Attractive, Acceptable and Affordable deep Renovation by a consumers orientated and performance evidence based approach

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Report: Aggregate Analysis of TripleA-reno Ethnographic Research

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2 Executive summary

The following report is the Delivery 2.3, part of TripleA-reno Work Package 2. It covers outcomes and key findings related to Tasks 2.2\(^1\) and 2.3\(^2\), both focused on understanding habits, practices and motivations of end-users involved in housing renovation processes by means of ethnographic research.

Our research is based on the 4 steps of the People-centred development approach (see Figure 1). The core idea is that people should become an indispensable part of industrial development processes, as a means to achieve new categories of products, services, or business strategies that truly address people’s needs and lead to sustainable innovation. The goal of Tasks 2.3, 2.4\(^3\), and 2.5\(^4\) was therefore to investigate the renovation process with the people involved in the renovation process through an ethnographic research. TripleA-reno researchers established a dialogue with the key target stakeholders defined in earlier stages of the research – on the one side the people who decided to renovate their buildings, and on the other the various actors that facilitate and realize building renovations. Research participants represented the future user communities of TripleA-reno project results – TripleA-reno digital tools and Energy transition board game. The outcomes already have an impact beyond TripleA-reno project activities, particularly through activities in new Horizon 2020 and Horizon Europe projects such as re-MODULEES\(^5\), where representatives of national-level institutions and professionals working in the field of energy efficiency and building renovations are testing the tools in their everyday work environments to enhance the rate of building renovations and support the development of local building renovation markets.

![Figure 1: Task 2.2 and Task 2.3/2.4. integrated into the People-centered design & development approach.](image)

\(^1\) Task 2.2 – Defining user groups.
\(^2\) Task 2.3 – Understanding habits, practices and motivations.
\(^3\) Task 2.4 – Visualizing energy use and relations to IEQ by sensory ethnography.
\(^4\) Task 2.5 – Community building and establishing dialogue.

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Outcomes of our research presented in this report are valuable for understanding people’s behaviour and decisions regarding energy use and housing renovation. In more general terms, this report indicates that **building renovation is essentially a social process**, defined largely by the particular network of animate and inanimate actors and relations between them. Similarly, buildings as such, in their material entirety (including insulation materials, furniture, windows, HVAC systems etc.), should be considered as **social objects** – physical entities with a variety of social functions and meanings attached to them. What is more, each building can be observed as a small **socio-technical system** comprised of materials, technologies, and animate actors that can influence the system directly or indirectly, or rather, intentionally or unintentionally. In other words, when we consider building energy performance of a particular building, the people who use the building should not be excluded from our analysis as a generic or negligible implication, as is often the case. People should be considered an integral part of the particular socio-technical system (the building) of which performance we are interested in. In this respect, also going back to renovation as the core focus of TripleA-reno, people involved in building renovation should not be referred to as simply as **investors, consumers and end-users on the demand side**, or **producers, suppliers and contractors on the supply side**. These are roles that people take on (or are ascribed to) and should be considered as such in a wider context, in the total sum of actors – a network – that comprise the context everyday reality of construction and renovation industries. Finally, the renovation cannot be and should not be considered strictly and simplistically in technical (physical) and economic (financial) terms. In the catalogue there are several references to interpersonal relations, conflicting interests, power play, and even corruption. These indicate that building renovation is just as importantly, or perhaps even more importantly, a **socio-political process taking place on the local level**, in arenas the size of buildings, neighbourhoods, villages, towns, and municipalities as the “largest” scenario. This aspect in particular is often dismissed or not adequately accounted for, which then often also translates into difficulties and complications that could have been avoided.

**Report structure**

**More specifically**, the purpose of this report is to indicate how to make decision-making for deep and nZE renovation not only **affordable and acceptable, but also attractive**. The report is based on the outcomes of seven ethnographic case studies performed by TripleA-reno consortium members across the EU – Greece, Hungary, Italy, Slovenia, Spain, and The Netherlands. That includes a variety of measures, investments, casual daily household practices and other aspects of everyday life. These practices were recorded by an interdisciplinary group of experts, contributing insights from the fields of architecture, engineering, anthropology and sociology.

Background and methods used to produce the report are discussed in the Introduction (Chapter 3) and Case studies (Chapter 4). The latter includes individual descriptions of the ethnographic case studies by country, a section describing the theoretical background, and a section highlighting various barriers and drivers related to building renovation, all as outcomes of the ethnographic research. The centrepiece of the report is the
Catalogue of practices (Chapter 5) – a series of interpreted snippets of information from the ethnographic reports, including short ethnographic descriptions from the field and visual materials (photos, maps, and plans). These are organized as catalogue items, all linked to energy consumption, IEQ, and building renovation. The chapter divided into three subsections – Energy related household practices (5.1), Investments in maintenance and renovation (5.2), and Management and facilitation practices (5.3). The catalogue is followed by Chapter 6, titled Beyond habits and practices, which highlights significant aspects that could not be appropriately communicated in the context of the catalogue but provide a valuable background for thinking about appropriate people-centred solutions and innovations in the developing construction and renovation industry. Finally, the report finishes with the chapters Affordability, Attractiveness and Acceptability (Chapter 7), and a Conclusion (Chapter 8). Some of the key conclusions resulting from work done in T2.3 include:

- Affordability, attractiveness and acceptability are categories that are understood differently in different socio-cultural contexts. During the decision-making process, renovation projects are therefore evaluated depending on the existing knowledge, experiences, social norms, and the characteristics of the involved stakeholders, and importantly, by the very relations between the involved stakeholders.
- Notions of trust, empathy, and even solidarity proved to be important, for some projects arguably even the most important “make-or-brake” factor. Nonetheless, they often tend stay an overlooked dimension of building renovation projects, which are typically heavily centred on technical and financial aspects.
- Finances play a key role in considerations of acceptability. In relation to affordability and attractiveness, acceptability can be understood as a point after which any unplanned (additional) costs render projects unaffordable, while attractiveness is a more general notion covering the spectrum of options before reaching the tipping point of (un)acceptability.
- Many people find renovation unattractive because of the virtually inevitable disruption of their everyday life, doubts in reliability of the project (potential technical complications), and lack of trust in the key stakeholders and their integrity.
- Human-to-human interaction should be made at least as important as any other technical, material, or practical aspect of tools and solutions that we are developing.

The entire list of conclusions related to affordability, acceptability and attractiveness of building renovations can be found in Chapter 7 of this report. In summary, this report provides an abundance of insights for initiatives related to TripleA-reno, which want to understand better the people-related market barriers for deep renovation in order to overcoming them. This knowledge of energy-related (household) practices can be leveraged in pursuit of positive change in the existing socio-technical systems within and beyond the TripleA-reno.
Introduction

The vision of the TripleA-Reno project is to promote widespread energy renovation of existing European housing stock and empower individuals and communities in favour of such developments. Within this context, tasks 2.3 and 2.4 are focused on understanding habits, practices and motivations of people involved in the gross process of building renovation. Our analysis based on ethnographic research methods creates the interdisciplinary value promoted by TripleA-reno by combining technological knowledge and expertise with socio-cultural insights. As argued by Sovacool⁶ and scholars alike⁷, the field of energy research is dominated by technical engineering and interdisciplinary research faces considerable difficulties on virtually all relevant fields and levels – institutional, academic and governmental. As we explain later in this introduction, TripleA-reno research consisting of tasks 2.3 and 2.4 aims to address exactly this issue. This report provides a concrete reference for understanding renovation – and other techno-centric – projects not only as a set of step-by-step protocols, quantitative variables and factors, but also as assemblages of socio-cultural processes. From a more general perspective, these can be conceptualized further as building blocks of renovation, which – per se – is a particular form of socio-cultural reality and a social practice.

Figure 2: A map of TripleA-reno ethnographic case studies.

The study includes cases from six different EU member states – Greece (GR), Hungary (HU), Italy (IT), Slovenia (SI), Spain (ES) and the Netherlands (NL). The research involved a student dormitory building (GR), blocks of social housing flats (ES, IT), blocks of flats with complex ownership structures and mixed purposes of use (HU, SI).

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SI), as well as a case of a privately owned individual semi-detached house (NL). People’s everyday-life experiences were recorded and buildings were observed in various stages of the renovation process and were found to have a variety of structural and performance issues. Such variety of particular contexts and conditions encountered in their field prompted researchers to apply a variety of research strategies, which led to an interesting and diverse collection of results reflecting the wide scope of challenges TripleA-reno project aims to address.

Diversity and heterogeneity of featured cases clearly reflects the complex nature of renovation projects. Besides the obvious quantitative (technical and financial) factors and variables, renovation projects are always subjects to specific cultural, geographical, socio-cultural, political and economic factors – from the micro (household and/or local) to meso (regional and/or state) and macro (national or even EU) levels. Some of these factors are easier to describe, conceptualize and foresee than others, but together they form what an analytical eye perceives as daunting complexity. It is worth to note, however, that outside of such analytical pursuits people experience the same complexity as simple everyday realities.

Within TripleA-reno this perspective was consistently present from the very beginning of the project activities. By stressing working with people rather than simply for them, the ethnographic research under Task 2.3 enabled sensibilisation of the project and identification of intangible factors that influence the decision making processes and building renovation as such. Also for this reason the consortium successfully demonstrated the importance and benefits of attractive, understandable and personalized information of realised real energy performance of buildings through evidence-based solutions in live demonstration cases. Furthermore, research participants were provided with reliable, trustworthy information regarding products and services related to deep renovation projects directly from the researchers and representatives of TripleA-reno in order to support and streamline the decision-making process. One of the outcome of this interactive and reciprocal process is also this report.

As one would expect for a research with such a diverse research sample, we faced a variety of methodological and analytical challenges. Nonetheless, we believe diversity is also the source of the research’s value. The aim of our ethnographic research is exactly to provide a valuable insight for better understanding of the complex realities of renovation projects. We approach this challenge by defining practices related to energy consumption and renovation, which we understand as particular patterns of interaction between people and the material world. These serve as reference points for developing efficient strategies addressing building renovation challenges. In the context of TripleA-reno solutions, these will take form of optimized and customized features and tools within our TripleA-reno online platform. What is more, our approach enables us to outline the universal aspects of human-building interaction shared throughout the EU. Simultaneously, it enables us to retain a considerable level of specificity and demonstrate the influence of context(s) for each individual case of renovation or building intervention.
4 Case studies

This chapter briefly presents the TripleA-reno methodological approach followed by short description of individual TripleA-reno case studies providing key information. First paragraph is focused on the context and the people in each individual demo case, the second focuses on the building and renovation, and the third one highlights particular aspects of the renovation project that make the case study different from other featured cases.

TripleA-reno research methods

The TripleA-reno tailored qualitative research method combines a variety of methods, including interviews, focus groups, and perhaps most importantly – participant observation, the central method of ethnographic research. We recorded life stories and sensory experiences by engaging with our informants in the field. The added value of our inductive approach is that it provides concrete reference points for development of goal-oriented tools and solutions based on real life evidence. The research setting was real, not fabricated for the needs of the research. The complex phenomenon of building renovation process was not only theoretically scrutinized but most importantly experienced first hand by the researchers who analyse it. By engaging with it in the field, we gained deep understanding of the explicit and tacit information, as well as intuitive insight into potentials and limitations of the analytical format that is produced as a result. Deep understanding of complexity that renovation projects face in real life environments is valuable especially for building professionals, which we believe are among the key beneficiaries of TripleA-reno project. As we indicate in the catalogue section Management and facilitation practices, insights we gain by engaging with the customers and resident communities can greatly outweigh the cost of time, effort and money put towards planning renovation in an interactive and inclusive way. In addition, our method involves elements of sensory ethnography⁸, having researchers recording observations from the field with focus on the senses – the visual, smell, the tactile, temperature, and noise.

<table>
<thead>
<tr>
<th></th>
<th>GR</th>
<th>HU</th>
<th>IT</th>
<th>SI</th>
<th>ES</th>
<th>NL</th>
<th>Total</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Interviews</td>
<td>30</td>
<td>5</td>
<td>15</td>
<td>11</td>
<td>7</td>
<td>1</td>
<td>69</td>
<td>30</td>
</tr>
<tr>
<td>No. of participant observation days</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>14</td>
<td>9</td>
<td>1</td>
<td>37</td>
<td>30</td>
</tr>
<tr>
<td>No. Focus Groups</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>/</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 1: Fact table of qualitative research for case study.

In the context of the TripleA-reno qualitative research, we conducted 69 interviews covering the broad spectrum of stakeholders involved in renovation projects. Majority of interviews were 45 to 75 minutes long and recorded with our informants’ permission, formalized by a signature of an informed consent. Research activities were conducted either in the buildings featuring in the case studies, in their immediate vicinity, or

in the offices and homes of the relevant stakeholders (housing managers, project managers, company directors etc.). The exact number of days involving participant observation was not transparently recorded. However, from provided data we conclude the number of days involving elements of participant observation is somewhere between 18 and 38. A total of 6 focus groups have been conducted during the research, bringing together different stakeholders involved in the process of renovation and inevitably different viewpoints on issues related to it. Researcher recorded their activities using a notebook and sometimes with a camera. They also used fieldwork journals as one of their key research tools.

These methods were tailored to the needs of TripleA-reno project by a team of anthropologists from IRI Ljubljana, who prepared guidelines based on a pilot research in Slovenia. Results of the research were introduced to representatives of TripleA-reno consortium, who used the guidelines for case studies in their local environments. Combined with quantitative methods of data collection and processing from the Task 2.2, TripleA-reno results offer a robust multifaceted inductive analysis of a variety of relevant perspectives in the real-life research setting. Further research by means of comparable qualitative methods is used in tasks 2.4, 2.5 and 2.6.

9 Task 2.6 – User feedback.
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### 4.1 Individual case studies

<table>
<thead>
<tr>
<th>Typology</th>
<th>Year of construct.</th>
<th>No. of occupants</th>
<th>Typology and size</th>
<th>Ownership</th>
<th>Management</th>
<th>Purpose of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>GR</td>
<td>1986</td>
<td>± 138 (residents) + staff (users)</td>
<td>3642 m² 138 single rooms</td>
<td>Public</td>
<td>University of Athens (NKUA)</td>
<td>Student dormitory</td>
</tr>
<tr>
<td>HU</td>
<td>1982</td>
<td>150</td>
<td>3887 m² 60 apartments</td>
<td>Private</td>
<td>Outsourced – private contractor</td>
<td>Housing &amp; business</td>
</tr>
<tr>
<td>IT</td>
<td>1977/78</td>
<td>± 60</td>
<td>2135 m² 21 apartments</td>
<td>ATER Venezia</td>
<td>= owner</td>
<td>Social housing</td>
</tr>
<tr>
<td>SI</td>
<td>1976</td>
<td>± 150</td>
<td>4133 m²</td>
<td>Mixed (private, public, business)</td>
<td>Zagorje housing company</td>
<td>Housing &amp; business</td>
</tr>
<tr>
<td>ES</td>
<td>1984</td>
<td>± 150</td>
<td>3554,2 m² 51 units</td>
<td>Regional Social Housing Company EVHA</td>
<td>= owner</td>
<td>Social housing</td>
</tr>
<tr>
<td>NL</td>
<td>1930</td>
<td>3</td>
<td>96 m² 1 unit</td>
<td>Private</td>
<td>= owner</td>
<td>Housing</td>
</tr>
</tbody>
</table>

Table 2: Fact table with general information by individual TripleA-reno case study.
4.1.1 Greece (GR)

Authors: Davide Prati and Anastasia Fotopoulou

Location: Athens, Attica region

The Greek case study is a student dormitory building located in the eastern suburb area of the state’s capital Athens. Nation’s biggest city with 5 million inhabitants and rich history – from the antique era all the way to modern times, mixing architectural and cultural influences of ancient Greece and Rome, the Ottomans, Art Deco, Bauhaus etc. – presents a unique backdrop for national and international students at the National Kapodistrian University of Athens (NKUA). With its 125,000 graduate and postgraduate students, the university is not only the biggest in Greece, but also one of the biggest in EU. Residents of the dormitory are its students – both women and men – ranging from 18 to 25 years in age.

The building is a typical construction typology for residential building blocks in wider region as well as Europe in general - reinforced concrete (pillars and beams), concrete slabs and hollow brick external walls. It has 138 dormitory studios with a variety of communal facilities and is in constant operation since its construction in 1986, with no renovation interventions since then. Renovation of the building, which started before TripleA-reno research took place, includes façade insulation, additional space (extra room, sunspace and balcony), static insurance, and measures to improve internal comfort (see Prati and Fotopoulou 2020: 8). It simultaneously targets the poor energy performance of the building as well as its structural deficiencies regarding seismic activities. Further reference to particular details regarding the building, its renovation and related particularities are discussed later in the report.

The renovation initiative in the Greek case is top-down, pursued by the manager and de-facto owner of the building, which is the NKUA (National and Kapodistrian University of Athens) – an autonomous public institution. Pressure for renovation was noted on the students’ side, however, their motivation origins primarily from aspects of comfort, convenience, and privacy, rather than improved IEQ, energy performance or financial savings. Prati and Fotopoulou report that almost 90% of informants perceive their rooms as being “too small” and “unsuitable for student’s accommodation”. That is not surprising, given that some rooms measure no more than 9.5 m². Sanitary facilities, living rooms and kitchens are shared, which provides a definitive backdrop for occupants’ “student way of life”, which from a socio-cultural perspective is perceived as normal both in the region as well as elsewhere throughout the EU. Although not explicitly expressed by any of the standard IEQ indicators, these factors significantly influence people’s perception and experience of the indoor environment and are a fundamental context-related element of the notion of quality. With regard to issues related to energy performance and IEQ of the building, Prati and Fotopoulou note a significant lack of “emotional bond” to the building, which they see as a result of significant occupant turnover. The Greek case in particular stresses the topic of seismic safety, which seems

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10 Prati, Davide and Anastasia Fotopoulou (2020). ‘Ethnographic Research and sensory ethnography report on Democase nr. 1 - Student houses: National Kapodistrian University campus, Athens, Greece – Student residences in Athens, Greece owned by the University of Athens’, unpublished internal TripleA-reno report.

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to occupy a significant position in the case report, which is rather peculiar in comparison to other featuring case-studies.
4.1.2 Hungary (HU)

Authors: Gabor Nemeth, Zoltan Magyar

Location: Szigetszentmiklos, Pest county

The Hungarian case is located in Szigetszentmiklos, a town on the Danube river 30 min car drive south of the national capital Budapest. It is a residential block of flats with some storage space used for business purposes. The apartments are privately owned. Informants of the Hungarian case are all in their 60s, financially independent, and pleased with the location of their home, but not necessarily with the building’s physical qualities and performances.

The building was built in 1982. It has 5 residential levels, a total of 60 apartments, and a ground level used mostly as storage space. The walls and the flat roof are made of prefabricated concrete panels, there is little thermal insulation, and the original windows and doors are wooden framed. It has poor energy performance and several consequential IEQ issues, of which Nemeth and Magyar note references to primarily thermal comfort. Individual residents introduced several measures to mitigate that, some investing into new windows, doors, or radiators. However, the individual management of heating is still limited, as we will see later in the report. Although the report provides no reference to concrete renovation plans, it does highlight residents’ and manager’s opinions, that it should include improved insulation of the building’s envelope, improvements in the ventilation system, new windows and doors where necessary, and renovation of the heating system.

The renovation initiative in the Hungarian case is bottom-up, pursued by the owners and residents of the block of flats and supported by estimated 80% of the households, Nemeth and Magyar report. In the context of TripleA-reno research, it is an interesting example for its issues related to heating. The building is connected to the district heating system for heating and domestic hot water, and costs are distributed among the residents on basis of apartment size rather than actual use. This provides residents with “limited motivation to save energy”, as Nemeth and Magyar point out. He goes on to suggest that in order to motivate households to actively support the renovation, a change in cost distribution combined with the renovation would be necessary. In addition, improved aesthetic appearance of the building and increased property value would also function as significant motivation factors.

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Figure 6: Location of the Hungarian case-study.

Figure 7: The case-study building from Hungary.
4.1.3 Italy (IT)

Authors: Davide Prati

Location: Concordia Sagittaria, Veneto region

The Italian case-study is a social housing block of flats located in Concordia Sagittaria. The town’s origin dates back to the Roman times. The original settlement, located on an important crossroad, developed its logistical potential with a considerable degree of continuity from antiquity through the medieval era to modern times. An heir to this tradition, Concordia Sagittaria is today an important agricultural, artisan and commercial centre with more than 10,000 inhabitants. The historical continuity is present in a somewhat tangible manner on an archaeological site, which happens to be in the immediate vicinity of the block of flats where Prati conducted his TripleA-reno fieldwork.

The building was built between 1977 and 1978 and contains 21 apartments on four levels. It has an elongated rectangular shape divided into two blocks. Materials used for the construction are typical of that period. The load-bearing structures consist of reinforced concrete pillars and beams, infill walls are made in weakly reinforced concrete, and slabs are made in precast concrete panels. The building is in a relatively poor physical state due to lack of maintenance and, as Prati highlights, constructional imperfections typical for the era in which it was built. Recorded issues include insufficient insulation, poor drainage capacity of the roof, and internal layout of the apartments that span across several floors connected by stairwells, which – in addition to the absence of elevators in publicly accessible spaces – render apartments in the block highly inaccessible to the elderly and disabled populations.

The renovation initiative for this building is top-down, run by social housing enterprise ATER Venezia – housing manager and owner – and supported by an initiative from the local Veneto region government. They plan for thermal insulation of the envelope – including the roof and several other elements – substitution of windows and doors, substitution of the heating system, and measures to improve the seismic performance of the building. Prati noted instances of tenants’ pressure for renovation, but not as part of the recorded renovation initiative. In relation to occupants’ perception of the planned renovation, Prati emphasized moisture-related issues as well as the already highlighted issue of inaccessibility for the disabled and elderly population.

Prati, Davide (2019). ‘Ethnographic Research and sensory ethnography report on Democase nr. 3.A - Multiapartment Building in Concordia Sagittaria (VE), via Julia nr. 3’, unpublished internal TripleA-reno report. THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION’S H2020 FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION UNDER GRANT AGREEMENT NO 784972. The sole responsibility for the content of this report lies with the authors. It does not necessarily reflect the opinion of the European Communities. The European Commission is not responsible for any use that may be made of the information contained therein.
Figure 8: Scheme of the Italian case-study building.

Figure 9: Location of the Italian case-study.

Figure 10: The Italian case study building.
4.1.4 Slovenia (SI)

Authors: Domen Bančič, Gregor Cerinšek, and Jure Vetršek

Location: Zagorje, Zasavje region

The Slovenian case is a residential block of flats located in a town of Zagorje, an appx. 7000 people strong urbanised administrative centre for the municipality of Zagorje ob Savi. The town’s location gives it logistical importance, which was recognised already in prehistoric and medieval times. In the era of Habsburgs, especially in the second half of the 19th century, the town exploded into a coal-mining and industrial powerhouse. This status was stressed and up-scaled even more in the time of socialist Yugoslavia, and need for workforce was large. The block of flats from Slovenian case-study was built in this era to provide housing for the workers and their families and was part of the state-owned housing stock, which was sold off to become private property after the fall of Yugoslavia in ‘91. Many of today’s residents are senior and middle-aged generations, which moved in time of Yugoslavia as tenants and are now owners of the flats. However, many are new residents, including young families, which reflects the contemporary realities of the town. With steady demise of coal mining and many of the primary industries in recent decades, contemporary Zagorje is a provincial town in economic transition into tertiary and quaternary sectors.

The building was built in 1976, which is reflected in its reddish brick façade and accented concrete elements, similar to many other building in town a distinct impression of that era. Its design combines spaces of mixed designation. Today, 51 residential units are located on the elevated levels while ground level is mostly business premises – two bars, a bank, a shop, a private gym, and storage space. The building has a variety of issues, including poor insulation, moisture and drainage problems, poorly functional ventilation, and issues with accessibility.

The renovation project is a bottom-up initiative, promoted by the community of residents. The initiative started 2016 by a group residents that believed renovation is needed both from a point of view of improved IEQ as well as an act of responsible management, while lowering heating costs was clearly also a strong motivating factor. The renovation process was hindered because of a variety of issues, including mixed and complex ownership structure, a relatively complex management structure, opposition from some of the owners of business premises and occasional lack of constructive collaboration between other stakeholders involved in the process. After years of troublesome negotiation, renovation started in February 2020. The project is focused on the renovation of the building envelope – façade and the roof – including some other systems, such as ventilation.

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Figure 11: Location of the Slovenian case study.

Figure 12: The Slovenian case-study building.
4.1.5 Spain (ES)

Authors: Ana Sanchis, Miriam Navarro and Leticia Ortega

Location: Alicante region, Almoradi

The Spanish case study is a block of flats rented as social housing located in a Spanish town of Almoradi. With appx. 18,500 inhabitants, the town is a medium-sized provincial town with economic orientation of primary industries, including agriculture, furniture, plastic, textile, and machinery. Although origins of the town date back to the 11th century BC, urban continuity – which included Roman, Greek and Carthagian influences – was heavily disrupted in 1829 by a severe earthquake. As a result, the urban plan of contemporary Almoradi is characterised by straight lines and wide streets. In recent decades also the city’s demographic structure has been changing significantly. A steady influx of migrant workers – most notably from (northern) Africa and the UK – resulted in non-native population now representing more than 1/5th of the population. As noted by Sanchis et al., this has had an impact on how some of their informants perceive their town, which they described as a “quiet, nice village where they have grown and stay their whole lives”.

In this context, Spanish contributors recorded habits and practices in a cluster of households located in an area with severe social issues, which, as they noted, directly affects people’s quality of life. Most of these households rely financially on part time jobs, miserable state pensions, government subsidies, or even have no income whatsoever. In addition, level of education among household members are generally low and many households are families with young children, which exacerbates their situation.

Spanish case is a set of five brick façade housing blocks of flats covered with curved ceramic tiles. They were built in 1984 and never renovated since. The energy performance of the buildings is poor (classified as G by current Spanish EPC standards) and its image “unattractive and outdated”. Some issues highlighted by Sanchis et al. are the leaking sanitary network running beneath the buildings, absence of elevators, and physical deficiencies of the buildings’ fabric resulting from poor maintenance. Further aspects of the buildings’ issues are discussed latter in the report.

The renovation is a top-down initiative run by the Regional Social Housing Company EVHA – the owners and managers of the buildings – and is part of a holistic renovation plan for their entire housing stock. The renovation was planned to go beyond considerations of energy performance and IEQ. Sanchis et al. report they plan to prioritize addressing aspects of safety, accessibility, and buildings’ “urban image”. They will also improve communal facilities and target existing defects. Their plans reflect the considerations of informants from the Spanish case, who “are more interested in solving their own homes deficiencies (humidity, fungi, mould, chipping, bug infestations...) and economic situation than in an energy savings or sustainability potential”. In addition, informants also pointed out concerns related to safety, especially the ones living on the ground level. With such considerations in mind, we can conclude that members of the household cluster engaged by Sanchis et al. deal with problems concerning dignity of human life, basic living conditions and


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health, rather than comfort, cleanliness or convenience\textsuperscript{15}, let alone thinking about energy performance and efficiency for the sake of a lesser environmental impact.

![Figure 13: Location of the Spanish case-study.](image)

![Figure 14: The Spanish case-study building.](image)

4.1.6 The Netherlands (NL)

Authors: Merle Savelsberg and Haico van Nunen

Location: Eindhoven, Brainport region

The Dutch case-study took place in Eindhoven. With more than 220,000 inhabitants, it is the fifth largest city in the Netherlands. Savelsberg and van Nunen describe it as a high-tech oriented educational and industrial centre with a “village” feel. The Dutch case is located in the neighbourhood called Gerardusplein. It is one of four neighbourhoods that were targeted by the local government for a carbon-footprint reduction “challenge” in 2017. The challenge was part of the nation-wide systematic and government supported push for decreasing dependency on fossil fuels. The Eindhoven challenge consisted of private businesses interventions aimed at private homeowners to both raise awareness and promote measures related to reducing CO₂ emissions. These interventions included community building activities, educational and promotional activities, heat-scans of houses, and also concrete measures, such as cavity wall insulation, and radiator foil application. In their report, Savelsberg and van Nunen present a case where their company – BouwhulpGroep – successfully supported a renovation process of a privately owned home from the targeted neighbourhood community.

The building featuring in this case is a typical Dutch style semi-detached house reflecting the architectural style of 1930s, which is the era of its construction. It houses a financially secure single-parent household of a father and two teenaged children. Several measures have been taken by the owner to improve the building’s energy performance in the recent decade, including floor insulation, façade insulation and implementation of double glazed windows. Upon consulting with the BouwhulpGroep, the owner decided to do a further step and install a high temperature air-to-water heat pump. This particular investment was a compromise between the size of investment and expected results, because it required minimal intervention regarding.

Savelsberg and van Nunen’s account is interesting for several reasons. It is the only TripleA-reno case focusing on a single household, which implies a significantly different dynamics of management, ownership and financing. This household in particular was run by one motivated, competent, and conscious individual with the capacity – including time, finances, knowledge etc. – to realize the investment. It is also the only account narrated from the viewpoint of a private company, reflecting on its strategies to pursue interests including promotion of the general CO₂ reduction agenda and most importantly, to do business. The account presents an online application called The 30 second test, which provides users with a general overview of their household’s energy performance as well as advice for potential measures for improvements of the performance. It also presents a set of sensors called The Sensi Family, which households can introduce to monitor their IEQ and energy performance. Both tools are presented in the light of the featuring household’s investment into improvement of energy performance.

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Figure 15: Location of the Dutch case-study.

Figure 16: The Dutch case-study building.
4.2 Stakeholders, actors and agents

Our case studies mapped out key stakeholders, actors and agents involved the process of building renovation. With the renovation projects in mind, we define stakeholders as individual or institutionalized actors that have invested interests into the process of renovation, either for business or following some type of benefit oriented logic. In the list below, these are presented under categories Users and beneficiaries, Decision makers, and Professionals. In contrast, we understand agents and actors as entities that (can) influence the renovation project directly or indirectly, but not for reasons related to renovation or perhaps without any kind of reason at all. The difference between actors and agents is that actors are humans who have the capacity for conscious agency – acting in pursuit of tangible results. In contrast, agents can be animate and inanimate – humans, pets, plants, objects, materials etc. – that do not exert agency consciously or intentionally, but still influence the decision-making and renovation processes. These are represented the category Other animate and inanimate agents and objects. It is important to note, that these are analytical categories, and that individual actors can – in practice – carry a variety of listed functions and profiles.

A variety of user profiles and scenarios have been described in detail within Deliverable 2.2\textsuperscript{17} with respect to development of TripleA-renu platform. The specific stress in this deliverable is on activity or active presence of individuals, institutions and other agents within decision-making and renovation processes. With regard to stakeholders and beyond, a set of factors and variables should be considered in pursuit of an efficient and resilient project. Most importantly, these include functions of actors and agents within the project, interests, carriers and networks of power (social, political), aspects of knowledge, time, finances, skills etc. Many of these aspects can and should be observed in the context of relations between individuals, households, and institutions involved in the projects. In addition, efforts to account for actors and agents outside the community of stakeholders (and its subgroups) should be made. That will optimize predictability of potential challenges and opportunities that might exist or emerge from any of the project stages – from planning and preparation to its execution and results. The profiles below suggest contextual considerations that should be taken into account to build good understanding of the relations within the stakeholder community and beyond.

**Users and beneficiaries of renovation**

**Building users**
- By building’s function (public services, transport, education, …)
- By patterns of use (regular user, occasional user, one-out occasion/visits, …)

**Household members**
- By function of an individual within the household (parent, caregiver, manager, dependent)
- By relations with other individuals within the household (equality, dependency, sub-rental)

**Decision makers**

**Owners**
- By relation to the household – internal or external actor
- By interest (short/medium/long term)
- By knowledge

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By financial capacity
Housing managers & associations
- By relation with the households – formal and informal
- By interests – business and purpose related
Governing institutions
- By level – local, regional, state
- By interest – resident, localised community, wider community,

Professionals
Building professionals & designers
- By their expertise and function – Architects, Project managers, Designers, Engineers, ...
Contractors
- By their trade and function – Building companies, sole-traders, ...
Suppliers
- By their trade and function – Manufacturers, middle-mans, big-box retail (DIY stores), ...
Third-party interest carriers – renovation related
- Driven by opportunity for business and profits (investors, banks, …)
- Driven by the purpose of their profession (social workers, researchers, local authority rep.)
- Driven by principles and values (wider community rep.)

Other animate and inanimate actors
Building itself and its surroundings
- Expected, assessable and measurable conditions
- Unexpected, hidden conditions
Geography and weather
- Predictable climate-related conditions and patterns
- Unexpected events and conditions – extreme weather events, earthquakes, floods, fires, avalanches, volcanic eruptions etc.
Third-party interest carriers – non-renovation related
- Driven by opportunity for business and profits (investors, banks, …)
- Driven by the purpose of their profession (social workers, researchers, local authority rep.)
- Driven by principles and values (wider community rep.)
Supporting institutions and schemes
- Financial (subsidies)
- Educational and expert services (support centres, tools)
Laws and regulations
- Supportive function
- Hindering function
Market
- Available materials and technologies
- The market culture and how it is woven in with the social fabric
- Relations and connections within the market players
Other (such as children, pets, plants, unexpected events)
- By relation to the stakeholder community and decision-makers – responsibilities, preferences, character of interpersonal relationships (friendship, disagreements, animosity etc.), …
- By type of influence and manageability – emotional, physical, magnitude, …

TripleA-reno research covered a large spectrum of representatives that directly or indirectly correspond to the listed categories. Notable exception from the interviews are representatives of governing institutions and representatives of product suppliers, who were not interviewed directly. However, particular viewpoints were presented reasonably well by individuals with a good insight and overview of renovation projects.

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18 Impact on health and comfort of housing is largely dependant on physical properties of the building – including the main building materials, paints, varnishes, and other elements, that are seemingly passively influencing people’s lives. This report, however, is focused on practices rather than materials as such.
Nonetheless, we recognize the future necessity and potential contribution that such informants have for deeper understanding of renovation projects.

### 4.3 Barriers and drivers

From a renovation project management perspective, mapping out the step-by-step plan for a renovation is fairly straightforward. However, as observed in virtually all of the cases featuring in TripleA-reno study, realisation of the projects tend to face both issues and challenges, as well as opportunities and solutions – all of those to a larger or lesser extent (un)predictable. These are often portrayed in a rather black and white narrative of positive **drivers** contrasting negative **barriers**. Such analytical worldview has often been disputed as oversimplified and ignorant to contextual and systemic aspects of the analysis\(^{19}\). Nevertheless, this dualistic cognitive model is likely to remain in expert and scientific literature and work. Its tendency – and capacity – to simplify complex reality to manageable dichotomies makes it a powerful analytical tool and vehicle of thought in goal-oriented pursuits such as renovation. As such, it will continue to be exceptionally hard and arguably foolish to ignore.

Many references to barriers, drivers and motivations have been given in the collection of featuring TripleA-reno ethnographic accounts. Below you can find a list compiled from these reports. We structured them into clusters – highlighted in grey colour – related closely to the core interests of TripleA-reno. Clusters are divided in two columns, corresponding to barriers and drivers and highlighting specific carriers and elements of practice. For orientation, we used the following working definitions:

- **Barriers** are definable contexts, people, and inanimate actors – objects, policies, actions – that function as an obstacle on the imaginary trajectory of a renovation project or on the way to meeting goals related to improvement of IEQ or energy performance of a building/housing unit.

- **Drivers** are definable contexts, people, and inanimate actors – objects, policies, actions – that function as enablers and catalysts of a renovation project or in relation to goals for improvement of IEQ or energy performance of a building/housing unit.

As it is obvious from the table below, several carriers and elements of practice can be interpreted as either barriers or drivers. That largely depends on the specific context and the interpreter’s viewpoint. We analysed attitudes and opinions of our informants by comparing various inputs from the fieldwork and expanded on it based on our own professional experience and knowledge. Where applicable, illustrated examples are provided, which we encountered in TripleA-reno research.

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Finances</strong></td>
<td><strong>Positive fiscal climate and context for individual investors</strong></td>
</tr>
<tr>
<td><strong>Lack of funds, insufficient funds, financial impotence of institutions</strong></td>
<td><strong>Access to funding and credit</strong></td>
</tr>
<tr>
<td>- People/institutions avoid or postpone renovation due to high or excessive investment costs, as it is often perceived.</td>
<td>- Includes financial mechanisms, subsidies, and other project related investment contexts and possibilities.</td>
</tr>
<tr>
<td>- IT, ES – residents cannot afford deep renovation (social housing). In addition, ownership and management institution do not have the financial capacity to pursue renovation.</td>
<td>- SI – renovation would not be possible without suitable credit mechanisms and less likely without access to a state subsidy scheme.</td>
</tr>
<tr>
<td>- HU, SI – reports of individuals, who could not afford to participate financially in the renovation initiative.</td>
<td>- IT – planned renovation relies on state subsidies.</td>
</tr>
<tr>
<td><strong>Lack of (institutionalized) funding possibilities</strong></td>
<td><strong>Prospects of long-term savings</strong></td>
</tr>
<tr>
<td>- Observation applicable to local, regional, state levels and beyond.</td>
<td>- SI, HU – Individual homeowners expect long-term savings</td>
</tr>
<tr>
<td>- IT – renovation was postponed due to absence of subsidy.</td>
<td>- IT, HU – introduction of split-monitoring for heating and a more impartial accounting system for related costs and responsibilities</td>
</tr>
<tr>
<td>- HU – residents has been waiting for state or municipal subsidy, but unfortunately it has not been available for years.</td>
<td>- IT, ES – Lower costs for near zero investment (case of social housing, rental housing, etc.)</td>
</tr>
<tr>
<td>- ES – renovation without institutionalized funding is not an option.</td>
<td></td>
</tr>
<tr>
<td><strong>Lack of financial incentive, irrational financial investment</strong></td>
<td></td>
</tr>
<tr>
<td>- Assessments of balance between costs and benefits.</td>
<td></td>
</tr>
<tr>
<td>- NL – renovation would not be deemed financially acceptable, if the technology would not enable minimal intervention into daily life and the existing state of the building.</td>
<td></td>
</tr>
<tr>
<td>- SI – an informant commented, that installing recuperation ventilation system does not seem to be attractive or affordable – largely for financial reasons.</td>
<td></td>
</tr>
<tr>
<td>- GR – temporary residents do not necessarily feel motivated to participate meaningfully in the renovation processes, because they carry little to no responsibilities or interests with regard to financial gains or losses from building maintenance or lack of thereof.</td>
<td></td>
</tr>
<tr>
<td><strong>Technical &amp; physical qualities of the building</strong></td>
<td></td>
</tr>
</tbody>
</table>
### The physical condition of the building

- Physical condition of the building clearly influences the decision-making process. Whether it tips the balance towards action or inaction, or rather, support or opposition depends on several factors. In other words, two different contexts – financial, socio-cultural, geographical, etc. – are likely to render two buildings of a objectively comparable physical condition to carry a significantly different function in decision-making processes.
- If cost-benefit ratio projects a marginal or negative gain/benefit from the renovation – which is often the case in good quality buildings or in very poor quality buildings – investments are likely to be avoided.
- NL – investment into the specific type of heat pump is acceptable with consideration of the existing qualities and past investments, financial potency of the household and other factors. In case of considerably different physical conditions – better or worse – alternative measures are likely to be considered.

### The physical condition and associated qualities of the building

- When the cost-benefit analysis with considerations of the physical condition of the plays out in favour of renovation, or when the physical conditions the building become intolerable, it can be considered a driver. Below are some aspects of the building’s physical condition that prompted people to support renovation in TripleA-reno case studies.
  - Cracks and structural problems. (IT, SLO)
  - Problems with window tightness. (IT, GR)
  - Tiles and plaster coming off due to moisture. (IT, GR, ES)
  - Broken sanitation network. (ES)
  - Poor quality of windows. (ES, IT, GR)
  - Poor thermal insulation of walls and roof (HU, GR)
- Associated qualities of the building also influence decision-making process and people’s attitudes to support renovation, often with prospects of developments towards wanted change.
  - Access related issues – no elevators, poorly positioned and small elevators, stairs within apartments, etc. (ES, HU, IT, SLO)
  - Absence of infrastructures – no connection to natural gas pipeline (IT)
  - Absence, poor or dysfunctional HVAC systems, including poor or no control over conditions of IEQ. (ES, HU, IT, GR)
  - Lack of space (ES, GR)

### Aspects, such as heritage, aesthetic and landscape value of the building.

- From strictly financial point of view, buildings protected by legislation and regulation for their added socio-cultural value often prove to be facing serious issues regarding the renovation. Similar considerations are related to buildings that co-create a specific local landscape or urban character.
- SI – the specific character of the building prompted debates about the legitimacy of renovation as the building – in the context of the city – co-creates the urban character particular to the town of Zagorje.
- Similarly, buildings with a particular architectural character can present a technical challenge to renovate.
- SI – the physical character of the building presented a challenge for the building professionals to plan an appropriate renovation approach.

### Other – practical, administrative, legislative

#### Bureaucratic challenges

- Formal approvals, permits and related paperwork can often prove to be overwhelming and, if nothing else, experienced as a psychological barrier.

#### Health and safety

- Closely related with physical conditions of the building, aspects of health and safety can be understood as particular categories of IEQ, which are
The size/magnitude and complexity of projects

- Size of project does play a significant role. For non-experts, it can present a significant psychological challenge and practical barrier as they require a substantial investment of time and effort. For this reason, big projects require some sort of professional facilitation and management.
- Renovations – particularly deep renovations – are inherently complex, involving a multitude of stakeholders, materials, and all kinds of both expert, material and social challenges.

The unexpected complications that emerge during the renovation

- Unexpected occurrences can have a significant or even fatal influence on renovation projects. Often they are rendered “unexpected” due to poor or insufficient planning.
- NL – renovation project was delayed due to a rotten beam in the bathroom.
- SI – renovation project delayed for years due to a number of rather unexpected, or perhaps, unforeseen obstacles.
- GR – renovation in progress, delayed due to beaurocratic barriers

Market

Access to appropriate materials and technologies

- Not all markets in EU have similar technology and materials available.

Monopolized markets

- Cases where there is lack of market diversity can present an issue regarding quality and price. That includes services and relates to the following point.

Lack of qualified and competent workforce

- Access issues related to quality competent workforce can present a serious obstacle for renovation projects.

Social, cultural, psychological, political

Lack of (political) will on various levels

Access to markets, materials and workforce

- In contrast to the associated barriers and challenges, a facilitated, transparent, and people-friendly access to markets, materials, and workforce can function as a driver of renovation projects. This is one of the reference points where TripleA-reno and its hereditary projects’ solutions can have the biggest impact.

Examples of good practices

generally highly important to people and present an important motivation factor. Following are some illustrative aspects recorded in our research:

- Moisture and mould. (IT, ES, GR)
- Issues with old water system and murky waters. (IT, GR)
- Bug infestation. (ES)
- Seismic safety. (GR, IT)
- Fire safety. (GR, HU)
- Violence; Lack of individuals’ safety; Fear of robberies through the windows. (ES)
Community governance.
  - GR – lack of will and motivation for engagement with the student-resident community.

Institutional level – local governments, ownership and management authorities.
  - IT – report of a resident community initiative that was put down with a change in local government.
  - ES, GR, IT, SI – reported a degree of passive opposition to the renovation by the housing management and ownership authorities.

Regional/state government.

Conflicts of interests
- These play out on both institutional and interpersonal levels. Often these take form of covert agency related to partial interests and speculations, which would be regarded illegitimate with the vast majority of the stakeholder community and beyond.
- SI – report of potential illegitimate business practices.

Lack of trust
- Between neighbours (within communities)
- SI – report about active opposition towards renovation on a basis of interpersonal conflicts entirely non-related to the renovation initiative.
- Between the housing communities and owners/managers
- ES, SI – reported lack of trust on relation between the (members of the) resident community and housing management company.

Uncooperative/problematic individuals & communities
- Vandalism in problematic social contexts.
- ES – reports of stolen clothes.
- Poor neighbouring/neighbourhood relations.
- ES, IT, SI, - reports of conflicts within the resident/user communities.

Examples of bad practices/failed renovations
- Although rare, negative experiences of renovation tend to spread fast and far, effectively giving rise to distrust and negative attitudes regarding renovation.

Examples of good practices and experiences with renovation have a considerable effect on attitudes and beliefs, effectively influencing decision-making processes positively.
- HU, IT, SI – reports of how examples of good practices from the neighbourhood and beyond positively influenced attitudes and opinions of informants.

Progressive policies
- Progressive policies supporting developments for sustainable future and institutions implementing them tend to function as a significant driver for positive change.
- GR, IT, SI – systematic funding has an undeniable positive impact not only on financial capacities of individuals and institutions to invest into renovation, but also on people’s attitudes and opinions.

Socio-cultural, emotional and psychological aspects
- A variety of socio-cultural aspects and contexts can positively affect people’s motivations and decision-making processes. Much of that has to do with meanings sourcing from a variety of social, cultural, emotional, and psychological. Some examples recorded in our research are:
  - Personal/emotional attachment to a location or particular qualities of the building.
  - The notion of home.
  - The feeling of community spirit and acceptance.
  - Lack of safety (thefts etc.)
  - Convenience related to lifestyle and individual life-situation (location, function, ...).

The immediate needs of occupants and users
- The requirements of the residents and members of the households – including the actors and agents that do not have direct influence in the decision-making process, such as children, pets, plants, etc. – can render renovation attractive or even necessary. That includes aspects of better IEQ, more (useful) space, healthier environment etc.

Research interventions
### Social, cultural, emotional, and psychological aspects

- A variety of socio-cultural aspects can have a negative impact on peoples’s attitudes and opinions regarding renovation, which can result as a barrier to efficient renovation. Some examples noted in our research include:
  - Personal (emotional) attachment to the existing condition.
  - Convenience status quo (avoiding change).
  - Free-rider issue – people reluctant to participate in the renovation process because they benefit from the current situation.
  - Value-action gap – people reluctant to follow sets of values and principles that they declaratively support for convenience and pragmatic reasons.
  - Convenience related to lifestyle and individual life-situation (location, function, ...).

### Knowledge

#### Lack of knowledge and experience on several levels

- **End-users**
  - HU, IT, SI – reports of (mainly experts) complains over general lack of knowledge and interest among people regarding renovation and building performance related topics.

- **Building experts, contractors, and tradesmen**
  - SI – reports of lack of knowledge and interest for continuous professional education and skill development among contractors and tradesmen.

- **Auxiliary services (banks, ...)**
  - SI – reports of banking sector not having the necessary insight to develop mechanisms for financial support of building renovation.

- **The gap between theory and practice can prove to be an obstacle to efficiency of renovation**
  - SI – reports of highly educated experts not having touch with practical aspects of renovation, which can result in hindrances of project development and even conflicts among stakeholders.

#### Educational opportunities

- Educational workshops and discussions with experts.
  - HU, IT – reports of facilitated activities, such as focus groups, having a positive and effectively improving communication between the involved stakeholders.
  - NL – reports of educational activities (masterclasses and workshops) providing ground for community developments and positively influencing people’s attitudes regarding investments.

- **Professional tutorials (for building professionals)**
  - SI – reports by several building professionals claiming that advancement of knowledge among building professionals and tradesmen involving improved methods of work and advanced materials are the future of building and renovation.

#### Reliable and accessible resources of information

- Reliable and trustworthy institutions and businesses can be a significant driver of change and proponents of quality through their educational and promotional activities.

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Conscious and well-educated individuals, communities and institutions are likely to pursue quality over convenience and price, especially when it comes to substantial and long-term and financially investments.

- SI – reports about how community of residents opted for more expensive and time intensive but reliable expert study to define necessary renovation action over a cheaper and faster “educated guess” offered by contractors.

Platforms, forums and digital tools can have a significant impact. This is another area, where TripleA-reno platform could play a significant role.

- NL – reports of digital tools and sensors enabling reliable (real-time) access to data and information about energy performance of buildings had a significant positive impact on people’s attitudes, opinions and effectively decision-making.

### Stakeholder community – beneficiaries, decision-makers, professionals

<table>
<thead>
<tr>
<th>Antagonists – opposition to the renovation</th>
<th>Protagonists – supporters of the renovation</th>
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</thead>
<tbody>
<tr>
<td><strong>Individuals within the stakeholder communities and beyond</strong></td>
<td></td>
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<tr>
<td>- SI – owners of business premises within the building who feel that renovation costs are not fairly distributed with regard to cost-benefit ratio.</td>
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<tr>
<td>- ES, SI – reports of opposition to the renovation by individuals, who had personal resentments against one or more of key stakeholders and protagonists involved with the renovation.</td>
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<tr>
<td><strong>Communities as a whole</strong></td>
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<tr>
<td>- Cases where users/occupants – for various reasons – feel renovation is against their best interests.</td>
<td></td>
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<tr>
<td><strong>Institutionalized entities, both passive or actively opposing</strong></td>
<td></td>
</tr>
<tr>
<td>- Looking at renovations as concrete actions in direction of necessary change, absence of such actions, particularly on the side of decision-makers, can be considered an act in the spectrum of passive opposition.</td>
<td></td>
</tr>
<tr>
<td>- HU, IT, SI – reports of responsible institutions taking a passive or – to a degree – opposing stance with regard to active pursuit of renovation.</td>
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</table>

**Individuals within communities and institutions – local heroes**

- Active members of the community, engaged individuals in positions of power, decision-makers, responsibility carriers, local heroes.
- IT, SI – reports of individuals from the resident communities, that actively campaigned and pursued renovation.
- NL – report of a single-parent household with capacity and interest in pursuing renovation.
- Driven professionals and members of relevant institutions or authorities, who act proactively, and with a degree of purpose and motivation that goes beyond personal interests or interests of institutions they represent.

**Individual institutionalized entities**

- Institutionalized ownership and management authorities – housing associations, housing management companies – who actively pursue renovation.
- ES, IT – reports of ownership and management authorities actively pursuing renovation. Agencies and institutions with capacity and mandate to actively
### Stakeholders and networks of stakeholders with particular interests

- SI – reports of illegitimate (corruptive) business practices and covert relations between some of the stakeholders involved in the renovation process with partial speculative interests
- SI – reports of a state-financed Eco-fund, which offers subsidies for energy efficient sustainable investments, including renovations.

### Stakeholders and networks of stakeholders

- Stakeholders who pursue their business or professional interests by exercising their authority, knowledge and capacity to constructively cooperate and act in the interest of the beneficiaries – users and residents.
- Communities or clusters of individuals within them that act unanimously and in coordinated manner to pursue renovation.
- HU, IT, SI – reports of community engagement that pushed the renovation agenda with considerable success.

### Table 3: Table of barriers and driver by general categories.
5 Catalogue of practices

Buildings and renovations – socio-cultural objects and practices

Buildings, including their systems and associated infrastructures, are inanimate material objects and spaces. They were designed with a particular built-in purpose and use in mind – with a particular user script\(^{20}\) – assuming or even requiring a particular way of use. Simply speaking, although buildings and other inanimate objects do not actively interact with people, the way that they are made (designed) influences people’s behaviour and practices of use. This can be described as passive agency of the material world that indirectly influences practices of its use. To illustrate, a building designed to be poorly energy efficient, such as a wooden shack, will likely prompt its dwellers to acquire energy inefficient practice of living, or will simply be a very uncomfortable place to live in.

On the other hand, people and cultures constantly innovate ways to use the material world, even the most thoughtfully designed objects, in a way that their designers and builders never have thought they could be used. If we think of the wooden shack again, perhaps people would opt to use it as a storage place for garden tools rather than a place to live in, and build a new, state-of-the-art nZEB house next to it. The trick, however, is that designing and building a perfect building does not also imply it will be used perfectly. The people that moved from the wooden shack into the masterpiece nZEB house, for example, might maintain some of their habits and behavioural practices from before, which might result in less than perfect energy use.

It is indeed a two-way process – on the one hand the material world influences people and cultures, and on the other, the material world is interpreted, appropriated and integrated into emerging and evolving cultures of use, and through this process, transformed into social objects, associated with meanings and values. In this report, we attempt to understand how we – people – meaningfully interact with our physical environment, which we call home, office, weekend houses etc. In particular, we focus on practices – the competences, skills, way of doing – that exist and make possible the connection between these particular material worlds and their socio-cultural perceptions.

Although we are talking about the material world, and specifically elements of the built environment, the focal point of our analysis are people. We embody both the rationality – the purpose and meaningfulness – of buildings and energy use, as well as the irrationality of it – the excesses of those that can’t afford or don’t know to do better, or those who don’t care and do it because they can. We use buildings, systems, and objects within them by combining our knowledge, skills, competences, capacity to take mindful action. Simultaneously, and certainly not less importantly, we follow and creatively interpret the user guidelines (user scripts) manifested in their material design.

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The conceptual and theoretical background

Our analysis is based on a combination of conceptual strands common to anthropology and sociology of energy, material culture studies, and the theory of social practice. Most importantly, items in the catalogue are structured following the socio-anthropological definition of practice promoted by Shove, Pantzar and Watson. They define practices as a combination of materials, competences and meanings:

- **Materials** are anything tangible and quantifiable – objects, technologies, raw materials.
- **Competences** are knowledge, experiences and capabilities that individuals have the capacity to exercise.
- Finally, **meanings** are the inanimate – symbolical meanings, ideas, wishes, hopes etc.

(see Shove, Pantzar and Watson 2014: 24)

The authors argue that “practices emerge, persist, shift and disappear when connections between elements of these three types are made, sustained or broken” (2014: 24-25). Ethnographic reports of informant’s life stories, their habits and practices featured in this report are analysed respectively. The catalogue format allows us to highlights universal patterns and case-specific particularities. Each individual catalogue item provides a key of comprising materials, competences and meanings. This enables readers quick orientation with regard to the content and focus of the catalogue item.

Catalogue items indicate contours of practices by a combination of analysis supported with concrete examples from the featuring case studies. They indicate the relations between the material and the social worlds relevant to the topics of energy consumption and renovation. We consider our informants and their homes – including individual elements that make their homes – as parts or segments of wider interconnected socio-technical systems. In this regard, renovation interventions can be understood as change to the existing state of socio-technical systems. With respect to our core interests, these are represented by networks of people, buildings, systems and other animate and inanimate actors that influence aspects of energy consumption and building renovation.

We look at **materials**, such as windows, doors, HVAC systems or insulation materials, and the variety of ways our informants use them – **competences** – in order to achieve what they perceive as **meaningful** results. The socio-cultural implications of their action – on individual, collective or institutional levels – are included in the analysis. We also conceptualize practices that are not directly associated to the materiality of an individual household but focus particularly on renovation as such. In fact, renovation process can be conceptualized as a form of a social practice per se. In this regard, our catalogue can also be understood as analysis of renovation as a complex socio-cultural practice comprised of materials, competences and meanings.

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Our catalogue offers insight into how people use energy in their households. It focuses on elements of practice and strategies people apply in their everyday life with specific attention to aspects of energy consumption. It combines a structured analysis of barriers, drivers, expectations and needs, tending towards simplicity and generalized conclusions. These are contextualized with descriptions of experiences and insights collected on the field. Outcomes are valuable for understanding people’s behaviour and decisions regarding energy use and housing renovation, which can be leveraged in efforts to influence existing socio-technical systems within and beyond the TripleA-reno in pursuit of positive change.

Interactions between humans and buildings

The practices presented below are generally focused on interactions between humans and buildings, not on buildings per se or people as individual users of energy. This aspect was also central to TripleA-reno’s methodology for calculating savings. We are interested neither solely in physical and performance characteristics of buildings nor people as individual energy consumers. Whether building featuring in our research is a state-of-the-art NZe masterpiece or a collapsing Victorian villa is secondary to our analysis. Similarly, we are not interested in individual’s energy consumption beyond the building. If people leave the building using a bicycle, a car, or a train – that is not the focus of our interest. Whatever references we provide that focus on buildings as such or go beyond the building are simply a tool to characterize important aspects of the practices discussed in that particular catalogue item.

What we are interested in is how people use their dwellings, primarily in terms of energy use. Household practices involve a large variety of material elements of practice, including installations, systems, materials, appliances etc. On the other hand, they are nested in multi-layered contexts, including social, cultural, political, market and legislative contexts. That results in considerable differences between individual cases. However, there are also significant similarities, and perhaps most importantly, opportunities for goal oriented intervention aimed at promotion of energy efficient household practices and building renovation.

Our search for efficient and meaningful renovation interventions is ambitious. We recognize and indeed highlight the fact that building renovation is undeniably a social process. Looking at it as a practice, renovation projects are only one of many practices of everyday life. As such they can interfere with other established practices and habits, which can lead to conflicts of interests that ultimately cause difficulties throughout the course of the renovation process.

We analyse recorded attitudes, opinions, motivations, emotions, and habits as particular aspects of practices, which we understand as more general and contextual. We interpret reported individual subjective preferences and skills similarly. We highlight the role of relations between stakeholders involved in renovation project. Furthermore, we try to include considerations of policy, legislative impacts and institutional interventions meaningfully. In search for optimal pathways towards efficient and widespread renovation action, we believe it should be considered as an intervention into socio-technical systems. For this reason we try to go beyond the simplistic narratives of techno-centric interventions or influencing
individual’s attitudes, patterns of behaviour, and beliefs. Besides the obvious techno-centric solutions, that includes a variety of socio-cultural aspects, as well as policy interventions, changes in legislation and investments of political will, promoting change on a larger systematic level.

**Structure of the catalogue**

The catalogue is divided in three main segments. The first segment – *Energy related household practices* – focuses on particular aspects of household daily energy consumption and management. The second segment – *Investments in maintenance and renovation* – focuses on renovation and adaptation measures aimed at improving energy performance of buildings, IEQ and potentially also people’s practices of energy use. The third and final section of the catalogue – *Management and facilitation practices* – focuses on auxiliary practices that support renovation projects and interventions.

Catalogue items are topical bricolages that draw from individual TripleA-reno studies to indicate both commonalities and particularities of practices related with energy use and building renovation. The catalogue is followed by two additional chapters. The chapter *Beyond habits and practices* touches on other particular aspects, that we find relevant in the context of TripleA-reno. Finally, the chapter *Affordability, Attractiveness and Acceptability* offers summarized findings highlighting commonalities with specific focus on the core interest of TripleA-reno project.

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5.1 Energy related household practices

The first section of the catalogue focuses on particular aspects of household daily energy consumption and management. This includes aspects of how people use energy in their households and measures they apply on periodical basis with specific focus to minimize energy consumption and energy spending. Such aspects include use of windows, doors, and systems for cooling or heating. We also look at practices of everyday life, such as clothing, use of appliances, and patterns of presence and absence in the building.

In individual case study reports, several practices or their elements were recognized and reported as failures or negative habits. For example, Nemeth and Magyar report observations by a housing manager from the Hungarian case.

The residents do know how to save energy. Even if they have an adjustable radiator valve, they just open a window if there is warm in the room. They do not feel interested. (Nemeth and Magyar 2019: 7).

There were also positive examples, such as intentional strategies of heating management aimed at reduced energy loss. Finally, some aspects we discuss were not necessarily explicitly expressed but implied, such as clothing practices and many aspects of appliance use. We tend to discuss practices in a neutral manner, focusing on the practices as they are and avoiding notions of right or wrong. As we try to highlight throughout the catalogue, practices can be conscious or subconscious, intentional or unintentional, mindfully practiced or embodied.

As mentioned in the introduction, practices of building use are importantly defined not only by the users’ agency and/or (un)willingness to act in a particular fashion. Practices are largely subject to the user script – particular character and qualities of the building that guide practices of use and simultaneously provide (or restrict) space for improvisation and spontaneity. Buildings’ physical characteristics and design are source of both poor and good energy performance. For example, a large number of (mostly old) buildings suffers constructional imperfections that originate from poor building design. Prati suggests for the Italian case that these can be related to patterns of imperfections that emerged from the general practice of construction in the years when the building was built, describing it a “clumsy’ repetition of a building typology, that at the time had great appeal” (Prati 2019: 9). Another hint at how physical design of the building defines patterns of use comes from the Greek case of student dorms. Foutoupoulou noted “the lack of dedicated bathrooms inside the bedrooms” as a “discomfort element for the students”. This observation is telling in many ways, including highlighting the fact that current practices of living – and significantly energy and water use – are considerably different from what could and might be if rooms would include an on-suit bathroom. This example clearly indicates how physical space arrangement, including presence or absence of particular material elements, influence the practices that emerge among their users.

In this section of the catalogue, we are primarily interested in habits, practices, and strategies that people perceive as their normal way of life and building use. This includes mitigating potential imperfections of the building to a degree that works best for them in the scope of what they can influence. We try to show both the importance of local contexts and wider socio-cultural influences, which go beyond spatial boundaries.
5.1.1 Use of windows and doors

**Materials:** Windows, doors, blinds, and curtains.

**Competences:** Ability to open and close, knowledge and/or ideas of the impact such practices have, hierarchy of priorities (privacy and control over environment above energy efficiency), feeling for management of indoor temperature and light.

**Meanings:** A sense of control over the indoor environment (temperature and light); Aesthetic aspects and experience of indoor environments.

The use of windows and doors is an integral part of energy related practices. It combines a variety of functions. Although the connecting function – connecting the space of home to its external environment – is likely the most obvious one, we look at it from a point of controlling the characteristics of the indoor environment – air quality, temperature, noise etc.

Doors and windows function as a physical barrier for the air, a barrier for noise, as well as a medium or barrier for light. In several cases, informants adapt their routines of using windows and doors depending on the **weather conditions and time of the year.** As Prati reports for one of his informants:

> In the **summer months,** she tries to keep windows closed during the day and opened at night to avoid excessive irradiation and air heating. (Prati 2019: 22)

In **summer** months, as observed in Slovenia (Bančič et al. 2018: 13) and Spain (Sanchis et al. 2019: 17), informants practice opening windows and door in the morning to let the fresh air into their homes, and close before temperatures rises over their desirable level. Use of balcony with the same motive comes from Hungary.

> There is not a specific reason for that, it is their habit. There is natural ventilation in the building and in their flat, therefore they usually open the windows in the mornings and in the evenings, if there is not too cold outside. (Nemeth and Magyar 2019: 12)

For Hungary, Nemeth and Magyar reported a case of a bad household practice, where one informant practices leaving windows open for prolonged periods during daytime in the **winter months.**

> On the site visit it was revealed that the owner keeps open some of the windows practically through the whole heating season, in order to reduce overheating. Opening constantly the windows results higher heating costs, and cause some acoustic complaints, because of the noise of the traffic. (Nemeth and Magyar 9-10)

In addition to higher costs and acoustic complaints, he claims such practices also negatively affect the indoor “thermal comfort”, and supports his claim with data from a monitoring campaign (see Nemeth and Magyar 2019: 4).

In contrast, Sanchis et al. report cases of people **avoiding use of windows** in the living room during the **summer** due to strong “drainage smell coming from the street” (2019: 16). **Another notable factor is proximity to roads with heavy traffic.** Reports from Spain, Slovenia, and Hungary indicate that people are often prompted to avoid use of windows and doors if they are located close to busy streets and other sources...
of noise and pollution. In relation to this, it interesting that people’s complaints over “bad” air more often than not tend to be related with external sources of bad air, such as roads, factories or other apartments within the building, where smoke or other unpleasant smells are produced. Although bad smell is arguably produced in all households – most notably perhaps in the toilet or in the kitchen – there has been few if any reference to that in TripleA-reno reports.

Windows and doors are typically used in combination with other objects and devices, such as blinds, curtains, locking/opening mechanisms (automatic or manual), etc. In relation to windows and doors, these function as attributes and expand the versatility of windows and doors with regard to their most crude functionality, which is a physical barrier. An example from Spain indicates how important these attributes are, especially for households on the ground level.

Ground floor flats are more compelled to install curtains, stores and blinds to be protected from pedestrian sight, thus, reducing natural lightning. (Sanchis et al. 2019: 22)

This example already indicates that using curtains and blinds can have a chain effect, prompting people to use more artificial lighting and thus, use more energy. Sanchis et al. describe another facet of using windows and doors, this time intentionally reducing the amount of natural light but with the same chain-effect.

Loli maintains blinds closed to minimize overheating due to overexposure to sunshine almost the whole day (long SE and SW façades), obscuring the house and being forced to use artificial lights. (Sanchis et al. 2019: 22)

Besides people using more artificial lighting, they also resort to other strategies, such as opening internal windows and doors, which can be seen as a compromise solution.

Trying to solve thermal comfort and avoiding the road windows opening, some flats open their main door, which provokes receiving noise from other neighbours. (Sanchis et al. 2019: 22)

Windows, doors, curtains and blinds are an integral part of the aesthetics of the building and affect the overall experience of comfort in a given space, either directly – with its appearance – or indirectly – by enabling their users a certain level of control of air qualities, noise and light. Physical qualities of windows and doors also impact levels of IEQ and energy use, which can be correlated to quantifiable data from cases where monitoring was introduced.

Another interesting example of windows and doors related practices comes from Spain.

One informant (which finally did not participate in the study) reported broken blinds in the living room windows, which are not to be repaired by the owner, since living room blinds are not mandatory by law. (Sanchis et al. 2019: 22)

It implies not only how important such rather simple practices are in people’s daily lives, which is often made evident once it stops functioning, but also how a set of broken blinds can function as a vehicle for conflict and tension between stakeholders, which too often leads to lack of trust and cooperation. Both aspects were implicitly or explicitly expressed also in Slovenian and Italian cases.
The above relates with the following observation from the Hungarian case. Nemeth and Magyar report about a dysfunctional entrance door to the building. Several of informants described the issue with the door, which could not be properly closed, although they have had them changed in the recent past (Nemeth and Magyar 2019: 9). Recurrent reference to this issue indicates how particular issues can play a disproportionately predominant role in the community’s collective consciousness in contrast to issues that might be considered more relevant (in our case various aspects of poor building qualities).

Another interesting windows-related record comes from Spain. As Sanchis et al. report, a housewife tends to use windows in a particular conjunction with their laundry practices.

She claims they’d need more space (they are 5 people living there, but at this breakfast time, there are other 3 adults with them), and some place for the laundry (if she hangs the laundry outside she often gets her clothes stolen). In fact, she is using one of the bedroom as a storage/laundry room, and is constantly windows-open. (Sanchis et al. 2019: 17)

This example of an overcrowded apartment, practices of space use, laundry practices, practices of windows use, and safety concerns is a good illustration of just how intertwined and complex experience of IEQ and different household practices can be.
5.1.2 Management of systems (heating, cooling, ventilation)

**Materials:** Radiators, electric heaters, air-conditioners, thermostats, valves, thermometers, fans, ventilation shafts, shaft covers and blocks, etc.

**Competences:** Ability to regulate the temperature, knowledge of how to use particular devices and systems to regulate thermal comfort and/or quality of air to impact the IEQ conditions.

**Meanings:** A sense of control, strategy to mitigate the absence of systems or poor physical qualities of the building, comfort, the question of shared and delegated responsibility and related costs.

Besides windows and doors, people use an array of different devices and systems to control conditions of their indoor environment by heating, cooling and ventilating. How they use it depends on a variety of factors and is often intertwined with other practices, such as use of windows and doors and patterns of absence and presence of people in the building. The initial condition for them to use it is — clearly — that they have the ability to do so. To illustrate, let us look at the Greek case.

There are no thermostatic valves or zone thermostats. Moreover, the pipes delivering hot water are not isolated. This decreases the efficiency of the system, as there are high distribution losses from the basement floor across each floor. There is no central air conditioning system, and only few rooms (warden’s room and living room on the ground floor) have autonomous split systems. There is no mechanical ventilation system — only natural ventilation is provided through the external frames. (Prati and Fotopoulou 2020: 5)

The description above tells us that residents of the student dormitory have very limited options to manage their indoor environment by means of heating or cooling systems because there simply are not there. Absence of functional heating and cooling systems, Prati and Fotopoulou report, prompts students to resort to alternative strategies to make their life in the dormitory bearable. They give examples of **portable electric fans and air-conditioners** being used in the hot summer days (2020: 14). In winter months, they report about an increase of both electric heating. They also describe how students **tend to stay indoor** more, in particular in the common area in the ground level of the building. As we know, human bodies release heat. We can take it for a fact that such practice has an impact on the IEQ of the common area. Whether or not this can be understood as a practice of managing the IEQ remains an open question.

**Radiators and valves**

Given there is presence of a heating system within the building, it can take several forms and sizes. They range from portable appliances, such as portable heaters and air-conditioners, to large infrastructures, such as district heating systems. A standard approach to management of thermal comfort within the building is handling of the **radiator valves**. Again, this practice depends on the possibility to actually control it. Nemeth and Magyar report from the Hungarian case:

Unfortunately, there is only theoretical opportunity to adjust the heating system by the old manual radiator valves, because these are very old equipment and does not work properly, so the occupants are not able to control the heating system according to their specific needs. (2019: 6)
He goes on to describe, that certain apartments have installed new radiators with valves that enable control and potential energy savings. However, he observes a different issue.

These are not used either, because of the lack of knowledge that they would save energy if they use them instead of opening the windows. (Nemeth and Magyar 2019: 4).

Knowledge is one of the key elements of all practices listed in this catalogue. In effect, education can be seen as an energy related practice per se, as we indicate in the catalogue item Educating end-users and experts. However, knowledge is not the single golden key to a solution. As Nemeth and Magyar observed in another household, people tend to combine different practices, even if they are sometimes contradicting or irrational. In that particular household people knew how to use radiator valves were to control the indoor temperature and they were using them everywhere except in the living room, where they were used to opening the balcony door instead of closing the radiator valve when the temperature was too high. (2020: 12).

**Ventilation systems**

Another interesting correlation with use of windows and doors is the use of ventilation systems. The Greek case has no ventilation whatsoever while reports from Hungary, Slovenia and Spain describe poorly functional ventilation systems. That has implications in aspects of energy use, comfort and convenience. A typical complaint related to poorly functional ventilation system is bad smell transmitted between flats via ventilation shafts. Such complaints have been made in Hungary, Slovenia and Spain.

The odours flow between the flats through the air duct of the central ventilation system. (Nemeth and Magyar 2019: 9)

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In Slovenian and Spanish cases, **noise complaints** related to ventilation systems have also been voiced.

All our informants report problems with poor ventilation in the bathrooms, which includes noises from other flats. (Sanchis 2020: 22)

Some informants reported problems with poor ventilation in the bathrooms. Part of the complaint is also noises, which you can hear from other flats. (Bančič et al. 2018: 20)

Several households tend to address these issues by not using the shafts, or by blocking the ventilation shafts completely. One of the households from Slovenia commented that simply changing the cover of the ventilation shaft with a new one, most likely including a non-return valve, this made a significant difference both in terms of noise and smells. Several informants also commented that the behaviour of the ventilation shafts, particularly in terms of the odours, tend to be related to the air pressure (morning vs. night; rainy vs. sunny weather).

**Shared heating costs**

Earlier we mentioned district heating infrastructure. Hungarian, Slovenian and Italian buildings are connected to district heating infrastructure. In Hungarian and Italian cases, the heating costs are divided among residents depending on the size of the individual housing unit. This leads to interesting situations, well illustrated with the following case from Italy.

Prati reports a case of an occupant who lives in an apartment with a central position relative to other apartments in the building. The occupant “think[s] to be slightly favoured in the management in relation to the fact that the location of their flat is central in the building block, allowing them to benefit from the heating of near apartments” (2020: 22). Not surprisingly, this individual also described the costs of heating “very expensive” (ibid.) as they are not using it as much directly.

In the Hungarian case, district heating provides for heating and hot water. The cost of heating is divided between flats by the volume of air per apartment. As the allocated shares of monthly cost are fixed, “there is limited motivation to save energy”, Nemeth and Magyar report (2019: 4). One of his informants voiced its opinion about this issue clearly.

It is important to introduce a fair heating cost sharing. She heard about a renovated house in the neighbourhood, where the apartments on the edge have lower savings compared to the flats in the middle of the house. So the middle flat owners pay less energy cost and they are satisfied, but apartment owners on the edge pay more and they are not satisfied with the renovation. (Nemeth and Magyar 2019: 11)

In Slovenia, similar concerns were described by residents retrospectively, because their block of flats has been equipped with heat cost allocators. All of the informants from Bančič et al.’s report claim that this was a positive development, likely because all of them also report paying notably less for heating each month. Interestingly, a similar push for individualised billing of costs in Slovenian case was towards water usage. Individual households already have the possibility to install an individual water meter and pay the water bill by their use. Not all of the informants had it installed, but ones who did report paying less and are happy about it. We discuss more aspects of how metering affects practices in the last catalogue section in the item Monitoring.
5.1.3 Casual household practices of energy consumption

Materials: Appliances used in a variety of household practices, such as laundry, washing, refrigeration and storage, cleaning, etc. Other electronic devices for work, leisure and personal hygiene.

Competences: Ability to use them, knowledge/ideas of use and impact on household energy use.

Meanings: Attitudes related to aspects of comfort, cleanliness and convenience. Meanings – symbolical, social and cultural – related to experiences of having fun, earning a living, aspects of intimacy, privacy and safety, perceptions of living a “descent” life. A spectrum of connotations and associations related to home, family, hobbies, leisure, lifestyles etc.

There are several aspects of casual energy consumption in households – from cooking and cleansing practices to entertainment and work. These practices include the use of electrical appliances, such as refrigerators, cooking stoves, laundry machines, entertainment devices etc. Studies have shown that household energy consumption, household work, as well as the individual and collective experience of space, is largely cultural\textsuperscript{25}. That implies potential for meaningful systematic intervention into patterns of household energy consumption and individual lifestyles.

Interestingly, little to no reference have been made in the individual case-study reports in relation to washing, cleaning, cooking and preservation of food and other typical household practices. This is somewhat surprising since modern households can hardly be imagined without appliances that facilitate these practices. Quite literally all of them have an impact on household energy use, which has implications for potential energy saving. Nonetheless, given the specific focus of TripleA-reno, which are the practices and contexts of building renovation, it is understandable that aspects of household energy use that are important but typically not directly associated with housing renovation have not been widely discussed.

A couple of references regarding casual household energy use were described in the Hungarian report. Nemeth and Magyar pointed out a couple of strategies of household appliance use. For example, one of the informants told him that they have installed energy efficient “compact fluorescent lamps”, a refrigerator, and washing machine to reduce energy consumption. They have also believed to have minimal water consumption due to the fact that they have a shower instead of a bathtub. A rare but important reference was also given to the practices of cleaning the household, which is undoubtedly related to the experience of IEQ of space but is difficult to account for by standard IEQ monitoring measures.

“As for the question how to improve the indoor air quality, she answered that she regularly cleans the apartment.” (Nemeth and Magyar 2019:10)

Another interesting example was observed in Spain, where lightbulbs were removed from some corridors to avoid “unnecessary” energy use.

Many informants try to minimize the use of electric light, and even have disconnected it (no bulbs) in distributors and corridors, for energy (money) saving. From a visitor point of view, this results in obscure flats. (Sanchis 2020: 22)

Clearly, there are other important energy-reliant casual household practices that happen daily or periodically across all of the households included in our study. As said, TripleA-reno case-studies have few such references. Most likely because they are typically not directly associated to the topic of renovation. Without sufficient attention to integration of a variety of measures, we can arguably foresee little change in relation to already established casual household practices. For that reason, and on the basis of our field experience, we suggest that there is potential to enhance the impact of renovation by clearly demonstrating potential correlations with the household practices, which are part of people’s daily routines and in most cases also the source of meaning and positive emotions.

A renovation – large-scale intervention into living and working space – has measurable impacts not only on the IEQ. It has a visual, tacit, and potential symbolical impact on the beneficiaries of the renovation. Combined with measures, that promote positive change with regard to practices that the beneficiaries find meaningful, has a significant potential to promote energy efficient practices and lifestyles. Combined with competence-building activities and material elements, new practices and habits can be developed to support longevity of the change. Such interventions range from simple awareness-building stickers, to smart meters and finally policy interventions, such as higher prices and taxes, change in waste (water) management, incentives to opt for environmentally responsible energy sources etc. These interventions are not necessarily the centrepiece of TripleA-reno project, however, results of our research certainly do have implications for further research and development beyond its targets.
5.1.4 Clothing practices

Materials: Clothes, blankets etc.

Competences: Knowledge of clothing strategies and impact of indoor temperatures on health, feeling for balance between heating and applying layers of clothing

Meanings: Comfort, convenience; subjective nature of needs and experiencing the indoor environment

As with Casual household practices, clothing practices have been poorly recorded in TripleA-reno case studies. In contrast with the majority of casual practices, clothing practices can directly influence the experience of thermal comfort. That indicates a particular relation with practices of management of heating and ventilation. To a certain degree, the relation of clothing and heating/cooling practices can be described in terms of cause and effect. By that we mean that turning on a heating device can prompt people to take off an extra layer of clothing. Similarly, putting on an extra layer of clothing can prompt them to turn off/down the heating.

Some accounts have been provided from the field, that people adopt different levels of clothing depending on the temperature. There are differences of course between women and men, on the scales of age, lifestyles, preferences etc. In addition, it is important to note that clothing practices – just as much as casual daily practices of energy use – are a largely part of socio-cultural patterns and individual lifestyles. Hence, they are subject to both spontaneous or targeted change. Clothing practices are therefore an excellent example of just how important symbolic meanings and purpose is in our daily lives. In the same day – even in the same weather conditions – an individual can change most of their clothes various times, depending on the activity, people and location she is interacting with.
5.1.5 Patterns of presence and absence

**Materials:** Alternative place of presence (office, weekend houses, public space, nature etc.). Means of transportation.

**Competences:** Ability to move from at will. Knowledge of impact active absence from the household has on energy use, the relations (balance) between necessity and possibility. Work policies. Socio-cultural patterns of movement through space.

**Meanings:** Social, cultural and individuals’ meanings attached to the physical space of living and working. Conceptions of space-related boundaries and rituals.

When thinking of energy consumption in buildings it is impossible to ignore the impact of absence and presence of building user(s), which in case of TripleA-reno are predominantly household members. It is, however, hard to conceptualize it as a practice without considering a broader context. This context is materially best referred to as alternative space of presence, and perhaps means of transportation. Although such perspective can be said to be beyond the scope of TripleA-reno, we believe it offers valuable insight related to the specific needs of our project.

Diverse practices of daily living obviously have an impact on the energy use of a housing unit. How much time individuals spend within their apartments varies a lot depending on their lifestyles and contexts. Clearly, there is also an obvious correlation between physical presence of building users and energy consumption within households. The Greek case presents an account of how prolonged absence from the dormitories affects the energy use in December, when students go home to their families to celebrate Christmas (2020: 14). In contrast, Prati reports of an informant claiming their household installed air conditioning because members of the household spend most of their times indoors (see 2020: 22). It is not clearly stated whether they would not install it, if they would be spending less time indoors. Nonetheless, such observation supports our claim that patterns of presence in the buildings – at declarative levels at the least – are a factor of energy use and potential motivation for building renovation.

Household’s energy consumption tends to have patterns of energy consumption, reflecting the lifestyle, practices and habits of their inhabitants. Household whose members tend to spend longer hours at home tend to have higher energy consumption per capita than ones whose members tend to spend long periods of time out of their house or apartment. Even factors, such as television programmes and associated patterns of electric kettle use can influence the patterns of energy use significantly. Clearly, patterns can only be clearly indicated when monitored and compared on a long timeframe. That is also indicated with our Greek study, where Prati and Fotopoulou report high levels energy consumption summer months in spite large absence of students from the campus. They claim autonomous HVAC systems are likely a key element influencing gross energy consumption in this case.

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Greek report noted another interesting pattern. In winter months, students tend to stay indoor more and particularly in the common area – the living room – on the ground floor (Prati and Fotopoulou 2020: 12). Their observation also indicates a correlation between the frequency of social activity in spaces with more favourable temperatures. In other words, although there are common areas in other parts of the building, people tend to flock together into one space, one that has more favourable IEQ conditions than others. This behaviour should be further researched to provide better grounds for conclusions. Nonetheless, it indicates that people under certain conditions choose to gather in particular spaces. Prati and Fotopoulou correlate this behaviour to the fact, that ground floor in general tends to have the highest level of thermal stability and comfort in the building. Whether there other contextual factors (e.g. convenience), that propagate such behaviour, remains an open question.
5.2 Investments in maintenance and renovation

If the first section of the catalogue was focused mostly on practices of everyday life, the following two sections focus more on the specific periods of building renovation and maintenance. People invest into their home in order to maintain a certain level of comfort and quality of life. We encountered elements of renovation and maintenance in all featuring case-studies, no matter what the social and financial backgrounds of our informants were. The size, cost and approach to the interventions, however, varied substantially.

When considering energy performance of buildings and IEQ, people have the following options:

- do nothing and leave the building to degrade with time,
- strive to maintain the existing condition (status quo),
- pursue improvement by changing practices of daily use,
- or pursue improvement by changing building’s physical and technical characteristics.

Analysing the why and how of people’s decisions and actions enables better understanding of complex realities of people’s everyday lives. General conclusions are presented in the chapter Affordability, Attractiveness and Acceptability while this section of the catalogue is focused specifically on how individuals pursue improvement by investing in change of building’s physical and technical properties. In addition, we look at some aspects of why they avoid investments.

Considerations regarding investments into building renovation largely revolve around finances, materials, technologies and systems. Finances are most closely associated to the notion of investments.

Residents find investments in renovation projects attractive due to long-term savings expectations. (Prati 2020: 27)

However, it is important to understand that the notion goes beyond finances and includes aspect of time, effort and emotion. Health and wellbeing are often voiced as key considerations.

One of the primary considerations for supporting a renovation is an improvement of the IEQ aspects of their homes – thermal comfort, sound, air quality and light – and therefore their family health and wellbeing conditions. This is especially true in our case, where some informants have reported respiratory illnesses or thermal and odour problems. (Sanchis et al. 2019: 25)

It also requires contextual considerations, such as availability of materials, knowledge, competent workforce, infrastructures etc. It also includes legislative restrictions, and socio-cultural aspects, such as self-build and DIY cultures, traditional building practices etc. Our research suggests, that besides the prospect of financial savings, people pursue renovation for the sense of improvement of the existing condition in which they live. What is more, the manner of how they do renovation is closely connected to a sense of control, which is why often people are prompted to do (or at least plan to do) DIY renovation.

An important aspect of investments is also knowledge and education. People are more likely to find renovation projects acceptable if they are well informed and educated about the key aspects of the project.
– technical, financial and practical. Similarly, they are more likely to find it acceptable if they have a sense of trust and confidence in the community of stakeholders involved in the project. These aspects are discussed in detail in the catalogue section Associated practices, but here is a short illustration from the Italian case.

The mere presentation of the main project topics in a location where the majority of the tenants were involved (the focus group) has strongly contributed to making the perspective of renovating more acceptable. (Prati 2019: 28)

It is not always possible or even sensible to invest in building renovation. Conditions and rationale behind the decision-making can be based on financial, practical (technical), or contextual factors. Among those, finances seemed to occupy the most prominent position in the cognitive landscape of most of our informants. Building renovation projects were repeatedly described as expensive, and insufficient funds has been repeatedly pointed out as one of the key challenges for deep renovations. Lack of systematic government support or innovative business/financial models were often blamed for lack of interest for renovation.

Nonetheless, solutions do exist. An interesting case of innovative business model comes from Hungary. Nemeth and Magyar reported observations by a building manager from Hungary managing a building that had undergone successful renovation in collaboration between a telecommunication company and the resident community.

On one hand, one part of the common cost has been added to the renovation fund of the house. On the other hand, the house has some annual income, because a telecommunication company hires some part of the roof for placing its telecommunication equipment. (Nemeth and Magyar 2019: 8)

Collaborations between private businesses and communities certainly have a potential to develop innovative business models and improve affordability and acceptance of renovation for the residents.

Beyond finances, technical and contextual issues proved to be just as obstructive, or rather, influential. An example is availability of infrastructures, such as district heating, electricity, natural gas, sewage and water supply. In pursuit of improved IEQ and building performance, presence or absence of these infrastructures substantially affects and defines the scope of possibilities (or potential necessities) for renovation interventions. Furthermore, presence or absence of systems – ventilation, heating, etc. – and the building’s (structural) capacity for functional intervention also sets the stage for renovation.

A strong argument for deep renovation is that housing elements (or individual housing units) of a single building are essentially indivisibly connected. Various examples of poor results of partial renovations presented in this catalogue item show why holistic deep renovation is the ultimate approach towards an overall people-centred indoor environment and building performance. Poor practices are also often connected to insufficient knowledge or poor quality materials. Here is an indication of that reported from Spain.

The future of energy efficient public housing stock relays on integral programs including educational features for tenants; and robust, standardized materials and techniques enabling scaled interventions which lower
prices, introduced component by component when minimum habitability requirements fail (stability, tightness, humidity...). (Sanchis et al. 2019: 13)

Beyond the focus on technical and practical aspects of renovation, we realize that renovation is essentially a social process. That is most obvious in blocks of flats and other cases involving several households and potentially complex ownership-management structure. In these cases, consensus building, decision-making, negotiations, conflicts, and other non-technical and non-practical aspects often prove to be the main challenge for investments into renovation. To illustrate, here are two short examples from Slovenia and Spain that speak for themselves.

People find it unacceptable if they feel someone involved in the project has illegitimate benefits from it. Cases of corruption and possible frauds are a major source of frustration especially for the housing community. (Bančič et al. 2018: 26)

In public owned residential buildings under social renting regimes, decisions rely on the corresponding public housing association. They are involved with very low-income occupants and many buildings, and have to act under the equality principle. Hence, a deep research on the most optimal solutions, adaptable to the different buildings and offering similar benefits to all the occupants, with a minimum maintenance level is needed, which requires a lot of work, time and resources. (Sanchis et al. 2019: 15)

Other important considerations regarding investments, which we discuss further in this chapter, include:

- the tension between the demand for simplicity on the side of the non-experts and the inherent complexity of renovation related topics on the expert side,
- choosing a trustworthy and reliable contractor for the renovation,
- ensuring good quality control,
- understanding individual interests and potential conflicts between the stakeholders,
- the need for reliable guarantees and agreements should be put in place in order to distribute responsibilities adequately among the stakeholders and ensure resilience of the project.
5.2.1 Building envelope renovation

**Materials:** Finances, time (as currency), relevant materials, tools and technologies – insulation materials, paints, tiles, windows, doors, necessary tools etc.

**Competences:** Knowledge of possible intervention and potential benefits. Knowledge, skills and experience of building for DIY interventions. Ability to contract (trustworthy) experts and contractors.


All TripleA-reno case-studies have reported some sort of planned investment into maintenance or renovation of the building envelope, the only notable exception being the Greek case. These ranged from simple DIY pursuits, such as painting or tiling, to bigger investments, such as cavity wall insulation or replacement of windows and doors. Reasons for these investments depend on a range of factors – health and wellbeing, aesthetics, potential long-term savings, improved IEQ, etc.

Investments into building envelope insulation are among the most (stereo)typical measures to improve building’s energy performance. However, as Savelsberg and van Nunen note, investments are always possible, but they can prove to be difficult for many people – which is to say unattractive, unacceptable or unaffordable – either for financial or practical reasons. In this regard, it is perhaps not a surprise that our research has one single record of complete insulation project. From the Netherlands, Savelsberg and van Nunen reported their informant decided for cavity wall insulation in the past 10 year period before the research.

Other reports mentioned partial external and internal wall insulation investments. In the Italian case, partial external wall insulation practice has been reported. Prati describes it as a measure taken primarily to mitigate the issue of deteriorating exterior wall. The tangible and positive side effect, mentioned by the informants, was also improved IEQ (Prati 2019: 22). In addition, Prati points out, that such a measure “created a partial interest of the other residents who therefore consider it important to act on the performance of the walls to reduce consumption” (Prati 2019: 26). In Slovenia, one unheated attic insulation attempt has been reported, where a tenant tried to insulate the ceiling of their rooftop apartment by simply laying a layer of rock-wool insulation on the attic floor area above their apartment (see Figure 18; Bančič et al. 2018: 14).
Again from Italy, Prati reports of several cases of **internal wall insulation**.

Light internal insulation has been realized in order to reduce the heating costs while giving up part of the internal living surface. (Prati 2019: 20).

Prati also reports an interesting strategy of internal segmentation of space applied by one of the households, which “closed the upper part of the stairwell with the insertion of an insulated internal false ceiling to reduce heat loss and the heated air volume” (2020: 26). A somewhat similar strategy, although requiring no particular investment and could be understood as a practice of management heating, was reported from Slovenia, were some informants described how in addition to turning off the radiators they intentionally shut-out segments of their apartments by closing doors in order to reduce the total heating volume of air. Other similar but simple measures, such as putting reflection foil on the wall behind the radiators, were reported from Italy, Slovenia and contextually from The Netherlands.

Most reports also give reference of renovation or complete **substitution of windows and doors**. This practice combines several aspects – better thermal insulationand visual appeal.

Renovating the energy production system and improving the tightness of the windows and doors is perceived as essential to achieve acceptable internal well-being while containing costs. (Prati 2019: 26)

It is well established that this measure can significantly improve the overall performance of the building and several aspects of IEQ, which our fieldwork results confirm. Nemeth and Magyar provide some technical specifications from the Hungarian case, where the measured performance of new windows was notably better compared to the old ones.

The thermal transmittance of the old windows is about $U=2.6 \text{ W/m}^2\text{K}$, the new windows is $U=1.3 \text{ W/m}^2\text{K}$. (Nemeth and Magyar 2019: 6)

In Hungarian, Italian and Slovenian cases, most of the building’s windows were reported being changed. In the Dutch case, all of the windows were changed, while in Spanish case fewer such references were made. The vast majority decided to install PVC framed double or triple glazed windows to exchange the old, typically wooden framed ones. An exception was reported from Slovenia, where an informant decided to install new wooden-framed windows purely out of personal preference. Finally, a noteworthy window-related investment comes from Italy, where Prati reports of installing additional external windows on one of the facades as an attempt to mitigate rain exposure and resulting moisture problem (see Prati 2019: 19).

As most of the window changing and renovation was done by the residents themselves, a certain level of variety in **aesthetic appearance** of the building appeared, best illustrated with the Slovenian case. Bančič et al. report an anecdote regarding colour of the window frames shared by his informants.

Several informants pointed out the colour mismatch of the block’s widows and commented on it as a disgrace. When people started to install new windows, they for a while tried to mimic the original brown colour. Then the municipality installed cheaper white windows in some of the flats. After that, everyone installed windows of whichever colour they wanted. (Bančič et al. 2018: 22)
The point here is that the municipality broke their own rule of requiring residents to install frames that mimic the wooden colour of original windows to preserve aesthetic consistency of the building’s appearance. After the first residents had changed the windows, complying with the rule and paying a relatively larger amount of money for painting the originally white PVC window frames in the original colour, the municipality installed new white-coloured windows in apartments it owned in the building. As one would expect, that created tension between the residents and the municipality.

Aesthetics appeared as an important aspect of renovation several times in our research.

Individuals sometimes find outer appearance of their building more important than any other reason. This could also be interpreted as a function of public appearance and conformation with the social standards. (Bančič et al. 2018: 24)

The case of windows reported above also implies how important the aspect is not only of the level of an individual, an individual household, or the housing community. The aesthetic appearance of buildings and infrastructure is in fact a wider aspect that concerns the visual landscape and identity of villages, cities and indeed entire regions. It is often considered part of the cultural, social and architectural heritage. Protection of architectural heritage is often regulated and protected by legislation, which can give rise to conflicts of interests and present an obstacle for renovation.

In practice, regulation does not always prove to be very strict. In Slovenian case, the municipality of Zagorje has clearly acted inconsistently with regard to the principle of maintaining the integrity of the building’s appearance, which it has imposed on the residents. It has also decided not to intervene and try to stop the community of residents from pursuing the renovation of the building, even though the building – with its typical brick façade – was part of the city’s architectural identity. Judging on the comments of Bančič et al.’s informants, it has consciously acted in the best interest of the building community although such developments are not in line with the municipality’s interests for maintaining the city’s landscape identity.

On a different note, many measures reported in the case studies were done by the residents themselves in a Do It Yourself (DIY) manner. Several strategies to mitigate the issues of poor built quality have been reported from Spain. (Re)painting walls is one of them.

All our informants have multiple times painted bedrooms near bathrooms and sealed toilets, baths, lavatories and drainages to hide stains and mould, which persistently reappears. (Sanchis et al. 2019: 22)

On a more specific note, application of impermeable painting in combination with installation of AC has been reported (see Sanchis et al. 2019: 17) as an attempt to mitigate problems with moisture and mould. Another commonly used strategy is laying tiles.

Many informants have replaced or relocated kitchen tiles near bathrooms. (Sanchis et al 2020: 22)

Most of the insulation attempts referenced in this catalogue item have also been done in a DIY manner. However, the nature of most DIY measures related to investments into building envelope recorded in our research tend to be rather small-scale and of superficial nature.
DIY approaches have to be taken into account when trying to understand why people invest or avoid investments. They reflect both the socio-cultural and socio-economic patterns of a specific region, nation or community. In Slovenia, for example, self-build culture is widespread and deeply rooted in the culture, including different aspects of DIY maintenance and repairs. Understanding DIY approaches have valuable implications for understanding why and how people approach the act of renovation in all its complexity. Besides the obvious financial considerations, the notion of trust and trustworthy contractors is certainly central.

The renovation will be acceptable if there is a good contractor, which has good references, gives appropriate guarantee for its work and provides clear schedule for the renovation process. (Nemeth and Magyar 2019: 4)

Consideration of trustworthy contractors and DIY interventions imply a sense of control over the situation. In a sense it indicates that, if there is no one who knows how to do it properly (and affordably), it is better to do it yourself or not do it at all. Nemeth and Magyar reported a comment by one of his informants, which shows where distrust towards contractors originates from.

The openings of the staircases were changed by non-professionals, and therefore the entrance doors cannot be locked properly. (Nemeth and Magyar 2019: 11)

Inclined to do the work on their own, individuals often postpone the renovation (investment) into the unspecified future, which often results in deteriorating conditions of buildings and its elements, gradually worsening IEQ and higher costs on the long run.
5.2.2 Investments in systems and devices

**Materials:** HVAC systems (air conditioning, heat pumps, recuperation, heating etc.), smart meters etc.

**Competences:** Knowledge of potential benefits and ability to invest. Knowledge of use.

**Meanings:** A sense of control; A sense of improvement in living standard; A sense of improved health and wellbeing conditions of the housing; Prospect of long-term savings; The feeling of being part of a larger progressive agenda; Health and safety implications especially with regard to children.

Besides investments into improvement of the building’s envelope, several investments in technological and technical solutions have been reported. These include investment into air-conditioning (AC) devices, heating devices and systems, recuperation systems, heat pumps, smart meters etc. We can also include investments into (new) furniture and appliances, as they often have indirect impact on several aspects of IEQ and experience of space as well as people’s household practices and energy use.

Investments into AC machine have been among most frequently mentioned. For example, AC installation was the only mentioning of investments prior to the planned renovation in the Greek case-study. It was done by the university and it included the common room and the security guard’s office in the ground floor of the building. Many other reports of residents and informants installing AC before TripleA-reno research come from Italy and Slovenia.

Such investment is also reported from Spain. Sanchis et al. report that decision for investment into AC has been taken because the children’s room was described as being “too hot” (2019: 16). This reference has a particular significance because it comes from a financially poor household. They prioritised the investment into AC over renovation of the kitchen, where they were experiencing issues with moisture and falling tiles. The household clearly needs to invest into renovation there, but as Sanchis et al. reports, “they can not because of their economic situation” (2019: 16).

We do not suggest, that the AC was less necessary, but this case indicates that children – as well as plants, and pets – prompt their caretakers to actively consider and pursue invest(ments) into systems as well as support renovation in their local communities or even campaign for it with responsible institutions.

Younger generations (with little children) tend to be more inclined to do the effort, on behalf of the better IEQ/ health conditions for their children, while older generations tend to move the responsibility to their grownup children. (Sanchis et al. 2019: 23)

Such observations are just another indication of the fact, that renovations – including the specific aspect of investments – are essentially a social process.

Another Spanish household decided for investment into AC following slightly different reasoning, reflecting more the location and orientation of the apartment rather than its occupants.

Bárbara installed air conditioning because she cannot open the windows because of the road drainage smell and traffic noise. She is forced to maintain the lights on because of the obscurity that this provokes, and also her PM values are higher than in the other flats, since cross-ventilation is cancelled. (Sanchis et al. 2019: 22)
Orientation – as an important contextual factor – proved to be among the key factors in deciding for investments also in Italy and Slovenia. In Slovenian case, the apartments in the block of flats with less exposure to daily sunlight - facing N-NE-E – were much less likely to invest into AC than flats with direct daylight exposure – facing S-SW-W.

Nadia and Bogdan [N-NE facing apartments] do not have an AC installed in their flat and say they do not need them. In contrast, Zmago, Matjaž and Anton [S-SW-W facing apartments] say that summers without AC can be "unbearable". (Bančič et al. 2018: 19)

However, as indicated in the example from Spain, contextual factors related with the orientation of apartments and buildings include not only aspects of exposure to daily sunlight, but exposure to noise (e.g. busy roads, factories, supermarkets), smells and other factors.

Details that are not indirectly connected to energy performance of buildings, such as colour of windows, are often if not always part of the decision-making process. Another such aspect is safety. As nicely illustrated by Savelsberg and van Nunen, people not only take these aspects into consideration with regard to acceptability and attractiveness, but are even willing to pay more money, if they can afford to.

If other qualities are improved as well, people are willing to pay more. For example better locks and more safety could be a reason to install new windows (instead of insulation and energy related reasons). (Savelsberg and van nunen 2019)

From Hungary, Nemeth and Magyar highlighted the need for investment into holistic renovation of the heating system paired with a change in dividing the costs. He emphasized the need to enable control over heating within individual dwellings (Nemeth and Magyar 2019: 4). He also makes note of some apartments, where the residents have replaced old (RADAL) radiators with new (steel plate) radiators equipped with new valves (Nemeth and Magyar 2019: 6).

Finally, the Dutch report focuses on investment into high temperature heat pumps.

We are experimenting with High temperature heat pumps. Their performance is less than a regular heat pump, but all other parts of the building can be left intact. In due time further optimisation of roof and facade are possible. (Savelsberg and van Nunen)

Savelsberg and van Nunen report installation of the heat pump in their case as a logical step. The owner of the house decided for a gradual renovation process of making the building more energy efficient, effectively transitioning from heating powered by natural gas to electricity by installation of air-to-water heat pump. As indicated above, this approach is particularly convenient because of minimal intervention and disruption of household’s everyday life. It enables utilisation of the existing heating installations in the house. This means minimal physical intervention and disruption of life, or as described by Savelsberg and van Nunen, “the breaking out of floors, pipes, radiators, stucco and paint work is no longer necessary”.

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5.2.3 Absence of investment

**Materials:** Short-term savings on time and money (currency), building as is.

**Competences:** Ability to externalize responsibilities; assessing balance between needs, wants and possibilities.

**Meanings:** Sense of control; The feeling of being satisfied with or indifferent towards the existing condition and the future of the building.

After looking at some examples of investments, we now look also at some examples of absence or active avoidance of investment. Focusing on absence of investments helps us understand the complexity of the decision-making process. It does not have the same character as other catalogue items, because there is no actual material elements around which these practices would exist. We could argue it exists around the absence of those material elements, or perhaps around short-term savings of time and money. Similarly, it exists around the feelings of control, certainty and contentment that comes with maintaining status quo and avoiding the disturbances of everyday life. Renovation and change requires commitment and responsibility, which is what people often tend to avoid.

The Greek case illustrates the aspect of time and temporality, which is most relevant in cases where users and tenants use or live in buildings on a temporary basis. The Greek case is special in comparison with other TripleA-reno cases because it is the only report which provides no reference related to residents’ investments into housing envelope or systems. Prati and Fotopoulou clearly indicate that the building is “relatively vulnerable to outdoor conditions, mainly due to insufficient thermal insulation” (2020: 16) and suggests that investment into building envelope indeed is the primary necessary measure for improvement of the current condition. However, it is not surprising that student residents seemed to have taken no action in this regard. They are temporary residents and have little to no agency regarding potential investments. We can assume with substantial certainty that they have similarly little motivation to pursue it. Why the university – absent owner and manager – did not invest into renovation earlier is open to question.

A different aspect of temporality is provided by Bančič et al. with regard to the process of renovation as such.

Such projects require individuals to invest efforts and time into realising it. An informant who was involved with one of the successful renovations retrospectively stated that he would not have invested himself so much in the project if he would have known how much trouble it will be. Similarly, some of our informants from the renovation initiative state that if it would not have already been such an investment of time and effort for them by this point, they would have gladly decline their active involvement. (Bančič et al. 2018: 25)

This can be interpreted as a particular aspect of disruption of everyday life, which is a common reason for avoiding investment. Nemeth and Magyar provide us with several opinions by his informants regarding how long the renovation should take place. These range from two to five months for external works (or total renovation) and from one day to two weeks regarding indoor works. Bančič et al. provide a comment based on the Slovenian case.
One of the major reasons that renders such projects unattractive is the disruption of everyday life. It forces people to make adjustments to their everyday routines, sometimes for extended periods of time. It also involves unwanted yet inevitable noise and dirt. (Bančič et al. 2018: 25)

Other closely related reasons for avoidance include **prospects of technical complications and concerns** regarding quality work of contractors, both implicating the possibility of prolonged renovation processes, higher costs, and ultimately a very unpleasant disruption of everyday life. On a slightly different note, reports also voiced negative attitudes related to the aesthetic impact of renovation. That suggests that people will actively avoid investments and oppose renovations if they find the change in building’s appearance a negative effect, which in comparison to other aspects mentioned above is permanent rather than bound to the period of renovation. With all these reasons it is not surprising that many consider avoiding investments into renovation as a better option.

In this regard, asking what is **the price and result of inaction** can be a valuable counterbalance. Fact is that buildings require at least constant maintenance to mitigate the deterioration from its elements. The Greek case is an example where few or too little maintenance has been exercised. That is clearly indicated by reports of deteriorating aging pipelines and poor drainage systems and their effects on the structural qualities of the building (see Prati and Fotopoulou 2020: 16 - 17) and even flooding of the basement. Similar reports come from Almoradi in Spain, where the buildings are located directly above a dysfunctional sewage system. As a result, informants complained about severe moisture problems, odours and even bug infestations.

An **argument for absence of renovation**, or perhaps temporary postponement, is provided by Prati. He presents the following comment by building expert and manager:

Renovation projects with scarce resources or insufficient projects have often resulted in sub-standard projects that have proved to be long-term failures. (Prati 2019: 16)

That suggest that the practice of avoiding investment, or to be more specific, postponing investments can be a reasonable move. How long and to what extent it is reasonable is another question, as well as what kind of measures are taken to avoid deterioration of the building during this period. From the Netherlands, Savelsberg and van Nunen report their approach to communicating importance of renovation and building maintenance to people.

The acceptability increase when people get a independent masterclass about sustainability. The overall message was: you have to do something, but save money so you can renovate in 15 years is also doing something. (Savelsberg and van nunen 2019)

As it often turns out, institutions – and sometimes individual investors – postpone such investments waiting for a **moment that gives legitimacy to decide for investment**. From our research we conclude, that this is often until some sort of systematic (financial) support is enabled by the local, regional or state authorities, until the pressure from the residents’ side is too big, or until the condition of the building deteriorates to a point which is no longer tolerable.
That is illustrated by the Italian case, which suggests that the motivation for the management of housing to decide for the renovation was a combination of “tenants’ pressing requests” and “access to regional and national funding” (Prati 2019: 15). It is only logical, that renovation is not possible without funding, however, the absence of simple top-down funding schemes may present an excuse for intermediary authority to dismiss responsibilities and disregard the actual difficulties people experience in their everyday life.

People that suffer most from the lack of systematic support for building renovation and improvement are members energy-poor households, which are households that struggle with bills for energy (particularly heating and cooling) and also cannot afford to invest large sums of money towards improving the energy efficiency of their property. Such is the case in Spain, where Sanchis et al. report a paradoxical situation they encountered in the field talking to their informants.

Renovations are considered expenses out of reach, involving not affordable investments, and therefore responsibility is put into the owner side. They prefer to pay a higher monthly energy bill than to invest a bigger amount that they have to pay in one payment (they have no financing access). (Sanchis et al. 2019: 19)

Effectively, these people will pay more on the long run than they would have if they would have invested into renovation. Yet again, for some there is no other way. Such paradoxical pattern, reffered to as energy poverty, is typical with financially unstable and poor households. As indicated in the example above, people are not able to afford a large one-off investment and often also do not have the capacity to understand the financial logic behind it. In addition, such households, often disillusioned by the society they live in, can show considerable levels of distrust and protectionism, which only worsens the situation.

Sanchis et al. understand affordability as a form of a barrier (2019: 24), claiming it is not a factor of attractiveness but acceptability of renovation projects. Bančič et al.’s observations support such conclusions.

For some, the initial costs of renovation outweighs the prospects of future savings. Specific reasons are poor household financial incomes, possibilities for inefficient realisation of the project, and seemingly overly expensive materials or solutions. (Bančič et al. 2018: 16)

There clearly is a strong relation between the perception of time and the capacity to invest. Some people might not find it economically sensible – attractive – to invest because of their temporal residency/use of the building, such as in the Greek case. Other simply cannot afford an investment, because of insufficient funds.

Long-term savings are out of scope of our community. If they are to invest the little money they have, they need to feel immediate results. (Sanchis et al. 2019: 23)

Sanchis et al. go on to point out that in the Spanish case “renovation is not seen as a disturbance, but a necessity” (Sanchis et al. 2019: 19). They support that by the following observation.

All of our informants are wiling to renovate, even when they cannot afford it. (Sanchis et al. 2019: 22)

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That paints a contrasting picture to the established worldview and attitudes of financially strong households, who – implicitly or explicitly – perceive housing renovation as a sort of investment, luxury, part of lifestyle, or even symbolic expression of their socio-political identity. In case of several people, especially in the Spanish case, the conditions of the housing were so poor, that renovation was necessary for reasons, such as health and wellbeing, rather than comfort, convenience, an act of wise long-term economic investment etc. Also, they point out how this can result in higher expenses in the long term, saying that:

> Occupants try to improve IEQ by short-term small investments (low quality or low performance improvements) which in long-term can result in more expensive energy bills, maintenance costs or need for replacement (and re-investment). (Sanchis et al. 2019: 22)

The context of social status and financial capacity of households has an obvious impact on decision making. In case of Spain, housing management has been reported to refrain from deep renovation because of unstable social status of their tenants and the urgency of providing housing – two largely contradicting but closely related reasons. As Sanchis et al. report the housing company’s view, it did not seem sensible to invest into “deep renovation” of apartments because tenants do not adequately maintain them. On the other hand, they do not want to evict the tenants, as for many families these apartments are their last resort (see Sanchis et al. 2019: 14). Some related aspects were observed also in the Italian case, which is also dealing with social housing.

In contrast, the Slovenian, Hungarian and particularly Dutch cases were less concerned with such issues, because the socio-economical context of the residents was much better. Here is remark by Savelsberg and van Nunen.

> The high temperature heat pump is not as affordable on its own, but because it can be placed without insulation of the house, the overall measure is more affordable. (Savelsberg and van nunen 2019)

It is a completely logical remark, reflecting the pragmatic reasoning by the standards and norm of a middle-class household. We should point out, however, that affordability, attractiveness and acceptability can be entirely different categories depending on the specific socio-economic context we are dealing with. Generalizations regarding energy use and renovation similarly focus on standards and norms of middle-class households and have limited value without sensible contextualization. Finally, it is worth pointing out that anomalies to these generalizations appear not only in the spectrum of the lower-income households. Paradoxically, when money is not an issue, considerations of needs in relation to energy consumption and IEQ can be just as difficult in the spectrum of high-income households, but for different reasons and aspects, including luxury, social status, energy intensive lifestyles, exercising individual freedoms etc.

Last but certainly not least, it is important to emphasize the importance of relations between the stakeholders involved in renovations. It is not uncommon that some individuals decline their support of a project because of “personal reasons”, which in practice often take form of resentments they have against other people involved in the project who promotes or actively supports renovation. Such cases can have no objective or rational relation with arguments against the renovation. To illustrate, here is Bančič’s summary...
of an experience shared by an informant, who was a key figure in a successful renovation of a block of flats in Zagorje.

Simon says that he was privileged in this respect. Many people knew about him before the project started because he is a visible and active member of the town’s community in general. As a new member of his housing community he was able to somehow mediate some of the conflicting relationships within the community and gain everyone’s support for the project. He notes, however, that he would most likely not be able to do that today, because there are some individuals in the community who started to resent him certain decisions he supported as a member of the housing committee. He notes that conflicts and resentments within such small communities are inevitable, even if not provoked. (Bančič et al. 2018: 11)
5.3 Management and facilitation practices

In the following section of the report, we focus on practices associated with management and facilitation of renovation projects. In other words, we are focusing on aspects of communicating renovation projects to the end users meaningfully. This includes aspects of education, exchange of experience and knowledge, practices of research intervention, monitoring, and community building. It emerged from our research repeatedly that these aspects are worthy of attention for optimization of efficiency and impact of renovation projects.

In the first catalogue item, we discuss aspects of education. As stated by Sanchis et al., “informed decisions influence habits and practices” (Sanchis et al. 2019: 19). We look at observations and comments regarding education of both end users and experts. This is closely related to aspects of exchanging experiences and good practices, research interventions, and monitoring. All these regard exchange of information, and making renovation interventions meaningful for the end users and creating value for them. Finally, community building focuses more specifically on relations between the stakeholders involved in the process of the renovation. Here particular focus is on larger projects, that involve several households and often complex ownership-management structures.
5.3.1 Educating end-users and experts

**Materials:** Communication channels/media; Meaningful information; People working on promotion and marketing.

**Competences:** Ability to convey an informative and trustworthy message; Tailored strategies of conveying information.

**Meanings:** Relevance for people’s everyday life – finances, health and wellbeing, personal preferences etc. The notion of trust and transparency.

A recurrent argument in TripleA-reno case-studies is that education is an important factor regarding attitudes and practices towards renovation and energy use. In Slovenian and Italian case, experts claimed that “general lack of technical knowledge of occupants is often a problem” and that “education of end-users would be more than beneficial in terms of the wide spread acceptance of energy renewal projects” (Prati 2019: 16).

The following comment by a building professional from Spain indicates the effect that lack of knowledge among end-users can have.

> Major problem for energy renovation is unawareness and misinformation from citizen: homeowners, tenants, or occupants, in general, who often (mis)believe that only expensive complex solution would lead to reliable significant results (but there are solutions and interventions with great results/price relation). (Sanchis et al. 2019: 15)

**Relevant, useful and reliable information** is clearly the key to relevant knowledge. However, as the comment above indicates, there are many facets to that. Considerations, such as who or what is the **source of information**, and perhaps most importantly, the **willingness of individuals to learn**, have appeared several times through our research. Those considerations are not limited to the end-users.

Also, lack of knowledge and expertise from professionals, who wrongly choose or implement renovation solutions. (Sanchis et al. 2019: 15)

As the Spanish expert indicates, **lack of knowledge on the side of the experts and contractors** can also be a challenge. Similar comments have been voiced in Slovenia, where a director of a building company commented on competences of some housing managers.

> Andrej detects an issue with occupants and even building managers who have no understanding what it takes to renovate the building in real life. In such cases, he says, it is hard to search for sensible solutions once it comes to realising the project and solving issues on site. (Bančič et al. 2018: 12)

Lack of knowledge among experts is a topic in itself and, as it implied in the comment above, often focuses on the void between theory and practice. In TripleA-reno, however, we recognise this issue but focus primarily on end users.

It might sound seemingly banal, yet people seem to lack basic knowledge of how to use radiators. Nemeth and Magyar reported individual apartments in their case had new radiators with new control valves, but people did not use them “because of the lack of knowledge that they would save energy if they use them instead of
opening the windows” (2019: 4). How much that is a result of the fact that costs for heating are divided by the volume of apartments, as we reported under catalogue item Management of systems, remains a question.

A hint of an answer can be found in another plastic example provided by Nemeth. He reports an opinion regarding radiator valves by another informant, saying that newly installed radiator valves “have no effect on heating costs” (Nemeth and Magyar 2019: 10). In the apartment of the same participant, Nemeth and Magyar observe, that “manual radiator valves are not adjusted as needed, but the windows are opened when there is overheating. It can be concluded this is an energy wasting operation of the heating system” (ibid.).

No matter what the principal (de)motivation for lack of efficient control over the existing heating system is in the Hungarian case, the examples highlight rather than negate the implicit the need for user education.

Another key aspect closely related to education is transparency. Transparent presentation of key aspects of the renovation process – finances, time, practical details and technical content – is an important part of building trust, meaningfulness and demonstrating value to the end-users.

Occupants and/or owners need to see tangible, short-medium term individualized benefits and understand intangible, long-term, collective benefits, thus, communication and trust is capital. (Sanchis 2020: 15)

From another angle, transparency in renovation projects is a way to display relations between the ideal (what people wish and desire), the possible (accounting financial and technical options) and the expected (accounting for potential challenges and issues that can possibly arise). In other words, it is to set people’s expectations. In the field, we encountered several examples of user’s expectations. For example, Nemeth and Magyar provided the following view by one of his informants.

He expects that by deep renovation the energy cost will reduce to half, or even to quarter of the existing energy cost (2020: 12).

On a similar note, in the catalogue item Absence of investments we gave examples from Hungary, where people have established ideas about how long the renovation should last. Expectations that are not taking into account facts, such as particular technical challenges of the individual renovation project, limited funds, limitations of technology and methodology, etc. can easily prove to be illusionary and turn into potential source of mistrust and tension between the involved stakeholders in all stages of the project. This is where the relation between transparency and education is very obvious. In this respect, it is important to provide people with transparent and meaningful information and prepare them for a reality that is different from what they might expect or want. Facts about challenges, potentials and benefits should be transparently presented for both the short and long term scenarios and user expectations set to be realistic and to minimize issues related to expectations not met.

Nemeth and Magyar reported how such information was circulated in Hungary.

The contractor introduced some measures from his own experience how can make the renovation process acceptable for the occupants. The first is the proper preconditioning of the execution, which means providing information letters to all occupants and hanging information posters in the building about the renovation.
Every facade should have its own renovation schedule and timeline. Concerning the complaint management, the occupants should send their complaints through the building manager to the contractor and these complaints shall be handled by the contractor within 48 hours. The building should have a contract with a technical inspector, who should visit the site two times per week. (Nemeth and Magyar 2019: 14)

As we see, residents are acquainted with facts about the renovation via letters and posters. Some of the information – such as timeline – is tailored to the orientation of the façade. We can assume information was also distributed via word of mouth, between households and facilitated by the manager. It is a rather standard approach that provides people with key information, gives them the option to reach out to the manager for more specific information, and has a certain capacity to instill confidence and trust among the residents through delegating a fair amount of objective responsibilities onto the manager and technical inspector.

Such approach only works if the precondition is right and the community of residents is willing to trust the manager and the contractor in the first place. Here is a related insight from Slovenia by an informant from a block of flats, which has successfully undergone renovation.

Avoiding illegitimate business manoeuvres was key for them. On the one side, they tried to avoid too much interference by the housing corporation suspecting that they might want to force their “preferred” contractor in the project. On the other side, they got off-the-record proposals by some of the contractors considered for the business. (Bančič et al. 2018: 11)

In the Slovenian case, significant levels of distrust and even a certain degree of active rivalry between the resident community striving for renovation and the housing management company has been reported. Some of Bančič’s informants accused their housing manager of being negatively biased towards the planned renovation and raised concerns about his personal agenda to favour a particular contractor, who – in their opinion – was not competent for the job. Both accusations point towards corruption, which is not taken lightly by the resident communities, as Bančič reports.

People find it unacceptable if they feel someone involved in the project has illegitimate benefits from it. Cases of corruption and possible frauds are a major source of frustration especially for the housing community. (Bančič et al. 2018: 26)

In the Dutch case, the need for building trust and knowledge in the community was well recognized. Savelsberg and van Nunen report how their company recognized and approached the local community.

Approach was to build a community from bottom up and learn people what could be done in their homes to reduce energy and therefore CO2. During the 6 months we had several events. We started with a Masterclass on sustainability. Later on we attended the neighbourhood fair, performed heat scans, and had individual talks with owners. After six months the challenge ended. Because we aimed at high level renovations, we had limited CO2 reduction, compared to other parties that applied cavity insulation and radiator foil. But for us it was proof we were on the right track. By building a community form the bottom up, it was more easy to come into contact with people. (Savelsberg and van Nunen)
Their strategy is a long-term one, building its foundations on education. By teaching their potential clients they enable them to understand how renovation measures can be meaningful and attractive for them, effectively creating ground for their business. In addition, they combine this approach with tools, such as portable IEQ sensors – which we discuss in catalogue item Monitoring – and an online application tool. The application called The 30 second test provides basic information about the building and indicates potential renovation measures, or as Savelsberg and van Nunen report, “advises the private home-owner in the renovation products that are most suited for his/her house in order to become more sustainable”. Such combination of education, step-by-step approach to renovation planning, targeting particular social groups, empowering people and decision-makers with tool, and connecting the key stakeholders is a recipe applicable beyond the Dutch context.
5.3.2 Exchange of practices and experiences

**Materials:** Examples of good practices – concrete data and reliable information, visual or tangible evidence.

**Competences:** Skills for meaningful comparison; Ability to understand community/individual’s way of reasoning; Ability to find good practices; Ability to meaningfully present examples of bad practices.

**Meanings:** Inspiration, attractiveness, competitiveness, fear of failure, disinterest.

With relation to education, a recurring practice regarding (de)motivation for renovation is also exchange and presentation of good and bad practices. In this regard, the importance of contextual social and spatial consideration again proves important. Reports of (mostly positive) impact by exchange of good practices come from Slovenia, Hungary and Italy, implicitly also from Spain and the Netherlands.

Prati notes that during his fieldwork in Italy “interesting topics had emerged, especially regarding the dynamics of comparison with other similar projects in the area that are a strong stimulus for the inhabitants” (Prati 2019: 18).

One of the points that seemed most interesting to me was the continuous reference to a building in near city of Portogruaro that was recently renovated and that was addressed by all residents as an example in terms of beauty, functionality, and comfort. This building is owned by ATER Venezia too and was renovated in 2013 with funding from the "European Regional Development Fund". The building is located in the nearby town of Portogruaro, in via Aldo Moro 3, a few kilometers away from the multi-apartment building in via Julia. Many of the inhabitants of the building in Concordia know directly residents in Via Aldo Moro and have highlighted, during the focus group, how the renovation had improved the living conditions in that building making it much more attractive, accessible and acceptable. (Prati 2019: 20)

In Slovenia similar references have been given, comparing the building planned for renovation with other blocks of flats in Zagorje and even in the neighbouring town of Trbovlje. Bančič’s informants also compared their experience of IEQ with other buildings they knew or lived before moving into the current apartment. Also from Hungary, Nemeth and Magyar provide accounts of comparison with a neighbouring block of flats – an case of a successful renovation that had an impact on his informants and functioned as a positive example.

The exchange of practices can happen either peer-to-peer in a rather informal manner, or it can be communicated top-down, by housing management and professionals. It is important to note, however, that people tend to interpret information from various resources differently. Expert arguments (or rather, authority) is sometimes disregarded or given less currency than opinions and experience by trusted non-expert individuals. (e.g. family, friends, neighbours, TV celebrities). External stakeholders, such as neighbours, family members, friends, or even TV celebrities might seem to play a passive and largely marginal function in the context of a renovation process. However, in practice they can have a substantial impact on the attitudes, opinions and even interests of stakeholders directly involved with the project.
Many residents have mentioned the nearby building of Portogruaro, which has recently been renovated. Even just knowing, by hearsay, that in that building the wellbeing is higher and the expenses are lower makes the occupants in Via Julia less skeptical towards the renovation process. (Prati 2019: 26)

Words about good and bad examples travel fast and far. Both examples of good and bad practices should be gathered, analysed and communicated meaningfully. Reports of bad practices can have a disproportionally negative effect in comparison with the positive. Clearly, renovations are generally a positive development, yet sometimes that is not the case. Examples of bad practices and effects hearsay has on the development of renovation projects should be recognised as an opportunity to persuasively promote renovations. Cases for renovation should be built on strong evidence and arguments to prove – at least in context of TripleA-reno – how well planned deep renovation has an advantage over examples of poor or insufficient renovation projects. In addition, strategies should be devised to highlight good practices from local environments, which people can relate to meaningfully.
5.3.3 Preliminary research

**Materials:** Allocated finances, measuring tools – meters, sensors, software – and tools for ethnographic work – diaries, notebooks, cameras, recording devices etc.

**Competences:** Knowledge of appropriate qualitative and quantitative research methods. Experience with the methods. Ability to access to data and relevant stakeholders. Knowledge of networks of power and invested interests. Analytical skills and capacity for empathy (understanding the native point of view).

**Meanings:** Meanings, purposes and concepts related to space and places within it – work, home, safety, privacy, family, fun, cleanliness, convenience, etc. Meanings, purposes and concepts describing social relations and transactions between the involved stakeholders and communities – reciprocity, solidarity, loyalty, corruption, responsibility etc.

No project happens without planning and good planning largely depends on good analysis of the project’s subject. For big projects, which renovation projects tend to be, a certain level of research has to be done to amass data and information for analysis. One aspect are expert technical investigations that determine the physical and technical properties of the building and its surrounding area. Prati reports about the preliminary research in the Italian case.

A campaign of diagnostic investigations was carried out, including 37 pacometric investigations, 2 SonReb investigations, 8 sclerometric investigations and extraction of concrete cores on the structures of the building. In addition, 1 static penetrometer test, 1 Masw survey and 1 digital tomography survey (HVSR) were carried out. (Prati 2019: 16-17)

The other aspect is investigation into social and cultural aspects of the renovation. Prati highlights these as “fundamental factor” for good understanding and contextualization of renovation projects for both preparations and quality control.

A further fundamental factor to proceed with the designing of a good redevelopment project is the knowledge of the habits (often bad habits) of the tenants and the main needs they express. It would also be useful to have feedback after the completion of the renovation projects. Without this, there is no control of the quality or type of impact that the renovation has on the IEQ. (Prati 2019:17)

As we have pointed out several times by now, analysis of social, cultural and political contexts of an individual project turns out to be just as crucial to prepare a robust and resilient project plan as is the analysis of quantifiable objective factors regarding finances, physical qualities of the building, IEQ indicators etc. By investigating the contexts in which the building exists as a socio-cultural entity, one can get a better insight into what meanings people ascribe to it in the context of renovation. As Prati reports in the following example, it is often not aspects of energy efficiency, energy use or comfort, but safety or aesthetics.

Many have pointed out that stairs and galleries are dangerous, especially when it rains, making it difficult for those who have mobility difficulties to go out or to get back home. The discussion then moved on to the condition of the facades, which, according to the tenants, are "ugly". Someone pointed out that the most pressing problem is not the ugliness of the facades but rather the safety of them. In fact, there are quite a lot
of plaster and concrete cover detachments in many spots of the building envelope that could jeopardize safety if they hit someone. Few residents have complained about the poor efficiency of the envelope in terms of energy performance, but all have reported the poor efficiency of the windows. (Prati 2019: 18)

There are many methodological approaches towards conducting qualitative research relevant to goal and technology oriented pursuits. One of the common approaches are forms and questionnaires, which have the advantage of being quantifiable and analysed. Such is an example of TripleA-reno questionnaire, that has been discussed and presented in length in Deliverable 2.2. Another qualitative research approach advocated by our project is one relying mostly on ethnographic methods, including semi-structured interviews, focus groups, and participant observation.

Our results suggest that research involving elements of ethnographic methods is a way that opens interactive possibilities that are hard to match with any other quantifiable form of research interaction and data gathering. In addition, sending a person to the field to interpret what often proves to be a complex social or even – to a certain level – political situation brings more depth and meaning to the project. While it does require a certain amount of additional work, it enhances the empathic capacity of the project – in a sense of community of experts and other relevant stakeholders who execute the necessary steps to execute the project – and creates knowledge of which problems, issues and concerns the community finds central and meaningful. It does so through the researcher’s own capacity for empathy and understanding of local sociocultural codes, which are difficult if not impossible to deduct from strictly quantifiable data analysis.

As such, ethnographic methods have the potential to direct the configuration of project goals and management process around issues and problems that key stakeholders find most relevant. As always, it is important to see the constraints of ethnographic research. Fact is that people act and communicate differently when they know that they are observed/studied. This difference is referred to as “distortion” in the quality of gathered data. Nonetheless, we believe it is better to approach the question proactively, searching for the meanings and problems people identify themselves with strongly, rather than avoiding it for the sake of avoiding recognition of potential or actual issues. In other words, we are more likely to encounter actual issues needing to be addressed than imaginary issues, which would better be left avoided.

TripleA-reno research interventions show that research intervention as such can have a positive impact on the course of a renovation project. It can raise awareness and influence organisation within the core community, as well as influence the relations between key stakeholders. The Dutch approach indicates that experts per sé function as a gateway to community building and create potential for the co-design processes, simply by interacting with people in the field. In addition, such interaction is always – to a certain degree – reciprocal. As such, research activity – a researcher actively and physically present in the field, engaging with beneficiaries and the stakeholders – can be regarded an intervention in itself and a vehicle for change.

As an example, Nemeth and Magyar present their experience with the TripleA-Reno focus group in Hungary, where experts were invited to discuss the renovation plan and options with the residents.
After answering to our questions on the renovation, they also had the chance to ask each other, which proved to be really good way to collect information. During the interview some of the questions about the renovation were answered and some uncertainties were already eliminated. (Nemeth and Magyar 2019: 13)

As a researcher, he recognised the focus group approach as a powerful tool for data and information gathering. In addition, he also highlighted the clarification of emerging questions. Fact is, that despite standard procedures of passing the information to the residents many questions, frustrations, fears and doubts arise. On this note, Prati reports his experience of a focus group from the Italian case.

The attitude of the tenants was rather sceptical at first and it was clear that especially the elderly, were quite confused about what was happening. As was to be expected, at first the complaints about the current situation, in particular about the maintenance conditions of the building, were "unleashed". (Prati 2019:18)

Both examples indicate that bringing residents, owners, architects and engineers together with an intention to communicate in the neutral context is beneficial. It creates space where residents can share their questions, doubts, fears and express frustrations, scepticism and confusion. On the other hand, gives experts a chance to clarify the process of renovation, explain the roles of individuals and institutions within the project and clarifies the reasons, aims and goals behind the renovation. In a sense, it creates an inclusive space with the potential to build mutual trust and a sense of cooperation.

On a similar note, it creates a space of mutual “education”. If in the previous catalogue items we focused on teaching end users about energy performance of buildings, IEQ and renovation, in Preliminary research we highlight the need for project-specific knowledge and insight on the expert side. By that we mean that renovation experts should also consider educating themselves about each individual case that they are working on. An account of the need for preliminary research comes from a Spanish architect working in social housing renovation projects. As Sanchis et al. report, he claims “a key aspect of a successful renovation project lies in understanding specific tenants’ profiles and adapt to them, paying attention to robust, non-maintenance needed solutions” (Sanchis et al. 2019: 13). He goes on to list the following measures as part of their practice:

- fighting budget (financial) constraints,
- managing legal constraints,
- dealing with issues related to social contexts of the people they work with,
- periodical inspections of renovation work by trustworthy individuals,

(ibid.)

As it was clearly presented by now through different TripleA-reno case-studies, people tend to have very different life situations, which often affect their willingness to learn and/or capacity to adjust. Some for work, others for personal situation or situation within the household (disabled, mentally impaired people etc.). It is important to recognise also, that in context of normality, people’s emotional status can influence the project’s destiny significantly. If someone is in a bad place, they will not necessarily think very rationally about things.
5.3.4 Monitoring

**Materials:** Monitoring devices and components – sensors, meters, monitors, software.

**Competences:** Knowledge of installing the necessary equipment. Knowledge of using the software. Experience of space in different IEQ conditions. Ability to command monitoring devices and respond to the readings appropriately.

**Meanings:** Sense of control and reliability. Sense of reliable evidence based distribution of costs and responsibilities.

Monitoring is not only an integral part of the TripleA-reno research, it is **an important practice in the contexts of modern building management and renovation**. It plays an essential role in assessing the building’s conditions and performances realistically and reliably. It also provides ground for fact based assessment of the impact renovation has had on the building. In the following example, Prati comments on the value of feedback from the measurable impact of renovations and illustrates it with experience shared by an architect from the Italian case-study.

This would be beneficial both for ensuring high standards and for the overall promotion of renovations, supported by clear evidence. An important factor in reducing energy consumption would be the introduction of monitoring units that measure the amount of heat used by individual households. A renovated condominium where the annual energy consumption for heating, combined with the addition of facade insulation, has decreased by almost two-thirds. He estimates that, on average, households consume 20 - 30% less energy since the introduction of monitoring. (Prati 2019: 17)

From Hungary, Nemeth and Magyar report an opinion by one of his informants that feels monitoring – in this particular case regarding water meters – is necessary and positive.

She considers the individual measurement necessary, because the cost of drinking water was higher before they installed the meters. (Nemeth and Magyar 2019: 9)

Similar opinions were expressed in Slovenia.

An important factor in reducing energy use in households managed by the [housing] corporation was the introduction of monitoring units that measures the amount of heat used by individual households. Gašper provided an example of a block of flats where yearly consumption of energy for heating, combined with added facade insulation, decreased for almost two thirds. He estimates that on average, households use 20 – 30% less energy since the introduction of the monitoring. (Bančič et al. 2018: 10)

As we consider monitoring, it is appropriate to note an observation regarding **distribution of heating costs**, which was voiced by several informants. In both Italy and Hungary, one of the key motivations for people to support or even actively promote renovation is the prospect of a better system for sharing costs of heating. Nemeth and Magyar report from Hungary how the existing system fails to distribute heating costs in a way that would prompt people to use energy responsibly.
The occupants pay the heating cost based on the measured thermal heating energy consumption of the building, which is divided into flats according to their heated air volume. Occupants pay the same heating cost if the size of the flat is the same. In this status there is very limited motivation to save energy, because for example if only one occupant saves energy and the others do not, it results that the energy saving will be divided between all the flats. (Nemeth and Magyar 2019: 15)

A similar observation comes from Italy, where Prati indicates that a measuring system will be put in place, so that heating costs will in fact be divided taking into consideration actual household consumption.

There was an almost unanimous complaint about the high cost of heating and the lack of comfort in the apartments in both summer and winter. A positive effect on this point was the clarification that the renovation project will introduce a separate accounting of energy use with the consequence that each occupant will pay what it actually consumes. (Prati 2019: 19)

In Slovenia such an accounting system was introduced prior to the research and was positively received by the residents. Comment were made, however, that such a system requires further consideration of the location and orientation of individual housing units, as there can be significant differences in heating demand between units with one or two outer walls in comparison to ones with two or more.

As we can see, impact of monitoring goes beyond insight and understanding. It has the potential to motivate people, catalyse decision-making processes (e.g. for the renovation and investments), and promote positive change of habits, behaviours and ultimately practices related to energy use in buildings. In addition, it has a considerable scalable potential and the advantage to prove its impact through data analysis. In the rest of this catalogue item, we will focus on a particular example of a monitoring campaign from the Netherlands, which serves as a example and illustration of a successful and multi-faceted monitoring intervention.

Monitors and sensors as social objects – the case of The Sensi Family

From the Netherlands, Savelsberg and van Nunen report an example of a monitoring campaign built around a set of sensors, branded as The Sensi Family. These sensors have a variety of functions. Their general function is to raise awareness.

People do not see that there is a ‘problem’. By using the Sensi’s we show people their indoor climate and we can suggest improvements by renovation options. (Savelsberg and van nunen 2019)

The sensors collect “data about energy consumption, living comfort and the health of the home,” which is later used to inform people about their household practices in relation to energy use. Savelsberg and van Nunen claim “this [approach] is applicable for both awareness about the indoor climate as well as awareness for the structural construction of the house and the renovation possibilities.” A feedback loop is established, channelling gathered data to the users through a special online platform and smart meters to inform residents about the building’s performance and implicitly about their own performance as building users. The other more specific function of the sensors is commercial, or in words of Savelsberg and van Nunen, “to improve the brand positioning.”
The concept was developed with consideration of the Dutch socio-cultural principles, specifically a concept of “Logeerbeer” – a stuffed toy used as a pedagogical tool to extend the pedagogical process beyond schools and engage other members of the children’s family or household members. Such approach made the product more likely to have impact and gain momentum. Parallel to this, a campaign was started on the social-media platform Instagram. Willing individuals using the product were able to engage, “build a community and share stories about where the Sensi’s have been where they will go” (Savelsberg and van Nunen 2019).

By using the Sensi concept, residents are trying to be made more aware of the qualities of the indoor environment in their homes. The Sensi’s measure temperature, humidity, CO₂ concentration and light intensity. At the same time, the Sensi connects with the smart meter of the home. The resident has a personal login code with which the results of the Sensi can be viewed in a personal dashboard. The distinction between the good data and data that has room for improvement can be made in colors. (Savelsberg and van Nunen)

In the Dutch case-study, this principle of monitoring was used before and after the renovation, enabling comparison of performances before and after the renovation interventions. Such approach has implications for considerations about practice of community building, which we discuss in the following catalogue item. The people who use the sensors are encouraged to share them with other people. As such, the sensors are becoming a social object to which a multitude of meanings are attached – from the idea of sustainability, to the institution of social exchange, peer pressure and mutual supervision. The example of the Sensi Family also indicates contextual ground for investigation of another potential and in context of contemporary world very important practice, which is building awareness and community using social media platforms. Some considerations implicitly related to this are discussed in the following catalogue item. However, as there have been no reference to social media outside the Dutch case-study, we only recognise this as an area for potential further investigation.

![Figure 20: The “Sensi Family” sensors.](image)
Figure 21: Online monitoring interface from the Dutch case.

Figure 22: Interaction of end-users through social media from the Dutch case.
5.3.5 Community building

Materials: Space, means, people, agenda, tools and established rituals.

Competences: Knowledge, experience and ability to run community management and organisation; Understanding group social dynamics.

Meanings: Symbolical meanings, codes of social conduct, identity building, trust, solidarity and responsibility.

In this catalogue item, we focus on the importance of community building with relation to practices and housing renovation projects. We have already emphasized the importance contextual factors – location of the building, its physical condition, characteristics of the local market(s), politics, policies, socio-cultural patterns etc. These reflect both in everyday practices of building users as well as in their attitudes and experiencing of the IEQ. They are reflect in the decision-making processes and in relationships between stakeholders involved in the renovation project. In the following paragraphs, however, we focus more on understanding the relations(hips) between stakeholders, role of efficient communication, and the role of individuals within the decision making and renovation processes.

Our research shows lack of community homogeneity and lack of capacity for consensus building proves to be a recurring issue. This includes aspects, such as:

- conflicts and rivalries on institutional and individual levels,
- particular – problematic or uncooperative – personalities within the relevant social network,
- variety of contrasting or opposing opinions related to values and interests,
- lack of reliable information,
- lack of efficient communication,
- lack of efficient project coordination
- lack of trust, empathy, solidarity, and responsibility.

In relation to renovation projects, the notion of community has two principal aspects. The more specific one is focusing on the residential or housing community that will experience renovation – users and residents of the building. The more general perspective is focusing on the wider community of stakeholders involved with the renovation project – the community of residents, owners and managers of the building, contractors, building professionals, and other stakeholders (neighbours, banks, local authorities etc.). In both cases, decision for renovation requires a substantial level of consensus between members of communities.

Understanding power relations between the involved stakeholders is very useful for understanding the micro social dynamics of individual projects. That includes clear awareness of ownership and management authorities involved in the project. That is particularly evident in projects with complex ownership and management structures, such as many that target buildings with complex household structures (e.g. multi-generational family houses or communes) or several households (e.g. block of flats). A related aspect is also understanding where the motivation and drive for renovation comes from – from the resident community (bottom-up) or management and ownership (top-down). In either case, good communication and relations between community members play an important role.
With respect to the residential communities, relations between members of the household and between neighbours seem to be central. Communities that describe themselves in these terms, such as in the Hungarian and Slovenian cases, are arguably more homogenous and have a larger consensus building capacity. **Good neighbouring and household relations** are often the quintessential ground from which spontaneous bottom-up renovation initiatives emerge. The ability of these communities to connect and build beneficial relationships with stakeholders beyond the strict residential community is also important. Prati presents us with a brief but illustrative account of a rise and demise of a community campaign as experienced by a couple of his informants from Italy.

In agreement with the other occupants and supported by the city mayor of that time, they have put in place a strike protest of rents to try to start a process of renovation of the building and to keep it better maintained.

Unfortunately, the change of administration has cancelled all previous agreements. (Prati 2019: 21)

This account indicated that the community managed to act collectively. They exercised the strategy of “rent-strike” and engaged an important local politician in a meaningful relation with the community. It also indicates how fast such achievements of such collective action can be put down simply by a change in the local administration, which can be understood as discontinuity of meaningful relations within the wider community of stakeholders.

For **top-down project initiatives**, recognising good neighbourhood relations can be a valuable indicator of projects that have better prospects of being easy to manage, and as a result, faster and more efficient. Prati also provides a case for a top-down initiative. He reports experience by a representative of a housing company that tried to build an inclusive community of stakeholders.

Direct contact with all people and their involvement is essential to try to also build a sense of belonging and community in order to improve the management of the property. The company always tries to work hard to communicate constantly with all the people involved in the redevelopment projects, but it is not always possible. Its position is that communication should start at an individual personal level and use simple and understandable means of communication, trying not to make the requalification process seem imposed but shared. (Prati 2019: 15)

**Good relationships, however, do not easily come about and require “high maintenance”**. They can not be created artificially or promoted systematically just for the purpose of promoting building renovations, at least not from the perspective of time and financial efficiency. In cases where communities have issues with interpersonal relationships of two or more individual members, a more pragmatic approach is required, focusing on reaching minimal consensus rather than pursuing best possible scenarios.

In pursuit of consensus building and community consolidation, **communication** appeared as the key factor several times in our research. An important aspect of communication is active pursuit of engaging residents in the process of renovation planning and execution – an approach often labelled as co-design process. This cannot only be a strong tool for community building around the project, but also a strategy for gathering valuable insights with regard to the needs of occupants. In other words, communicating and creating value
for the community and – whenever possible – with the community can be a reliable approach to optimize the speed, efficiency and long-term positive impact of project activities.

On a related note, an integrated community of residents and stakeholders can also have a positive effect on securing high quality of renovation works. Nemeth and Magyar report a comment by one of his informants from Hungary, indicating that such cases provide a higher and more complex (community) supervision.

The contractor of the renovation should be from the city or from the surroundings, because its reference works should be viewed. (Nemeth and Magyar 2019: 11)

A similar report comes from Slovenia, where a building professional stated that working in their local community requires professionals to perform at their best or face deteriorating reputation and fewer business opportunities.

Sebastjan notes that experts working in their local environment, such as building designers, construction companies etc., generally tend to put extra effort into successful realisation of the project. He claims the reason for that is the wish to maintain a good public image – no one wants to be regarded as “a slacker” in their local environment. (Bančič et al. 2018: 9)

Another way to ensure efficient communication between residents, owners, contractors and other stakeholders is through a centralized role of project and community managers. As Sanchis et al. report from Spain, building managers and facility managers are often uniquely positioned to take on such a role. If they are skilful, motivated and driven, they can facilitate communication between all stakeholders involved in the renovation. In this regard, a building expert highlighted the value of building good relationships between stakeholders.

Best value for successful renovation is building a trustful relationship with owners and/or occupant. (Sanchis et al. 2019: 15)

However, our research shows that is not always the case. We noticed many renovation projects have no obvious central coordinator or institution that would both formally and factually take this role on. In the Hungarian case study, it is unclear who plays the central role in promoting the renovation. Nemeth and Magyar report a claim by one of his informants indicating that the building manager should be “involved in the inspection of the contractor and keep in touch with the residents” (Nemeth and Magyar 2019: 10), which would make him the central figure. In contrast, lack of trust towards building managers was substantial in the Slovenian case, with suspected corruption reported by residents, building professionals, and contractors. Bančič reports an insight shared by a construction company CEO.

Some sort of corruption is often part of the business. Andrej states the initiative often comes from the side of building managers, less frequently from the side of the suppliers. This seems to be one of the major problems of construction business in general. Andrej notes that if you do not “play by the rules” of whomever it is that holds a powerful position in an area, you can have serious problems doing business there. Often times it is also the case that building managers have an unofficial deal with one contractor that always gets the job for a certain percentage of the project’s cost. (Bančič et al. 2018: 12).
This suggests there should be an option that would accommodate a third party candidate – a trustworthy, knowledgeable and competent individual with the capacity to take on the role of the project manager and mediate the potentially conflicting relations within the stakeholder community.

Efficient and meaningful communication is clearly important, but does not always present the key challenge. Sanchis et al. report an insight by a representative of the social housing corporation from Spain, indicating that in the case of social housing, trying to convince tenants about the need for renovation is not an issue.

Engaging occupants for the renovation is not a problem, since they usually don’t have to pay anything; and interventions are aiming at essential living conditions urgently needed to address, so most of the times occupants are really willing (and impatiently waiting) for them. (Sanchis et al. 2019: 13)

However, issues might arise from non-financial aspects of the renovation, such as problematic relationships between stakeholders (conflicts and rivalries), technical and practical difficulties, or simply lack of capacity for rational decision-making on the side of relevant stakeholders. Our research suggests such issues are best addressed by getting the residential community involved as much as possible. Again from Spain, Sanchis et al. report an insight shared by a building manager supporting such conclusion.

A key aspect of a successful renovation project lies in the tenants’ involvement: if they feel that the project takes into account their needs and expectations, they will latter take care of the results. They need to feel the project as theirs. (Sanchis et al. 2019: 14)

On a similar note, Prati reports on the positive impact of actively involved individuals in Italy.

Active members of residential communities make an important difference and make the manager’s job much easier. (Prati 2019: 15)

Accounting for individuals within communities that either facilitate or hinder the development of renovation projects can be very beneficial for renovation. We can imagine decision-making as a process where stakeholders position themselves on the continuum between the extremes of opposition and support for the project, or perhaps, between the negative and positive poles of Affordability, Attractiveness, and Acceptability.

On the positive extreme, we can locate individuals who take on the role of local heroes. In the context of our research, local heroes are primarily individuals driven and motivated to promote and realize renovation projects. Secondly, they are individuals who are – or have the capacity to be – considered trustworthy by the vast majority of the relevant stakeholder community, and perhaps most importantly by the resident community. Finally, an ideal local hero has skills (or capacity to learn) about community building and project management, and have a good insight and grasp of knowledgeable related to technical details and processes concerning the renovation.

There is an obvious parallel between the concept of a local hero and a community manager as we highlighted it earlier in close association with housing managers. One individual or institution can incorporate both roles. However, local heroes should ideally be trusted active members of residential communities supporting
community managers at their professional work. That enables professionals to work more efficiently on technical and practical aspects of the project while local heroes take on the role of an advocate and communicator within the local community. That also relieves them from having to devote large amounts of time to work that professionals can do more efficiently. A good illustration of a local hero profile is provided by Sanchis et al.

Potential local heroes can be found among the occupants of the households, presenting both strong personal interest in the renovation of the building (since they live in there) and the capacity to advocate for, promote or even lead the process of renovation on behalf of their households and/or community of supporters ('influencers’ or community leaders). Local heroes often function as the catalyst of the renovation process and bridge the gap between, experts, planers, owners and other building occupants, but to be successful they will usually act through skilled building administrators, equipped with skills and/or knowledge that enable them to push their agenda forward regardless of the obstacles they encounter on their way. Among others, these obstacles can be conflicts among different individuals involved in the process, legislative obstacles, financial impotence of involved stakeholders etc. On the other hand, local heroes can be found among the public housing corporation employees, who compromise time and effort in the search of achieving a continued improvement of their maintenance and renovation procedures. (Sanchis et al. 2019: 15-16)

On the negative side of the continuum, we can locate individuals who tend to “seek ‘problems’ rather than solutions” (Prati 2019: 15). Such cases have been reported in Italian, Slovenian and Spanish cases. However, it is not always black and white when defining who supports and who hinders the initiative for renovation. Sanchis et al. comment on the role of the housing corporation in the Spanish case.

In this context, the Housing Corporation can be seen as both local hero, since is the one deciding an realizing the renovation by their own means; and antagonist, since it can be reluctant to invest on the building, being public budget is limited, building stock to be managed huge, and occupants not-proper users. Therefore, they’ll do the very minimum renovations for legally complying, being the energy efficiency (specially nZEB objectives) far from their scope. (Sanchis et al. 2019: 13)

Reasons why individuals, communities, or institutions oppose renovation projects are manifold and complex, just as the reasons for supporting them. In addition to the most frequently voiced financial aspects, reasons noted in our research that provoke opposing sentiments are:

- social exclusion of individuals or households from the wider community,
- “problematic” characters of uncooperative individuals, and
- emotionally motivated opposition between individuals involved in the project.

Motivation and drive behind both opposition and support can be either pragmatic or emotional in its nature. What gives either of the tendencies legitimacy is its contextualization and collective recognition (or judgement) by the relevant community. Although TripleA-reno takes a general stance that renovation projects are positive developments in the interest of the resident communities, involved stakeholders, and wider society, not all individuals and communities see it as such. Sometimes for legitimate reasons.
Depending on the size of projects and different socio-cultural contexts, each individual case has a different level of susceptibility to issues related with opposition. In the Dutch case – a single parent household – there is little potential for such issues. In contrast, Sanchis et al. report an illustrative comment by an experienced housing manager from Spain.

“Biggest problems for renovation in social housing buildings under social rental regimes /.../ is the tenants’ profile which entails problems of vandalism and coexistence” (Sanchis 2019: 14).

Possibilities for making consensual decisions and community building are obviously much more difficult in such cases. However, social housing is clearly a specific context where complexity of individual personal and household situations should be carefully considered before making judgements. Here is an illustrative description of a household from the Spanish case.

Maria Dolores ‘Loli’ (in her 50’s) lives in a 4 bedrooms rented flat with her husband (in her 50’s) and three children (in her 20’s). They both are unemployed, and children alternate sporadic jobs, so their household is financially precarious. So it is, that income perceived from one of this sporadic jobs have made them loose the social rental rate, and are now in real problem of suffering electric cuts or not affording the rental payment which could lead on loosing privileges with the landlord (not paying attention to correctly files claims, because of debts). Moreover, the husband has a respiratory disease, which makes him live connected to an (electric) oxygen machine, which makes electric bills higher than regular. Loli has always lived in Almoradi, and she and her family moved in the flat more than ten years ago, after successfully applying for social housing through the local public housing scheme. (Sanchis et al. 2019: 16-17)

Such examples perfectly illustrate the diversity of cases and provide ground for understanding passive or active disregard of any measures regarding energy use and investments into renovation. What is more, such examples clearly indicate the need to accommodate strategies to mitigate and accommodate such exceptions to the “norm” into its models, allocate a certain amount of finances to tackle them, and last but most certainly not the least important, to integrate notions of solidarity and compassion in planning of renovation projects and beyond.

Finally, once community consensus is reached, steps towards a formalised agreement should be considered to secure support for the planned project and its quality. On this note, Sanchis et al. report a comment by the housing manager from Spain.

Although occupants are very active in demanding interventions (usually related to health-related problems), they are not so good in recognizing the value of the performed interventions, so formal acceptance of interventions performed in their flats or common spaces is mandatory, in order to avoid subsequent complaints. (Sanchis et al. 2019.: 14)

Fact is that people can and do change their minds. Renovation projects – as any other form of social process – are fluid and subject to constant change. It is important to secure their efficiency and success. However, it is equally important to build resilient integrated communities, where all of the stakeholders are given voice...
and ability to meaningfully partake in the project activities from the beginning to the end. Fact is that certain 
doubts and complaints might prove to be well founded, especially if the measures or materials introduced 
prove to be deficient or causing more harm than good. That is why rigorous and trust-worthy monitoring – 
as accounted for in the catalogue item Monitoring – should be put in place from the beginning to the end of 
projects. Also, whatever form the agreements between stakeholders should take place, they must distribute 
responsibilities and benefits between all parties involved. Benefits can be understood as return on 
investment of time, effort and money – in financial terms and beyond. Responsibilities, in contrast, can be 
understood with distinction between building professionals and beneficiaries (building users, residents and 
owners). For the former responsibilities imply delivering promised results. For the latter it means not to 
participate constructively in the renovation process and not to obstruct or halt the project after the its start 
for unfounded reasons.
6 Beyond habits and practices

In the catalogue we focused on aspects of practices related to energy consumption and renovation. However, there are contextual considerations we were not able to meaningfully include in the catalogue. By contextual we mean that the following aspects perhaps are not directly connected to the goal of improving energy performance of buildings by making them more energy efficient or influence practices of their users and occupant. Nonetheless, as we emphasized several times in our analysis, contextual aspects often prove to be crucial for the success of renovation projects or interventions related to energy performance of buildings and households.

The key realization is that building renovation as such is a complex socio-cultural practice, or rather, an assemblage of practices outlined in this catalogue. Interventions in buildings should therefore be understood as interventions into a socio-technical systems – networks of animate and inanimate actors. Renovation, and deep renovation in particular, requires a combination of measures and interventions which come with a cost – both in financial and practical terms, for some individuals also emotional. In this report, we attempt to think about the complex reality of everyday life by reducing it to manageable and relatively simple parameters and entities, such as the practices presented in the catalogue. Such approach, however, has limitations. For one, not everything can be sensibly analysed in the format of a catalogue. In addition, analysis of complexity requires simplification, which inevitably puts certain aspects in the shadow of whatever is discussed.

For example, the notion of needs is very slippery as a concept. It is hard to explain in simple yet meaningful terms. In fact, scrutiny of this notion is opening a Pandora’s box of philosophical debate. On top of a variety of different socio-cultural contexts, our research involved profoundly different socio-economic contexts. As soon as we consider those, the notion of needs becomes increasingly difficult to operate with. Questions arise, such as what is the difference between needs and wants, or what is the difference between dignity and comfort of living. We are faced with a challenge of locating standards and goals on a continuum between poverty and abundance, dealing with a series of slippery notions, such as inadequacy, contentedness, normality, luxury etc. Although the notion of needs, paradoxically perhaps, appears to be one of the key notions in the context of TripleA-reno interests, profound understanding of what it really means seems to be well beyond reach of our research.

To make up for the limited capacity of our project to elaborate on such topics, we present some valuable insights gained through our research in a series of short observations and commentaries, which have come out of our research as loose ends with potential for further research and conceptual development. Implicitly many of them were already present in the catalogue. Nonetheless, we believe they deserve a special mentioning. We also indicate how these observations are relevant to the specific focus of TripleA-reno.

- Buildings are social objects. The vast majority of time, people think of buildings and their practices of using them not in terms of efficiency and performance, but as places and spaces filled with meanings – home, work, family, safety, security, privacy etc. This is why efficiency and performance are often not accounted for, because they only present a backdrop for interactions that people find truly meaningful. That is not to say, that
efficiency and performance are not meaningful to people. Our research clearly indicates that they are. However, they are generally given lesser priority in comparison other aspects. Keeping in mind, that each individual household and building should be considered individually, a general working conclusion might be that the key to influencing people’s practices is to make them more conscious of their interaction with space in which they are present at any given time.

- **Habits and cultural practices influence energy use, even when they are not directly associated with them.** They can be in a form of patterns of habits – such as smoking or working out – or periodic events – such as parties, celebrations, and even visits. Such socio-cultural patterns influence both measurable aspects of energy consumption and IEQ, including our individual and collective judgements or experiences.

- **Unexpected events or conditions** that have not been taken into account while planning for renovation. It is virtually impossible to plan for a perfect renovation project in a sense that all possible situations would be accounted for. However, a lot can be done by simply accounting for a possibility of unexpected events – such as earthquakes or global pandemics – or the unexpected structural conditions of the building – such as rotten bearing beams, as reported in the Dutch case study. Counting such inconveniences into budget and timeline planning, and – perhaps most importantly – communicating them clearly to all stakeholders involved in the process makes projects more resilient to the impact of the unexpected.

- **There always is a level of uncertainty about the effect of renovation.** This is related to the considerations of unexpected. Plans for renovations forecast effects of the renovation and results can vary from better to worse than expected. Comparing newbuilds and renovations, this is particularly true for the latter.

- **We – people – experience buildings differently, both individually and collectively.** That is not to say that IEQ standards and norms are false or useless. It is more to highlight, that understanding how individuals experience their apartments, or how a resident community experiences their block of flats, can be highly valuable when planning how to communicate with the resident community and indeed the whole stakeholder community. Addressing problems which people find central, even when not directly related to considerations of building energy performance, can contribute substantially to keeping the community on-board with the renovation. To illustrate, people coming from different age groups, different social class or vulnerable communities – such as disabled or mentally impaired people – are likely to have a completely different experience of space and reality as standards, norms and models can predict.

- **Motivation is related to emotion.** That perhaps relates best to the first point, highlighting meaning. People are more likely to support or participate in the renovation if particular aspects of the project provoke emotion. Money is not a good motivator because it sits nicely in the bank, but because it enables us – people – to do things we need or want in our lives. Generally speaking, it also provides a sense of accomplishment, security and control. Understanding the role of emotion provides us a good indication of why people are motivated to renovate for aesthetic reasons or why people are motivated to renovate because their neighbours have done so successfully. **Understanding the role of emotion** is also the main reference point to relativize the tendency to interpret all human agency in terms of finances and money as well as to understand why empathy and solidarity are necessary to actually put people before quantifiable parameters, factors. That is most evident in projects dealing with social housing.
• **People have considerable capacity to adapt.** Our researchers visited many apartments with poor IEQ conditions, some overcrowded and often in buildings with built-in accessibility issues for many of their residents. Nonetheless, the vast majority of our informants – including the ones living in such poor conditions – were content with their existing living conditions and IEQ. Some because they considered their stay temporary – as in the case of student dormitory in Greece – others because they were simply happy to have a place they can call home – such as in the case of social housing in Spain and Italy.

• **Barriers are often external in relation to the resident community.** Legislative barriers, absence of appropriate financial mechanisms or subsidies, corruption between stakeholders and other similar aspects are external in relation to the residential community and can have a considerable negative impact on the renovation projects. Even things, such as failure of (poor quality) materials or delayed effects of work done poorly can have a devastating effect to the project. That relates to guarantee mechanisms that ensure resilience and long-term viability of projects. Who and how will be held responsible if residents start to experience issues, such as mould after the renovation? Who will be held responsible for defects, such as failing façade a couple of years after renovation has been deemed completed? And if the contractor company went bankrupt during that period? These are questions that should be accounted for beforehand.

• **People do not always have the willingness or conditions to engage with the digital world.** It is fact that digitalization is increasingly having an impact on who we are as human beings. However, this does not mean everyone are or will be able to engage meaningfully with platforms and tools, such as the one we are developing in TripleA-reno. Our research suggests, that a way to meaningfully include a large amount of individuals in the project is simply by **human-to-human interaction.** If we are to render results of our platform truly accessible to everyone, tools have to be put in place for individuals who will – best professionally – engage with individuals and communities, who might benefit most from renovation of buildings. Such an approach is not only likely to improve engagement of renovation beneficiaries with key project stakeholders. It also has the potential to accelerate the process and go beyond the plain renovation, bringing communities together, build trust and pave pathways to sustainable futures, which go beyond the plain techno-centric solutions.
7 Affordability, Attractiveness and Acceptability

We now return to the focus of TripleA-reno project and summarize our findings on aspects of Affordability, Acceptability and Attractiveness (AAA). We discuss both negative and positive aspects of the notions and draw building on insights presented in the catalogue. Before focusing on each individual notion, here are some general conclusions regarding all three notions equally.

- Interpretation and understanding of all three notions largely depends on contextual factors. Cases featuring in this report are very diverse. Hence, residents and building users had a very different understanding of what they find AAA.
- Social status, age, values, interests, ownership liability and responsibilities importantly influence people’s perception of AAA.
- AAA are largely social categories – individuals and communities will consider interventions and investments more affordable, attractive and acceptable when compared meaningfully to other projects, buildings, people’s experiences and related attitudes. In addition, communities and individuals are more likely to regard interventions and practices as positive or even necessary with regard to AAA if they are established as a norm, standard, as being efficient, desirable etc.
- A thorough analysis of individual interests and power relations should be done at the beginning of projects to reveal hindrances sourcing from personal reasons of involved individuals and groups of stakeholders, including political affiliations, interpersonal resentments, illegitimate business practices, which can have a significantly negative effect on people’s attitudes towards renovation in the light of AAA.
- Investments and risks related to renovation should be presented transparently, avoiding misleading information or speculations to instil trust and confidence in all stakeholders involved. That will positively influence people’s attitudes towards renovations in the light of AAA.

7.1 Affordability

The notion of affordability is primarily associated with finances and seems to be – at least at the declarative level – a key aspect of affordability and in decision-making process. From Hungary, Nemeth and Magyar report the following set of questions that tend to dominate reasoning processes of many housing managers and owners:

- How much do I have to pay and for how long?
- How much will be the energy cost savings?

(Nemeth and Magyar 2019: 8)

Similar finding have been reported in other TripleA-reno case studies as well, suggesting that fixation on finances tends to shadow other important aspects of renovation, even such as health, safety, and wellbeing. Individuals and institutions who carry financial responsibility for renovation are likely to give priority to pragmatic financial reasoning over values or other forms of currency, such as time, comfort, convenience, social status etc.
People want influence in their solutions. Especially when it concerns owners, they pay for the job, so they want influence in the design. (Savelsberg and van nunen 2019)

However, decision-making process is always dynamic, involving assessments and balancing of various aspects, responsibilities and interests, which essentially give investments their meaning and purpose.

As for the owners (public housing corporation), affordability can be read in terms of financial capacity, but also on durability and suitability of technical solutions for the whole public tenants’ community. (Sanchis et al. 2019: 23)

Although many aspects of renovation projects and household practices can be monetized, considerations of time, effort, emotional investment and other should also be taken into account for better understanding of the decision-making process and people’s motivation, drives and actions. Our research suggests, that financial reasoning is only given priority to a certain point. As soon as questions of health, safety and wellbeing are being raised – often regarding agents that do not have indirect capacity or authority to make decisions, such as vulnerable members of the community, children, pets or plants – the dynamics of decision-making process change and active search for solutions increases. On a similar note, cases when money is not an issue – in case of wealthy individuals or institutions – financial reasoning plays a secondary or even a negligible role, and other aspects – often ones related to luxury, social status, convenience and comfort – come to the fore. This is why the following findings from our research regard affordability as a general notion, beyond the constraints of understanding it as a strict financial category.

- Affordability is primarily associated with finances.
- Considering aspects of time, affordability tends to be assessed from the point of view in short-term cost and disruption of everyday life, rather than long-term investments and benefits.
- More affordable – or accessible – the renovation project, more likely it is for people to find it acceptable and attractive.
- People can find renovation projects attractive, acceptable or necessary even if they personally do not find it affordable. However, whether or not they will support or actively pursue renovation largely depends on their individual (financial) capacity and responsibilities towards the necessary investments.
- Greater affordability prospects can be a motivational factor not only for the individuals to participate in renovation, but also for (resident) communities to form and act collectively in pursuit of common goals.
- Especially but not exclusively in case of social housing and large renovation projects, systematic support for housing stock renovation – on regional, state, or EU levels – should be put in place to make renovation more financially affordable and attractive.
- Innovative collaboration between private investors and communities also has a potential to render renovation projects more affordable and acceptable.
7.2 Attractiveness

People describe attractive or unattractive aspects of renovation with similar references as affordability, highlighting from financial aspects to convenience and aesthetics. A general notion that reflects the essence of attractiveness is improvement.

For most people in Gerardusplein it is about their own home. So if the appearance of the building can be improved it will appeal to them. (Savelsberg and van nunen 2019)

In comparison with affordability, attractiveness is focused more on results and effects of the renovation than the renovation itself. Affordability primary focus is assessing investments of time, effort and money. With attractiveness assessment if focused on the benefits of the intervention. Clearly investment can also be analysed in terms of attractiveness, focusing largely on the balance between input and output ratio. Smaller the investment and bigger the improvement the better.

The renovation will be attractive for the residents because there will be energy and financial saving, better thermal comfort, no overheating, and last but not least the value of the property will increase after renovation. (Nemeth and Magyar 2019: 17)

As with affordability and acceptability, also attractiveness should be considered in context and with regard to the subjective judgements of individual investors.

There are people who want building that look the same after renovation, but there are also people who use a renovations to make their home stick out. (Savelsberg and van nunen 2019)

One of the key aims of TripleA-reno project is to analyse what makes renovation projects attractive for owners and other key stakeholders, or as Sanchis et al. put it, which “keys to press to get a project successfully into reality” (Sanchis et al. 2019: 23). Here are some key general findings focusing specifically on the notion of attractiveness:

- People find renovation projects attractive for financial reasons – for prospects of both long-term savings and increased financial value of the property.
- There is a strong correlation between affordability and attractiveness. The more affordable people will find investments necessary to achieve wanted results, the more attractive they will find it. In contrast, they are likely to find it unattractive in case of costs and disruption of everyday life they cannot or are not willing to afford.
- People find renovation projects attractive for aesthetic reasons. That includes aspects of indoor environment – how users, residents and visitors experience the inside of the building – as well the building’s external aesthetic appearance – how people experience it from the outside. How and why people find something aesthetically appealing as well as why they find it attractive to invest into what they perceive as improved aesthetic appearance is a complex social, cultural and philosophical question, which goes well beyond the reach of our research.
In addition to aesthetics, people find renovation attractive for reasons such as improved IEQ, comfort, or even the feeling that they have acted in line with the established social norm and in the interest of the wider community.

In cases with exceptionally bad living conditions, as often the case in social housing, the notion of attractiveness is an understating euphemism for necessity. As Sanchis et al. specifically pointed out in their case, improvements regarding health and safety can not and should not be discussed as attractive or desirable. In the light of dignity of human life by the basic standards of a civilized society, which is what EU member states are striving for, they should simply be considered as necessary and urgent.

People find renovation attractive if they can relate it to their personal values and principles. Some associate it with values and lifestyles related to environmental sustainability. Others relate it primarily to notions of solidarity, equality, justice, and social responsibility. We should note, however, that in the context of efforts for sustainable futures these aspects are complementary or even different facets of the same entity.

People find renovation attractive for prospects of improved IEQ. That includes aspects of thermal comfort, noise, illuminance, and air quality. In addition, from point of view of individual’s experience of indoor environments, aspects of health, wellbeing, aesthetics, comfort and convenience should also be regarded as important qualitative aspects. Again, each of these can be further analysed and positioned on the continuum between needs and wants, or rather, between the necessary and desirable.

People are more likely to find renovation attractive if they have the capacity to understand it. That relates to aspects of education, monitoring, community building, transparency, and meaningfulness. Large part of sentiments and attitudes that fall under the category of unattractive comes from fear and uncertainty of the unknown. The other source is non-expert bias towards simplicity, which contrasts the inherently and increasingly complex expert world of sophisticated technological solutions.

People find renovation unattractive because of inevitable disruption of their everyday life, doubts in reliability of the project (potential technical complications), and lack of trust in the key stakeholders and their integrity. These aspects are further analysed under the category of acceptability.

7.3 Acceptability

Reaching strong consensus on acceptability is the turning point in decision-making process of any project, including renovations. If a solution or project is not acceptable to all parties involved, it is likely that it will face problems at one or more steps in its implementation. Prati describes how the notion of acceptability is intertwined with different aspects mentioned with relation to affordability and attractiveness:

The relationship of trust with the management company that will have to make decisions about the project and with the companies that will have to carry it out is undoubtedly a decisive factor in making a project acceptable. The assurance that the renovation will not exceed certain limits, deadlines and budgets are also crucial. The greater this confidence, the easier it will be to make the process acceptable. From this point of view, the promotion and valorization of already successful projects carried out in the area greatly contribute to increasing the reliability of the management company. (Prati 2019: 28)
The following findings highlight some key aspects of acceptability in relation to other key notions and energy renovation projects:

- **Finances** again play a key role in considerations of acceptability. In relation to affordability and attractiveness, acceptability can be understood as a point after which any unplanned (additional) costs render projects unaffordable, while attractiveness is a more general notion covering the spectrum of options before reaching the tipping point of (un)acceptability.

- **Reaching consensus** on acceptable terms and conditions of a renovation project is an integral part of a decision-making process. In case of a simple household structure in can happen seemingly effortless as decisions might depend on one single individual who has to decide what works best for him and his household. In contrast, big projects can require considerable efforts, especially ones involving a number of households, complex ownership-management structure, and complex technical, social, legal and administrative contexts. In such cases, there is often need for professional facilitation and project management.

- **Transparency, reliability, trust,** and other notions describing relations between stakeholders and the resident communities (or individual investors) are often key aspects of acceptability. Again, this relates closely also to aspects of education, community building, and monitoring. It highlights the need for efficient communication and facilitation as well as reliable quality control. Lack of character and integrity on the side of key stakeholders is likely to become a source of frustration, distrust and ultimately prompt many people to consider renovation project unacceptable for reasons, which could be entirely unrelated to its technical or practical aspects.

- **Formalized guarantees and consents** are an important vehicle for trust, mutually shared responsibility and ultimately acceptability. In other words, renovation will effectively be deemed accepted once all parties involved understand their benefits and responsibilities towards the project and are willing to formally consent to its realization.

- To insure people considering renovation interventions as acceptable, each project should be tailored to the specific context and needs of building users and residents.
8 Conclusions

TripleA-reno is a goal-oriented project, pursuing people-centred solutions and developments with specific focus on building renovation and improvement, its energy performance, and improved IEQ. In our report we looked at a number of important aspects, highlighting the everyday interaction between people and buildings, impact of seemingly invisible household practices, contrasting logics behind renovation planning, importance of knowledge and education, the power of efficient communication, and the benefits of monitoring and research interventions, to name a few. We indicated the relevance of understanding dynamics between the roles of owners, managers, investors and beneficiaries. These roles largely set the stage for renovation projects and characterize the project – more complex the network of stakeholders, the larger probability of complications. A relatively simple case of a single-family house, where all three functions are unified in one person or a couple, has a completely different character in comparison to a block of flats, with mixed ownership, externalized housing management and complex financial structure. We also discussed various contextual aspect of decision-making and everyday practices, such as the physical condition of the building, its location, socio-cultural contexts, policies, legislative limitations, etc.

Through our report we show that practices related to energy consumption and renovation are constantly changing socio-technical realities. With regard to the practical and qualitative character of our aims and goals, it is important to emphasize, that people – as carriers of practices – have limited capacity to integrate clear definitions of wrong or right, good or bad, hot or cold, beautiful and ugly into their everyday life. That is bad news for many of the standards and norms promoted by experts and authorities. Each individual renovation is a socio-technical world of its own that is also fluid and constantly changing. As such, it is often hard for an average citizen to use tools and understand measurements that were tuned to expert norms and standards. In other words, pragmatic, techo-centric, and financial logic do not necessarily work in real-life contexts that require capacity for deep understanding and empathy. Algorithms and bots on which platforms and digital tools stand on, at least for the time being, lack such capacity.

In conclusion, fostering human-to-human interaction should be made at least as important as any other technical, material, or practical aspect of TripleA-Reno tools. Although the future of humanity seems to be increasingly hard-wired and digital, TripleA-reno IT solutions and tools should account for the fact, that much of the meaning and value related to buildings and energy consumption emerges from the social and cultural, from relations and relationships. In light of this conclusion, enabling connectivity and meaningful interaction between household members and households, interaction between the resident community and building professionals, and indeed interactions between all relevant stakeholders involved in the renovation is central. That includes contractors and service providers, providers of products and material, neighbours and interested communities, researchers and wider communities beyond the local level etc.

Insights from this report provide useful starting points. Elements of practice – materials, competences, and meanings – can be singled out and used as social objects or strategies for building solutions and pathways towards sustainable futures in TripleA-reno and beyond.