D 4.1 Implementation of models of coordination

Société wallonne du Logement

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1 PART I PILOT PROJECT TECHNICAL DESCRIPTION

1. Description of the pilot building

1.1. Urban Context

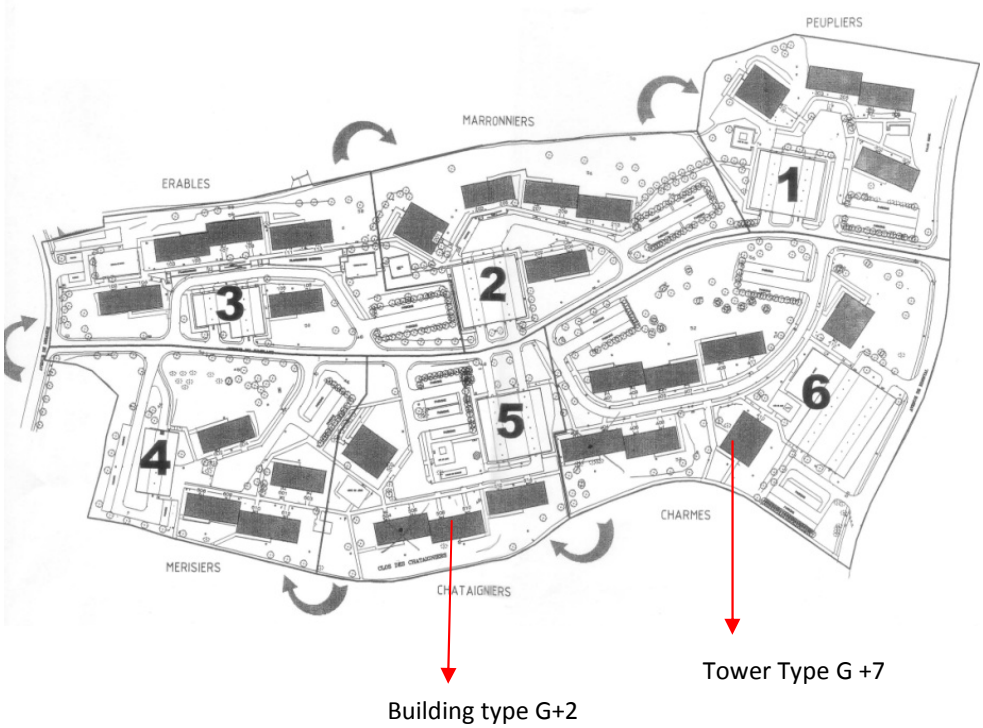
The pilot buildings are situated in the Chestnut orchard and Hornbeam orchard dead-end streets, which are integral part of the 'Cité des bruyères" (City of the Heaters), in Tubize.

Briefly, Tubize is a French-speaking city in the Walloon Region, in Belgium, located in the province of Walloon Brabant.

Until the late twentieth century, Tubize was an important center of the Belgian steel industry thanks to the presence on its territory of Clabecq Forges.

Crossed by a dense network of communication routes converging on the city of Brussels but characterized by rolling topography, the entity has maintained a rather rural face.

The total population of this county has more than 20,000 inhabitants, for a total area of ±33 km².



The “Cité des Bruyères” includes 518 dwellings (+ 2,000 residents) and covers an area of approximately 11.50 hectares.

Its scale is large compared to that of the city of Tubize and, due to its isolation, it suffers from a "social" negative representation.

The “Cité des Bruyères” includes :

- 24 buildings of type Ground + 2 (each including 12 units):
- 5 towers type Ground + 7 (each including 46 units)
- and 532 garages (covered type or isolated).

Average accommodation surface: + 90 m²

These building are spread over 6 dead-end streets (cf. map).

1.2. Specific description

Project name	“PEI” (Exceptional Investment Plan) major renovation of 72 social housing units in the Chestnut orchard and Hornbeam orchard dead-end streets in Tubize.
Address	Clos des Charmes (Hornbeam orchard) & Clos des Châtaigniers (Chestnut orchard) 1480 Tubize Belgium
Years of construction	1975-1978
Type of building	Apartments in buildings type Ground + 2 (each including 12 units accessible via two entrances, each serving two units per level).
Number of dwellings	72
Tenure	Social rental

Construction characteristics	Buildings are designed as experimental steel constructions. Cellars are built under the entire building. Description of the structure: • Pile foundations • Cellars : concrete structure made of concrete block walls from two types : 1st type) thickness 9 cm. U value = 2,06 W/m².K 2nd type) thickness 19 cm. U value = 1,64 W/m².K • Upper structure : steel building system, • Walls: o Exterior walls: sandwich metal panels (two 5mm steel plates and a 9cm insulating PUR foam panel within). U value = 0,36 W/m².K o the partitions are composed on both sides of gypsum on a honeycomb cardboard core. • Frames: the frames are in aluminum without thermal break and are of three types : 1st type) double glazed windows. U value = 4,29 W/m².K 2nd type) double glazed windows and opaque panels similar to walls. U value = 4,09 W/m².K 3rd type) Single glazed entrance doors. U value = 4,29 W/m².K • Floors : precast concrete ribbed sheet from two types : 1st type) Floor between cellars and ground floor: precast concrete ribbed sheet with polystyrene foam insulation (9.5 cm) + screed compression + PUR foam insulation (5 cm) + layer of concrete. U value = 0,21 W/m².K 2nd type) floors between levels (above non-heated areas): precast concrete ribbed sheet + layer of concrete. U value = 1,70 W/m².K • Roofs : steel trays + PUR insulation 10cm + bituminous waterproofing. U value = 0,33 W/m².K Description of the finishes: • Floor : carpet, vinyl • Ceiling : 60x60 False ceiling plates (Gyproc)
HVAC system	Electric heating system: local electric heaters with heating accumulation Therewith heating storage system (primary central air handling – Mainly, retain the heat during the night to benefit from it during the day). Natural Ventilation, but only in bathroom. There is no other ventilation system.
Energy performance before renovation	K80 Heating needs : 215,65 kWh/m²/year
Expected performance after renovation	K39 Heating needs : 82,77 kWh/m²/year

1.3. Identified problems

Major problems met with the different units:

a. Health:

The health problems are due to the dilapidated state of housing due to its age, to construction characteristics and HVAC system:

- Presence of asbestos in buildings:
  - Black glues encountered in some flooring (bathrooms, kitchens, storage, ...).
  - Glasal plates : forming the vertical bathtubs formwork;
  - Asbestos cords : found in the ducts (the passage of pipes and cables in the walls and slabs between floors and between Ground and basement)
  - Asbestos cement: present in the empty ducts, the rubbish bins for flats, the ventilation ducts, the ducts in the roof and the ventilation ducts in the garages.
  - Carpentry plates: partition walls between sanitary, and electricity in the hoppers landing.
- Presence of mold, condensation and humidity in the housing due to thermal bridges.
- Non compliant Electricity and ventilation.
- Water infiltrations through the roof

b. Habitability:

Similarly to the salubrity problems, habitability problems are due to the dilapidated state of housing due to its age, to construction characteristics and HVAC system:

- The finishes are outdated (floors, walls, ceilings)
- The energy consumption is relatively high
- There are frequent elevator breakdowns (in the towers, not covered by this part of the project)
- Outdoor and indoor degradations are due to obsolescence

c. Social aspect:

"Cité des Bruyères", located not far away from the center of the city, faces problems with urban and social integration because the scale of the city is larger than the town, and its access is located off the main roads.

The building image suffers from a repetitive appearance (uniformity and massiveness of the city (garages, basements of buildings)).

The site is considered by the neighborhood and the residents themselves as being a relegation zone, and even lawlessness. There is a high rate of antisocial behavior and vandalism.

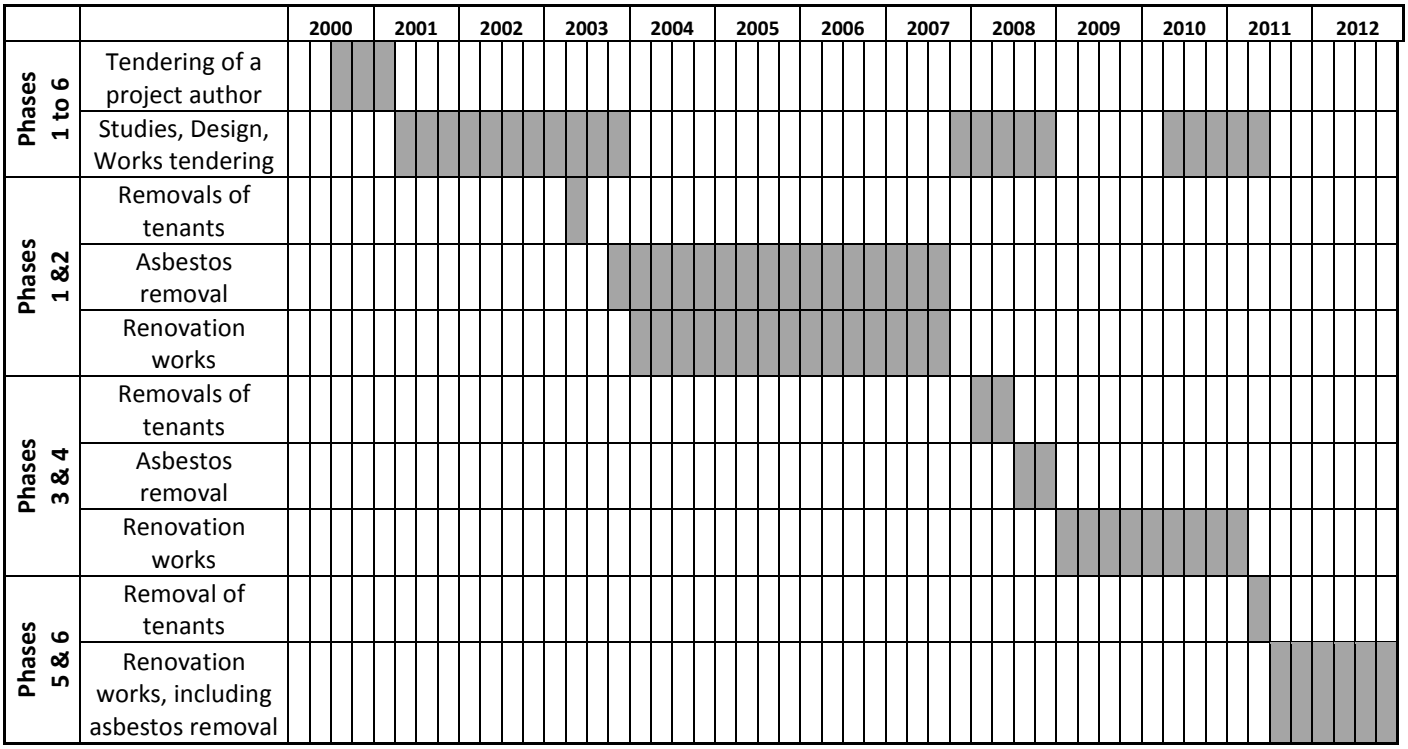
The problems listed below are worsened by maintenance problems and a large number of unoccupied dwellings (nearly 140 at the beginning of the project):

- Incivility
- Vandalism
- Squats

- frequent arsons source of insecurity feeling

2. Description of the refurbishment project

2.1 Main stages of the renovation project:



- 2001 : Designation of a project author (including architecture, coordination, stability & special techniques studies, and social support)
- Since 2001 : Social support for tenants:
    - study of the needs and wishes considered in the adaptations of the project
    - information and involvement of people before, during and after work (full time presence of two social workers on site)
- 2003-2012 : Implementation of the project, divided into 6 phases (corresponding to the dead-end streets), each consisting of:
    - Removals of tenants
    - Asbestos removal
    - Renovations of buildings, garages and around

  Each phase lasts nearly 2 years.

  The renovation work on this present project (Chestnut orchard and Hornbeam orchard dead-end streets) started on the 6th of June 2011 and completed in December 2012.

2.2 The renovation project

2.2.1 Overall objectives

The purpose of the renovation is to solve the problems identified and listed above, by:

- Securing housing according to safety standards

- Improving the quality of life of the occupants by the creation of a fulfilling and healthy life and, in particular, the elimination of condensation in the apartments

- Reducing the cost of charges and building maintenance

Both technical and social approaches were combined and led to the project.

2.2.2 Social aspect

Alongside technical analysis and planning, the social approach developed here has been of great importance in the project.
A sociological study was conducted to determine the needs of tenants; they were invited to participate in the study project. The needs analysis was conducted through a social survey including closed and open questions on three specific areas: the neighborhood, the housing project and suites.
Through this survey, tenants were able to express how they perceive their neighborhood, their homes and what change they want or refuse as part of the renovation of their living.
The passive nature of the involvement of tenants is significant. The people want to keep informed, but do not want to get involved in the choice of renovation. The team therefore sought to provide a pedagogical approach popularized and to integrate them into the project.
This has solved the greatest resistance of the tenants relating to the refusal of the move, choosing to carry out the renovation in phases to generate only one move per household, and conduct large social surveys before each phase to propose to the extent possible housing corresponding to the composition of households, and the wishes of tenants. Also, situations of disability or reduced mobility have been taken into account. Finally, the costs of removals were offered.
The composition of housing has also been adapted to meet the needs of the inhabitants of the site (more 1 bedroom, 4 bedrooms and 6 bedrooms designed)

Social intervention is built on two pillars:
- A collective approach in the form of:
    - general meetings held before each phase of work for the tenants concerned by the renovation project is presented and all questions can be asked,
    - distribution of information brochures-to-door when needed
    - a booklet of advice for maintenance and use of housing is distributed before each move into the renovated units
- Individual approach in the form of permanence and social survey via both social workers:
    - support for Removals tenants
    - permanent presence of a social team on site throughout the project, intended to provide, listen and solve the demands of people on renovations

2.2.3 Technical aspect

The technical aspect is described below into two categories:
- Energy Works
- Other Works

2.2.3.1 Energy works

The purpose of the energy works is to reduce the cost of charges.

The theoretical heating needs were calculated at 215,65 kWh/m²/year before the renovation.
After works, the theoretical heating needs were calculated at 82,77 kWh/m²/year.

Major energy works:

1) Replacing accumulation electric heaters with central gas heating :
   For ease of use and management of consumption, each apartment (unit) has its own individual heating unit (condensing gas boiler type HR +, power 8 to 24 kW), also used for the instantaneous production of hot water.
2) Isolation of the outer envelopes :

   The current insulation will be complemented by PUR foam panels (λ = 0.034 W/mK) with a thickness of 4cm, to further reduce the existing local thermal defects.
   Wall : U value = 0,22 W/m².K
3) Window frames : Replacement of the existing glazing by actual double glazing
   Aluminum frames are replaced by PVC or aluminum frames with thermal break.
   - 1st type & 2nd type are replaced by double glazed windows with PVC frames. U value = 1,38 W/m².K
   - 3rd type is replaced by double glazed entrance doors with aluminum frames with thermal break. U value = 1,48 W/m².K
4) Installing double-flow ventilation
   The existing ventilation system was no longer meeting current standards.
   It will be replaced by controlled mechanical ventilation with heat recovery: it consists of mechanical feed and discharge of the air as well as a recovery of the energy contained in the exhaust air.
5) Installation of Photovoltaic panels on the roofs (40 m² per building)
   They are used to supply electricity for common areas

Whole renovation investment in €*		Energy renovation investment in €*		% of renovation investment dedicated to energy saving measures
Total	Per dwelling	Total	Per dwelling	%
7.708.142,04€	107.057,53€	1.205.934,53€	16.749,09€	15,64%

* all amounts include 29% fees

Name of the energy saving measure	Saving		Necessary investment*	Repayment period	Reduced CO_2 emissions
	kWh/year	€/year	€	years	t/year
1) Replacing accumulation electric heaters with gas central heating*[2]			422.815,29€		
2) Isolation of the outer envelopes*[2]			92.137,15€		
3) Window frames : Replacement*[2]			336.941,68€		
Subtotal 1), 2) and 3)	888.838,86 kWh	X 0,2€ = 177.767,77 €/year	851.894,12 €	4,8 years	X 0,251 = 223.098,55 t
4) Installing double-flow ventilation *[2]	/	23.400,- €/year*[3]	124.876,40€	5,3 years	/
5) Photovoltaic panels	28.572,- kWh	X 0,2€ = 5.714,4€ + green certificates : n90 x 65€/p = 5.850,-€/year	229.164,01€	19,8 years	X 0,251 = 7.171,57 t
Total:		212.732,17 €/year	1.205.934,53€	5,7 years	

* all amounts include 29% fees

*[2] these investments are recovered by the tenants and not by the SWL

*[3] Heating 18.660,-€ + Electricity 4.740,- € (one blower instead of 8)

2.2.3.2 Other works :

The aim of the other works is to:
- Secure the housing according to safety standards
- Improve the quality of life of the occupants by the creation of a fulfilling life and, in particular, the elimination of condensation in the apartments
- Reducing the building maintenance

These works are listed below by sort:

Salubrity

- Asbestos and moisture removal
- Rehabilitation of roof waterproofing

Technical

- Refurbishment of electricity
- Upgrading of lifts (in the towers)
- New sanitary facilities and kitchen

Finishes

- Plaster, fiberglass and paint
- New ceilings
- Linoleum

Work on improving the social aspect

- Adapted housing following the needs of the population (number of rooms, storage areas)
- Improving of the image of buildings :
    - Replacement of siding
    - Remodeling of the land around the constructions
    - Transformation of the garages into public places
- Creation of two priming roads to open up the district
- Demolition of degraded equipment

2 PART II IMPLEMENTATION OF THE ALTERNATIVES TO THE CURRENT COORDINATION MODEL

1. Reminder of main conclusions from TU Delft study and targeted problems that the pilot project will try to overcome

Regarding conclusions of Work Package 3, five main problem areas have been identified:

1. Strategy
2. Design decisions
3. Tendering and contracting
4. Knowledge
5. Influence on tenants behaviour

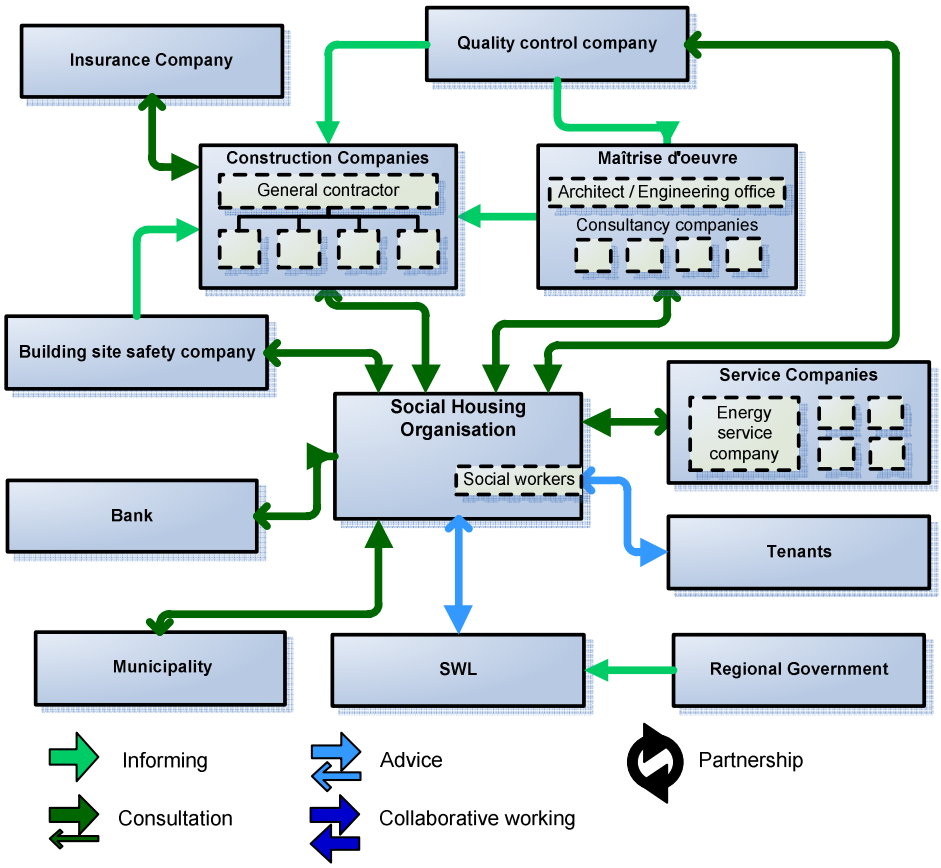


Figure: Categorization of the interactions among actors in usual SWL's energy renovation projects

Five broad solutions for the problem areas pointed were presented. For each solution several concrete actions to make them possible in different degrees were presented and ordered in terms of complexity of implementation:

Problem area:	1. Strategy
Possible solution:	A. Introduce energy saving as one of the main goals of the renovation strategy
Actions:	A.1. Define an energy efficiency goal in terms of energy certification score A.2. Define systems to evaluate the energy saving improvements
Problem area:	2. Design decisions
Possible solution:	B. Involve more actors in early stages of design
Actions:	B.1. Invite the maintenance companies to participate during the design phase

	B.2. Tender design-construct-maintain together
Problem area:	3. Tendering and contracting
Possible solution:	C. Define the responsibilities better
Actions:	C.1. Use award criteria in tendering procedures C.2. Use performance-based criteria in tendering and contracting
Problem area:	4. Knowledge
Possible solution:	D. Assure that the participating actors have the needed knowledge
Actions:	D.1. Organize a meeting with all the contractors and subcontractors involved in the construction and operation phase as project start-up D.2. Tender critical tasks as a separate lot D.3. Define a larger transfer time period between construction companies and maintenance companies
Problem area:	5. Influence on tenants behaviour
Possible solution:	E. Get information about real consumptions and create opportunities for mutual benefit
Actions:	E.1 Monitor the energy consumption of dwellings E.2 Create opportunities to share the benefits of reduction in the energy consumption

Problem areas identified and proposed possible solutions and actions to implement them

2. Analysis of the chosen alternatives (phase by phase)

The renovation project was started before starting the SHELTER project. Therefore, it was not possible to incorporate some of the recommendations.

2.1. Chosen Alternative: Design decisions

The type of energy renovation used in Tubize is the DBB.

However, asbestos removal was initially passed through a separate market, before the renovation works.

From phases 5 and 6 of the project, it was integrated into the work of the general contractor.

This has resulted in a reduction of the total duration of work: from 962 days of work for 108 dwellings (phases 3 & 4), we went to 574 days of work for 72 dwellings, or 7.97 days / housing instead of 8.91 days / housing, ie a reduction of 11%.

2.2. Influence on tenants behavior

After reviewing the different alternatives propose by the TU Delft report, and trying to implement them in our models of renovation, and considering the main objective of the Walloon Housing company: to provide quality standards of housing and to reduce the energy costs: the choice fell on one alternative: influence on tenants behavior, in all the main phases of the renovation process (conception, construction and maintenance).

2.2.1. Organization of collaborative works

The next Figure illustrates the Categorization of the interactions among actors in Tubize's energy renovation project, particularly we see the specific role taken by the social aspect.

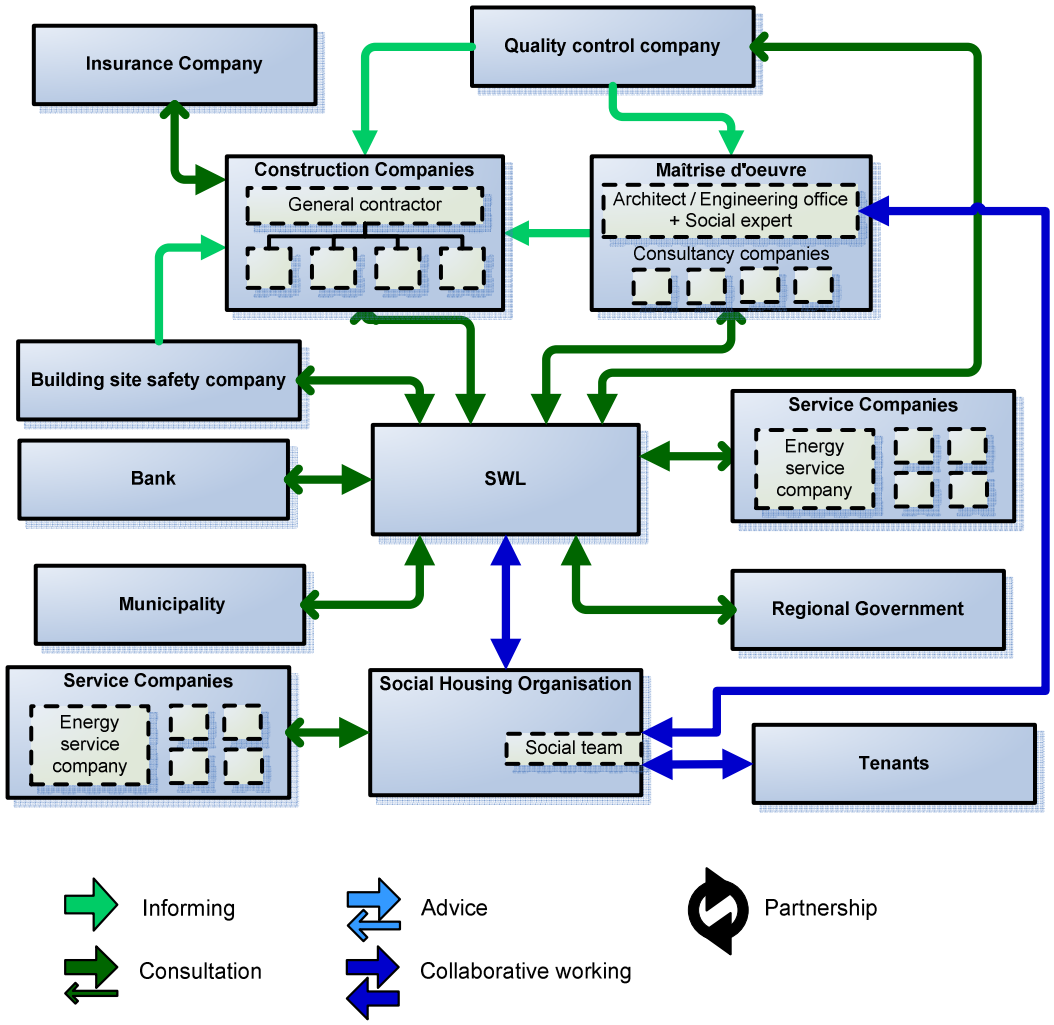


Figure: Categorization of the interactions among actors in Tubize's energy renovation project

2.2.2. The experience of the tenants

Usual social consideration

For usual renovation works by the SHO's: so far, the information sessions were done by housing societies.

In a way, tenants became aware, without having the opportunity to influence the renovations or to express their wishes. In no way, tenants were considered as a stakeholder in the renovation process.

Social consideration in Tubize

In the case of Tubize, a new element was added: the social element by incorporating a social team whose main objective is to be the relay from the housing society.

As explained in Part I of this report: prior to any renovation project, tenants were informed about the future works: the duration, extent, the relocation plan and especially improvements that will be made.

This structure aims to establish a dialogue between the implementing agents and professional organizations. This dialogue is intended to meet the needs of operational stakeholders' questions, but also tenants' ones. This allows not only considering improvements in the design of energy efficiency improvements, but to integrate human and social aspects through the involvement of tenants, thanks to the presence of the social team.

This cooperation between professionals, the social team and tenants has led in particular to adapt the work by including new elements, for example, integrating access ramps for the disabled; the ramps were not integrated in the original project. As a matter of fact, tenants become older, it was necessary to integrate this aspect in the renovation, incorporate mobility into the only building energy performance, integrate sustainable values in the renovation of buildings.

This coordination between all actors has been improved, it integrates the component "suitable building" in the "energy performance", in other words by improving access to the building, we have integrated a sustainable aspect, in what was just a renovation process and energy performance process.

This change would probably not have happened in the construction phase without a real coordination between all stakeholders: the social team, in echoing the needs of tenants, has caused a chain reaction among all stakeholders. In other words: to sell the idea, design and integrate the changes, modify the original plans and especially respond to a request.

Beyond this simple example, and considering the alternative, information sessions will be held prior to giving back their homes to the tenants. These sessions will aim to raise awareness among tenants about the benefits they can get just with simple gestures, not only benefit from the energy efficiency of their homes, but also in order to reduce energy costs they will face.

An example of the work done by the social team in order to inform the tenants is an information leaflet.

The new coordination structure helped working with the tenants on energy issues. A guidance was given to tenants on energy behavior:

The team SWL-Tubize 2004 took into account tenant’s comments and wishes at the stage of preliminary studies.

At each phase of the works (corresponding to the dead-end streets), they also organized general meetings with the tenants: the team SWL-Tubize 2004 explained the renovation project and answered to questions from tenants.

And last, when the tenants moved to the renewed apartments, each family received a booklet detailing how to use the new systems and facilities in the renovated units.

Following of tenants energy consumption

There is no special following of tenant’s energy consumption because they remain free to sign a contract with suppliers of electricity, water and heating, either in distribution or maintenance.

But in order to objectify the improvements of the renovation, we managed to obtain the energy consumption on a voluntary basis, in three apartments, allowing comparison between renovated and unrenovated housing.

Note that one of these three units is used as offices for social workers on the site.

	Energy consumptions				**Reduction**
	Before renovation (kWh)	**After renovation (kWh)**			
	Electricity	Electricity	Gas	**Total**	
Tenants 1	6005	1066	2446	3512	42%
Tenants 2	15170	3378	5711	9089	40%
Social Team	7868	Unavailable information			

PART III CONCLUSIONS

1. Result

Work has improved the following aspects:

- Technical point of view:

o healthier environment (removal or encapsulation of asbestos-containing components, mold removal through the outer insulation and replacement of chassis)

o safer environment (installation of fire detection systems centralized upgrading elevators)

- Urban point of view:

o improving the image of the city through the removal of a level garages, remodeling land to cover the cellars, the placement of a new skin facades and creating plots constituting spaces friendly meetings.

- Social point of view:

o safer environment (security and access to common halls and garages)

o significant reduction in the overall cost of heating consumption

o more friendly environment through the creation of plots

o less degradation renovated apartments, thanks to the "schooling" of the social team (Issue advice given to lessees)

The beneficiaries are mainly tenants, but also the Roman Pais and SWL by the decrease in complaints.

2. Impact

The impact of the implementation of alternatives is evaluated in terms of time and energy savings detailed in Part II of this report:

- Time saved : 11%
- Theoretical energy savings (only heating needs): 62%
- Real energy savings (heating + electricity needs): 40-42%

3. Possible improvements

All these steps would be in vain, without a real involvement of tenants. Indeed, we can determine all the criteria for selecting contractors, we can improve coordination between all stakeholders, we can calculate with auditing the energy performance of buildings, but without a real involvement of all tenants our Shelter project could be, in my opinion, useless. On paper, one can determine what will be the K building, but if your customer prefers to increase the temperature of the slot at 23 degree and open a window if it is too hot, no matter what renovation you will be planned to do will be useless, because its costs will not be reduced and benefits in reducing energy will be irrelevant.

I fully understand that the interests of project partners are divergent. In a business ground Shelter has to lead and focus on changes in public procurement rules, for architect’s minimum criteria standards of achievement, but the main objective still remains the tenants. Only the tenant holds the key to optimum energy performance. This essential ingredient must be done through relevant information for tenants.