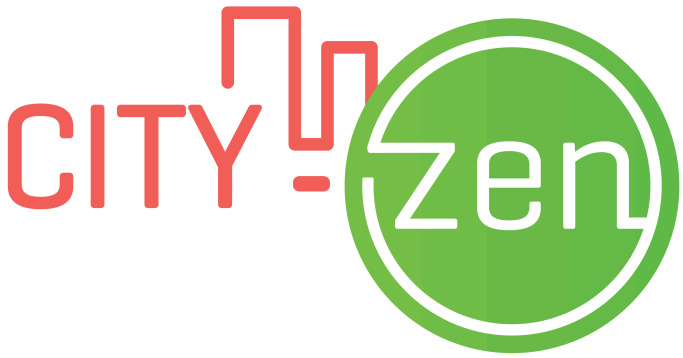
NEW URBAN ENERGY



WP2 – Project Initiation
Key Innovation Form

RETROFITTING IN AMSTERDAM

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5	Alliander	LIAN	NL
6	HESPUL Association	HESP	FR
7	The Queens University of Belfast	QUB	UK
8	Th!nk E	THNK	BE
9	KEMA Nederland BV	KEMA	NL
10	Technische Universiteit Delft	TUD	NL
11	Stichting Waternet	WAT	NL
12	Mastervolt International B.V.	MAST	NL
13	SOLCALOR	SOLC	NL
14	AEB	AEB	NL
15	Daikin Airconditioning Netherlands B.V.	DAIK	NL
16	Siemens Nederland NV	SIEM	NL
17	Universita'degli Studi di Siena	UNIS	IT
18	Ville de Grenoble	MUNG	FR
19	Commissariat a l'Energie Atomique et aux Energies Alternatives	CEA	FR
20	Compagnie de Chauffage Intercommunale de l' Agglomeration Grenobloise	CCIA	FR
21	Gaz Electricite de Grenoble	GEG	FR
22	SAS ATOS Worldgrid	ATOS	FR
23	Clicks and Links Ltd&L	C&L	UK

DELIVERABLE INFORMATION

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Main author(s)	AIM
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Reviewers	Benjamin Giron (HESP)
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2.0	22/08/2015	A. van der Stoep / B. Giron	Final version

ABSTRACT

Knowledge in the areas of energy efficiency and smartification is rapidly evolving. It is important to incorporate the knowledge on the latest state of the art in each of the 3 areas (buildings, district heating/cooling and smart grids) with special attention to the synergy between those.

The objectives of Work-Package 2 are:

- To incorporate the knowledge on the latest state of the art in each of the 3 areas;
- To indicate which of the collected technologies are relevant for City-zen
- To serve as input for the following Work Packages:
  - > Technology/integration (WP3)
  - > Processes/stakeholders/regulation (WP4)
  - > The demonstration activities (WP5 & 6)
  - > The City-Zen & Deployment: WP8 (serious game) & WP9 (social issue)

The State of the Art analysis task (task 2.1) answers the following questions:

- What has been the experience and outcome of recently finished projects, with special focus on demonstration projects?
- What are the experiences in ongoing projects at different scale?
- What are the latest industrial innovations in this area?
- What are recent outcomes from research programs in this and closely related domains?
- What have been successful approaches for valorising the products and services of innovative companies?

This State of Art Analysis will mainly focus on:

- **Technologies that show a large potential for the European context,**
- **Innovations that are focusing on the interoperability between networks (electricity, gas and heating & cooling)**
- **Process wise: which are the existing methodologies of approach for transition processes?**

This work will deeply rely on the outputs of recent European projects (TRANSFORM, ZENn, LINEAR, Next-Buildings) as well as on the Smart City Stakeholder Platform. Databases such as BuildUp, OpenLivingLabs, Smart cities and Communities platform and SETIS.

The State of Art Analysis information will be stored in the information exchange website developed under WP9[1]. The information will be publicly accessible. The website section developed within WP2 will further take shape throughout the project with the outputs of other WPs (cfr. task 2 of WP2).

[1] The project website (task 9.5) will be on line by end of M6 (end of August 2014)

RETROFITTING IN AMSTERDAM

1. DESCRIPTION OF THE INNOVATION AND RATIONALE FOR THE SELECTION

In this section, regarding the innovations list in the appendix, each the partner describes the innovation he is in charge of to allow other partners and the public to have a better understanding about what will be demonstrated in City-zen project.

Please justify why this is an *Innovation compared to existing technologies/practices. You can develop argumentation with the following criteria:*

- *Performance*
- *Simplicity*
- *Affordability/Replicability*
- *Technology integration*
- *Potential impact*
- *Etc..*

Many houses in Amsterdam have poor energy performances. Housing counts for 15% of the total CO2 emission of the city. This is not only in environmental terms a huge and serious challenge, but also has challenges in terms of affordability of the total living costs for the residents. In City-zen we aim to address the mass of this challenge. This means we do not focus solely on high-level retrofit towards zero energy households, but our core is to find ways to improve the energy performance of as many houses possible. In City-zen 52.000m2 (approximately 700-900 dwellings) will be retrofitted towards a 75% CO2 reduction as stated in the BEST table which is included in the DoW.. In Dutch terms: this equals a 'label B' performance.

We focus on common types of dwellings (in Amsterdam for instance on duplex houses, and multi family 'portieketage' dwellings) and we address several issues that together can make a renovation successful. The proof of the pudding will be in the combination and integration of all these measures.

- To wisely choose the measures with most local relevance, each retrofit project will be related to the Amsterdam Energy Atlas.
- There are technical issues for which technical innovations are welcome. We intend to look at tendering and contracting ways, which provoke innovation.
- There are financial issues: the benefits of the retrofit and the investments needed are not necessarily in the same hand. A sound business case for all stakeholders needs to be in place. For further info on this aspect, please refer to the Key Innovation Form of WP4 task 1.2
- Seen from a residents point of view their say in the choice of measures is important. The knowledge on how to involve, engage and commit tenants and homeowners in a successful way needs to be wider spread.
- Retrofit can be done whilst the tenants continue to live in the dwelling, or they can be moved out (temporarily). We will look in to the decision making process.
- LEAN building processes, which optimize planning, and collaboration on site and minimize the nuisance for residents are being used more often. In City-zen we will look in to this more closely. Especially the influence of residents on the renovation process (i.e. planning) needs to be included.
- Via Chain integration and other ways of working together the technical solutions and the renovation process will be improved.
- After the retrofit, residents will enjoy their improved house. We will follow them to see if the measures taken really improve their comfort and reduce their energy consumption and energy costs. To do so, we will combine the hard data from smart meters with the soft data collected via interviews and surveys.
- Allthough the main focus in Amsterdam will be on social housing by social housing corporations, local groups or residents might take up part of the retrofitting task.

2. LEVEL OF DEVELOPMENT

The objective of City-Zen project, as for any lighthouse projects of the Smart City and Communities (SCC) call, is to demonstrate replicable SCC concepts in city context where existing technologies or very near to market technologies (TRL 7 and more, see below) are integrated in an innovative way.
The European Commission has defined a scale of 9 technology readiness levels (TRL):

- *TRL 1: basic principles observed*
- *TRL 2: technology concept formulated*
- *TRL 3: experimental proof of concept*
- *TRL 4: technology validated in lab*
- *TRL 5: technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)*
- *TRL 6: technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)*
- *TRL 7: system prototype demonstration in operational environment*
- *TRL 8: system complete and qualified*
- *TRL 9: actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)*

Please indicated the TRL of your innovation and argue (10/15 lines max) what is the actual level of deployment (e.g. existing system prototype demonstrated in operational environment).

Most of the techniques and processes mentioned are in place, but not necessarily widely spread. Neither are they combined in one project.
Within City-zen retrofit will be done in actual urban conditions: real people living in existing buildings > TRL 9

3. WHAT ARE THE MOST RELEVANT DEMONSTRATION PROJECTS?

In this section, for the innovation/solution proposed will be indicated:

- *The experience and outcome of recently finished projects that have been demonstrating this innovation,*
- *The most relevant reference of the integration of this key innovation in operational environment in national, EU or international project,*
- *The links where to find presentation or/and analysis about the related projects (ex.: TRANSFORM, ZENn, LINEAR, Next-Buildings, etc.) as well as on the Smart City Stakeholder Platform and databases (ex.: BuildUp, OpenLivingLabs, Smart cities and Communities platform and SETIS).*

Amsterdam Energy Atlas (TRANSFORM) maps.amsterdam.nl - Open data which helps to make sound local choices
Stroomversnelling www.stroomversnelling.net Program to improve 110.000 Dutch houses towards 'zero-on-the-meter'. First prototypes delivered.
www.ketensamenwerking.nl Platform on chain integration in the building process. E-sequent: chain integration by Amsterdam housing corporation De Alliantie

4. EXPECTED IMPACTS OF THE INNOVATION

This section presents the information on impacts supplied in the innovation/ solution proposal as well as the expert assessment by the relevant working group members. If the solution proposal does not present this information, the provider of the solution has to be contacted to assist in the provision of this information. Where possible, the drafting of the KIs, should involve the stakeholder that submitted the proposed solution.

4.1. Impact on Energy (supply or savings) & greenhouse gas reduction expected

In this section, will be explained how the innovation/solution proposed participates to:
- *The RES production,*
- *Energy savings,*

The retrofit will reduce CO2 emission with 75%. The comfort of residents will be improved. The costs of energy will be reduced.
This reduction will be achieved by a combination of measures: Improvement and replacement of insulation, heating systems, glazing, ventilation systems. But also connection to the district heating grid, and the addition of PV power production or solar hot water heating is possible. The exact set of measures depends on the project at hand. The most feasible measures will be taken. For each project a BEST table will be filled in.

4.2. Wider potential benefits for cities

In this section, will be exposed how the innovation/solution proposed contributes to the potential benefits on jobs creation, economy, safety, health, etc. for the city.

A reduction of energy use and introduction of new energy production capacity on a local scale will help the city to achieve their CO2 goals (40% reduction in 2020 as compared to 1990)
The sales and rental value of the retrofitted dwellings will be better (higher/ more stable).
The comfort of citizens will improve, with possible health benefits. As older installations will be replaced, the safety of citizens improves as well.
The total costs of living for residents will be lower and more stable. Therefore their purchasing power will improve.
The huge amount of houses with poor energy performances shows that there is a huge potential for jobs in this area. For figures, please refer to http://www.amsterdam.nl/gemeente/organisatie-diensten/dienst-ruimtelijke/duurzaamheid/circulaire-metropool/@732345/pagina/
Affordable and comfortable housing options are important to the city and its economy.

4.3. Other impacts

In this section, will be developed the other impacts of the innovation/solution proposed participates, in terms of urban sustainability, smart citizens, governance, urban mobility, transport flow, mobility efficiency, shift to more sustainable modes, etc.

Smart Government: During the City-zen period the City of Amsterdam will further improve its instruments (Amsterdam Investment Fund, carrot & stick, performance contracts with housing corporations). Via WP4 the optimal combination of instruments can be researched. The local coordinator of City-zen has a close connection the the Climate & Energy Program of the City, to ensure insights from City-zen (WP4) will be implemented, but also to keep City-zen up-t0-date with the latest developments within the City Counsel.
Smart Citizens: Citzens will gain more insight in their energy behaviour via smart meters, games. WP8 and WP9 will address this in more detail.

5. TECHNICAL FEASIBILITY AND SOCIO-ECONOMIC VIABILITY

In this section for the innovation/solution proposed, will be explained:
- *The technical requirements (ex: data sharing for the territorial monitoring system)*
- *And the socio-economic viability (ex: obligation versus incentives for property owners or developers to connect a thermal loop or thermal retrofitting)*

Technical feasibility: the level of retrofit aimed for in City-zen can be done with already demonstrated technical solutions as Insulation, air-tightness, heating system, PV power production, solar hot water heating.
The technical/economical feasibility of the connection to the district-heating grid of existing medium rise multi family buildings needs to be improved. Especially the access costs are an obstacle.
Socio economic viability: 70% of tenants must approve the project. If not: the project can't go through and/or the raise of rent cannot be imposed. For privately owned buildings this depends on the internally agreed apartment regulations.

6. INTEGRATED MEASURES

6.1. Integrated measures combining multiple of the domains: buildings, smart grids and district heating and cooling

In this section for the innovation/solution proposed, will be explained:
- *What the combination of domains actually is*
- *What examples are available*
- *Which stakeholders were involved in the roll out*

Each retrofit project in Amsterdam City-zen will have its own set of measures. In some a combination with smart grids or district heating and cooling will be made.
Main stakeholders are

- Residents, tenants – a 70% approval is needed before a project can start. Therefore their main concerns (affordability, comfort, hassle during the renovation) need to be addressed by the property owners.
- Social housing companies & other property owners. – Retrofit should fit their own agenda
- Architects, engineers
- Building Contractors and sub-contractors
- Local government
- Licencing Authorities
- Banks

6.2. Which other stakeholders would need to be involved in the implementation of the key innovation?

In this section for the innovation/solution proposed, will be indicated how to imply stakeholders and which can be the potential challenges to do it. When relevant, indicate how the implication of citizen can be enhanced.
Stakeholders:

- Innovative SME's and start-ups
- Operators and providers of electricity, district heating, fiber, telco, gas

7. CHALLENGES TO BE ADDRESSED BY CITY- ZEN

In this section, will be explained what are the main difficulties that would need to be addressed by City-Zen to ensure the successful demonstration of the innovation. This can be technical barriers as well as financial, legal or societal challenges.
Ex: Requirements for wide deployment. Indicate any potential barriers or risks facing wide deployment or replication elsewhere (governance,, regulation, stakeholders to involve, ….

The main barriers in this energy transition will be addressed in WP4 task 1.1 (Energy policies and legal context) and 1.2. (Financing schemes for replicable businesses models). For instance, the issue that a homeowner cannot distribute its locally produced energy to its neighbor without running into all kinds of legal requirements. This also goes for questions about privacy, the role of the government, etc. The local perception of these barriers and solutions might be different in different EU countries, which might slow down replication.
In some of the demonstrations in WP5 which will be connected to the retrofit, the technical and financial solution (local battery storage, connection of existing dwellings to district heating, vehicle to grid a.o.) is not viable yet, which must be solved in order to scale-up.
Societal issues as the wish to be more self-sufficient might become stronger, asking for different and new solutions.