# DELIVERABLE 7.3b: FOLLOWER CITY REPLICATION PLAN
# CITY OF GRAZ
# WP 7 – REPLICATION


Follower Cities of GrowSmarter

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GrowSmarter
Transforming cities for a smart, sustainable Europe

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# 1 Objective

The Grow Smarter Follower Cities (FCs) are committed to preparing for the replication within their territories of the Smart Solutions demonstrated by the Lighthouse Cities (LCs). In order to ensure appropriate and effective transfer of knowledge, experiences and Smart Solutions, the FCs have developed a baseline assessment for replication and an implementation plan of selected measures in the medium and long term, reflected in this document.

The objectives of this Replication Assessment and Implementation Plan include:

- Identify and assess the full potential of replication and up-scaling of Smart Solutions on a city level and for specific districts
- Provide a matrix for FCs to develop their smart city projects through in-depth understanding of concept, approaches, applications, opportunities, challenges, needs, success factors of smart city applications in LCs
- Support related and necessary local smart-city stakeholder engagement
- Support the political and technical capacity development process through mapping the framework conditions for deploying Smart Solutions and identifying opportunities and needs for a knowledge transfer
- Identify and select key actions needed to implement and replicate the GS smart solutions on a city/district level.
- Define a replication plan for the selected GS smart solutions in accordance to city priorities and to address city sustainability challenges.

# 2 Engagement of Parties for Assessment and Replication

The Assessment Report and Replication Plan has been prepared by all GS FC. The cities of Cork, Graz and Porto are supported through all activities by ICLEI while Suceava and Valetta are supported by REC.

The different stakeholders that are supporting the assessment and future implementation of smart measures in the city of Graz include:

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**Lead author (Follower City of Graz)**: Christian Nußmüller, Local Project Coordinator (christian.nussmueller@stadt.graz.at)

**Members of Follower City Graz Liaison Group**

Municipality Level (core group):

- Executive Director for Urban Planning, Development and Construction, Mr Bertram Werle
- Executive Office for Urban Planning, Development and Construction, Mr. Kai-Uwe Hoffer
- Urban Planning Department, Head of Unit, Mr Bernhard Inninger
- Urban Planning Department, Oliver Konrad
- Environment Department, Head of Unit, Dr. Werner Prutsch
- Environment Department, Wolfgang Goetzhaber
- Road Management Department, Head of Unit, Mr Thomas Fischer
- Road Management Department, Mr Bernd Cagran
- Road Management Department, Mr Werner Zipper
- Department for Traffic Planning, Head of Unit, Mr Barbara Urban
- Department for Traffic Planning, Mr Mark Thaller
- ITG-Informationstechnik Graz GmbH, Managing Direktor, Mr Friedrich Steinbrucker
- Holding Graz, Ms Elena Just-Moczygemba
- Holding Graz, Mr Alexander Schaffler

Smart City Graz Pilot Project Consortium:

- Energie Steiermark, Mathias Schaffer
- SFL technologies, Mario Müller
- Architektur GmbH, Markus Pernthaler
- Energie Graz, Stromnetz, Wolfgang Knaus
- Green Tech Cluster Styria, Bernhard Puttinger
- ALFEN Consult, Hans Wilhelm Alfen

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- Technical University Graz, Department for Urban Construction, Ernst Rainer
- StadtLABOR Graz, Barbara Hammerl, Hans Schnitzer
- AVL List, Erwin Hauser

# 3 Timeline and replication roadmap

The Smart City Replication Assessment and Plan can be understood as a living document that which is continuously (and at least annually) updated and refined as needed to reflect the latest developments of the potential and framework conditions for the replication of Smart Solutions. Two public reports are foreseen; the first for month 6, the second for month 30. Subsequently, the Replication Assessment will lead to the development of a Replication Plan in month 48.

The Replication Assessment and Implementation Plan is part of the overall replication roadmap of the Follower Cities (FCs) of GrowSmarter and can be characterized by the following milestones:

| | |
|---|---|
| **Milestone 1** | • Establish a multi-stakeholder Smart City Liaison Group |
| **Milestone 2** | • 1st Replication Assessment for deployment of Smart |
| **Milestone 3** | • Establishment of capacity development programme and stakeholder process in FC |
| **Milestone 4** | • 2nd Replication Assessment for deployment of Smart Solutions |
| **Milestone 5** | • Development of Replication Plan in FCs |
| **Milestone 6** | • Up-scaling and replicability Report |

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# 4 Structure of the Replication Assessment and Implementation Plan

The Smart City Replication Assessment and Implementation Plan consists of the following main sections:

| | |
|---|---|
| **Smart City Replication Profile** | • Mapping the overall framework conditions and potentials for replication within the city territory |
| **Smart Solutions Selection** | • Description of replication potential of selected Smart Solutions of LCs within FC |
| **Smart District Replication Profile** | • Per potential replication site/district: Mapping of district related framework conditions relevant for the replication of the selected solutions |
| **Smart Measure Specifications** | • Assessment and adaptation of measures towards the most effective deployment and integration at site/district level |
| **Replication Plan for Smart Measures** | • Definition of activities and actions required for the replication and future implementation of the specific smart solutions on a city and district level. |

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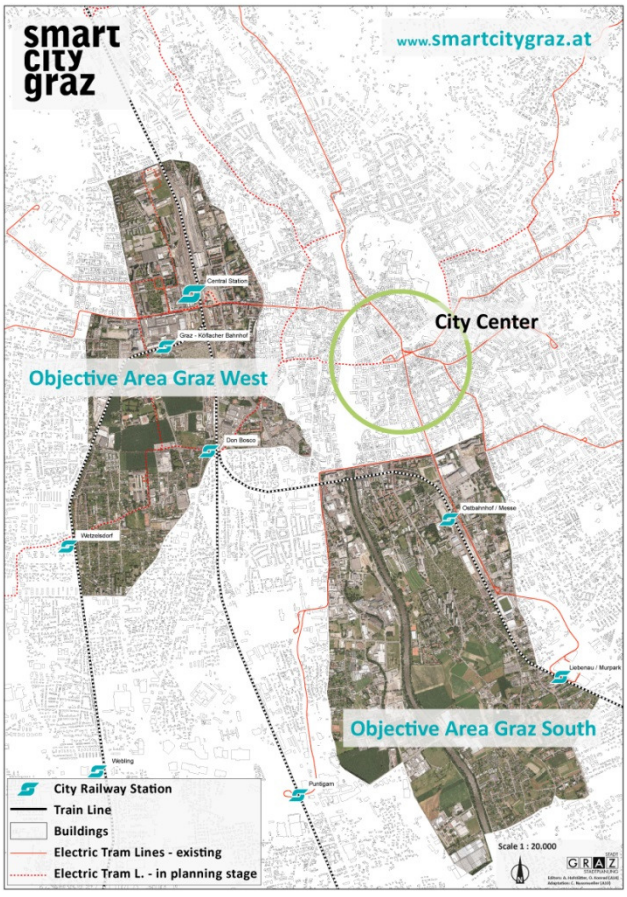
# 5 Replication Assessment of the Follower City Graz

## 1.1. Smart City Replication Profile

### 1.1.1. Mapping the overall framework conditions for replication within the city territory

#### *1.1.1.1. Q1 What is the overall replication potential for Smart Solutions until 2020 and beyond?*

The Smart City Urban Development Strategy of Graz had been developed since 2010 in the course of the strategy formation project "I live Graz" which was national funded by the Austrian Climate and Energy Fund. It was politically decided on local level by the municipal council midyear 2013.




Within "I live Graz", the vision, guidelines and roadmaps for the Smart City Graz were elaborated using the ZEUS method.

Methodological approach of the Smart City Graz Strategy

The classical approaches of improving a situation is to describe the current situation, to analyse strengths and weaknesses and based on this apply changes (continuous improvement).
Mostly it gets more difficult to find new improvements as development progresses according to the law of diminishing marginal utility. In

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other words, same efforts lead more and more to smaller successes. This is also the method of “classical urban development”.

Based on the current state, driven by interests of investors, citizen, economic, politics, etc. and influenced by (mega-) trends (migration, demographic change, changes in economic situations, etc.) planning activities are implemented in different fields of action, mostly not or too less coordinated. The involvement of relevant actors is mostly carried out too late and sometimes very hesitant. This often leads to opposition against new expediently infrastructural constructions (e.g. streets, wind turbines or hydro-electric power plants).
The development of livable cities as a consequence of many individual actions hence can be seen as a lucky coincidence. With the approach described a system could be improved but hardly not changed.

For the methodological approach of the Smart City Graz Strategy on the other hand with the overarching goal of a livable city in the year 2050 the strategic focus lies on systematic innovation based on following principles:

- Urban development should not be limited to the balance of interests between target groups.
- Urban development must be seen as urban policy which should point out potentials and should develop perspectives. It do not have to command majority backing in the first phase but should have the aim to convince as much as possible by continuous integration of parties concerned.

This approach was already tested in the preceding project „ZEUS“ (Zero Emissions Urban System). Within the framework of Smart City Graz this approach had been extended substantially. The main difference is a modified objective function. While the ZEUS-project was targeting “only” an emission-free urban environment, the Smart City Graz Strategy targets a comprehensively livable Smart City which goes far beyond the waste and emission topic and as well includes important many other material/non material aspects.

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Thus the implementation of the Smart City Graz Strategy follows these steps:

1. Development of ideal visions of a livable city in the year 2050 including several thematic fields and an intermediate target for 2020
2. Selection and Definition of suitable smart city indicators to be able to measure the progress
3. Development of a roadmap which describes the necessary foci and milestones and the time priorities for the implementation.
4. Development of an action plan for the time period until 2020

I live Graz – Abstract

With its 276.526 inhabitants (01/2015), the Styrian provincial capital Graz bundles the requirements of a university, administrative and economic centre.

The goal: thanks to its high quality of life, by 2050 Graz will probably nearly double its population while using a fifth of the resources. In the course of the project additionally one or two national and international demo projects need to be identified.

The way

In Roadmaps 2020 and 2050 and (adapted) action plans by 2020, concrete measures are pooled together in the five considered areas (region, city, district, quarter and project) and the existing strategies are adapted. To achieve the vision one or two international demonstration projects are being developed.

The area of focus: communication and information transparently conveying information is an essential component of the "I live Graz" project in order to integrate the participating actors and citizens. The way to deal with new technologies needs to be communicated in a comprehensible and target group-specific way.

One result of this strategy process was the designation of two appropriate smart city objective areas one in the western part of the city ("Smart City Graz West") and one south of the city center ("Smart City Graz Süd"). These areas should become the main focus for Smart City Pilot Project within the first phase of the implementation.

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Based on this overall Smart City Strategy, Graz actually aims to match different topics of the strategy with suitable funding schemes on EU and national level.

ENERGY VISION SMART CITY GRAZ

In 2050, the city of Graz finds itself at sustainable energy equilibrium. The total energy required is produced 100% from the region and from renewable energy sources. This could be energy from waste heat source of industry within the city or neighboring municipalities, a central run-of-river power plant in the city (construction has already begun in 01/2017), PV (Big Solar Graz Project – currently: feasibility study phase; concept: PV modules need to be installed in neighboring municipalities because of the lack of free space in the city center of Graz – question of an strategic energy planning for the functional urban region), biogas, , wind-power, also geothermal sources in small sales (only on building level) which could supply smaller areas in a decentralized system. As pointed out this is a very ambitious vision – we are aware that with today's technologies these goal is still unachievable. Main conclusion from the topical point of view is, that there is a strong need for technical large scale solutions to make an real effect on the existing district heating system of Graz. All small scale technologies (building level) might be smart, but would not lead to the big change.

Currently (2015) 70% of the energy for the central district heating system of Graz is produced in private owned a coal-fired and gas-fired power plant in a municipality south of Graz (Mellach). Since the operating company of these plants announced a premature exit from the supply contract with the City of Graz in 2013 a comprehensive search for alternative energy sources began ("Heating Supply Graz 2020/2030" led by the Environmental Department of Graz). Outcome of this strategy process was the fact, that in a short and medium term as compensation for the soon closed plant in Mellach a gas-fired power plant has to be built owned by the municipality ("natural gas as a bridging technology"). Renewables have in a short and medium term only a potential to cover 10% of the whole heating demand of the City of Graz (appr. 1.000 GWh/a) according to current calculations. This figure orientates towards the current

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demand, since Graz is a growing city (in average plus 1800 residential units per year and already implemented refurbishment of the largest residential complexes, we assume that this energy requirement will not decrease in the midterm.

2050 the citizens of Graz understand the value of energy and use it consciously and efficiently.

Establishment of specific targets for future urban development projects:

- Reduction of Greenhouse Gas Emissions by 20% (these 20-20-20-targets were primary following the EU-targets; on local level we interpret it currently as improvements on district level with reference to the average across the City)
- Increase of the share of renewables by 20 %
- Increase of the energy efficiency by 20%
- Reduction of land consumption for buildings and infrastructure
- Implementation of compact, energy-optimized building structures
- Optimized development of public transport infrastructure – avoidance of settlement patterns which foster motor-driven private transport

www.smartcitygraz.at

## I live Graz – Details

### Initial situation/ Description of the City or urban region

268,602 people were living in the city of Graz – Austria's second largest city and capital of Styria province – in May 2013. This corresponds to a population density of 2,058 inhabitants per square kilometer. Together with the surrounding municipalities, around 405,000 people currently have their main place of residence in the Graz region. The long-term trend shows a steady increase in inhabitants. Current forecasts predict an increase to approximately 490,000 inhabitants by 2050.

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Due to its sheltered situation in a basin, Graz is disadvantaged in terms of climate in winter due to hampered exchange of air in atmospheric inversion conditions. There is particular need for action with regard to carbon dioxide and particulate matter emissions.
The main sources of energy used are distant heating (33%), heating oil (~25%), electricity (~20%) and gas (~15%). Renewable energies amount to ~5%.
At one third, motorised private transport makes up the largest percentage in the modal split, with a slight decrease apparent for the first time in 2008. A continuous increase in bicycles, from 8.3% in 1982 to 16.1% in 2008, can be observed. Public transport shows a slight increase, currently amounting to just under 20%.

The "Mobility Concept Graz 2020" which was approved by the municipal council in 2012 aims to the share of cyclists from 16% to 20% in 2020. An urban traffic planning guideline and specific measures complement this Mobility Concept.

The aim of the "I LIVE GRAZ" project was to work out the vision and strategic principles for the Smart City Graz, to define the appropriate measures, and to initiate the first steps.

**Thematic content/ technology areas covered**

A total of eight central topics have been processed for the future development of the city of Graz towards the goal of "Zero Emission". Individual indicators were created for the seven specific topics "Economy, Society, Mobility, Energy, Supply/Disposal, Buildings Ecology".
In the eighth, overarching topic – "City" – strategies were elaborated with regard to the future development of the city.
The eight topics are combined in five focal actions in accordance with the options available to a city: Urban planning, Citizen participation and awareness raising, Economic incentives
Legal conditions, organizational development.

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## Visions developed until 2020/2050

Vision 2020: Graz has established itself as a Smart City with a high level of urban quality of life and as a center of innovation, technology and services of international standards, ranking among the top ten of Europe's medium-sized cities

Vision 2050: The sustainable city worth living in Graz is a dynamic city with compact development and mixed urban use, with attractive public space and an extremely high quality of life. By rigorously pursuing Smart City strategies and creating a broad awareness, it was possible significantly to reduce consumption of resources and energy and associated pollutant emissions, and to take major steps towards realizing a zero-emission city. 100% of energy required in Graz is generated in the region and from renewable sources. As a city of research, qualification and business, Graz is an international touchstone for value creation by means of innovative urban technologies and systems.

## Roadmap developed

In the spirit of consistently pursuing these visions, the five focal actions for developing a sustainable city worth living in – the Smart City Graz – are essentially tackled concurrently. The "Smart City Graz" roadmap contains the following two milestones on the road to a completely smart city in 2050:

- 2020 milestone: development of 5 Smart City quarters
- 2030 milestone: development of a total of 25 Smart City quarters (strategic defined urban development sites) and 5 Smart City districts (according to existing administrational district term; currently Graz is structured in 17 districts)

The development of an energy-efficient, resource-saving and low-emission city comprises the following guidelines:

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Focal action 1: Urban planning

This focal action comprises all tasks of the municipal administration which are relevant for planning and development issues (e.g. urban planning, traffic planning, energy planning, construction planning, open space planning. Main goal is the systematic alignment of all planning and subsequently all implemented construction projects with the vision of the Smart City Graz Strategy for 2050.

- Infill development of existing residential structures and development of residential brownfield sites before repurposing building land
- Promotion of compact and dense development structures connected to existing public infrastructure
- Mix of uses (Mobility: a well functioning mix of usages within a urban structure causes short distances in everyday life and finally leads to a sustainable traffic behavior (modal split). Mixed usages are economic functional and stable as long as minimum built densities (1,8 – 2,0) lead to a sufficient number of inhabitants. Increasing housing densities moderately the share of required road space can be reduced up to 25%. A part of this space-saving could be used for public green.
- Safeguarding and creation of attractive public green and outdoor spaces

Modification of competition programmes to achieve the target Smart City qualities (indicators)

Focal action 2: Citizen participation and awareness raising:

- Early involvement of groups affected by planning
- Target group-oriented citizen's information and participation
- Accompanying district management for district development projects
- Promotion of awareness raising for sustainable lifestyle

Focal action 3: Economic incentives:

- Efficient handling of resources and public funds

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- Promotion of research, innovation and development projects in urban development
- Private-law quality agreements with investors to implement sustainable urban development measures
- Promotion of green economy company set-ups
- Initiation of investment funds to finance infrastructure measures

Focal action 4: Legal conditions:

- All relevant (provincial) laws encourage the implementation of the Smart City Graz objectives
- Municipal regulations supply these legal conditions

Focal action 5: Organizational development:

- Commitment to the Smart City Graz policies
- Smart City as an interdisciplinary project with clearly defined responsibilities in organizational units and overarching project management
- Ongoing communication and transdisciplinary co-operation
- The municipal administration of Graz (and its participations) as a model for other stakeholders
- Accompanying monitoring and evaluation

**Action plan developed**

The catalogue of measures for 2020 provides the following measures for the individual action focuses (selection):

Urban planning

- Implementation of the Demo project SCP-Graz Mitte
  This first national funded Smart City demo project aims to demonstrate new innovative urban technology components to make use of RES to be strongly linked into an integrated urban development site (goal: zero emission quarter)
- Targeted control of the urban development

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- Systematically monitoring and ongoing analyses of the Demo project SCP Graz Mitte
- Initiation of further Smart City quarters (Living labs)

Citizen participation and awareness raising

- Target group-oriented citizen's information and participation with with diverse mix of tools and methods
- Accompanying district management for district development projects
- Focal campaigns, training and coaching for sustainable lifestyle.

Economic incentives:

- Promotion of implementation of Smart City quarters (here the municipal administration aims to convince investors of added values by investing in sustainable building technologies or high standards of public space around their building complexes; unfortunately calculation of life cycle models is not standard for investors at the moment who intend to build and sell their infrastructure fast and do not care how it will function in the long term.)
- Promotion of green economy company set-ups
- Initiation of investment funds to finance infrastructure measures

Legal conditions:

- Urban development agreements with investors governing Smart City target qualities / indicators assume the form of secondary legislation
- Elaboration of land planning and legal specifications for future investors in Smart City quarters
- Demand for legal amendments by Styria Province, e.g. embodying the Smart City objectives in the Styrian Land Planning Act

Organizational development:

- Formation of the municipal core team, an overarching project management team, and set-up of internal municipal communication
- Establishment and continuation of co-operation with partners

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- The city as a model: definition of binding standards
- Motivation of all staff in the "Graz House"
- Creation of a monitoring and evaluation system for all Smart City agendas (annual report with development of energy use and greenhouse gas emissions)

**Outlook**

**Due to its cross-disciplinary project approach, the I LIVE GRAZ project has led to new solutions and furthermore to the Smart City Graz strategy.**

This strategy is the basis for a smart and comprehensive future-oriented urban development in Graz. Measures planned in the framework of this project will guide our forthcoming work.

First submissions of pilot projects in national and international programmes have already been made. In the target area Graz Mitte (Graz Centre), implementation of Smart City pilot projects is intended to enable the application of additional innovative urban technologies and systems and thus trigger the development of the whole district in the direction of a smart sustainable neighbourhood.

STEK 4.0 Stadtentwicklungskonzept Graz/Urban Development Concept Graz, 2013: 1. Principle/§3: "Graz is developing into a Smart City" (Urban Development Concept – mandatory local regulation: According to the spatial planning law of the Province of Styria the STEK 4.0 is aimed as the overarching planning instrument which outlines the medium and long termed goals of the City of Graz for the next 15 years. The precise land development plan of Graz has to respect the framework of this strategy paper about the dimension of residential areas as well as for other functions or land uses. On the other hand, the STEK 4.0 has additionally to respect superior targets of the regional development programme like e.g. priority zones for green infrastructure or settlement development. Due to the fact, that the STEK 4.0 is enacted by the

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Styrian government as an ordinance the role of it became more important than in the past.)

- financing and funding opportunities available (European, national , local programmes, private investment etc.)
    - national funding by the Austrian Climate and Energy Fund
    - as from 2015/16: specific Investment Priority within the national EDRF-programme for capital expenditure projects (e.g. public buildings like schools, etc.) which save carbon dioxide in the framework of Smart City Strategies in Styrian municipalities
    - urban development contracts between municipality and private investors pre-arranging the co-financing of public infrastructure in pilot development sites (mobility measures, open space, etc.)
    - etc.

- legislation frameworks affecting the solution's development / implementation
    - Steiermärkisches Raumordnungsgesetz 2010 (defines legislative planning instruments of the municipality)
    - 4.0 Stadtentwicklungskonzept Graz, 2013 (Urban Development Concept – mandatory local regulation for urban development – see description above)
    - OIB-Richtlinie 6 – Energieeinsparung und Wärmeschutz (Österreichisches Institut für Bautechnik, 2015)/Austrian Institute of Construction Technology (national standards for energy savings and thermal insulation for buildings as a basis for the application for subsidies for housing construction and refurbishment of the province
    - regulations for subsidies for housing construction and refurbishment (province level)

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- further regulations/laws for specific topics (mobility, energy, etc.)

Currently, there are no special fiscal incentives for deep refurbishment:

A major obstacle for Cities like Graz to implement deep refurbishment projects within EU-funding-schemes is the fact that Austria seems to have comparatively high energetic building standards on national level, which constitutes the baseline for the EU-funding of innovative renovation/retrofitting measures within e.g. the Horizon 2020 Programme.

On the one hand, new residential buildings in Austria widely comply with high energy standards. On the other hand, we lack comprehensive refurbishment strategies for building ensembles, on district or even better on city level.

Since energy costs are mostly seen as further offsetting and transitory items (also in the social housing sector) we can see a limited motivation of investors in bearing higher costs for implementing higher standards in refurbishment/retrofitting measures of residential buildings.

Therefore from our point of view at the moment it would be necessary to

*a.* to offer attractive financial instruments as well as fundings on EU-level to foster the implementation of highly innovative pilot projects in the refurbishment of (public but also private owned) building ensembles or whole urban districts.

*b.* detach fundings for energy efficiency improvements of refurbishment measures within Horizon 2020 from the national energy standards to give noticeable incentives also to further developed cities and stakeholders to participate in such EU-funding-schemes.

#### *1.1.1.2. Q2 How does the "Smart City" approach feed into/connect with your existing local planning processes?*

As described above the Urban Development Concept of the City of Graz predetermines the aim to become a Smart City. Other local strategies have to follow this overall mandatory local regulation.

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An urban refurbishment strategy should be developed within the next years – this is one of the major reasons for us to take part in the GrowSmarter project. This strategy should tackle both private and municipal buildings as well since the housing stock of the municipality itself is rather limited in comparison to private housing cooperatives.

A communal energy concept (Kommunales Energiekonzept 2020/KEK 2020) was first elaborated in 1992 and since then it was repeatedly revised. Currently the City of Graz/Environmental department is working on a strategy to secure the supply of district heating within the urban region on a long-term basis (within this process all alternative energy supply options suitable for Graz were evaluated in 2014).

The „Grazer Mobilitätskonzept 2020"/Graz Mobility Concept 2020 consists of three parts: targets, policy paper/directive for traffic planning and a set of implementation measures.

In the field of E-Mobility Graz and the surrounding region was chosen as a „model region" to be funded by the Austrian Climate and Energy Fund (www.emobility-graz.at and www.klimaundenergiemodellregionen.at ).

E-Mobility- Model Region Graz

Within this national funded project the City of Graz and the surrounding region aims to optimize the regional traffic/transport system and to foster the usage of e-vehicles, cars as well as bikes. Within current urban development projects and urban construction projects (like e.g. the Smart City Graz Pilot Project) these e-mobility measures should be considered too. Goal for the year 2020 is to increase the rate of electric vehicles of new registrations of automobiles up to 15% (baseline: total of new registrations of automobiles 2009: 15.318; 15% = 2.300 e-vehicles per year) and a significant shift towards environmentally friendly means of traffic.

In parallel the expansion of the required charging infrastructure in public areas and in companies will be promoted. Additionally renewable energy sources (e.g.

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PV) are promoted to supply clean energy for the e-mobility-measures helping to reduce CO2-emissions on regional level.

Other municipal strategies to tackle current urban challenges :

- Establishment of a Digital Agenda for Graz including a Data-Guideline for internal/external project partners (e.g. preconditions for the installation of sensing hardware in the public space)
- Sustainable city logistics (Microhub structures, SUMPS, …)
- A Green Lab, a Mobility Lab and an Energy Lab structure will be established in Graz until 2018 with the help of national funding of the KLIEN-Fun. With the help of these Lab structures we intend to drive forward these three important urban issues with the help of external specialists (scientific community, NGOs, private stakeholders, investors).

#### *1.1.1.3. Q3 Is there a (strategic) plan and organizational structure in place to become a "Smart City"?*

A strategic plan to become a "Smart City" based on 5 indicator-sets, which are seen essential for a smart city, has been worked out within the strategy-development process „I live Graz" (2011-2012).

Proposed indicator-sets (to be further developed)

**1. Urban planning (Urbane Planung)**

**Individual indicators on level Smart City quarter (Personenindikatoren - Quartiersebene):**

- User density: individuals per square meter gross floor area (Nutzerdichte: Personen / m² BGF)

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- Usage intensity for public space: individuals per square meter public space
  (Nutzungsintensität öffentlichen Raum: Personen / m² öffentlicher Raum)

**Area indicators on level Smart City quarter (Flächenindikatoren – Quartiersebene):**

- density of construction (Bebauungsdichte)
- Public Space (collectively used area) – Share of circulation areas/green infrastructure/squares [percentages]
  (Öffentlicher Raum – Verkehr/Grünflächen/Plätze [% Anteile])
- Transportation route areas – Share for private car transport/public transport/foot and cycle paths

  (Verkehrs)flächenanteile (Öffentlicher Raum): MIV/ÖV/Fuß- und Radweg [% Anteile]
- Modal Split [% Anteil]
- Consumtion of building space per project: built-up area/ circulation area/open space
  Bauflächenverbrauch/Projekt: Bebaute Fläche/Verkehrsfläche/Freifläche [% Anteil]
- Energy efficiency
  We found out that a major obstacles for external stakeholders like local residential property developers to implement deep refurbishment project are mixed ownership structures in housing estates (majority resolutions pro deep refurbishment) and the obligation to meet the comparatively high energetic building standards on national level as a precondition to become eligible for housing subsidies of the provincial government (financing problem).
  There are no specific standards set on municipal levels – national standards are to be implemented (http://www.oib.or.at/sites/default/files/richtlinie_6_26.03.15.pdf).
- Energieeffizienz (Dauerleistung/Einwohner) [Watt/J]

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- Living space per resident
  Wohnfläche pro Einwohner [m²/EW]
- development of the total amount of residential areas and circulation areas
  Entwicklung Siedlungsfläche und Verkehrsfläche (ha)

**Cost indicators (Kosten Indikatoren):**

- infrastructure costs per resident
  Infrastrukturkosten je Einwohner (nach Stadtteilen)
- costs for social infrastructure per resident
  Sozialinfrastrukturkosten je Einwohner (nach Stadtteilen)

**Other indicators (Sonstige Indikatoren):**

- routes across the site/passageways of foot and cycle paths – mesh size
  Fuß- und Radwegdurchwegung – Maschenweite
- proportion of green space for different types of landuse
  Grünflächenanteil – mind. Werte – Kernstadt/Wohngebiete/offene Bebauung/Industrie [%] (Quelle: Freiraumplanerische Standards)
- catchment area of public transport
  ÖV Einzugsgebiet [Hüllkurve] 300m (Kat 1) (Quelle: STEK 4.0)
- quarters calling for (immediate) action
  Stadtteile mit Handlungsbedarf ; großen Handlungsbedarf/Handlungsbedarf (Quelle: STEK 4.0)
- public sport fields per district
  Bezirkssportplätze pro Bezirk (Quelle: STEK 4.0)
- catchment area of public gardens and parks
  Einzugsbereich Parkanlagen [600m] (Quelle: STEK 4.0)

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**Indicators not yet quantifiable (Noch nicht quantifizierbare Indikatoren):**

- quality of public space and urbanized ground floor zones per built-up area
  Qualitätsvoller öffentlicher Raum und urbane EG Zonen / bebaute Fläche m² pro Quartier
- mixed use of urban areas on distict level
  Nutzungsdurchmischung im Quartier und Stadtteil
- individual identification with the district
  Identifikation mit Stadtteil

**2. Citizen participation and awareness raising (BürgerInnenbeteiligung und Bewusstseinsbildung)**

**Citizen participation (Bürgerbeteiligung):**

- total number of participation processes
  Anzahl der Partizipationsprozesse
- level of satisfaction with process results

  Zufriedenheitsquote mit dem Prozessergebnis
- web-services containing participation tools, information and visualizing of development projects
  Online--Plattformen für Beteiligung, Information und Visualisierung der Projekte.
- neighbourhood/district management initiatives accompanying the urban development projects
  Stadtteilmanagement begleitend zu Stadtteilentwicklungsprojekten

**Awareness raising (Bewusstseinsbildung):**

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- "Ecological Footprint"
  ökologischer Fußabdruck

**Quality of life (Lebensqualität):**

- Model of collecting and analysing data relevant for quality of life within the City of Graz (Lebensqualitätsindikatoren LQI-System der Stadt Graz)

  11 groups of indicators; representative population surveys all five years; calculation of need for action for all districts as a strategic planning tool for the departments of the municipality

**3. Economical aspects (Wirtschaftliche Aspekte)**

**Using resources and public money effectively by coordinated investment decisions (Effektiver Umgang mit Ressourcen und öffentlichen Mitteln durch abgestimmte Investitionsentscheidungen):**

- Share of budget for municipal Smart City Projects compared to total of the annual construction budget of the City of Graz
  Budgetmittelanteil Smart City Aktivitäten am städtischen Jahresbudget (Budget für Bau, Förderung und Information)
- Costs for social infrastructure per inhabitant (district level)
  Soziale Infrastrukturkosten je Einwohner (nach Stadtteilen)
- Costs for technical infrastructure per inhabitant (district level)
  Technische Infrastrukturkosten je Einwohner (nach Stadtteilen)

**Promotion of scientific and innovative urban development projects (Förderung von Forschungs-, Innovations- und Entwicklungsprojekten im Bereich von Stadtentwicklung):**

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- Number of projects
  Anzahl der geförderten laufenden Innovations-, Forschungs- und Entwicklungsprojekte für zukunftsfähige urbane Entwicklung

**Quality agreements with investors under civil law for a targeted implementation of sustainable urban developmnet measures (Zivilrechtliche Qualitätsvereinbarungen mit Investoren zur zielgerichteten Umsetzung zukunftsfähiger Stadtentwicklungsmaßnahmen):**

- Share of quality agreements compared to the total of urban development projects
  Anteil von Qualitätsvereinbarungen bei Stadtentwicklungsprojekten

**Promotion of attracting „Green Economy"-companies (Förderung der Ansiedlung von „Green Economy" Unternehmen):**

- Share of „Green Economy"-companies and companies with environmental certifications/labels to the total of companies in Graz
  Anteil der „Green Economy" Betriebe und der Betriebe mit Umweltzertifizierungen an allen Betrieben in Graz

## 4. Legal framework (Rechtliche Rahmenbedingungen)

**Zoning plan (Bebauungsplan):**

- Zoning plan proceedings including Smart City indicator assessment
  Bebauungsplanverfahren mit Smart City Indikatorenbewertung (Anzahl der relevanten urbanen Bauvorhaben)

**Zoning fee (Widmungsabgabe/Mehrwertabgabe):**

- Zoning fee earmarked for the purpose of financing smart urban development projects

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Zweckgebundener Einsatz der Widmungsabgabe für smarte urbane Projekte

**Smart City targets embedded in legislation (Gesetzliche Verankerungen der Smart City Ziele):**

- Number of decisions and regulations taking into account Smart City targets made by the local government
  Anzahl der erlassenen städtischen Beschlüsse und Verordnungen in Hinblick auf Smart City
- Interventions to adopt legal frameworks on province and national level
  Interventionen zur Anpassung gesetzlicher Rahmenbedingungen durch Bund und Land

**5. Organisational development (Organisationsentwicklung)**

**Political commitment and responsibility (Politisches Bekenntnis und Verantwortlichkeit):**

- Share of municipial departments included in Smart City projects
  Anteil der beteiligten Abteilungen an Smart City Aktivitäten
- Share of municipial employeed included in Smart City projects
  Anteil der beteiligten Mitarbeiter/innen an Smart City Aktivitäten
- Number of Smart City Projects and activities implemented by local administration
  Anteil der Smart City Projekte und Initiativen

**Communication and co-operation (Kommunikation & Kooperation):**

- Number of relevant external stakeholders
  Anzahl/Anteil der relevanten, externen Kooperationspartner

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- Number of cooperation with other Smart Cities
  Anzahl/Anteil der Kooperationen mit anderen Smart City Städten (vergleichbarer Größe, ähnlicher Herausforderungen)

**City setting a good example (Stadt als Vorbild):**

- Number of exemplary Smart City projects per year
  Anzahl der Smart City Vorbildprojekte der Stadt pro Jahr
- Number of employees involved into the forward the motivating process
  Anteil der Mitarbeiter/innen im Motivationsprozess

**Monitoring and evaluation issues (Monitoring und Evaluierung):**

- Number/Share of urban development projects which are checked for the Smart city indicators
  Anzahl/Anteil der Projekte (z.B.: Bebauungspläne), bei denen die Smart City Indikatoren überprüft werden

In terms of organisational structure we are currently taking up a process to establish an internal smart city working group including all relevant departments with the aim to set up institutionalized working structures for integrated urban development projects in the framework of the Smart City Strategy. This group started their work in September 2015.

At the moment the Smart City process is mainly promoted by the Executive Office for Urban Planning, Development and Construction which is also the leader of the PPP-consortium of the "Smart City Pilot Project Graz Waagner Biro". An internal resumption process which should again bring together all relevant units within the municipality with the aim to establish the smart city strategy in all relevant departments (see also Q3 above).

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In 2016-2017 there was a strong collaboration between several municipal departments elaborating a H2020 Smart City Application, which was at the end not successful.

Nevertheless this process led to important side products/effects like the set up of a Sustainable Energy Action Plan for Graz or the establishment of a strategic group for digitalization issues (currently elaborating an Digital Agenda and a Manual for internal/external projects dealing with sensitive data.

To sum it up the process to install an internal smart city working group as a formal unit stagnates at the moment mainly because of limits of administrational logics. It is not foreseen within the administration to set up a task force or a special unit consisting of members of different departments which tackles an highly integrated strategic issue like interdisciplinary Smart City development.

#### *1.1.1.4. Q4 Are there synergies and/or conflicts of the "Smart City" plan and organizational structure with existing initiatives and their structures within the city?*

- initiatives (see also Q6): ECR Energy City Graz Reininghaus, +ERS - Plus Energy Network Reininghaus Süd, EU-Project Act4PPP, I Live Graz (as the strategic starting point for the Smart City Strategy Graz), etc.
- synergies: Urban Development unit and EU-unit are cooperating ideally because they are located within the same department (Executive Office for Urban Planning, Development and Construction)
- conflicts: typical vertical structures within the traditional administration system are more than ever confronted with horizontal integrated planning approaches in regard to the Smart City strategy process – this sometimes leads to conflicts;
  more/specific staff for specific tasks like Smart City strategy would

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always be ideal; at the moment most of the employees are tackling the smart city-topic beside their basic work load;

#### *1.1.1.5. Q5 Which and how are regional and local stakeholders involved in the Smart City strategy and planning process on a city level?*

"Smart City Pilot Project Graz Waagner Biro" -Consortium (13 national and international partners are taking part in the first Smart City Graz project):

- Stadt Graz (Consortium Leader)
- Holding Graz (implementing mobility measures within the pilot project; 100% owned by the City of Graz)
- Energie Steiermark (energy supplier on regional level/province level)
- Energie Graz GmbH & Co KG (local energy supplier)
- FIBAG - Forschungszentrum für integrales Bauwesen - Hans Höllwart
- SFL technologies (private company; investor of the Science Tower subproject; developer and producer of PV-Graetzel cell technology)
- AVL List GmbH (AVL is the world's largest independent company for the development of powertrain systems with internal combustion engines as well as instrumentation and test systems)
- DI Markus Pernthaler Architekt ZT GmbH (architect and technical support of the smart city pilot project)
- Technische Universität Graz (scientific partner)
- StadtLABORGraz (NGO; deals mainly with participation issues/stakeholder processes within the pilot project - represent opinions of organised civil society, but also the voice of the anonymous local citizen)
- SOT - Süd-Ost Treuhand Gesellschaft m.b.H. (funding/accounting management)
- Alfen Consult GmbH (scientific partner)

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- ECO WORLD STYRIA Umwelttechnik Cluster GmbH (200 companies and research centers are working on the Green- and Cleantech solutions of tomorrow within the Cluster ECO World Styria)

Smart City Pilot Project Waagner Biro:

- executive committee/steering board (two times per year): political representatives (town councils), managing directors of the companies within the consortium
- Project Steering group (one SCP-Jour Fixe once per month): Consortium Leader City of Graz, work package leader, representatives of all consortium members

#### *1.1.1.6. Q6 What are past (<5 years) and current projects that are closely related to the "Smart City" concept?*

- ECR Energy City Graz Reininghaus (http://www.hausderzukunft.at/results.html/id5854)
  Urban strategies for the new conception, construction, operation and restructuring of an energy self-sufficient city district
  The aim was the development of a valid set of specific values and a guideline as a basis for energy self-sufficient district development. Based on the results, a masterplan (energy-network) for the district Graz-Reininghaus shall be developed. Future-oriented "city-building-blocks" will be implemented as flagships of innovation.
  Lead Partner: Technical University of Graz, Department for urban building; project partner among others: City of Graz, Executive Office for Urban Planning, Development and Construction;

- ECR Energy City Graz - subproject 3: +ERS - Plus Energy Network Reininghaus Süd

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The multifunctional neighbourhood "+ERS – Plus Energy Network Reininghaus Süd" was realized within the urban planning area of Graz-Reininghaus. The project aims to optimize the energy concept of the single buildings as well as of the building cluster in order to achieve a plus-energy standard within the residential neighbourhood.
(http://www.hausderzukunft.at/results.html/id6854)

- Act4PPP within the Central Europe Programme (www.act4ppp.eu)
  Many cities and regions in Europe are increasingly challenged by their responsibilities to provide public services and infrastructure, to offer social housing or to develop brownfield sites etc.. To increase their capacities and the efficiency of public actions they search for private partners for cooperation, joint actions and institutionalised public private partnerships (PPP). ACT4PPP will provide a platform for cities and regions from all over Central Europe to exchange experiences and know-how and assist them in applying more and better targeted public private cooperations.

- I Live Graz
  The Smart City Urban Development Strategy of Graz was developed in2010 (in the course of the strategy driven project “I live Graz”) and was adopted on a politically level midyear 2013.

- Other EU-funded programmes/projects in the field of integrated urban development and urban mobility realised by the Executive Office for Urban Planning, Development and Construction of the City of Graz:
  www.graz.at/eu-urban

#### *1.1.1.7.* Q7 Which sites/districts are projected to be developed in the next five/ten years?

- The **"Smart City Pilot Project Graz Waagner Biro"** as the first national funded Smart City flagship project in Austria is intended to be a première, demonstrating new urban energy technologies for a smart zero-emission

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quarter offering great quality of life. The renovation plan for the Helmut-List-Halle includes the building of an energy plant that will provide the entire city district with carbon-neutral energy. At the same time, the building will offer acoustic insulation for the district. At the heart of the design is the use of "Grätzel" (dye-sensitized solar) cells, which also act as noise protection elements in the glass walls and the roof construction. Within this first implemented Smart City Graz pilot project, the use of innovative technologies allows the majority of the energy demand to be locally generated.
Innovative developments in terms of buildings, energy networks and mobility will be linked up to form an urban whole. The integrated holistic planning process involving all relevant players will make smart urban development tangible and come alive. The exchange with national and international partner cities will support learning and reflective processes and further the disseminations of findings and results.
(http://www.smartcitygraz.at/projekte-ebene-03-geschichtlicher-abriss/).
Possible starting points/aspects relevant for the GrowSmarter project at the moment: Smart, energy saving tenants through information, Smart lightning, lampposts as hubs for communication, Smart mobility solutions;

- The second Smart City-development site is **Graz Reininghaus**, a huge development site of 100 hectare close to the city centre located on a former brewery area also in the western part of Graz.
(http://www.smartcitygraz.at/projekte-ebene-03_graz-reininghaus/)
Possible starting points/aspects relevant for the GrowSmarter project at the moment:
energy saving tenants through information, Smart lightning, lampposts as hubs for communication, Waste heat and local heat integration by new business models, Smart mobility solutions;

- While the Waagner Biro and the Reininghaus development sites are located within the Smart City target area Graz West within the Smart City Strategy there was defined a second target area in the south of the city center (Smart City target area Graz South). This second area is not yet set-up in such a

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detailed way because potential urban development projects haven't started yet. Smart City target area Graz West is seen as the frontrunner for possible following Smart City developments in Graz.

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## 1.2. Smart Solutions Selection

The table below shows which solutions the Follower Cities intend to replicate (for additional explanations please refer to Chapter 6).

| | | **Follower Cities** | | | | |
|---|---|---|---|---|---|---|
| **Area** | **Smart Solutions** | Porto | **Graz** | Cork | Valetta | Suceava |
| **Housing measures** | 1. Efficient and smart climate shell refurbishment | | **X** | X | | X |
| | 2. Smart building logistics and alternative fuelled vehicles | | | | | |
| | 3. Smart, energy saving tenants through information | X | **X** | | | X |
| | 4. Smart local electricity production and integration with buildings and grid | | | X | | X |
| **Integrated measures** | 5. Smart lightning, lampposts as hubs for communication | X | | X | | X |
| | 6. Waste heat and local heat integration by new business models | | **X** | | | |
| | 7. Smart waste collecting, turning waste to electricity, heat and biogas for vehicles. | X | | | | X |
| | 8. Big data protocol for saving energy and improving the quality of life | X | **X** | | | |

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| | | | | | | |
|---|---|---|---|---|---|---|
| **Mobility measures** | 9. Sustainable delivery | | **X** | | X | |
| | 10. Smart traffic management | | | | | X |
| | 11. Alternative fuel driven vehicles for decarbonizing and better air quality | X | | X | | X |
| | 12. Smart mobility solutions | | **X** | X | X | X |

**Smart Solutions Graz plan to replicate (according to GA)**

**Smart Solution 1. Efficient and smart climate refurbishment**

The issue of innovative energetic district redevelopment will become strategically relevant in Graz for the next years and will additionally play an important part within our Smart City-Strategy in near future. Thus the City of Graz would especially benefit from innovative energetic district redevelopment know how and as well from ICT-knowhow as expected outcomes of the prepared GrowSmarter project. Both Smart City Districts GRAZ WEST (Waagner Biro, Graz Reininghaus) and GRAZ SÜD defined within the official city development plan have a potential concerning refurbishment of multi-storey-buildings of the 1970s (energy efficient renovation). Graz intends to replicate smart solutions in integrating know how from the lighthouse cities in refurbishment strategies which should be developed first for these local Smart City districts; besides innovative financing schemes (PPP) for implementation purposes should be expedited in Graz within the Horizon 2020 Project.

**Smart Solution 3. Smart, energy saving tenants**

Within the Smart City Strategy of Graz various target-group-specific participation actions are implemented at the moment like “Energy regular´s table” organized by Stadtlabor Graz on behalf of the municipality. The City of Graz aims to gather additional know how in this field of action from GrowSmarter that should be implemented within existing strategies.

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**Smart Solution 5 Smart lightning, lampposts as hubs for communication**

This Solution had been skipped because of the following reasons:

- A city-wide rollout of dynamic light control is strategically not (anymore) in the interest of the Road Authority Department, because the potential energetic savings does not have a favorable relationship to the investment costs.
- While attempts are still being made on a variety of technologies and manufactures in Graz, at present the concerns about the data integrity and any technical dependencies of individual suppliers are too high.
- Furthermore, the issue of potential data transfer is also regarded as highly questionable, also in the sense of the "Guidelines for digital data management of the city of Graz" currently under preparation and the required absolute data integrity of the city.

**Smart Solution 6. Waste heat and local heat integration by new business models**

Because of the change of global economic parameters the existing long-distance heating grid in Graz is currently disputed. Questions of cost effectiveness and alternative decentralized district solutions are in discussion (e.g. miniature cogeneration plants considering in advance the opportunity for a future expansion option). As replication measures within the GrowSmarter project the City of Graz plans to set up a local action group gathering local stakeholders from the administration, the energy supplying companies and other relevant sectors as well. After this first step a discussion and a decision-making process will be started to define the main points for a new “waste heat and local heat integration strategy”. Subsequently the first steps to implement waste heat and local heat integration pilot projects could then be defined.

**Solution 8. Big open data platforms**

Since December 2016 the municipality has formed a “Steering Group for Digitalization” integrating the Exexutive office for urban planning, construcion and development, the Road administration department, the CEO of the municipal Informationtechnology provider company, the Holding Graz, the environmental department, the Surveying department and the Chief executive director of the

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municipal administration which aims to tackle issues of ICT-driven pilot projects, topical external requests for industrial partnerships, etc. in an orderly manner respecting the public interests, data privacy issues of and more.
Until autumn 2017 a “Digitization Strategy Graz” and “Guidelines for the digital data management in the City of Graz” shall be approved by the municipal council.
In this regard an urban data platform (partly open) and environmental sensing pilot projects are intended to be implemented the next years.

### Smart Solution 12. Smart mobility solutions

Citizens feedback on traffic plans, direct mobility surveys and mobility monitoring is beside an attractive supply of eco-friendly urban mobility and freight transport is foreseen within the local Smart City Strategy – additional knowhow which could be implemented in existing strategies would be strongly appreciated and could be seen as a replication measure growing out of the Horizon 2020 project which would have real value for future civic participation processes driven by the municipal administration of Graz.

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### 1.2.1. Smart Measures Selection

The table below specifies which smart (bundle of) measures within the 12 solutions each FC intend to replicate (for additional explanations please refer to Chapter 6).

| SC Measure | Measure title | Follower City Graz |
|---|---|---|
| **Low Energy Districts** | | |
| **Solution 1 – Efficient and smart climate shell refurbishment** | | |
| 1.1 – Energy efficient refurbishment of the building | Energy efficient refurbishment of residential buildings – Stockholm | X |
| | Climate shell refurbishment – Cologne | X |
| | Energy quality assurance – Stockholm | X |
| | New adaptative control and regulation techniques for heating systems – Barcelona | |
| | Re-build an industrial site: Ca l'Alier – Barcelona | |
| | Efficient and smart climate shell and equipment refurbishment – Barcelona | |
| | Efficient and smart climate shell refurbishment of residential buildings – Barcelona | |
| | Efficient and smart climate shell and equipment refurbishment of tertiary buildings – Barcelona | |
| | Energy efficient swimming pools – Barcelona | |
| **Solution 2 – Smart building logistics and alternative fuelled vehicles** | | |

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| | | |
|---|---|---|
| 2.1 Integrated multimodal transport for construction materials | Construction consolidation centre – Stockholm | |
| **Solution 3 – Smart, energy saving tenants** | | |
| 3.1 Active House/Home energy management system/Smart home system | Home Energy Management – Cologne | X |
| | The Active House – Stockholm | |
| | An Open Home Net – Stockholm | |
| | Hubgrade – Energy Saving Centre – Stockholm | |
| | Adaptive Temperature Control System – Stockholm | |
| | Home Energy Management System (HEMS) – Barcelona | |
| | Virtual Energy Advisor – Barcelona | |
| | Dynamic Pricing Models – Barcelona (Stochastic Model of Appliances Energy Consumption) | |
| **Solution 4 – Local renewable energy production and integration** | | |
| 4.1 Virtual power plant | Residential Estate Management – Cologne | |
| 4.2 Smart energy and self-sufficient block | Smart Energy & Self-Sufficient Block – Barcelona | |
| | Building Energy Management System (BEMS) to minimise consumption of fossil fuels and electricity – Barcelona | |
| **Integrated infrastructures** | | |
| **Solution 5 – Smart lighting, lamposts and traffic posts as hubs for comm.** | | |
| 5.1 Smart streetlighting | Smart LED streetlighting Stockholm | |
| 5.2 Combined electrical charging | Combined electrical charging and street lighting poles + Wifi-to-grid connection – Barcelona | |

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| | | |
|---|---|---|
| and street lighting poles + wifi | Combined electrical charging and street lighting poles + Wifi-to-grid connection – Stockholm | |
| 5.3 Smart meter information analysis and actuators | Smart Meter information analysis and actuators – Barcelona | |
| **Solution 6 – New business models for district heating and cooling** | | |
| 6.1 Open district heating with feed-in of waste heat | Open district heating – Stockholm | X |
| 6.2 District heating and cooling rings | District heating rings – Barcelona | |
| 6.3 Smart local thermal districts | Smart local thermal districts – Barcelona | |
| **Solution 7 – Smart waste collection , turning waste to energy** | | |
| 7.1 Optical sorting of waste | Smart waste management – Stockholm | |
| 7.2 Introduction of AWCS | | |
| 7.3 Waste collection statistics for individual households/businesses | | |
| **Solution 8 Big open data platforms** | | |
| 8.1 Big consolidated open data platform | Big consolidated open data platform – Stockholm | X |
| | Big open data platform – Barcelona | X |
| | Urban Cockpit – Cologne | |
| | | |
| | | X |

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| | | |
|---|---|---|
| 8.2 Urban models | | |
| 8.3 Semi-automatic instance mapping | | |
| 8.4 Integration of sensor and heterogeneous data in standard data format | Integration of sensor data in a uniform in standard-driven data format – Barcelona | |
| 8.5 Sustainable connected lighting to enhance safety and mobility | | |
| **Sustainable Urban Mobility** | | |
| **Solution 9 – Sustainable delivery** | | |
| 9.1 Integrated multi-mode transport for light goods | Communal service boxes for sustainable deliveries – Stockholm | X |
| 9.2 Micro-distribution of freight | Micro distribution of freight – Barcelona | |
| **Solution 10 – Smart traffic management** | | |
| 10.1 Traffic management through MFD | Smart traffic signals – Stockholm and Barcelona | |
| 10.3 Travel demand management | | |
| 10.4 Traffic control systems for passenger vehicles | | |

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| | | |
|---|---|---|
| 10.5 Traffic signals synchronised to prioritize movement of goods | | |
| **Solution 11 – Alternative fuel driven vehicles** | | |
| 11.1 Developing charging infrastructure | Normal charging infrastructure for electric vehicles – Stockholm | |
| | Fast charging infrastructure for electric vehicles – Stockholm and Barcelona | |
| | eTankE – Cologne | |
| | Vehicle to X (V2X) Charging for EVs – Barcelona | |
| 11.2 E-mobility management system | | |
| 11.3 Charging infrastructure for electric tricycles for micro-distribution | | |
| 11.4 Refueling facilities for alternative heavy duty fuels | Alternative fuels for heavy duty vehicles – Stockholm | |
| 11.5 Smart guiding to alternative fuel stations and fast charging | | |
| 11.6 Small distributed CNG grid | Small distributed CNG grid – Barcelona | |
| **Solution 12 Smart mobility solutions** | | |
| 12.1 Green parking index | Green parking index – Stockholm | |

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| | | |
|---|---|---|
| 12.2 Electrical and cargo bike pool | | |
| 12.3 Mobility hub | Mobility Hub – Cologne | X |
| 12.4 Electrical and conventional car sharing | | |
| 12.5 Conventional/PHEV/ CNG vehicle sharing fleets | | |
| 12.6 Smart taxi stand system | Smart taxi stand system – Barcelona | |

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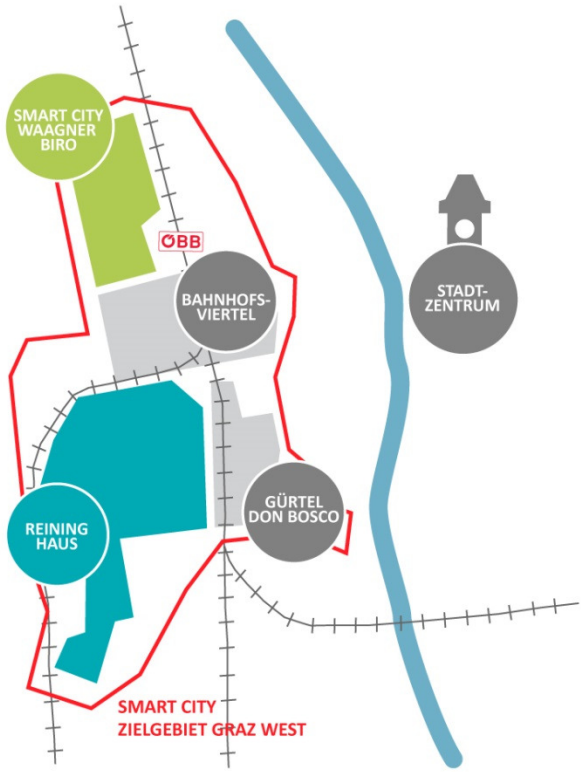
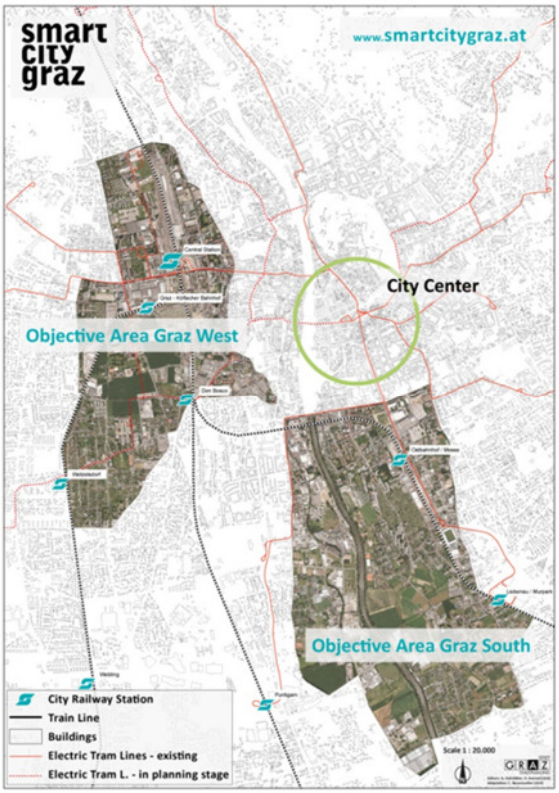
## 1.3. Smart City and District Replication




Graz has selected two districts to implement different Smart Solutions:

SMART CITY TARGET AREA GRAZ WEST

The "Smart City Graz"-strategy will be first implemented around Waagner-Biro-Straße in Graz West. This former industrial area near the center of Graz is an important local land reserve that will be developed into a sustainable place to live and work, boasting a high quality of life. National funding of the Climate and Energy Foundation facilitates flagship projects that implement modern technologies, deliver sustainable energy and preserve resources. In addition, a new residential area and a high-quality public space will be created.

SMART CITY GRAZ WAAGNER BIRO

A new, energy-autonomous city district will emerge in the former industrial area next to the main railway station of Graz, surrounding the cultural venue Helmut-List-Halle.

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Energy technologies for the intelligent “Zero-Emissions City“ will be used for the first time in Graz.
The project components include integrating Grätzel cells and implementing flagship construction (e.g. the research tower), a local energy network and residential and commercial areas with innovative building technologies, sustainable urban mobility and generous open spaces.

KEY FEATURES OF THE PROJECT

- Realizing the first local energy network
- Implementing Grätzel cell technology in building facades
  One of the core technologies of the Smart City Graz project are Grätzel (dye-sensitized solar) cells. The Science Tower will be enveloped in colored to whitish translucent photovoltaic cells, housed between glass plates. These solar cells imitate the photosynthesis in plant leaves, turning light into electrical current.
- Science Tower: The cornerstone of Smart City Graz Waagner Biro is the construction
  of the “Science Tower,“ by FIBAG and SFL Technologies. The 60-meter-high research tower north of Helmut-List-Halle will house research institutions and feature a publicly accessible rooftop garden.
- Meeting Smart City goals through PPP contracts in the energy, mobility, building
- technology and public space sectors
- Accompanying city district management to involve all actors

The Smart District Waagner Biro is the first Smart City pilot project in implementation in Graz; as outlined before a strong PPP-consortium under the leadership of the municipality is supporting this project.

Coming from this first Smart City pilot demo site the Smart City strategy Graz implies the transfer of experiences made here to other Smart City demo sites like e.g. Reininghaus. One example are the PPP urban development contracts which were

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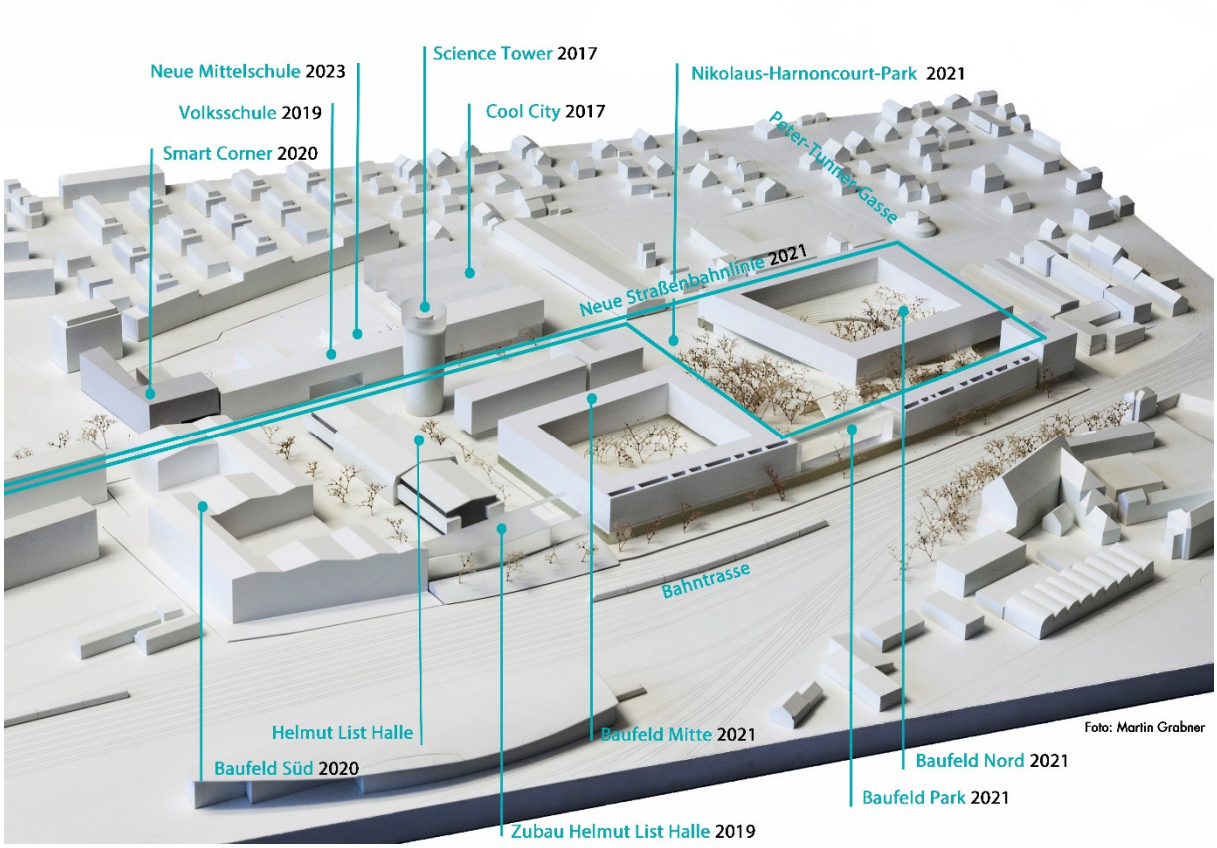
first established and tested in Waagner Biro and are now transferred (in an adapted way) to the Reininhaus site.

3D Model of the Site




all planning processes follow the overall Smart City Strategy and the master plan defined for this district

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What financing and funding opportunities exist?

- national funding by the Austrian Climate and Energy Fund
- as from 2015/16: specific Investment Priority within the national EDRF-programme for capital expenditure projects (e.g. public buildings like schools, etc.) which save carbon dioxide in the framework of Smart City Strategies in Styrian municipalities
- urban development contracts between municipality and private investors pre-arranging the co-financing of public infrastructure in pilot development sites (mobility measures, open space, etc.)

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#### *1.3.1.1. Q2 Are there synergies and/or conflicts related to the Smart Solutions with the existing infrastructure, socio-economic profile and social acceptance?*

To be completed when info is available.

#### *1.3.1.2. Q3 How will local stakeholders be involved in the replication of Smart Solutions?*

To be completed when info is available.

### 1.3.2. District Graz Reininghaus – Smart Measures Specifications

To be completed after development process has fully started (currently start of main building measures is on hold because of legal reasons);

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Currently the masterplan of the quarter development is elaborated, there is only an open issue between an existing industry and the housing developer about the costs-sharing of emission-reducing measures.

## 1.4. Smart Measures Specifications

### 1.4.1. Smart District Waagner Biro – Smart Measures Specifications

**The selected smart solution chosen for the Smart District Waagner Biro include:**

1. Efficient and smart climate refurbishment
3. Smart, energy saving tenants through information
6. Waste heat and local heat integration by new business models
8. Big (open) data platforms
9. Sustainable delivery
12. Smart mobility solutions

#### *1.4.1.1. Q1 What is the replication potential of the Smart Measure?*

- 1: an urban refurbishment strategy should be developed in the medium-term; main question is how deep refurbishment on district level/level of building ensembles could be financed at all! (currently there is only an object based funding foreseen on provincial level)
- 3: energy saving issues are to be taken more serious not least after the Paris Agreement 2016
- 6: existing long-distance heating grid in Graz was disputed the last years because of supply security reasons; currently issues of alternative sources for

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the existing heat network (industrial waste heat, big solar plants incl. buffers), cost effectiveness and alternative decentralized district heating solutions are in discussion;

- 8: Since December 2016 the municipality has formed a "Steering Group for Digitalization" which aims to tackle issues of ICT-driven pilot projects, topical external requests for industrial partnerships, etc. in an orderly manner respecting the public interests, data privacy issues of and more.

  In this regard an urban data platform (partly open) and environmental sensing pilot projects are intended to be implemented the next years.

- 9: At the moment the City of Graz plans to test an open system service box for sustainable deliveries as one part of a more comprehensive urban logistic demo for the development sites of Waagner Biro and Reininghaus.

- 12: promoting eco-friendly urban mobility measures is one of the top priorities of Graz because of the need to improve air quality above all in reducing particulate matter.

Key policy and legislation frameworks affecting the solution's development / implementation

- 1: Urban Development Concept of the City of Graz; Energy and Climate Protection Strategy Graz; Steiermärkisches Raumordnungsgesetz 2010 (defines legislative planning instruments of the municipality); OIB-Richtlinie 6 - Energieeinsparung und Wärmeschutz (national standards for energy savings and thermal insulation for buildings as a basis for the application for subsidies for housing construction and refurbishment of the province; regulations for subsidies for housing construction and refurbishment (province level)

- 3: Energy and Climate Protection Strategy Graz (Kommunales Energie- und Klimaschutzkonzept für Graz - KEK GRAZ 2020)

- 6: Energy and Climate Protection Strategy Graz; strategy paper "Heating Supply Graz 2020/2030"

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- 8: Until autumn 2017 a “Digitization Strategy Graz” and “Guidelines for the digital data management in the City of Graz” shall be approved by the municipal council.
- 9: „Grazer Mobilitätskonzept 2020“/Graz Mobility Concept 2020; E-Mobility-Model Region Graz Strategy
- 12: see above

Status quo of deployment of solution (e.g. feasibility study available etc.)

- 1: not yet existing
- 3: diverse information campaigns and online energy saving calculators provided by the environmental department
- 6: strategy paper “Heating Supply Graz 2020/2030”
- 8: strategy papers in elaboration
- 9: feasibility study in elaboration within the EU-den project NOVELOG (Weblink: novelog.eu)
- 12: E-Mobility- Model Region Graz (project in implementation)

Specify area and scope of potential implementation (e.g. deep refurbishment of $m^2$)

- 1: can not be assessed at the moment
- 3: Smart District Waagner Biro
- 6: cannot be assessed at the moment
- 8: cannot be assessed at the moment
- 9: pilot installation planned of one box system next to a new built housing complex in Waagner Biro, installation of a Microhub planned between both sites Waagner Biro and Reininghaus
- 12: Smart District Waagner Biro

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What needs to happen for the Smart Solution to get implemented?

- 1: the achievement of developing a specific refurbishment strategy on the medium term as a part of the smart city strategy; rethinking of allocation of funding for refurbishment measures (increasing attention on innovative refurbishment measures for old buildings; until now new buildings were focused by the relevant social housing cooperatives/private investors/funding bodies on province level)
- 3: approval of innovative financing models in regard to concrete benefits for the tenants; cost-efficient implementation strategies for the municipality
- 6: necessary consent to new business models from the local energy suppliers (partly owned by the City)
- 8: innovative financing models for such applications
- 9: Service Box project: funding decision from the KLIEN-Funds; Microhub: positive feasibility study; finding of an adequate building infrastructure;
- 12: some smart solutions are already implemented yet, nevertheless Graz intends to learn more from the project partners

### *1.4.1.2. Q2 What is the business case and do financing opportunities already exist?*

no business case/financing opportunities yet

<u>Potential financing opportunities (European, national, private etc.)</u>

1: national ERDF-Programme

3: Energy provider still mainly want to sell energy at the moment – additional services are developing tentatively.

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6: Two excess heat delivery contracts between City of Graz and local industries could be implemented in 2016

8: ?

9: demo project applied for national funding

12: national funding schemes by Austrian Climate and Energy Fund

Market up-take / expected consumption

not yet known

Future financing model and ownership of Smart Solution

not yet known

#### *1.4.1.3. Q3 What are the main challenges and barriers related to the measure(s)?*

Technological barriers

6: no real competitive system to existing large scale (high temperature) district heating grid (covering main parts of the town)

1, 6, 8, 9, 12: Main barrier: financing of innovative smart city measures

3: Lack of personal interest of tenants to save (heating) energy.

#### *1.4.1.4. Q4 How does the Smart Solution integrate with the existing and future infrastructure?*

- 1: ideally innovative refurbishment measures for old buildings should enable a transfer of suitable smart city-technologies also to existing urban infrastructure
- 3: energy saving behaviors of users concern new buildings as well as old buildings

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- 6: in this field of action in Graz only isolated solutions will be realistic to implement because the existing district heating system is technical designed for higher temperature conditions than state of the art-heating solutions
- 8: for the development of a municipal "Big (open) data platform" it is necessary to join existing data sources within the administration (e.g. geodata) with new gathered data
- 9: Open Delivery Service Boxes could be installed either in new built or already existing housing complexes; Microhubs should be installed near the city center to maximize the effects of it;
- 12: ideally existing mobility infrastructure and initiatives could be complemented with smart solutions of the GrowSmarter-project

#### *1.4.1.5. Q5 What user / stakeholder involvement is foreseen?*

1: amongst others: Technical University Graz, Environmental Department, Urban Planning Department, social housing cooperatives, private investors (e.g. homeowners, landlords associations, construction companies, real estate companies), funding bodies on province level

3: amongst others: StadtLABORGraz (NGO; deals mainly with participation issues/stakeholder processes within the pilot project), tenants, landlords, Environmental Department (have certain experiences with this issue so far)

6: amongst others: Technical University Graz, Environmental Department and Energie Graz, our local energy service provider, industries providing excessive heat

8: municipal administration, open data community, citizen in general, scientific researchers, external hardware providers, etc.

9: Housing companies, transport companies, municipal administration, hub operator, customers, etc.

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12: amongst others: traffic planning department, e-mobility GmbH as an outsourced division of Holding Graz (municipal economic enterprises), Energie Graz

What are their main interests (I)/objectives (O)/expectations (E)?

Solution 1

I: innovative financing schemes for implementation purposes to convince housing companies and housing associations owning real estate to implement innovative refurbishment measures (e.g. cost-effective retrofit installations of elevators or balconies or barrier-free/accessible ground floor apartments);

O: fostering to create a refurbishment strategy/guideline for the City of Graz in the medium-term
E: to learn from experiences from the lighthouse cities in implementing refurbishment measures (also without the usage of EU-funding or other funding schemes)

Solution 3

I: to learn new (information/educational/didactic) approaches in motivating tenants to optimize their daily energy usage

O: to include such approaches within the participation measures within the Smart City pilot project and perhaps also within other city-wide projects

E: to learn from experiences from the lighthouse cities in implementing such information approaches

Solution 6

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I: to get known of innovative approaches in regard to waste heat and local heat integration (main problems: only isolated solutions possible in Graz; costs of provide backup systems; new heating approaches are competing directly with existing Business Model of the municipality)

O: to get new ideas and inputs how to combine exiting and new heating systems at city level

E: to be able to get known of heating strategies of lighthouse cities and discuss them on expert level

Solution 8

I: getting an integrated overview over existing data within the administration to be able to define the needs for new data to be collected for planning/strategic purposes

O: to make use of the data to enhance living quality within the city

E: to get new findings and deduction how the city is functioning with the help of big data analytics; selected data sets are intended to put into an open data platform – other (more sensible data) should be used for internal strategic/planning purposes.

Solution 9

I: feasible business models for the operation of micro hubs and b2c and b2b-delivery with cargo bikes/electric vehicles

O: reducing freight transport traffic (emissions, energy requirements, etc.) within the whole city area

E: to learn from the LH-cities and transfer adapted solutions

Solution 12

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I: to get known of innovative approaches in regard to smart mobility issues (beside technical solutions as above financing models are relevant for Graz)

O: to learn from experiences from the lighthouse cities in implementing such measures

E: to complement existing pilot strategies with know-how from the GrowSmarter-project

What group(s) can be supportive (SU), skeptical (SK) or blocking (B) towards the solution?

Solution 1

SU: municipal planning departments, environmental dep., dep. of provincial administration level

SK: social housing cooperatives, private investors

B: not yet known

Solution 3

SU: municipal planning departments, environmental dep., Stadtlabor Graz

SK: tenants, local population

B: not yet known

Solution 6

SU: local scientific community, municipal planning departments

SK: environmental dep., local energy supplier

B: parts of local politics (there is a strong need to save public finance and therefore there is a tendency to preserve the current district heating system and to oppose it with decentralized supply solutions – “either or” instead of

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"one complementing the other system" – rethinking of this strategy takes place at the moment

Solution 8

SU: all municipal departments

SK: financial department

B: local population if not communicated in a transparent way

Solution 9

SU: municipal administration, citizen

SK: freighters, customers

B: urban transport companies

Solution 12

SU: e-mobility Graz, Holding Graz, traffic planning department, other municipal planning departments

SK: not yet known

B: traditional car industry and petrol companies

#### *1.4.1.6. Q6 What is the potential implementation timeframe?*

N/A

#### *1.4.1.7. Q7 What do you need to know for the successful deployment of the Smart Measure(s) beyond the GrowSmarter factsheets?*

Financing aspects of smart solutions and contractual aspects between municipalities and industrial partners would be interesting in general.

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# 6 GrowSmarter Replication Plan

At the beginning of the GrowSmarter project the intention of the City of Graz as a Follower City was to get deeper insights in the topics which were selected in the table in chapter 5.2. and to prepare local development projects for a replication of innovative measures successfully tested and evaluated in the Lighthouse Cities.

According to the information we gathered during the project lifetime about the requisite local framework conditions in the Lighthouse Cities, we realized and identified obstacles on local level in Graz for a direct replication of the measures originally chosen – those obstacle are described in chapter seven of this report.

On the other hand, since the beginning of GrowSmarter policy framework conditions or rather priorities of the smart city implementation strategy partly changed in Graz. For instance, the issue of building up a big data platform for strategical planning and fact based decision making emerged end of 2017 and is currently ongoing. Another issue, which came up on political level from 2015 on, was the topic of sustainable urban freight transport.

In this context, Graz decided to replicate Smart Solution 8. Big Open data platforms. The following chapters aim to describe those obstacles and changed policy framework conditions in Graz.

## 6.1 Replication plan of Smart Solution 8. Big open data platforms

### 6.1.1 Summary of implementation activity

*What does the measure consist of/key components?*

The solution "Visualizing of Traffic Data for strategic planning purposes (Cologne-Graz)" consists of using smart urban infrastructure, and more specifically traffic light hardware of the last generation (with specific interfaces to gather data for an urban platform) in order to measure traffic flows (vehicles) and optimize them. The data will be monitored via the Urban Cockpit platform system implemented within the Grow Smarter project in the lighthouse City of Cologne. Its graphic analyzation interface will allow to acquire a better understanding of traffic flows, to minimize congestion due to strategical decisions, and will serve as a base for future traffic

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regulations in Graz. Additionally, the gathered traffic data shall be put into context in future with environmental sensor data (air quality) also measured in the pilot area.

*Specify area and scope of implementation*

The first pilot area in Graz shall be implemented at the intersection of Elisabethstrasse and Glacisstrasse. This area, in the immediate proximity of the historical centre, is often prone to congestion.
The future goal is to expand the solution to a wider area in Graz, starting with the Waagner Biro Smart City district, and at the end eventually to monitor the traffic in the whole city.

*Name key steps and activities required for the project implementation*

GrowSmarter Replication Measure "Visualizing of Traffic Data for strategic planning purposes" (Cologne-Graz)
Next Steps:

- Identification of suitable pilot area in Graz
- Technical Adaption of traffic light system in pilot area
- Expert-Workshop in Graz April/May 2019
- Pilot Operation at least until end of 2019 – idea: further extension after end of GrowSmarter (to be discussed with partners in Cologne)

*Status quo of deployment / implementation step (if) already achieved (see below)*

The solution currently is between the planning and implementation phases. The first traffic lights equipped with sensors should be installed in spring 2019.

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### 6.1.2 Phase 1: Preparation of the implementation framework

**Objective: Set the basis for a successfully implementation of the measure.**

| Indicative timeframe | Description of key activities | City departments/ offices involved |
|---|---|---|
| II Q, 2019 | **Policy and regulatory screening:**<br><br>All current Austrian regulations have already been screened and will not need to be adapted for the solution to be implemented<br><br>**Stakeholder´s roles definition:**<br><br>• City of Graz<br>• InformationsTechnik Graz GmbH, city-owned IT company<br>• UI, developer of the Urban Cockpit solution | Road Management Department, Department for Traffic Planning, ITG InformationsTechnik Graz GmbH, Executive Office for Urban Planning, Development and Construction, (additionally environmental department at a later stage) |

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### 6.1.3 Phase 2: Project inception planning, performance and finance

**Objective: Outline key structural aspects for the measure's implementation.**

| Indicative timeframe | Description of key activities | City departments/ offices involved |
|---|---|---|
| I Q/2019 | **Governance designation:**<br>• Road Management Department, ITG InformationsTechnik Graz GmbH: technical part<br>• Department for Traffic Planning: defines pilot area, end user<br>• Executive Office for Urban Planning, Development and Construction: overall coordinative part<br><br>**Targets and goals setting (short- to long-term):**<br>Smart City Graz Strategy<br>Digital Agenda Graz<br>Sustainable Traffic Plan Graz<br><br>**Technology and infrastructure planning:**<br>• The first data captors will be installed on traffic lights on the test site at the intersection of the Elisabethstrasse and Glacisstrasse.<br>• UI will finish its software development activities till April 2019 (then an expert workshop will be held in Graz to discuss details and further development steps)<br><br>**Definition of key performance indicators (KPIs):**<br>• The qualitative value of the solution will be measured by interviewing decision makers and smart city experts with a pre-defined questionnaire. The questions will address if and | Executive Office for Urban Planning, Development and Construction: overall coordinative part<br><br>Road Management Department, ITG InformationsTechnik Graz GmbH: technical part<br><br>Department for Traffic Planning: defines pilot area, end user |

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| | | |
|---|---|---|
| | how the solution makes their work faster and more efficient, and how the solution could be further adapted to increase its value.<br>• The quantifiable indicators regarding the data are:<br>▪Big Data velocity and volume: GB/day and GB total<br>▪Big Data variety: how many distinct data sources have been integrated since the implementation of the solution<br>▪Big Data energy use: electricity use in data centers for storage, access and processing of the data (kWh/day) | |

| | | |
|---|---|---|
| | **Cost-benefit analysis:**<br><br>Externality: increased waste heat due to the higher data traffic and volume in the data centers.<br>Measuring traffic flows will allow the City to have a precise picture of the mobility modal share, and fine-tune its measures and regulations to reach its sustainability goals (20/20/20 objective of the EU)<br><br>**Business and financial model definition:**<br><br>According to the Digital Agenda of Graz (DAG), the collected data has to remain demonetized.<br>• In the medium-term, a partial release of the data can be considered, allowing start-ups and companies to develop new services and products for the citizens.<br>In the first stage, the pilot implementation will be financed by the GrowSmarter Replication budget. | |

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### 6.1.4 Phase 3: Political approval and stakeholder engagement

**Objective: Obtain and maintain political and stakeholder commitment for the implementation.**

| Indicative timeframe | Description of key activities | City departments/ offices involved |
|---|---|---|
| II Q 2019<br><br>April/May 2019 | **Political commitment:**<br>• our aim is to use the budget from Graz GrowSmarter funded budget share<br>• additionally, for a possible roll-out at the Smart City District Waagner Biro there is a dedicated Digitalization Funds sourced by the municipality and private partners to bring forward innovative solutions in this topic<br><br>**Strategic intermediaries:**<br>all stakeholder are integrated at the moment<br><br>**Public participation and citizen engagement:**<br>• Transparently communicate on the necessity of the collected data to ensure better urban services, and on the privacy of the collected information. Beside no direct citizen engagement is foreseen.<br><br>**Capacity building of city staff:**<br>• Workshop with local project team, City of Cologne and ui! in April/May 2019 in Graz to clarify technical aspects and experiences with such traffic data visualizations (know how from the other Lighthouse Cities Stockholm and Barcelona would be useful for the local implementation)<br><br>• Perhaps it is possible to additionally offer a | Executive Office for Urban Planning, Development and Construction: overall coordinative part<br><br>Road Management Department, ITG InformationsTechnik Graz GmbH: technical part<br><br>Department for Traffic Planning: defines pilot area, end user |

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| | | |
|---|---|---|
| | GrowSmarter-Webinar to discuss this measure with a broader audience. | |

### 6.1.5 Phase 4: Project implementation

**Objective: Plan the effective implementation of the defined measure.**

| Indicative timeframe | Description of key activities | City departments/ offices involved |
|---|---|---|
| April/June 2019 | **Implementation plan:**<br><br>1.Upgrade of traffic lights with data interfaces at the Elisabethstrasse/Glacisstrasse intersection<br>2.Integration of the data collected by the traffic computer in Graz into the Big Data platform of Cologne.<br>Currently UI! an the City of Graz proof the monthly volume of data and the costs to clear if it is possible to integrate the data in the Urban Pulse. Feedback is expected in January 2019.<br>Some of the tasks planed by UI are:<br>• Developing a connector to integrate the data of the traffic computer of Graz into the urban big data platform of Cologne<br>• Replicating Analytics Services for calculating important traffic situation KPIs<br>• Visualising data and KPIs on the Urban Cockpit of Cologne<br>• Analysing data quality and develop and document recommendation of actions for improve data quality<br>• Workshop in Graz where we will present the results and identify further chances for cooperation and possibilities for economic recovery | Executive Office for Urban Planning, Development and Construction: overall coordinative part<br><br>Road Management Department, ITG InformationsTechnik Graz GmbH: technical part<br><br>Department for Traffic Planning: defines pilot area, end user |

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| | | |
|---|---|---|
| | • Skype sessions with the other 4 follower cities and Stockholm and Barcelona, where we will present our solutions (all of our GrowSmarter solutions) in order to figure out whether they have a demand for our solutions<br><br>**Procurement model:**<br><br>• At the current time, no procurement is planned. It is intended for Graz to work with existing traffic lights (Siemens System) and the Urban Cockpit developed in Cologne (similar producer/vendor).<br>• When the implementation has been broadened to different sites in Graz, the City will work with Siemens's Scala solution.<br>▪ Siemens already is the vendor for Graz traffic computer and traffic light system. The City will closely work with them from the very beginning of the pilot.<br><br>**Contract negotiation and management:**<br><br>• *Not relevant* | |

### 6.1.6 Phase 5: Monitoring and progress evaluation

**Objective: Plan the monitoring, evaluation and reporting of the implementation of the measure.**

| Indicative timeframe | Description of key activities | City departments/ offices involved |
|---|---|---|
| 2019 / 2020 | The monitoring and evaluation of the solution will be similar to the ones used by Cologne (c.f. ''Evaluation Plan WP3''). Additionally the impacts on the quality of life shall be monitored via the Graz Survey on the Quality of Life- | Executive Office for Urban Planning, Development and |

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| | | |
|---|---|---|
| | process.<br><br>**Project monitoring**: see Evaluation Plan WP3<br><br>**Project evaluation**: see Evaluation Plan WP3<br><br>**Internal and external reporting**: see Evaluation Plan WP3 | Construction: overall coordinative part<br><br>Road Management Department, ITG InformationsTechnik Graz GmbH: technical part<br><br>Department for Traffic Planning: defines pilot area, end user |

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# 7 Conclusions

In the project application phase, the follower City Graz had selected a total of six solutions it would be interest in replicating. Out of them, only one will be implemented in Graz during the Grow Smarter Replication phase: Solution 8 – Big open data platforms. The solutions 1 and 3 are not planned to be developed in Graz in the medium term. However, declinations of the solutions 6, 9 and 12 are currently being implemented, or will be in the short term, through other European or national funding programs.

**Smart Measures that will not be replicated.**

This section details why the City of Graz is not replicating the Grow Smarter solutions as first planned.

**Solution 1 – Efficient and smart climate shell refurbishment / 1.1 Energy efficient refurbishment of the building**

The measures that interested the City of Graz within this solution were:

- Energy efficient refurbishment of residential buildings (Stockholm)
- Climate shell refurbishment (Cologne)
- Energy quality assurance (Stockholm)

The main reason why this solution will not be replicated in Graz is very different local context. In Stockholm, the municipality owns and manages an important share of housing through its daughter companies, which gives it an important flexibility regarding the refurbishment standards it establishes. In Graz this is not the case: the great majority of buildings, and especially housing, is owned by private companies or housing cooperatives. Another element is that the Austrian standards for building and refurbishing are already very high regarding energy efficiency. This makes negotiating with the private investors a hard exercise, for a result only marginally better than the legally required standard. For this reason, the replication of this solution has been abandoned in Graz for the moment.

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### Solution 3 – Smart, energy saving tenants / 3.1 Active House/Home energy management system/Smart home system

This solution will not be replicated in Graz in the immediate future. As explained for the Solution 1.1, because of extensive requirements regarding building standards in Austria, the private investors struggle to dedicate more funds in housing operations. In the medium-to-long-term, however, we can hope that smart home systems will see their prices decrease, making them a possibility for Smart City districts such as the one in Graz.

We assume that such intelligent House/Home energy management systems will in medium term be implemented gradually by private house/flat-owners but not rolled out with the help of broader public initiatives.

### Solution 6 – New business models for district heating and cooling / 6.1 Open district heat with feed-in of waste heat

It is not possible to locally replicate the solution implemented in Stockholm, mostly because Graz does not benefit of large data centers in its vicinity.

In Graz, waste heat of the "Marienhuette" steel production plant has been used for district heating for the last 15 years. It is planned to store more of its waste heat for the Reininghaus Smart City district in the near future, adapting to the variation in demand (indicative implementation timeframe: 2019-2024).

The working group « Heat Supply Graz 2020/2030 » is currently working on ways to integrate more heat sources into the district heating network, while permanently maintaining its temperature between 85 and 120°C.

### Solution 9 – Sustainable delivery / 9.1 Integrated multi-mode transport for light goods

This solution will not be replicated in Graz through the Grow Smarter project, but the City is currently working on a similar one.

The *Communal service boxes for sustainable deliveries* developed in Stockholm cannot be replicated as is in Graz, as the housing buildings lack the space to dedicate a room to parcels. However, an open parcel locker system is been tested in the "Brauquartier development district" (District of Graz Puntigam) though the nationally funded *SoWas* project. The locker units are open to all operators and not exclusive to one building (indicative implementation timeframe: 2019-2020).

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## Solution 12 – Smart mobility solutions / 12.3 Mobility Hub

Since 2016, Graz has developed mobility hubs called *TIM – täglich, intelligent, mobil* (daily, intelligent, mobile). They combine e-car-sharing, e-taxis, public transport, as well as indications for pedestrians. The TIM mobility hubs are a product of the Holding Graz, the public service company of the City of Graz, and was initiated through the KombiMo II project financed by the Austrian Ministry for Traffic, Innovation and Technology (bmvit). There are seven TIM hubs in Graz so far, as well as e-car-sharing and e-taxis stations across the city, and more are planned to be installed in the upcoming years.

Additionally there is currently implemented a roll out of this TIM-MaaS-solution on regional level funded by the national ERDF-programme (indicative implementation timeframe: 2019-2020).

As an outcome of the Interreg-project SOLEZ Graz and the functional urban region is currently implementing a development process to find and create future services for this TIM-concept.

The TIM mobility hubs were developed and implemented after the conception of the Grow Smarter project. As the solution already exists, there is no need to replicate the Grow Smarter solution.

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