Article

Urban Regeneration through Integrated Strategies to Tackle Inequalities and Ecological Transition: An Experimental Approach

Liliana Leone [1], Gaetano Giunta [2], Marco Giunta [3], Domenico Marino [4,*] and Andrea Giunta [5]

1   CEVAS Centre of Social Research and Evaluation, Via Calpurnio Fiamma 9, 00175 Roma, Italy; leone@cevas.it
2   General Secretary Fondazione Messina, Forte Petrazza—Camaro Sup, 98151 Messina, Italy; g.giunta@fdcmessina.org
3   EcosMed Csrl Department of Action-Research, Forte Petrazza—Camaro Sup, 98151 Messina, Italy
4   Department of Heritage, Architecture and Urban Planning, University Mediterranean of Reggio Calabria, Salita Melissari, 89124 Reggio Calabria, Italy
5   Responsible Information Services, Fondazione Messina, Forte Petrazza—Camaro Sup, 98151 Messina, Italy
*   Correspondence: dmarino@unirc.it

Abstract: Cities have a growing role to play in ensuring environmental transition while addressing issues of social inclusion and social sustainability. The aim of this study was to evaluate a multi-dimensional policy of the city of Messina, in southern Italy, aimed at experimenting a sustainable model of urban regeneration to overcome its shantytowns after the 1908 earthquake. The impact indicators of a pilot program of urban generation were collected in terms of environmental, social, and economic criteria, while the real experiment focused on the mechanisms of choice related to the housing of extremely marginalized people. In the end, two slums were demolished, and 205 households had a home without additional land consumption. Attitudes toward social cohesion were measured through 29 interviews and the administration of a pre–post structured test. According to the individual payoffs over time, it is possible to correlate housing choice mechanisms with components not related to short-term economic rationality. The development of a positive attitude toward the future and trust in others are associated with the development of the riskiest option, which is also the one that can have the highest payoff. The program strategy reduced reliance on social welfare measures and enforced institutional capacity building and skills for sustainable urban development.

Keywords: social sustainability; housing; capabilities approach; redistribution; housing policy; social impact; choice

1. Introduction

A challenge for urban regeneration policies is to promote sustainable development that includes both social justice criteria, with cultural, economic, and social sustainability, and environmental sustainability criteria.

Cities are often at the forefront of providing solutions to climate change and reducing social inequalities [1,2]. Urban regeneration is increasingly recognized as a policy for the sustainable development of cities [3] since restoring degraded neighborhoods according to the criteria of ecological transition, by limiting urban sprawl and land consumption, is perfectly in line with the objectives of a sustainable city.

Among the main issues highlighted in the literature on urban regeneration are the design of multidisciplinary and integrated policies, with approaches able to take into account the interactions between different ecosystems, and the promotion of sustainable communities.

Literature Review and Justification

Urban regeneration practices reflect specific local circumstances, and therefore, "there is no single prescribed form of urban regeneration practice and no single theoretical explanation" [4] (p. 3). The literature emphasizes the interplay between the physical, economic, and social dimensions of urban problems and urban regeneration interventions, which aim to bring about lasting improvements in the economic, physical, social, and environmental conditions of an area.

The need for an integrated approach to urban regeneration is a priority according to the European Economic and Social Committee as ordinary measures are considered inefficient [5]. Sustainable urban development (SUD) is mandatory in the EU Structural Funds 2021–2027 and is conceived as an integrated approach at different levels (transnational, national, regional, city, neighborhood), driven by a place-based approach to territorial development (i.e., a multisectoral policy, a multilevel and multistakeholder governance and community-led strategy) [2].

Social sustainability should be an integral part of all urban regeneration initiatives, but it is only recently that it has been increasingly taken into account with the Sustainable Development Goals (SDGs) [6]. This trend is also described in a study by the Western Australian Council of Social Service (WACOSS), which found that while considerable work has been conducted "on the environmental and economic aspects, the social has tended to fall off the sustainability agenda" [7]. The concept of urban social sustainability does not have a single cross-disciplinary definition but usually refers to the equitable access to a city's resources, the presence of a social capital stock, and according to Larimian and colleagues [8], it includes several dimensions such as social interaction, sense of place, social participation, safety, and neighborhood satisfaction.

Promoting sustainable communities also means considering the social, economic, political, and cultural contexts as a collective action, for community development needs a minimum stock of social capital. "Social capital refers to features of social organization, such as networks, norms, and trust, that facilitate coordination and cooperation for mutual benefit" [9] (pp. 6–7). A definition of social capital that combines different perspectives might be it is how individuals, communities, and societies live together and strive to achieve the development goals they have chosen for themselves and for future generations (their children) [10], including the dimensions of physical boundaries at local and supralocal levels.

One of the key challenges is to integrate different objectives into a coherent local strategy and to promote cross-sectoral integration, acting simultaneously on both fronts: that of social inclusion and the fight against inequalities and poverty, and that of environmental sustainability. Integrated urban strategies should include interrelated actions to improve the economic, environmental, climatic, and social conditions of urban areas. Among the potential distortions, the 'precertification' drift in the public sector has been identified as one that can undermine the effectiveness of a strategy (ibid, p. 26). The second challenge is the need to overcome the 'silo' structure associated with the division of functions between sectoral policy areas, typical of public administrations, and to anticipate and counteract possible negative externalities (environmental, social, economic). Integrated policies mean actively seeking win–win solutions and adopting the paradigm of complexity to design and address public issues, adopting new frameworks and conceptual models (circular economy and regenerative design concepts), and developing impact assessment of initiatives, including beyond the boundaries of the municipality [11].

There is extensive literature on the need to include elements outside the traditional sphere when explaining people's decision-making dynamics [12]. What has just been said is expected to be not only true but crucial in local contexts trapped below the poverty line. Indeed, it is plausible to expect that people in conditions of extreme deprivation manifest housing decisions characterized by irrational time-discontinuing economic decision and risk preferences related to rewards/losses (e.g., choosing smaller, earlier rewards) [13]. An

increase in time-discounting preferences [14] (p. 769) indicates a "preference for smaller, immediate rewards over larger, distal rewards".

Therefore, effective policies that have as beneficiaries/protagonists people living in multidimensional conditions of poverty, such as those involved in this study, need to be based on more complex anthropological models than reductionist assumptions of perfect rationality.

On these issues, and on the need to adopt complex anthropological approaches as a basis for socioeconomic theories, Amartya Sen himself has intervened authoritatively on several occasions [15–17].

Housing Policy and the Capability Approach

As argued by Trang Pham, the capability approach (CA) can be used as an evaluation framework to design and to evaluate community-driven development programs [18].

Housing plays an important role in increasing inequality [19], and the concept of well-being is multidimensional [20], in the sense that it has to take into account several factors at the same time, which are not necessarily homogeneous. It is not simply a question of income or wealth but is linked to the ability to have the means to realize a life project. In this sense, well-being is more properly linked to capability, that is, to the ability to have a standard of living that respects human dignity. In the CA, the freedom to achieve well-being should be understood in terms of the expansion of people's capabilities, that is, their ability to choose and be what they have reason to value [21]. The relationship between housing and capabilities is central in this sense because housing and living are elements that have a relevant and very important weight in the possibility of planning for the long term and, more generally, are among the elements that determine a basic minimum of dignity. Housing insecurity is one of the elements that most jeopardizes the possibility of guaranteeing the long-term well-being of people, especially children [22].

The literature on the relationship between the role of housing and the CA has developed considerably in recent years, although it is still an underexplored area, partly due to the difficulty of operationalizing the theoretical concepts.

Fayard et al. [23] proposed a model to represent the well-being of individuals, showing that the CA can be very useful for decision support, especially when the gap between theory and empirical work is bridged. To build resilience, decision-making processes require the participation of people [23]. Individuals need to be asked about their perception and management of risks and threats, both in everyday life and in exceptional circumstances.

According to Coates et al. [20], housing satisfaction is related to overall life satisfaction, and a wide range of different types of variables appear to have an impact on housing satisfaction itself.

Irving [24] examined the relationship between housing conditions and well-being, using Nussbaum's approach to the CA [25] as the basis for analysis. The analysis revealed a great diversity in the way residents perceive their housing conditions and their impact on the performance of key functions, despite all living in similar environmental conditions.

Housing is closely related, albeit in complex ways, to the ability to escape deprivation and to live a 'well-lived' life [26]. A case study has shown that defining housing policy in terms of individual well-being, rather than 'paternalistic' policy objectives based mostly on combating monetary deprivation, leads to better outcomes [27]. There is also a need to design appropriate financial services for people on low incomes to address the root causes of financial exclusion [28]. Although further analysis is needed to translate the principles of the CA into interventions with measurable results, the role of the CA and the expansion of freedoms to ensure the social sustainability of housing interventions within urban regeneration initiatives are prominent.

The problem addressed by this paper is the identification of effective strategies of urban regeneration to contrast emergency housing and, at the same time, ensure medium- and long-term socially, economically, and environmentally sustainable impacts. The objectives of this research are to illustrate a new model of "impact economy" with long-term

socially sustainable impacts of urban regeneration and to verify if and how the housing decision-making processes of households in extreme poverty are affected by the interventions. This study illustrates the results of a socioeconomic real experiment aimed at overcoming two shantytowns in Messina, a metropolitan city in Sicily (Italy), and at permanently extricating the inhabitants from the conditions of the poverty trap, which contributed to retrofitting the urban building stock [29]. The redistribution of a stock of resources (intended for home ownership) was a key component of the program in addition to standard services with controlled rents for social housing. This study was carried out within a systemic program of urban regeneration, methodologically inspired by long-term criteria of social and environmental sustainability, and by human development theories according to the capability approach (CA) [17,18,21]. The program represents an experiment of social innovation to address the problem of emergency housing through the CA [30]. This study is an attempt to empirically measure the integrated sustainability impacts of an emergency housing intervention. It focuses on the mechanisms of choice of the people who find themselves in contexts of degradation, crime, and spatial segregation.

2. Materials and Methods

2.1. Research Phases

The research was conducted in several phases, starting with an analysis of the context of two unhealthy shantytowns and the identification of the needs of the population, which has been confined to the Fondo Saccà and Fondo Fucile areas for decades. In the second phase, a complex urban renewal program was designed to permanently demolish the two shantytowns and ensure that households have access to housing and are able to overcome conditions of extreme poverty [31]. In the third phase, an impact evaluation of the program was carried out, focusing on the process of household choice in relation to different housing options.

PHASE 1: Identification of the problem: the slums of Messina and the needs of the population.

Fondo Saccà and Fondo Fucile are two slums built after the 1908 earthquake in the III district of the municipality of Messina, characterized by shantytowns. The shacks with asbestos-cement artifacts were built illegally without foundations, flooring, and sewerage connections, and are totally lacking in hygienic and structural requirements, and suffer from recurring flooding. Around 650 people will live there until 2022. After several complaints to the judiciary in 2018, the Regional Council (19 September 2018) declared the social, health, and environmental emergency of the two areas.

PHASE 2: Analysis of emergency housing measures.

An urban regeneration program called Capacity, which was to be implemented between 2017 and 2022, was designed jointly by the Municipality of Messina and the Community Foundation Messina [32], with the aim of overcoming the slum problem. It was designed according to the capability approach and the criteria of social, environmental, and economic sustainability in the long term. The strategy was based on a strong integration between the social system, financial and economic productive measures, scientific and technological research, and a participatory strategy to promote community empowerment.

The Capacity Program acted on both contexts and households through the following:

(1) The creation of quality urban and socioeconomic systems capable of generating alternatives in terms of human functions related to housing, income/work, sociality and knowledge;

(2) The development of a prototypical small horizontal residential building, built according to sustainable engineering and bioarchitecture criteria, and a renewable energy community (REC) at the Fondo Saccà pilot site, with battery-based hybrid energy storage solutions for a smarter, more sustainable, and efficient grid;

(3) The implementation of personalized and community-based social and technical mediation interventions that have helped people living in the city's shantytowns, in situa-

tions of severe material and cultural deprivation, to take advantage of new opportunities, choosing those that are more functional for their gradually increasing well-being.

The program proposes two possible alternatives to address the problem of emergency housing and to guarantee the right of households to housing after the demolition of the shanties, in accordance with national and regional legislation:

(A)   The acquisition by the beneficiaries of their own home thanks to the economic benefits called Personal Capability Capital (PCC). This administrative dispositive consists of a one-off contribution that enables the purchase of a house and represents a concrete possibility to take back one's life by planning, together with the technical and socioeconomic actors of the project, ways to regain one's civil rights at the individual, socioeconomic, and community levels. The PCC cannot exceed 75% of the gross purchase value of the house; the economic estimate, determined by means of a rigorous technical calculation, of the value of the self-help activities carried out by the beneficiaries; and the resources needed to transfer the energy efficiency and home automation prototypes resulting from the program's research activities to the new houses. The total value of the PCC must not exceed EUR 80,000.00. Beneficiary families were able to purchase their own homes using part of the PCC and the remainder either from their own resources or with the support of financial services and/or ethical microfinance instruments in accordance with the project's policy. The PCC was linked to a legality pact, enshrined in the notarial deed of sale and other documents:

-      No problems with the judiciary due to convictions for mafia crimes;
-      The houses purchased with the PCC's contribution cannot be sold for 10 years, and in any case, for no less than the repayment period of any mortgage taken out.

(B)   The Municipality of Messina will purchase the housing units on the municipal real estate market and then allocate them to the beneficiaries of the project through participatory procedures and in accordance with the standards established by the Italian and Sicilian legislation on housing. In this case, the beneficiaries will be tenants who will have to pay a modest rent.

The concrete possibility for the inhabitants of the shantytowns to choose between the two housing options, A or B, was intended as an extension of the individual's material freedoms and freedom of choice. The possibility of a real option was closely accompanied and supported by technical and mediating interventions aimed at transforming a theoretical opportunity into a real one to be exploited by households.

PHASE 3: Evaluation of emergency housing measures and choice mechanisms.

This study aimed to assess the impacts of the housing interventions and to model the mechanisms of choice of the beneficiaries in relation to the housing alternatives generated by the Capacity Program. The main impact indicators of the housing interventions are presented in Table 1. The analysis emphasizes economic sustainability to make the model scalable and replicable.

Twenty-nine beneficiaries who lived in Fondo Saccà and Fondo Fucile during the first two years of the program were interviewed in order to collect data on the attitudes and opinions about the program and its influence on neighborhood relations. We focused on the relationship between housing choice (Options A or B) and social cohesion (i.e., trust in institutions and others), hope for the future, perceptions of health, and risks posed by the environment in which they lived.

2.2. Instruments and Statistical Analysis

To assess the attitudes of the beneficiaries, the ECCA (Emotional Climate and Consumption Attitude) test was administered face-to-face during an open interview with a sample of 20 Fondo Saccà households when they were about to buy their house thanks to the PCC.

Table 1. Outcomes of the housing measure of the Capacity Program.

Indicators	
Degraded area cleared of shacks and cleaned up	17,345 m^2
Asbestos-cement artifacts disposed of in accordance with the law	100%
Total amount of microcredit disbursed to program beneficiaries	€620,600
Housing purchased on the open market	205
Building of an experimental ecological condominium with III-generation photovoltaic system	7 dwellings
Realization of a renewable energy community in Fondo Saccà	1
Households living in decent housing after eviction	205
Households able to access their own housing thanks to the PCC and facilitated access to credit	66
Housing purchased on the open market by the municipality of Messina	139
Average size (151 to 66 sqm) of dwellings purchased by PCC beneficiary households and average price of EUR 787 per m^2	97 m^2
Square meters of buildings on the open market upgraded	2500 m^2
Minors improving housing conditions and reducing health risks related to asbestos-cement exposure	102
Households receiving social microcredit for home purchase	37
Entrepreneurial activities supported or start-ups activated	11
Households with microcredits about job dimension	14

The open interview was administered by the same researcher that used an open interview grid that explored the following areas: (1) housing (describing how and for what reasons the household came to a decision regarding the choice between one of the two options); (2) the role of social mediation and technical services; (3) the influence of the choice on other spheres of life (social, work, children's education, future perspectives); (4) changes in the proximity networks and relations with neighborhoods; (5) issues related to the health; and (6) opinions and expectations about the project Capacity.

The ECCA test is based on the semantic differential and aims to measure, in a standardized way, the attitudes of the household and the pre–post variation in choice/purchase. The test indirectly detects some human 'functioning' as conceived by the CA: being insecure, poor, confident, unhappy, brave.

It presented eight items drawn on paper in the form of a ten-point self-anchored scale. Each respondent placed himself or herself on the continuum. The test was designed to measure attitudes and perceptions at two points in time (t1, t2.), before and after (pre–post) housing selection.

Variables of the ECCA Test pre–post choice:

1. Hope (toward the future)–Resignation
2. Confidence/trust–Defiance (toward people and life)
3. Wealth–Poverty (perception about one's economic conditions)
4. Healthiness–Insalubrity (of one's home and living environment)
5. Cicada–Ant (propensity to consume: savings or spending)
6. Happiness–Unhappiness
7. Security–Insecurity
8. Courage–Fear

The Cronbach's alpha coefficient of the scale's internal consistency was calculated, and three items were selected to obtain a scale with a high Cronbach's alpha coefficient (in both the PRE (0.916) and POST (0.709) versions). The final score of the 'Positive Attitude Scale' is obtained by adding together the scores of three items: 1. Happiness; 2. Trust;

and 3. Courage. Finally, we constructed two measures: the first called the 'Positive Attitude Scale' to assess psychological attitudes toward the future and trust in others, and the second called 'Healthiness', based on the value of Item 7 to assess the perception of the healthiness of the current home.

To monitor the program and measure its results, two databases were set up and fed weekly. The first concerned the composition, biographical, and socioeconomic characteristics, and any outstanding legal debts of all the families living in the slum. This database recorded the choices made in relation to the two Capacity housing options (dates, notarial deeds, decisions by the local authority, the amount of house purchased, etc.). The second database, managed by MECC, the microcredit and financial counseling agency, contained all the information on the financial aspects of each household that had applied for a subsidized loan.

2.3. The Model of Choice

The hypothesis of this study is that a positive attitude toward the future and trust in others is associated with the development of the choice of the riskiest alternative but the one also capable of ensuring the highest payoff. Therefore, social mediation interventions aimed at strengthening social cohesion, trust in institutions, and the engagement of households and communities may yield better results.

The elements that characterize the chosen model are essentially three:

(1)　A group of agents: the inhabitants of the Fondo Saccà shantytown, who are the beneficiaries of the Capacity Program;

(2)　Two possible strategies, corresponding to the previously detailed alternatives A or B, generated by the Capacity Program;

(3)　An individual payoff function that quantifies the utility for each possible (alternative) strategy available to the agents.

The model has dynamic properties precisely because it is studied over time. Each agent has access to all the information about the alternatives available and the choices of the other beneficiaries, thanks to the personalized social mediation services mentioned above and to the strong interactions that exist in the social group.

Below are the parameters used in the model:

$N = 20$ is the number of individuals/families belonging to a subgroup, those living in the shantytown at the time of the interview who chose Option A.

The total project duration T is three years. It should be noted that the survey was conducted by means of a test after the choice had been made (hereinafter referred to as 'Post') and generally at the time of the purchase of the house. In the same survey, the attitudes registered before the development of the choice were also evaluated (hereinafter referred to as 'Pre'). Indicatively, t_0 represents the start of project operations; time t_1 corresponds to approximately one year after the start of the project; and time t_2 corresponds to approximately two years after the start of project operations.

The time analysis makes it possible to understand how individual choices change during the dynamics of the real experiment and how they influence the choices of other agents. For example, if at time t_1 many beneficiaries decide to implement the strategy of 'participating with confidence', it is expected that other agents, at the same time still skeptical about fully participating in the project, may change their minds and implement a more collaborative strategy, for example, at time t_2.

Player payoffs are estimated using a contingent valuation. Since this is a real experiment, and we therefore know the choices that individuals made and the variables that most influenced their choices, we can run a backward model. The main payoff is the house.

Payoff Estimation

To quantify the value of the variables over time, it is necessary to calculate the dynamic payoffs of the model and, more specifically, a sort of discount rate with respect to the value of the house:

$$⟦p(t)⟧\_i = (C\_i) × e^{(-⟦α(t)⟧\_i t)} \tag{1}$$

where

C_i = the conventional value of the house (EUR 100,000.00);

$E^{(-⟦α(t)⟧\_i t)}$ = the discount rate;

⟦α(t)⟧_i = α_i^f + α_i^(s);

α_i^f (t) = the positive attitude coefficient (Trust, Happiness, Courage); and

α_i^s (t) = the healthiness coefficient.

So, note that if α_i (t)→∞ ⟹ ⟦p(t)⟧_i = 0. If instead α_i (t) = 0 ⟹ ⟦p(t)⟧_i = C_i.

The individual coefficients (α_i^f (t), α_i^(s) (t)) are calculated as follows:

$$α\_i^f (t) = (Vmax − V\_i)/(V\_i − Vmin) \tag{2}$$

α_i^(s) (t) = (Vmax − V_i)/(V_i − Vmin)

where

Vmax = 10;

Vmin = 1; and

V_i = the value of the beneficiary i at the time t whose coefficient is to be calculated.

We will therefore have that the payoff is greatest when ⟦α(t)⟧_i = 0 and the discount rate is equal to 1.

The payoff instead will be equal to 0 and therefore will be at a minimum when α_i (t)→∞ since in this case the discount rate will be 0. So, the discount rate will be between 0 and $1:0 ≤ e^{(-⟦α(t)⟧\_i t)} ≤ 1$.

Clearly, the payoffs calculated in this way will be different for each agent because while the value of the house is conventionally chosen as a constant, the discount rates, functions of the variables considered, are entirely subjective.

3. Results

3.1. Identification of the Problem: The Slums of Messina

Farinella and Saitta (2019) [33] have recently published a detailed study analyzing the post-disaster processes in Messina that led to the emergence of new forms of spatial segregation and slums, with the emergence of a new urban underclass and the consolidation of the power of certain families that influenced these dynamics over time. After the Messina earthquake of 1908, special agencies were created for the financial management of economic flows intended for reconstruction, maneuvered by small interest groups that reconfigured the city both socially and physically. The significant expansion of the city would be the result of speculative processes encouraged by the financial mechanisms of reconstruction. The housing issue in Messina has conditioned the urban development of the city with the development of a 'shack culture', which has affected the cohesion and quality of social capital, giving rise to enclaves of decay. In recent decades, housing has been configured as a bargaining chip, implying a double blackmail: on the one hand, that of political clientelism and, on the other, that of the shack waiting to be ranked [34]. The contexts of the two slums were characterized by environmental degradation (Figure 1), organized crime control, and poor health conditions that led to a poverty trap mechanism for the inhabitants.

The dropout rate in the first year of secondary school for children living in the two slums is four times higher than the regional rate (18% vs. 4%). The health of adults and children living in the two slums is very poor, with frequent cases of bronchitis, pneumonia, and cancer linked to the presence of asbestos-cement artifacts (ASP ME inspection 21 April 2021).

Figure 1. Before—Fondo Saccà in 2018–2020 (*Source: Google Maps Area view*).

Between 1990 and 2018, the population of these shantytowns lived on average 7 years less than the inhabitants of other areas of Messina, and the percentage of children dying in

the first months of life was 3.7%, four times higher than the rest of the city (source: Municipality of Messina Register). The differences in mortality are statistically significant [32,35].

3.2. Analysis of Emergency Housing Measures

The multidimensional policy adopted by the program Capacity, which includes technical and financial services, technological innovation and social mediation, aimed at generating alternatives in the most important aspects of people's lives (housing, work/income, sociability, knowledge), thus increasing the inhabitants' considerable freedom of choice, while respecting environmental sustainability criteria. The pilot program Capacity aimed to test a new approach to community welfare, to achieve sustainable development and to redistribute material and immaterial wealth in highly degraded areas of a demographically depressed metropolitan area that has been below the poverty line for years.

The first objective of the program was to break the stalemate that had characterized the two slums for decades and to counteract mechanisms of distrust and resignation on the part of the citizens. The social capital of the communities was built up through mediation activities and the use of a participatory approach with public assemblies, meetings, and one-to-one integrated social and technical tutoring of households. The technical tutorship consisted of financial advice on the access to microcredit and debt restructuring, official technical assessments to value properties and design renovations, and the installation of home automation devices to control energy consumption. The social mediation activities consisted of explaining the different options offered by the project and accompanying people in their choice of housing.

The hypothesis was that a significant increase in the stock of knowledge, relationships, trust, and material assets (home ownership) of households living in conditions of severe deprivation could generate a significant leap in life prospects and, as a further effect, stimulate the development of the socioeconomic dynamism of the entire community.

3.3. Evaluation of Emergency Housing Measures and Mechanisms of Choice

By August 2022, both the Fondo Saccà and Fondo Fucile slums had been cleared (Figure 2), and all 205 households below the poverty line had fulfilled their right to housing, with one in three opting to buy their own home through the integrated use of the PCC device, microcredit, and financial interventions. The economic valorization of the maintenance work carried out by the beneficiaries themselves made it possible to rehabilitate properties on the open market that had fallen into disrepair. New houses were purchased on the open market and were built according to energy efficiency criteria, avoiding the consumption of land and the typical mechanisms of ghettoization and stigmatization associated with evictions and the creation of additional areas in which social marginalization is concentrated.

Eco-efficient solutions to fight energy poverty were tested. In Fondo Saccà, a prototype of a small sustainable horizontal eco-condominium (7 dwellings) has been tested (Figure 2), with building systems made of compressed straw and wood, incorporating photovoltaic systems linked to energy exchange systems, the recycling of gray water to irrigate the green areas around the house, experimental home automation systems for health and energy saving, and environmental monitoring systems.

The eco-condominium is a condominium with a positive balance without having to support any energy costs. The smart grid is supported by a storage system that will allow energy to be redistributed according to social algorithms and environmental efficiency; it is the nucleus of the largest energy community, which will allow families to save 35% of their energy costs by significantly reducing the financial flows.

Fondo Saccà is one of three European Union pilot sites where a battery-based hybrid storage solution for smarter, sustainable, and more energy-efficient grids has been developed as part of the Hybris (2020) project, funded by the European Union under the Horizon 2020 Program.

Figure 2. After—Fondo Saccà after the demolition of the slums for the eco-condominium in 2022.

Below are the results of the choices (Table 2) made by the beneficiaries with respect to the alternatives generated by the housing measures of the program Capacity.

Table 2. Distribution of households between the two housing options.

	Fondo Fucile	Fondo Saccà	Total
Option A: Personal Capability Capital	29	40	69
Option B: Purchase and assignment of the municipality	106	30	136
TOTAL	135	70	205

Nonbankable households had access to regular credit for debt restructuring and home purchase, significantly reducing the risk of usury. There were 38 microcredit interventions and 25 loans provided by ethical and social financial partners.

A paired-sample within-subjects t-test was conducted to determine whether there was a difference within the beneficiary group between two time points, i.e., before and after homeownership. Households buying their own home with the PCC experience differences in all eight dimensions measured by the pre–post ECAC Test, and all differences (Pre

Scores–Post Scores) are statistically significant (Table 3). The two items that show the greatest change are the perceived improvement in the healthiness of the home and the increase in the level of trust in others (respectively, Pair 1 mean value −5.82 and Pair 7 −5.29).

Table 3. Results of the t-test of the pre and post ECAC test.

Pre–Post Scores		Coupled Differences				P (Two Tails)
		Mean	SD	C.I. 95%		
				Lower	Upper	
Pair 1	Healthiness	−5.82	3.07	−7.40	−4.25	0.000
Pair 7	Trust	−5.29	3.72	−7.21	−3.38	0.000
Pair 8	Happiness	−4.35	3.45	−6.12	−2.58	0.000
Pair 4	Safety	−4.29	3.69	−6.19	−2.40	0.000
Pair 3	Courage	−4.12	3.94	−6.14	−2.09	0.001
Pair 6	Hope	−3.53	3.96	−5.56	−1.50	0.002
Pair 2	Spending	−2.59	3.37	−4.32	−0.85	0.006
Pair 5	Poverty	−1.88	2.80	−3.32	−0.44	0.014

Figure 3 shows the cumulative frequency of beneficiaries who chose the PCC option (Option A), limited to the Fondo Saccà slum. The logistic curve shown in Figure 3 reflects the processes of collective choice, which are influenced both by individual learning processes and by processes of imitation and social pressure.
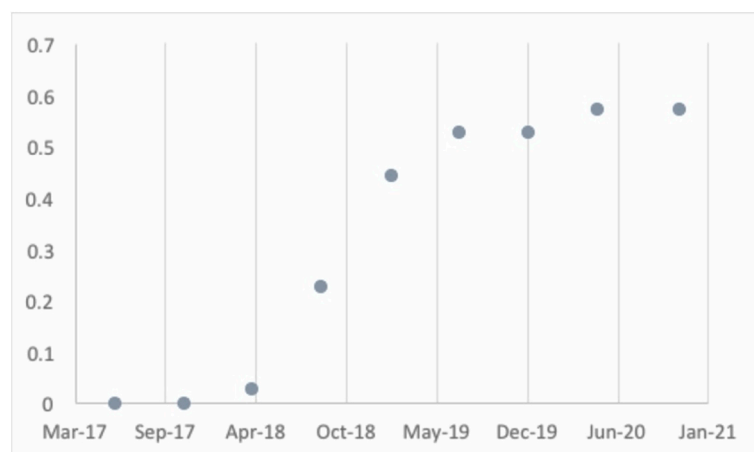

Figure 3. Rate of beneficiaries choosing the PCC (Option A: Fondo Saccà) over time.

The Purchase Choice Model

A dynamic model of the relationship between the decision to buy a house, quantified in terms of the economic value of the benefit, and a range of attitudes related to levels of trust and the perceptions of the households was developed over three time periods.

If just one of the beneficiaries had decided to engage in the particularly violent demonstrations that are common in the city's shantytowns (e.g., squatting in the houses built as part of the Capacity pilot project or others), there would have been a high risk of the project being suspended by the local authority or the co-financiers. The dynamic in the preparatory phase was one of simultaneous action, and all actors chose their strategy at the same time. The actors involved in the process came to a coalition agreement, determined by the fact that most of them considered it useful to explore the project process to understand whether there were real chances of achieving the announced objectives. The dynamics of choice in the second phase were sequential; in fact, not all beneficiaries chose at the same time. Once the continuity of the project was guaranteed, the individual agents could adopt one of the two strategies available to them, i.e., continue to cooperate with confidence (A) or with low confidence (B). Moreover, since the dynamic process and the payoff function

were based on time T, it was possible to study how the players' decisions varied over the three time periods: t0, t1, t2 ∈ T.

Below is the calculation of payoffs (Table 4), with values in EUR, of the N agents taken into consideration:

Table 4. Payoffs.

Agents	T0	T1	T2
1	-	-	100,000.00
2	9759.56	100,000.00	100,000.00
3	-	100,000.00	100,000.00
4	1083.47	100,000.00	100,000.00
5	1028.65	77,880.08	68,728.93
6	0.00	100,000.00	100,000.00
7	-	100,000.00	100,000.00
8	1258.81	92,596.11	89,102.34
9	-	-	68,728.93
10	-	-	100,000.00
11	3019.74	91.19	100,000.00
12	0.00	0.00	92,311.63
13	2405.84	57.88	40,789.76
14	26.73	0.01	78,662.79
15	2787.57	77.71	2351.77
16	-	94,890.03	92,433.82
17	-	-	89,102.34
18	3877.42	150.34	78,662.79
19	-	-	68,728.93
20	91.19	0.08	68,728.93

The data in Table 4 have been calculated by obtaining the parameters in Formulas (1) and (2), necessary to calculate the discount rates, through the decoding of the test submitted to the players, i.e., to the inhabitants of the shantytowns, at time t0, t1, and t2.

As it can be seen from the payoff table of the subgroup of the beneficiaries examined, of these, 8 made the decision at time t1 and the other 12 at time t2. This result shows how many people were initially skeptical about the actual viability of such an alternative, or at least showed fear in facing such a radical change in their lives. So, 12 players showed a wait-and-see tactic, allowing themselves to be positively influenced by the moves of the other beneficiaries who first believed in the project's possibilities.

Other evidence that immediately stands out in the above table is the value of the rewards, which changes scale at the time of the purchase choice and shows a positive leap in its numerical value. From an analytical point of view, this result is determined by the rapid increase in the subjective variables that influence people's choices: the positive attitude coefficient (trust, happiness, courage) and the health coefficient.

The case identified with the number 15 is conditioned by the healthiness coefficient, which, due to the health conditions of the beneficiary, determines an overall high value of the coefficient $⟦α(t)⟧\_15$, maintaining a low value of the discount rate and, therefore, of the payoff over time, despite the positive attitude coefficient signaling a gradual full confidence and adherence to the initiative.

The financial cost of the investment in the case of the purchase decision is quite high, especially when compared to the disposable income, which hardly exceeds EUR 1000 net per month. An analysis of the data on the loans taken out for the purchase reveals an average value of EUR 206, with an average duration of 8.5 years. A total of EUR 206 represents around 20% of disposable income. The alternative chosen (subsidized rent) had an average cost of EUR 75 euros, which would be largely offset by the lower incidence of taxation and the absence of exceptional maintenance costs, which would be borne by the municipality of Messina.

Of course, the way in which the value of the individual beneficiaries' payoffs evolved, and thus the outcome of the real experiment, depended critically on the evolution of the relationship of trust within the community and the household's social network, the cultural and social changes that fostered this factor, the legal constraints of the project, and the imitation effects that took place during the selection process.

For example, one of the interviewees stated: "almost everybody in my neighborhood has the house now, but before they were suspicious, they thought they were going to get screwed".

Decision-making processes were strongly influenced by imitative factors among neighbors and relatives, and by group influence mechanisms.

4. Discussion

The decision-making processes of the inhabitants of a shantytown in the city of Messina in southern Italy regarding the purchase of a house were studied. The aim of the study was twofold: firstly, to assess the impact in terms of the social and environmental sustainability of complex interventions related to emergence housing, and secondly, to verify how the development of a positive attitude toward the future and the growth in bonds of trust toward others would have contributed to the choice of housing. The decision to buy was the riskiest alternative, even though it was substantially supported by financial assistance and sociotechnical/financial advice and mediation. At the same time, it was the option that could guarantee the highest payoff and ensure a housing stock available for future generations, thus expanding other opportunities such as education and health for all household members [17]. Households have chosen to strengthen their stock of resources (the house) at the expense of short-term flows, giving priority to long-term planning rather than to satisfying some short-term needs. In this way, the individual aspirations and horizons of families have been redefined.

From a monetary point of view, the choice to invest in the purchase is the least economically advantageous choice in the short term, since it means accepting a significant reduction in disposable income, which, being close to the poverty line, implies the need to reduce some essential consumption. The choice of a low-income person is usually to give greater weight to the possibility of consuming in the short term, despite the possibility of consuming in the long term. The choice of most agents to invest in purchases is therefore outside the traditional concept of the rationality of a strictly economic nature, suggesting that the decision-making sphere certainly had a rational component, but it was also linked to other factors. The decision-making mechanisms of the house purchases were conditioned by needs, beliefs, desires, and fears and are in contrast to logical criteria of rationality: as demonstrated by researchers, people are myopic in their decisions [11]. The weight that each individual has given to his or her own fears and desires, expectations, and needs, with regard to the real prospect of escaping poverty and deprivation and living in a chosen, possibly owned house, certainly depended on personal conditions (e.g., involvement in criminal contexts) and environmental conditions (e.g., health). Moreover, decision-making mechanisms proved to be strongly correlated with social cohesion, trusting others and public institutions, and the perception of the physical and relational microclimate. The program aimed to create new stocks of relational assets, new technical and financial knowledge, and community relations within the group of beneficiaries. The expectation of a possible increase in individual benefits over time, even if this expectation was weak or disillusioned at first, has substantially consolidated the agreement and allowed the dynamic process to begin. The social sustainability related to this urban regeneration program is ensured by the strong community engagement and changes in the processes of social cohesion, by overcoming the risk of ghettoization, as well as by the long-term impact on the well-being of the people in terms of the growth of capabilities (income, housing, sociality, and knowledge dimensions) and expansion of freedoms (CA). The first implication for urban renewal policy and urban sustainable development is that offering the most deprived households a package of different services within an integrated pro-

gram and cross-sectoral integrated strategies [2] [p. 126] is not enough. The CA concept of 'conversion factors' can help shed light on this issue and ensure social sustainability outcomes [7,8]. According to Sen's approach, the ability to transform income or other goods into real opportunities is affected by a multiplicity of individual and social differences (e.g., gender, education, stigmatized minorities), which means that some households, and communities, need to be accompanied by mediation and technical counseling activities in order to recognize and evaluate public offers and to reach a higher level of capabilities.

Moreover, the analysis of changes in the capabilities (CA), in attitudes and choice mechanisms (see housing options) at the level of the individual household and at the community level, can represent a contribution and a step forward for the methods [21] used to assess the social sustainability of urban regeneration strategies.

The present case seems to have all the typical features of an evolutionary game [36] but one not based on pure rationality hypotheses. The purchase choice model, which showed an evolutionary learning dynamic (Figure 3), suggests how such a real-life experiment can be modeled by game theory. In fact, in general, a game [23], like the project, is characterized by three elements:

(1) A set of players—in our case, the inhabitants of the shantytown, the beneficiaries of the Capacity Program;
(2) A set of strategies available to each actor—in our case, the strategies correspond to the housing options (A and B) generated by the Capacity Program and described above;
(3) A payoff for each player—i.e., the payoff for each possible end of the game and therefore for each (alternative) strategy available to the player.

People's choices, as has been widely argued, are the result of dynamic 'environmental' balances rather than just intra-individual processes [37]. When people perceive contexts around them that are dominated by hawks, it is easier for choices to be trapped by fears and needs; if, on the contrary, when they perceive contexts that are dominated by doves, i.e., warm and supportive, then mechanisms of sharing, cooperation, and openness to the future are more easily triggered. Thus, the perception of contexts, which evolves along learning curves, influences the choices of individuals and thus the local social and economic dynamics.

However, we must mention some limitations of the work and suggest possible future in-depth studies. The real experiment was carried out in parallel with the implementation of the city's urban regeneration program, which by its very nature is a complex path from a political and operational point of view and presents several management uncertainties. The research in the field had to adapt to respect for privacy, time constraints, feasibility, and the limitations of opportunities. The optimal solution would have been to test opposing hypotheses on the other sample of citizens who had not decided to buy their own home. However, with these households, it was only possible to conduct field interviews at a stage prior to the allocation of social housing, without being able to capture attitudes before and after the purchase decision.

A possible extension of the study is to link CA social justice theory to game theory. In fact, game theory seems to be a conceptually adequate tool to model working hypotheses based on the CA, and thus on the generation of alternatives regarding the main areas of human functioning, precisely because it allows the analysis of choice mechanisms and mutual influence processes between beneficiaries/players, and more generally between them and the external environment.

5. Conclusions

This socioeconomic experiment clearly overcomes the urban poverty policy dilemma facing policymakers: how much to invest in poor people or in poor places, and what type of interventions to choose to reduce spatial inequalities [37,38]. Although Capacity is an area-based policy that focuses on specific geographic units and very poor neighborhoods, the main actions are not only 'hard measures', such as physical demolition and renovation or improved social infrastructure, but also a mix of strategies aimed at enhancing the freedom

of choice and capabilities of people living in poverty. Under this scheme, people are not forced to change their homes by the local housing authority but can buy their homes on the open market.

The outcomes of the project provide clear indications for the operationalization of the capability approach in housing policy as suggested in the literature [20]. The policy lessons that can be drawn from this real experiment relate in particular to the management of housing emergencies typical of the outskirts of large urban centers. By adopting a solution based on the transfer of a stock of resources for the direct benefit of households in extremely difficult housing conditions, the traditional instruments entrusted to temporary accommodation or social housing with capped rents have been overcome.

The innovations promoted by a system of social-economy [39] introduced by the real experiment allow a significant expansion of the beneficiaries' capabilities and also ensure the social and environmental sustainability of the community over time. They have also proved to be much more efficient for the public welfare system and have had a significant positive impact on the more complex socioeconomic dynamics of an area characterized by extreme inequalities.

The results of the real experiment seem to confirm the prediction of a theoretical model [29] based on simulations of economic agents interacting according to random algorithms. The model showed that for initial values of the stock of wealth, above the threshold values, the economic system will evolve toward configurations characterized by a progressive concentration of wealth and thus a few dominant attractor nodes. In such a phase, the economic dynamics will progressively become trapped. Conversely, for maximum values of the wealth stock below the transition region, the economic system activates/reactivates durable random walk dynamics.

The program has succeeded in promoting cross-sectoral integration, acting simultaneously on two fronts: that of social inclusion and the fight against inequality and poverty through personalized interventions, and that of environmental sustainability. A policy that can rightly be seen as a kind of exogenous shock, capable of determining a significant redistribution of material wealth (home ownership), knowledge, and social capital in favor of the poorest and most disadvantaged, has come to fruition, avoiding spatial segregation [34,40,41]. This process has made it possible to move the system into the subcritical phase, thus overcoming the trajectories of the poverty trap and directing the investment of EU structural funds toward the pilot actions tested by Capacity [42].

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