RUGGEDISED
Designing smart, resilient cities for all

Factsheets on **Energy Management and Connections**

ROTTERDAM . UMEÅ . GLASGOW

Using Information and Communications Technologies (ICT) to manage energy use in cities

This also includes smart waste management and smart lighting.

USER INFLUENCE ON ENERGY CONSUMPTION

PREPARE FUTURE UPSCALING

REAPING THE BENEFITS OF ENERGY MANAGEMENT

About the publication

This factsheet booklet is one of four in a series that focuses on particular aspects of the smart city approach and how to tackle common challenges faced by cities and communities across Europe. The list of challenges does not cover all complexities for a succesful Smart City project, but provides key output from RUGGEDISED on specific issues. The thematic challenges found in this booklet on energy management and connections have also been covered in various ways in public reports available on RUGGEDISED.EU/Publications.

Table of contents

Embedding smart energy management in city structures

In large scale projects related to city innovation and urban development, partners have to deal with more than just deploying technological solutions. To successfully implement energy solutions that connect and work with the full urban environment, Smart City projects have to approach the challenge from different levels within municipal organisations. RUGGEDISED has identified an operational level, a tactical level and a strategic level for Smart City projects to work with and within.

Municipal levels for innovation efforts

Local Governments should embed highly innovative projects within all three levels of their organisation

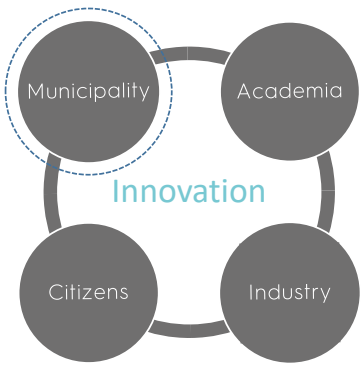
The Strategic, Tactical and Operational levels are similar for all truly innovative and ground-breaking smart city projects within administrations, but the particularities on what should/should not be included at each level differs depending on what city-integration is necessary. In RUGGEDISED, partners have worked with 'Smart Thermal Grids' and 'E-mobility and charging', and 'Urban Data Platforms' ,in addition to the content of this factsheet-booklet, on 'Energy Management and connections'. Energy Management in many ways forms the corner stone of any Smart City development, as it seeks to connect the production, distribution, planning and use of energy on either the city or the community level.

This requires a thorough understanding of the operational situation on the ground, i.e. what organisations are the biggest consumers, what are their needs and their possible contributions?

In terms of managing the demand side, the operational aspects and partnerships involving other large consumers becomes extra important as the actual consumption and production is often placed outside of direct municipal control.

On the tactical level in the form of dedicated planning through SECAPs (Sustainable Energy and Climate Action Plan) and finally on the strategic level in the form of political buy-in and commitment allowing the entire municipality – and their partners in other public sectors, business and the citizenry – to pull in the same direction.

External partnerships



The Quadruple helix cooperation model for innovation projects

Smart Energy Management and Connections in the Lighthouse Cities

Rotterdam

In Rotterdam, partners, especially a large energy company, a large telecom company, and the Municipality, are working with energy management – and connectivity – in the Heart of South area of the City. They do so in a number of different ways including a dedicated Energy and building Management System installed at the Ahoy Venue (R8), early plans for LoRa (Long Range) connectivity (R10), Intelligent Street Lighting (R11), feasibility studies on installing servers in residential buildings and a rollout of Smart Waste Management (R13).

Umeå

In Umeå, the city works closely with the university and the regional hospital, the largest building operators in the area, to implement and test an intelligent and integrated energy management system (U9), enabling continuous monitoring and analysis of buildings internal energy performance, e.g. room temperature and lighting, and different ways of intelligent building control (U4A), including Gamifcation (U4B).

Glasgow

Glasgow's energy management includes innovative use of street lighting (G6) and work to include demand-side management installations (G8) . Specific street lights are also being installed with EV-charging functionality, further increasing the possibility of managing demand.

Finally, Glasgow has worked with demand-side management in large buildings with the potential to alleviate fuel poverty (G9 & G10).

Bonus: Gdańsk takes on energy demand

The fellow City of Gdańsk is also working on energy use in buildings and are implementing solutions in major public buildings in the city.

Learn more about Gdańsk's work in its Gdańsk Śródmieście ("Downtown") district here: https://ruggedised.eu/cities/gdansk/

User influence on energy consumption

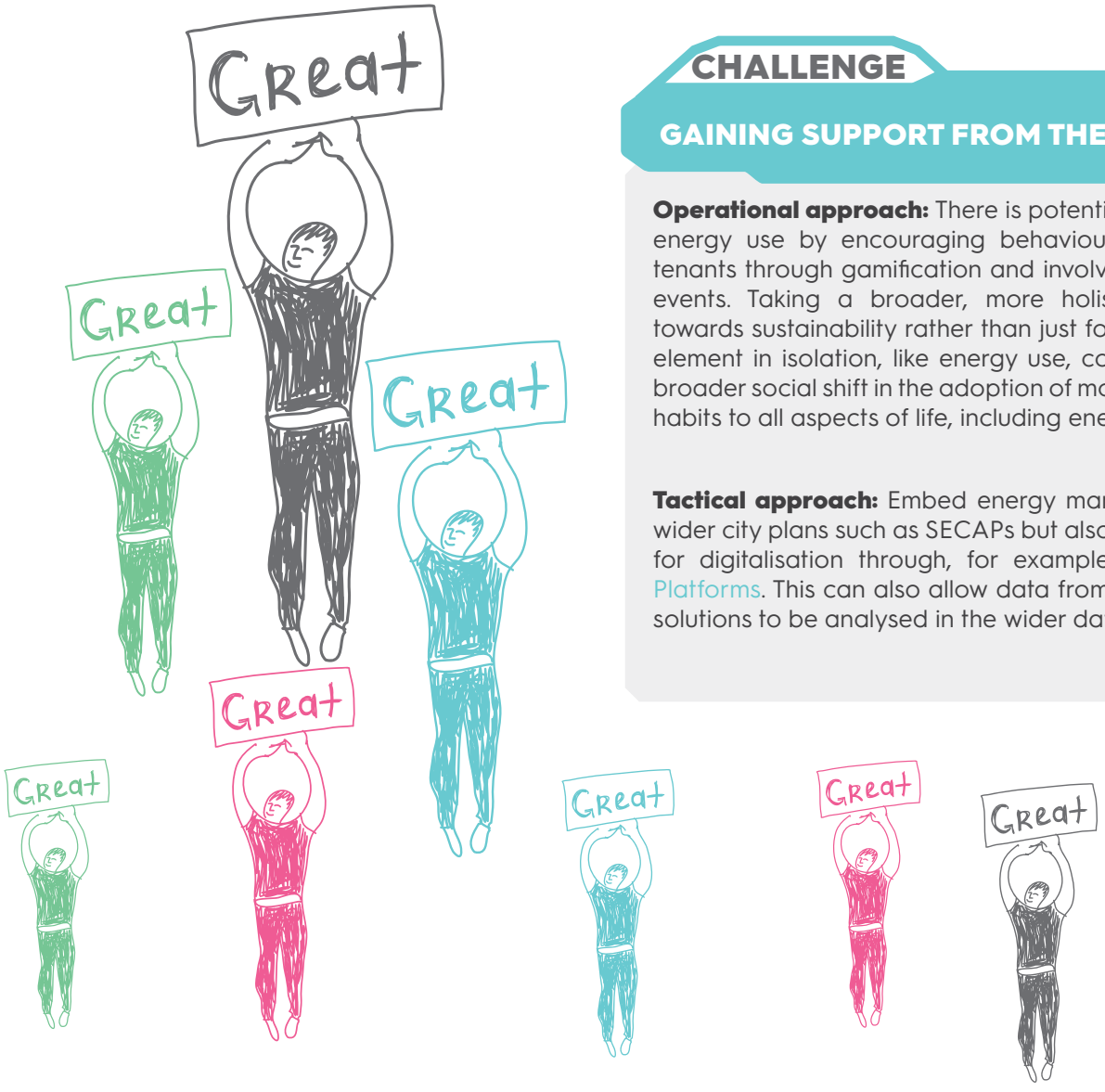
The energy demand of most buildings and infrastructure is dependent on their usage and therefore their users and support from them. Temperature, ventilation, lighting etc. is essential for the wellbeing of residents, their feeling of comfort and the practical benefit of everything from a lecture hall to a street lamp. Therefore, **buy-in from users and solutions that are working *with users* allow for optimising the energy use in buildings**, as shown in the RUGGEDISED cities.

CHALLENGE

CHALLENGE: HUMAN FACTORS ARE HARD TO PREDICT

Operational approach I: Engage in cross-disciplinary work and draw in expertise from designers and input from the users early in the process to minimise the unexpected usage of the more user-centred parts of the system, such as unused booked rooms, and open windows in ventilated rooms. In RUGGEDISED, issues such as open windows and other minor actions taken by the users, influenced the pilots.

Operational approach II: In the operational stage, there is major savings potential based on how familiar staff are with the interaction of the technical systems and the usage. Thus, there is a need for training the staff. This training can start when the systems are installed and the buildings are occupied. It requires interaction with the system provider. Essential for the optimisation is climate control and the setting of the criteria for the ventilation.



CHALLENGE

GAINING SUPPORT FROM THE USERS

Operational approach: There is potential to lower the energy use by encouraging behavioural change in tenants through gamification and involvement in local events. Taking a broader, more holistic approach towards sustainability rather than just focusing on one element in isolation, like energy use, could result in a broader social shift in the adoption of more sustainable habits to all aspects of life, including energy use.

Tactical approach: Embed energy management into wider city plans such as SECAPs but also into the plans for digitalisation through, for example Urban Data Platforms. This can also allow data from demand-side solutions to be analysed in the wider data platforms.

Reaping the benefits of energy management

From WiFi-signals, motion detection, CO2 measurements, human bookings, traffic monitoring, Urban data etc., there is no shortage of possibilities when it comes to monitoring, tracking or 'Smartifying' issues related to energy management, and the RUGGEDISED cities have tested different constellations. It has allowed the cities to decrease their energy use, automate processes and city flows, in various ways. To **ensure the results of smart city installations equal lower CO_2 emmissions**, attention must be paid to both the hows and the whys when deciding on an implementation path.

CHALLENGE

CHOOSING THE BEST TOOLS

Operational approach I: Study the best specific technical tools to keep track of occupancy, traffic etc., before implementing it. WiFi, as an example, has advantages, but in RUGGEDISED non-negligible issues led to a preference for a sensor approach, which requires an estimation of attendance in most buildings.

Operational approach II: Create an early overview of exactly what information you need to analyse in order to achieve the required output. This will reduce complexity and leave more freedom when choosing the tools to collect the information needed, as it's unlikely one solution will be able to provide all inputs on its own.

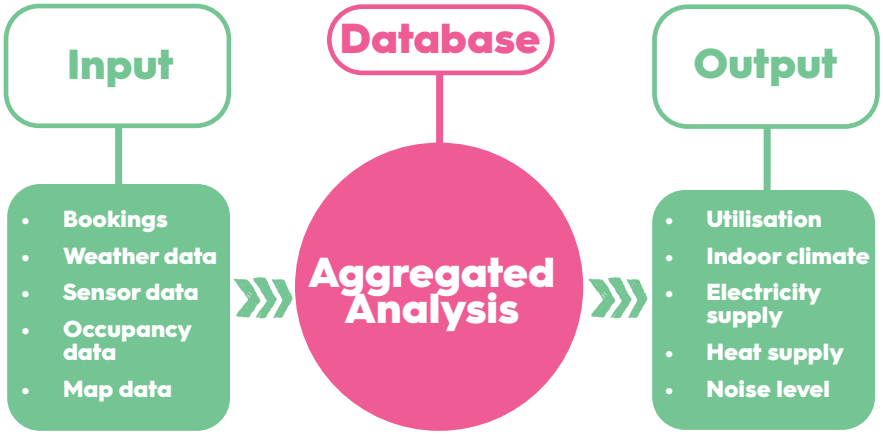


Figure adapted from the report on 'Analysis tool on energy consumption implemented on campus' written by Umeå University

CHALLENGE

PROCURING THE RIGHT SOLUTIONS

Tactical approach: Ensure your solutions fit within wider municipal procurement plans and exploit technology already utilised by the municipality to the extent possible, while still gaining from added innovation. This is especially important in terms of connectivity, where breaking away from the local standards may complicate the deployment of specific smart solutions.

Operational approach: When purchasing a specific service or solution ensure the service is utilising the desired connectvitiy to provide what's needed. For example, Smart Waste solutions can exploit different standards for communication and it should be clearly stated in the procurement documents whether WiFi, LoRa or a third option is preferred.

Preparing future upscaling

The different energy management systems – or other smart solutions – are great candidates for upscaling and offer the possibility to connect new buildings, street lights or waste collecting routes providing additional savings in both costs and energy use with a minimised effort. In RUGGEDISED, all solutions were developed and planned with an eye to upscaling and important challenges were overcome in the lighthouse cities to achieve this. The **potential benefits of a successful Smart City solution increase manyfold if its possible to upscale internally in the city or replicate aspects of the solution elsewhere**.

CHALLENGE

DEPLOY SOLUTIONS THAT ALLOW FOR UPSCALING

Operational/tactical/strategic approach: Work closely with the large property owners and/or energy companies, allowing upscaling to move beyond the scope of only the municipality. Lessons learned in one location from large organisations are more likely to be used elsewhere than if the lessons were not made by the company/ organisation itself. This cooperation should ideally happen at all levels of the organisations.

Tactical approach: Use innovative smart city projects as frontrunners for other urban plans. By embedding specific testing and deployment within already planned upscaling, such as plans to update street lights or the deployment of the initial system, serves as a frontrunner for a large scale roll-out.

CHALLENGE

ENSURE SUPPORT FOR FUTURE UPSCALING

Strategic approach I: As demand-side management is in the end a political topic, ensure political guidance/decision-making from the outset. Especially the hierarchy of decisions within use cases of interest to different policy domains, where actors and their wishes should be carefully weighed against each other. Cases also exist, where a municipality may have firm commitments/opposition to take on a strong role in energy management, which should be planned for during implementation.

Strategic approach II: Connect the benefits of energy management to important issues beyond sustainability, such as 'energy poverty'. Housing developments can represent possible use cases for both decreasing energy usage and the costs carried for residents to heat their homes. This can make the issue more politically salient and benefit further upscaling and replication.

Recommended publications for expert info

RUGGEDISED SOURCES

Analysis tool on energy consumption implemented on campus (report)

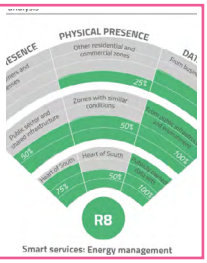
This report details the work done in campus buildings at Umeå University to support demand-side-management. It covers how one large building operator can cut energy consumption and gives concrete advice for others looking to implement similar solutions.

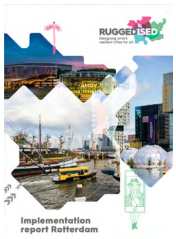
The report is written by Umeå University.

"Rich narratives" – Scenario analyses for the Lighthouse cities and recommendations

This report offers an inspiring look into what is possible with the smart solutions in the Lighthouse Cities in the long term. It looks at the maximum credible upscaling potential in each city.

The report is written by RISE Sweden.





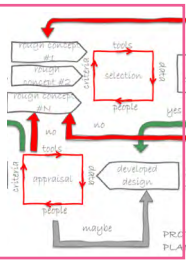
Implementation reports from the Lighthouse Cities

These reports detail the work undertaken by the Lighthouse Cities of RUGGEDISED to implement the cities' smart solutions.

They are written by cities for cities and share the main considerations behind the smart strategies in Umeå, Rotterdam and Glasgow to support other cities in developing Smart City strategies and implement solutions.

Other RUGGEDISED material

The partners of RUGGEDISED have produced a large library of material relevant for all Smart Cities professionals. It will continue to be updated until the end of the project and covers everything from webinars to scientific publications on a wide range of issues - from European cooperation to the work done and planned in the Fellow Cities of Gdańsk, Brno and Parma.



OTHER SOURCES ON ENERGY MANAGEMENT AND CONNECTIONS

Guidance Packages and booklets from EU initiatives

The European Union is compiling lessons from the large Smart City Projects through the Smart Cities Marketplace. Find booklets specifically on the impact of the EU's changing electricity market, on the development of smart cities and much more on the website.

About

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About the project
RUGGEDISED is a smart city project funded under the European Union's Horizon 2020 research and innovation programme. It brings together three lighthouse cities: Rotterdam, Glasgow and Umeå and three follower cities: Brno, Gdansk and Parma to test, implement and accelerate the smart city model across Europe. Working in partnership with businesses and research centres these six cities will demonstrate how to combine ICT, e-mobility and energy solutions to design smart, resilient cities for all.

About the publication
This factsheet booklet on Energy Management and Connections is one of four in a series to focus on particular aspects of the smart city approach and how these can help tackle common challenges faced by cities and local regions across Europe.

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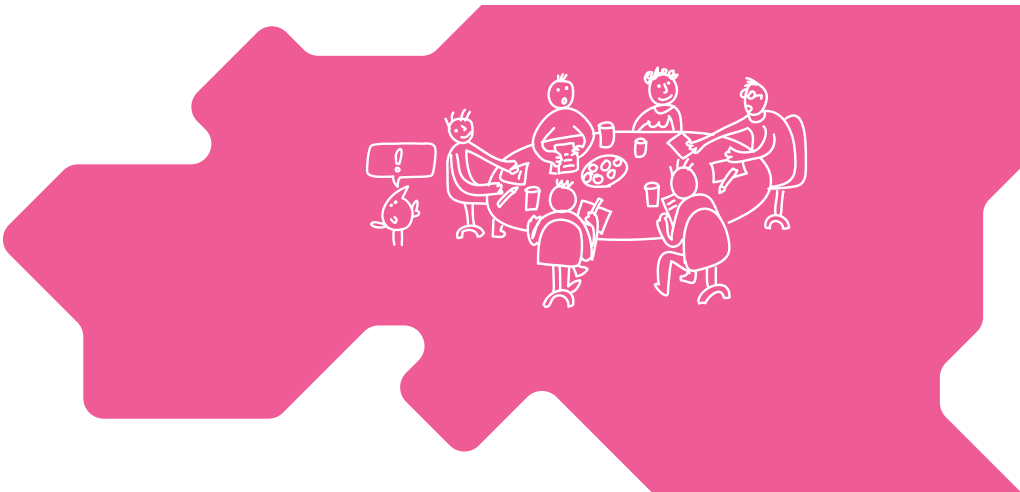
Partners



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