

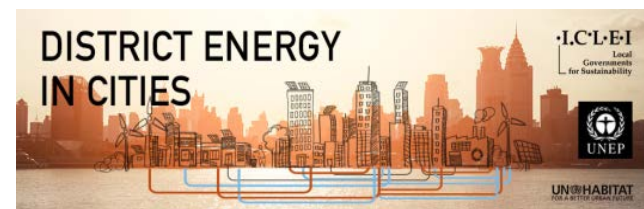
# Combining Building Efficiency and District Energy for More Sustainable Cities: A Sustainable Energy for All Webinar

1<sup>st</sup> September 2015

## Welcome and Introduction of SE4ALL Energy Efficiency Accelerators

Maryke van Staden, Low Carbon Cities Program Manager, ICLEI World Secretariat

Lily Riahi, Advisor on Sustainable Energy in Cities, UNEP



# Today's agenda

- *Welcome and Introduction of SE4ALL Energy Efficiency Accelerators (10 minutes)*
  - Maryke van Staden, Low Carbon Cities Program Manager, ICLEI World Secretariat
  - Lily Riahi, Advisor on Sustainable Energy in Cities, Energy, Climate and Technology Branch, UNEP
- *The building efficiency and district energy relationship and opportunities for action in cities: Building Energy Accelerator and District Energy in Cities (15 minutes)*
  - Ingo Wagner, Policy and and Project Officer, Euroheat and Power
- *Warsaw's building efficiency and district energy activities (20 minutes)*
  - Leszek Drogosz, Director of Infrastructure Department, City of Warsaw, Poland
  - Marcin Wróblewski, Infrastructure Department, City of Warsaw, Poland
- *Dubai's building efficiency and district energy activities (10 minutes)*
  - Samer Khoudeir, Chief Sales & Marketing Officer, Empower
- *Summary & call to action (5 minutes)*
  - Maryke van Staden, ICLEI
- *Questions & answers (30 minutes)*

# UN Sustainable Energy for All



ENSURING  
*universal access*  
TO MODERN ENERGY  
SERVICES.



DOUBLING THE GLOBAL  
RATE OF IMPROVEMENT IN  
*energy efficiency.*



DOUBLING THE SHARE OF  
*renewable energy*  
IN THE GLOBAL  
ENERGY MIX.

# Energy Efficiency Accelerators

The Accelerator Platform was established to support specific sector-based energy efficiency accelerators

## Lighting

Global market transformation to efficient lighting



## Appliances & Equipment

Global market transformation to efficient appliances & equipment



## Vehicle Fuel Efficiency

Improve the fuel economy capacity of the global car fleet



## Buildings

Promote sustainable building policies & practices worldwide



## District Energy

Support national & municipal governments to develop or scale-up district energy systems



## Industry

Implementing Energy Management Systems, technologies & practices



Power Sector Accelerator is under development





 **GLOBAL ENERGY EFFICIENCY ACCELERATOR PLATFORM**

# An Introduction to the SE4ALL Building Efficiency Accelerator



**WORLD RESOURCES INSTITUTE**



# Partners

## Coordinating partner:



WORLD  
RESOURCES  
INSTITUTE

WRI ROSS CENTER FOR  
SUSTAINABLE  
CITIES

## Cities:

Mexico City (Mexico), Milwaukee (United States), Science City of Muñoz (Philippines), Toyama (Japan), Warsaw (Poland)

## NGOs/Associations:

Global Buildings Performance Network  
Global Green Growth Forum  
ICLEI - Local Governments for Sustainability  
UN Environment Programme  
UN Foundation  
US Green Building Council  
World Business Council for Sustainable Development  
World Green Building Council

## Companies:

Accenture  
Alstom  
China Energy Conservation and Environmental Protection Group (CECEP)  
Danfoss  
Johnson Controls  
Philips  
Saint-Gobain  
TECNALIA

# Why is the efficiency of buildings important?

## Large impact:

- Buildings consume nearly **40% of energy demand** and account for about one third of GHG emissions globally

## Large potential:

- Global building energy **demand can be reduced by one-third by 2050**, if known EE best-practices are implemented on a large scale across regions

## Long-lasting implications:

- Buildings **last for 30-50 years or more**. Poor choices today can **lock-in** high costs, carbon emissions, and poor urban services

## Multiple benefits:

### Economic

Cost-effective opportunities : each additional \$1 spent on EE avoids more than \$2, on average, in energy supply investments

### Social

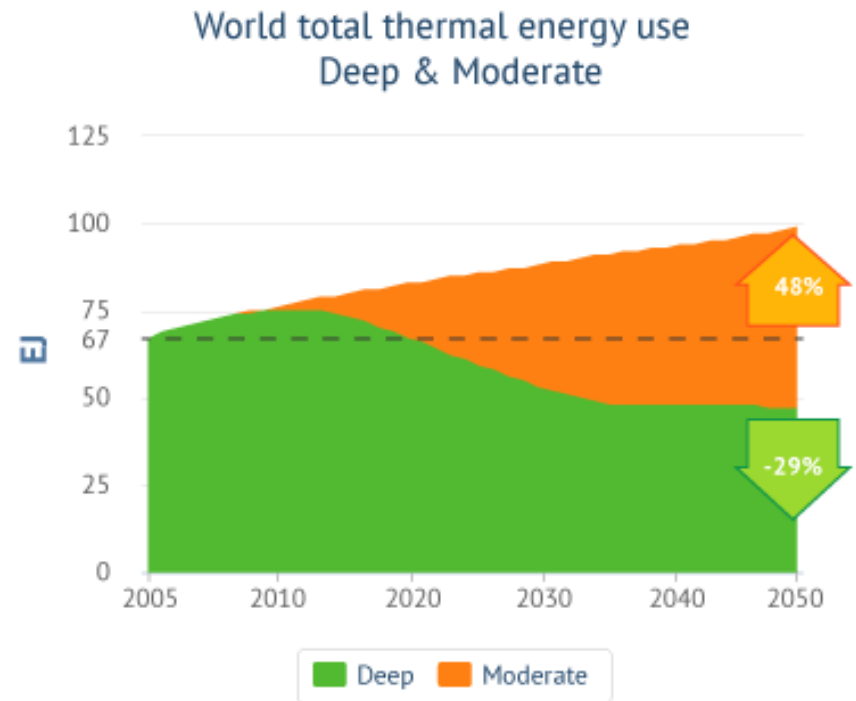
Energy access, Reliability, Security of energy supply, Health & productivity improvement, Job creation

### Environmental

GHG emissions reduction, Sustainable building materials, Water conservation, Climate resilience

# The building efficiency conundrum

- Technologies are available and cost-effective
- *Barriers are behavioral and institutional, not technical*
  - Awareness
  - Technical expertise
  - Performance uncertainty
  - ROI requirements
  - Split incentives
  - Funding
- Diffuse decisions, result in inaction or single-technology approaches
- Must overcome barriers to achieve “deep” efficiency





# Acceleration of policy efforts

New partnerships enable implementation of ambitious projects and policy packages to address barriers, bridge efficiency gap, and avoid lock-in of inefficient building stock.



Source: Institute for Building Efficiency, Johnson Controls Inc.(2011)

# What are BEA cities signing up to do?

## Overarching commitment:

double the rate of building energy efficiency by 2030 in targeted sector within the jurisdiction

Implement one enabling **policy** and one demonstration **project** to be announced at COP21 in Paris

**Interventions**

Create a **baseline** of building energy efficiency performance

**Baseline**

Track, report annual progress, and **share experiences** and best practices with other governments

**Tracking & communication**

# BEA City Engagement Process

Light Touch



Commitment

Assessment

Development

Implementation

Improvement

Deep Dive





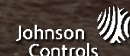
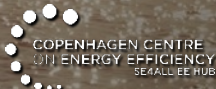
# DISTRICT ENERGY IN CITIES

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



UNEP

UNEP in collaboration with





# A GLOBAL PARTNERSHIP TO SCALE-UP MODERN DISTRICT ENERGY SYSTEMS



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ENERGY  
IN CITIES



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DISTRICT  
ENERGY  
IN CITIES

# OBJECTIVES OF THE INITIATIVE



## TAP THE POOL OF EXPERTISE ACROSS ITS PARTNERS TO:

- Increase awareness
- Promote and strengthen local - national policies
- Create an environment that attracts investment



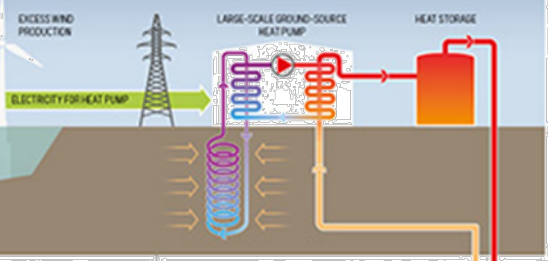


# WHAT IS DISTRICT ENERGY?



## CONNECTING RENEWABLE ELECTRICITY GENERATION

Excess variable electricity production, such as wind generation, can be utilized and stored using district energy, providing valuable demand response for the power system. This electricity can power large-scale heat pumps, which capture low-grade heat (such as from underground) to produce hot water to be stored as heat or fed directly into a district heating network. Similarly, high-efficiency electric chillers could provide demand response and store surplus cold water as cold to be used in district cooling. Through such means, district energy can enable higher shares of renewable energy in power systems.



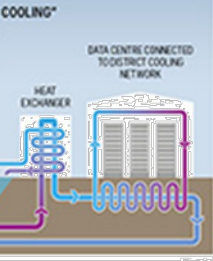
## WASTE INCINERATION

Instead of sending non-recyclable municipal solid waste to landfills, cities can incinerate it. The waste burns water into steam, and this heat is transferred into the district heating system. Some larger waste incinerators also have a steam turbine to produce electricity and heat. The exhaust fumes of the incinerator must be controlled so as not to contribute to local air pollution.



## CONNECTING SOURCES OF "FREE COOLING"

Many cities have renewable sources of low-temperature water that can be used to provide district cooling. The cooling is extracted from sea, river, lake or aquifer water using a heat exchanger. District cooling networks can meet the demands of data centres, which normally require huge amounts of electricity to stay cold.



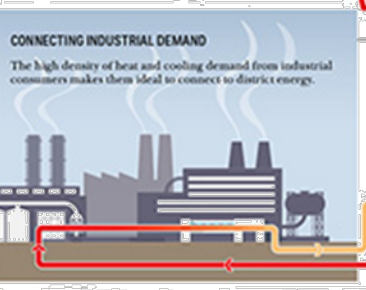
## CONNECTING COMMERCIAL DEMAND

The high density of heat and cooling demand from commercial consumers makes them ideal to connect to district energy.



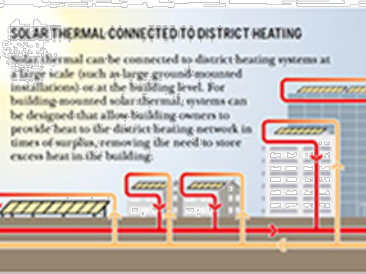
## CONNECTING INDUSTRIAL DEMAND

The high density of heat and cooling demand from industrial consumers makes them ideal to connect to district energy.



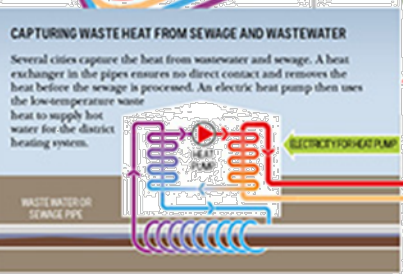
## SOLAR THERMAL CONNECTED TO DISTRICT HEATING

Solar thermal can be connected to district heating systems at a large scale (such as large ground-mounted installations) or at the building level. For building-mounted solar thermal systems can be designed that allow building owners to provide heat to the district heating network in times of surplus, removing the need to store excess heat in the building.



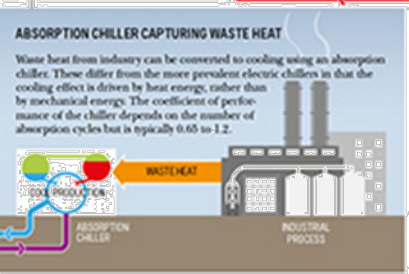
## CAPTURING WASTE HEAT FROM SEWAGE AND WASTEWATER

Several cities capture the heat from wastewater and sewage. A heat exchanger in the pipes ensures no direct contact and removes the heat before the sewage is processed. An electric heat pump then uses the low-temperature waste heat to supply hot water for the district heating system.



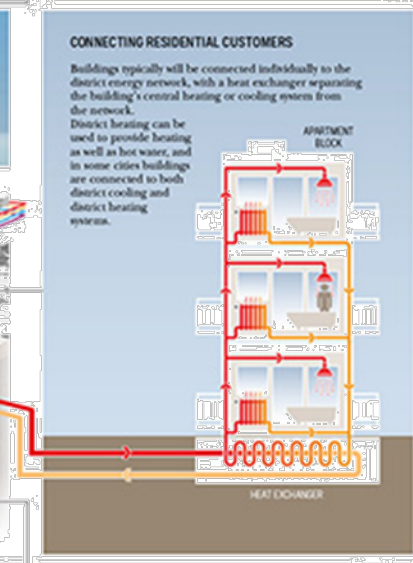
## ABSORPTION CHILLER CAPTURING WASTE HEAT

Waste heat from industry can be converted to cooling using an absorption chiller. These differ from the more prevalent electric chillers in that the cooling effect is driven by heat energy, rather than by mechanical energy. The coefficient of performance of the chiller depends on the number of absorption cycles but is typically 0.65 to 1.2.



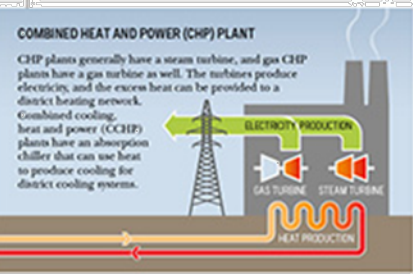
## CONNECTING RESIDENTIAL CUSTOMERS

Buildings typically will be connected individually to the district energy network, with a heat exchanger separating the building's central heating or cooling system from the network. District heating can be used to provide heating as well as hot water, and in some cities buildings are connected to both district cooling and district heating systems.



## COMBINED HEAT AND POWER (CHP) PLANT

CHP plants generally have a steam turbine, and gas CHP plants have a gas turbine as well. The turbines produce electricity, and the excess heat can be provided to a district heating network. Combined cooling, heat and power (CCHP) plants have an absorption chiller that can use heat to produce cooling for district cooling systems.



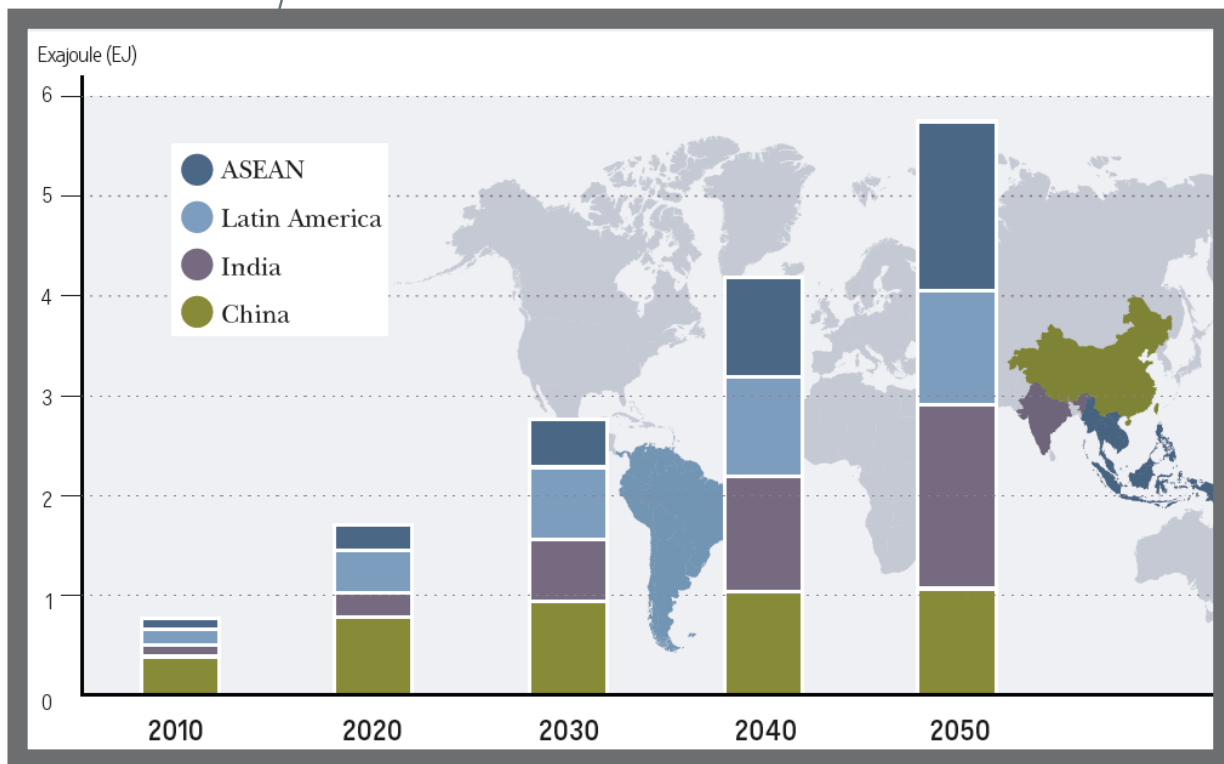
# WHY IS DISTRICT ENERGY IMPORTANT?



DISTRICT  
ENERGY  
IN CITIES



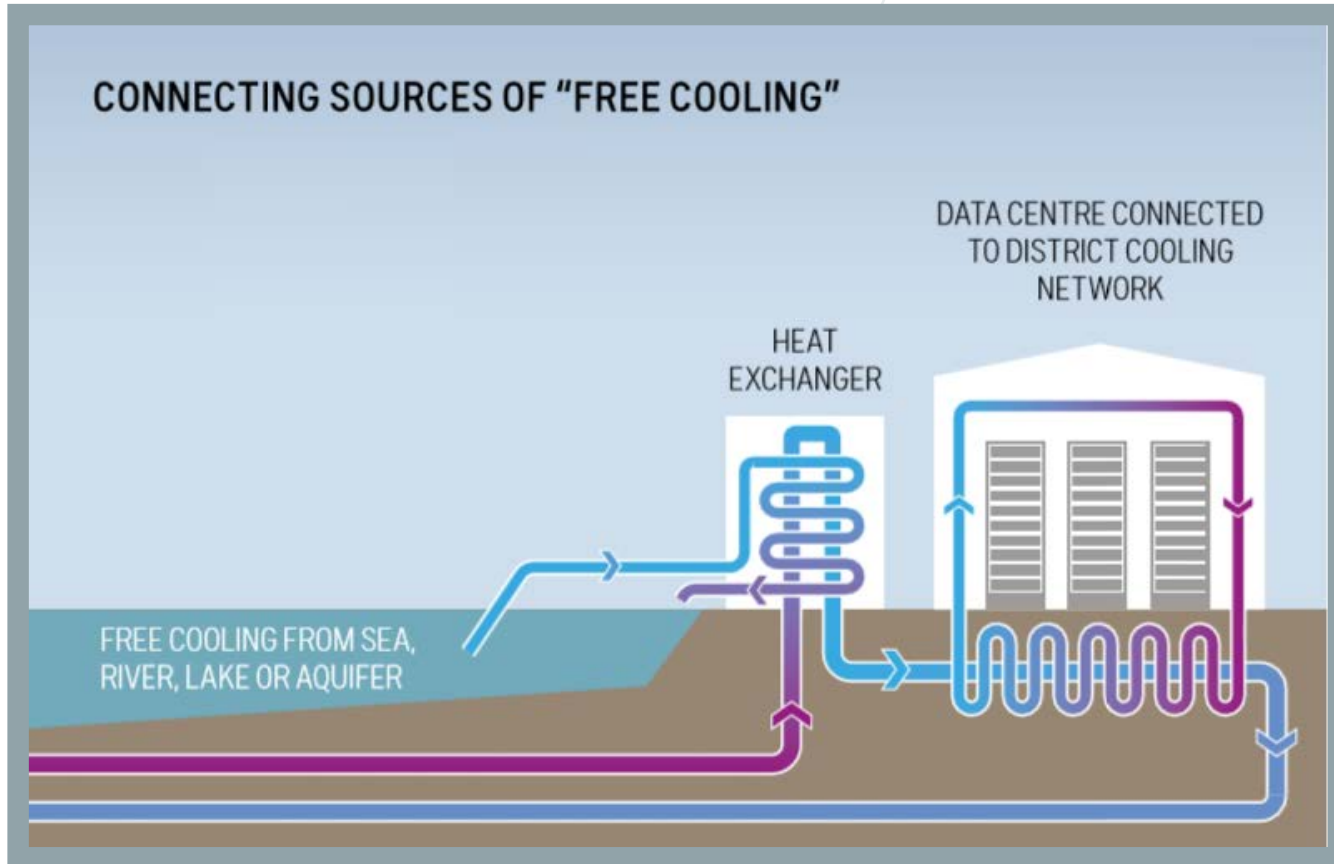
50% of the global energy consumption in buildings, largely met by fossil fuels





DISTRICT  
ENERGY  
IN CITIES

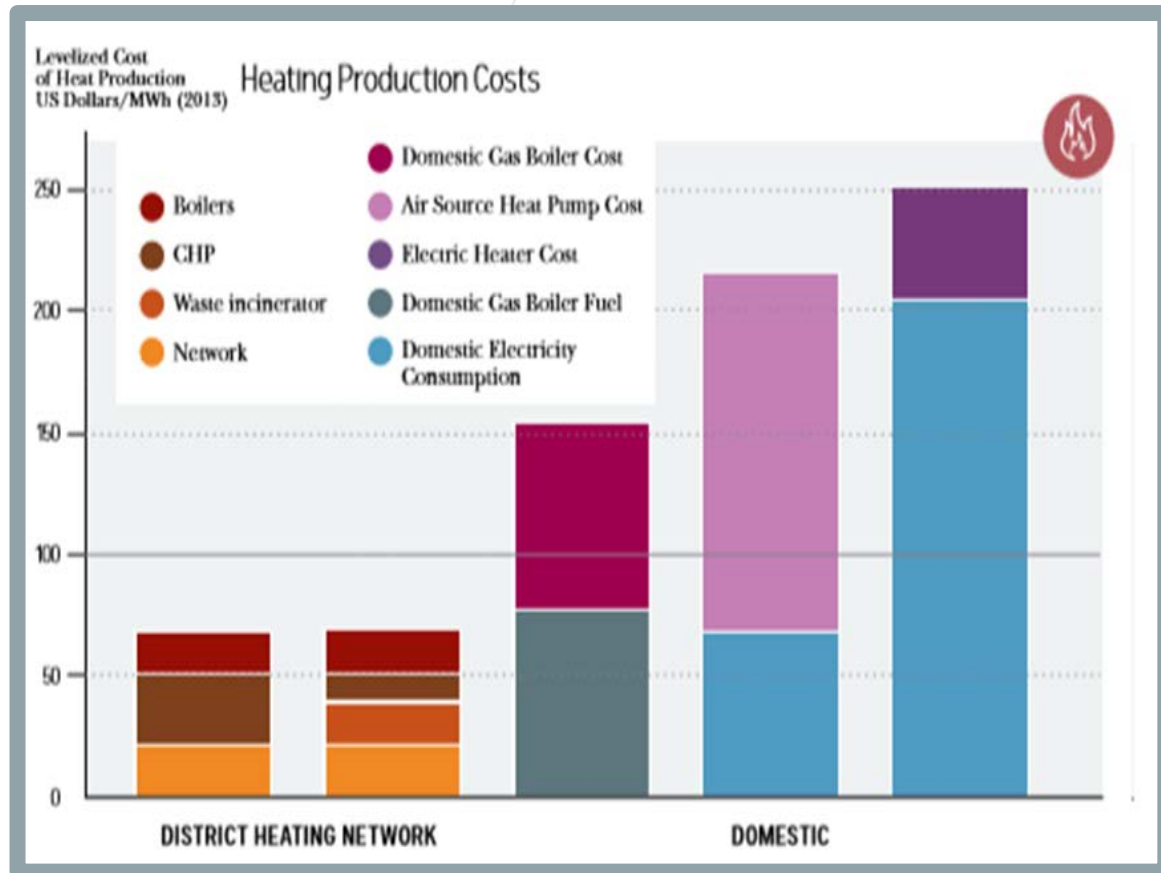
# ENABLE USE OF WASTE HEAT AND LARGE SCALE RENEWABLE SOURCES



Connecting sources which cannot be used on an individual building level  
Can achieve 30-50% reductions in primary energy consumption for cooling



# COST EFFECTIVE



Cost & Energy Efficient Means to Heat/Cool Buildings in Energy Dense Areas

# MULTIPLE BENEFITS TO ACHIEVE DIVERSE POLICY OBJECTIVES

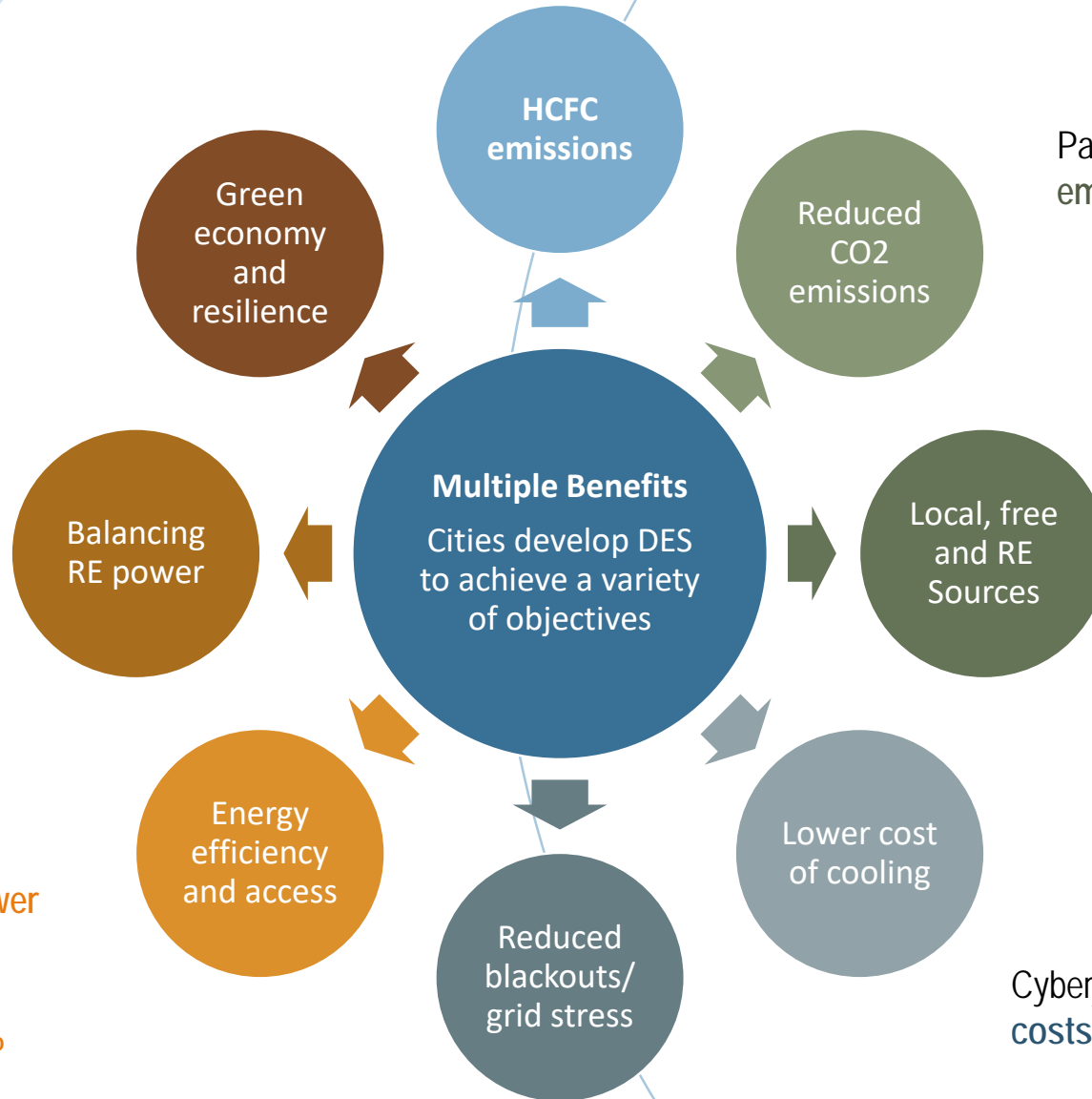


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IN CITIES



Empower created  
700 full-time jobs.

Paris reduced refrigerant  
emissions by 90%



GIFT City could **lower electricity consumption for cooling by 65-80%**

Cyberjaya lowered cooling costs by 39%



# INITIATIVE ACTIVITIES



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## ASSESSMENTS

- National assessments of DES potential and benefits
- City assessments and mapping



## POLICY

- National policies to ensure cities assess DES
- Disseminate best practice local policies for supporting DES



## IMPLEMENTATION

- Initiative methodology rolled-out to multiple cities across four regions
- Demonstration projects and policy-investment roadmap for cities

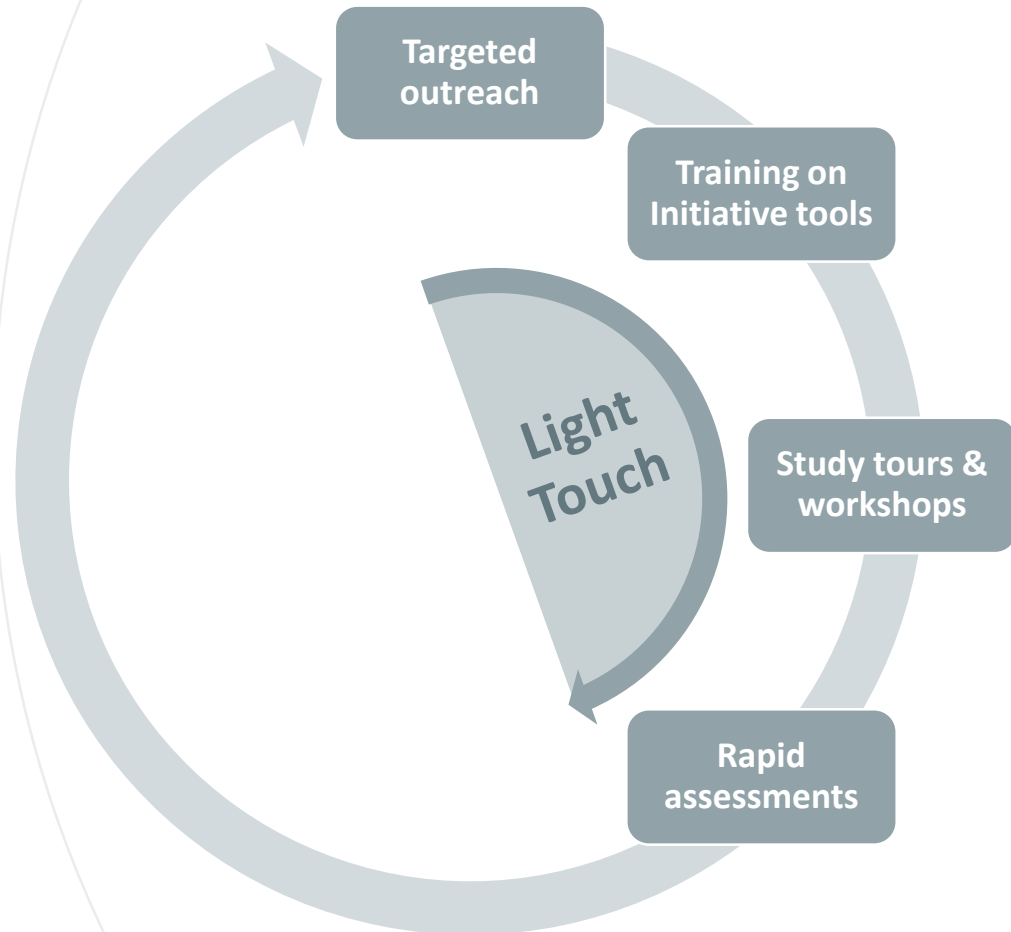






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ENERGY  
IN CITIES

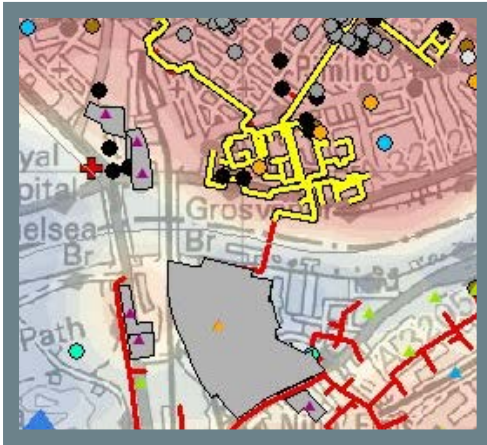
# LIGHT TOUCH ACTIVITIES



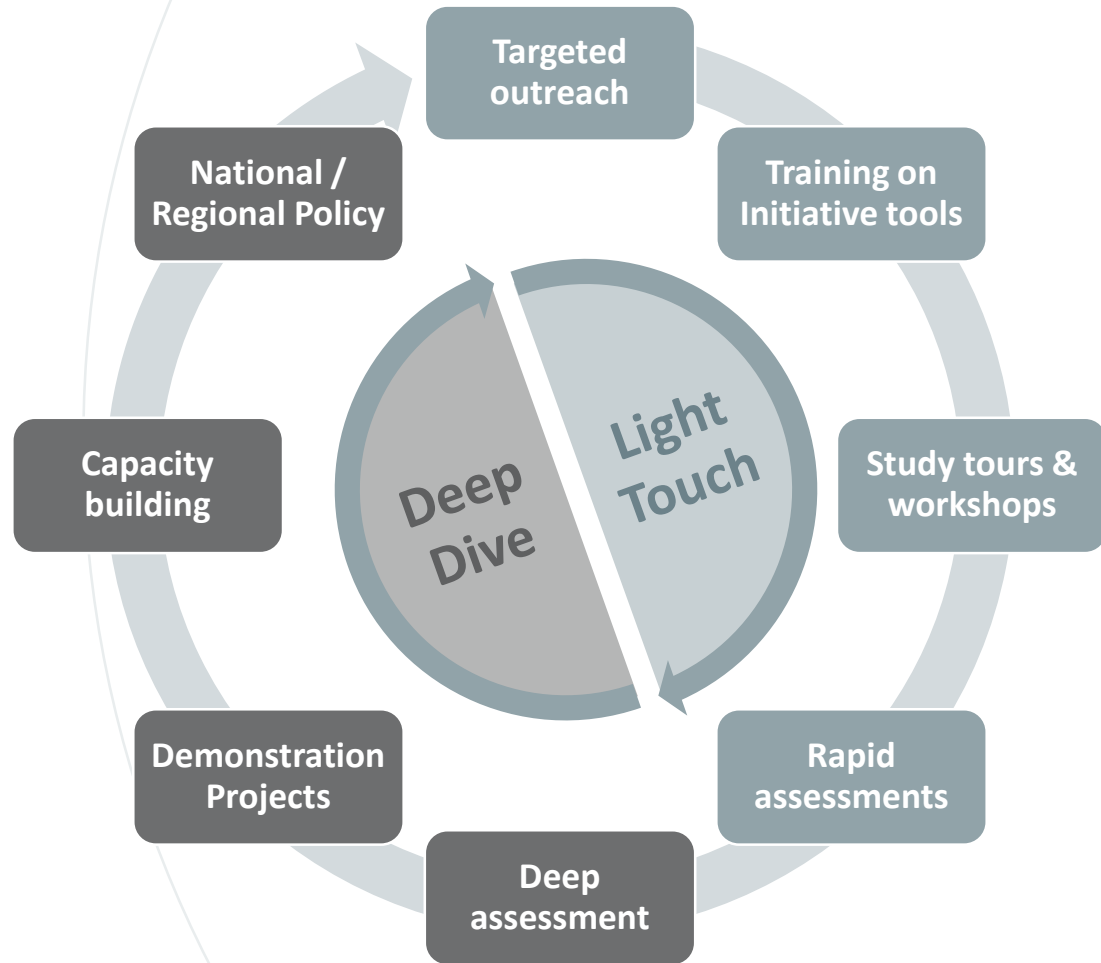


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# DEEP DIVE ACTIVITIES



Picture Source: London Heat Map



# PLANNED ACTIVITIES IN MULTIPLE REGIONS



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Per region the Initiative will do:

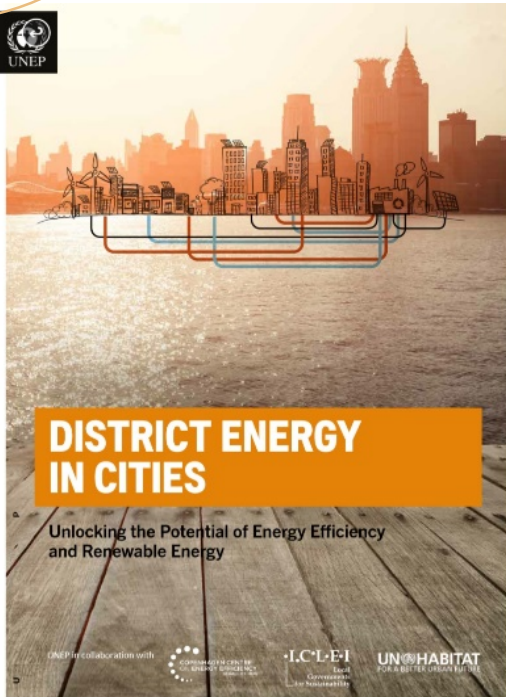
- 5 country assessments
- 25 cities with diverse climates
- 5 demonstration projects and policy-investment roadmaps
- Attract project co-financing
- Regional capacity building, learning and replication





DISTRICT  
ENERGY  
IN CITIES

# A TECHNICAL GUIDE TO DISTRICT ENERGY



*"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

# DEVELOPING THE INITIATIVE'S APPROACH



DISTRICT  
ENERGY  
IN CITIES



## FOR ACCELERATING DES

# 45

CITIES AROUND THE WORLD

BOX 1.1

The 45 champion cities for district energy use

|   |  |
|---|--|
|  ABERDEEN, U.K.                |  MALMÖ, Sweden              |
|  AMSTERDAM, the Netherlands    |  MILAN, Italy               |
|  ANSHAN, China                 |  MUNICH, Germany            |
|  ARLINGTON COUNTY, USA         |  OSLO, Norway               |
|  BERGEN, Norway                |  PARIS, France              |
|  BOTOSANI, Romania             |  PORT LOUIS, Mauritius      |
|  CHRISTCHURCH, New Zealand     |  RIYADH, Saudi Arabia       |
|  COPENHAGEN, Denmark           |  ROTTERDAM, the Netherlands |
|  CYBERJAYA, Malaysia           |  SEATTLE, USA               |
|  DOHA, Qatar                   |  SEOUL, South Korea         |
|  DUBAI, United Arab Emirates |  SINGAPORE, Singapore     |
|  FRANKFURT, Germany          |  SØNDERBORG, Denmark      |
|  GENOA, Italy                |  ST. PAUL, USA            |
|  GOTHENBURG, Sweden          |  SYDNEY, Australia        |
|  GUELPH, Canada              |  TOKYO, Japan             |
|  GÜSSING, Austria            |  TORONTO, Canada          |
|  HELSINKI, Finland           |  VANCOUVER, Canada        |
|  HONG KONG, China            |  VÄXJÖ, Sweden            |
|  IZMIR, Turkey               |  VELENJE, Slovenia        |
|  JINAN, China                |  VILNIUS, Lithuania       |
|  KUWAIT CITY, Kuwait         |  WARSAW, Poland           |
|  ŁÓDŹ, Poland                |  YEREVAN, Armenia         |
|  LONDON, U.K.                |  |

Best Practice Guidance developed with  
45 champion cities (150 Interviews)

- Technology Options and Benefits
- City policies
- Business models
- National policies



INITIATIVE'S APPROACH



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ENERGY  
IN CITIES

# THANK YOU!





## How do the accelerators benefit cities (and countries)?

- Partners for implementing efficiency in the buildings sector
  - Development of shared vision and agenda (?) meaning?
  - Private sector commitments to local efficiency improvement
  - Collaboration across government ministry “silos” (horizontal) and between national and subnational government (vertical)
  - Knowledge exchange with cities, countries, global partners
- Technical assistance
  - Holistic assessment of efficiency opportunities tailored to local conditions and objectives
  - Capacity building and stakeholder engagement on project development and policy design
  - Identifying funding for policies and projects
- International recognition and regional leadership

# BEA's Menu of policy options

|                                      |   |
|--------------------------------------|---|
| <b>Codes</b>                         | <ul style="list-style-type: none"><li>• Building codes to establish minimum requirements of energy performance.</li></ul>   |
| <b>Targets</b>                       | <ul style="list-style-type: none"><li>• Targets to align interests and spur action in the building sector.</li></ul>  |
| <b>Government Leadership</b>         | <ul style="list-style-type: none"><li>• Programs to support government efficiency, including public building retrofits and innovative procurement.</li></ul>        |
| <b>Benchmarking &amp; Disclosure</b> | <ul style="list-style-type: none"><li>• Policies that generate data, baselines, and disclosure to support transparent building performance to the market.</li></ul> |
| <b>Financial Mechanisms</b>          | <ul style="list-style-type: none"><li>• Programs and incentives to provide funding to building efficiency improvements.</li></ul>                                   |
| <b>Utility Actions</b>               | <ul style="list-style-type: none"><li>• Planning and programs for utility companies for energy efficiency progress.</li></ul>                                       |
| <b>Certifications</b>                | <ul style="list-style-type: none"><li>• Certifications including green buildings that allow market differentiation of key environmental attributes.</li></ul>       |

# DES Initiative's Menu of policy options



DISTRICT  
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IN CITIES

## Codes and planning policies

- Tailored planning policies for connection ready buildings
- Building codes assessing system efficiency of heat/cool

## Targets

- Targets to align interests, get political buy-in from multiple stakeholders and reduce risk for investment

## Government Leadership

- Strategy that includes heat/cool sectors and identifies benefits and role of DES in relation to policy objectives
- National framework for local planning

## Benchmarking & Disclosure

- Policies that generate data, baselines, and disclosure to support transparent building performance (supply and demand) to the market.

## Financial mechanisms

- Set-up revolving funds, price-support for cogeneration, loan guarantees, subsidies, pollution taxes

## Tariff Regulations

- Local and national tariff regulations that protect consumers and stabilize district energy business models

## Certifications

- Certifications of buildings that include assessment of efficiency and renewables in heating and cooling supply

## Call to Action

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Ministries, governments, industry, universities, NGOs and international organisations can help support our drive to doubling the global rate of improvement of energy efficiency.

The SE4All Building Efficiency Accelerator and Global District Energy in Cities Initiative welcome your support in achieving system efficiencies in the buildings sector.

**Make your leadership known at the COP21 in Paris, Dec 2015!**

# Join the Initiatives

## **For more information or to join as a partner, contact:**

*ICLEI- Local Governments for Sustainability*

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Angie Fyfe, Director, Efficiency & Renewable Energy, [angie.fyfe@iclei.org](mailto:angie.fyfe@iclei.org)

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## **Buildings efficiency accelerator**

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[www.se4all.org/energyefficiencyplatform/building-efficiency/](http://www.se4all.org/energyefficiencyplatform/building-efficiency/)

## **Global District Energy in Cities Initiative:**

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Ms. Lily Riahi, Advisor on Sustainable Energy in Cities [lily.riahi@unep.org](mailto:lily.riahi@unep.org)  
[www.se4all.org/energyefficiencyplatform/district-energy](http://www.se4all.org/energyefficiencyplatform/district-energy)

<http://unep.org/energy/des>