



DISTRICT ENERGY
IN CITIES
INITIATIVE

E-TRAINING PROGRAM DISTRICT COOLING DEVELOPMENT







MODULE 5. POLICY DEVELOPMENT: INTEGRATING DCS INTO URBAN PLANNING



LEARNING OUTCOMES

Objective: share insights on policy development to incorporate district cooling into urban planning

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

-  Describe, understand and discuss the role of integrating DCS in urban planning
-  Recognise key steps to integrate DCS in urban planning
-  Define key actions from local authorities to ensure the integration in the process
-  List the strengths and limitations of integrating DCS into urban planning

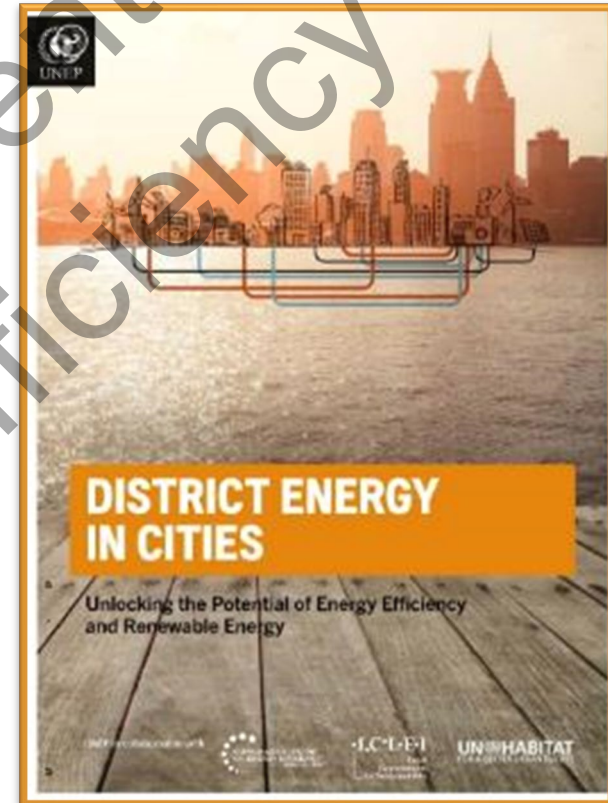


MODULE 5. POLICY DEVELOPMENT IN DC

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



MODULE 5. POLICY DEVELOPMENT IN DC ITS RELEVANCE

From an energy system perspective

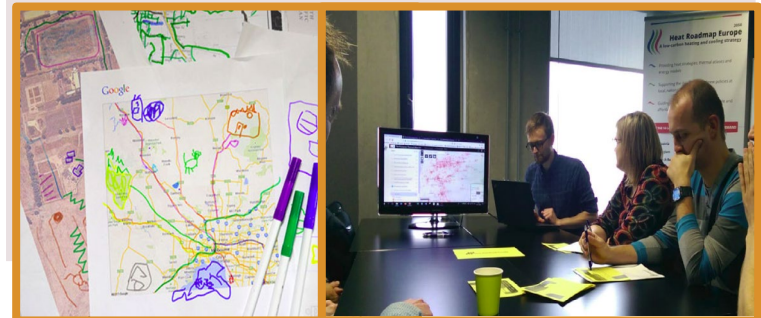
- Integrating energy infrastructure with urban planning is key for sustainable urban development.
- Update the city's energy infrastructure to develop in a sustainable and efficient way.



Source: Deltares, Unsplash

From a process perspective

- Ensure cost-effective district cooling in cities, addressing the interaction between energy, land use and infrastructure – including power, waste, water, buildings and transport.



Source: Heat Roadmap Europe



DEFINITION

What is urban planning?

- Also known as regional planning, town planning or city planning
- It is a **technical and political process** concerned with the development and design of land use and the built environment.
- Includes **air, water, energy, and the infrastructure** passing into and out of urban areas, such as transportation, communications, and distribution networks.

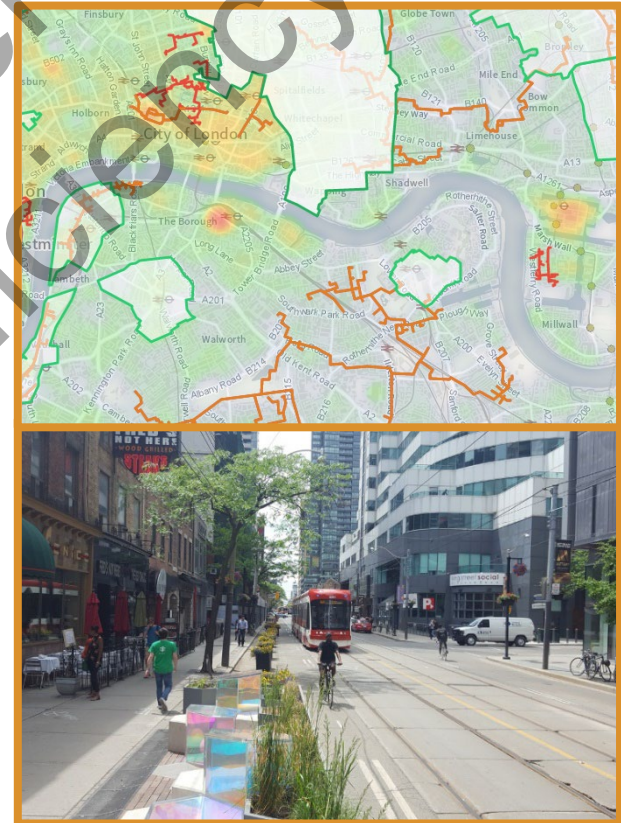
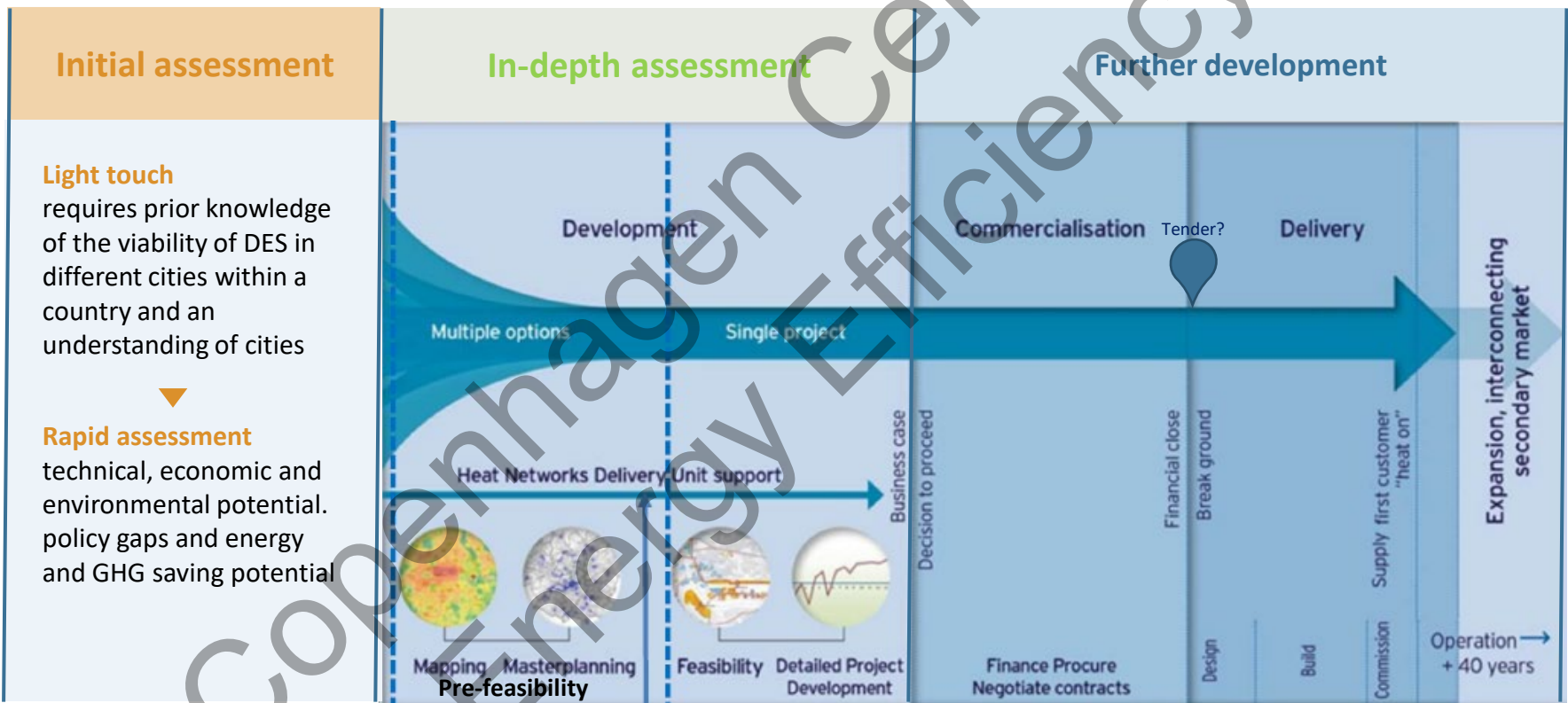


Image: maps.london.gov.uk, 880cities.com

MODULE 5. POLICY DEVELOPMENT IN DC

MAIN PHASES

Main phases and assessments in DCS planning



Source: Adapted from Carbon Trust



MODULE 5. POLICY DEVELOPMENT IN DC

THE ROLE OF LOCAL AUTHORITIES

Local authorities have the following main roles in DCS planning

Enable DC activities to be carried out by accessing financial instruments.
For e.g. loans, grants, bonds, tax exemptions, subsidies etc.



Develop plans & policy regulations to effectively catalyse DC deployment.
For e.g. zoning, taxation & tariffs



Advocate and coordinate tasks that will set up suitable environment for DC development.
For e.g. identify and implement policies, demo projects etc.



Local authorities play both a consumer and producer role.
For e.g. publicly owned buildings having large energy demands and publicly owned utilities being the producers



MODULE 5. POLICY DEVELOPMENT IN DC

THE ROLE OF LOCAL AUTHORITIES

As planners and regulators,
local authorities have three main areas for policy intervention:

1. Energy policy objectives, strategy
and targets

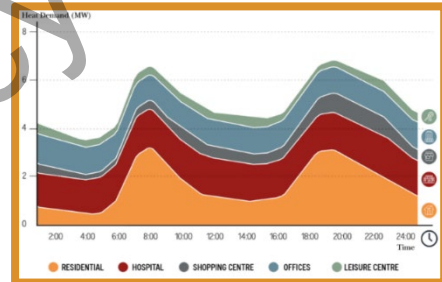
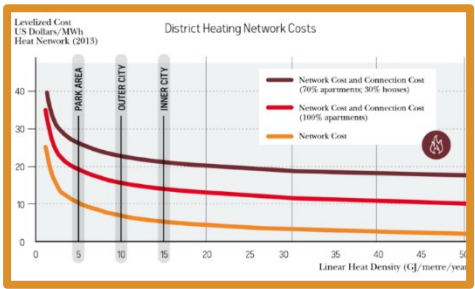
2. Holistic energy mapping

3. Policy development

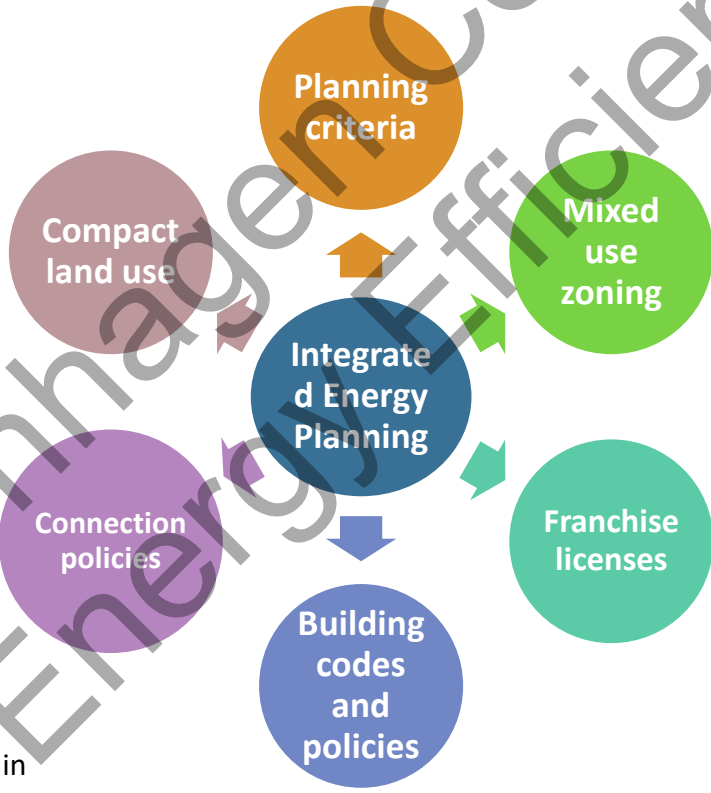


MODULE 5. POLICY DEVELOPMENT IN DC PLANNER AND REGULATOR

1. Energy policy objectives, strategy and targets



- Zonal or city-wide mandatory connections
- Density bonus
- Connect (unless)
- Subsidies for connection
- Building compatibility requirements
- Green certification



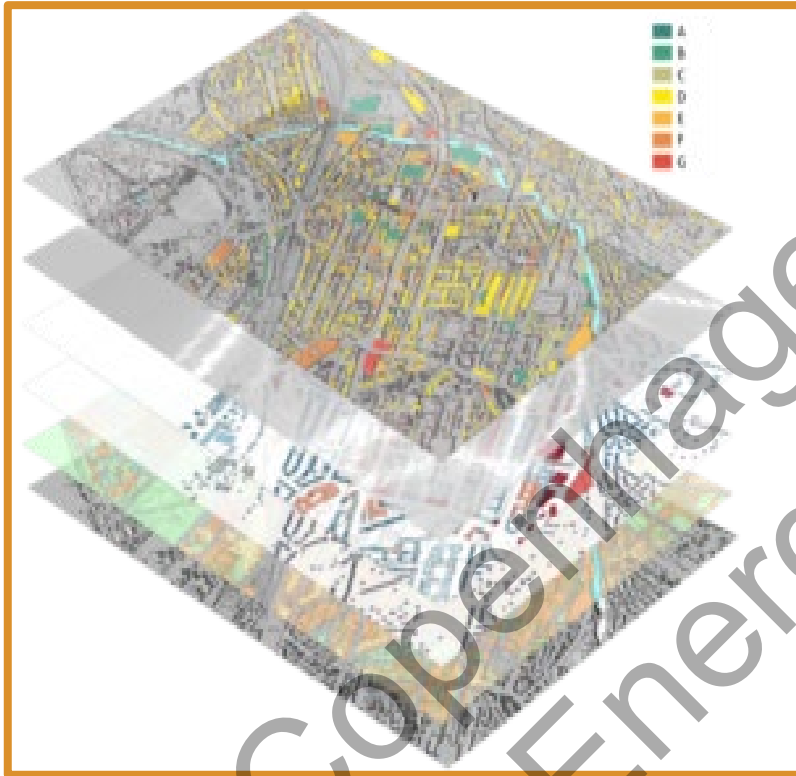
- Zoning
- New development policies
- Control development
- Mandate connection
- Regulate tariffs
- Protect consumers
- Competition to win franchise

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



MODULE 5. POLICY DEVELOPMENT IN DC PLANNER AND REGULATOR

2. Holistic energy mapping



Source: CityLab.com

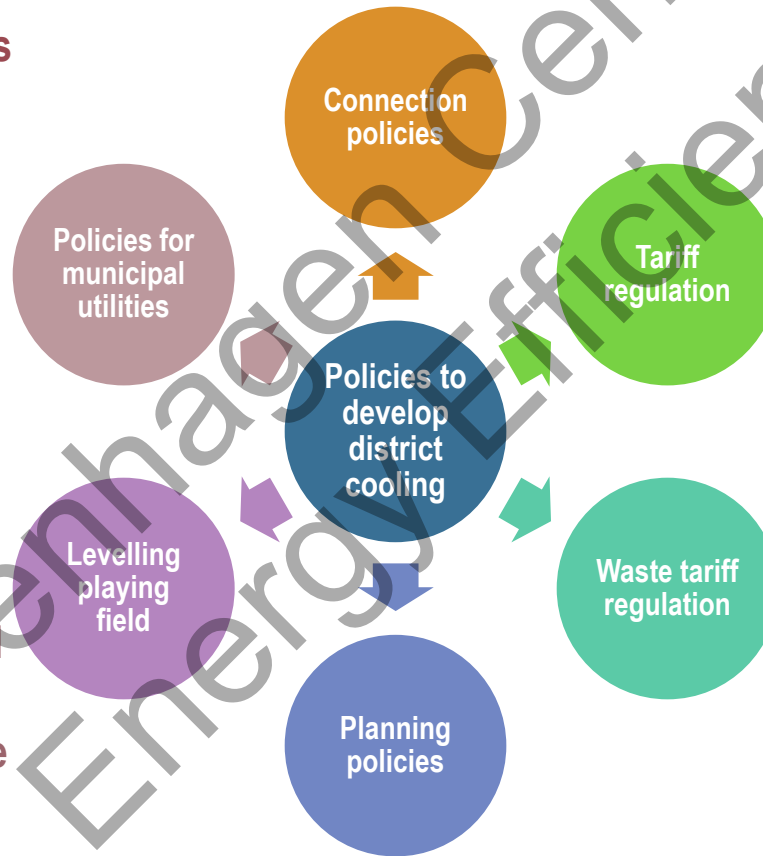
- An **energy plan** is a **road map** of project developments and policy interventions to help a city realize the articulated goals of its energy strategy.
- It helps to **identify synergies and opportunities for cost-effective district cooling**, such plans needed to analyse the impact of (and interaction between) energy, land use and infrastructure – including waste, water, buildings and transport.
- **Holistic energy planning** can allow a city to **promote and/or designate areas or zones** that have favourable conditions for **district cooling development or expansion**, and to apply tailored policies or financial incentives on a case-by-case basis.



MODULE 5. POLICY DEVELOPMENT IN DC PLANNER AND REGULATOR

3. Policy development

- Mandates for renewables and waste heat
 - Social housing focus
 - Interconnection and transmission
-
- CHP FiT
 - Municipal subsidies or fiscal benefits
 - Pass through of national energy subsidies
 - Other policies may come from national level



- Protect consumers
 - Limit profits and pass on costs
 - Next available technology
 - Other policies may come from national level
-
- Encourage waste heat connection
 - Cost of connection and cost of redundancy
 - Ability to guarantee supply



MODULE 5. POLICY DEVELOPMENT IN DC

POLICY DEVELOPMENT

3. Policy development: Connection Policies

Classified by enforcement type:

Mandatory

- City-wide mandatory connections
- Zonal mandatory connection policies
- Mandatory connection (unless) policies
- Mandatory district cooling development through zoning policies

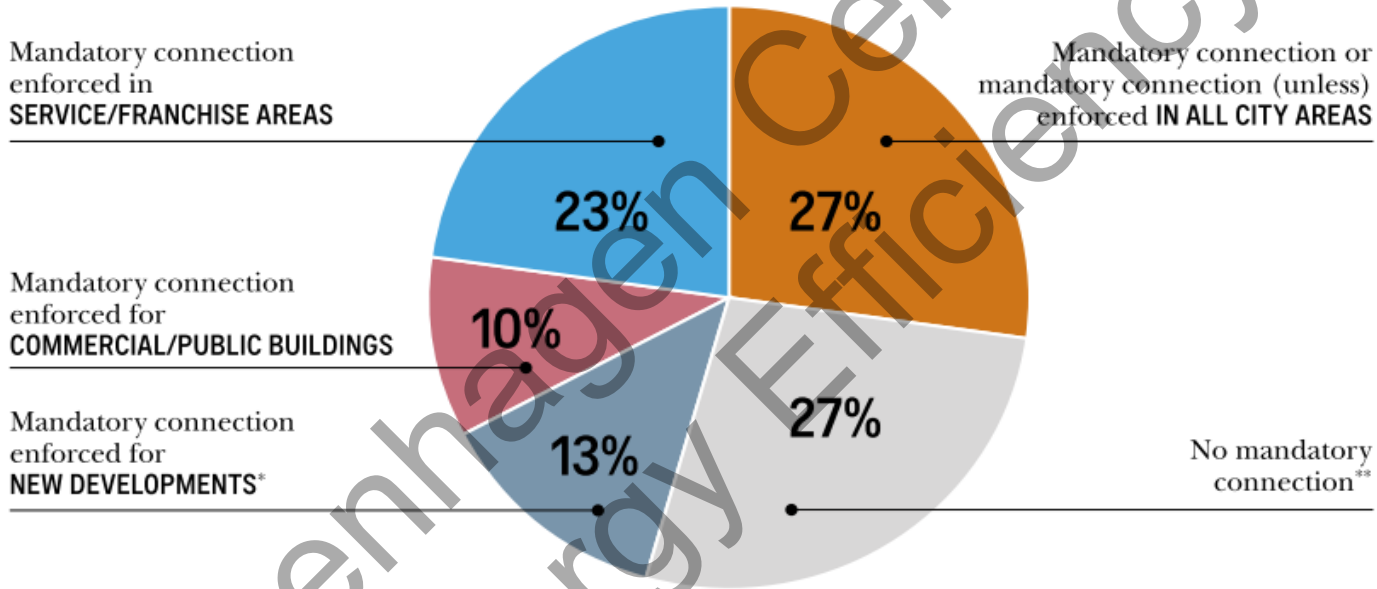
Encouraged

- Density bonus
- Access to rights-of-way
- Take or pay
- Bans
- Regulated and transparent tariffs
- Building compatibility requirements
- Inclusion in local green building standards
- Financial assistance

MODULE 5. POLICY DEVELOPMENT IN DC

POLICY DEVELOPMENT

Connection policies, by type in 45 champion cities (1)



* Vancouver and Tokyo have this policy, but only for new developments over a certain size, and were not counted for this.

** Cities that are still developing their first district energy network are not included here because their connection policy is undecided.

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



MODULE 5. POLICY DEVELOPMENT IN DC

POLICY DEVELOPMENT

Connection policies: Connecting Waste Heat

Lessons from other cities

- Connect waste heat and **set a tariff** for it.
- Cities can encourage connection of waste heat and **provide pricing guidelines**.
- Cities could **mandate utilities to connect** waste heat where economically and technically viable.
- Waste heat **important in 'refurbishment' cities** due to lower costs and reduction of fossil fuel imports
- Waste heat **tariffs will depend on the technology** and will differ significantly between a waste incinerator or CHP and industrial waste heat.
- Waste heat is like electricity generation from variable renewables

- Waste heat tariffs should consider:
 - The ability to guarantee supply
 - Redundant 'back-up' plants required
 - Impact on operations of supplier
 - Cost of connection

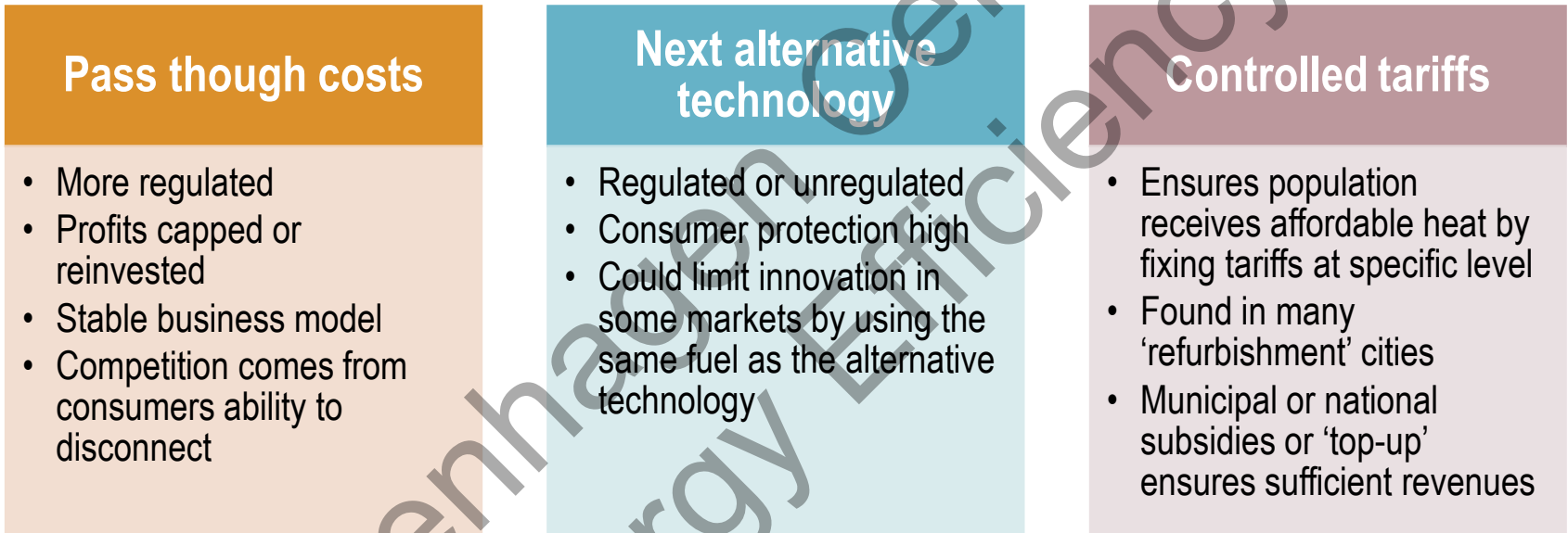
In Anshan, China refurbishment is centred around connecting 1GW of industrial waste heat. This will:

- Reduce air pollution
- Reduce coal consumption
- Cost 1.8 US Cents per kWh
- Have a payback period of three years



POLICY DEVELOPMENT

3. Policy development: Tariff regulation and consumer protection



- **Tariff regulation** may come from the **national level** but many cities also exert control.
- **Three broad categories of tariff regulation**, very dependent on the 'culture' of energy price regulation in a country and/or city.
- Objective: **protect consumers & ensure stable business model** (incl. load certainty).



MODULE 5. POLICY DEVELOPMENT IN DC

POLICY DEVELOPMENT

3. Policy development: Planning Policies

Integrating energy into planning and land-use policies

Use of zoning

- Municipalities can use zoning to influence development in the city by defining different land uses in different zones. Through zoning, they can promote DC by ensuring new large developments are mixed-use. This delivers a diversity of building types in a new area which significantly improves the commercial viability of DC.

Use of public buildings

- Municipalities could also ensure that public buildings are established in new areas. Hospitals and large administrative buildings can 'anchor' new DC development by connecting a significant cooling demand and lowering risk through the participation of the public sector.

High priority zone for DCS

- The municipality can use its zoning authority to create 'high priority' and 'medium priority' zones for DC, based on energy mapping studies and using benchmarks for DC viability (e.g. cooling demand density). The city could then attach specific conditions to building permits within these zones which could require large new developments entering the planning process, in a designated 'priority zone for DC' to have to submit an 'energy efficiency plan' in order to obtain a building permit.

Use of exclusive franchise zones

- The city can use the planning process to put in place specific connection policies (of different buildings types) in the high priority areas. Furthermore, it can designate these areas as exclusive franchise zones, wherein potential developers of DC will have exclusive access to consumers, if they are granted the franchise/license to operate in that particular zone. This will have to be developed together with a licensing scheme that protects consumers from monopoly pricing



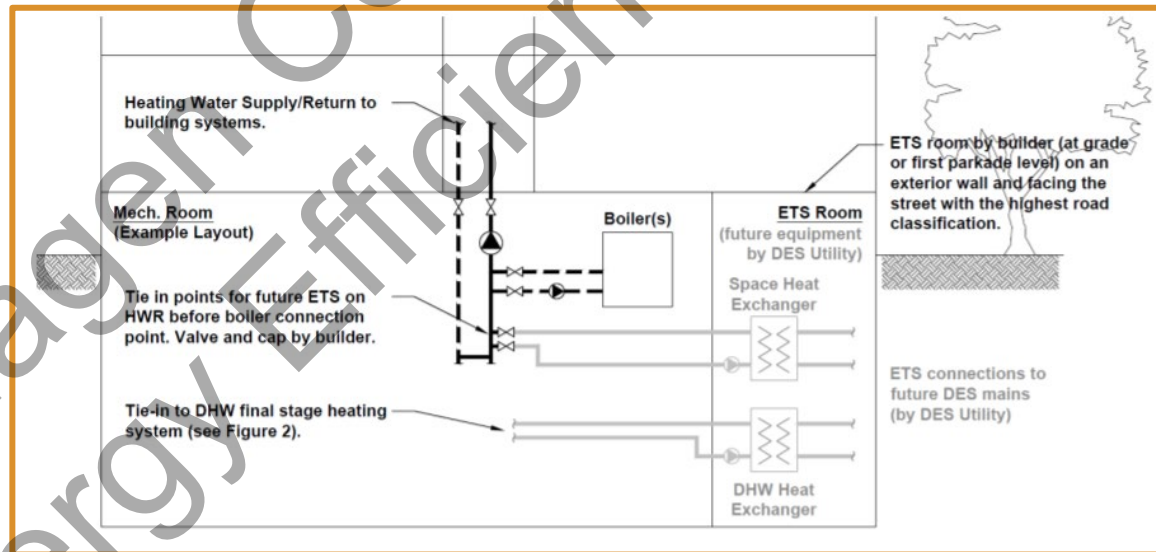
MODULE 5. POLICY DEVELOPMENT IN DC

POLICY DEVELOPMENT

3. Policy development: Planning Policies

DC ready buildings

- Cities could ensure buildings are developed that in the long-term are district cooling ready, specifically requiring centralized cooling for specific building types, or for those over a certain size, or in a specific zone (e.g. high/medium priority zone).
- Mandates for connection to, or development of, district cooling systems in high priority zones, could be exercised. Such a policy would need to be accompanied by a support programme to the city and developers to ensure district cooling assessments and tendering do not slow down the development of real estate.



Building Mechanical Room with ETS Sample Layout (District heating),
Source: District of north Vancouver

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POLICY DEVELOPMENT

3. Policy development: Levelling the playing field

Incentivising DC through density bonuses

- Cities could use the existing administrative structure of **premium FSI payments** or **TDR** to promote connection or development of DC. Buildings under development that commit to connect to DC or develop a DC network could be **granted additional FSI** or have FSI payments reduced as an incentive. Coupled with this, the city could highlight the floor space saved from connecting to DC.
- To ensure the **long-term sustainability** of such an incentive scheme, requirements to be given an FSI bonus could become increasingly difficult, could be linked **more generally to building efficiency** (for example through building certification schemes such as GRIHA or LEED).



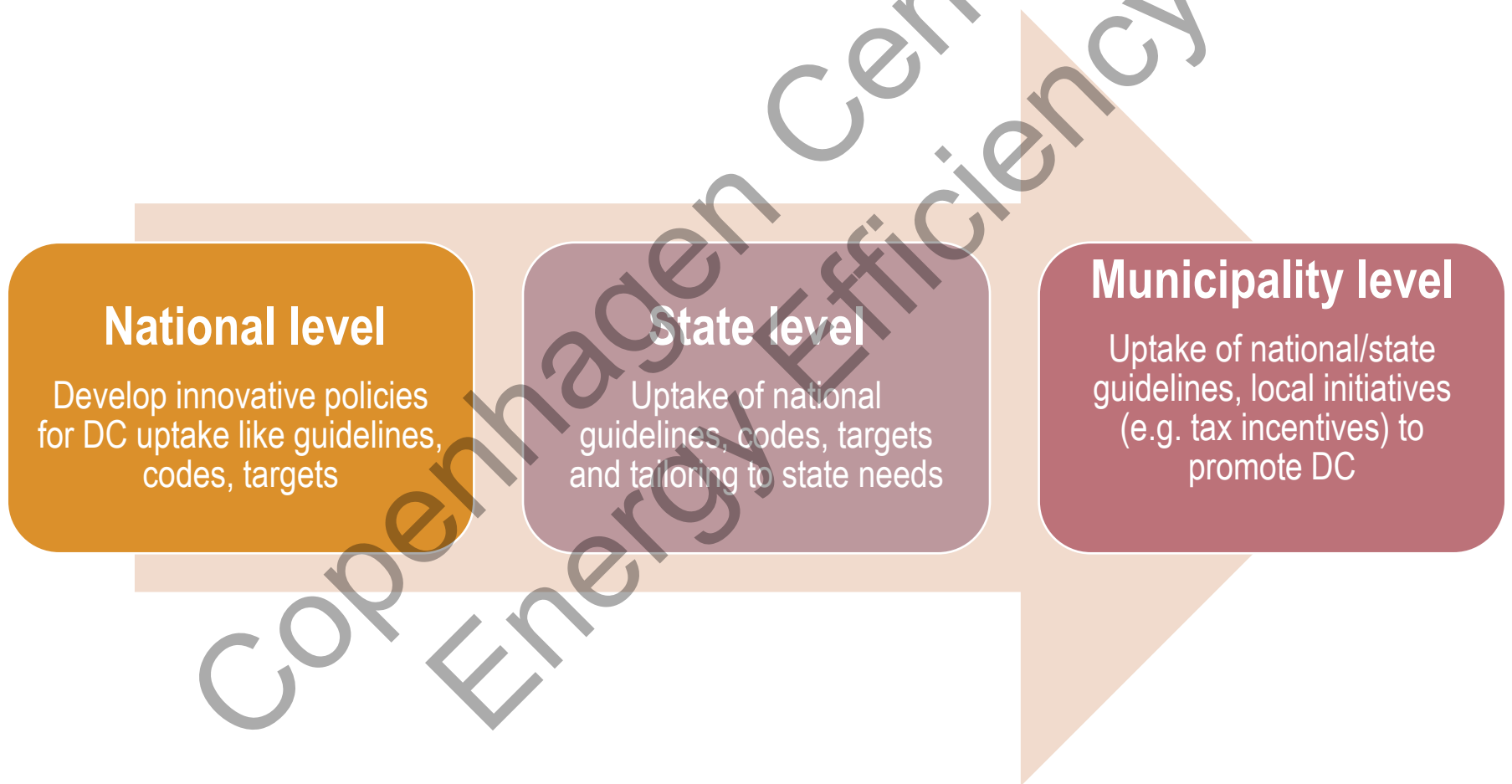
Image: Home Electrical



MODULE 5. POLICY DEVELOPMENT IN DC

POLICY DEVELOPMENT IN INDIA

Policy development flow in India





POLICY PUSH FOR DC IN INDIA

- **Urban and Regional Development Plans Formulation and Implementation (URDPFI) guidelines** – These guidelines are referred by Urban Development Departments at State level and cities for regional planning, urban planning, infrastructure planning and sustainability guidelines. This could be revised to include new guidelines such as percentage green cover mandatory in new area development and land use planning – forcing any new area development above certain square meters to follow some mandatory norms on construction considering energy conservation and environment conservation. DCS could come into these guidelines.
- **National Mission on Sustainable Habitat** can be updated by MOEFCC advocating preparation of plans for specific sectors such as improvement of energy efficiency in buildings through extension of ECBC- which addresses the design of new and large commercial buildings to optimize their energy demand, better urban planning and modal shift to public transport to facilitate growth of medium and small cities, improved urban waste management, adapt to climate change by improving resilience of infrastructure, community based disaster management, and measures for improving advance warning systems for extreme weather events.
- Mapping urban heat; identify areas where things need to change – all happening too slowly; peri-urban development is outside the municipal corporation control – goes to state UDA.



POLICY PUSH FOR DC IN INDIA

- Govt has declared to support to 15 new smart cities under this years financial budget. These cities can adopt new guidelines developed by MoHUA/NIUA for resource efficient investments. Climate Smart Cities Assessment Framework to include indicator on district cooling
- District cooling should be listed out as separate infrastructure in the Plan under City Assessment (just as power, water, sanitation etc. are)
- Energy Conservation & Building Code (ECBC) when adopted at State level to include DC connection requirements.
- District cooling policy (i.e. defining district cooling zones and outlining minimum thresholds required to implement or connect to district cooling) to be included in Development plan which is developed by the city but then needs approval at State level
- Provision of by-law that requires integrated energy planning: energy master planning for Town Planning schemes
- Provision of by-laws to make connection to district cooling mandatory in priority zones above a certain size/cooling density



MODULE 5. POLICY DEVELOPMENT IN DC

ENERGY EFFICIENCY POLICIES IN INDIA

Examples of policies adapted for building energy efficiencies in five Indian cities

Red: Not developed, Orange: Under development, Green: Existing policy

	Bhopal	Coimbatore	Pune	Rajkot	Thane		Bhopal	Coimbatore	Pune	Rajkot	Thane
Smart city	Green	Green	Green	Green	Green	Mandates on SWH and/or PV by sector	Red	Green	Green	Green	Green
Solar city program	Green	Green	Green	Green	Green	Mandates on centralised HVAC	Red	Red	Red	Green	Red
Baseline GHG assessment	Red	Green	Green	Green	Green	Green building policy	Red	Yellow	Green	Yellow	Yellow
Low GHG plan / target	Red	Yellow	Red	Green	Green	Mandate on water re-use in cooling	Red	Green	Red	Red	Red
City-wide efficiency & renewables target	Green	Green	Green	Green	Green	Mandates on building certification	Yellow	Red	Green	Red	Red
Efficiency & renewable target by sector	Red	Green	Yellow	Green	Green	FAR bonus linked to certification	Red	Red	Green	Green	Red
Zonal renewable energy target	Red	Red	Green	Green	Green	Property tax rebate for SWH installation	Red	Red	Green	Green	Green
Zonal building efficiency target	Green	Red	Red	Red	Green	Direct investment in energy projects	Green	Green	Green	Green	Green
						Public buildings to demonstrate	Green	Green	Green	Green	Green



DISTRICT
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IN CITIES

CASE STUDIES



Kai Tak, China, Source: Unsplash



CASE STUDY: THANE, INDIA

Cities can incentivize and remove barriers and risks to DCS development through streamlined **approvals and permitting** procedures, **local policy** development and **advocacy** for state or national-level policy changes

Analysis of local policy options

- Fiscal incentives
- FSI bonus
- District cooling ready buildings
- Connection policies
- Concession contracts
- 'Open-access'

Thane's District Cooling Cell

Advocate for state/national policy

- VAT/GST incentives
- Power tariffs for thermal storage
- Trigeneration grid connection
- Standards
- Building codes

Streamlining

- Clear permitting procedures
- Fast approval process



MODULE 5. POLICY DEVELOPMENT IN DC

CASE STUDY: THE EU PERSPECTIVE

EU Policy on heat planning

EU LEGISLATION ON HEAT PLANNING

“EU legislation on energy efficiency requires that regional and local authorities plan and design an urban heating and cooling infrastructure that utilizes all available renewable energy sources and CHP in their region.”

UNEP, District Energy in Cities



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

MODULE 5. POLICY DEVELOPMENT IN DC

CASE STUDY: THE EU PERSPECTIVE

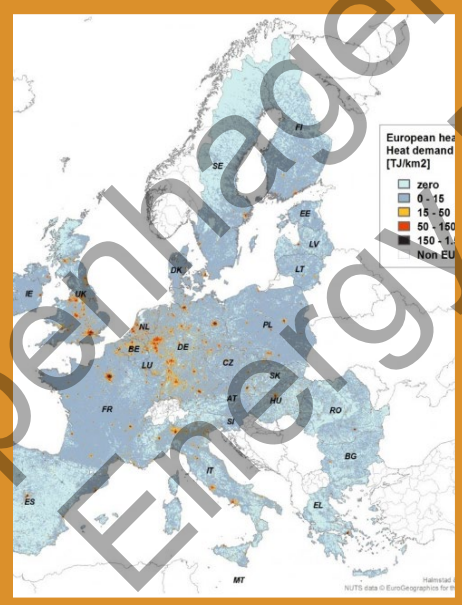
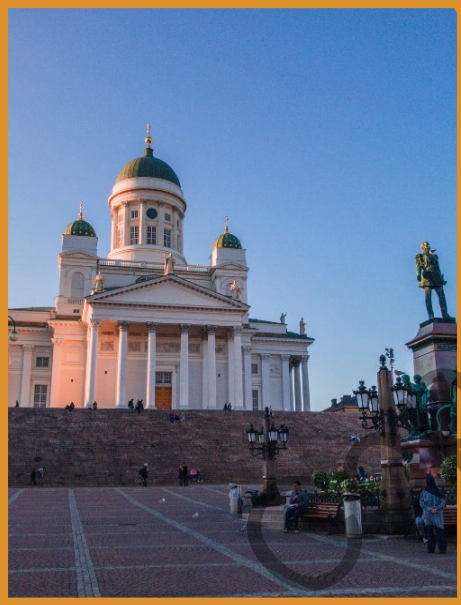
Overview of DE cases within the European Union

Finland: Building code and EPBD

Heat Roadmap: Planning for districts

Norway: Licensing of DH

Sweden: Levelling the playing field

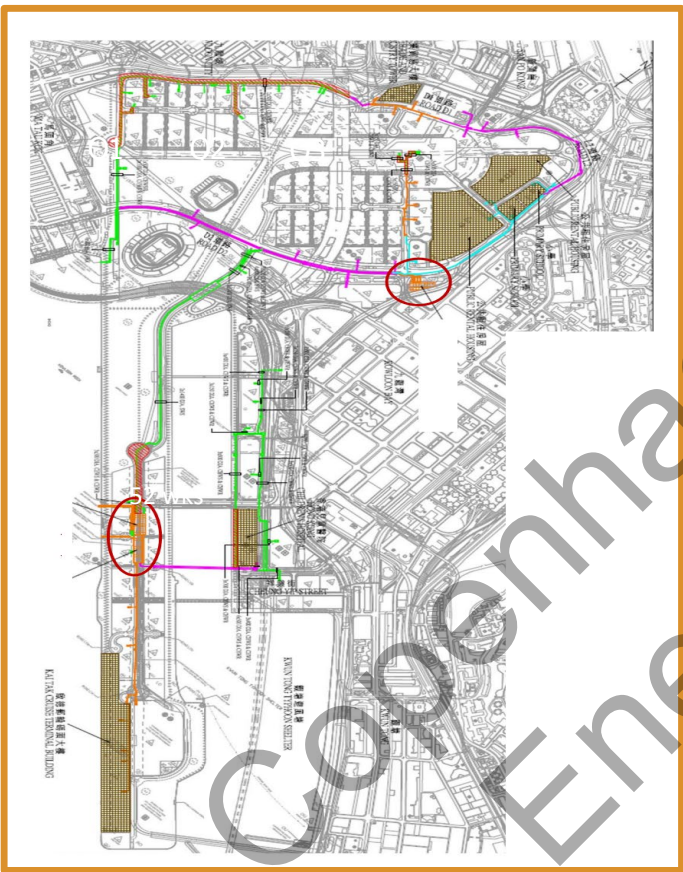


Source: image 1: Unsplash, image 2: EnergyPLAN, image 3 & 4: District Energy in Cities. Unlocking the Potential of Energy Efficiency and Renewable Energy

MODULE 5. POLICY DEVELOPMENT IN DC

CASE STUDY: KAI TAK, CHINA

The case of Kai Tak Development: mandatory connection through planning



- District cooling developed as new buildings are constructed: phased development
 - Phase 1 (2011-2013)
 - Phase 2 (2011-2014)
 - Phase 3 (2013-2017): 5000 TR
 - Remaining (2017-2021): 40,000 – 73,000 TR

Development area: 3.2 million m²
Full load: 81,000 RT
Pipe length: 40km
Number of consumers: 60
Technology: Electric chillers and seawater cooling
Electricity savings: 85 GWh per year (equivalent to \$1.7 million)
CO₂ reduction : 59,500 tons of CO₂ per year

Source: Implementation of District Cooling System at Kai Tak Development. Electrical and Mechanical Services Department



Tokyo: District Energy Planning System for Effective Energy Utilization

- District cooling incorporated into Tokyo's city-wide planning system
- New developments above 50,000m² must provide an "Energy Plan for Effective Utilization"
- This includes assessing **connection to nearby district cooling** or assessing **new network development**
- City will seek to overcome economic barriers to connection
- District cooling suppliers have **exclusive service areas**
- District cooling suppliers required to meet efficiency standards through this policy



**20 large scale developments lead to DES/yr
- \$150million in last 5 yrs
Use 44% less primary energy and 50% less
CO₂**



KEY TAKEAWAYS (I/II)

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

- Urban planning is a **technical and political process** concerned with the development and design of land use and the built environment.
- From an energy system perspective, the purpose of integrating urban planning in the development of DCS is to ensure a **sustainable urban development**.
- For each of the steps of urban planning, specific actions need to be undertaken towards the development of the DCS network to ensure an **integrated process**.
- As planners and regulators, local authorities have **three main areas for policy intervention**:
 1. Energy policy objectives, strategy and targets
 2. Holistic energy mapping
 3. Connection policies
- **Integrated energy planning** entails: planning criteria, mixed use zoning, franchise licenses, building codes and policies, connection policies, and compact land use



KEY TAKEAWAYS (II/II)

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

- An energy plan is a **road map of project developments** and policy interventions to help a city realize the articulated goals of its energy strategy.
- **Holistic energy mapping** helps to identify synergies and opportunities for cost-effective district cooling,
- **Connection Policies**, can be classified by enforcement type;
 - **Mandatory**: city-wide mandatory connections, zonal mandatory connection policies, mandatory connection (unless) policies, mandatory district cooling development through zoning policies
 - **Encouraged**: density bonus, access to rights-of-way, take or pay, bans, regulated and transparent tariffs, building compatibility requirements, inclusion in local green building standards, financial assistance
- Each city or municipality should identify the **best policy instruments** to develop DCS based on its framework conditions.



MODULE 5. POLICY DEVELOPMENT RECOMMENDATIONS

Some recommendation for policy development are:

- **Characterise business-as-usual**, analysing socio-economic, technical, policy and urban planning framework
- **Develop a DCS potential analysis** (rapid assessment and city-wide deep assessment)
- Assess the **other technical alternatives** and cross against DCS solution
- Present benefits of DCS to the energy plan and requirements to the urban planning
- Strengthen know-how of DCS technical capacity in the energy department
- **Provide policy instrument gaps** to stimulate demand (i.e. mandatory and/or encouraged measures)



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



E-TRAINING PROGRAM

DISTRICT COOLING DEVELOPMENT

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

Module 6

- Business models for sound sustainable district cooling systems

Copenhagen Energy Efficiency Centre



MODULE 5. POLICY DEVELOPMENT IN DC

CASE STUDY: THE EU PERSPECTIVE

The greater London authority: encouraging connection through planning



Source: Bunhill CHP plant in Islington, London. The tower is a large heat storage unit that reduces the need to provide heat from the district heating system', lanvisits

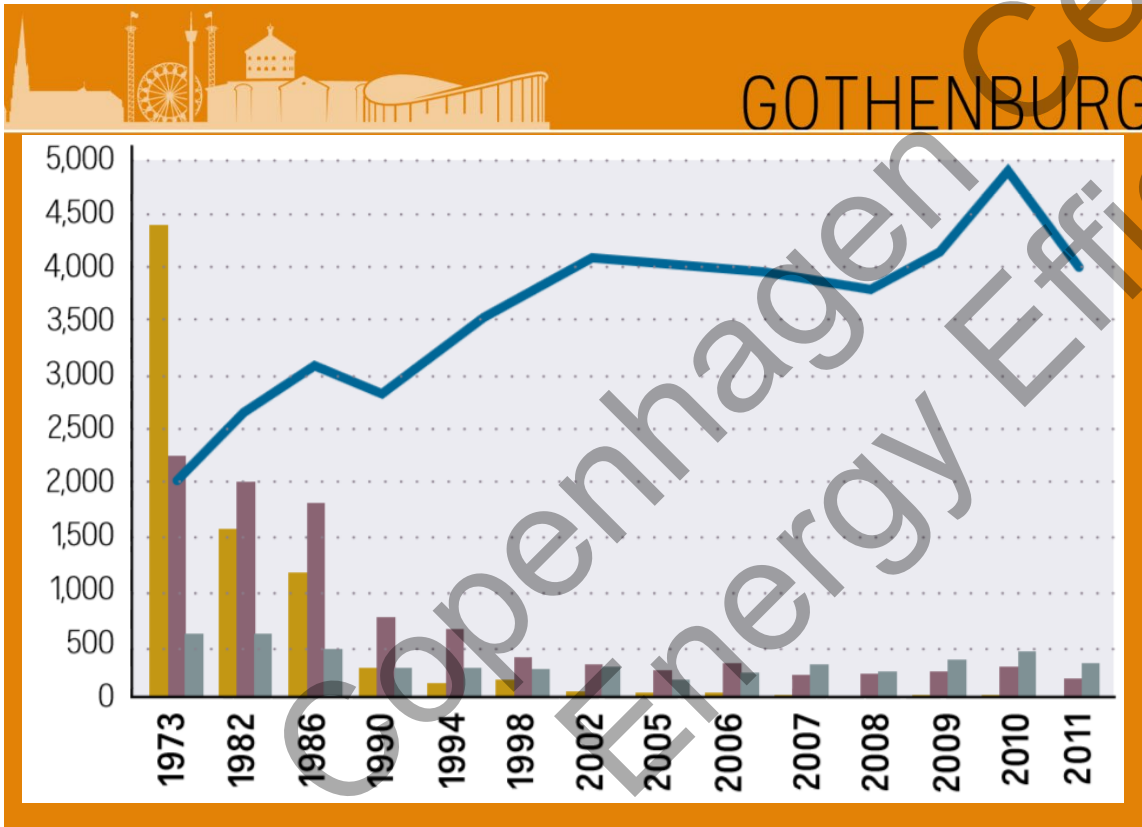
- The **Greater London Authority's** (GLA's) energy planning started with a focus on **climate change**, but it now also takes into account the **city's rapid growth and ageing infrastructure**, including the electricity grid.
- London uses its **land-use planning authority** to promote district energy development.
- Current GLA planning policies require **all new developments** to include energy assessments that detail efforts to **minimize the associated CO₂ emissions**.



MODULE 5. POLICY DEVELOPMENT IN DC

CASE STUDY: THE EU PERSPECTIVE

Best practice national policies: Gothenburg (Sweden)



“In Sweden, a CO₂ tax was critical to the country’s energy transition strategy and Gothenburg identified the CO₂ tax as the most important national policy for district energy in the city”

UNEP, District Energy in Cities

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