naples does for the pursuit of sustainable public housing, it must be remembered that at this time it is intervening with sixteen energy efficiency measures in existing ERP for the amount of about 16 million euros coming from FESR funds (European Fund of Regional Development); it has recently completed the construction of a sustainable building (36 apartments of A energy class) in a lot of completion in Quarto (Naples) and it is also planning the construction of co-Housing for singles, in a suburb of Naples.

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