High on
Low Carbon Footprint

Amsterdam takes first stride under the EU TRANSFORM project towards building an Energy Atlas Plus to answer key energy-related questions about the city, on any scale, from a single street to the city as a whole

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How much carbon dioxide do our cities emit on a yearly basis? And where do these emissions originate from? These are questions that can be answered by using datasets, a clever way of combining data to distil relevant information. They are the foundation on which smart energy cities are built. If we understand the complexities of the energy system, we can start discussing which levers to pull and what results our actions may bring.

Relevant data of the appropriate size and scale is often not easily accessible. Then there is a lack of knowledge on how to process data into useful information, or how to use them for effective communication. The various partners of the TRANSFORM programme — a consortium of leading European cities, energy and grid companies, and commercial and knowledge partners committed to strengthen their low-carbon energy agendas — in Amsterdam are working towards resolving at least some of these problems. They are compiling the Energy Atlas Plus, a prototype environment designed to share data, link datasets and reveal information. The Energy Atlas Plus supports decision making, building business cases, writing scenarios and establishing strategy.

Over the next two years, the TRANSFORM partners, led by Accenture and the Austrian company AIT, will assist the cities of Amsterdam, Genoa, Hamburg, Copenhagen, Vienna and the

Grand Lyon region with their data collection and the design of a decision support environment for energy transition projects. This environment has been named the Energy Atlas Plus and will be tested and developed by processing real user cases.

From separate datasets to the energy atlas

Amsterdam's Department for Physical Planning has taken its first stride towards the Energy Altas Plus by producing an energy atlas version 1.0, which is a combination of datasets. The Energy Atlas builds on the earlier work carried out by other cities, including the cities of Hamburg, Berlin and New York. It comprises data on three main themes — the (spatial and social) context of the city, the use of energy and the potential for local energy production in the city or region. The Energy Atlas answers key energy-related questions about the city, on any scale, from a single street to the city as a whole.

The atlas was developed by collecting separate datasets from various organisations and converting these into map images and infographics. It was not always easy to convince organisations to share their data and the process called for clearly defined commitments and the confidence to trust each other. The local government played a pivotal role in this process, by bringing together different parties and organising meetings in which datasets were directly applied to explore the viability of a number of projects in one of Amsterdam's districts. The Department of Physical Planning was able to contribute its expertise and support the discussions with the use of map images.

There were also a couple of technical challenges which needed to be met. Firstly, organisations often have their own particular way of storing data. Secondly, new data cannot always be converted directly into a spatial representation; first, a manual translation needs to be carried out by linking coordinates to address details. Through this process, data previously used for administrative purposes was converted to map images. This time consuming process could not have

Hamburg: energy & poverty

In the city of Hamburg similar data was used in a different way. Rather than focusing on one area to identify its issues, many areas were searched for their potential to launch the projects. So, the issues and the projects were clear, it was the locations that needed to be identified. Hamburg matched data on the social context of the city with data on the use of energy in the city. Those city areas where people were on low incomes but were paying high energy bills, were selected by the city to launch their insulation projects.

been carried out without the knowledge of GIS, which can assign information to a physical location.

Variables in scale and type: looking for opportunities

The spatial and social contexts make up a large part of the atlas, as they have a direct impact on CO_2 emissions and the energy system. Examples are the size of houses, the date of construction of houses and offices and the building density of a city. Other relevant indicators would be the ownership of property, available roof surface for solar panels, disposable incomes and consumption patterns, willingness among citizens to invest or launch initiatives, and modes of transport.

Different contexts also enable monitoring of how much energy the city uses and in which areas savings could be made, or who would benefit from the production of sustainable energy. People can also see what is already being done in the city in terms of sustainable energy and how they can connect to existing sources or networks. One of the energy-related issues closely related to the spatial context is the use of solar power.

Courtesy: Liander NV
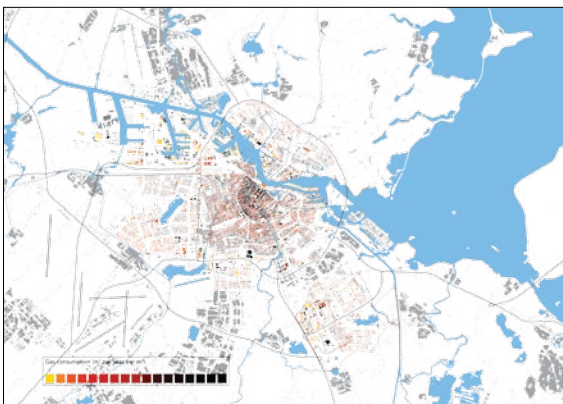
Map of gas consumption; data from 2012

Map of existing electricity networks

Courtesy: Waternet Amsterdam and NUON

Map of existing thermal grid

Courtesy: zonatlas.nl/amsterdam

Map of sun potential

Its potential is for a great part determined by the landscape of roofs available. Similarly, the potential for thermal energy storage is also dependent on the spatial context, but in a different way (excess heat or cold can be stored underground in the form of water, to be used in another season). The composition of the soil the energy is stored in and the use of the built environment determines the suitability for thermal energy storage.

As a final point, the atlas demonstrates in map images and (validated) numbers that each part of the city has its own characteristics and potential. This means that any energy strategy for the city or the region should have a built-in flexibility to take advantage of these specific opportunities.

From energy atlas to energy atlas plus: decision support

With regard to the sharing of data, the next logical step up from the energy atlas is an always up-to-the-minute interactive tool to support discussion-making among various stakeholders on possible new projects. TRANSFORM is therefore devising its own decision support tool: the Energy Atlas Plus. To this end, all existing tools and instruments were thoroughly researched.

By using the data from the energy atlas, this tool can provide a picture of not only the current energy situation of any area of a city, but also the contributing factors. Moreover, the tool will also offer the possibility to extrapolate into the future. Developments in population size, energy prices or projected new housing developments could lead to different energy choices than one would expect on the basis of the current situation. Being able to assess these scenarios allows for robust decision making.

Within the tool, the measures which one selects can be applied to the location. With the use of maps, diagrams and graphs, the tool will subsequently offer quick and simple insight into the impact a measure will have in the selected area, including the CO_2 emissions, but also how much stakeholders will have to spend on new energy systems. So the (economic) interests of stakeholders are also taken into account. The insights the tool provides could encourage various stakeholders to align their agendas.

The way ahead

The aim is to make the process of data sharing better, smarter and faster in the future, to share knowledge within the framework of TRANSFORM and to contribute to the discussions on a European level. Meanwhile, participating cities have run up against barriers to sharing data. The reasons are that parties are not clear on the use of sharing, or that availability of data has been contractually restricted or that it proves difficult to give detailed information whilst respecting privacy. In some cities no data may be available at all, compelling us to work with proxy data.

The Amsterdam energy atlas is completed and published on www.maps.amsterdam.nl. The Energy Atlas Plus is still in development, a first version is expected to be ready in mid-2015. The next step will be to test the tool in Smart Urban Labs or at strategic sessions in one of the cities. The basic rule remains that these tests are carried out while projects are underway, so that they can be of instant practical value.

Amsterdam Zuidoost: business case for excess heat

At the TRANSFORM workshop in smart urban lab Energiek Zuidoost, data from the energy atlas was used. The maps and the information provided the participating businesses with insight into the thermal management in the area. Energy specialists identified many different functions in the area which could contribute to the thermal demand of the area. Their calculations produced a balanced business case for the use of excess heat in Zuidoost.

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