# Bottrop, Germany

## InnovationCity Ruhr – Model City Bottrop: revitalizing an industrial region through low-carbon redevelopment and active public-private partnerships

ICLEI Local Governments for Sustainability

**Since 2010, Bottrop has transformed itself through active public-private partnerships and an engaged citizenry, into a living laboratory, initiating over 200 projects focused on climate-friendly urban redevelopment. Today the InnovationCity Ruhr has become a model for the renewal of the entire Ruhr area, but also to other industrial cities worldwide.**

169 ICLEI Case Studies March 2014


## Abstract

In 2010, with the goal of enhancing overall quality of life and reducing greenhouse gas emissions by 50 percent by 2020, the Ruhr Initiative Group – a consortium of over 70 leading companies in the Ruhr region - developed an innovative project: to transform seven districts in the heart of the city with more than 14,000 buildings and 70,000 inhabitants into a blueprint of energy efficiency. The city itself became a living laboratory for urban redevelopment, sustainable energy and climate change mitigation. Under the motto, "InnovationCity Ruhr", the Initiative Group launched a campaign to find a pilot city to conduct comprehensive urban development, with the final objective of replicating the pilot's successful projects across the Ruhr region. In turn, Bottrop was selected by an independent jury as an ideal candidate for its pilot project concept, "Model City Bottrop".

The "Blueprint" for Bottrop's redevelopment focuses on energy efficiency and renewables in both commercial and residential areas, with measures for environmentally friendly mobility and adaptation of urban space for increased quality of life for its residents.


## The importance of active Public-Private Partnerships

Bottrop is a city with deep roots in coal mining and industry – both economically and culturally. However, structural economic changes due to globalization since the 1970s, coupled with higher environmental standards and policies in Germany since the 1980s, have initiated a post-industrial redevelopment in Bottrop and the entire metropolitan area of Ruhr. These processes are intrinsically interconnected with one another and pose significant adaptation challenges to both public and private interests.

**Population / Land area**
116,498 / 1,200 km² (2012)

**Municipal budget**
$ 458 million (2013)
(€ 330 million)

**Local Economy**
Services, logistics, industry, mining

**Role of city in the region**
Administrative and commercial center within a metropolitan region

InnovationCity Ruhr
Modellstadt Bottrop

# Case Study – Model City Bottrop

**Key elements of Model City Bottrop**

1. InnovationCity Management GmbH
2. Energy consulting
3. Blueprint for replicability
4. Localized neighborhood management
5. Local network structure
6. Scientific research

## InnovationCity Management

The City of Bottrop chose to drive the "Model City Bottrop" project management and coordination forward through the founding of a private company, InnovationCity Management GmbH, comprised of five key public and private shareholders: Initiative Ruhr GmbH – the initiators of the Ruhr initiative, the City of Bottrop, a local energy company (BETREM Emscherbrennstoffe), an industry and public sector consultancy (agiplan), and a real estate company (RAG Montan Immobilien). The company serves as a platform and facilitator to bring together all stakeholders and foster new partnerships and networks.

## Model City through citizen involvement

Over 22,000 citizen signatures were gathered in support of bringing the InnovationCity Ruhr project to Bottrop. Naturally, the role of citizens does not stop at collecting signatures. To achieve the goal of a significant reduction in $CO_2$ emissions, a systematic energy efficient retrofitting of existing buildings was necessary. About 60 percent of the 14,474 buildings in Bottrop's selected pilot area had a high or medium need for refurbishment in 2010. Approximately 12,500 of these buildings are privately owned by residents.

Since November of 2011, InnovationCity Management has offered individualized energy consulting to both households and businesses through their Centre of Information and Advice (Zentrum für Information und Beratung – ZIB). These consultations offer energy efficiency advice to building owners, by analyzing the consumption data of each building. With this data, personalized energy efficient retrofitting proposals are developed, implemented and customized to maximize efficiency for each individual unit. In parallel, informed citizens are motivated by advertising campaigns and targeted events such as InnovationCity Day and community workshops. These events are designed to engage the community and let citizens become part of a project and support its goals.

The energy refurbishment ratio for the pilot district of Bottrop is an impressive 7.82 percent, compared to the German annual average of about 1 percent.

Through the extensive consultation efforts towards homeowners an outstanding energy refurbishment ratio of 7.82 percent was achieved in 2013, outperforming by far the common European and German average rate of energy efficient retrofitting of about one percent.

Image: InnovationCity Ruhr

Citizen Information Center: Model City through citizen involvement

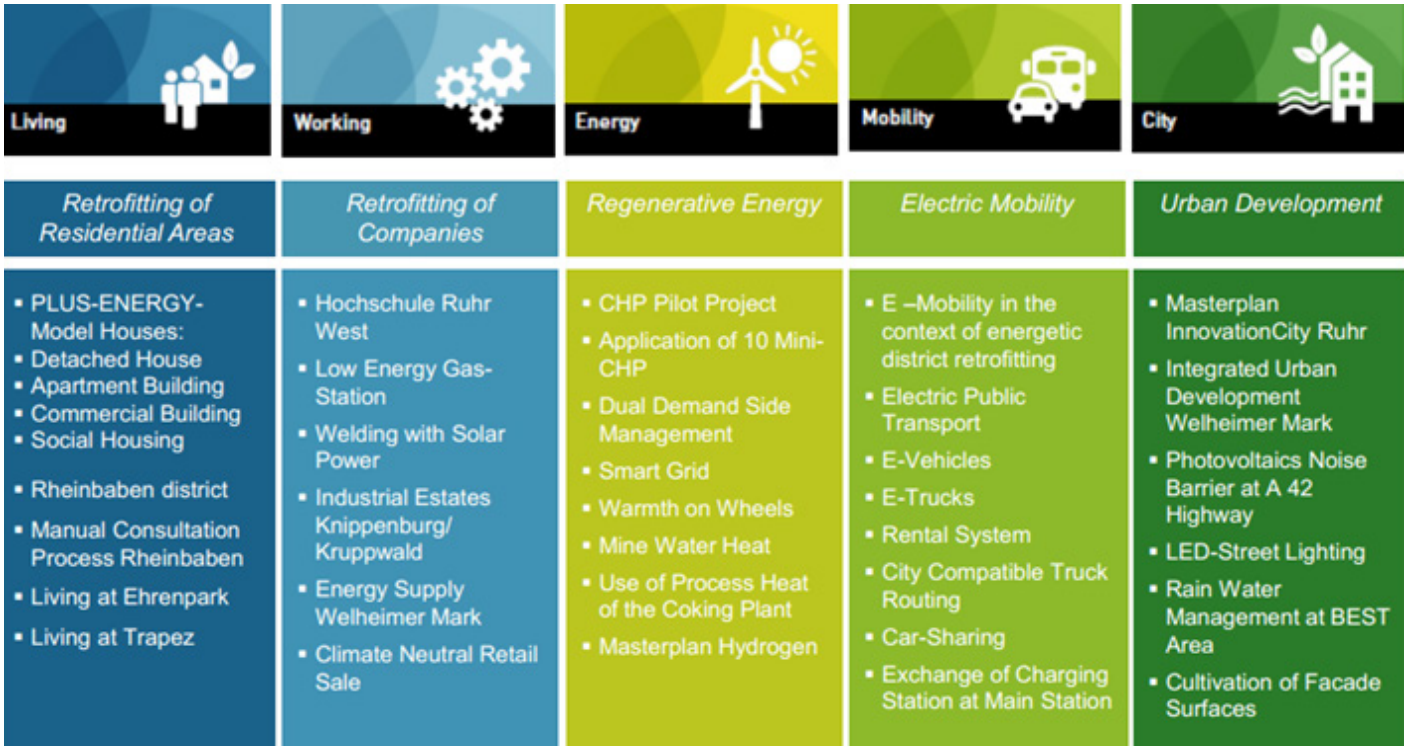
## A Blueprint for climate-friendly urban redevelopment

Since October 2012, InnovationCity Management - together with its local consortium and strategic partners, worked on the creation of an exportable "blueprint" alias "master plan" as an example of successful climate-friendly urban redevelopment. The basis of the Blueprint was conceptualized as a bottom-up approach within the selected seven pilot districts of Bottrop, comprising an area of 70,000 inhabitants in the center of the city. Bottrop's citizens were provided with forums and workshops to express their ideas and visions on how their district and city should look like in the future, which resulted in over 300 concrete individual proposals – another impressive display of active public participation.

The overall Blueprint for technical and process related innovation towards a climate-friendly urban redevelopment focuses on five fields of action, which are understood as open and guiding categories:

- **Living**: systematic retrofitting of privately owned residential buildings
- **Working**: energy efficient retrofitting and synergy potential within the private sector
- **Energy**: smart, decentralized, efficient and renewable energy supply
- **Mobility**: sustainable mobility
- **City**: urban development and integrated management

Source: InnovationCity Ruhr

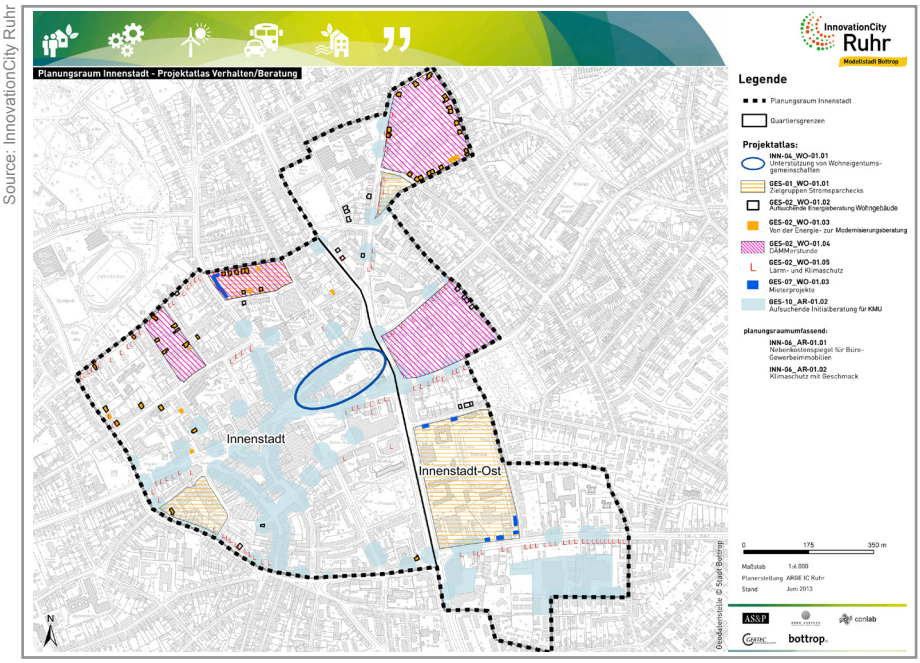



In parallel to the citizen's involvement, InnovationCity Management undertook an 18-month long comprehensive and detailed analysis of the social and infrastructural elements of the pilot district (see map). With more accurate knowledge about citizen's ideas, needs and lifestyles, customized packages of projects could be tailored to specific households or businesses and formulated into an overall blueprint. This analysis, as well as the subsequently developed goals and expectations of the InnovationCity Ruhr project were shared with the targeted stakeholders including citizens.

Consequently, the developed Blueprint has now become a framework to integrate strategies and projects openly into one overarching concept, with the intention of being rolled out in other districts and cities. In particular, it is a guiding model to bundle single energy projects for the systematic refurbishment and development of low-carbon infrastructure for an entire urban area. Individual activities are clustered under the five fields of action and coordinated through locally installed district managers which in turn involve stakeholders in the immediate vicinity of the projects.

Through the Blueprint the City of Bottrop, InnovationCity Management and the Ruhr Initiative Group, now offer specific details and cutting-edge insights on its "living laboratory" to other cities around the globe.

Source: InnovationCity Ruhr




The blueprint for climate-friendly urban redevelopment

## Bottom-up district management for systematic retrofitting

Central to Bottrop's development Blueprint, is the active role of the community within projects and the bottom-up approach to implementation. Following InnovationCity Management's collection ofnumerous suggestions for the redevelopment of the seven pilot districts through citizen planning workshops, district management committees were established. The committees consist of various actors from the community and have the purpose to ensure continuation and ownership of the local decision-making processes and implementation of action. At this level, the interaction of technical, social and economic interests are taken into account, to cater to the appropriate development of each neighborhood's unique project.

In each of Bottrop's pilot districts, a district manager coordinates the integration of all activities, namely: urban renewal, energy efficient retrofitting, historic preservation, energy consulting and social considerations. A pool of district architects then advise building owners on how to best implement an energy efficient retrofitting action plan in accordance with the overall blueprint developed through public and private participation.

In addition to consulting building owners, tenants and businesses, district management committees are also actively involved in outreach to schools in topics of environmental and climate education in cooperation with universities of applied sciences. Together, students assist in research projects, investigate energy related topics, and learn how changes in behavior can help save energy.

### Innovation Handbook:

The finalized Blueprint, compiled into a handbook, demonstrates how climate-friendly urban redevelopment to suit local climatic conditions can be implemented in other cities for local decision makers. Furthermore, it provides examples of best practices on active public-private partnerships and low-carbon projects that enhance local quality of life.

## Local network structure for active partnership

InnovationCity Management has organized networks of local craftsmen, architects and energy consultants and established a partner network for technology and process related innovation within the Ruhr metropolitan region. To ensure the

quality and sustainability of the work performed in Bottrop, members of the network are verified to confirm that they are able to provide high quality and energy-efficient performance. Network members must demonstrate high technical skills such as the preparation of expert reports and thermographic analysis, the installation of heating systems and photovoltaic (PV) systems as well as the planning and execution of building renovations according to the best available standards.

The network communicates via InnovationCity Management through various working bodies, such as the district management committees, along with the community to streamline the implementation of projects.

## Accompanying scientific research

The Bottrop Model City is also from a scientific point of view a unique real laboratory and testing ground for the exploration of possible pathways to a climate-friendly and ultimately carbon-neutral urban redevelopment. Due to the fact that the InnovationCity Ruhr is not restricted to a purely technical approach, but includes targeting aspects of urban development, participation and quality of life, many research disciplines have also gained access to the project. The focus of the accompanying scientific research lies on the initiation and accompanying support of concrete projects under implementation. Hence, experience and new scientific findings are transferred and brought together by all key stakeholders.

Bottrop is one of the first cities that simultaneously tackles climate change and structural change worldwide and together with its citizens, systematically creates a replicable blueprint for low-carbon urban redevelopment.

Scientific participation is facilitated by a Scientific Advisory Board, which was established by InnovationCity Management. It consists of ten universities and nine research institutes, including renowned organizations like the Frauenhofer Institute and the Wuppertal Institute. The Wuppertal Institute, for instance, provides support for assessing and consulting on projects as well as evaluating, supplementing and modifying the Bottrop Blueprint. Further, the affiliated universities are involved in hands-on action. In the Hochschule Ruhr West – University of Applied Sciences, the students of Information Technology and Energy Systems not only partake in project design and monitoring of the Blueprint, but started to convert a university building into an “Energy Campus Lab”.

## Grassroots energy transition

Significant for the replicability of the Blueprint is that the strategy and concept of InnovationCity Ruhr is based on a “grassroots energy transition”. The objective of this transition is to change the dependence on fossil energy carriers and how the energy system is organized from the micro to the macro level. Thus, the grassroots energy transition focuses on scaling energy savings and efficiency, producing electricity and heat locally through combined heat and power generation (CHP) and renewable energy generation, as well as building up a decentralized energy system with smart micro-grids and energy storages.

Moreover and most innovatively, this grassroots energy revolution intends to change the role of energy consumers into “prosumers”. This means that consumers are not only using energy with awareness, but actually take part in its production as well. Through capacity building and the location of energy production in the immediate vicinity of people, consumers once unsure about where their energy came from are now active in its production and the promotion of a decentralized energy supply.

## Five project examples out of the Blueprint

Image: RWE / André Laaks

### Living: More than future homes

One of the flagship projects of Model City Bottrop is ZUKUNFTSHÄUSER+ (future home plus). ZUKUNFTSHÄUSER+, supported by industry partners, aims to incite a ripple effect by being a showcase for the greater InnovationCity Ruhr concept. In this project, three types of existing buildings – a single family, multifamily, and commercial building – were retrofitted to become energy plus buildings, creating more energy than they consume. Moreover, a newly constructed multi-family home has become North-Rhein Westfalia's first energy plus house in the social housing sector. Six families now enjoy subsidized housing and low energy costs. The established concepts and references of ZUKUNFTSHÄUSER+ serve as a guiding module within the Blueprint handbook.

Image: Technoboxx

### Working: Sun welds steel

Technoboxx, a local metal processing company has installed over 1,500 square meters of photovoltaic (PV) panels to power their energy intensive industrial processes such as welding and milling. Operating under the motto "sun welds steel", Technoboxx not only produces enough energy for its own yearly demand, but is able to generate an impressive surplus of 60,000 kWh – making it an energy self-sufficient company as well as a powerhouse. Now to further reduce the total $CO_2$ emissions, Technoboxx plans to install energy storage systems and implement heating and water heating systems powered by energy efficient renewable raw material pellet technology. The company's diversified effort of reducing $CO_2$ emissions even while working in one of the most energy intensive sectors of industry, is a prime example of how active, committed and innovative industrial players can absorb and strive for the potentials within InnovationCity Ruhr.

Image: InnovationCity Ruhr

### Mobility: City smart truck routing

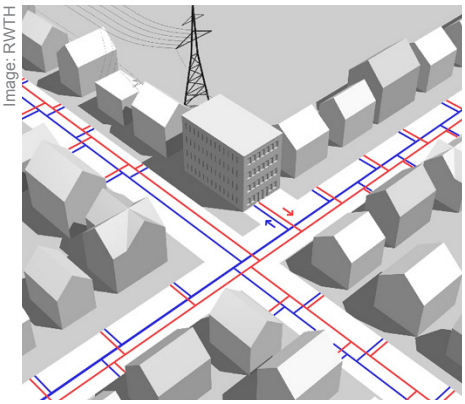
Accessibility of commercial and industrial companies will be optimized for traffic load through city-smart truck routing. Road restrictions and suitability of roads for truck traffic are analyzed and monitored. This data feeds into the City's transport concept and is also passed on to the producers to truck navigation systems. Hence, the most efficient route is calculated with the navigation devices and trucks are routed to business locations in the quickest, safest, and most environmentally friendly way. Information such as delays, detours and difficult traffic conditions are also provided on this platform.

Image: InnovationCity Ruhr

### Energy: 100 combined heat and power systems

Combined generation of heat and electricity can increase energy production efficiency by 90 percent. As part of a larger European project, "100 CHP in Bottrop", one hundred combined heat and power plants have been installed in a representative cross-section of homes and businesses for Germany. Therefore the one hundred CHP plants serve as guiding examples and hub of experience for their replication within the larger Blueprint. The "power-generating heating" is tested in the "living laboratory" of Bottrop daily. Moreover, the "power-generating heating" units are now closely monitored in its daily use so that their operation can be optimized and further lessons can be learnt for the selected variety of building types.

Image: RWTH



### Energy: Dual demand side management

The increasing development of renewable energy can lead to significant capacity fluctuations in the power grid. These variations must be compensated with a suitable storage technology. With the "dual demand side management" project, these problems are explored together with RWTH Aachen University, to find ways how buildings and neighborhoods can be used to create an intelligent energy system capable of storage and displacement of fluctuating energy levels from different renewable energy sources. Dual demand technology aims to build up the ability to draw energy from both a central energy generation source as well as decentralized energy supply sources. For displacement and reduction of additional loads to the power grid, the thermal dynamics of the buildings are also taken into consideration in the project.

## Budget and Finances

In the InnovationCity Management GmbH, the staff from the City and industry continuously enhance the overall project framework, steer the management and work on the now over 200 individual projects. Currently, there is a core team of 25 employees ensuring the success of the InnovationCity Ruhr's ambition, of which five persons are part of the City Bottrop's administration.

In 2013 the project InnovationCity Ruhr had a budget of approx. € 1.8 million of which € 700,000 was dedicated to the development of the Blueprint through InnovationCity Management GmbH. For the Blueprint the project received 40 percent co-funding from the State of North Rhine-Westphalia. Moreover, InnovationCity Management generates additional revenues through service contracts with its partners and the renting of their exhibition (Marketplace Climate Protection), and finally also receives a contribution by the Ruhr Initiative Group GmbH.

## Lessons learned and replication

Bottrop has ambitious goals to redevelop itself and adapt to meet the changing needs of its citizens and industry and protect the environment they inhabit.

The Bottrop Model City project is a unique example of how a City, as well as a region, can overcome local and regional challenges through political commitment and successful public-private partnerships. Within the last three years the City has already kicked off over 200 individual projects and over 170 more are in the pipeline. Investments in innovative environmentally friendly infrastructure and climate protection services pay off through development and research of new technologies and appliances – stimulating new industry and tax revenue for the City of Bottrop, direct benefits to local construction companies and businesses, and the reduced heating and electricity costs to both citizens and businesses alike. Therefore both the risks and the rewards of a low-carbon urban redevelopment path are numerous. Consequently:

**An *active* public and private participation is of high importance in order to bundle resources, find synergies, but also achieve social acceptance**. All-encompassing partnerships in projects such as InnovationCity Ruhr have been most successful when members of the public, corporate, civil and academic sectors worked proactively together to approach common goals.

**Bottrop ensured that outreach and active participation of citizens has been a strong component of InnovationCity Ruhr right from the start**. Grass-roots involvement has been key to achieving small-scale and localized energy sources that are cross-linked to surrounding buildings through intelligent energy management systems instead of traditional high cost infrastructure, such as overhead power lines. In addition, investing in improving households' energy efficiency has ensured that the energy produced is consumed as efficiently as possible. The Model City Bottrop therefore owes its ambitious achievements to the City's strategy to involve and activate its citizens, particularly through a crucial feedback loop for acceptance, coupled with consultations.

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**City of Bottrop**:
www.bottrop.de

**Engaging private partners as well as scientific institutions**. In this unprecedented public-private partnership in Germany, over 50 private partners, 15 scientific institutions and 5 Federal and State Ministries, combined with actively organized citizen participation, formed the foundation for exchange, funding and implementation of the German flagship project Model City Bottrop.

Most importantly, **the creation of a blueprint and the guidance provided by CityInnovation Management ensures that cities and towns throughout the world are able to follow InnovationCity Ruhr and replicate Model City Bottrop**. The handbook of the Blueprint contains information about advisory structures, project management tools and concrete project examples for systematic retrofitting of privately owned residential buildings (Living), energetic modernization and synergy potential within the private sector (Working), smart, decentralized, efficient and renewable energy supply (Energy), sustainable mobility (Mobility) as well as urban development and integrated management (City). In adopting this, it enables decision makers to tackle climate change and structural change simultaneously and systematically, to revitalize former industrial regions and at the same time enhance the quality of life of local citizens. Political will and an active public and private participation is of high importance in order to bundle resources, find synergies, but also achieve social acceptance and swift implementation of action.

## Acknowledgements

We would like to thank the German Federal Land of North Rhine-Westphalia through the State Chancellery for their financial contributions to this case study in the framework of supporting the carbonn City Climate Registry.

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carbonn Climate Registry

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