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CASE STUDY

Sustainable Energy Strategy for "Future Cities"

A MapTable with CommunityViz deployed for "Arnhem CO_2 Neutral"

Location: Arnhem, Netherlands
Partners: City of Arnhem; KEMA; MAPSUP

Context: The City of Arnhem, the Netherlands, is one of eight European regions and cities participating in "Future Cities," a project funded by the European Regional Development Fund aimed at helping city regions in Northwest Europe cope with predicted climate change impacts. Arnhem already offers electric trolley buses and a district heating network, and the Municipal Council has declared its intention to ultimately become a CO_2 – neutral city.

The city currently accommodates a population of about 150,000 and is expected to grow by 10 percent over the next few years. There are some 70,000 buildings, and about a quarter of the CO_2 emissions originate from supplying heat and electric power to those buildings, another quarter is from industrial processes, while the rest of the emissions can be attributed to traffic. To make the city CO_2 neutral, the owners and energy suppliers will have to invest in building insulation and conversions away from fossil fuels. The city administration has few possibilities to force people to make these changes, so it has adopted a strategy to seek the support of residents through an interactive planning process.

Project Description: The City of Arnhem asked KEMA, an energy consulting firm, to make an energy map of Arnhem. The map drew upon data provided by the Dutch Central Planning Agency, with index data assigned by the Dutch Energy Agency to the various usage categories (e.g., homes, cars, and offices). They also developed models showing the effects of various sustainable energy concepts, such as solar hot water heaters, rooftop photovoltaic systems, building insulation, and district heating. Subsequently, MAPSUP, a Dutch consulting firm, was asked to make the energy map and models dynamic using the ArcGIS® CommunityViz® Scenario 360™ extension. All information and formulas that KEMA provided were added to a Scenario 360 analysis.

> *"ArcGIS with CommunityViz Scenario 360 has helped us to quantify the contribution to the total sustainable energy goal of specific actions, such as covering buildings with photovoltaic cells. It has shown us the difference in impact of, for example, placing a geothermal heat pump for a whole street, and providing each house with a sun boiler. This tool enables us to better translate the potential found on the map into real life projects."*
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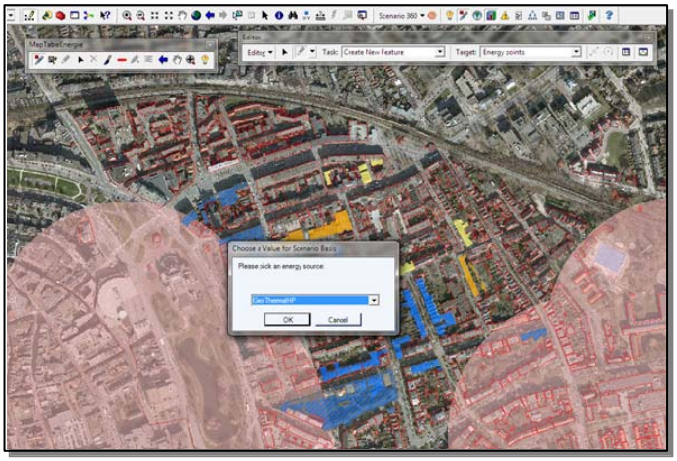
> — Matilde van der Zel, Municipal Geo-Information Adviser, City of Arnhem

The CommunityViz analysis was put in MapTable, a digital drawing board made by MAPSUP with a 47-inch display that can be controlled interactively by pen or finger touch. The table allows participants to digitally share information and ideas about an area on the table. CommunityViz was used as the tool for

collecting, computing and visualizing information. The KEMA energy formulas are the core of the application. They are used to calculate the sustainable energy production, CO_2 reduction, and contribution to the goal for each sustainable energy concept. In addition, the application dynamically calculates costs and efficiency for each sustainable energy concept.

In order to demonstrate and also to test the application, MAPSUP launched an Energy Game at the 2010 ESRI Netherlands Conference. The game was based on a quarter of the city of Arnhem and the goal was to reduce CO_2 emissions for the area by 20%. Participants used Scenario 360 Sketch Tools to paint sustainable energy concepts. Participants could also cut CO_2 emissions by placing windmills in the area or by using geothermal storage. The contributions of the different concepts were calculated dynamically and were immediately shown on the screen as indicators. About 100 participants played the game, and response was favorable.



In the project version of the application, homeowners and housing agencies can indicate which buildings and which sustainable energy concepts they will invest in, now and in the future. By discussing these issues around a MapTable, stakeholders and stakeholder groups improve their mutual understanding by explaining to each other why they make certain choices. The tool also gives the participants the opportunity to explore "what-if" scenarios. Project leaders believe that this interactive process broadens support needed for implementation of a CO_2 neutral building renovation and new construction, and the use of sustainable energy sources.

Technology and Tools: Software: CommunityViz Version 4.1 for ArcGIS 9.3 and Version 4.1 for ArcGIS 10; MAPSUP MapTable; Stakeholder workshops.

Outcomes: With the development of the CommunityViz Scenario 360 based tool, MAPSUP was able to quantify the contribution of different concepts to a sustainable energy goal of 20% in 2020 for the City of Arnhem. The project has already given the city administration a feel for the costs and benefits of CO_2 neutral measures. Furthermore, the map-based tool immediately shows the spatial footprint for any given amount of sustainable energy production. The tool will be used over time as the city and its residents consider CO_2 neutral strategies.

The next step is to plan a series of workshops with stakeholders such as energy companies and housing agencies. A first workshop is planned to create an inventory of investment plans and anticipated timing of renovations and new construction, all of which will be recorded in the MapTable. The focus will primarily be on what these plans mean with respect to energy savings and the use of sustainable energy. In a second workshop, based on the earlier inventory and the Scenario 360 tool, the stakeholders will draw a number of possible energy scenarios. In a third workshop, stakeholders' choices will be evaluated based on the opportunities, financial implications and total reduction in the use of fossil fuels.

KEY LINKS

CommunityViz
http://placeways.com/communityviz
City of Arnhem
http://www.arnhem.nl/english
KEMA
http://www.kema.com/Default.aspx
MAPSUP
http://www.mapsup.nl
MapTable
http://www.mapsup.nl/index/1/25/producten.html
Future Cities Project
http://www.future-cities.eu/project.html

Sources: MAPSUP; Future Cities Project, http://www.future-cities.eu/project.html; KEMA, June 2010 Report at http://www.kema.com/Images/Global%20Contact%202-2010%20LR.pdf. CommunityViz is a registered trademark of Placeways LLC. Scenario 360 is a trademark of Placeways LLC.