DISTRICT ENERGY INTERNATIONAL CONFERENCE LAC 2025

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
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SPEAKERs

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TOPIC

DISTRICT ENERGY IN EMERGING MARKETS

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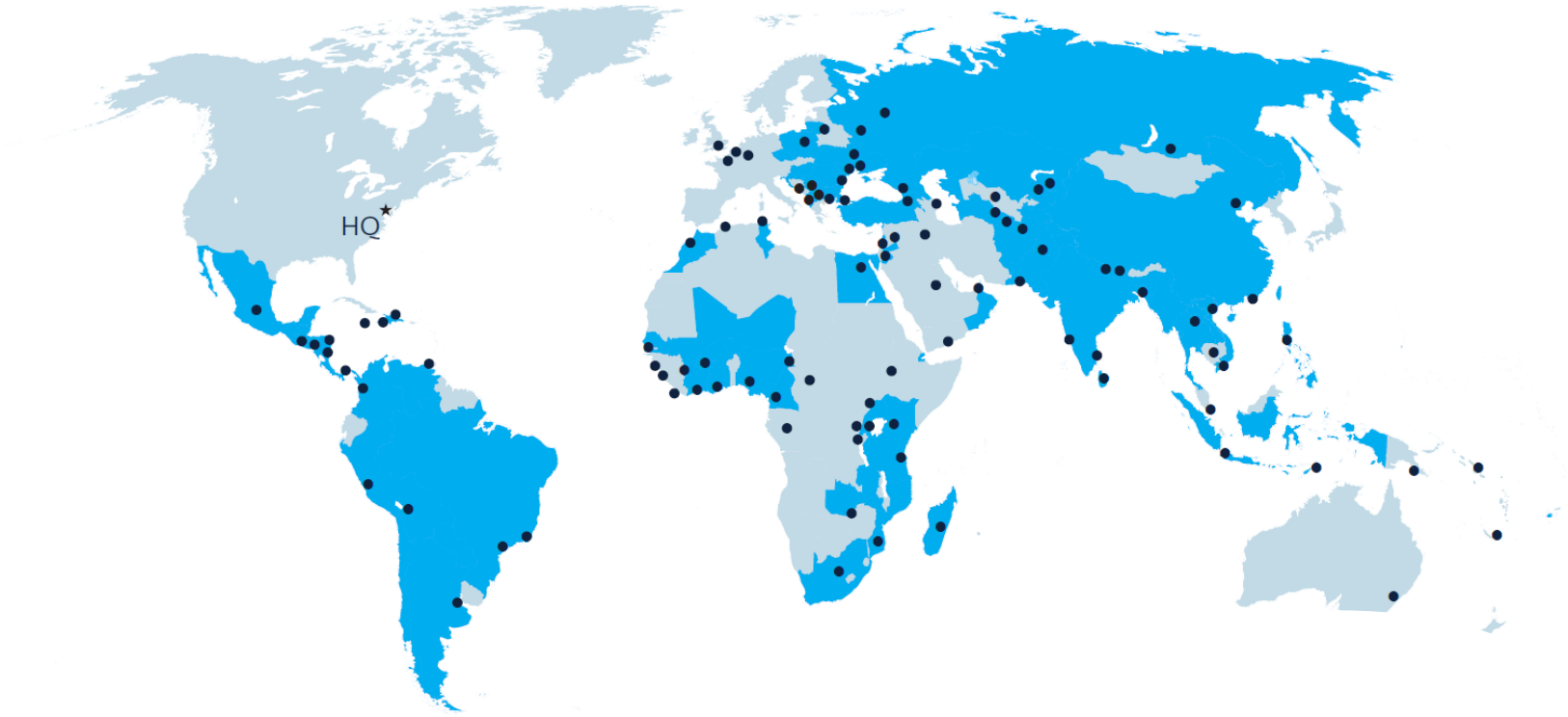
IBRD	IDA	IFC	MIGA	ICSID
International Bank for Reconstruction and Development	International Development Association	**International Finance Corporation**	Multilateral Investment Guarantee Agency	International Centre for Settlement of Investment Disputes
Loans to middle-income and credit-worthy low-income country governments	Interest-free loans and grants to governments of poorest countries	Solutions in private sector development	Guarantees of foreign direct investment's non-commercial risks	Conciliation and arbitration of investment disputes

WBG: SIX DECADES OF CREATING OPPORTUNITIES IN EMERGING MARKETS



ABOUT WBG

Local presence in
100 countries

AAA-rated
by S&P and Moody's

$117.5B
Committed in FY24

Advisory Services
to support projects

World-class
ESG standards

WORLD BANK GROUP
THE WORLD BANK IBRD • IDA | IFC International Finance Corporation | MIGA Multilateral Investment Guarantee Agency

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WBG FINANCING PRODUCTS

Investment Project Financing (IPF)

IPF provides IBRD loan, IDA credit/grant and guarantee financing to governments for activities that create the physical/social infrastructure necessary to reduce poverty and create sustainable development.

Development Policy Financing

DPF provides IBRD loan, IDA credit/grant and guarantee budget support to governments for political subdivision and for a program of policy actions and institutional reforms to achieve sustainable development.

Program-for-Results (PforR)

PforR links disbursement of funds directly to the delivery of defined results while strengthening countries' implementation capacities through the design and implementation of their own programs and achieving results by strengthening institutions and building capacity.

Guarantees

Guarantees can: mitigate key government risks to enable financial viability and sustainability; support new investment for strategic projects or sector support; expand private financing options, reduce costs and improve terms.

WBG SERVICES AND ANALYTICS

Advisory Services and Analytics (ASA)

ASA are discrete and programmatic non-lending activities of the World Bank that help its external clients or audiences to attain a specific development objective. ASA can either be stand-alone activities or a complement to lending programs.

Reimbursable Advisory Services (RAS)

RAS are an increasingly important way for the Bank to meet emerging client demand through the provision of customized advisory services

FINANCING AND ADVISORY SOLUTIONS ACROSS SECTORS

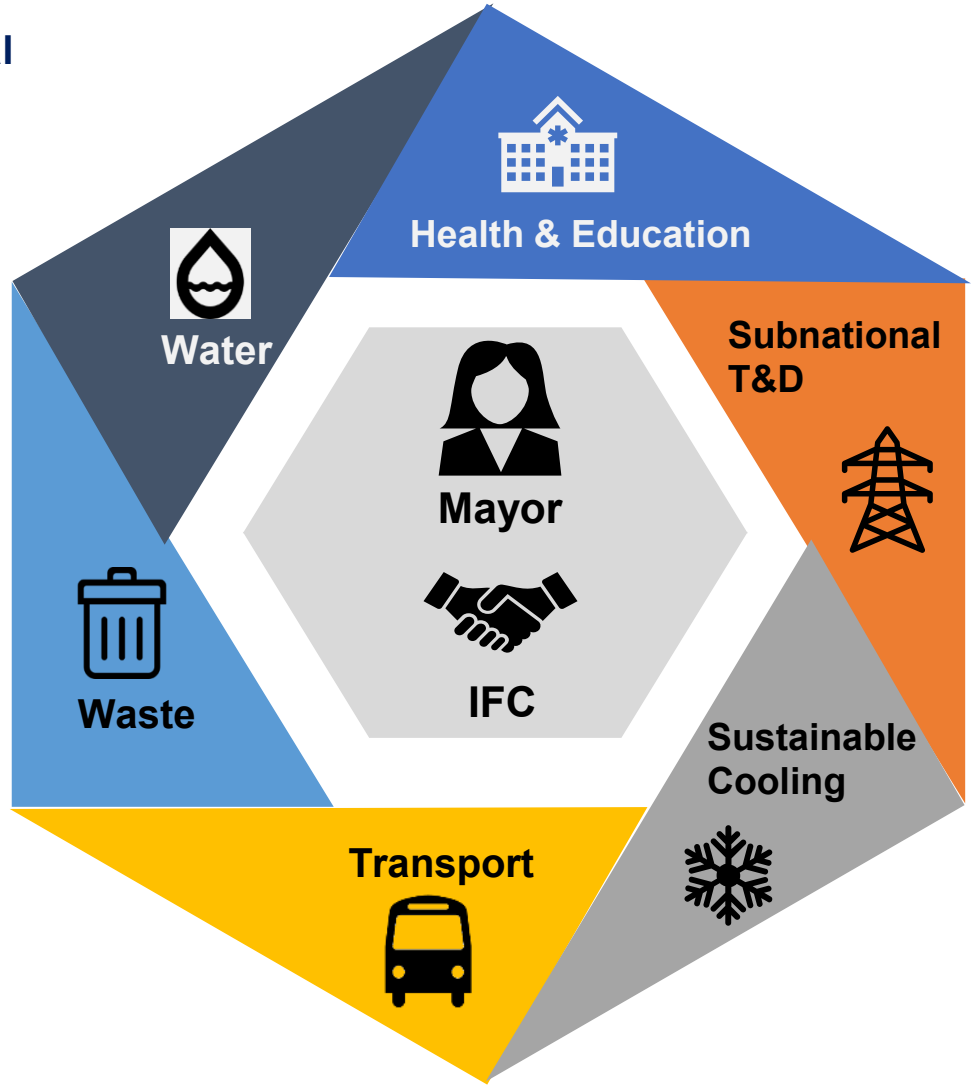
IFC Livable Cities supports the development of green, inclusive, smart, and resilient cities

Subnational Commercial Finance

- Wide range of customizable financial products to help fund Cities partners' infrastructure needs

Advisory Services

- Capacity building
- Project Preparation
- Project Enhancement



PPPs

- Competitively tender private involvement in urban infrastructure projects

Private Sector Investments

- Support private investments in priority urban sectors

5 Source: IEA, IPCC, ILO, C40

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DISTRICT HEATING

DISTRICT HEATING INTERNATIONALLY

17.4 EJ
Global DH Generation, 2022

9%
Coverage of global final heating need in buildings and industry

48%, 38%
Global DH Fuel Mix, coal and natural gas, %

$2 - 2.5 trillion
Investment need in sustainable heating transition in ECA, by 2050*

IBRD DH Projects

- Ukraine
- Poland
- Bulgaria
- China
- Croatia
- Russia
- Lithuania
- Serbia
- Moldova
- Belarus (biomass-based DH)
- Large number of advisory projects: e.g.
- Regional Balkans Biomass DH

IFC DH Projects

- Kryvyi Rih, Zaporizhzhia, Ukraine (2021)
- Timisoara - Municipal investment, Romania (IFC ~$34.6 M, 2014)
- Botosani – Municipal investment, Romania (IFC ~$7.7 M, 2014)
- Bucharest – PPP project, Romania
- KKS – Private DH company, Russia (IFC $ 18.2M equity, $7.7M loan, 2012)
- Mytischi - Municipal investment, Russia (IFC $ 8.4 M, 2008)
- A number of advisory projects

Source: International Energy Agency, Tracking District Heating; (*) World Bank.

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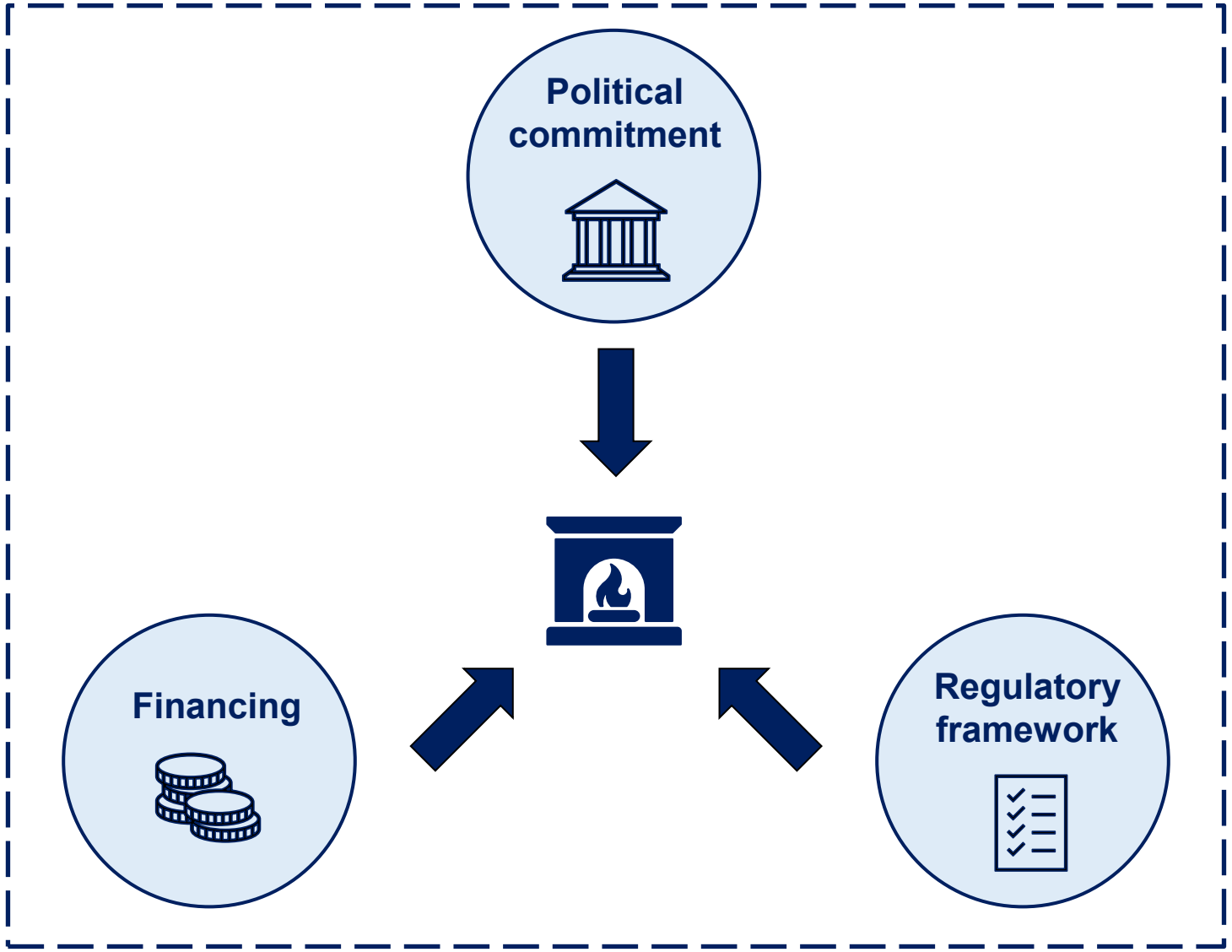
SUCCESS FACTORS FOR SUSTAINABLE DISTRICT HEATING



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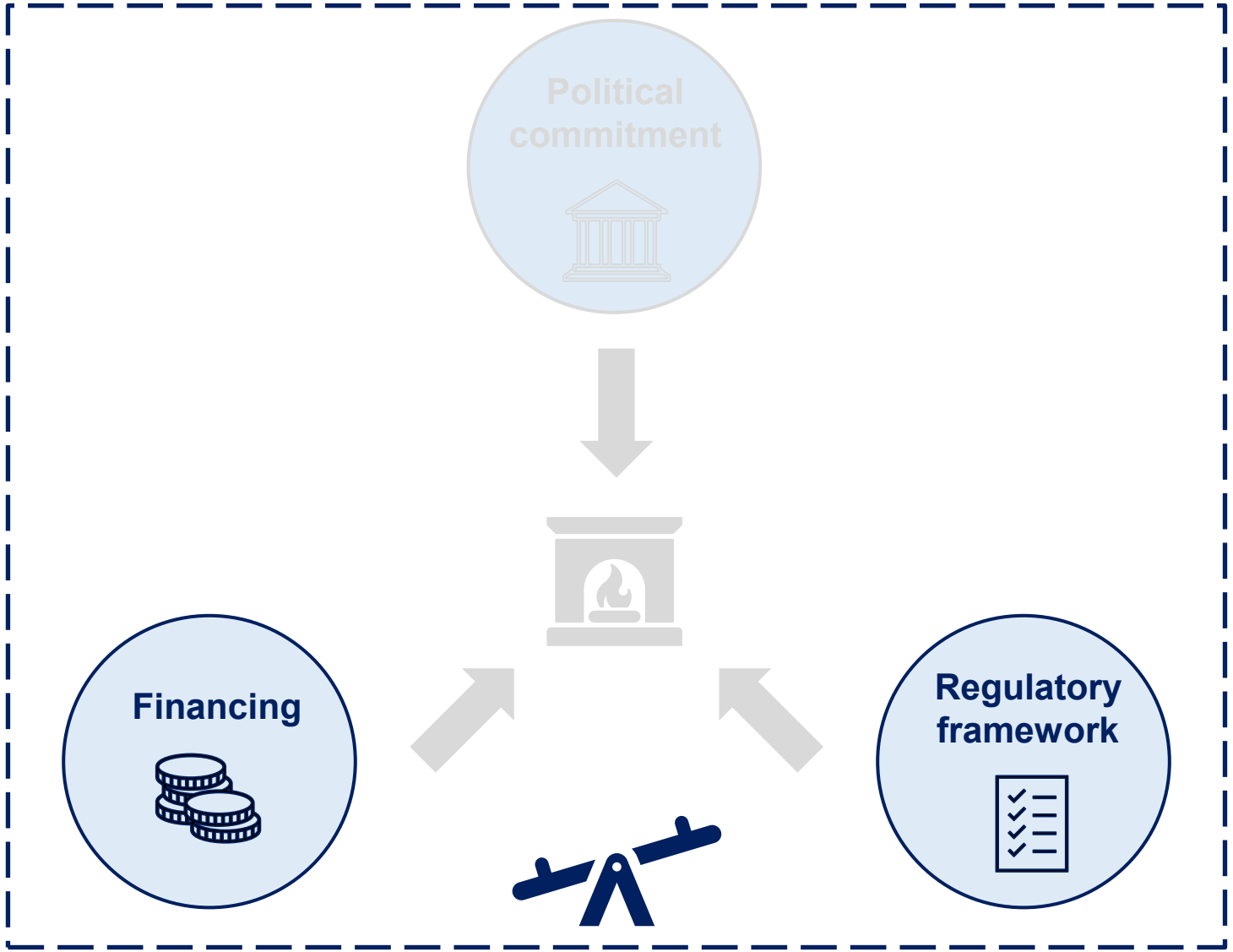
SUCCESS FACTORS FOR SUSTAINABLE DISTRICT HEATING



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REGULATORY FRAMEWORK COULD ATTRACT (OR SCARE AWAY) CAPITAL

Heat Tariffs

- Full cost-recovery (CAPEX / OPEX) for all customers
- Predictable and stable, politically independent
- Adjustment for fuel price
- Incentives for decarbonization

Affordability/ Payment Discipline

- If properly designed, DH should be least-cost
- Targeted safety-nets/ pro-poor subsidies
- Heat payments spread throughout the year
- Good collection mechanism

Consumption-Based Billing

- A minimum standard of building-level heat meter
- Heat-cost allocators
- Heat meters
- Legal base for CBB

Concessions Ownership/PPP

- Clearly defined property rights and concession terms
- Duration, tariff structure, payment terms (billing cycle), security, inflation, dispute res.
- Termination and buy-out terms

Decarb Incentives

- Renewables
- Heat pumps
- Waste heat
- Sector coupling
- Co-gen bonus for highly efficient CHPs
- Verification process
- Cost-allocation methods

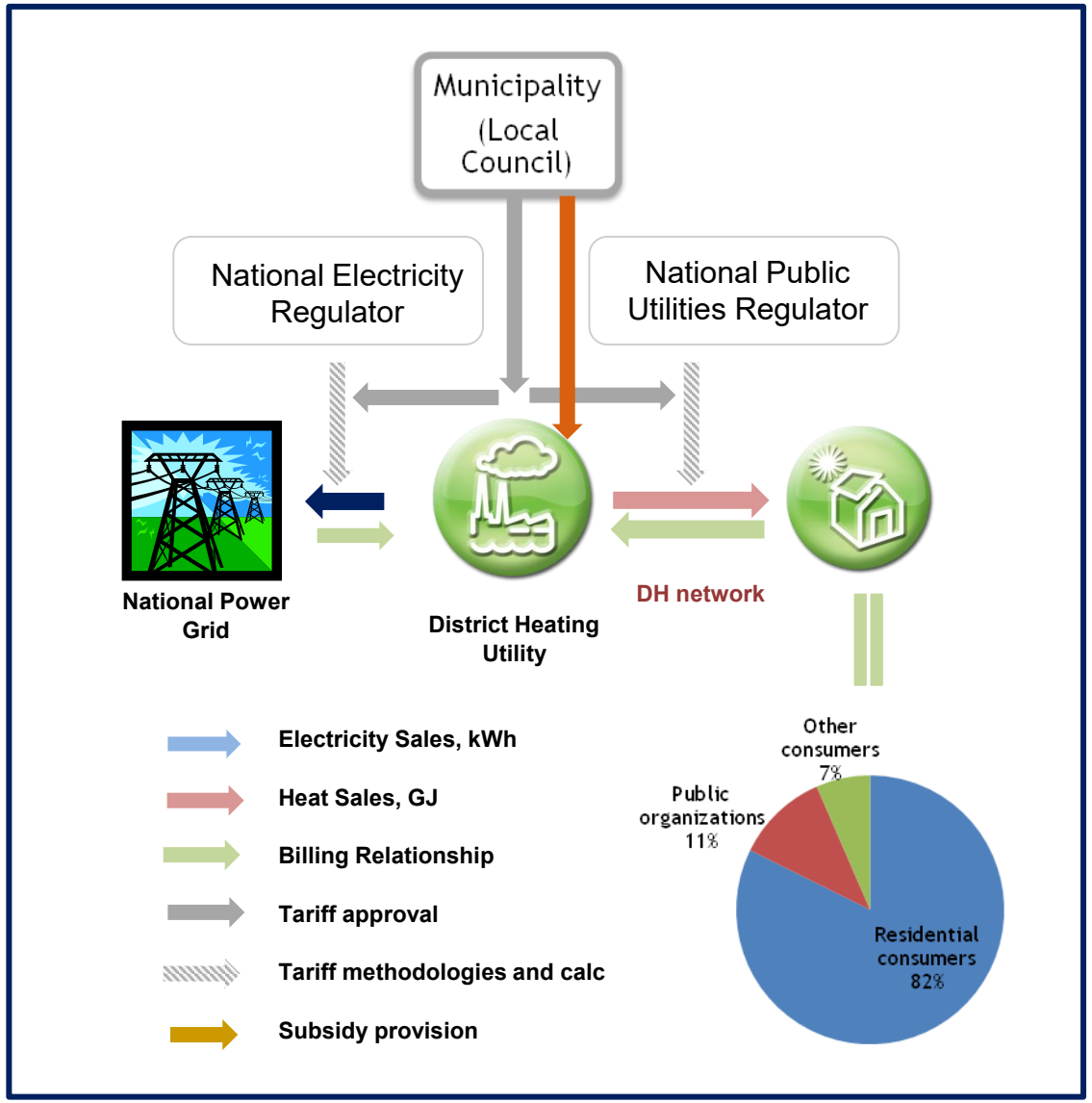
Carbon Market

- Predictable carbon regime (VCM vs Article 6)
- Appropriate carbon credits prices
- Adequate allocation of allowances in ETS

Fuel price Incentives

- Often times cross-subsidized between residential and industrial tariffs
- Clear contractual obligations (price, amount (MCQ), duration, dispute res., etc.)

REGULATORY FRAMEWORK COMPLEXITY



Regulatory Framework Complexity

- Public Utilities Regulator -methodology for heat tariff for heat-only boilers and T&D network;
- Electricity Regulator – methodology for heat and electricity generated at CHPs;
- Municipalities approve final end-user heat tariffs and related subsidies.

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TYPES OF OWNERSHIP OF DISTRICT ENERGY SYSTEMS

Wholly Public

- Local authority or public utility has full ownership of the system but also takes on most of the risk
- Local authority sets tariffs and gets the returns
- Sources of finance include public, commercial, or blended debt

Hybrid Public and Private

- Joint Venture via creation of an SPV and ownership split between public and private; risks are shared
- Concession contract for private sector where public authority conducts the feasibility study; risks borne by the concessionaire
- Cooperative model where local authority takes on most of the risk

Wholly Private

- Private company has full ownership although likely to enter into some agreements with the local authority to mitigate risks. Depending on geography, DH can have a status of regulated natural monopoly (DH tariffs set by a regulator), or unregulated B2B (regulation by contract).
- Private company provides financing and has control but may include local authority as a minority rep on their board.

Source: District Energy Initiative. IFC publication: Private Sector Participation in District Heating

LEARNING FROM THE PAST

WBG track record in district heating: no non-performing investments

Learning from the past..

- Dalkia Annual Report 2009 “Dalkia has signed a 25-year lease contract to operate several networks in a community of 40,000 inhabitants near St. Petersburg, where it is investing to upgrade the principal heating plants, convert the smaller plants into substations and renovate 89 km of network” (1)
- Romania DH sector “The number of localities connected to district heating in Romania decreased by approximately 78 % during the period 1989 ÷ 2014, namely from 315 to 70 localities” (2)
- Some countries in Eastern Europe: Using DH as a political tool: suppressed tariffs..

(1) Source: untitled (veolia.com), IFC Makes First Major Investment in the District Heating Sector in Eastern Europe,
(2) Source: Energy EC EU, Romanian Ministry of Energy; (3) photo credit

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INDICATIVE RESULTS FROM WBG DH PROJECTS

Heat Consumption Reduction	12 to 20 %
Fuel Consumption Reduction	Up to 30 %
Heat Losses Reduction	Up to 35 %
Make-up Water Savings	Up to 50%
IRR	19.5 to 146.3%

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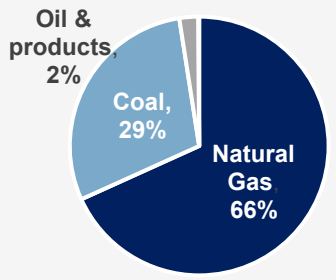
DISTRICT HEATING SYSTEMS IN EUROPE AND CENTRAL ASIA (ECA) - CURRENT STATE & SUSTAINABILITY OPPORTUNITIES

Scale & Fuel Mix

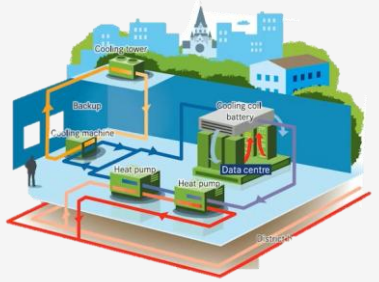
30%
of ECA's urban population uses District Heating

52,000
DH Utilities in ECA but only 2,300 outside Russia



over 97% of the ECA's CHP and heat-only plants rely on fossil fuels

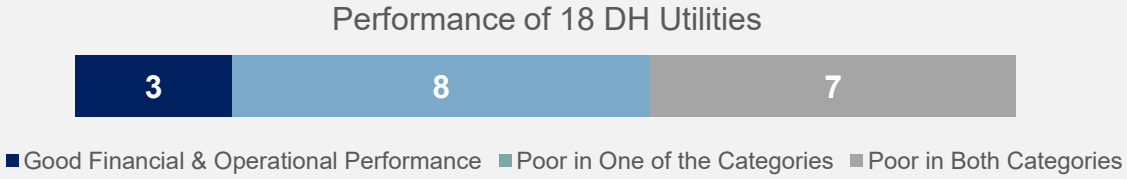
System Challenges



- Decades of low upgrades & maintenance
- Heating tariffs underpricing
- Low service levels have led to customer disconnections, which has eroded revenue bases and further limited new investments

Performance Snapshot

A 2017–21 survey of 18 district heating utilities in Bulgaria, Kyrgyz Republic, Poland, and Serbia found performance gaps, highlighting the need for critical reforms before large-scale sustainable heating investments



Pathway to Sustainability

1. Cleaner energy sources: renewables, electricity, waste heat, biogas, hydrogen.
2. System upgrades: lower temperatures, building-level substations, hot water, district cooling, heat storage, and power-heat coupling.

Source: World Bank, Toward a Framework for the Sustainable Heating Transition in Europe and Central Asia

DESIGNING SUSTAINABLE HEATING PROGRAMS

Individual policy measures are often insufficient to overcome the multitude of barriers

Individual Barriers (beyond traditional EE barriers)

Multi jurisdictional responsibilities

Heating sector policies requires **coordination across ministries and across levels of government**, which makes coordinated interventions difficult to plan and implement.

Prevalence of unregulated markets for solid heating fuels

The **lack of formal regulation** in firewood and biomass markets, coupled with illegal and informal logging, lack of certification, etc. often **leads to underpriced firewood and charcoal and unsustainable biomass harvesting and use.**

Uneven access to network infrastructure

Since rural areas often lack DH and gas, solid fuels such as firewood and coal are often the **only affordable and readily available alternatives.**

Uneven prevalence of building-level hot water plumbing.

Where there is no hot water plumbing, it is **very expensive to upgrade to more efficient heating systems** leaving many homes reliant on lower-efficiency solutions such as room-level firewood or coal stoves or electric heating.

Lack of qualified service providers

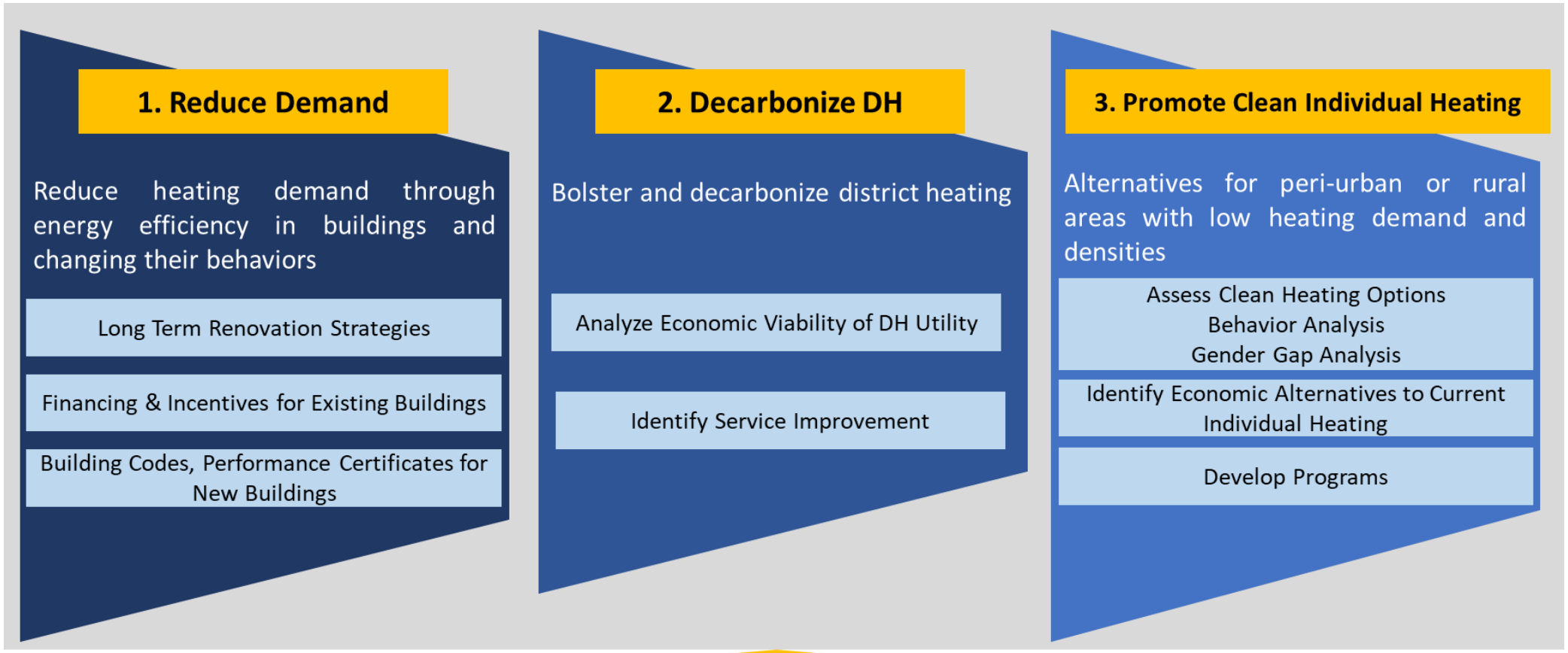
Capacity of the sustainable heating supply chain remains underdeveloped, with many energy auditors, designers, installers, etc. lacking the training required to size and install newer technologies.

Lack of consumption-based billing for DH

Many DH providers **bill their consumers based on heated floor area rather than heat consumed**, which disincentivizes energy efficiency measures.

FRAMEWORK FOR TRANSITIONING TO SUSTAINABLE HEATING

Reduce demand, decarbonize district heating, promote clean individual heating



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KEY TAKEAWAYS

Towards a Sustainable Heating Transition

Existing institutions, systems, fuels, and technologies will have to undergo a massive shift in order to achieve the sustainable heating transition, along with the relevant enabling policies, financing and business models, and communications.

Other key actions needed include:

Push heating-related reforms
Gradual phase out of direct/indirect subsidies, consumption-based billing for district heating, etc. can provide proper price signals and incentivize switch to sustainable fuels, technologies and energy efficiency. Other reforms on prosumers, sustainable biomass, technical standards, homeowner associations, etc. are also needed.

Countries to prepare plans or roadmaps for sustainable heating transition
Governments need a clear vision and coordination with line ministries, local governments, businesses, households, utilities, and others to ensure optimal investment decisions regarding their heating supply, and then develop implementable roadmaps and suitable policies and regulations.

Design and launch of national programs
Incentives and financing, communications and outreach and training are all important elements for a holistic government response; judicious use of public funds is needed to enable the private investment and sustainable heating markets. Market surveys can help understand local conditions and behaviors, programs can address market barriers, drawing from international experiences, and developing specific provisions for the poor and for gender differences.

Energy efficiency measures can reduce heat demand by up to 50%, help ensure heating bills are affordable and will help optimize the cost of the transition.

Investments in the public sector
Government investments can help stimulate markets, demonstrate new technologies, and approaches. Including training energy auditors and designers, develop new financing and implementation models, provide stable demand leading to more competition, lower prices, etc.

ENABLING HEATING SECTOR REFORMS

Power	Gradual phase-out of fossil fuel subsidies, removal of direct and indirect subsidies for electricity and DH, and better targeting of cross-subsidies in electricity and DH tariffs.
	Adequate pricing of externalities associated with unsustainable heating options, such as environmental and health impacts, with complementary measures to protect the poor and vulnerable social safety nets.
Heating	Prosumer regulations to encourage installation of rooftop and/or ground-mounted solar PV to support the electrification of heating for buildings.
	Consider measures to reform the DH sector, such as unbundling heat generation from distribution and introducing standard heat supply contracts with private producers and universal consumption-based metering and billing.
	Promote sustainable biomass through the formalization, regulation, certification, and pricing of informal markets for biomass fuels (e.g., firewood, wood pellets, wood chips), including better forestry chain management and mandatory sustainability certification of biomass used for heating.
EE Standards	Better design, enforcement, and updating of building codes and certifications.
	Enforce energy-efficiency performance standards for heating products.
	Create or strengthen home-owner association (HOA) regulations to allow them to register, vote on renovations, sign contracts, open bank account and impose homeowner fees and payments.
Air quality	Develop air quality standards and bans of polluting fuels and technologies.
Other	Reforms to support businesses and skilled employment across the sustainable heating value chain, such as: legal and market measures to improve labor conditions; improvements in building energy rehabilitation training; compulsory continuous training (“upskilling”) in new approaches/technologies for workers who are already in the sector; quality assurance for installation services, etc.

FINANCIAL MECHANISMS FOR SUSTAINABLE HEATING IN PRIVATE BUILDINGS

Sample of Financial Instruments	Description
Tax credits, rebates, exemptions	**Can be introduced to encourage sustainable-heating investments and equipment purchases.** They can take the form of reductions in personal or company income taxes.
Investment grants, subsidies or rebates	**Cash incentives from the government to offset a portion of the investment cost for sustainable heating investments**. This is often done to stimulate markets or to make expensive, clean technologies more affordable to households.
Commercial bank or EE fund loans	Allow building owners to amortize costs over loan period. Government subsidies for **interest buy-downs** can **encourage banks to offer financing in new markets or make loans more affordable for households**.
Guarantees	A public or private agency (e.g., development or commercial bank, insurance or guarantee company) guarantees a **portion of loan losses from defaults** to encourage banks to lend for sustainable heating and defray perceived risks
Utility demand-side management programs	**Regulatory mechanisms** that **oblige utilities to implement energy efficiency measures in their customers'** premises, which can include on-bill financing and incentives for insulation or more efficient heating appliances.
Financial interventions on the supply side	Could involve a **variety of steps governments can take to promote sustainable heating products**, such as (i) bulk procurement and distribution of efficient heating appliances; and (ii) manufacturer partnerships.

SUSTAINABLE DISTRICT HEATING IN FINLAND

- **High Efficiency and Strong Performance:** Finland's DH relies heavily on CHP plants, which are about 30% more efficient than producing heat and electricity separately. Heat generation efficiency reaches 93%, with network losses under 9%. Less than 1% of pipelines are replaced each year thanks to preventive maintenance. Profitability is high at 10–20%, even with some of the lowest tariffs in Europe, and there are no operational subsidies.
- **Climate Targets and Energy Transition:** Finland aims to be carbon neutral by 2035 and carbon negative thereafter. Power generation is already 80% carbon neutral, and DH is increasingly shifting from fossil fuels to biomass and recovered heat. Biomass use has more than doubled and recovered heat has tripled over the last decade.
- **Innovation and Adaptation:** Many DH companies also provide district cooling, which uses the same infrastructure and is expected to grow as heating demand falls. Some companies trade heat through interconnected networks based on marginal prices. Smaller rural systems operate remotely with automated controls, local biomass supply, and 24/7 online monitoring.

Source: World Bank

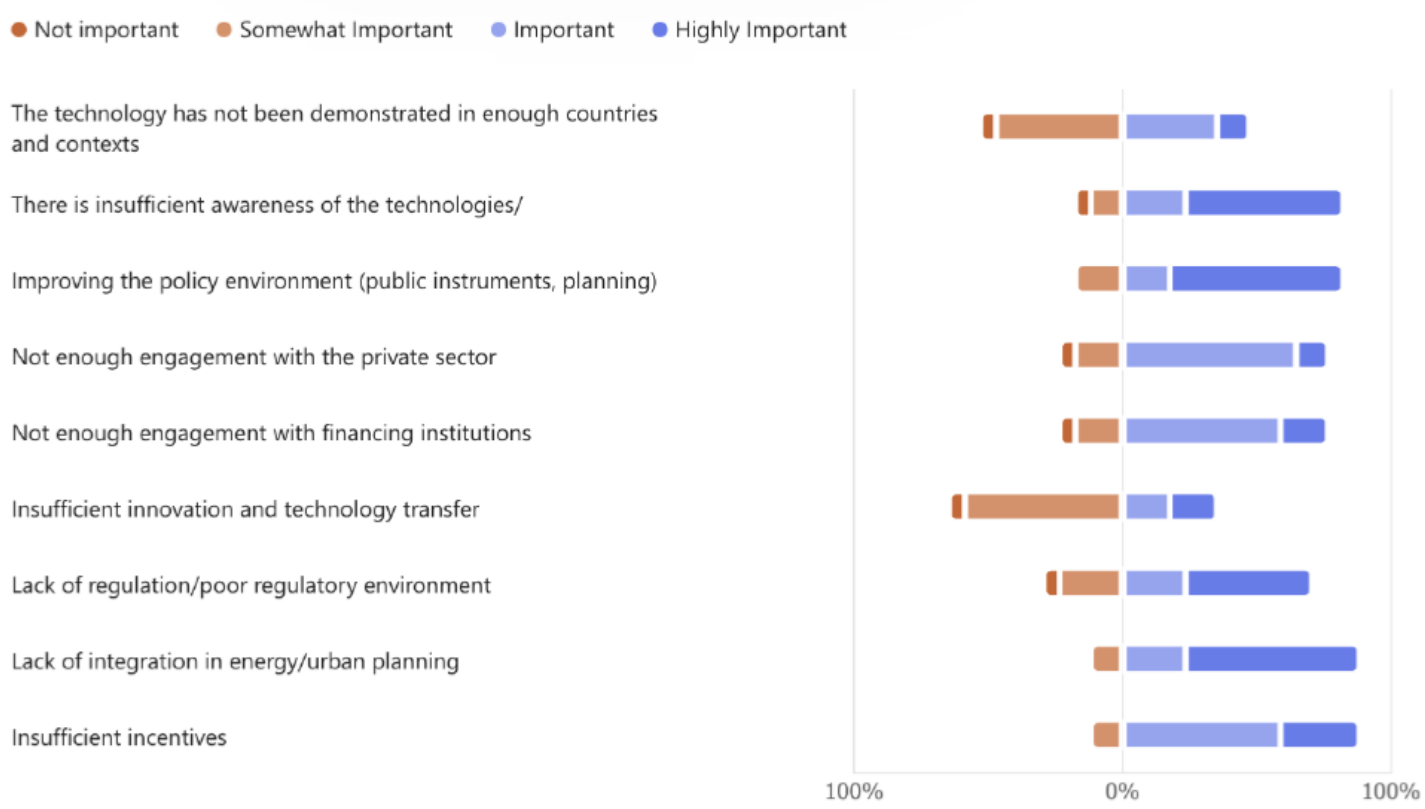
DISTRICT COOLING

COOL COALITION: DISTRICT COOLING WORKING GROUP SURVEY RESULTS

Top Gaps

1. Insufficient awareness of DC solutions
2. Lack of Enabling policy environment for DC
3. Lack of integration in energy/urban planning

1. What in your view are the most important gaps/barriers preventing the scale-up of district cooling?



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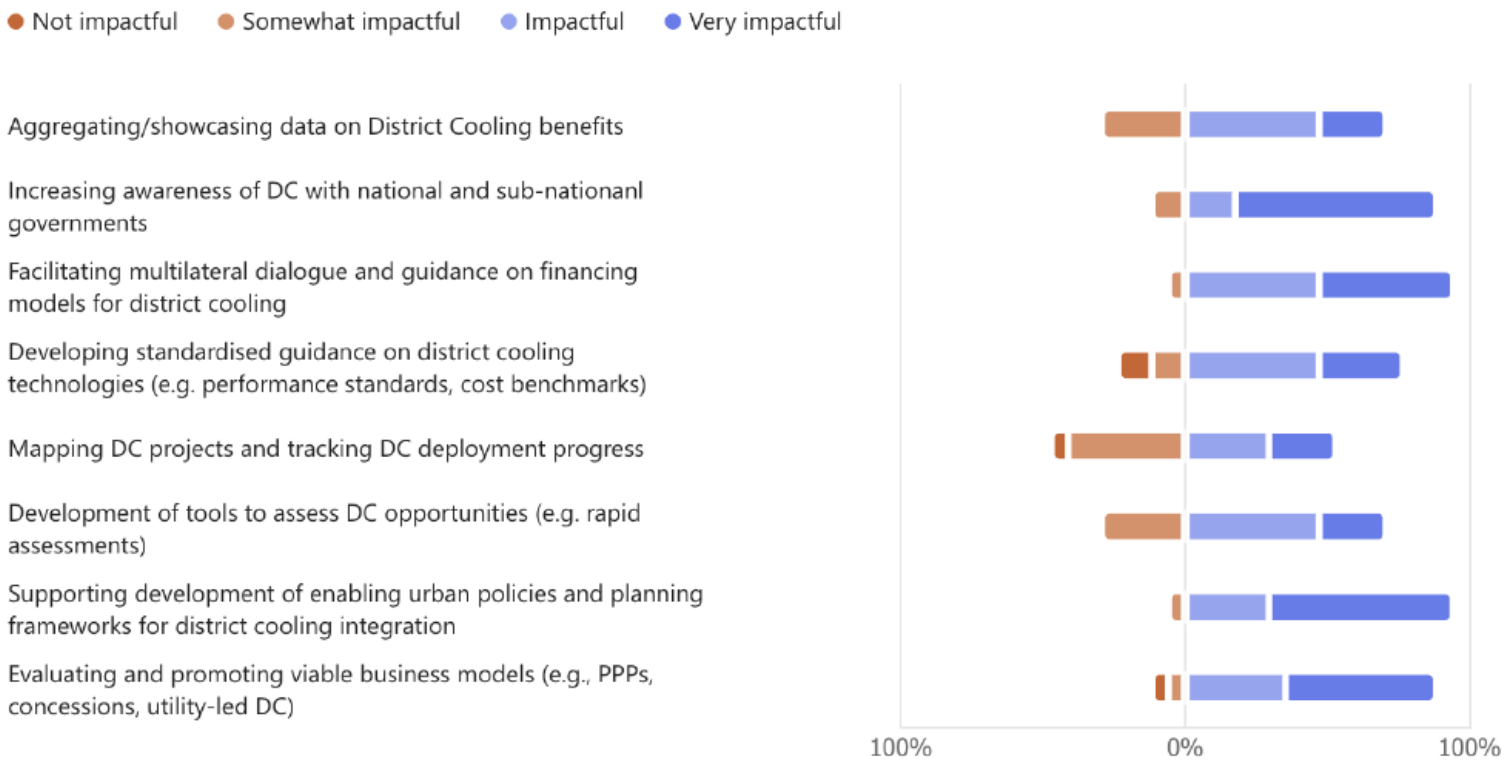
DISTRICT COOLING WORKING GROUP SURVEY RESULTS

Top 3 Activities

1. Supporting development of urban policies and planning frameworks
2. Increasing awareness of DC with nationals and sub-nationals
3. Evaluating and promoting viable business models in EMs

What activities would be most impactful for the future District Cooling Working Group to develop, to address the barri ers/gaps above and accelerate progress?



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HIGH-POTENTIAL MARKETS

SCREENING METHODOLOGY

25%	Cooling Market Maturity	40%	Identified District Cooling (DC) Systems			30%	Cooling Tech Compatibility with DC			30%	DC Market		
20%	Enabling Environment	30%	DC Regulations	25%	Cooling Policies	15%	Corruption Perception	10%	PPP	10%	Liberalization of Elec. Market	10%	FDI Restrictions
20%	Real Estate Sector	50%	Planned Large Developments	25%	Commercial Sector Growth	10%	Urbanization Rate	10%	Number of Cities	5%	RE Transparency		
10%	Macroeconomic Perspective	50%	GDP Per Capita			40%	Population			10%	GDP Growth		
10%	Cooling Demand	40%	Cooling Degree Days	25%	AC Unit Sales			20%	Commercial AS Cons. Growth	15%	Commercial AS Power Cons.		
5%	National Energy Target	50%	Regulatory Indicators	50%	Sustainable Development Goals								
5%	Climate Related Factors	100%	Grid Emission Factors										
5%	Electricity Cost Burden	100%	Electricity Tariffs										

Adequate data available for nearly all countries

Missing data for certain countries

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SCREENING RESULTS

High Potential Countries

Egypt

- 20+ DC projects under operation or development
- High scores on real estate, cooling demand, cooling market maturity, and favorable enabling environment
- Large number of developers actively seeking to build new cities & presence of international DC companies

Malaysia

- 40+ DC projects under operation or development
- High scores on cooling market maturity, cooling demand, and macroeconomic perspectives, high GDP per capita

Thailand

- 15+ DC projects under operation or development
- High scores in cooling demand (4,000 CDD), real estate sector development, high electricity costs

Colombia

- 11 DC projects under operation or development
- High scores on electricity cost burden, cooling market maturity, favorable economic environment
- Launch of the District Energy Initiative by the government in 2013 and funded several feasibility studies

India

- 10+ DC projects
- Launch of the government's national cooling action plan which includes enacting a national policy for DC

Other Countries Screened

- **China:**125+ DC projects planned or operating but limited to public sector
- **Mexico:** strong cooling demand and real estate sector but low market maturity
- **Vietnam:** strong cooling policies and macroeconomic environment but low market maturity and low electricity cost burden
- **Chile:** high electricity cost burden and favorable national energy targets but low cooling demand
- **Indonesia:** strong cooling demand and macroeconomic environment but low cooling market maturity
- **Türkiye:** strong real estate sector and national energy targets but low electricity cost burden and cooling market maturity
- **Philippines:** strong cooling demand and high electricity cost burden but low cooling market maturity
- **South Africa:** high electricity cost burden and strong climate related factors but low cooling market maturity and unfavorable enabling environment
- **Brazil:** high electricity cost burden and favorable energy targets but low cooling market maturity and enabling environment
- **Tunisia:** favorable national energy targets but unfavorable macro environment
- **Senegal:** strong climate related factors but weak national energy targets, low cooling market maturity

THAILAND

I. KEY FINDINGS – THAILAND

Good potential for the growth of DC systems driven by real estate growth and private sector business models

Market Potential

Rapid growth in the greater Bangkok area, Eastern Economic Corridor (EEC), and data centers offers opportunities.

Existing Projects

5 DC systems are in operation (41k RT), 8 systems are under development (200k RT), and 3 systems are in the pipeline (156k RT).

Business Model

Progressive developers in JVs with international DC utilities. Private sector led.

Enabling Environment

There is no specific legislation or gov coordination bodies for DC. Energy efficiency and green building initiatives exist.

6,909
GDP per Capita (Current US$, 2022)

72
Population (million, 2022)

10%
Est. Commercial Real Estate Growth

4,500
Cooling Degree Days

Montreal Protocol

✓ **Ratified**

Kigali Amendment

✗ **Unratified**

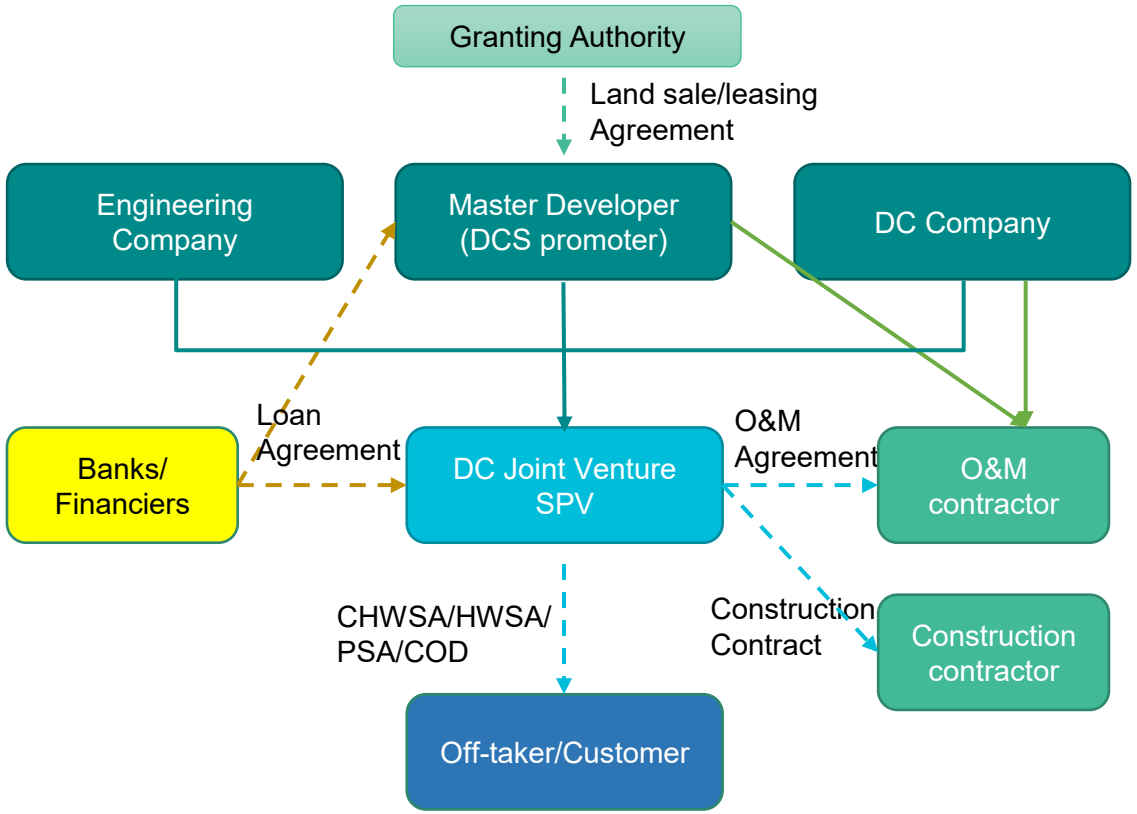
Key Challenges

- Lack of enabling environment.
- Lack of awareness at the national / state level of DC benefits.
- Lack of cross-sectoral urban planning practices in general, and energy planning in particular.

II. BUSINESS MODEL

Most DC projects in Thailand are relatively small and under JV with several players

- **Master developer** sets up the SPV, where **DC utility company** and **engineering company** hold minority stake.
- The DC utility company may be the **O&M contractor** through another SPV, where the master developer may hold minority stake.
- Debt can be taken at the SPV level or the developer level or the EPC contractor level.
- The **construction contractor, O&M contractor** could be one of the shareholders, or affiliated unit/sub-companies of the developer.



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III. PUBLIC SECTOR LED DEVELOPMENT Eastern Economic Corridor (EEC)

EEC lies at the heart of Thailand 4.0 scheme, providing most growth opportunities in the future

- EEC focuses on the **3 Eastern provinces**, namely Rayong, Chonburi, and Chachoengsao.
- EEC aims to develop **"Livable Smart Cities"** based on technological integration, low carbon emission, and circular economy.
- EEC has **Special Services Promotional Zones** for infrastructure and technological development, and **Industrial Promotional Zones** for the development of 12 targeted industries.
- **EEC Offices** (EECOs) handle permissions and licenses for business operations in EEC.

MALAYSIA

I. KEY FINDINGS – MALAYSIA (1/2)

Advanced market with strong DC prospects

Market Potential

Increasing urbanization and the development of regional economic corridors (Iskandar Malaysia) offer greenfield opportunities.

Existing Projects

Malaysia has most DC systems in Southeast Asia. 30+ projects under operation (240k RT), and 8 projects under development (160k RT).

Business Model

Private sector led. Market players are DC companies, power utilities, real estate developers, and hospitals & campuses etc.

Enabling Environment

There is no specific legislation or gov coordination bodies for DC. Relevant regulations are referenced in construction and energy sectors.

11,972
GDP per Capita (Current US$, 2022)

34
Population (million, 2022)

8%
Est. Commercial Real Estate Growth

3,700
Cooling Degree Days

Montreal Protocol
✓ **Ratified**

Kigali Amendment
✓ **Ratified**

Key Challenges

- Lack of widespread awareness at national and state level.
- DC projects are not included in master plans at the city/regional level, which requires strategic vision and coordination among public stakeholders.

I. KEY FINDINGS – MALAYSIA (2/2)

- **Kuala Lumpur (KL) is the largest city in Malaysia** with 1.9 million people and has the highest population density of 8,045 people per Km^2, followed by Putrajaya with 2,418 people per km^2. KL and Iskandar Malaysia are the two biggest urban agglomerations in Malaysia. Very high urbanization rates.
- The **national strategic plans** including the national long-term plan (WKB 2030), the 12th Malaysia Plan, the National Energy Policy(2022-2040), and the National Physical Plan have continued aiming for equal and sustainable development.
- **Cooling penetration is among the highest in EMs at 29%**
- 50% of the existing DC projects have a capacity of less than 5,000 RT, which accounts for less than 16% of the installed capacity of identified projects in operation. With the expectation of DC industry to be put into the government policy framework, **these "small" projects will have the potential to be pooled and expanded**.

II. BUSINESS MODEL

- **DCS is driven by market demand** in Malaysia, the DCS is commonly invested by the developer, the institute, or industry owners.
- Typically the DCS is **either in house development, or by JV SPV, or under fully concession**.
- The progressive utility operators have developed and applied various business models, for example TNB and KJTS have experience on below models: BOOT (Build-Own-Operate-Transfer), BOT (Build-Operate-Transfer), BOO (Build-Own-Operate), DBO (Design-Build-Operate), ROT: Rehabilitate-Operate -Transfer (for existing facility)
- Chilled Water Supply Agreements (CWSAs) varies in tariff, duration performance and guarantees etc.

Three Types of DC Business Models

Public or Private Concession

- 0% real estate developer or municipal equity
- Financed & operated by DC company

Joint Venture SPV

- <100% real estate developer equity
- Partly financed and operated by DC company

In House

- 100% real estate developer equity (could be refinanced after COD)
- Operated by internal O&M or mgmt. contractor

III. PUBLIC SECTOR LED DEVELOPMENT (1/2)

Five regional economic corridors under implementation to drive high-density integrated clusters

- In 2006 (during the 9th Malaysia plan), five regional economic corridors were announced by the government to unlock the regions' potential through *micro-planning* and build competitive cities by integrating economic zones into urban planning. Since then **a high-density integrated cluster development approach** was adopted.
- Various **regional corridor authorities have been set up** to oversee the economic corridors program, they mainly function as a supporting, coordination, and facilitation layer between the central government and state government.

Northern Corridor Economic Region (NCER)	Automobile and aerospace
East Coast Economic Region (ECER)	Petrochemical
Iskandar Malaysia in Johor	**Creative industries**
Sarawak Corridor (SCORE)	Renewable energy hydropower
Sabah Development Corridor	Tourism and palm oil

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EGYPT

I. KEY FINDINGS – EGYPT

High potential for the growth of DC systems with the development of new cities

Market Potential

Growing population and real estate needs from new cities.

Existing Projects

10 DC systems in operation (190k RT), 6 DC systems under implementation (214k RT) and 15 projects being planned (401k RT).

Business Model

Interest from the public sector along with green shoots in the form of private sector business model.

Enabling Environment

A DC Code was established that requires developers to assess the feasibility of DC systems in their project design stage.

4,295
GDP per Capita (Current US$, 2022)

111
Population (million, 2022)

15%
Est. Commercial Real Estate Growth

2,900
Cooling Degree Days

Montreal Protocol

✓ **Ratified**

Kigali Amendment

✗ **Unratified**

Key Challenges

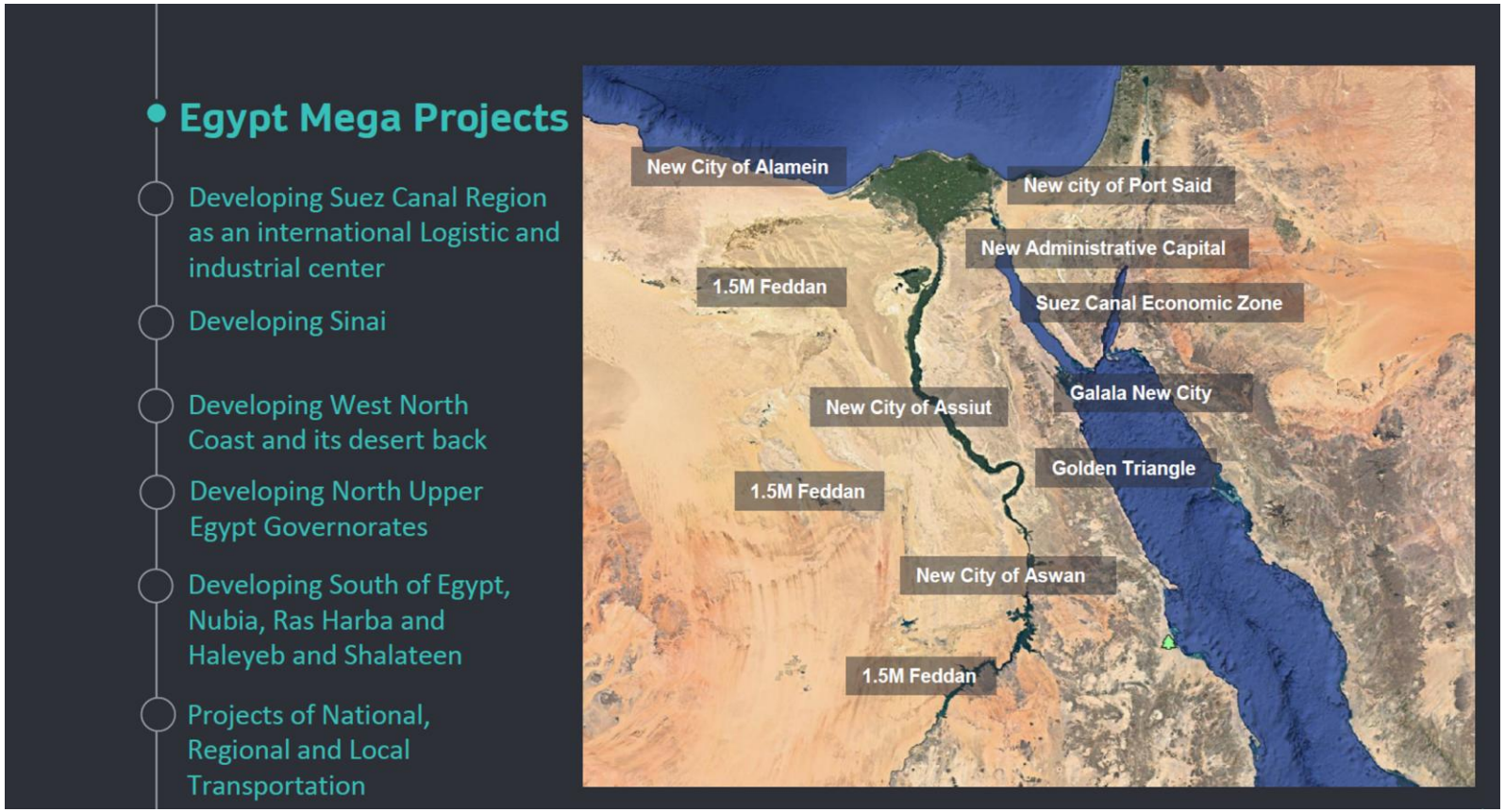
- Unfavorable macroeconomic conditions.
- Limited enforcement of the DC code.
- Limited willingness and lack of capacity in the public sector to develop master plans integrating DC.

II. PUBLIC SECTOR LED DEVELOPMENT

Growth is fueled by outward movement from the exceptionally high-density city in Cairo through the construction of eighteen 4th generation smart cities

List of 4th Generation Cities

- New Alexandria
- New Rashid City
- New Alamein
- East Port Said
- New Mansoura
- New Obour City
- New Nasser City
- New Administrative Capital
- Sheikh Zayed Extension
- New Sixth of October
- October Gardens
- New Al Fashn City
- New Malawi City
- New Assiut
- West Qena
- New Luxor
- New Aswan
- New Toshka



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III. PUBLIC SECTOR LED DEVELOPMENT

NUCA

هيئة المجتمعات العمرانية الجديدة
New Urban Communities Authority

- New Urban Communities Authority (NUCA) Is a **state owned enterprise affiliated to the Ministry of Housing**. NUCA is the master developer of the 2.3 million acres* of state-owned land, including all the 4th generation new cities. It is also the regulator of these new cities.
- It is in charge of implementing the first phases of the new cities, including infrastructure services and buildings for housing, schools & hospitals, and governments etc.
- In 2021, UNEP conducted a feasibility study for the first phase of the New El Alamein City with an estimated cooling capacity of 35,500 RT. Seven cooling stations are under construction as part of building commissioning by El Alamein City Development Company.

ACUD

ACUD
ADMINISTRATIVE CAPITAL
FOR URBAN DEVELOPMENT
العاصمة الادارية للتنمية العمرانية

- Administrative Capital For Urban Development (ACUD) is the **state-owned master developer of New Administrative Capital (NAC)** and an anchor investor in all infrastructure projects. ACUD manages the planning, subdivision, infrastructure construction and sale of land parcels together with the NAC Development Authority affiliated to NUCA.
- ACUD is owned 49% by NUCA and 51% by the Ministry of Defense.
- Ongoing developments include:
  - NAC: GasCool is developing DC for NAC, with an estimated cooling capacity of **64,000 RT** and an investment value of **USD130 million.**
  - Embassies district and Tower district: Estimated capacity of **40,000 RT** each. BOOT structure under bidding process with international and national utilities.

 *1 acre = 4,047 m2

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India

I. KEY FINDINGS – INDIA

Advanced market with strong DC prospects

Rising Heat & Economic Risk:

- Rising heat across India threatens economic productivity and public health with only about 8% of Indian households currently owning air-conditioning units.
- About 75% of India's workforce, or approximately 380 million people, depend on heat-exposed labor that generates nearly half of the country's GDP.

Cooling Demand Growth:

- Cooling demand in India is growing by 15% to 20% annually.
- Space cooling for buildings currently accounts for the largest share of cooling demand, refrigerant use, energy consumption, and greenhouse gas emissions in the country.
- GIFT City in Gujarat hosts India's first large-scale standalone district cooling system, while other existing systems were mainly located in university and corporate campuses.

Policy & Regulatory Framework:

- The India Cooling Action Plan recommends that all new developments with a cooling requirement exceeding 8,000 tons of refrigeration per square kilometer conduct a feasibility study for district cooling systems.
- The policy encourages the adoption of efficient cooling such as DE, TES, and the development of low GWP refrigerants

II. AMARAVATI GOVERNMENT COMPLEX: DISTRICT COOLING CONCESSION OVERVIEW

Tendering Process

- **Pre-feasibility:** In-house with support from master planning consultants
- **PPP tender:** Two level selection - technical pre-qualification, followed by least cost bid
- **Least Cost (L1):** Based on committed lowest lifecycle cooling charges

Parties

- **Concessionaire**
- **Concession Grantor/Authority** (Amaravati Capital Region Development Authority (APCRDA))

District Cooling Concession

- **Scope:** Concessionaire to design, build, finance and operate DCS. Grantor to provide land/ fulfill other obligations.
- **Term :** 32 years (2 yrs construction + 30 years operation)
- **Tariffs:** Fixed Demand charge per RT and Variable Consumption Charge per ton-hour basis meter readings.
- **Customer(s):** APCRDA- sole customer responsible for tariff payments. Novation in future to other departments.
- **Flexible and Scalable Terms:** Guaranteed load availability and service delivery, modular capacity addition to avoid over/pre-investment, and surplus capacity sold to 3rd parties through revenue
- **Project Bankability & Risk Allocation:** Risk-allocation to allow long term project finance to reduce life cycle cooling cost, robust termination (& payment) regime, and procurement benchmarked against other PPP frameworks in India including for solar.

Service Area & Cooling Demand

- **Nine Green (Platinum) Buildings:** Assembly, High Court, HOD & Secretariat Towers (5) and Future Towers (2)

BUA (Mn sft)	Peak Demand (RT)	Building Diversity (RT)	Campus Diversity (RT)
11.9	25,035	21,280	19,152

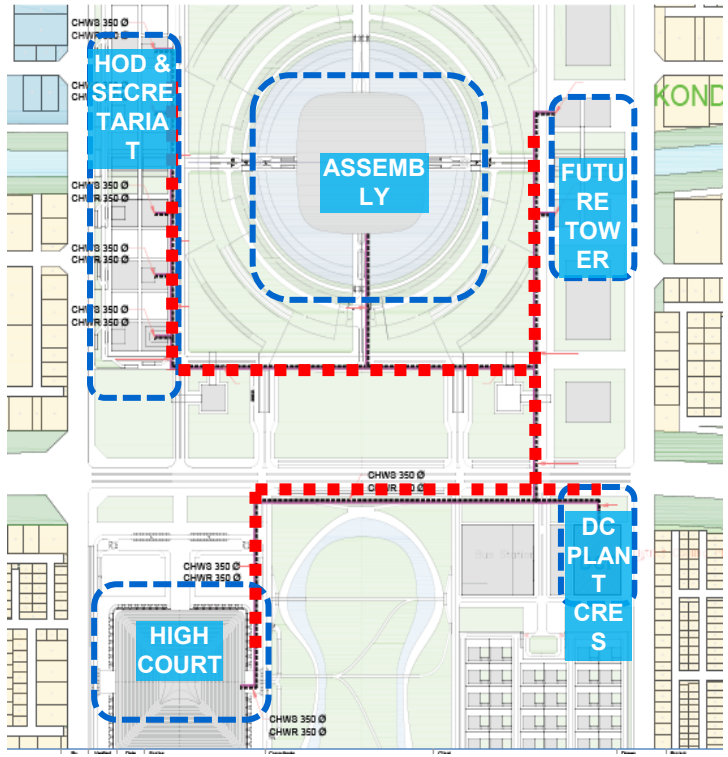
Cooling Capacity
6,000 RT reduction
(25% lower capacity)

Power Demand
14 MW reduction (40% lower capacity)

Cost
10% higher upfront capex
50% lower opex
18% savings on lifecycle basis

Other Opportunities: Amaravati City

- If Adopted, can be first greenfield city in the world to mandate DCS
- Amaravati masterplan includes residential, offices, hotels, institutions, hospitals, entertainment centres and intends to adopt 100% green building concept. DCS can attract $4BN in investments and offer significant sustainability benefits



AGC District Cooling Concession Area

III. HYDERABAD PHARMA CITY – TENDER AWARDED: DISTRICT COOLING CONCESSION OVERVIEW

Tendering Process

- **Pre-feasibility:** In-house with support from master planning consultants
- **PPP tender:** Two level selection - technical pre-qualification, followed by least cost bid
- **Least Cost (L1):** Based on first year costs

Parties

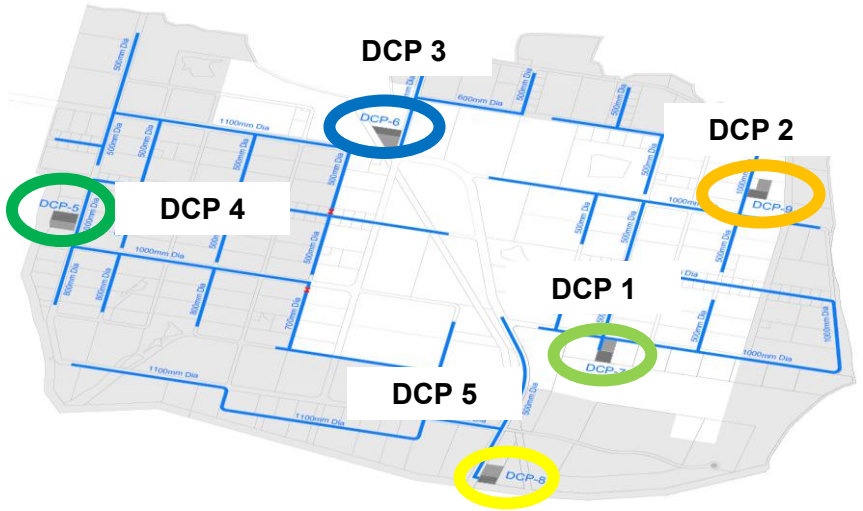
- **Concessionaire:** Tabreed
- **Concession Grantor/Authority:** Telangana Industrial Infrastructure Corporation (TGIIC)

District Cooling Concession

- **Scope:** Tabreed to design, build, finance and operate DCS. Grantor to provide land/ fulfill other obligations.
- **Term :** Up to 40 years (incl. 18 months for construction).
- **Tariffs:** Fixed Demand charge per RT and Variable Consumption Charge per ton-hour basis meter readings (5% escalation applicable).
- **Customers:** Pharma companies (with offtake guarantee for the first phase).
- **Phase 1:** 2,500 RT start + civil for 25kRT + network 12.5kRT; expand at 90% load trigger

Service Area & Cooling Demand

- Master plan estimates total installed cooling capacity of 125,000 RT (USD 200 MN)
- Met through 5 nos. inter-connected DCPs of 25,000 RT each on a modular basis.
- Respective pharma units manage secondary side process cooling requirements independently.



Cooling Capacity
20kRT reduction (15% lower capacity)

Cost
15% higher upfront capex
40% lower opex
15% savings on lifecycle basis

Power Demand
57 MW reduction (~60% lower capacity)

1,040 Mega Liters (~18%) annual water savings

170 GWh (~26%) reduction in annual power consumption

0.13 Million Tons (~26%) reduction in annual carbon emissions

COLOMBIA

I. KEY FINDINGS – COLOMBIA

Small market for DC systems with long-term potential. Market has been driven by tri-generation projects

Market Potential

No new cities coming up, but relatively high real estate growth in existing cities. Barranquilla, Cali, Cartagena, and Medellin are high-potential cities for DC.

Existing Projects

7 DC systems in operation (~8,300 RT) and 4 projects being developed (4,500 RT). Trigeneration schemes prevail where natural gas is the main energy driver.

Business Model

The market has been driven by private utilities. Promising start with buildings connected on the same plot. “Intramural” projects exist.

Enabling Environment

There are no specific legislation or gov coordination bodies for DC. Existing regulations are related to the energy sector. Energy efficiency requirements for buildings are still lacking.

6,630
GDP per Capita (Current US$, 2022)

52
Population (million, 2022)

3%
Est. Commercial Real Estate Growth

3,000
Cooling Degree Days

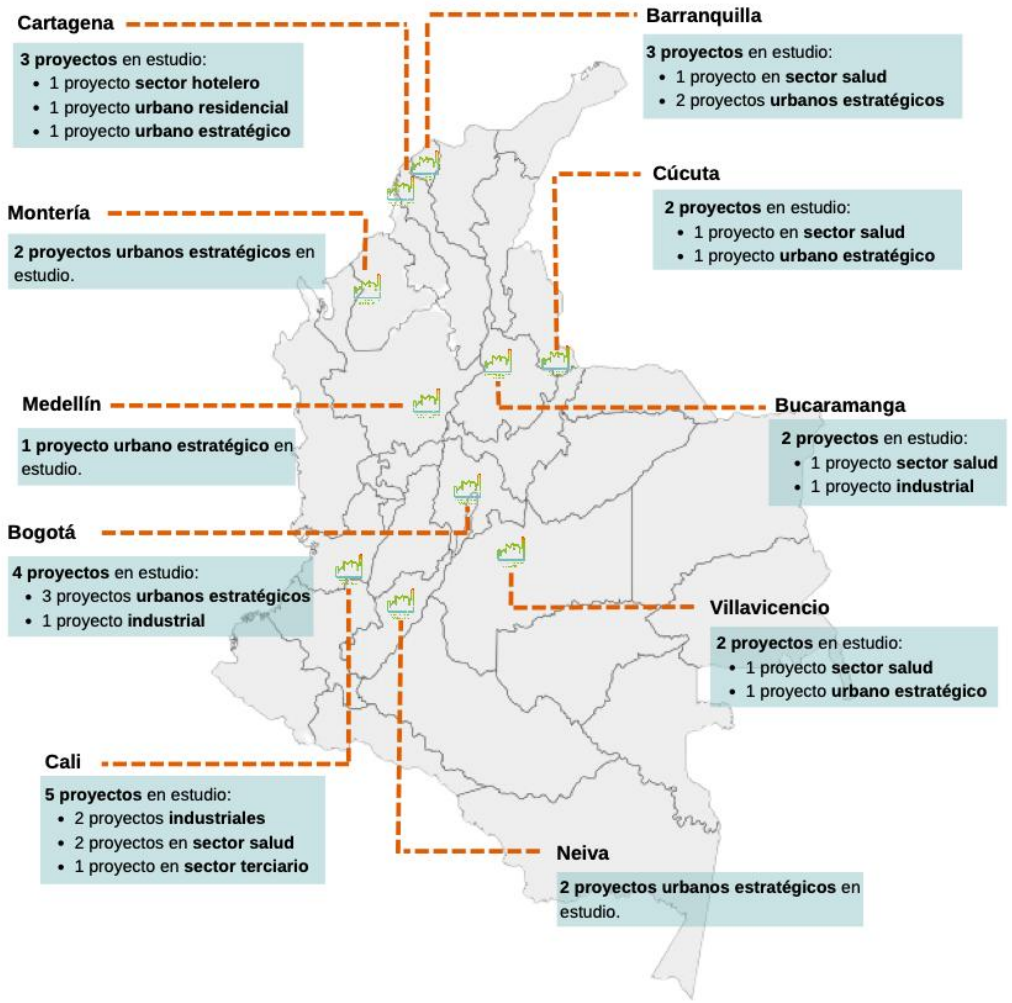
Montreal Protocol
✓ **Ratified**

Kigali Amendment
✓ **Ratified**

Key Challenges

- Lack of a coherent national strategy and regulatory framework.
- Lack of engagement with municipalities for urban planning.
- Lack of real estate developers’ involvement.

II. COLOMBIA DISTRICT ENERGY INITIATIVE



- **Ministry of Environment and Sustainable Development** through the Directorate of Climate Change and Risk Management and the Ozon Technical Unit leads the District Energy (DE) initiative.
- As part of Colombia's DE Initiative, 26 studies in key cities have been conducted to assess the feasibility of DC/DH systems. 10 studies are done, 16 are ongoing.
- The first phase (2013-2019) focused on **promoting the implementation of the first DE pilot project in the country** and financing several pre-feasibility studies.
- The second phase (2019 onwards) focuses on the expedited deployment of district energy systems in 10 cities. **Barranquilla, Cali, Cartagena, and Medellin** are high-potential cities for DC, while Bogota does not have significant cooling demand.

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III. MARKET ASSESSMENT

Cooling demand and moderate real estate growth present good DC potential in the cities of Barranquilla, Cali, Cartagena, and Medellin

- **Stable real estate growth.** Offices and retail spaces are expected to grow at a rate exceeding 3% per year.
- No new cities are being planned. Opportunities in **urban regeneration plans in existing major cities**.
- Potential leads for DC include **Medellin Innovation District in Medellin**, **Rio Arena in Barranquilla,** and **Zonamerica in Cali**.
- Additionally, there is a **concentration of important hotel developments** along the northern Atlantic coast of the country. During 2022-2025, there will be 35 new four & five-star hotels in Cartagena (7 hotels and 1,119 rooms), Cali (5 hotels and 750 rooms), Santa Marta (5 hotels and 726 rooms), and other cities.

*While Bogota has significant building stock and favorable real estate growth, cooling demands are not as high.

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IV. DISTRICT COOLING UTILITIES

Pioneering District Cooling Projects Driving Sustainable Urban Development in Colombia

CELSIA

- **Celsia currently operates 3 DC systems, with a total of 3,884 RT, incorporating trigeneration technology**.
- Project leads include:
  - **Expansion of the Serena del Mar system: N**ew satellite city, close to Cartagena.
  - **Gran Manzana mall expansion:** Under construction DC project. First DE system with thermal energy storage.

epm

- Developed the first DC project in Colombia **La Alpujarra.** The system started operating since 2016 and has a total cooling capacity of **3,600 RT**.
- **Distrito Medellin Innovation,** a brownfield mixed-use project. An initial feasibility study done

Llanogas

Surtigas

EMCALI

VEOLIA

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THANK YOU!

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