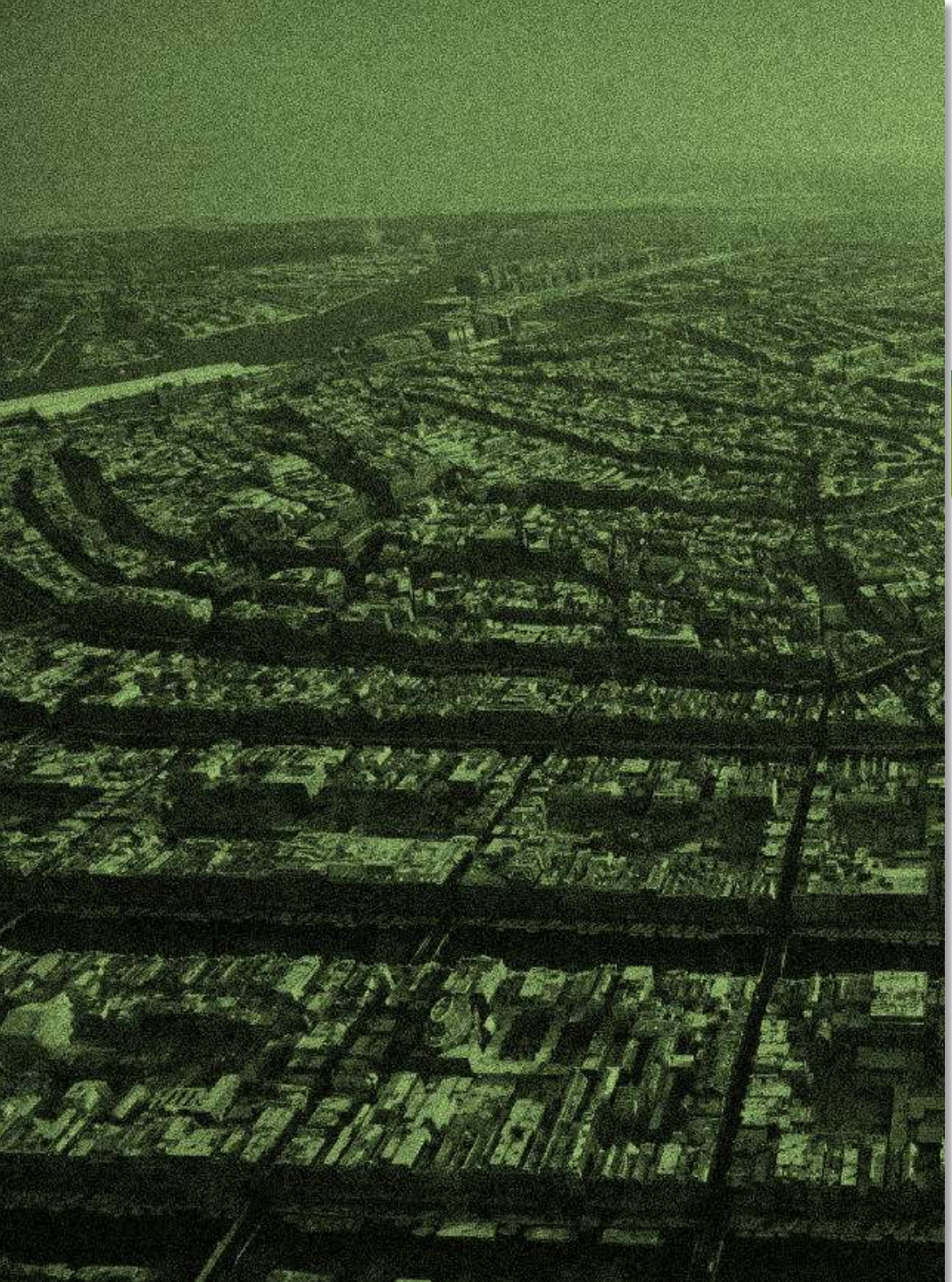


TRANSFORM

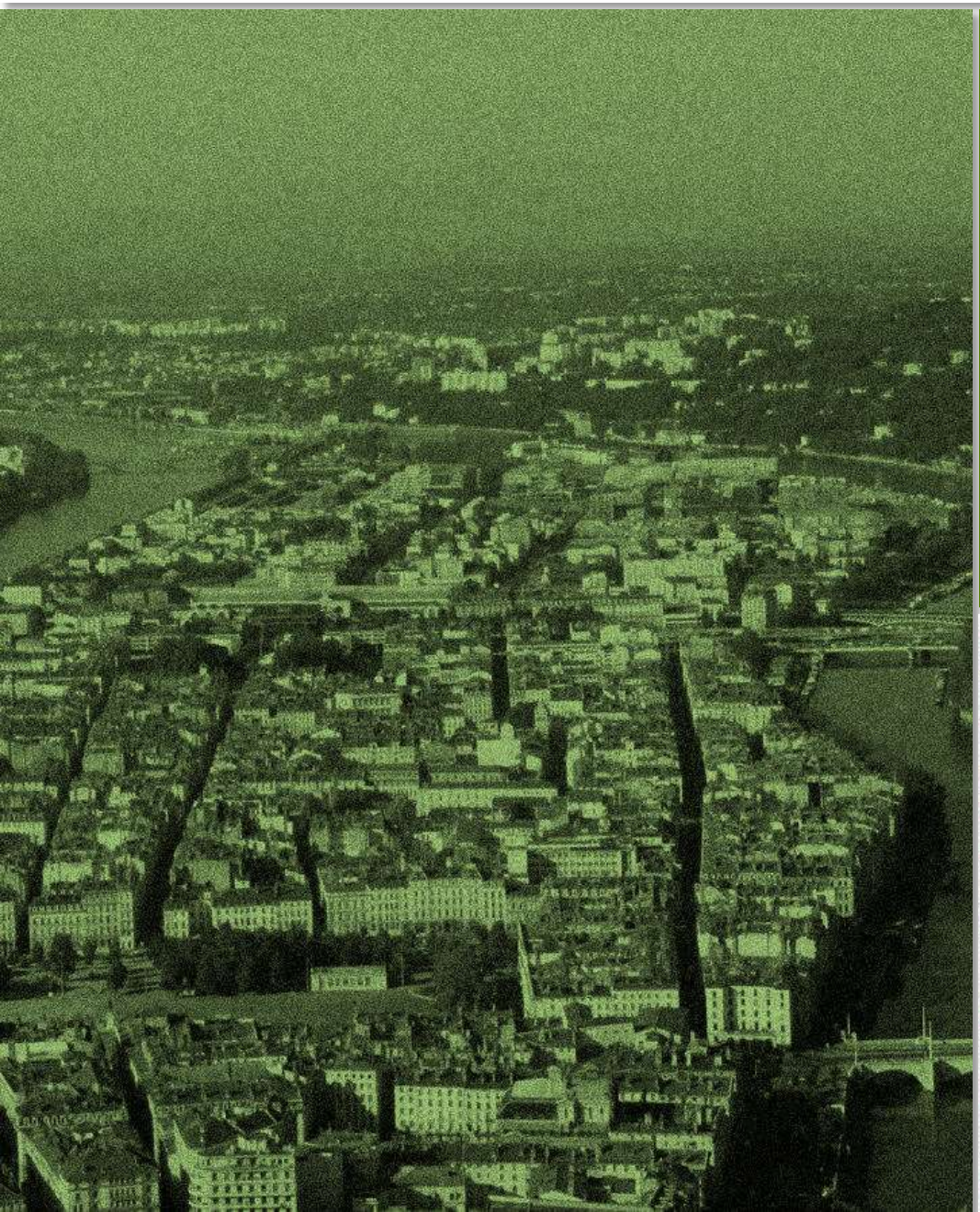
The smart way to transform a city to low carbon

TRANSFORM decision support environment

accenture

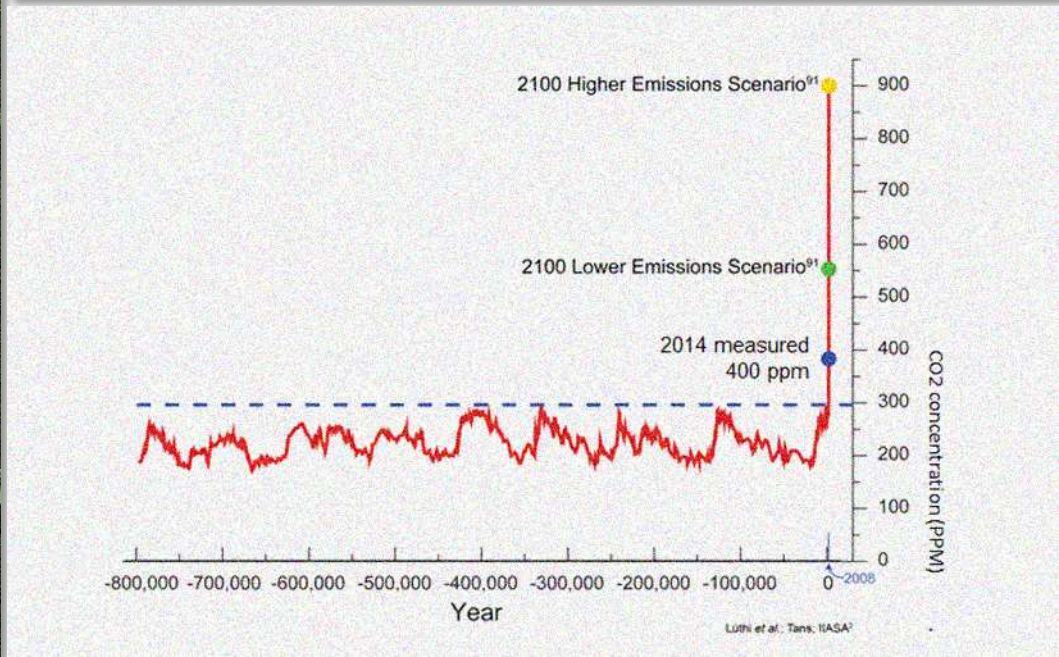
AIT AUSTRIAN INSTITUTE OF TECHNOLOGY

The need for action

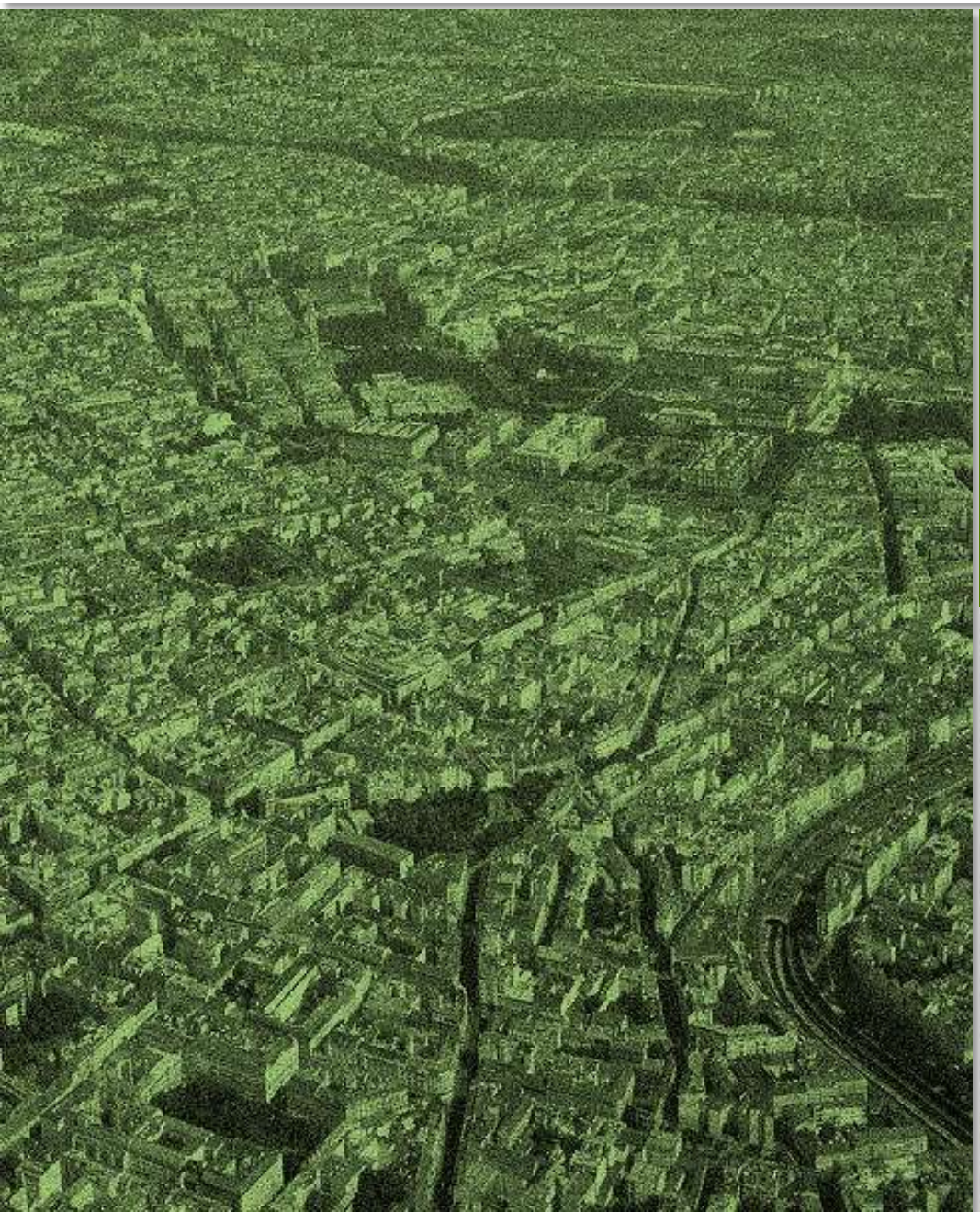


The climate is changing, and to keep this world a livable place for the human kind we need to …

- Start a radical reduction in carbon emissions now
- Understand that a 2 degrees challenge is real and critical

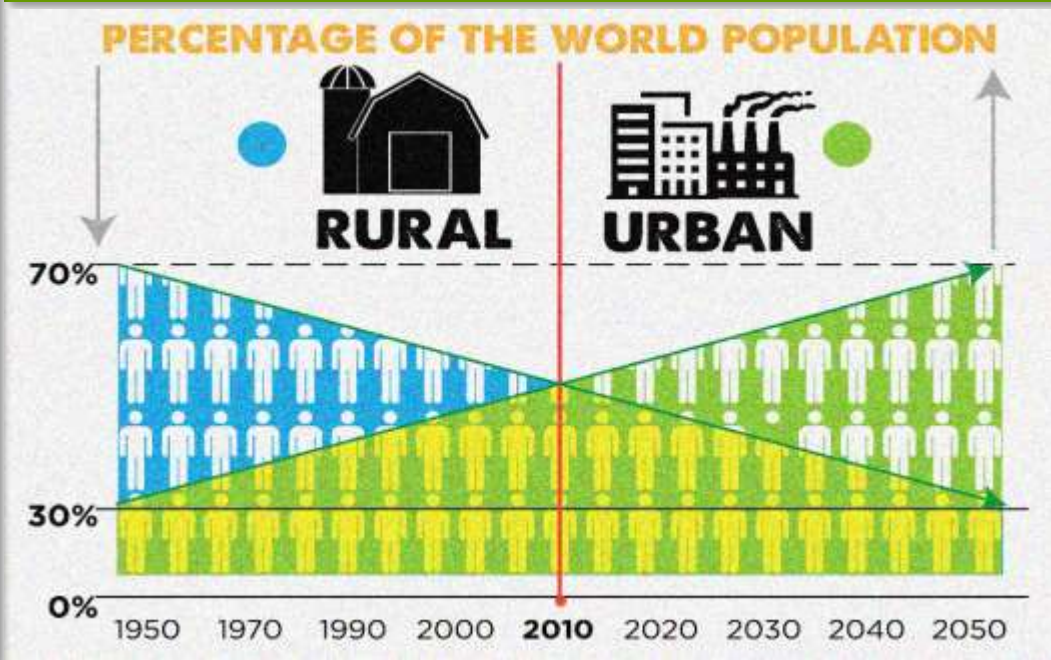


The role of the cities

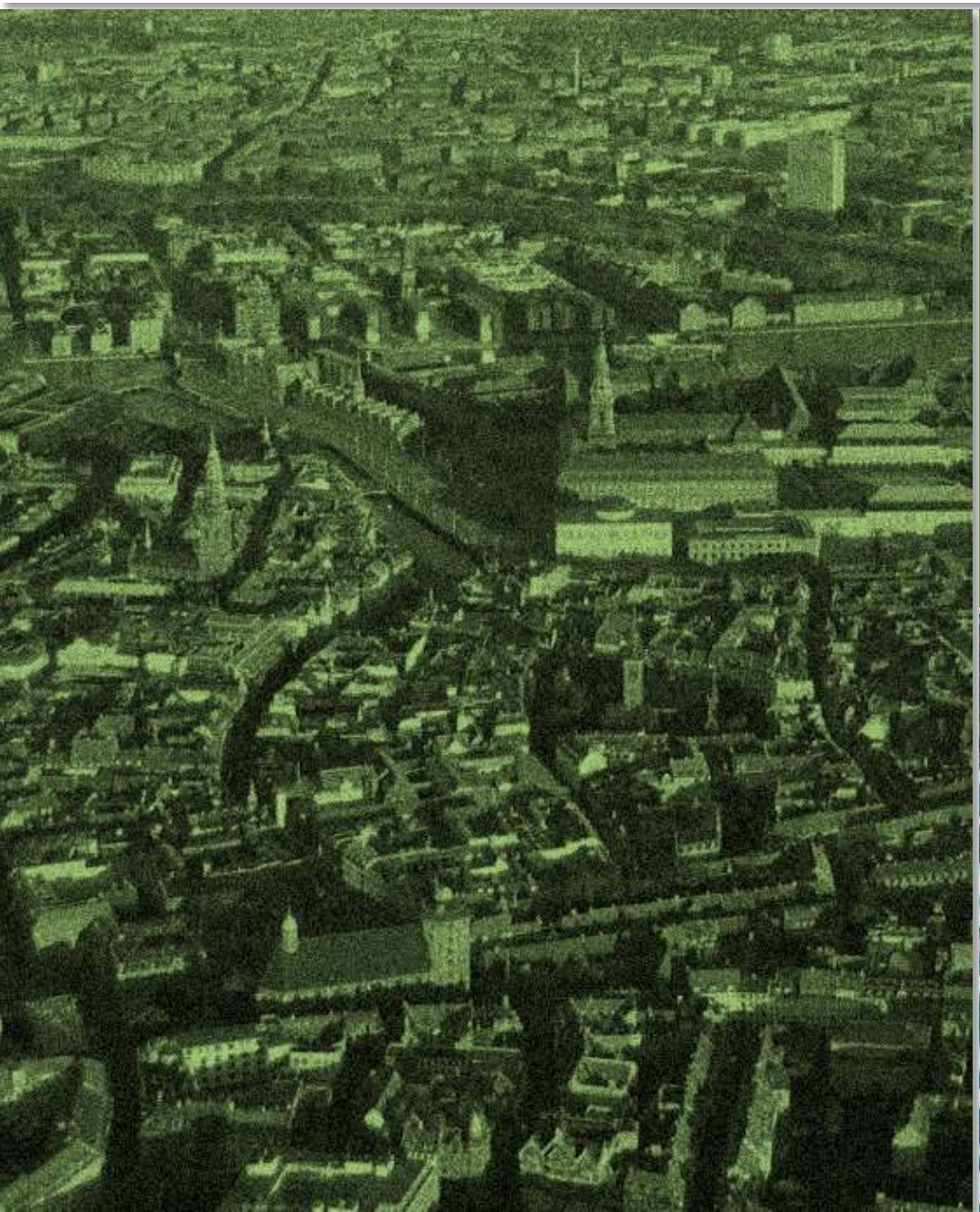


Cities are the right place to start actions for making a positive impact on the climate because …

- Cities are home to over 50% of global population
- They contribute to more than 75% of global CO2 emissions
- They can act much faster than national governments



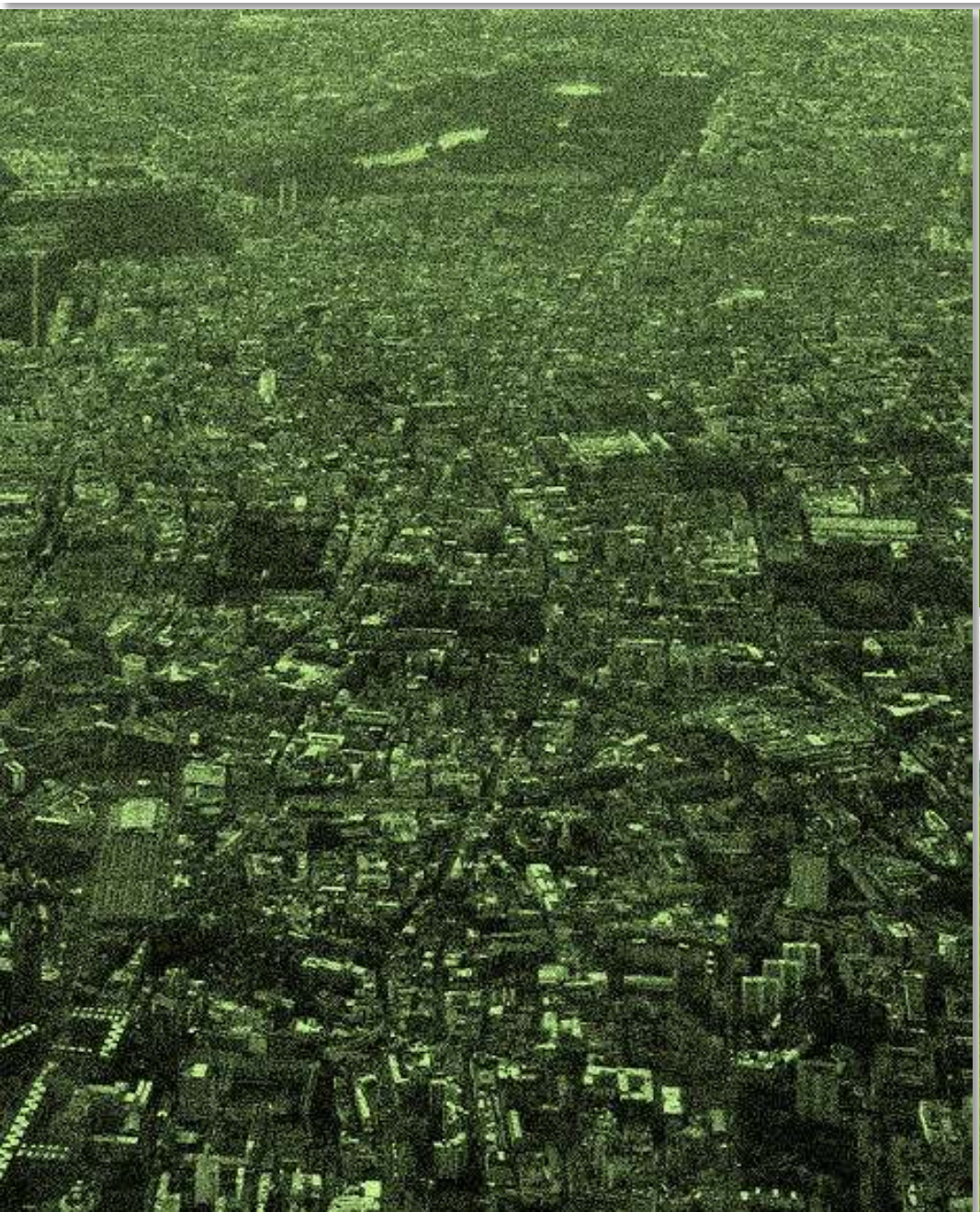
The key challenges



Cities are however struggling to …

- Enable open and fact-based dialogue with stakeholders
- Understand which measures will have the most impact
- Make strategic energy-related decisions
- Get both political and societal commitment to act

TRANSFORM program



TRANSFORM program is one of the EU initiatives aimed at responding to the challenges cities are facing and enabling these cities to …

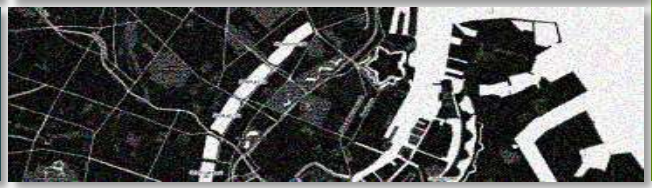
- Engage a broad spectrum of stakeholders
- Define ways to drastically reduce their CO2 emissions
- Transform themselves to low carbon cities

TRANSFORM program

TRANSFORM cities

Amsterdam

Copenhagen



Genoa

Hamburg

Lyon

Vienna

TRANSFORM program is …

- Run by a consortium of 6 leading European cities and their 13 partners
- Developing methods and tools aimed at enabling cities to transform themselves into low carbon and smart energy cities on a district as well as a city level
- Focused on helping cities achieve their energy and climate targets

EU energy and climate targets

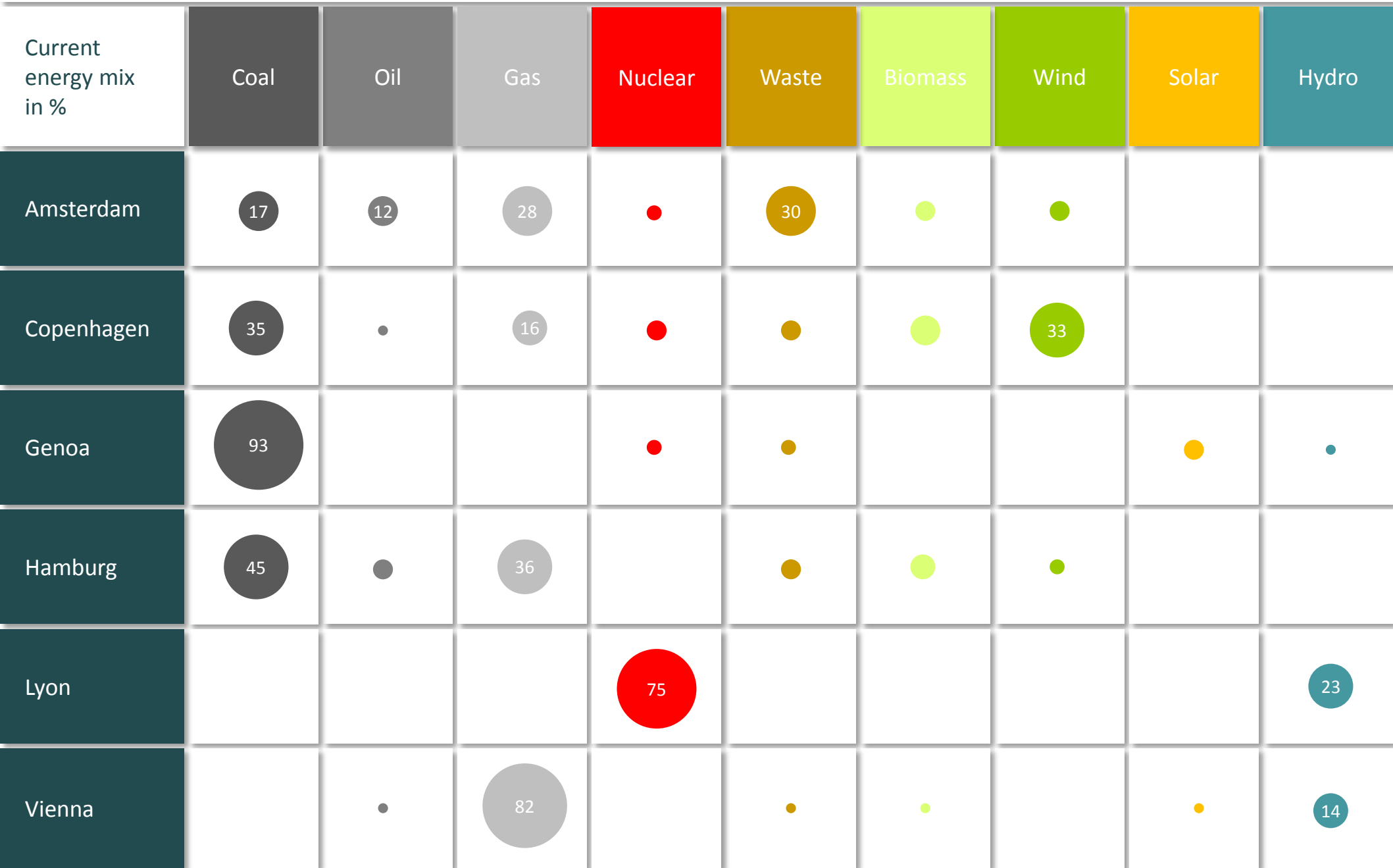
Efficiency in energy consumption

Generation of renewable energy

Carbon emissions

TRANSFORM program – Partners

TRANSFORM program – Cities current energy mix



TRANSFORM program – Cities' ambitions

	Political commitments behind the TRANSFORM program	Current emissions & reduction targets
Amsterdam	The Amsterdam of the future will be a city that can provide its own energy needs. A city where each individual can be proud on its independence and their own initiative. Department of Climate and Energy Municipality of Amsterdam	5.094.000 t - 40% CO2 by 2025
Copenhagen	A sustainable world starts with sustainable cities. In Copenhagen, we have kept that thinking in mind as we approach our own challenges. Now, we are making our solutions available to cities everywhere. Frank Jensen, Lord Mayor of Copenhagen	2.124.312 t - 100% CO2 by 2025
Genoa	The future of Genoa is a sustainable city whose identity and development are inextricably linked to the harnessing of its natural resources. Genoa Municipality	2.271.913 t - 24% CO2 by 2020
Hamburg	Hamburg will continue to make its contributions towards reaching the national climate protection goals: to reduce CO2 emissions by 40% by 2020 and by at least 80% by 2050. Senate of the Free and Hanseatic City of Hamburg	11.445.000 t - 40% CO2 by 2020
Lyon	Our community in 2007 set itself the goal of a 20% reduction in greenhouse gas emissions by 2020 and aims to reduce them by 75% by 2050. Gerard Collomb, Senator-Mayor of Lyon and President of the Greater Lyon Urban Community	7.500.000 t - 20% CO2 by 2020
Vienna	Protecting our resources and strengthening our economy to provide a basis for social justice are the main challenges for the cities in the 21st century. Dr. Michael Häupl, Mayor of Vienna	9.194.000 t - 21% CO2 by 2020

TRANSFORM program – Program structure

Current state and ambition Work package 1	Smart energy city vision and current state leading to a trajectory for becoming a smart energy city	
Transformation agenda Work package 2	An addition to current city strategies leading to an integrated and focused approach to planning	
Quantitative decision support Work package 3	Web-based decision support environment leading to informed decisions based on city data	
Smart urban labs Work package 4	Implementation plans leading to direct impact on ongoing urban redevelopment projects	

TRANSFORM program is …

- An integrated and focused approach to capturing and promoting synergies within and between cities
- Facilitating the development of each city's specific contribution to the achievement of smart energy city objectives

TRANSFORM program – Current state and ambition

Current state and ambition

Work package 1

Transformation agenda

Work package 2

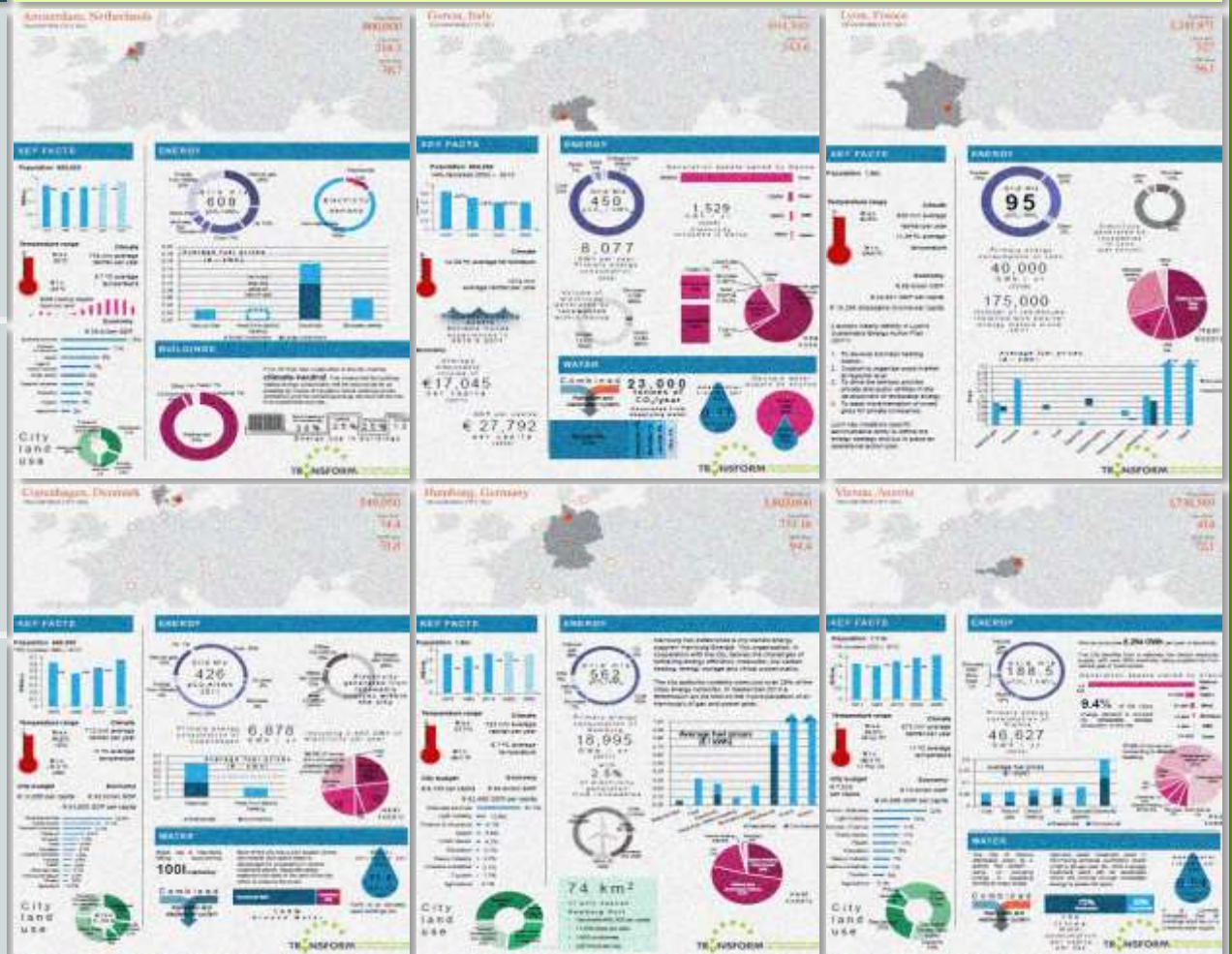
Quantitative decision support

Work package 3

Smart urban labs

Work package 4

Determining the cities' current state and ambition is part of the program focusing on each city's context in terms of climate, energy consumption, ambitions, targets, and main possibilities in terms of energy efficiency, flows, production.



This part of the program …

- Draws largely on existing strategic energy action plans, climate action plans, and urban development plans
- Defines what a smart energy city is, what the key performance indicators are, and how these relate to where the cities and the living labs are at the moment
- Creates an oversight on gaps and barriers for becoming a smart energy city on both a strategic and a tactical level

http://urbantransform.eu/about/smart-energy-city/

TRANSFORM program – Transformation agenda

Current state and ambition

Work package 1

Transformation agenda

Work package 2

Quantitative decision support

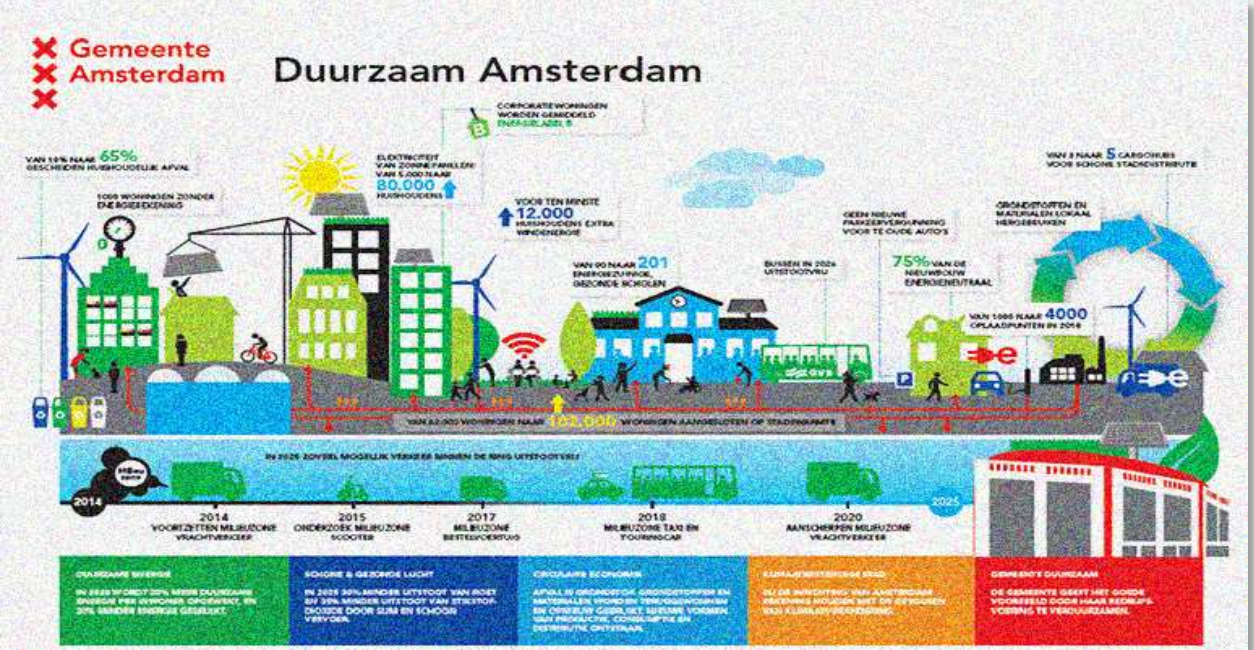
Work package 3

Smart urban labs

Work package 4

Development of the transformation agenda is part of the program focusing on each city's vision and commitment around energy efficiency measures and actions that need to be taken by different stakeholders in the city, in order to make a city low carbon.

Working towards a Transformation Agenda will support cities in their strive for integrated energy planning, through the combination of strategy and operations. By making Transformation Agendas for the city as a whole, urban strategy is combined with the operational level of tangible implementation plans for city districts, embedded in urban planning and the local city specific context.



This part of the program …

- Defines the way for meeting the 2020 and 2050 targets
- Looks beyond the political borders of cities to their energy borders
- Addresses the main components influencing energy production and consumption, as well as possible energy efficiency in flows of water, waste, IT, and mobility
- Is based on qualitative and quantitative insights and contains a financial strategy
- http://urbantransform.eu/about/transformation-agenda/

TRANSFORM program – Smart urban labs

Current state and ambition

Work package 1

Transformation agenda

Work package 2

Quantitative decision support

Work package 3

Smart urban labs

Work package 4

Smart urban labs are part of the program focusing on specific urban development projects in partnering cities.

Amsterdam Zuidoost: Transformation of an area of 3km^2, including main sport arena, offices, leisure, shopping, hospital, data centers, and an energy plant.	Amsterdam
Nordhavn – Redevelopment of a port area towards a CO2 neutral, mixed-use lively new neighborhood for living and working.	Copenhagen
Mela Verde – A port area that will be transformed into a new carbon-low urban area with a technology master plan.	Genoa
IBA Wilhelmsburg – Transformation of a partly industrial zone into a mixed-use urban area, combining housing, industry, harbor, water, and open spaces.	Hamburg
Part Dieu – A central district from the 1960s is transformed into a mixed-use area, including offices, residential and commercial areas.	Lyon
Seestadt and Liesing – Greenfield and brownfield development, including 20.000 apartments, 20.000 work places, public transport, social and smart infrastructure.	Vienna

This part of the program …

- Involves all stakeholders of specific urban development projects in planning and implementation of smart energy city measures
- Ensures that approaches and tools that have been developed by the overall program are effectively used during the planning phase of each urban lab
- http://urbantransform.eu/about/smart-urban-labs/

TRANSFORM program – Decision support environment (DSE)

Current state and ambition

Work package 1

Transformation agenda

Work package 2

Quantitative decision support

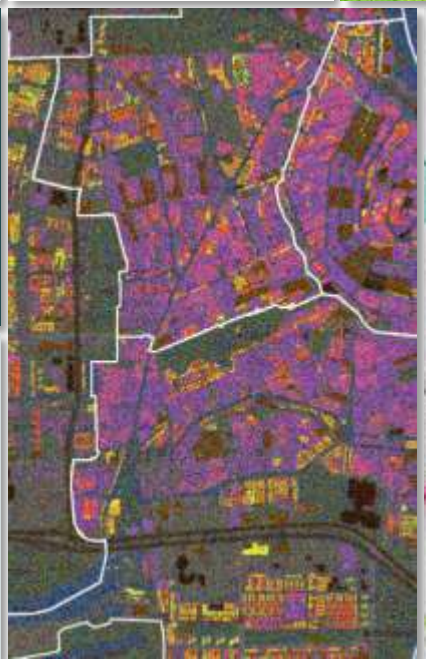
Work package 3

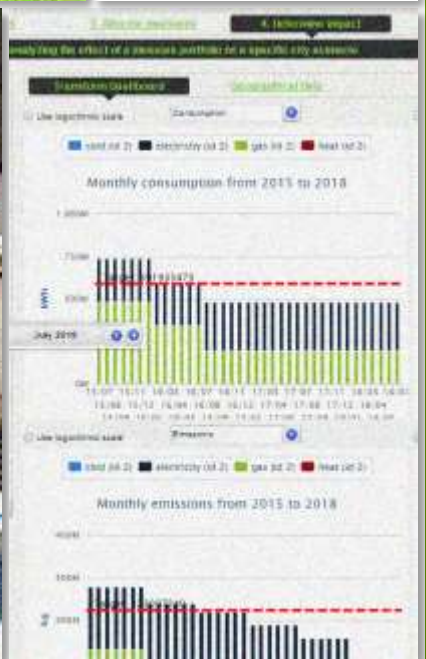
Smart urban labs

Work package 4

Quantitative decision support is part of the program focusing on development of an open source web-based decision support environment (DSE) that is optimized for each city and enables informed decisions based on city specific data.

Data → Measures → Impacts





This part of the program …

- Develops an advanced visualization and simulation tool, that uses detailed city-specific data to help define and test possible future scenarios for achieving their energy and emission targets
- Enables visualization of finely grained geo-specific city data
- Supports definition and testing of different carbon reducing measures
- Helps providing insight on possible impacts of these measures on future energy use and emissions
- http://urbantransform.eu/about/energy-atlas/

TRANSFORM DSE – Translation of data

Translate data

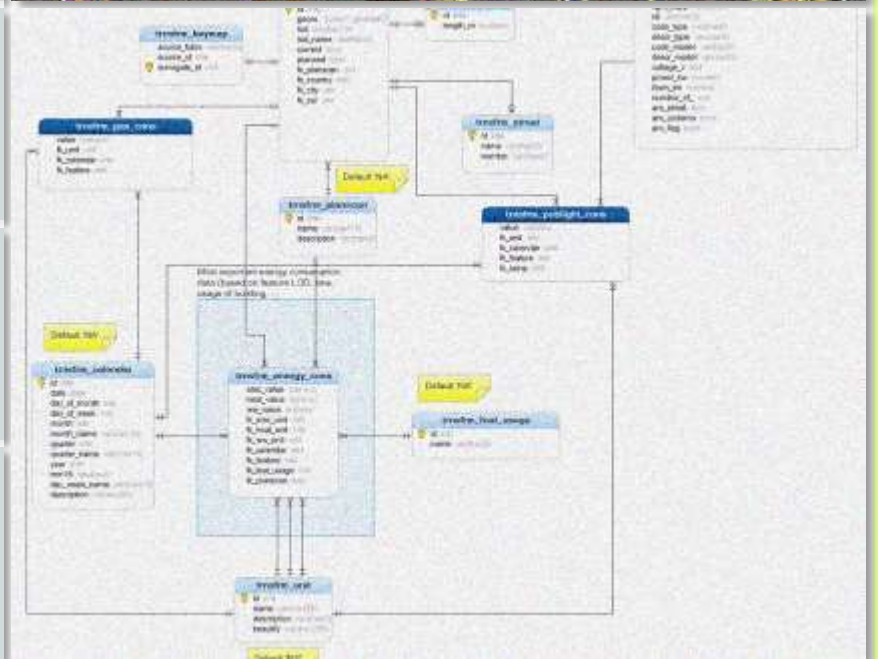
Analyze context

Set scenarios

Define measures

Allocate measures

Analyze results



Before working with the decision support environment users need to …

- Gather city-specific geospatial and energy-related data on a granular level from different data owners (e.g. energy suppliers, municipality, network companies)
- Clean-up and combine data from different sources and formats and aggregate privacy-sensitive data
- Enrich energy consumption data by using statistical analysis, upload data into the Transform database, and connect it to the web interface

Some of the data used …

- Electricity consumption
- Natural gas consumption
- Building energy label
- Building function
- Solar potential
- Aquifer thermal storage potential

Data to information

Information to insights

Insights to action

TRANSFORM DSE – Current data availability

Translate data

Analyze context

Set scenarios

Define measures

Allocate measures

Analyze results

Data currently available in DSE	Number of data points	Building data	Energy consumption				Energy generation potential				
			Electricity	Gas	Heat	Cold	Solar	Wind	Aquifer	Geothermal	Waste heat
Amsterdam	173,000 buildings	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓
Copenhagen	20 buildings	✓	✓	✗	✓	✗	✓	✗	✗	✗	✗
Genoa	55.000 public light units	✗	✓	✗	✗	✗	✗	✗	✗	✗	✗
Hamburg	82.000 buildings	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗
Lyon	127 buildings	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗
Vienna	128 buildings	✓	✓	✓	✗	✗	✓	✗	✗	✗	✗

Data to information

Information to insights

Insights to action

TRANSFORM DSE – Analysis of the context

Translate data

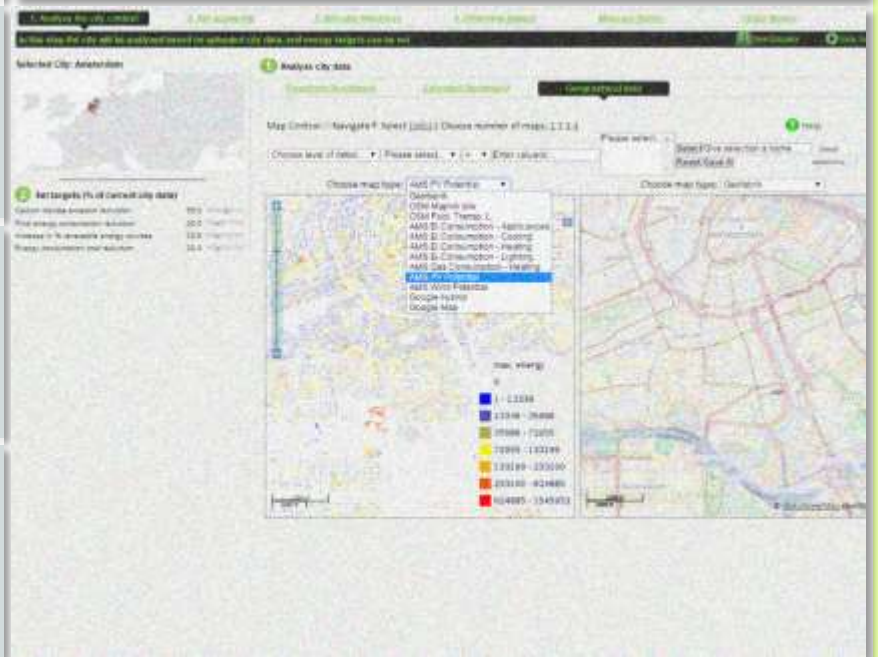
Analyze context

Set scenarios

Define measures

Allocate measures

Analyze results



During the 'analyze context' phase of working with the DSE users can …

- View different energy and climate KPIs from the city (e.g. natural gas consumption, CO2 emissions, energy costs)
- Run data queries on different spatial levels (buildings, blocks, districts) and across different energy and climate related indicators to identify potential opportunities
- Zoom in on city maps to see where the biggest impact on achieving energy and climate targets can be made
- Set city's energy and climate performance targets against which the impact of proposed portfolios of measures will be assessed

Data to information

Information to insights

Insights to action

TRANSFORM DSE – Setting of scenarios

Translate data

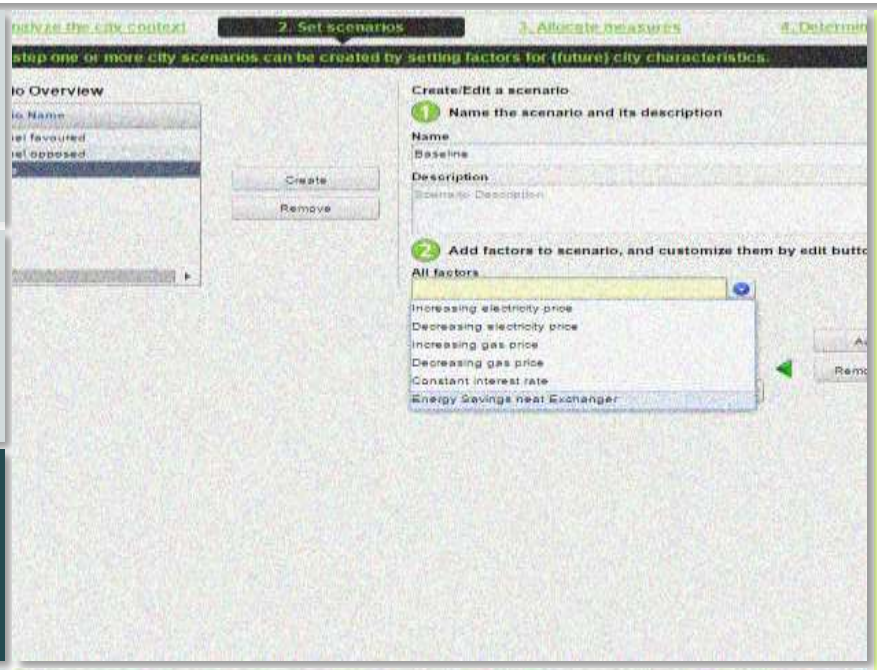
Analyze context

Set scenarios

Define measures

Allocate measures

Analyze results



During the 'set scenarios' phase of working with the DSE users can …

- Identify variables that are outside of the direct control of the city and will be used as part of sensitivity analysis (e.g. energy prices)
- Create custom scenarios by defining values for different variables in time (e.g. energy price development, socio-demographic factors) or load existing scenarios (e.g. country averages)

Data to information

Information to insights

Insights to action

TRANSFORM DSE – Definition of measures

Translate data

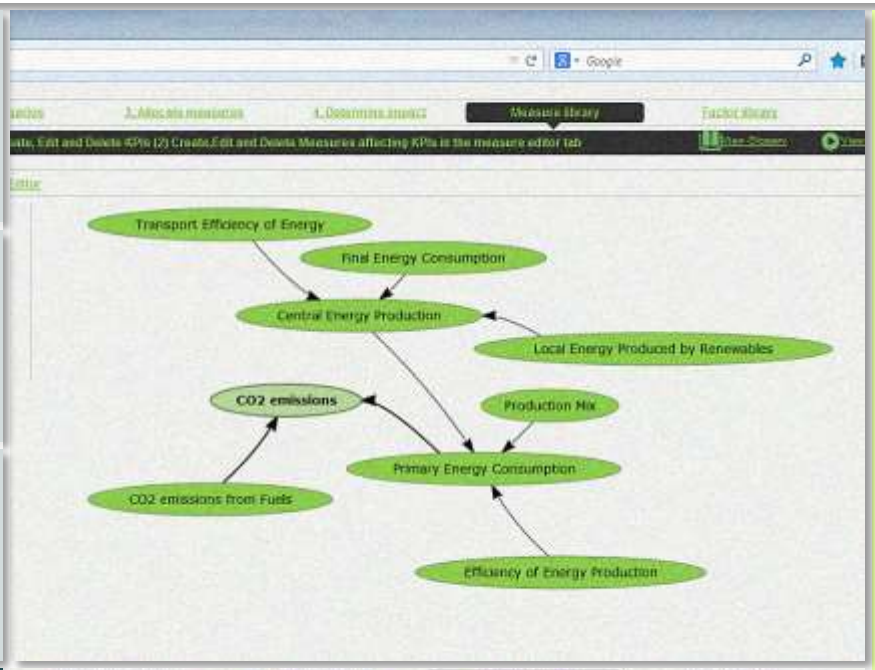
Analyze context

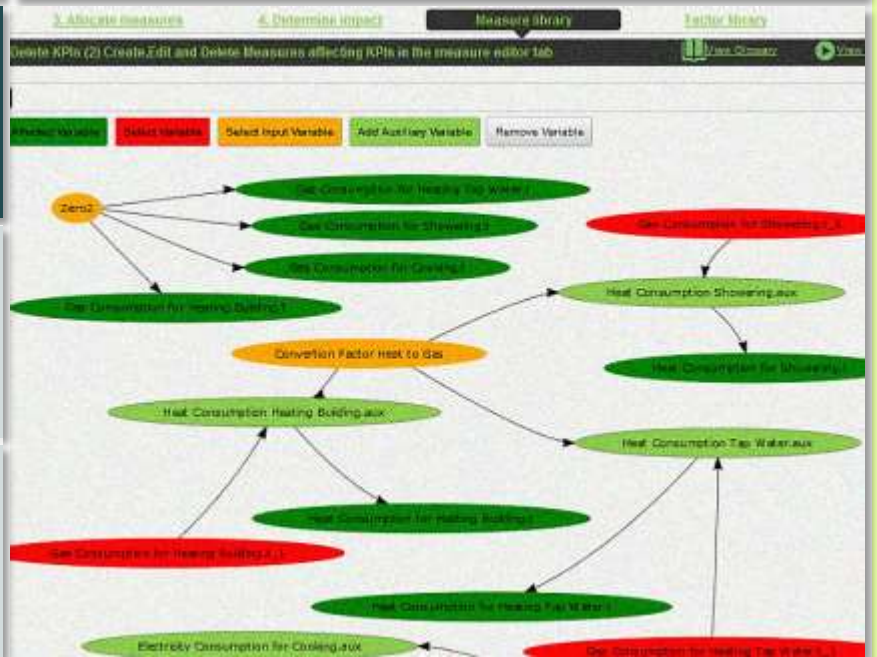
Set scenarios

Define measures

Allocate measures

Analyze results





During the 'define measures' phase of working with the DSE users can …

- Use the KPI Definition editor to define, construct, and edit the algorithm logic behind key performance indicators (e.g. carbon emissions)
- Use the Measure editor to define, construct, and edit the algorithm logic behind different measures aimed at helping the city reach its energy and climate targets (e.g. thermal grid extension)
- Store different measures in the measure library for later use

Data to information

Information to insights

Insights to action

TRANSFORM DSE – Some of the measures implemented in DSE

accenture

TRANSFORM

Translate data

Analyze context

Set scenarios

Define measures

Allocate measures

Analyze results

Solar PV panels on the roof or façade

Wind turbines

Air source Heat Pump

Micro CHP

District heating and cooling grid

Window replacement

Shower Heat Exchanger

LED lighting

Insulation

Aquifer thermal storage (open system)

Data to information

Information to insights

Insights to action

TRANSFORM DSE – Allocation of measures

Translate data

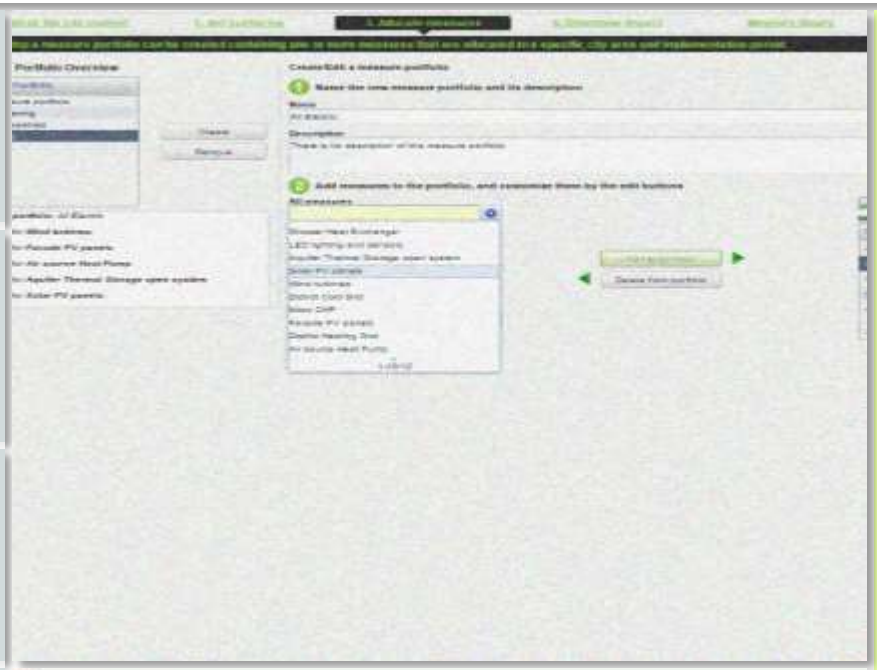
Analyze context

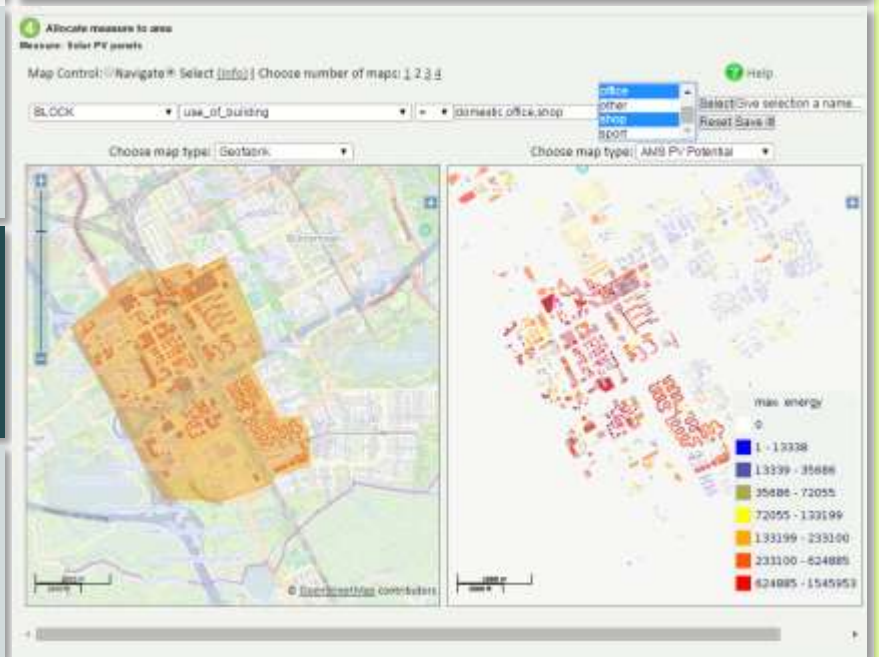
Set scenarios

Define measures

Allocate measures

Analyze results





During the 'allocate measures' phase of working with the DSE users can …

- Combine measures to create different measure portfolios, mimicking actual decision making processes within the specific context of a city
- Select the area for allocating measures by drawing a freehand polygon directly on the map in addition to using a variety of selection criteria (e.g. energy label of buildings, ownership of buildings)
- Allocate and apply measures to selected districts, streets, blocks or buildings and determine the timing, rollout speed, and penetration rate for each of the allocated measures
- Define alternative implementation plans by creating different combinations (portfolios) of measures

Data to information

Information to insights

Insights to action

TRANSFORM DSE – Analysis of results

Translate data

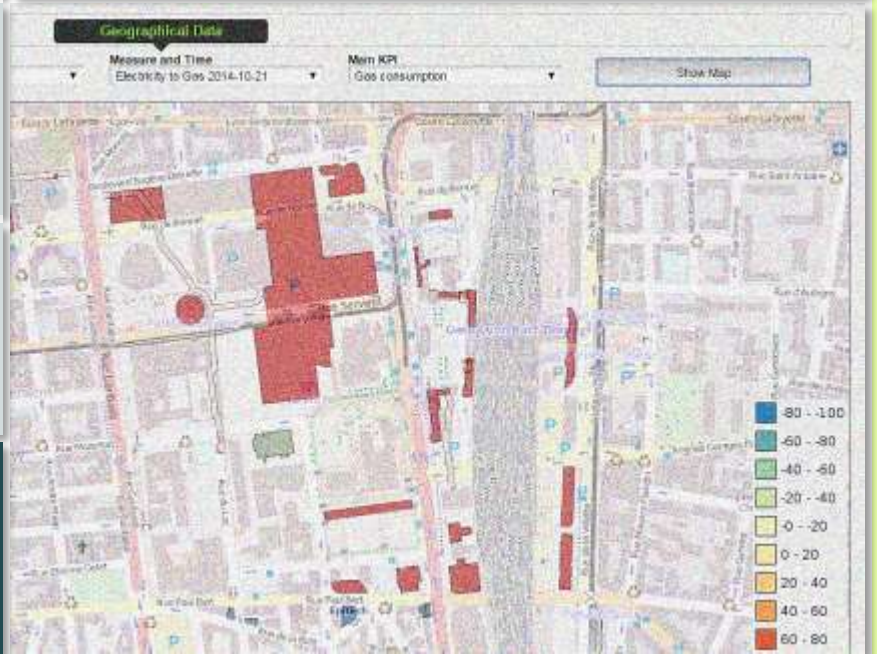
Analyze context

Set scenarios

Define measures

Allocate measures

Analyze results



During the 'analyze results' phase of working with the DSE users can …

- Run simulation experiments – a combination of selected scenarios and measure portfolios in time
- View projected results in time (via detailed graphs, charts, and maps) to assess the impact of different implementation plans on achieving city's energy and climate targets
- Analyze projected results by looking at different KPIs in time, review city's targets, identify gaps, optimize different measure portfolios, and redefine implementation plans

Data to information

Information to insights

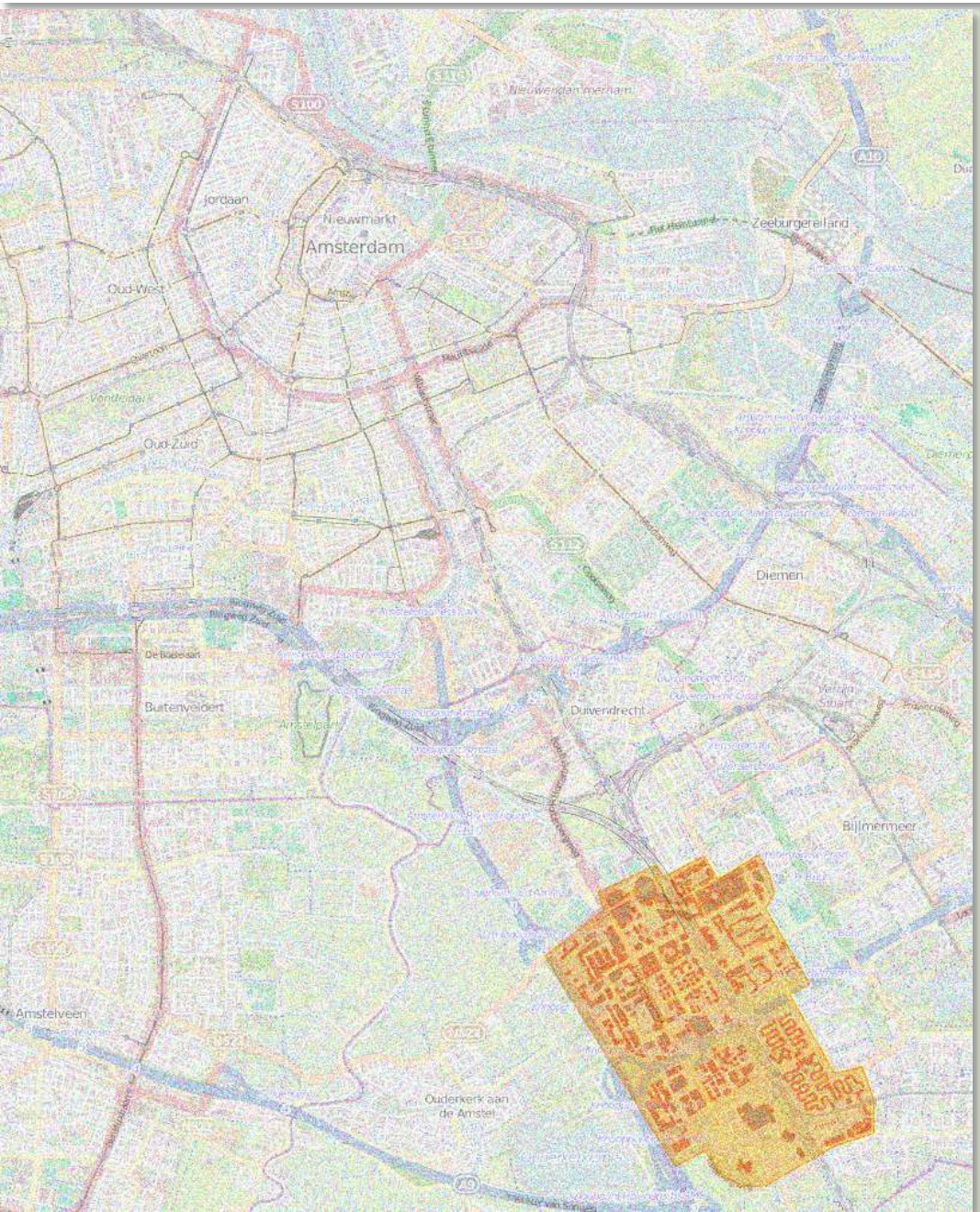
Insights to action

Smart urban lab Amsterdam Zuidoost – Situation

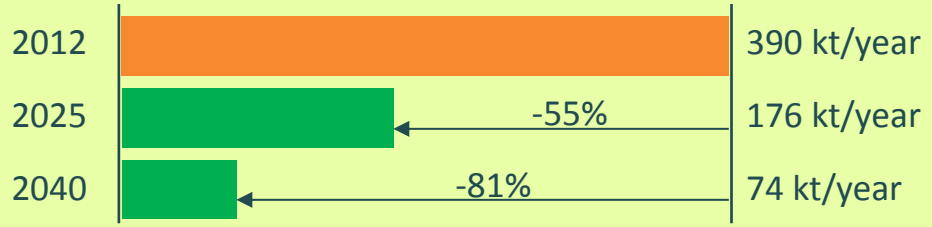
In Amsterdam the decision support environment was used at the smart urban lab Amsterdam Zuidoost, an area characterized by …

- Mixed-use area (300 hectares) including the Ajax soccer stadium, offices, businesses, leisure and entertainment industry, shopping malls, academic hospital, data centers, residential areas and an energy plant
- Business activities are key contributors to the high energy consumption in the area
- The combination of low prices and little restrictions makes the area very suitable for urban innovation and experiments
- High potential for renewable energy generation (solar, wind, biomass) as well as for the exchange of energy between buildings
- The municipality of Amsterdam's medium-long term vision for Zuid Oost is to integrate housing into the office area to make it a more lively, socially safe and attractive

Smart urban lab Amsterdam Zuidoost – Challenge and ambition



The key challenge for Amsterdam Zuidoost is the gap between current CO2emissions (level of 2012) and the ambitious 2025 and 2040 targets …



The main ambition of Amsterdam Zuidoost is to become a self-sufficient neighborhood where energy is produced locally, from renewable sources and from waste, and where energy losses are minimized !

Smart urban lab Amsterdam Zuidoost – DSE experiments

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Energy saving

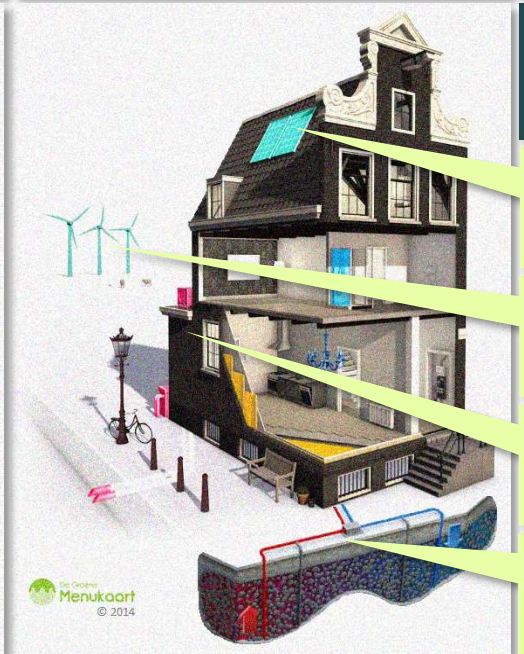
- Window replacement
- Shower Heat Exchanger
- LED lighting
- Insulation

Maximum renewables

- Solar PV panels
- Wind turbines

City grids

- District heating grid
- District cooling grid



All electric

- Solar PV panels
- Wind turbines
- Air source Heat Pump
- Aquifer thermal storage

Smart urban lab Amsterdam Zuidoost – DSE experiment results

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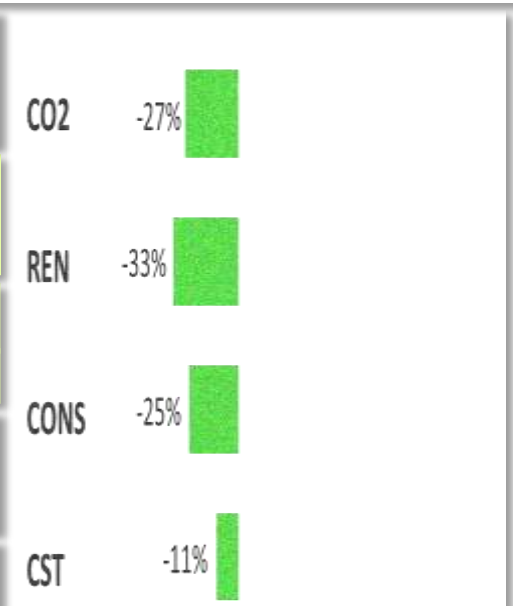
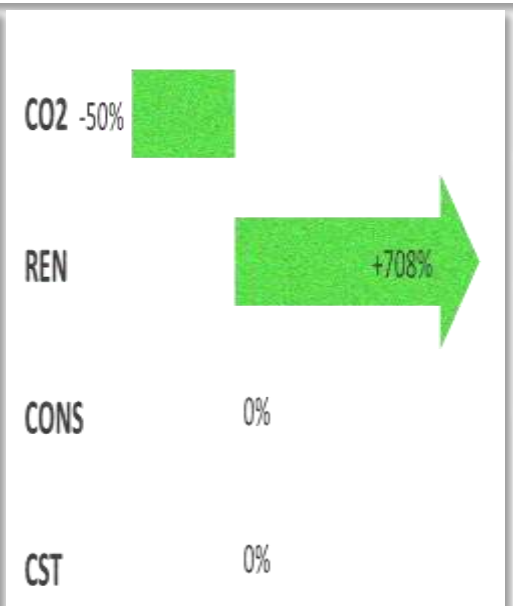
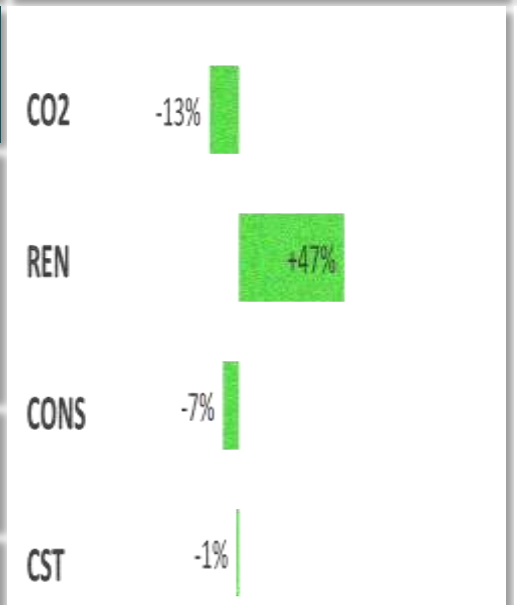
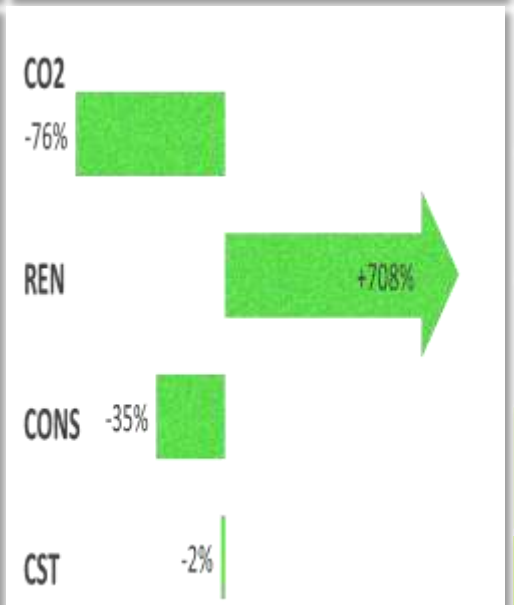
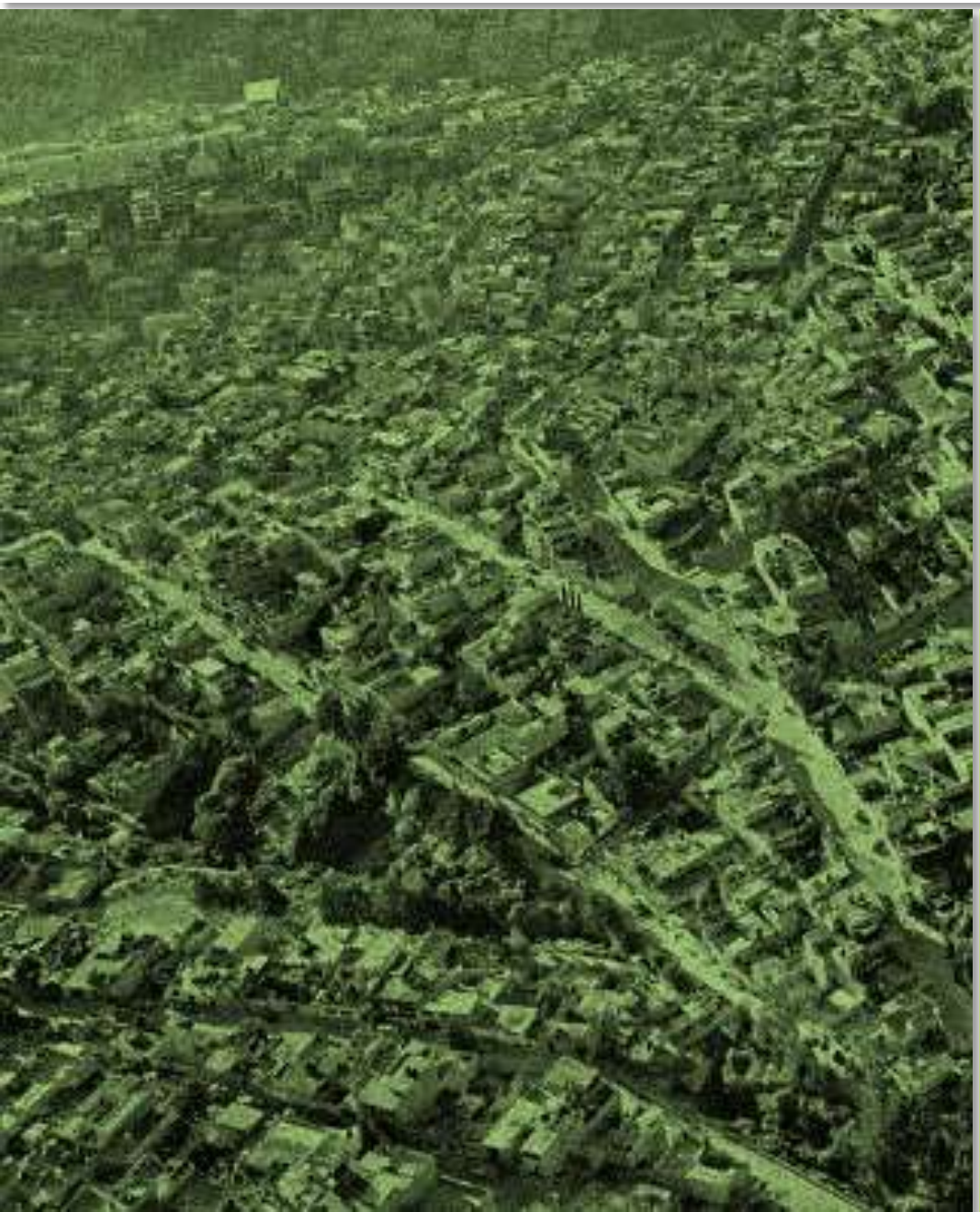
Energy saving		
Window replacement		
Shower Heat Exchanger		
LED lighting		
Insulation		
City grids		
District heating grid		
District cooling grid		

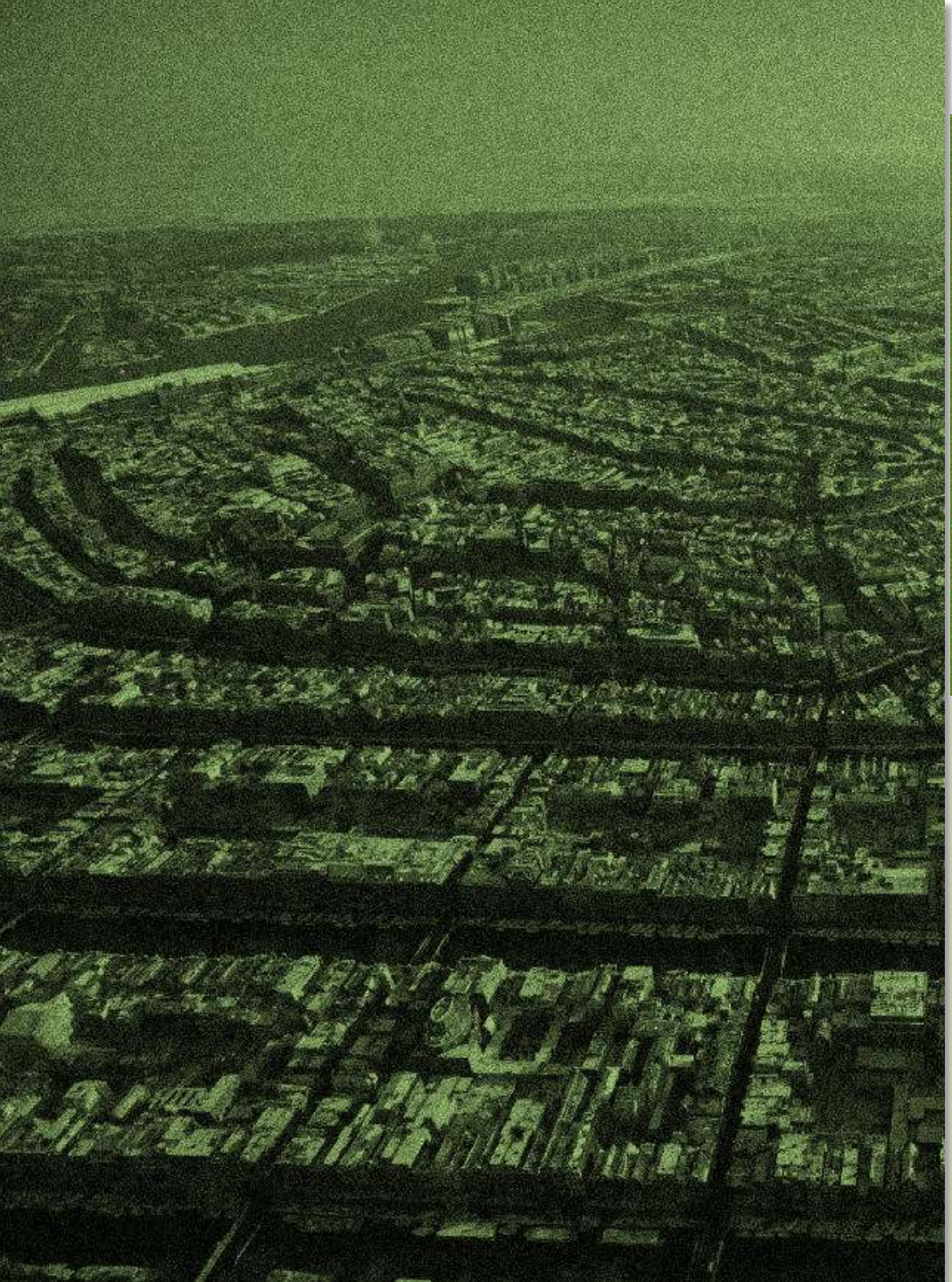
Maximum renewables
Solar PV panels
Wind turbines
All electric
Solar PV panels
Wind turbines
Air source Heat Pump
Aquifer thermal storage

Our ambition with TRANSFORM



We believe that …

- the TRANSFORM approach could benefit other cities all over the world in engaging a broad spectrum of stakeholders, defining ways to drastically reduce their CO2 emissions, and transform themselves to low carbon cities
- the TRANSFORM decision support environment (DSE) has a potential to become an important element of each city's analytical capability



We are the first generation which feels the impact of climate change …

and the last generation which can do something about it.

Follow us at …

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