DISTRICT ENERGY IN CITIES

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A GLOBAL INITIATIVE TO UNLOCK THE POTENTIAL OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

ntegration of district cooling from a planning and urban development perspective

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Energy, Climate, and Technology Branch, UNEP

IEA, Paris, May 17th-18th 2016

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LAUNCH AT CLIMATE SUMMIT

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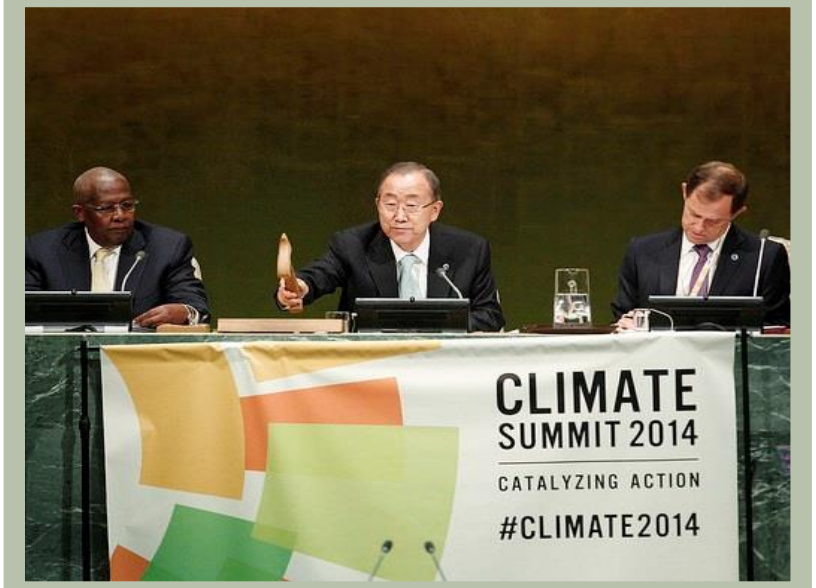
Sustainable Energy for All (SE4All) Sub-Committee's

Co-chairs:
- UNEP Executive Director
- CEO Accenture
- Minister for Trade and Development Cooperation, Denmark

Global Energy Efficiency Accelerator Platform: to scale up efficiency gains and investments at the national, sub-national and city levels through technical assistance, support and public-private sector collaboration

Individual accelerators focus on specific energy efficiency sectors

- Buildings
- Transport
- **DISTRICT ENERGY**
- Lighting
- Appliances & Equipment



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GLOBAL ENERGY EFFICIENCY ACCELERATOR PLATFORM

Double Global Rate of Improvement of Energy Efficiency by 2030

A GLOBAL PARTNERSHIP TO SCALE-UP

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MODERN DES

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EUROHEAT & POWER

I·C·L·E·I Local Governments for Sustainability

SSG SUSTAINABILITY SOLUTIONSGROUP

Johnson Controls

Danfoss

COPENHAGEN CENTRE ON ENERGY EFFICIENCY
SE4ALL EE HUB

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

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KEY OBJECTIVES

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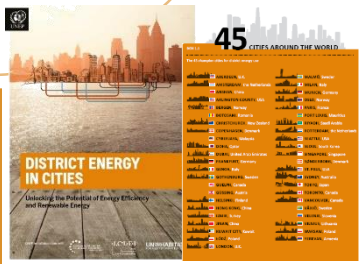
MARKET TRANSFORMATION



Increase **knowledge** of multiple benefits to promote district energy

Demonstrate the viability of district energy & develop city-wide policy-investment plans

Scale up district energy in cities by **replicating** best practice

Create an environment that favours **investment** in district energy

Double the rate of energy efficiency improvements for heating and cooling in buildings by 2030 through district energy

DISTRICT COOLING APPLICABLE GLOBALLY

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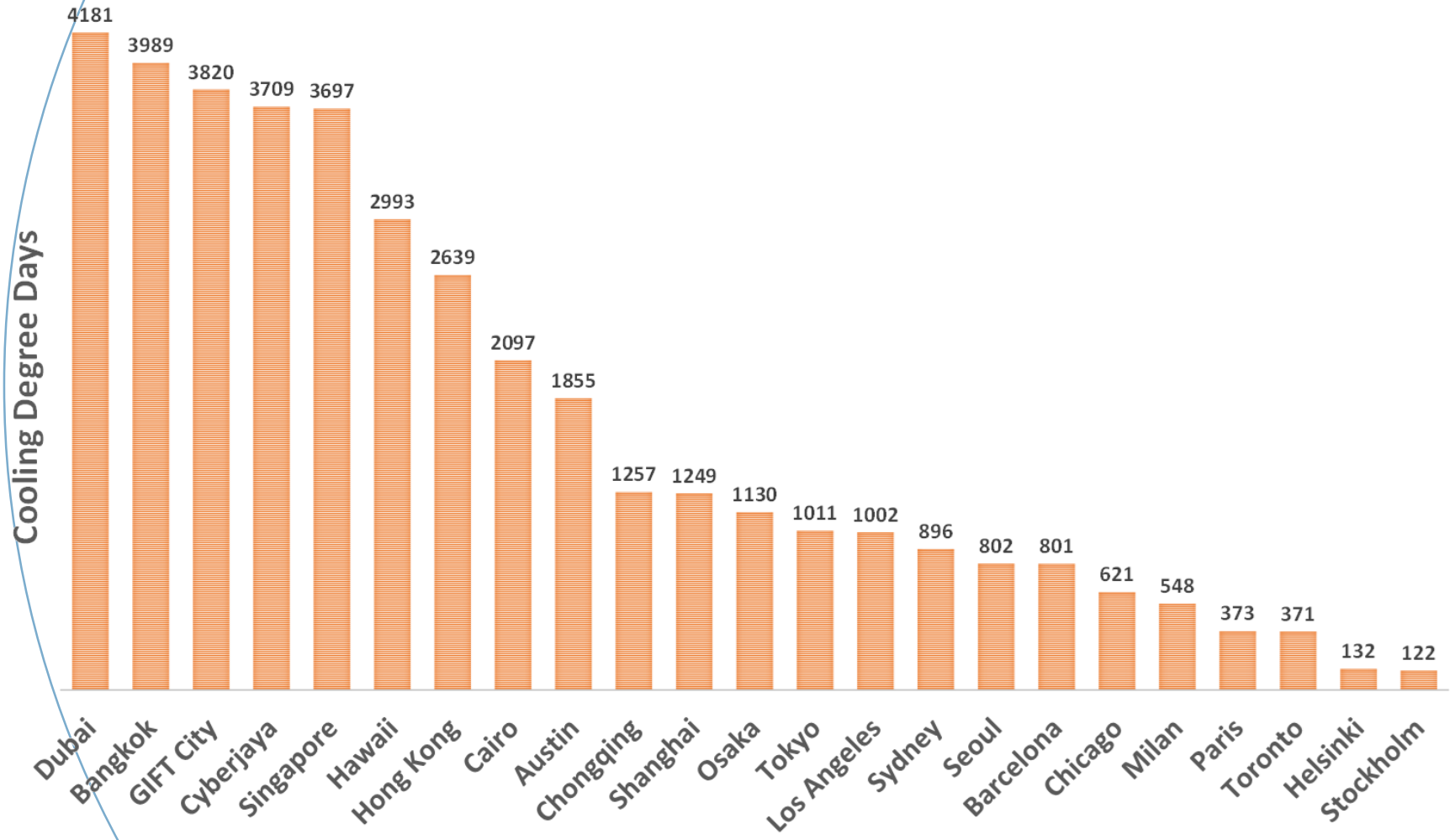
Cooling degree days of select cities with successful district cooling



*Average of 2014 and 2015 cooling degree days for locations in selected cities using 18 degrees Celsius as reference temperature.

SIGNIFICANT BARRIERS TO DISTRICT ENERGY DEVELOPMENT

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- Lack of awareness and misperceptions
- Local and institutional capacity for coordinating DES development.
- Lack of holistic planning policies that integrate energy and DES
- Incentives and accounting methods that are not harmonized
- Commercial viability of DES unproven in some markets.
- Lack of data on cooling consumption

LAUNCH OF A TECHNICAL GUIDE

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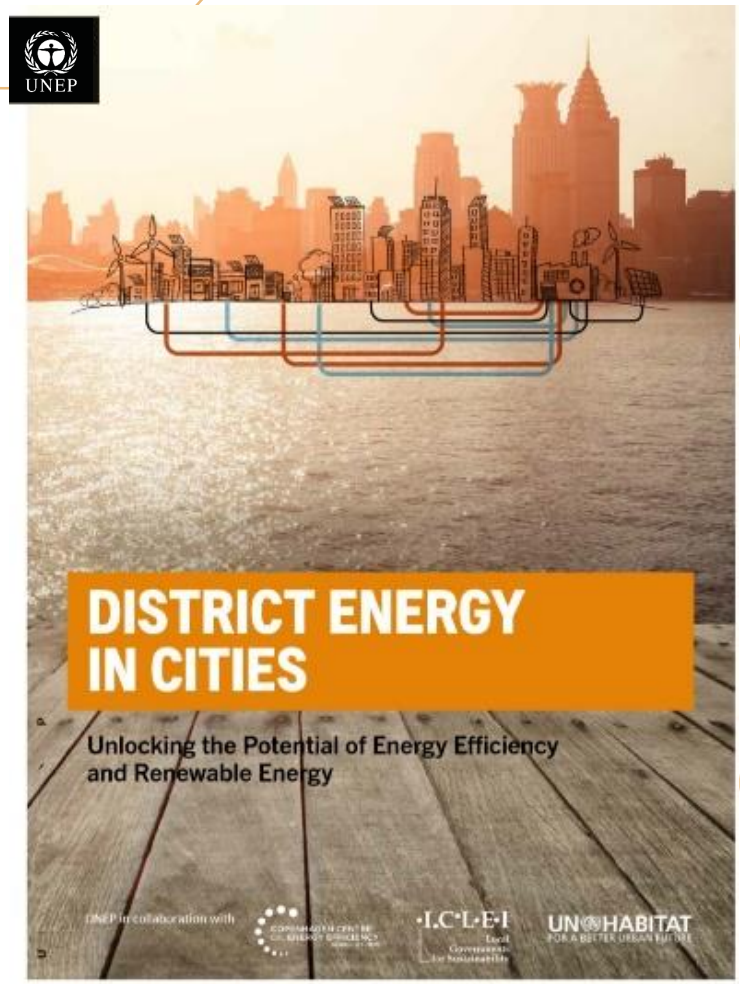

Methodology and Key Steps

*"In launching this report we want to draw the **attention of the world's decision makers**, mayors and leaders at the community level **to the importance of district energy systems**."*

- Achim Steiner, UN Environment Programme Executive Director. Launch of the District Energy in Cities Report - Paris, 25 February 2015

THE ROLE OF LOCAL GOVERNMENT

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- OBJECTIVES, STRATEGY AND TARGETS
- INTEGRATED ENERGY PLANNING:
  - HOLISTIC URBAN PLANNING
  - CATALYSING NETWORK DEVELOPMENT
  - CONNECTION POLICIES

OBJECTIVES, STRATEGY AND TARGETS

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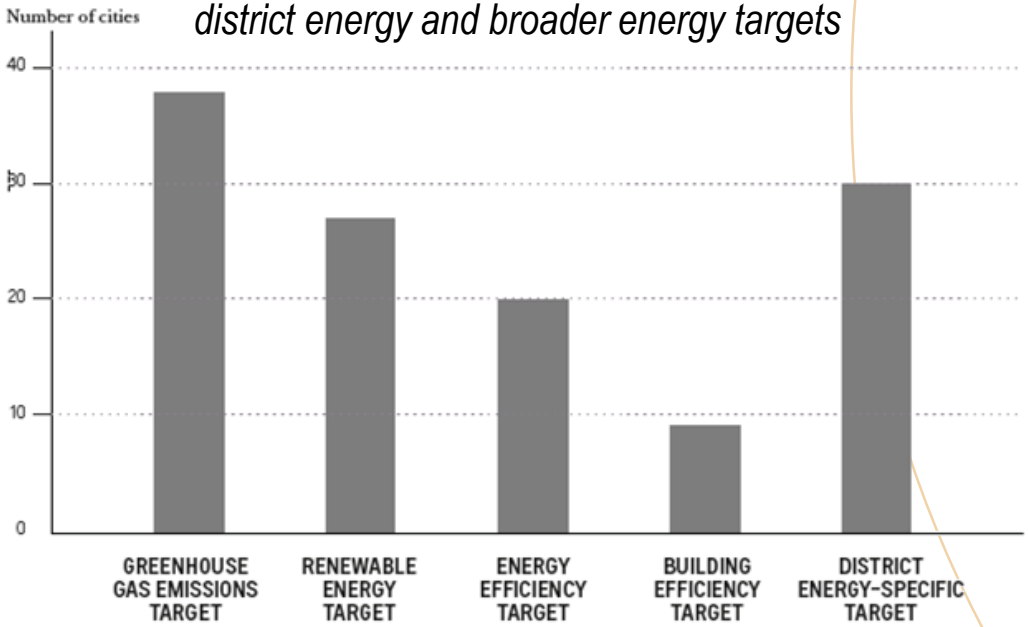
- Cities need to **assess** and **demonstrate** the benefits of district cooling in the context of local objectives and its potential.
- Long-term development of district cooling requires its incorporation into local energy strategy and targets.

Shares of the 45 champion cities that have targets for district energy and broader energy targets



ADVANTAGES

1. Stakeholder buy-in
2. Reassure investors
3. Justify resource expenditure
4. Justify local policy changes
5. Advocate for national policy changes

HOLISTIC URBAN PLANNING AND DISTRICT COOLING

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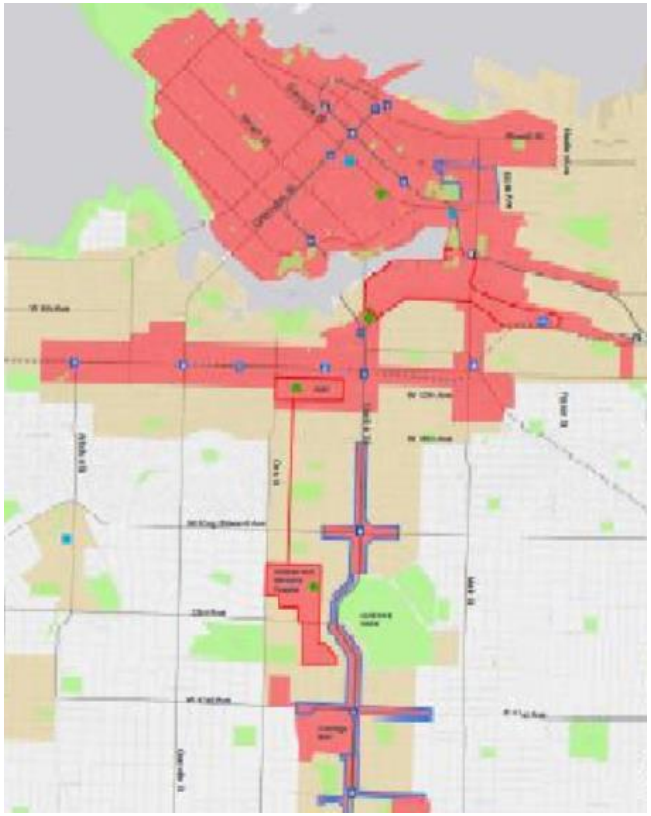
To ensure cost-effective district cooling, cities need to analyse the interaction between energy, land use and infrastructure – including power, waste, water, buildings and transport.

- Energy planning integrated into **infrastructure development**
- Exert planning authority to create optimal conditions for district cooling: **mixed use zoning** and **compact land use**
- **Designate** zones to **apply tailored policies or financial incentives** for district energy



MIXED USE ZONING, COMPACT LAND USE & ANCHOR LOADS

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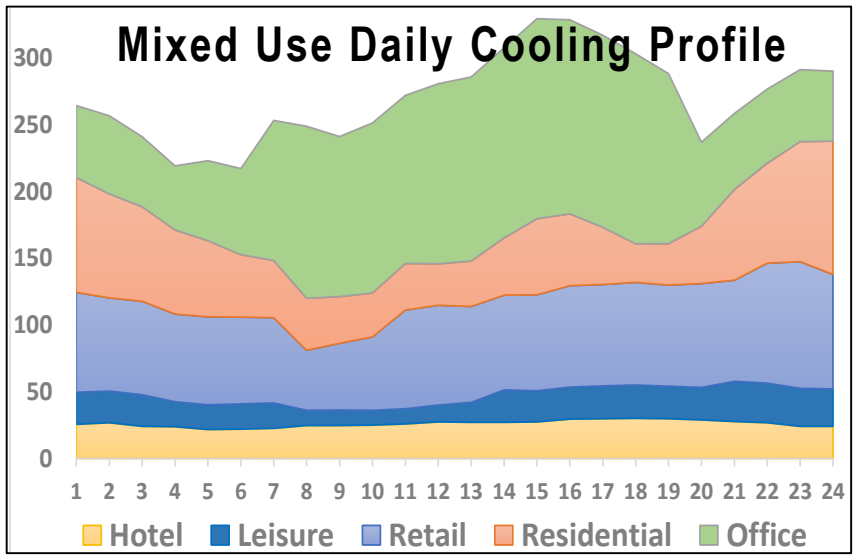
CITY ACTION

- Ensure that opportunity areas are zoned as **mixed-use**.
- Ensure that opportunity areas have a high allowable **building density**
- Establish **anchor loads** in or adjacent to opportunity areas *(hospitals, malls, leisure centres, government buildings…)*



BENEFITS

- Smoother load profile improves business case for district cooling
- Higher cooling demand density, lowering network costs
- Reduce load risk and secure the initia build-up of a district cooling system

HONG KONG:

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KAI TAK DEVELOPMENT

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Image from airport2park.org

CHALLENGES

- 32% of Hong Kong's electricity is for AC.
- Lack of experience in district cooling

OBJECTIVES

- Cut down coal consumption for electricity.
- Demonstrate district cooling in Hong Kong to kick-off other projects
- By 2020 improve refrigeration performance by 50% for all commercial buildings

PROJECT IDENTIFICATION

- Identified redevelopment of old airport as potential district cooling demonstration.
- Project's proximity to seawater for cooling
- Hong Kong had authority over design and development of zone

HONG KONG:

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KAI TAK DEVELOPMENT

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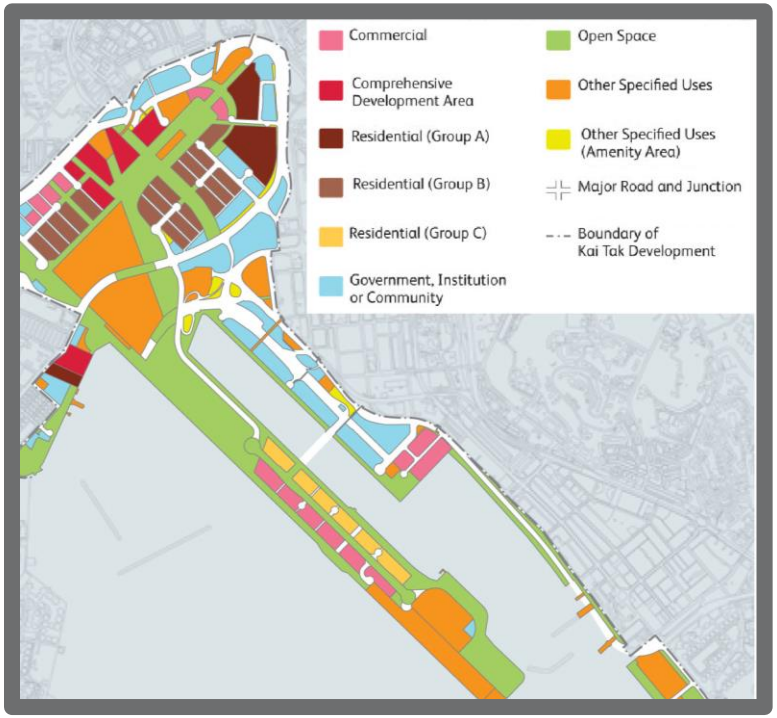
DENSE AND MIXED-USE ZONE

- Public consultation process developed *Kai Tak Outline Zoning Plan* defining a **high density**, **mixed use** development.
- Zoning Plan sets out ratios for different building types and maximum densities within sub-zones



ANCHOR LOADS

- Large share of institutional buildings and publicly owned residential
- Numerous anchor loads

BENEFITS

- Demand will fall to **only 30% to 50%** of peak during cool season
- Full system electricity savings: 85 GWh per year (equivalent to $1.7 million)
- New district cooling projects identified in Hong Kong

Total area	**3.23 km²**
Built-up area	**1.53 km²**
Proportion of built-up area:	
Residential	**23%**
Commercial	**9%**
Residential & Commercial	**6%**
Institutional	**25%**
Transport terminals	**38%**

Image edited from ktd.gov.hk

Data: http://www.info.gov.hk/gia/general/201209/14/P201209140279.htm

CATALYSING NETWORK DEVELOPMENT

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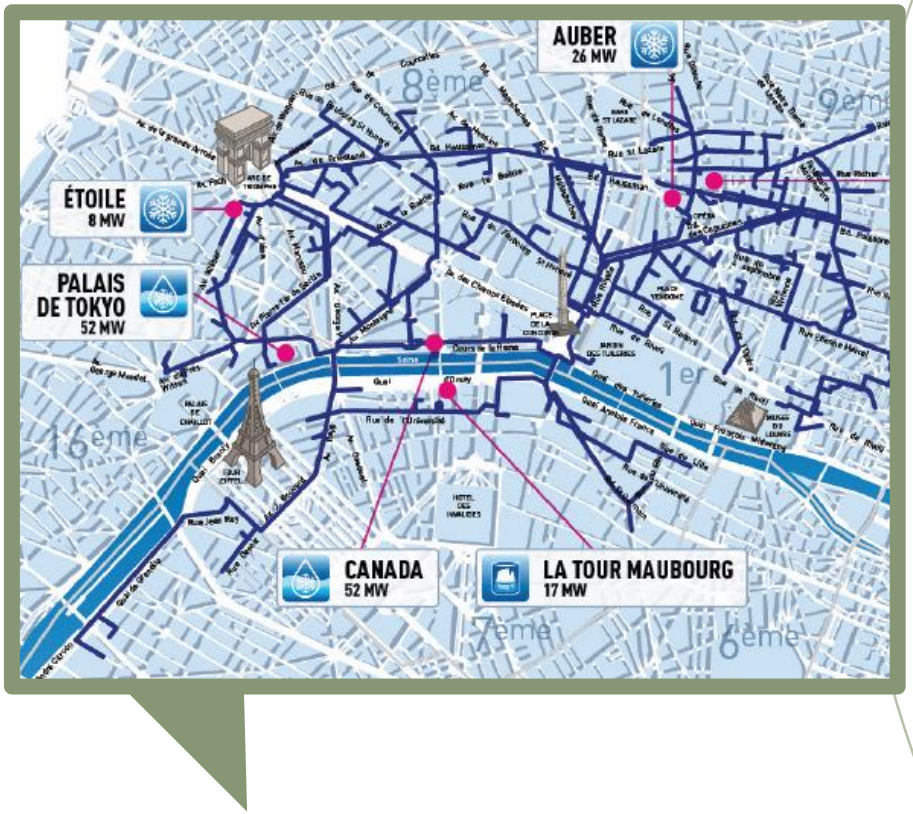

- Local government assesses district cooling in a government controlled development and:
  - directly finances development *(Hong Kong, Singapore, Dubai)* or
  - proposes concession *(London Olympic Park, Paris, Cyberjaya)*
- Established local district heating utility develops district cooling *(Copenhagen, Helsinki, Gothenburg, Stockholm, St. Paul, Toronto)*
- City-wide policies require large developments to develop district cooling if they cannot connect to existing networks *(Tokyo)*

CONNECTION POLICIES:

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MANDATORY CONNECTION

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- Zonal or city-wide **mandatory connection.**
- Exceptions may depend on feasibility of connection or building type.
- Typically combined with regulated tariffs.

POLICY MECHANISMS

- City-wide planning policy
- Target for government buildings
- Service-area bylaw
- Land lease model

SINGAPORE: MARINA BAY

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BUSINESS DISTRICT

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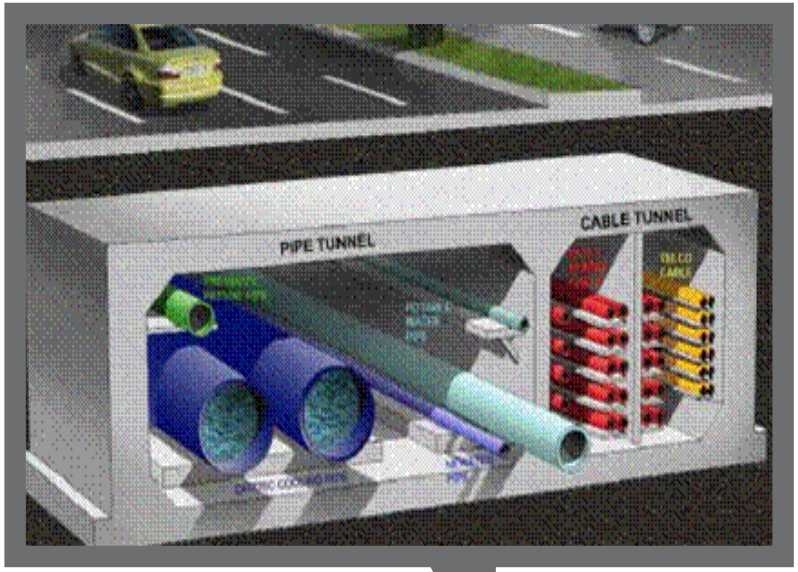
CHALLENGES

- 70% of electricity usage in commercial buildings is cooling
- Imports all energy needs
- Lack of experience in district cooling
- No existing policy framework for DC that reduced demand risk or regulated tariffs to protect consumers

PROJECT IDENTIFICATION

- Identified new business district as potential district cooling demonstration.
- City undertook feasibility study
- Singapore had authority over design and development of zone
- Singapore invested directly in Joint Venture



Source: Veolia

BEST PRACTICE MULTI-UTILITY

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BUSINESS MODEL

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CONNECTION POLICY

- Singapore District Cooling Act mandated connection of commercial buildings in zone

TARIFF REGULATION

- Regulates tariffs to be cheaper than alternative technology
- Operator allowed to earn baseline return on invested assets
- Once start-up costs paid off, profits are shared with consumers

BEST PRACTICE IN TOKYO:

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LOCAL PLANNING REQUIREMENTS

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District Energy Planning System for Effective Energy Utilization

- District cooling incorporated into Tokyo's city-wide planning system
- New developments above 50,000m^2 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

CONNECTION POLICIES: INCENTIVES AND BUILDING DESIGN

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- **Incentives:** targeted incentives to encourage connection to district cooling
  - Density bonuses
  - Subsidies for connection
  - Credit towards green building certification

- **Building compatibility requirements**
  - Centralized cooling systems

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INITIATIVE ACTIVITIES

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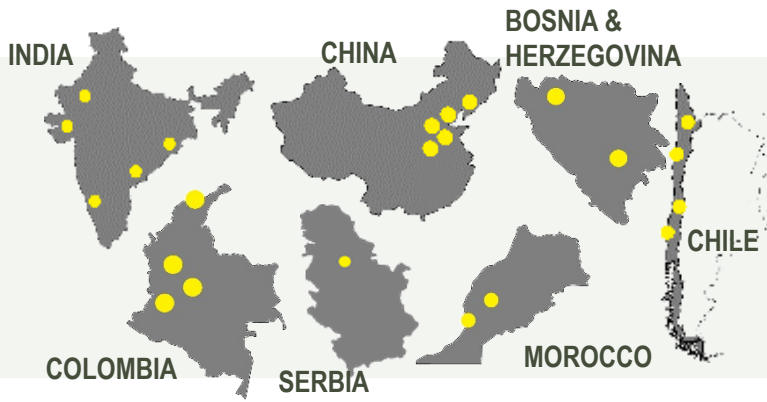
LIGHT TOUCH

CAPACITY BUILDING

- RAPID ASSESSMENTS
- NATIONAL WORKSHOPS
- NEW ACTIONS, PROJECTS OR POLICIES



DEEP DIVE

FACILITATING FINANCE

- DEEP ASSESSMENT
- TRAINING
- PROJECT TENDERS
- DES CITY-WIDE PLANS
- MRV SYSTEM

REPLICATION

CREATING A PIPELINE

- NEW CITIES
- RAPID ASSESSMENTS
- VIRTUAL PLATFORM
- MENTOR CITIES
- MATCHMAKING

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THANK YOU!

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For more information on the Global District Energy in Cities Initiative and to become a partner, please visit the website or contact:

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