brenet

22. Status-Seminar

Konferenzband

SustainDesign
user friendly and resilient design with appropriate technology

8. & 9. September 2022
Kultur & Kongresszentrum Aarau

Herausgegeben von:
Prof. Dr. Jürg Bichsel
Michael Sattler
Dr. Roman Rudel
Prof. Dr. Olivier Steiger
Prof. Dr. Frank Tillenkamp

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SOLARMARKT
Kompetenz und Komponenten.

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Vorwort

Status-Seminar

Das Status-Seminar präsentiert im Zweijahresrhythmus aktuelle Themen aus der Praxis und Forschung im Bereich Gebäude und Quartiere mit Fokus auf Energie- und Umweltthemen. Das Seminar richtet sich an Fachpersonen aus Industrie, Ingenieur- und Architekturbüros sowie Forschung und Behörden. An der zweitägigen Veranstaltung wird dargestellt, wo die Praxis mit ihren Erfahrungen und Fragen steht sowie sich der Stand der Forschung in der Schweiz präsentiert.

Das Status-Seminar 2022 widmetet sich dem Thema «SustainDesign». Der Begriff SustainDesign vereint Nachhaltigkeit und Design und steht für eine Bauweise, die in Gebäuden das richtige Mass an Technik und Design einsetzt - maximaler Nutzen mit minimalen Ressourcen – und die die notwendige Flexibilität bei zukünftigen Nutzungsänderungen berücksichtigt. Nur eine ganzheitliche, lebenszyklusorientierte Sicht auf Standort, Nutzung und Technik ermöglicht ein resilientes, nachhaltiges Gebäude nach einem SustainDesign-Ansatz.

Um das Thema SustainDesign zu vertiefen, wurden im Kultur & Kongresshaus in Aarau am ersten Seminartag neuste Erkenntnisse zu folgenden Fokusthemen präsentiert: SustainDesign, Netto Null und graue Energie, Strategische Energieplanung.
Der Freitag war der angewandten Forschung gewidmet. In themenbezogenen Sessionen wurden die für die Zukunft relevanten Themen rund um das nachhaltige Bauen vorgestellt.

Am Status-Seminar präsentierten 64 Autoren ihre aktuellen Projekte. Der vorliegende Konferenzband
präsentiert diejenigen Beiträge, die von den Autoren zur Veröffentlichung in Form eines Papers eingereicht wurden.

brenet

Das Status-Seminar wird durch den Verein brenet organisiert. brenet versteht sich als Plattform, an die sich Industrie, Gewerbe, Planende wie auch die Behörde zu den Themen Nachhaltiges Bauen, Quartierentwicklung, Gebäudetechnik und Erneuerbare Energien wenden können.

Im Nationalen Kompetenznetzwerk im Bereich Gebäudetechnik und Erneuerbare Energien (brenet) erforschen seit 2001 Institute von Fachhochschulen, Empa (ETH-Annexanstalt) und unabhängigen privaten Organisationen institutsübergreifend Lösungen für eine nachhaltige Zukunft.

Durch die verschiedenen Kompetenzen der brenet-Mitgliederinstitute ergeben sich dank der Synergien innovative Lösungen für Forschungs- und Entwicklungsvorhaben aber auch für neue Dienstleistungen. brenet-Projekte haben den klaren Schwerpunkt auf der praxisorientierten und wirtschaftlichen Umsetzung. Mit der klaren Mission, die Zukunft aktiv zu gestalten und an Lösungen mit einem langen, nachhaltigen Zeithorizont mitzuwirken.

Jürg Bichsel, Präsident brenet

Michael Sattler, Geschäftsleiter brenet

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22. Status-Seminar «Forschen für den Bau im Kontext von Energie und Umwelt»

Commune rénove : Putting municipalities in proactive mode for the energy renovation of the building stock

Image _ L. Rinquet

Autor/in oder Autor/inn/en : Lionel Rinquet, Luca Cardinale, hepia, HES SO Genève
Kontaktperson: lionel.rinquet@hesge.ch, https://www.hesge.ch/hepia/

Zusammenfassung Résumé Abstract

The canton of Geneva declared the climate emergency in 2019 and published its energy master plan in 2021. This has given a major impulse to several programs to support and encourage the energy refurbishment of the building stock in the canton, implemented by the cantonal energy office, Services Industriels de Genève (SIG) and the Haute école du paysage, d'ingénierie et architecture de Genève (hepia).

Among the projects launched is the "Commune rénove" program, which aims, to encourage municipalities to take proactive steps to target owners of priority buildings for renovation and to help them implement ambitious energy refurbishment projects.

In this context, hepia has developed tools to enhance municipalities' level of knowledge of the building stock on their territory and support them in targeting and informing the buildings' owners about potential refurbishment scenarios. These tools include typology guidance sheets, a typological census covering the whole canton, and interactive maps, that are used by local authorities in their approach to owners of multi-family buildings, which represent the most important source of energy savings.

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1. Scope

The building stock heating accounts for 24% of greenhouse gas emissions in Switzerland (OFS/BFS). Existing buildings refurbishment (envelope retrofit and fuel switch) is a route towards the reduction of these emissions, but despite important state incentives (Buildings programme subsidies, etc.) the renovation rate stagnates at some 1% nationwide. This rate has to be improved if we want collectively to have a chance to reach the goals set by the Confederation energy strategy 2050.

The low rate of refurbishment can be explained by various factors : cost of the works, tenants-owner dilemma; technical, constructive, heritage and tenants constraints, owners personal priorities, administrative hurdles, lack of qualified professionals, etc.

It also appears that basing public policies exclusively on subsidies and tightening the regulatory constraint is not the only possible route. The experience in canton Geneva, with pilot projects such as “Onex rénove” and SIG-éco21 actions, shows that proactive public actions can make a difference and represent a real incentive for owners to consider renovation projects. To answer their questions and fears about what often looks like a mountain to climb is part of the incentive work that falls to the public authorities, in addition to the regalian and financial support tasks.

In canton Geneva, the “Commune rénove” program, supported by SIG (canton’s publicly owned energy provider) and the canton’s Energy office proposes tools to those municipalities that are ready to move to a proactive way in the energy transition of the building stock located on their territory.

By proactive actions, we mean that public authorities wishing to commit to the environmental transition of buildings constructed on their territory should move from a reactive mode (mainly issuing building permits and subsidies) to an active mode, consisting of

1. Identify priority target buildings for energy renovation on their territory;
2. Invite the owners of these buildings to workshops to provide them with personalised relevant information about refurbishment options for their property;
3. Offer coaching tools to owners who take the step and undertake renovation projects to ease the process.

The work presented in this article aims to provide municipalities with simple and robust tools to address (partially) points 1 and 2 above, i.e. proposing a clear cartography of the issues at stake and good practice guidelines for the overall renovation of the different typologies of buildings likely to be found in the municipality.

2. Methods

The method to develop the required tools consisted of 3 stages:

1. Elaboration of a typological catalogue (maximum 10 typologies, for the sake of simplicity) of collective housing buildings likely to be found on the canton Geneva territory and presenting the greatest possible potential for thermal energy savings;
2. Meta-diagnosis for each of the typologies listing the related architectural, constructional and energy issues, and development of schematic renovation options adapted to each of the typologies, with an estimate of the potential energy gain and of the cost of the works.
3. Census of typologies on the whole canton’s territory and translation into a suitable cartographic tool.

2.1 Step 1 - typological catalogue

The first task of step 1 was to define the population of buildings targeted by the program. This selection was based on Jad Khoury’s work at UNIGE[(1)(2)] identifying the energy saving potential of the Geneva building stock. This allowed us to identify the following population as having the

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greatest potential energy savings: multifamily housing buildings built in canton Geneva between 1946 and 1990 and with an Energy reference surface (ERS) of more than 500m2.

This selection corresponds to a population of 5523 buildings (EGID), and to an energy reference surface (ERS) of some 10'468'000m2, i.e. 36.3% of the EGID and respectively 51.2% of the ERS of all collective housing in the canton (data extracted from SITG, Geneva geodata system).

The majority of the buildings are located in the City of Geneva, in the new towns of Meyrin and Onex, as well as in the communes of Lancy, Carouge and Chêne-Bourg (Fig.1),

The remainder is made up of buildings built between 1946 and 1990 with an ERS of less than 500m2 (1389 EGID, ERS: 413'000m2), built before 1946 (5073 EGID, ERS: 5'507'000m2) or built after 1990 (3194 EGID, ERS: 4'029'000m2).

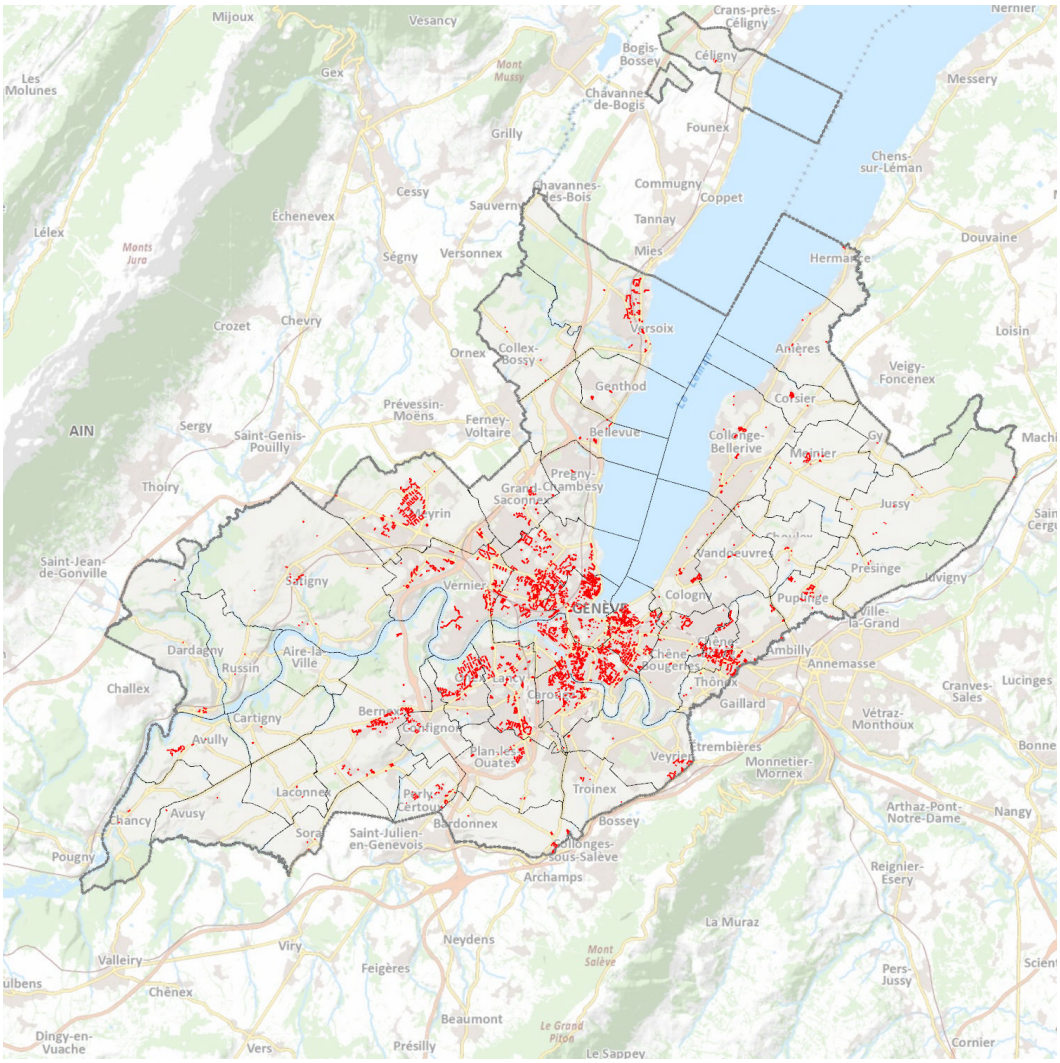

Fig.1 Selected buildings in canton Geneva, collective housing built 1946 to 1990, ERS >500m2

The second task of stage 1 was to define the catalogue of constructive and architectural typologies for the selected population. This work was based on literature, mainly the eREN research project [(3)], on interviews with retired architects, active in Geneva during the buildings construction period, and finally on a full-scale test in Carouge, a municipality representative of Geneva's built environment to validate the robustness of the catalogue.

This work resulted in 9 typologies:

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Type 1 : Familia Buildings

Type 2 : 1950's building

Type 3 Loggia buildings

Type 4 : Continuous balconies

Type 5 : Blocks

Type 6 Grid and filling

Type 7 : Curtain wall

Type 8 : Precast cladding

Type 9 Perimeter insulation

Fig. 2 : typologies

The full-scale test in the municipality of Carouge validated the robustness of the catalogue, as shown on the following table :

Type	# EGID	% EGID	ERS (m2)	% ERS	Av. ERS.	Av.IDC*
0 – No type	9	5%	27 625	7%	3 069	562
1 – Familia buildings	7	4%	6 827	2%	975	635
2 – 1950's buildings	10	5%	16 080	4%	1 608	500
3 – Loggia buildings	9	5%	21 903	5%	2 434	508
4 - Continuous balconies	48	24%	117 384	29%	2 446	497
5 – blocks	6	3%	13 110	3%	2 185	434
6 – Grid and filling	32	16%	61 355	15%	1 917	497
7 – Curtain wall	3	2%	4 262	1%	1 421	395
9 – Precast cladding	62	31%	115 516	29%	1 863	475
10 – Perimeter insulation.	11	6%	17 079	4%	1 553	429
TOTAL	197	100%	401 141	100%	2 036	497

* Av. IDC = average heating and hot water energy consumption of last 3 years, in MJ/m2*year

Table 1 . Carouge typological census

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2.2 Step 2 – guidance sheets

Next step consisted in producing guidance sheets for each typology. These three-page guidance sheets describe the typology, propose a meta-diagnosis of the existing condition, define one or two detailed options for renovating the building envelope, analysing their advantages and disadvantages, their energy and economic impacts, and outline constructive details for their implementation.

The objective of these sheets is to propose a simple and effective tool to local authorities to engage in a personalized dialogue with the owners, on a concrete basis. The sheets allow owners who have not yet decided on the path to follow to renovate their building to have a relatively precise idea of the potential and the issues related to the typology to which their building belongs. Once a decision has been taken to launch a renovation project, it goes without saying that a project adapted to the specific characteristics of the building will have to be developed.

The guidance sheets are only intended as an incentive tool and can in no way constitute a "recipe" that can be applied to the building as it stands. It will be essential to hire qualified professionals to carry out the renovation project in accordance with the rules of the trade and with respect for the architectural substance of the building.

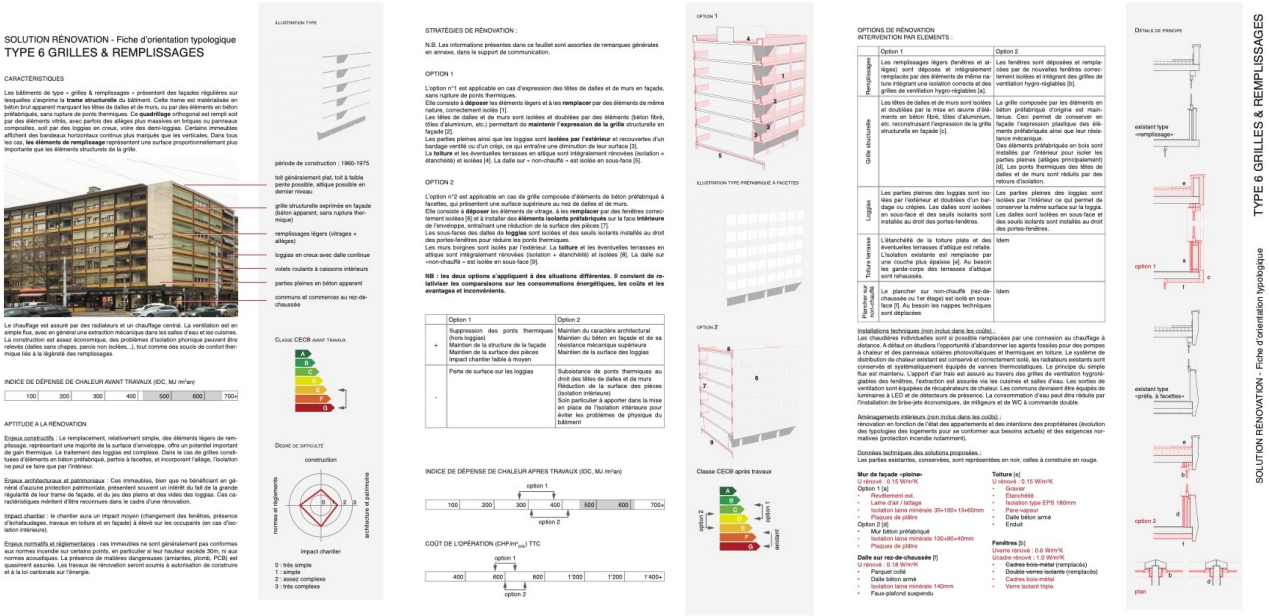

Fig. 3 : Sample of guidance sheet

The guidance sheets are available on the following websites :

https://ww2.sig-ge.ch/immobilier/optimisation-energetique-et-environnementale/documentation-eco21

https://www.ge.ch/document/fiches-typologiques-batiments-propositions-solutions-renovation-energetiques

2.3 Step 3 – cantonal census

Finally, a physical census of the 5500 considered budlings (EGID) on the territory of the canton (see figure 1) has been carried out, to assign a typology to every building. This information has been added to a database extracted from the SITG (Geneva geodata system), which already contains each building with its coordinates, its energy reference surface (ERS), its energy agent and its heat expenditure index (IDC).

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The last step was to link the data base to an interactive map system, that give a precise and multicriteria view of the canton's building stock, thanks to multiple filters (construction period, energy consumption, typology, etc.). The tool used for this mapping work is the QGIS software.

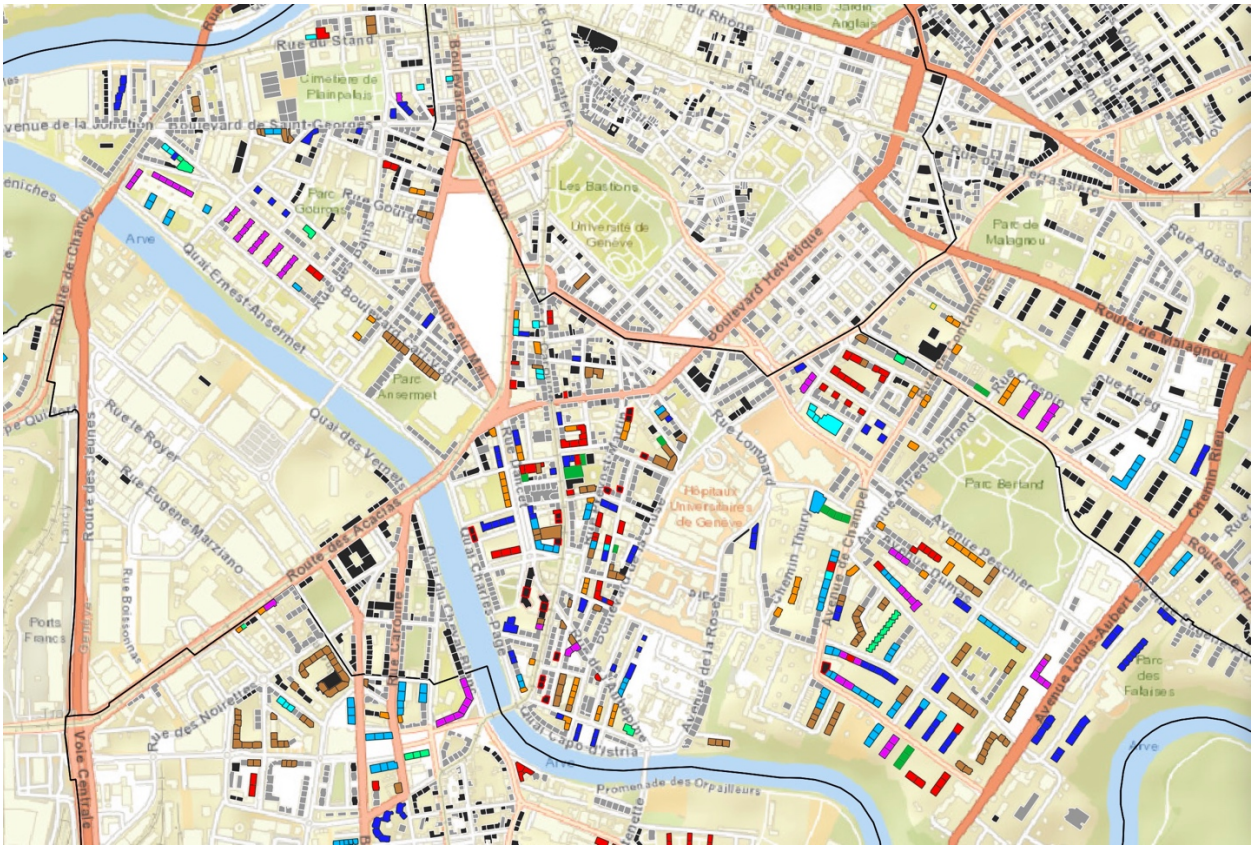

Fig. 43 : extract of interactive map, showing typologies in various colors in one sector of the canton of Geneva

The Interactive maps are a very visual and powerful tool, giving an important quantity of geo-located information, in a very readable, even playful way.

3. Results

The maps and the census are currently used by SIG and three municipalities in the canton of Geneva (Lancy, Carouge, Grand-Saconnex) to identify the most promising targets and to organise workshops and one-stop shops with the buildings' owners and property managers to discuss potential ambitious renovation projects. The first feedbacks are very positive: the tools allow the local authorities to better understand the nature of the building stock on their territory and to actively canvass buildings' owners and to motivate them to launch refurbishment projects,

The guidance sheets are used by municipal departments and SIG, both before and after the workshops, to dialogue with building owners on a concrete basis about potential renovation scenarios and try to push them towards ambitious comprehensive renovation projects that will significantly improve the buildings' energy performance.

These tools have been developed in parallel with the first workshops that took place in Lancy back in 2020, online, during the covid time. It is too early to have results in terms of work carried out and proven energy improvements. However, intermediate results can already be given in relation to the last workshops organized in may 2022 for the 3 municipalities participating in the program :

- 22 potential refurbishment projects attended workshop 1 (first contact), accounting for 66'314 m2 of ERS.
- 90% of the owners declared at the end of the round 1 workshop that they would take part to round 2 (advanced workshop, once a CECB/GEAK audit is realized).

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- 40% of round 1 workshop owners declared that they were considering bringing other projects to a next workshop
- 11 potential refurbishment projects attended workshop 2 (reserved to buildings that already have a CECB/GEAK certificate), to discuss with the cantonal pre-advisory boards, representing 50’204 m2 of ERS.

The above results are encouraging and in the long run, “Commune rénove” is expected to enhance the refurbishment rate of buildings in canton Geneva that stagnates at less than 1%. It is however to early to conclude to a success. Although the pool of target buildings is large, the interest in the program could be related to a popcorn effect (many buildings ready for renovations at the same time and same place, by coincidence, with no relation to “Commune rénove”) or to a windfall effect (owners that adhere to the program in order to benefit from its advantages, but for purposes other than energy savings).

The “Onex rénove” pilot project is an example of these effects: after the “Onex rénove” workshops (2015-16), the renovation rate in the municipality exploded to 7%. Six years later, these projects are completed or underway, but we have no evidence that the renovation rate in Onex is sustained at such a level, especially since the program has been discontinued.

Construction projects take time to complete, the “Commune rénove” program should be sustained long enough (as long as it attracts homeowners) to achieve strong performance indicators.

4. Discussion

Despite the potential windfall effect, the above results show that there is a demand for proactive approaches by local authorities and that they are likely to enhance the refurbishment rate if they are perpetuated. However the feedbacks from the persons in charge demonstrate that it requires :

- Appropriate information at appropriate stage to identify the targets
- Adequate level of resources, relying in political willingness and financial capacity
- Huge amount of energy to contact owners and convince them, one by one, to participate

The guidance sheets and the typological census, allow to identify the target buildings. The fact that the heat expense index is available for all buildings in Geneva is without any doubt a huge advantage compared to other cantons, where this information is not available, resulting in local authorities having a far less clear and robust picture of the performance of the building stock on their territory.

Surprisingly, contacting owners proved to be much more complex. The identity of the owners is considered as confidential and managed by the canton’s Land Register. Unlike in other cantons, Geneva’s municipalities (45 in total) have very limited autonomy and prerogatives, and they do not have ownerships records. Sometimes arduous negotiations were necessary to obtain the coordinates of the owners from the Land Register.

Given that most of the targeted buildings are managed by property managers, known to the municipal authorities and to the buildings’ tenants, property managers were a gateway to the owners and often acted as their representatives in the workshops. However, this filter can be a potential handicap for achieving the objectives of the energy transition: going fast and strong.

As far as political willingness is concerned, the results are mixed. It takes a lot of time for the municipalities to decide to adhere to “Commune rénove”, although the program that is heavily subsidized by the canton and benefits from proven methods. The city of Onex, which was a precursor (“Onex rénove” pilot project), is no longer participating in the program. Following the departure of the city’s Energy Delegate, the political will to continue the project was missing. Finally, the municipality of Carouge, which has just joined the program, has decided to abolish the position of the program's contact person, for reasons unknown to us, which raises the question of the continuation of the project in this municipality.

These accidents show that without awareness and a strong political will, projects such as “Commune rénove” have little chance of success.

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However, a positive aspect of the project (in addition to the success of the workshops) should not be overlooked: the personalized canvassing that must be undertaken with each interlocutor (management and/or owner) makes it possible to create a direct and personal relationship between them and the local authorities.

Property owners and managers are generally reluctant to cooperate with the authorities and put their cards on the table, for fear of being put under the spotlight of the administration and its regulatory controls. The “Commune rénove” approach, is showing to them that local authorities can also help and bring solution in a positive and proactive way, and not only tax them and create regulations.

5. Perspectives

Perspective for the projects are twofolds:

- Extension of “Commune rénove” to other Geneva municipalities
- Extension of “Commune rénove” at national scale

For the time being, three municipalities in canton Geneva are involved in “Commune rénove” : Lancy, Carouge and Grand-Saconnex. They count in total some 68’000 inhabitants (OFS/BFS), and 747 buildings /EGID) representing 1’370’000 m2 of ERS for buildings falling into the targeted category (multifamily housing build between 1946 and-1990 with ERS > 500 m2).

Despite the situation described above concerning Carouge, it is expected that the project will continue in these municipalities, and that it will be extended soon to other suburban municipalities in the canton, and perhaps to the city of Geneva. The adhesion of City of Geneva would represent a major step forward, since it hosts some 53% of the targeted ERS on the canton’s territory.

At national scale, SIG, the City of Lancy,,Cité Lumière production and hepia, the major partners of “Commune rénove”, are involved in the Innosuisse Flagship project Renowave.

The overall goal of Renowave is to boost refurbishment of multifamily housing in Switzerland, in a broad and interdisciplinary approach. It gathers more than 15 academic partners and 40 implementation partners across Switzerland. One of its subprojects, under le lead from hepia, is about expanding incentive and proactive programs for refurbishment through municipalities, based on the pilot experimentations carried out in canton Geneva. Renowave just started in 2022 and is due to complete in 2025.

Literature/references

[1] Khoury, J. et al. *Comparenove*, UNIGE, 2018

[2] Khoury, J. *Rénovation énergétique des bâtiments résidentiels collectifs: état des lieux, retours d'expérience et potentiels du parc genevois*, UNIGE, 2014

[3] Rinquet, L. Schwab, S. et al *Rénovation énergétique, approche globale pour l’enveloppe du bâtiment*, HES SO, 2016

See also :

https://www.lancy.ch/prestations/lancy-renove