



**DISTRICT ENERGY
IN CITIES
INITIATIVE**

E-TRAINING PROGRAM DISTRICT ENERGY DEVELOPMENT



MODULE 4. STRATEGY DEVELOPMENT: INCORPORATING DE INTO LOCAL ENERGY & LOW-CARBON HEAT/COOL STRATEGIES





MODULE 4. STRATEGY DEVELOPMENT IN DE

LEARNING OUTCOMES

Objective: share insights on strategy development to incorporate district energy into a local energy and low-carbon heat/cool strategies

By the end of this module, you will be able to:



Describe, understand and discuss the role of district energy strategy development in local energy and low-carbon heating and cooling strategies;



Recognise and apply key steps to integrate district energy in local energy and low-carbon heating and cooling strategies;



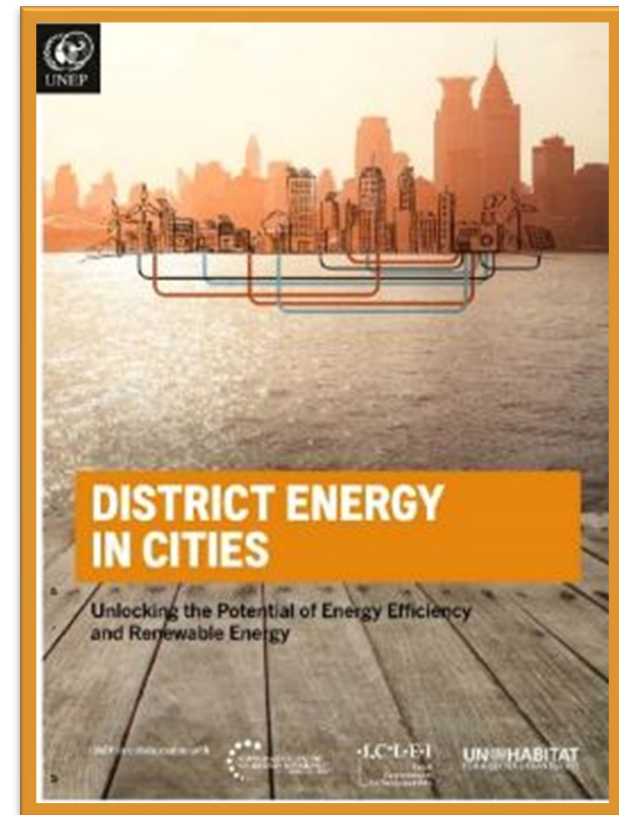
Identify best case practices in incorporating district energy planning in local energy strategies;

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DISTRICT ENERGY PLANNING

Key Steps in District Energy planning

1. **Assess** existing energy and climate policy objectives, strategies and targets and identify catalysts
2. **Strengthen** or develop the institutional multi-stakeholder coordination framework
3. **Integrate** district energy into national and/or local energy strategy and planning
4. **Map** local energy demand and evaluate local energy resources
5. Determine relevant **policy design** considerations
6. Carry out **project pre-feasibility** and viability
7. Develop **business plan**
8. Analyse **procurement options**
9. Facilitate **finance**
10. **Replicate**



Source: District Energy in Cities. Unlocking the Potential of Energy Efficiency and Renewable Energy



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WHY IS THIS IMPORTANT?

Incorporating district energy into local energy and low carbon heating and/or cooling strategies ...

- **Most efficient and measurable way to meeting city objectives**
- Provide a coherent vision around which to **mobilize project champions**
- **Reassure investors**, making possible longer-term infrastructure developments such as district energy
- Resources **spent justified against the potential benefits**
- A city can shape the low-carbon pathways of its services, capture synergies across business segments, and **direct the local district energy strategy towards social and economic objectives**
- In essence, **to tackle energy-related challenges** in a coordinated and informed manner, **with a long-term perspective**



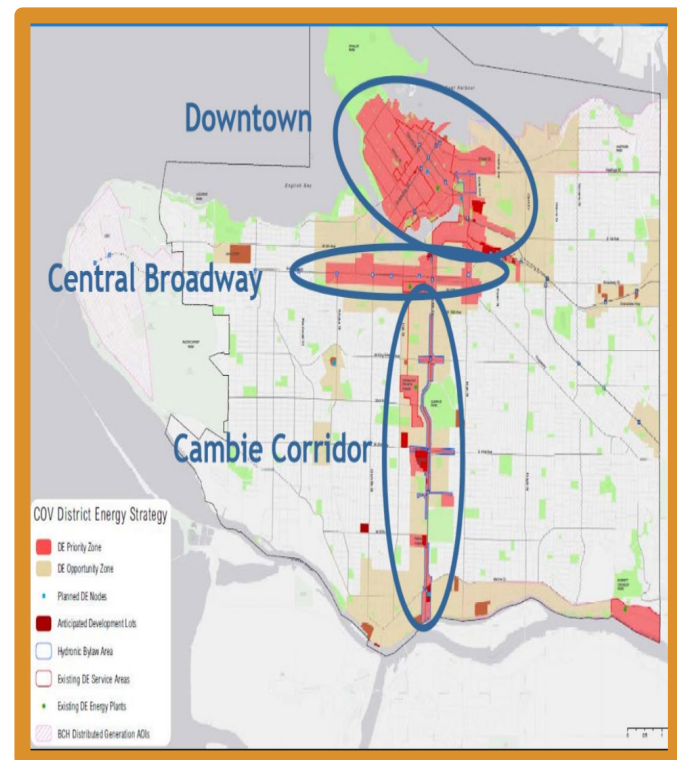
Source: EnergyLab Nordhavn



MODULE 4. STRATEGY DEVELOPMENT IN DES DEFINITION

An energy and low-carbon heating/cooling strategy implies...

- Identify and apply the **practical steps** required to develop the “portfolio” of projects and actions.
- **Coordination and monitoring of progress** and the engagement of stakeholders.
- Setting **delivery mechanisms** and enabling mechanisms in order to facilitate and stimulate investment in the “portfolio”.
- **Strategic heating and cooling planning** differs from planning for other energy carriers due to the local nature of heating and cooling supply.
- It is necessary to include **technical, economic, environmental and societal contexts** in the assessment.



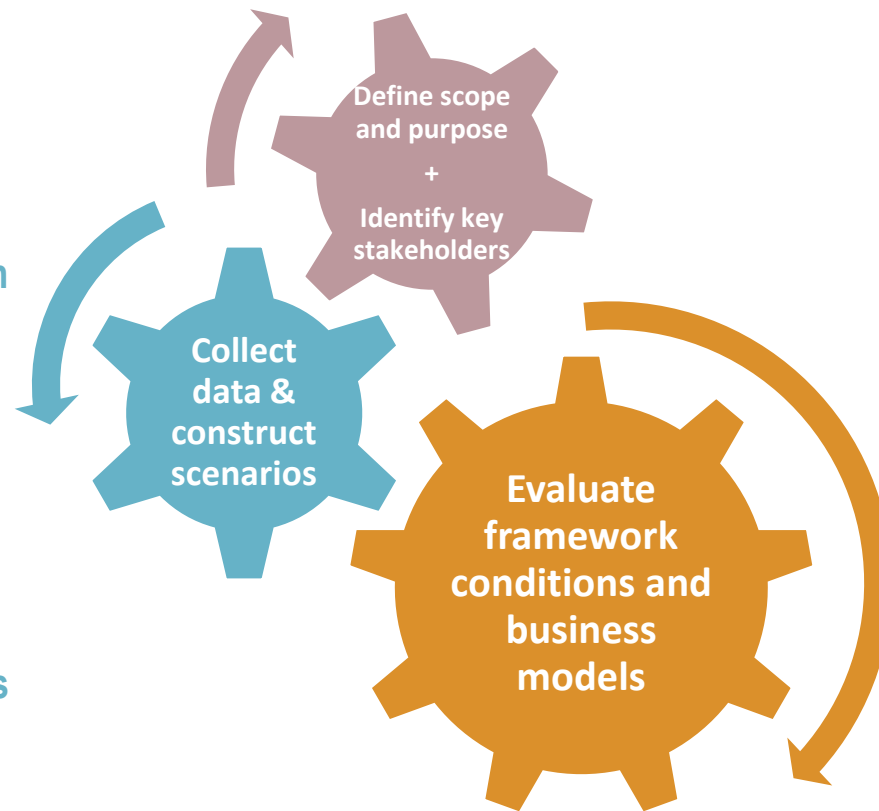
Source: Vancouver Authorities

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DEFINITION

An energy and low-carbon heating/cooling strategy...

- Elaborate technical scenarios
- Assess compatibility with existing heating and/or cooling networks in buildings
- Address technical challenges when implementing low-temperature heat sources (e.g. geothermal, excess heat/cooling, etc.)



- Objectives
- Scope
- Identify and engage stakeholders

- Regulation
- Ownership
- Pricing
- Financing

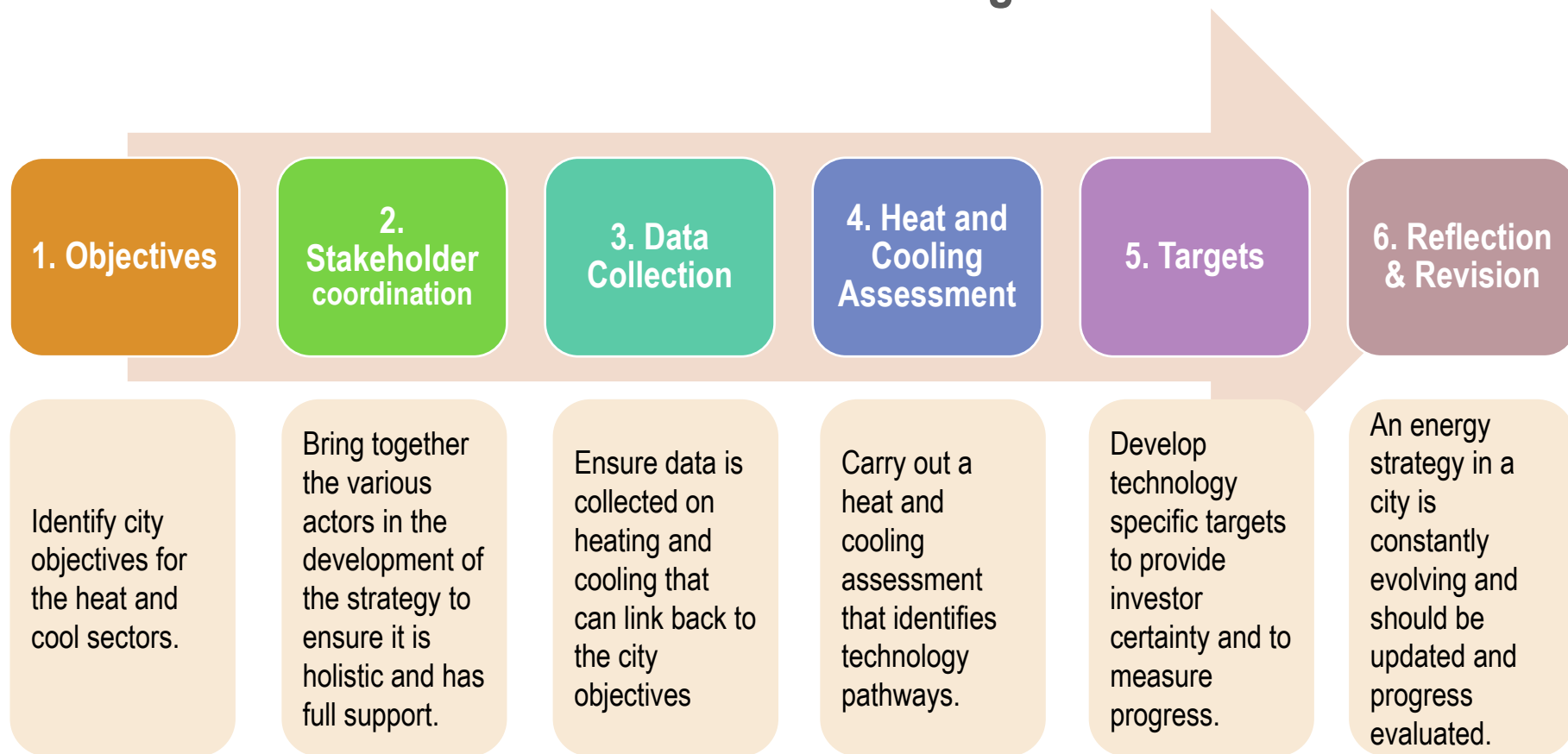
Strategy development in local energy and low-carbon HC is not solely an engineering, economic or political activity but it is **interdisciplinary** in its nature



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HOW TO DEVELOP STRATEGY IN DES?

Six steps in incorporating district energy into a local energy and low-carbon heat/cool strategies





MODULE 4. STRATEGY DEVELOPMENT IN DES

HOW TO DEVELOP STRATEGY IN DES?

1. Objectives: Definition

1.

ASSESS existing energy and climate policy objectives, strategies and targets, and identify catalysts

Cities develop district energy to achieve a variety of objectives

- Understanding and articulating these objectives is key to get 'buy-in' from different actors and the community.
- It also provides a focus for the strategy development.

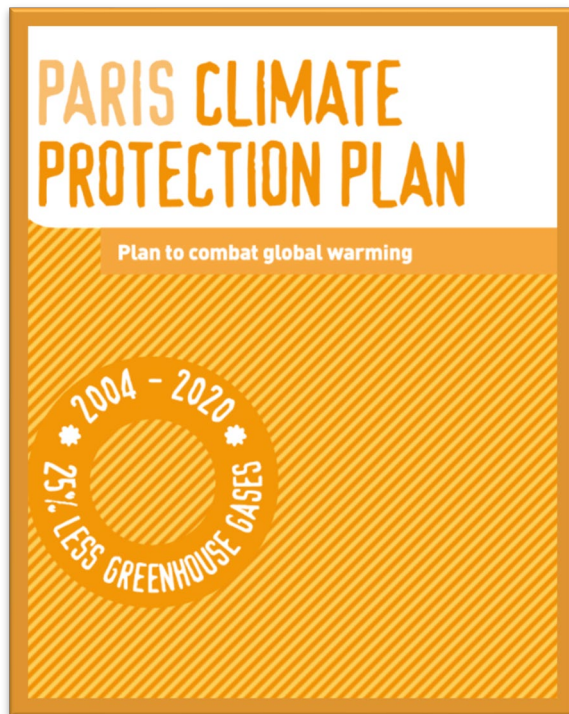




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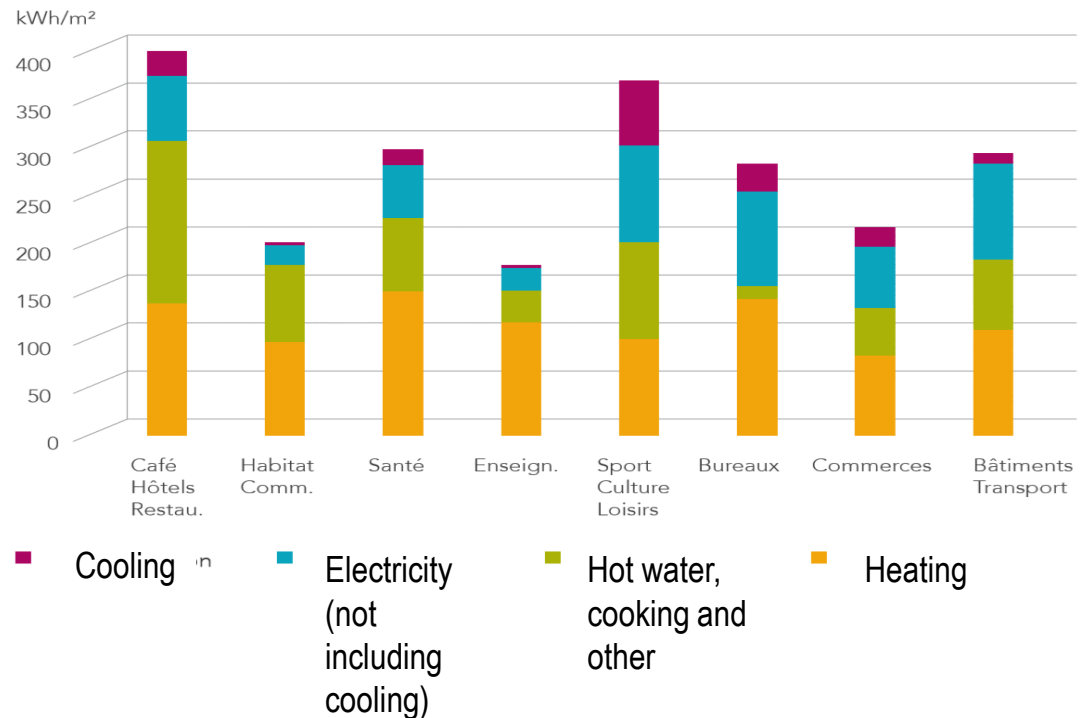
HOW TO DEVELOP STRATEGY IN DES?

1. Objectives: An example



Source: District Energy in Cities Initiative

Annual energy consumption by building type in Paris (2009)



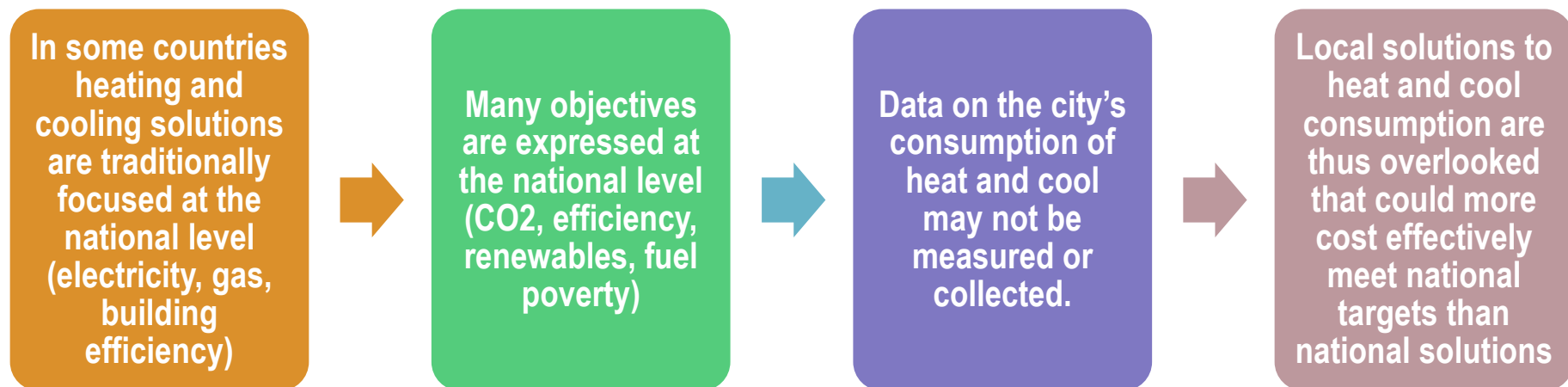


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HOW TO DEVELOP STRATEGY IN DES?

1. Objectives: Challenges & Opportunities

Heating and cooling not being considered at the city level



Development of a **local energy strategy**, particularly **data collection** at the city level, can shift the discourse of energy policy to the local level.

A **heat and cool assessment** as part of the development of an energy strategy may demonstrate that local solutions such as utilizing a city's waste heat in district heating or cooling systems is best.

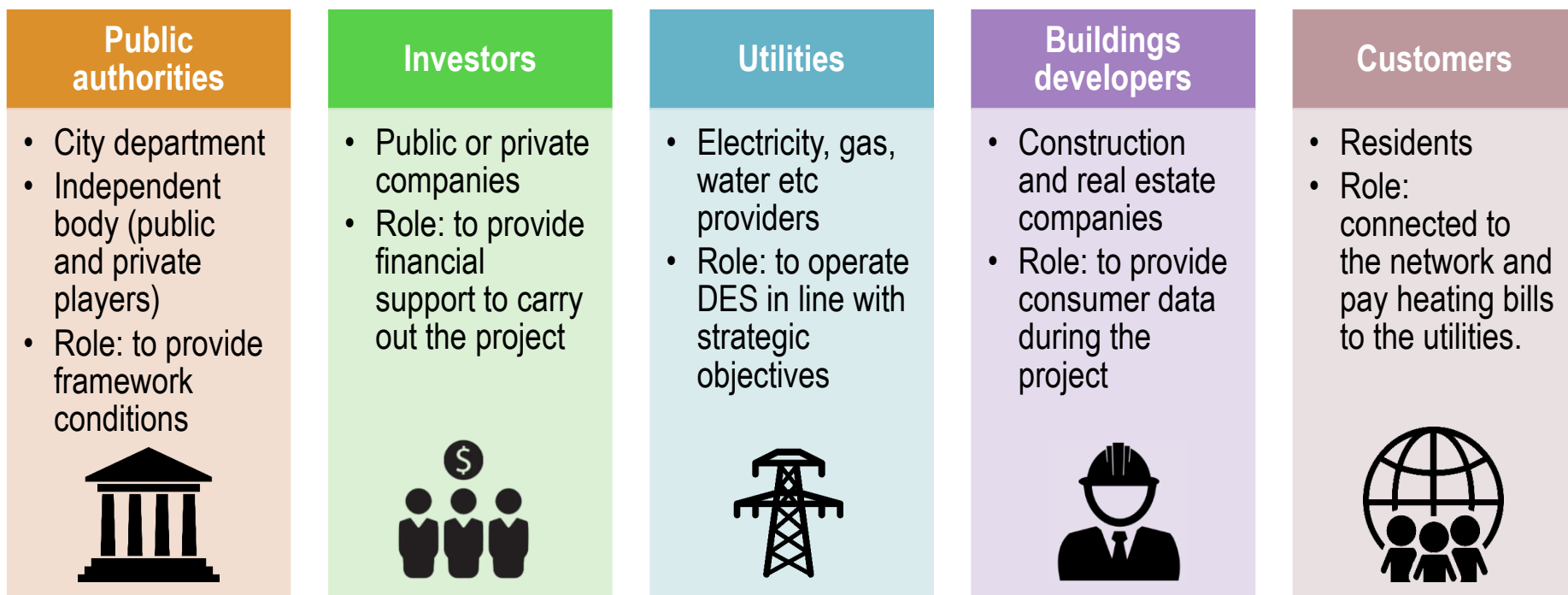


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HOW TO DEVELOP STRATEGY IN DES?

2. Stakeholder coordination

Bring together the various actors in the development of the strategy to ensure it is holistic and has full support



[Further details in Module 2!]

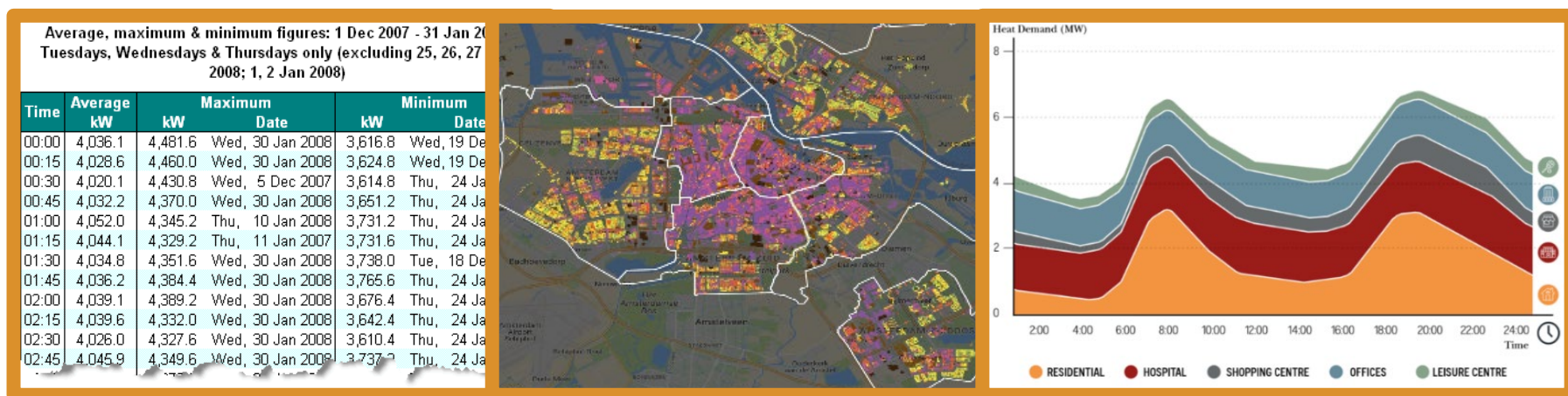


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HOW TO DEVELOP STRATEGY IN DES?

3. Data Collection

Ensure data is collected on heating and cooling that can link back to the city objectives. This step is called energy mapping and refers to the **visual representation** of energy and material flow distribution along the system, **related to its geographical location**



Source: District Energy in Cities. Unlocking the Potential of Energy Efficiency and Renewable Energy

[Further details in Module 3!]

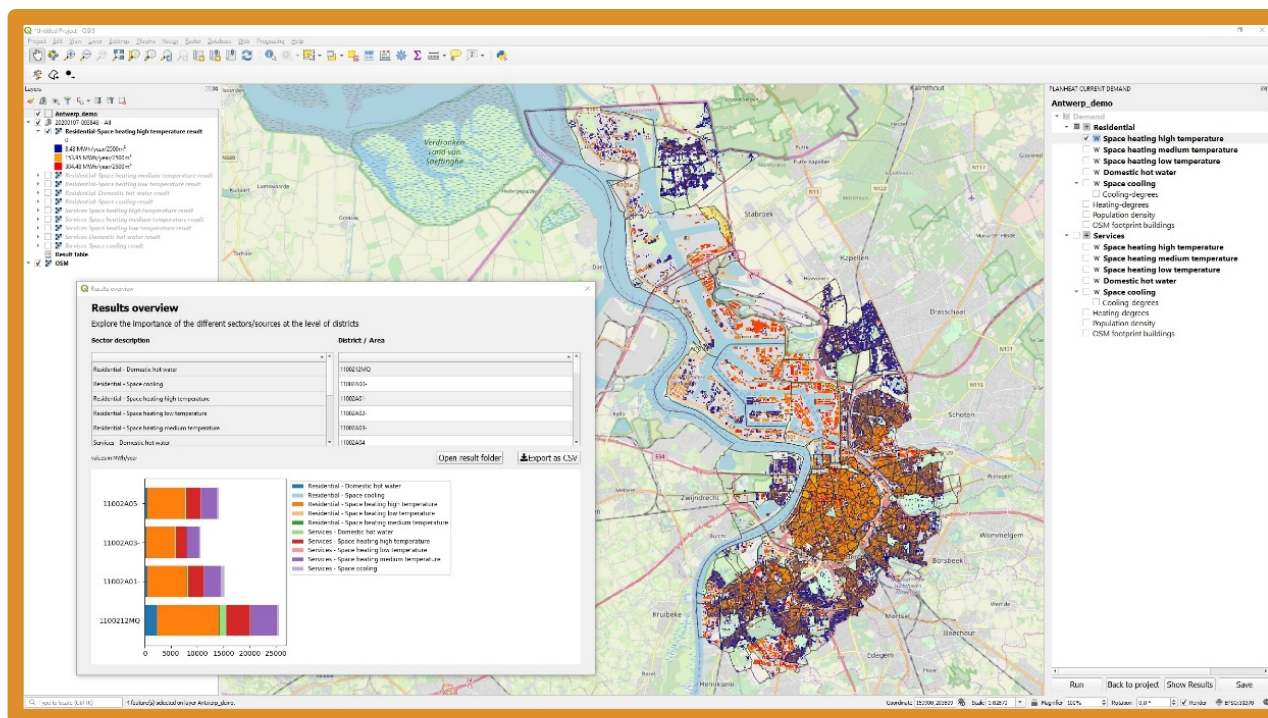


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HOW TO DEVELOP STRATEGY IN DES?

4. Heating and Cooling Assessment

Carry out a heat and cooling assessment that identifies **technology pathways** to achieve city objectives. These technology pathways must account for **costs**, **fuel price risks**, **timescales**, **changing regulatory environments** and **local economic benefits**



Source: PLANHEAT Tool



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HOW TO DEVELOP STRATEGY IN DES?

5. Targets in development for project type

New

- Not commit to large scale DE development immediately;
- **Capacity building**, development and testing of appropriate policies and 'proving the technology' takes time;
- **Can later refine energy strategy to reflect lessons learned** in the local authority and the increased **investor confidence**;

Consolidation

- Keeping the **business model stable** and **customers connected** is a **priority**;
- Lessons learned from the initial development should be collected and implemented;
- **Staged development allows periodic refining of the energy strategy and slowly increasing** the ambition of the development;

Refurbishment

- Cities will **target reduced losses, high efficiency and cheap heat in the long term**;
- Cities may not be available to upgrade the whole network at once;
- Proving the cost savings and financial viability of new technologies is important;
- Best practise is to demonstrate new policies before expanding to the whole network;

Expansion

- **Lessons learned from the initial development should be collected and implemented**;
- Again, staged development allows periodic refining of the energy strategy and slowly increasing the ambition of the development as benefits are proven, risks reduced and working capital increased



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HOW TO DEVELOP STRATEGY IN DES?

5. Targets in Vancouver: Transitioning from 'new' to 'expanding'

Between 2006 and 2010 Vancouver developed Southeast False Creek Neighbourhood Energy Utility (SEFC NEU).

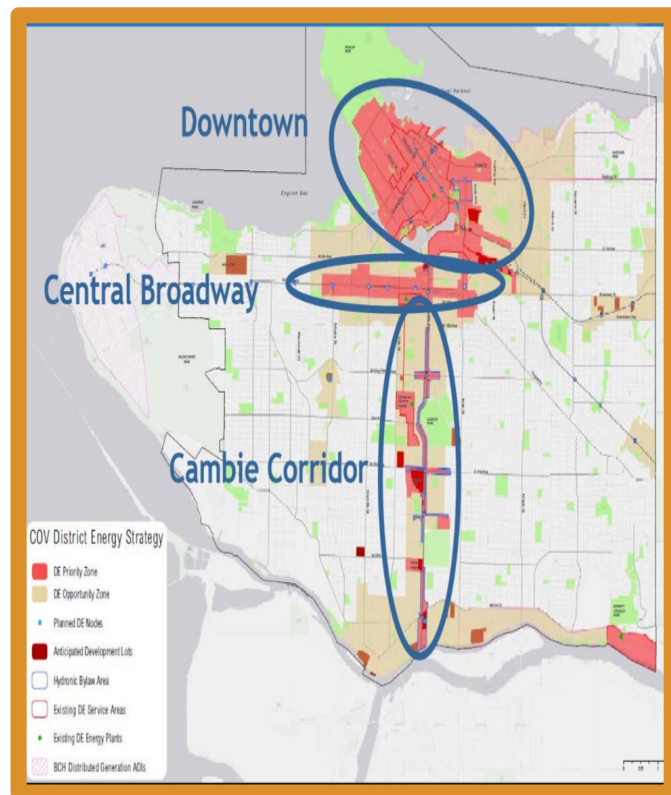
SEFC NEU tested new policies such as service area by-laws requiring connection and proved the benefits of district energy.

In 2010 the city developed the 'Greenest City Action Plan' in 2010.

Vancouver consulted with utilities, NGOs, building developers and other levels of government on new district energy strategy.

City now has district energy strategy targeting specific network development up to 2020.

Current strategy and vision based on SEFC NEU and the lessons learned.



Source: Neighbourhood Energy in Vancouver -- Strategic Approach and Guidelines



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HOW TO DEVELOP STRATEGY IN DES?

5. Targets in Latvia: Refurbishing and keeping heat tariffs low

The **objective of refurbishment** is to **reduce the subsidies required** to district heat networks and make them more efficient whilst keeping heat affordable.

Many municipalities do not have the capital for large scale improvements. **A lack of investment can push tariffs up making it harder to retain customers**, which makes the problem even worse.

For many municipalities **the solution will be slow and long-term with small incremental improvements** made that do not impact the business model significantly.



Source: Laima Gūtmane

73%
Share of
CHP in
DE

577,409
Residents
served by DE

2,254
MWth
installed
capacity

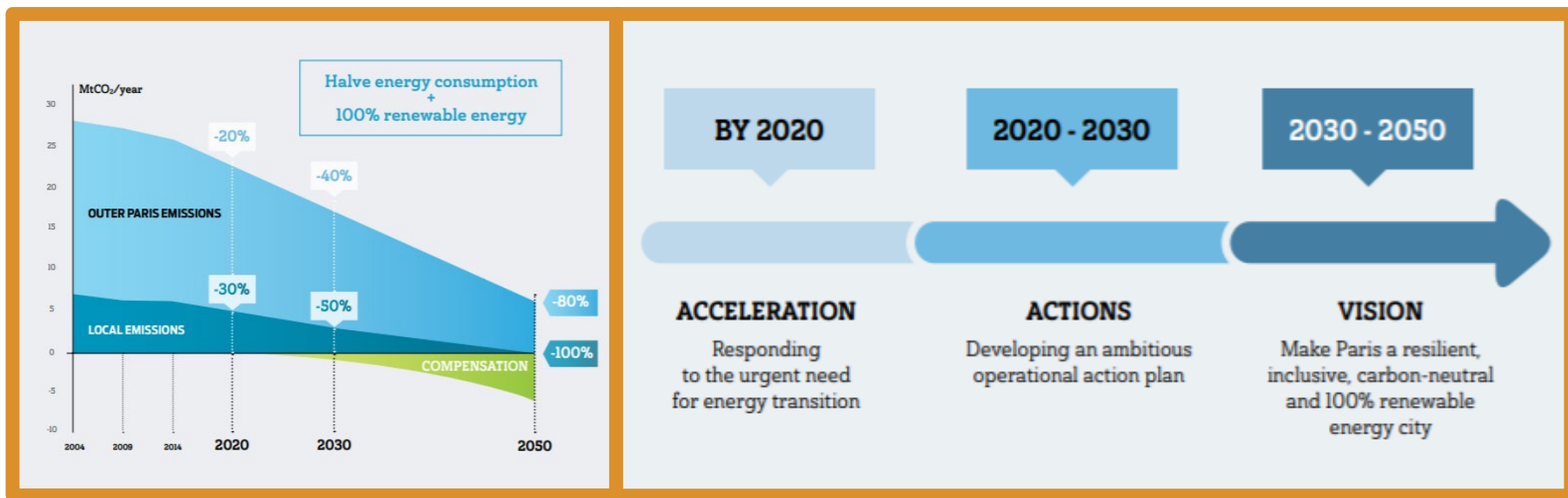


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HOW TO DEVELOP STRATEGY IN DES?

6. Reflection and revision

An energy strategy in a city is constantly evolving and should be updated after a period (e.g. 5 years) and progress evaluated.



Source: Paris Climate Action Plan. City of Paris, 2012



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CASE STUDIES



Shenzhen, China Source: Unsplash



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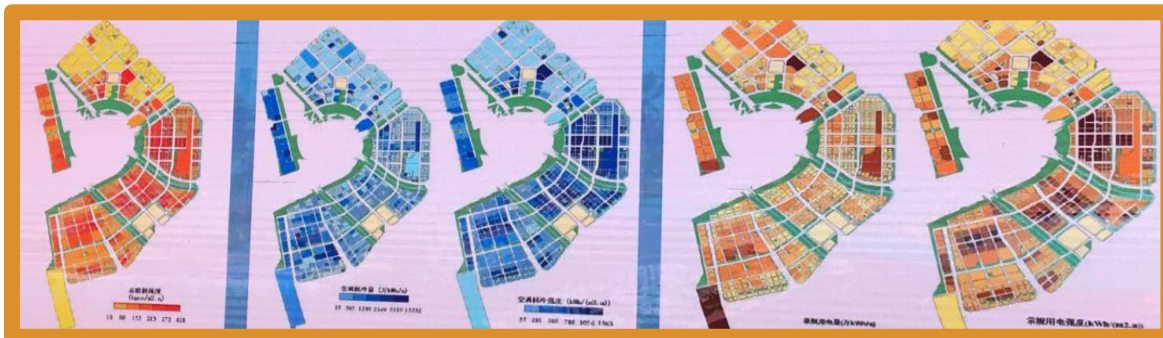
CASE STUDY: SHENZHEN QIANHAI, CHINA

New: Setting City targets

- Energy saving rate: 12.3%
- Electricity saving: 0.13 billion kWh
- Reduction of standard coal: 16000 tons
- Reduce peak electric power: 0.12 mkWh
- Reducing thermal island effect
- CO₂ emission reduction: 123,000 tons
- Reduce water: 3 million tons



Source: Renderings of urban planning document in Shenzhen, Urban planning document municipality



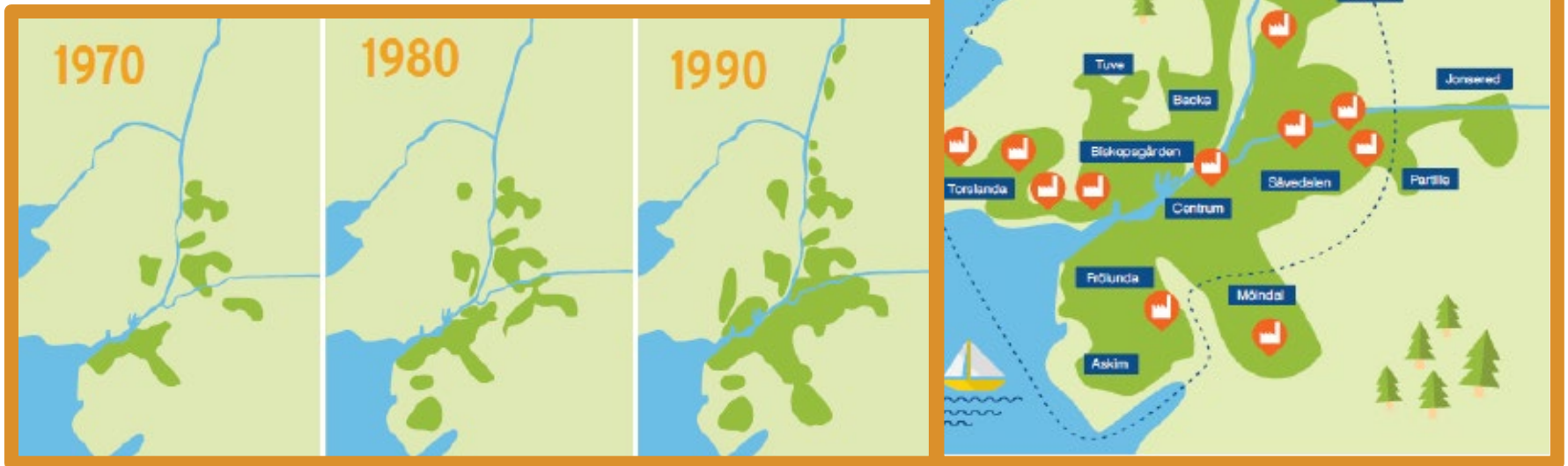
Source: Urban plans for Qianhai, Urban planning document municipality

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CASE STUDY: GOTHENBURG, SWEDEN

Consolidation: from oil to waste heat

- From 8 isolated heat island to an interconnected sustainable network reaching 60% of the city
- The oil crisis in the 70's lead the shift towards a decarbonisation of the generation mix
- The network optimizes available heat from its surroundings, reducing the dependency on imports



Source: Göteborg Energi

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CASE STUDY: ANSHAN, CHINA

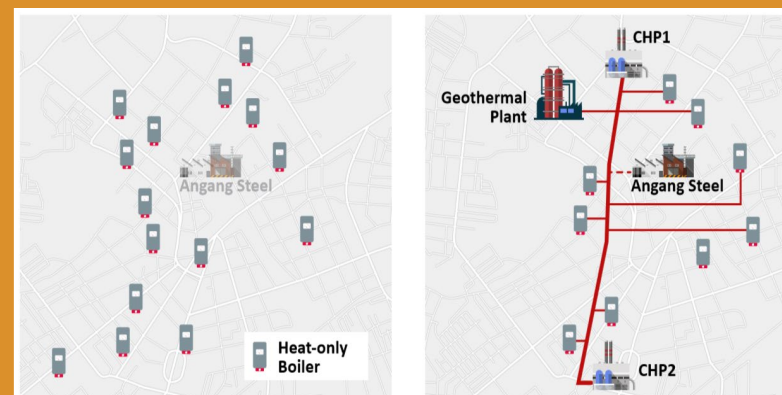
Developing a strategy in refurbishment project



Pooling of networks, connection of waste heat and removal of small coal-fired boilers.

Connection to a large transmission line and pooling of networks is being achieved in stages connecting and upgrading individual districts at approximately 200MW each stage

Short payback period of less than 2.5 years



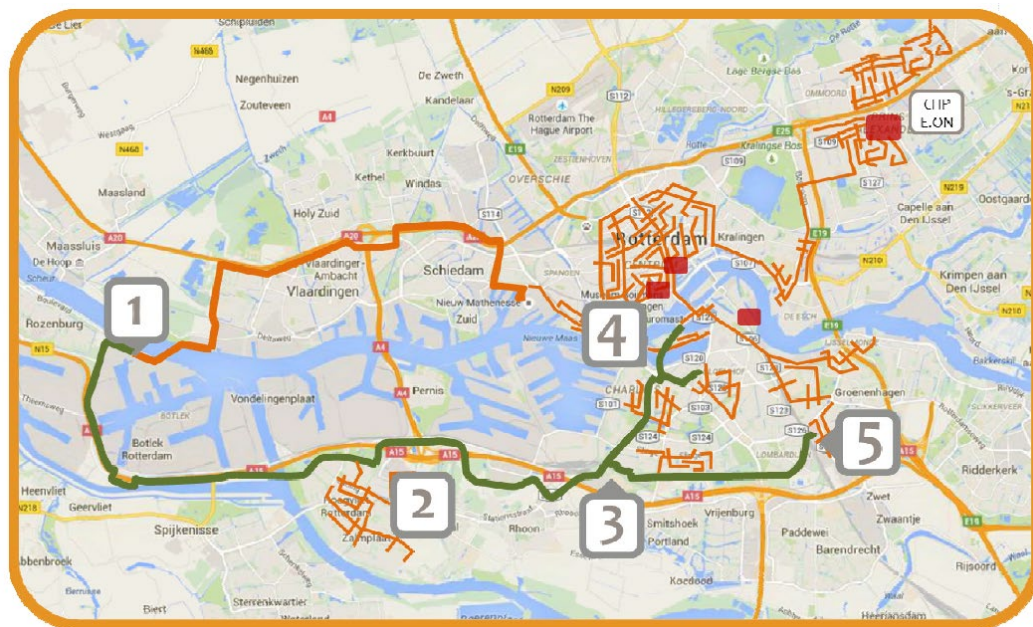
Source: "District Energy in Cities: Unlocking the Potential of Energy Efficiency and Renewable Energy". UNEP, 2018



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CASE STUDY: ROTTERDAM, NETHERLANDS

Developing a strategy in expansion project



Current district heating network:

- **2 different utilities** partially owned by the municipality
- Large potential for **heat recovery from the harbour**
- **Risk for private investors** to interconnect the harbour while the demand is not ready
- **City intervention**



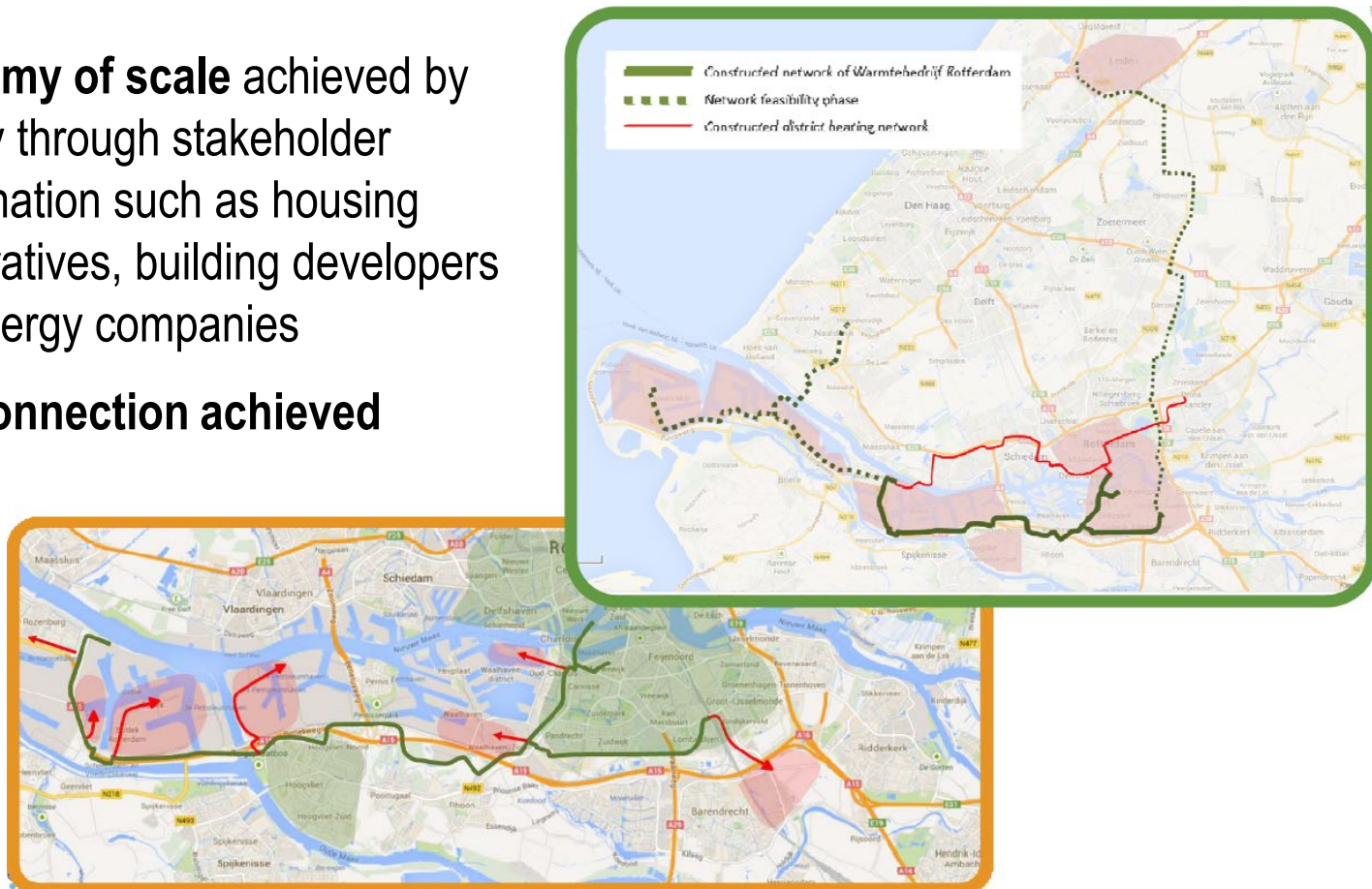
Source: Map of main components of the district energy network in Rotterdam, Warmtebedrijf Rotterdam

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CASE STUDY: ROTTERDAM, NETHERLANDS

Future plans: Regional expansion

- **Economy of scale** achieved by the city through stakeholder coordination such as housing cooperatives, building developers and energy companies
- **Interconnection** achieved



Source: Regional expansion plans, Warmtebedrijf Rotterdam



MODULE 4. STRATEGY DEVELOPMENT IN DES

KEY TAKEAWAYS

Some of the main aspects we have seen in this module are:

- District energy planning should be **consistently integrated with local energy and low-carbon heat/cool strategies**
 - Ensure a stable and sustainable development, maintenance and operation of the network, throughout its complete life-cycle
 - Cities to assess and demonstrate the benefits of district heating and cooling in the context of local objectives and its potential.
 - Enable the support for stakeholder buy-in and reassure investors
- Key steps are: (1) defining objectives, (2) stakeholder coordination, (3) data collection, (4) heating and cooling assessment, (5) setting targets, (6) reflection and revision
- There are **different levels of strategy development** depending on the **pre-existing infrastructure**: New, Consolidation, Refurbishment , Expansion
- The **various levels of local or city engagements** in each phase to capture synergies across business segments, and direct the local district energy strategy towards social and economic objectives.



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RECOMMENDATIONS

Some recommendation for strategy development are:

- Incorporating district energy into a local energy and low-carbon heat/cool strategies will **ensure that the city can shape the low-carbon pathways of its services**, capture synergies across business segments, and direct the local district energy strategy towards social and economic objectives
- It allows to **tackle energy-related challenges** in a coordinated and informed manner, with a long-term perspective
- It should be done from the start following the steps that were shared in this module
- Development of a local energy strategy, particularly data collection at the city level, can **shift the discourse of energy policy to the local level**
- A **heating and cooling assessment** as part of the development of an energy strategy may demonstrate that local solutions such as utilizing a city's waste heat in district heating or cooling systems is best.



THANK YOU FOR COMPLETING THIS MODULE!

For more information about the initiative or this Training, please visit the following websites or contact:



www.districtenergyinitiative.org



unep.org



c2e2.unepdtu.org



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DISTRICT ENERGY DEVELOPMENT

In the upcoming modules, you will learn about ...

Module 5

- Carbon heating and cooling strategies

Module 6

- Business models for sound sustainable district energy systems