Renovation Strubergasse, Salzburg (Austria)

Country: Austria

Name of city/municipality: City of Salzburg

Title of case study: Renovation Strubergasse

Year and duration of the renovation: 2008 – 2018 (it includes concept phase, planning phase, building phase and resettlement phase)

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Link(s) to further project related information/publications, etc.: https://www.stadt-salzburg.at/internet/websites/smartcity/smartcity/wohngebaeude/strubergasse_452403/quartierserneuerung_461475/sanierung_strubergasse_452405.htm
https://nachhaltigwirtschaften.at/resources/hdz_pdf/berichte/endbericht_1443a_stadtumba

Schematic figure or aerial overview

Figure 1. Schematic/aerial view of Strubergasse renovation area

New buildings/high-performance renovation of building owner GSWB

Thermal renovation of building owner City of Salzburg

Introduction and description of the situation before the renovation

The city of Salzburg owns 26 residential buildings in the district of Lehen between the Ignaz-Harrer-Straße in the north and the railway line in the south. The residential buildings in the area were built between 1950 and 1965. The formerly common small apartments were hard to rent. with stove heating based on coal or wood. In some cases, single gas boilers were installed. Some objects were faced with massive problems of mold.

Already implemented renovation measures were scarce: In some houses windows were exchanged, in one object the façade was insulated and the roofs were partially renovated. The heat loss to the outside was therefore considerably high.

Figure 2. Photographs of the conservation state of the buildings prior to rehabilitation

The acoustic protection was a problem within the houses, but also against the outside, as the living and sleeping rooms were partly situated to the heavily trafficked roads (Rudolf-Biebl-Straße and Ignaz-Harrer-Straße).

A further issue was the accessibility of the buildings. Even if elevators were retrofitted, the residents had to overcome the mezzanine from the elevator to the apartments.

Between the buildings, generous open spaces were given but hardly any car parking areas. Many residents parked on the public roads.

In the adjacent district “Stadtwerk Lehen” many projects were implemented between 2008 and 2015, which, on long-term, lead to an appreciation of this central district: In the northern part 287 subsidized rental apartments, a kindergarten, the new city gallery and a dorm, in the southern part offices, laboratories and seminar rooms. Here, the largest thermal solar system of Salzburg with 2,048 m² thermal collectors and a 200,000-liter buffer storage was built.

Description of the renovation goal

The general objective of the renovation with partially new constructions was to create a sustainable and long-lasting residential complex with high sociocultural, functional, ecological and economic quality.

In detail the renovation goals were:

- Increasing the living quality and adapting the buildings to a contemporary standard of living
- Quality improvement and increase in the value of the building stock
- Improving the quality of open space in the district
- Ensuring permanent rentability
- Reducing energy costs and CO_2 emissions
- Improving the image and its effect as identification for the inhabitants and for the district

As part of the modernization, a balanced mix of apartments should be achieved. The complex has 482 residential units with a focus on 2- and 3-room apartments. Due to the favorable location and the unused areas in the attic, it made sense to carry out an extension. Due to the high demand for housing, apartments for four and more people should be newly created. The concept included the possibility to create approximately 70 apartment units in this way.

Description of the renovation concept

The following measures were implemented in the buildings which are owned by the City of Salzburg:

- Thermal renovation: façade insulation, new windows, insulation of the basement and attic ceiling.
- Balconies: Each apartment was equipped with a balcony during the renovation.
- District heating connection to the existing network of the Salzburg AG. The micro-grid of the neighboring city district “Stadtwerk Lehen” has been extended into the area around the Strubergasse, so that the heat from the solar system (especially in summer) can be used.
- Since the old apartments were not connected to a modern central heating system, supply lines were laid to each apartment. Each tenant had the opportunity to continue to operate his old heating system or to connect to the district heating system of the city of Salzburg.

Thermal renovation

For the thermal renovation of the buildings, radical measures were proposed. Each building component, which is renovated, should achieve the highest possible energy standard, to achieve acceptable energy consumption also in 40 to 50 years without mayor renewals.

Different renovation packages were elaborated and evaluated:

- Renovation package 1: optimized building envelope according to already intended standard.
- Renovation package 2: “factor 10” renovation: improved standard with high profitability using passive house components and mechanical ventilation systems with heat recovery.
- Renovation package 3: passive house standard for all new buildings and also for the additions of stories.

The following table shows a comparison of the U-values of all three renovation packages and of the existing buildings (on average).

Table 1. U-values in W/m²K before and after renovation.

	existing buildings	renovation package 1		renovation package 2		renovation package 3	
	U-value	insulation thickness	U-value	insulation thickness	U-value	insulation thickness	U-value
component	**W/m²K**	**cm**	**W/m²K**	**cm**	**W/m²K**	**cm**	**W/m²K**
exterior wall	1.015	16	0.180	20	0.138	25	0.114
ceiling to cellar	1.111	12	0.231	20	0.151	25	0.124
ceiling to attic	0.812	20	0.143	25	0.119	30	0.101
roof	1.127	27	0.154	30	0.131	35	0.113
windows			0.90		0.85		0.80
ventilation	free	mechanical exhaust air		mech. supply/exhaust air with heat recovery		mech. supply/exhaust air with heat recovery	
airtightness of envelope	3 - 6 h^{-1}	1,0 h^{-1}		0,6 h^{-1}		0,6 h^{-1}	

The results of the PHPP calculation for the different renovation packages and the existing situation can be found in the following figure:

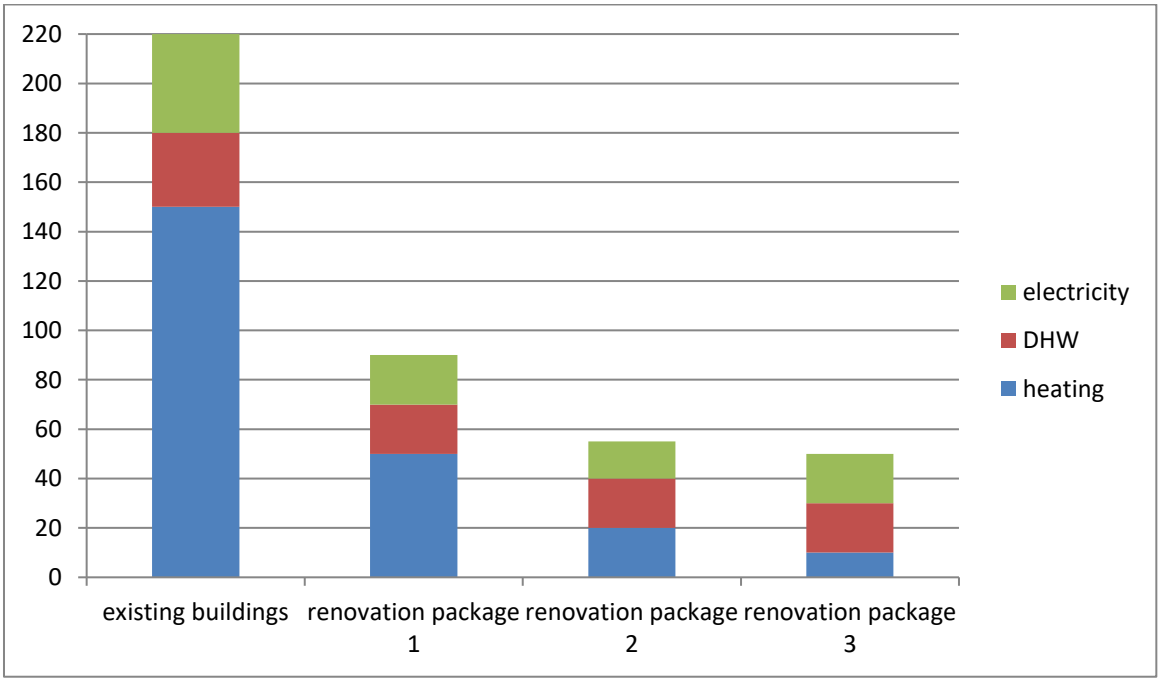


Figure 3. Calculated energy demand of the existing buildings and the three renovation packages in kWh/m²a

During the planning phase, it was also the goal to evaluate the possibility to produce electricity on-site by photovoltaic modules. One of the findings was that the highest electric yield can be achieved on the roof areas if different roof shapes were created. The yield of a large-scale PV is higher than the demand, so on the balance sheet electricity could be obtained for mobility.

Project Fact Box (I)

General information

Parameter	unit	before renovation	after renovation
Urban scale of area:	m²	45,000	45,000
Population in the area:	-	1,400	1,600
Number of buildings in the area	-	26	23
Heated floor area of all buildings	m²	15,500	36,000
Building mix in the area:			
Single family homes (SFH)	% of heated floor area of all buildings	-	-
Multi-family homes (MFH) - up to three stories and/or 8 flats		-	-
Apartment blocks (AB) - more than 8 flats		95	95
Schools		-	-
Office buildings		-	-
Production hall, industrial building		-	-
other (ground floor area spaces)		5	5
Consumer mix in the area:			
Small consumers: SFH + MFH – < 80 MWh/a	in % of annual heat demand	-	-
Medium consumers: AB, schools, etc. – 80-800 MWh/a		100	100
Large consumers: industrial consumers, hospitals, etc. > 800 MWh/a		-	-
Property situation of buildings:			
private (but: limited profit organization)	% of heated floor area	50	50
public		50	50
Property situation of energy supply system (district heating):			
private (but: city as a shareholder)	% of heated floor area	100	100
Public		-	-

Project Fact Box (II)

Specific information on energy demand and supply:

Parameter	unit	before renovation	after renovation
heating demand (calculated)	kWh/m²a	93-150	27-35
domestic hot water demand (calculated)	kWh/m²a	included in the heating demand	
cooling demand (calculated)	kWh/m²a	-	-
electricity demand (calculated)	kWh/m²a		
heating consumption (measured)	kWh/m²a		
domestic hot water consumption (calculated)	kWh/m²a	included in the heating consumption	
cooling consumption (measured)	kWh/m²a	-	-
electricity consumption (measured)	kWh/m²a		
(Thermal) energy supply technologies:			
decentralized oil or gas boilers	% of heated floor area	50	0
decentralized biomass boilers		-	-
decentralized heat pumps		-	-
centralized (district heating)		0	75
other *(please specify) coal, wood ovens*		50	0
renewable energy generation on-site:		0	25
solar thermal collector area	m²	0	2,048 (connected to microgrid of “Stadtwerk Lehen”
photovoltaics	kWp	0	0
other (please specify)	kW	0	0

Financial issues:

Parameter	unit	before renovation	after renovation
total costs of the whole renovation and construction project	Euro	-	59,520,000
Thereof costs of the renovation	Euro	-	7,800,000
- building envelope renovation costs	Euro/m^2	-	-
- heating/cooling supply costs	Euro/m^2	-	-
- renewable energy production costs	Euro/m^2	-	-
LCC available	yes/no	No	no

Description of the technical highlight(s) and innovative approach(es)

Non- technical Aspects:

Gentle neighborhood redevelopment through successful relocation management

The acceptance and understanding of the existing residents, as well as efficient settlement management. Over a period of five years (2001-2016), 337 households were resettled in the settlement. Thus, satisfactory housing solutions, including relocation assistance, were found for almost all residents. For the most part, a professional relocation service, free of charge for the tenants, was used. Otherwise, a relocation aid was paid out. Fears could be overcome in long personal conversations. In this way, it was possible to offer new or renovated apartments to the residents who were to move, mostly in their familiar surroundings. An evaluation after completion of the project has shown that there is a flexible response to complex problems. Challenges are impending redemption demands or delays in the course of the project. On the other hand, only targeted information work by all those involved can help to inform the relevant residents about rental price developments in urban and subsidized rented housing and thereby convey realistic ideas. Methodically, on-site meetings, information letters and personal contacts were selected. Resettlement also requires a clear implementation plan with time reserves in order not to come under pressure in case of difficulties. It is also essential to inform the affected citizens immediately of the decision to resettle and to have the responsible staff and politicians accompany and support the entire process.

Decision and design process

General/organizational issues:

Stakeholders involved

Non-profit building association GSWB and Bausparerheim

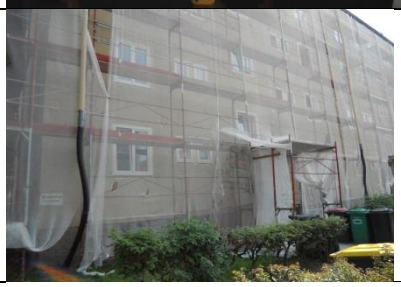
City of Salzburg Municipal Department 3/03

Main steps

The main steps of the process for the successful implementation of the project were as follow.

Table 2. Timeline and main project milestones.

June 2008	Concerto contract for EU funding project to finance construction measures in Salzburg Lehen	
Summer 2008	First talks with the mayor of the city of Salzburg	
Spring 2009	Evaluation of the existing situation	
September 2009	The founding of the working group “Rehabilitation of Strubergassensiedlung”	
October 2009	Start of construction of Stadtwerk Lehen housing unit	
December 2009	Commissioning of the master plan study by Arch. Schulze-Darup from Nuremberg	
February 2010	Workshop on the framework parameters and definition of objectives	
April 2010	Presentation of the study to the responsible people in the city administration and in politics.	
Autumn 2010	Residents’ information and survey	

January 2011	The decision of the municipal council to refurbish 14 multi-family houses and to demolish and rebuild 12 residential buildings.	
February 2011	Start of the information and the resettlement of the residents in stages	
November 2011	Handover and settlement of the flats in the “Stadtwerk Lehen”	
December 2011	Establishment of the steering group to coordinate the various project stages and construction measures	
Spring 2012 – Summer 2013	Renovation of residential buildings in the Strubergasse (façade insulation and new windows, insulation of top floor ceiling, new balconies, connection to the district heating system)	
Summer 2012	Architectural competition for part A of the newly constructed buildings	
Autumn 2012	Architectural competition for parts B and F	

April 2013	Start of the demolition of part A	
June 2013	Starting the construction of part A of the new buildings	
Spring 2014	Start of the demolition of 3 buildings of part B	
February 2014	The decision of the municipal council on the concept to create open space and also on the budget for the project	
June 2014	Ground-breaking ceremony for part B	
	Starting the construction of part B of the new buildings	
September 2015	Handover of 111 new subsidized rental apartments in building A	
December 2015	Handover of 108 new subsidized rental apartments in building B	
Autumn 2015	Beginning of the demolition of three buildings of part F	
January 2016	Starting the new construction of part B	
December 2016	Handover of 65 new subsidized rental apartments of part F	

March 2017	Starting the construction of the new open space	
May 2017	Starting the new construction of part I	
June 2017	Completion of open space	
September 2017	Settlement festival for the inhabitants	
October 2017	Handover of 23 rental apartments in section G	
Autumn 2018	Handover of 43 rental apartments of part I	

Resources available before the project

There is no information available.

Drivers and barriers (opponents)

Main drivers: There is no doubt that the "Green Solar City" project, supported by the EU's CONCERTO funding programme, was the driving force behind the renovation offensive and kick-started the process that was difficult in the beginning due to the political differences at the time.

Main opponents: Political differences occurred because of the social aspect: “Would a renovation be considered a gentrification process?” Media exposure had negative impacts, voices against the project were formulated (partly within politics, partly from inhabitants).

Stakeholders' role and motivation

Main stakeholder	Specify which organization(s) was (were) involved	Role (decision-maker, influencer, technical advisor, delivery)	Driver/motivation
Policy actors (municipality department, government body, innovation agency, etc.)	City of Salzburg Municipal Department MA 05	Decision maker	Renovation of existing housing stock
Users/investors (individual owner, housing association, building managers, asset manager, project developer)	Non-profit building association GSWB and Bausparerheim	Influencer	Construction of new housing as their business model
District-related actors (Community/occupants organizations, etc.)	Rosemarie Fuchshofer "StadtLandBerg"	Influencer	Social science support of process
Energy network solution suppliers (Distributor system operator, energy supply company, energy agency, ESCO, renewable energy companies)	Salzburg AG	Technical advisor	Supplier of energy services; supplier district heating
Renovation solution suppliers (Planning and construction parties, urban planners, architects, design team general contractors, products suppliers, ESCO, contractor, energy monitoring, facility manager, installation provider, one-stop-shop, etc.)	Schulze Darup & Partner, Nürnberg Housing Office City of Salzburg Architect Aicher	Technical advisor Influencer Technical advisor	Development of framework plan Keeping Social dimension, "gentle" refurbishment Open space concept
Other intermediaries (public bodies, trade organizations, NGO's, consultancies, research institutes)	SIR – Salzburger Institut für Raumordnung und Wohnen	Advisor and project developer; Scientific Partner	improve the quality of the district

Design approach:

The design approach followed was the "Open and Green Space Concept".

Technical issues:

There is no information available.

Financing issues:

Costs and financing concept

For buildings from the post-war period, it is essential to check to what extent demolition and new construction represent an economically viable solution. In the development phase of this success story very detailed estimations of the investment costs were made. The following table shows an excerpt of the energy-related investment costs and the additional investment of the individual building components of renovation packages 2 and 3 (compared to renovation package 1), as well as of the building services.

Table 3. Investment costs of different renovation scenarios.

	renovation package 1		renovation package 2 additional investment		renovation package 3 additional investment	
	EUR	EUR / m²	EUR	EUR / m²	EUR	EUR / m²
exterior wall	121,565	79.45	7,497	4.90	8,899	5.82
exterior wall to soil	1,954	1.28	118	0.08	118	0.08
top floor ceiling	32,719	21.38	2,809	1.84	2,929	1.91
basement ceiling	24,038	15.71	4,651	3.04	2,835	1.85
interior wall to unheated	6,545	4.28	691	0.45	810	0.53
interior doors to unheated	7,128	4.66	0	0.00	3,300	2.16
windows	98,206	64.19	6,799	4.44	15,109	9.87
exterior doors	5,856	3.83	0	0.00	2,768	1.81
thermal bridges	4,103	2.68	0	0.00	3,025	1.98
air tightness	5,049	3.30	400	0.26	200	0.13
ventilation	48,960	32.00	53,550	35.00	0	0.00
heating	159,970	104.56	-23,178	-15.15	-9,383	-6.13

Remarks: the mentioned Euro amounts are the gross values; Euro per m² refer to the m² of each building component

For cost-effectiveness calculations, it is essential to consider the foreseeable overall life cycle of the buildings. "Cash Cows" in the housing industry are always buildings that were created in a sustainable way at the time and can continue to be rented to a high standard even after the loan obligations expire. The same is the goal of renovation projects: to implement a sustainable master plan with a long-term economic viability assessment.

Policy framework conditions:

There is no doubt that the "Green Solar City" project, supported by the EU's CONCERTO funding programme, was the driving force behind the renovation offensive and kick-started the process that was difficult in the beginning due to the political differences at the time.

Lessons learned/interesting findings

The renovation of 286 apartments and the demolition and new construction of another 350 apartments, including the implementation of a new, high-quality open space, shows a possible way for improvements of the housing quality for other existing city districts.

However, this requires a clear political decision and an integrative process of project development and project execution. In this integrative process, it is absolutely necessary to include also the tenants and the residents´ service points.

The goal must be the creation of an added value for both, the residents and the society, and to significantly improve the living quality, the infrastructure including mobility, as well as the quality of its open spaces.

This example shows that the resettlement of the residents is indeed labor-intensive and tedious. But when applying an intelligent professional approach, as done in this example, even that is not a real problem.

In the city of Salzburg, there are several buildings that would have to be upgraded in the following years to be ready for the future requirements of the housing market. This success story has shown how this is possible and should encourage stakeholders also to tackle larger projects.