Report: Work Package 3

D3.2 Promotion of existing lighthouse initiatives

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Deliverable aims and objectives

This report presents the results of Deliverable 3.2, 'Promotion of existing lighthouse initiatives', from the STEP UP partner cities of Ghent, Glasgow, Riga and Gothenburg. It is part of Work Package 3, 'Development of innovative projects', within which the partner cities are developing a number of innovative projects based on an integrated approach to energy planning. This deliverable focuses on the identification and promotion of existing lighthouse initiatives in each STEP UP city; initiatives that take an integrated approach, have high impact and replication potential, and cover a range of different sectors. It seeks to identify the winning elements of these initiatives on the key themes of long term political leadership, collaboration and engagement with stakeholders, contribution to multiple policy objectives, and project economics and business models.

The outputs of this deliverable are being promoted through the STEP UP website, at events and more, and will be used as a knowledge base and inspiration for the innovative projects that the STEP UP partners will develop later in this Work Package. They will also serve as motivation for the companion cities and cities of the learning network in STEP UP to develop similar projects in their own cities.

City approaches

Previously, in Deliverable 3.1, a total of 36 'best practice projects' were identified in the partner cities. In this second deliverable, nine criteria taken from the European Commission's Smart Cities and Communities communication[1] have been used to define which of the cities' best practice projects can also be defined as lighthouse initiatives. Through direct communication with the European Commission the following criteria have been given more weight than others:

- Tackle issues at the intersection of the transport, energy, and ICT sectors;

- Be demonstrated and validated at scale sufficient enough to enable systematic change in applications which are not yet commercial; and

- Followed by a review phase to assess performance and transferability.

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[1] C(2012) 4701 final, Communication from the commission, Smart Cities and Communities – European Innovation Partnership

In addition, key winning elements of all initiatives have been identified, as well as their replication potential, economic information and business models, and existing promotional activities in the cities.

The initiatives in this report have been analysed against all of the Commission's lighthouse criteria, with the three listed above given additional weighting. This weighting has been used in a scoring system, in which projects have been scored according to which criteria they meet. A total score of 12 is possible, with lighthouse initiatives being those that score 10 or higher. Other projects that do not score as highly are considered to be 'benchmarks of excellence'; projects that provide positive impact in the cities and are worthy of promotion, but do not meet all of the three key lighthouse criteria above.

Key findings

In each city a number of lighthouse initiatives have been identified and analysed further. Glasgow has identified three lighthouse projects (the TSB Future Cities Demonstrator, Commonwealth Games Athletes' Village and Clyde Waterfront), Gothenburg has two (Congestion Charge and New Travel Habits, as well as the Kvillebäcken sustainable urban district), Ghent has two (Car free city centre and Ledeberg Alive!), and Riga also has two (smart cards for transport and social services, and the Tornakalns new building complex).

Most of these focus on the transformation of transport systems, retrofitting of existing districts or establishment of new districts, with the help of ICT and with decreased energy consumption as an important goal. In addition to the lighthouse initiatives, two 'benchmark of excellence' projects for each city are presented in Annex B of this report.

Annex B presents the full analysis of all projects against the criteria set out. In this report, summary information is provided on each lighthouse initiative, followed by an analysis focusing on the following key elements:

1. Integration of energy, ICT and transport

2. Replication and scalability

3. Integrated building blocks

4. Monitoring and reporting

5. Winning elements (the key factors for successful projects that emerged from D3.1)

6. Promotion

Promotion of lighthouse initiatives

Each of the lighthouse initiatives is being promoted within the cities, and there are many similarities in terms of the approaches used. The municipalities have in most cases put in resources in order to spread information about the initiatives to the general public through communication campaigns, using posters, leaflets and new websites. Public dialogues have also been arranged for representatives to increase understanding among stakeholders and to seek their points of view.

Beyond this, several actions for communicating the lighthouse initiatives are being taken as part of the STEP UP project, focusing on the key winning elements of the initiatives, as well as the general recommendations drawn from this deliverable. The initiatives, together with the benchmarks of excellence projects that are part of this deliverable (see Annex B), are being promoted in the 'Projects' section of the STEP UP website, with summary information on each project and the key winning elements that make it a 'lighthouse' initiative. Some of the projects will also be featured as 'benchmarks of excellence' on the Covenant of Mayors' website in due course.

Within Work Packages 4 and 5, the STEP UP cities are organising a variety of learning activities for companion and learning network cities, including coaching sessions to help companion cities to develop their own enhanced SEAPs. There is potential for later coaching sessions to focus on helping them develop their own lighthouse initiatives, learning from STEP UP lighthouse initiatives and their winning elements. This provides a forum for promoting the lighthouse initiatives and the benchmarks of excellence projects to European cities beyond those in the STEP UP project.

This process will be supported by a communications toolkit in which the initiatives, their winning elements and the key recommendations from this deliverable will be presented. The toolkit, which will be available from September 2014, will be an easy and accessible way for the STEP UP partners to communicate their initiatives at meetings, events and in other engagement with local stakeholders and cities outside of the STEP UP project. This will help others to learn from existing lighthouse initiatives and consider how they could develop their own.

Challenges and learning points

The conclusions of this report can be summarised as follows:

Integration of energy, ICT and transport - there is not one way to organise a lighthouse initiative. In many cases, the initiatives have a main focus, and then have a variety of other building blocks attached to them depending on local circumstances. ICT tends not to be a central focus of an

initiative, but is instead used as a support tool that helps to achieve goals such as higher energy efficiency in city districts or more effective transport systems.

Replication - all of the lighthouse initiatives presented in this report have replication potential. There are, however, no initiatives for which a 'copy and paste' approach can be used, where an identical version of the initiative can be transferred to another place and time. Factors such as culture, economy, politics, technology and geography have an impact on the potential for replicating initiatives to specific cities. In many cases some parts of the initiatives are easier to replicate than others.

Monitoring - there are differences in how much data is available on the different lighthouse initiatives, but also in how hard or easy they are to monitor depending on their complexity. Two of the initiatives have not been monitored yet, since they are just starting up, and one has not been monitored as it is focused on values and behaviours, for which changes are difficult to measure. The rest have been monitored and show effects on energy consumption as well as on other areas.

Winning elements of success – four main winning elements have been identified in Deliverable 3.1, and the analysis shows that these remain relevant here: 1) political leadership with a long term approach; 2) collaboration and dialogue with all stakeholders; 3) contribution to multiple policy objectives; and 4) business models that attract investment.

Promotion – most of the initiatives have so far mainly been promoted within the cities. Some initiatives have gained public acceptance early on in the process, while others have not, which has caused problems but has also helped the cities learn lessons from these experiences.

One last conclusion that has been drawn is that it is hard to make any absolute claims about what makes a lighthouse initiative successful, because of their very complex nature. In this report however, some general tendencies regarding how lighthouse initiatives can be organised have been described, which other cities can learn from.

Key recommendations

From the findings and learning points above, a number of recommendations have been generated, as follows:

- **Understand lighthouse criteria**: if cities are aiming to identify and promote projects that meet the European Commission's lighthouse criteria, a clear and thorough understanding of

these criteria needs to be developed. Where aspects are unclear or open to misinterpretation, direct communication with the Commission may be required.

- **Build in key criteria from an early stage**: where potential lighthouse initiatives are at an early stage of development, cities need to ensure that elements which meet key lighthouse criteria are built in early on, including regular monitoring of performance and impacts, and the potential for replicating and scaling up. Where this is not possible, the potential to add in lighthouse elements later, such as the integration of additional sectors, should be explored so that key windows of opportunity are not missed.

- **Start off small**: sometimes it is wiser to start off small and scale up the initiative if successful, than to acquire large amounts of resources from the beginning.

- **Build on existing initiatives**: initiatives do not always have to start from anew. Rather, the analysis in this report shows that it is possible to get help with resources and promotion by basing a new initiative on an existing project that has high status or symbolic value in the city.

- **Understand replicability**: when thinking of replicating an existing initiative in another city, a thorough analysis of its specific replicability is needed; what parts of it would be possible to replicate based on political, economic, geographical, technological and cultural factors?

- **Explore different funding sources**: an integrated approach gives opportunities to explore new types of hybrid funding; when various stakeholders and sectors are combined in an initiative, resources can be generated from several different sources at once.

- **Think cross-sectorally**: when developing an integrated, cross-sector project, new ways of addressing problems can be explored. For example, an initiative focused on decreasing energy consumption within the transport sector can also contribute to the city's goal of improving public health.

- **Secure political support**: successful initiatives need both local and national political leaders that champion them and act as enablers.

- **Think long term**: sustainable energy projects will last for decades. Therefore it is important that the approach taken has a long term focus and looks beyond short term political cycles.

- **Collaborate and engage with stakeholders**: the promotion of lighthouse initiatives in, and by, cities needs to be carried out in conjunction with high quality stakeholder engagement and collaboration, to ensure city-wide support from a variety of stakeholders.

- **Maintain up to date project information**: cities need to regularly update information on their existing lighthouse initiatives in order to make the promotion of these initiatives much more straightforward and effective.

- **Learn from mistakes**: an important part of learning is to understand elements of projects that are weaker or do not work, and use this to develop future projects that have a higher impact. Cities need to be more willing to identify and accept mistakes or weaknesses in order to learn from these.

Going forward, the lighthouse initiatives that have been analysed and promoted in this deliverable will be used as a knowledge base and inspiration for the innovative projects that the STEP UP partners will develop to the edge of implementation further on in the project, in deliverables D3.5 and D3.6. The promotion of lighthouse initiatives, in conjunction with STEP UP work packages 4 and 5, will also serve as motivation for the STEP UP companion cities and cities of the wider learning network to develop similar projects in their own cities.

1.   Introduction to Work Package 3 'Development of innovative projects'

Work Package 3 focuses on the development of innovative projects in the STEP UP cities of Ghent, Glasgow, Riga and Gothenburg. The objectives of the work package are to:

- Identify best practice energy and lighthouse initiatives in partner and learning network cities

- Define the winning elements of these lighthouse initiatives and promote them

- Define in depth the common challenges for the cities

- Identify integrated project opportunities with potential for execution between 2013-2020, based on analysis done for Sustainable Energy Action Plans (SEAPs) in WP2 and the current pipeline of projects in the cities

- Develop several innovative projects in each city, which should include the following elements: project concept, descriptions of key actors, stakeholder engagement, project economics, energy calculations and key performance indicators

- Show that an integrated approach between sectors and actors achieves better energy efficiency and economics than traditional approaches

The innovative projects developed in this work package draw inspiration from best practice solutions and winning elements from 'lighthouse' initiatives employing the integrated approach. Defining certain initiatives as 'lighthouse' is done with the explicit goal of accelerating changes in perceptions and beliefs on a wide scale. The innovative projects will also be based on an inventory of pipe line projects and windows of opportunity in the cities, as well as on an analysis of integrated project opportunities identified through the enhanced SEAPs that are developed within Work Package 2. The projects will thereby utilise the outputs of the first four deliverables within Work Package 3 as a way of sharing experiences, while identifying the key elements of success, challenges and exploitable similarities in the cities.

The contribution to all three European 2020 climate and energy targets is also important, as well as increased knowledge transfer and replication potential across European countries. STEP UP is focused on how integrated planning between industry sectors and other actors can generate better energy efficiency performance, economics and social benefits compared to traditional approaches. The integrated approach towards energy planning, integrated project design and implementation is considered by addressing three core themes together: energy and technology; economics; and organisation and stakeholders.

2. Deliverable 3.2 'Promotion of existing lighthouse initiatives'

Deliverable 3.2 (D3.2) is the second deliverable in Work Package 3, focused on the identification and promotion of existing lighthouse initiatives in each STEP UP city. The structure of the deliverable has been derived from task 3.1 in the STEP UP Description of Work; 'Identifying best practice solutions and 'lighthouse' projects'.

The purpose of this deliverable is to promote a selection of lighthouse initiatives, many of which were developed before the STEP UP project started. The projects should have a high impact and high replication potential and be derived from a range of different sectors, thereby demonstrating an integrated approach. Key winning elements for success are also identified.

These lighthouse initiatives will be used as a knowledge base and inspiration for the innovative projects that the STEP UP partners will develop to the edge of implementation further on in the project, in deliverables 3.5 and 3.6. These initiatives are being promoted on the STEP UP website, and are being promoted by the cities locally as well. The promotion of lighthouse initiatives, in conjunction with STEP UP WP4 and WP5, will also serve as motivation for the companion cities and cities of the learning network in STEP UP to develop similar projects in their own cities. This will be done with support from a toolkit which, from September 2014 onwards, will be accessible for the STEP UP cities in order to communicate key learnings and recommendations connected to the initiatives.

3.   Methodology

The process of identifying suitable lighthouse initiatives has been facilitated by the work package leader, SP Technical Research Institute of Sweden. However, the methodology was developed as a collective effort through participatory research, with all project partners playing a crucial role in developing the approach, identifying initiatives and analysing data.

Following the identification of best practice projects in D3.1, further detailed research was conducted in all cities to understand the specific criteria for lighthouse projects and to define which of the cities' best practice projects match this criteria.

The criteria used to identify lighthouse initiatives have been taken from the European Commission's Smart Cities and Communities communication[2], which says that lighthouse projects should:

- Tackle issues at the intersection of the transport, energy, and ICT sectors.

- Trigger strategic partnerships of innovation driven companies acting across geographical borders.

- Forge strong partnerships with local leaders and municipal authorities.

- Engage and empower citizens and local stakeholders to reduce greenhouse gas emissions, energy consumption and more widely to improve the urban environment.

- Offer solutions to the broad scope of geographical, spatial and demographic characteristics of European cities.

- Encompass a project design phase where different building blocks would be selected.

- Show an integration phase where these would be combined, and in many cases also integrated with legacy infrastructure and systems.

- Be demonstrated and validated at scale sufficient enough to enable systematic change in applications which are not yet commercial.

- Followed by a review phase to assess performance and transferability.

Through direct communication with the European Commission the following criteria were considered to have higher importance than others:

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[2] C(2012) 4701 final, Communication from the commission, Smart Cities and Communities – European Innovation Partnership

- Tackle issues at the intersection of the transport, energy, and ICT sectors.

- Be demonstrated and validated at scale sufficient enough to enable systematic change in applications which are not yet commercial.

- Followed by a review phase to assess performance and transferability.

The criteria for best practice projects used in D3.1 were also matched with the lighthouse criteria above to ensure a consistent approach was used (see Annex A).

In order to decide which projects could be considered as lighthouse, a scoring system was developed which gave the above three key criteria a double weighting compared to the others, and a score of 2 if met. All other criteria were given a score of 1 if met. The total score a project could receive was 12. To be 'lighthouse', it was decided that projects must meet the three most important criteria, and also receive a total score of more than 10 (see the Excel sheet in Annex B).

These selected projects were initially due to be called lighthouse projects. However, the European Commission's definition of a lighthouse project changed in March 2014 to include only projects that are funded under Horizon 2020. Since STEP UP is an FP7 project, it was decided to change the name to 'STEP UP lighthouse initiative' instead.

Through this deliverable, STEP UP has therefore created three different types of 'best practice' projects that cities wish to promote, categorised depending on the criteria met:

- **Lighthouse initiatives** – as explained above, these are projects which meet all of the most important criteria set out by the European Commission and score higher than 10 in the STEP UP scoring system.
- **Benchmarks of excellence projects** – these are projects that excel in all areas, but do not meet the most important lighthouse criteria (usually by not combining the three sectors of energy, ICT and transport). These projects are still seen to be worthy of promotion across Europe, with the intention to feature them on the Covenant of Mayors' website.
- **Best practice projects using the integrated approach** – these are all of the projects included in Deliverable 3.1.

4.   Results and findings

The main aim of this deliverable has been to identify, analyse and promote a number of STEP UP lighthouse initiatives. The full results and analysis of projects and how they have been categorised into lighthouse initiatives or benchmarks of excellence can be found in Annex B.

Below is a brief summary of each lighthouse initiative, and an explanation of how each one meets the key criteria set out by the European Commission, with emphasis put on:

1. Integration of energy, ICT and transport

2. Replication and scalability

3. Integrated building blocks

4. Monitoring and reporting

5. Winning elements (the key factors for successful projects that emerged from D3.1)

6. Promotion

In total, nine projects are classified as STEP UP lighthouse initiatives (two in Ghent, three in Glasgow, two in Gothenburg and two in Riga), and eight as STEP UP benchmarks of excellence (see Annex B).

Table 1. Summary of STEP UP lighthouse initiatives and how they meet key European Commission criteria

City	Project	Brief project description	Tackle issues at the intersection of energy, transport and ICT	Be demonstrated and validated at scale sufficient enough for systemic change	Review phase to show performance and transferability	Report section
Glasgow	Technology Strategy Board (TSB) Future Cities Demonstrator	Public, private and academic sectors are combining expertise and using the latest technology to enhance day-to-day life in the city of Glasgow. Integrates technologies and applications in public safety, transport, health, technology and sustainable energy.	A range of initiatives are included, covering all three sectors: Energy: energy efficiency and energy demand management, collection and use of energy consumption data; intelligent street lighting; renewable energy opportunity mapping. ICT: city technology platform to integrate, analyse and present data streams; integrated operations centre to monitor and control CCTV camera network; citizen science mapping for local people to share their knowledge of Glasgow. Transport: active travel encouraging cycling/walking; social transport improvements.	This is a city wide project, with a number of its initiatives being demonstrated at the city wide scale. The project also has wider links across Scotland and the UK, including the Scottish Cities Alliance (SCA), Future Cities Catapult and Smart Cities Forum, which means that other cities can learn from the Glasgow demonstrator.	High level measures of success for the Future Cities Demonstrator have been identifed, and individual measures of success will be identified in due course. Continuous measurement of performance will be a key component of the City Management System, though as the projects are still in development there is no data available yet.	4.1.1
Glasgow	Commonwealth Games Athletes' Village and Energy Centre	First large scale carbon neutral project in Scotland, with two key objectives: regeneration of Glasgow's east end with new approach to sustainable housing; reduction of fuel poverty and creation of affordable heat in one of the poorest parts of the city. Athletes' Village comprises 700 new homes and a care home, both joined to a local district heating system housed in a purpose built Energy Centre. This is also connected to the Emirates Arena sports complex.	The project features innovation and integration in all three sectors: Energy: Energy Centre housing a district heating scheme, linked to an eco-housing model; Eco-housing with all homes built to 'excellent' eco-homes rating, provided with energy monitors and smart meters to encourage lower energy use. ICT: Telecommunications infrastructure and equipment, including fibre optic broadband; smart meters. Transport: Transport Strategic Plan to encourage public transport use, walking and cycling.	A whole new area of housing is being established, and through this systemic change has been achieved in a whole city district. The project has also been seen as an opportunity to trial innovative ideas and enhance understanding of what could be achieved elsewhere in the city. There are also plans to extend the district heating network, which has additional capacity, to other heat users nearby.	Overall success being monitored by City Legacy, including a number of key performance indicators. Estimated CO2 savings are 1,013 tCO2 per annum, with grid derived electricity consumption falling by 9,462MWh per annum. Energy performance of the site will be monitored by the Council's carbon management team. Transferability is being closely monitored, with approaches being seen as exemplar - some have already been replicated elsewhere in the city.	4.1.2
Glasgow	Clyde Waterfront	Major regeneration project, rejuvenating 20km of the city alongside the River Clyde. Includes aroun 250 individual projects, with two interlinked projects selected under STEP UP to illustrate best practice: a) NHS South Glasgow Hospital campus featuring innovative energy standards and generation sources; b) Fastlink transport project featuring energy efficient buses.	a) NHS South Glasgow Hospital Campus - It covers ICT and energy predominantly, making use of advanced technology and innovative building energy standards and generation sources. LAN infrastructure will ensure efficient and effective patient care is delivered. Centralisation of facilities reduces need to travel. 2) Fastlink improves transport through energy efficient buses to the NHS South Glasgow Hospital campus and other locations. Dedicated routeways and bus lanes will be developed, with real-time passenger information and number plate recognition CCTV used to deter other drivers from using the bus lanes.	Clyde Waterfront is a large scale regeneration project, including over 250 subprojects. It has already led to a better environment and new jobs. Covering 20km of land alongside the River Clyde, this is a large enough base to result in systemic change in the the city district.	The performance of the whole initiative has been monitored since 2003, particularly in relation to its contribution to GVA and employment. Monitoring of the two schemes will be done according to NHS and GCC performance management systems, which include energy and environmental performance. Targets: a) 15% renewable energy contribution (DH). Low energy design: 80kg CO2/m²/annum & 55GJ/100 m³/annum, BREEAM excellent rating. b) Reduction of 22,000 tonnes CO2 per annum (for core, inner and regional phase)	4.1.3

City	Project	Brief project description	Tackle issues at the intersection of energy, transport and ICT	Be demonstrated and validated at scale sufficient enough for systemic change	Review phase to show performance and transferability	Report section
Gothenburg	A sustainable transport system: Congestion Charge and New Travel Habits	Part of an overarching strategy for the West of Sweden region, these two initiatives are supporting the city's plans to create a long term sustainable transport system based on increased cycling, walking and use of public transport. The congestion charge gives drivers financial incentives to choose other means of transportation, whereas New Travel Habits focuses on changing values and attitudes among citizens.	Energy and transport: both initiatives aim to encourage people to shift their mode of transport to zero or low carbon means. Part of the West Swedish Agreement, which aims to upgrade transport infrastructure across the area and create a better environment. ICT: web based platforms as part of the congestion charge, to inform and maintain a dialogue with citizens; digital monitors keep track of car traffic and help drivers find the best routes; smartphone apps make it easier to travel by bus or bike.	The congestion charge was implemented city wide from the start, impacting on the whole transport system and resulting in lower levels of traffic in the city. Links with other city policies and administrative routines have been made from the start which has made this city-wide transformation possible. New Travel Habits is also a city wide project which seeks to change values and world view among citizens.	The congestion charge has been monitored since the beginning, and it is currently being evaluated with some revisions being made. Traffic volume has declined by 15-20% since its implementation, which is likely to be due to the charge. The impacts of the New Travel Habits project have not been monitored. Though there has been an increase in public transport use by 25% it is not clear what role the scheme had to play in this.	4.2.1
Gothenburg	Step by step to sustainable urban districts: Hamnhuset to Kvillebäcken	The project aims to set a new model for sustainable city planning and building in Sweden and beyond, through the development of a new city district on the basis of social, economic and ecological values. It features six demonstration projects: 1) waste to biogas 2) cycle storage 3) buildings as heat storage 4) fast biogas-powered ferries for pedestrians and cyclists 5) methane-diesel trucks 6) an innovation platform and dissemination activities	Energy: central smart heating control; temporary heat storage; energy efficient buildings and appliances; electricity and heat metering. ICT: smart heating controls adjusting and aligning supply and demand; car pool online booking system; waste collection system using an underground automatic vacuum system that uses ICT to communicate with waste bins. Transport: encouraging modal shift to cycling or walking through different parking standards, cycle storage facilities and a car pool; use of food waste as biogas for car fuel.	The initiatives have been demonstrated in an entire newly built neighbourhood, with the aim of setting a new model for sustainable city planning and building. Therefore it has to potential to create systemic change in the way newly built areas are developed.	The project is monitored in several ways, with a common vision for sustainable development that includes guidelines and requirements for planning, design and construction. Each construction project is monitored by the overall environmental coordinator, and partners also meet to share knowledge and report on project progress. All buildings are certified through a third party, and project results are report every year. Emissions reductions currently match those in the previous Hamnhuset project, where emissions fell by 75% compared to an average residential building. 60 tonnes of CO2 emissions per year have been avoided.	4.2.2

City	Project	Brief project description	Tackle issues at the intersection of energy, transport and ICT	Be demonstrated and validated at scale sufficient enough for systemic change	Review phase to show performance and transferability	Report section
Ghent	Ledeberg Alive!	City renewal project in a densely populated and disadvantaged neighbourhood. It aims to imporve quality of life within six domains: green spaces, buildings' energy efficiency, traffic management, active travel, transport infrastructure and community spaces.	Energy: energy efficient renovation with incentives (subsidies) and advice for residents. ICT: digital monitoring of use of new cycling and pedestrian bridge, with visual display. Transport: new cycling and pedestrian bridge to increase accessibility of neighbourhood and connection to city centre.	A whole city district has been retrofitted, with large investments made using a holistic and integrated approach. The effects on energy consumption and other less tangible factors, such as attractiveness and accessibility, indicates that it could lead to systemic change in bigger parts of a city.	The amount of users of the new bridge (increased by 9.6% between 2012 and 2013), the application for subsidies (1,400 applications) and the renovation work itself is monitored. However, Ghent has set no standards for renovation, and the balance between investment and energy savings has not been measured.	4.3.1
Ghent	Car free city centre	Car free city centre of 35 hectares created as part of a new mobility plan for the city centre. This was seen a solution to tackle traffic, safety, health and environmental issues and improve liveability, economy and tourism. The car free centre was supported by tools such as digital parking guides for cars, apps for cyclists and pedestrians, bike hire and route planners.	Energy: use of restrictions and incentives to encourage residents and visitors to use more sustainable and lower energy consuming modes of transport. ICT: digital systems including traffic guidance, parking guides, and apps providing guidance on route planning and real-time information on parking spaces. Transport: restricting car access to city centre and measures to encourage travelling by foot or bicycle. Options for a green city distribution centre are also being investigated.	The project covers the entire city centre; an area of 35 hectares. This has meant other measures, such as digital systems and apps, have also had to cover the whole area. By relieving the city centre of cars this project has created systemic change in the whole transport system of Ghent.	Various indicators are being monitored to demonstrate the positive effects of this initiative, including: air quality; numbers of pedestrians or cyclists at specific points in the car free area; use of underground parking. CO_2 reduction has not been measured.	4.3.2

City	Project	Brief project description	Tackle issues at the intersection of energy, transport and ICT	Be demonstrated and validated at scale sufficient enough for systemic change	Review phase to show performance and transferability	Report section
Riga	Smart cards as a transport, social and education policy instrument	An innovative easy public transport payment solution (electronic card), that can also be used for other services including registering for social services, city car parking, park and ride and access to discounts for certain social groups. The project focuses on: creating a more rational organisation of public transport; reducing energy consumption in the city; and achieving greater convenience for residents.	Energy: energy consumption is reduced by using passenger flow data for the long term planning of the public transport system; e-card system reduces use of paper technologies. ICT: centralised information network manages data within the system and ensures its smooth and effective running. It consists of different 'nodes', including smart card validators, transport operator consoles and data concentrators (system connected to data centre). Transport: improved public transport service, routes and frequency. Reduces the need for private cars.	The project has been implemented across the entire Riga public transport system, which has helped ensure it is cost effective. This means it has led to change in the whole transport system of Riga, rather than just one district or area.	There are 400,000 smart card users in Riga. There is continuous monitoring of the system, with five regularly measured parameters: number of vehicles, number of drivers, number of trips, kms and hours (separate data for bus, trolleybus and tram, and separate measures for working days and weekends). This data is then used for the planning of public services. Changes in traffic flows are on average 2-8% on workdays and 9-13% on weekends. Monitoring has also included customer surveys and public opinion polls. There is no information on the environmental benefits of the system. There are socio-economic benefits but no statistical information is available on this.	4.4.1
Riga	Smart solutions for a new building complex in Tornakalns district	A modern large scale neighbourhood construction that is being planned and constructed in an existing district in Riga. It will be a combination of buildings, transport infrastructure and public spaces, and will include different functions including residential, academic and business.	Energy: focus on reduced energy consumption, including: district heating supplying energy for heating, ventilation and cooling; integration of ground source heat pumps for heating/cooling; solar collectors for hot water; lighting provided by luminescent lamps, energy efficient lamps and LEDs; wind rotors and solar-battery equipped light sources. ICT: power network control system featuring night/day mode, safety controls and protection against blackouts; automatic lighting control. Transport: integrated infrastructure with functional zones located at walking distance from each other, and a new multimodal transport junction which includes a new railway station, bus terminal, tramway line and cycling tracks. This will provide fast connections to the city centre.	The project is a large scale development of a whole district, which will completely change the nature of the area. The multi-functional approach will result in considerable change for a number of different types of users - including inhabitants, businesses and academia. The new transport junction will also have effects on the wider transport system of Riga.	A research study on technical and economic justifications for brownfield redevelopment at Tornakalns (conducted in 2009) forecasted a number of benefits from the development, including productivity growth, education quality, cost savings and employment. It is also expected to reduce environmental pollution in the area, and the expected energy savings from the project are 50-70% compared to areas of similar scale that are built in a traditional way. Although the project is underway so it is too early to see any results, details on how these impacts will be monitored have not been provided.	4.4.2

4.1 Glasgow's lighthouse initiatives

4.1.1 Technology Strategy Board (TSB) Future Cities Demonstrator

The Technology Strategy Board (TSB) Future Cities Demonstrator is a UK government initiative, which started in January 2013 and is due to complete in August 2014. In this initiative, public, private and academic sectors are combining expertise and using the latest technology to enhance day-to-day life in the city of Glasgow. By integrating technologies and applications in public safety, transport, health, technology and sustainable energy, it is expected that Glasgow will become a smarter city, with the knowledge, data and integrated systems it needs to develop further opportunities to become more sustainable.

The sections below set out how the initiative fulfils the key European Commission and STEP UP lighthouse criteria.

4.1.1.1 Integration of energy, ICT and transport

The TSB Future Cities Demonstrator is working at the intersection of the energy, transport and ICT sectors, with key initiatives including[3]:

Energy

Energy efficiency: this project shows how technology can help ensure that energy efficiency strategies are built on increasingly accurate data. It does this by working with businesses, schools, academia and power providers to set up a pilot project which enables management systems in different buildings to 'talk' to the power network and reduce their energy demand by automatically adjusting their lighting and heating, taking factors like the weather into account. Data on energy consumption in public buildings is being made available via an Open Data Platform and online mapping tools help to create a clearer picture of power consumption in the city, making it easier to plan future developments.

The project also works with housing providers to address energy consumption in older, traditionally hard to heat properties. A pilot project is testing insulation methods for tenement flats and collecting data on their impact on energy consumption. Glasgow has more than 60,000 tenement properties so the data collected will be of huge interest.

Street lighting: intelligent street lighting is being trialled in two pilot projects. Energy efficient LED lamps are being installed to demonstrate how the city could use them to reduce carbon emissions,

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[3] Project descriptions taken from http://futurecity.glasgow.gov.uk/index.aspx?articleid=10213

increase safety and reduce power consumption. Sensors are also being installed on lighting columns which collect data such as footfall, air and noise pollution levels. This real time information will feed into the Open Data Platform which, in turn, will make it available to the public.

Smart lights are being programmed to increase in brightness if noise level rises; for instance if there is a disturbance in the area. These can be operated remotely from the Operations Centre. Any faults in the system are automatically reported to the operations centre; speeding up repair times and increasing efficiency.

Intuitive street lights are also being installed on a stretch of the city's off-road cycle routes, which are mostly unlit. This will increase safety in the area and give more people confidence to use the routes after dark.

Renewable energy mapping: working with local universities, renewable energy opportunities are being mapped within the city. This is linked to the citizen science mapping project described below. The initiative aims to develop a tool which will enable people to identify land where they would like to position community renewables projects and to rapidly receive information on the planning/policy and technical constraints which might apply to that site.

ICT

City Technology Platform: more than 200 data streams have been identified in Glasgow. They include information on everything from bin collections to footfall in retail areas. Some of this data is already available to the public but often it is held in isolation, difficult to access and even harder to understand. It is not personal information but anonymous data. The new City Technology Platform integrates the data streams, analyses the information, presents it in a meaningful format and makes it open for use by the public, businesses and academics alike. It can be accessed through websites and smartphone apps including a data portal, a mapping portal and the MyGlasgow dashboard.

Integrated Operations Centre: a state-of-the-art Integrated Operations Centre has been created to monitor and control the city's new network of CCTV cameras. More than 400 advanced digital cameras are being installed across the city to replace the existing outdated network. Their operators, who used to work from separate locations, are now based in a new control room alongside specialists from TRAFFCOM - the team in charge of the city's traffic lights and traffic cameras.

Citizen science mapping: people are being encouraged to share their local knowledge of Glasgow as part of a Mapping Demonstrator project, including uploading information about their communities

on to an online map. This includes details of their favourite beauty spots, restaurants, shops or heritage highlights.

Transport

Active travel: the Active Travel Demonstrator shows how technology can help make the city more cycle friendly. The aim is to let data drive investment so that resources can be put to best use. People who currently walk and cycle are being encouraged to use a smartphone app to help collect information which will pave the way for infrastructure improvements.

Social transport: this aims to demonstrate how technology can assist in the creation of a flexible, efficient and demand responsive transport service. It is exploring the use of route optimisation software and scheduling tools with providers such as Glasgow City Council's education and social work departments and Cordia (the largest provider of home care services in Scotland). This technology would modernise management of the services and enable providers to use their fleets more effectively.

4.1.1.2 Replication and scalability

The TSB Future Cities Demonstrator is linked to the Future Cities Catapult based in London. This is a global centre of excellence on urban innovation, and is intended to be a place where cities, businesses and universities come together to develop solutions to the future needs of cities.

The Future Cities Demonstrator is also helping to shape developments across the UK through the Smart Cities Forum, which aims to enable local authorities and businesses to work together in order to ensure that growth opportunities are capitalised in a growing world market. It includes cities from across the UK, together with private sector organisations and research partners from a variety of universities.

The Scottish Cities Alliance (SCA) is also developing strategies based on the learning of the Demonstrator in order to spread the knowledge across Scotland and enable its cities to develop their own city management systems and funding bids.

4.1.1.3 Integrated building blocks

The building blocks of the project are:

- Technology infrastructure;
- The integration of city systems and data across multiple agencies; and

- The delivery of improved and responsive city services.

The intention is to improve outcomes in the four main service areas of interest: health, energy, transport and public safety. The architecture of the Future Cities Demonstrator is described below.

Figure 1. Glasgow Future Cities Demonstrator Proposal
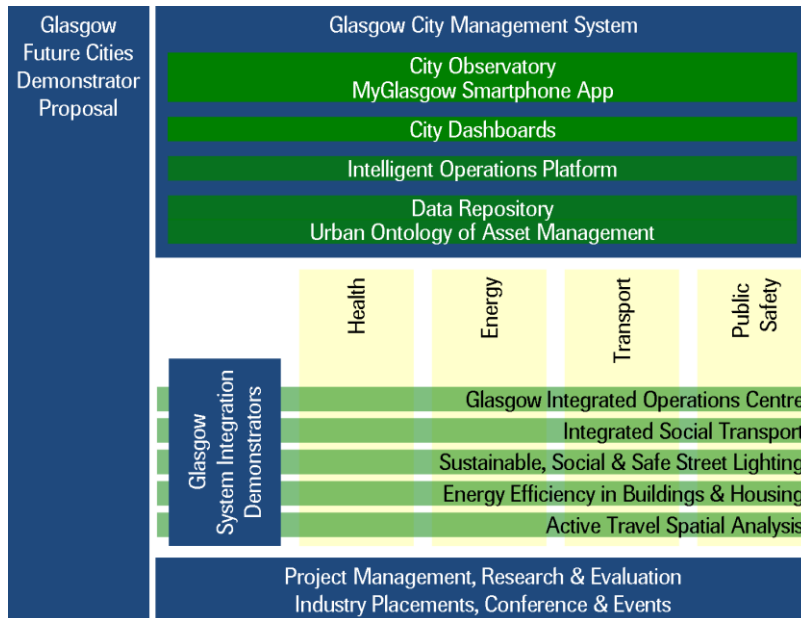
Glasgow System Integration Demonstrators: these join and analyse data from different sources within the same sector and systems. Part of this is the Integrated Operations Centre: the single biggest integration of systems within the TSB Future Cities Demonstrator, involving the integration of public realm CCTV systems, traffic management services, the command and control function for the Glasgow 2014 Commonwealth Games and the resilience and safety team, which has an emergency planning function.

Glasgow City Management System: this utilises data from the System Integration Demonstrators and other sources across the city, joining them in one large data repository. The main function of this is to consolidate data and make data collections more accessible and available to a wider community. It can be accessed and used either via a City Dashboard (for city operational management purposes) or through the City Observatory.

4.1.1.4 Monitoring and reporting

High level measures of success for the overall Glasgow Future Cities Demonstrator have been identified, such as its impact on the economy, life expectancy and air pollution.

Individual measures of success are being identified within each Glasgow System Integration Demonstrator as part of the Benefits Realisation Strategy, for example: access to health, travel times, exposure to anti-social behaviour and energy use and efficiency.

The continuous measurement of performance is a key component of the Glasgow City Management System. This builds on the technological capability present within the Intelligent Operations Platform and the ongoing data captured by the Data Repository. All these projects are still in the process of development and implementation so no baseline data is available yet.

4.1.1.5 Key winning elements of success

Political leadership with a long term approach

The TSB Future Cities Demonstrator is led by Glasgow City Council in partnership with key public, private and academic organisations including the University of Strathclyde. The Leader of Glasgow City Council has supported the project from its inception, highlighting that it will put Glasgow at the forefront of innovative and smart cities, not just in the UK but in Europe and beyond. The long term approach begins with the demonstrator project and will help Glasgow create a more efficient and sustainable city, contributing towards the EU 2020 climate and energy targets. The project also links with other initiatives bringing investment into Glasgow, such as the University of Strathclyde's Technology and Innovation Centre. The project is benefiting from the city's research and innovation base, and will show what can be achieved by the innovative use of today's technology.

Collaboration and dialogue with all stakeholders

The Future Cities Demonstrator has a strong stakeholder relationship with the executive directors of Glasgow City Council and the Director of Digital Economy at the Scottish Government, as well as a number of leading organisations within Glasgow across the public, private and third sectors.

Many of the companies that the Demonstrator is engaged with, such as Serco, are national and multi-national companies that cross borders in their operations and help disseminate learning from the project across wider networks.

There are established partnerships of innovation driven companies ranging from small innovative design start-ups in Glasgow, to UK-wide specialist technology companies and multi-national corporations famed for innovation in the ICT sector. Some examples are ACCESS, Microsoft, Swirl, We are Snook, the University of Glasgow, the University of Strathclyde and the University of Aberdeen.

The Demonstrator has also engaged with academia, enterprise and other public sector organisations to help develop the key aspects of the programme around innovation and partnership, and to deliver cross sector collaboration and integration.

Contribution to multiple policy objectives

The Future Cities Demonstrator addresses specific challenges within health, energy, transport and public safety.

Health strategies: Glasgow is the most deprived city and local authority area in Scotland, encompassing 31% of the most deprived data zones in the country. The project helps to address health issues by providing an integrated approach to data and services, ensuring that there is an increasingly healthy living environment for residents. Active travel has been identified as a key component of a Scottish Government Health Programme that is taking a whole systems approach to improving healthy life expectancy in Scotland.

Environment and energy strategies: the project supports Glasgow's environmental and climate change strategies and also addresses air quality issues by taking a more integrated approach to transport and traffic management. To date, Glasgow has declared three Air Quality Management Areas (AQMAs) in the city in response to levels of nitrogen dioxide (NO_2) being recorded above the objective and European limit value (40ug/m3). The European limit value for particulate matter (PM10), widely recognised as a more harmful air pollutant than NO_2, is currently reached in Glasgow on some days and this must be reduced.

*Transport strategie*s: the project seeks to improve the management of traffic through the city, reduce pollution, integrate facilitation and promote active travel opportunities for citizens.

Public safety strategies: the Demonstrator, through the Operations Centre, is bringing all the CCTV monitoring for the city together with the aim of improving community safety and integrating this with traffic management and street lighting.

Business models to attract investment

The project investment is approximately €30 million (£25 million). It is funded by the Technology Strategy Board, which is a UK government initiative, following the launch of a nationwide competition for a large-scale future city demonstrator in 2012. In July 2012, 30 of the local authorities which had applied were awarded grants of €63,000 (£50,000) in order to develop feasibility studies for their demonstrators. Four cities (Bristol, Glasgow, London and Peterborough)

were shortlisted and, in December 2012, Glasgow was chosen as the winner. The TSB project started in January 2013 and is due to complete in August 2014.

The focus of the Future Cities Demonstrator in recent months has been on the implementation of the various projects that are described above. Many of these projects have commercial opportunities which can be realised following their implementation. As the project is now approaching its completion date, the legacy aspects are starting to be addressed more actively.

A key feature of the business model for this initiative is that partners of this project are able to develop their markets well beyond Glasgow and act as leaders in this area, as well as lock in benefit for the UK and Glasgow through economic growth in line with the Technology Strategy Board's vision for Future Cities.

Both the TSB Future Cities Demonstrator programme and Future Cities Catapult are part of a wider UK programme in this area, led by the Department for Business, Innovation and Skills (BIS) at a central Government level, and regionally through bodies such as the London Smart Cities Advisory Board and the Scottish Enterprise Smart Cities Programme. This joined up way of working between business, city governments and academia facilitates capturing the momentum gathered through the Future Cities Demonstrator project, and helps the continued development of the integrated city systems agenda across the UK.

4.1.1.6 Promotion of the initiative

As a national project the TSB Future Cities Demonstrator has dedicated support for promotion, provided by a communications officer at Glasgow City Council. The project's dissemination activities are promoted on its website (http://futurecity.glasgow.gov.uk/) and the Council's website (www.glasgow.gov.uk/FutureCities)

The Demonstrator has held a series of 'hackathons' recently to explore how technology and data can improve the future of everyone living and working in Glasgow. One of these was on energy, with the winning team developing an idea for an application which features real-time alerts on energy consumption in buildings, with the potential to help Glasgow and other local authorities cut their energy bills substantially.

A free open air WiFi network has been made available in Glasgow in time for the 2014 Commonwealth Games and publicity around this is helping to promote the project.

4.1.2 Commonwealth Games Athletes' Village and Energy Centre

The Commonwealth Games Athletes' Village and wider East End regeneration is in a former industrial area extending along the River Clyde, which houses some of the most deprived communities in Scotland. It is the first large scale carbon neutral project in Scotland and it has two key objectives:

- Regeneration of Glasgow's East End with a new approach to sustainable housing
- Reduction of fuel poverty and creation of affordable heat in one of the poorest parts of the city

The Commonwealth Games Athletes' Village comprises 700 new homes joined to a local district heating system, housed in a purpose built new Energy Centre. The village will, post-Games, become an eco-friendly community with both private and social housing residents in a family and pedestrian-friendly environment, with state-of-the-art ICT providing a model for other developments to follow.

The sections below set out how the initiative fulfils the key European Commission and STEP UP lighthouse criteria.

4.1.2.1 Integration of energy, ICT and transport

The Commonwealth Games Athletes' Village is an outstanding regeneration project in terms of innovation and integration in the three sectors of energy, ICT and transport.

Energy

Energy Centre: the Athletes' Village Energy Centre is a district heating scheme linked to an eco-housing model, with other sustainability features on the site also forming part of the scheme. All homes are supplied with heating and hot water by a network of underground pipes from the purpose built central energy centre, which houses a Combined Heat and Power (CHP) engine and three back-up gas boilers. The energy centre will also serve a Care Home Unit for elderly people.

The scheme has been future-proofed to include capacity for an additional CHP engine, boiler and thermal store in order to accommodate additional connections at a later date beyond the site boundary, including the potential to connect with other district heating schemes across the city.

Eco-housing: in terms of energy efficiency, all the properties in the Athletes' Village have been built to achieve an 'excellent' eco homes rating, including high quality thermal insulation and solar panels

to allow properties to supplement their electricity supply. Energy monitors and smart meters also help ensure homes and appliances are used efficiently (see below).

ICT

Telecommunications: as the project is part of the Glasgow 2014 Commonwealth Games, this provides an opportunity to combine telecommunications infrastructure and equipment with state-of-the-art eco-housing and district heating. High speed fibre optic broadband has been made available on the site and at each venue for future business and community use. Every terraced house has been fitted with a satellite dish. Access to, and the availability of, ICT will enable people to work more flexibly in the future, which has the potential to improve their work-life balance.

Smart meters: energy monitors and smart meters will help to make homes and appliances more energy efficient, ensuring residents only pay for the energy they use and helping them understand their use better. This will encourage residents to use energy more efficiently and, as a consequence, will see lower bills. A spin-off benefit will be better energy literacy amongst residents.

Transport

Transport Strategic Plan: a Transport Strategic Plan has been developed as part of the Commonwealth Games 2014, to enhance opportunities to develop and expand projects to promote public transport use, reduce reliance on cars and improve air quality, both during the Games and after. During the Games, the Athletes' Village area and all Games venues have been designated as a 'low emission zone' (LEZ), with vehicles subject to a permit system to restrict access to venues based on the Euro-5 engine category (designated as the minimum standard for LEZs).

The actions being undertaken include the improvement of cycling, walking and public transport routes. In particular, railway stations close to Games venues, including Dalmarnock Station near the Athletes' Village, have benefited from a €1.3 million (£1 million) programme of improvements in passenger facilities, including new customer information screens, waiting shelters, seating and lighting.

Other

Additional measures beyond energy, transport and ICT include: Sustainable Urban Drainage Systems (SUDS); innovative approaches to the decontamination and reclamation of vacant and derelict land in the city; ambitious targets for the diversion of waste from landfill (80% of Games waste will be diverted from landfill, with the ambition to extend this further); sustainable procurement procedures; the use of recycled materials in the construction of the Village; and the provision of

extensive recreational space including a new woodland park and other facilities for young people. In addition, there have been many opportunities for local employment in the construction of the Athletes' Village, which has provided economic and social benefits for local communities.

4.1.2.2 Replication and scalability

Although the development is connected to a large scale, one-off sporting event, the Athletes' Village project has been seen as a good opportunity to trial innovative ideas, enhancing understanding of the potential for what could be achieved elsewhere in the city after the Games. The project is recognised as an exemplar, and elements of it are already being replicated in other areas of Glasgow (e.g. through the Clyde Gateway). City Legacy, the company responsible for delivering the Athletes' Village, has been open about its approach, helping others to learn from the project.

The 700 houses demonstrate innovation in building design and the use of sustainable materials. The homes have been rated under the BREEAM (Building Research Establishment Environmental Assessment Management) Code for Sustainable Homes and voluntary measurement rating for green buildings ('EcoHomes') as 'excellent' (best practice in sustainable building design). The Athletes' Village now sets the standard for best practice in sustainable building design, construction and operation in the city. The city's new Local Development Plan (2015) will set out a vision that any new development in Glasgow will meet similar standards, based on the high standards achieved in the Village. There are also plans to extend the district heating network from the Energy Centre in the Athletes' Village to other local housing structures. The transferability of the project is being closely monitored, with approaches adopted in the Village being seen as exemplar in fields such as sustainable building design and the management of waste streams.

The knowledge, publicity and awareness gained through the operation and monitoring of the Low Emissions Zone scheme will help consideration of future formal LEZs across the city, taking into account the health of Glasgow's citizens, the impact on business and the Council's overall strategic environmental and transport policies.

4.1.2.3 Integrated building blocks

The Energy Centre and district heating system were created as a commitment of the Games bid submitted by Glasgow, as part of the ambition to deliver a sustainable Games. This was then translated into the Games development brief, with the connection to the development of energy efficient housing established. In turn, this informed a competitive dialogue process leading to the appointment of City Legacy to deliver the Athletes' Village and Energy Centre infrastructure.

The synergy between the Energy Centre, housing development and sports complex has been integrated from an energy, ICT and transport perspective, as part of an overall approach to sustainability and regeneration. The Energy Centre, as well as serving the residential area (Athletes' Village and care home), is connected to the Emirates Arena sports complex, meaning that the benefits of communal heating are shared amongst different users and for different purposes. This strategic approach has helped to reduce energy costs at the sports centre and maximise the efficiency of the whole system.

The location of the Athletes' Village is in a loop area of the river Clyde and as part of the integration and sustainable use of resources, a new bridge is being built across the river. This bridge will link the Athletes' Village with the Cuningar Loop on the southern bank, where a woodland park is due to open after August 2014. Around 10,000 trees are being planted to create a woodland park which will create a breathing space for the community, social recreation and green space as part of the regeneration of the former derelict site.

4.1.2.4 Monitoring and reporting

The overall success of the project is being closely monitored by City Legacy, as required by the Commonwealth Games contract, under which a report must be provided setting out how everything agreed in the initial bid has been met. A number of key performance indicators for sustainability are also being monitored, as noted in Glasgow City Council's Commonwealth Games legacy framework.[4] In addition, Scottish Government research teams are studying various impacts related to the legacy of the Games, including the sustainability of the Athletes' Village.[5]

The Athletes' Village and district heating network will count towards the reduction of carbon emissions for Glasgow. The carbon savings estimated for this project are 1,013 tCO_2 per annum, due to the introduction of a gas CHP plant. Grid derived electricity consumption is estimated to reduce by 9,462 MWh per annum and gas consumption will increase by 20,165 MWh per annum (to run the CHP). As gas produces lower emissions than electricity, the overall CO_2 emissions result for this project is a net reduction. The energy performance of the site is, and will continue to be, monitored by the carbon management team in Glasgow City Council.

4.1.2.5 Key winning elements of success

Political leadership with a long term approach

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[4] Glasgow 2014 legacy framework: www.glasgow.gov.uk/CHttpHandler.ashx?id=7770
[5] An Evaluation of the Commonwealth Games 2014 Legacy for Scotland:
www.scotland.gov.uk/Resource/0040/00408160.pdf

The Athletes' Village, initially created for the Commonwealth Games 2014, is a political priority for the city and will have an important legacy for Glasgow in terms of regeneration and city profile. One of Glasgow's aims for the legacy of the Games is to create a greener Glasgow, and this project (as it is linked to a high profile international event) serves as a demonstration project for the city. It will help meet the city's ambitions in terms of becoming one of Europe's most sustainable cities, whilst also making the 2014 Commonwealth Games the 'greenest Games ever'.

The project is a central element of Glasgow's political commitment to a 30% carbon reduction target by 2020 from 2006 levels, as set out in the Sustainable Glasgow report (the city's Sustainable Energy Action Plan, or SEAP) in 2010. Tackling fuel poverty and providing affordable heating is another political priority for Glasgow, where 30% of the population currently live in fuel poverty.

Collaboration and dialogue with all stakeholders

The Athletes' Village project is built upon, and has demonstrated the need for, an integrated approach between sectors and stakeholders, without which the project would never have been feasible. This project features strong integration between the private and public sectors. By working together, the stakeholders have transformed a brownfield, derelict site into an attractive urban environment.

Glasgow City Council, through the City Legacy consortium, has taken forward the construction and development of the Athletes' Village. Local citizens have had the opportunity to influence the scope of this project, with the local community council using this opportunity to lobby for a new community centre, which was approved by the Council.

Contribution to multiple policy objectives

Carbon emissions reduction

The Athletes' Village will see a reduction in carbon emissions of around 60% compared to what would be expected from similar sized conventionally designed and heated schemes. It is the first development of this size in Scotland to be designed and heated in this way and will contribute towards Glasgow's 2020 CO_2 emissions reduction target (see section on monitoring and reporting above).

Transformation of brownfield sites

The area of land used to build the Athletes' Village was previously contaminated land left derelict as a consequence of the decline of many industrial sites over the past century, from power stations to

water works, leaving 35 types of contamination on site, including metals, arsenic, lead, hydrocarbons, pesticides and others. Of the 38.5 ha site selected, 33 ha required remediation of soil. Glasgow City Council appointed private consultant Grontmij and contractor VHE to decontaminate the area using soil washing. In total, 140,000 cubic metres of soil were decontaminated and reused for the housing development; if this measure had not been implemented the contaminated soil would have ended up in landfill. Decontamination of this land was a considerable challenge for project partners, especially given the level of contamination and limited time available (less than a year).

Generation of employment

The construction of the Athlete's Village and other facilities has created 620 jobs (direct and indirect). City Building, one of the stakeholders involved in the project, employed local school leavers to work on the site under the Commonwealth Apprenticeship Initiative (CAI). In total 84 apprenticeships were created, giving local young people skills in trades and business, whilst also providing practical experience and income.

Tackling fuel poverty and supporting affordable warmth

Housing in the Athletes' Village is well insulated, making it easier and cheaper to heat. Energy bills in the Athletes' Village are estimated to be 40% lower than average. Each house will have a heat meter and will pay for the energy they use rather than receiving estimated bills.

The provision of affordable warmth is a priority amongst some European countries, although poorer quality home insulation compared to elsewhere in Europe means this is more of a priority in the UK. The provision of district heating alongside better insulation and energy efficiency is now growing in the UK, and in Scotland in particular, having become commonplace and almost universal in places such as Denmark and Sweden. The Athletes' Village is seen to be a good example of how these schemes could work in Glasgow, where a number of other district heating schemes are in the pipeline.

Improving social housing

Central to this project is the improvement of the quality of inner city social housing, a challenge faced by cities across Europe. In Glasgow, the Athletes' Village project is likely to raise expectations of what can be achieved in new build housing and also what can happen to existing social housing stock elsewhere in the city, much of which is in great need of insulation and better heating.

Business models to attract investment

Owing to the project being part of the Commonwealth Games, the model used is broadly a partnership between public and private sectors, split into pre-Games, during the Games and post-Games structures. Overall, the financing of the project is split on an 80/20 basis between the Scottish Government and Glasgow City Council. The total project investment is approximately €250 million (£200 million).

Pre-Games

Glasgow City Council, in partnership with the developer City Legacy, is providing housing and general infrastructure (roads and utility services). Leading up to the Games the site was developed by City Legacy, subcontracting out the following works:

- Housing construction: to several private sector consortiums from across Scotland;

- Energy Centre: provided by Vital Energi (a UK wide CHP specialist with expertise from other similar centres constructed in the UK);

- Care home unit: City Building Ltd.

During the Games

During the Games the organising committee, Glasgow 2014 Ltd, is responsible for the site and the operation of all facilities connected to the Games. The handover took place in January 2014 with the remainder of the Games overlay installed ahead of the opening of the Athletes' Village on 13 July 2014.

Post-Games

Management of the site post-Games will revert to Glasgow City Council. The completion of the retrofit works on the site will take place by April 2015 and handover to Glasgow City Council, housing associations and developers will take place at this time. The roads will be adapted and maintained by the Council.

- Around 300 houses will be allocated for private sale, with the remaining 400 houses for social rent through three local housing associations (Glasgow Housing, Thenue Housing and West of Scotland).

- The care home unit will be managed by Glasgow City Council (Social Services).

- The district heating network will be operated by Glasgow City Council and Vital Energy.

4.1.2.6 Promotion of the initiative

The Commonwealth Games Athletes' Village is actively promoted as one of the sustainability flags for the forthcoming Commonwealth Games in Glasgow (www.glasgow2014.com/games/venues/athletes-village). Visits to the site were promoted last year as part of the 'Open Doors Day' in Glasgow, where many buildings are opened to the public (glasgowdoorsopenday.com/programme/events/athletes-village).

The project has attracted attention from the media because of its link with the Commonwealth Games and also because of the innovative nature of the project from a building and sustainability perspective.

4.1.3 Clyde Waterfront

Clyde Waterfront is the biggest regeneration project ever undertaken in Scotland. It brings together public and private sectors to rejuvenate 20km of the city alongside the River Clyde, from central Glasgow westwards past the towns of Clydebank, Renfrew and Erskine to Dumbarton. The initiative started in 2003 following the publication of an OECD report, 'Urban Renaissance: Glasgow', which recognised that the river Clyde area and its environs represent the city's main under-utilised assets: people, land and buildings.[6] Around 250 individual projects fall under the umbrella of Clyde Waterfront. Currently approximately one third of these are completed, one third is at the planning stage, and the other third are underway.

The overarching Clyde Waterfront Regeneration Initiative (CWRI) seeks to develop a vibrant and thriving area around the River Clyde, with people and communities at its heart. The regeneration is based on the four themes of economy, place, people and connectivity.

Two interlinked projects have been selected to illustrate best practice from Clyde Waterfront:
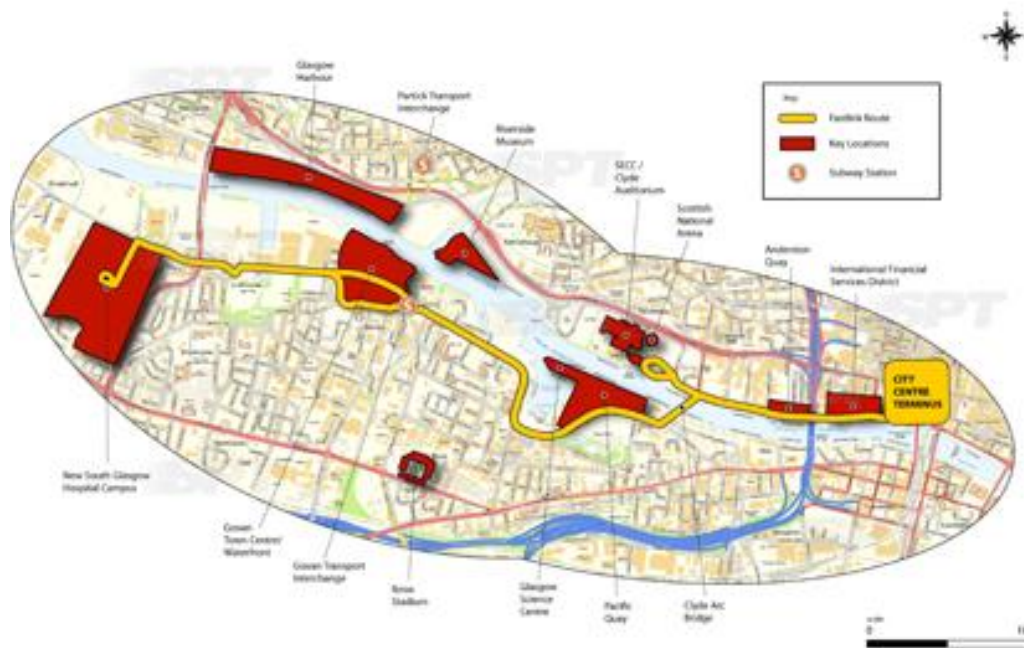
- **NHS South Glasgow Hospital campus (NSGH):** this will comprise a 1,109-bed adult hospital and 256-bed children's hospital with maternity services, able to treat 725,000 patients a year. Due for completion in 2015, it will be the biggest hospital in the UK.

- **Fastlink:** this is a transport project, promoting rapid transit 'tram on tyres' energy efficient buses. The new routes will improve the connection of the city centre with areas that are

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[6] OECD, 2002, Urban Renaissance - Glasgow: lessons for innovation and implementation
http://browse.oecdbookshop.org/oecd/pdfs/product/0402111e.pdf

difficult to access by public transport. The core route will connect the city centre to the SECC and Govan (NHS South Glasgow Hospital campus). The regional route will connect Glasgow Harbour with Clydebank and Braehead.

Figure 2 below shows the Fastlink route. The yellow line shows the core route that will connect the city centre with strategic areas. In the first phase it will connect the city centre with South Glasgow Hospital Campus.

Figure 2. Fastlink route in Glasgow

The sections below set out how the Clyde Waterfront initiative fulfils the key European Commission and STEP UP lighthouse criteria.

4.1.3.1 Integration of energy, ICT and transport

Energy

NHS South Glasgow Hospital campus: once the hospital campus is fully operational the energy efficiency targets will be: 15% renewable energy contribution, including 0.06% of visible generating capacity; BREEAM excellent rating; Scottish Energy Performance Certificate (EPC) assessment rating of 'B'.

The NSGH campus aims to deliver a world class, modern health care campus which comprehensively addresses energy and sustainability, and makes use of advanced technology and innovative energy standards and generation sources. The new hospital campus will allow services to transfer from their

current buildings, the majority of which date from the Victorian era and have poor energy efficiency. The centralisation of facilities also brings a decrease in transport energy use through a reduced need to travel.

The development has a low energy design, with a future target of 80kg CO_2/m²/annum and 55GJ/100 m³/annum. This will be achieved through high building efficiency and reduced energy consumption features, such as:

- Building fabric U values set to optimise efficiency, providing both heating and cooling;

- IP integrated building management system (BMS);

- Utility metering and services sub-metering, monitoring and reporting via integrated software;

- Low carbon tracker to identify areas of opportunity for reduced energy consumption;

- Use of e-glass to optimise heat retention in north/north east elevations; minimise solar gain on south/south east/south west elevations; air permeability designed at 5m³/m²/hr @ 50 pa, half the value required under Scottish Building standards;

- Utility metering and services sub-metering, monitoring and reporting via integrated BMS/ERM software;

- High efficiency lighting design to DEFRA extemporary standards; complete with daylight sensing dimming controls, saving energy while maintaining operational lighting levels; PIR occupancy control, switching lighting and, where suitable, heating (areas of intermittent use) off when space is unoccupied;

- Innovative heating and ventilation with 100% fresh air for clinical environments; free cooling control; zoned heat recovery via thermal wheel technology within central air handling plant; optimisation of local space heating/cooling controls; user comfort control limited to ±2°C range; inverter controlled fans and pumps to manage variable load conditions.

The sustainability and low energy design strategy for the NSGH campus will utilise a low carbon tracker to ensure that all opportunities to reduce energy consumption are considered. This will include the following requirements:

- Exceeding the Scottish Building Standards;

- LZC (Low or zero carbon) energy supplied utilising three 1.1 MWe, gas fired CHP units, providing tri-generation output of electricity, heating and cooling (via absorption cooling plant);

- District heating system approach utilising MTHW (Medium Temperature Hot Water System) distribution from seven 5 Mwth (Megawatt thermal) dual fuel boilers complete with economisers and electricity supply;

- Provision of 100 KW of photovoltaic electricity generation (see picture below).

Figure 3. Solar panel installation at NHS South Glasgow Hospital campus
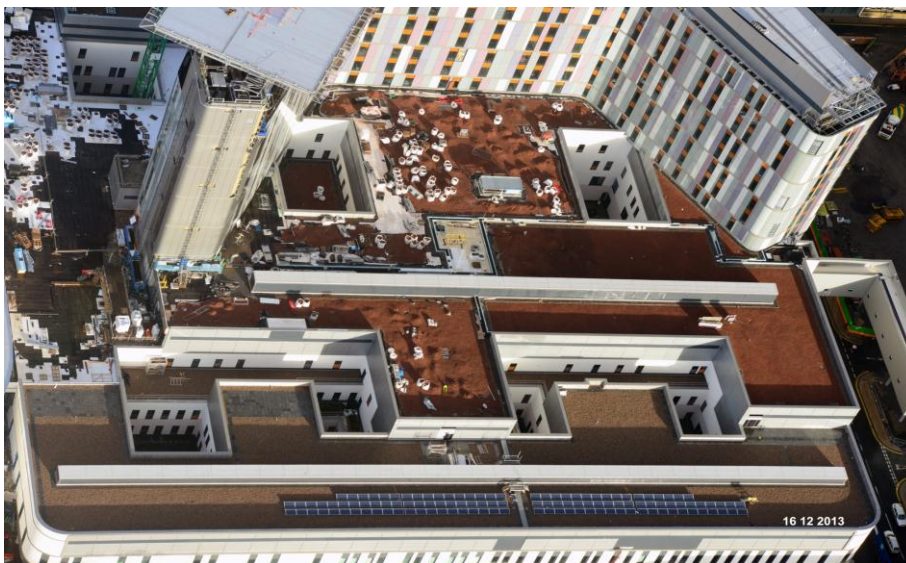
Solar Panel Installation

Fastlink: the project has integrated elements of efficient transport, air quality improvement, reduction in carbon emissions and social benefit as the main building blocks of the project. The project will result in a reduction of 22,000 tonnes of CO_2 per annum (for the core, inner and regional phase).

ICT

Masterplan: the NSGH campus and Fastlink are part of a Masterplan framework which includes a wider 'Creative Clyde' initiative. The Masterplan has a particular focus on creating a Digital Media Quarter for the city to deliver a vibrant centre for media, technology and creative businesses in Scotland, offering opportunities to blend digital media into the physical landscape. Opportunities to

incorporate digital media into the public realm of the area through temporary structures and public art commissions are also being considered. Examples include control of lighting features through mobile phone SMS messages and the movement of other pieces of street furniture through interactive controls.

Hospitals' Local Area Network: Local Area Network (LAN) infrastructure will support the new South Glasgow Adult and Children's Hospitals due to open in 2015. The building will be state-of-the-art and the IT infrastructure will support Scotland's biggest emergency department and critical care complex. The technology will ensure that the right patient care can be delivered quickly, efficiently, effectively and safely. The new LAN will provide the core network for the hospital and will integrate with the existing infrastructure across the hospital campus. Clinicians will be able to access and share information, such as electronic patient records or picture archiving images, with other departments quickly and securely. This will enhance the patient experience, as they will be subject to fewer delays from the moment they enter the hospital to the time they leave. This will also help to reduce the length of stay for in-patients and support the hospital's delivery of patient care and reduce the need for frequent returns to the hospital.

Transport

NHS South Glasgow Hospital campus: the campus will be supported by the Fastlink project to provide increased connectivity for commuters, staff and patients from across the city. It should also result in lower transport energy use and emissions through a reduced need to travel.

Fastlink: part of the project is developing dedicated route ways and bus lanes with high priority measures on roads and at junctions, as well as a high frequency service at peak times. ICT improvements will see real-time passenger information installed at bus stops and stances, as well as number plate recognition CCTV brought in to deter drivers of other vehicles taking advantage of bus-only routes. In this way the project will link into the new technologies that are being delivered to improve transport and traffic as part of the TSB Future Cities Demonstrator project (see section 4.1.1 above).

Other

The NHS South Glasgow Hospital campus has also considered urban planning effects, from a land use ecology and pollution perspective:

- Tree preservation orders: protected trees are to be incorporated into the design;

- Storm water: run off is minimised by use of permeable paving, Sustainable Urban Drainage Systems (SUDS) and vegetated (green) roofs;

- Water use minimisation; and

- Food waste will be collected separately for environmentally friendly processing.

4.1.3.2 Replication and scalability

Clyde Waterfront is a large regeneration project with a strong partnership between the public and private sectors, working together in a long term commitment for development. The partnership model used has the potential for replication in other regeneration projects at a local and regional level. Some elements are already being replicated in other areas of Glasgow, for example the regeneration of East End and Clyde Gateway.

Clyde Waterfront has helped the local authority and private sector work together in its approach to regeneration, using the lessons learned in the implementation of new projects such as the Glasgow and Clyde Valley City Deal.

The NHS South Glasgow Hospital Campus has invested in IT infrastructure with appropriate functionality to support the reconfiguration of services and emerging models of care, which will be crucial to the successful implementation of modern efficient healthcare systems. This element has replication potential in modernising health care facilities across Scotland and the UK. In building design, the hospital campus demonstrates innovation in sustainable construction, BREEAM, a strong energy efficiency approach with targets and the maximisation of resources, including a district heating system, integration of SUDS and soft facilities management. The hospital campus will set the standard in healthcare buildings. There are plans to use similar approaches in all new developments in the NHS estate, including elements such as district heating.

The Fastlink scheme has high potential to be replicated, provided there is cooperation between the local authority and transport provider. The overall regeneration project would be a costly and significant undertaking, but many elements of it would be more easily replicable.

4.1.3.3 Integrated building blocks

Clyde Waterfront aims to deliver significant social, environmental and economic benefits by integrating a diverse mix of business, housing, tourism, leisure and transport solutions.

A priority objective of the Clyde Waterfront regeneration is to connect disadvantaged communities to new economic opportunities. The regeneration of the Clyde is intended to drive forward the growth and development of modern industry in key sectors such as digital media, biotechnology and financial services. Long standing industries on the Clyde, such as shipbuilding and engineering, will also remain of critical importance and they can be re-energised through a vibrant Clyde Waterfront.

Transport infrastructure has been a key building block; the Clyde Arc, which opened in September 2006, is the first new vehicular bridge over the River Clyde since 1969, and is a crucial infrastructure component in the continued development of Clyde Waterfront. The Broomielaw to Tradeston pedestrian Bridge, opened in May 2009, improves pedestrian links between Tradeston and the International Financial Services District (IFSD).

The NHS South Glasgow Hospital Campus combines social, environmental and economic benefits by providing jobs and training to locally recruited apprentices and unemployed citizens. The project also is sub-contracting to local small to medium businesses. Working in partnership with the main contractor and the local regeneration agency, to date the project has filled in excess of 500 vacancies, including over 350 'new entrants' incorporating 103 apprenticeship places. In addition to employment opportunities the project has also provided 198 work experience placements for young people and engaged over 2,000 pupils in activities to promote careers in healthcare and/or construction.

4.1.3.4 Monitoring and reporting

The performance of the Clyde Waterfront Regeneration Initiative (CWRI) has been monitored since 2003 by BiGGAR Economics and Ekosgen, principally to assess its contribution to GVA and employment.

Monitoring of the performance of the NHS South Glasgow Hospital Campus and Fastlink will be done according to the performance management systems of the NHS and Glasgow City Council. The measures that will be monitored include energy and environmental performance.

Given the scale of the Clyde Waterfront project, when it transfers to the Council it will come under the performance management system for strategic projects, which looks mainly at delivery of key milestones. Fastlink, as a strategic project within Clyde Waterfront, is already monitored in this way as part of the Land and Environment Services' strategic projects programme.

4.1.3.5 Key winning elements of success

Political leadership with a long term approach

The Clyde Waterfront is one of three key political priority areas for regeneration in Glasgow (see below).

Figure 4. Priority regeneration areas in Glasgow
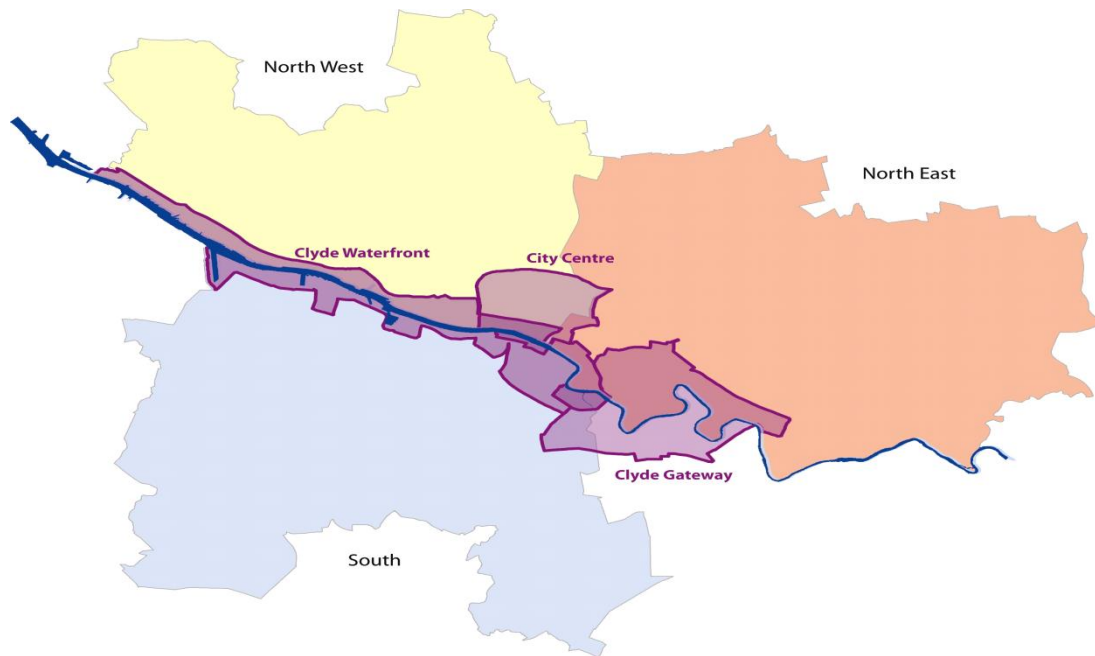
Source: Glasgow City Council, 2013

In the future, the CWRI will be developed under the Glasgow and Clyde Valley City Deal, an agreement between the local authorities in the Clyde Valley and central Government which provides additional funding to support economic growth. The area is identified as a strategic priority in the draft Local Development Plan (GCC, 2014), the Council's key spatial planning policy document. At the regional and national level, the Clyde Waterfront is a key initiative in terms of meeting political priorities for supporting economic development, reducing inequality and addressing social exclusion.

CWRI is a strategic partnership between the public sector working in tandem with the private sector and local community groups. The project is a partnership including three local authorities, the NHS, a regional transport partnership (Strathclyde Partnership for Transport (SPT)), the Scottish Government, Scottish Enterprise and Communities Scotland. These actors are involved in different ways, and have different priorities, such as:

- The Scottish Government believes the regeneration of the Clyde will help reduce inequality and address social inclusion;
- Scottish Enterprise has an interest in the impact of Clyde Waterfront on the Scottish economy. Between 2004 and 2011 expenditure will total approximately €158 million (£126

million) across a number of projects including Pacific Quay, Renfrew Riverside, Clydebank Re-built and the Shipbuilding Task Force;

- Glasgow City Council is working on regeneration from Glasgow city centre to Yoker on the north bank and King George V Dock on the south;

- Renfrewshire Council is engaged in projects along the south bank from Braehead to the Erskine Bridge;

- West Dunbartonshire Council, together with Scottish Enterprise, has established and funds Clydebank Re-built, a company working towards the regeneration of the town. Its area runs from Rothesay Dock to Dumbarton on the north bank.

All the actors in the project acknowledge that the widespread regeneration of the River Clyde cannot be delivered through one organisation and so a Strategic Partnership Board has been created to drive the transformation and ensure all efforts along the river are carefully planned and co-ordinated. This integrated approach is ensuring that Scotland gains economic, social and environmental benefits from this public sector investment.

Collaboration and dialogue with all stakeholders

The main stakeholders involved in the NHS South Glasgow Hospital campus are NHS Greater Glasgow and Clyde, Brookfield Europe (asset management) and Scottish Enterprise. Brookfield Europe, the contractor, has created local jobs and training for young apprentices who are currently unemployed. The project has also hired sub-contractors, giving priority to local small to medium businesses. This has had a positive benefit for the local community.

The main stakeholders involved in the Fastlink project are the Scottish Government, Strathclyde Partnership for Transport (SPT), Glasgow City Council, West Dunbartonshire Council and the NHS. These organisations are all from the public sector and form the project's steering group. There is also participation from bus operators as key private sector actors for delivering the transport services within Fastlink. Meetings have already taken place between the local authority and bus operators. Glasgow City Council also has a close monitoring role over the project.

Contribution to multiple policy objectives

The transformation and regeneration of the areas around Clyde Waterfront has been hugely significant. Projects have enhanced attractiveness and economic development potential and reduced social and economic inequality in the wider area, with improved connectivity increasing prospects and standards of living for all. The soon to be completed New South Glasgow Hospital,

Pacific Quay Media Quarter and creative industries cluster all offer major opportunities for growth in key sectors. CWRI has created employment, infrastructure, amenities and buildings for businesses and communities to prosper, tackling unemployment and inequality in an integrated and strategic way.

Urban regeneration and economic development are core policy objectives that the Clyde Waterfront initiative is contributing to. The areas that have seen major transformation include the development of an International Financial Services District, widespread construction and refurbishment and the creation of pedestrian plazas. The approach taken by Glasgow and neighbouring councils to regenerate the Clyde River is also an example of how to work in partnership with the private sector to regenerate old industrial and brownfield areas.

Projects have been delivered in an integrated way so that economic development (retail, commercial and housing) has been provided at the same time as social facilities (leisure and public amenities) and improved infrastructure. The area has seen the creation of new colleges, museums, footways, cycle ways, office buildings and housing, creating over 20,000 new jobs, and thereby greatly reducing inequality and unemployment in previously deprived areas. Projects have delivered employment, training opportunities and apprenticeships, as well as widespread community benefits (see below).

Investment to date has led to:

- Job creation (20,000 new jobs);

- Housing stock development (9,000 new homes); and

- Commercial development (313,000 m^2 of commercial space).

Over the course of the project it is expected that approximately 50,000 jobs will be created, 25,000 new homes will be built and around 2.8 million m^2 of new commercial space created.

Figure 5. Regeneration of River Clyde through Clyde Waterfront projects

Business models to attract investment

Clyde Waterfront is funded through public and private partnership funding. Investments of around €2.5 billion (£2 billion) have already been made; much of this by the private sector. It is projected that €6.3-7.5 billion (£5-6 billion) will be invested over the full 25 year regeneration project. The public sector input is €1.6 billion (£1.3 billion) from the Scottish Government, €313 million (£250 million) from Glasgow City Council and €125 million (£100 million) from Scottish Enterprise.

In terms of the two specific projects that have been highlighted, the nature of the funding and amount is:

1. NHS South Glasgow Hospital campus: approximately €1063 million (£850 million) invested from public funds through Scottish Government spending on the NHS (National Health Service).

2. Fastlink phase 1: approximately €50 million (£40 million) invested, funded through the Scottish Government.

The CWRI is under a process of restructuring. Until this year, Scottish Enterprise coordinated the project but in the future Glasgow City Council, under the new Glasgow and Clyde Valley City Deal, will be the umbrella under which projects of the Clyde Waterfront will be developed. Glasgow City Council is to lead the process, though the detailed arrangements for project governance are still to be determined over the course of this year.

4.1.3.6 Promotion of the initiative

The Clyde Waterfront initiative has been promoted using its dedicated website (www.clydewaterfront.com), at events in the city and in the area itself, especially around the International Financial Services District (IFSD).

4.2 Gothenburg's lighthouse initiatives

4.2.1 A sustainable transport system: Congestion Charge and New Travel Habits

The City of Gothenburg is working to create a long term sustainable transport system based on increased cycling, walking and use of public transport, which is meant to lead to a better local environment and decreased energy consumption. As part of an overarching strategy for the West of Sweden region, the city has recently implemented two initiatives that complement each other and can be considered as lighthouse initiatives due to their integrated nature, support from stakeholders and potential for replicability in many other cities.

Congestion Charge

A congestion charge was implemented at the beginning of 2013 for Swedish registered vehicles entering Gothenburg city centre. The aim is to give car drivers financial incentives to choose other means of transportation, and to finance investments in sustainable travel for the region, reduce traffic congestion and improve air quality, in order to create a more liveable city with more useable land.

New Travel Habits

Recognising that financial incentives alone may not be enough to decrease car use, the City of Gothenburg is also focusing on changing values and attitudes among citizens via the 'New Travel Habits' initiative. This consists of an on-going flow of events, family oriented activities, exhibitions and competitions, which are arranged as a way of creating structured dialogue and informing citizens on transport related issues. New Travel Habits is complementary to initiatives with an infrastructure focus, such as the congestion charge, in that it focuses on changes to norms, values and world views of citizens and other stakeholders.

The sections below set out how these two initiatives fulfil the key European Commission and STEP UP lighthouse criteria.

4.2.1.1 Integration of energy, ICT, and transport

Energy and transport

Modal shift: the congestion charge and New Travel Habits initiative aim to reduce car traffic in the city and encourage people to shift their mode of transport to zero or low carbon means. In this way both of the projects have a combined transport and energy focus. They are also seen by the local

administration as crucial elements in reaching goals and visions connected to planning and infrastructure, as well as environment and economic development.

West Swedish Agreement: these two projects are part of the larger West Swedish Agreement ('Västsvenska Paketet'[7]) which has been implemented by the City of Gothenburg, together with different regional actors and the Swedish national government. The aim of this package is both to upgrade the transport infrastructure across the whole of western Sweden and to create a better environment.

ICT

Congestion charge: connected to the congestion charge a number of different web based platforms have been set up as tools for informing and keeping dialogue with citizens. A metering system and digital monitors are used in order to keep track of car traffic and guide drivers towards the best routes and parking places.

New Travel Habits: within this project a web page and a Facebook page are two of the tools used to inform citizens about the issue of travel behaviour. Two smartphone applications have been created in order to make life easier for individuals who travel by bus and bike.

4.2.1.2 Replication and scalability

Gothenburg used the experience of congestion charging in Stockholm to build its initiative, and the same company that developed the technological system used in Stockholm has further developed and implemented the system in Gothenburg. The project is also built upon cooperation between politicians and public sector actors in Gothenburg and Stockholm. This means that the congestion charge in Gothenburg is in itself a replication of the previous initiative in Stockholm, both when it comes to technology and policy. Inspiration has also been drawn from other cities in the world that utilise the same system, such as Singapore, Milan and Manchester. This shows that the system has already been replicated and therefore there are further opportunities for other cities to adopt the system, such as those of the STEP UP learning network. There are several other European cities that are already investigating the possibility of introducing a congestion charge and these could also learn from the Gothenburg initiative.

Gothenburg's congestion charge has existed for approximately one year. Rather than implementing it in certain parts of the city and then scaling up the system, it was implemented city wide from the

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[7] For more information in English see:
www.vgregion.se/upload/Regionkanslierna/regionutveckling/Kommunikation/Paketet/V%c3%a4stsvenska%20paketet%20eng.pdf

beginning. This has had an impact on the whole transport system, with traffic volume decreasing by 15-20% since its implementation. This is an example of how innovation such as a congestion charge offers a way to deal with unsustainable traffic on a scale wide enough to affect the whole transport system in a city. However, for this to be achieved, a city also needs to achieve a transformation in the way city-wide policies and administrative routines function, as well as how these co-exist with similar policies and routines on a regional and national scale. This has been done in Gothenburg.

One further element that needs to be in place if a city wants to replicate these kinds of initiatives and achieve a long term transformation of its transport system is a change in values and world view among citizens and stakeholders. The importance of combining infrastructure projects, such as the congestion charge, with city-wide projects that deal with values and behaviour, is evident from the Gothenburg experience. The congestion charge has met resistance from some citizens and stakeholders, which led to a public referendum being held in 2014 on whether to keep the system or not. This is an important lesson for other cities that want to implement a congestion charge; it is likely that this process becomes more successful if early on in the project it is combined with stakeholder engagement and other activities related to changes in values and behaviours.

4.2.1.3 Integrated building blocks

The principal building blocks that have been combined for Gothenburg's sustainable transport system are changes in infrastructure and new technology (congestion charge) and initiatives that aim to change citizens' attitudes and behaviour (New Travel Habits), as together these are seen to have greater synergy effects. Over time, other building blocks have also been added to the city's work on sustainable transport. A new train tunnel (Västlänken), a new bridge, an upgraded tram and bus system and an EU project on increased cycling among citizens (Karma) are among the projects that are today connected to the congestion charge and New Travel Habits. As a result, several different ways of working with transport issues are together contributing to the city's goal of increased sustainable transportation.

This does not mean that transport based on fossil fuels is not still a major part of the Gothenburg transport system. However, the amount of car traffic has decreased in the city, and cycling and public transport is increasing (for more information see monitoring and reporting below). This has the potential to create long term synergy effects which could contribute to a major restructuring of the transport system.

4.2.1.4 Monitoring and reporting

The City of Gothenburg closely monitors most, but not all, changes in its traffic system. The congestion charge project has been monitored from the beginning. Soon after the system was implemented in January 2013, the city saw a decline in car traffic of approximately 15-20%, which has been constant ever since. It is therefore likely that this decline is due to the congestion charge, meaning that the project has, in a little more than a year, contributed to changes in the traffic system as well as to the EU 2020 climate and energy targets.

The impacts of the New Travel Habits project, however, have not been monitored. The reason for this, according to the City of Gothenburg, is that reductions in CO_2 emissions and other climate impacts are very hard to estimate for communication campaigns or for projects that focus on changes in values. There has been an increase in public transport use in Gothenburg by 25% during the period 2008-2012, and there is a possibility that this is because of changed norms among citizens caused by the New Travel Habits project, in combination with many other factors, but there is no data to show this. That being said, the City of Gothenburg believes that norm-changing projects such as New Travel Habits should be seen as one of many types of initiatives that are needed in order to change the transport system in a city.

4.2.1.5 Key winning elements of success

Political leadership with a long term approach

The transformation of the Gothenburg transport system is organised around a long term consensus over political borders, both on a local and a regional level. The congestion charge covers investments planned until the year 2027, and is organised around a partnership with the national government of Sweden, as well as the regional political leadership in Western Sweden and nearby municipalities. The New Travel Habits project also builds on a long term partnership with the Göteborg Region Association of Local Authorities (GR), which involves several municipalities in the nearby area. This wide political consensus, together with the long term approach, has been key to making investments of this size possible in Gothenburg.

Collaboration and dialogue with all stakeholders

The importance of communication, and of connecting this communication to concrete activities and investments that impact citizens' everyday lives, is clear in these initiatives. The New Travel Habits project has engaged local citizens and private companies in various activities, such as events, competitions and dialogues, as a way of giving them new tools for changing their own travel behaviour. Furthermore, the project has given personal support to companies in Gothenburg to help their employees change their travel habits.

When it comes to the congestion charge however, there was a lack of communication and dialogue activities in the earliest phases of the project, which may have led to discontent with the project among some stakeholders. Since communication activities are important in order to build trust and mutual understanding, this is a winning element of the New Travel Habits project that the congestion charge can learn from.

Contribution to multiple policy objectives

EU 2020 climate and energy targets

By reducing car travel in the city, both initiatives are reducing carbon emissions and energy consumption in the city. Since the congestion charge's introduction in January 2013, traffic volumes have decreased by 15-20% and air quality has improved.

A good living environment and conditions for growth

An attractive, easily accessible city core creates improved conditions for people to live and work throughout the whole region. Infrastructure initiatives also contribute to slowing down the negative effect of traffic on the environment and reducing the vulnerability of infrastructure.

Business models to attract investment

Good partnership working is key to the success of these initiatives. Overall, the West Swedish Agreement is being financed by 50% state funding and 50% local, municipal and regional funding. The regional co-financing includes the congestion charge, and this is a precondition for it being possible to finance the whole package. Between January and June 2013, the scheme generated approximately €110 million in revenue, with costs of €32 million; overall it will be cost neutral.

Using the money that the City of Gothenburg receives from the congestion charge, additional investments in more sustainable forms of transportation are being made, which has the potential to lead to further sustainability improvements in the city. Without the congestion charge it would not have been possible to implement the wider sustainable transport strategy in such a short space of time.

4.2.1.6 Promotion of the initiative

Given the arguably unpopular nature of a congestion charge, the need for communication of the plans and purpose of the scheme was recognised early on. Based on the experiences of Stockholm, the City of Gothenburg and the Swedish Transport Administration put substantial effort into

communicating the reasons for introducing the scheme and the way that it would work. This has been combined with the communication and promotion of public transport and cycling.

Communication about the scheme has consisted of information and special editions in newspapers, radio commercials, meetings with citizens in public squares, festivals and many other forms of communication. Participating organisations behind these activities are the City of Gothenburg, the Swedish Transport Administration, the Public Transport Company Västtrafik and the Region of Västra Götaland. By coordinating efforts it is believed that the impact and number of citizens reached will be maximised.

Representatives of the city have also presented the initiatives at conferences outside of Sweden, but the main part of the communication has focused on Western Sweden and the rest of the country.

4.2.2 Step by step to sustainable urban districts: Hamnhuset to Kvillebäcken

The overall aim of the development of Kvillebäcken is to set a new model for sustainable city planning and building in Sweden and beyond. The development of Kvillebäcken is a learning process on how to develop a new city district on the basis of social, economic and ecological values.

The main objectives are to:

- Create attractive and lively urban spaces;

- Link the area to existing districts and develop the island Hisingen as an expansive part of central Gothenburg;

- Build the area with common and rational waste management;

- Provide possibilities for stakeholders to influence the process;

- Create a signature that consists of quality of life, safety and diversity;

- Compile with the City´s new environmental standards for housing;

- Build Kvillebäcken for long term sustainability, economic and ecological benefits, based on a lifecycle approach; and

- Enhance possibilities for environmentally friendly mobility.

Kvillebäcken has also been used as an opportunity to expand the use of existing green technology and test and demonstrate new solutions, models and products. Six demonstration projects are included in the development of the Kvillebäcken area:

1. Waste to biogas

2. Cycle storage

3. Buildings as heat storage

4. Fast biogas-powered ferries for pedestrians and cyclists

5. Methane-diesel trucks

6. An innovation platform and dissemination activities

Between 2010 and 2014 the Swedish government decided to support sustainable city planning and building in Sweden by establishing the Delegation for Sustainable Cities. The Delegation funded, promoted and worked as a platform for knowledge-sharing between top-of-the-line projects in Sweden. Kvillebäcken was one project that received funding for the six specific demonstration projects set out above.

The sections below set out how the initiative fulfils the key European Commission and STEP UP lighthouse criteria.

4.2.2.1 Integration of energy, ICT and transport

Energy

Central smart heating control: in Kvillebäcken a new concept for saving CO_2 emissions on city level has been implemented. The buildings are highly energy efficient and can therefore be used for temporary heat storage. The aim is to decrease the daily heat peak loads during the morning and afternoon when people are using the most heat and hot water. By smart control of the heat supply to the buildings the peak load can be avoided. The heat supply to the buildings is lowered during these hours and thereby the total amount of heat needed at the same time is decreased. On a city level this means that the use of the extra heat plant that runs on oil can be avoided. Consequently, the fossil peak load can, if this is replicated across 25% of the building stock in Gothenburg, be completely avoided and thereby save 15,000 tonnes CO_2 per year.

Energy efficiency in the home: in addition to the central control of the heat supply, tenants can influence their own energy use. The apartments are equipped with energy saving kitchen appliances,

water saving shower nozzles and other measures, and the electricity and hot water is measured for every tenant. The tenant is in charge of the amount of energy used in their apartment. This is unusual for Swedish rental apartments but has become more common during the last five to ten years. All these energy saving measures result from a passive house that was built a few years ahead of Kvillebäcken, called Hamnhuset, which has set an example for energy efficient buildings and smart systems in Gothenburg.

ICT

Smart heating control: as set out above, smart control of heating in the buildings helps adjust and align supply and demand at different times of day and ensure the heating system is used more efficiently.

Car pool booking system: online facilities for booking cars in the car pool makes it easier for residents to manage their commuting and other transport needs without owning a car.

Waste collection: the waste collection system in Kvillebäcken consists of an automatic underground vacuum system that handles three waste fractions; bio waste, newspapers and waste for incineration. The vacuum system uses ICT to communicate with the waste bins, and due to this smart system waste trucks have been removed from the small streets within the area. This has had a positive effect on the safety of the local environment and causes less noise and air pollution from trucks locally.

Transport

Modal shift: the mobility and transportation of people and goods is vital for a city but also causes many difficulties such as bad air quality, noise, congestion and land use. In the development of Kvillebäcken several solutions have been tested in order to enable citizens to travel and commute in more environmentally friendly ways. When planning the district the parking standard was set to 0.5 cars and 2.1 bikes per apartment (plus visitors' lots); this car parking standard is almost half compared to nearby newly built districts. To encourage people to commute by bike, cycle storage facilities provide bike parking space that is safe, secure and convenient. The common car pool that the inhabitants of Kvillebäcken can book online is also intended to reduce the need for self-owned cars.

Biogas: the environmental objective is to collect 70% of the food waste generated by the inhabitants of Kvillebäcken and then, by treatment in the region, make it into biogas that is used as car fuel

instead of gasoline or diesel. The use of a smart waste collection system makes it easier to separate out different types of waste.

4.2.2.2 Replication and scalability

The overall aim of the development of Kvillebäcken is to set a new model for sustainable city planning and building. Kvillebäcken consists of a number of demonstration projects, such as smart systems for waste collection, heat storage and the use of district heating for appliances, as well as lower car parking standards and improved cycle storage. Each of these demonstration activities are in general possible to replicate in another context or city, so long as the necessary geographical, economic, political and cultural factors are in place.

The project was funded by the Swedish Delegation for Sustainable Cities and has thereby been promoted as a platform for knowledge sharing between top-of-the-line projects in Sweden. This means that the project is seen as a role model for sustainable building and living. Several studies and reports have been written on it, increasing the possibility for other cities to learn from it.

Kvillebäcken is itself a result of a passive house that was built in 2008 in Gothenburg; Hamnhuset. This building has set an example for energy efficient buildings and smart systems in Gothenburg. With a quarter of the heating requirement of a normal apartment building, 75% lower CO_2 emissions, the same rent and a healthier indoor environment, it has become an exemplar for the building of a new city district. More than 9,000 people have made study visits to Hamnhuset. A conclusion from this is that, since Kvillebäcken is itself a replication of a previous experience in Gothenburg, it could in turn offer opportunities for replication in other cities.

4.2.2.3 Integrated building blocks

The main focus of Kvillebäcken has, from the beginning, been on energy saving and reduced carbon emissions through an integrated approach. To achieve this a number of private and public sector companies have worked together with the municipality in order to achieve several solutions that all fit together in the necessary way to have a greater impact. The consortium has had to tackle issues such as new building materials, new ways of handling indoor environments, new transport technologies and infrastructure, public spaces and ICT solutions to give the area an improved environmental profile. Throughout the project the focus has not only been on technological issues, but also behavioural, economic and political issues and benefits for the area and wider city.

4.2.2.4 Monitoring and reporting

The project is monitored in many ways. There is a common vision (Kvillebäcksfördraget) and a common programme for sustainable development in Kvillebäcken, with guidelines and requirements for planning, design and construction. Every construction project is monitored by the overall environmental coordinator who analyses the project in connection to a common environmental plan. The partners also come together to share knowledge and difficulties and report on the project progress and results. All buildings are certified by a third party through a Swedish system called *Miljöbyggnad* (environmentally adapted building), which makes it possible to compare the project's performance with other projects in Sweden. Every year the project results are reported to the National Board of Housing, Building and Planning.

To date the carbon emissions saved by the energy standards in Kvillebäcken are at least the same as the ones for the Hamnhuset project. In Hamnhuset CO_2 emissions decreased by 75% compared to a regular residential building. It was profitable from day one, with the same rent as other new buildings and good indoor comfort. Hamnhuset has contributed to EU 2020 climate and energy goals by avoiding 60 tonnes of CO_2 emissions per year, from one single building.

4.2.2.5 Key winning elements of success

Political leadership with a long term approach

The Kvillebäcken project emerged from political decisions taken some time ago, in relation to the transformation of an old shipyard area in Gothenburg. The shipyard was closed down in the 1970s, and the City Council has worked to find new ways to utilise this area since then, which today has resulted in a fast growing and entirely new part of Gothenburg. This process has, during the last decade, had a focus on the key political objectives of housing, eco-living and mobility. A big part of this work has been carried out by the municipally owned property developer Älvstranden Utveckling AB using their model for cross-sectoral development and cooperation. The transformation of this area would never have been possible without the long term political will to do this. Life cycle cost calculations have been a key tool in making the project financially viable.

Collaboration and dialogue with all stakeholders

Major stakeholders in the Kvillebäcken project are the City Planning Authority of Gothenburg and Älvstranden Utveckling AB that runs the project, other project partners (investors), other planning authorities within the city, green tech companies through the network Eco-Ex, the energy company Gothenburg Energy and Business Region Gothenburg.

Älvstranden Utveckling AB is the property developer, a municipally owned public-private partnership with a focus on the development of the area. The partnership has functioned as a type of platform within which the municipality, together with private companies, has planned, through mutual discussions and negotiations, how to use the available land. The partnership has also functioned as the central project manager when it comes to the actual development of the area. It has also taken care of dialogue with stakeholders.

Within the partnership, eight building companies have engaged in the process of developing the area, and through this they will be able to make their mark on the new city district. They have worked together with housing companies, municipal authorities, citizens, architects and developers, the waste authority and the energy company.

In addition, there has been some controversy around Kvillebäcken within Gothenburg because it was built on a much contested brownfield site; there are some actors that think the land could have been put to better use than it has been. As a consequence, the initiative has been communicated and discussed with community groups, NGOs, companies and political organisations, with the aim of generating greater support for the project.

Cross-sectoral cooperation and engagement of the kind described above has been a prerequisite for success in such a complex and unusual neighbourhood development project as Kvillebäcken.

Contribution to multiple policy objectives

The Kvillebäcken project is part of many different political strategies and objectives. One dominant political objective is the provision of housing in the central part of the city. The area is strategic for housing because it is close to the city centre and well provided with public transportation. Densification is also an important policy objective in Gothenburg, enabling the city to more efficiently use existing infrastructure and reinforce the centre. The link between energy and economics is also clear. Achieving energy objectives and not having to raise rents was the driving force of the project from the beginning. A life cycle cost perspective became the solution to this.

Kvillebäcken is also an attempt to find ways to fulfil the city's climate objectives, including those set by the Covenant of Mayors. These issues have been key for a long time in Gothenburg and there is strong support for it.

Business models to attract investment

The project has been modelled around a public-private partnership approach, funded by public and private property developers (building companies) and also by tenants and apartment buyers. For the

six demonstration projects the project received 30% of the extra costs (35 million SEK, approximately €4 million) in funding from the national Delegation for Sustainable Cities.

Designing the project to meet the Delegation for Sustainable Cities' core objectives and priorities was key to securing this funding. The work in Kvillebäcken has had a holistic approach that focuses on the design of the buildings as well as the energy systems used, as part of wider sustainable city planning objectives. In this, many of the learnings from working in Hamnhuset have been taken into account. This means that the use of a step-by-step approach, with learnings from previous buildings, has been important for success.

Investment is about 4% higher for passive housing (Hamnhuset FTX) with solar panels compared to the equivalent building constructed according to Swedish building regulations. The return over 10 years is estimated to be 5.8-7.3%, so the investment is therefore profitable. Life cycle cost calculations were seen to be important as this allowed the project to become financially viable.

4.2.2.6 Promotion of the initiative

The Kvillebäcken project is a much talked about initiative both within Gothenburg as well as internationally, mainly because of its high ambitions for environmental sustainability. Because of this, the project has been promoted within Sweden as well as internationally. It continues to attract study visits from city planning professionals from all over the world. It has also been presented at conferences and seminars by representatives from the municipality as well as from Älvstranden Utveckling AB, the public-private partnership that is in charge of the initiative.

4.3 Ghent's lighthouse initiatives

4.3.1 Ledeberg Alive!

'Ledeberg Alive!' is a city renewal project in one of the most difficult districts in Ghent, on an economic, social and ecological level.

In the spatial structure plan for Ghent a number of urban renewal projects, like Ledeberg Alive!, are included. Ledeberg is a neighbourhood in Ghent that is very densely populated, with a high concentration of vulnerable and disadvantaged inhabitants. Ledeberg is part of the so-called 19th century belt; small municipalities around Ghent where industry was formerly located. From the 1970s, the city was faced with increased urban migration to the outside edge of the city, where new housing estates arose. These movements led to an impoverished belt around the centre, including

the district of Ledeberg. The urban renewal project Ledeberg Alive! adds new value to the old, densely-concentrated neighbourhood.

The City authority used an approach called '4Ps' (people, planet, profit, policy) for this project, aiming to improve the quality of life within six domains: creation of more green spaces, improved energy efficiency of dwellings, improved traffic management, encouragement of active travel, provision of better transport infrastructure and provision of more community spaces.

The sections below set out how the initiative fulfils the key European Commission and STEP UP lighthouse criteria.

4.3.1.1 Integration of energy, ICT and transport

Energy

Renovation incentives: in order to stimulate energy efficient renovation in the neighbourhood citizens were given subsidies for renovation, as well as guidance by the energy agency REGent. Financially weak households were supported in their administration of the renovation process. In addition, low energy corner houses have been built by SOGent.

ICT

Monitoring travel: the number of people crossing the new bridge cycling and pedestrian bridge (see below) is digitally monitored by a measuring post with a digital display counting passengers. The display is visual to the passengers.

Transport

Accessibility: a new cycling and pedestrian bridge has been created as a way of entering the neighbourhood. As such the accessibility of the neighbourhood has been increased by creating new access and a new connection between Ledeberg and the city centre, at the same time as encouraging people to travel by foot or bicycle.

4.3.1.2 Replication and scalability

The project addresses the challenge of refurbishing properties that are owned by private individuals as part of a wider regeneration of an area. Public schemes of this kind normally focus on public owned properties, but in Belgium it is more common for individuals to own their properties. In this way the approach complements several other schemes in Europe and provides valuable lessons. The size of the total project means that significant funds need to be available, as well as political

determination and capacity to implement it. Ledeberg Alive! provides a good example of how a holistic and integrated approach to large scale investments can be used in order to meet the challenge of improving the quality of life in vulnerable neighbourhoods that is common to many European cities.

The Ledeberg Alive! project was big both in geographical scale and finances. As such the project has not only had an effect on energy consumption, but also on many other aspects that are part of an urban environment, such as the less tangible factors of attractiveness and accessibility. This is an example of how Ledeberg Alive! has had impacts on a city district scale in Ghent.

4.3.1.3 Integrated building blocks

To achieve a long term solution for the district, the city had to outline several different sub-projects that were intended to mutually reinforce each other. The area is dominated by privately owned houses, and the attractiveness of the neighbourhood is particularly increased by the renovation of corner houses in different streets of the district, which are highly visible to passers-by. To address this, Ghent's city development company SOGent bought difficultly-located houses on street corners and has renovated them into low energy houses. Alongside the subsidies offered to home owners to improve their homes, this ensured that entire streets were improved, both in terms of efficiency and appearance.

Major infrastructure investments have been made to complement the improvements to housing, including a new main road and entrance to the area by means of a new cycling bridge. This has significantly improved cycling access to the surrounding city for the residents in Ledeberg, making them less dependent on car or public transport.

Overall, a number of different activities covering a wide range of different problems have been put together in order to achieve synergy effects when developing the neighbourhood.

4.3.1.4 Monitoring and reporting

The City of Ghent has set no standards for renovation and the balance between investment and energy savings in buildings has not been measured in connection to the project. Since the demolished or retrofitted buildings were of very low standard there was no useable reference at the start.

So far the activities in the project have resulted in:

- Renovation of the main entrance road to the district

- A new slow road connecting the district with the city which consists of a cycling and pedestrian bridge. The use of this bridge increased by 9.6% between 2012 and 2013;

- The development of 8 corner houses;

- 20 flats for older people;

- 750 houses screened on quality of life and energy;

- 1,400 applications for subsidies, of which 250 were for roofs, 250 for windows, 170 for heating and 100 for all kinds of insulation; and

- A 'living care zone' to facilitate elderly people to live as long as possible in their own house.

4.3.1.5 Key winning elements of success

Political leadership with a long term approach

Ledeberg Alive! is part of a major long term political strategy in Ghent. Ghent City Council aims to renovate different neighbourhoods situated in the 19th century belt of Ghent (small municipalities around the city centre where industry was formerly located), and to improve the quality of life of inhabitants in these regions through urban renewal projects. Ledeberg Alive! is one these urban renewal projects.

Collaboration and dialogue with all stakeholders

The project has gathered many key stakeholders and actors, which has proven to be a clear winning element. They represent many different layers of public organisations as well as societal groups. The main actors have been:

- Several city services of Ghent City Council;

- Ghent's City Development Company (AG SOB);

- REGent (Ghent Energy Agency);

- OCMW (national organisation for Social Care);

- Samenlevingsopbouw (Social organisation on the regional level);

- Flemish Public Transport Company (De Lijn); and

- Citizens.

A Sounding Board Group was created to bring inhabitants and other actors together to shape the project. Children were also involved in the project.

Residents have been closely engaged throughout the project. In particular, those undertaking renovation works to improve the energy efficiency of their homes could receive a grant. The energy scanners of the REGent energy agency provided many households with guidance and advice in the renovation process. The city also involved and paid for a third party constructer, Domus Mundi, to support deprived households in practical matters and in the administration of the renovation.

Contribution to multiple policy objectives

The broad variety of impacts that the project has had have been made possible through an integrated approach where different sectors and geographical areas have been connected. The project has focused on establishing new buildings in difficult areas, as exemplars to show what social, environmental and economic benefits are possible. For example, the focus on housing quality and sustainable living has been linked with advice, guidance and financial support for residents.

Furthermore, the initiative has been linked to other city strategies and projects for additional benefits, such as the City of Ghent light plan, which has made the area both safer and more attractive for residents and visitors. The project has also improved connections with the city centre, making it easier for residents to travel for work or social activities, and leaving them feeling less isolated from the rest of society.

Business models to attract investment

Central to securing resident buy-in and the resulting success of the project was the offer of a subsidy to owners of private houses in the project area to encourage them to make improvements to their homes. The grant includes 30% of the total amount (VAT excluded) of the renovation invoices and a maximum of €10,000 per house. Conditions to receive this grant are that the income of the household in the third year before the registration may not be more than €35,000 for singles, or €50,000 for married and cohabiting couples, and for singles with one person in charge. Per extra person in charge the amount increases by €2,800.

4.3.1.6 Promotion of the initiative

Ledeberg Alive! is promoted by a project website, digital and printed newsletters sent to inhabitants, and a communication campaign using leaflets and posters. The promotion has occurred in collaboration with all involved partners. Inhabitants and local organisations were involved from the

earliest stages of the project (for example in the Sounding Board Group), as stakeholder participation was seen to be key to its success.

In 2011 a large housing fair was organised in Ledeberg, where all involved partner organisations informed inhabitants on energy efficient and high quality housing in the district. In 2012 this fair was held again with testimonies of inhabitants who had already renovated their houses with the guidance and energy subsidy of Ledeberg Alive!. As well as printed leaflets and newsletters, campaign posters were disseminated in the district. Home owners that received the energy subsidy from Ledeberg Leeft hung the campaign poster "Hier wonen is de max" ("Awesome to live here!") in their front window to inform neighbours of their involvement and their willingness to provide others with information on the project.

4.3.2 Car free city centre

In 1996 Ghent created a car free city centre of 35 hectares as a single solution to tackle several of the city's problems: persistent traffic jams, safety of pedestrians and cyclists, energy and air quality, public transport, revaluation of the city centre, attractiveness of Ghent as a shopping centre for the region and attractiveness of Ghent for tourists.

The local authority strongly believed that creating a car free zone would have positive effects on environment, liveability and economy and tourism. Local shops and retail companies initially protested, while environmental and mobility organisations supported the idea. Through an intensive information and participation campaign, starting a year before the actual launch, the borders of the car free zone were established and support grew. It was the first car free zone in Europe of its size.

The car free zone, in combination with the revaluation of the city centre, was, according to some standards, a huge success. Squares and riversides became key meeting points for residents, and the city centre became a safer place for cyclist and pedestrians. This whole reorganisation had an effect on the inhabitants and visitors of the city. Tools such as digital parking guides for cars and apps to stimulate slow transport enabled people from outside the city to reach the car free city centre easily. They experienced an agreeable, safe and tranquil city, without cars. For inhabitants it reinforced the pleasant character of the city as a place to live and stimulated shopping and night life in their own city. It also underlined the image of Ghent as a shopping centre for the region and a tourism destination. In combination with the Ghent Light Plan which also revalidated the historic centre, in

2008 Ghent received a historic destination National Geographic award.[8] The project focused on a combination of several themes:

- Social: agreeable space to meet and stay;

- Economic: more people shopping and consuming;

- Ecological: less noise, better air quality, lower energy use;

- Safety: safe to walk and bike without any concern;

- Health: lowering the threshold towards cycling and walking;

- Comfort: including repair points for bikes, safe storage, bike hire and route planners.

The sections below set out how the initiative fulfils the key European Commission and STEP UP lighthouse criteria.

4.3.2.1 Integration of energy, ICT and transport

Energy

Modal shift: the car free city centre, through both restrictions and incentives, encouraged residents and visitors to use more sustainable and lower energy consuming modes of transport (see 'transport' below for more information).

ICT

Digital systems: the scheme is supported by ICT measures, without which it cannot be successfully managed. The only digital system at the time that the project was established was the park guiding system, which indicated the number of free places in the city's underground car parks. Meanwhile, Ghent has changed the old system into a traffic guidance system (2011), which is more flexible and can guide the traffic in and out the city. ICT solutions, such as apps, have been created to provide guidance on route planning, real-time information about parking spaces and more.

Transport

Mobility: the main focus of the car free zone is on mobility. Cars were banned from the city centre covering a zone of 35 hectares and large scale interventions were made to encourage changes in behaviour. Restrictions and incentives, including zoning and parking, provided a way to limit and

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[8] http://traveler.nationalgeographic.com/2008/11/historic-destinations-rated/list-text

steer mobility from individual car travel towards public transport and cycling. For example, the use of bicycles in the city centre was stimulate, and the car free zone opened up possibilities for new and better cycling infrastructure (for example new cycling bridges in the district). The city of Ghent also stimulates car sharing by supporting Cambio, a national organisation for car sharing.

Distribution: the car free zone stimulates new businesses like electric boats and delivery services by carrier cycles. Recently Ghent also investigated the creation of a green city distribution centre which will open up the possibility of distribution for local stores in the city centre by means of more sustainable vehicles (electric or gas).

4.3.2.2 Replication and scalability

Due to political sensitivities, the replication potential of a car free zone or similar large scale schemes often depends more on political leadership, public acceptance and legal restrictions than on technological barriers. The technical solutions are available on the market, including surveillance cameras, rising bollards, smart card solutions or registration plate recognition. Ghent's initiative has become widely known in Europe and has achieved a lot of attention. In this way it is likely to have played an important role as inspiration to other city politicians and officers, in that it shows that schemes like this can be carried out, with positive results and with public acceptance. A combination of clear and open communication, as well as offering complementary opportunities for mobility (e.g. cycling), is likely to contribute to successful replication.

The optimal geographical scale of a car free zone or similar schemes is often debated and there is not one obvious way to make these limitations. Other similar schemes, such as congestion charging in London and Gothenburg for example, have been highly debated among citizens and between political parties, and the boundaries have been, or are likely to be, altered (London 2013 and Gothenburg likely during late 2014). Because of the complexity of cities, the optimal balance between traffic flows, economic development and environmental protection is very hard to find and the scale will ultimately be decided in local or regional assemblies, often after lengthy debates and disagreements.

4.3.2.3 Integrated building blocks

The establishment of the car free city centre has involved a number different measures connected to mobility, ICT, energy, business and tourism. Additional measures include repair points for bikes, safe storage, bike hire schemes, a route planner, a park and ride zone to facilitate shoppers from outside Ghent, better public transport, bike lanes towards the centre, a digital route planner for cars and

pedestrians, a mobility website (www.mobiliteitgent.be), and facilities for bicycle repair and maintenance.

One way of connecting the different building blocks has been by establishing a 'transition arena' for mobility, in which a group of citizens formulated an innovative view of what transport in Ghent will be like in 2050. This group is now experimenting with specific projects that will help reach that vision, for example, liveable streets with cars out of the street view, new functions for public space or experiments with more sustainable ways of transportation.

The overall approach of the car free zone has resulted in several side effects. In areas around the centre measures were taken to lower car traffic by simple measures such as one way streets, the creation of loops to stop passing through traffic or 30 mph zones. Some new businesses were created to meet the same ambition, such as electric boats.

4.3.2.4 Monitoring and reporting

Different indicators demonstrate the positive effects of the car free centre:

- Air quality: monitoring of this has shown significant differences for the parameters black carbon and ultra-fine particles (small particles which are related to emissions from transport). The lowest concentrations of these parameters were measured in the car free zone. In contrast, hot spots are located around busy traffic roads. This confirms a clear link between traffic intensity and concentrations of fine particles. In turn this has a considerable impact on the health of the population, since fine particles are the most harmful.

- CO_2 reduction: these have not been measured yet and there is no monitoring available.

- Number of pedestrians or cyclists at specific points in the car free zone: for example, monitoring has shown that the shopping street Veldstraat has a footfall of 140,000 a week.

- Increased use of underground parking in the city centre.

- Increase in the amount of restaurants and bars in city centre.

The balance between results and investment has been positive since the required financial investment was not substantial; only the costs of traffic signalling were involved.

4.3.2.5 Key winning elements of success

Political leadership with a long term approach

In 1996, when the car free zone was created, there was no policy for air quality. A political process resulted in the car free city centre, as part of a long term approach to improve Ghent socially, economically and environmentally. Over time, a Local Policy for Air Quality (2005-2010) was established, in which the city of Ghent stipulated a plan to increase urban air quality and stimulate a liveable, healthy environment using a set of local measures; this was Ghent's first policy for air quality. This policy seeks to reduce the contribution of traffic to the total amount of air pollution, reduce the concentration of finer particles in problem areas with bad traffic, inform citizens about the problem of air quality, and influence individual behaviour and choices in favour of better air quality.

Collaboration and dialogue with all stakeholders

Access restrictions do limit the ability for people and goods to flow freely, so key to achieving acceptance is to combine these kinds of restrictions with incentives and benefits related to the type of mobility that is in line with political ambitions in areas such as climate protection, air quality or congestion.

The creation of additional initiatives alongside the car free city centre, such as bike hire and park and ride routes, has made the scheme more attractive to residents and visitors, and made it easier to engage with different stakeholders.

4.3.2.6 Promotion of the initiative

The car free city centre of Ghent was intensely promoted when it was installed in 1996. The new mobility plan for the city centre was presented at 18 different informative meetings for various target groups (including citizens, retailers and companies). At the Flanders Technology Fair the new technology of the parking guiding system was presented to companies.

For inhabitants of Ghent the new mobility plan was introduced with the communication campaign "Zit niet in de strop" ("Don't get the rope", referring to the nickname traditionally given to the inhabitants of Ghent). Folders with a city map and a map of the pedestrian area were posted in all houses. The folder elucidated the new mobility plan as well as the conditions and permits for entering the car free zone.

For retailers a specific communications plan was set up to inform and guide them. As well as two informative meetings in the city centre, an evaluation meeting was organised on the pros and cons of the project. Retailers received special guidance and were offered communication materials for distribution amongst their customers. To counteract the concerns that the project would have a negative impact on retail, Ghent's Department of Economy set up the campaign 'Gent Verwent' (Indulging Ghent) in 1997, which aimed at stimulating shopping in the city centre. Articles in national and international magazines were published to promote Ghent's car free city centre as a shopping area.

4.4 Riga's lighthouse initiatives

4.4.1 Smart cards as a transport, social and education policy instrument

The smart cards project focuses on developing an innovative and easy payment solution in the form of a common electronic card system. It is a multifunctional system that can be used as payment for public transport, to register for different social services (e.g. catering services), for city car parking, park and ride or access to different kinds of discounts for certain social groups.

Figure 6. Smart cards

The project focuses on three issues:

- To create a more rational organisation of public transport;

- To reduce energy consumption in the city; and

- To achieve greater convenience for residents.

The project started in 2007, with the aim of creating an electronic payment system for public transport in Riga and to ensure its functionality. By using new technologies the system aims to provide an effective, efficient and inclusive service to all inhabitants.

The sections below set out how the initiative fulfils the key European Commission and STEP UP lighthouse criteria.

4.4.1.1 Integration of energy, ICT and transport

Energy

Passenger flow data: reducing energy consumption is one of the main aims of the project and is done in several ways. Data on passenger flow is analysed daily so that the optimum car or coach size can be used. The data is also used for long term planning of the public transport system in order to be able to introduce necessary changes when it comes to energy consumption. By achieving increased access to public services, the system aims to reduce private motoring in the city.

E-card system: implementation of the e-card system also aims to reduce the fuel consumption of public transport by cutting unnecessary costs. Furthermore, energy consumption should also be affected through an increased use of non-paper technologies.

ICT

Centralised information network: the basis of the project is to use ICT as a way of making services for citizens more effective and thereby achieve a more holistic solution to several challenges at the same time; such as reduced energy consumption and better access to public services. A centralised information network that manages all data within the system has been developed. This has been built to manage the complex nature of the system and its many different functions; whether it is used in order to access social services, public transport or parking. The multi-functionality of the network also means that it can be accessed from different geographical locations and through different types of technologies, depending on where and for what you are using it. This also means that the network consists of many different 'nodes', such as: ticket validators where passengers validate their cards; consoles that the drivers use for validating and selling tickets, the portable terminals that are used by the staff in order to check the passenger´s tickets as well as the data concentrator which connects the system with the main data centre.

Transport

Improved public transport: the system deals with different aspects of transportation. The introduction of the smart card system has affected how public transport services are planned, including traffic routes and transport frequency. The benefits of the system, such as better routes, improved timing and comfort, together with additional measures, helps citizens prioritise public transport over private cars and reduces the need for private cars.

Figure 7. Smart card system coverage in Riga

4.4.1.2 Replication and scalability

In general e-cards systems tackle issues that are important in many parts of Europe, such as the need to create a more rational organisation of public transport, to reduce energy consumption in the city and to achieve greater convenience for residents. This means that there should be an interest across many European cities in using similar systems. Furthermore, the method of switching paper-based systems to electronic tickets for public transport and social services should in principle be possible to implement many European cities, and already has been in some.

The Riga e-card initiative is based on similar e-card systems that already exist in a number of other cities – such as Paris, Lyon, Toulouse, Warsaw, Zurich, Houston, Montreal and Melbourne – which shows that there is a replication potential. However, the system in Riga has been adapted in order to meet Riga's needs, including a wide variety of different services and a high degree of integration between different sectors. The feature that separates the system in Riga from other similar systems is that it connects social services with transport. This might increase the difficulties of replicating the system as a whole, since elements like resources, policy decisions and infrastructure need to be implemented not only within the transport sector but also within social services. However, provided that the necessary political decisions are taken and that funding is available, the system should be replicable, as the overall methodology and technological solutions are already there.

When it comes to the system's potential for being scaled up, there can be positive effects of implementing a system like this on a relatively large scale from the beginning. If measures such as introducing new tickets, devices, terminals and data concentrators are to be cost-effective this

needs to be done on quite a large scale. These measures can have effects on the system as a whole; in Riga, the introduction of the smart card has affected the whole public transport system, including routes and transport frequency. Today there are 400 000 smart card users in Riga.

4.4.1.3 Integrated building blocks

The approach to e-cards that is used in Riga – which combines traffic and social services – must, by

Figure 8. Ticket validator

necessity, integrate different building blocks. However, initially the system only included public transport, and therefore consisted of fewer building blocks than it does today. Over time, it was developed as a wider system for different purposes. To begin with, several different transport-related building blocks were added. However, over time a whole new sector was added, so that today the system is used by individuals in order to apply for a variety of different social services in addition to transport related services, as follows:

1. The transportation of school pupils;

2. Entrance to schools (in order to take care of security);

3. School catering services;

4. Social services – the provision of free meals by the Welfare department of Riga City Council and others.

The e-card system will also soon be implemented for the integration of railway transport, and there is an ambition for additional smart card pilot projects with new purposes over time.

By connecting the different building blocks described above a number of different synergy effects have been achieved. On the traffic side it has been possible to get a better overview of how individuals transport themselves, and how to motivate them to decrease their use of private cars. When it comes to social services, the system generates opportunities for a more effective and holistic system for delivering social services.

4.4.1.4 Monitoring and reporting

Prior to the introduction of the system in Riga, a research project was performed in order to analyse the current situation as well as different capabilities. Technological, economic and legal aspects were

assessed. The research phase ended in 2007, when the e-ticket implementation model was developed and approved. The most appropriate system was found to be the one provided by the US company ACS (Affiliated Computer Services Inc.). The electronic ticketing system implemented by this company also exists in Paris, Lyon, Toulouse, Warsaw, Zurich, Houston, Montreal and Melbourne.

A basis for the initiative is the continuous monitoring of flows within the system. Five parameters are regularly used: number of vehicles, number of drivers, number of trips, km travelled and hours. Data can be acquired for different types of transport (bus, trolleybus and tram) and can also be divided between working days and weekends.

The data that is acquired from the continuous monitoring of traffic flows is used for public transport planning in Riga. The data shows that the number of passengers using public transport in Riga is increasing from year to year. Between 2012 and 2013 there was a 6% increase in the use of public transport. By understanding how traffic flows are structured it is possible to organise the use of vehicles in a more effective way and thereby reduce their energy consumption, as well as save money. On average, since 2010 traffic has fallen by 2-8% on working days and between 9-13 % on weekends.

4.4.1.5 Key winning elements of success

Political leadership with a long term approach

From the start Riga City Council has had a key role in this initiative, by both introducing it and providing finance. In addition:

- Riga City Council sets the policy, adopts the discounts and accepts new smart cards pilot projects;
- The traffic department is responsible for public transportation in Riga and planning public transportation zones;
- The welfare department assists individuals from risk groups;
- The department of education, youth and sports optimises and coordinates assistance in schools

Collaboration and dialogue with all stakeholders

A system that connects different services and sectors with the aim of solving a variety of problems can only function if a number of different actors are engaged and connected.

The role of the City Council has been central to the project, as set out above. The limited liability company "Rigas karte", created specifically for this initiative, owns and promotes the e-card in public transport and develops the system for other social purposes. "Rigas satiksme", the transport company owned by the municipality, deals with public transportation and owns the public transport fleet. It uses data from the smart cards system to improve daily operations and long term planning.

Citizens use public transport, different offers connected to the system such as free dining opportunities and car parking services. Additionally, pupils use the e-card to check in at schools.

Contribution to multiple policy objectives

One key winning element which has enabled the initiative to be successful is that the system provides a general ICT infrastructure – the e-card system – that integrates different kinds of transport services with the delivery of social services; students use the same ticket to register their arrival at school as others who use it for public transport or to park their car. The use of a general ICT infrastructure has meant that the system has been able to deliver new services within different sectors and to different actors at the same time, and therefore contributes to a number of policy objectives in the city.

Traffic data is used as a tool for the development and planning of the system. The fact that the system generates data which can then be used in order to develop the system further is a winning element. This opens up opportunities for a system that has a high potential for organisational learning.

The system has grown over time and new building blocks have already been integrated. This potential to add new elements to the system has so far created scope for ongoing expansion of the system and thereby for continuous growth. For example, in the future there may also be an opportunity to integrate the system with suburb trains and taxis.

Business models to attract investment

For the development, financing and management of the project, Riga's municipal public transport company (100% owned by the City of Riga) created a joint venture with Affiliated Computer Services Solutions France S.A.S by creating a limited liability company called "Rīgas karte". Rīgas karte proposed technological solutions by integrating them with Riga's public transport system, including buses, trams and trolleybuses.

The system also attracts sub-contractors that are specialised in a variety of issues. It works together with state and local organisations, as well as with ticket issuing and trading venues.

The business model combines public sector grants and loans, alongside commercial activities. To begin with, the establishment of the project was mainly financed by Riga City Council using municipal grant and loans. The initial investments amounted to 11.6 million lats or €16.5 million, including VAT. The cost of maintaining the system is approximately €12.8 million, which is largely financed by Riga City Council. Additional financing is achieved through the selling of e-tickets that can be purchased in supermarkets and ticket machines in Riga.

4.4.1.6 Promotion of the initiative

The promotion of the e-card system started with a wide range of information being presented in the media. Focus was put on the benefits of the system and on its convenience for customers. The system was demonstrated at conferences and through several press briefings. Text and visual information was presented at public transports vehicles, at stations and at the customer offices of the transport company. The promotion and education has focused not only customers, but also on sellers, drivers of public transport vehicles and controllers of tickets.

4.4.2 Smart solutions for a new building complex in the Tornakalns district

The Torņakalns complex is a large-scale neighbourhood that is currently being planned and constructed Riga's existing Tornakalns district (see Figure 9). The initiative derives from wider plans to develop a new city centre, the Pārdaugava centre. It is also a result of long term discussions on the concept and location of a new administrative centre for the city, which will now be established as part of the new complex.

Figure 9. The Tornakalns complex

Foto: www.a4d.lv
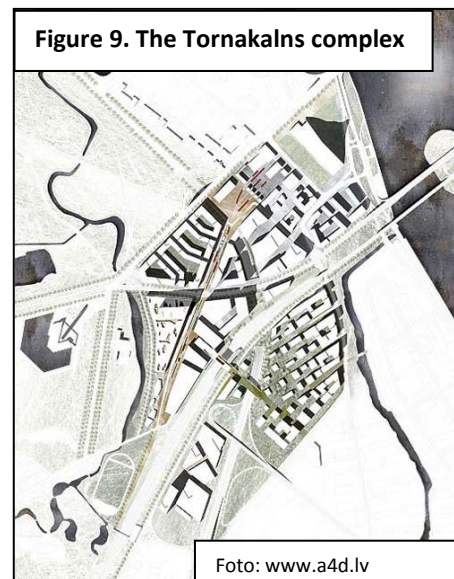
The complex will consist of a combination of buildings, transport infrastructure and public spaces. As an integrated project, it will feature different functions, including Riga's Administrative Centre, the Academic Centre for the University of Latvia, housing, schools, workplaces, recreational and shopping areas, as well as transport services. Parts of the complex will take the form of a 'slow movement' area, with different services located at a walking distance from each other. The overall area is 46 ha, with a total of 665,000m^2 of newly constructed buildings.

Parts of the complex are already under construction, including the Academic Centre of the University of Latvia; this includes a number of buildings housing different academic departments, institutes and national research centres.

Figure 10. The National Library
Foto: www.mixnews.lv

Construction of The National Library (See Figure 10) is fully completed and the surrounding infrastructure improved, including adding cycle tracks and pedestrian lanes on the main roads along the river Daugava.

Low energy consumption is central to the development of the Torņakalns complex, and new technologies are planned to contribute to this. Territorial improvements and well-functioning transport flows are other key goals; this will be met in part by a new multimodal transport junction, with a new railway station, bus terminal, tramway line and cycling tracks.

The Torņakalns project is designed to help meet the city's overall strategic 2030 goal; to create energy efficient, resident-friendly and modern neighbourhoods. Reduced traffic flow in the city centre is part of this, with neighbourhoods situated close to the centre being used more intensively.

The sections below set out how the initiative fulfils the key European Commission and STEP UP lighthouse criteria.

4.4.2.1 Integration of energy, ICT and transport

Energy

According to the development plans, the contribution towards the city's overall 2030 strategic goals will be made in a variety of ways, including:

Heating, cooling and ventilation: energy for heating, ventilation and cooling will be supplied by a district heating system. Ground heat will be integrated into heating and cooling systems, with bearing poles functioning as thermoprobes for the heat pumps. Air conditioning equipment is planned to include heat and humidity retrieval.

Water: accumulation devices will be installed for collecting rainwater, which can then be used to water green spaces. Hot water supply will be managed using solar collectors.

Lighting: since approximately 35-50% of the power consumed in buildings of the type being constructed is typically used for lighting, this will be provided by luminescent lamps, energy efficient

lamps and LED diodes. Furthermore, outdoor lighting will be powered using renewable energy resources such as wind rotors and solar batteries, with reserve connections to the grid.

ICT

New technologies will be used to achieve the best possible conditions for energy efficiency, territorial improvements and better transport flows, as well to maintain the buildings to meet the needs of residents and visitors to the city. As the complex is still being planned, a number of ICT elements are still in development. However, the academic centre, which is already being built, provides some examples.

Power network control system: efficient functioning of the electrical power network within the academic centre will be achieved by implementing a network control system integrated with a lighting control system. The network control system will feature the following functions:

- Night mode - after classes, vacant areas will be transferred to night mode, with all power consuming devices which are not required switched off automatically. Devices that need continuous power supply will be left on.
- Safety and control – the simplified identification of damage and timely prevention of accidents will be enabled, as well as the capability to observe other existing processes.
- Manual control - the system user can adjust the system to his or her own needs.
- Protection against black-outs - in case of an emergency black-out the system is automatically transferred to alternative power sources (for example, UPS, diesel-operated generator or reserve input).

Automatic lighting control: lighting devices will be controlled from a multifunctional monitoring system which will provide energy efficient lighting to all premises, and include measures for maximising the use of daylight, recording the presence or absence of people on the premises, zoning for required intensity and night mode functions.

Transport

The development of the complex is aligned with the strategic 2030 development goal of Riga; that the city is to become friendly to pedestrians, cyclists and public transport.

Integration of transport and mobility: the complex will integrate transport infrastructure with new buildings and public spaces. Parts of the complex will have the feel of a 'micro town' with all the functionalities of a town: housing, schools and workplaces, recreational and shopping areas and

transport services. The micro town will have a 'slow movement' area with all functional zones located at a walking distance from each other.

Connections to the rest of the city: solutions will not only take into account the needs of the specific neighbourhood, but also the nature of all transport flows in the district of Pārdaugava, where the Torņakalns complex is situated, as well as the need to reduce traffic congestion in the historical city centre. The new railway station and bus terminal will reduce public transport flow on the right-hand side of the nearby Daugava River, and will provide a fast and simple transfer to the city centre.

Multimodal transport junction: the complex will include a new multimodal transport junction with a new railway station and bus terminal, as well as a new tramway line and cycling tracks. This will encourage users of, and visitors to, the area to use alternative modes of transport to private cars.

4.4.2.2 Replication and scalability

The Torņakalns complex is designed to address a challenge that is common in many European cities: how dense and multi-functional neighbourhoods can be established on vacant city centre land, in a way that results in increased public transport and energy efficiency. There are other examples of such initiatives elsewhere in Europe, such as Kvillebäcken in Gothenburg (see section 4.3.2), which creates opportunities for such initiatives to learn from each other. However, initiatives such as these, which consist of many parts and actors, are always based on local circumstances and therefore take various forms.

What is characteristic of the Torņakalns complex is that it is centred around the establishment of a new City Administrative Centre and agglomeration of university buildings, that it uses an existing railway line as a multimodal transport junction rather than keeping it as a barrier that separates different city parts, and that the area is formed as a micro town which provides not just one, but many, functionalities. Replicating the whole concept of the Torņakalns complex would not be possible for most European cities, but many parts of it could be. This is also shown from the fact that the Torņakalns initiative has learned from other initiatives, such as Stratford City in London and Rapid City in York, in terms of how a centre can be spread out on both sides of an existing railway line without these lines potentially isolating the different parts of the scheme.

When it comes to the complex's potential for being scaled up, there are certain aspects of the initiative that are well suited to other parts of a city, for example the establishment of multi-functional neighbourhoods. Some of the technology solutions for decreasing energy consumption could also be implemented in other districts and thereby have effects on a wider scale. In addition, the transport solutions already take into account transport flows and congestion across the wider

city; which implies that the new transport junction will certainly have effects on the city's wider transport system.

4.4.2.3 Integrated building blocks

Planning started in 2004, with discussions concerning the new administrative centre in Riga. The idea that the initiative should integrate different building blocks in this way arose during the planning process. The discussions have since then evolved and become more concrete, with new building blocks added to the plans. These plans are now being implemented: parts of the complex are already being built and other parts are at the planning stage and will be built further on.

The complex will be made up of a number of buildings that have been designed as separate unique constructions; however, spatially they will create a single complex. These include:

- Riga City administrative buildings (58,000m^2);
- Office buildings (265,000m^2);
- Residential buildings (225,000m^2);
- Commercial buildings (60,000m^2); and
- Recreational buildings (6,000m^2).

The Academic Centre of the University of Latvia, one of the first buildings to be constructed, includes a number of buildings offering a comfortable, functional and economic learning, work and living environment oriented towards sustainable development. The centre includes different parts: the Academic Centre for Life Sciences (which will be completed in 2015), two institutes (the Institute for Microbiology and Biotechnology and the Institute for Chemical Physics), as well as six national research centres which focus on everything from environment resource acquisition and sustainable utilisation technologies to public health and clinical medicine.

Transport infrastructure is another important building block in the complex. The micro town nature means that a network of roads will connect the different functions of the complex, and these functions will be accessible by foot, bicycle and public transport. The new railway station and bus terminal will provide a fast and simple transfer to other areas in the city, and the existing railway line will be developed so that its barrier effect is reduced as much as possible.

Public spaces and outdoor environments are another building block. An urban recreational area is planned within the Kīleveina Grāvis area, aiming to create a well-adapted and comfortable space for people of different age groups and varied interests, friendly to the existing ecosystem and adapted

to the existing urban environment. The buildings of the Academic Centre of the University of Latvia will be located around a square, which will be the representative public outdoor space of the University. Other initiatives will create green outdoor environments; the Academic Centre for Life Sciences will have an external design which shows an affinity to nature, with a green five-leaf akebia vine growing on the central façade to mitigate the effect of excessive solar heat in the summer and frost in the winter, succulent plants grown on the roof and crops planted in the yard.

4.4.2.4 Monitoring and reporting

A research study on the technical and economic justifications for the redevelopment of brownfield sites in the Torņakalns district was conducted in 2009, forecasting a number of benefits from the development.[9] These include productivity growth and improvement in educational quality, cost-saving benefits expected from the relocation and merging of the university, and additional employment. Furthermore, the project is expected to contribute to reduced environmental pollution in the area. The expected energy savings from the project are 50-70% compared to areas of a similar scale that are built in a traditional way.

4.4.2.5 Key winning elements of success

Political leadership with a long term approach

Long term political support has been key to work on the Torņakalns complex to date, with the historical roots of the initiative starting when the concept and location of a new administrative centre for the city of Riga was discussed over 10 years ago. In 2006 an international architectural competition was held, supported by Riga City Council, for which 17 proposals were submitted. Five proposals were rewarded, with the British company Fletcher Priest Architects winning the competition. Their design is being integrated in the spatial plan of the territory, linked to the Torņakalns Administrative Centre. The idea of a compact and energy efficient neighbourhood is also supported by Riga's wider political strategies, and the initiative is directly linked to Riga's development strategy of becoming a smart and sustainable city with an emphasis on socially responsible, sustainable, smart and compact urban development. The development also contributes to Riga's SEAP targets.

Collaboration and dialogue with all stakeholders

Political leadership has played a central role in the initiative, which has been made possible as a result of initial plans for an administrative centre for the city. In addition, the university is closely

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[9] www.sus.lv/sites/default/files/media/faili/tornakalnstep_final_30122009.pdf

involved with the development of the complex, and it is likely that this research and teaching establishment has been an important catalyst for the project.

Various other stakeholders have also been involved, including through a management and marketing committee (established in 2008) with 22 members from stakeholder organisations. Each organisation represented a particular area, and the committee enabled stakeholders to harmonise projects and decisions, create ideas and find the best solutions. Citizens have also been engaged through an exhibition of the projects for all Riga residents and a four week public consultation.

Business models to attract investment

The administrative centre and the university campus are two examples of how the Torņakalns complex has been made possible by building on existing initiatives of strategic interest. The first stage of the initiative, which focuses on the establishment of the university buildings and their equipment, is partly financed by the European Regional Development Fund and partly by Latvian governmental organisations. The public tender is at this stage not to exceed €22.45 million (excluding VAT), divided as follows: €19.15 million of funding from the European Regional Development Fund, €1.49 million of government funding and €1.79 million of funding from the University of Latvia. The infrastructure and roads will at this stage be financed by municipal funds.

Decisions have not yet been made on what business models will be used for future stages of the project. However, the 2009 research study on the technical and economic justifications for the redevelopment of the Torņakalns district presented four alternatives for action: 1) that no project would be developed at all; 2) that the area would only consist of commercial constructions and that the territory would therefore be rented to private developers; 3) that only public constructions would be developed in the area; and 4) that it would contain public as well as commercial facilities. The study suggested developing the area through a public and private partnership (PPP).[10] This is now being considered as an option going forward.

4.4.2.6 Promotion of the initiative

Until 2006 the promotion of the project focused mostly on the national and local level in order to solve land ownership questions during the early planning stage. After this the initiative was promoted on municipal, urban development and planning levels, including to professionals, experts and relevant organisations. Riga City's Architect's Office played an important role in promotion, working in close cooperation with Riga City Council Departments.

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[10] www.sus.lv/sites/default/files/media/faili/tornakalnstep_final_30122009.pdf

Furthermore, the international architectural competition (2006-2007) also played an important part in the promotion of the initiative. The winner of the competition, Fletcher Priest Architects, has promoted the initiative on an international level, including at the 2008 London Architecture festival. The initiative has also received a variety of local and international media coverage.[11]

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[11] Examples of media coverage: Open Buildings - New Urban Centre, Riga July 2011; Building April 2010; 4AD July 2009; Riga Dienas February 2009; Ingatlan Magazin February 2009; Urbanism.org February 2009; Diena Riga February 2009; World Architecture News February 2009; LvArhit December 2008; Architecture - Riga December 2007; Architecture - Riga December 2007; e-Architect December 2007; Design Build Network November 2007; Riga City Council October 2007; Europaconcorsi September 2007; Building Design September 2007; Riga City Council September 2007

5   Conclusions

All projects that have been included in this deliverable are based on an integrated approach in which different sectors and actors are brought together in order to achieve holistic solutions to pressing problems faced by the cities. Furthermore, they are all contributing towards the EU2020 goals of energy use reduction, reduced CO_2 emissions and an increase in renewable energy. The European Commission's criteria for lighthouse projects have been used to analyse the projects, the result of which shows that all four STEP UP cities have a number of projects that are contributing to a more sustainable Europe and are worthy of promotion across Europe.

However, only a selection of the best practice projects set out in deliverable D3.1 meet the European Commission's key criteria on the integration of energy, transport and ICT, as well as showing a clear potential for replicability and scalability and including monitoring to understand their impacts and performance[12]; these are the only projects described as lighthouse initiatives in this deliverable. The rest of the projects in the deliverable have been named as benchmarks of excellence (see Annex B); they are worthy of promotion but do not contribute to all required lighthouse criteria.

In this last part of the report the main conclusions from each section of the analysis of the lighthouse initiatives are presented, so that future innovative projects developed within STEP UP, and elsewhere, can learn from them.

5.1 Integration of energy, ICT and transport sectors

One of the main attributes of the lighthouse initiatives is that they combine energy, transport and ICT as part of an integrated, cross-sectoral approach (see figure 11 below).

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[12] C(2012) 4701 final, Communication from the commission, Smart Cities and Communities – European Innovation Partnership

Figure 11. Integration of energy, ICT and transport sectors
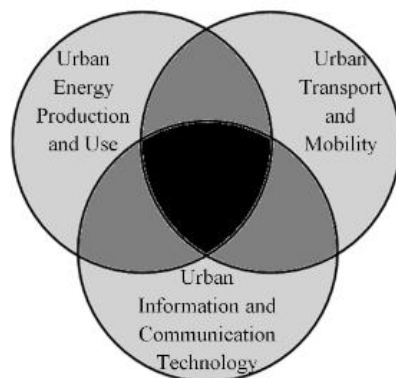
Projects such as these are complex by nature. They work with various arrangements of actors and sectors in order to address complex problems for which there are no easy solutions; these are sometimes called 'wicked' problems.

A key learning from this deliverable is, therefore, that there is not one way to organise, or even analyse, a lighthouse initiative. The initiatives all feature transport, energy and ICT, but do this in different ways. In many cases, the initiatives have a main focus with other building blocks attached to them. For example, projects such as the car free city centre in Ghent or the congestion charge in Gothenburg have transport and mobility as their main focus, but also use ICT as a means of facilitating a reduction in energy consumption. Furthermore, these projects connect issues of improved urban environments, quality of life and vibrant city centres to the core aim of reducing car traffic. In comparison, the initiatives within STEP UP that have regeneration of city districts as their focus also target energy efficient buildings, mobility and transport, and how people and goods can be transported as efficiently as possible. Often ICT is a solution for monitoring energy consumption, the smartest way of travelling or for smart grids. However, none of the initiatives have ICT as their main focus; instead ICT is essential in order to support overall transitions in other systems.

In some cases the projects have also changed significantly over time, meaning that they started off as non-integrated projects, but over time started to integrate different building blocks. This is also a reason why 'lighthouse initiative' is a suitable description for the projects. Many of them are not in the strictest sense 'projects'; they are long term initiatives that have evolved over time, such as Clyde Waterfront in Glasgow or the car free city centre in Ghent. This means that there is likely to be a wealth of different initiatives in European cities that currently cannot be defined as lighthouse initiatives, but have the potential to develop into integrated projects in the future.

5.2 Replication and scalability

The potential for replication is important if European cities are to learn from each other. All of the lighthouse initiatives presented in this report have replication potential, meaning that they could also contribute to sustainability in other European cities. However, the concept of 'replication potential' is worthy of being discussed.

Some of the initiatives show better potential for replication than others. There are, however, no initiatives for which a 'copy and paste' approach can be used, where an identical version of the initiative is created at another place and time. Projects focused on regeneration of districts, for example, contain elements that are easy to replicate in another cities. However, it will never be possible to copy these districts in their totality, because they are big in size and depend on many different factors; local, regional, national and international. Projects that are not as complex and consist of fewer parts, such as the car free city centre in Ghent, are in general easier to replicate. However, they are also dependent on a number of local aspects, making them difficult to replicate in exact detail and meaning that modified versions of the original are more likely to be successful.

This shows that replicability is not only about the sender, but also about the receiver. Innovations are dependent on innovation systems; if the receiving party does not have a well-functioning innovation system, a particular innovation will be difficult to implement there. This also means that a project can have very high replicability in one particular city, but very low replicability in another. This means that it may be useful to split 'replicability' into two sub-terms: 'specific replicability' to describe how hard or easy it is to replicate a project in a specific case, and 'general replicability' to analyse a project's replication potential in general. Some general factors that influence replication have been identified below:

Technology: the more a technology builds on 'common' designs, and the simpler it is, the easier it is to replicate. However, technology that works perfectly in one condition may not be possible to use in another, for example due to lack of fit to existing systems, climate differences or legal hindrances. The smart card ticketing system in Riga, for example, may not work elsewhere without significant technological changes to existing ticketing systems used on the transport network.

Policy and governance: it can be difficult to replicate a project when the governance structures in two cities are completely different. All lighthouse initiatives in this deliverable have started as a result of strong political leadership with a long term approach. A great project is hard to implement without support from politicians and public officials. It is also likely to be easier for a project to succeed if a similar project already exists at some other geographical location in the country. The

congestion charge in Gothenburg was easier to implement as there were existing nationwide regulations and pay systems due to the existing congestion charge in Stockholm.

Culture, norms, values, traditions and world view: culture and norms can make project replication a challenge. In a city with very strong support for car use and where infrastructure is built for car travel, it could be difficult to succeed with a project like New Travel Habits in Gothenburg or the car free city centre in Ghent.

Economy: the economy is one of the most important factors that make a project feasible. The e-card initiative in Riga and the Future Cities Demonstrator in Glasgow were both funded by central government. Clyde Gateway in Glasgow and Ledeberg Alive! in Ghent, however, were the results of investment from public-private partnerships. Economic models and funding are often very specific for each project, and what is possible for one may not be possible for another.

Geography: some projects are very dependent on specific geographical and topographic circumstances, whilst others are not. For those that are, in general it is harder to translate them into other cities. If a city, for example, lacks space for green areas or new buildings, then geography will be a barrier. An example of this is the Torņakalns complex in Riga or Athletes' Village in Glasgow, both of which were in part made possible by the fact that there was a considerable amount of vacant land in an area in need of regeneration.

Integrated approach: the greater and more complex a project is, the more difficult replication is. These projects often feature a number of actors, large budgets and local dependencies, which mean that from the beginning they are not suited to replication as a whole. The Clyde Waterfront in Glasgow is one example, as it is a large initiative consisting of many smaller parts. However, lessons can still be learned from these types of projects, and they act as inspiring examples of the fact that there are indeed many ways of arranging initiatives which can have significant energy impacts on a wider scale. However, cities do need to plan ahead, and at the same time be flexible, open for collaboration and different initiatives, and take advantage of windows of opportunity.

5.3 Integrated building blocks

Combining a number of components in one initiative often results in synergy effects; this has been shown in the analysis of the STEP UP lighthouse initiatives. Many of the problems that the lighthouse initiatives are trying to solve interact with one another, creating negative feedback loops, and they therefore need to be addressed on many fronts at the same time. With an integrated approach and a holistic view there is an opportunity to find creative solutions to the global and local problems faced by the cities. The future is in many ways unpredictable and we do not know today what the

problems and the solutions of tomorrow will be. When projects are complex and designed to feature a mix of solutions there is the potential for both short term actions and long term change. Equally, some actions which seem quite small today can have the greatest effects in the future.

5.4 Monitoring and reporting

According to the European Commission's criteria, lighthouse projects should have a 'high impact'. In order for this to be demonstrated, monitoring and reporting on the progress and impacts of a project is essential. However, despite this there are differences in how much data is available on the different lighthouse initiatives. In deliverable D3.1 'Inventory of best practice energy projects using the integrated approach' the cities faced problems obtaining data, which still seem to be apparent. For example, the congestion charge in Gothenburg has a lot of traffic data, recorded every 15 minutes on all the toll roads, but at the same time some of the other initiatives, such as the New Travel Habits initiative, do not involve as much monitoring. Some factors that influence the ease of monitoring are:

- The more complex a project is, the more difficult it is to calculate its impacts. All the projects in this report take an integrated approach and the projects often involve different kinds of effects;

- Projects that have behaviour change as an aim, e.g. those that focus on travel choices or energy use, are hard to monitor when it comes to their impact;

- New projects often lack data in the early stages; and

- Sometimes, monitoring only focuses on activities (for example the amount of new study visits or workshops arranged), not on results (social impact or environmental impact).

These are all valid factors that make monitoring more challenging or limit the amount of useful data that is available. However, it makes it more difficult to understand whether an initiative is lighthouse or not if its impacts are not known, so all projects should have monitoring built in from the start. Three initiatives have still been defined as lighthouse initiatives despite the lack of statistical information to show their impacts. One of these, Gothenburg's New Travel Habits, is, together with the congestion charge (which has been monitored), part of a bigger initiative to transform the transport system of the city, and has therefore been included. It is likely that it has had impacts on travel habits in the city, but changes in norms and values are hard to measure. The impacts of the Tornakalns complex in Riga and the TSB Future Cities Demonstrator in Glasgow have not yet been quantified either, as both initiatives have just started. However, monitoring is planned, and due to

the scale and innovation potential of these initiatives they have still been included as lighthouse initiatives.

5.5 Winning elements of success

The problems tackled by the lighthouse initiatives in this report are complex and multifaceted, and addressed in different ways. However, despite this, all the initiatives have four key features which have been central to their success. These key features emerged when all best practice projects were analysed in D3.1. However, by analysing the initiatives even further in the D3.2 report, we have been able to learn more about these winning elements.

Political leadership with a long term approach

Local authority leadership is vital for the success of sustainable energy projects, due to the authority's unique position to influence other actors in the city, as well as the scale of the investment required, the nature of the obstacles and the complexity of the risks to be managed. This report shows that successful projects have local political leaders that champion projects and act as enablers. As sustainable energy projects will last for decades, it is important that the approach taken has a long term focus and the ability to look beyond short term political cycles. Although municipalities may tend to seek short term stakeholder or voter satisfaction, for many of the projects the emphasis is on thinking about long term effects.

This can be seen by Ghent's car free city centre which was a 15 year project and required bold, visionary (but not necessary popular) thinking from the local leaders at the time. It was the ability of these leaders to look beyond short term horizons and make then unpopular decisions that has led to the creation of a city centre that is free from car traffic, utilises low carbon forms of transport and is open for citizens to enjoy. Similarly, the congestion charge implemented by Gothenburg has also benefitted from bold political leadership and a long term approach as it covers investments planned up to 2027.

It is also significant for the projects that political leadership in the districts or projects goes beyond the local level. Many of the projects have national or regional support and funding in addition to the local level, which might help to prioritise and focus the development, as well as raise wider awareness of it.

Collaboration and dialogue with all stakeholders

The projects have many different actors and stakeholders involved. It is common for projects to include strong partnerships between the public and private sectors, and this itself seems to be a key

element for success. The projects tackle social, ecological and economic issues, requiring cross-sectoral cooperation.

A number of the projects recognise that collaboration and dialogue with stakeholders throughout the project is important, and this has been built in from an early stage. New Travel Habits in Gothenburg is a good example of this. Others, such as the congestion charge in Gothenburg, have learnt this the hard way and this has proved to be a useful lesson for future projects of this kind.

Contribution to multiple policy objectives

The projects contribute to multiple objectives within the cities, providing environmental, social and economic benefits. The STEP UP cities all recognise that if a city wants to change its energy consumption, it is necessary to work with other policy areas as well as energy, such as mobility and traffic. Similarly, if a city wants to improve public health, changing mobility patterns is a prerequisite.

Often the aim of addressing multiple policy objectives is built into these projects, and is a key part of their integrated nature. The Athletes' Village and Ledeberg Alive! are two clear examples, where environmental objectives have been combined with the social and economic objectives of regenerating deprived urban areas.

Business models to attract investment

Some of the projects started in a smaller format and have grown over time, such as the car free city in Ghent or the New Travel Habits initiative in Gothenburg. Other projects, such as Kvillebäcken in Gothenburg or the Athletes' Village in Glasgow, have been big projects from the start. This makes a difference in terms of the funding needed. If a project starts small, it is easier for the local authority to support it, and others can connect later on. For big projects, larger amounts of funding need to be secured from the beginning. Some initiatives, such as the Tornakalns complex in Riga, show that opportunities can arise when an initiative is based on an existing project, with new features added to this.

The lighthouse initiatives in this deliverable are dependent on a mix of funding from local, regional, national and European bodies, as well as private and public funding. Business models vary, but often public-private partnership working is a principal feature. This reveals yet another positive outcome of using an integrated approach; when different kinds of stakeholders and sectors are combined within a project, this can open up opportunities for new types of hybrid funding, meaning that resources can be found in several different places.

5.6 Promotion of the initiatives

5.6.1 Promotion by the cities

There are many similarities between the lighthouse initiatives when it comes to how they are being promoted. Roughly the same methods have been used in all four cities; the municipalities have in most cases put in resources in order to spread information about the initiatives to the general public through communication campaigns, using posters, leaflets and new websites. In other cases, public dialogues have been arranged for representatives to increase understanding among stakeholders and to seek their points of view.

For some of the more controversial initiatives, such as the congestion charge in Gothenburg, promotion has very much focused on creating acceptance among the public. A key learning is that this could have been avoided if more resources had been put in from the beginning in order to increase understanding, and achieve greater acceptance, among the general public.

Some initiatives, such as projects that have been developed as part of the Commonwealth Games in Glasgow, have received help with promotion due to the fact that they are part of a much bigger initiative. The New Travel Habits project in Gothenburg is another example; it is connected to the much bigger West Swedish Agreement. A key learning here is that initiatives of this kind should, if possible, look for wider processes and initiatives that they can connect to and take advantage of in order to raise awareness.

Last but not least, most of the initiatives have predominantly been promoted within the cities rather than further afield. There are exceptions, such as Kvillebäcken, which has received study visits from all over the world. The general focus on promotion within the cities and the opportunity to raise awareness further afield is something that the STEP UP partners can take with them when developing further promotion activities.

5.6.2 Promotion within STEP UP

Several actions for communicating the lighthouse initiatives are being taken within STEP UP. The focus is being put on communicating key winning elements of the initiatives, as well as the general recommendations that are presented in section 5.8 below. To begin with, the lighthouse initiatives, together with the benchmarks of excellence projects that are part of this deliverable (see Annex B), are being promoted on the STEP UP website. All lighthouse initiatives are featured in the 'Projects' section of the website, grouped by city, with summary information on each project and the key winning elements that make it a 'lighthouse' initiative. A link to a more detailed description of each

project is made available for any reader wishing to learn more. Some of the projects will also be featured as 'benchmarks of excellence' on the Covenant of Mayors' website in due course.

Furthermore, within Work Packages 4 and 5, each STEP UP city is organising a variety of learning activities for STEP UP companion and learning network cities. This includes coaching sessions for companion cities, which help them to develop their own enhanced SEAPs. There is potential for later coaching sessions to focus on helping cities develop their own lighthouse initiatives, learning from STEP UP lighthouse initiatives and their winning elements. As a result, these activities function as a forum for promoting the lighthouse initiatives and the benchmarks of excellence projects to European cities beyond those in the STEP UP project.

This process will be supported by a communications toolkit (a brochure and a PowerPoint presentation) in which the initiatives, their winning elements and the key recommendations from this deliverable will be presented. The toolkit, which will be available from September 2014, will be an easy and accessible way for the STEP UP partners to communicate their initiatives at meetings, events and in other engagement with local stakeholders and other cities outside of the STEP UP project. This will help others to learn from existing lighthouse initiatives and consider how they could develop their own.

5.7 Overall reflections

Lighthouse initiatives are complex, meaning that general conclusions about them should be made with care. Since the projects involve a wealth of different building blocks, and European cities also involve a complex range of different building blocks – both literally and symbolically – it is difficult to make any absolute claims about what makes an initiative successful. In this report, however, some general tendencies regarding how lighthouse initiatives can be organised have been described, which other cities can learn from.

However, this more complex view of the opportunities to learn from a lighthouse initiative also has another important implication; other European cities that want to develop similar projects are not tied to using exactly the same organisational and technological models as have been used here. On the contrary, they should use the initiatives in this report as inspiration and learn from them as they develop their own models based on local challenges and windows of opportunity.

A downside of the method used in this report is that the information is very much dependent on the quality, accuracy and detail of the data that the city representatives have delivered. There is a risk that this might have resulted in a more positive view of the projects than would have otherwise been the case, and given the nature of this deliverable it can be expected that cities will not have

dwelled on many negative aspects or elements that could be improved. As with all research projects, one can only trust that the information derived from the representatives gives a balanced view, though it can't be guaranteed that this is the case. On the other hand, the positive side of a method of this kind is that the city representatives have been closely involved in the learning process, which should help to facilitate a greater understanding of the different processes.

5.8 Recommendations

The conclusions and reflections above help to identify a number of recommendations for other cities looking to develop and promote lighthouse initiatives; whether that is the STEP UP companion cities, those cities that are part of the STEP UP learning network or others across Europe. These recommendations are set out below:

- **Understand lighthouse criteria**: if cities are aiming to identify and promote projects that meet the European Commission's lighthouse criteria, a clear and thorough understanding of these criteria needs to be developed. Where aspects are unclear or open to misinterpretation, direct communication with the Commission may be required.
- **Build in key criteria from an early stage**: where potential lighthouse initiatives are at an early stage of development, cities need to ensure that elements which meet key lighthouse criteria are built in early on, including regular monitoring of performance and impacts, and the potential for replicating and scaling up. Where this is not possible, the potential to add in lighthouse elements later, such as the integration of additional sectors, should be explored so that key windows of opportunity are not missed.
- **Start off small**: sometimes it is wiser to start off small and scale up the initiative if successful, than to acquire large amounts of resources from the beginning.
- **Build on existing initiatives**: initiatives do not always have to start from anew. Rather, the analysis in this report shows that it is possible to get help with resources and promotion by basing a new initiative on an existing project that has high status or symbolic value in the city.
- **Understand replicability**: when thinking of replicating an existing initiative in another city, a thorough analysis of its specific replicability is needed; what parts of it would be possible to replicate based on political, economic, geographical, technological and cultural factors?
- **Explore different funding sources**: an integrated approach gives opportunities to explore new types of hybrid funding; when various stakeholders and sectors are combined in an initiative, resources can be generated from several different sources at once.

- **Think cross-sectorally**: when developing an integrated, cross-sector project, new ways of addressing problems can be explored. For example, an initiative focused on decreasing energy consumption within the transport sector can also contribute to the city's goal of improving public health.

- **Secure political support**: successful initiatives need both local and national political leaders that champion them and act as enablers.

- **Think long term**: sustainable energy projects will last for decades. Therefore it is important that the approach taken has a long term focus and looks beyond short term political cycles.

- **Collaborate and engage with stakeholders**: the promotion of lighthouse initiatives in, and by, cities needs to be carried out in conjunction with high quality stakeholder engagement and collaboration, to ensure city-wide support from a variety of stakeholders.

- **Maintain up to date project information**: cities need to regularly update information on their existing lighthouse initiatives in order to make the promotion of these initiatives much more straightforward and effective.

- **Learn from mistakes**: an important part of learning is to understand elements of projects that are weaker or do not work, and use this to develop future projects that have a higher impact. Cities need to be more willing to identify and accept mistakes or weaknesses in order to learn from these.

5.9 Next steps

The lighthouse initiatives that have been analysed and promoted in this deliverable will be used as a knowledge base and inspiration for the innovative projects that the STEP UP partners will develop to the edge of implementation further on in the project, in deliverables D3.5 and D3.6. The lighthouse initiatives and benchmarks of excellence projects are featured on the STEP UP website, and will continue to be promoted by the cities locally as well. Furthermore, the promotion of lighthouse initiatives, in conjunction with STEP UP work packages 4 and 5, will serve as motivation for STEP UP companion cities and cities of the wider learning network to develop similar projects in their own cities. Each STEP UP city is organising a variety of learning activities for the companion and learning network cities through which the lighthouse initiatives and key recommendations set out above can be communicated. In September 2014 a communications toolkit, consisting of a brochure and a PowerPoint presentation, will be ready. This will be used to communicate the key learnings at events and meetings, as well as being available online as a public resource.

6   Annexes

Annex A: Criteria fit

The table below describes how the European Commission's lighthouse criteria used in this report align with the STEP UP best practice criteria used in the D3.1 report. It also shows an interpretation of each criteria, which was used by the STEP UP partner cities to analyse whether their projects were lighthouse or not.

European Commission lighthouse project criteria (used in D3.2)	STEP UP best practice project criteria fit (used in D3.1) – these criteria help demonstrate the lighthouse initiatives	How to interpret the lighthouse criteria
Tackle issues at the intersection of the transport, energy and ICT sectors	Urban technology integration - integration of two or more sectors from: transport, energy networks, buildings, or waste management	If a project does not meet this criteria (for example the integration of all three sectors), it cannot be considered lighthouse.
Trigger strategic partnerships of innovation driven companies acting across geographical borders	Integrated urban planning - bringing together actors in innovative ways from one or more sectors	What partnerships were part of or arose from the project from other cities, regions or countries? Geographical boundaries should be seen as city/regional at minimum. Were any partnership formed with businesses from other cities, regions or countries?
Forge strong partnerships with local leaders and municipal authorities to gain the vital support and visibility necessary to engage and empower citizens and local stakeholders	Integrated urban planning - bringing together actors in innovative ways from one or more sectors	What partnerships were part of, or arose from, the project? This should be more than just a case of the project helping to meet city targets/plans, but should involve the municipal authority as well
Engage and empower citizens and local stakeholders to reduce greenhouse gas emissions, energy consumption and	Integrated urban planning - bringing together actors in innovative ways from one or more sectors	How were citizens and stakeholders engaged? This should be more than a simple list of these stakeholders.

more widely to improve the urban environment		
Offer solutions to the broad scope of geographical, spatial and demographic characteristics of European cities	Contribution to one or more of the European Union 2020 climate and energy goals Integrated sustainability planning - energy projects which have clear social and economic benefits, e.g. energy poverty, employment (win-win on multiple themes)	The initiative should offer solutions to different kinds of problems at the same time.
Encompass a project design phase where different building blocks would be selected	This dimension was not represented in criteria used for analysing best practice projects	What was the initial driver of the project? Why were key elements selected in the planning phase?
Show an integration phase where these would be combined and in many cases also integrated with legacy infrastructure and systems	This dimension was not represented in criteria used for analysing best practice projects	How did the project evolve over time? Why and how were different elements brought together to make an integrated project?
Be demonstrated and validated at scale sufficient enough to enable systemic change in applications which are not yet commercial	Replicability	If a project does not meet these criteria, it cannot be considered lighthouse. Has the project been demonstrated on a scale such as district or city wide? What has the project changed? Has it/parts of it been replicated elsewhere? Market uptake - What are the particularly innovative technologies/solutions that this project is catalysing/supporting the market uptake and scaling up of, and how does it do this? This can include projects that are in earlier stages but have potential to

		bring about systemic change.
Followed by a review phase to assess performance and transferability	It should be possible to describe and quantify the impact of the projects and solutions on energy and economy. Replicability. Contribution to one or more of the European Union 2020 climate and energy goals.	If a project does not meet these criteria, it cannot be considered lighthouse. How is the project being reviewed and monitored? Is transferability to other areas being assessed as part of this?

Annex B: Excel sheet with complete information on lighthouse initiatives and benchmark of excellence projects

See separate Excel sheet in file attachment.