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Strategies for an urban renewal in Rome: Massimina Co_Goal

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Abstract

The paper presents a research project about the regeneration of an informal neighbourhood in Rome. To address the complexity of the regeneration process, the project relies on a combined top down/bottom up strategy. The project envisions the implementation of a Public Call to promote a set of retrofitting actions for a defined number of private houses to be involved in a co-financed refurbishment program. Main goal of the Public Call is to foster the transition towards sustainable development, transforming the existing district into a low energy district and developing new community services implemented and managed by a local community company.

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Keywords: Urban regeneration; community company; co-governance; urban metabolism; participatory placemaking; social retrofitting

1. Introduction

1.1. Context: From the European Call to the INARCH Master in Sustainable Architecture

In 2015 the Department of Urban Transformation of Roma Capitale, ENEA (Italian National Agency for New Technologies, Energy and Sustainable Development), the Laboratory for the Governance of Commons at LUISS

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Guido Carli University, Seci Real Estate (a property developer) and INARCH (Italian National Institute of Architecture), formed a multidisciplinary team to participate in the European Call "Smart Cities and Communities".

They elaborated the CO_GOAL Project: a project aimed at the social and environmental regeneration of distressed neighbourhoods with low housing quality, in European cities. The proposal did not win European financial support, but INARCH decided to develop it further, using its methodological premises and the envisioned site in Rome, the Massimina neighbourhood, as design topic for the Master in Sustainable Architecture. Inarch Master in Sustainable Architecture is a post graduate certificate focused on strategies and tools to regenerate existing cities and architectures, turning them from being places of high environmental impacts, in “re-productive places” [1]: places able to sustain life, reducing their material flows, reusing and recycling resources, and reducing their energy needs so to meet these needs locally and through renewables sources [2], [3].

Our basic assumption is that if the challenges of sustainable development ask for the reduction of energy consumption, the enhancement of energy efficiency could be a social-collective business, able to fight spatial and social exclusion creating new (green) jobs and a new form of governance [4]. The key question is: how to trigger the regeneration processes, in distressed areas where the ownership structure is distributed in a one-flat-one-owner model, if the low carbon transition does not start from the grassroots?

1.2. The Transition Literature

In the vast academic literature about the challenges of climate change and the 'sustainability transition' [5], two main strands have not been linked yet and remain separate. On one side there is the research agenda on 'ecological modernization' [6] or technological innovation to improve resource efficiency, building performances, smart systems, from the top down [7], [8], [9]. On the other side, there is a growing research agenda to describe and sustain the value of community-led 'grassroots innovation' [10], [11], [12] as well as about new form of governance of the 'commons' [13], [14]. Bridging this divide, proposing an urban regeneration strategy able to combine the competitiveness factors of the top down models (where all the infrastructures, services and city transformations are designed and managed by the municipality and its utilities) with the citizen engagement of the bottom up models (able to mobilise the community potential), is the major contribution of the research proposal presented in this paper.

1.3. The Neighbourhood: Massimina suburb in Rome

The Massimina settlement arose spontaneously in the 60s, in the western outskirts of the Rome Ring Road (GRA). It is a typical example of a self-made settlement in the peripheral urban area between town and countryside, developed without building regulation with limited public spaces and services; absence of sidewalks and pedestrian paths; dead-end roads and absence of a coherent road system; lack of public transport; neglected green spaces. The existing buildings are mainly small buildings of low energy quality, which have undergone extensions and elevations over time. All buildings are equipped with independent boilers fired by natural gas for heating and supply of hot water, usually with low efficiency. The neighbourhood is characterised by its proximity to the landfill of Malagrotta, the biggest of Europe. The landfill, finally closed October 1, 2013, was the main site for long-term storage of municipal solid waste of the city of Rome and its province. The area is also bounded to the east, via di Casal Lombroso, by a disused quarry, in which will be carried out one of the Centrality (large mixed-use developments) provided by the 2008 city Master Plan.

The neighbourhood has a population of about 9,000 people with 14% of foreigners (against 9.5% of foreigners for Rome and 8.7% of foreigners for Italy), with a density of 5,800 inh/ km². Originally, living conditions were very difficult due to the lack of basic infrastructure. In 1985, Italy passed a law that allowed their owners to register their properties, whilst giving them the right to organise into autonomous consortia for the development of the needed infrastructure (sewer system, public lighting and roads) and the responsibility for the recovery and renewal plans for their own area. The resulting renewal plans, being based on principles of self-planning, are considered to be early examples of innovation that promotes citizens’ participation.

2. Methodology

2.1. A community-based business model

In past decades several European countries developed national policies to incentive energy efficiency measures, i.e. tax abatements for building retrofitting, but these incentives have revealed themselves good basis but not yet

sufficient to motivate citizens, aggregate individual demand and generate economic return by energy saving. As a matter of fact, procedures (especially in Italy) are too complex, banks don't give credits to low-income families, even with the national incentives the regeneration costs are still too high and payback is too slow. As a result, the poorest and lowest quality housing suburban areas have not been involved in regeneration processes.

To address these obstacles, this project relies on a conceptual model that combines top down/bottom up strategies, so that the Municipality (supported by scientific partners as Enea, Inarch and University) acts as a proposer and facilitator to mobilise citizen engagement and community resources. Using the Multi-fund National Operational Programme Metropolitan Cities (PON Metro) or similar public funds, the Municipality promote a Public Call for the regeneration of the neighbourhood. The Call for a Low Energy District promotes a set of retrofitting actions and optimal financial schemes to involve a defined number of private houses in a co-financed regeneration program. On the same time the Call invite unemployed or underemployed citizen to be actively involved in the regeneration process: a training programme is envisioned as a tool for *social retrofitting* (able to trigger economic growth in the district area) and as an opportunity to reduce the retrofitting costs. The citizens involved in the training activity are supported to establish a non-profit "community company" which becomes the main actor of the district refurbishment (design and implementation) as well as of the management of the local services and of the renewable energy sources.

The collaborative design of a portfolio of *standard actions* for the retrofitting of buildings (Abacus), related to specific building typologies, is a key point in order to set up a business model to refurbish large existing building stocks. Actions range from building envelope improvements, new heating/cooling and ventilation systems, and the implementation of renewables. Interventions are conceived according to the criteria of economic sustainability and of low disturbance, avoiding the necessity of people displacement. The cost of each action is significantly reduced both form the scale effect (aggregated demand) and from the implementation model based on the *social retrofitting program*.

2.2. The different actors and roles

According to this combined (top down/bottom up) strategy, the project envisions the emergence of three main actors and roles.

- The Municipality: it starts and facilitates the process, defines the refurbishment targets and promotes the creation of a local no-profit community company. In Italy the "*administrative barter*" (Law n. 164/2014) allows the Municipality to assign some services such as local mobility service and maintenance of public spaces to a cooperative based in the community in exchange of tax abatements. This process fosters a relationship based on the cooperation between the Municipality and the community. It promotes the availability and the guarantee of financial instruments agreed with credit institutions to finance the retrofitting.
- The citizen: he becomes actor of the transformation process, engaging his own economic resources in the retrofitting of his house and, if he wants to, participating in the community company.
- The community company: in a learning by doing process, supported by the Municipality and the scientific institutions partners of the program, it designs the overall masterplan and designs and implements the set of retrofitting actions. In a democratic and non-profit logic, it also manages the community services (mobility, smart services, maintenance of public spaces, programs to support retrofitting, training). It allows free access to citizens wishing to participate, establishes a structured relationship with the Municipality and city utilities, operates a social platform for the exchange of goods and services within the community, initiates processes of social training as well as expressive and cultural exchange, manages the co-governance of the district.

2.3. Analysis of the building stock as part of Massimina's urban metabolism

To simulate the project implementation process so to partially verify its feasibility, at least in terms of citizens' interest, energy savings, costs and payback time, Inarch Master worked on the field carrying out a detailed survey of the area and a questionnaire survey about the population's perception of the area. To reach a significant sample of respondents, in accordance with the demographic distribution of the area, interviews were conducted on-field (137) and on-line (40), with open-ended and closed-ended questions. The covered topics include the quality of life, the efficiency of public transportation, sense of belonging to a community, the security perception, the quality of the environment and the available general services, everyday life and potential interest in the neighbourhood

refurbishment. The results of the poll have played a crucial role in defining the project goals. At the end of the analysis and design process, the plan of action has been proposed to the dwellers, obtaining a positive response in 75% of cases.

Considering the housing renovation as the main target to reach the low carbon district goal and to gain the inhabitants engagement, most of the analysis and design focused on the building stock and the set of retrofitting actions. The specific approach to the study of the existing building stock has been that of mapping the neighbourhood dividing it in three main areas, corresponding to the three main north-south axis on which the neighbourhood have been developed (with a comb-like structure perpendicular to the Via Aurelia): via di Casal Lumbroso, via Vanni and via di Massimilla. On each area, as a first step we mapped the buildings typologies and uses. As a second step, we focused on the residential sector and, according to an expert choice based on rules-of-thumb to compensate the lack of comprehensive information, we selected the most representative building types (in terms of possible energy savings), investigating them through four main variable parameters: geometry (single-family house, semi-detached house, multi-family house, multi-storey house, apartment block), year of construction, constructive technology, and energy demand (EPgl). As a third step we selected 14 case-studies or "reference buildings" [15] able to represent the target building stock. The importance of these reference buildings is great in order to study the thermal, geometric and functional characteristics of the target group of housing, so to develop the portfolio of possible actions for the retrofitting of the whole group, estimating the entire stock consumption and the potential savings. Starting from the calculated energy demand of the reference buildings, and re-estimating the demand after the retrofit actions, the difference between ante and post scenarios gives us the savings.

The study of the building stock and its possible savings has been conducted with a wider focus on the urban scene and its flows of matter and energy. The Master approach to these flows is that of looking to the main source of social and environmental impact, using the ecological footprint and the carbon footprint as methodological and accounting tools [16]. As a matter of facts, if from the carbon footprint evaluation we know that mobility is the main source of impact, representing nearly the 50% of the carbon footprint of the area, from the ecological footprint evaluation we know that food and housing represent nearly the 70% of the source of ecological impact.

On this basis, we elaborated a new masterplan, based on a new mobility plan, but also on a new system of waste and water management. The re-design or retrofit of the public space is at the core of the masterplan: the shared space of the neighbourhood is reclaimed, giving space to side-walks (turning two-way streets in one-way streets) to allow soft and slow local mobility, giving space to new public functions in strategic places at the ground floor of private buildings (turning them in new "shop-house" or mixed-use building typology) and imagining new "productive" surfaces such as photovoltaic pergolas and landmarks.

3. Results: The Low Carbon Transition and Social Retrofitting

As proposed in the CO_GOAL project, we imagined a "basic intervention" applied to 440 apartments including: a complete smart home kit (smart valves, smart plugs, electricity lines monitoring, presence monitoring, appliances monitoring, water, gas and electricity smart meters), the installation of thermal solar panels, the replacement of the existing boilers with new high-efficient and smart boilers, integrated with solar panels for hot water production and pre-heating of water for heating, installation of LED lamps. A remote smart home platform will optimise heater set points (in relation to the presence profile, solar panel production, climate condition and the user preferences) sending feedbacks and diagnostic warnings to the citizen to avoid consumption errors and adopt correct behaviour.

For about 100 buildings (about 10% of the residential building stock of the neighbourhood, corresponding to the target stock exemplified by the "reference buildings") an additional "heavy retrofitting" intervention is considered. This intervention is to be realised according to the portfolio of actions developed through the specific studies of the reference buildings. The actions include the external envelop refurbishment as well as variation to the internal or external geometry: exterior insulation and finish system (EIFS), new windows, greenhouses, ventilated facade, buffer zone, stack effect ventilation, bioclimatic atrium, green roof. According to the Italian energy performance certificates (D.lgs n.192, 19/08/2005), the energy demand (EPgl) after the retrofit actions changes from a G class to A4 class (Nearly Energy Zero Buildings) with a global CO2 saving of more than the 85% for the target group (the most energy demanding stock).

The implementation model aims to maximise the involvement of local workers, through a field training process for all aspects of retrofitting: audit, executive design following the solution abacus, installation, administrative procedures, certification, monitoring. But even in this case, we imagine to link top-down business solutions, where specialised and well-established companies (suppliers and installers) are directly involved in the execution of the interventions, to bottom-up solutions, where a direct involvement of local professionals, specifically trained within the project, is carried out.

The financial scheme is based on the possibility to use the national incentives for retrofitting, heaters and solar panels (tax deduction of 65% of the investment during the following 10 years), as well as on the involvement of one or more bank as main partner of the program. The role of the banks is to guarantee bank loans to citizens for the initial investment, with a monthly rate equal to the monthly income coming from incentives and energy savings. In fact, as the project demonstrate, the large scale effect (aggregated demand) and the community-implemented factor, allow to reach a 10-year payback time for basic+heavy retrofitting (85% fossil energy reduction) and 4-year payback for basic retrofitting (40-50% fossil energy reduction). For an expected amount of 440 retrofitted apartments and 100 buildings turned in NEZB (a surface of approximately 40.000 square meters), a global citizen investment of 5.2 ML is foreseen, 2.3 ML reimbursed by national incentives, 1.2 is the direct contribution of the citizen, 1.7 is the contribution financed by PON METRO or European funds (32%).

Finally, since we evaluate that about 60% of the 5.2 ML total investment (3.1 ML) is spent for work, that corresponds to 126 work-years of temporary job, this will represent a very attractive Social Retrofitting Program for citizens. As a matter of fact, the project leads to a double increase of the community's GDP: increase in the economic value of housing and new (permanent and temporary) jobs generated in the community. On the base of the Italian Revenue Agency data, the houses market value for Massima-Castel di Guido area goes from 1750 to 2450 Euro/m². On the base of the numerical parameters provided by I-Com (Istituto per la Competività), published in the 2nd Annual Report on Energy Efficiency (RAEE) sponsored by ENEA, the house refurbishment yields a gain on the value of the properties up to 18%. Furthermore, the property value could rise even more considering the additional interventions on the district scale.

4. Discussion: the re-design of the Metabolic Flows

To complete this framework, the Massimina Co_Goal Masterplan foresees the following.

- *Renewable energy production* in public spaces and on large private roof. The big existing pergola in the public park, three local schools and some industrial and commercial buildings have been selected to provide an overall surface of 3,55 ha (35.500 m2), able to produce 900.000 kWh per year, equal to a 400.000-ton reduction of CO2.
- *Smart mobility* to move people from private car to public transport and green mobility (cycling, walking). The project will implement an EV smart bus fleet. EV shuttle buses equipped with a fast charge system are obtained through a revamping of used electric buses. Shuttle buses will run in the area connecting the main intermodal points of interest in the area and just outside the neighbourhood itself. Furthermore, the project envision: 7,3 Km of cycle lane, installation of 12 positions for bike sharing with 80 electric bikes, 5 electric cars for carpooling, 7 charging points for electric vehicles.
- *Waste Management*. To reduce the neighborhood waste and promote a circular economy the project envisions the creation of a Reuse and Recycle Center, to be realized inside one of the abounded shed of the area and managed by the community cooperative. To realize a sustainable management of the organic waste the project envisions local, family-based (for houses with private garden) and community based composting. Considering 70 kg per capita per year for nearly 9.000 inhabitants, the overall organic waste production of the neighborhood is about 600.000 kg per year, equal to more than 500.000 kg CO2/year. According to IPCC and EPA conversion factors, the production of local compost will reduce this amount of the 55%. An additional profit will come from a 30% reduction of the local waste tax (in Rome about 350 euro per family per year), as provided by AMA, the public utility for the waste management in Rome.
- *Water Management*. The implementation for rainwater collection systems, mainly in private gardens, can save up to 36% of drinking water for domestic use and reduce the flooding problems which are present in the district.
- *Citizen Engagement and Activation*. The project envisions the creation of about 30 permanent green workers in the field of circular economy: for the local cooperative management (2), the social platform management (2), the

smart home management (2), the public space maintenance (6), the re-use centre management (3), the smart mobility (15).

5. Conclusions: Social impact and replicability

This project demonstrates that a private-public collaboration on a large scale context as that of an urban neighbourhood can be the key to trigger a holistic regeneration process, where the cure of the urban environment become the occasion to stimulate a new circular economy, establishing a new relationship between citizens and the governance of their collective spaces. As a matter of fact, the role of the Municipality, deciding to invest in the area and promoting the public call, is essential to simplify and secure the authorisation procedure, to enable the credit, to organise the training program for local professionals and to generate the large scale effect which result in a reduction of the housing refurbishment cost of at least the 26%. On the other side, the citizens and private owners' engagement within the process, generate an important resources mobilisation, in terms of money, expectations and creativity. If the public incentives and the costs reduction allow to reach a 10-year payback time for basic+heavy retrofitting (85% fossil energy reduction), financeable through a bank loan with a monthly rate equal to the monthly income coming from incentives and energy savings, after 10 years, saving turns into a gain and the house value is risen. Moreover, citizens have the possibility to become part of the community company managing the renewable energy plants as well as the renewed local services. Decarbonization is in fact one of the main impacts but not the only one of the project. Transition towards a more sustainable, resilient and attracting neighbourhood, where main services like energy supply, waste management, gardens and public space cleaning, are managed by a local non-profit company in a new form of shared governance, is the major overall achievement.

Finally, the high number of low-quality housing and low-income neighbourhoods across Europe, open up a high replication potential for a higher social impact.

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