NET ZERO CITIES

systemssolutions.org
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Centre for Systems Solutions

Energy Renovations Good Practices Reading List

based on ideas presented in the NZC Social Simulation, Seasonal School 2024

Themes included:
Clean Energy and Energy Efficiency in the Context of Urban Building Stock

NZC Seasonal School
November 27th - 29th 2024, Madrid

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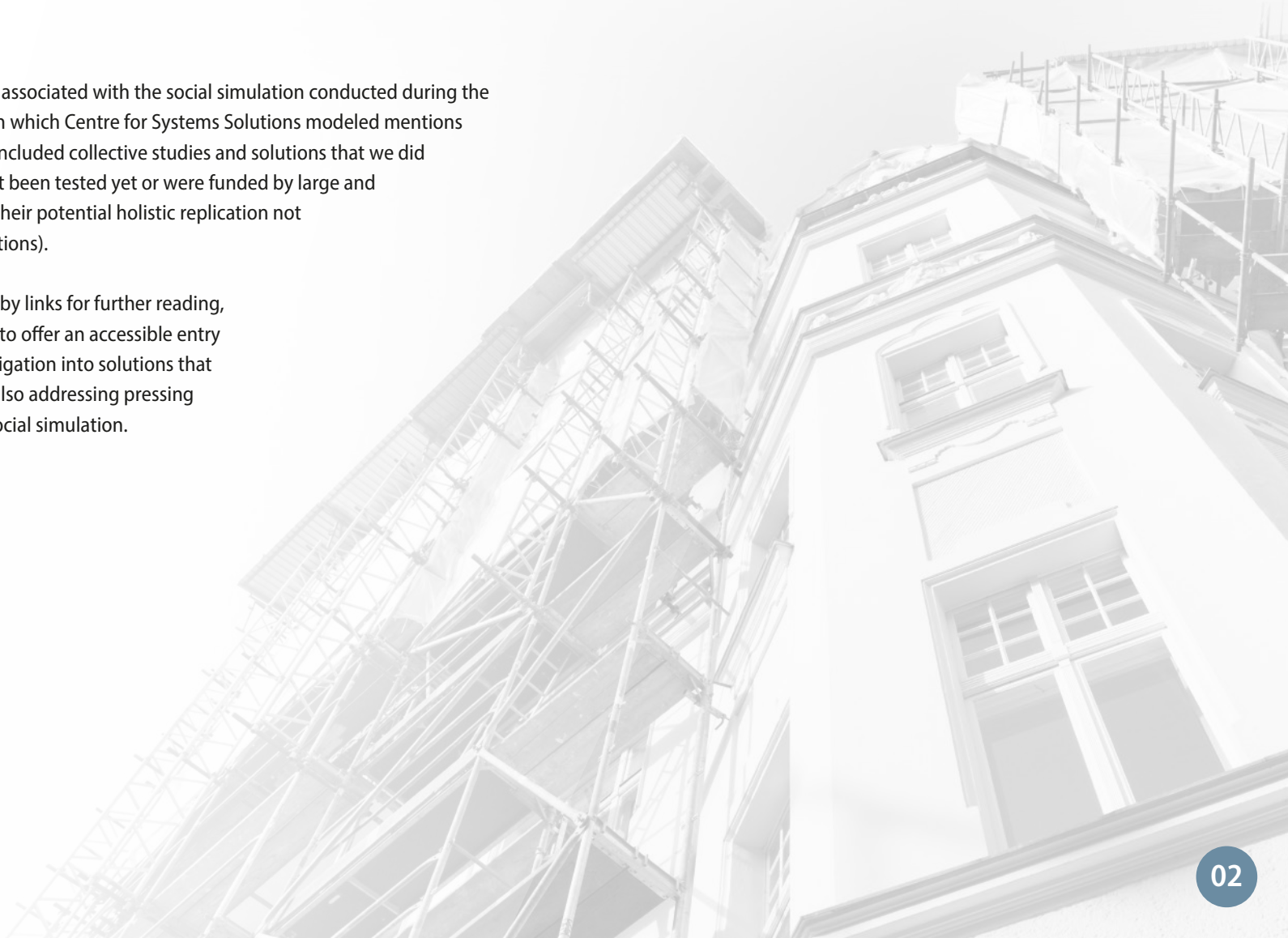
Introduction

This document provides an overview of the solutions associated with the social simulation conducted during the Seasonal School in Madrid. These may be solutions on which Centre for Systems Solutions modeled mentions in videos or lobbyist messages. In addition, we have included collective studies and solutions that we did not select for simulation because they either have not been tested yet or were funded by large and relatively difficult-to-access EU grants (which makes their potential holistic replication not guaranteed while they still may provide great inspirations).

Each solution is briefly outlined below, accompanied by links for further reading, as **buttons or clickable thumbnails**. The purpose is to offer an accessible entry point for exploration and to encourage further investigation into solutions that may align with your city's goals and priorities, while also addressing pressing challenges related to the overarching theme of the social simulation.



Superbonus (Italy)

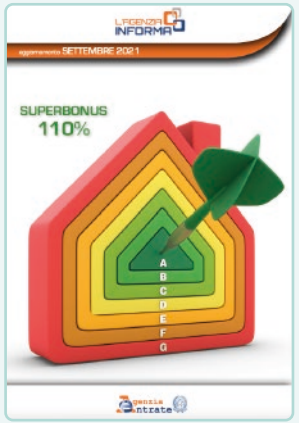
Theme: **Financing energy renovations**

Comprehensive **tax incentive program that allows homeowners to claim up to 110% tax deductions for expenses related to energy efficiency renovations** and seismic upgrades of buildings. Aimed at stimulating the construction sector and promoting sustainable building practices, the program covers eligible works such as insulation, installation of solar panels, and the upgrading of heating systems.

While the Superbonus has been instrumental in improving the energy performance of Italy's building stock and reducing carbon emissions, its results have been mixed. On the one hand, **it has led to job creation and a boost to GDP; on the other hand, it has also resulted in ballooning costs and significant strain on the public budget**. Additionally, the program has faced challenges related to insufficient targeting and monitoring.

OFFICIAL ITALIAN SOURCES

Short official introduction from the Ministry of Economy and Finance



A 2021 guide from a gov agency, including 7 practical examples

MEDIA COMMENTS

Superbonus! Italy's green growth gambit lines homes and pockets

How long will Italy's miraculous growth last?

Why Italy's Superbonus blew a hole in state accounts

KredEx Revolving Fund (Estonia)

Theme: **Financing energy renovations**

"A financing institution that operates as a private company but is owned and governed by the national government (...). KredEx **Revolving Fund** provides soft loans [interest rate fixed for 10 years] for multifamily apartment building owners who wish to reduce energy consumption and increase energy efficiency of their homes. Further financial sources, coming in particular from the EU structural funds (ERDF) and the sale of CO_2 emissions allowances are available for the owners in form of grants."

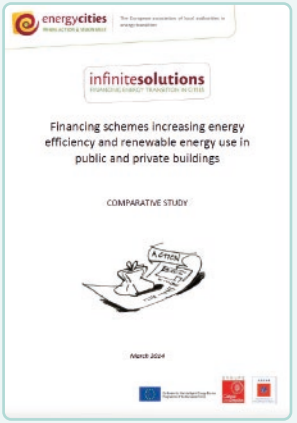
Contributors to the capital of the Fund: The Council of Europe Bank, Estonian government, KredEx, European Regional and Development Fund.

"The beneficiaries are supposed to **pay their monthly installments from the savings made on their energy bills**. (...) The financing scheme also offers a grant component for:

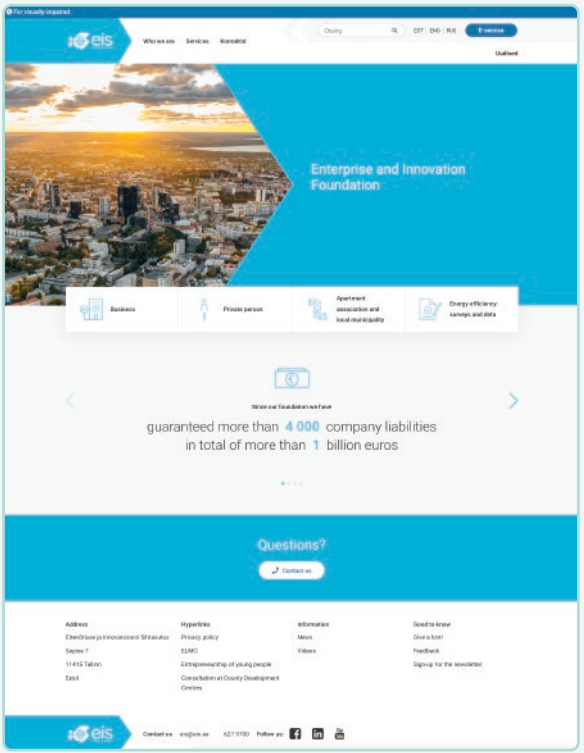
- Independent energy audit and monitoring,
- project design documents."

Grant for reconstruction depending on the level of energy savings achieved.

RELEVANT LINKS



Chapter on the KredEx Revolving Fund in: Financing schemes increasing energy efficiency and renewable energy use in public and private buildings (pp. 27-31)



In 2022, KredEx merged with Enterprise Estonia and is now the Estonian Business and Innovation Agency. You can take a look at their "Services" tab.

Latvian Baltic Energy Efficiency Facility - LABEEF (Latvia)

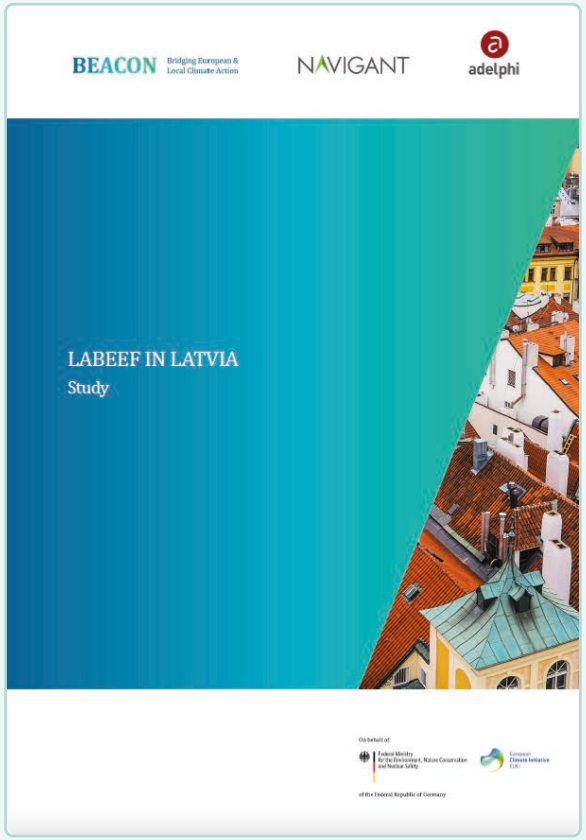
Theme: **Financing energy renovations**

Financial mechanism designed to promote deep renovations of multi-family residential buildings in Latvia. LABEEF provides funding for comprehensive renovation projects that significantly enhance energy performance.

The program operates on a **"pay-as-you-save"** model. An ESCO finances renovation measures through a commercial bank and makes an Energy Performance Contract with the building owners. Once renovation measures are completed and their effectiveness has been monitored and verified, **a third party forfeits the EPC and continues to collect the EPC receivables** from the building owners until the renovation investment has refinanced itself.

To be able to forfeit the EPCs, the third party should collect loans, eg. from international financial institutions, like the European Bank for Reconstruction and Development. The measures are conditional on the building's residents' agreement and their willingness to pay about 15% higher energy bills for ca. 20 years.

RELEVANT LINKS



LABEEF in Latvia: Study

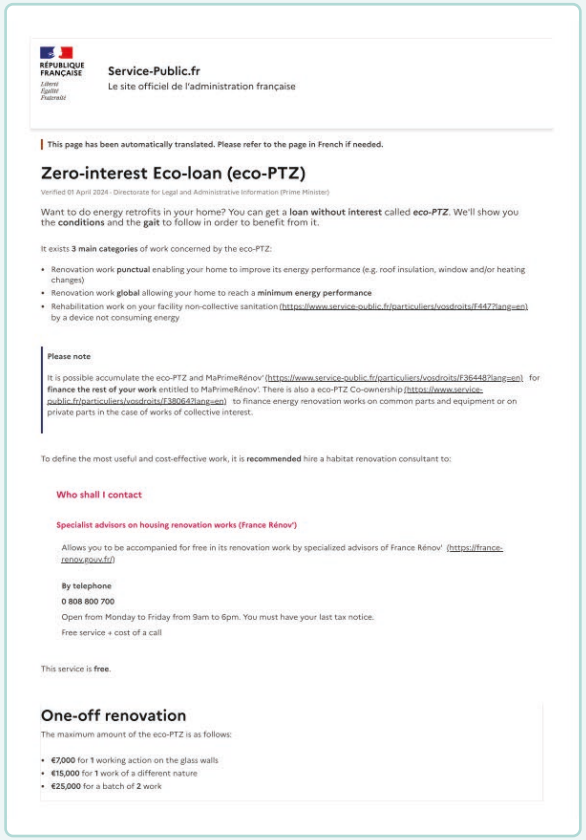
éco-Prêt à Taux Zéro - éco-PTZ (France)

Theme: **Financing energy renovations**

This French initiative offers **zero-interest loans to homeowners** for financing energy renovation projects. Designed to encourage energy-efficient home improvements, the eco-PTZ covers upgrades such as insulation, heating system enhancements, and the installation of renewable energy sources.

Available to all homeowners, it can provide up to €30,000, depending on the scope of the work. While it has been **very successful in mobilizing private investment**, the program has faced criticism for effectively **excluding low-income or uncreditworthy households**.

RELEVANT LINKS



RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

Service-Public.fr
Le site officiel de l'administration française

This page has been automatically translated. Please refer to the page in French if needed.

Zero-interest Eco-loan (eco-PTZ)

Verified 01 April 2024 - Directorate for Legal and Administrative Information (Prime Minister)

Want to do energy retrofits in your home? You can get a **loan without interest** called ***eco-PTZ***. We'll show you the **conditions** and the **gait** to follow in order to benefit from it.

It exists **3 main categories** of work concerned by the eco-PTZ:

- Renovation work **punctual** enabling your home to improve its energy performance (e.g. roof insulation, window and/or heating changes)
- Renovation work **global** allowing your home to reach a **minimum energy performance**
- Rehabilitation work on your facility non-collective sanitation (https://www.service-public.fr/particuliers/vosdroits/F4427?lang=en) by a device not consuming energy

Please note

It is possible accumulate the eco-PTZ and MaPrimeRénov' (https://www.service-public.fr/particuliers/vosdroits/F36448?lang=en) for **finance the rest of your work** entitled to MaPrimeRénov'. There is also a eco-PTZ Co-ownership (https://www.service-public.fr/particuliers/vosdroits/F38064?lang=en) to finance energy renovation works on common parts and equipment or on private parts in the case of works of collective interest.

To define the most useful and cost-effective work, it is **recommended** hire a habitat renovation consultant to:

Who shall I contact

Specialist advisors on housing renovation works (France Rénov')

Allows you to be accompanied for free in its renovation work by specialized advisors of France Rénov' (https://france-renov.gouv.fr/)

By telephone

0 808 800 700

Open from Monday to Friday from 9am to 6pm. You must have your last tax notice.

Free service + cost of a call

This service is **free**.

One-off renovation

The maximum amount of the eco-PTZ is as follows:

- **€7,000** for **1** working action on the glass walls
- **€15,000** for **1** work of a different nature
- **€25,000** for a batch of **2** work

Official guidance by the French gov.

One-Stop-Shops (multiple countries)

Theme: **Holistic approach to buildings decarbonisation**

One Stop Shops are **integrated service platforms designed to simplify the process of undertaking energy renovation projects** for homeowners and businesses. One-Stop-Shops provide a range of services including technical assessments, project management, financing options, and access to skilled contractors.

By streamlining the renovation process, they aim to **increase participation** in energy efficiency programs and facilitate deeper renovations that lead to substantial energy savings and improved building performance. If done well, they can **mitigate most behavioural and some financial barriers** to climate renovations, such as information overwhelm, disaggregated demand and supply, lack of trust, excessive paperwork, or prolonged tiresome renovation chaos at home due to lack of coordination or delays.

RELEVANT LINKS


One-Stop-Shops for Energy Renovation of Dwellings in Europe—Approach to the Factors That Determine Success and Future Lines of Action

Academic summary and recommendations based on multiple cases comparison

Analysis and policy report on One-stop shops for residential building energy renovation in the EU


Business models for residential retrofit in the UK: a critical assessment of five key archetypes

Summary and comparisons of different business models for energy renovations

Energiesprong (The Netherlands, UK, France, Germany, Italy)

Theme: **Holistic approach to buildings decarbonisation**

Program Overview: Originally a Dutch initiative, Energiesprong has scaled up internationally, offering "net-zero" **retrofits for social housing**. The approach focuses on **rapid, prefabricated renovations, which minimize tenant disruption**.

Financial Success: Energiesprong's financial model **combines public funding with private investment, allowing economies of scale**. By reducing energy bills through efficient retrofits, the program enables a **"pay-as-you-save"** model, where energy savings finance the renovation costs over time.

RELEVANT LINKS

Website: Energiesprong Global Alliance

Ecopower Cooperative (Eeklo, Belgium)

Theme: **Energy cooperatives**

This renewable energy cooperative **enables local communities to invest in sustainable energy projects** like wind farms and solar panels. The cooperative model keeps individual investments affordable by **pooling resources** from a large group of citizens. Members receive **dividends** based on energy production and have a **democratic say** in investment decisions, with one vote per member regardless of share ownership.

Ecopower focuses on **keeping money within the local economy by financing projects that benefit the community**, such as a sustainable concert hall, electric bicycle charging points, and insulation for public buildings. The cooperative also funds a part-time energy expert to support the development of additional renewable energy and energy efficiency projects in the community.

RELEVANT LINKS


Model 25

COOPERATIVE CASE - ECOPOWER

Eeklo, Assse, Beerse – Belgium

Summary

Factsheet:
Cooperative case EcoPower

Online news article: The Belgian Towns Producing Their Own Green Power

Online news article: Energy crunch in Belgium drives spike in demand for renewable energy cooperatives

Munich Smart City Initiative (Germany)

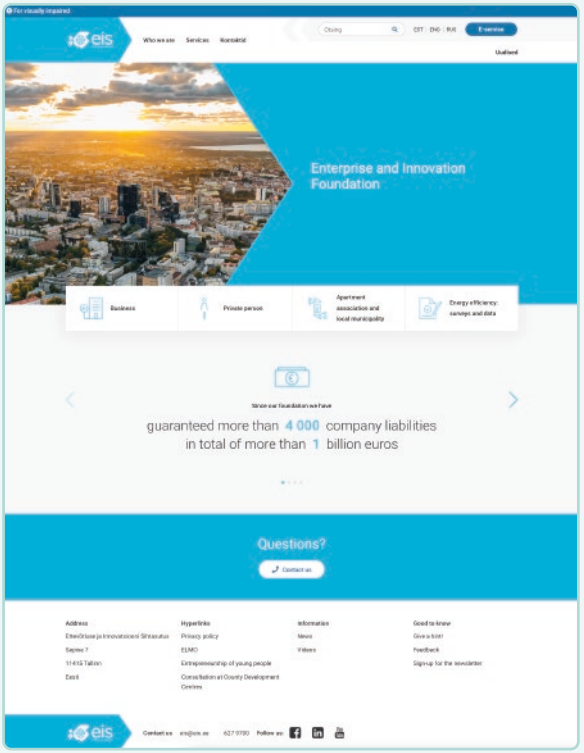
Theme: **Renewable energy integration**

This project is part of the EU-funded Smarter Together project. Key components of the project include developing **smart mobility** solutions, implementing **intelligent street lighting**, creating a **smart neighborhood app**, and establishing **e-mobility stations**. Additionally, the project seeks to enhance the integration of renewable energy sources through **smart grid** technologies.

The initiative **encourages users to adjust their energy use** to balance the grid, reduce peak loads, and improve the integration of renewable energy. To achieve this, incentives are provided for industrial users to modify their energy consumption based on **real-time pricing signals**, allowing for better load management during high-demand periods.

Further supporting these goals are **predictive energy demand models**, which help forecast consumption patterns, and real-time monitoring systems that provide data on energy usage.

RELEVANT LINKS



Smarter together – project summary

Slide deck: EU-Project Smarter Together Munich Documentation of Activities and Achievements

Utrecht's Smart Solar Charging – SSC (The Netherlands)

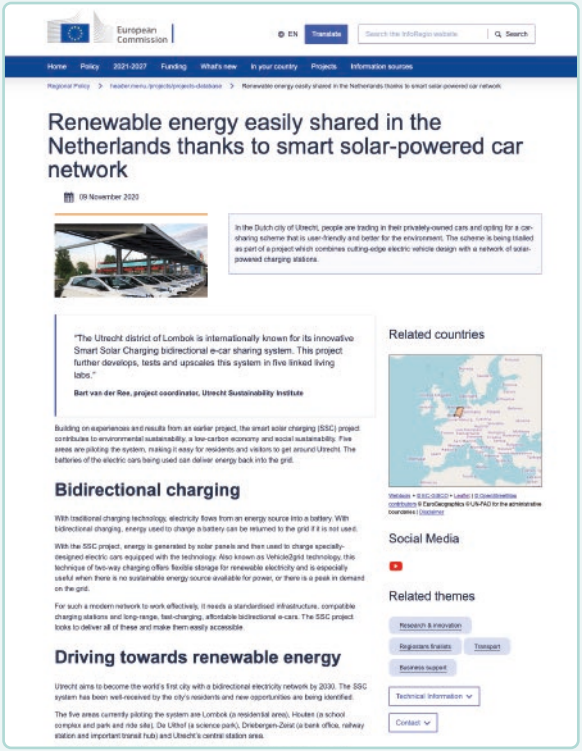
Theme: **Renewable energy integration**

Innovative initiative that integrates solar power with electric vehicle (EV) infrastructure and grid management, aiming to enhance renewable energy integration. The project uses solar panels installed on rooftops across the city to generate clean electricity. **EVs in the system utilize bidirectional charging** (Vehicle-to-Grid, V2G) technology, allowing them to not only consume but also **store and feed energy back into the grid**.

The system optimizes grid balancing by storing excess solar energy during peak production and releasing it during periods of high demand. Solar-controlled charging **adjusts the charging rates automatically** based on solar energy availability. By creating a localized energy ecosystem, the SSC project **maximizes the use of renewable energy within neighborhoods**, contributing to reduced carbon emissions in urban transportation.

RELEVANT LINKS

Smart Solar Charging – project website



Online article: Renewable energy easily shared in the Netherlands thanks to smart solar-powered car network

Smart City Mannheim - Model City of Mannheim – MoMa (Germany)

Theme: **Renewable energy integration**

Initiative focused on integrating renewable energy sources into the grid, demonstrating how the city can function as an energy store. A key aspect of the project is **transitioning the conventional power grid to a smart grid**, enhancing energy supply security and grid stability through **advanced ICT technologies**.

The project created a **real-time communication platform that connects households, energy generators, and measuring devices**. With 3,000 households equipped with smart home devices, MoMa enabled intelligent control of appliances, linking them to the smart grid. Additionally, **dynamic pricing and variable tariffs** were implemented, with customers showing price elasticity ranging from 10-18%, and up to 35% in the evenings.

RELEVANT LINKS

Online summary: Moma – Smart City Mannheim


moma
Modellstadt Mannheim

Modellstadt Mannheim (moma)

Abschlussbericht

Beiträge von moma zur Transformation des Energiesystems für Nachhaltigkeit, Beteiligung, Regionalität und Verbundenheit

Gefördert durch:

Die Verantwortung für den Inhalt dieser Veröffentlichung liegt bei den Autoren

E-Energy - IKT-basiertes Energiesystem der Zukunft
FÖRDERPROGRAMM DES BUNDESMINISTERIUMS FÜR WIRTSCHAFT UND TECHNOLOGIE (BMWi) SOWIE DES BUNDESMINISTERIUMS FÜR UMWELT, NATURSCHUTZ UND REAKTORSICHERHEIT (BMU) [Bm07]:

Förderkennzeichen: 0325089D beim Projektträger Jülich (PtJ) für das Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU) Referat KI III 5 - Forschung und Entwicklung im Bereich Erneuerbare Energien

Status: Final
Version: V1.01
Verbreitung: Öffentlich
Date: 01.07.2013

Verantwortlicher Autor: Andreas Kießling (MVV Energie AG)

Report in German: Contributions From Moma to the Transformation of the Energy System for Sustainability, Participation, Regionality and Connectedness; E-Energy - ICT-Based Energy System of the Future

Net Zero Neighbourhood Model

Theme: **Financing energy renovations**

Coordination of ca. 1000 properties for one project. Works best if orchestrated on the national level (using central taxes to make up for regional differences in income and property value). Avoiding individual debt. Utilising economy of scale.

RELEVANT LINKS

Whitepaper: Net Zero Neighbourhood Funding Model

Business case report: The Case for a National Net Zero Neighbourhoods Programme

Green Neighbourhood as a Service

Theme: **Financing energy renovations**

"To address the mismatch between ownership of the capital spend and of the value of benefits, tackle the fragmentation issue, overcome barriers to entry, allow aggregation of projects and matching of different types of finance (...).

GNaaS envisages the establishment of a central entity in a city or region which designs, commissions, manages and funds deep energy retrofit on a street-by-street scale (...) at no cost to the property owners, regardless of ownership and usage typology.

(...) a mechanism is needed to attach the long-term energy and maintenance savings to the centralised funding source. The proposal is that this takes the form of a long term (30 year+) comfort and maintenance contract with the resident. The contract would (...) automatically novate to whoever lives in the property and does not follow the individual when they move away."

RELEVANT LINKS

Whitepaper: Green Neighbourhoods as a Service: A Proposed Mechanism to Address the Challenge of Scaling Energy Efficiency Measures in the Urban Built Environment

Sinfonia (international)

Theme: **Varia**

The project focused on two pioneer cities, where **large-scale district retrofits** were implemented to achieve 40%-50% primary energy savings and increase the share of renewable energy by 20%-30%.

The project also created a **structured approach to scalability** by working with five "follower cities" (La Rochelle, Rosenheim, Borås, Pafos, and Seville). These cities adapted the model to diverse climates and regulatory frameworks, demonstrating its flexibility and applicability across Europe. Key features for scalability included:

1) Integration of **advanced technologies**.
2) Close collaboration between **public bodies and private sector** stakeholders.
3) Financial modeling to support urban transformations through **grants, loans, and public-private partnerships**.

RELEVANT LINKS

Report: Sinfonia – Low Carbon Cities for Better Living

FITHOME (The Netherlands)

Theme: **Financing energy renovations**

Project co-financed with EU funds (Horizon 2020). Integrating a unique local tax instrument with a digitised, end-to-end approach.

RELEVANT LINKS

Entry in the CORDIS database: Making home retrofitting accessible, affordable and simple for everyone

CITyFiED (international)

Theme: **Varia**

The project focused on large-scale renovations in three demonstration sites: Laguna de Duero (Valladolid Metropolis, Spain), Lund (Sweden), and Soma (Manisa Province, Turkey), while involving 11 additional "follower cities" to adapt and replicate its model.

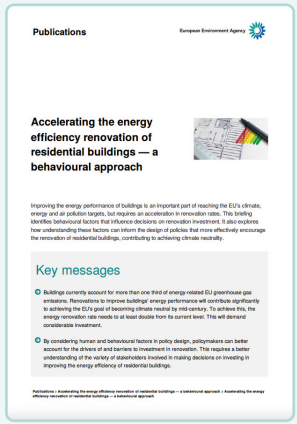
CITyFiED funded retrofits for residential buildings, integration of renewable energy systems (e.g., solar and biomass), and improvements in district heating and cooling networks.

The project developed a scalable approach for urban retrofitting, combining technical solutions (e.g., smart grids and efficient energy systems) with strategies for overcoming financial, social, and administrative barriers.

The project received funding from the EU FP7 program and co-financing from local and national governments and private stakeholders.

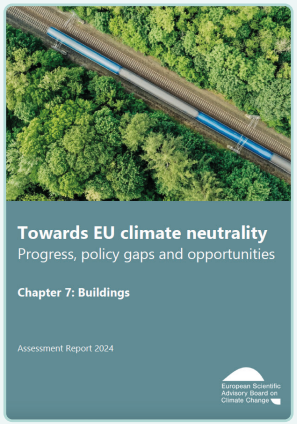
RELEVANT LINKS

You can find brilliant technical insights and all deliverables on the project's website. If you're not successful with registration, try a different browser.



Accelerating the Energy Efficiency Renovation of Residential Buildings: A Behavioural Approach (policy brief)

European Environment Agency, 2023



Towards EU Climate Neutrality Progress, Policy Gaps and Opportunities (Chapter 7: Buildings)

European Scientific Advisory Board on Climate Change, 2024

Theme: **Holistic approach to buildings decarbonisation**

Key behavioural non-monetary factors: improved living and building conditions, the perceived level of effort and potential disruption, and uncertainties on the outcome of the investment.

The design of policies and measures could involve better designing communication actions and tailoring interventions to specific target groups.

Addressing behavioural factors can help to mitigate the rebound effect after renovation.

Behavioural initiatives should be seen as part of a holistic approach to policymaking that combines behavioural insights and traditional approaches based on economic instruments and pricing.

Theme: **Financing energy renovations**

A high-level comprehensive roadmap for decarbonizing the EU building stock, focusing on energy efficiency, policy alignment, and sustainability. It will give you a good understanding of what may be prioritised on the higher levels of gov for the next ~10 year

How to Finance the European Union's Building Decarbonisation Plan (policy brief)

Breugel (U. Keliauskaitė, B. McWilliams, G. Sgaravatti and S. Tagliapietra), 2024

Theme: **Financing energy renovations**

Excellent source for understanding key trade-offs, targeted interventions, the potential impact of ETS2, and mistakes made so far/ lessons learned.

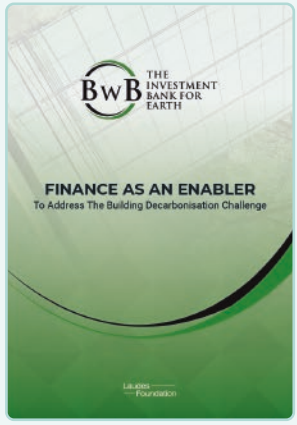
Funding Energy Efficiency through Financial Instruments (policy brief)

Policy Learning Platform on Low-Carbon Economy, 2019

Theme: **Financing energy renovations**

"Public authorities can help to leverage private investment through financial instruments, which can incentivise investments by overcoming market failures and distortions. A number of financial instruments have been tested and used and are ready to be replicated throughout Europe (...)."

Many practical examples.



Finance as an Enabler To Address The Building Decarbonisation Challenge (report)

Bankers without Boundaries, 2023

Theme: **Financing energy renovations**

The report examines the essential role of innovative financial mechanisms in accelerating the transition to sustainable buildings. It outlines strategies for developing key financial instruments. Includes case studies that demonstrate how targeted financing can effectively drive building decarbonization.

Finance Sustainable Buildings Playbook

European Environmental Bureau

Theme: **Financing energy renovations**

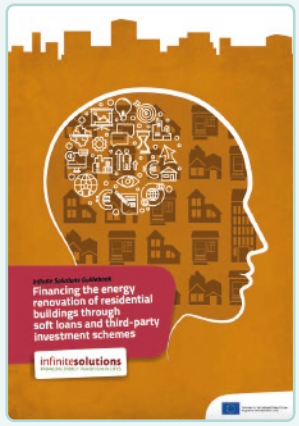
Comprehensive interactive tool presenting a wide variety of different solutions and assessing their impact and feasibility. You can filter to see local-level instruments only.

SHAPE II (previously SHAPE-EU): The Affordable Housing Initiative European Partnership (website)

SHAPE II (previously SHAPE-EU)

Theme: **Varia**

Various cases and best practices presentation (including the so-called Lighthouse Districts), policy solutions, handbooks + a forum and events you can join.



Financing the Energy Renovation of Residential Buildings Through Soft loans and Third-Party Investment Schemes (guidebook)

Energy Cities (Infinite Solutions project), 2017

Theme: **Financing energy renovations**

Introduction to soft-loan schemes. Step-by-step guidance on how to build a soft loan financing scheme, including an overview of three already tested alternative business models. 7 case studies, including Stuttgart's third party investment scheme.

Financing and Incentivising Energy Renovation of Condominiums (peer-review-type meeting report)

Policy Learning Platform on Low Carbon Economy, 2024

Theme: **Financing energy renovations**

Recommendations from discussion of 6 experts on 2 following challenges:

1) How to support co-owners in (pre)-financing their renovation works of condominiums?
2) How to improve the overall working process and increase the number of renovations?

How to Create a Local Support and Financing Service Dedicated to Home Energy Renovation? The Example of Third-Party Financing Companies in France (methodological guide)

Energies Demain and Energy Cities with the support of the SERAFIN association, 2024

Theme: **Financing energy renovations**

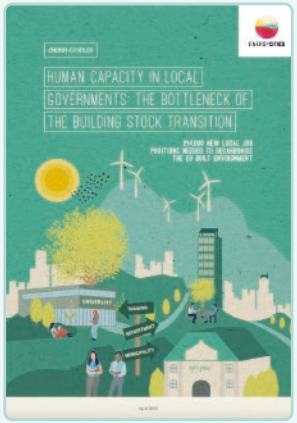
"The aim of this guide is to present the existing TPF companies and their role (part 1), explain how they operate (part 2), and help public players, particularly local authorities, set up a TPF company in their area if the conditions are right (parts 3 and 4). The objective is to make these elements available to as many people as possible, so that, in a near future, they become the norm in the renovation market."

How to Finance Energy Renovation of Residential Buildings: Review of Current and Emerging Financing Instruments in the EU (academic paper)

P. Bertoldi, M. Economidou, V. Palermo, B. Boza-Kiss, V. Todeschi, 2020

Theme: **Financing energy renovations**

In addition to “traditional” financial schemes such as subsidies, tax incentives, and loans, the paper assesses innovative financing schemes: On property tax and on-bill financing, energy efficiency mortgages, and energy efficiency feed-in tariffs. The paper offers an assessment of the characteristics, benefits, and challenges of each analyzed financing instrument and provides policy recommendations for their successful implementation.



Human Capacity in Local Governments: The Bottleneck of the Building Stock Transition (study)

Energy Cities (A. Ancelle, M. Bourgeois, J. Joubert), 2022

Theme: **Holistic approach to buildings decarbonisation**

Recommendations for closing the financing gap in local administrations on their way to net zero.

Comment Financer La Transition Écologique Dans Les Collectivités Locales? (study)

L'Agence France Locale & l'Institut national des études territoriales, 2021

Theme: **Holistic approach to buildings decarbonisation**

Good decarbonisation practices based on real-life cases from France, including the value of federalisation (alliances of cities/ towns/ villages). It covers more than the built environment but can provide fairly universal inspirations