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Federal Department of the Environment,
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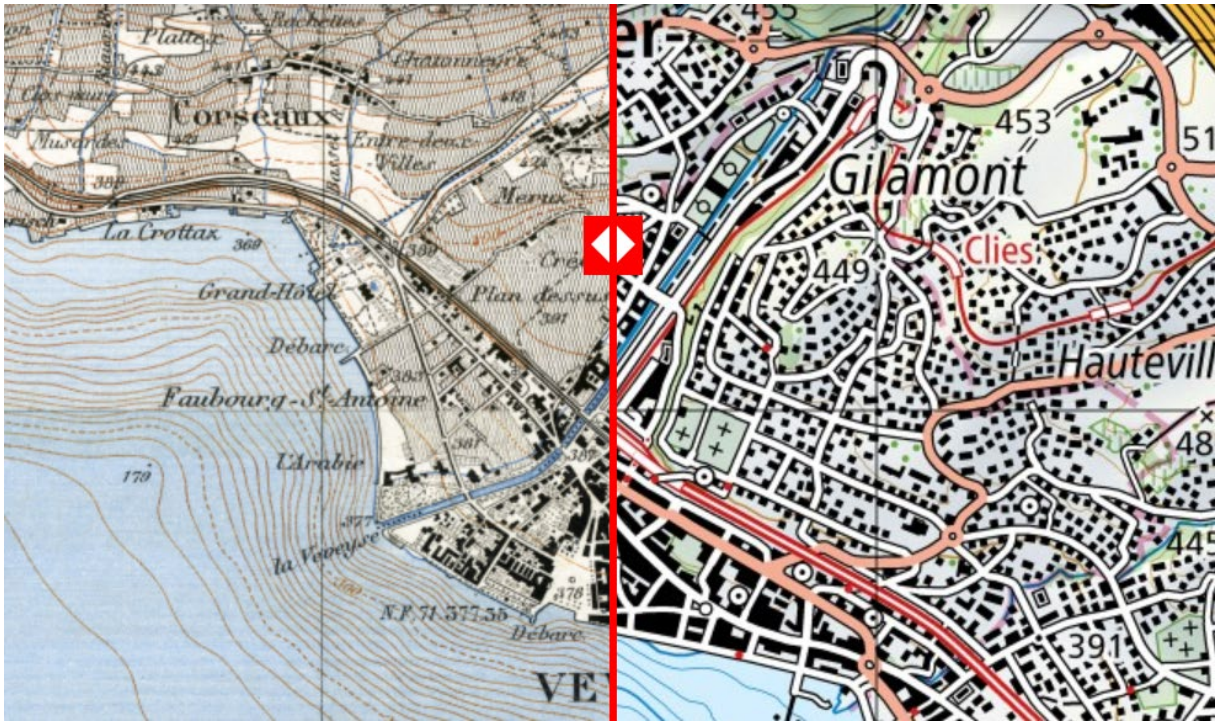
Swiss Federal Office of Energy
Energy Research and Cleantech

Final report from 14 February 2025

Régie-Rénove

What role do building management companies play in building renovation?



Source: swisstopo, 2022.

Publisher:
Swiss Federal Office of Energy SFOE
Energy Research and Cleantech
CH-3003 Berne
www.energy-research.ch

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SFOE contract number: SI/502422-01

Summary

The "Régie Rénove" project follows the previous SFOE project and initiative "Commune Rénove", building upon the role of the public actor and expanding its scope to specifically address the role of building management companies in accelerating the decision towards energy renovations. These companies, which typically act as intermediaries between property owners and tenants, hold valuable data on energy consumption. Despite their pivotal position, they have not been considered critically in driving energy renovations. The project aims to understand how building management firms can position themselves as facilitators of energy renovation. It explores how they can use their data, expertise and relationships to support renovations and contribute to the Federal Council's net-zero target by 2050. The project's main initial objective was to explore how building management companies can be better equipped to initiate energy renovations across French-speaking Switzerland. However, after its findings, the project reformulated the objective to determine whether building manager companies can play a role in the current state.

This involves assessing the data they currently manage, their role in renovation processes, and identifying the tools they need to facilitate energy renovation opportunities. The stakeholders' engagement, from project design to feedback on results, was employed as a comprehensive approach. The assessment was conducted through multiple methods, first by analysing the context, including the market, regulations, and methods of providing energy renovation consulting. Secondly, it involved interviews, surveys, and testing simplified energy renovation consulting methods.

One critical challenge identified is that many property management companies need more knowledge and resources to focus on energy renovation, which creates a gap in the broader energy transition. The project also highlights the importance of data quality and usage. Better management of energy consumption data could enhance renovation efforts and drive a more effective energy transition. Key findings from the project show that building management companies still need to integrate energy renovation into their business model. Managers wait for owners to ask about it, not necessarily proposing a proactive, value-oriented approach with potential energy refurbishments. Energy renovation regulation could motivate building management to invest their resources into energy renovations. Without such regulations, the reliance on subsidies and ad-hoc investments can hinder renovation efforts and their timely scale-up. The project also points out that current business models in property management often limit the integration of energy services due to perceived costs, uncertain returns, and a lack of decision-making power. Additionally, more data than is treated by building managers is often needed to effectively guide energy renovations, like energy consumption or heated floor numbers. This underlines the importance of standardising data collection and using open-source databases like RegBL.

Overall, results show that building managers can systematically play a role in energy renovation only by responding to external changes impacting the property. The role played by exemplar building managers is related to small market demand or personal ethics, which we evaluate as insufficient levers to involve more managers in the renovation systematically. We recommend a holistic approach to energy management with a key change in the legal context to integrating energy renovation into building management operations. The key change requires energy renovation requirements in the cantonal energy legislation, including better energy data management. A formal requirement would push the sector to adopt current business models further towards energy renovation, increasing the demand for employing user-friendly decision-making tools and boosting continuing education. Continuing education feedback suggests potential improvement through feedback, renovation monitoring following formation, and providing a checklist or calculation examples corresponding to building management practice. The potential of positioning building management companies as proactive drivers of energy renovation remains unexploited. However, it is primarily unused due to the building managers' limited pressure to transform their current business model and their limited decision-making power. Without more interest from building owners or the evolution of the legal renovation requirements, a leading actor in the decision-making process remains without a key role, but in a position of unused energy information and contacts to building owners and users.

Zusammenfassung

Das Projekt „Régie Rénove“ folgt dem vorherigen BFE-Projekt und der Initiative „Commune Rénove“, baut auf der Rolle des öffentlichen Akteurs auf und erweitert seinen Umfang, um speziell die Rolle der Gebäudeverwaltungsunternehmen bei der Beschleunigung der Entscheidung für energetische Sanierungen zu berücksichtigen. Diese Unternehmen, die in der Regel als Vermittler zwischen Immobilieneigentümern und Mietern fungieren, verfügen über wertvolle Daten zum Energieverbrauch. Trotz ihrer zentralen Stellung wurden sie bei der Förderung energetischer Sanierungen nicht gründlich berücksichtigt. Das Projekt zielt darauf ab, zu verstehen, wie sich Gebäudeverwaltungsunternehmen als Vermittler energetischer Sanierungen positionieren können. Es untersucht, wie sie ihre Daten, ihr Fachwissen und ihre Beziehungen nutzen können, um Sanierungen zu unterstützen und zum Netto-Null-Ziel des Bundesrats bis 2050 beizutragen. Das Hauptziel des Projekts bestand zunächst darin, zu untersuchen, wie Gebäudeverwaltungsunternehmen besser dafür gerüstet werden können, energetische Sanierungen in der gesamten Westschweiz einzuleiten. Nach seinen Ergebnissen formulieren wir das Projektziel jedoch neu, um festzustellen, ob Gebäudeverwaltungsunternehmen im aktuellen Zustand eine Rolle spielen können. Dazu gehört die Bewertung der Daten, die sie derzeit verwalten, ihrer Rolle in Renovierungsprozessen und die Ermittlung der Tools, die sie benötigen, um Möglichkeiten zur energetischen Sanierung zu erkennen. Die Einbindung der Stakeholder, von der Projektgestaltung bis zur Rückmeldung zu den Ergebnissen, wurde als umfassender Ansatz eingesetzt. Die Bewertung wurde mithilfe mehrerer Methoden durchgeführt, zunächst durch die Analyse des Kontexts, einschließlich des Marktes, der Vorschriften und der Methoden der Beratung zur energetischen Sanierung. Zweitens umfasste sie Interviews, Umfragen und das Testen vereinfachter Methoden zur Beratung von energetischen Sanierungen.

Eine kritische Herausforderung besteht darin, dass viele Immobilienverwaltungsunternehmen mehr Wissen und Ressourcen benötigen, um sich auf die energetische Sanierung zu konzentrieren, was eine Lücke in der umfassenderen Energiewende darstellt. Das Projekt unterstreicht auch die Bedeutung der Datenqualität und -nutzung. Ein besseres Management der Daten zum Energieverbrauch könnte die Renovierungsbemühungen verbessern und die Energiewende effektiver vorantreiben. Die wichtigsten Ergebnisse des Projekts zeigen, dass Gebäudeverwaltungsunternehmen die energetische Sanierung immer noch nicht in ihren Geschäftsmodellen abdecken. Die Manager warten darauf, dass die Eigentümer danach fragen, und schlagen nicht unbedingt proaktiv einen gebäudewertorientierten Ansatz mit potenziellen energetischen Sanierungen vor. Eine energetische Sanierungsverordnung könnte die Gebäudeverwaltung dazu motivieren, ihre Ressourcen in die energetische Sanierung zu investieren. Ohne solche Regelungen kann die Abhängigkeit von Subventionen und Ad-hoc-Investitionen Sanierungsbemühungen und deren rechtzeitige Ausweitung behindern. Das Projekt weist auch darauf hin, dass aktuelle Geschäftsmodelle im Immobilienmanagement die Integration von Energiedienstleistungen aufgrund empfundener Kosten, unsicherer Erträge und mangelnder Entscheidungsbefugnis oft einschränken. Darüber hinaus sind oft mehr als die von Gebäudemanagern verarbeiteten Daten erforderlich, um energetische Sanierungen effektiv zu steuern, wie etwa Energieverbrauch oder beheizte Stockwerkzahlen. Dies unterstreicht die Bedeutung der Standardisierung der Datenerfassung und der Verwendung von Open-Source-Datenbanken wie dem GWR.

Insgesamt zeigen die Ergebnisse, dass Gebäudemanager nur dann systematisch eine Rolle bei der energetischen Sanierung spielen können, wenn sie auf externe Veränderungen reagieren, die sich auf die Immobilie auswirken. Die Rolle vorbildlicher Gebäudemanager hängt mit einer geringen Marktnachfrage oder persönlicher Ethik zusammen, die wir als unzureichende Hebel bewerten, um mehr Managerinnen systematisch in die Sanierung einzubeziehen. Wir empfehlen einen ganzheitlichen Ansatz für das Energiemanagement mit einer wichtigen Änderung des rechtlichen Kontexts zur Integration der energetischen Sanierung in den Gebäudemanagementbetrieb. Die wichtige Änderung erfordert legale Anforderungen an die energetische Sanierung in der kantonalen Energiegesetzgebung zu erhöhen, einschließlich eines besseren Energiedatenmanagements. Eine formelle Anforderung würde den Sektor dazu drängen, aktuelle Geschäftsmodelle weiter in Richtung energetischer Sanierung zu lenken, was die Nachfrage nach benutzerfreundlichen Entscheidungshilfen und die Förderung der Weiterbildung erhöhen würde. Weiterbildungsfeedback deutet auf Verbesserungspotenzial durch Feedback, Sanierungsmonitoring nach der Ausbildung und Bereitstellung von Checklisten oder Berechnungsbeispielen hin, die der Gebäudemanagementpraxis entsprechen. Das Potenzial, Gebäudemanagementunternehmen als proaktive Treiber der energetischen Sanierung zu positionieren, bleibt ungenutzt. Es wird jedoch hauptsächlich aufgrund des geringen Drucks der Gebäudemanager, ihr aktuelles Geschäftsmodell umzugestalten, und ihrer begrenzten Entscheidungsbefugnis ungenutzt. Ohne stärkeres Interesse von Gebäudeeigentümern oder die Weiterentwicklung der gesetzlichen Sanierungsanforderungen bleibt ein führender Akteur im Entscheidungsprozess ohne Schlüsselrolle, sondern in einer Position ungenutzter Energieinformationen und Kontakte zu Gebäudeeigentümern und -nutzern.

Résumé

Le projet « Régie Rénove » fait suite au projet et à l'initiative « Commune Rénove » de l'OFEN. Il s'appuie sur le rôle de l'acteur public et élargit son champ d'action pour aborder spécifiquement le rôle des régies immobilières dans l'accélération de la décision de rénovation énergétique. Ces sociétés, qui agissent généralement comme intermédiaires entre les propriétaires et les locataires, détiennent des données précieuses sur la consommation d'énergie. Malgré leur position centrale, elles n'ont pas été prises en compte de manière critique dans la conduite des rénovations énergétiques. Le projet vise à comprendre comment les régies immobilières peuvent se positionner comme des facilitateurs de la rénovation énergétique. Il explore comment elles peuvent utiliser leurs données, leur expertise et leurs relations pour soutenir les rénovations et contribuer à l'objectif zéro émission nette du Conseil fédéral d'ici 2050. L'objectif initial principal du projet était d'explorer comment les régies immobilières peuvent être mieux équipées pour lancer des rénovations énergétiques en Suisse romande. Cependant, après ses conclusions, le projet a reformulé l'objectif pour déterminer si les régies immobilières peuvent jouer un rôle dans la situation actuelle.

Il s'agit d'évaluer les données qu'elles gèrent actuellement, leur rôle dans les processus de rénovation et d'identifier les outils dont elles ont besoin pour faciliter les opportunités de rénovation énergétique. L'engagement des parties prenantes, de la conception du projet au retour d'information sur les résultats, a été utilisé comme approche globale. L'évaluation a été menée selon plusieurs méthodes, d'abord en analysant le contexte, notamment le marché, la réglementation et les méthodes de prestation de conseil en rénovation énergétique. Ensuite, elle a impliqué des entretiens, des enquêtes et des tests de méthodes de conseil simplifiées en rénovation énergétique.

L'un des défis majeurs identifiés est que de nombreuses sociétés de gestion immobilière ont besoin de plus de connaissances et de ressources pour se concentrer sur la rénovation énergétique, ce qui crée un écart dans la transition énergétique plus large. Le projet souligne également l'importance de la qualité et de l'utilisation des données. Une meilleure gestion des données de consommation énergétique pourrait améliorer les efforts de rénovation et favoriser une transition énergétique plus efficace. Les principales conclusions du projet montrent que les sociétés de gestion d'immeubles doivent encore intégrer la rénovation énergétique dans leur modèle économique. Les gestionnaires attendent que les propriétaires posent des questions à ce sujet, sans nécessairement proposer de manière proactive une approche axée sur la valeur du bâtiment avec des rénovations énergétiques potentielles. La réglementation sur la rénovation énergétique peut inciter les gestionnaires d'immeubles à investir leurs ressources dans les rénovations énergétiques. Sans de telles réglementations, le recours aux subventions et aux investissements ponctuels peut entraver les efforts de rénovation et leur mise en œuvre en temps voulu. Le projet souligne également que les modèles commerciaux actuels de gestion immobilière limitent souvent l'intégration des services énergétiques en raison des coûts perçus, des rendements incertains et du manque de pouvoir décisionnel. En outre, les données traitées par les gestionnaires d'immeubles sont souvent plus que nécessaires pour guider efficacement les rénovations énergétiques, comme la consommation d'énergie ou le nombre de planchers chauffants. Cela souligne l'importance de normaliser la collecte de données et d'utiliser des bases de données open source comme RegBL.

Dans l'ensemble, les résultats montrent que les gestionnaires d'immeubles ne peuvent systématiquement jouer un rôle dans la rénovation énergétique qu'en répondant aux changements externes ayant un impact sur la propriété. Le rôle joué par les gestionnaires d'immeubles exemplaires est lié à la faible demande du marché ou à l'éthique personnelle, que nous évaluons comme des leviers insuffisants pour impliquer systématiquement davantage de gestionnaires dans la rénovation. Nous recommandons une approche holistique de la gestion de l'énergie avec un changement clé dans le contexte juridique pour intégrer la rénovation énergétique dans les opérations de gestion des bâtiments. Le changement clé nécessite des exigences de rénovation énergétique dans la législation cantonale sur l'énergie, y compris une meilleure gestion des données énergétiques. Une exigence formelle inciterait le secteur à adopter davantage les modèles commerciaux actuels en faveur de la rénovation énergétique, augmentant la

demande d'outils d'aide à la décision conviviaux et stimulant la formation continue. Les retours d'expérience de la formation continue suggèrent une amélioration potentielle grâce au retour d'information, au suivi de la rénovation après la formation et à la fourniture de listes de contrôle ou d'exemples de calcul correspondant à la pratique de gestion des bâtiments. Le potentiel de positionnement des sociétés de gestion des bâtiments comme moteurs proactifs de la rénovation énergétique reste inexploité. Cependant, il est principalement inutilisé en raison de la pression limitée des gestionnaires de bâtiments pour transformer leur modèle commercial actuel et de leur pouvoir de décision limité. Sans plus d'intérêt de la part des propriétaires de bâtiments ou de l'évolution des exigences légales en matière de rénovation, un acteur de premier plan dans le processus de prise de décision reste sans rôle clé, mais dans une position d'information énergétique et de contacts inutilisés avec les propriétaires et les utilisateurs des bâtiments.

Main findings («Take-Home Messages»)

Effective and timely legislation requiring energy renovation could facilitate the engagement of stakeholders, including building managers. This legislation would drive multi-sector efforts for building and scaling up energy renovations.

Despite the recognised importance of energy management, building management business models cannot systematically integrate energy services due to the limited quality of the data they treat for large-scale renovation approaches, i.e., missing or incomplete energy consumption data records.

Building managers need to acquire sufficient energy renovation knowledge to avoid becoming a barrier to its implementation. This can be done by following existing continuing education.

Existing methods for estimating building energy performance can be developed into simplified tools that empower building managers to prioritise energy renovation coherently across their portfolio.

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BCA	Approximated Heat Requirement method
CAD	District Heating
CECB	Cantonal Energy Certificate for Buildings
DHW	Domestic Hot Water
ERA	Energy Reference Area
IDC	Heat Expenditure Index method
MoPEC	Model of Energy Regulation for the Cantons
PPE	Condominium ownership
SaaS	Software as a Service
SER	Sustainable Energy Renovation
SFOE	Swiss Federal Office of Energy

1 Introduction

1.1 Context and Motivation

This project has been developed within the context of the case study area, French-speaking Switzerland, focusing on stakeholders involved in building management services. The case study examines explicitly the French-speaking region of Switzerland, where the authors' institution is located. This alignment ensures their expertise is relevant to the local context, facilitating a more insightful analysis.

French-speaking Switzerland includes the cantons of Geneva, Vaud, Neuchâtel, Jura, and parts of Fribourg, Valais, and Bern. The study targets building management, building on the results of the previous project, Commune Rénove. It investigates the role of building management and how it interacts with various stakeholders. During the project, public actors are encouraged to lead the local implementation effort at different stages. Companies providing building management services are often active in real estate; however, since this project focuses on management services rather than property sales, we refer to them as building management companies rather than real estate firms.

The following paragraph discusses the significance of the case study area and the essential role of building management in energy renovation. The project objectives are driven by the need to address the housing market and the building management context related to energy renovation. Additionally, the legal framework for energy renovation across the cantons is examined, along with the integrated energy consulting services offered by building management, including existing training and tools.

1.1.1.Case Study Area

This paragraph describes the housing market in Switzerland and then in the specific French-speaking cantons to understand the context of the case study area.

In 2022, 2,407,491 rented homes were recorded, compared with 1,419,883 owned by residents. Therefore, most of the population was renting (64.9%). Condominium ownership, thus shared housing with multiple owners and residents, accounts for just over 12% of occupied homes in Switzerland. The occupancy status is heterogeneous across cantons. For example, condominium ownership is a prevalent model in Valais, with a rate of 24.9%, more than twice the Swiss average, as shown in **Error! Reference source not found.**

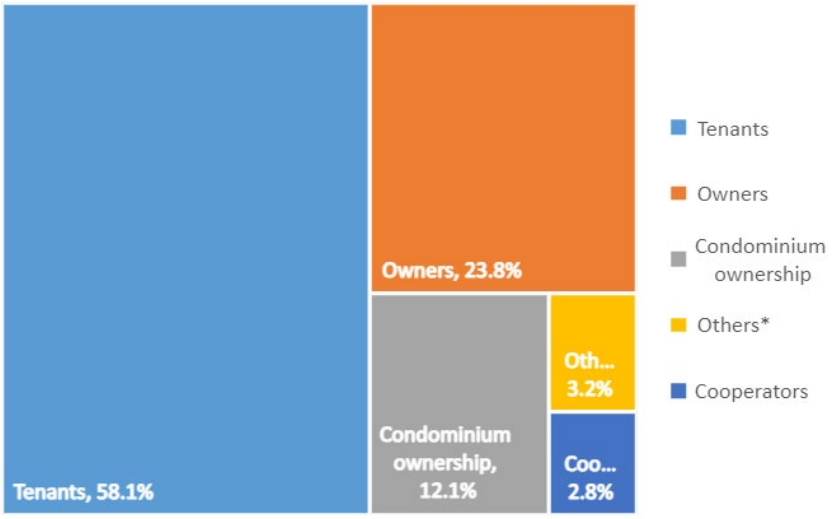

Figure 1: Occupancy status of dwellings occupied in 2022. Other include accommodation provided free of charge by a relative or employer and service accommodation, according to StatBL 2022.

Private individuals in Switzerland own 46.1% of the rentals. Private companies and cooperatives, i.e. pension funds, banks and investment funds, own 34.7% of rentals, as shown in Figure 23. More specifically, in the canton of Fribourg, 53.1% of rentals are in private hands, only 6.9% are owned by public authorities, and SA/SARL/cooperatives hold 30.8%. Cantonal differences can be relevant in terms of the housing market. For example, the breakdown in Valais is 69.3% privately owned, 2.1% publicly owned, and 21.3% owned by SA/SARL/cooperatives (OFS, 2024).

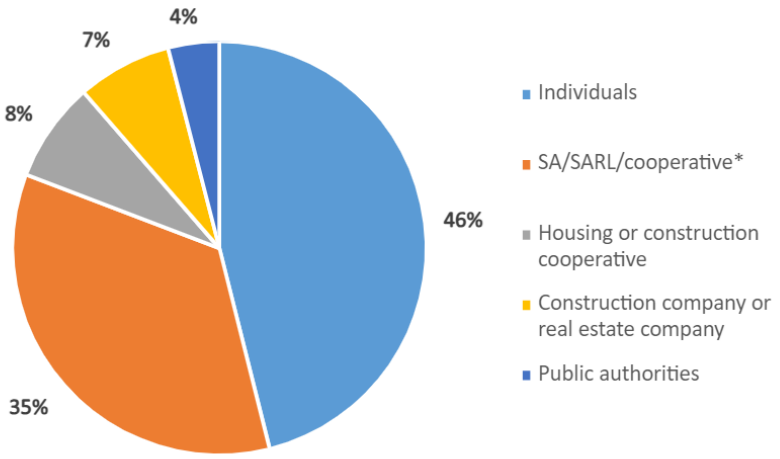

Figure 23: Type of owners of tenant accommodation, 2021-2023 combined. SA/SARL/cooperative typically refers to banks, investment funds, insurance companies and pension funds. Based on data from types of owners, OFS 2024.

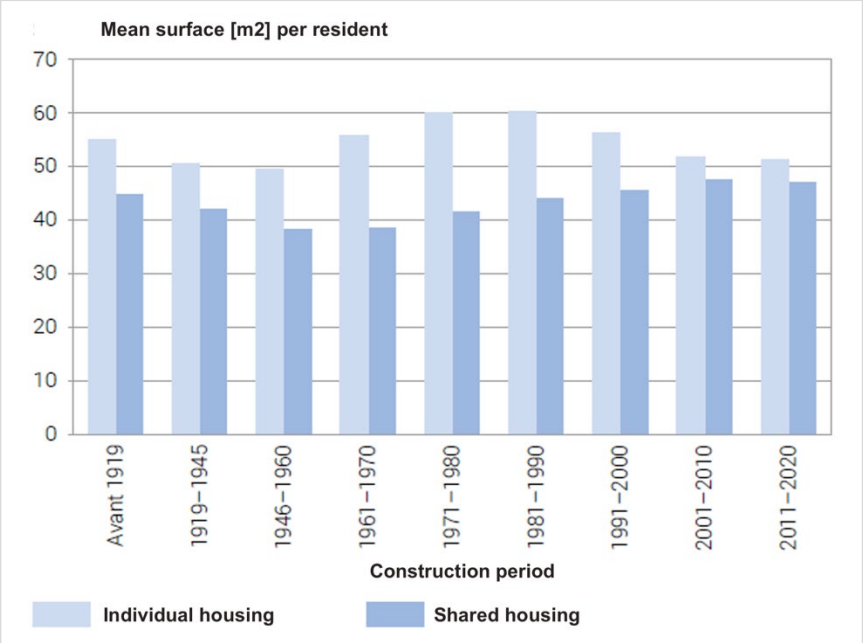

Figure 32: Average floor area per inhabitant by building category and construction period 2020. Taken from Construction and Housing, OFS 2020.

The average living area per inhabitant in 2020 was 46m^2. This varies according to the type of dwelling and the year of construction. A house with several dwellings has 43m^2, compared with 55m^2 for a detached house, as displayed in Figure 32 (OFS, 2022). Since the 1990s, the size of detached houses has been falling, while that of flats has been rising since 1960 until 2010. However, the increase in the size of flats runs counter to energy efficiency targets, which may explain the slight decrease in the size of flats over the last decade.

Figure 4 This chart breaks down buildings by date of construction. Buildings constructed before 2000 have the most significant potential for energy renovation (TRANSFORM, 2017), which shows the scale of the energy renovation project.

1.1.2.Housing Carbon Emission in Switzerland

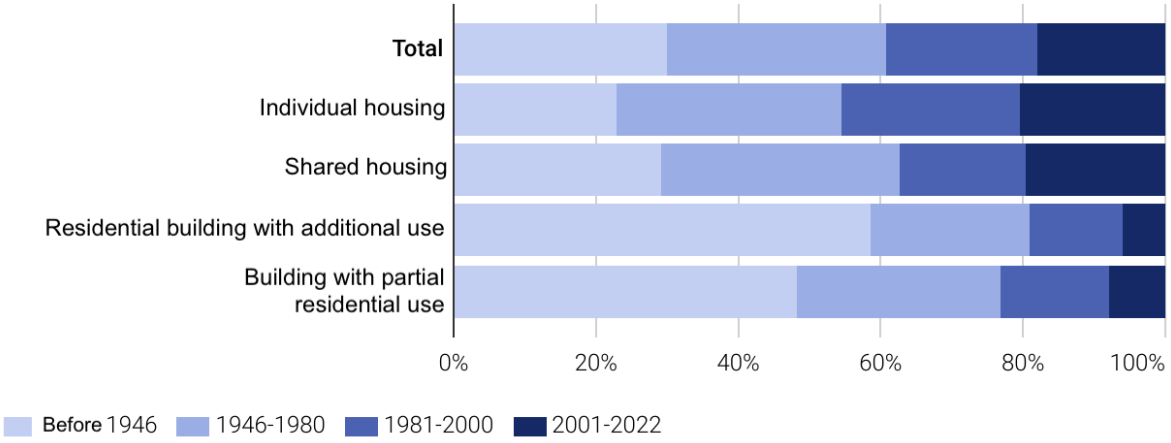

Figure 4: Buildings by category and date of construction, in 2022 (OFS 2023).

This section analyses the impact of the housing sector on Switzerland's energy consumption and greenhouse gas emissions. It helps to justify the importance of energy-efficient building renovation as part of the drive to reduce emissions.

According to the Federal Statistical Office, in 2022, Switzerland had 4.74 million homes (OFS, 2023b). The housing stock alone represents 46% of Switzerland's energy consumption (EnDK, 2022), with households alone accounting for around 28% (OFS, 2023a). This represents almost 57.6 TWh of household final energy, 63.7% of which is used for heating and 15.7% for hot water, as shown in Table 1 (Kemmle et al., 2023).

Table 1: Energy consumption with the relative weight per application in %. Adapted from Kemmle et al, 2023.

Application	**Energy [TWh]**	**Proportion [%]**
Heating	36.6	63.7
Hot water	9.0	15.7
Kitchen	2.9	5.0
Cooking and dishwasher	2.4	4.2
Media and leisure devices	1.7	2.9
Fridge and freezer	1.5	2.6
Climatization and ventilation	1.3	2.2
Light	1.2	2.1
Other	1.0	1.7
Total	**57.6**	**100.0**

In In 2019, the average household electricity consumption was 5,000 kWh/year. However, according to SuisseEnergie, this figure is heavily influenced by highly energy-hungry homes. In this study, SuisseEnergie determined the consumption of a typical two-person household living in a flat. This typical household uses 2190 kWh/year of electricity, excluding heat pumps. Each additional inhabitant increases consumption by around 459 kWh. A house consumes between 20% and 30% more than an apartment. The most significant areas of use are cooking, cleaning and washing clothes, which together account for more than 50% of consumption (Figure 5). Then, the Swiss housing sector consumed 19,355 GWh of electricity in 2022, including electric heating and domestic hot water (DHW), which is 33.9% of total national consumption. The breakdown is approximately 58% for the winter period and 42% for the summer period (OFS, 2023a).

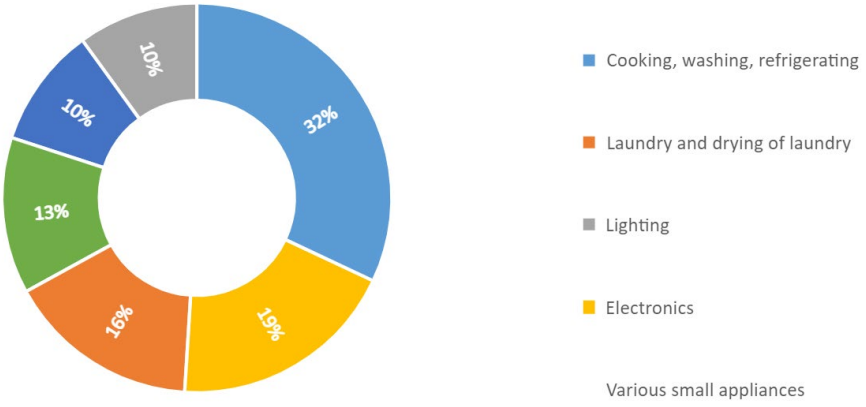

Figure 5: Breakdown of electricity consumption for a typical household in 2019 consisting of two people in a flat. Electricity for communal areas includes technical installations but excludes heat pumps. Adapted from Household electricity consumption, Suisse Energie, 2021.

Water consumption is estimated at 142 litres per person per day, with over 54% of which is used for flushing the toilet, showering and bathing, and hot water accounting for 50 litres of this total (SVGW, 2022).

As a result, the building sector in Switzerland is a significant emitter of greenhouse gases, responsible for around 23% of national CO_2 emissions, thus 9.4 t of CO_2e. (OFEV, 2024). Households account for 15% of emissions or around 6.4 million tonnes of CO_2e (OFEV, 2024). When interpreting these figures, it should be remembered that they only include direct fuel-related emissions. Consequently, the carbon impact of distance heating or the electricity used by a heat pump, which is indirect emissions, is reported in the industry category. This follows that these estimations partially represent the real impact of the building sector. These emissions are primarily attributable to the heating of buildings, with 57% of residential buildings still heated by fossil fuels in 2022, i.e. 39% by oil and 18% by gas, as displayed in Figure 6 (OFEV, 2024; OFS, 2023a).

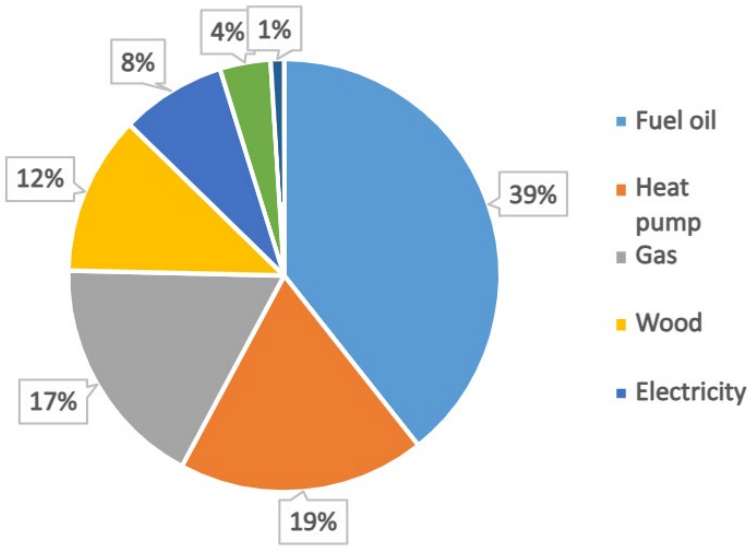

Figure 6: Distribution of means of heating for Swiss residential buildings in %.
Other corresponds to solar thermal or no heating. OFS 2023.

1.1.3. Energy Renovation Legal Context

This project looks at the potential of property management companies in energy renovation. Property management companies need to have detailed knowledge of the energy legislation in the cantons in which they operate to advise their customers. Therefore, studying the legal framework is necessary to understand the subject comprehensively. This chapter presents the various cantonal legislations.

The target data related to this project are studied pertained to building management. Consumption data and the CECB+ should be addressed in this chapter. Instead, this chapter focuses on the requirements for energy renovation, energy certificates, domestic hot water production, and heating. Cantonal and communal buildings are subject to stricter requirements under the duty to set an example (MoPEC art. 1.47); they will be discussed in detail here.

Table 2 Below is a summary of the main content of the various cantonal laws. It should be noted that the parliament had not yet passed the Vaud law at the time of writing. In addition to these cantonal laws, the communes can set higher energy requirements to apply the building code.

Table 2: Summary of cantonal laws on energy renovation. IDC: “Indice de Dépense de Chaleur” for energy requirements for thermal energy. A-G MOPEC energy classes, A being the best, G the worst.

Canton	*Energy renovation*	*Energy certification*	*Fossil fuel heating*	*Electric heating*
Fribourg	Non-mandatory	Sell and construction: Mandatory	Construction: <70%, Renovation <80% of fossil/heating needs	Installation forbidden, replacement allowed if building class A, B, C; or if renewable sources cover 50% of energy
Geneva	Mandatory according to IDC	Mandatory after HPE, including IDC calculation	Forbidden above 5 KW with > D class and depending on the cost of renewable sources implementation	Forbidden with exceptions
Jura	Non-mandatory	Sell and fossil fuel heating: Mandatory	Construction: possible if covers <60% (oil), <80% (gas) of needs; Replacement possible > D class	Forbidden with exceptions
Neuchatel	Mandatory according to standards	Mandatory for building dating 1990 or older with >1000 m2 or central heating, or >4 housing units	Construction: standard SIA 380/1; Replacement: possible depending on the cost of renewable sources implementation and if fossils cover < 80% of needs	It was forbidden, with exceptions—mandatory replacement for 2030.
Valais	Non mandatory	Non mandatory	Construction: forbidden; Replacement possible after 20% consumption reduction, or 20% covered by renewable or < D class	Forbidden with exceptions
Vaud	Mandatory for G class in 10 years and F class in 15 years	Sell and buildings older than 1986: Mandatory	Forbidden, replacement mandatory in 15 years	Forbidden, replacement mandatory in 15 years

Switzerland has a federal strategy to address emission reductions, while cantons have a heterogeneous legal context for energy renovation. The following paragraphs describe the federal strategies and programs related to energy renovation, the legal context of energy renovation in French-speaking cantons, and, in the end, the legal context of building management regarding energy renewal.

Federal legal context: The Energy Strategy 2050+

The Paris Agreement, signed by 55 countries, including Switzerland, limited the rise in temperature to 1.5°C above pre-industrial levels (OFEV, 2024) . As part of this commitment, Switzerland has undertaken to halve its greenhouse gas emissions by 2030, compared with 1990 levels, and achieve net zero emissions by 2050 (OFEV, 2024). Considering the impact of the building sector, there is considerable reduction potential. Therefore, the Swiss Federal Office of Energy (SFOE) is developing its 2050 vision for the building stock to reduce emissions through five points: reduction, optimisation, substitution, renewable energies, and sustainability (SFOE, 2022). As the SFOE understands, sustainability integrates the environmental and social dimensions with affordable rents and a guaranteed quality of life.

Reduction and substitution are complementary. Needs are reduced through energy renovation and replacing the building stock, as older buildings are particularly energy intensive. Substitution is mainly concerned with heating and hot water production systems.

According to the SFOE's vision for 2050, no fixed fossil fuel or electric heating systems should exist. They will be replaced by more efficient heat pumps, renewable energies, or a connection to a CAD20. Therefore, the total energy demand for Swiss housing stock, electricity, and thermal should fall from 90 TWh in 2019 to 65 TWh in 2050. Even though the energy reference area should increase by 16% between 2020 and 2050, global warming alone is expected to reduce heating requirements by 10% (SFOE, 2022).

As a result, the average energy index of all energies combined should be reduced to 72 kWh/m^2/year, compared with 156 kWh/m^2/year in 2010. For the Swiss building stock today, 0.2% of the Swiss building stock is destroyed. Less than 1% of renovations are completed each year. To achieve these energy reduction targets, renovation should reach 2.5% annually by 2030 and 4% by 2050 (BCV, 2024).

To reach emission goals for 2030, all buildings should be optimised for energy use, and by 2050, the energy status of the entire Swiss building stock should be known (OFEN, 2023).

Buildings could offset most of their energy consumption through renewable energy production. They should also be able to cover a significant proportion of electric mobility (OFEN, 2023).

Under the Federal Constitution, the use of energy in buildings is the responsibility of the cantons (art. 89 para. 4 Cst.). As a result, all Swiss cantons have cantonal energy legislation, for which they issue laws and ordinances. These aim to minimise and optimise energy use and promote renewable energies. The Conference of Cantonal Energy Directors aims to promote cooperation between the cantons and harmonise their practices in this area. It publishes the Model Energy Regulations for the Cantons, namely MoPEC (EnDK & EnFK, 2024). The MoPEC is a collection of energy regulations on which the cantons can base their energy legislation. The MoPEC typically relies on the standards published by the Swiss Society of Engineers and Architects (SIA) to define limit values, such as a wall's U-value. The U-value measures the thermal conductivity of heat. Measured in W/m^2K, it defines a structure's insulation quality. These standards must be complied with during renovation or new-build projects but do not apply to existing buildings.

The Federal Building Program

To achieve the objectives of the SFOE's Vision 2050+, the Confederation and the cantons set up the Buildings Programme in 2010. Its main aim is to promote energy efficiency and reduce CO_2 emissions in the building sector by focusing on three main areas:

- Improving the energy efficiency of existing buildings by financing renovation work.
- Reducing greenhouse gas emissions by replacing heating systems that use fossil fuels with more environmentally friendly systems.
- Encourage the installation of systems using renewable energy sources.

To achieve this, the programme offers grants for various types of work, including

- Thermal insulation: Insulation of facades, roofs, walls and floors.
- Replacement of windows: Installation of energy-efficient windows.
- Upgrading heating systems: Switching to heating systems that use renewable energy (heat pumps, wood-burning heating systems, etc.).
- Installation of solar systems: Thermal and photovoltaic solar panels.
- Complete renovation: Integral renovation projects aimed at improving overall energy efficiency.

Grants are awarded based on specific criteria and vary according to the type of project and the anticipated energy savings. Subsidy applications must be submitted before the work begins, and current energy standards must carry out the work. All Swiss cantons participate in the Buildings Programme. Each canton implements the programme in its specific way, adapting the measures and subsidies to local needs based on the harmonised cantonal incentive model (EnDK & EnFK, 2024). Most of the funding will come from CO_2 tax revenues with around CHF 400 million for a tax of CHF 120/t and from the cantons with between CHF 170 and 200 million (Le Programme Bâtiments, 2022).

Between 2011 and 2022, the work financed by the Buildings Programme will have saved an average of 3.2 TWh/year of energy and 883,000 t/year of CO2 for CHF 3.1 billion. That is an average cost of over 3,000 CHF/t. In 2022, the building services category will become the most significant funding item with CHF 139 million, overtaking the thermal insulation category with CHF 128 million for the first time, as shown in Figure 7. Most expenditure on building services relates to changing the heating system. (Le Programme Bâtiments, 2022).

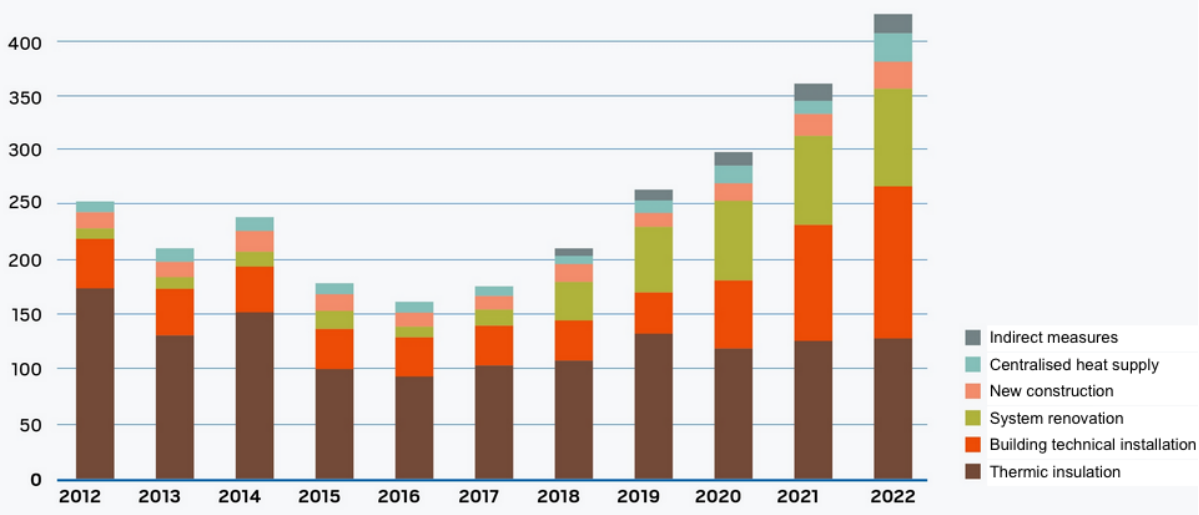

Figure 7: Distribution of payments under the Buildings Programme 2012 to 2022, in CHF million. Indirect measures include information and advice (CECB), training and further training, quality assurance and operational optimisation. Graph taken from the Buildings Programme Annual report.

Canton of Geneva

The canton of Geneva is the only canton that introduced an obligation to renovate particularly energy-intensive buildings by the date of this report. This should increase the pace of renovation of its building stock. As a result, building managers will be increasingly confronted with the issue of energy renovation. It is, therefore, necessary to understand how this law works.

Energy-intensive buildings are identified because of a heat expenditure index, which is mandatory for all heated buildings under the Energy Act of the Canton of Geneva (art. 15C, para. 1, LEn). The IDC represents the energy requirement for heat production, DHW, and heating, and the meteorological data for the year in question weigh it. The State Council defines the limits that must be within the limit for the IDC on average over 3 years in the Implementing Regulations for the Energy Act (REn). If the IDC is moderately exceeded, the owner must undertake energy optimisation measures at his own expense, as defined in the SIA 2048 standard (SIA, 2024), to bring the energy consumption below the threshold value. If the threshold is significantly exceeded, as defined in paragraph 2, art. 14 of the REn, an energy audit must be carried out. The audit can lead to an energy renovation that must be carried out at the

owner's expense (art. 14, REn). The fact that the IDC threshold is constantly evolving impacts building managers, who need to keep their knowledge up to date to give their customers the best possible advice.

The same law stipulates that:

- Any renovation or construction according to the defined energy performance standard (art. 15. C LEn) requires an energy certificate.
- In principle, replacing or installing fixed-resistance electric heating is forbidden. Permission may be granted in exceptional cases, particularly if it is shown that the investment required to change the means of heat production is disproportionate (art. 15B para. 1 and 4 Len). However, fixed electric heating elements for DHW production remain authorised for residential buildings (art. 15B al. 6 and 7 LEn).

Authorisation is required to install or replace a fossil fuel boiler if its output exceeds 5kW for fossil fuels and 70kW for renewable fuels. Authorisation is only granted if using renewable energy or waste heat can be exploited with disproportionate costs. In addition, the boilers must be condensing boilers that supply the building at a low temperature. The building must achieve at least class D for overall energy efficiency or meet the minimum requirements of SIA 380/1 of 1988 while covering 30% of its heating needs with renewable energy.

Canton Vaud

The canton of Vaud has developed a new version of its Energy Law (LVLEne), and the Grand Council, the parliament of the State of Vaud, is due to vote on it in 2024. It may, therefore, be amended during the parliamentary debates, but its application is scheduled for 2025.

The new version stipulates that:

- Owners of buildings constructed before 1896 must have an energy performance certificate, at their own expense, within 5 years of the law coming into force (art. 29 LVLEne).
- Buildings whose thermal envelope quality is equivalent to G in the CECB must be renovated within 10 years, and those whose quality is F within 15 years. At the very least, they must achieve class D after renovation (art. 32 LVLEne).
- The obligation to have a CECB in the event of the sale of a building, already present in the 2017 law, should be retained (art. 39 LVLEne).
- Hot water and heating may no longer be produced using fossil fuels or electricity via direct resistance in new buildings when replacing an existing installation or no later than 15 years after the new law is introduced (art. 40 and 41 LVLEne). If this version is adopted, the most energy-intensive buildings in the canton of Vaud will also be required to undergo renovation.

Canton Fribourg

The canton of Fribourg's new Energy Act (LEn) came into force on 1 June 2023. There is no obligation to renovate. However, an energy certificate will be required if a building is sold or newly constructed (art. 11 Len). Fossil fuels can still produce heat and DHW for new buildings and renovations. In the former case, non-renewable energy sources may cover no more than 70% of eligible requirements and 80% in the case of renovation (art. 40 Len). Therefore, it is possible to install fossil-fuelled heating systems in sufficiently insulated buildings or where renewable energy sources, such as solar thermal panels, are used. New fixed electric resistance heaters may not be installed. However, they may be retrofitted if the building's thermal envelope is at least CECB class, if half of the heating requirement is covered by renewable energy, or if 50% of the electricity required is generated on-site using renewable energy sources (art. 15 Len).

Canton Valais

On 8 September 2023, the Valais Grand Council approved an amendment to the Energy Act LcEne, which has not yet been implemented while writing in October 2024 (SGS & Canton Valais, 2024). There is no obligation to renovate, and no energy certificate is required. However, installing heating systems that run on fossil fuels is prohibited for new buildings, except for fossil fuels of renewable origin (art. 32 al. 3 LcEne). Renewal of an existing installation is possible if there is a 20% reduction in heating requirements or if this 20% is covered by renewable energy. If the overall energy performance class of the building's CECB is at least D, then there are no restrictions on replacing a heating system (art. 38 al. 3 LcEne).

Fixed electric resistance heaters may not be installed in new buildings; their replacement is possible following constraining standards and must be replaced within 15 years of the law coming into force (art. 32 and 39 LcEne). Decentralised electric heating systems must be replaced by other systems that comply with the law in the event of a significant replacement of the system or its entirety or major renovation of the interior of the building. There are exceptions, however, particularly for buildings with an overall energy performance of at least D, an energy reference area (ERA) of no more than 50m2, or a total installed capacity of less than 3 kW (art. 40 LcEne).

Canton Neuchatel

The current law for the canton of Neuchâtel dates from 1 September 2020. Neuchatel is the only state that judges the energy performance of buildings using two different approaches. Either the CECB or Display certificate is required. However, it is the only state that requires the Display certificate, and only a few auditors are still certified with this approach. Therefore, CECB will take overstep by step. An obligation exists for buildings for which planning permission was issued before 1990 and which meet one of these conditions (art.45 LCEn): if the ERS exceeds 1000m2, if the building is used for residential purposes, and has at least five users of a central heating system.

Installing and replacing fixed electric resistance heating systems and water heaters is prohibited. Existing installations will be banned from 1 January 2030 (art. 54 LCEn). Installing fossil fuel heating systems in new buildings is subject to authorisation (art. 56 LCEn). New buildings must meet the target values of SIA 380/1 for the thermal insulation of the building envelope (art. 53 LCEn and art. 33 RELCEn). When replacing a heat-generating installation, the proportion of non-renewable energy may not exceed 80% of thermal requirements. If it is technically possible and does not entail additional costs, then all the heating requirements must be covered by renewable energy (art. 53 LCEn).

Existing buildings that do not meet current performance standards as defined by the SIA must be renovated to achieve the minimum values required when the subsequent conversion, renovation or change of use that affects energy consumption is carried out or no later than 30 years after the introduction of this law (art. 44.). Otherwise, there is no obligation to renovate per se.

Canton Jura

A new energy law has been in force in the canton of Jura since 1 March 2024. In principle, it is forbidden to install or replace fixed electric resistance central heating systems (art. 16 LEN). The Ordinance implementing the Energy Act (OEn) defines a few exceptions, particularly for very isolated buildings or challenging to access (art. 24 OEn).

An energy certificate, in the form of a CECB, must be drawn up when a property is sold or when the heating system is replaced by one that uses fossil fuels (art. 48 OEn). Fossil fuel heating systems can still be installed in new buildings. In the case of heating oil, the building's heat requirement must not exceed 60% of the legal limit. The limit is 80% for gas (art.19 al. 4 OEn). The calculation of the limits is detailed in the ordinance and is based on the formulas in SIA 380/1. Replacing fossil fuel boilers remains possible, provided the building is Minergie® certified or its overall energy performance exceeds CECB class D (art. 39 OEn). There are exceptions for owners with taxable assets of less than CHF 100,000

and a taxable income not exceeding CHF 30,000 for single people and CHF 55,000 for married couples. Installing and replacing fixed electric heating systems is prohibited in principle (art. 16 LEN). There are exceptions for isolated buildings or buildings that are very difficult to access, provided that other systems are technically and financially not feasible (art. 24 OEn). There is no obligation to renovate. During conversion, renovation or significant change of use, buildings must be renovated to meet the minimum requirements (art. 9 LEN), which comply with the standards and technical data sheets published by the SIA and the EnDK (art. 18 OEn).

In conclusion, cantonal legislation is different. Some, such as the canton of Geneva, are more restrictive, which may influence the owner's building maintenance strategy. Some property management companies operate in several cantons, so they must be familiar with the legal framework to meet their customers' expectations best.

1.1.4. Building Management Legal Context

The hypothesis of the project is the critical role that building management companies could play in energy renovation. However, they are intermediaries between the owner and the tenant. It is, therefore, essential to understand who pays what in terms of energy consumption, who benefits from a drop in consumption in the event of renovation and what costs can be deferred by the owner since all these points can impact the decision to renovate. To do this, a presentation of lease law is made in this chapter through the legislation governing incidental costs usually charged, as well as the deferral of costs related to energy renovation or energy performance contracts.

Accessory charges

What can be billed to tenants is detailed in the Ordinance on the rental and lease of residential and commercial premises (OBLF). This includes, among other things, the fuel and energy consumed, operating costs, maintenance and servicing costs for heat and hot water production facilities (art. 5 RS. 220). Hot water and heating are thus considered incidental costs (art. 257b CO) and can be billed to tenants but must be mentioned explicitly in the contract (art. 257a CO). On the other hand, the boiler room's repair, refurbishment and depreciation are not chargeable to tenants (art. 6 RS. 220).

In practice, the utilities are always charged to the tenants. As a result, the tenant is the only one to benefit from a reduction in utility bills during an energy renovation. Therefore, the owner has no direct financial interest in changing a still functional means of heat production to a more efficient means, for example, replacing an oil boiler with a heat pump. The owner does not benefit from the energy savings when installing new insulation. This situation can also impact the owner's choice of heating technology, favouring the system with the lowest investment without regard to performance and operating costs. In this case, the choice is made to the detriment of the tenants, who bear the higher fees.

Other approaches exist in Switzerland, such as the commercial building management of an agricultural cooperative. For instance, Fenaco applies a full-cost approach to its building facility management, including energy. The users pay for the investment in energy infrastructure and must decide how the operational and investment costs are best allocated. However, as a cooperative, the user and owner are the same, so they favour a full-cost approach.

Rent increase following energy renovation

In Switzerland, tenants are protected against rent increases deemed abusive, so the landlord cannot simply increase the rent at will. How can this impact renovation? According to Article 269 of the Code of Obligations (CO), a rent is abusive if it allows the landlord to obtain an excessive return of more than 3.75% to date or results from an overvalued purchase price.

However, rents increased due to cost increases or additional services the landlord provides are generally not considered abusive (Art. 269a lit. b CO).

The services listed hereunder are considered additional services of the lessor (Art. 14 para. 2 OBLF):

• Reduction of energy losses from the building,

• Optimization of energy use,

• Reduction of emissions from technical equipment,

• Adoption of renewable energies,

• Replacement of energy-intensive household appliances with more economical models.

Federal legislation, therefore, authorises the full deferral of the costs of energy improvements on the rent. However, according to the Federal Court ruling 4A_484/2011 of 2 November 2011, the work must be of a nature to reduce the charges. Furthermore, only investment costs not resulting from restoration or maintenance of the rented property can be considered (Art. 14 para. 3 OBLF), from which the subsidies received must be subtracted (Art. 14 para. 3bis OBLF).

In theory, the owner can, therefore, defer the renovation costs. However, the main challenge lies in precisely calculating the difference between the theoretical maintenance cost and the added value of the energy renovation. The owner is also exposed to a challenge from the tenant in the event of an increase in rent, which limits his desire to renovate because it might lead to a legal dispute first.

Energy Performance Contract

An energy performance contract is an agreement where a service provider commits, for a fee, to reduce the energy consumption of a building (art. 6C al. 1 OBLF). These savings measures are (art. 6C al. 2 OBLF):

• Optimizing the operation of heating, ventilation and air conditioning systems and building automation.

• Providing instruction and advice to residents,

• Replacing equipment, installations and light sources,

• Improving the building envelope.

The lessor may defer these costs to the rent, less any subsidies obtained, as incidental expenses for 10 years (art. 6C al. 3 and 6 OBLF). However, the amount may be at most the savings made by the tenant on charges (art. 6C al. 4 OBLF). The lessor may choose to defer the costs according to the method of Article 14 of the OBLF (see previous section) or Article 6, but they are not cumulative. (Lewandowski et al., 2024).

Cantonal Specifications

The impact of energy renovation costs can be limited by cantonal laws, which currently only seems to be the case in Geneva. In its Law on Demolitions, Conversions and Renovations of Residential Houses (Support Measures for Tenants and Employment) (LDTR), the Canton of Geneva limits the price of rents. Thus, in the case of energy renovation, this ceiling can only be slightly exceeded. This increase corresponds to the energy savings achieved, adding an energy contribution of CHF 120 per room per year from the tenant (Art. 6 para. 3 LDTR). In practice, this means that the cost of energy renovation can hardly be charged to tenants in the Canton of Geneva (Lewandowski et al., 2024). Therefore, the inability to defer the cost risks putting off owners wishing to embark on energy renovation and slowing down the pace of renovations. However, depending on the IDC of their building, some will not have a choice (see Cantonal et al.).

1.1.5. Energy Building Management Continuing Education Offer in French-speaking Switzerland

We define a continuing education for a building manager as any education program designed for building managers that includes energy-related, for example, focusing on energy renovation or energy efficiency consulting. We are primarily interested in the links utilities maintain with their clients, which SER projects could strengthen. Some utilities already provide project owner support services for renovation projects and ensure coordination between renovation companies and tenants. To our knowledge, only the canton of Geneva provides financial support to the agencies that assist owners wishing to renovate their buildings. Therefore, we did not consider:

- Formations for technical services (construction enterprises, energy consulting, …),
- The Romandie platform for continuing education in energy and buildings brings together a multitude of courses intended for technical professions and, in particular, for the optimisation of equipment and energy renovationFe3.ch (Bureau Ehe SA, 2023),
- The General Directorate of Energy (DIREN) of the canton of Vaud also offers caretakers and heating engineers training on optimising energy consumption in collective housing,
- EPFL / HES courses: These courses require certification, are paid, and have a minimum of several working days,
- SIA (SIA, 2024),
- Continuing education for the generic formation of building management.

To note that SuisseEnergie encouraged financial subvention to the local administration to create or follow existing formations about energy renovation (Suisse Energie, 2024a)

List of relevant continuing education programs or similar programs with the key target group:

- USPI immoderate: building management professionals
- Energie Fribourg: Property owners
- Romande Energie: real estate in general
- Eco21 of SIG: building managers and owners
- UNIGE CAS: building managers and, more extensively, other professionals
- Coptis: building managers
- Immoenergie from APGCI: building managers
- Label Vert program from USPI Geneva: building managers
- SiL: building owners

USPI formation immodurable: (USPI, 2024)

- Subsidised Training: Immodurable Certification,
- Location: Lausanne (VD),
- Price: CHF 2,300 for USPI members, CHF 3,050 for non-members,
- Course Duration: 5 days plus a half-day exam, with a maximum of 24 participants per class,
- Financial Support: The State of Vaud offers a subsidy of CHF 600 for participants residing or employed in Vaud.

The Immodurable training covers six topics over five days. It aims to provide a comprehensive understanding of energy renovation, helping participants guide clients in building energy planning. Practical

exercises accompany expert-led theoretical presentations, and all materials are provided electronically. The course concludes with an exam, which awards an Immodurable certificate upon success.

The training has the following objectives:

- Raise awareness and educate professionals on energy renovation,
- Strengthen collaboration for energy transition,
- Standardize messages and increase sustainable energy renovations,
- Offer comprehensive client guidance.

The target audience is technical building managers, real estate brokers, client advisors (banking and insurance), and construction entrepreneurs.

The course includes energy context and legislation, building fundamentals, Cantonal Energy Certificates (CECB), economic aspects, customer relations, and practical case studies.

Admission requires an Immobase certificate or at least two years of relevant experience in real estate or construction. Participants from Vaud can benefit from a CHF 600 subsidy, which can be combined with other discounts for USPI members.

Energie Fribourg: (Etat de Fribourg & Service de l'énergie, 2024)

The Canton of Fribourg offers various professional training and information sessions related to energy renovation for building owners. Energie-FR, the cantonal program for continuing education in these areas, organises training sessions for professionals in building energy renovation and renewable energy.

- Continuing Education:
    - eREN: Comprehensive approach to building envelope energy renovation,
    - Geothermal Energy: In collaboration with Geothermie Schweiz,
    - Heat Pump Systems: In collaboration with the Swiss Heat Pump Association.
- Information Sessions for Property Owners: Energie-FR collaborates with local municipalities and the cantonal climate plan to offer information sessions on building renovation and installing photovoltaic systems for property owners,
- Certified Programs: HES-SO (University of Applied Sciences of Western Switzerland) offers a Master of Advanced Studies (MAS) in energy and sustainable development, comprising nine Certificates of Advanced Studies (CAS) that can be pursued individually.

The Canton of Fribourg provides professional training and information sessions focused on energy-efficient building renovation and renewable energy. Programs such as eREN and certified courses from HES-SO help professionals and building owners enhance their knowledge of sustainable building practices and energy-efficient technologies. Additionally, the canton offers information sessions to educate property owners on the technical and financial aspects of building renovation and photovoltaic installation.

Energie Romande: (Romande Energie, 2024b)

This program is designed for real estate professionals, offering services and solutions for managing and renovating buildings with a focus on sustainability and meeting modern regulations:

- Solar Energy: Installation of photovoltaic solar panels and management of energy-sharing communities,
- Charging Stations: Solutions for installing electric vehicle charging stations for various types of buildings,
- Advice and Renovation: Energy transition services to renovate and elevate building performance,
- Heating and Cooling: Sustainable heating, cooling, and ventilation solutions (CVC),
- Infrastructure: Infrastructure optimisation with services for emergency power, lighting, and temporary installations,
- Hygiene: Ensuring building cleanliness with systems for surface disinfection, self-disinfecting door handles, and air purification.

They offer support for property owners, managers, and agencies in navigating regulations, installing sustainable systems, and handling tenant requests, such as charging stations for electric cars.

Romande Energie offers real estate professionals various services for sustainable building management and renovation. They focus on solar energy, electric vehicle charging, energy transition, heating/cooling systems, and infrastructure optimisation to meet decarbonisation goals and regulatory requirements. They provide tailored solutions for energy-efficient renovations and infrastructure improvements to meet new environmental standards.

Programme Eco21 (SIG, 2024)*:*

The Services Industriels de Genève offer the éco21 program aimed at helping individuals, businesses, and public entities reduce their energy consumption through practical and effective solutions. Key elements of the program include:

- Tailored support for various clients (individuals, real estate managers, companies, local communities),
- Specific training and advice related to energy efficiency and sustainable building management,
- Financial aid for energy-saving projects.

The main goals of éco21 are to support energy savings, help protect natural resources and reduce CO2 emissions. These goals align with both local (Canton of Geneva's "2000W society") and national (Swiss Energy Strategy 2050) objectives. Since 2007, éco21 has successfully helped residents reduce energy use and emissions.

The program offers multiple solutions:

- Support for homeowners improving energy efficiency in their homes,
- Help building managers and companies navigate energy regulations,
- Initiatives to reduce energy use in vulnerable households to address energy poverty.

The estimated impact of the program:

- Energy Savings: 271 GWh saved per year, equivalent to the consumption of 90,000 households,
- Financial Savings: CHF 46 million saved annually by customers,
- CO2 Emissions: 652,000 tons of CO2 emissions avoided,
- Investment: CHF 182 million invested in the local economy,

- Job Creation: 860 jobs were created in Switzerland.

In 2024, over CHF 29 million in energy renovation subsidies will be available for property owners in Geneva through partnerships between the Canton, the Confederation's "Building Program," and the éco21 program. This program positions Geneva as a leader in energy efficiency while promoting the development of intelligent and sustainable neighbourhoods. For more details, SIG collaborates with platforms like TopTen for efficient product comparisons and offers an online resource, GEnergie, to guide users through available subsidies and solutions.

UNIGE CAS for energy professionals (UNIGE, 2024).

The CAS in Energy Strategy and Management – For a Sustainable and Decarbonized Economy 2025 at the University of Geneva is a professional training program that equips participants with the skills necessary to manage the energy transition within companies and institutions.

The training runs from January to June 2025 (131 hours, 13 ECTS credits), is organised in person (with the option to move online if needed), and costs CHF 6,400 (or CHF 1,800 for Module 1 alone).

It takes place in Geneva, and its objectives are:

- Understand the political, technical, and economic energy issues,
- Integrate energy risks and opportunities into corporate strategy,
- Implement effective energy management systems (EMS) aligned with ISO 50 001 standards.

The program is tailored for professionals such as building and infrastructure managers, energy and environmental project leaders, facility managers, engineers, NGOs, and researchers who want to enhance their energy efficiency and sustainability expertise.

The training addresses the following key components:

- Master legal and technical frameworks for energy and CO_2 management,
- Assess and improve energy performance in critical processes,
- Lead energy projects and apply renewable energy solutions.

The course consists of five modules:

- Energy management fundamentals,
- Identifying energy improvement opportunities,
- Managing energy policy with ISO 50001,
- Leading energy efficiency and renewable energy projects,
- Case study and final project.

Professor Martin Patel and Dr. Olivier Epelly direct the program, offering academic and practical insights into energy management.

Coptis formation (Coptis, 2024)

The Coptis Association offers a tailored training program for building management professionals to address sustainability challenges in the industry. The training focuses on practical solutions, helping participants understand essential sustainability tools, establish clear strategies, and meet investor demands. The course was developed in response to members' requests to navigate the complex implications of sustainability, including carbon neutrality and regulatory requirements. It is based on the "Swiss Triple Impact" program, which has already trained over 300 Swiss companies.

The program spans five sessions, combining in-person and virtual workshops, with limited participants to ensure personalised guidance and active interaction. By the end, participants will have tools to measure their environmental and social impact, comply with legislation, and set achievable sustainability goals. The training emphasises practical application, with participants expected to create a tailored roadmap to integrate sustainability into their business models. The first cycle occurred in spring 2022; an improved version began in February 2023.

Immoenergie from APGCI (CGI Conseils, 2024)

Two courses belonging to the unit Immoenergie are proposed to building managers about SER from APGCI: Technical Approach and Energy Strategy and Planning.

The "Immoénergie: Technical Approach" training, scheduled from January 16 to March 6, 2025, is a 32-hour certified course focused on the technical and energy management aspects of building renovation. The program costs CHF 2,500 and is aimed at technical managers, assistants, or equivalent roles in building management. Participants will learn to incorporate energy efficiency in renovations and optimise the use of building installations.

The program consists of several modules:

- Global Approach (January 16) – Covers energy strategy, CO2 reduction, energy laws, financial incentives, and energy renovation planning,
- Basic Techniques (January 23) – Focuses on energy optimisation and renewable resources,
- Technical Modules (January 30 - March 6): This includes five half-day sessions on thermal insulation, heating, ventilation, electricity/water, and tenant relations.

Each module is a prerequisite for the next, and participants must pass a final exam to obtain certification. Under specific conditions, financial subsidies covering up to half the course fee may be available through the "eco21" program.

A certified training program, "Immoénergie: Energy Strategy and Planning," will be held in Geneva from January 28 to March 11, 2025. The 43.5-hour course costs CHF 2,700 and is designed for sustainability managers, portfolio managers, and equivalent roles. It aims to provide participants with a comprehensive understanding of energy efficiency in the real estate sector, focusing on renovation projects and long-term energy planning.

The program consists of four modules:

- Global Approach – Energy strategy, CO2 reduction, energy consumption, and financial incentives for energy renovations,
- Basic Techniques – Optimization of energy use, exploitation of local renewable resources, and performance impacts,
- Work Planning – Roles, responsibilities, and critical elements for planning and managing renovation work,
- Heat Pump Installation – Designing and managing heat pump systems for multifamily buildings.

Participants must pass a certification exam at the end of the program. Under certain conditions, financial subsidies covering up to half of the course fee may be available through the "eco21" program.

Label Vert from *USPI Geneva* (USPI-GE, 2024)

The Green Label program, initiated by USPI Geneva in 2009, is a certification to reduce energy consumption in buildings, aligning with Switzerland's Energy Strategy 2050. Property managers holding the Green Label are critical in advising property owners on energy optimisation and implementing impactful energy-saving measures such as building insulation, heating system upgrades, and energy-efficient appliances. Program participants access a formation focusing on SER.

The program also encourages sustainable practices within property management firms, including recycling, energy-efficient office equipment, and promoting public transportation for employees. The label is valid for one year, requiring firms to meet specific energy-saving criteria to maintain certification.

Rénovons from *SiL* (SiL, 2024)

The "Rénovons Lausanne" program, launched by the Services Industriels de Lausanne (SiL), aims to assist building owners in reducing their energy consumption by up to 75% through comprehensive renovations. Heating accounts for nearly 60% of CO2 emissions in Lausanne, making building renovations a central focus of the city's climate plan, which targets zero direct emissions by 2050.

The program offers a streamlined process for property owners and partners with the expert firm Amstein + Walthert to provide reliable information on contractors and available subsidies. SiL covers the initial costs of project audits, with additional financial support from the Canton of Vaud. The audit cost is partially subsidised, and further financial assistance of up to CHF 10,000 is available for project management. The initiative also encourages cost-sharing by grouping renovation projects, which allows for better pricing and shorter timelines.

A recent information session in April 2024 attracted significant interest from local property owners, highlighting the program's appeal and potential impact on the city's energy efficiency goals. The comprehensive support, including expert guidance and financial incentives, aims to facilitate the adoption of energy-efficient renovations and significantly reduce Lausanne's building sector's carbon footprint.

1.1.6. Building Management Business Model

The group of stakeholders delivering building management services is a heterogeneous group of services with different business models. Building management services involve comprehensive operations to ensure effective functioning and maintenance. Key components include:

- Property Management: Overseeing daily operations, tenant relations, and lease management,
- Maintenance Services: Regular upkeep of HVAC, plumbing, electrical systems, and elevators,
- Security Services: Implementing security measures such as surveillance and access control,
- Cleaning Services: Maintaining cleanliness in common areas and facilities,
- Building Inspections: Routine inspections to identify maintenance needs and ensure safety compliance,
- Emergency Preparedness: Developing plans for emergencies and training staff and tenants,
- Energy Management: Monitoring energy consumption to enhance efficiency and reduce costs,
- Compliance Management: Ensuring adherence to safety, health, and environmental regulations,

These services can be managed in-house or outsourced to specialised companies to create a safe and efficient environment while maximising property value.

This section describes hereunder in detail the different configurations of the owner-manager-tenant relationship. The authors produced this classification to understand how business models relate to the

project objective. This characterisation is specific to the geographic area of French-speaking Switzerland only. The interest lies in the fact that the levers to be activated to trigger an energy renovation may vary according to the nature of the relationship. Seven different types of building management have been identified, described hereunder and displayed by the diagram in Figure 8.

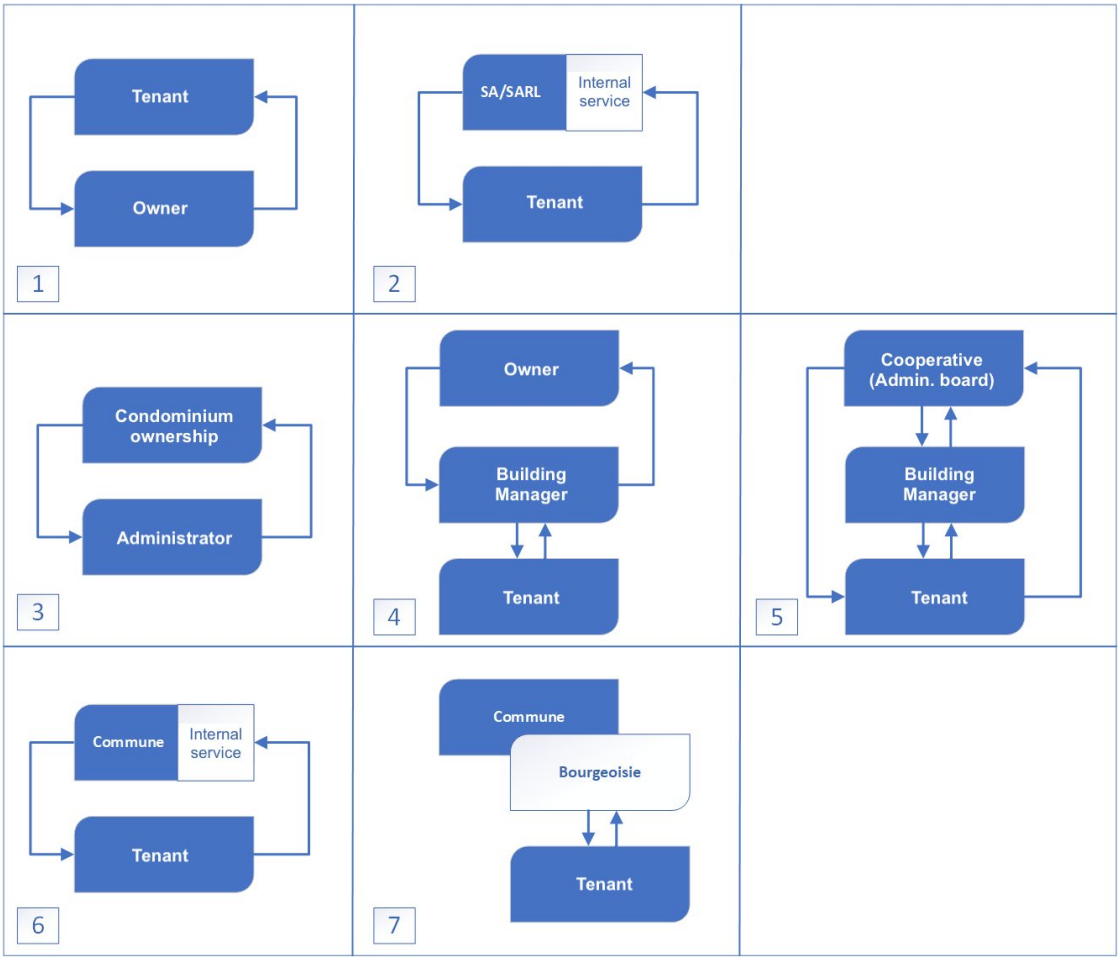

Figure 8: Diagram of the different types of existing tenant-regulator-owner relationships.

Owner-tenant (1)

The landlord provides the accommodation, manages the tenant's requirements, and maintains the property. The tenant pays the landlord the rent and service charges.

In this configuration, the tenant has privileged contact with the owner. They can complain directly to the landlord about excessive service charges or the dilapidated state of the property, which could affect the likelihood of the landlord carrying out an energy renovation and have a straightforward indirect knowledge of the building. This is typically used to accommodate a holiday property or an apartment in the owner's house.

Corporate ownership-Tenant (2)

A company (SA/SARL) with an internal department manages the property. The in-house department provides tenant management services such as maintenance, administration, etc. The tenant pays the rent and service charges and can communicate directly with the in-house department for services and needs relating to the property.

The management/board of directors makes decisions. The board decides on an energy renovation policy, which the in-house department is responsible for implementing. Typically, limited companies have substantial cash flow, which enables them to renovate their entire property portfolio, part by part. Potentially, they are more sensitive to the state of their property stock than a private company for fear of impacting their brand image (Le Temps, 2024). Typically, the company is a pension fund or a bank.

Tenancy in co-ownership: Condominium Ownership - Administrator (3)

Condominium ownership is a form of co-ownership in which each co-owner owns a specific share (part of a building or a flat). Common areas, such as entrance halls, staircases and communal facilities, are shared between all the co-owners. The co-owners form an association and elect an administrator to manage and maintain the common areas. Major decisions concerning the common areas and the budget are taken collectively at general meetings. Each co-owner pays a share of the management and maintenance costs in proportion to their share of the condominium ownership. The administrator (often a property management company) manages the common areas of the condominium ownership and may provide various administrative and maintenance services to the co-owners. The co-owners, members of the condominium ownership, pay a management fee to the administrator for these services.

The co-owners enjoy the direct benefits of energy renovation (lower charges and increased comfort) and are potentially more inclined to renovate. However, a double majority, i.e., co-owners and co-ownership shares, must be obtained to trigger an energy renovation (Tesnier, 2023). Reaching a quorum can be complicated, slowing down energy renovation projects.

Owner-Manager-Tenant (4)

The owner hires a management company to manage its property. Management provides management services such as rent collection, maintenance, etc., to the landlord in return for a fee (generally 3 to 5% of the annual rent (ASLOCA, 2020). It is the contact for tenants and manages their requests/complaints. The tenant pays the rent to the management company.

Therefore, the landlord does not interact with his tenants and is isolated or unaware of their complaints. This distancing could lead the owner to prioritise the return on his property to the detriment of energy renovation. This is particularly true in the context of a tight property market, which means that landlords do not have to worry about being able to rent out their property, regardless of its energy status. (Vuille et al., 2014).

Cooperative-Management-Tenant (5)

Housing co-operatives in Switzerland are non-profit organisations that provide affordable housing for their members, who are both tenants and co-owners of the properties.

Each member buys one or more shares, which gives them the right to rent a property in the co-operative and to participate in its management. The supreme body of the cooperative is the General Meeting, where every member has the right to vote. Critical decisions, such as approving budgets and annual accounts, amending the articles of association and electing board members, are taken at these meetings (ARMOUP, 2016).

The property is owned by a cooperative run by a board of directors. Often, the co-op hires a steward to manage the properties. The Steward provides management services to the tenants, who pay rent to the manager and report to the co-op's Board of Directors.

Major renovations or projects involving significant expenditure require a qualified majority of co-operators to be passed at the annual general meeting. The percentage of members required to reach this qualified majority is defined in the articles of association, often ⅔ or ¾ of the votes. Consequently, the propensity to act on energy renovation depends on the cooperative's sensitivity to this issue and financial resources. The challenges and advantages are like those of condominium ownership.

Municipality-Tenant (6)

A local authority owns the property, such as low-cost housing, and manages the services via an internal department. The relationship is the same as in case 4, with the local authority replacing the traditional landlord and the internal service acting as property manager. Maintenance of the building stock is the responsibility of the internal service, but the local council or a specific committee must approve significant renovation work. However, local authorities must set an example, and new buildings/renovations must meet higher energy standards, which can accelerate energy renovation (paragraph 1.1.3).

Commune-Bourgeoisie-Tenant (7)

The bourgeoisie is an independent department of the Commune with its administration. However, the president of the Commission's bourgeoisie is a local councillor, and the Local Council must approve the objects, accounts, and budgets before they are brought before the Bourgeois Assembly (Ville de Fribourg, 2024b). The Bourgeoisie rents and manages its properties. It decides on any renovations to be carried out, subject to approval of the budget by the commune. However, as it is independent of the commune, it is not subject to the same duty to set an example regarding energy standards. However, given the projects currently underway (Ville de Fribourg, 2024a), it is taking a keen interest in energy renovation. This type has been described after the example of the Bourgeoisie of the city of Fribourg, and minor differences may occur case by case.

1.1.7. Energy Management Tools

Engineering firms, building managers and local authorities can use tools to monitor buildings' energy consumption or assess their energy performance. This can help identify opportunities for renovation and energy optimisation. This section reviews the leading software/platforms that are or can be used in French-speaking Switzerland. Each tool is briefly described. At the very least, the strengths and weaknesses are assessed according to the following criteria:

- Tool costs.
- Managing a portfolio of buildings: The criterion is met if the tool can record several buildings and classify/compare them.
- Energy consumption: The criterion is met if the tool can enter DHW, heating, and electricity consumption and track changes over several years.
- Energy renovation: If the tool can be used to determine the effect of an energy renovation by comparing alternatives or providing advice, then the criterion has been met.
- Level of knowledge required:
    - Basics require no specific knowledge apart from mastering and differentiating between standard units such as kWh and litre.
    - Intermediate requires knowledge that can be achieved through self-training, e.g. familiarity with the SRE concept.

- Advanced is intended for engineers/architects familiar with building thermal engineering.
- Expert requires advanced knowledge of the tool.

This chapter may highlight other points, depending on the documentation available. Table 1 provides an overview and quick comparison of existing tools.

Software requiring connected meters and home automation for optimisation, such as ABB Ability™ Energy and Asset Manager, is deliberately ignored. This is because the infrastructure to be put in place is much more substantial and costly and requires advanced IT skills. It is, therefore, not easily implementable for small utilities and is outside the scope of this research. It should be noted, however, that these systems will undoubtedly be used more and more in the future as new buildings are systematically fitted with smart meters.

Table 3: Comparison of existing energy management tools according to the evaluation criteria.

Tool	Cost	Knowledge level	Portfolio management	Energy consumption	Energy renovation
Consobat	Free	Basic	No	Yes	No
Energuide.ch	Free	Intermediate	No	Yes	Yes
Objective-a.com	Free	Advanced	No	No	No
INSPIRE	Free	Advanced	No	No	No
EPIQR+	300 /Building	Advanced	No	No	Yes
EnergoTOOLS	Fee unknown	Basic	Yes	Yes	No
EnergyView	Fee unknown	Basic	Yes	Yes	No
EnerCoach	400 to 500	Basic	Yes	Yes	No
Lesosai	990 (base version)	Expert	No	No	Yes

Consobat

A free online tool offered by the Conférence romande des délégués à l'énergie (CRDE) (Batismart, 2021). It allows you to monitor the energy consumption of buildings. To do this, start by creating your building, entering at least the number of inhabitants, the number of m2 of living space and the weather station corresponding to the building from a choice of 15 stations. Next, you must manually enter the meter readings for the heat production system, DHW, heating, and electricity. Consumption can then be displayed on a graph against the heating degree days with the energy signature, enabling any anomalies in the boiler room regulation to be detected.

However, for sufficient accuracy, it is recommended that you enter one reading per week. It is possible to enter only a few readings per year, but in this case, the tool will not be accurate and will monitor consumption. It also offers building performance emissions, as displayed in Figure 9. This only considers heating and DHW.

Strengths:

- Free of charge
- No specialist knowledge is required.
- Visually compelling performance display
- Adapts to different heat production systems

Weaknesses:

- As the tool is free, it is potentially more vulnerable to data leaks than software specialising in the field, and data protection must be ensured.

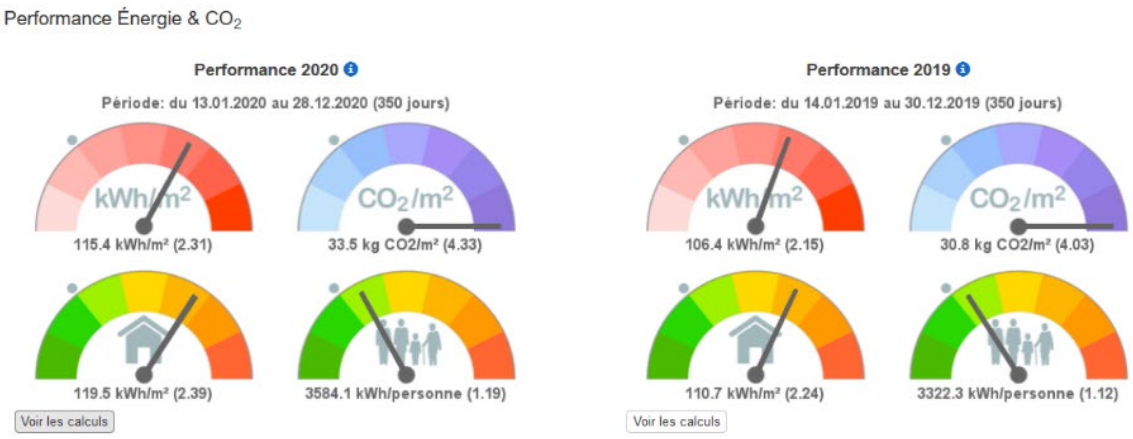

Figure 9: Consobat tool output interface. This example shows the output performances estimated for a house with a heated surface of 120m^2 located in Sion, Switzerland, for four people, for an average consumption behaviour estimated by ChatGPT 4o.

Objective A

This website was developed by M. Zufferey, a consulting engineer in building physics, in collaboration with the HES-SO Valais/Wallis and CREM (Zufferey, 2024b). It offers a range of free services, including U-value calculation (SIA 180), heat balance (SIA 380/1: 2009), calorimetry (SIA 384.201), domestic hot water (SIA 385/3), Minergie index, energy certificate (SIA 2031), and estimation of renovation costs.

Strengths:

- Very detailed for a free tool and offers many possibilities.
- Easy-to-use interface.

Weaknesses:

- It does not allow you to manage a fleet of buildings and get an overview. Therefore, the tool is not designed for use by a management company.
- The ‘export building’ option, which allows data to be reimported, is impractical.
- Most tools require a good knowledge of building heating, so they are unsuitable for people with no training in the field.

Energuide

Arnaud Zufferey developed the website (Zufferey, 2024a). It aims to evolve objective-a, easier and more intuitive to use. It offers several free calculators that allow you to:

Estimate the energy consumption (heating, DHW, and electricity) of a building based on its m2, number of inhabitants, and year of construction and renovation. In detail, it estimates the DHW consumption, production, solar installation cost, insulation performance, the building's energy consumption, the heating capacity and energy and CO2 labels.

Intermediate knowledge is required to use it. This can be acquired through self-training using the video tutorial. A professional level is optional.

Strengths:

- It is possible to Estimate a building's energy consumption based on a typical building or enter a specific address and retrieve data from the Federal Register of Buildings and Dwellings (RegBL).
- The thermal envelope of the building can be detailed, if known, to obtain a better estimate.
- You can insert renovation work to compare the building before and after renovation.
- Provides cost and subsidy estimates.
- Full tutorial and FAQs for use.
- Easy-to-understand interface.

Weaknesses:

- Impossible to save/retain results. It is, therefore, impossible to manage multiple buildings or monitor them.
- No consumption monitoring
- It is impossible to enter actual consumption into the calculator to improve accuracy.
- The solar calculator needs to consider location and is therefore useless. However, it is considered a tool for estimating the building's consumption and energy label.
- No indication of the assumptions made.

INSPIRE Tool

Developed by Econcept and TEP (Suisse Energie, 2024b), this tool is an Excel workbook. However, at the outset, it should be noted that the project stopped at version 1.48, i.e., in 2016, with no updates since. The various sheets enable the thermal envelope of a building to be modelled and the impact of different renovation scenarios to be measured.

Strengths:

- Very detailed for a free tool.
- Easy to use; all you must do is fill in the cells on the Excel pages.

Weaknesses:

- Does not allow you to manage a fleet of buildings and get an overview. The tool is, therefore, not designed for a control centre. It requires one file for each building.
- It requires a good knowledge of building heating. It is not suitable for people with no training in the field.
- It has not been updated since 2016, and climate data has been updated manually.

- It requires much information, and the building must be perfectly known to be modelled.
- The licence is free, but accessing/modifying the formulas and macros is impossible.

EPIQR+

EPFL and five other European laboratories developed the EPIQR in 1996. EPIQR+ is now being developed by EPIQR Rénovation, a start-up company based in EPFL's Innovation Park. This new tool was launched in 2024 (EPIQR Rénovation, 2024).

The tool, in the form of a web platform, conducts a comprehensive analysis of the architectural elements, technical installations, and the energy and environmental aspects of a building. This thoroughness ensures the accuracy of the assessment. According to the EPIQR+ website, an on-site visit (2-3 hours) by a qualified auditor is required to assess the condition of the various elements. It is also necessary to know information such as the ERS, window surface area, facade, etc., to enter the data for the analysis. A summary report requires one day's work in addition to the visit and offers an accuracy of 25% of the cost estimates. A detailed report requires 2-3 working days. The method seems primarily designed to optimise costs for building management.

A fleet of 11-100 buildings costs €300 (excl. VAT) per building, with access for three months, 45/per year/building for updated diagnostics and renovation costs. Training courses for qualified auditors (720.00 excluding VAT per person for the introductory one-day course) are also included.

Strengths:

- Provides a renovation cost estimate accurate to ±15%.
- Calculates the CO2 footprint of the renovation.
- Allows you to prioritise the work required to maintain or increase the property's value.
- Allows you to carry out both one-off and complete renovations.

Weaknesses:

- The qualified auditor must be a technician, engineer or architect. Good knowledge is therefore required.
- It is time-consuming because it is detailed. As a result, the method only allows you to quickly obtain an overall, approximate picture of a building stock.
- Access to the building on the platform and data updates are only available for three months. Only the report can be downloaded. This means it cannot be used to manage a building stock over the long term but is designed to process one building at a time.

EnergoTOOLS

Energo developed the web platform and describes itself as a ‘centre of expertise in energy efficiency in buildings for over 20 years.’ (Energo, 2024). It can monitor a building's energy consumption by entering data from meters (remotely or manually read), establishing an energy signature for the building, measuring energy savings, and detecting energy drift. As an option, you can advise on optimising energy use or even renovating technical installations. Training courses on how to use the platform are available, particularly for caretakers.

Strengths:

- Allows monitoring a whole range of buildings, possibly classifying them in order of consumption or comparing them with other buildings using EnergoTools.
- Does not require in-depth knowledge.

Weaknesses:

- Prices are not transparent or available on the website.
- Renovation of the thermal envelope needs to be covered.
- The functions of the basic package seem limited. Other contracts with commissioned engineers cover the optimisation and modernisation of installations.

EnergyView

EnergyView is an energy management module part of the CITIZEN suite developed by the T2i group (Groupe T2i, 2024). Now, it is a privatised tool designed for local authorities. It makes monitoring community-building energy and water consumption easy. It offers a simplified graphical interface that quickly identifies the biggest consumers.

Strengths:

- Requires virtually no action - import the local authority's energy invoices as a CSV file.
- Simple, easy-to-use interface that requires no special skills.
- Allows you to identify large consumers quickly.

Weaknesses:

- It is not designed for energy optimisation or renovation; it produces consumption graphs.
- The consumption of buildings is absolute and not related to surface area. Therefore, comparing buildings is impossible, although they can be classified by consumption.
- Chargeable, but prices need to be communicated.

EnerCoach

EnerCoach is a web-based platform initially developed with the funding of SuisseEnergie for local authorities. It is a tool for managing and monitoring the energy consumption of local authority infrastructures (Enercoach, 2024). It enables users to enter, evaluate, and interpret energy data to optimise energy use in buildings, vehicles, public lighting, and other municipal facilities. Energy certificates can also be calculated.

These are progressive and depend on the municipality's population. For a municipality with a population of 5,000 to 10,000, the cost is CHF 400 per year and CHF 500 for a population of 10,000 to 20,000.

Strengths:

- Fairly intuitive to use, although training is available on how to use the platform correctly.
- Allows you to monitor an entire building stock.
- Calculates the carbon footprint of energy consumption.
- Attractive prices.
- A demonstration version of a fictitious local authority is available, giving an idea of the platform's capabilities.
- No special knowledge is required.

Weaknesses:

- Use seems to be restricted to local authorities, given the pricing.

- It offers no suggestions for renovating or optimising buildings' energy efficiency. It is simply a tool for monitoring consumption.
- The buildings on the list cannot be classified according to their energy consumption.

Lesosai

This is a comprehensive software package developed by EPFL to help with the energy assessment of buildings (Westphal, 2024). It has been designed to conduct detailed analyses of buildings' energy performance and renovation needs. Its basic version can be used to model buildings, enabling a complete thermal balance to be drawn up following the SIA 380/1 standard. It is possible to modify the thermal envelope of the building and the technical installations to determine the gains from an energy renovation and compare several variants. There is also an assistant function, which guides the user and suggests modifications in the report to improve the building's energy efficiency. Additional modules are available for Minergie certification, building lifecycle analysis calculations and many other functions.

Building professionals use Software such as Lesosai when a renovation project has already been decided to have a complete and dynamic simulation of the building and to measure the impact of different variants. They are not used to monitor a building stock or building to decide whether it is necessary to optimise or renovate it. As such, they are not used by building authorities but by engineering firms. This type of software is, therefore, outside the scope of this work. Consequently, similar software will not be developed here. We can, however, mention some of the best-known tools, such as bSol, EnergyPlus, DesignBuilder, PHPP (Passive House Planning Package) and OpenStudio.

The basic version costs CHF 990 per licence, usable on three machines. Software updates are charged. Depending on the module chosen, additional modules are available for between CHF 100 and CHF 600.

Strengths:

- Lesosai incorporates catalogues from manufacturers' databases for building materials (insulation, windows, etc.) and technical installations, enabling precise building modelling.
- Very comprehensive software: suggestions for optimising renovation, cost estimates, and dynamic modelling (hourly, monthly).
- Developed Swiss standards, with the ability to automatically fill in certain forms such as EN-1a (for building permit applications).
- Ability to import and export data from/to the CECB platform.

Weaknesses:

- Software designed for professionals (engineers, architects, etc.) requires sound knowledge of building heating. It requires complete information on the building (wall composition, ERS, etc.) and is, therefore, very time-consuming.
- Cannot be used to manage a whole building stock, only a new build or renovation project.
- No tracking of building consumption over time.

1.1.8. SaaS Building Management

The SaaS (Software as a Service) building management uses cloud-based software to manage and optimise building operations and maintenance. This type of solution enables building managers, property owners, and facility operators to oversee various aspects of building management—such as energy usage, maintenance scheduling, tenant communication, and compliance—via an online platform that can be accessed from any device with an internet connection. SaaS building management platforms often include features for real-time monitoring, automation, analytics, and integration with IoT devices, all aimed at improving efficiency and reducing operational costs (Gartner, 2024).

Key Features of SaaS Building Management include maintenance automation, energy management, tenant communication, compliance tracking, and remote access.

The SaaS platforms can significantly facilitate sustainable energy consulting for buildings compared to traditional management systems (ENERGYSTAR, 2024; Poghosyan et al., 2024).

These platforms automate, monitor, and analyse real-time energy consumption, offering building managers actionable insights to optimise usage and reduce carbon footprints. SaaS-based building management systems (BMS) integrate advanced analytics, predictive maintenance, and IoT devices for more precise and efficient energy management, surpassing traditional manual methods that rely on periodic audits and reactive maintenance.

The SaaS Facilitates Sustainable Energy Consulting through:

- Real-time Monitoring: SaaS platforms continuously track energy usage across all building systems, from HVAC to lighting, helping consultants identify inefficiencies instantly.
- Data Analytics & AI: These platforms use data analytics and AI to provide detailed reports on energy consumption patterns, helping sustainability consultants recommend tailored energy-saving solutions.
- Predictive Maintenance: SaaS platforms use predictive analytics to anticipate equipment failures before they happen, improving the operational efficiency of building systems and reducing unnecessary energy consumption.
- Compliance and Reporting: SaaS tools automatically generate reports to ensure buildings comply with energy regulations and sustainability goals, facilitating the work of energy consultants.
- Integration with Smart Technologies: IoT-enabled SaaS platforms integrate smart sensors and devices that provide consultants with deeper insights into how buildings consume energy and where optimisations can be made.

SaaS companies, such as eSmart, are already operating in French-speaking Switzerland. eSmart (eSMART, 2024), Allthings (Allthings, 2024), or Facilioo (Felicioo, 2024), which all integrate innovative energy management key service components.

1.1.9. Outsourcing Energy Management

Outsourcing energy management in building management involves hiring external experts or firms to handle energy monitoring, optimisation, and sustainability measures. These external consultants conduct energy audits, monitor consumption, recommend and implement efficiency upgrades, and ensure regulatory compliance. They also help negotiate energy contracts, reduce costs, and develop sustainability strategies.

The essential benefits lists:

- Access to specialised knowledge in energy efficiency,
- Optimized energy use reduces costs,
- Use of intelligent technologies and SaaS platforms,
- Ensures adherence to energy and sustainability regulations,
- Building owners can concentrate on primary activities while energy experts manage efficiency.

Outsourcing energy management more effectively helps optimise building operations, reduce costs, and improve sustainability than traditional in-house methods. It could benefit SER while relying on external actors in building management. Construction companies that implement SER or consulting engineering companies are supposed to possess knowledge about energy management so that they may integrate it after a change in their business model.

1.2 Project Objectives

The "Régie Rénove" project supports the confederation and cantons in accelerating building energy renovation. This project extends the "Commune Rénove" initiative, vital for achieving the Federal Council's net-zero target by 2050. To meet this target, the current building renovation rate of 1% must increase to 2-3% by 2030 and reach 4% by 2050 (SFOE, 2022; Suisse Energie, 2018). Energy renovation is, therefore, a central pillar of this effort.

The "Commune Rénove" project assists building owners through the strong engagement of the local public actor in their energy renovation efforts, particularly those who own large rental properties (Romande Energie, 2022). One key outcome of this project has been recognising the critical role that property managers play in energy renovation. They manage the relationship between owners and tenants, deeply understand real estate portfolios, handle energy consumption billing, and serve as direct contacts for both parties.

The "Régie Rénove" project builds on the premise that building management companies possess critical data like real energy consumption data and building characteristics with the heated surface so that they can drive energy renovations. While institutional owners generally can undertake renovation projects, private owners often rely on building management companies to identify renovation opportunities. However, many property managers are not yet fully equipped or focused on energy issues. A survey indicates a gap between management companies and property owners regarding energy policies and carbon dioxide emissions, with only one-third of agencies, primarily larger ones, feeling prepared to meet the challenges of the energy transition (Swiss Property Management Lab, 2021).

The "Régie Rénove" project aims to analyse the role of building management companies in facilitating energy renovations. It addresses several research questions, incorporating insights from the initial "Commune Rénove" project and engaging relevant stakeholders regarding sustainable energy renovation:

(i) What types of data do building managers currently possess regarding energy consumption, and how can this data be utilised to identify energy-saving opportunities in buildings?

(ii) How involved are building management companies in energy renovation efforts? What are the needs of these managers in promoting energy renovation if they are involved? How can their operations be aligned to support energy renovation goals further?

(iii) What barriers currently exist that hinder the promotion and implementation of energy renovations, particularly from the viewpoint of property management companies?

- Can building managers acquire sufficient knowledge to assist in sustainable energy renovation? Does the existing training on sustainable energy renovation provide reliable support to these managers?
- What tools and resources do property management companies already have, or could they develop, to support energy renovation projects more effectively?

The "Régie Rénove" project aims to demonstrate how building management companies can position themselves as critical facilitators of energy renovation, potentially replicating successful approaches across multiple municipalities. The objective is to explore how these agencies, with their direct connections to building owners and tenants, can significantly enhance renovation efforts and contribute to the national goal of increasing the renovation rate.

By investigating the competencies of building management companies in managing energy renovations and analysing the needs and involvement of municipal and cantonal authorities, the project seeks to identify the untapped potential for scaling up renovation efforts. It examines how building management companies could be an underutilised but essential lever in achieving these targets, especially given their role in managing energy resources and interacting with property owners.

While the project objectives and tasks listed in the contract are distinct, the Table 4 relates how the objectives contributed and tried to contribute to achieving the tasks. The mismatch between tasks and objectives is related to the fact that the project design has undergone multiple adaptations while engaging relevant stakeholders. While initial project objectives addressed mainly “how” building managers can better play a role in energy renovation, the actual project better tests the assumption of understanding if they “can”.

Furthermore, building managers are trained in negotiations and often can rely on a strong political network. Several other projects linked to renovation were stopped or at least significantly delayed during the project duration. Unlike during “Commune Rénove”, local public administration could not be secured for a project demonstrator. As a result, a key driver initially supporting the project, “Regie Rénove”, lacked crucial support, leading to a decrease in the project’s ambition during execution.

Table 4: Relation between project objectives and realised project tasks.

Task	Objective	Explanation through the project report
1. State of the Art Review	(iii)	It is described in the literature review and enriched by interviews.
2. Typology Development	(ii), (iii)	It is described in the literature review and quantified through the survey. Feedback interviews provide narrative examples.
3. Tailored approach of energy renovation valorisation	(i), (ii)	The survey and interviews describe how building management needs relate to the context beyond their activities. They also investigate the project assumption that building management can deliver energy services rather than understanding how to do it better.
4. Tool and Continuing Education Development	(i), (ii), (iii)	The literature review assesses the existing tools and continuing education programs. Tools and training levels are assessed in the survey. The first-phase interview collects insight into existing education programs. A lack of partnership with local administrations limited the development of both. During the first phase of the interviews, the authors tried to set up training development with local administrations without success. The lack of partnership and low data quality did not allow a tool to be developed. It allowed the assessment of simplified methods that matched the limited data of building managers. The literature review and the interviews also supported the positive evaluation of existing formations and tools to the detriment of developing new ones.
5. Program Comparison and Quantification	(iii)	The literature review assesses the existing programs and legal contexts, while the first-phase interviews provide experience insights. The survey collects energy renovation services of building manager practice and describes them in the feedback interviews. The lack of partnership and data did not allow the comparison and quantification of program impacts. The latter were discussed during the interviews.

2 Approach

2.1 Stakeholder-engaged Approach

This project is characterised by a strategic approach based on stakeholder engagement in two phases: project development and providing feedback on preliminary results. This paragraph introduces how partial engagement affected the development of project tasks.

As Table 4 shows, three groups of stakeholders have been identified for this multi-step approach for their respective functions.

Table 5: Stakeholders' groups engaged in the project Régie Rénove.

Stakeholder	Relevant function
Building managers (1.1.6)	Management of building, including energy accountability
Local administration and services	Detailed project planning of SER, such as subventions, communication, formation management
Continuing education stakeholders	Deliver formation to building managers

Firstly, after setting the project objectives and hypothesis, the authors first engaged in contact with multiple relevant stakeholders to explore:

- How project objectives are coherent with their development strategy.
- How project objectives are compatible with the local context.
- If and how existing programs or projects have addressed the project objective.
- How other groups of stakeholders would be engaged in the project.

The approach has been chosen to drive the methodology's choice while tailoring it at the local scale and valuing the existing resources.

In practice, this approach leads to multiple bilateral meetings or interviews with all groups of stakeholders to gather relevant information and develop a project that corresponds to real needs so that stakeholders can be immediately engaged in multiple project phases. During this phase, the authors proposed different forms of collaboration related to this project that aligned with project objectives to stakeholders. For example, authors asked energy data building managers to deliver energy consulting services through simplified tools or asked local administration about their interest in developing workshops or tailored formation.

However, the engagement of building managers allowed the partnership with only two managers, which provided insufficient data for tool development and tailoring energy services valorisation, thus affecting tasks 3 and 4. The lack of positive responses impacted the number of partners, matching the low survey participation rate in the group of building managers.

Then, the lack of partnership with local administration did not allow the development of training activities, such as workshops or other continuing education activities, or a program comparison and quantification, thus affecting tasks 3 and 5. The local administration's needs did not match the project timing or were finally unnecessary due to existing activities.

Secondly, this project diffused a survey and collected the respective answers for the group of building managers.

Thirdly, this project shared the outputs and interviewed different stakeholders to receive feedback on the preliminary results, particularly the survey and first-phase interview results. The feedback on preliminary results was designed to help improve the communication of the project output while collecting a deeper and more contextual insight into the project objectives.

3 Methods

3.1 Interviews

We conducted a series of semi-structured interviews in various formats: in-person, online meetings, and telephone conversations, with or without the support of visual presentations. The interviews took place during two critical phases of the project: the project design phase and the feedback phase following the presentation of preliminary results. The interviews allowed for the presentation of the project and to propose partnerships with multiple stakeholders. The initial positive response of two local administrations, Lausanne and an administration of an anonymous city in the study area, allowed us to re-iterate this process and tailor multiple proposals. However, the latter did not produce a partnership within this project. The positive response from two building managers, IMALP and the City of Fribourg department of the “Bourgeoisie”, allowed testing tools on actual data as presented in paragraph 3.3.

The interviews followed a consistent structure:

- Objective Definition: The purpose of each interview was clearly defined, whether it was to gather insights, opinions, or specific data. The objectives were aligned with the broader research or project goals.
- Project Presentation: The project design phase provided a brief overview of the project's potential development. In the feedback phase, the focus was on explaining the project's methods and preliminary outputs.
- Interview: We used semi-structured, open-ended questions tailored to the project presentation, encouraging participants to provide detailed responses.

It is important to note that the interviews were not recorded. The report findings were shared exclusively with participants from local administrations and only after the preliminary results were presented.

The collected data was analysed to identify recurring themes, patterns, and critical insights, providing valuable input for the project's development and refinement.

In the phase of project design, we interviewed:

- Formation institutions: USPI Valais, Eco21 of SIG, city-owned energy utility of Lausanne (SiL), energy and building department of an anonymous city in the study area
- Local administration (two times, project design and project tailoring): city-owned energy utility of Lausanne (SiL), and the administration of an anonymous city in the study area
- Building Managers: IMALP, Bourgeoisie of the city of Fribourg as a building owner and manager

In the phase of results feedback, we interviewed:

- Formation institutions: USPI Valais
- Local administration: SiL, and the administration of an anonymous city in the study area

- Follow up on building manager answers from the survey contact form: five anonymous building managers.

3.2 Survey of Building Managers about Energy Management

3.2.1. Purpose

The primary purpose of the questionnaire is to study the involvement of French-speaking Swiss management companies in energy renovation. In essence, it is a question of determining whether they provide advice, the level of knowledge, and the main obstacles to renovation from the point of view of management companies and customers. The state-of-the-art shows no tool to easily classify buildings according to the renovation/optimisation potential, so the interest in such a tool is studied.

3.2.2. Survey Design

Scientific literature shows that questionnaires that are completed more quickly obtain a better response rate than longer questionnaires (>20min) (Marcus et al., 2007; Shropshire et al., 2009). More generally, Kantar, a world leader in marketing data and analysis, recommends keeping the survey length to no more than 10 minutes. (Kantar, 2024). The questionnaire was developed and tested not to exceed this time limit, maximising the response rate. Particular attention was also paid to the logic of the continuity of the questions, which could impact the survey completion rate (number of people finishing the latter) (Kantar, 2024)The questions were formulated in the most neutral way possible to avoid influencing the responses. They are closed-ended to promote the consistency of the responses and their analyses. You can add your response if none of the proposals satisfy the participants. Twice, a 5-point Likert scale measures participants' agreement with a statement. The questionnaire was developed on Microsoft Forms. No contact data was recorded without the participants' explicit consent.

3.2.3. Distribution

The email was sent in two stages, depending on the responses obtained. The email is deliberately brief to ensure that the recipients can read it in full and contains the URL for completing the questionnaire. It is specified that no contact information is recorded unless the participant explicitly agrees. If possible, the email is sent to a management member or the management section's email address, if there is one. Some large groups have several headquarters (Bernard Nicod, etc.). In this case, only the head office is contacted. Unfortunately, no follow-up can be made, with the risk that two different people from the same agency will fill out the form and distort the statistics.

Initially, the Swiss Union of Real Estate Professionals (USPI) members in the French-speaking sections (GE, VD, NE, JU, FR, and VS) were contacted. The email addresses were obtained from the lists of members of the different sections on their respective websites. Since USPI members include managers, brokers, architects, etc., each member's website was visited. Only those offering management or condominium ownership administrator services were retained for 203 managers.

In a second step, the list of real estate agencies, available on www.immobilier.ch, was consulted for each of the cantons studied. The same checks were conducted, retaining only the managers who had not been contacted for 117 additional agencies. The final distribution list thus reached 320 entries. As some managers did not make their email addresses available, they had to be contacted via the contact form on their website. The survey distribution did not ensure a representative response of the multiple types of building managers available in the market of French-speaking Switzerland or their geographic distribution across French-speaking cantons of Switzerland.

3.2.4.Analysis

The data are categorical. Due to the small size of our sample and the low frequencies observed in some categories, the Fisher exact test was used. This is particularly suitable in these situations because it provides exact p-values without the approximations required by other tests, such as the Chi-square. The analyses were carried out with the software R (version 4.1.0).

3.3 Assessment of Simplified Methods for Energy Management

Building management can integrate energy consulting services through third-party platforms and tools. The authors studied the existing market tools and the potential of applying open-source simplified methods to integrate energy consulting in building management better. The concept behind this project is to boost energy consulting services through open-source, scalable and simplified methods proportional to building management needs and capabilities. The authors assessed simplified methods rather than developing brand-new approaches because of the lack of quality data and the existence of sound-proof methods compatible with building management data or public datasets. The tool's potential development is available in this paragraph's respective discussion (5.3.3).

This section is organised as follows: first, the purpose of the tool, then a section concerning the theory behind the CECB, and then the methodology of the three methods allowing to test the hypotheses necessary for creating the tool, presented in their respective sections.

The tool must allow management companies to quickly classify a stock of residential buildings without commercial space to identify exciting buildings to renovate/optimise. It must, therefore, be based on data that the management companies have, i.e. heating consumption data and public data, from the Federal Register of Buildings and Housing (RegBL). Since the number of CECB+ received is limited, it is not possible to formally develop the tool. Only the preliminary phase is tested in this work. It involves comparing the accuracy of three different methods for estimating the energy efficiency of the thermal envelope. These three approaches are named as such in this work:

- The EnerGuide method,
- The Approximated Heat Requirement method, from now on called BCA,
- The heat requirement index method is now called IDC.

These three methods are compared in Excel to the CECB+ received to validate and invalidate their approach. Therefore, the CECB concepts must be introduced in the following section to understand the three approaches.

After each simplified method, the comparison of methods is briefly described. The comparison is direct for the Energuide and BCA, while an ordering comparison is used for the IDC method.

3.3.1.CECB

The efficiency of the thermal envelope in CECB standards is calculated according to the ratio between the practical heat requirement (Q_{Heff}) of the building and the limit heat requirement (Q_{Hli}) (Hall, 2023). The calculation of these values is detailed in the SIA 380/1 standard and explained below.

$$Q_{\text{Heff}} = \sum Q_T + Q_V - \eta_g(Q_{i+}Q_s) \quad (1)$$

With:

- Q_{Heff} Heat requirements for heating, in kWh/m².
- Q_T Transmission losses in kWh/m².
- Q_V Transmission losses in kWh/m².
- η_g utilisation rate of heat inputs.
- Q_i internal heat inputs in kWh/m².
- Q_s Solar heat inputs in kWh/m².

The calculation is carried out monthly and then added up to obtain the annual total. The CECB platform carries it out. In essence, the Q_T results from the losses through the thermal envelope. It is calculated by entering all the envelope surfaces, including windows and doors, and their U value measurement of the insulation efficiency in W/mK. Added to this are the thermal bridges. The software can thus determine the heat loss by transmitting the entire building. The calculation is made based on a standard interior temperature of 20°C. Q_V is based on standards depending on the presence of mechanical or natural ventilation. Q_i Corresponds to the heat released by people and electrical appliances; it is also calculated from standards. Q_S is calculated according to the surface area of the windows, their orientation (N, S, E, W), the g value of their glazing (the % of solar energy that the glass lets through) and the geographical position of the building. Each value is returned to the SRE to express a loss in kWh/m^2 of SRE.

The heat requirement limit (Q_{Hli}) corresponds to the heat requirements that a new building must not exceed. It is defined as follows:

$$Q_{Hli} = [Q_{Hli0} + \Delta Q_{Hli} * (\frac{A_{th}}{A_E})] * f_{cor} \quad (2)$$

With:

- Q_{Hli0} the basic limit values, given by SIA 380/1, i.e.13 kWh/m² for a building.
- ΔQ_{Hli} the increase, given by the same standard, i.e. 15 kWh/m².
- A_{th} the surface area of the thermal envelope in m^2 of the building.
- A_E the SRE in m^2.
- f_{corrr} correction of temperatures:

$$f_{corr} = 1 + [(9{,}4°C - \theta e, avg) \cdot 0{,}06K - 1] \quad (3)$$

- θe,avg: average annual temperature in °C. It is defined in the SIA 2028 for reference weather stations for Switzerland.

The thermal envelope efficiency rating is given by the ratio Q_{Heff} / Q_{Hli}. The rating A for a ratio < 50%, B up to 100% and so on (Table 6).

Table 6: CECB classes.

Class	Q_{Heff}/Q_{Hli}
A	< 0.5
B	0.5 - 1.0
C	1.0 - 1.5
D	1.5 - 2.0
E	2.0 - 2.5
F	2.5 - 3.0
G	> 3.0

3.3.2.EnerGuide Method

It is possible to estimate energy efficiency in the EnerGuide platform (Energuide, 2024). By entering the building address, the platform retrieves four critical pieces of information: the floor area, the number of floors, the building construction period and the means of heat production. It then calculates the building envelope label in the same way as Minergie®. To achieve this, a series of assumptions are made:

- The SRE is calculated by multiplying the number of floors by the floor area.
- The thermal envelope is determined by adding the floor area, the facades and the roof. For the facades, the building is considered a square. Its dimensions are, therefore, extrapolated from the floor area of the building. The latter is systematically considered to have a sloping roof, with two sides whose top is in the middle of the building, 1.5m above the top floor.
- Depending on the construction period, the type of windows, the percentage of the facades occupied, and their U and g values are assumed.
- Depending on the period, the U value of the facades is estimated.

All these values are then compiled to calculate the envelope's energy label according to equations 1 and 2. However, Energuide does not consider a correction factor for the average annual temperature. Finally, the energy labels obtained are compared to those of the CECB+, which serve as a reference.

3.3.3.BCA Method

The Q_{Heff} represents the quality of the thermal envelope. Calculated for standard conditions of use, it allows the comparison between the envelopes of two buildings by removing the effect of users on the need for heat, such as the heating temperature. In a CECB, however, it is based on a certain number of assumptions. The composition of the walls is not always known precisely; thermal bridges are also assessed, as well as the quality of the windows. Most buildings are heated to 22-23°C instead of 20°C. Each additional degree increases consumption by approximately 6% (see 4.8.2); it is assumed that subtracting 12% from the Q_{Hreal} should accurately transcribe the Q_{Heff}.

For this method, it is necessary to know the annual consumption of the building for heating and the precise number of floors in the building. It is as follows:

- The SRE is obtained by multiplying the number of floors and the floor area of the building multiplied by a factor of 0.9. This factor is commonly used to approximate the SRE (Rey Tristan, HEI collaborator in Sion, personal communication).

- The Q_{Heff} is no longer calculated according to equation 1 but is estimated by considering it equivalent to the heating consumption, reduced by 12%.
- The form factor is estimated from the orthophoto of the building in map.geo.admin by referring to Figure 10.
- The Q_{Hli} is calculated according to equation 2 using the estimated form factor.
- The energy label of the envelope is calculated according to the ratio $Q_{Hestimated}$ / Q_{Hlim}.

Finally, the results obtained are compared to the energy labels of the envelope of the reference CECB+.

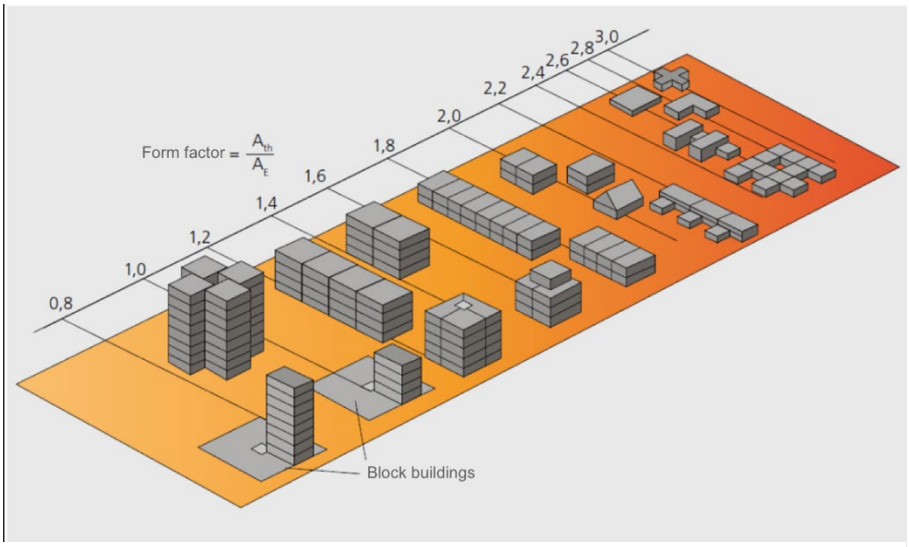

Figure 10: Form factor simplified characterisation by Vincent Luyet, HES-SO Valais course on building thermodynamics.

The name refers to the heat expenditure index, notably used in the canton of Geneva (paragraph 1.1.3). The IDC considers the total heat expenditure, i.e. DHW and domestic hot water (E-nno, 2024)Since this is an indirect estimate of the thermal envelope's efficiency, only heat consumption is considered.

It is necessary to explain the concept of degree days here to understand the calculation of the IDC. In Switzerland, we speak of degree days 20/12, as defined in SIA 383/1. 20°C corresponds to the indoor temperature according to SIA standards, and 12°C corresponds to the maximum outdoor temperature from which a degree-day is considered. For each day whose average temperature is below 12°C, the difference between 20°C and the average outdoor temperature is calculated. This operation is repeated for all days of the period considered, and the sum of the differences is calculated. A reference degree-day for weather stations is found in the SIA 2028 standard.

The IDC calculation follows:

$$IDC = \frac{Q_{Hréel}}{SRE} * F_{DJ} \quad (3)$$

With:

- $Q_{Hréel}$ actual heat consumption for the heating system in kWh.
- SRE was calculated as the first method.
- $F_{DJ\ is}$ a climate correction factor that allows temperature variations to be levelled from one year to another. It is calculated by taking the ratio between the reference degree days (SIA 2028) and the degree days calculated for the given geographical position and period

The IDC is calculated for all buildings that are classified according to it. The exact ratio Q_{Heff} / Q_{Hli} is calculated for all CECB+ (reference), which are then ordered according to it. The IDC and CECB+ rankings are then compared.

4 Results

4.1 Interviews for Project Tailoring from Multiple Stakeholders

Interviews with relevant stakeholders regarding energy renovation and building management were conducted in various formats. The insights gained from the previous project, “Commune Rénove,” were further developed to engage better building managers by suggesting potential project developments. Presentations were adjusted based on feedback, leading to proposals for a potential partnership to advance this initiative.

The stakeholders interviewed included training managers and directors associated with local administrations. They all possess administrative experience in providing training at various levels, from communication events to certified training programs. The stakeholders included representatives from the Industrial Services of Lausanne (SiL), the administration of an anonymous city in the study area, the Industrial Services of Geneva (SIG), and USPI Valais.

Therefore, leveraging the potential of building management requires gradually tailoring project development to meet the specific needs of stakeholders and the local context. The authors’ proposal focused on aspects related to training and data.

4.1.1. Education and Continuing Education

The interviewees must characterise a clear understanding of the training needs. Continuing Education has reached more participants in cantons where the legal framework requires building managers and owners to implement energy renovations. Additionally, these trainings have been active in the same contexts for extended periods. A relevant factor affecting the reach of these training sessions is the rate of residential properties; areas with higher residential property rates generate more demand from third-party stakeholders involved in building management. Ultimately, linking training with a recognised certification can increase participation rates, though there is a risk of attracting participants interested primarily in improving their image rather than enhancing their services.

Awareness-raising has been identified as the most critical aspect of the content of these training sessions. Awareness-raising is crucial, especially since there is no legally binding context surrounding building management and a lack of demand. Increasing awareness can motivate and engage building managers to incorporate energy renovation within their practices. Technical knowledge is another essential subject for training, which may require efforts to simplify concepts and provide real examples. On the other hand, administrative management of energy consumption is already well-understood by building managers, suggesting it may not be a necessary focus.

Enhancing activities and interaction time, including feedback collection and monitoring post-training, could improve the effectiveness of the training sessions. Both feedback and follow-up monitoring can integrate forms of data collection to overcome the issue related to the data developed in the following paragraph. Utilising pair communication can foster better interaction and awareness, thereby sharing exemplary building management practices with other managers. Shortening the training duration or reducing costs may also improve accessibility. Building management enterprises, particularly smaller ones, may lack the resources to invest in optional training due to financial constraints. While condensing

the training content might impact outcomes, it could also encourage hesitant building managers to consider scaling up their efforts.

Local administrations value training building managers but often prioritise engaging owners to facilitate efficient energy renovations. They fear building management's contribution could be undermined if they do not connect with owners despite their efforts.

Cantons with stricter legal requirements regarding energy renovations are also interested in expanding the training process to meet strategic emission reduction goals and to monitor the impact of the training. Although the interviewed stakeholders expressed interest in the subject, they view the potential to increase energy renovation through building management training as limited and secondary to other strategies, such as reaching out to owners, changing legal frameworks, or providing subsidies. Moreover, long-term planning is necessary for developing building management training due to the strict administrative processes within local administrations. Another obstacle for local administrations is delegating training responsibility at the cantonal level instead of the communal level. This limits opportunities for localised approaches to address regional needs, such as the differences between urban and rural areas.

Despite identifying the potential of continuing education development, stakeholders did not accept a partnership with this project. A partnership with the stakeholders, besides the local administration of Lausanne and the administration of an anonymous city in the study area, was impossible. The local administration of Lausanne did not want a building management-specific, and their local offer was judged sufficient for their needs. Instead, the administration of an anonymous city in the study area finally had different needs, and there was no available time to spend on this project during its execution phase despite their interest. Both partner's proposals were tailored multiple times to adapt to their needs but did not end in a partnership.

4.1.2.Data issues

Energy consulting relies heavily on data to effectively address energy renovations. Access to databases from building management companies and publicly available datasets is crucial for operationalising the renovation process. This project operates on the hypothesis that building management has limited decision-making power despite having access to extensive data on energy consumption, an idea confirmed by the stakeholders interviewed.

Public datasets about energy requirements and consumption are available in various cantons, such as Geneva and, more recently, Vaud, which offer geoportals and datasets that provide high-quality information at the cantonal level, namely the RegEner dataset (https://www.vd.ch/fileadmin/user_upload/organisation/dinf/sit/fichiers_pdf/MGDM/MGDM_ID103-VD_2024_05_15.pdf). This information is accessible to building management and other private stakeholders. The availability of quality data could enable information sharing among all stakeholders, including property owners, thereby reducing the need for intermediaries like building management. However, communication and training events are organised to engage all potential stakeholders to accelerate the renovation process.

Cantons lacking public datasets to estimate energy needs and consumption should focus on improving these datasets to enhance information availability, which can facilitate energy renovations across all stakeholders. Additionally, training or communication events could serve as a platform to explore data collection methods and identify alternative sources of quality data. Creating a more effective data platform could provide building managers with simple, ready-to-use information, minimising the need for training resources.

Regarding private datasets, stakeholders expressed that data collected by building managers could be more practical for systematic data gathering due to resource constraints and privacy concerns. Therefore, it is essential to understand the quality of existing data and data collection practices better to integrate energy consulting effectively within building management. This point was developed by engaging building management companies to collaborate with this project by providing their operational data (paragraph 4.3) or by sharing their practice (paragraph 4.2). Despite identifying the issue related to data,

the lack of partnership in tailoring or developing training resulted in a lack of program monitoring development (task 5).

However, the interviews at this phase allowed for the collection of insights about the need for continuing education and data to address the project subject.

4.2 Survey of Building Managers about Energy Management

4.2.1. Building Management Companies' Characterisation

The survey closed on 5 August 2024. 47 of the 320 management companies responded, i.e. 14.7% of those surveyed. The number of property managers contacted by the canton can be seen in Figure 11In the latter, the cantons of Jura and Neuchâtel are grouped because they belong to the same USPI section. Some of the email addresses come from different USPI sections, and they are grouped for the cantons of Jura and Neuchâtel.

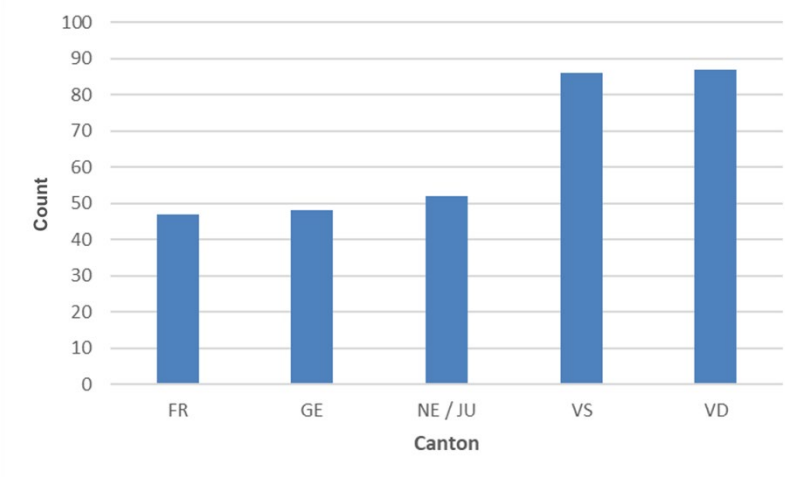

Figure 11: Number of building management companies contacted per canton in French-speaking Switzerland. The canton was attributed after the identification of the contact; a building management company could be present in other cantons beside the canton identified at this phase.

As the questionnaire was anonymous, it is impossible to produce statistics on the response rate by canton for data protection reasons. However, property managers were asked to indicate the number of cantons in which they are active and to select them using a drop-down menu. It is possible to break down management companies by canton if they are active in only one. Since this category accounted for 62% of the responses, it is possible to get a rough idea of the management companies' distribution, as shown in Table 7. Thus, the management companies in the Valais alone represent at least 36% of all the responses or 58% of the management companies active in only one canton.

Table 7: Survey answer count and distribution across cantons.

Number of answers: 47 companies	Canton	Count
	Valais	27
Number of companies active in:	Vaud	22
• 1 Canton: 28	Jura & Neuchatel	13
• 2 Cantons: 7	Fribourg	11
• 3 Cantons: 8	Geneva	6
• 4+ Cantons: 3	Bern	4
	German-speaking cantons	5

Nearly half of the management companies manage a stock of 50 to 200 buildings, and 81% manage fewer than 200 buildings (Figure 12) and 62% of the management companies are active in only one canton (Table 7). The influence of the size of the management company on all other questionnaire responses was statistically tested. Figure 13 Illustrates the distribution of the management companies according to the size of the stock managed and the number of cantons where they are present. The two independent variables have no significant correlation (Fisher's Exact Test; p-value 0.1786).

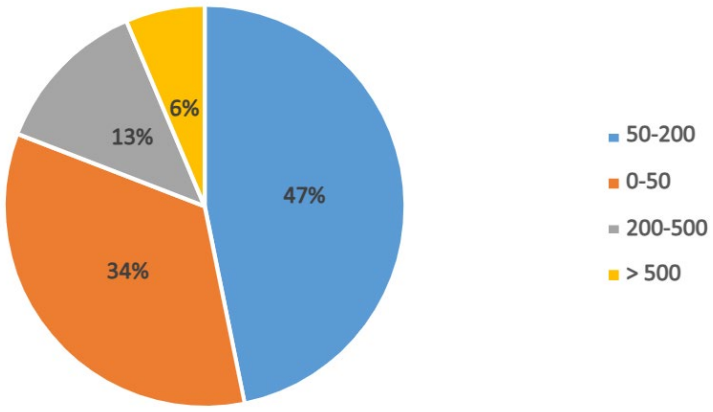

Figure 12: Distribution of management according to the size of the managed building stock.

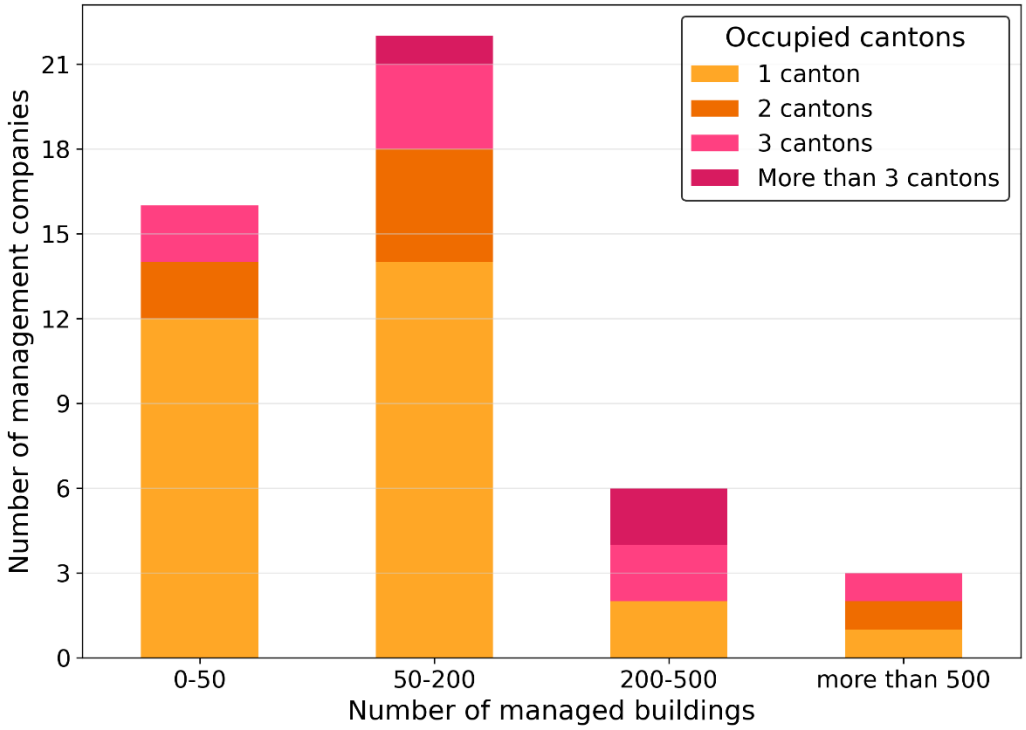

Figure 13: Distribution of companies per canton and managed building number.

4.2.2.Educational Level

The questionnaire included the following definitions for clarity: “Energy renovation concerns significant interventions such as replacing windows, re-insulating, or replacing the heating system.”

Energy optimisation concerns, in particular, changes to the ventilation and heating system settings and the use of more efficient devices (low-energy light bulbs, ecological shower heads, etc.).

Almost all management companies (87%) have at least one person with knowledge of energy renovation/optimisation. One person did not answer this question for undetermined reasons, so the statistics are calculated based on the number of participants who responded. Figure 14 Provides information on management companies' level of knowledge of energy renovation. Only the 40 participants who responded positively to having someone with knowledge in the field could respond here. It should be noted that several answers could be checked, so the total number of answers exceeds 40.

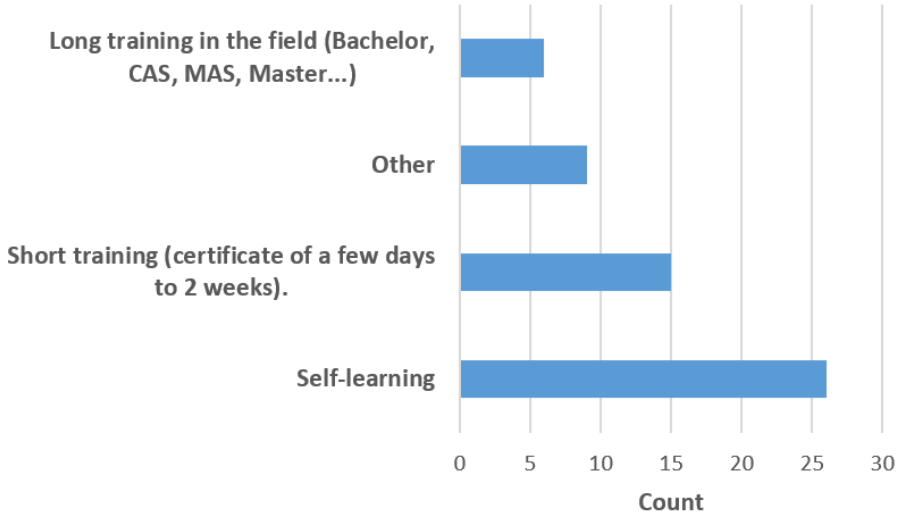

Figure 14: Auto-reported knowledge level of building managers responding to the survey.

In Figure 15, the data were post-processed; in the case of multiple responses, only the highest level of knowledge was retained (long training>short training>self-learning). In both cases, self-learning is the primary method for training (42%), followed by short training (30%) and long training (15%). The “Other” category (12.5%) includes half (3) the federal certificate in real estate management and the other half the fact of having attended several non-certifying seminars. The size of the management company does not significantly influence the level of training (Fisher Exact Test; p-value 0.3342).

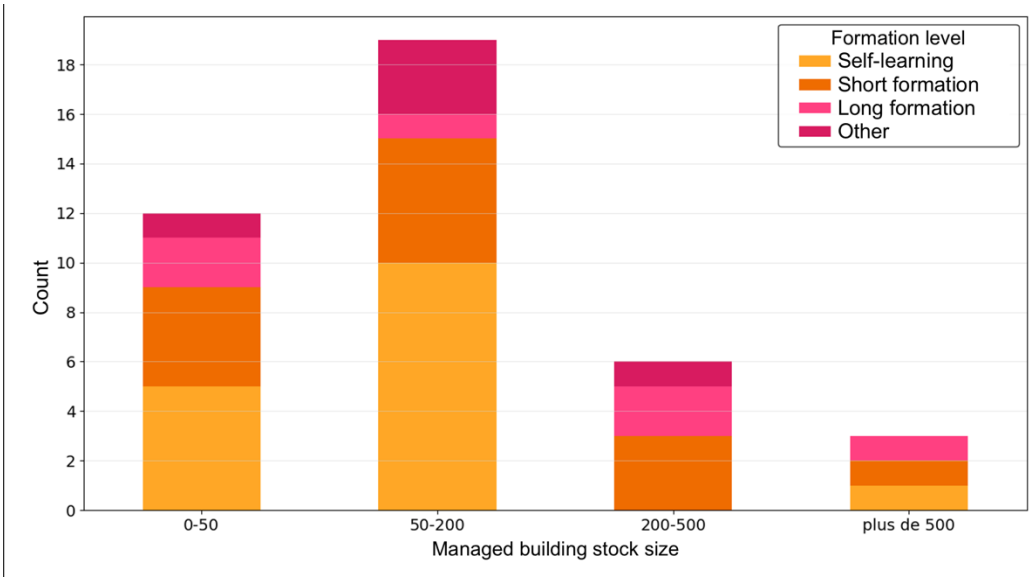

Figure 15: Depending on the managed building count and auto-reported educational level, distribution building management companies.

4.2.3.Building Management and Sustainable Energy Renovation

85% of respondents believe that there is a barrier to renovation for management companies. The first cause identified is the lack of knowledge for 30% of respondents, but other causes show similar percentages, like lack of financial gain (25%) and lack of clients' interest (20%). The correlation between the size of the managed park and the main obstacle identified is insignificant (Fisher's Exact Test; p-value 0.2899). The size of the management also has no significant impact on whether a barrier to renovation is identified (Fisher's Exact Test; p-value 0.4539), although it is mainly present among small management companies (Figure 16).

Most management companies offer advice on energy optimisation and renovations (Figure 17). There is no correlation between the size of management and the advice given (Fisher's Exact Test; p-value 0.4517). Grouping all categories of advice versus not advising does not change anything, and no correlation is detected either (p-value = 0.4144).

More than half of those offering advice use a tool (N=21). Management companies mainly use the services of a third-party provider (N=18), while five report using a tool, thus either software or web platforms. The reported tools list E-nno, Energuide.ch, Eco21 from SIG, and EPIQR+.

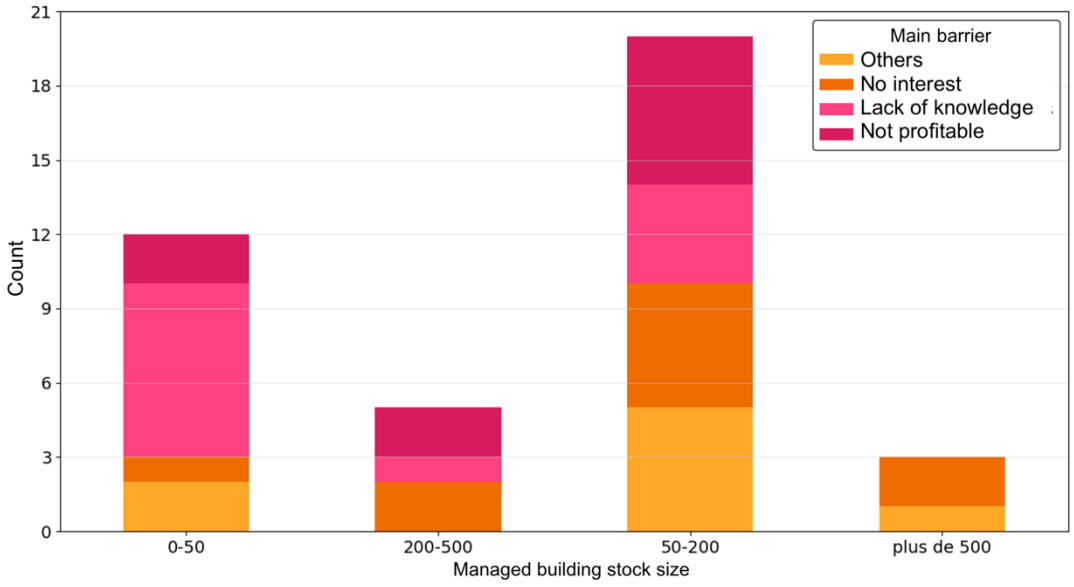

Figure 16: Distribution of management according to the size of the managed park and the main obstacle declared. No interest means a lack of interest from customers. The point of view reflected here is that of the management companies.

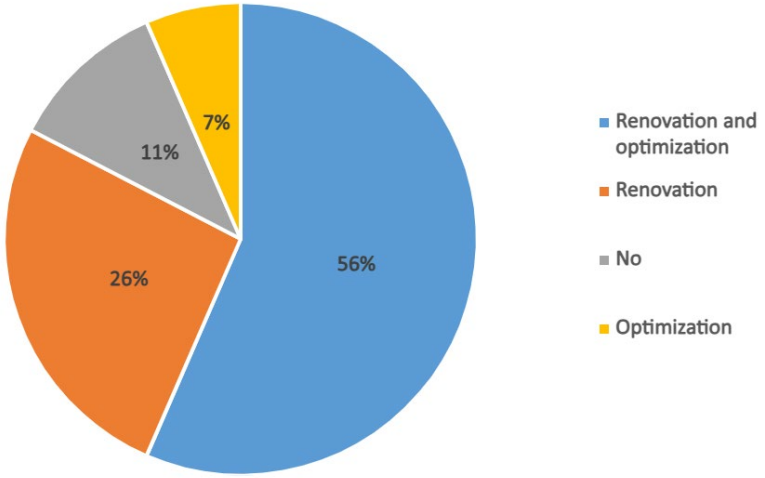

Figure 17: Proportion of building management companies providing advice on renovation and/or energy optimisation.

In Figure 18, participants were asked to rate their agreement with the following statement:

"Your agency would like to provide energy renovation/optimisation advice."

60% of participants agreed with the statement, including 22% who strongly agreed.

Among the respondents' primary motivations for renovations, 59% would like to participate in the energetic transition rather than reporting practical motivation. Indeed, 19% of responses find it advantageous to attract customers, and 2% for financial gains.

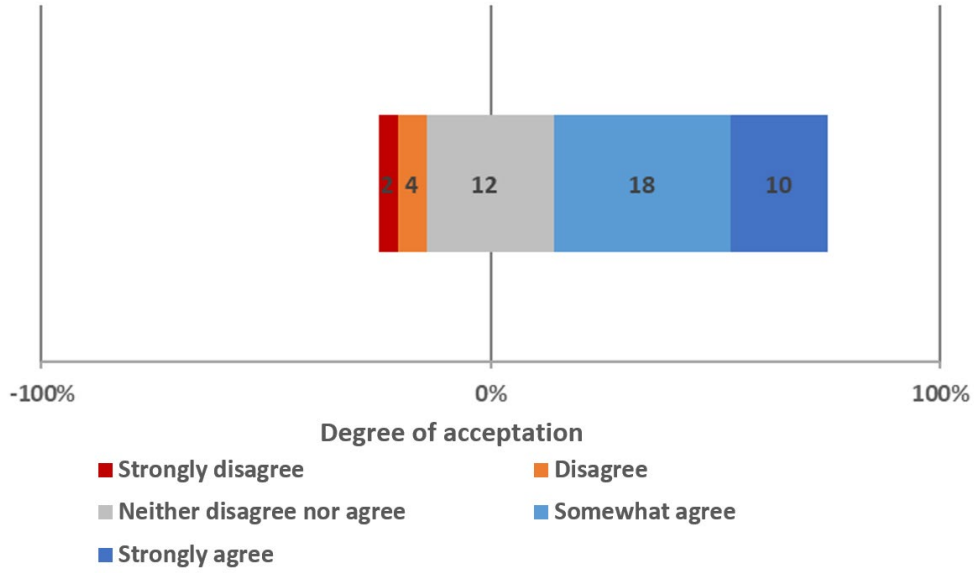

Figure 18: Reported interest in providing energy consultancy or optimisation.

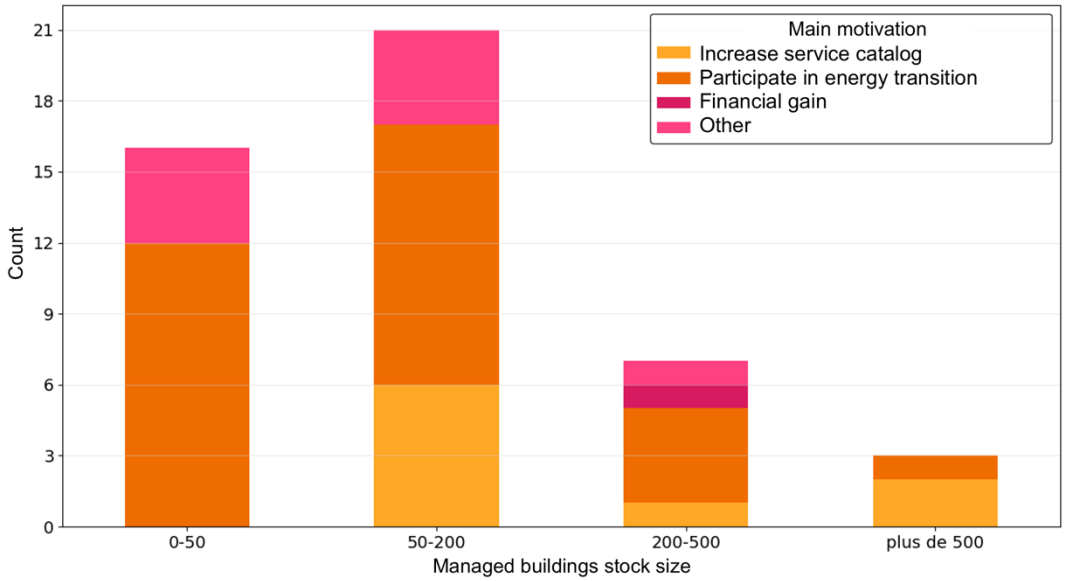

Figure 19: Distribution of primary motivation for energy consulting renovation for the size of the managed park of buildings.

There is no relationship between the size of the managed park and the primary motivation for renovation (Figure 19) (Fisher Exact Test; p-value 0.06791). In the “Other” category, there are two main groups: those who want to be able to advise condominium owners and those who want to preserve the value of the real estate under management.

4.2.4.Energy Consumption Monitoring

Table 8 This table presents the proportions of management companies monitoring energy consumption in their buildings. The majority do so across their entire portfolio. The size of the management companies does not influence either of these parameters (Fisher Exact Test; p-value 0.2907 and p-value 0.2585). Table 8 Provides information on how often management companies use monitoring to compare them from year to year. The majority do so systematically.

Table 8: Energy monitoring across the managed park of buildings and years.

Energy consumption monitoring	*Answers*	**Proportion (count)**
Across the park of buildings	*On all building*	51% (24)
	On most of the buildings	38% (18)
	On few buildings	9% (4)
	Never	2% (1)
Across years	*Always*	59% (27)
	Sometimes	41% (19)
	Never	0%

4.2.5.Perceived Interest of the Owners

Table 9 This table provides information on the proportion of owners who spontaneously address the issue of energy renovation. They are in the majority. This table also shows the proportion of management who think there is a barrier to renovation for owners; they are also in the majority.

Figure 20 describes the primary motivations for renovating for owner-clients. The main reason identified is maintaining the building's value Table 10, which lists what management companies consider the main obstacle for their clients when embarking on an energy renovation: perceived cost.

Table 9: Perceived point of view of owners from building management companies.

Question	**Response (count)**
Do owners spontaneously approach the subject of sustainable energy renovation?	Yes: 74% (35)
	No: 25% (12)
According to you, do owners perceive a barrier to sustainable energy renovation?	Yes: 83% (39)
	No: 17% (8)

Table 10: Main barrier perceived by owners according to building managers.

The main barrier perceived by the owners	**Proportion (count)**
Perceived cost	87% (34)
Legal and administrative constraints	8% (3)
Lack of knowledge	3% (1)
Lack of interest	3% (1)

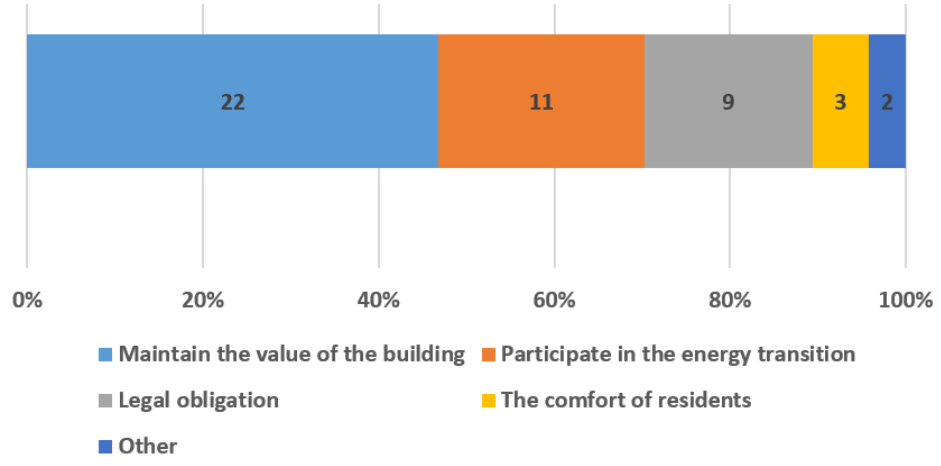

Figure 20: Main motivation perceived by building managers for owners to implement sustainable energy renovation.

4.3 Assessment of Simplified Methods for Energy Management

In this section, the results of the accuracy of the data from the RegBL are presented first, followed by those of the accuracy of the SRE estimation. Then, the results of the envelope factor estimation are detailed, and finally, the results of the accuracy of the thermal envelope quality estimation and their comparison with the CECB+ are presented.

The development of a fully developed tool was not possible due to a lack of data and especially the human interface part out of scope of this project. The two partnerships allowed data collection even though within a lengthy procedure and had only few a CECB+ that validate the data collection. Due to privacy concerns, building management enterprises refused. The assessment of simplified methods shows how open data or any data potentially available to building managers can provide an estimation of the energy performance of the managed buildings. This adaptation also relates to the potential development of employing public data resulting from the project-design interviews (paragraph 4.1).

4.3.1. RegBL Data Details

Energuide uses data from RegBL for years of construction and the number of floors. Out of 5 CECB+, 1 has the wrong period, marked in red, of construction, and two others have the wrong number of floors, as shown in Table 11.

Table 11: Comparison between CECB+ and RegBL data, year of construction and floor number. Incoherences are marked in red.

Buildings	Construction year from CECB+	Construction period from RegBL	Floors count from CECB+	Floors count from RegBL
Roseraie	1963	1961-1970	6	6
Les Trolles	1975	1971-1980	11	12
Bel Horizon	1965	1961-1970	5	6
Rhodania	1964	1996-2000	7	7
Collégial	1982	1980-1985	6	6

4.3.2. Energy Reference Area

Figure 21 Provides information on the accuracy of the Energy Reference Area (ERA) estimation according to the BCA and Energuide methods. The BCA method gives an ERA that tends to be underestimated (Table 12) but is closer to the exact ERA and has a lower error dispersion than the Energuide method. The latter systematically overestimates the ERA.

Table 12: Energy reference area input across methods.

Buildings	ERA from CECB+ [m²]	ERA from Energuide [m²]	ERA from BCA [m²]	Relative error with Energuide	Relative error with BCA
Roseraie	2039	2235	2012	9.61%	-1.32%
Les trolles	4161	5192	4283	24.78%	2.93%
Bel Horizon	1984	2799	2099	41.08%	5.80%
Rhodania	4893	4990	4491	1.98%	-8.22%
Collégial	2334	2522	2270	8.05%	-2.74%
Differences' mean				**17.10%**	**-0.71%**
Coefficient of Variation				**15.81%**	**5.40%**

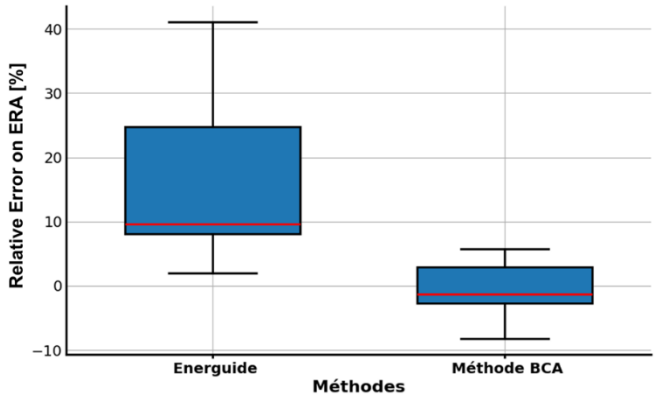

Figure 21: Box plot of relative errors of estimating Energy reference area for Energuide and BCA methods compared to CECB+ data.

4.3.3. Energy Label Estimation

Energuide systematically underestimates the energy label and this by a significant amount (Table 13). Method 1 has no clear trend and suffers from an even greater dispersion of errors than Energuide (Table 13).

Table 13: Energy label comparison between simplified methods estimation and CECB+. Incoherent labels are marked in red.

BUILDING	CECB+	ENERGUIDE	BCA
ROSERAIE	F	G	G
LES TROLLES	F	E	G
BEL HORIZON	F	G	G
RHODANIA	E	C	F
COLLÉGIAL	G	E	G

In Table 14, buildings are classified according to the performance of their envelope. In the CECB+ column, the figure is the ratio between the Q_{Heff} and the Q_{Hli} and thus expresses the quality of the thermal envelope. The IDC method gives relatively similar results to the CECB, but the classification of Les trolles and Roseraie buildings is reversed.

Table 14: Ranking comparison between CECB+ and IDC method. Buildings are displayed in colours that match the respective names.

Buildings	CECB+	IDC	Buildings
Rhodania	2.34	112	Rhodania
Roseraie	2.55	123	Les trolles
Les trolles	2.69	135	Roseraie
Bel Horizon	2.98	140	Bel Horizon
Collégial	> 3	140	Collégial

4.4 Interviews from Survey Contact Form

After obtaining the preliminary results of this project, relevant stakeholders were contacted to disseminate the findings and gather their feedback. These stakeholders were the same ones engaged during the project design phase, explicitly targeting two main groups: building managers from the survey contact form and stakeholders involved in building management, administration, and energy renovation training.

For the first building manager group, telephone interviews with open-ended questions were conducted in October 2024. These interviews, lasting at least 20 minutes each, were conducted to solicit feedback on the results. The second group, comprised of stakeholders related to building administration and training, used email, phone calls, and in-person meetings. Local administrations participated in face-to-face presentations of the findings, while stakeholders focused on training were interviewed over the phone. Additionally, a draft of their feedback was shared for their review.

4.4.1. Feedback from Building Managers

Building Manager ID 23 specialises in managing condominium ownership, primarily in Valais for second homes. They expressed that as the owners are also the tenants, they actively seek suggestions for energy renovation. Despite the ecological awareness driving their initiatives, they noted a need for more competitive or financial incentives. They favour a renovation model with minimal intermediaries, where owners directly approach service providers. Critically, they pointed out flaws in the CECB(+) assessment due to data inaccuracies and suggested that the canton could benefit from improved subsidy plans, particularly for long-term renovation projects. They highlighted that most of the buildings in their portfolio were constructed between 1970 and 1990, and consequently, the potential for energy renovation is perceived as high.

Building Manager ID 48 manages condominium properties and engages in real estate in Valais. Having completed an energy management course by USPI in Lausanne, they found the training beneficial. They provide renovation consultancy services, often utilising third-party experts to increase property value and reduce energy consumption. They advocated for simplified, free tools to enhance their services, as previous methodologies had proven helpful. They noted a convergence of issues, particularly for older buildings owned by elderly tenants reluctant to invest due to long ROI periods and financial constraints. They also mentioned positive examples, such as Saviese's subsidies, but highlighted challenges with conservative local administrations that often hinder solar PV installations. They observed a growing appreciation for energy renovation in Valais, driven by rising energy prices and European geopolitical

events. However, they criticised retailers for aggressively promoting disproportionate PV systems, exploiting subsidies and causing inefficiencies. In their experience, property owners tend to do the bare minimum for energy renovations. They emphasised the need for balanced regulations and better communication strategies, including simplified explanations for the public.

Building Manager ID 31, who handles mainly residential condominium ownership in Valais, relies on third-party enterprises for energy renovation consultancy due to limited in-house training and resources. They identified financial barriers as a significant hurdle to renovation, exacerbated by the lack of accessible, straightforward information for clients. They expressed interest in short, practical training sessions and simple, clear documentation to aid in the renovation process. Although they do not currently collect data for consulting, they would consider it if it was not time-consuming. They suggested a simplified tool, like an Excel sheet, for preliminary assessments to decide if a complete CECB evaluation is necessary. While they supported subsidies to promote renovations, they believed more financial backing was needed.

Building Manager ID 32 primarily manages secondary home condominiums in Valais. They have undergone USPI training and integrated energy consulting into their services. They highlighted that administrative delays often complicate the renovation process, mainly when projects are divided into phases, significantly increasing the paperwork. For secondary homes, limited occupancy leads to extended ROI periods, reducing the owners' willingness to invest. They acknowledged the difficulties in motivating older owner-tenants who do not perceive immediate benefits from renovation. They suggested combining subsidies and rent adjustments, focusing on reduced charges post-renovation, could be effective strategies.

4.4.2. Feedback from Local Administrations

The administration of an anonymous city in the study area expressed a desire to understand better the limited role of building managers in promoting energy renovations. They showed interest in establishing a counselling service to facilitate subsidy access, particularly for hesitant stakeholders. Inspired by Geneva's successful implementation of the IDC method, they considered replicating it in their context and were keen to engage with Geneva's governance for further discussions. They also suggested piloting a simplified tool with a small group of managers before a broader rollout.

The City of Lausanne's Industrial Services (SiL) noted the need for more detailed survey questions to understand building managers' roles better. They emphasised the significance of the evolving legal context in Vaud, noting that future obligations under new energy laws could boost renovation rates. The SiL suggested leveraging open data from Lausanne for reliable energy analysis and proposed organising workshops to help building managers utilise this data effectively. They identified a gap in business models that support energy renovation despite some managers beginning to offer related services. They advocated using data sources like the SiL thermal cadastre over introducing new, intermediate tools due to the ongoing discussion about the new energy law in the Canton of Vaud.

4.4.3. Feedback from USPI Valais

The USPI Valais highlighted their engagement in promoting energy renovation among building management stakeholders. They noted recent training courses for property managers, including those focused on secondary homes. He emphasised the importance of tailoring support strategies based on regional topography, distinguishing between mountainous and valley areas. They also stressed the need for improved communication to effectively integrate energy advisory services into building management. Finally, they stated that building managers should facilitate, rather than obstruct, the renovation process but are not expected to replace specialised engineering consultants.

4.5 Results Summary

The results of this project are developed in four points related to the different methods and project phases:

- **Project-tailoring interviews**: Relevant stakeholders provided insights into reaching and training building managers for SER. Training opportunities are considered accessible in French-speaking Switzerland, while they can better focus on raising awareness and simplifying technical aspects. Open-source energy data can fill the resource gap to address energy renovation across all stakeholders. Reaching reluctant stakeholders is a priority, firstly, owners. The lack of partnership did not allow the development of training programs and monitoring.
- **Building managers' survey**: The low response rate across the local building management enterprises group shows the lack of broad involvement in energy renovation within this group. The size of enterprises in managed stock is unrelated to different responses. Most managers have a low level of training in SER but also collect systematic energy data and have an interest in providing SER services. The cost perceived by owners is reported as the main barrier to SER, and the main motivation for SER is the preservation of building value. Most of mangers integrate SER services only by personal motivation rather than a business advantage.
- **Assessment of simplified methods**: The collected data of CECB+ allows us to understand which measures of simplified methods are applied to open-source, public, or data available to building managers, providing information to guide SER. The lack of energy consumption data employed by building managers did not allow the development of a specific tool. Energuide and BCA methods systematically underestimate the energy class, while IDC provides a correct ranking of the building stock.

Feedback interviews: The interviews at the end of the project allow us to disseminate preliminary results and collect further insights. The business model type for building managers relates to different motivations and potentials. Their involvement in SER is directly related to the external needs of the owners and partially to subvention availability. A specific approach could target management in condominium ownership, secondary housing, and the elderly population. The resources to implement SER services are scarce. The case of condominium ownership may be the more relevant case, as underlined by Filho et al. in other study cases outside Switzerland (Leal Filho, 2019). The return on existing training is positive, with some potential suggestions for improving communication and vulgarising content. Local administrators recalled the need to reach reluctant stakeholders, firstly owners, and the relevance of the legal context to scale up timely SER. The training stakeholders confirmed their interest in promoting SER so that building managers could facilitate SER. They also ask for a more tailored approach from governance about local climate needs or specific business models.

5 Discussion

5.1 Insight into the Interviews during the Project Design

Insights from the "Commune Rénove" project were used to engage building managers and suggest project developments. Feedback led to proposals for partnerships to advance the initiative by engaging multiple stakeholders.

Training managers and directors from local administrations highlighted the importance of understanding training needs. Training is more effective in cantons with legal requirements for energy renovations. Linking training to any certification can increase participation but may attract those more interested in image than service improvement. While the political and legal context is crucial, change can occur through other approaches, usually after understanding local needs and avoiding waiting for the legal context to adapt. Understanding local needs may encompass multiple sectors, i.e., targeting approaches

that depend on the prevalence of the business model, tailoring building standards on the topography and ecosystems, or estimating the local capacity of supporting a scale-up of the renovation process at the operational level.

About enhancing the continuing education, raise awareness, simplify technical knowledge and providing real examples is reported to be crucial in a context lacking a regulatory framework. Within continuing education, administrative management of energy consumption is well-understood, so it may not need focus. However, doubts remain about the deeper understanding of energy. Therefore, enhancing practical activities that increase interaction time between teacher and student based on concrete energy management examples and feedback collection can improve training effectiveness. Pair communication can foster better interaction, for example, through the contribution of exemplar building management. Shortening training duration or reducing costs can improve accessibility, especially for smaller enterprises which have less resources to invest in optional services.

The authors assume that existing formations could easily tailor these insights which correspond to collected feedback across multiple stakeholders. Moreover, the authors suggest collecting more detailed information by integrating feedback into the formation, like by boosting interaction, by increasing the time collecting feedback or by setting a monitoring plan following the continuing education.

It was commonly assumed that smaller enterprises needed more resources to implement energy renovation. However, a better comprehension of building management interviews and business model comprehension suggests that it is more complex. Patterns to efficiently target building management types would require further studies to identify subgroups for differentiated approaches.

Local administrations prioritise engaging directly owners directly in energy renovations. While this focus is evident at the administrative level, it is crucial to ensure that building managers are not a barrier to energy renovation. The magnitude of building management's influential role is likely to be understood case by case internally.

Stricter legal requirements in some cantons drive interest in expanding training to meet emission reduction goals. However, political, legal and administrative processes require long-term planning, threatening the success of emission reduction strategies.

Effective energy consulting relies on data from building management companies and public datasets. Public datasets in cantons like Geneva and Vaud are valuable for information sharing. Improving data quality in cantons with insufficient datasets is crucial. Private data collection faces challenges due to resource constraints and privacy concerns. The authors tested the potential of building a management dataset through assessment using simplified methods.

5.2 Insights of the Building Management Survey

5.2.1. Data Quality

Interpreting the data requires careful hindsight, as the questionnaire introduces inherent biases. Research indicates that individuals with a greater interest in the topic are more likely to respond, which can skew the results. The response rate of 14.7% leads to non-response bias, making the findings potentially unrepresentative (Groves, 2006). Additionally, there is an overrepresentation of management companies operating solely in Valais, which may affect perspectives due to the variability in the cantonal context (discussed in Chapter 4). Therefore, this study's conclusions are limited to French-speaking Switzerland, as only those management companies were contacted.

Two factors likely contributed to the low response rate: the survey was distributed in July, coinciding with calculating heating and hot water charges and vacation periods (ASLOCA Genève, 2017). Furthermore, a lack of follow-up prevented multiple responses from individuals within the same agency, as follow-ups typically improve response rates. As most responses came from Valais, we can hypothesise that the respondent types are well-represented concerning the administrator of condominium ownerships and tenant-management-owner dynamics, as illustrated in Figure 8.

Fisher's exact tests indicate that the number of buildings managed does not influence other responses. However, it is essential to note that the number of buildings must accurately reflect the management scale. For example, managing 50 buildings with 40 apartments each requires more resources than managing 60 buildings with 5-6 apartments each. Investigating the number of housing units under management or the number of employees could provide a more straightforward measure of management size. Unfortunately, these questions could not be included in the survey.

5.2.2. Knowledge Level of Building Managers

Almost all property managers (87%) have at least one staff member with knowledge of energy renovation and optimisation, primarily gained through self-training (42%) and short courses (30%). However, more than this knowledge may be required, and a follow-up survey could explore whether property managers feel adequately informed and identify specific knowledge areas like financial aspects or building thermodynamics.

Four of the six property management companies without specialised staff in Valais might be less concerned with renovation due to their focus on holiday rental properties, which are not continuously occupied year-round. Only one company cites customer disinterest as the main barrier, indicating that the high representation from Valais could influence these results. Despite many housing associations offering advisory services, 85% still identify obstacles to energy renovation, with 30% citing a need for more knowledge (see Table 11). This issue seems more pronounced among smaller authorities managing fewer than 50 buildings, suggesting potential resource challenges.

Among the 12 management companies that cited knowledge gaps, most had yet to pursue extensive training. This indicates that more than self-training may be required to overcome challenges in energy renovation. Nonetheless, a lack of profitability and customer interest hinders renovation efforts (see Table 11). Interestingly, 89% of property managers provide advice on renovation and optimisation (see Figure 18), with 86% using third-party service providers. However, only 7% focus on optimisation compared to 26% on renovation, possibly due to unfamiliarity with the optimisation subject. Finally, among the authorities that do not offer advice, three report that a lack of knowledge remains a crucial barrier, highlighting that, in some cases, this issue persists.

5.2.3. Use of Tools

Does your local authority use any tools to advise on energy renovation? Over half of the participants answered “yes”, with 86% relying on third-party companies. The CECB+ was mentioned three times under the 'Other' category, with responses indicating it is accessed through a third-party service provider. This suggests that experts must conduct audits, as property managers typically lack the necessary expertise. This raises the question of whether connecting clients with technicians constitutes providing advice—a matter that requires further study. Table 12 lists the tools used, all included in the state of the art (see Chapter 4.7.2), validating previous research. The E-nno software, used for optimising energy consumption, stands out as it involves data collected by intelligent meters analysed by AI to guide technicians. Since the requirement for smart meters does not align with the criteria for state-of-the-art tools, it was not included. The Eco 21 GIS platform, while mentioned in the table, provides generic information and serves mainly as a connector for energy audits and renovation projects. Furthermore, 79% of participants expressed interest in an Excel tool that could prioritise buildings for renovation and monitor energy consumption (see Figure 23). Given the lack of such tools for building managers and Excel's widespread use, this exploration of tool development is justified, as it also ensures data privacy.

5.2.4. Interest of Building Managers

Property managers are increasingly interested in energy renovation and optimisation, with 60% in favour, including 22% keen to provide advice (see Figure 20). This marks a shift from a 2014 study

indicating property managers were generally unfavourable toward renovations, likely due to the heightened urgency of climate change and stricter cantonal energy laws, such as the mandatory CECB (Vuille et al., 2014). Additionally, rising energy prices after the invasion of Ukraine in February 2022 have put further pressure on Swiss property renovation efforts (Etienne, 2022).

Sixty per cent of surveyed utilities cite a desire to participate in the energy transition as their primary motivation for renovations (see Table 13). Increasing service offerings is tied for second place, with 'Other' motivations. There is no correlation between portfolio size and renovation motivation (see Figure 21) (Fisher's Exact Test; p-value 0.06791). Among those in the 'Other' category, many want to advise property and energy providers or maintain property values. Interestingly, three out of five participants who were not offering energy advice mentioned the need to attract clients, suggesting that not providing such advice may be a disadvantage.

Nonetheless, 25% of property managers identify client disinterest as a significant obstacle, while another 25% consider the renovations unprofitable (see Table 17). Property managers typically charge landlords a flat fee based on property value (Ms. Fanti, Imalp Property Manager, personal communication), making energy renovation management time-consuming and often unprofitable.

5.2.5. Energy Monitoring for Building Managers

Monitoring heating and domestic hot water consumption is not systematic, with only 51% of building managers tracking it for all buildings. However, this figure rises to 89% for those who monitor most of their properties. While many property managers record consumption, only 59% compare data systematically each year, and 41% do so infrequently. For meaningful comparisons, consumption data should be adjusted for yearly temperature variations, but it needs to be clarified if property managers are making this correction.

Future research could explore property managers' awareness and application of this adjustment. With it, they can accurately determine if changes in consumption stem from temperature shifts or boiler room issues. Currently, there are no statistics on optimising boiler room regulation in Switzerland. An expert suggests that incorrect settings are likely standard, supported by SIG's observation of a 16% average improvement in heating efficiency from optimising systems in Geneva.

5.2.6. Owner Perceived Interest

Landlords are increasingly interested in energy renovation, with ¾ of property managers noting that clients bring it up spontaneously. This shift may explain property managers' greater willingness to renovate compared to past studies. However, practical motivations outweigh altruistic ones; nearly half of property managers identify preserving property value as the main reason for renovation, and 68% cite legal obligations. Notably, most managers who view legal obligation as the primary reason operate in Geneva or Vaud, where energy laws are strict. Despite this interest, many property managers perceive clients as reluctant to renovate, with less than 1% of Switzerland's housing stock renovated annually. Perceived cost is overwhelmingly cited as the main obstacle, followed by legal constraints, while tenants' lack of knowledge or interest is mentioned infrequently.

5.2.7. Perspectives about the Survey

A follow-up to the questionnaire could be conducted to gather more details on property managers' knowledge about energy renovation. The study's scope should expand to cover all of Switzerland for a more accurate representation. A follow-up survey with a higher response rate would yield more reliable statistics. To achieve this, a unique connection code would be assigned to each management company and recorded in a register. When a manager logs in with this single-use code, it prevents others from reusing it, allowing for reminder emails without risking duplicate responses. Access to the questionnaire would be linked to the code, but responses would remain anonymous to ensure data protection.

5.3 Insights about Simplified Methods Assessment

5.3.1. BCA and Energuide Methods

We compared both methods with CECB+ as they reflect reality, using experts who follow a standardised methodology. However, they make assumptions about window U and G coefficients and wall insulation, leading to variations. The BCA and Energuide methods yield unsatisfactory energy label assessments compared to CECB+, making it challenging to classify building stock. Energuide relies on RegBL's inaccurately reported number of floor levels, leading to overestimations in crucial metrics like ERS. It also includes areas like laundry rooms and cellars in the ERS, skewing results. Energuide's methodology assumes buildings are square, affecting the envelope factor and Q_{Hlim} calculations, while its estimate for Q_{Heff} is compromised by possible inaccuracies in construction period data. Consequently, Energuide's estimates are unsatisfactory. The BCA method better estimates SRE by using the exact number of floor levels, but it can lead to errors in form factor estimation based on geoportal data. Despite being slightly better than Energuide in estimating energy labels, developing a reliable rating tool is still imprecise within the sample of available CECB+s.

5.3.2. *IDC* Method

The previous methods proved too imprecise, so we assessed a third approach: the heat expenditure index (IDC). This method, inspired by the canton of Geneva, does not consider heat consumption for domestic hot water, focusing instead on residents' consumption habits. This study shows promising results, correctly ranking three out of five buildings to CECB+. Only one building, Rhodania, was incorrectly rated, as the two misclassified buildings exchanged positions. While CECB+ objectively assigns energy labels based on standard usage conditions and compares building envelopes, the IDC aims to classify buildings for an overall energy performance view quickly. It identifies buildings with poor performance to determine an intervention order but does not provide specific recommendations. Future analyses can explore whether heating, boiler systems or insulation adjustments are necessary. The IDC method appears promising, but further data is needed to validate its applicability. IDC works well if you have a measured consumption for buildings. If the measurement is not available only other methods such as the energy signature or more sophisticated models can estimate the energy requirement. Energy signatures are fast to calculate but only work well with a low CECB grade because the external temperature is anti-proportional to the heating requirements. Therefore, the method might fail on buildings with high CECB ratings, where additional factors such as human behaviour or past heating through the sun gain importance. But these buildings do not require a SER now.

5.3.3. Limitations and Potential

The buildings analysed are all in Sion and heated by gas. Ensuring consistent results for a broader case study, such as at the cantonal or municipal level, poses challenges. Accurate testing of the SRE estimate requires more data to evaluate its precision effectively. Although one might assume that building management companies have detailed knowledge of the heated surface area for each building, discussions revealed this is only sometimes the case. The issue is not entirely about overlooking the geographical location but rather about inconsistencies in local temperature measurements. The method uses local temperature as a proxy for location; however, reliable temperature data is only available for specific points across some regions. Additionally, this calculation should have a standardised (SIA) norm, with existing norms being outdated and currently under revision. Only commercial software provides a relatively precise evaluation method for transposing measurements from one location to another with different parameters such as irradiation, altitude and rough approximation on the visible horizon.

For instance, a building in Zermatt will consume different amounts of energy than a similar building in Lugano due to temperature differences and different irradiation, potentially leading to significant variations in the IDC when supposing the same user behaviour. Dwellings located in high variable topography

may require heterogeneous requirements, so these locations are more likely to be affected by a lack of precise data. A climate correction factor could help by comparing the degree days of a reference weather station in Switzerland with the building's location and standardising conditions. However, more data, such as the exact sky view factor, could increase the effectiveness of this correction. This lack of data limits the development of the tool, leading to a theoretical exploration of future enhancements in the next section.

5.3.4. Potential Development for a Simplified Tool

The tool will help users determine if a building is in a heritage protection zone or individually protected. Information regarding this is available through the federal inventory of built sites (ISOS) on the Federal Office of Culture's geoportal and cantonal and communal portals (BAK, 2024). These geoportals support APIs (Application Programming Interfaces) facilitating system data exchange. Users can access solar thermal potential and photovoltaic data via API requests from toitsolaire.ch or geo-map-admin. The geoportals also provide information on suitable areas for geothermal heat pumps and regions connected to district heating (CAD) (KGK-CGC, 2024).

Some data, like authorisation zones for geothermal systems and existing thermal networks, may only be available in some cantons. For example, Jura's geoportal provides less information, while cantons like Geneva and Vaud offer comprehensive data due to their more significant residential buildings. The software could function as follows: the building's manager enters the building address and annual heat consumption and corrects, if necessary, the heated surface. The software calculates the building's IDC. It generates a list of buildings classified by IDC while gathering additional data through APIs. The manager can filter results to focus on buildings with poor IDC but good solar potential, excluding those with heritage protection requirements (Lutz architects, 2024). Additionally, the tool would allow users to view selected buildings on a Swiss map for grouped construction opportunities and tenders. In a second phase, the tool could help manage the investment into the renovation project over a 5-to-15-year period to undergo energy renovation in the correct order while planning the financial requirements and predicting the influence of the expenses on the cash flow for each building.

Another feature would enable monitoring of energy consumption. Initially, management manually input consumption data, which the software visualises in a graph. In a more advanced version, the tool could retrieve billing data from energy suppliers, though fuel oil readings would still need to be entered manually during tank fills (ConsoBat, 2024).

5.4 Insights about the Feedback Interviews

After obtaining preliminary results, the project team contacted relevant stakeholders for feedback, focusing on two main groups: building managers from a survey and stakeholders involved in building management, administration, and energy renovation training. Overall, the interviewed stakeholders reported that our findings were coherent with their experience. They confirmed that the reported limited potential of building management in energy renovation is de facto bound to the business model and the owners' initiative.

Building managers reported considerable experience managing condominium ownership (PPE). Consequently, the business model specialising in PPE shows a high interest among customers regarding renovations, leading building management to pursue training in energy renovation whenever possible. They directly connect to operational enterprises, covering everything from energy certification to installation. As a result, the role of building managers is primarily influenced by the owners' demands if they align with the business model. This role may shift from being a pipeline owner to a reliable service provider when necessary. The study case of Germany shows how condominium ownership is considered a barrier due to the complexity in decision-making and the lack of profitability of building managers (Leal Filho, 2019).

Building managers cite many examples where a PPE's energy renovation is unsuitable, such as a prolonged return on investment (ROI) for secondary homes, an unreasonable ROI, or concerns about comfort for elderly residential owners. However, for all cases also, arguments in favour of energy renovation can be identified, such as reducing energy dependency and operating costs while increasing comfort or not leaving the problem up for the next generation. Addressing specific needs based on the local building environment is crucial, suggesting that multiple strategies could be developed to accommodate different contexts.

Resources required for energy renovation may need to be considered, making it vital to minimise obstacles. The lack of integration of energy renovation into the business model can impact its successful implementation within building management services. Simplified tools are generally welcomed, as are free or low-cost tools and rapid methods for energy assessment. The interviewed building managers indicated that improved communication and increased subsidies could enhance their role significantly.

Instead, regarding feedback from local administration, both the administration of an anonymous city in the study area and the City of Lausanne confirmed the need to define better and support the role of building managers in promoting energy renovations. This includes understanding their limitations and enhancing their involvement through targeted training and more straightforward guidelines. While communication events or short continuing education are already set, they would like to reach reluctant stakeholders better before improving the quality of the activities. The scale-up of energy renovation by including more stakeholders is the primary strategy. It gains importance when a change in the legal context is not possible in the short term. The legal context must be adapted mid to long term if the energy renovation rate does not increase.

Stakeholders called for developing practical, user-friendly tools to facilitate preliminary assessments and decision-making in energy renovations. Suggestions included piloting simplified tools and leveraging open data for more accurate energy analysis, which can help building managers guide renovation projects from an early stage on more effectively. Some cantons, like Geneva and Vaud, already have a platform for accessing energy-related data, and they plan to set communication events to improve its use.

Also, USPI Valais's feedback indicated a strong need for tailored support strategies. For example, regions with varying topographies and building types could provide flexible or multiple standards or subventions. Improved communication and education about the benefits of energy renovations, combined with accessible guidance on subsidies, can help overcome financial barriers and increase uptake.

The legal context is sought out to be perceived as relevant. The evolving legal landscape, especially in areas like Vaud, was highlighted as a critical driver for future renovation efforts. Local administrations and associations emphasised the importance of aligning support strategies with new regulatory requirements to ensure building managers are well-equipped to meet upcoming obligations.

Building managers are trained on a regular basis in client contact. This has the downside for this study that they can provide a coherent argument of their situation. However, when asking for specific supporting measures, we did not evaluate whether their current business model really requires them because it was not goal of this project.

In conclusion, enhancing energy renovations in building management will require a multifaceted approach defining a more explicit roles for building managers, simplified decision-making tools, targeted support, and effective adaptation to regulatory changes. This combined effort can help address financial and operational challenges, ultimately leading to a limited increased adoption of energy-efficient practices, which other stakeholders are bound to.

5.5 Transversal Insights

The discussion below aims to answer the questions raised in the problem. To the authors' knowledge, this is the only Swiss study that has directly surveyed management companies on the topic of energy renovation. One was commissioned in 2014 by the canton of Vaud on the obstacles to energy sanitation in the canton of Vaud (Vuille et al., 2014), which interviewed management companies. However, the research was done through interviews with only seven building management enterprises. Boillat's work looked at the issue of obstacles to energy renovation, but the context was limited to mountain tourist destinations and only with the owners (Boillat, 2022).

(i) The nature of the data that building management collects plays a role in energy renovation.

At the administrative and legal level, building management companies treat data to establish charges, such as the consumption of cold water, electricity in common areas, and heating. However, the quality and specificity of heating data depend on technical installations, and all energy consumption data is classified as sensitive personal information protected by the Federal Data Protection Act (Romande Energie, 2024a)Consequently, management companies need direct access to individual apartment electricity consumption if available; the local utility company manages this. Charges are allocated among tenants based on a distribution key or a fixed amount over the last three years (per Article 4 of OBLF).

At the technological level, two primary scenarios exist for heating consumption, without and with individual meters.

Without individual meters, a single centralised meter for domestic hot water (DHW) and heating provides only total consumption data for the building, or sub-meters on the outgoing DHW circuit and heating allow for detailed tracking between the two.

With individual meters, separate meters for DHW and heating give complete consumption data per apartment, typically required in new constructions; if only DHW is metered, heating costs are allocated based on a distribution key.

Data availability also depends on the type of heating system. Central oil heating usually provides only total annual oil consumption; CAD or gas heating gives monthly consumption statements in kilowatt-hours, while heat pumps may offer direct electricity readings if connected to their meter; otherwise, only everyday area consumption is available.

In practice, our findings from the survey and after establishing the partnership with two building managers confirmed that the collection of energy consumption data is partial in most building management enterprises. While energy consumption costs are generally integrated with building management services, they are not the same for the energy data. Interviewed stakeholders reported that they needed

too many resources to change the data management and implement new functions to define specific measures (e.g., establishing a CECB). Missing knowledge or educational background in working with energy-related building data could also be the underlying obstacle. Traditional management often lacks detailed data to estimate energy renovation potential or methods to estimate the missing data in reliable but resource-efficient estimation. They may not know the specific heated surface to be renovated or prior renovations unless they are actively managing the building at that time.

In conclusion, data from management companies are often insufficiently detailed, especially for older buildings that lack individual meters and have the highest renovation potential. Thus, assuming management companies have crucial consumption data, as proposed in this project Régie Rénove, may be unproductive. However, the authors suggest that these companies can still play a relevant role in energy renovation, albeit a different one than expected.

Data analysis through tools platforms and open-access energy data leads to accessible renovation strategies. Regarding building management needs, open-source or low-cost simplified tools could sustain energy consulting after a change in data management. They could also deliver a sufficiently precise assessment of the building management needs, for example, by providing a screening assessment of the building's park before starting energy building certifications. Some companies selling services through platforms employ an aggressive marketing approach, which in some cases is reported to be counterproductive for the project aim. Management companies get swapped with different, somewhat similar offers without being able to understand each offer in detail while being in fear of becoming platform dependent.

(ii) Interest and Involvement of Management Companies in Energy Renovation

The project findings report that interest and involvement are systematically limited in multiple aspects.

The business model of the management companies is crucial. With condominium ownership, building managers are asked by the owners to address energy renovation. Building managers can better motivate owners since the return on investment directly benefits them. When the reason for addressing energy renovation is merely relying on individual, moral motivation, other enterprise business advantages prevail. This finding is coherent with other countries, like Germany, despite a different context (Leal Filho, 2019).

The questionnaire analysis shows that management companies are interested in energy renovation, driven by their desire to engage in the energy transition. Since the study commissioned by the canton of Vaud, many management companies have begun advising clients on energy renovation and optimisation, indicating active involvement. However, the exact nature of this advice needs to be clarified, and further research is needed. The Imalp agency suggests that their clients establish a CECB+ with an accredited external expert to better understand their property’s energy condition. Their strategy reinforces that management companies often act as intermediaries between owners and renovation professionals. There is no single operating mode among these companies. While some aim to contribute to the energy transition, others see it as a chance to expand their services and attract new clients. This divergence may influence their approaches: one group might focus on comprehensive strategies considering grey energy and natural insulation, while the other may prefer standard solutions prioritising efficiency.

Overall, management companies vary in their involvement in energy renovation. Simple tasks, such as tracking a building's energy consumption over time, still need to be standard practice, potentially due to a lack of profitability. In summary, management companies are engaged in energy renovation, motivated by the energy transition, but they may need more skills and knowledge to tackle related challenges effectively. Identifying these gaps is essential for equipping them with the right tools and training.

Support for energy-building management is heterogeneous and mainly non-management-specific. Lausanne and Geneva are advanced in this area, while other cantons in French-speaking Switzerland are foreseeing in the long term. There is a general interest in local administration and governance in boosting subvention participation and scaling up to speed up the process.

(iii) Obstacles to energy renovation and its promotion

Identifying the obstacles to renovation helps us discover potential solutions, reaffirm management's central role in energy renovation based on the working hypothesis, and redefine their responsibilities.

The obstacles to renovation can be examined from three perspectives: management, owners, and tenants. Each perspective is discussed below in its respective section. Hereunder discusses the management perspective by the business model's lack of knowledge and profitability, then their perspective about owners and tenants.

5.5.1. Lack of Knowledge in Building Management

Energy consulting is an optional and recent service of building management companies. Their human resources can be formed about something other than it. It occurs that building management companies integrate or form managers after multiple causes. Currently, the building management market partially demands energy services, which results in a heterogeneous within French-speaking Switzerland.

Further education is reported to be complete enough, with some margins for improvement. Energy knowledge is considered accessible in the region. Understanding the integration of energy knowledge across management companies reveals that self-reported energy services are present. The questionnaire did not identify the specific areas where knowledge is lacking among property managers—whether related to the thermal, legal, or financial aspects of energy renovation. While advising clients to lower heating settings or install energy-efficient lighting is straightforward, more complex questions about building physics arise. For instance, can a property manager suggest changing windows without considering the need for facade insulation, which might lead to mould issues due to increased airtightness (Suisse Energie, 2018)? This may explain why most property managers in this study coherently rely on third-party companies for advice.

Despite the availability of training courses for building management professionals, such as "Immodurable," or the course developed by the energy department of the canton of Valais and HES-SO engineering school, the impact of these relatively new programs must be proven (HEVs, 2024; USPI, 2024).

The course covers legal, technical, and financial aspects and includes modules on the CECB (Certificate of Energy Performance for Buildings) and customer relations. Although these programs exist, a follow-up study could explore whether they effectively meet management and further educational needs while remaining accessible and whether there is adequate awareness of these training options (APGCI, 2024).

While continuing education is successfully integrated into cantons, do they correspond to actual implementation? After the interviews, the local administration in Lausanne has yet to answer this relevant question. In Geneva, the situation is reported to be different. After establishing regulations, individuals pursue continuing education to obtain certification rather than for actual implementation. Participants attend to receive the necessary documentation to comply with the rules, but no subsequent change in practice is visible, such as an increase in energy renovations.

Overall, the size of a management company likely affects the resources available for training. While no significant size effect was observed in the questionnaire data, caution is warranted due to the sample size. Larger firms, like Naef, typically claim to provide training on energy renovation to all their employees based on the local context (Naef, 2021). Also, Braun management integrates some open-source calculators to access energy consumption (Régie Braun SA, 2024).

5.5.2. Profitability of Building Management Business Model

One of the main obstacles to energy renovations is the need for management companies to become more profitable. As noted by Ms Fanti, these companies have seen their workload double over the past 15 years, threatening their financial stability. They typically receive a flat fee and have yet to charge

customers for tasks such as monitoring construction sites, which can be time-consuming and unprofitable.

To address this, harmonising practices through a billing table for various services could allow management companies to engage more effectively in the energy transition without jeopardising their finances. The lack of profitability also contributes to limited knowledge, as management may question the value of continuing education if the resulting services are not viable. Initiatives like "Valais Rénoves", “Group-IT” or “Renovo” offer support by having experts identify renovation opportunities for a fee of 500 CHF per building, often thanks to a cantonal and municipal subsidy, conducting energy audits, and assisting with administrative tasks (Valais rénove, 2024)This initiative is currently in a pilot phase in Collombey-Muraz and Monthey and should be expanded to other areas. When the management coordination of condominium ownership for renovation is not adequately paid or not at all, the building manager may not invest enough resources and act as a barrier to implementation (Leal Filho, 2019).

The Project Management Assistant (AMO) model offers another solution. An AMO, a CECB expert, supports a Project Owner (PO) through the renovation process, helping with planning, stakeholder coordination, and administrative procedures. Several cantons, including Geneva and Vaud, subsidise these services to reduce management workload and fill knowledge gaps (Batismart, 2021; État de Vaud, 2024a).

Finally, property type can influence investment and profitability. For joint ownership properties (PPEs), a double majority is needed for renovations, requiring management to interact with numerous owners, which increases their workload. The billing system could be revamped to enhance management profitability or alternative actors like AMOs could be brought in to assist (Vuille et al., 2014).

While profitability does not motivate building energy services in management companies, the sector is considered to be financially healthy, valued at several billion Swiss Francs yearly in Switzerland and may take more advantage of increasing reinvesting (Research and Markets ltd, 2024). Building management is a tertiary activity that involves operating and maintaining services rather than materials, machinery, and infrastructure costs. They could consider increasing the reinvestment through energy consulting services.

5.5.3. Lack of Owners’ Interest

More investigation would be necessary regarding this specific obstacle to determine the reason for the lack of customer interest, as building a management business model has limited power in decision-making. Unfortunately, no Swiss study addresses the issue of building management. Management companies identify their customers' main obstacle to energy renovation as perceived overwhelming cost, so we can assume that the latter is the main factor in this lack of interest.

Two main obstacles were identified for the owners: perceived cost and administration.

The cost affects different types of owners unequally. Owners of PPE will benefit directly from the investment made during an energy renovation through a reduction in charges and a potential increase of the value and in the thermal comfort of their homes. However, this last point has been highlighted as a triggering factor for renovation for owners in several studies (Alberini et al., 2013; Dadzie & Djokoto, 2022). Therefore, the owner of PPE does not necessarily consider only the investment made as a criterion for deciding on a renovation. However, owners still need to have the necessary funds. Today, many PPE owners have taken advantage of the low mortgage rates of the last decade to access property with a limited budget. Now that rates are rising, they do not have the financial capacity to feed a renovation fund properly and cannot renovate their property energy-wise (Ms. Fanti, CP).

Conversely, landlords do not benefit from reduced charges or increased comfort during an energy renovation, but the tenants do. The owners bear the costs of such an undertaking but do not have any immediate benefits. It is possible to defer the costs of such an operation, but this is not so obvious. With the rent protection in place in Geneva, it is only possible to pass on a small part of the costs (see state of the art). Moreover, because of the rent increase, Swiss landlords are exposed to tenant disputes.

However, only some landlords have automatically passed on the rent reductions that tenants could have claimed when the mortgage reference rate fell in recent years, although it rose slightly in 2024 (OFL, 2024). The Swiss Tenants Association ASLOCA estimates that only 6% of landlords have automatically adjusted their rent (ASLOCA, 2021). However, the practice is very different between French-speaking Switzerland and German-speaking Switzerland (Vuille et al., 2014). Therefore, the landlord may be unable to increase the rent or pay less than expected. This uncertainty regarding the deferral of costs represents a brake for landlords.

Subsidies are often considered insufficient. Julian Reymond, director of Realstone, a major player in real estate investment in Switzerland with a fund of CHF 4 billion, estimates that subsidies only cover 10% of the cost of an energy renovation. This varies depending on the project, the canton, or the municipality. A comprehensive renovation allows for better energy performance and, therefore, better subsidies but also costs more (État de Vaud, 2024b).

Subsidies are only one of the relevant parameters for assessing the profitability of a project. Boris Clivaz, director of Gefiswiss, an asset manager specialising in sustainable real estate, stated in an interview given to the newspaper Le Temps in 2023 that there is currently a difference in value between energy-intensive buildings and more efficient buildings. He explains that the tools for determining the added value do not yet exist due to a lack of data and still need to be developed (Beauchat, 2023). The increased property valuation on the real estate market after an energy renovation is an additional element to consider in calculating profitability. In the same interview, Yves Cachemaille, a real estate evaluation expert at CBRE, stated: “It is impossible to draw generalisations on the profitability of energy renovations. It is essential to carry out an in-depth analysis for each building.” Profitability will particularly depend on the rental reserve, i.e. “the ability to generate higher rental income after the capital-added work" (Beauchat, 2023).

In 2024, the renowned real estate investment consultancy Wüest Partner released the most comprehensive study on the profitability of energy renovations in Switzerland. The study targets 931,000 Swiss buildings heated unsustainably with oil, gas and electricity. Two scenarios are explored: the basic scenario, where all heating systems are replaced and the thermal envelope renovated (roof, façade and windows). The other scenario substitutes only the heating system. The estimated costs for the two scenarios are CHF 258 and CHF 52 billion, respectively. By subtracting tax deductions and subsidies, the study articulates an amount of CHF 162 and CHF 37 billion, respectively. The base case scenario increases the value of the real estate market by CHF 168 billion, representing a return on investment (ROI) of 4%. The replacement of heating increases its value by CHF 81 billion for an ROI of 117%. These two scenarios are, therefore, considered economically viable overall. However, the ROI varies greatly depending on the type of property between rental properties, condominiums, and single-family homes and whether the property is continued to be used or sold after renovation. The main conclusions of the study are:

• Renovations are generally more profitable in urban areas with high real estate prices because the costs can be quickly passed on to tenants.

• Energy renovations in condominium buildings are less profitable, mainly due to the difficulty of coordinating renovation decisions between several owners before the project starts (Leal Filho, 2019).

A cost issue may also be the client's ability to bring equity to benefit from bank loans. At this level, not all owners are equal. Large groups, such as pension funds, have a significant cash flow that allows them to finance loans for renovation work easily (Le Temps, 2024). However, this problem should be put into perspective. Indeed, providing 20% of equity for new construction is necessary during energy renovation. Some banks, if you have your mortgage with them, do not require any equity, provided that specific energy standards are unmet. This is the case, for example, of the Banque Cantonale Genevoise (BCGE) (BCGE, 2024). Mortgages at preferential rates after the energy performance are also possible (SIG, 2024); or even zero rates (Equiwatt, 2023). It should also be noted that energy renovation work is 100% deductible from taxable income over three tax years (VermögensZentrum, 2024).

Regarding energy renovation costs at the system level, providing an incomplete, additional service increases the costs, thus worsening the perceived most relevant obstacles. It should be carefully

considered whether a building management enterprise could further increase costs and reduce the speed of the renovation rate.

In summary, the cost is the primary customer obstacle building managers perceive. However, there are solutions, and each project should be studied carefully to determine its profitability. Management companies could be key players in energy renovation in this area. By thoroughly knowing the mechanisms of subsidies, financing, and possible tax deductions, management companies can demonstrate the profitability of projects to customers or break down any preconceived ideas about the exorbitant cost of energy renovation. A future study would probe the knowledge of management companies in this area. A study on owners' perceptions of costs would also be necessary. Combined, the results would make it possible to issue clear recommendations in terms of training and communication.

In the questionnaire, some respondents denounced the complexity of obtaining the necessary authorisations or the lease law, with lengthy, complicated procedures as a hindrance. Solutions such as Valais Rénove or AMO are probably also a solution to generalise and resolve this problem. Management companies should also be able to play a decisive role in supporting customers. The necessary knowledge of legislation, subsidies, and administrative procedures could help minimise this obstacle in energy renovations.

5.5.4. Tenants

This project focused on the role of building management companies. However, they interact with tenants, and it may be interesting to take an interest in their points of view quickly. Tenants bear the costs and would favour rentals in energy-renovated buildings. By making competition work this way, they would also be a player in the energy transition by forcing owners to renovate. Unfortunately, the reality of the Swiss real estate market in the Lake of Geneva region does not allow such levers to be activated. As of June 1, 2023, available rentals in Switzerland represented 0.93% of all existing housing, with particularly tense situations in the cantons of Vaud and Geneva, 0.76% and 0.34%, respectively (OFS, 2023b). As a result, tenants must refrain from bringing competition into play. This observation is similar to the study commissioned by the DGE-DIREN in 2014 (Vuille et al., 2014).

Tenants are, therefore, currently only spectators. However, depending on the region, ecological sensitivities, and financial means, the energy quality of rental properties may still be included in the selection criteria. Given the availability of rental properties, the authors presume this phenomenon to be marginal.

5.6 Discussion Summary

The discussion develops in four points related to the different methods and project phases and X points transversal to the project:

- **Project-tailoring interviews:** Existing training is accessible in Western Switzerland and can be partially enhanced in content, while firstly, its capacity to reach stakeholders should be boosted. The owners are the priority in training and raising awareness for SER. Overall, the efficiency of timely SER scale-up in the territory depends on the legal context. The availability and quality of the open-source energy data can help the SER process in the absence of a binding legal context or to reduce resource needs in case of the legal context integrating SER implementations.
- **Building managers' survey:** The survey is novel in addressing SER and building management in the territory. The interest in SER for building managers is limited to scarce. The results are not representative of the whole of French-speaking Switzerland and of the heterogeneity of the business models of building managers. Building management size is unrelated to a different response from previous studies. The lack of knowledge about SER is considered insufficient not to hinder the SER process; however, the strong connection with SER operational providers may not require building managers' training. Their involvement is supposed to be triggered by owners' needs and depending on the canton's legal context. The energy data are not systematically managed by a relevant share of managers, thus disagreeing with the project

assumptions. Any open-source tool and data can reduce the barrier of resources demanded by building managers to integrate SER services.

- **Assessment of simplified methods:** The assessment was tested on a limited dataset that was not representative of the territory's heterogeneity, and the dataset size was sufficient to provide only a limited assessment of methods**.** Simplified methods' reliance on public open-source data is crucial. The most relevant data for the latter are form factor, heated surface, floor number and construction or renovation year. These datasets can be integrated and calculated using simplified methods or entered by building managers on open platforms and tools to facilitate SER services. The tested methods provide helpful information for ranking a building stock and identifying priorities, as shown by assessing the IDC method.
- **Feedback interviews:** The results are coherent with stakeholders' experiences. Overall, SER integration in building management depends on building owners and their business models. Tailoring must address specific contexts, such as secondary housing, climate heterogeneity, and the elderly population. The legal context triggering SER across all stakeholders is essential. If a change in the legal context is not possible, it is first necessary to improve communication to reach more stakeholders, particularly reluctant owners, without excluding building managers. Training in SER services is accessible in Western Switzerland and has a margin for improvement. Monitoring the training impacts of SER programs is relevant and could be implemented during training activities.
- **Data (transversal):** The potential of energy data from building managers is limited. First, while managing energy billing data, it is not feasible to say the same for energy consumption. The same applies to other parameters relevant to SER services, such as heated surfaces, floors, and the building construction period. Second, due to privacy protection laws, local utility companies have more detailed access to granular consumption data than building managers. Reshaping building management practices to integrate adequate data collection and analysis would require intensive resources that enterprises are less likely to adopt spontaneously. Local authorities could instead solve this lack of data processing and resources by providing ready-to-use energy datasets or open platforms to estimate the potential of SER in a building stock internally.
- **Passive response (transversal):** Building managers' interest in participating in SER is scarce. Their engagement depends on external triggers, first from owners and their respective customers and indirectly from changes in the legal context with a trade-off of SER services profitability. The business model of building managers is relevant to understanding if SER is triggered more efficiently: that is the case for residential and condominium owners because of the direct financial gain of energy spending reduction. The heterogeneity of SER involvement of building managers is described as a product of legal context and business model variability.
- **Knowledge level (transversal)**: While continuing education for building managers is available in Western Switzerland, the knowledge level is considered scarce on average. This also appears variable across building management, regardless of the size of enterprises. The effort to educate managers should not be pushed to duplicate SER operational enterprises but should be sufficient to support the SER process. The authors suggest that over-educated building managers may increase the SER process costs, thus hindering its scale-up. The lack of tools addressing strategic portfolio management aiming at SER for building management companies completes the picture.

6 Conclusions and outlook

Building management remains a competitive and highly diverse sector. Small to medium-sized enterprises need more expertise in energy renovation. Even though climate change and energy transition are known and accepted challenges, building managers do not offer their clients proactive support for energy renovation. They tend to take a relatively passive approach, waiting for the owner to suggest actions before becoming active. Energy efficiency initiatives are also becoming more proactive, but they still need to be defined from a holistic perspective.

Therefore, effective and timely energy regulations are essential in driving multi-sector efforts for building energy renovations. As highlighted in the *Regulatory Impact and Market Response* sections (1.1), building management is more inclined to invest in improvements within regulated environments, adapting more readily to energy renovation initiatives and, consequently, to owners' needs. Switzerland should follow international examples, as the optimised mix between emission tax and mandatory long-term renovation in Austria (Muller et al., 2024). In less regulated contexts, voluntary approaches such as subsidies become indispensable for scaling up renovations to achieve federal emissions reduction targets. Tailored policy implementation at the cantonal level can address specific needs in mountain, rural, and urban areas, ensuring a harmonised approach to energy management. Regulation changes must be accompanied by proportional resource allocation to mitigate administrative challenges and support effective implementation. The quality and outcome of continuing education and promotion initiatives should be monitored to understand how energy renovation is upscaled.

Despite the growing recognition of the importance of energy management, current business models in building management do often lack of energy renovation services and need more capacity to integrate this aspect systematically. Barriers such as perceived high investment costs, uncertain returns, and restricted decision-making power hinder progress. This disconnection between market demand and service offerings often shifts the burden of energy renovations onto property owners. Unless regulatory frameworks and market incentives are adjusted, prioritising resources toward owners or other stakeholders may be more effective. A strategic realignment of incentives could encourage integrating and scaling energy services within building management enterprises, thus avoiding increased costs across the renovation process.

High-quality, standardised energy consumption data is pivotal for effective renovation planning, yet data management within management enterprises needs to be improved. For example, basic building characteristics data, such as floor number and heated surface, can be missing, while energy management may collect energy billing data but not link it to energy consumption data. Privacy concerns, such as individual apartment energy consumption data collection, inconsistent practices across building management, and the perceived high cost of internal data collection and analysis from building managers further exacerbate this issue. Open-source databases like RegBL and 3D digital landscape mapping advancements could significantly enhance data reliability and provide valuable insights, especially for older buildings with prevalent data gaps. Such improvements would benefit building managers and support a broader range of stakeholders, fostering a more collaborative approach to scaling energy renovations. An open-source database with ready-to-use energy information should follow changes in energy regulation to support the operational scale-up of energy renovation extensively.

Property managers often need more technical expertise and a business model trigger to leverage energy data for renovations, yet their role remains vital in facilitating energy efficiency improvements. Empowering them should focus on establishing a minimum level of knowledge to avoid being a barrier to progress while targeting reluctant managers and owners. Simplified decision-support tools—such as an easy-to-use system for evaluating building energy efficiency based on minimal inputs like heating

consumption and building height—can enable managers to conduct preliminary assessments and engage more effectively with owners. Additionally, focused training on financial mechanisms, legal frameworks, and subsidy options can help property managers guide clients through renovation.

Efforts to integrate energy management into building practices and accelerate renovation rates align closely with Swiss energy transition goals. Regulatory improvements, enhanced data utilization, and adaptable business models are critical for fostering a more efficient and collaborative approach to energy renovations. The problems described were also witnessed in EU countries. The study of Matschoss et al. provides a summary of country-specific insides (Matschoss et al., 2013).

6.1 Outlook

Public authorities on the cantonal and communal levels play a central role by establishing legal frameworks that set minimum energy management and renovation planning standards. Successful models like Geneva's IDC provide valuable insides into the energy status, demonstrating how precise data requirements and simplified procedures can streamline a quick energy evaluation of a building. The MOPEC's CECB+ contains even more precision with concrete energy renovation scenarios but would require more work. Different solutions with resources must evaluate a portfolio of buildings, considering potential energy renovation scenarios in a required depth for prioritisation. On the international level, EU countries also opt for more restrictive legal frameworks with more obligations for the owner: in France, buildings with the lowest energy rating cannot be rented out anymore.

Cantonal and communal authorities can continue to increase the quality of energy-related datasets with ready-to-use energy information to support building managers in gathering them. The data also supports regulation changes and reduces resource allocation for energy services in building management enterprises, thus avoiding an additional cost across the renovation process.

More robust legal frameworks on energy renovation would continue to improve energy data management at the building management level. Combined with practical (mandatory) training sessions for building managers, extending today's already wide training offers a way to show how energy renovation could be integrated into their business model and a client's portfolio of buildings. The training should also reach out extensively to reluctant managers while integrating into local energy renovation initiatives.

In a political context with a lot of inertia and limited changes in energy renovation regulation, cantonal and communal authorities can focus on improving communication and providing accessible information. In addition to increasing the number and variety of communication efforts, communication can be improved by providing checklists and real and best practice examples. Providing calculation templates and implementing pair communication that allows the tailoring of the template to local needs encourages (local) adaptation of business models.

Simple decision-support tools aimed at building managers that encourage building portfolio planning have market potential and could accelerate the process. By aligning market incentives, simplifying decision-making tools, and strengthening knowledge bases, building managers can become proactive advocates for energy efficiency. A collaborative strategy, grounded in tailored regulations, reliable data, and accessible resources, has the potential to accelerate renovation rates while delivering significant environmental and economic benefits.

Finally, a deep series of expert interviews with the most common organisational property management structures could elaborate pathways linking more restrictive legal frameworks to property management companies' new or adapted business models.

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8 Appendix

8.1 Building Management Survey Data

This appendix displays the data collected by the survey with the building managers introduced in paragraph 3.2. The Table 15 lists the survey questions, and Table 16 collects survey data. The data from the contact form have been removed to respect the anonymity of participants. The numbering of participants in the dataset omits initial numbers due to the data collection not being reset after the initial test phase.

Table 15: List of questions in French language from the building management survey.

Q0	**ID**
Q1	De combien de bâtiments votre régie s'occupe-t-elle ?
Q2	Sur combien de canton est réparti le parc immobilier que vous gérez ?
Q3-6	Sélectionner le canton correspondant
Q7	Au moins une personne au sein de votre régie possède des connaissances dans le domaine de la rénovation énergétique et/ou dans l'optimisation énergétique ?
Q8	Ces connaissances ont été acquises par :
Q9	Votre régie prodigue-t-elle des conseils sur la rénovation énergétique et/ou l'optimisation énergétique ?
Q10	Votre régie utilise-t-elle un ou des outils pour conseiller sur la rénovation énergétique ?
Q11	Quel(s) outil(s) utilisez-vous pour conseiller sur de la rénovation énergétique ?
Q12	En cas d'utilisation d'un logiciel, ou d'une plateforme web, merci de bien vouloir préciser ici le nom de celui-ci. Cette question peut être autrement ignorée.
Q13	Veuillez évaluer votre degré d'accord avec la déclaration suivante : Votre régie serait intéressée à faire du conseil de rénovation/optimisation énergétique.
Q14	Pour votre régie, la motivation principale pour faire du conseil à la rénovation/optimisation énergétique est :
Q15	Identifiez-vous des obstacles particuliers à la rénovation énergétique ?
Q16	Pour votre régie, quel est le frein principal pour faire du conseil à la rénovation/optimisation énergétique ?
Q17	Votre régie soit-elle la consommation d'énergie pour le chauffage et eau chaude des bâtiments que vous gérez sur plusieurs années ?
Q18	Est-ce que vous comparé ou analysé ces relevées entrent les différentes années ?
Q19	Vos clients abordent-ils de leur propre initiative la question de la rénovation énergétique ?
Q20	Du point de vue de vos clients, existent-ils des obstacles à la rénovation énergétique ?
Q21	Le frein principal à la rénovation énergétique pour vos clients est :
Q22	La motivation principale pour faire de la rénovation énergétique pour vos clients est :
Q23	Un outil Excel permettant de classer un parc de bâtiment par ordre de priorité pour de la rénovation ainsi qu'offrant un suivi des consommations serait utile pour ma régie ?

Table 16: Collected data from building management survey. This table is split in multiple pages.

Q0	Q1	Q2	Q3-6
8	plus de 500	2	GE; VD;
9	50-200	1	VD
10	0-50	1	VD
11	200-500	>3	FR; GE;VD;ZH;ZG;VS;LU;BL;BE;
12	50-200	1	FR
13	50-200	1	VD
14	plus de 500	3	FR; VS; VD;
15	200-500	>3	JU; NE; VD; FR; BE;
16	0-50	3	GE; FR; VD;
17	50-200	3	BE; NE; VD;
18	200-500	3	FR; NE; VD;
19	plus de 500	1	GE
20	50-200	1	VS
21	0-50	1	VS
22	50-200	1	VS
23	0-50	1	VS
24	0-50	1	VS
25	50-200	1	VS
26	0-50	1	VS
27	50-200	2	NE; VD;
28	50-200	>3	JU; NE; VD;BE;
29	50-200	1	VS
30	50-200	1	VS
31	0-50	1	VS
32	0-50	1	
33	50-200	1	VS
34	50-200	1	GE
35	50-200	1	NE
36	50-200	1	VD
37	50-200	1	VD
38	50-200	2	FR; VD;
39	50-200	2	VD;VS;
40	50-200	3	BE;JU;NE;
41	0-50	1	NE
42	200-500	3	VD;NE;FR;
43	50-200	3	FR;VD;VS;
44	0-50	1	VS
45	200-500	1	VS
46	0-50	3	FR;VD;VS;
47	50-200	1	VS
48	0-50	1	VS
49	0-50	2	VS;VD;
50	50-200	2	VS;VD;
51	0-50	1	VS
52	0-50	1	NE
53	200-500	1	GE
54	0-50	2	VD;VS;

Q0	Q7	Q8
8	Oui	Auto-apprentissage ;Formation courte (certificat de quelques jours à 2 semaines).;
9	Oui	expérience du terrain + séminaires;
10	Oui	Formation longue dans le domaine (Bachelor, CAS, MAS, Master...);
11	Oui	Formation longue dans le domaine (Bachelor, CAS, MAS, Master...);
12	Oui	Auto-apprentissage ;
13	Oui	Auto-apprentissage ;
14	Oui	Auto-apprentissage ;
15	Oui	Formation courte (certificat de quelques jours à 2 semaines).;
16	Oui	Auto-apprentissage ;
17	Oui	Auto-apprentissage ;
18	Oui	Auto-apprentissage ;Formation longue dans le domaine (Bachelor, CAS, MAS, Master...);Formation courte (certificat de quelques jours à 2 semaines).;
19	Oui	Formation longue dans le domaine (Bachelor, CAS, MAS, Master...);Formation courte (certificat de quelques jours à 2 semaines).;
20	Oui	Auto-apprentissage ;Brevet fédéral de gérance d'immeubles;
21	Oui	Auto-apprentissage ;Intervention d'un ingénieur lors de nos assemblées PPE 2023-2024;
22	Oui	Auto-apprentissage ;
23	Oui	Auto-apprentissage ;
24	Oui	Auto-apprentissage ;
25	Oui	Auto-apprentissage ;Formation courte (certificat de quelques jours à 2 semaines).;
26	Oui	Formation courte (certificat de quelques jours à 2 semaines).;Auto-apprentissage ;
27	Oui	Formation courte (certificat de quelques jours à 2 semaines).;
28	Oui	Auto-apprentissage ;Métier du bâtiment ou Brevet Fédéral de gérant d'immeubles;
29	Oui	Formation courte (certificat de quelques jours à 2 semaines).;
30	Non	
31	Non	
32	Non	
33	Non	
34	Oui	Auto-apprentissage ;Formation longue dans le domaine (Bachelor, CAS, MAS, Master...);
35	Oui	Auto-apprentissage ;Brevet fédéral;
36	Oui	Auto-apprentissage ;séminaire, etc (sans certificat);
37	Oui	Auto-apprentissage ;
38	Oui	Auto-apprentissage ;
39	Oui	Auto-apprentissage ;
40	Oui	Formation courte (certificat de quelques jours à 2 semaines).;Auto-apprentissage ;
41	Non	
42	Oui	Auto-apprentissage ;Différents séminaires et séances;
43	Oui	Formation courte (certificat de quelques jours à 2 semaines).;
44	Oui	Auto-apprentissage ;Formation courte (certificat de quelques jours à 2 semaines).;
45	Oui	Formation courte (certificat de quelques jours à 2 semaines).;
46	Oui	Brevet Fédéral de gérant d'immeubles;
47	Non	
48	Oui	Formation courte (certificat de quelques jours à 2 semaines).;
49	Oui	Formation longue dans le domaine (Bachelor, CAS, MAS, Master...);Formation courte (certificat de quelques jours à 2 semaines).;Auto-apprentissage ;
50	Oui	Brevet fédéral;
51	Oui	Auto-apprentissage ;
52	Non	
53	Oui	Formation courte (certificat de quelques jours à 2 semaines).;
54	Oui	Formation courte (certificat de quelques jours à 2 semaines).;

Q0	Q9	Q10	Q11	Q12
8	Oui, sur les deux	Oui	Logiciel/ plateforme internet;Via un prestataire tiers (bureau d'ingénieur);	
9	Oui, sur de la rénovation	Oui	Via un prestataire tiers (bureau d'ingénieur);EpiqR & CECB+;	
10	Oui, sur de la rénovation	Non		
11	Oui, sur de la rénovation	Non		
12	Oui, sur les deux	Oui	Via un prestataire tiers (bureau d'ingénieur);	
13	Oui, sur les deux	Oui	Via un prestataire tiers (bureau d'ingénieur);CECB;	
14	Non			
15	Non			
16	Oui, sur de la rénovation	Non		
17	Oui, sur les deux	Non		
18	Oui, sur de la rénovation	Non		
19	Oui, sur les deux	Oui	Logiciel/ plateforme internet;Via un prestataire tiers (bureau d'ingénieur);	E-nno
20	Oui, sur les deux	Non		
21	Oui, sur de l'optimisation	Oui	Via un prestataire tiers (bureau d'ingénieur);	
22	Oui, sur les deux	Oui	Via un prestataire tiers (bureau d'ingénieur);	
23	Oui, sur les deux	Non		
24	Oui, sur les deux	Non		
25	Oui, sur de la rénovation	Non		
26	Oui, sur de la rénovation	Oui	Via un prestataire tiers (bureau d'ingénieur);Logiciel/ plateforme internet;	Energuide.ch
27	Oui, sur de la rénovation	Non		
28	Oui, sur les deux	Oui	Via un prestataire tiers (bureau d'ingénieur);Logiciel/ plateforme internet;	
29	Oui, sur les deux	Non		
30	Oui, sur les deux	Oui	outil en construction avec entreprise partenaire;	
31	Oui, sur de l'optimisation	Oui	Via un prestataire tiers (bureau d'ingénieur);	
32				
33	Oui, sur les deux	Oui	Via un prestataire tiers (bureau d'ingénieur);	
34	Oui, sur les deux	Oui	IDC et plateforme ECO21 des SIG;	
35	Oui, sur les deux	Non		
36	Oui, sur les deux	Oui	Via un prestataire tiers (bureau d'ingénieur);	
37	Non			
38	Oui, sur de la rénovation	Non		
39	Oui, sur les deux	Oui	CECB+;Via un prestataire tiers (bureau d'ingénieur);	
40	Oui, sur de la rénovation	Oui	Via un prestataire tiers (bureau d'ingénieur);	
41	Oui, sur de la rénovation	Non		
42	Oui, sur de l'optimisation	Non		
43	Oui, sur les deux	Non		
44	Oui, sur les deux	Oui	Via un prestataire tiers (bureau d'ingénieur);	
45	Oui, sur les deux	Oui	Logiciel/ plateforme internet;	Pleins d'instruments privés et étatiques
46	Oui, sur les deux	Non		
47	Non			
48	Oui, sur les deux	Non		
49	Oui, sur les deux	Oui	Via un prestataire tiers (bureau d'ingénieur);	
50	Oui, sur de la rénovation	Non		
51	Oui, sur les deux	Oui	Via un prestataire tiers (bureau d'ingénieur);	
52	Non			
53	Oui, sur les deux	Oui	Via un prestataire tiers (bureau d'ingénieur);	Eco 21 SIG
54	Oui, sur les deux	Non		

Q0	Q13	Q14
8	Tout à fait d'accord	De participer à la transition énergétique
9	Ni pas d'accord, ni d'accord	D'augmenter son catalogue de prestations pour attirer de la clientèle
10	Plutôt d'accord	Les 3 réponses
11	Pas d'accord	De participer à la transition énergétique
12	Ni pas d'accord, ni d'accord	De participer à la transition énergétique
13	Plutôt d'accord	De participer à la transition énergétique
14	Pas d'accord	D'augmenter son catalogue de prestations pour attirer de la clientèle
15	Ni pas d'accord, ni d'accord	D'augmenter son catalogue de prestations pour attirer de la clientèle
16	Plutôt d'accord	De participer à la transition énergétique
17	Plutôt d'accord	D'augmenter son catalogue de prestations pour attirer de la clientèle
18	Plutôt d'accord	De participer à la transition énergétique
19	Tout à fait d'accord	D'augmenter son catalogue de prestations pour attirer de la clientèle
20	Ni pas d'accord, ni d'accord	Savoir répondre aux questions des copropriétaires
21	Plutôt d'accord	Répondre à la demande des PPE
22	Ni pas d'accord, ni d'accord	D'augmenter son catalogue de prestations pour attirer de la clientèle
23	Ni pas d'accord, ni d'accord	De participer à la transition énergétique
24	Ni pas d'accord, ni d'accord	De participer à la transition énergétique
25	Ni pas d'accord, ni d'accord	D'augmenter son catalogue de prestations pour attirer de la clientèle
26	Tout à fait d'accord	De participer à la transition énergétique
27	Plutôt d'accord	De participer à la transition énergétique
28	Tout à fait d'accord	De participer à la transition énergétique
29	Tout à fait d'accord	De participer à la transition énergétique
30	Tout à fait d'accord	De participer à la transition énergétique
31	Plutôt d'accord	De participer à la transition énergétique
32		De participer à la transition énergétique
33	Plutôt d'accord	De participer à la transition énergétique
34	Tout à fait d'accord	De participer à la transition énergétique
35	Plutôt d'accord	De participer à la transition énergétique
36	Pas du tout d'accord	Service professionnel aux clients !
37	Plutôt d'accord	Nécessité d'avoir des compétences vu les demandes des clients et les contraintes légales à venir.
38	Plutôt d'accord	De participer à la transition énergétique
39	Ni pas d'accord, ni d'accord	De participer à la transition énergétique
40	Plutôt d'accord	D'augmenter son catalogue de prestations pour attirer de la clientèle
41	Pas du tout d'accord	De participer à la transition énergétique
42	Plutôt d'accord	De participer à la transition énergétique
43	Tout à fait d'accord	les 3
44	Plutôt d'accord	De participer à la transition énergétique
45	Ni pas d'accord, ni d'accord	De participer à la transition énergétique
46	Tout à fait d'accord	De participer à la transition énergétique
47	Pas d'accord	D'augmenter son catalogue de prestations pour attirer de la clientèle
48	Plutôt d'accord	De participer à la transition énergétique
49	Tout à fait d'accord	Optimiser le rendement des biens immobilier de mes clients
50	Ni pas d'accord, ni d'accord	Gains financiers
51	Plutôt d'accord	De participer à la transition énergétique
52	Ni pas d'accord, ni d'accord	De participer à la transition énergétique
53	Plutôt d'accord	Les trois réponses ci-dessous sont valables
54	Ni pas d'accord, ni d'accord	Conseiller afin de préserver la valeur des immeubles

Q0	Q15	Q16
8	Oui	Pas d'intérêt notable de la part des clients
9	Oui	Pas rentable comme prestation (durée, complexité ...)
10	Non	
11	Oui	Pas rentable comme prestation (durée, complexité ...)
12	Oui	Pas d'intérêt notable de la part des clients
13	Oui	Pas rentable comme prestation (durée, complexité ...)
14	Oui	Pas d'intérêt notable de la part des clients
15	Non	
16	Oui	Disposer des connaissances nécessaires
17	Oui	Freins administratifs et patrimoniaux
18	Oui	Pas d'intérêt notable de la part des clients
19	Oui	Obtention des autorisations cantonales
20	Oui	Les capacités financières des copropriétaires
21	Oui	Disposer des connaissances nécessaires
22	Non	
23	Oui	Intérêts moyens des clients vu les coûts
24	Oui	Pas rentable comme prestation (durée, complexité ...)
25	Oui	Pas d'intérêt notable de la part des clients
26	Oui	Disposer des connaissances nécessaires
27	Oui	Disposer des connaissances nécessaires
28	Oui	lourdes charges administratives
29	Oui	Profil des biens (résidences secondaires, propriétaires peu présents et peu intéressés par ce thème)
30	Oui	Pas d'intérêt notable de la part des clients
31	Oui	Disposer des connaissances nécessaires
32	Oui	Disposer des connaissances nécessaires
33	Oui	Pas rentable comme prestation (durée, complexité ...)
34	Oui	Pas rentable comme prestation (durée, complexité ...)
35	Oui	Entrave par le service de l'urbanisme
36	Oui	Disposer des connaissances nécessaires
37	Oui	Disposer des connaissances nécessaires
38	Oui	Pas rentable comme prestation (durée, complexité ...)
39	Oui	Pas rentable comme prestation (durée, complexité ...)
40	Non	
41	Non	
42	Oui	Pas rentable comme prestation (durée, complexité ...)
43	Oui	Pas d'intérêt notable de la part des clients
44	Oui	Pas rentable comme prestation (durée, complexité ...)
45	Oui	Pas d'intérêt notable de la part des clients
46	Oui	Disposer des connaissances nécessaires
47	Oui	Disposer des connaissances nécessaires
48	Non	
49	Non	
50	Oui	Pas d'intérêt notable de la part des clients
51	Oui	Pas d'intérêt notable de la part des clients
52	Oui	Disposer des connaissances nécessaires
53	Oui	Disposer des connaissances nécessaires
54	Oui	pas de prêt bancaire possible pour les communautés de copropriétaires

Q0	Q17	Q18	Q19	Q20
8	Sur la plupart	Toujours	Non	Oui
9	Sur la plupart	Parfois	Non	Oui
10	Jamais		Oui	Oui
11	Sur tous les bâtiments	Toujours	Oui	Oui
12	Sur tous les bâtiments	Toujours	Oui	Oui
13	Sur la plupart	Parfois	Non	Oui
14	Sur une minorité	Toujours	Oui	Oui
15	Sur la plupart	Parfois	Non	Non
16	Sur la plupart	Toujours	Oui	Non
17	Sur tous les bâtiments	Parfois	Oui	Oui
18	Sur la plupart	Toujours	Oui	Oui
19	Sur tous les bâtiments	Toujours	Oui	Oui
20	Sur tous les bâtiments	Toujours	Oui	Oui
21	Sur la plupart	Parfois	Oui	Oui
22	Sur tous les bâtiments	Toujours	Oui	Non
23	Sur tous les bâtiments	Toujours	Non	Oui
24	Sur la plupart	Parfois	Oui	Oui
25	Sur tous les bâtiments	Toujours	Oui	Oui
26	Sur tous les bâtiments	Toujours	Oui	Oui
27	Sur la plupart	Toujours	Oui	Oui
28	Sur la plupart	Parfois	Non	Oui
29	Sur la plupart	Parfois	Oui	Oui
30	Sur tous les bâtiments	Parfois	Non	Oui
31	Sur une minorité	Parfois	Oui	Oui
32	Sur tous les bâtiments	Parfois	Oui	Oui
33	Sur la plupart	Parfois	Oui	Oui
34	Sur la plupart	Parfois	Oui	Oui
35	Sur tous les bâtiments	Toujours	Oui	Oui
36	Sur tous les bâtiments	Parfois	Oui	Oui
37	Sur tous les bâtiments	Toujours	Oui	Oui
38	Sur la plupart	Parfois	Oui	Oui
39	Sur la plupart	Parfois	Oui	Oui
40	Sur tous les bâtiments	Toujours	Oui	Oui
41	Sur tous les bâtiments	Parfois	Non	Non
42	Sur tous les bâtiments	Toujours	Non	Oui
43	Sur la plupart	Toujours	Oui	Oui
44	Sur tous les bâtiments	Toujours	Non	Non
45	Sur tous les bâtiments	Toujours	Oui	Oui
46	Sur une minorité	Parfois	Non	Oui
47	Sur tous les bâtiments	Toujours	Oui	Non
48	Sur tous les bâtiments	Toujours	Non	Oui
49	Sur une minorité	Toujours	Oui	Non
50	Sur tous les bâtiments	Toujours	Oui	Oui
51	Sur la plupart	Toujours	Oui	Oui
52	Sur la plupart	Parfois	Oui	Oui
53	Sur tous les bâtiments	Toujours	Oui	Non
54	Sur tous les bâtiments	Toujours	Oui	Oui

Q0	Q21
8	Le coût
9	Le coût
10	Droit du bail, longues procédures compliquées
11	Le coût
12	Le coût
13	Le coût
14	Le coût
15	
16	
17	Le coût
18	Le coût
19	Les contraintes légales pour obtenir les autorisations
20	Le coût
21	Le coût
22	
23	Le coût
24	Le coût
25	Le coût
26	Le manque de connaissances
27	Le coût
28	Le manque d'intérêt
29	Le coût
30	Le coût
31	Le coût
32	Le coût
33	Le coût
34	Grand investissement pour le prop. alors que c'est les locataires qui en profitent
35	Le service de l'urbanisme
36	les 3 premiers
37	Le coût
38	Le coût
39	Le coût
40	Le coût
41	
42	Le coût
43	les 4
44	
45	Le coût
46	Un ensemble des facteurs à savoir coût/temps/rendement et en plus de ça certains cantons bloquent encore les loyers sur une période. En plus de tout ça, vous avez encore les risques liées aux oppositions et réductions de loyers demandées par les locataires alors que ce sont les premiers à bénéficier des ces améliorations.
47	
48	Le coût
49	
50	Le coût
51	Le coût
52	Le coût
53	
54	Le coût

Q0	Q22	Q23
8	Obligation légale	Tout à fait d'accord
9	Obligation légale	Tout à fait d'accord
10	les 4	Tout à fait d'accord
11	Participer à la transition énergétique	Plutôt d'accord
12	Maintenir la valeur du bâtiment	Plutôt d'accord
13	Participer à la transition énergétique	Plutôt d'accord
14	Maintenir la valeur du bâtiment	Plutôt d'accord
15	Le confort des habitants	Ni pas d'accord, ni d'accord
16	Maintenir la valeur du bâtiment	Plutôt d'accord
17	Obligation légale	Plutôt d'accord
18	Obligation légale	Pas d'accord
19	Maintenir la valeur du bâtiment	Plutôt d'accord
20	Maintenir la valeur du bâtiment	Pas d'accord
21	Participer à la transition énergétique	Plutôt d'accord
22	Maintenir la valeur du bâtiment	Plutôt d'accord
23	Maintenir la valeur du bâtiment	Plutôt d'accord
24	Obligation légale	Plutôt d'accord
25	Maintenir la valeur du bâtiment	Ni pas d'accord, ni d'accord
26	Participer à la transition énergétique	Tout à fait d'accord
27	Participer à la transition énergétique	Tout à fait d'accord
28	Maintenir la valeur du bâtiment	Tout à fait d'accord
29	Maintenir la valeur du bâtiment	Tout à fait d'accord
30	Maintenir la valeur du bâtiment	Plutôt d'accord
31	Le confort des habitants	Tout à fait d'accord
32	Maintenir la valeur du bâtiment	Tout à fait d'accord
33	Participer à la transition énergétique	Plutôt d'accord
34	Obligation légale	Plutôt d'accord
35	Participer à la transition énergétique	Plutôt d'accord
36	les 4	Pas d'accord
37	Obligation légale	Tout à fait d'accord
38	Maintenir la valeur du bâtiment	Plutôt d'accord
39	Maintenir la valeur du bâtiment	Ni pas d'accord, ni d'accord
40	Maintenir la valeur du bâtiment	Plutôt d'accord
41	Participer à la transition énergétique	Tout à fait d'accord
42	Maintenir la valeur du bâtiment	Plutôt d'accord
43	Maintenir la valeur du bâtiment	Ni pas d'accord, ni d'accord
44	Maintenir la valeur du bâtiment	Ni pas d'accord, ni d'accord
45	Maintenir la valeur du bâtiment	Plutôt d'accord
46	Participer à la transition énergétique	Tout à fait d'accord
47	Participer à la transition énergétique	Pas d'accord
48	Obligation légale	Plutôt d'accord
49	Maintenir la valeur du bâtiment	Plutôt d'accord
50	Maintenir la valeur du bâtiment	Tout à fait d'accord
51	Maintenir la valeur du bâtiment	Plutôt d'accord
52	Obligation légale	Plutôt d'accord
53	Participer à la transition énergétique	Plutôt d'accord
54	Le confort des habitants	Ni pas d'accord, ni d'accord