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The Lessons of Public–Private Collaboration for Energy Regeneration in a Spanish City. The Case of Txantrea Neighbourhood (Pamplona)

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Abstract: Although the transformation of the energy model is a global problem, cities take on a leading role in the process as they are important consumers of energy resources. For years, local authorities have been implementing various energy saving initiatives. The transport and equipment renovation sectors, as well as the residential renovation sector, are the focus of the objectives of local strategies to reduce greenhouse gas (GHG) emissions. In this article we analyse the role of local government in the energy transition, its relationship with other public–private territorial agents, and the involvement of citizens in the design and implementation of their initiatives. To this end, we will focus on the case of Pamplona, a city in the north of Spain with a policy aimed at low-energy, renewable, decentralised, and sustainable restructuring. We will analyse the heating districts of its Txantrea neighbourhood. By means of qualitative information obtained through interviews, we will see how the project has been carried out, which actors participated, the problems encountered, and how it has impacted savings, the improvement of quality of life of the residents, and urban and energetic regeneration processes.

Keywords: urban governance; energy transition; heating districts; citizen empowerment; prosumer; Pamplona; Spain

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1. Introduction

We are living in critical times in which numerous crises (health, financial/property, energy, climate/environment, social) are converging in time and which are also interconnected [1,2]. Overcoming them requires the promotion of solid models of governance that drive deep changes in the way we perceive and manage the future of urban spaces, and the design policies focused on social cohesion, sustainable economic development, and the public's quality of life. Cities can cease to be hotspots where the problems that affect modern society are concentrated (demographic congestion, poverty, marginalisation, insecurity, land artificialisation, pollution) [3] and emerge as a privileged field for the application of new forms of governance [4], which help to manage the urban complexity and reshape the economic, socio-political, and urban landscape. All that is required is the political will and commitment to implementing reforms to achieve more effective management by designing urban policies in accordance with real needs and taking as a basis for action multi-actor cooperative participation that ensures socio-political interaction between government, civil society, and the market [5]. Insufficient governance of the city, together with inadequate planning, can generate significant economic, social, and environmental costs, threatening the sustainability of urban development [6]. We only have to recall the impacts resulting from the prevailing governance and development model up to the 2008 crisis in countries such as Spain, Italy, Ireland, Greece, and Portugal, dominated by capitalist dynamics and deregulation that favoured the unprecedented acceleration of urban expansion, land artificialisation, and the proliferation of urban skeletons and ghost neighbourhoods [7].

We are facing a time when the public have been empowered, going from being passive to active agents, demanding their rights to the city and pressuring governments to participate in a new way of making or managing cities [4,8–11]. Research resulting from the project "New models of governance of Spanish cities and intervention in urban spaces in the post-crisis period"—financed by the Ministry of Economy, Industry and Competition [12]—shows that local governments have retaken their roles as planning agents and promoters of a social and environmentally sustainable cohesive city. In contrast to the speculative and deregulated neoliberal urban growth model that prevailed in Spain from the 1990s to the crisis of 2007, their policies are focused on mitigating the social, economic, and residential vulnerability of neighbourhoods, as well as improving their environmental and physico-spatial conditions, given that they directly impact the public's quality of life. [13,14] In Spain, cities such as Barcelona, Valencia, Seville, Albacete, and Toledo top the ranking of those with the highest PM2.5 particulate concentration, exceeding the limit established by the WHO (10 micrograms/m^3) along with Valladolid, Bilbao, Huesca, Madrid, Oviedo, Palma de Mallorca, and San Sebastián, resulting in serious health problems [15]. This situation has led many of them to undertake actions to tackle energy transition, to reduce greenhouse gas (GHG) emissions, promote renewable energy, and reduce energy consumption by improving the energy efficiency of buildings and certain products and sectors. Notable among the actions carried out is the application of anti-pollution protocols. Limiting access to urban centres, speed limits, and vehicle mobility (old vehicles, diesels, or by registration number) are the most common methods. However, in general these are no more than isolated actions against the greatest peaks of nitrogen dioxide (NO_2) concentrations in the air. Nevertheless, one of the most restrictive cases is London, with financial measures complementing the former ones: a tax of over EUR 800 on the purchase of new diesel cars, incentivising the purchase of zero-emissions cars with discounts, and the existence of tolls for all vehicles that wish to access the city.

In other cities we can underscore that they do not limit themselves to mobility and have more inclusive plans that complement their long-term strategies. One of the world's largest, oldest, and most successful examples of the commitment to efficient district heating systems is the case of Copenhagen. Werner [16] set out the transition of these energy systems from using fossil fuels where the connected building had high heating demands towards a new approach with a combination of recycled heat and renewable heating (more variable renewable energies, fewer thermal plants) with customer buildings with reduced heating demands.

In Spain, the predomination of isolated actions contrasts with the innovative plan of Pamplona. It is a model aimed at urban sustainability, the main characteristic of which is having approached the territory of the city as a whole. It covers the different and varied sectors, which differ substantially in accordance with the time and type of construction, the latter owing to the recipients for whom they were conceived. To do so, the improvements carried out, in addition to mobility in the strict sense, also address aspects such as improving building envelopes, the implementation of municipal renewable energy plants, and the expansion and renovation of green spaces, all under the paradigm of multi-level and participative governance.

Over the course of this article, we will reflect firstly on the role of local government in energy transition, the policies being put into practice and their relationship with other territorial governments/actors, as well as the challenges that must be faced. We will then delve deeper into the case of Spain, analysing to what degree national and regional authorities have promoted or limited the introduction of renewable energy and self-generation mechanisms, before finally focusing on the city of Pamplona—the Spanish city with the best quality of life, and where the local government has promoted the Efidistrict project to implement heating districts in direct collaboration with the regional government. We will introduce the project and the perception of it held by the local government, the company in charge of managing it, and the affected residents.

2. The Role of the Local Government in Energy Transition

Energy transition represents a radical, systemic, and managed change towards more sustainable and more effective partners for the provision and use of energy. It requires a reflection on how new energy technologies and social responses evolve together in cities and how we link sociotechnical tools to urban planning and policies [17,18]. Furthermore, it requires societies to commit massive investment not only to redesign infrastructure, buildings, and equipment, but also to make choices from a range of possible spatial solutions and scales of governance [19].

In this context, cities become urban laboratories where new initiatives go beyond the traditional remit of urban/energy (planning) policy, given that they involve a group of multiple actors—generation companies, consumers, governments, stakeholders, vulnerable groups, etc.—each with its own interests and expectations regarding the objectives of the energy transition. As such, the companies pioneer the technological changes and decide whether to replace their technologies with others that are more environmentally friendly within a stable regulatory framework. Meanwhile, consumers, based on their preferences or needs, prices, and their purchasing power, decide whether to purchase an electric or petrol car, install an induction stove or keep their gas stove, as well whether to have heating based on electricity, natural gas, or heat pumps. These decisions have associated implications in the process of decarbonising the economy and will also depend on the support that the different actors receive from governments. For example, the purchase decision regarding a community heat pump may be different for a residents association if it is partially subsidised by the local government, or if there is *Plan Renove* [Renewal Plan], which subsidises the replacement of old household appliances for more energy-efficient ones.

The complexity of the process and the multiplicity of actors involved demand collaborative planning for promoting clean energy [20]. All agents must be aware that we are progressing towards a (re)localisation of energy governance due to a combination of interdependent political, economic, and technical decentralisation trends [17], in which each of them faces new challenges (Table 1).

Table 1. Actors, competencies and challenges with a view to energy transition.

Actors	Role	Competency	Challenges
EU	Regulator Guidance	Energy regulations Prepare framework documents on proposals for energy transition	Help member states to achieve the recommended targets [6]
National and Regional authority	Regulator Guidance	Draft legislation National/regional energy transformation plans: materialising European principles in specific policies and actions	Design regulatory frameworks that facilitate the participation of new actors in the energy market [6] Define commitments for reducing greenhouse gas emissions in urban settings [6] Create a stable and predictable framework for action by the public and private sectors, ensuring the inclusion of vulnerable groups [21] Create and support room for niches and experiments [22] Increase the attractiveness of the renewables market Grant economic incentives to promote alternative energy and production methods [23] Attract the private sector to invest in renewable energy by increasing risk-sharing by the government [24] Promote innovative stakeholders who are unable to exploit their full innovation potential without public intervention [22] Offer alternatives to companies that close down due to technological advances and the modification of production processes [23]

Table 1. *Cont.*

Actors	Role	Competency	Challenges
Local government	Planner Manager	Planning of cities Management of services (transport, power, water, waste)	Design and implement public policies on energy savings [17] Reorient local infrastructure services such as water, housing, and transport [19] Materialise policies in actions (electric public transport, limits on vehicle access to city sectors, low-consumption street lighting, residential buildings with almost zero energy consumption, district heating, positive energy districts) [17,19,25] Ensure flexibility of energy system and supply to consumers [18,26] Coordinate the different actors and activities [17] Institutionalise consumer participation in local energy generation and management [26] Attend to the most vulnerable urban sectors (energy poverty) [6]
Companies	Decision-making R&D	Lead technological changes Decide on the replacement of existing energy sources with cleaner ones	Tackle decentralisation of energy production, the decrease in the average market price, and the reduction of peak demand [27] Promote social-technical experiences: new market niches and controlled field experiments [28] Offer new products and services Change technologically and offer new production facilities
Market intermediaries to households	Guidance	Articulation of expectations, demands, and visions	Develop a Strategic Niche Management to spur a system-wide transition [29] Accept measures implemented by government Education and training for self-production and energy management
Citizens	Consumer	Evolution from consumer to prosumer [30], generating energy for their own consumption	Economically incentivise them to participate in the energy market [31] Change consumption guidelines (saving electricity and water, improving electrical appliances, using electric cars) [27] Make them more responsible towards the urban environment [3,19]

The success of the process will depend on carrying out multi-level governance in which European, national, and regional governments establish the framework documents and regulations, but in which the local government plays a leading role, given that it is responsible for urban planning and the obligation to implement plans and initiatives favouring the design of a sustainable city that is also competitive and cohesive. In this regard Newman, Beatley and Boyer [32] extolled localism as the required modus operandi for the post-oil era. They believe that intelligent planning and visionary leadership can help cities tackle the impending crises and the time has come to start building cities powered by renewable electricity with much greater localism in the economy and infrastructure, given that passing a resolution acknowledging climate change is a critical first step in moving towards resiliency, but the resolutions must be followed by a plan for implementing change. The fact is not only that local governments find themselves being pushed to formulate political responses to urban problems and develop plans and good practices in the energy domain, but also that local action on energy is increasingly seen by multiple actors as more compatible with objectives for promoting societies of greater and smarter resilience and decarbonisation [17].

The public also acquire a leading role in this collaborative planning. They are key actors for making the actions successful, given that in the end they are the ones who must accept them being carried out in their neighbourhoods and in their homes. Promoting campaigns to raise awareness, which make clear the advantages of having a sustainable neighbourhood—better air quality, habitability of homes, and a reappraisal of their image—and the economic advantages that can be gained—reduction in water and electricity bills, income from energy generation—is required to provide an understanding of the importance

of achieving sustainable neighbourhoods. These campaigns should also aim to educate residents on self-generation and energy management.

Nevertheless, the process towards energy transition is slow and there are numerous obstacles to be found. It is common for the public to be unfavourable towards some energy projects from the outset [33]. Lack of knowledge on the subject and the economic contribution that some projects entail mean that in some buildings the votes to implement the actions for improvement do not achieve the required majority. For governments, actions are sometimes limited by factors of the following nature [34]:

- Political: State actors remain very dominant. The legal instrument concerning common rules for the internal market in electricity is implemented by the national government through laws that are very restrictive [35]. Retroactive processes in energy reform plans generate uncertainty when investors are seeking certainty, clear regulations, secure frameworks, and medium- and long-term plans that guarantee the path to be travelled. This is added to by the fact that legislation may restrict the re-municipalisation of services through instrumental bodies.
- Economic: The power held by energy companies allows them to vie with national governments when negotiating energy transition. There have been numerous occasions when they have blocked the use of renewables and initiatives that promote electric self-consumption, [36,37] added to by the problem of having sufficient financing to undertake the projects. Only those cities that participate in European networks or projects or have managed to overcome their public deficit will be able to launch initiatives requiring strong investment. Directive 24/2014 of 26 February 2014 on public procurement restricts the possibility for municipal energy companies to supply electricity to the population to a maximum of 20% of its activities; while EU state aid legislation does not allow community energy companies to differentiate tariffs between customer categories due to continuously rising energy costs, giving the market access to only larger, free-market companies [35].
- Social: limited capacities and weakness of local actors to do or manage things. While it is true that the public are going to position themselves as active agents in energy plans, and that energy democratisation is linked to the empowerment of residents in self-consumption schemes, success will depend on raising the awareness of the population by explaining to them the advantages of generating their own electricity and educating them to manage their generation/consumption through new technological tools.

3. Spain in the Face of the Energy Transition Challenge

Even though Spain is a privileged country in terms of resources, technology, technical know-how, and the renewables industry, becoming the world leader in photovoltaic energy in 2008 (with 2708 MW installed in a single year), it still has not taken the final step towards energy transition. The causes lie in having a centralised energy model marked by the interests of an energy oligopoly, as well as legislation that curbed the implementation of renewables and destroyed thousands of jobs over the course of a decade. With Royal Decree 1578/2008 on photovoltaic remuneration [38], variable premiums were established based on the location of the installation, subject to a maximum installed annual power quota, which would be adjusted annually based on the market. And with Royal Decree 900/2015 [39], known as the tax on the sun, consumers would have to pay the taxes corresponding to the energy that they generated in their self-consumption installation. It was necessary to wait until its repeal in 2018 (Royal Decree 15/2018 [40]) and its subsequent regulatory implementation (Royal Decree 244/2019 [41]) for the opportunity to develop shared, individual, and proximal self-consumption models, and for the remuneration of surplus generation to be recognised. In addition, the regulations included the obligation of governments to promote the energy transition.

According to the Energy Transition Barometer of the Economics for Energy Research Centre [42], Spain improved its energy transition index in 2019 compared to 2018 thanks to the reduction of greenhouse gas emissions, the continued downward trend in the cost

of reserves for integrating renewable sources, and the decrease in both energy spending and prices.

On a national scale, it has approved the Climate Change and Energy Transition Law and the Integrated National Energy and Climate Plan (presented in February 2019), which seek to reduce GHG emissions in Spain to under 230 $MtCO_2eq$ in 2030 (reduction of GHG emissions of at least 20% with respect to 1990, which equates to ~30% with respect to 2016) [43].

On a regional scale, there is a heterogeneity of situations, although the proposed strategies are a long way off providing a rapid answer to the transition. Autonomous regions such as Madrid—one of the territories with the least installed power from renewables and with the greatest external energy dependency, despite concentrating high economic and population activity as the national capital—Asturias (one of the greatest emissions values by GDP and per capita), La Rioja, and Murcia do not have documents on fighting climate change. Quite the opposite is happening in the regions of the Basque Country, the Balearics and Catalonia, which have targeted total greenhouse gas emissions reductions of 40% by 2030 and 80–90–100% by 2050 [44]. In Galicia, these percentages are 25% and 80%, respectively [45].

On a local scale, the municipalities that signed up for the Covenant of Mayors—an initiative promoted by a range of entities at European level to commit cities to the fight against climate change—have committed to ambitious goals to improve energy sustainability [43]. There are various initiatives that are being promoted in terms of energy savings: Madrid published an energy consumption and emissions inventory, prepared based on the guidelines of the European Environment Agency; Barcelona, Malaga, Seville, and Vitoria are promoting sustainable transport through a network of buses/electric cars and bicycle use; Zaragoza has awarded grants for renovating buildings with energy sustainability criteria; and in Valdespartera buildings have been built with bioclimatic criteria.

On a larger scale of intervention, there are projects aimed at designing positive energy districts and heating districts. The former are urban zones where a series of both public and private, residential and tertiary buildings generate and share energy among them with the goal of generating an overall energy surplus that can be exchanged with other urban and peri-urban zones of the city. By covering an entire neighbourhood, they allow multiple actors united in a common objective to reduce consumption and simultaneously increase generation with distributed sources. These energy districts are based on the efficient use of energy, energy restructuring, renewable generation, and ecological restoration. Cities such as Valencia, León, Bilbao, Granada, and Sestao are already promoting them. According to the Universidad Politécnica de Valencia [46], their advantages include:

- Offering a cheaper and more efficient solutions than the home-to-home alternative because they increase the efficiency of the system by matching demand and generation and avoiding oversizing systems.
- Designing more ambitious energy plans than traditional interventions focused on buildings.
- Helping cities to align with energy savings and flexible demand management trajectories.
- Generating multiple innovations and a variety of solutions based on nature, the circular economy, open data, geographical information systems, sustainable finance, etc.

Meanwhile, a heating district consists of a neighbourhood having a facility that generates heat that is channelled through the streets to reach homes. The network is generally supplied by a cogeneration plant, although renewables such as biomass, solar, and even excess heat from urban waste incinerators are increasingly being used. Cities such as Barcelona, Oviedo, Lleida, Guadalajara, Madrid, and Pamplona have already implemented them.

4. Pamplona, on the Road to a More Energetically Sustainable City

Pamplona is the capital and the main city of the region of Navarre, concentrating 30.82% (201,653 inhabitants) of the population [47]. The urban growth experienced by the city over the past 40 years has surpassed its administrative limits, meaning that Pamplona

has become the central city in a continuous urban network that makes up a metropolitan area where 52.32% of the population of Navarre live. According to the Survey of Living Conditions [48] and data from the Organisation of Consumers and Users [49] Pamplona occupies first place in the Spanish quality of life ranking, followed by Vitoria, Gijón, Bilbao, and Logroño. It is also notable for the availability of green zones, a high level of education, and important R&D systems [50]. Its notable national positioning from a social, economic, and environmental perspective stems from the championing of an urban governance model committed to coordinated and effective management between the local government, the regional government, and a variety of territorial actors, such as the entrepreneurial fabric, the university, and research centres. They all believe that territorial development, whether regional or local, requires the promotion of projects and initiatives aimed at favouring economic competitiveness, environmental sustainability, social well-being and cohesion, and participation based on a flexible governance model.

In this regard, it should be noted that the objectives of urban policies include GHG emission reductions and energy efficiency. This requires increasing renewable energy demand to 42% of final usage and reducing energy sources with high carbon content [51]. To this end, the local government has made a diagnosis of the energy situation in the city based on data from 2017 [52] and adopted a Sustainable Energy Action Plan (SEAP) [53], and, since the beginning of 2020, an energy diagnosis [54]. The data indicate that the annual energy demand in the city was 4,434,882,250 kWh (22,496 kWh per inhabitant), which represented an increase of 32.09% over 1998 (Table 2). In addition, 56% of the energy demand was covered by oil products, while the sum of renewable energies only represented 9.3% (4.3% from renewable sources, 5% from renewable electricity), a much lower percentage than the Spanish average (14.89%). In 2017 emissions represented a total of 1.13 MtCO_2eq (5.75 tn CO_2eq/inhab.), with transport being the sector demanding the most energy (53% and 2,355,044,224 kWh) and emitting the most GHGs (55%), followed in importance by the residential and industrial sectors (22% and 14%, respectively). In this context, economic expenditure for the city was estimated at around EUR 459,026,705.05 (EUR 2325/inhab. a year), which left limited benefits for the local economy.

Table 2. Energy demand of the city of Pamplona. Source: Prepared by the authors based on data from the Go Green Pamplona strategy, Energy Transition Action Plan and National Statistics Institute.

	1998	2010	2017
City power demand (kWh)	3,357,255,360	5,303,419,560	4,434,882,250
Change on 2005 (%)	−31.53	8.16	−9.55
Consumption per inhabitant (kWh)	19,616	26,854	22,496
Change on 2005 (%)	−22.66	5.88	−11.30

In this context, local government launched multiple actions and projects aimed at creating energy self-generation facilities, with the government setting an example in the field of energy savings and efficiency. Through the Go Green Project, they responded to a series of challenges related to sustainability, climate change, renewables, self-sufficiency, and improved environmental quality of the city. Notable among these was the implementation of a micro electric smart grid in the municipal police building, making it a state-of-the-art building in national terms. It combines thermal energy recovery technologies, renewable generation (with a photovoltaic array recently installed), electrical energy storage (implementation of second-life electric batteries), and V2G electric vehicle technology [55]. Also, as part of the Go Green Pamplona strategy, for three years the council has been making subsidies available to homes to install photovoltaic electrical generation facilities for self-consumption in homes, in order to help develop distributed renewable generation in Pamplona [56]. The aim is to promote the participation of the citizens as active users. To this end, in addition to subsidies, there are deductions from the regional government on the net liability for personal income tax (IRPF), from 15% up to a maximum of 30%, for investments in energy installations originating from renewable sources that are used

for self-consumption, allowing for storage systems as well as off-grid self-consumption installations [57].

Furthermore, Pamplona participates in different European projects and is pursuing the current objectives of the city [58], among which the following are of note: STARDUST, with actions such as the electric smart grid mentioned previously, the implementation of smart technology for managing power in homes, promoting electric mobility, a new public electric bicycle system, a super-fast charging point for electric vehicles, and the establishment of zones with smart street lighting systems, among others; POTEnT, through which progress is sought towards carbon reduction by improving the provision of energy services by public authorities; mPOwer, an intercity learning programme, which seeks to boost municipal actions that create low-carbon energy transition systems by sharing experiences between public entities employing innovations in the management of the energy sector and those exploring their options; and FIESTA, which consists of increasing the energy efficiency of homes, especially by acting on the energy consumption of HVAC systems.

Likewise, in the city of Pamplona more projects are being developed along the same lines of energy transition and efficiency, thanks to coordination with the regional government of Navarre through the public company Navarra de Suelo y Vivienda S.A. (Nasuvinsa). Notable among its initiatives are projects such as SustaiNAVility—for the implementation of renewables and the promotion of electric mobility, retrofitting of the thermal envelope heat recovery ventilation system, and renovation of street lighting (Figure 1) [59]—and Efidistrict. The latter is intended to achieve the comprehensive regeneration of the Txantrea district in Pamplona through the planning of three different types of actions [60]:

- The creation of a new biomass-powered district heating system,
- The renovation and improvement of the housing distribution networks through measures to control and regulate housing (substations and meters at the sub-block level),
- The renovation of the facades of the buildings (residential and commercial) by means of thermal enclosures.

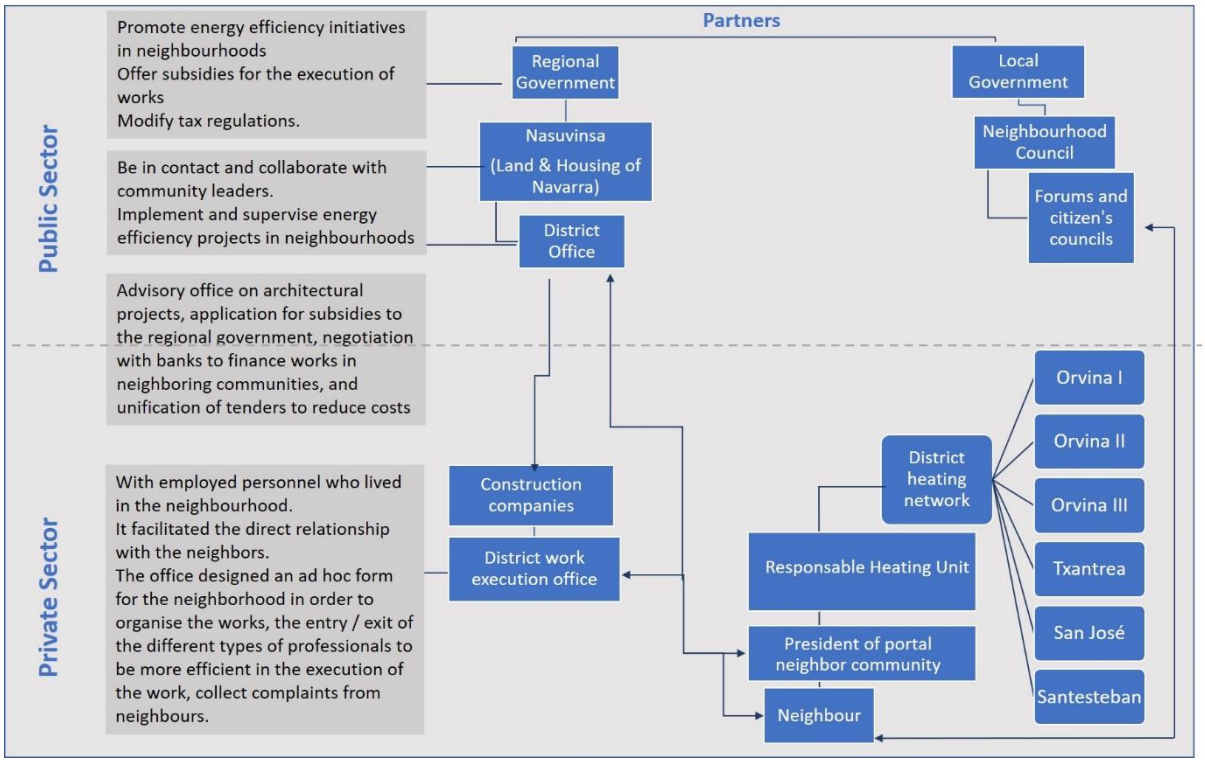

Figure 1. Public–private agents involved in the project. Source: Prepared by the authors from interviews I1, I2, I4, I7.

It is a project that has involved a process of urban renewal in the neighbourhood and that we will analyse in the following sections, although we will focus on the impact that the improvement of the surroundings has had, as the biomass network project is not only moving more slowly, but also revealing a certain degree of reluctance on the part of the residents, who consider the savings currently implemented to be sufficient and do not wish to involve themselves in additional works and costs.

5. Method

We reviewed the literature on new models of urban governance, sustainability, and energy transition as well as existing legislation on energy transition in Europe and Spain. The case study was based on two complementary methodological approaches. First, we consulted the documentation generated around the Efidistrict project, such as reports [60] and the project's official website [61]. Later, fieldwork was carried out that included conducting semi-structured interviews with the multiple project stakeholders. Authors such as Shenhar [62] and Koelmans [63] have insisted on the importance of understanding the viewpoints of all actors involved, given that the requirements of each stakeholder group will differ, and therefore their perceptions of what constitutes success will vary. Consequently, we considered the main actors to be interviewed: regional and local administration managers (I1, I2), managers of the heating boards (I3, I4, I5, I6) and construction companies in charge of the execution of the works (I7, I8). A total of eight interviews were carried out between May 2019 and November 2020. All of the interviewees were presented with a series of questions to make them comparable [64]. They could speak freely [65], and, following the recommendations of Quad [66], as interviewers we were: knowledgeable (familiar with the topic), clear (providing simple, easy, and short questions), gentle (tolerant, sensitive, and patient), steering (controlling the course of the interview to avoid digressions from the topic), critical (testing the reliability and validity of the information the interviewee offered), and interpretive (offering an interpretation of what the interviewee said).

In order to conduct the interviews, a list of questions was followed that arose from consulting the literature and reports on energy transition, specifically, the Efidistrict project. Through them, we were able to gain an in-depth understanding of the affected sectors, the initiatives/actions to be carried out, their technical characterisation, and the results expected in terms of energy savings. Furthermore, consulting this documentation allowed us to confirm that Pamplona considers the citizens to be key actors in the energy transition process, involving them through the performance of the different actions (from their presentation to their implementation and monitoring).

However, all of this technical information continued to generate a number of uncertainties. Why was the Txantrea neighbourhood chosen for this project? How did the government present the project to the neighbours to spark their interest? How was the public–private partnership put together and how was the interaction between the regional/local government, companies tasked with performing the works, and residents managed? How could the latter afford to finance the works? To what degree were they relied on to carry out the actions? To what degree has the project led to greater energy savings and an improvement in the habitability of homes, and has it had an effect on improving the image of the neighbourhood? These would therefore need to be posed in the interviews.

In parallel, a broad literature was consulted on the main dimensions that demonstrate the success of a project [63,67,68], which can be grouped into three large blocks: project management, stakeholder relationships, and project impact (Table 3).

Table 3. Project success dimensions.

Project Management	Stakeholders	Project Impact
Implementation process [69–72] Project efficiency [62,73,74] Project management success [75] Organisation (project management office); budget; tools and techniques used by the project team; schedule; investments success [76] Future potential [77] Impact on the project team [74]	The understanding the team has of the requirements of the stakeholders [76] User satisfaction; information quality [78,79] Effectiveness in reducing conflicts [80]	Impact on the customer, the business, and society [62,73,74] Impact on health, safety, and the environment [63] System and service quality [78,79]

Based on these and in order to organise the list of questions in a clear and logical manner for stakeholders involved in the project [81], we established four thematic blocks (Table 4) (The Project; Participatory Model; Perception of Success Achieved; and Quality of Life) on the understanding that these best match the characteristics of the project to be studied and the recommendations made by new governance models, such as public–private partnerships, efficiency, transparency, public participation, and quality of life.

To ensure the validity of the interview, a pilot test was conducted [81] among several professors from the Universities of Santiago de Compostela, the Balearic Islands, and Barcelona. Furthermore, all subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of the project "Fractured Metropolis. Housing, Segregation, Institutional Density and Political Attitudes in Large Spanish Cities" (PID2019-108120RB-C31).

All contributions by the interviewees were transcribed in Spanish and translated into English, and they were coded to facilitate the interpretation of their remarks. This qualitative information was very useful for developing the section related to the impact of the Efidistrict project in the Txantrea neighbourhood. The ideas were reproduced either as indirect information or with literal quotations, guaranteeing anonymity and seeking to develop an analysis focused on words and their meaning rather than on data and statistics [82,83].

Table 4. Organisation of the questionnaire into thematic blocks and actors interviewed.

Thematic Blocks	Political and Technical Actors	Residents Affected by Energy Improvement Projects
The project	How did the project emerge and how was the work financed? What work has been carried out in the neighbourhood and the buildings? What was your strategy for presenting the project to the residents?	What work has been carried out in your building? What financial contribution did you have to make to the work?
Participatory model	What was the contact with the residents like? How did they receive the energy improvement project?	To what degree did you feel informed and participants in the project? What was your participation in it?
Perception of success achieved	What savings capacity do you foresee once the actions have been implemented? Will you repeat the experience in other neighbourhoods? Have you been asked for information to transfer the project to other municipalities in the metropolitan area?	What savings have you made on your electric, water, and heating bills with the improvements made? Do you consider the success achieved is encouraging other housing blocks to carry it out?
Quality of life	To what extent do you believe that your project has improved the neighbourhood, the homes, and the public's quality of life?	

6. Evaluation of the Impact of the Efidistrict Project in Txantrea Neighbourhood

The fact that the neighbourhood of Txantrea was chosen to implement the energy transition pilot project is not a coincidence. The local government is interested in intervening in areas considered vulnerable from a social and economic point of view in order to rebuild the urban fabric, make them more energy-efficient, and increase the social self-esteem of the residents (E1). In this sense, Txantrea met all of the requirements:

- It is a working class neighbourhood from the mid-20th century, a prototype for social housing from the Franco era, with buildings distributed in an open grid. It has 8883 dwellings, of which 71% were built between the years 1950–1980 (6335 homes). It hosts different building types, which range from traditional low houses to buildings of various heights.
- The age of the buildings and the poor quality of the construction were generating damp and mould problems and a serious lack of energy savings (I2, I7).
- Nevertheless, it is a neighbourhood with strong social capital. There is a strong sense of community and identity.
- The neighbours have already collaborated on other occasions with the government on urban improvement projects such as Txantrea park and sustainable gardens (I1, I7).
- The neighbourhood already had several heating cooperatives built in the 1970s, which is to say, groups of buildings and homes that, despite being very different from each other (Table 5), share a central boiler for the supply of heating, fed in the majority of cases by natural gas. Each cooperative or group distributes the heat from the boiler room to the homes, in some cases using intermediate substations (I1). Energy consumption varies greatly from one cooperative to another, whether due to the housing characteristics, the condition of the distribution system, or due to the operating regime of the generation plant of each cooperative (I3). However, its existence would facilitate the connection of the old heaters of the neighbourhood to the municipal energy company whose implementation is planned (I1, I2).

Table 5. Heating cooperative characteristics.

Characteristics	Orvina I	Orvina II	Orvina III	Txantrea	San José	Santesteban
Dwellings	272	1,200	704	1614	604	432
Built surface area m^2	22,328	116,109	63,820	130,000	48,823	36,836
Year of construction	1964–1968	1971	1975	1951–1963	1954–1956	1969–1972
Sub-block entrances	17	38	23	422	113	42
Construction type	GF+4	GF+6 to GF+9	GF+6 to GF+8	GF to GF+3	GF+1 to GF+4	GF+4

6.1. The Project

According to the interviewees, the project has been a success. The key factor was the public–private partnership (I7) (Figure 1). All work was tendered, and although it was private, the government supervised the results. The regional government was represented by Nasuvinsa (the entity in charge of the public promotion of housing, social rent management, rehabilitation, industrial land, and sustainability). It defined the project at the scale of the Txantrea neighbourhood, while raising awareness and accompanying the neighbours when selecting the architectural projects, requesting financial aid from the regional government, negotiating with the banks for financing of the works in the neighbourhood communities, and helping in the unification of the tenders to reduce costs. (I2). Its role in the project was vital because it "generated confidence in the neighbourhood" (I7) to get the project started. The neighbours trusted it more (because of its public nature) than the private companies that won the construction bids. As for the local government, not only was it a partner in the project towards the energy transition, it also stimulated the participatory processes by organising forums and neighbourhood councils where the different intervention proposals were discussed (I1). The private part was represented by the companies in charge of designing and executing the work projects, as well as

the neighbours, represented by the president of the neighbourhood community and the representatives of the heating district boards.

Nasuvinsa oversaw the call for architects to present their projects for the improvement of the enclosures. With more than 300 proposals presented, three types of actions were chosen: ventilated facades, exterior insulation and finish system (EIFS), and mixed. However, "most of the neighbours chose the first option, limiting the EIFS to the less exposed areas. They did not like it that much and in addition it had to be renovated and painted every ten years. The ventilated façade did not need that treatment" (I3). In addition, because they had a 75% grant and favourable payment terms, the neighbours were encouraged to choose the higher-quality enclosure option because the monetary difference between the rockwool insulation and the EIFS was very small (I7).

Furthermore, Nasuvinsa was in charge of negotiating with the financial institution Caja Rural for the financing of the works in the communities of neighbours, with a loan to be paid in instalments of EUR 40–60 per month for 12 years. These "matched the energy savings derived from the envelope, so that in theory the work would pay for itself" (I7). For those sectors such as Orvina III, in which 11 building towers were involved, all of them with more than seven storeys and more than 350 residents, this alternative proved to be adequate. However, it was not adequate for other heating districts, with an urban morphology made up of lower-height homes (two or three storeys) and a smaller number of residents, which caused a notable increase in the monthly payments to be made (I5, I6). In the case of the district of San José, the circumstances were very different. Of the approximately 600 homes in existence, 480 were members of the heating cooperative and the rest were not, so there could be homes attached to the heating network and others that were not (I5). This circumstance undoubtedly limited the agreements when implementing any type of action. Thus, "this funding was only successful in those districts where it was possible to optimise the subsidy and get less economic pressure from neighbours" (I7).

6.2. The Public Participation

We can assert that it was genuine and very active. From the outset, the governments and construction companies were interested in informing the neighbours and integrating them into the project. Thus, one of the construction companies established an office in the neighbourhood to promote the relationship with the neighbours, listen to their ideas or complaints, and carry out works that were to the liking of all parties involved. They employed some neighbours, which had positive repercussions from two points of view: greater trust in the company and a better relationship with the residents, who came to the office not only to see the project and its evolution but also to present their complaints (I7).

It is precisely the relationship and collaboration with the residents that has been key to the success of the project carried out in some heating districts, mainly in Orvina. To implement it, two-thirds of the residents of the sub-blocks had to vote in its favour (I3, I4). However, one of the main difficulties of the project was managing agreements within the neighbourhood communities (I2). As a result, "the key to achieving great involvement of the neighbourhood was to provide technical, economic and social support to citizens in their own residential area" (I2). There were multiple factors that made people reluctant to collaborate. On the one hand, "in some heating groups such as Sanesteban or Orvina II the people were older and were afraid to get involved in these works" (I4); in other sectors the problem was economic, since they had a high unemployment rate (I7).

In this context, Nasuvinsa launched an awareness campaign, presenting the project to the neighbours, asking them about their income level, how much they wanted to spend on heating, and explaining that they could save up to 60% on their bills (I2, I3, I7). Even so, one neighbourhood sector was still unsure, because although 75% of the work was financed by various contributions (state and regional government and the Institute for Energy Diversification and Saving), the neighbours had to contribute a substantial amount of money ranging from EUR 7000–9500, depending on whether they had already made some kind of improvement (metal or PVC carpentry, closing of balconies, etc.) (I3).

In addition, some companies, aware of the serious economic situation that some families were going through, established clauses in their work execution agreements to promote employment. For example, in the Orvinas, two people were hired per tower to be improved, for a total of 22 people who were thus able to pay the bank fees (I7).

6.3. Perception of Success Achieved

Although it is true that in the first phase of the project the neighbours did not believe in the subsidies and it was necessary to make an enormous effort to generate confidence, from 2014—the moment when the project began—through to the present day more than 2000 houses have agreed to execute the thermal enclosure (I2). Although the regional government and construction companies estimated that the improvement of the enclosures could save 60% of the energy consumed, the truth is that until the work on all of the thermal enclosures is completed, this objective will not be achieved. In fact, several representatives of the heating districts stated that the savings obtained are currently estimated at around 30% (I3, I4). In some cases, they pay water, employees for maintenance, insurance, heating, and repair costs jointly, and the total cost is spread among the residents (I4). Nevertheless, the fee paid varies depending on the size of the home, ranging from EUR 90 for one-bedroom homes to EUR 115 for three-bedroom homes. The same happens in other districts where "there is a meter in the sub-block and we divide the amount of heating on the basis of four types of houses depending on their size" (I3).

All of the interviewees described multiple positive aspects derived from the project. It has improved the image of the buildings and this has increased their value. According to the interviewee E7, "while before its price was around €80,000, the installed high gamma enclosures substantially increase its value". The neighbourhood is more attractive now. New people are arriving, who comprise either second or third generations of former residents (I3), or young people from other urban sectors who like the new aesthetics of the buildings, their open-plan morphology, and the green spaces that surround them (parks, orchards). In the medium term, this phenomenon could lead to gentrification (I3, I7), and that should be "managed or controlled adequately" so that the people who have been living in the neighbourhood are not forced out.

6.4. Quality of Life

The habitability has been improved (I3, I4, I7). The damp and mould on the walls have disappeared, the envelope reduces the interior temperature in the summer, the radiators break down less often, and the boiler does not have to work as hard (when previously the boiler temperature had been around 80–100° in order to maintain the homes at 21°, currently with the boiler at 55° a temperature of 23–24° is maintained). Currently, the neighbours were comfortable and wanted to stay in Txantrea. These were people who could still contribute significantly and who were vital for the promotion of the project by word of mouth. The regional government is already replicating this model in three municipalities, and mayors from other cities have visited Txantrea to find out about project in detail.

7. Discussion

The interviews conducted point to the success of the heating district initiative in the Txantrea neighbourhood, thanks to its combination of a series of factors that are not always present on an infra-urban scale: the availability of a prior heating network and a very active social capital concerned about sustainability and improving their neighbourhood. The citizens confirmed that investing in renewable energy and sustainable construction materials leads to savings on their bills and improves the habitability of their homes.

In spite of this, we believe that these kinds of initiatives may see limits on their development in the future. Fluctuations in fuel prices and price parity between natural gas and biomass may hinder projects such as the biomass heating plant promoted by the Pamplona council. This is joined by the fact that the neighbours, once they achieve

a degree of comfort in their homes and savings on their bills—as occurred in Txantrea with the façade envelopes—are reluctant to complete the energy transition process in their neighbourhood. They are not willing to undertake and finance new works, especially in the context of the economic and social crisis in which we are currently mired. Our results therefore suggest that if the conditions of economic and labour insecurity persist in time, and the works initially planned for the neighbourhood as a whole are not undertaken, the level of savings foreseen will not be achieved and this will jeopardise the ability to design the energy transition in the city as a whole.

In any event, it is interesting to confirm the way in which many of the aspects stated in the literature in terms of governance and urban sustainability were combined in the Efidistrict project for Txantrea.

First of all, designing a neighbourhood-scale plan was a decisive element for success. Generally, we speak of urban governance and its five principles (openness, participation, responsibility, efficacy, and consistency) [84], but the reality is that the complexity of the urban grid demands that projects be designed on a smaller scale if we wish to attend to the specifics and needs of each urban sector. This is why we view the neighbourhood scale as ideal for tackling comprehensive improvements, without this meaning that we lose sight of the need to have a plan for the urban area as a whole that acts as an umbrella under which the different actions are articulated, which in the case of Pamplona is the Energy Transition Action Plan [54].

It is interesting to confirm the way in which putting together multi-level governance was achieved based on techniques of collaboration, cooperation, and coordination between public and private sector entities. However, the novelty lay in the existence of socially reinvigorating institutional innovation processes, such as the fact that the regional government took on the role of intermediary between the financial institutions and the public. This role was promoted in Spain by the Indignados Movement (15M), but failed to become established in cities such as Madrid and Barcelona, despite being governed by political forces that emerged from that movement [8].

Furthermore, there is evidence of a change in mentality by the participating private partner. It no longer only seeks financial profits, but has come to accept their reduction in favour of greater social responsibility, which results in a regeneration of the neighbourhood, as well as processes of inclusion and social diversification.

The government has committed to a new model of creating the city and to public administration compared to privatisation and outsourcing of services. In the public policies there is an interest which extends beyond the purely economic and grants greater weight to questions of an environmental and social nature—a fact that in the energy sector is managing to transform the traditional power relationship and generate new models allowing situations of vulnerability such as energy poverty to be tackled.

Likewise, the implementation of coalitions open to the majority of local groups, and not just private interests, in the sense proposed by Logan and Molotch [85], has allowed the dilemma faced by the majority of cities to be overcome: the need to make urban competitiveness compatible with the growing demand to focus policies on the development of community interests [86]. In this context, public participation has taken on special relevance and significance because it is directly involved in the regeneration of the Txantrea neighbourhood. While in some cities such as Madrid, the participatory model is questioned by organisations such as the Regional Federation of Residents Associations of Madrid because it is considered biased and politicised [86]; in Pamplona both public and private actors agree on the strong partnership that has been established between the government and the companies that performed the works, and between them and the public [I1, I2, I3, I4, I7], in a way in which everyone wins. In this regard, we believe that history and tradition have played a major role in the processes of openness and participation [4]. At the neighbourhood scale, the bond of identity and the feeling of belonging are strongly rooted, especially among first-generation residents who previously fought to improve the urban conditions. However, from a research perspective, we wonder

if this support and identification with the neighbourhood will continue in the future when that group of elderly people disappears and the historical link to collective struggle is progressively lost.

Finally, it would be remiss not to mention the importance of financing for performing energy transition projects. Authors such as Michelini [87] and Floater [88] have stressed the excessive dependence on European funds in order to implement innovative urban infrastructure and technology such as energy-efficient buildings. As a result, we believe that managing to attract developers and investors who support the energy transition of our cities and renewable energies is key. While it is true that small stock market investors are providing their support and certain Spanish financial institutions are incorporating environmental, social, and corporate governance (ESG) criteria into their activity under the principles of Responsible Banking, in general, investors remain reluctant to enter the renewable energy market because they consider it risky [89].

8. Conclusions

Despite the context of crisis that we are suffering (health, economic, social, environmental), the energy transition remains in force in the policies of governments at different scales (European, national, regional, and local), aware of the need to maintain a proactive action in this regard so as not to stop the transition process that has begun and, at the same time, to avoid the recovery of global emissions at the end of it, as occurred at the end of the financial crisis of 2008. It will be important and decisive for this commitment, decided by the highest European authorities to maintain the energy transition in the post-pandemic recovery programmes, to be properly channelled to the local level and to counteract the budgetary limitations imposed by the growth of health spending and social emergency.

However, it is the local authorities who must carry out the energy transition with specific actions in their neighbourhoods, because of both their acquired skills in planning matters, as well as in-depth knowledge of the specific reality of their cities, the neighbourhoods they are composed of, and the needs of the communities. However, the road to the new model is not proving an easy task. The pressure from the large electricity companies, the gaps and legal contradictions that are observed in the transition from being a consumer to a prosumer, together with the current debt in numerous local administrations, reduce their capacity to act. Added to this are the lack of knowledge and distrust of the public regarding the implementation of sustainable initiatives in their neighbourhood, due to either lack of information and training or the cost that the refurbishment works may entail, as is the case with the heating plant and heating network project in the Txantrea neighbourhood in Pamplona, for the gradual replacement of gas by biomass, within the framework of a broader programme of actions to improve energy efficiency, living conditions, and the quality of life of its residents.

Navarre, and, in particular, the city of Pamplona, have been pioneers in starting the transition towards a new energy model. There are several factors that favour it: real and effective collaboration between regional and local government; the healthy state of the municipal coffers; lower incidence of economic, social, and residential vulnerability than in other Spanish cities; design of an integrated urban strategy for environmental sustainability and energy savings; as well as the existence of an active, concerned, and environmentally conscious social fabric. This public awareness revealed and called into question the growing process of dualization of urban societies and favoured priority intervention in socially disadvantaged neighbourhoods, making the principles of integrality, sustainability, participation, and urban co-creation included in the Leipzig Charter a reality, renewed on 14 October 2020 to empower cities to meet global challenges.

However, projects such as the implementation of a municipal energy company for energy self-sufficiency of public and private buildings have highlighted the need to carry out major works (heating network, connection of heating districts to the new network), to face new payments, to learn how to manage the self-production of energy, and to learn how to use the building in the most efficient way to optimise energy savings. As a result,

people prefer it to stop (I3, I4), even if it means leaving the city's energy transition plan half complete.

Finally, we cannot fail to reflect on the future of this type of project. These days we can see the weaknesses of the Spanish electricity sector following the 27% increase in energy bills in the middle of a cold spell. Although up until now the increase in the use of renewable energies in the energy mix had made consumption costs cheaper, in the context of adverse weather conditions, which in turn have reduced the production of renewable energies due to the lack of sun and wind, the electricity sector has demonstrated their limited capacity to meet demand. This circumstance once again highlights the debate on the restrictive nature of energy policies in Spain, until a couple of years ago in relation to renewables, limiting the development of new installations and the production of energy for self-consumption; as well as the use of nuclear energy, with its pros—being less polluting than coal and natural gas-fired power stations, competitive cost—and cons—generation of waste and the creation of new infrastructure.

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