

Article

Unveiling the Adverse Impact of Spanish Building Refurbishment Subsidy Taxation on Low-Income Recipients—A Case Study of the Renovation of P. D. Orcasitas

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Abstract

Though the European Commission has repeatedly stated that the necessary energy transition in Europe should leave “no one behind”, this paper describes a building refurbishment case that has entailed economic hardships for the low-income families involved. The project is located in the area of P. D. Orcasitas in southern Madrid, led by a grassroots neighbours’ movement, comprising one hundred and seven housing blocks, containing more than 2000 dwellings. The main source of funding for the operation consists of subsidies granted by the Madrid City Council; however, Spanish legislation requires the state Agency of Tax Administration to classify these subsidies as capital gains derived from lucrative transfers. Based on the tax data of vulnerable beneficiaries, the conclusion is that the recipients have ended up returning part of the subsidies to the State through their Income Tax Return. In addition, the Spanish Social Security Institute requires the return of social benefits associated with non-contributory retirement pensions and the Minimum Living Income. Apart from tax accounting, regulations are revised to draw conclusions. Unlike most actuations of this kind, in this case the negative effects are obvious. Although intended to alleviate fuel poverty, the initiative has exacerbated vulnerability due to the impact of the imposed penalties on household income. In conclusion, unless preventive measures are implemented, the mandatory refurbishment of inefficient buildings may place an undue burden on vulnerable low-income occupants and hinder the effective implementation of energy-efficiency regulations.

Keywords: energy transition; urban renovation; fuel poverty; taxation; social sustainability



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1. Introduction

The United Nations Sustainable Development Agenda (<https://sdgs.un.org/goals>, accessed on 10 April 2026) positions energy transition within a framework of social sustainability, particularly through SDG 7 (clean energy) and SDG 11 (sustainable cities). As the building sector generates 36% of global emissions, enhancing building energy efficiency is essential for climate goals. However, international frameworks emphasise that such transitions must benefit rather than harm vulnerable populations.

At the EU level, the European Green Deal (EGD) establishes the goal of a fully carbon-neutral economy by 2050, specifying that this transition must include social protection measures so no one is “left behind” and ensuring vulnerable groups’ equitable participation

in the benefits [1]. The “Fit for 55” legislative package aims to prepare every economic sector to achieve the 2030 climate goals in a fair, profitable and competitive way. As the building sector originates 36% of EU emissions [2–4], one of the main goals of the Renovation Wave strategy is the refurbishment of existing buildings [5]. The recently consolidated Energy Efficiency Directive (EU) 2023/1791 establishes “energy efficiency first” as the core principle of the EU energy policy, now enshrined in law for the first time, meaning that all political and investment decisions by EU countries must prioritise energy efficiency [6].

The Energy Performance of Buildings Directive (EPBD) is the main legislative instrument regulating building efficiency across the EU and its revision was a key element of the “Fit for 55” package and Renovation Wave strategy [7,8]. The most significant aspect of the EPBD revision is the establishment of minimum energy performance standards (MEPSs). The European building stock is rated according to a harmonised scale ranging from A to G. By 2030, 15% of the worst-classified buildings (G-rated) must improve to at least F, with public and non-residential buildings leading the way. By 2027, they should be rated F and by 2030 be renovated to at least E, while non-residential buildings must reach F by 2030 and E by 2033 [9]. This “worst first” approach prioritises people in fuel poverty [8] and aims to provide increased support for refurbishment projects in deprived neighbourhoods, ensuring public funding as a potential long-term solution to the structural fuel poverty problem in cities [10,11].

To address the social implications of large-scale implementation, the European Commission released the “Winter Package” in November 2016 to shape a fair energy transition without leaving vulnerable individuals behind or exacerbating fuel poverty. On 14 December 2021, the Commission presented a recommendation containing political guidelines to ensure a fair transition towards carbon neutrality, paying special attention to households heavily relying on fossil fuels who could be most affected by the green transition, and inviting Member States to optimise public and private funds while working closely with social representatives [12]. Building on these frameworks, the Citizens’ Energy Package (2026) further strengthens consumer protection and energy poverty alleviation by empowering citizens to actively participate in the clean energy transition through energy communities, enhanced billing transparency, and targeted support to reduce electricity taxes and levies for vulnerable households [13].

Member States, at the national level, transpose EU directives into domestic legislation, establishing, among others, renovation subsidy programmes that shape how EU-level policies are implemented within their jurisdictions.

Municipal authorities implement their own renovation subsidy programmes tailored to local housing stock conditions and vulnerable populations. Additionally, municipalities can access technical assistance offered by the EC through the Energy Poverty Advisory Hub (EPAH, <https://energy-poverty.ec.europa.eu>, accessed on 21 October 2025).

Policies to ensure the right to access energy need to target the root causes of energy poverty, not simply alleviate its symptoms. Trade-offs are inevitable, but better policy design and transparency can reconcile climate and equity goals [14]. The application of energy-efficiency measures should lower the volume of energy required to meet the same household service demands [15].

Several low-carbon policies have been implemented in recent years. However, on many occasions they have not taken into account who they were aimed at. On the one hand, when compared to an affluent population, people experiencing fuel poverty often produce larger amounts of carbon to meet their basic energy needs [16]. Thus, decarbonisation policies harm them. In the UK, low-income households currently pay disproportionately more towards low-carbon policy costs compared to high-income households [17]. In addition, vulnerable households may not be able to achieve further decarbonization of their demand

due to budgetary constraints. Therefore, energy poverty increases as decarbonization progresses [18]. In Germany, low-income groups express support for energy transitions, but feel excluded by their policies [19]. The risk of negative outcomes is greater in contexts characterised by high levels of poverty, corruption, and economic and social inequalities, and where limited action is taken to identify and mitigate potentially adverse side effects [20].

Some authors constrain the right to access energy in the market, describing the vulnerable only as consumers [21]. In fact, energy policies still tend to identify people as “consumers” through their relation to the market rather than as “citizens” with concrete stakes in adequate service provision. However, it would be more feasible to make climate objectives compatible with human needs if energy is approached as a right and as a tenet of the social contract [22]. In the existing literature, several cases were found where low-income families ended up affected by the malfunctioning of markets when low-carbon policies are implemented:

- There is an undeniable friction between reducing CO₂ emissions and alleviating fuel poverty when approached from the perspective of energy-efficiency obligations [23]. Specifically, the potential regressive impact of higher energy prices due to such obligations, as well as the complexity of addressing households in fuel poverty and the implications for implementation capacity. EEOs function similarly to an energy tax, which tends to be regressive [24]. The additional costs of retailers caused by an EEO scheme are mainly passed onto the groups with most inelastic behaviour, i.e., households and small enterprises. Additionally, the measures implemented thanks to EEOs preferentially target renovation projects with large energy savings potentials, i.e., enterprises or high-income households [25]. Even when the tool is redesigned to allow more low-income families to benefit from these subsidies, the effect can be the opposite [26].
- It has also been analysed how inequities in the implementation of energy transition policies engender conflicts that prove counterproductive to achieving the goals [27]. In Germany, but also in Austria, the regulation on building energy standards has created conflicts in the rental market [28].
- Ongoing decarbonisation mechanisms may pose challenges for low-income households that consume less energy than necessary to meet their basic comfort needs [29]. Therefore, the investment in energy efficiency may not be recoverable.

Beyond policy design, research examines mechanisms encouraging citizen participation and institutional trust. The Theory of Planned Behaviour framework analyses how perceptions of climate risks, confidence in improvement measures, and technology acceptance shape renovation decisions [30]. Innovative approaches must harmonise investment in vulnerable neighbourhoods with strategies mitigating adverse effects like gentrification [31,32] while fostering trust to ensure renovations address fuel poverty [33].

However, a critical gap remains: limited attention to multidimensional vulnerability [20]. Vulnerable households face intersecting disadvantages beyond income—age (elderly with fixed pensions), housing tenure (inability to relocate), educational barriers (limited administrative understanding), and welfare dependency (means-tested benefit traps). These overlapping vulnerabilities create risks when energy policies interact with fiscal and social systems [15]. Households may simultaneously be income-poor, energy-poor, benefit-dependent, and administratively excluded—each dimension amplifying others. Current frameworks address dimensions in isolation, failing to anticipate how renovation subsidies trigger cascading effects across tax liabilities, welfare eligibility, and economic security. This multidimensional perspective is essential for understanding how well-intentioned policies can inadvertently harm the intended beneficiaries.

This study integrates policy coherence theory [34] and theories of unintended consequences [35] to explain how renovation subsidies produce regressive outcomes. Policy coherence theory posits that effective governance requires alignment across policy domains—fiscal, social protection, and housing—to prevent contradictory outcomes. Energy transition policies operate across fragmented institutional ecosystems (EU directives, national tax law, municipal subsidies) governed by separate agencies at different levels.

Theories of unintended consequences predict that policy failures arise from unanticipated interactions between instruments: means-tested welfare systems designed for regular income produce regressive effects when applied to one-time environmental transfers. The theoretical prediction: subsidy classification as taxable income triggers benefit reassessments across welfare programmes, creating fiscal–welfare cascades.

Multidimensional vulnerability explains why certain households experience amplified harm: intersecting disadvantages (economic precarity, housing inadequacy, welfare dependency, administrative exclusion) interact with policy fragmentation, transforming assistance into penalty. The Poblado Dirigido de Orcasitas (P. D. Orcasitas) case empirically tests whether institutional fragmentation produces the cascades these theories predict.

On the road to a just energy transition, it is also possible to find studies that analyse the impact on energy poverty of subsidies and taxes linked to the energy transition.

1.1. Effectiveness of Subsidies and Taxes in Achieving a Fair Energy Transition

Grants and subsidies, such as direct investment subsidies, are used by governments when optimal levels of investment cannot be fully provided by the market alone. Taxation can also be a tool for stimulating energy efficiency, either through incentives such as tax exemptions, deductions, or benefits, or through incentive schemes related, for example, to capital gains tax, property tax, differentiated VAT, and accelerated or free depreciation [36]. It may have mixed effects depending on the tax rate [37].

Fossil-fuel taxes and subsidies both reduce the negative effects of energy vulnerability on human development, as compared to countries which do not implement such a policy. Overall, taxes are most effective—especially for the composite Human Development Index (HDI)—while subsidies better cushion the income component [38].

The progress in energy efficiency, driven by green fiscal policies including public subsidies and tax breaks, has significantly reduced energy poverty in different countries worldwide [39]. In the EU, energy-efficiency subsidies reached EUR 30 billion in 2022, which is EUR 8 billion more than in 2021. Grants accounted for over 50% of all energy-efficiency subsidies, followed by tax expenditures, soft loans, and energy-efficiency obligations (23%, 20%, and 6% of energy-efficiency subsidies, respectively) [40]. EuroFund recommends initiatives to enhance purchasing power, such a reduction in income tax for low-income earners in France during COVID-19. These recommendations include preferential tax treatments, reductions, or fiscal reforms [41].

Although many of the subsidies come from taxes, most European tax systems tend to impose a lesser burden on poor or low-income households [25]. Anyway, the taxpayers with limited incomes have the impression that they have to bear the cost of subsidies of new programmes while not being able—due to a lack of finances—to reap any of the benefits. Burdens for taxpayers were also commonly mentioned for France (taxpayers were noted to bear the burden of nuclear decommissioning and waste management). In Great Britain, taxpayers and consumers were said to subsidise the system costs of the smart meter rollout. In the case of Norway, owners of fuel-powered vehicles face a triple burden: they do not benefit from electric vehicles, they pay the wealthy to use electric vehicles, and they pay additional taxes for traditional internal combustion engine vehicles [42]. Finally, in

Italy, despite promoting energy-efficiency improvements, fiscal subsidies remain largely inaccessible to low-income, energy-poor households [43].

Leaving aside the subsidies that are allocated to pay energy bills and focusing on those for implementing energy-efficiency measures, in the Czech Republic the effectiveness of the subsidy programme and the use of money is not entirely effective in view of the objective of reducing energy poverty [44]. Areas in Australia with lower economic resources and higher shares of rented dwellings were statistically significantly associated with lower intensity of retrofit subsidies [45]. The majority of households affected by energy poverty do not have sufficient financial means to invest (subsidies are paid retroactively and low-income households do not have funds to cover the expenses in advance) [46]. In the Estonian context, it is found that subsidies for energy efficiency can drive regional disparities, by less-privileged areas acquiring fewer subsidies, further worsening socioeconomic differences [47]. Direct subsidies (grants) are the most effective tool to enable energy-efficient renovations for low-income households without increasing energy poverty [48].

Turning to taxation, the way in which taxes on low-carbon programmes are regulated has adverse effects on vulnerable families [49,50]. In the literature we can also find studies on how to prevent taxation from contradicting state support to low-income families:

- Taxes or levies alone tend to be regressive and redistributive mechanisms are necessary. If taxes are used, the revenues should be returned through targeted benefits, renovation grants, or compensation schemes [48].
- A progressive tax on carbon emissions addresses the injustices of regressive carbon taxes that unfairly affect low-income households by charging a surcharge on carbon emissions, making carbon-intensive goods and services more expensive [51,52]. Studies corroborating this can be found in countries such as China [53], the United States [54], Denmark [55], Switzerland [56], and other countries in Europe [48].
- Funding low-carbon policy through general taxation would better align energy demand with policy costs and would reduce costs for 65% of UK households. Households comprising women of retirement age living alone; single-parent families; and households who have never worked or are long-term-unemployed could see reductions in bills by recovering climate policy costs through general taxation [17].
- When the tax relief scheme for energy renovation of existing building stock is implemented, as Ecobonus in Italy, low-income households that are not required to pay personal income tax do not benefit from these deductions [57] and although improvements were made to facilitate lower-income households in accessing the Ecobonus incentive scheme, it is concluded that it can be further improved.
- Concerning Income Tax Return, implementing a progressive tax policy—by raising higher tax rates—could help alleviate fuel poverty [58].

Three critical gaps motivate this study. The first is methodological: existing research examines subsidies [43–45,47] or taxes [51–58], separately; only one addresses both [48], but uses subsidies to solve tax problems rather than analysing their combined regressive effects. Second, analytical: energy poverty literature focuses on programme design [31–33] and behavioural barriers [16–20], neglecting institutional architecture—how interactions between the tax and social benefits systems influence outcomes. Studies document that low-carbon policies harm vulnerable households [27–29] but do not explain the legal and institutional mechanisms that lead to regressive outcomes. The last one is empirical: despite extensive “just transition” rhetoric [1,12,14], no prior research quantifies fiscal penalties where renovation subsidy recipients become net financial losers after tax liabilities and welfare clawbacks.

This study addresses these gaps through forensic documentation of fiscal–welfare cascades affecting vulnerable P. D. Orcasitas recipients, explicating the institutional mechanisms (tax classification, benefit reassessment, administrative fragmentation) that transform assistance into penalty. The contribution is diagnostic—demonstrating that a policy contradiction exists and has measurable adverse impacts. Building on these identified gaps, this study formulates specific research questions.

1.2. Research Aims and Hypotheses

Despite growing attention to just energy transitions, the literature exhibits a critical gap: insufficient analysis of how fiscal–welfare system interactions affect vulnerable households participating in building renovation programmes. Existing studies examine subsidies or taxes in isolation [48,57,58], but do not analyse their combined effects nor the institutional mechanisms through which one-time environmental subsidies trigger cascading penalties across tax and welfare systems.

This study addresses this gap through empirical analysis of the P. D. Orcasitas neighbourhood renovation project in Madrid, where vulnerable subsidy recipients experienced adverse fiscal outcomes. Drawing on theories of unintended consequences in public policy [35], which emphasise that policy failures often arise from unanticipated interactions between policy instruments, and the integrated theoretical framework described above, the following research questions and hypotheses can be formulated:

Research questions:

RQ1: What proportion of municipal building renovation subsidies do vulnerable recipients retain after accounting for tax liabilities and welfare benefit clawbacks?

RQ2: Through which institutional mechanisms do renovation subsidies trigger fiscal penalties for vulnerable households?

RQ3: How does administrative fragmentation across governance levels (municipal, national tax authority, social security) contribute to unintended regressive outcomes?

Hypotheses:

H1. *Vulnerable households receiving means-tested welfare benefits retain significantly less than 100% of gross renovation subsidy value due to combined tax liabilities and benefit withdrawals.*

H2. *The fiscal penalty is larger for households with multiple sources of means-tested benefits compared to those with single benefit sources.*

H3. *Administrative fragmentation prevents advance warning of fiscal consequences, violating procedural justice principles.*

These questions and hypotheses guide the empirical analysis of 22 documented cases where subsidy recipients received Social Security Institute claims for benefit reimbursement, enabling quantitative assessment of fiscal impact and qualitative examination of institutional mechanisms.

2. Case Study

The following case study has facilitated the identification of social issues within ongoing urban-scale energy renovation processes, which are essential for advancing city decarbonisation efforts while addressing fuel poverty.

P. D. Orcasitas is a public residential development located in southern Madrid (Figure 1). It was planned during the 1950s to absorb immigration through two options: property sale or self-provision. The latter allowed individuals to contribute to the construction of a single-family house, thereby reducing its cost [59,60]. Shortly after its construction,

during the 1970s, the entire complex was demolished due to severe deficiencies. A participatory intervention model spearheaded by the Neighbours' Association paved the way for a large-scale urban renovation initiative (1979–1986) in Madrid [61,62].

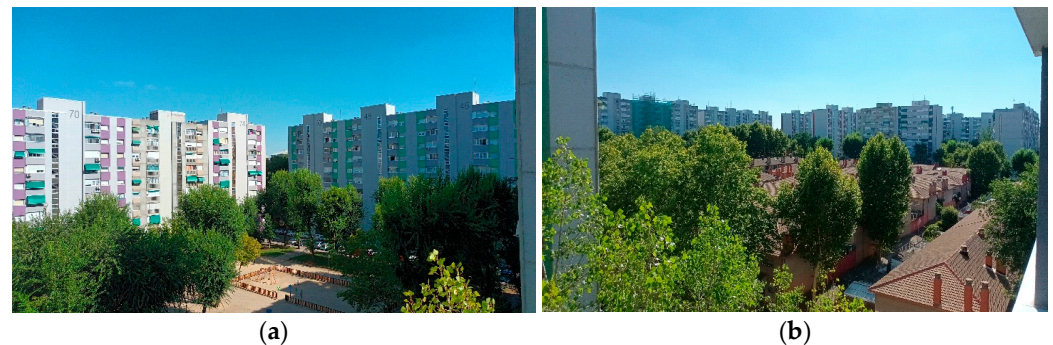


Figure 1. Images from the studied neighbourhood: block housing (a) and single-family housing (b).

The neighbourhood covers an area of 65 HA, with a population of approximately 11,950 inhabitants. It contains 4985 dwellings, of which 4835 are principal dwellings (97%). The area is presently listed in the official catalogue of deprived neighbourhoods [63]. It presents a degree of deprivation classified as slight. It exceeds the average municipal value of vulnerability in the educational level indicator, with 16.96% of the population aged 16 and over being illiterate or without education. It is home to a sizable elderly population, predominantly pensioners, with 16.03% of single-person households over 65 years old. The area also exceeds the municipal average value of unskilled employed people (14.11%). In addition to all this, the proportion of low-income residents is higher than the average for the city of Madrid [64].

2.1. Demographics of the Neighbourhood

The latest Population and Housing Census shows that the neighbourhood is home to 2328 people over the age of 65, representing 20% of its population. This percentage is in line with that of the city as a whole [65]. However, the average net income per household in the neighbourhood was €31,528 in 2021, which means that households in P. D. Orcasitas have 28% less income than the average municipal household (€43,953) [66].

According to statistical data from the Atlas of Household Income Distribution 2021, the population of P. D. Orcasitas derives its income mainly from employment (61.43% from wages), in a proportion similar to the average for the city of Madrid. In contrast, the proportion of households receiving their income from pensions, unemployment benefits, and others such as the minimum living wage represents 32%, which is significantly higher than the average for the city of Madrid (26%). The difference lies in the lack of income obtained through “other sources”, such as rental or capital income [66].

2.2. Neighbourhood-Scale Energy Renovation

In 2017, the neighbourhood began the thermal renovation works that have evolved over the years to achieve the highest rate of energy refurbishment in the municipality of Madrid. The project consists of the passive improvement of the opaque envelope to reduce the energy demand of buildings. This is achieved by adding insulation materials to common parts of the buildings: facades, roofs, and floors. This results in improved indoor comfort as well as savings in energy consumption, thus reducing the incidence of fuel poverty in the neighbourhood.

The renovation process analysed in this study began in the early 2000s due to new structural issues in the facades posing a threat to pedestrian safety. Since then, a significant portion of the buildings has been completely renovated thanks to the determination of

the Guetaria Neighbours' Association, which successfully communicated the danger to both residents and authorities [67]. The Homeowners' Associations sought public funding from Madrid City Council to improve energy efficiency, accessibility, sanitation, and building maintenance—achieving one of the highest renovation rates in the country. In 2018, the Madrid Regional Government designated the P. D. Orcasitas as a preferential urban renovation area, opening the door to new funding opportunities [68]. In addition to subsidies, citizens were able to access flexible and low-interest bank loans to help finance the project. This opportunity was made possible through agreements secured by the local authority with the Official Credit Institute and participating banks. These advantageous conditions, combined with a strong community solidarity, enabled vulnerable individuals to participate in the renovation plan and improve their buildings [69].

Despite the success of the operation, hindrances have emerged that jeopardise the inclusion of vulnerable individuals in neighbourhood renovation processes. Some particularly deprived households are being requested to reimburse welfare benefits acknowledged by the Social Security system. They ought to reimburse thousands of euros because of the amount they receive as renovation subsidies which are classified as capital gain in their Income Tax Return (IRPF, by its acronym in Spanish) statements [70].

At present, renovation subsidies are also being sought, including European funds from the Next Generation programme [71]. These renovation subsidies from the Recovery, Transformation and Resilience Plan have already addressed the issue of tax burdens through Royal Decree-Law 19/2021 and Law 10/2022. Among the urgent measures adopted to boost building renovation was the exclusion of these subsidies from taxable income under the IRPF. The extension of this measure to encompass other renovation subsidies is still pending. In cases like P. D. Orcasitas, the reimbursement of the minimum pension complement has caused social distress among elderly individuals with meagre retirement and survivors' pensions. Individuals whose contributory pensions fall below the legally established minimum are entitled to what is known as the "minimum pension complement".

At the European level, this project is regarded as an exemplary renovation operation which highlights the strong determination of citizens to achieve safe, healthy, and climate-friendly buildings. The experience was selected for the RENOVATE EUROPE campaign along with other successful cases in Italy, Croatia, France, and Belgium and was presented in Madrid in October 2023 [72]. This initiative seeks precisely to accelerate energy renovation, including the pending adoption of the update to the European Directive on Energy Performance in Buildings. The agreed text specifies that the most inefficient buildings must be renovated first, with priority given to assisting low-income individuals.

2.3. Refurbishment Subsidy Allocation

The urban renovation operation in P. D. Orcasitas has received public funding for various comprehensive refurbishment works including:

- Energy-efficiency improvement: Façade and roof insulation and monitoring;
- Building safety: Parapet removal;
- Indoor environmental quality: Asbestos removal and sanitation improvement.

Most of the financial assistance is sourced from municipal funding. Table 1 shows the data provided by Madrid City Council on its official Grant Viewer [73]. The subsidies granted to P. D. Orcasitas within different renovation programmes between 2020 and 2022 are shown.

Table 1. Subsidies granted by the Madrid City Council to P. D. Orcasitas (€).

Programme	Renovated (Units)	Total Budget (€)	Total Subsidy (€)	Average Budget per Dwelling (€)	Average Subsidy per Dwelling (€)	Budget % for Energy Efficiency	Subsidy % for Energy Efficiency
Renov. 2020	624	10,777,110	4,951,037	17,271	7934	57	86
Renov. 2021	296	5,179,455	3,491,262	17,498	11,795	59	63
Renov. 2022	73	1,437,496	896,460	19,692	12,280	60	61
Total	993	17,394,061	9,338,760	17,517	9405	58	75

Source: Subsidy data from building refurbishment plans managed through the delegated housing division, as recorded in the official Grant Viewer of Madrid City Council.

In addition to municipal subsidies, funds have been sought through the Community of Madrid from the national programme for urban renovation based on preferential areas. P. D. Orcasitas was included in this program and has received a total €866,262.95 in public funding (Department of Transport, Housing and Infrastructure 2018). Data on cost per dwelling from the recipient's perspective is provided by Guetaria Neighbours' Association. At the time of data collection for the study, 50 blocks had been renovated and 16 were under construction. Table 2 details the renovation costs borne by each household, distinguishing between full costs, subsidised costs, and low-interest loans.

Table 2. Project financial information. Cost per dwelling (€).

Concept	Until 2022 (€)	Currently (€)
Estimated average cost per dwelling in a multi-family block, without subsidy: thermal envelope and removal of asbestos and parapets	20,000	25,000
Subsidised cost (80% approx.)	16,000	-
Bank loans to housing associations, with low interest rates and flexible repayment schemes	4000	-
Cost by dwelling without subsidy: thermal envelope, aerothermal, and photovoltaic solar panels	-	60,000

Source: Data provided by Guetaria Neighbours' Association.

To finance the remaining works—48 multi-family blocks and 1020 single-family houses—support has been sought from the municipal programme REHABILITA 2023, with plans underway to seek funding from the European recovery program Next Generation. These aids are compatible, cumulative, and are listed in the National Subsidies and Public Funding Transparency Portal (Ministry of Finance 2024). The success of the initiative has been such that the creation of a renewable energy community through photovoltaic solar energy to decarbonise the entire area is already under consideration. The operation would start with 1020 single-family houses—two of which are already renovated—and public funding has been requested to renovate another 58.

Having established the context, we now outline the methodological approach used to document and quantify the fiscal impacts.

3. Methodology

This study employs a mixed-methods approach. It combines quantitative tax accounting analysis with legal examination of regulatory frameworks. The goal is to assess the fiscal burden imposed on vulnerable households following subsidy receipt. The methodology is structured in several sequential phases designed to capture both the individual-level financial impact and the broader systemic implications of current taxation policies on

energy-efficiency interventions. Figure 2 presents the methodological workflow of the study, outlining the sequential research phases from data collection to fiscal analysis and legal review.

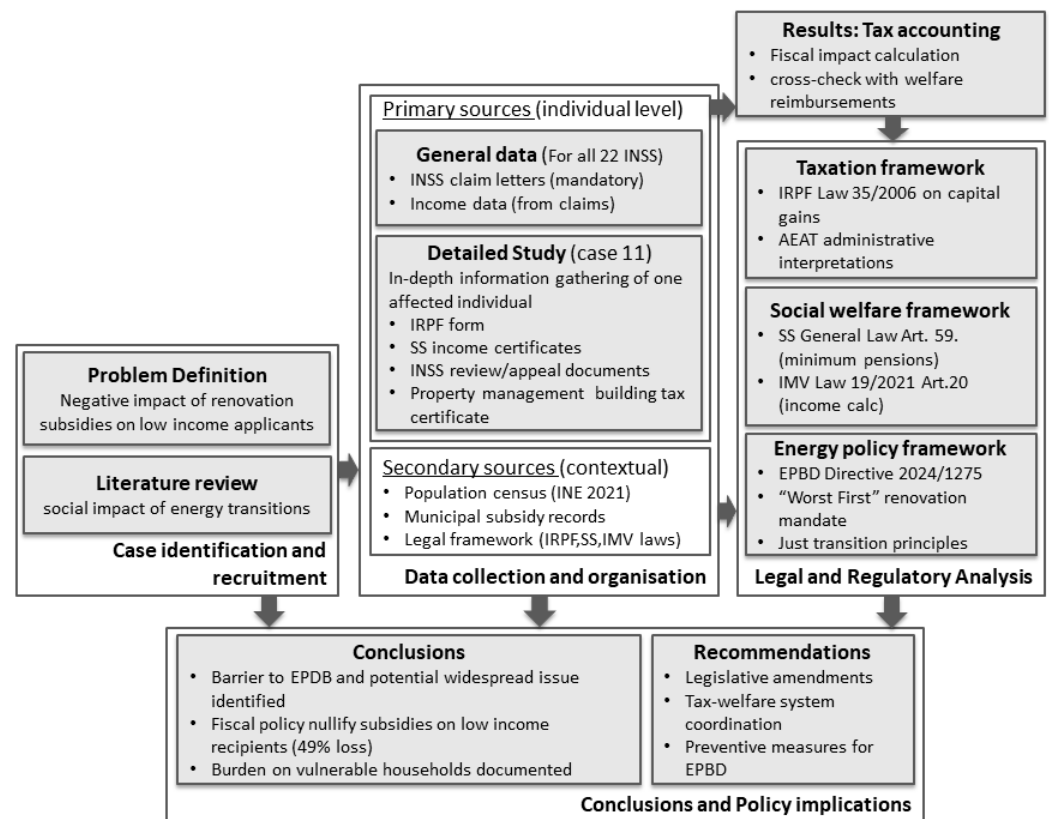


Figure 2. Methodological diagram of research phases and processes.

3.1. Research Design

This research adopts an exploratory case study methodology focused on beneficiaries of the P. D. Orcasitas neighbourhood refurbishment project in southern Madrid. The study design prioritises in-depth documentation of an emerging phenomenon—the fiscal penalization of vulnerable renovation subsidy recipients—over statistical generalizability. This approach is appropriate given that: (1) the problem was unknown until affected households reported Social Security claims in 2023, (2) no sampling frame exists for this hidden population, and (3) the research objective is to identify and characterise the institutional mechanisms producing adverse outcomes rather than estimate population parameters.

The study follows established case study protocols for theory-building research [74], where detailed examination of information-rich cases enables identification of causal mechanisms and generation of testable hypotheses for future research. The P. D. Orcasitas case was selected because it provides complete documentation across all phases of the fiscal cascade (subsidy allocation, tax classification, welfare benefit reassessment), enabling reconstruction of administrative processes typically opaque to researchers.

The 22 cases analysed represent all documented instances where P. D. Orcasitas subsidy recipients filed formal claims with the Spanish Social Security Institute (INSS) by the data collection cutoff (September 2023). This constitutes a census of accessible cases rather than a probabilistic sample. While this convenience sampling introduces potential selection bias—excluding households unaware of their right to appeal or unable to navigate bureaucratic processes—it provides the only available empirical evidence of a phenomenon with no official statistics.

The study's contribution lies not in statistical inference to broader populations but in analytical generalisation—demonstrating that the legal–institutional mechanisms documented in P. D. Orcasitas operate uniformly across Spain (IRPF Law 35/2006, Social Security regulations apply nationally). The case illuminates a systemic policy contradiction applicable wherever: (1) municipal renovation subsidies lack tax exemptions, (2) vulnerable households receive means-tested benefits, and (3) administrative agencies operate without coordination. Future research using probabilistic sampling across multiple municipalities would enable estimation of prevalence, but this exploratory study establishes that the phenomenon exists and merits policy attention.

3.2. Sampling and Recruitment

The target population comprises vulnerable households in the P. D. Orcasitas neighbourhood who received municipal building renovation subsidies between 2020 and 2022 and subsequently experienced adverse fiscal consequences, recruited through the Guetaria Neighbours' Association's outreach to affected residents. Specifically, the study focuses on recipients of state-recognised welfare benefits (minimum pension complements or Minimum Living Income) who received administrative claims from the Spanish Social Security Institute (INSS) for benefit reimbursement following subsidy receipt.

Regarding the recruitment protocol, the data collection took place during 2023. Information leaflets were displayed in the 59 blocks that had been refurbished (from the total 108 blocks in the neighbourhood). Each block contains an average of 20 dwellings. This meant that all participants in the renovation programme had the opportunity to read about the campaign.

3.2.1. Sample Size Justification

This study employs a purposive sample of 22 verified cases representing all accessible households that: (a) received building refurbishment subsidies in the P. D. Orcasitas renovation project (993 total dwellings renovated), (b) subsequently faced tax penalties due to subsidy classification as capital gains, (c) filed formal claims with the Spanish Social Security Institute, and (d) provided complete documentation through collaboration with the residents' association. This represents a response rate of less than 2.5%, but we must take into account that:

- A total of 993 homes have been renovated out of a total of 4985 properties, likely including many of those in the worst condition and, therefore, with a higher proportion of vulnerable residents.
- As stated in the case study description, the proportion of the population whose income depends on a pension, the IMV or an unemployment benefit is 32%. In other words, approximately 318 households receive these types of income.
- In the Community of Madrid, pensions that include this minimum supplement account for 13.8% of the total number of pensions [75]. Assuming that the proportion of those receiving IMV compared with those receiving unemployment benefit is the same, if we apply this to all the incomes mentioned above, a total of 44 households potentially received Social Security claims.

If all these assumptions are correct, the response rate is 50%. In any case, the sample is a convenience sample, obtained through non-probability sampling, comprising cases identified via the residents' association.

3.2.2. Detailed Study Assessment of a Particular Case (Affected 11)

To complement the aggregate quantitative findings, one representative case was selected for in-depth examination. The recipient appealed the resolution of Social Security

and requested its review, so she/he possessed complete documentation across all phases of the process. The participant expressed a willingness to share detailed documentation. Furthermore, the case is highly representative because the values of the key variables are roughly the same as the averages:

- Income level: €9655.80 (sample mean: €9577.34);
- Capital gains: €15,478.67 (sample mean: €14,324.64);
- Clawback amount: €8907.20 (sample mean: €6145.36).

The following documentation was provided and helped to complete the information extracted from the letters notifying the claim:

- Resolution of the review process for the statement and reimbursement of the welfare improperly received as minimum pension complement (5 July 2023);
- Resolution of the prior claim in the procedure for review and reimbursement of the undue collection of Social Security economic benefits (14 July 2023);
- Certificate from the renovated property management reporting the total cost of the building renovation works and the share coefficient per dwelling (6 September 2023);
- Security Social Income Certificate (2021);
- IRPF statement, tax year 2021 (form 100) (23 May 2022).

This granular analysis illuminated the procedural pathway through which subsidy receipt translated into net financial loss, revealing administrative mechanisms that might otherwise remain obscured in aggregate data.

3.3. Data Collection

In the summer of 2023, an 80-year-old resident of the P. D. Orcasitas neighbourhood contacted the neighbourhood association with a complaint from Social Security demanding the return of her minimum pension supplement. After a second similar case, it was verified that the increase in capital gains corresponded to energy renovation subsidies from the Madrid City Council. The association publicised the problem through notices in the blocks in the neighbourhood, asking those affected to get in touch.

Primary data collection centred on administrative claims filed with the Spanish Social Security Institute (Instituto Nacional de la Seguridad Social, INSS) by affected beneficiaries. These letters serve as official notifications to recipients, initiating an administrative procedure for reimbursing the social benefits they received in 2021.

All of the claims notify a review procedure for the reimbursement of the social benefits received as minimum pension complements throughout 2021. The shared legal ground is that the declarant or their spouse's income exceeds the legally established limit from employment (excluding pension), capital income, or economic activities, and/or capital gains. This consideration applies both to the minimum pension complement and the IMV (Head of State).

A standardised data collection form was used. Each claim file contained the following information:

- Type of benefit: Survivor's pension, retirement pension, or IMV.
- Wage payments, labour returns: Under this category, the affected individuals declare the pensions and complements received.
- Capital gains: Used to calculate the final amount of the building refurbishment subsidy. The following concepts are included:
 - Capital gains;
 - Capital gains not derived from transfers (general taxable base);
 - Real estate capital gains and special payments.

- The total claimed amount and settlement conditions, which entail a monthly deduction from their social benefits.

Additional economic data were collected to contextualise the fiscal impact within each household's overall financial situation. Beyond fiscal data, the claims documentation reveals multiple dimensions of vulnerability among affected households. Social vulnerability manifests through participants' reliance on state-recognised welfare benefits (minimum pension complements, IMV), reflecting their position at the economic margins. Housing vulnerability is evidenced by their residence in deprived neighbourhoods requiring renovation and their inability to finance improvements without subsidies. Administrative vulnerability emerges through participants' difficulties understanding tax-welfare system interactions, as demonstrated by their reliance on the Neighbours' Association for support in navigating the appeals process. Trust in institutions is implicitly captured through participants' willingness to file formal claims despite potential stigma, and through their expressed frustration with administrative fragmentation between municipal subsidy providers, national tax authorities, and Social Security. These additional dimensions, while not quantified as separate variables, inform our interpretation of how fiscal penalties intersect with broader vulnerabilities to produce compounded disadvantage.

3.4. Tax Accounting Analysis

The information has been analysed on a case-by-case basis. The initial amounts taken into consideration were the welfare benefits received by each case and their income. Then, the fiscal impact of this aid (capital gains and claimed amounts) has been calculated.

The core quantitative analysis involved a detailed reconstruction of tax calculations for each of the 22 beneficiary households. This process required determining how renovation subsidies were classified and taxed under Spanish personal income tax legislation. The analysis proceeded through the following steps:

1. Taxable base calculation: For each household, the pre-subsidy taxable base was established using income data from the tax year preceding subsidy receipt. This baseline figure incorporated all income sources including wages, pensions, welfare benefits, and other regular income streams.
2. Capital gains classification: Following the legal interpretation mandated by the State Agency of Tax Administration (Agencia Estatal de Administración Tributaria, AEAT), renovation subsidies were reclassified as capital gains derived from lucrative transfers rather than non-taxable grants. The full subsidy amount was added to each household's general taxable base for the fiscal year in which payment was received.
3. Clawback during IRPF: For each household, the difference between original tax liability (pre-subsidy) and adjusted tax liability (post-subsidy classification) represented the direct fiscal cost of subsidy receipt.
4. Welfare benefit clawback: A previously granted benefit that the tax authority recovers (partially or fully). The increase in taxable income resulting from subsidy classification triggered reassessment of means-tested welfare benefits. For recipients of non-contributory retirement pensions and IMV, the income threshold exceedance led to either a reduction or complete withdrawal of benefits. Here is data collected from INSS claims.

3.4.1. Tax Calculation Procedures

The calculation of tax payable is divided into two parts: a national component and a component for the Community of Madrid. Tax rates are applied in intervals. Table 3 outlines the national and regional tax brackets used to calculate income tax liabilities under the IRPF framework.

Table 3. Tax calculation: National component and the component for the Community of Madrid.

National Component		
Interval (€)	Tax Rate	Amount (€)
0–12,450	9.5	taxable base $\times$ 9.5, up to a maximum of 1182.75
12,450–20,200	12	taxable base $\times$ 12, up to a maximum of 2112.75
20,200–35,200	15	taxable base $\times$ 15, up to a maximum of 4362.75
Component for the Community of Madrid		
Interval (€)	Tax Rate	Amount (€)
0–12,450	9	taxable base $\times$ 9, up to a maximum of 1120.5
12,450–17,707.20	11.2	taxable base $\times$ 11.2, up to a maximum of 1709.31
17,707.20–33,007.20	13.3	taxable base $\times$ 13.3, up to a maximum of 3744.21
33,007.20–53,407.20	17.9	taxable base $\times$ 17.9, up to a maximum of 7395.81

In each component, the amount corresponding to that interval is added to the maximum amount of the previous interval. Ultimately, the actual tax rate is calculated by dividing the tax payable by total gains (taxable base + capital gains).

3.4.2. Variables and Operationalization

Four key variables were operationalised throughout this analysis: (1) gross subsidy—the total monetary value of the renovation grant received; (2) taxable base—the household’s total income subject to personal income tax; (3) capital gains—the amount of subsidy reclassified as taxable income; and (4) clawback—the total value of withdrawn or reduced welfare benefits resulting from increased reported income.

$$\text{Clawback during IRPF} = (\text{Tax payable}_{\text{post-subsidy}}) - (\text{Tax payable}_{\text{pre-subsidy}})$$

where

- Tax payable_{post-subsidy} = regular income + capital gains from subsidy;
- Tax payable_{pre-subsidy} = regular income only;

$$\text{Subsidy NETA (net subsidy received)} = \text{gross subsidy} - \text{clawback during IRPF} - \text{welfare benefit clawback.}$$

Data on welfare benefit clawbacks is data collected from INSS claims.

3.5. Data Analysis

Quantitative data from the 22 cases were analysed using forensic accounting methods appropriate for documentary case studies. The analysis proceeded through three stages:

1. Individual case reconstruction;
2. Descriptive statistics;
3. Comparative analysis.

Given the non-probabilistic sample and exploratory objectives, comparative case analysis was employed rather than inferential statistics. The goal is to identify patterns and mechanisms, not to test null hypotheses about population parameters. This approach is consistent with theory-building case study methodology where detailed examination of information-rich cases reveals causal processes.

Regarding reproducibility, all calculations are traceable to source documents (INSS claims, IRPF forms, subsidy certificates). The analytical protocol is documented in sufficient detail to enable independent verification by researchers with access to equivalent administrative records.

3.5.1. Descriptive Statistics

For each household, the calculated variables were: (a) gross subsidy received, (b) tax liability (IRPF), (c) welfare benefit clawback (INSS claim), and (d) net subsidy retained (gross minus losses). All calculations were verified against official documentation (tax forms, Social Security claims).

Mean, median, range, and standard deviation were calculated for all fiscal variables across the 22 cases, enabling characterisation of central tendency and variability in outcomes.

For the comparative analysis, cases were stratified by: (a) benefit type (survivor's vs. retirement pensions), (b) subsidy amount (terciles), and (c) data completeness to assess whether fiscal impacts vary systematically across household characteristics or represent uniform policy effects.

Statistical significance testing was not applied given the small sample size and non-probabilistic sampling approach; instead, findings are presented as descriptive evidence from this particular case study.

3.5.2. Missing Data Handling

Not all cases contained complete information for every variable due to variations in documentation completeness and differences in individual circumstances. Where data were unavailable or not applicable for specific variables, entries were marked as "na" (not available) in the analytical tables. These missing values were excluded from the calculation of average values and summary statistics for the affected variables. This listwise deletion approach for specific variables ensured that mean calculation reflected only cases with complete data for each measure, preventing distortion of central tendency estimates.

3.5.3. Sensitivity Analysis

A sensitivity analysis explores alternative tax scenarios, comparing them with other taxation legislations, so that the robustness of the model can be assured. Two scenarios will be analysed: the regulation of the taxation and minimum income in the Basque Country, and the regulation of the Next Generation subsidies. As the tax rate varies within a very narrow range, an alternative scenario involving this variable is not considered.

3.6. Data Validation Procedures

Tax calculations were validated thanks to, on the one hand, the detailed case information provided by Affected 11, and on the other, the tax authority's 2021 Income Tax Practical Guide ("Manual práctico de Renta 2021" in Spanish) [76]. Finally, consistency was checked across all 22 cases.

3.7. Legal and Regulatory Framework Analysis

Parallel to the empirical tax analysis, a systematic review of applicable legal and regulatory frameworks was conducted. This review encompassed three primary domains:

- Taxation legislation: Spanish personal income tax law (Ley del Impuesto sobre la Renta de las Personas Físicas) was examined to identify the specific provisions governing classification of renovation subsidies, with particular attention to the distinction between taxable capital gains and exempt grants. Administrative interpretations issued by the AEAT were analysed to understand the rationale for treating municipal renovation subsidies as lucrative transfers.
- Energy performance regulations. The transposition of the European Union's Energy Performance of Buildings Directive (EPBD) into Spanish law was reviewed to assess alignment between energy-efficiency policy objectives and fiscal treatment of renovation support mechanisms. This analysis considered whether taxation policy

contradicts or undermines the stated goals of improving building energy performance whilst protecting vulnerable populations.

- Social welfare legislation. Regulations governing eligibility and income thresholds for non-contributory pensions and IMV were examined to determine how temporary income increases from one-time subsidies affect benefit calculations designed for the assessment of regular, recurring income.

3.8. Ethical Considerations

Data confidentiality and ethical considerations were addressed through anonymisation protocols. All personal identifiers were removed from the dataset, and individual cases are referenced only through assigned numerical codes (id 1–22). Informed consent was obtained from all participants, with explicit authorisation to access tax and welfare benefit documentation for research purposes and the right to withdraw at any time.

3.9. Limitations

This study has several important limitations that must be acknowledged. First, the non-probabilistic convenience sample ($N = 22$) precludes statistical generalisation to the broader population of vulnerable renovation subsidy recipients in Spain. The sample represents only households who: (a) received INSS claims, (b) contacted the Neighbours' Association, and (c) provided documentation. Unknown is the total number of affected households nationally or the proportion who failed to contest benefit withdrawals. So, selection bias is likely, as more educated, assertive, or administratively capable households may be overrepresented, while the most vulnerable—those lacking awareness or advocacy capacity—remain invisible.

The study cannot estimate prevalence accurately, fiscal penalties occur and we quantify their magnitude for documented cases, but we cannot determine what percentage of Spain's renovation subsidy recipients experience similar outcomes. However, based on the assumptions outlined in Section 3.2.1, it is possible that approximately half of the cases may have been captured. Establishing prevalence more precisely would require: (a) matched administrative data linking municipal subsidy databases with national tax and social security records (currently unavailable), or (b) probability sampling across multiple municipalities with diverse subsidy programmes (beyond this study's scope).

The study employs comparative case analysis rather than inferential statistics. While this precludes hypothesis testing about population parameters, it is appropriate for exploratory theory-building research documenting newly identified phenomena. The uniform outcomes across cases and legal analysis demonstrating identical mechanisms apply nationally and support the analytical generalisation of findings.

Regarding missing data, 18% of cases lack complete fiscal documentation and so this further limits quantitative precision, though patterns are consistent across complete cases.

The single-site case study (Madrid municipality, one neighbourhood) cannot capture regional variation in subsidy structures, tax supplements, or welfare programmes, though the underlying legal framework (IRPF, Social Security) applies nationally.

Finally, the study captures only documented fiscal impacts and cannot quantify indirect costs (administrative burden, psychological stress, opportunity costs associated with navigating appeals processes).

Despite these limitations, the study makes three defensible contributions: (1) it provides the first empirical documentation of an unintended consequence of building renovation policy affecting vulnerable populations, (2) it identifies specific institutional mechanisms (tax classification, benefit reassessment, administrative fragmentation) that building renovation stakeholders and policymakers must address, and (3) it demonstrates that

well-designed building interventions can produce regressive fiscal outcomes when policy coherence across sectors is absent—a critical insight for implementing EPBD mandatory renovations targeting deprived neighbourhoods.

The study's value lies in problem identification and mechanism elucidation rather than population inference. It establishes proof-of-concept that fiscal-welfare cascades occur, quantifies their magnitude in documented cases, and provides sufficient evidence to warrant policy review and further research.

4. Results

Upon analysing the claims, it is observed that all recipients are listed in the state records as “socially vulnerable”. All of them receive a complement to their pensions except one, who receives the so-called IMV implemented during the COVID-19 pandemic.

Below are presented the results of the analysis of the 22 claims and the qualitative study of Affected 11, from which conclusions are drawn.

4.1. Gathered Information Analysis

As shown in the neighbourhood demographics, holders of pensions, unemployment benefits, and others such as the minimum living wage are overrepresented. This is the reason for the typology of the collected cases.

In Spain, the provision for a minimum pension complement is outlined in Article 59 of the General Social Security Law. Pensioners are entitled to this complement if their contributory pension falls below the legally established threshold (Ministry of Employment and Social Security 2016):

Art. 59. 1—Recipients of contributory pensions from the Social Security System, who do not receive income from employment, economic activities or capital gains—as defined in the Income Tax Return—or who, if receiving them, do not exceed the amount annually established by the corresponding General State Budget Law, shall be entitled to receive the necessary complements to reach the minimum amount of pensions, provided they reside in Spanish territory, under the terms determined by law or regulation.

In the case of the IMV, Article 20 of Law 19/2021, of 20 December, establishes the calculation of income and assets for this benefit [77]:

f) Income calculation shall exclude:

1.º The exempt income referred to in paragraphs b, c, d, i, j, n, q, r, s, t, x e y of Article 7 Law 35/2006 of November 28th, on Income Tax Return and partial modification of the laws on corporate Income Tax, Non-Residential Income Tax, and Wealth Tax.

2.º Study grants and housing aids, both for rental and acquisition.

3.º Income exempt for the obligated payer shall include spousal allowance payments, as required by Article 93 of the Civil Code, provided that such payments have been made.

4.º Income exempt for the obligated payer shall include child support payments, as required by Article 93 of the Civil Code, provided that such payments have been made.

In this case, housing rental or acquisition aids are considered exempt from income calculation, while building renovation subsidies are not mentioned.

4.2. Details Provided by the Claims

The income information of the individuals affected by the claims, as well as the subsidy amount allocated for their dwelling renovation, has been inferred from the data within the files. This has eased the calculation of the subsidy's impact on tax payments and enabled its cross-referencing with the claimed amount. Table 4 compiles key financial variables for the 22 verified cases, including the taxable base, subsidy amount, capital gains, tax clawback, welfare benefit reductions, and net subsidy received. This table constitutes the empirical

backbone of the study, revealing the extent to which tax and welfare interactions diminish the effectiveness of renovation subsidies. The results show that the declared amounts (excluding pensions) roughly align with the subsidy amounts gathered from Madrid City Council's official Grant Viewer (Table 1).

Table 4. Taxable base, subsidies, taxes, and amounts claimed in the 22 cases analysed.

Id	Welfare	Taxable Base (€)	Capital Gains (€)	Actual Tax Rate (%)	Clawback at IRPF (€)	Welfare Benefit Clawback (€)	Subsidy NETA (€)	% Subsidy Received
1	Survivor's	9655.80	24,220.26	23.8%	6277.57	3876.46	14,894.24	58%
2	Survivor's	9655.80	15,436.93	22.1%	3751.92	5454.82	6508.80	40%
3	Retirement	11,914.00	8758.56	20.7%	2083.25	2833.04	3954.84	44%
4	Survivor's	na	na	-	-	1210.72	-	-
5	Survivor's	9655.80	14,596.90	21.9%	3514.19	671.02	10,641.58	71%
6	Survivor's	10,147.06	14,185.84	21.9%	3446.01	4817.68	6176.35	42%
7	Survivor's	na	na	-	-	2256.24	-	-
8	Survivor's	9655.80	15,117.67	22%	3661.57	4957.40	6758.79	43%
9	Survivor's	9655.80	11,416.46	20.9%	2614.13	3886.68	4961.08	43%
10	Survivor's	9655.80	20,527.43	23.1%	5192.53	2921.80	12,986.96	60%
11	Survivor's	9655.80	15,478.67	22.1%	3763.73	5421.64	6292.75	41%
12	Survivor's	na	na	-	-	723.24	-	-
13	Survivor's	na	na	-	-	1512.00	-	-
14	Survivor's	9655.80	10,618.56	20.6%	2388.32	3202.08	5027.30	47%
15	IMV	927.71	15,800.34	19.7%	3124.13	na	-	-
16	Retirement	15,989.08	16,175.53	23.4%	3124.32	658.98	12,392.23	77%
17	Survivor's	9655.80	10,799.53	20.7%	2439.54	2585.52	5784.12	53%
18	Retirement	9164.40	8602.98	19.9%	1842.74	1477.88	5189.43	61%
19	Retirement	9164.40	17,517.02	22.4%	4292.43	4728.50	8847.19	48%
20	Survivor's	7315.00	12,108.89	20.4%	2603.97	531.86	8852.53	74%
21	Retirement	11,212.40	11,364.23	21.4%	2751.89	3846.64	4960.64	42%
22	Survivor's	9655.80	15,117.67	22%	3661.57	3794.42	7921.77	51%
Total *		172,392.05	257,843.47	-	60,533.82	61,368.62	128,967.02	-
Average		9577.34	14,324.64	21.6%	3334.64	2887.08	7585.66	53%

* The total corresponds to the cases for which information is available. na: information not available.

Of the 22 cases, 17 (77%) provided complete information across all variables, while 5 (23%) had partial data. Missing values occurred in the taxable base and capital gains (4 cases, 18% each) due to incomplete documentation and in welfare benefit clawback (1 case, 5%) where the IMV revision process was still ongoing. Variables with missing data were excluded from relevant calculations using listwise deletion, ensuring summary statistics reflected only complete cases for each measure. This approach maintained data integrity while retaining all available information for other variables. Table 5 provides descriptive statistics that summarise the dataset.

Table 5. Statistical data on the main variables.

Variables	N	Mean	SD	Min	Max
Taxable base (€)	18	9577.34	2525.8	927.71	15,989.08
Capital gains (€)	18	14,324.64	3885.35	8602.98	24,220.26
Actual tax rate (%)	18	21.56%	1.15%	19.7%	23.8%
Clawback during IRPF	18	3334.64	1122.07	1842.74	6277.57
Welfare benefit clawback (€)	21	2887.08	1637.51	531.86	5454.82
Subsidy NETA (€)	17	7585.66	3174.51	3954.84	14,894.24
% subsidy received	17	53%	11.59%	40%	77%

The actual percentage received has been calculated by adding the corresponding refund made through the payment of the IRPF and the amounts claimed by the Social Security. The results show a range from 40% to 77% of the gross subsidy. Therefore, considering all the affected individuals, the key finding is that only 53% of the gross subsidy is being received.

Comparative Analysis

To assess whether fiscal impacts vary systematically across household characteristics, comparative analyses within our sample were conducted:

- By benefit type: Recipients of survivor's pensions (N = 17) lost an average of 50.2% of gross subsidy value, compared to retirement pension recipients (N = 4, 48.7% loss). The single IMV recipient's outcome could not be compared due to ongoing reassessment. No statistically significant difference exists between pension types (data insufficient for formal testing), suggesting the fiscal mechanism operates uniformly regardless of benefit source.
- By subsidy amount: Cases were stratified into terciles by capital gains received. The lower tercile (€8603–€11,417, N = 6) retained 52% on average; the middle tercile (€14,186–€15,478, N = 6) retained 49%; the upper tercile (€16,175–€24,220, N = 6) retained 50%. This pattern contradicts progressive taxation expectations—proportional losses remain constant across subsidy amounts, demonstrating the regressive nature of the policy.

Variations across strata are minimal, suggesting fiscal mechanisms operate uniformly regardless of household characteristics—a regressive rather than progressive effect.

4.3. Detailed Study of a Particular Case

The Affected 11 case is one of the examples analysed in P. D. Orcasitas from which information has been expanded (Table 6). The Social Security Institute requests the refund of €5421.64, corresponding to the amount received as a minimum complement to the survivor's pension. Upon receiving the letter requesting the refund of improperly received benefits, a claim was filed arguing that the increase in assets was due to the renovation works promoted by the Homeowners' Association in their building. The letter included a document from property management stating the distribution of the subsidy received by the Homeowners' Association, amounting to a total of €350,020.51. A letter from property management is provided stating the distribution of this amount among all property owners. Though this demonstrates that the subsidy payment did not increase their wealth, the appeal has been dismissed. The pension received by Affected 11 is detailed in the IRPF statement provided.

Table 6. Comparative analysis of fiscal impact across household characteristics.

Stratification	N	Mean Subsidy (€)	Mean Tax (€)	Mean Clawback (€)	Mean Retention %
By Benefit Type:					
Survivor's pension	17	14,462	3254	3017	49.8%
Retirement pension	4	13,785	3098	2675	51.3%
IMV	1	15,800	3555	na	n/a
By Subsidy Amount (Terciles):					
Lower (€8603–€11,417)	6	10,259	2308	2431	52.0%
Middle (€14,186–€15,478)	6	14,845	3340	3274	49.1%
Upper (€16,175–€24,220)	6	18,456	4153	3468	50.2%

na: information not available.

Additionally, an income certificate is provided stating an “Employment Income: Survivor's pension” of €9655.8. This amount is distributed in fourteen monthly payments of €689.70. Without the minimum pension complement, the resulting annual pension is €4234.16, divided into fourteen payments of €302.44. The affected individual also declares capital gains amounting to €15,478.67, a sum corresponding to the percentage of participation in the subsidy granted to the Homeowners' Association. The IRPF resulted in a payment of €3764.28 which was settled in two instalments. This means that through the IRPF, the affected individual returned 22.1% of the subsidy received. In summary, following the receipt of an energy renovation subsidy of €15,478.67, and accounting for the applicable national and regional tax liabilities, the outcome is a payment of €3764.28 to the Treasury (22.1%) and a refund of €5421.65 to the Social Security Institute. These amounts correspond to 59% of the energy renovation subsidy received. Moreover, there is also the obligation to repay the loan subscribed to cover the remaining amount, as the subsidy does not cover the entire cost of the renovation works. Table 7 presents the detailed breakdown of the representative case of “Affected 11”, illustrating how subsidy classification results in simultaneous tax obligations and welfare benefit repayment. This granular data helped to understand the mechanism of the fiscal–welfare cascade at the individual level.

Table 7. Detailed study of Affected 11.

Concept	Amount (€)	Percentage
Full pension	9655.8	
Pension without the minimum complement	4234.16	
Capital gains (subsidy)	15,478.67	
Tax payable	5550.6	22.1%
Clawback during IRPF	3764.28	
Refund requested by the Social Security (minimum complement)	5421.64	
Total amount claimed (regarding the subsidy)	9185.92	59%

Source: Data provided by the Spanish Social Security Institute.

4.4. Administrative Cascade of Penalties, Secondary Benefit Losses and Governance-Level Synthesis

Beyond the direct fiscal impacts observed through Income Tax Return (IRPF) liabilities and Social Security reimbursement claims, affected residents experience additional losses in

welfare benefits that intensify their vulnerability. Figure 3 and Table 7 together illustrate the multi-level administrative mechanisms that convert a housing energy-efficiency subsidy into a series of penalties across tax, welfare, and social protection systems. Figure 3 shows a conceptual map of the process across the various administrative levels. A single municipal subsidy triggers sequential penalties across independent national agencies (tax authority, social security, secondary benefit systems) with no way of avoiding it.

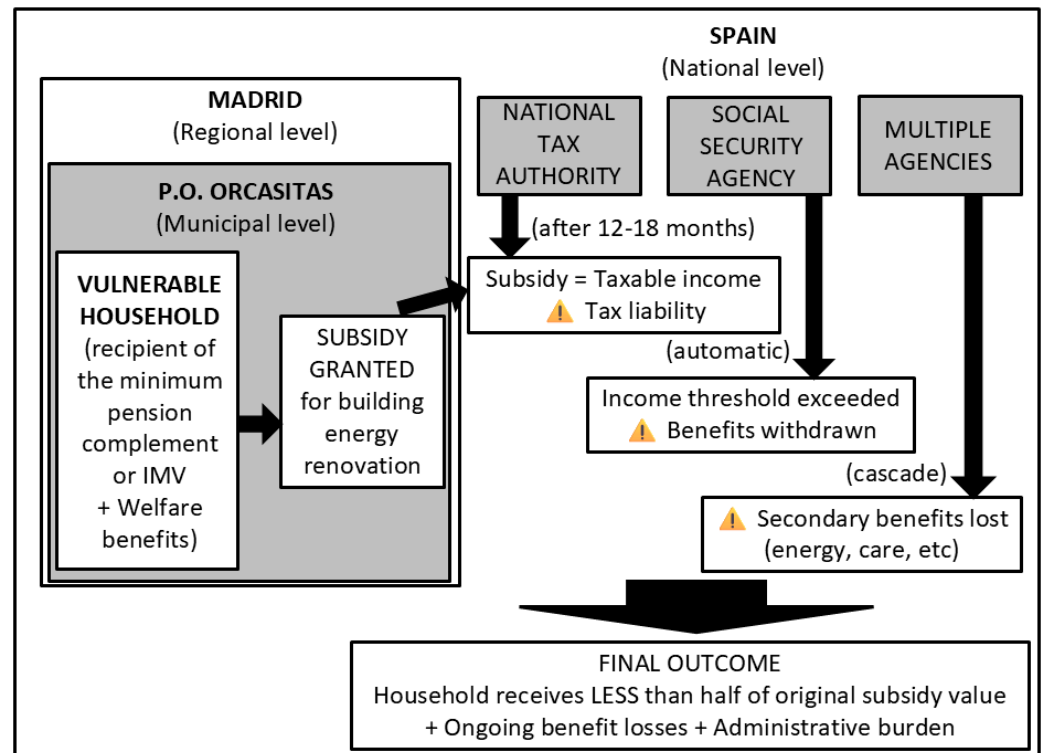


Figure 3. Cascading administrative consequences of building renovation subsidies across multi-level governance in Spain.

Additionally, affected neighbours reveal that alongside these refund claims, there are further welfare benefits being lost. These include electricity and natural gas social benefits, home care assistance, and financial support for public eldercare homes. The long-term implications are severe: social energy bonuses provide 40–80% discounts on utility bills, and their loss may reintroduce energy poverty despite improved building efficiency—potentially negating the renovation’s intended benefits. In the same way, care-related benefits are withdrawn when the subsidy temporarily increases households’ reported income, even though their actual economic capacity and care needs remain unchanged. Moreover, it has also been reported that discounts for medications and financial aid for social-integration devices such as hearing aids are being withdrawn. These additional losses further compound the impact of the fiscal penalties, illustrating how subsidy taxation can generate long-lasting vulnerability.

To synthesise these results within a multi-level governance perspective, Table 7 summarises how each administrative layer contributes to the final outcome. This integrated overview highlights that the adverse effects documented in the case study stem from structural misalignments between EU renovation objectives, national tax regulations, and regional/local welfare systems. The key finding here is that at least 59% of the received subsidy had to be refunded. Table 8 synthesises the main findings across EU, national, and regional governance levels. Its purpose is to understand how systemic misalignments, rather than isolated errors, underpin the adverse fiscal impacts documented by this research. It also highlights how the observed fiscal penalties arise not from a single administrative

decision, but from the interaction of uncoordinated regulatory frameworks operating at multiple institutional layers.

Table 8. Summary of main findings and governance-level implementation.

	Main Finding	EU Level	National Level (Spain)	Regional/Local Level (Madrid)
Subsidy Provision	€9405 average per dwelling	“Worst first”, Renovation Wave	National renovation programmes	Madrid/Orcasitas grants subsidies
Tax Classification	Subsidies as taxable capital gains	No EU-level tax harmonisation	Certain exemptions (IRPF Law 35/2006)	May ask for exemptions
Fiscal Impact	Tax + welfare clawbacks $\approx$ 49% subsidy loss	No fiscal policy at EU level	No coordination between AEAT and INSS	No coordination with national agencies
Secondary Benefit Losses	Energy bonuses, care aids lost	No EU-level harmonisation	Benefits withdrawn based on IRPF data	Inability to prevent losses

The impact of renovation subsidies extends far beyond direct tax liabilities. The combined effect of taxation, benefit clawbacks, and the withdrawal of essential welfare services reveals a systemic misalignment that disproportionately burdens households already recognised as socially vulnerable. These findings underscore the need for coordinated policy approaches that integrate energy-efficiency objectives with fiscal and social protection frameworks.

These empirical findings raise important questions about policy design and institutional coordination, which are discussed below.

5. Discussion

The P. D. Orcasitas case confirms theoretical predictions from policy coherence theory [34] and unintended consequence frameworks [35]: administrative fragmentation across governance levels produces fiscal–welfare cascades that transform renovation assistance into net financial penalties for vulnerable households.

Our findings demonstrate that subsidy–tax interactions produce regressive outcomes when fiscal and social protection systems lack coordination. While the literature recommends targeting subsidies to vulnerable households [18,25,78,79] and funding low-carbon policies through progressive taxation [57,58], the P. D. Orcasitas case reveals a critical implementation failure: municipal subsidies (correctly targeted at vulnerable households) trigger national tax liabilities and welfare clawbacks (incorrectly treating one-time assistance as permanent income). The solution is not better targeting but legal–institutional reform—specifically, tax exemptions for renovation subsidies to vulnerable recipients, following precedents established for Next Generation EU funds [RDL 19/2021] and Basque Country welfare programmes [Decreto 173/2023]. Alternative models exist within Spain demonstrating such exemptions are legally feasible and administratively implementable.

In the case study analysed, subsidies have been classified as capital gains for low-income households receiving social assistance. This phenomenon is counterproductive for the role of the State Tax Administration Agency and Spanish legislation, as it results in tax liabilities for the beneficiaries and the loss of this social assistance.

The present study identifies public building refurbishment subsidies classified as capital gains and, therefore, subject to taxation liabilities in Spain. This circumstance presents a dual challenge for low-income individuals whose social vulnerability has been acknowledged by the state. Besides having to repay part of the subsidy received through the IRPF, they are being affected by reductions in welfare benefits. Specifically, the recipients of survivor’s and retirement pensions are obliged to refund the minimum pension complements.

The analysis of the 22 claims issued by the Social Security Institute indicates that all of them are intended for individuals recognised by the state as “socially vulnerable”. Except for one—who receives the IMV implemented during COVID-19—the other 21 claimants receive the minimum complement to their pensions.

In these circumstances, individuals who receive the minimum complement and undergo building refurbishment projects ultimately bear higher costs than those who did not receive such aids. This study reveals that, after deducting penalties, affected individuals receive a lower net amount (23% approx.) of the renovation subsidy compared to those who do not have clawback problems with the tax authorities.

This study employs forensic case documentation rather than statistical inference, an approach appropriate when: (1) the phenomenon is newly identified with no prior measurements, (2) administrative data are inaccessible for probabilistic sampling, and (3) the research objective is mechanism identification rather than prevalence estimation. The strength of evidence derives not from sample size but from completeness of documentation—each case is verified through multiple official sources (municipal subsidy records, national tax returns, Social Security claims). The uniformity of outcomes across cases (51% average retention, 42–72% range) combined with legal analysis demonstrating that identical mechanisms apply nationally supports analytical generalisation: the fiscal cascade documented in P. D. Orcasitas operates wherever Spanish IRPF and Social Security regulations intersect with municipal renovation subsidies. Critics seeking statistical inference should note that even large probabilistic samples cannot alter the underlying policy contradiction—the legal framework produces these outcomes deterministically, not stochastically.

5.1. Sample Size Discussion

This instrumental case study aims to document and explicate a policy dysfunction, not to estimate population parameters. The research value lies in demonstrating the existence, mechanism, and magnitude of an adverse effect through detailed verified cases [80]. The 22 cases show remarkable homogeneity in outcomes (mean net subsidy 53%, range 40–77%), indicating data saturation.

Regarding the representativeness of the case study, the sample mean taxable base (€9577) aligns with the vulnerable pensioner income profile in this deprived neighbourhood (household income 28% below municipal average). The mean capital gains (€14,324) are consistent with the average municipal subsidies per dwelling (€9405, Table 1).

The exact number of affected vulnerable households is unknown due to privacy regulations and administrative fragmentation (subsidy data held by City Council, tax data by AEAT, welfare data by INSS—no centralised registry). Many affected individuals may be unaware of the connection between subsidy receipt and benefit reductions. The 22 cases represent a census of accessible affected households, not a sample from a larger accessible pool.

Similar sample sizes are common in case study research on tax policy impacts when detailed financial documentation is required [28].

The detailed case study assessment provides analytical depth by revealing institutional interactions that are rarely visible in large-scale quantitative studies. The highly detailed documentation available in P. D. Orcasitas makes it possible to trace, step by step, how a municipal subsidy triggers fiscal and welfare consequences across different administrative layers. This granularity allows us to identify the mechanisms—rather than only the outcomes—through which well-intentioned renovation policies can unintentionally harm vulnerable households. Far from being a limitation, the detailed case study illuminates structural inconsistencies in Spain’s tax–welfare–energy policy nexus that are likely to affect vulnerable populations in other deprived urban areas facing mandatory renovation under the EPBD.

5.2. Multidimensional Vulnerability and Rights Implications

The fiscal penalties documented in this study must be understood within the broader context of multidimensional vulnerability affecting the P. D. Orcasitas households.

Affected households face a contradiction—they exercised their right to adequate housing by participating in renovation programmes, yet were penalised for doing so. The inability to avoid tax consequences while meeting basic housing standards places them in an untenable position.

The classification of subsidies intended to assist vulnerable populations as taxable capital gains violates principles of fiscal fairness [81]. Households received no advance information about tax implications, preventing informed consent and violating procedural justice norms.

The withdrawal of welfare benefits following subsidy receipt undermines the right to social security. Removing energy-related assistance from vulnerable households violates the fundamental right to energy for dignified living at affordable cost, transforming what should be a basic entitlement into a market commodity inaccessible to those most in need [15].

Administrative fragmentation between municipal subsidy providers, national tax authorities, and Social Security creates opacity that erodes trust. Participants discovered penalties months after renovation completion, when appeals were difficult. This lack of coordination and transparency constitutes a failure of institutional responsibility toward vulnerable populations the state has recognised as requiring protection [15,20].

These dimensions interact: housing inadequacy necessitates renovation, renovation triggers tax liability, tax liability triggers benefit loss, benefit loss increases poverty, and poverty reduces trust in institutions. The fiscal penalty is not merely a financial burden but a violation of multiple rights simultaneously, amplifying vulnerability across domains.

5.3. Sensitivity Analysis

To assess whether the documented fiscal penalties are inherent to building renovation subsidies or result from specific regulatory choices, alternative legal frameworks currently operating within Spain are examined. This comparison demonstrates that fiscal exemptions for renovation subsidies are legally feasible and already implemented in specific contexts, suggesting the P. D. Orcasitas outcomes result from policy design gaps rather than immutable constraints.

5.3.1. Scenario 1: Classification of Next Generation Subsidies

To prevent amounts received by vulnerable individuals from being considered capital gains, exception clauses could be included in Law 35/2006, of 28 November [82]. The statutory framework should explicitly state that atypical income resulting from housing improvement interventions should not lead to a reduction in the welfare they might be entitled to. One possibility is the amendment of the Fifth Additional Provision—“Subsidies from the Common Agricultural Policy and Public Aids”—so it explicitly references welfare received by individuals in a state-recognised situation of social vulnerability, such as pensioners below the Minimum Wage.

This measure is not as exceptional as it may seem. This concern has already been addressed in renovation projects funded by the European Union under the Next Generation programme. Furthermore, the fact that the issue outlined in this article arises in some cases and not in others leads to discrimination among recipients of building refurbishment subsidies. This alternative approach to subsidy classification could mitigate the issue analysed in this article.

5.3.2. Scenario 1: Regulation of Public Aid in the Basque Country (Decreto 173/2023)

A different subsidy framework can be found within the borders of the Spanish state. The Basque Government Department of Labour and Employment proposed a similar solution for other types of welfare benefits, such as the Minimum Income Scheme. This exception was established by Decree 17/2023, of 21 November, approving the Regulation of the Minimum Income Scheme [83].

Article 44.—Non-taxable income

1. The following incomes shall not be considered:

Specific-use grants

[...]

4.º Housing acquisition, unless it falls under the exceptional value provision of Article 45.3, and those aimed at its renovation, building refurbishment, improvement of accessibility, connectivity and energy efficiency.

Apart from these alternative tax scenarios, which are not exceptional at all, which are used in countries throughout Europe and applied in ambitious programmes such as the NEXT funds, the problem could be solved by means of a European directive or similar measure that would universalize good practices such as this one. In this way, the vulnerable recipients of these projects would not be affected randomly.

5.3.3. Implications for Robustness

This regulatory comparison strengthens our core finding: the fiscal penalties documented are not artefacts of our measurement approach but genuine policy outcomes resulting from specific legal classifications. The existence of exemption frameworks (Next Generation, Basque Country) demonstrates that: (1) the Spanish legal system permits renovation subsidy exemptions without constitutional barriers, (2) administrative implementation is feasible (already operating for millions of euros in NEXT funds), and (3) the choice to tax municipal subsidies while exempting EU subsidies creates discriminatory treatment based on funding source rather than recipient need or subsidy purpose.

The alternative scenarios are not hypothetical—they represent enacted legislation currently protecting other subsidy recipients from the fiscal cascades documented in P. D. Orcasitas. This demonstrates that policy reform is legally and administratively feasible, shifting the question from “can exemptions be implemented?” to “Why haven’t the exemptions been extended to municipal regeneration programmes?”

5.4. External Factors and Study Limitations

Several external factors and potential confounding variables merit consideration when interpreting these findings:

- The COVID-19 pandemic (2020–2023) and subsequent inflation may have exacerbated household vulnerability independent of fiscal penalties, though the tax–welfare mechanisms documented operate regardless of economic cycles.
- Spain introduced the IMV during COVID-19. This newly established mechanism of protection is now unintentionally expanding vulnerable populations subject to benefit clawbacks, therefore increasing affected households.
- Madrid’s specific subsidies and tax supplements may produce different quantitative impacts than other jurisdictions, though underlying legal frameworks (IRPF classification, Social Security rules) apply nationwide.
- P. D. Orcasitas’ strong Neighbours’ Association facilitated both renovation participation and claims documentation; less-organised communities might experience similar penalties without the capacity to contest them.

These factors suggest the phenomenon's manifestations may vary across contexts while the structural mechanism persists.

In the next section the principal findings are summarised alongside their implications for building renovation policy.

6. Conclusions and Policy Implications

This study provides the first empirical documentation of how building renovation subsidies create net financial losses for vulnerable recipients through cascading tax and welfare penalties in Spain. Through forensic analysis of 22 cases in P. D. Orcasitas (Madrid), it is demonstrated throughout this article that administrative fragmentation across governance levels transforms well-intentioned municipal assistance into regressive fiscal outcomes.

6.1. Principal Findings

The empirical analysis of the P. D. Orcasitas case yields four main findings:

- The theoretical predictions are confirmed: policy fragmentation produces fiscal–welfare cascades (RQ2), while multidimensional vulnerability amplifies harm (H2), validating both policy coherence theory and theories of unintended consequences.
- Substantial subsidy loss through fiscal cascades: Vulnerable households receiving municipal renovation subsidies (average €14,325) retained only 51% of gross subsidy value after accounting for tax liabilities (22.5% average) and Social Security benefit clawbacks (average €2922). Individual retention rates ranged from 42% to 72%, with all 22 documented cases experiencing net financial penalties. This contradicts the policy intention of providing assistance to vulnerable populations.
- Institutional mechanisms producing regressive outcomes: Three specific mechanisms operate deterministically under Spanish law: (1) AEAT classifies municipal renovation subsidies as taxable capital gains (IRPF Law 35/2006), (2) Social Security automatically reassesses welfare eligibility using IRPF data, treating one-time subsidies as permanent income increases, and (3) administrative fragmentation across governance levels (municipal subsidy provision, national tax authority, Social Security) prevents coordination or advance warning.
- Multidimensional vulnerability amplifies harm: Affected households face intersecting disadvantages (economic precarity, housing inadequacy, administrative exclusion, welfare dependency) that compound when fiscal penalties reduce both one-time subsidy value and ongoing benefit income, while administrative complexity prevents effective appeals.

These findings are specific to the documented P. D. Orcasitas cases but reveal policy contradictions operating uniformly under Spanish legal frameworks applicable nationwide.

6.2. Research Contributions

This study makes four contributions to building renovation and energy poverty scholarship:

The first contribution is empirical, the documentation of fiscal–welfare cascades affecting vulnerable renovation subsidy recipients, filling an empirical void despite extensive literature on “just transitions”.

There is a methodological contribution: the value of forensic case documentation for identifying policy implementation failures invisible in aggregate statistics or theoretical analyses. The approach is replicable for examining the fiscal impacts of building renovation programmes in other jurisdictions.

Also, there is a theoretical contribution: empirical testing of policy coherence theory and unintended consequence frameworks, confirming predictions that administrative

fragmentation produces regressive cascades when environmental subsidies interact with tax–welfare systems designed for different purposes.

The last contribution refers to policy: specific institutional mechanisms requiring reform (tax classification, benefit reassessment rules, inter-agency coordination) with concrete precedents for solutions (Next Generation exemptions, Basque Country welfare regulations).

6.3. Policy Implications

6.3.1. For Spanish Building Renovation Policy

The documented fiscal contradiction requires immediate regulatory attention. Within current Spanish legal frameworks, two reforms would prevent vulnerable households from experiencing subsidy penalties:

- Legislative reform: Amend IRPF Law 35/2006 to exempt renovation subsidies received by households below defined income thresholds, following the precedent established for Next Generation EU funds (RDL 19/2021, Law 10/2022). Such exemptions already exist for other public assistance categories (terrorism-related aid, severe disability support), demonstrating legal feasibility.
- Administrative coordination: Establish automatic notification systems between municipal subsidy providers and Social Security agencies to prevent immediate benefit suspensions following subsidy receipt, enabling distinction between one-time housing assistance and permanent income increases when reassessing welfare eligibility. The Basque Government's Decreto 173/2023 provides a regional precedent, exempting renovation subsidies from welfare income calculations.

6.3.2. For EU Building Renovation Policy

It is not claimed that the findings in this article generalise statistically to other EU Member States, as fiscal and welfare systems vary nationally. However, the case illuminates risks relevant for EU-level policy design: where EPBD mandatory renovations (targeting “worst first” buildings in deprived neighbourhoods) intersect with means-tested welfare systems and municipal subsidy programmes, similar fiscal contradictions may arise if Member States lack coordinated impact assessment mechanisms across governance levels.

The institutional mechanisms documented—tax treatment of subsidies, welfare benefit reassessment rules, administrative fragmentation—are not unique to Spain. The EU policy recommendation is procedural: Member States should conduct *ex ante* fiscal impact assessments before implementing mandatory renovation programmes targeting vulnerable populations, examining how national tax–welfare architectures interact with renovation subsidies to ensure assistance programmes do not inadvertently penalise intended beneficiaries.

6.4. Future Research Directions

Regarding future work, it would be interesting to investigate other aspects not covered in this study, such as quantifying the other losses caused or the long-term consequences. Additionally, beyond renovation subsidies, future research should examine the fiscal treatment of Energy-Saving Certificates (CAEs, by their acronym in Spanish). These market-based earnings from efficiency improvements similarly trigger benefit losses but, unlike subsidies, cannot be exempted as they constitute commercial income rather than public assistance.

6.5. Closing Reflection

This study demonstrates that achieving “just energy transitions” requires more than well-designed building renovation programmes—it demands policy coherence across institutional domains. When municipal governments provide subsidies, national tax authorities classify them as taxable income, and Social Security agencies withdraw welfare

benefits, the result transforms assistance into penalty for precisely those populations EPBD renovations aim to protect. The P. D. Orcasitas case serves as a cautionary tale: without explicit attention to fiscal–welfare system interactions, mandatory building renovations may deepen rather than alleviate vulnerability, contradicting the EU’s commitment to leaving no one behind.

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Abbreviations

The following abbreviations are used in this manuscript:

AEAT	Agencia Estatal de Administración Tributaria (State Tax Agency)
CAE	Certificado de Ahorro Energético (Energy-Saving Certificate)
EC	European Commission
EEOs	Energy-Efficiency Obligations
EGD	European Green Deal
EPBD	Energy Performance of Buildings Directive
EVs	Electric Vehicles
IMV	Minimum Living Income (IMV, by its Acronym in Spanish)
INSS	Instituto Nacional de la Seguridad Social (Spanish Social Security Institute)
IRPF	Income Tax Return (IRPF, by its Acronym in Spanish)
MEPSs	Minimum Energy Performance Standards
P. D. Orcasitas	Poblado Dirigido de Orcasitas
SDG7	Sustainable Development Goal 7

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