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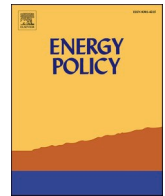
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From policy to practice: Evaluating public-led energy renovation processes in Belgian condominiums -lessons from five Flemish case studies

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ABSTRACT

Energy renovations in multi-owner residential buildings are a critical but complex component of Europe's decarbonization strategy. Co-owned condominiums face challenges related to collective decision-making, technical complexity, legal rigidity, and financial risk. Across Europe, national and regional governments have launched support structures, most notably one-stop shops, to guide co-owners through the renovation process and to bridge technical, financial, and organizational gaps. In the Belgian region Flanders, the Flemish Energy and Climate Agency has launched a subsidized Renovation Master Plan to overcome these barriers by facilitating one-stop shops that provide neutral renovation advice (Energy Houses), and engineering and architectural consultancies (Study Offices) to support condominiums throughout the renovation process. This article investigates how this Public-Led Approach operates in practice by analysing five real-life condominium renovation projects across three cities: Antwerp, Mechelen, and Ostend. Based on case studies, interviews with co-owners and relevant stakeholders, and analysis of project reports, this study explores this policy instrument with the aim of optimizing its effectiveness and exploring its potential for replication in other EU member states. The findings show that successful energy renovations are not just a matter of technical planning or financial subsidies. Progress depends on how public actors build trust, coordinate fragmented stakeholders, and adapt their business models to diverse ownership structures and renovation pathways. We argue that replicating and scaling such Public-Led Approaches requires sustained local engagement, institutional flexibility, and public-private collaborations. The findings can inform policymakers, practitioners, and researchers in developing effective and targeted Publicly-Led Integrated home renovation services in the EU.

1. Introduction

The decarbonization of Europe's building stock is one of the most urgent and complex tasks in the transition to a low-carbon society (Tsemekidi Tzeiranaki et al., 2022). The European Green Deal, the revised Energy Performance of Buildings Directive (EPBD), and national climate plans all call for a dramatic acceleration in deep energy renovations (Fetting, 2020; BPIE, 2024). Around 47.7% of people in Europe live in condominiums (Eurostat, 2024). Renovating condominium buildings remains a shared challenge across the EU (D'Oca et al., 2018; Končalović et al., 2022). Condominiums, governed by Homeowner associations (HOAs), also known as condominium or co-owners' associations, remain particularly difficult to renovate at scale due to institutional, financial, technical, and social complexities (Elgendy

et al., 2024a). Many condominiums are ageing, poorly insulated, and occupied by diverse groups of owners with varying levels of technical knowledge, financial capacity, and motivation (Elgendy et al., 2024b). Additionally, legal constraints and the absence of integrated support services intensify the difficulties that HOAs face in organizing, financing, and executing energy renovation projects (Elgendy et al., 2024b).

EU member states have established one-stop shops (OSS) to help facilitate renovation processes for the residential sector (Bertoldi et al., 2021). These initiatives, often funded or supported by public authorities, aim to reduce complexity for homeowners by offering integrated advice, technical expertise, and access to financing options. In this context, Integrated Home Renovation Services (IHRS) refer to service models that bundle multiple renovation-related functions (such as technical

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assessment, coordination of actors, financial guidance, and process management) into a coherent, customer-oriented renovation journey (Milin and Bullier, 2021). While OSS and IHRS can take different organizational forms, ranging from municipal energy agencies and regional platforms to public-private consortia, they share the overarching goal of simplifying renovation journeys and accelerating uptake (Elgendy et al., 2024b).

Building on this broader European trend, Belgium has developed its own Public-Led Approach in Flanders “the Renovation Masterplan” facilitated by the Flemish Energy and Climate Agency (VEKA). This initiative aims to provide structured, step-by-step support to HOAs by commissioning study offices to prepare technical and financial renovation roadmaps. The implementation is supported by a network of public energy houses, which creates a multilevel governance structure to facilitate deep renovation in the condominium sector. This approach represents a novel form of Public-Led renovation service provision, with the potential to act as a OSS facilitator model tailored to condominiums (Architecture Workroom Brussels and Rebel, 2024; Elgendy et al., 2023; Inge, 2024). The approach is further explained in Section 2.

Beyond Flanders, several EU public models support HOAs and offer pathways for replication. For example, France operates a national public service for renovation, which combines building-level grants for co-ownerships with mandatory, state-approved accompaniment for larger projects, and an integrated mix of subsidy and technical assistance (Le Jeannic, 2023). Estonia offers 30–50% grants to HOAs, with a required technical consultant and clear performance conditions, another pairing of finance plus structured support (Kuusk and Kalamees, 2016). Austria illustrates strong city-regional models: Vienna’s approach couples subsidy administration with hands-on guidance, while federal incentives target condominiums (Elgendy and Mlecnik, 2024). The Netherlands has historically followed a more market-driven approach to service provision, but has recently seen a surge in public initiatives such as the VvE Loket (municipal HOA support desks), large-scale informational campaigns through platforms like Milieu Centraal, and the HOAs acceleration agenda (BZK, 2023). Increasingly, Dutch municipalities are prioritizing support for HOAs, making it essential to understand how different institutional configurations function.

Taken together, these cases point to a common, scalable architecture, public finance tied to minimum energy-saving thresholds, embedded OSSs, and mandated or incentivized technical accompaniment that can inform replication and adaptation in regions with active HOAs.

However, while promising in design, there is limited empirical understanding of how such Public-Led Approaches operate in real-life contexts. Most research to date has focused on developing OSSs for energy renovations and evaluating their business models (Bertoldi et al., 2021; Elgendy et al., 2024b; Pardalis et al., 2025), with little attention to this complex group typology and to the evaluation of how effective and replicable those business models are by looking into actual operationalization, stakeholder dynamics, and lived experiences in Public-Led renovation processes. In particular, we lack insights into how these approaches perform across diverse urban settings, how value is created and delivered for co-owners, and how stakeholder relationships evolve during complex, multi-year renovation trajectories.

While existing research on OSS and IHRS has provided valuable insights into organizational typologies, service design, and business model configurations, most studies focus on ex-ante assessments, pilot evaluations, or market-based service provision. Less attention has been paid to how Public-Led renovation approaches operate in practice once they are embedded in real-life governance contexts and confronted with the institutional, social, and financial realities of condominium ownership. This study contributes to the literature by explicitly examining a Public-Led renovation approach as a distinct analytical category, where neutrality, public accountability, and long-term engagement replace market-driven logics. By analysing how this approach is implemented across five real-life condominium cases, this paper provides empirical insights into stakeholder coordination, role distribution, and decision-

making dynamics that are not captured in conventional OSS evaluations. For policymakers, the findings offer actionable lessons on how public actors can structure, finance, and govern IHRS to build trust, reduce collective-action barriers, and enhance the replicability of Public-Led renovation processes beyond the Flemish context. This paper addresses that gap by investigating the implementation of the Public-Led Approach in three Flemish cities with differing profiles: Antwerp (a large metropolitan centre), Mechelen (a medium-sized city), and Ostend (a coastal city with a high share of second-home ownership).

The aim of this research is to try to answer the research question: *How effective is the Public-Led Approach in delivering actionable renovation pathways for condominiums?* In doing so, we identify critical success factors and areas for improvement, with implications for replicability and policy design. This study not only assesses the current impact and limitations but also examines the potential for development, viability, and replication across Europe. While this paper focuses on the Flemish region of Belgium, it serves as a basis for future comparative analysis.

The paper is structured as follows. Section 2 provides an overview of the Flemish Renovation Approach. Section 3 outlines the methodology and case study design. Section 4 presents the empirical findings. Section 5 discusses the key cross-cutting insights and provides Business model development and policy recommendations. Conclusions are drawn in Section 6.

2. Institutional design of the Flemish Public-Led renovation approach

This section describes the institutional design and intended functioning of the Flemish Public-Led renovation approach, providing the policy context against which the empirical case study findings are later evaluated.

Belgium splits energy competencies between the federal state and the regions. In Flanders, the public authority responsible for energy and climate policy is the Vlaamse Energie en Klimaatagentschap (VEKA), which leads building-sector policy and finances renovation instruments (e.g., *Mijn VerbouwPremie*, *Mijn VerbouwLening*) while subsidizing local public Energy houses (Energiehuizen) that provide front-line advice and lending support. Flanders invests in a Public-Led Master Plan for HOAs to meet EU-regional climate/renovation targets that are highlighted in the EPBD Articles 12 and 18 (European Parliament & Council of the European Union, 2024).

Previous research (Fig. 1) conceptualises the renovation journey of HOAs as a sequence of interrelated phases, spanning initial problem recognition and agenda setting through decision-making, financing, and implementation. Across these phases, recurring technical, financial, organisational, and social barriers are identified as key sources of delay and project failure. Rather than depicting a linear project trajectory, the framework characterises renovation as a decision-intensive and iterative process shaped by collective governance arrangements, legal decision thresholds, and coordination demands among multiple actors. Building on this framework, the present study examines the extent to which the Renovation Master Plan aligns with and supports these phases, with specific attention to process design, phase coverage, and mechanisms that facilitate implementation in practice.

To overcome the challenges for HOAs and support the scaling of renovations in line with EU climate targets, the Flemish government has introduced a set of targeted interventions as a policy response. A key objective of the EPBD is to establish technical support structures that guide stakeholders throughout the renovation process. The Flemish approach operationalizes this objective by combining subsidized renovation masterplans, low-interest renovation loans, targeted awareness campaigns, and renovation coaching, coordinated through public energy houses and accredited study offices, as illustrated in Fig. 2. One central measure is the provision of a professional Renovation Master Plan (Vlaanderen, 2022; Soete, 2024), designed to help HOAs identify renovation opportunities within their condominium buildings. This

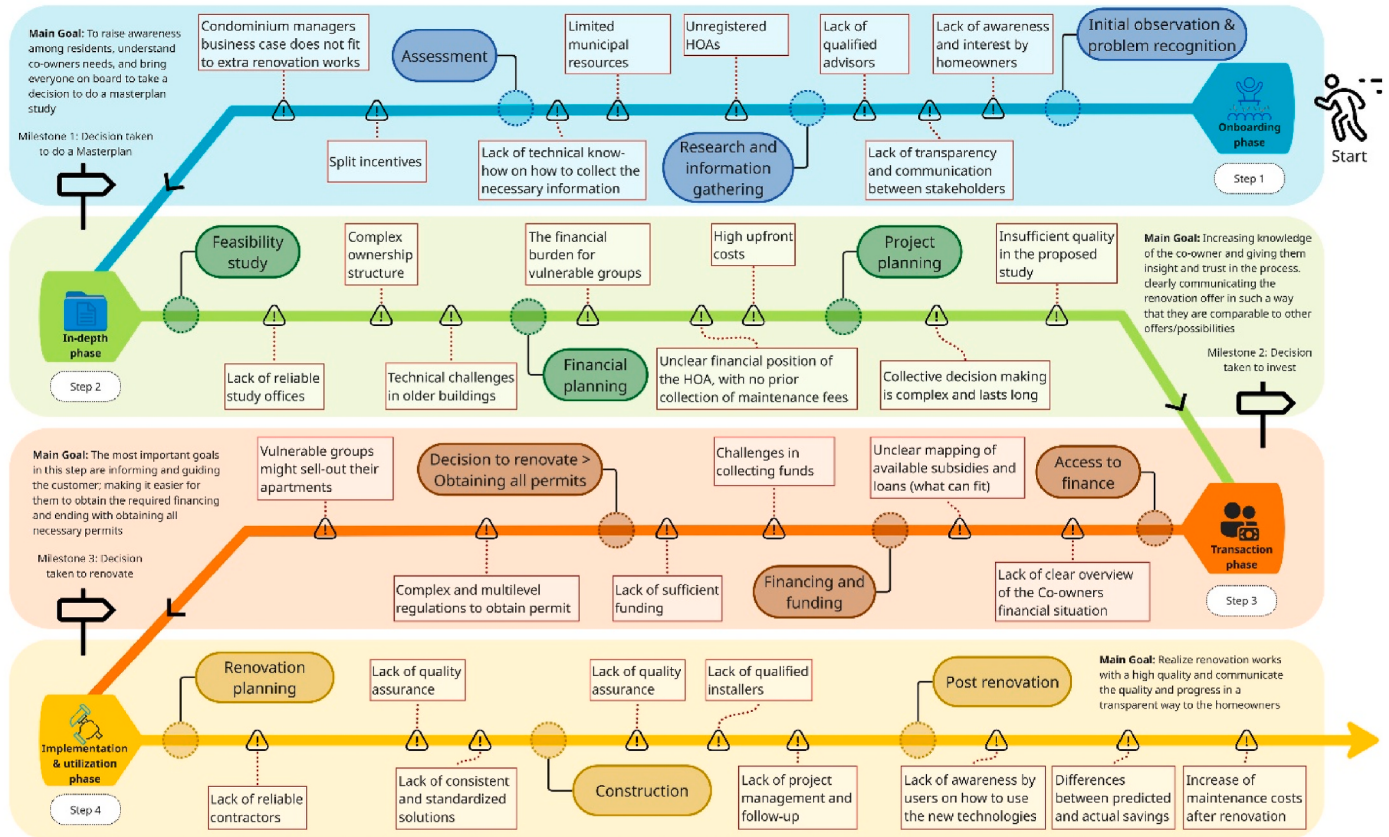


Fig. 1. Renovation Journey of Homeowner Associations and identified barriers to Uptake. Source: Author's synthesis based on (Elgendy et al., 2024a) and adjusted from (Elgendy et al., 2024b).

service is partially subsidized and can currently be developed by only one of six government-accredited study offices, each required to adhere to predefined methodological and content criteria set by the Flemish authorities.

The Flemish government offers low-interest renovation loans for HOAs up to €60,000 in addition to €25,000 per apartment, along with targeted awareness campaigns. They also subsidize the Energy Houses to provide free guidance and technical advice through renovation coaches.

These efforts are coordinated by Public Energy Houses, which embody the IHRS principle by offering a bundled, structured service model to support HOAs throughout the renovation journey. Through these instruments, the Flemish government aims to address key barriers and contribute to the broader goals set forth by the EPBD, as illustrated in Figs. 2 and 3.

Fig. 2 outlines the hypothesized mechanisms through which public policy instruments are expected to influence renovation processes in

Expected Impacts of policy instruments

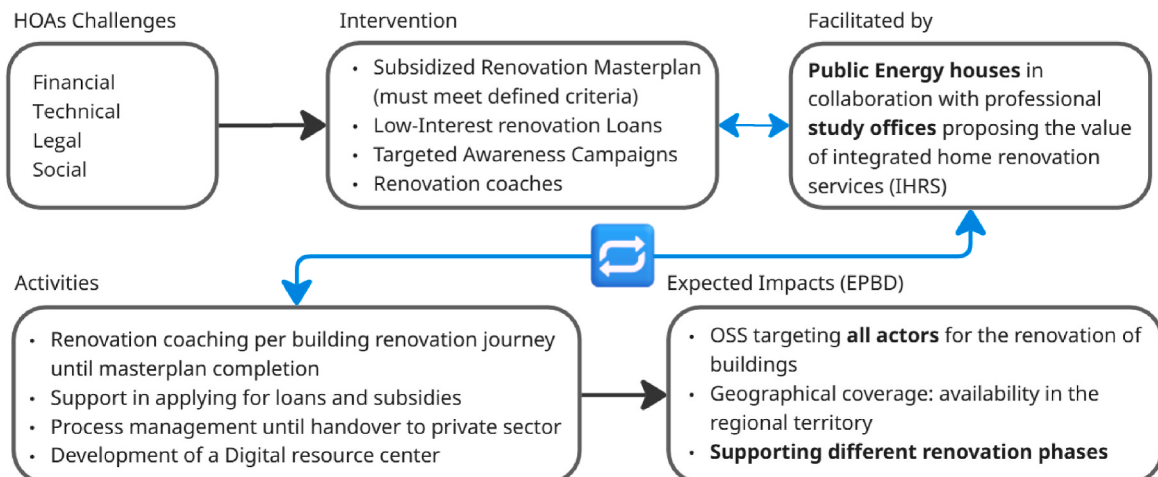


Fig. 2. Expected impacts of policy instruments as defined in the design of the Flemish Public-Led renovation masterplan (ex-ante policy logic).

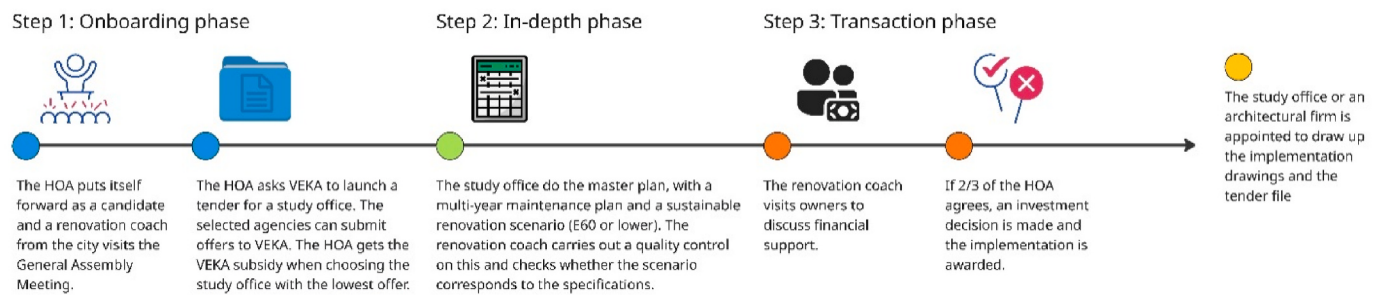


Fig. 3. The Flemish Master Plan approach, adapted from: [Architecture Workroom Brussels & Rebel \(2024\)](#) Collectieve renovatie van appartementsgebouwen.

condominiums. The model situates public energy houses and accredited study offices as intermediary actors that translate policy objectives into building-level support by combining technical assessment, process guidance, and access to financing instruments. These interventions are expected to affect key decision-making conditions within HOAs, including information asymmetries, coordination costs, and perceived financial and organizational risks. By explicitly linking policy inputs to anticipated process-level effects, the figure provides an analytical framework against which the empirical case studies examine how, and to what extent, the Public-Led approach operates as intended across different local contexts.

Local municipalities and energy houses play a crucial role as intermediaries, identifying candidate buildings, maintaining contact with HOAs, and facilitating communication between HOAs and technical partners. For buildings with 15+ apartments, VEKA subsidises such studies, covering up to 60% of eligible costs (capped at €12,000), and provides tools and templates to standardize the process. An important milestone in the process is the general assembly decision, where, most of the time, a two-thirds majority is required to proceed with the renovation scenario. If approved, the project can move into a follow-up phase involving contractor selection, technical drawings, and preparation of a tender dossier.

While the masterplan approach is designed to provide structured, phased support aligned with EU and Flemish policy objectives, its effectiveness depends on how these instruments are enacted in real-life condominium contexts. The following section, therefore, outlines the methodology and case study design used to examine how this Public-Led approach operates in practice across different cities, building typologies, and stakeholder configurations.

3. Methodology, data collection, and data analysis

This research forms part of the EU LIFE CondoReno project and was implemented through a two-stage research design. The first stage, reported in a previous publication, analysed the business models underpinning public renovation services in three cities and identified key improvement needs, including the importance of achieving early-stage successes, strengthening stakeholder collaboration, enhancing communication and decision-making support, fostering public-private partnerships, and developing integrated service packages. Building on these findings, the second stage, presented in this paper, examines how these business models operate in practice. Between October 2022 and April 2025, five in-depth case studies were conducted, drawing on semi-structured interviews with HOAs, study offices, energy houses, and policy representatives, complemented by observations from co-creation workshops and analysis of technical reports produced within the EU LIFE projects CondoReno and BE REEL!

While the Public-Led nature of the approach offers structured support through local actors, it remains essential to assess whether the services provided are operationally and financially sustainable, responsive to co-owners needs, and capable of delivering consistent value across diverse condominium settings. To do so, our evaluation

framework, as illustrated in Fig. 4, combines indicators from the literature with benchmarks harmonized with the EPBD criteria mentioned in Section 2 to assess the Master Plan's viability. The indicators are: financial stability (Schinasi, 2004), adaptability and flexibility of the business model (Güss et al., 2017), customer focus and value proposition (Anderson et al., 2006; Osterwalder and Pigneur, 2010), supportive financing solutions (Waddle and Perlack, 1992), supported by digital tools (Laffont-Eloire et al., 2019; Calderon-Monge and Ribeiro-Soriano, 2024), and operational efficiency (Teece, 2010). These criteria form the analytical backbone of the study and were used as thematic codes for analysing stakeholder interviews and case documentation. Assessing viability through this multi-dimensional lens allows for a more grounded understanding of what makes integrated renovation support successful in practice and what challenges must be addressed to ensure broader replication. The remaining viability dimensions in the framework (i.e., supply chain resilience, scalability, competitive advantage, and diversification) are typically applicable to more mature business models and were therefore not operationalised in this study, as the public-led approach is still in an early development phase (Casadesus-Masanell and Ricart, 2010; Gomes and Livdan, 2004; Jabbarzadeh et al., 2018; Nielsen and Lund, 2017). While the study was enriched by data from various stakeholders, interviews with condominium managers (CMs) could not be conducted, as they did not respond to invitations. This limitation is understandable, since they are not involved in the subsidized approach and have no financial incentive.

3.1. Research design

This study adopts an exploratory, qualitative case study design to investigate the implementation of the Public-Led Approach and its potential for replication, as well as the barriers and success factors that affect its outcomes. Following (Yin, 2017). The research examines five cases as social phenomena embedded in real-life contexts, allowing for in-depth analysis of the dynamics between public service providers, study offices, policymakers, and HOAs during the renovation process.

3.1.1. Case selection and case study characteristics

This study adopts a multiple-case study design to examine how the Public-Led IHRS approach operates in practice within condominium contexts. Five case study buildings were selected using purposive sampling to achieve analytical diversity rather than statistical representativeness. Selection criteria included building typology (e.g., size, height, and number of units), construction year and renovation history, neighbourhood characteristics, willingness of residents and HOAs to participate, governance and ownership conditions, and stage of progress within the IHRS process. The cases were intentionally distributed across three Flemish cities to capture variation in local implementation contexts, stakeholder configurations, and urban conditions. As shown in Table 2, this diversity enables comparative analysis of how the Master Plan approach is implemented under differing conditions and supports identification of cross-cutting challenges, success factors, and service responses.

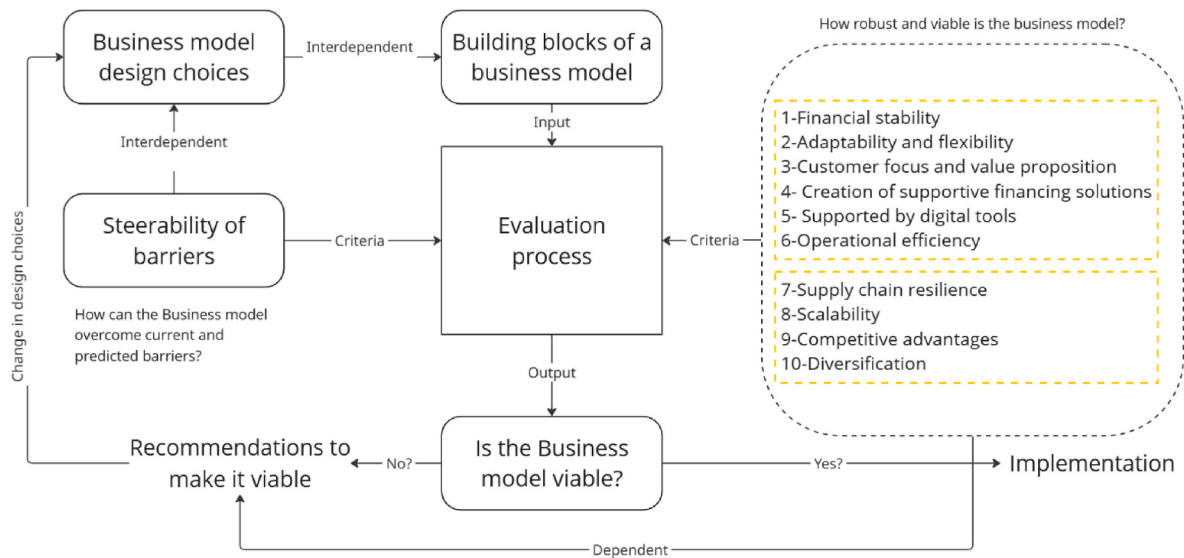


Fig. 4. The evaluation framework is used to assess the viability of the IHRS and guide recommendations for business model improvement.

With respect to the broader building stock, the cases reflect the types of condominiums explicitly targeted by Public-Led IHRS instruments and typically considered challenging to renovate due to collective decision-making, fragmented ownership, and coordination constraints. While the cases are not intended to statistically represent the full condominium stock, they provide sufficient coverage of key contextual conditions relevant to the research question and enable assessment of mechanisms through which the approach supports (or fails to support) renovation progression.

Regarding sample sufficiency, the number of cases was appropriate for an in-depth qualitative design focused on understanding mechanisms and implementation dynamics. The analysis prioritizes analytic generalization: insights are derived through systematic within-case analysis and cross-case comparison, enabling the identification of robust themes that recur across cases and stakeholder groups. This approach is consistent with established qualitative case study methodology, where a moderate number of information-rich cases enables both depth and comparative inference.

3.2. Data collection

The study employed multiple data sources to strengthen triangulation and contextual understanding (see Figs. 5 and 6). Primary data were collected through sixteen semi-structured interviews with seventeen key stakeholders involved in the selected cases (see Table 1). These included co-owners (primarily board members of HOAs), study offices, project managers from public energy houses, and one policy representative from VEKA.

The research employed a multi-step qualitative approach. First, the business models of three participating energy houses were analysed, drawing on two years of engagement through workshops, focus groups, and project activities. These insights informed the development of interview protocols. Semi-structured interviews were then conducted with co-owners to capture motivations and experiences, followed by interviews with study offices to examine their role and compare perspectives. A policy-level interview provided government insights, while a joint session with the three energy houses enabled reflection on collaboration, co-owner engagement, and city-specific differences. All

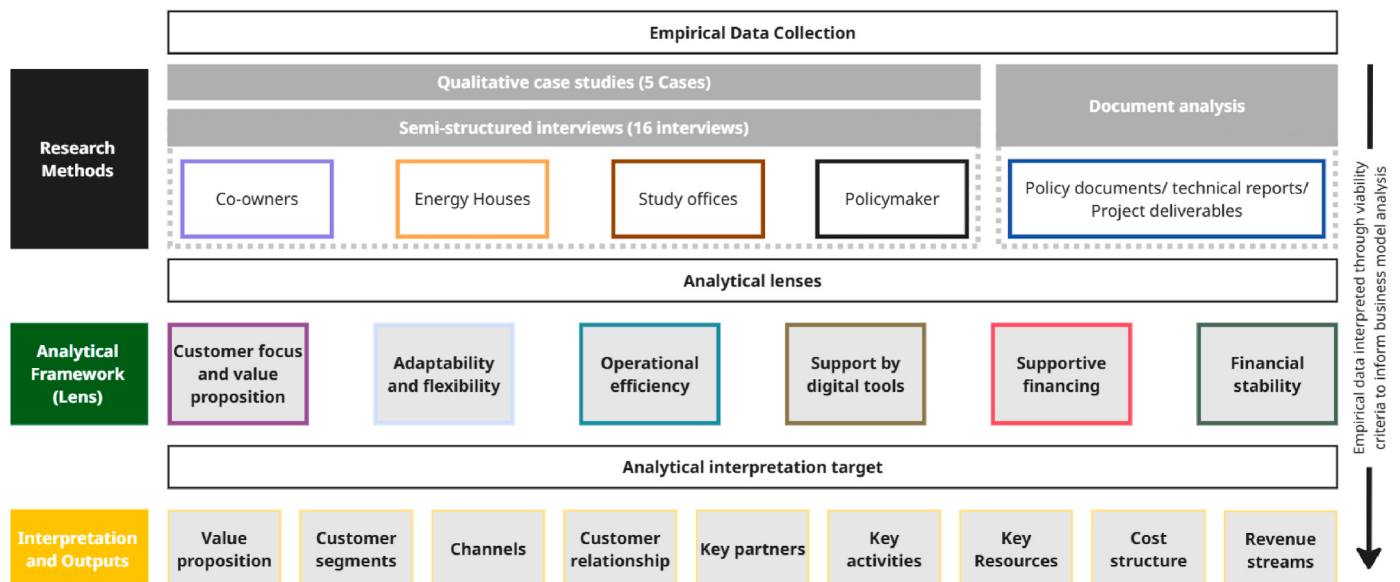


Fig. 5. Analytical framework linking qualitative research methods, viability criteria, and business model interpretation in the evaluation of Public-Led IHRS.

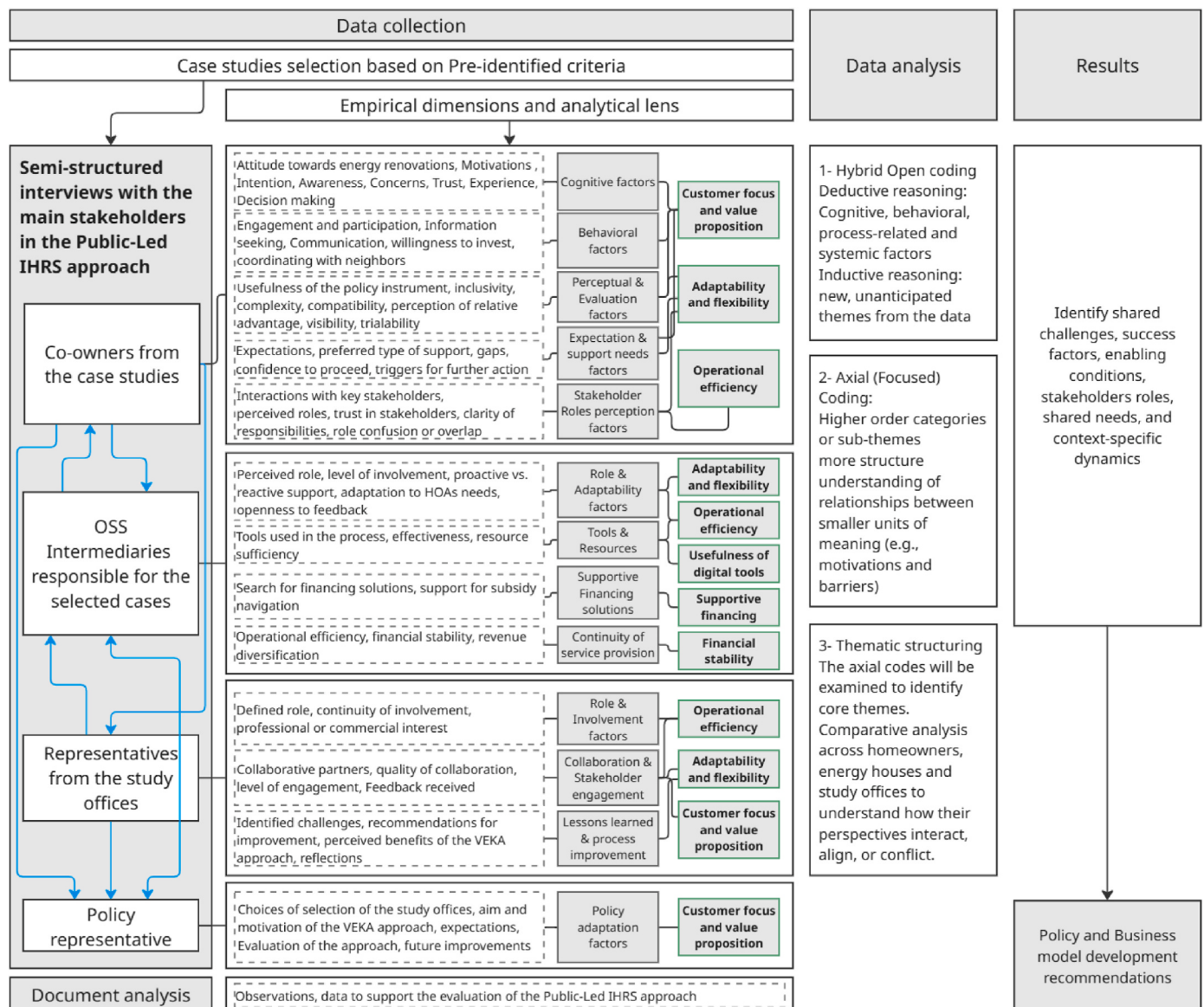


Fig. 6. Overview of the qualitative data collection and analysis workflow, illustrating how empirical materials were coded and structured through viability criteria to generate cross-case analytical results and policy-relevant insights.

Table 1
Profile of the conducted interviews.

Code	Date	Stakeholder	Case study	Method	Duration
I-1	3-3-2025	Co-owner and board member	Case study 1	Semi-structured interview (in Person)	1 h
I-2&3	3-3-2025	Co-owners and board members	Case study 2	Semi-structured interview (in Person)	1 h & 10 m
I-4	18-3-2025	Co-owner and board member	Case study 3	Semi-structured interview (online)	52 m
I-5	18-3-2025	Co-owner and board member	Case study 3	Semi-structured interview (online)	1 h
I-6	24-3-2025	Co-owner and board member	Case study 4	Semi-structured interview (online)	1 h & 10 m
I-7	25-3-2025	Co-owner and board member	Case study 4	Semi-structured interview (online)	44 m
I-8	8-4-2025	Co-owner and board member	Case Study 5	Semi-structured interview (online)	34 m
I-9	8-4-2025	Co-owner and board member	Case study 5	Semi-structured interview (online)	27 m
I-10	26-3-2025	Policymaker	All cases	Semi-structured interview (online)	59 m
I-11	6-2-2025	Study office representative	Case study 3 & 4	Semi-structured interview (online)	49 m
I-12	12-3-2025	Study office representative	Case study 5	Semi-structured interview (online)	1 h & 12 m
I-13	13-3-2025	Study office representative	General (all cases)	Semi-structured interview (online)	52 m
I-14	14-3-2025	Study office representative	Case study 1 & 2	Semi-structured interview (online)	58 m
I-15	18-6-2025	Energy House representative	Case study 1 & 2	Semi-structured interview (online)	1 h
I-16	18-6-2025	Energy House representative	Case study 3 & 4	Semi-structured interview (online)	1 h
I-17	18-6-2025	Energy House representative	Case study 5	Semi-structured interview (online)	1 h

interviews were audio-recorded, transcribed, and anonymized. Supplementary materials: policy documents, project deliverables, workshop reports, and meeting minutes, were also reviewed to triangulate findings and compare lived experiences with institutional objectives.

The analytical framework guiding this study is presented in Fig. 5. Qualitative empirical data collected through five case studies, semi-structured interviews, and document analysis were interpreted through a set of viability criteria derived from the literature. These criteria function as analytical lenses that guide the coding and interpretation of the data. The resulting insights were then used to assess how different dimensions of viability shape decision-making and configuration choices within the business model components (Osterwalder et al., 2005; Wirtz et al., 2023) of Public-Led IHRS. In this way, the framework links empirical evidence to business model evaluation and supports cross-case comparison and policy-relevant interpretation.

3.3. Data analysis

The qualitative data analysis followed a structured, theory-informed approach. Interview transcripts, case study notes, and documentary materials were analysed using thematic coding, guided by the viability criteria. These criteria were used as analytical lenses rather than as evaluative indicators.

In a first step, all interview transcripts and documents were coded according to these six dimensions to identify recurring themes, challenges, and enabling factors related to the functioning of Public-Led IHRS. Coding was applied across stakeholder groups to capture differing perspectives among co-owners, public intermediaries, study offices, and policymakers. In a second step, the coded material was interpreted at the case level to assess how each viability dimension manifested in practice and how it influenced decision-making processes and organizational arrangements.

Finally, insights from the individual case analyses were compared across cases to identify common patterns, context-specific dynamics, and structural bottlenecks. These findings were then mapped onto the business model components to support a systematic evaluation of how viability considerations shape the design and performance of Public-Led IHRS. This analytical process enabled cross-case comparison while maintaining sensitivity to contextual variation.

This study used a hybrid thematic analysis approach that combined both deductive and inductive coding (Fereday and Muir-Cochrane, 2006). Each first-order code was grouped into second-order categories to support thematic interpretation and cross-case comparison. While the coding was primarily deductive, the process remained open to emergent insights within each category, allowing for inductive refinement where relevant (Saunders et al., 2023).

It is worth noting that interviewees occasionally used different terms interchangeably, such as syndic, property manager, or condominium manager, all referring to the same role. Similarly, some interviewees used condominium association instead of homeowner association. In this manuscript, we retained the original wording in the interview quotes but use the terms homeowner association (HOA) and condominium manager (CM) consistently throughout the text for clarity.

Fig. 6 provides an overview of the qualitative data collection and analysis workflow used in this study. It illustrates how empirical material from semi-structured interviews with key stakeholder groups involved in Public-Led IHRS, including homeowner representatives, Energy houses/OSS, study offices, and policymakers, as well as supporting documents, was analysed using a hybrid inductive–deductive coding strategy.

Initial open coding was applied to identify cognitive, behavioural,

process-related, and systemic themes emerging from the data. These codes were subsequently consolidated through axial (focused) coding into higher-order categories capturing shared challenges, enabling conditions, stakeholder roles, and support needs. In a final step, the resulting themes were structured using the viability criteria. The outputs of this analytical process informed the cross-case results presented in Section 4 and the policy and business model development recommendations discussed in Section 5.

3.4. Case studies description

Table 2 summarizes the key characteristics of the selected cases and highlights the diversity of contexts in which the Public-Led IHRS approach was examined. Across the cases, the buildings differ in typology, size, ownership structure, and governance conditions, these factors shape coordination needs, stakeholder engagement, and the feasibility of staged decision-making. At the same time, the cases share core characteristics typical of condominium renovation challenges, including fragmented ownership, reliance on collective decisions, and the need to align technical planning with financing and co-owner acceptance. This combination of shared structural features and contextual variation supports comparative analysis of how the Public-Led approach performs under different conditions.

4. Results

In this section, we present the results from four complementary strands of qualitative data: Co-owners perspectives, Insights from the study offices, Insights from the Energy houses, and Policy maker perspective. Taken together, these perspectives provide a multi-level understanding of the Public-Led approach, revealing how the masterplan process is experienced at the building level, interpreted by technical experts, facilitated by local energy houses, and shaped by policy frameworks. This layered evidence base allows us to assess the Public-Led approach, to identify what enables or hinders its adoption, to evaluate the viability of the business models developed by the energy houses, and to explore how policy can be refined to generate stronger impacts.

Across the five case studies, the analysis reveals both shared structural challenges and context-specific dynamics that shape the functioning of the Public-Led renovation masterplan. All cases are characterised by fragmented ownership and collective decision-making requirements, which create coordination challenges and heighten the importance of intermediary support. At the same time, variation in governance capacity, stage of renovation progress, and local implementation conditions influences how effectively the Public-Led approach supports decision-making and maintains momentum. This combination of common constraints and contextual variation provides the analytical basis for the results presented below and enables the identification of recurring mechanisms as well as factors that condition the viability of Public-Led IHRS business models.

The subsections below, therefore, focus on analytically relevant patterns rather than exhaustive stakeholder accounts.

4.1. Homeowner associations' experiences with the public-led approach

Across the five case studies, HOAs experiences with the Public-Led Approach reveal recurring patterns related to motivation, trust-building, and feasibility within collective decision-making contexts. While subsidies and visible building deterioration often triggered initial engagement, sustained progress depended on how financial uncertainty,

Table 2
Overview of the five Flemish Case Studies that went through the Master Plan Approach.

Case study code and location	Key characteristics	Facts	Picture
Case study 1 Mechelen	Number of housing units: 13 Building year: 1955 Basement: Yes Ratio of owners to tenants: 7 - 6 Heating system: Collective central heating with 2 condensing gas boilers (10 years old) Number of Board members: 3 Condominium manager: Yes	Challenges: Unexpectedly higher costs due to higher material costs for the façade, the condominium manager is reluctant to accept any extra work, and the neighbouring building did not agree to do interventions to be able to insulate the common wall. 3 board members (1 approached the energy house, inquiring about a renovation Master Plan). Master Plan developed (without the VEKA subsidy, because the building is not eligible <15 apartments) Fire safety and façade renovation started	
Case study 2 Mechelen	Number of housing units: 41 Building year: 2001 Basement: yes Ratio of owners to tenants: 26 - 15 Heating system: Individual heating installations, mostly with a condensing gas boiler/1 heat pump Number of Board members: 5 Condominium manager: Yes	Challenges: mixed ownership, the commercial owner on the ground floor has a different time frame for renovation works than the other co-owners, and the technical condition of the building is good since it was built in 2021. However, some parts are deteriorated. 5 board members (1 approached the energy house, inquiring about a renovation Master Plan). Master Plan developed.	
Case study 3, Ostend	Number of housing units: 240 Building year: 1966 Basement: Yes Ratio of owners to tenants: 120 - 120 Heating system: Individual electrical heating (accumulation or storage heating). Individual electrical heating (boiler and flow heater) Number of Board members: 10 Condominium manager: Yes	Challenges: About 50% of the flats are empty (second co-owners), mixed ownership, and a great amount of maintenance backlog. 10 board members who are proactive. Master Plan developed.	
Case study 4, Ostend	Number of housing units: 30 Building year: 1962 Basement: yes Ratio of owners to tenants: 6 - 24 Heating system: Collective heating with non-condensing boiler (CO!) Number of Board members: 4 Condominium manager: Yes	Challenges: Balconies are not accessible anymore due to the bad structural condition and maintenance backlog. Master Plan developed.	
Case study 5, Antwerp	Number of housing units: 31 Building year: 1979 Basement: yes Ratio of owners to tenants: 18 - 13 Heating system: Building > Collective central plant with condensing boiler Sanitary > Linked to space heating Number of Board members: 4 Condominium manager: Yes	Challenges: Many co-owners are still cautious or critical. A dedicated project team has been established to oversee the renovation. Master Plan developed.	

communication gaps, and divergent owner priorities were managed. The findings highlight the central role of phasing, intermediary support, and realistic financial framing in translating initial willingness into actionable renovation decisions.

4.1.1. Motivation, perceived value, and initial engagement

Initial engagement was frequently driven by a combination of financial incentives and material building conditions. The availability of subsidies was often decisive: “Without the subsidy, it would never have passed ... ‘if it doesn't cost us anything now, why not try?’” (I-2). In Ostend, visible deterioration and liability concerns triggered action: “We knew the façade was crumbling ... better to do it with a long-term vision” (I-6).

Willingness to engage varied across ownership profiles. Younger or

newer owners expressed a stronger desire for active involvement: “it was important to be part of the decision” (I-7), while some older residents were more hesitant about large investments: “Some are in their eighties and ask, why spend so much for something we may not even see finished?” (I-5). In coastal cities, the presence of second-home owners further complicated engagement, as energy efficiency was often perceived as a lower priority: “They don't care much about energy efficiency because they only use the apartment occasionally” (I-5). Together, these factors shaped how far and how fast associations were willing to proceed.

Beyond initiating engagement, the master plan was widely valued for providing an objective reference point that helped resolve internal debates. Interviewees described how formal technical assessments reduced circular discussions: “For the first time we had it in black and white ... it

shows what is urgent and what can wait" (I-2). In Antwerp, this clarity was seen as a turning point: "Once it's in the study, the discussion is over" (I-8). At the same time, the comprehensive scope of the studies sometimes overwhelmed residents: "People were scared when they saw the marks everywhere" (I-6).

4.1.2. Communication, intermediary roles, and trust dynamics

Communication pathways and intermediary roles significantly shaped co-owners' experiences. Direct involvement was often limited, with information filtered through CMs, generating frustration and perceptions of exclusion: "Nobody from the owners' side was informed" (I-6). Similar concerns emerged in Mechelen, where co-owners felt decisions were taken without sufficient consultation.

Where participatory tools were used, engagement and acceptance improved. Antwerp residents highlighted the value of a city-led survey: "Everyone had the chance ... it's for the whole building" (I-8), while in Ostend, surveys were seen as an important way to capture diverse concerns (I-7).

Intermediaries played differentiated roles in shaping trust and momentum. CMs were frequently described as bottlenecks due to delays or reluctance: "Unless you push, nothing happens" (I-8), while study offices were valued for technical quality but criticised for distant communication when interactions were channelled exclusively through CMs (I-2). In contrast, Energy Houses were perceived as stabilising actors, helping to depoliticise discussions and reframe expectations: "The plan is a roadmap ... you don't have to do everything right away" (I-6). Municipal involvement further increased legitimacy and trust among co-owners.

4.1.3. Financial feasibility, phasing, and prioritisation of measures

Financial feasibility emerged as the dominant constraint across all cases. Co-owners repeatedly stressed that long-term planning without realistic financing scenarios was of limited value: "Otherwise it's just a wish list" (I-8). Large cost estimates often resulted in shock and resistance: "Once they saw the figures ... 30 million euros is overwhelming" (I-5). Many, therefore, advocated for building-level loans to spread costs over time, noting that fragmented, individually targeted subsidies were poorly suited to collective renovation.

Resistance to high upfront costs was particularly pronounced among older owners. Across cases, co-owners consistently emphasised the importance of phasing renovation measures to maintain both financial and social feasibility: "We don't have to do everything at once, but can spread it out so it's financially manageable" (I-6). Urgent safety and condition issues often took precedence over energy measures, leading co-owners to reorder proposed sequences based on visible risks: "Balconies had become unsafe" (I-6).

Despite frustrations, most interviewees recognised the added value of having an external roadmap and professional guidance: "Now we have something objective to guide us" (I-2). However, many stressed that follow-up support remains essential to prevent stagnation: "A masterplan is useless if you can't implement it" (I-6). Concerns were also raised about shifting policy signals and high approval thresholds, which continued to slow decision-making.

4.2. Technical mediation and implementation challenges from study office perspectives

Across the case studies, study offices emerged as key intermediary actors within the Public-Led Approach, operating at the intersection of technical expertise, stakeholder coordination, and implementation feasibility. Their role extended beyond producing technical assessments to mediating between co-owners, CMs, municipalities, and energy houses. The analysis indicates that study offices play a decisive role in translating complex renovation pathways into socially and institutionally workable processes, while navigating structural constraints related to governance, procurement, and capacity.

4.2.1. Technical mediation and communication with homeowner associations

A recurring challenge identified by study offices was translating complex technical information into accessible narratives for heterogeneous HOAs. Interviewees emphasised that technical competence alone was insufficient; effective communication and persuasion were essential to sustain engagement and avoid decision paralysis. As one study office explained: "We already have a lot of background in communicating with co-owners about complex topics ... breaking down the information so they can understand and engage with it" (I-13).

While boards and co-owners were generally described as motivated, differences in knowledge levels and expectations complicated decision-making. In Antwerp, study offices highlighted a critical gap between delivering the renovation masterplan and maintaining momentum thereafter: "We finish the renovation master plan ... but then we wait. We can't do more, we're not paid for it" (I-12). This illustrates how the absence of continuous follow-up mechanisms can limit the effectiveness of technically robust plans.

CMs were consistently identified as pivotal gatekeepers. Their willingness (or reluctance) to facilitate meetings and communication significantly shaped implementation timelines. One interviewee noted: "We are only allowed to present in April this year because they didn't want to organise an additional meeting" (I-13). As a result, study offices adapted their planning strategies around general assembly cycles: "The first thing we ask is: when is your yearly meeting?" (I-13).

4.2.2. Phased renovation planning and sequencing strategies

Integrated, all-at-once renovation strategies were largely absent across the cases. Instead, phased approaches were adopted as a pragmatic response to financial, organisational, and social constraints: "None ... have chosen an integrated renovation, zero at this moment. All in small steps" (I-14). Phasing was framed as an enabling strategy rather than a compromise: "Each step ... is good" (I-14).

Study offices described deliberate efforts to group measures in ways that distributed benefits across residents and minimised resistance. Safety-related interventions, such as fire protection or asbestos removal, were often prioritised, while energy measures were sequenced to avoid technical lock-ins. As one interviewee explained: "We group measures so that within one group there are benefits for everyone" (I-13). This underscores the role of study offices in aligning technical sequencing with social acceptability.

4.2.3. Expanded roles and one-stop shop configurations

The scope of study office involvement varied significantly across cities. In Ostend, offices primarily delivered advisory reports before transferring responsibility to energy houses. In contrast, in Antwerp and Mechelen, some study offices positioned themselves as IHRS providers offering OSS functions: "The whole process from A to Z can be done by us" (I-14). HOAs reportedly valued this model for reducing coordination burdens: "They really appreciate having one party that can handle everything" (I-14).

These differences reflect alternative interpretations of the study office role within the Public-Led Approach, ranging from narrowly defined advisory functions to broader process coordination and implementation support. Expanded service models appear to enhance continuity and reduce transaction costs, particularly in larger or more complex condominiums.

4.2.4. Institutional constraints and coordination with public actors

Collaboration with public actors was described as both enabling and constraining. The presence of energy houses helped sustain continuity after the delivery of renovation plans: "Someone from the city is there to make sure the process doesn't stop" (I-13). However, regional procurement and governance arrangements introduced challenges. The price-only procurement model was criticised for distorting competition and creating conflicts of interest: "Architects drop their prices for the master

plan to get the architecture job afterwards" (I-13).

Study offices also expressed frustration with limited advisory support and slow communication from regional authorities: "I have to send an email, wait weeks, and often the answer is not correct" (I-14). These institutional frictions were compounded by variations in municipal capacity, with smaller municipalities often lacking sufficient staff or back-office support (I-13).

4.2.5. Implications for implementation

Taken together, the findings from study office perspectives indicate that the effectiveness of the Public-Led Approach depends on more than technical planning quality. The ability to manage phasing, avoid lock-ins, coordinate actors, and sustain engagement over time emerged as critical conditions for implementation. Interviewees emphasised the need for policy frameworks that enable phased renovation pathways while ensuring coherent sequencing: "You cannot just insulate the façade and then ten years later change the windows ... you have to look at the order of measures" (I-14). Concerns were also raised about procurement rules that prioritize price over expertise, alongside calls for more proactive guidance during implementation rather than corrective measures after the fact.

4.3. Intermediary roles and business model viability within public IHRS

Across the cases, Energy Houses emerged as pivotal intermediaries whose effectiveness depends not only on technical expertise but on their capacity to coordinate actors, adapt to heterogeneous condominium contexts, and sustain engagement over time. The findings indicate that Public IHRS viability is shaped by internal capacity, funding structures, governance positioning, and their ability to balance neutrality with active facilitation.

4.3.1. Intermediary roles and adaptive involvement

All three Energy Houses described their role as extending beyond technical and legal advice to facilitation, mediation, and coaching. In Antwerp, this involved active quality control and contextualisation of renovation plans: "I read the whole report every time. I check what's missing, what needs more elaboration, whether the information is still correct" (I-17). In Mechelen, the level of involvement varied depending on condominium dynamics and the role assumed by the CM: "In one building, the board is deeply divided ... so I step in more ... In another building, the condominium manager leads ... so I stay more in the background" (I-15). Ostend emphasised neutrality as a core value: "We try to maintain a balanced triangle ... we defend the interests of both co-owners and condominium managers" (I-16). These accounts illustrate that Public IHRS effectiveness relies on adaptive engagement rather than standardised service delivery.

4.3.2. Internal capacity and organisational constraints

Substantial differences in internal capacity were observed across the Energy Houses. Antwerp benefited from dedicated staff working exclusively on condominiums: "We have four colleagues who work exclusively with apartment buildings ... that's why we're not facing the same issues as Ostend or Mechelen" (I-17). In contrast, Mechelen and Ostend reported challenges related to training, internal workflows, and staff availability: "I'm currently struggling to create internal processes and workflows" (I-16). Limited capacity constrained proactive outreach, with some energy houses forced to shift from active engagement to reactive support: "I've reached the limit of what I can manage ... We only respond to incoming questions" (I-15).

4.3.3. Inclusion challenges and mixed-use complexities

Ensuring inclusivity emerged as a persistent challenge. Interviewees highlighted the risk that financially vulnerable households could be excluded from renovation decisions, potentially leading to displacement: "With the governance tools we have, it's almost impossible to

include everyone in the energy transition ... We'll see enormous gentrification" (I-16). Energy houses attempted to mitigate this through individual financial consultations, yet uptake remained limited due to stigma, mistrust, or complexity. Innovative financing strategies were explored but often rejected as too disruptive: "They did a study ... they could recover a percentage of the cost ... But in the end, the General Assembly voted against it" (I-17).

Mixed-use condominiums introduced additional coordination challenges, particularly where commercial activities conflicted with renovation timelines and technical solutions: "The shop owners say they can't shut their shops ... they'll lose too much money" (I-15).

4.3.4. Monitoring, funding, and business model viability

Monitoring and evaluation practices varied considerably. Antwerp previously relied on a CRM system, but after a cyberattack resorted to temporary tools, while Ostend developed milestone-based monitoring to track progress. In Mechelen and Antwerp, follow-up relied largely on continued involvement from the Energy Houses: "If we ease off our involvement, things slow down, or even stop" (I-17). Across cases, monitoring was considered essential to justify staffing and secure political support.

Funding structures were widely perceived as misaligned with the complexity of condominium renovations. Interviewees criticised the limited and capped subsidies for collective projects: "A condominium with 20 units gets the same as one with 200. That makes no sense" (I-15). European projects were therefore seen as crucial for experimentation and service development beyond fee-per-service models: "Operational funding is based on a fee-per-service model. But that's not sustainable" (I-16).

4.3.5. Condominium managers and collaboration dynamics

CMs emerged as pivotal but highly variable actors. While some actively resisted masterplan trajectories due to increased workload, "about half of them are against the renovation master plan" (I-17). Others recognised its long-term value. The Energy Houses emphasised the importance of maintaining neutrality between co-owners and CMs to avoid conflict: "Whenever one side of the triangle gets too close ... it creates tension" (I-16). However, mismatched expectations persisted, particularly where co-owners assumed responsibilities beyond the CM's formal mandate.

4.3.6. Replication potential and collaboration beyond the public sector

Despite structural constraints, interviewees viewed several Public IHRS practices as transferable beyond the Flemish context. In particular, translating building-level costs into apartment-level implications was seen as widely applicable: "That's a method that can be valuable elsewhere too" (I-15). Replication was framed less as a legal challenge than as a question of engagement and communication: "It's more about the people ... how do we create a shared vision?" (I-16). Emerging interactions with private actors suggest growing interest in hybrid public-private collaboration models, particularly around financing and coordination support.

4.4. Policy perspectives on the design and implementation of the public-led approach

From a policy perspective, the renovation masterplan was conceived as a public response to a persistent market gap in the condominium sector. The policymaker described the rationale as addressing the lack of neutral, pre-investment support for HOAs: "We saw that there was a big need for neutral advice for HOAs, because they don't know how to start or what the priorities are ... no private companies could provide that kind of pre-sales support because it's too time-consuming" (I-10). This framing positions the Public-Led Approach as a corrective governance mechanism rather than a substitute for market actors.

4.4.1. Structural barriers in implementation

The analysis highlights several structural barriers that constrain implementation. Decision-making within HOAs is inherently slow due to infrequent general assemblies: “They can usually only have one meeting per year” (I-10), while social heterogeneity further complicates collective agreement: “Every apartment building is unique ... it's always a cocktail” (I-10). CMs were identified as a critical bottleneck profession, affected by capacity shortages and conflicting incentives: “There are simply not enough syndics ... contractors approach syndics and say, ‘If you give us work, you get a fee from it’” (I-10).

Financial constraints persist despite the availability of collective loan instruments. While building-attached loans exist, their scale is often insufficient: “The amount people can borrow may not be enough” (I-10). The policymaker also raised concerns about exclusion and displacement risks: “I think the so-called ‘renoviction’ will become more and more important” (I-10).

4.4.2. Evaluation challenges and emerging lessons

Although uptake has been substantial (180 requests and 105 masterplans since May 2023) the absence of a structured evaluation framework limits insight into outcomes: “We don't yet have a structural way of evaluating” (I-10). Variation in the format and scope of study office reports was also seen as problematic, sometimes overwhelming residents: “They are suddenly told that the building is in poor shape ... it's simply too much information at once” (I-10).

Policy learning is nevertheless taking place through experimentation across cities. Antwerp's all-at-once renovation model and Ghent's incremental strategy were both considered viable but context-dependent: “Better to have a small yes than a big no” (I-10). Knowledge exchange between municipalities and energy houses occurs through regular coordination meetings and working groups focused on apartment buildings.

4.4.3. Policy adaptation and future directions

Looking ahead, a revised “Renovation Masterplan 2.0” is under development, aimed at simplifying procedures, expanding eligibility to smaller buildings, and removing price-only procurement requirements: “That condition will be removed, so HOAs can choose whichever engineering company they want” (I-10). A broader shift toward phased renovation pathways was also emphasised: “It's no longer feasible to expect a one-step approach ... we now need to think in terms of step-by-step approaches” (I-10).

Additional policy directions under consideration include stronger support for fossil-free heating systems, cooperative financial models, and expanded training for CMs, contractors, and architects. These priorities reflect structural constraints rather than finalized decisions. As the policymaker noted, “The reality is that private banks don't offer many products for apartments in Belgium”, while skills shortages remain acute: “We have too few syndics, contractors, and architects available for the apartment market” (I-10).

Finally, post-masterplan support remains unresolved, with ambiguity surrounding institutional responsibility: “Who should do it? Should it be the syndic, the energy house, or a new actor?” (I-10). These policy-level constraints and adaptations frame the discussion of governance improvements and policy implications in Section 5.

4.5. Cross-sectional synthesis of results

Taken together, the four analytical perspectives reveal that the effectiveness of the Public-Led Approach is shaped less by technical ambition than by governance capacity and process continuity. Across cases, homeowner willingness to engage was conditional on trust, perceived feasibility, and the ability to phase decisions over time. Study offices and Energy Houses emerged as critical intermediaries, translating technical complexity into socially and institutionally workable pathways while navigating constraints related to capacity, funding, and

coordination. From a policy perspective, these findings highlight persistent structural bottlenecks, particularly in financing, professional capacity, and evaluation, alongside emerging adaptations aimed at improving alignment between policy design and implementation realities. Together, the results point to a governance challenge centred on sustaining engagement across multiple decision cycles, rather than on initiating renovation trajectories alone.

5. Discussion and policy implications

This section first synthesizes the empirical findings through the lens of the six viability criteria (Section 5.1) and subsequently translates these insights into business model development recommendations (Section 5.2) and policy implications (Section 5.3).

5.1. Viability of the public-led approach: A multi-actor perspective

The viability of the Public-Led Approach was assessed using six criteria that capture financial, organizational, and governance dimensions. Drawing on perspectives from homeowners, study offices, Energy Houses, and policymakers, this section synthesizes how the approach performs across these criteria, highlighting both enabling mechanisms and structural constraints. Table 3 provides a cross-actor synthesis of strengths, weaknesses, and policy-relevant implications.

Overall, the findings indicate that the approach is effective in building trust, creating technical clarity, and offering flexible pathways, making it a credible entry point for condominium renovation. Its impact is most visible in the onboarding phase of the HOA journey, with partial engagement in the second phase and limited involvement in the third and fourth (see Fig. 1). However, systemic weaknesses in financing, procurement, digital support, and post-plan continuity constrain its viability. To evolve from a promising pilot to a sustainable model, reforms can:

- Extend funding beyond planning.
- Align financing instruments with phased pathways and collective needs.
- Standardize digital supports and ensure reliable data.
- Clarify roles, strengthen mandates, and expand municipal and staffing capacity.

From a business model perspective (Casadesus-Masanell and Ricart, 2010; Teece, 2010), the Public-Led Approach demonstrates strong value proposition and trust-building capacity but weak revenue model diversification. This imbalance helps explain its dependence on public subsidies and its vulnerability beyond the planning phase.

The findings indicate that financial fragility remains the central viability constraint. This aligns with prior OSS evaluations (Bertoldi et al., 2021), which highlight funding instability as a recurring challenge. However, this study demonstrates that in condominium contexts, funding fragility is compounded by collective governance dynamics and procurement design, revealing a distinct structural vulnerability in Public-Led IHRS models.

5.2. Business model development recommendations for public-led IHRS

The findings reveal key opportunities to strengthen the business models of Public-Led IHRS and enhance their long-term viability. First, the value proposition should extend beyond the delivery of a master plan. Positioning IHRS as a long-term partners, through clearer communication, phased roadmaps, and collaboration with contractors and financiers, would better meet expectations while maintaining the neutrality that underpins trust.

Second, services should be tailored to the diversity of co-ownership contexts. Building size, ownership structure, and socioeconomic mix influence willingness to invest and risk of exclusion. Early diagnostics

Table 3

Analytical assessment of the viability of the public-led approach in condominium renovations.

Viability criterion	Key strengths (what works)	What needs attention
Financial stability	Public funding enables neutral advice and lowers entry barriers for HOAs, particularly in the early planning phase. Energy houses and study offices are able to initiate complex renovation trajectories that would otherwise not emerge through market mechanisms alone.	The model remains almost entirely subsidy-dependent. Energy houses are funded only up to the delivery of the masterplan, while co-owners expect continued support during implementation, creating unfunded workloads and staff pressure. Study offices face additional instability due to procurement rules prioritizing lowest-cost bids, and banks remain reluctant to offer condominium-specific loan products.
Adaptability and flexibility	The phased approach aligns well with HOA governance rhythms, allowing urgent safety and maintenance issues to be addressed before energy upgrades. Study offices and Energy Houses demonstrate flexibility by tailoring their involvement to building-specific dynamics and decision cycles.	Adaptability is resource-intensive and relies heavily on continuous follow-up, negotiation, and experiential learning. Phasing increases demands on staff capacity but is not supported by structural funding or formal mandates, exposing the approach to overextension and uneven application across cases.
Customer focus and value proposition	The masterplan provides a neutral, credible evidence base that reduces internal conflict and supports collective decision-making. Intermediaries successfully frame benefits in terms of comfort, safety, and property value, while OSS configurations enhance perceived continuity and clarity.	Residents can be overwhelmed by the volume and complexity of information presented at once, weakening engagement. Expectations toward intermediaries often exceed their formal roles, particularly regarding implementation and project management, leading to frustration and perceived discontinuity beyond the planning phase.
Supportive financing solutions	There is broad recognition among homeowners, intermediaries, and policymakers of the need for collective, long-term financing adapted to condominium renovations. Building-level loans are perceived as conceptually appropriate for spreading costs across owners and time.	Existing financial instruments remain poorly aligned with renovation pathways, placing significant administrative burdens on CMs. Fragmented subsidy schemes and limited uptake of available loans risk stalling technically robust master plans at the transition from planning to implementation.
Support by digital tools	Digital tools, such as surveys, support early engagement and enable broader co-owner participation. Study offices and energy houses recognise the potential of simulations and decision-support tools to make the impacts of renovations more tangible.	Data quality and digital fragmentation undermine effectiveness. Unreliable EPC data increases workload and weakens trust, while the absence of standardised platforms or guidebooks leaves staff dependent on ad hoc solutions, limiting scalability and operational consistency.
Operational efficiency	Municipal involvement strengthens legitimacy, coordination, and continuity, particularly where Energy Houses are actively embedded in local governance structures. Informal collaboration across actors can accelerate progress in motivated cases.	Operational efficiency is undermined by unclear post-masterplan responsibilities, unpredictable roles of CMs, and capacity shortages among public and private actors. The absence of a formal mandate for follow-up leads to loss of momentum after plan delivery, while administrative complexity and staffing constraints slow implementation.

and inclusive financing schemes can prevent the displacement of elderly or low-income residents.

Third, customer engagement should shift from one-off information sessions to participatory co-design processes supported by visualization and decision tools. Appointing renovation coaches to guide associations through multiple phases would strengthen continuity and trust.

Communication also needs diversification. Reliance on the general assembly alone leaves absentee owners uninformed and amplifies CM bottlenecks. Multi-channel strategies, such as dashboards, Q&A sessions, and follow-up communications, can ensure broader participation.

Operational efficiency requires clearer protocols and professionalized coordination. Certified renovation coordinators, CM training, and regional learning networks could improve collaboration and consistency across cities.

In line with the literature on public sector business model innovation (Wirtz et al., 2023), the findings suggest that Public-Led IHRS models generate social value but face structural constraints in scaling without institutional reform.

Finally, the financial model must evolve beyond short-term subsidies. Extending funding to post-study coordination, introducing optional service tiers, and allocating resources for engagement and conflict mediation would enhance financial resilience.

These findings are consistent with previous evaluations of OSS, which identify coordination complexity and continuity gaps as major barriers to implementation (Bertoldi et al., 2021; Pardalis et al., 2025). However, this study extends that literature by showing how these challenges are amplified in condominium contexts due to collective governance dynamics.

5.3. Policy implications

The long-term success of Public-Led IHRS depends not only on stronger business models but also on enabling policy frameworks. Four priorities stand out:

- First, the roles of study offices, Energy Houses, and CMs must be clearly defined. A Flemish-wide protocol that institutionalizes renovation coaches or building coordinators could ensure continuity from planning to execution.
- Second, financing instruments require redesign to match collective ownership structures. Current schemes are fragmented and inequitable compared to those for single-family homes. Tailored instruments, such as capped-cost contributions or means-tested grants, are needed to protect vulnerable co-owners.
- Third, inefficiencies in condominium governance demand reform. CMs often act as bottlenecks; mandatory training, targeted subsidies, or alternative governance models could strengthen coordination capacity.
- Finally, sustained investment in capacity and quality assurance is crucial. Extending the mandate of Energy Houses beyond the masterplan stage, while investing in training, certification, and digital platforms, would enhance stability and scalability.

5.3.1. Conditions for replication and transferability across the EU

While the empirical findings are grounded in the Flemish institutional context, the results point to a set of conditions that shape the replicability of Public-Led renovation approaches across Europe. Replication should therefore be understood as adaptation rather than direct transfer. Certain elements are strongly context-dependent, including subsidy levels, legal frameworks governing collective decision-making, and the maturity of condominium management professions. These factors influence the pace, scale, and affordability of implementation and require alignment with national and regional institutional settings.

At the same time, the cross-case analysis identifies several design principles that appear broadly transferable across European contexts with significant condominium stocks. These include the use of phased renovation pathways aligned with collective decision-making rhythms, the presence of neutral public intermediaries (such as OSSs) to build trust and reduce coordination and information asymmetries, the

institutionalisation of renovation coaching (or equivalent) to ensure continuity across phases, and the translation of building-level costs into apartment-level implications.

Together, these transferable elements represent underlying governance functions (coordination, trust-building, phased decision support, and quality assurance) that can be organised through different policy instruments and institutional arrangements. As illustrated in Fig. 7, these functions provide a flexible governance template that can be adapted to diverse regulatory, financial, and administrative environments while preserving the core logic of Public-Led IHRS.

Fig. 7 presents a conceptual synthesis of the empirical findings by translating the results of the cross-case analysis into an improved governance model for Public-Led renovation approaches. The figure abstracts and integrates the key roles, coordination mechanisms, and information flows that were consistently identified across the cases. The governance configuration depicted reflects how intermediary actors, particularly OSS, mediate between policy objectives and building-level decision-making, and how this mediation supports trust-building, continuity, and alignment among stakeholders. As such, the figure should be read as an analytical consolidation of the Results section, illustrating how observed practices can be reconfigured into a more coherent and effective Public-Led governance model.

In summary, several key actions can be undertaken to strengthen Public-Led renovation approaches for European condominiums, as presented in Table 4.

Table 4

Policy synthesis: Key actions to strengthen public-led renovation approaches for condominiums.

Policy Level	Key actions
Municipal level:	- Strengthen the capacity of public Energy Houses through stable staffing, training, and dedicated condominium teams. - Act as neutral intermediaries between HOAs, CMs, and technical experts to sustain momentum. - Invest in participatory tools and multi-channel communication strategies to reach absentee owners and vulnerable groups.
Regional (Flemish/national) level:	- Extend public funding beyond the delivery of renovation master plans to cover post-plan coordination and implementation support. - Reform procurement frameworks to prioritize quality, continuity, and expertise over lowest-price selection. - Develop collective, building-attached financing instruments aligned with phased renovation pathways. - Institutionalize the role of renovation coaches or building coordinators to ensure continuity across renovation phases.
EU level:	- Align EPBD implementation with the realities of collective ownership by promoting dedicated instruments for condominiums. - Support the development of shared digital standards, such as building renovation passports and decision-support tools for condominiums. - Fund long-term capacity building, training, and knowledge exchange for renovation coordinators, CMs, and public authorities across member states.



Fig. 7. Generalized governance model for Public-Led renovation approaches, derived from the Flemish case studies and intended as a transferable framework rather than a case-specific configuration.

5.4. Limitations and future research

This study provides an in-depth qualitative evaluation of the Public-Led renovation masterplan across five condominium cases. While additional cases were available, the study prioritised analytical depth and cross-case comparison over numerical coverage. The cases are not intended to statistically represent the full condominium stock; rather, they support analytic generalisation by capturing key variations in building characteristics, governance conditions, and renovation stages.

The analysis does not include condominium managers and focuses exclusively on a Public-Led Approach, limiting direct comparison with private-sector IHRS models. Future research could expand the case base, incorporate additional stakeholder perspectives, and examine the updated Renovation Masterplan 2.0 as well as private IHRS models to explore complementarities between public and private approaches.

6. Conclusion

This study examined the Flemish Renovation Masterplan Approach as a Public-Led model to tackle the persistent challenges of condominium renovations. Based on case studies, interviews, and observations, it showed that successful energy renovations in condominiums depend less on technical planning or subsidies than on how public actors build trust, adapt to diverse ownership structures, and provide continuity in decision-making support.

The analysis highlighted key strengths, including the neutrality of energy houses as trusted advisors, the adaptability of study offices, and the value co-owners attached to objective masterplans. Yet systemic weaknesses persist: the model is financially fragile, dependent on subsidies, hampered by fragmented financing instruments, and undermined by CM capacity constraints and limited post-plan follow-up. Vulnerable groups, such as the elderly and low-income residents, remain at particular risk of exclusion.

To enhance viability, Public-Led IHRS providers must extend their role beyond planning, institutionalize renovation coaches, professionalize communication, and tailor support to heterogeneous resident groups. Policy reforms are equally essential, including collective financing instruments, expanded mandates for energy houses, training for CMs, and investment in market capacity and digital platforms.

Taken together, the Flemish approach offers a credible foundation for condominium renovation but requires stronger alignment between organizational innovations and systemic reforms. At the EU level, these lessons point to the need for harmonized financing instruments for collective housing, shared digital standards such as building passports, and cross-national training schemes for renovation coordinators and CMs. Embedding these principles can help Public-Led IHRS evolve into a scalable driver of Europe's residential decarbonization.

CRediT authorship contribution statement

Ragy Elgendy: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Erwin Mlecnik:** Writing – review & editing, Validation, Supervision. **Henk Visscher:** Writing – review & editing, Validation, Supervision. **Queena Qian:** Writing – review & editing, Validation, Supervision.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Ragy Elgendy reports financial support was provided by European Union. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.4121/a6c32d5b-6fac-498f-9da4-fdcfa9a69125.v1>.

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