EU FUNDED LIGHTHOUSE PROJECTS AS THE MOVING FORCE TOWARDS KNOWLEDGE INTENSIVE URBAN DEVELOPMENT

Grigorijs Oļevskis
Dr. habil. econ.

Timurs Safiuļins
M. sc. econ.

Abstract

This article focuses on the identification and promotion of existing lighthouse initiatives in Latvia's capital city Riga; initiatives that take an integrated approach, have high impact and replication potential, and cover a range of different sectors. The authors seek 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. Two lighthouse initiatives are investigated – development of the smart card and smart solutions for a new building complex, the Torņakalns complex. The electronic card system 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. 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 Torņakalns lighthouse initiative is designed to help meet the city's overall strategic 2030 goal: to create energy efficient, resident-friendly and modern neighbourhoods. The development of the Torņakalns complex is aligned with the strategic 2030 development goal of Riga; that the city is to become friendly to pedestrians, cyclists and public transport. 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. Analysis of the processes of planning in Riga is inspired by the best practical solutions and "lighthouse" initiatives winning elements.

Keywords: Latvia, Riga city, key winning elements of success, lighthouse initiatives, planning

Introduction

In this article, information is provided on each lighthouse initiative, followed by an analysis focusing on the following key elements:
1. Integration of energy, INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) AND TRANSPORT
2. REPLICATION AND SCALABILITY
3. INTEGRATED BUILDING BLOCKS
4. Monitoring and reporting
5. Winning elements
6. Promotion

The lighthouse initiative result 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.

This article focuses on the development of innovative projects in the STEP UP Latvia's capital city Riga. The objectives of the article are to:
- Identify best practice energy and lighthouse initiatives in partner and learning network Riga;
- Define the winning elements of these lighthouse initiatives and promote them;
- Define in depth the common challenges for the city;
- Develop several innovative projects in Riga, 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 analysis of the processes of urban planning in this article is inspired by the best practical solutions and "lighthouse" initiatives winning elements. 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 pipeline projects and windows of opportunity in the cities.

Principles of the Strategic Planning of Urban Development

Industrialised countries since the mid XX century demonstrated the widespread use of planning tools in the management of cities. After the Second World War, almost all European countries and the US research groups and institutions have begun to develop long-term forecasts of economic development. At the turn of 1950–1960, it was possible to observe a real boom in economic forecasting. In this was manifested the desire to determine long-term trends in national and global economic development, order to use them in capital investment and innovation policy development in the struggle for markets and sources of raw materials. Especially wide circulation was received methods of strategic planning (both national and regional), whose foundations were laid by management theorists and implemented in practice by enterprises and corporations.

At the same time, this has increased the need for strategic planning of urban development, which was due first of all to the inability to solve complex of short-term and medium-term social and economic problems, and make more predictable the risks of entrepreneurship.

The decisions of the authorities, especially local, impact on people's lives by providing them with basic needs in housing, education, nutrition, health, and so on. Local authorities, like businesses, need to respond to changes in the surrounding situation. Business is necessary for the optimal allocation of personnel, equipment and capital in order to maximise return on investment. The city authorities must distribute human and capital resources to the best use of their advantages to meet the needs of the population.

Strategic thinking as applied to urban processes is a fairly new concept dating back to the 1980s, with its roots in military planning and adopted first by the business world. Global consideration of the processes that affect citizens is advisable when it is included in any initiative whose aim is to plan for the future or to define planning. Cities experiencing strong competition with other cities or even within their own neighbourhoods might use this documental framework to understand, project and intervene. Despite the relatively limited importance of the environment as a policy objective within formal policy documentation, a large proportion of local authorities have initiatives in place, or planned, which attempt to combine economic development and environmental aims. (Gibbs et al., 1998).

In general terms, it can be stated that strategic plans over the last twenty years have acted reasonably well as instruments of strategic reflection, as processes of public-private consensus and inter-administrative coordination, and as frameworks for formulating strategies in the local and territorial sphere. Without overriding the other planning systems in

the territory, the strategic plans have meant creating a state of opinion, motivating institutions and introducing reflections oriented in the long term towards having more developed cities, bearing sustainability in mind (Golden, 2006).

The ideas and practice of strategic planning have evolved over time. It has become generally recognised that the planning process rarely follows the 'rational' model of a sequential cycle of formulation, implementation, monitoring, and evaluation. Instead, planning occurs as a continuous and iterative process, in which important decisions are frequently taken during the implementation stage, and monitoring and evaluation occur in advance of final outputs and outcomes. Thus, although current understanding of strategic planning retains the idea of planning as being about setting goals and identifying the means of achieving them, it has moved away from a fixed plan and solutions, to an adaptive process, involving the management of change as it affects conditions, constraints, and resources. Second, it involves a shift away from the view that the state alone is responsible for development, to one in which various stakeholders are involved in the planning processes of dialogue and accountability. Third, strategic planning involves a comprehensive and holistic approach, which seeks to integrate the full range of available resources, and to build on existing policies and initiatives (Cherp et al., 2004; Gonzalez & De Lazaro, 2013).

The range of considerations for positive urban growth management is extensive (Paul James et al., 2013).

- Providing for land assembly and eminent domain. Where land availability is tied to the capacity to assemble land, particularly through the use of compulsory acquisition, these provisions can be stronger tools for economic development. However, this is only culturally and politically legitimate if handled as a positive form of exclusion within the law, and in accordance with human rights obligations, including to customary land-holders and undocumented settlers.
- Establishing plans for integrated economic development and land-use. Integrated land-use and transport development is an important subset of activities related to economic development and a more equitable distribution of job opportunities. Actions to co-ordinate household location, employment/enterprise location, and transport networks can create powerful economic development nodes within growing cities, preferably at large scale through the accumulation of linked activities. However, this has not prevented extension of the urban growth boundary on several occasions.
- Centralising metropolitan planning and authority. Sometimes, metropolitan development may fully integrate urban growth

management within one agency. Developing one comprehensive development plan is more easily accomplished when there is one metropolitan jurisdiction; however, this is rare.

- Demarcating particular economic precincts. Technology precincts and urban-based actions to enable innovation, science, and technology can be part of, or give rise to, urban growth that needs to be carefully managed.
- Developing a capacity for urban growth management. This area of intervention is critical in matching economic development and urban growth management.

Urban planning per se is not a European policy competence. However, economic, social and territorial cohesion all have a strong urban dimension. As the vast majority of Europeans live in or depend on cities, their developments cannot be isolated from a wider European policy framework. The EU has had a growing impact on the development of cities over recent decades, notably through cohesion policy. Cities are expected to play a key role in the implementation of Europe 2020 (European Union, 2011).

1. *Smart Growth*: Cities concentrate the largest proportion of the population with higher education. They are at the forefront in implementing innovation strategies. Innovation indicators such as patent intensity demonstrate that there is a higher innovation activity in cities than in countries as a whole.
2. *Green Growth*: Cities are both part of the problem and part of the solution. The promotion of green, compact and energy-efficient cities is a key contribution to green growth.
3. *Inclusive growth*: Social exclusion and segregation are predominantly urban phenomena. Cities are the home of most jobs, but also have high unemployment rates. Cities can contribute to inclusive growth, notably in combating social polarisation and poverty, avoiding the segregation of ethnic groups and addressing the issues of ageing (European Commission, 2011).

In view of the on-going discussions about climate change and the worldwide trend of urbanisation, cities and urban regions are moving into the focus of attention of policy, industry and research. The European targets for achieving a low-carbon economy ("2020 targets" and "European Energy Roadmap 2050") are enormous challenges for society in the field of energy, which can only be tackled through clear strategies. The concept of Smart Cities can provide solutions on both a technological and process level for shaping the future of European Cities in a sustainable way based on two key elements: highly increased energy efficiency and maximum integration of renewable energy sources into existing systems.

Current questions for research and implementation in the context of Smart Cities focus on the following thematic areas:

- integrated urban energy planning & intelligent energy management on regional & city level;
- merge of Information and Communication Technology (ICT) and energy, as well as transport technologies;
- smart urban energy networks (thermal + electric, complemented by gas grids);
- energy-efficient interactive buildings;
- renewable energy supply for urban areas; and
- sustainable mobility.

The initiative puts its focus on the EU member states. It elaborates how a Europe wide implementation of the Smart. (The Smart Cities Member States Initiative, 2011) the idea of Smart Cities is rooted in the creation and connection of human capital, social capital and ICT infrastructure in order to generate greater and more sustainable economic development and a better quality of life. Smart Cities have been further defined along six axes or dimensions:

1) Smart Economy
2) Smart Mobility
3) Smart Environment
4) Smart People
5) Smart Living
6) Smart Governance

Smart Cities comprise a portfolio of initiatives, with different (though often overlapping) focal areas, modalities, participants and constituencies (European Union, 2014).

The European Commission's Smart Cities and Communities communication define which of the cities' best practice projects can be defined as lighthouse initiatives[1]:

1. Tackle issues at the intersection of the transport, energy, and ICT sectors.
2. Trigger strategic partnerships of innovation driven companies acting across geographical borders.
3. Forge strong partnerships with local leaders and municipal authorities.

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[1] The lighthouse project was instigated by students at the Chalmers School of Entrepreneurship (CSE), which is an action-based master-level educational program, integrating entrepreneurial education with venture creation within the university. (Ollila, Williams-Middleton, 2011).

4. Engage and empower citizens and local stakeholders to reduce greenhouse gas emissions, energy consumption and more widely to improve the urban environment.
5. Offer solutions to the broad scope of geographical, spatial and demographic characteristics of European cities.
6. Encompass a project design phase where different building blocks would be selected.
7. Show an integration phase where these would be combined, and in many cases also integrated with legacy infrastructure and systems.
8. Be demonstrated and validated at scale sufficient enough to enable systematic change in applications, which are not yet commercial.
9. Followed by a review phase to assess performance and transferability (European Commission, 2012).

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.

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.

Riga's Lighthouse Initiative to use Smart Cards

The smart cards lighthouse initiative 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 initiative 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. The initiative fulfils the key European Commission and STEP UP lighthouse criteria.

The lighthouse initiative to use smart cards focuses on three issues:

I. To create a more rational organisation of public transport;
II. To reduce energy consumption in the city; and
III. To achieve greater convenience for residents.

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.

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. 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.

Centralised information network: the basis of the lighthouse initiative 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 one is 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.

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.

The approach to e-cards that is used in Riga – which combines traffic and social services – must, by 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 individuals use the system 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; and
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.

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.

Key winning elements of success are as follows:

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 e-card initiative, as set out above. 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.

Business models to attract investment. For the development, financing and management of the e-card initiative, 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 "Rigas karte". Rigas 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. Riga City Council using municipal grant and loans mainly financed the establishment of the e-card 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.

Riga's Smart Solutions for a New Building Complex

This 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, the Torņakalns complex. The Torņakalns lighthouse initiative 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.

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. 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 (Municipal portal of Riga, 2014).

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 665,000 m^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. Construction of The National Library 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.

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.

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 blackouts – in case of an emergency blackout 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.

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.

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, 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.

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 (58,000 m^2);
- Office buildings (265,000 m^2);
- Residential buildings (225,000 m^2);
- Commercial buildings (60,000 m^2); and
- Recreational buildings (6,000 m^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, 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 (*Akebia quinata*) 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.

Key winning elements of success, as follows:

Political leadership with a long-term approach. 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.

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 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.

Contribution to multiple policy objectives. The initiatives contribute to the implementation of different development objectives Riga, providing city environmental, social and economic benefits. 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.

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 infrastructure and roads will at this stage be financed by municipal funds.

Conclusions and recommendations

Conclusions

All the initiatives that have been included in this article 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 Riga. Furthermore, they are all contributing towards the EU2020 goals of energy use reduction, reduced CO_2 emissions and an increase in renewable energy.

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. Initiatives such as these is 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.

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. 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.

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 lighthouse initiative 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 lighthouse initiative when the governance structures in two cities are completely different. All lighthouse initiatives in Riga have started as a result of strong political leadership with a long-term approach. A great initiative 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 initiative already exists at some other geographical location in the country.

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 the infrastructure is built for car travel, it would be difficult to succeed.

Economy: the economy is one of the most important factors that make an initiative feasible. Central government funded both the e-card initiative in Riga. Economic models and funding are often very specific for each initiative, 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, which is partly 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 lighthouse initiative t is, the more difficult replication is. These lighthouse initiatives 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. 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.

Combining a number of components in one initiative often results in synergy effects. 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 initiative 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.

According to the European Commission's criteria, lighthouse initiatives should have a 'high impact'. In order for this to be demonstrated, monitoring and reporting on the progress and impacts of an initiative is essential. Some factors that influence the ease of monitoring are:

- The more complex a initiative is, the more difficult it is to calculate its impact;
- Initiative 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 initiative 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 initiatives should have monitoring built in from the start.

all the initiatives have four key features, which have been central to their success:

I.   Political leadership with a long-term approach.
II.   Collaboration and dialogue with all stakeholders.
III.   Contribution to multiple policy objectives.
IV.   Business models to attract investment.

Key recommendations are 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 study 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 initiative, 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 initiative 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 citywide 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.

Lighthouse initiatives are complex, meaning that general conclusions about them should be made with care. In this article, however, some general tendencies regarding how lighthouse initiatives can be organised have been described, which other cities can learn.

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