

Celsius Talk:

“Financial instruments: success stories, challenges & solutions”



A nighttime photograph of a city street with a canal. The street is lined with historic buildings, some of which are illuminated. The canal reflects the lights from the buildings and the sky. The sky is a deep blue with some clouds. The overall scene is a serene urban landscape at night.

Accelerating the energy transition in cities

Celsius

A collaboration hub for efficient, integrated heating and cooling solutions supporting cities in their energy transition to carbon-neutral systems.

Partners:



City of
Gothenburg



Johanneberg
Science Park



Research Institutes
of Sweden



...and more than 70 European cities!



Climate-KIC is supported by the
EIT, a body of the European Union



Funded by the
European Union



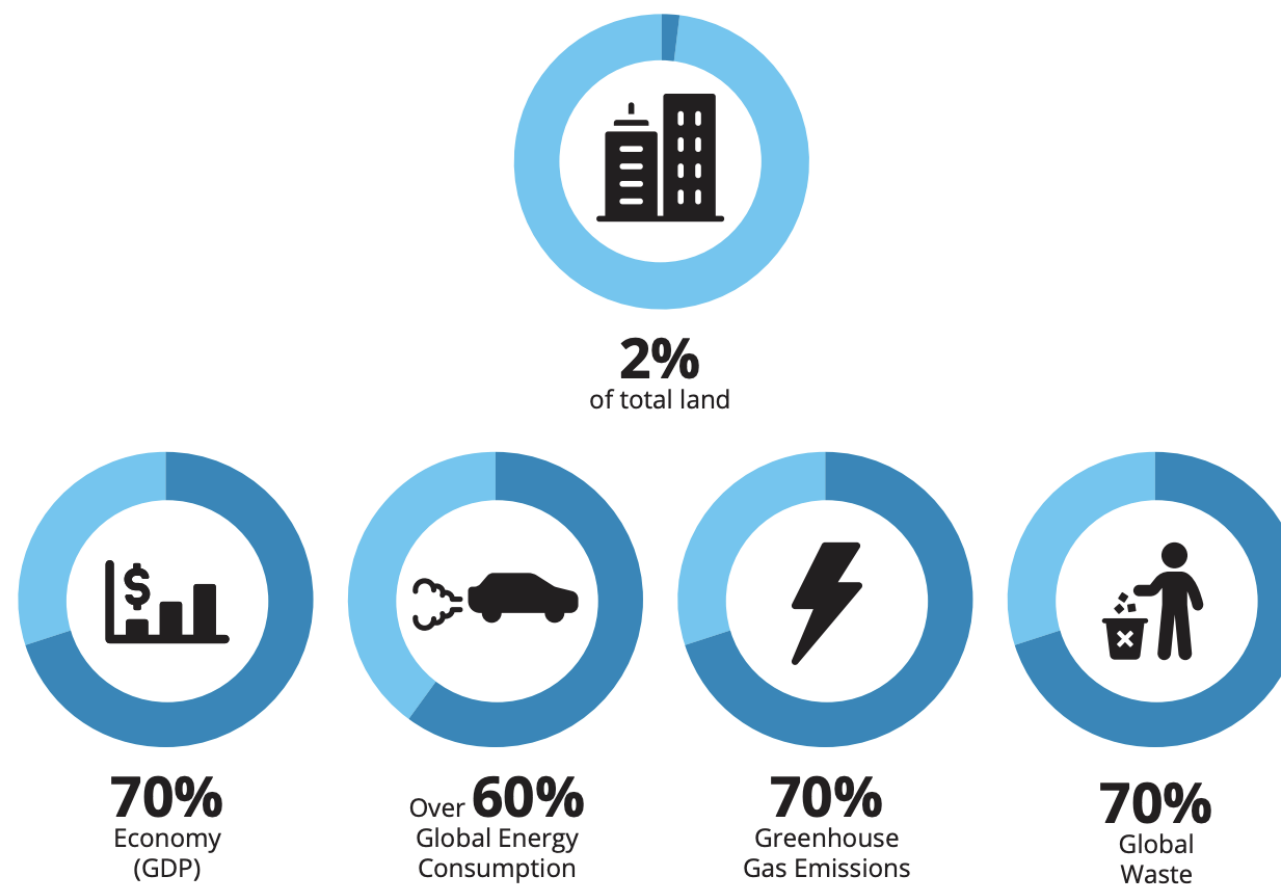


The talk is a part of being successful
in the transition from sustainable demonstrator
to commission and replication

... focus financial investment

Key in Energy Transition

WHY CRITICAL TO SUCCEED .. AND FAST



*Smart city
guidance package

History

Our story starts with CELSIUS project design of 2012

We are not alone

... many colleagues are actively working in the area





What is the issue?

CITIES

“Main obstacle”

FINANCE

“Abundance of capital
available”

TRUE



Sneak peek

Handling the gap



A European perspective regarding financial investments



- Simon Wyke, principal policy and programme officer at the Greater London Authority
European Union's Urban Agenda Energy Transitions Partnership



- Kristina Lygnerud – Energy Department Manager at IVL Swedish Environmental Research Institute & Assistant Professor at Halmstad University
Challenges to District Heating



- Rolf Bastiaanssen, Partner at Bax & Company
Investor Challenges



Success Stories & Key Learnings



- Rodrigo Matabuena, Energy Capital Projects Manager, Islington Council
Bunhill – successful funding PoC to Commissioning



- Fredrik Block, portfolio manager at the City of Gothenburg
Green bonds & Fred's five



Magnus Andersson

Partner at IMCG
Senior expert at the
Celsius Initiative

Celsius Initiative & Financial Instruments



Simon Wyke

Principal policy &
programme officer at the
Greater London Authority

European Union's Urban Agenda Energy Transitions Partnership

Urban Agenda - Energy Transition Partnership

<https://ec.europa.eu/futurium/en/urban-agenda>

Simon Wyke - Greater London Authority

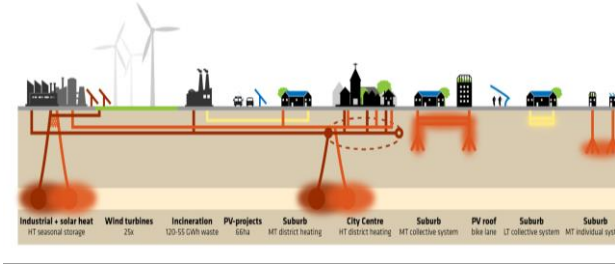


Urban Agenda - Energy Transition Partnership

- Objective to involve Urban Authorities in policy development and implementation
 - Better Funding/Better Knowledge/Better Regulation
- Energy Transition Partnership, 1 of 14
- Vision - Security & Resilience; Affordable, Fair and equitable; Clean & Sustainable
- Objective - demand led, smarter, integrated, interconnected and ultimately zero carbon



Urban Agenda - Energy Transition Partnership



Working Groups

- Energy sources, storage and distribution
- Energy masterplanning and energy management
- Buildings, consumers and consumption

Action Plan – May 2019

- Five Actions
 - **Call for a ‘Financing for District Energy’ Task Group**
 - Maximising use of waste heat in cities
 - Guidance on Energy Masterplanning for cities
 - Deployment Desks for City Retrofitting
 - Closer Co-operation with EU bodies to promote energy transition funding



Kristina Lygnerud

Energy Department Manager
at IVL & Assistant Professor
at Halmstad University

Challenges to District Heating

Challenges to District Heating

- *the ReUseHeat experiences*



May 28, webinar, Celcius Talk

Contact: kristina.lygnerud@ivl.se



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768936.

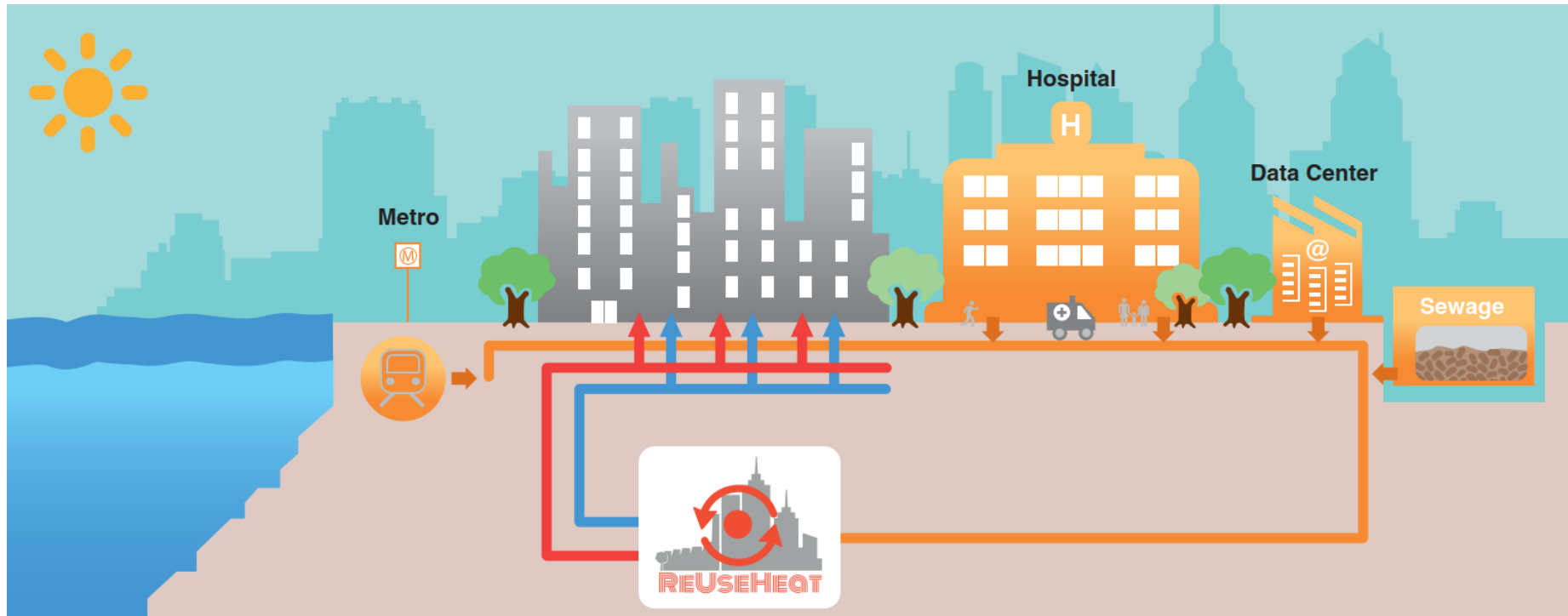
www.reuseheat.eu

@ReUseHeat

Agenda- findings from the ReUseHeat project

- 1. A large urban waste heat potential**
- 2. No standardization**
- 3. Unclear regulatory framework**
- 4. The cost of carbon is too low**
- 5. There is an interest to invest in the DHC sector**

The ReUseHeat idea



...what if a city could heat itself?

The ReUseHeat project

Project in short:

48 months, 4 demosites (IA), 16 partners in 9 countries, 5MEUR

Expected results:

- Identify the urban waste heat **potential & what happens if we use it**
- **Stakeholder analysis**: Who? Needs? How?
- Validated **technologies** for 4 system innovations
- Identify necessary adjustments to existing **business models and contracts**
- Address the financing constraints: **investment risk & bankability**

1. A large urban waste heat potential

Approximately **1.2 EJ** (or 340 TWh) per year are possible to recover from data centres, metro stations, service sector buildings, and waste water treatment plants.

This corresponds to more than 10 percent of the EU's total energy demand for heat and hot water, which is approximately 10.7 EJ (or 2,980 TWh)*

**ReUseHeat D1.4, Halmstad University, Urban Persson*

www.reuseheat.eu

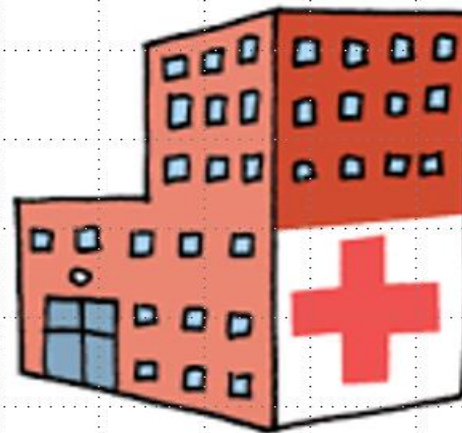
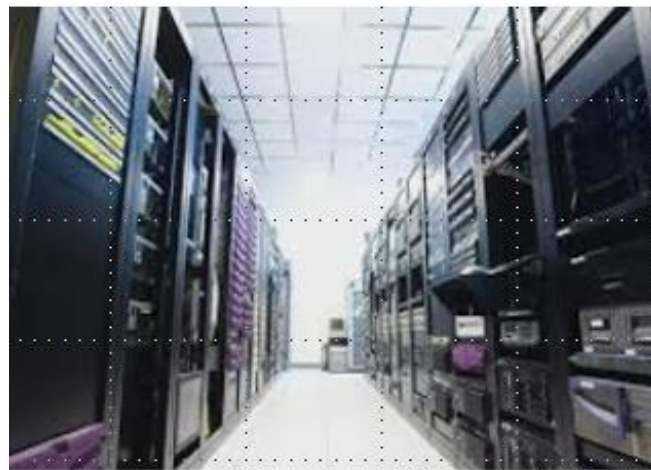


2. No standardization

The empirical data on urban waste heat recovery is limited

- There are not readily available systems off a shelf
- Each investment needs to be tailor made

...more demonstration is needed (sewage water, datacenter, hospital, metro)



3. Unclear regulatory framework

How should waste heat be treated?

- Is it a RES?
- Should it be incentivized ? (RES are incentivized)
- What kind of permits are needed?

...surprising since waste heat recovery is no news (1974 first, documented case in Sweden)

4. The cost of carbon is too low

The urban waste heat recovery solution is green

- 2050: carbon neutrality in Europe.... there are few other alternatives
- There is still a low will to pay for green (end-user)
- A new category, the prosumer becomes important and a driver for green solutions
- There are investors interested in green solutions (Green Deal) ...

5. There is interest to invest in DHC

*“We don’t lack money, but we lack good projects to lend money to”
(ReUseHeat D2.1, RINA-C, Giorgio Bonvincini)*

How can we make the investments happen?



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www.reuseheat.eu

ReUseHeat



Thank you for the attention!

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Contact: kristina.lygnerud@ivl.se



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www.reuseheat.eu

@ReUseHeat



Rolf Bastiaanssen
Partner at Bax & Company

Investor Challenges



Heat networks - a snapshot of the trends in financing

Giulia Rinaldi, Rolf Bastiaanssen

www.baxcompany.com

What lenders say about trends at macro-level...

- An **excess of liquidity** has created more competition among debt investors. Infrastructure debt funds that have traditionally favoured long-dated, high-rated project finance deals look for better returns, with many turning to shorter-dated corporate-style financing.
- Pension funds are becoming active as entry-level investors, due to a focus on environmental, social and governance (ESG) criteria. Increasing **interest in greenfield assets** which can be owned at cost instead of paying a “brownfield premium” on acquisition.
- The **share of renewables** in district heating plants in the EU is 19.5%, but securing supply is a major challenge

...and at the project level

// The market for district heating is growing. At our level, **financing models have not changed much though, nor did financing options**. For green networks, securing supply is a critical new quality and risk we are looking into.

- EIB project analyst

// Our sustainable energy systems desk provides financing for district heating. We contract out technical risk assessments as we do not have that expertise ourselves. This obviously means we only look at **larger, more mature projects**

- Director green finance, Dutch wholesale & retail bank

// Projects are still unique, which makes it costly, time consuming, and risky to develop. We should work towards the **development of standardized models** that would allow a thorough and detailed analysis facilitating the development of economically viable projects.

- Innovation manager, Spanish Infrastructure Company

Reality of the project pipeline

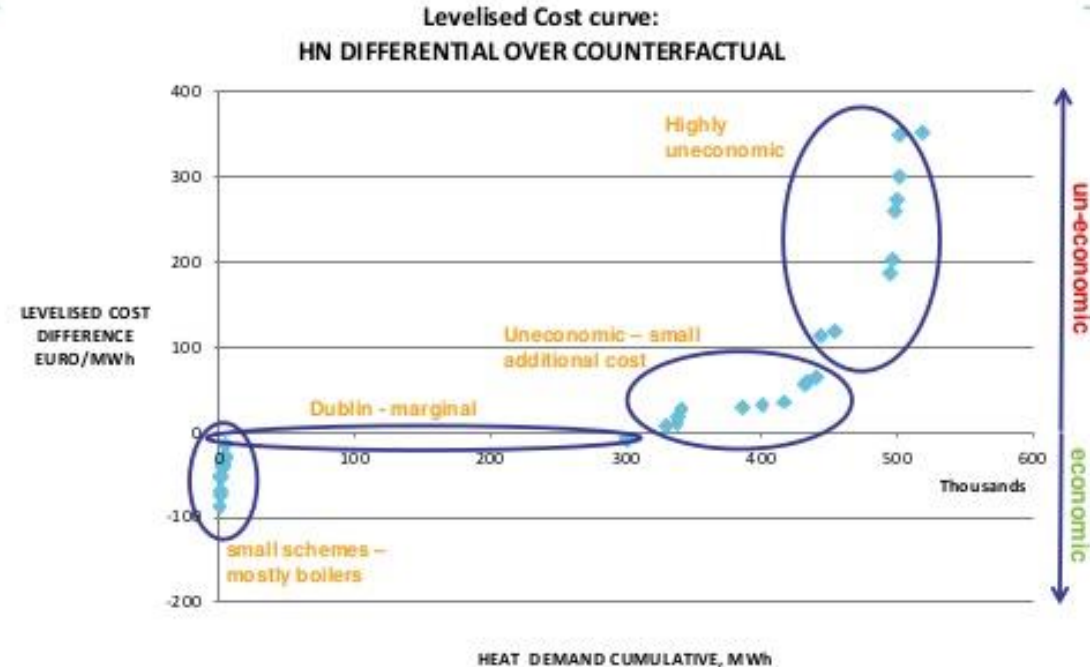
A relatively small portion of potential networks has a positive business case.

These tend to be small-scale networks in urban or industrial areas of high heat demand.

These will connect over time reducing risk and cost for grid extensions

Most assessment prove to be cost-neutral or uneconomic on the long-term.

NATIONAL CBA – HEAT CURVE



Emerging models

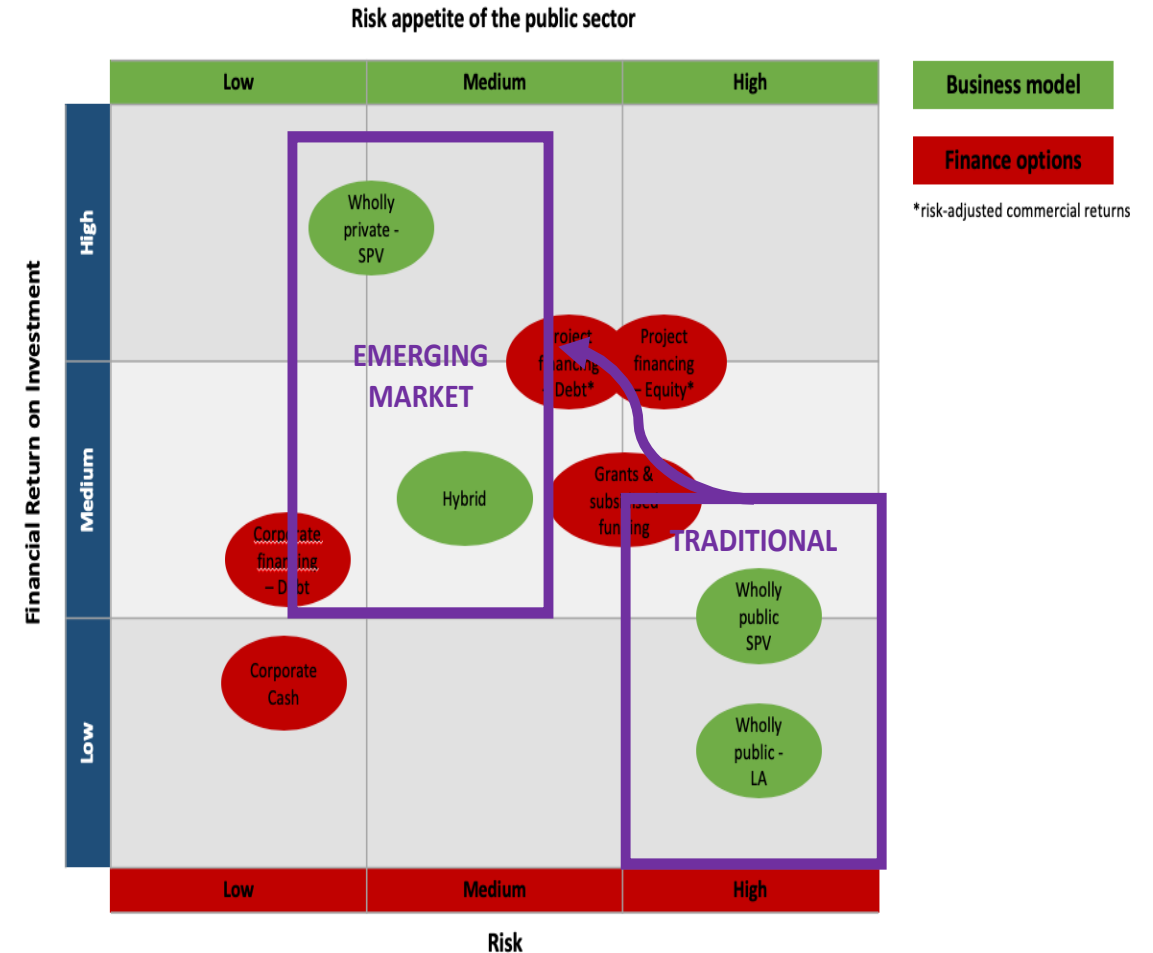
EnNatuurlijk and PGGM: pension fund backing

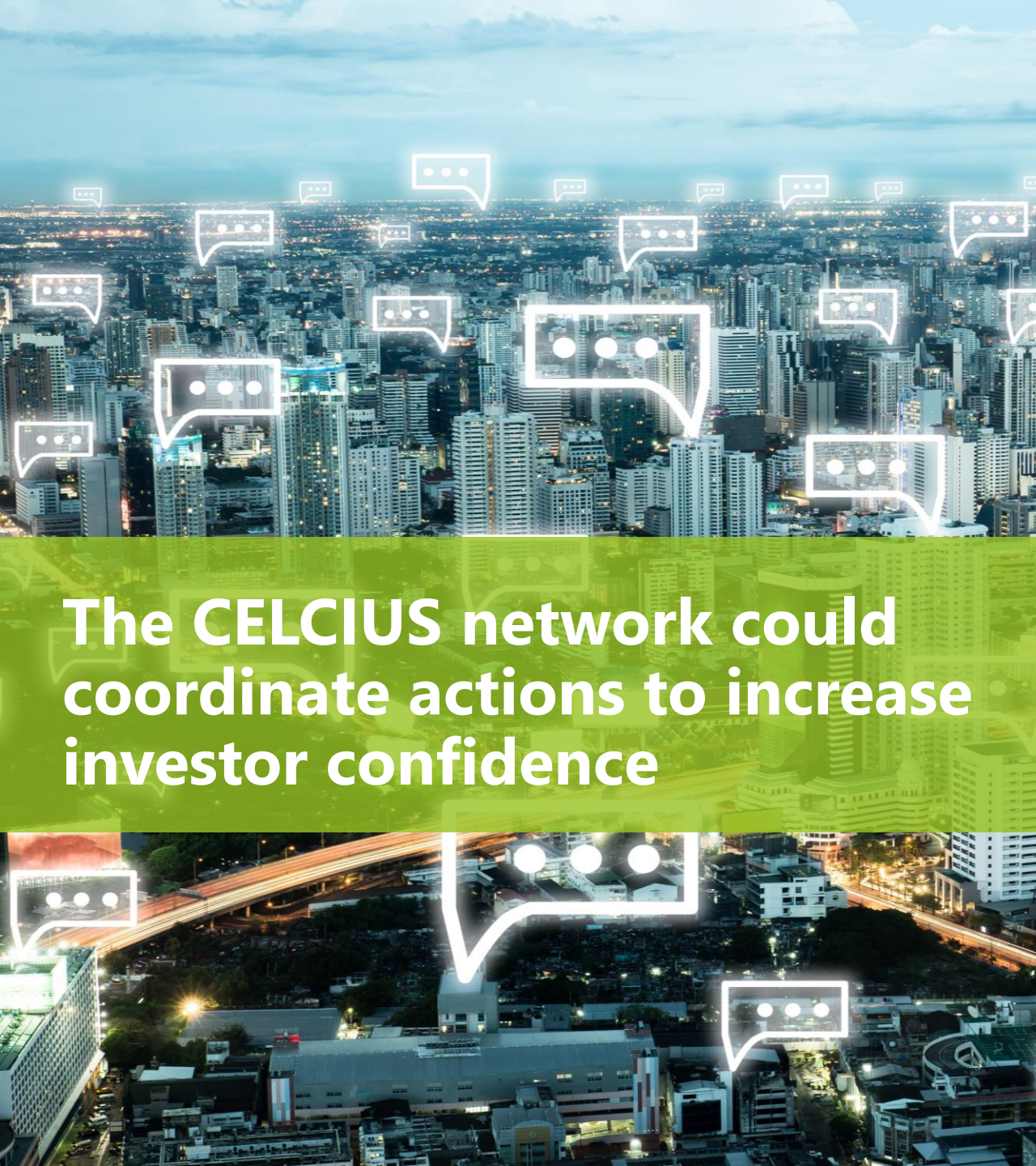
The non-profit pension fund PGGM is financing district energy projects through a heat supplier company EnNatuurlijk in a collaboration with Veolia.

The PipeCo model: an alternate approach

The installation of pipes is the main cost component (50% of capex) resulting in a payback period of up to 50 years.

The PipeCo model refinances the distribution network and opening competition between different generators using the same distribution system. Third party investors would at this stage have a long-term low-risk asset and project developer would recover most of





The CELCIUS network could coordinate actions to increase investor confidence

RECOMMENDATIONS

Standardisation for project assessment

- Broader standardisation of project assessment methods would increase market readiness of projects and reduce due diligence cost
- See eg energy efficiency in the built environment / EEFIG

Availability of Technical Assistance instruments

- Many investments start small. TA typically is only available for large projects. Reduce thresholds to €1M investment or create an aggregators
- Support development of National aggregation platforms

Value of green investments

- The premium for green district heating projects is hard to assess, and does not yet significantly impact cost of finance



Success Stories & Key Learnings



- Rodrigo Matabuena, Energy Capital Projects Manager, Islington Council
Bunhill – successful funding PoC to Commissioning



- Fredrik Block, portfolio manager at the City of Gothenburg
Green bonds & Fred's five



Rodrigo Matabuena

Energy capital projects
manager at Islington Council

Bunhill 2 Energy Centre



Financial challenges for new heat networks in Islington

CELSIUS Talk

28/05/20

ON ENERGY

 ISLINGTON

Local Context

- Islington is the most densely populated borough in the UK
- Third smallest district in England.
- Around 4,500 listed buildings
- 55% of the homes in Islington are Council owned or managed
- Ambitious target of Net Zero Carbon by 2030
- Average fuel poverty levels around 10% with some Council estates peaking at 25%



Bunhill Heat and Power – since 2012

- 2 MWe CHP plant
- 115m³ thermal store
- 1.5 km pipe network

Provide heat to:

- 600 council homes
- 100 private homes
- 4 office buildings
- 2 leisure centres



Electricity generated is sold to the national grid

Reduced carbon emissions by 2,000 tonnes CO₂e per year



Bunhill II

- 2nd Energy Centre
- 1 MW heat pump
- 500 kW_e CHP plant
- 75m³ thermal store
- 1+ km pipe network

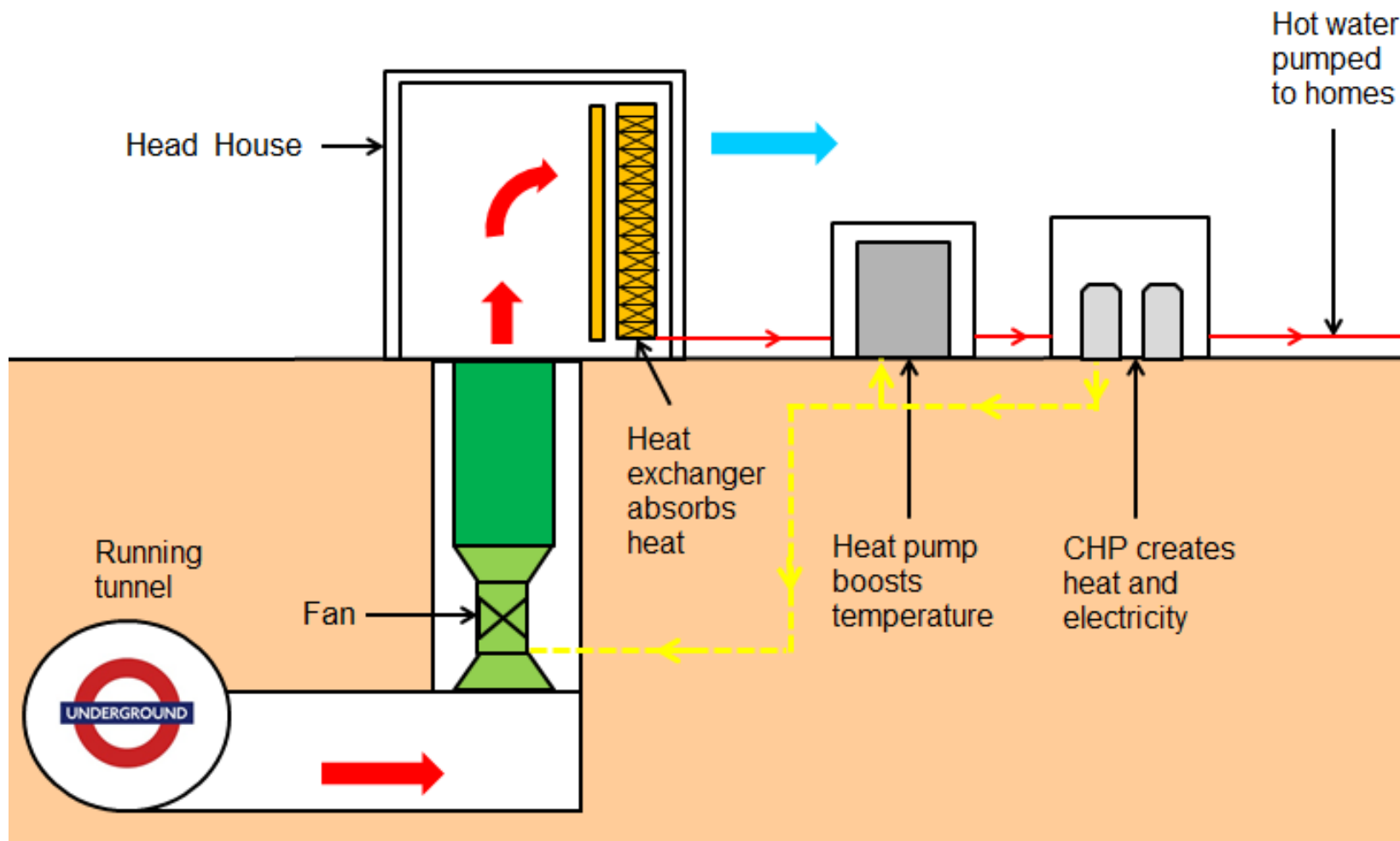
Will provide heat to:

- 600 council homes
- 100 private homes
- One school



Most electricity from the CHPs will power the heat pump and the fan





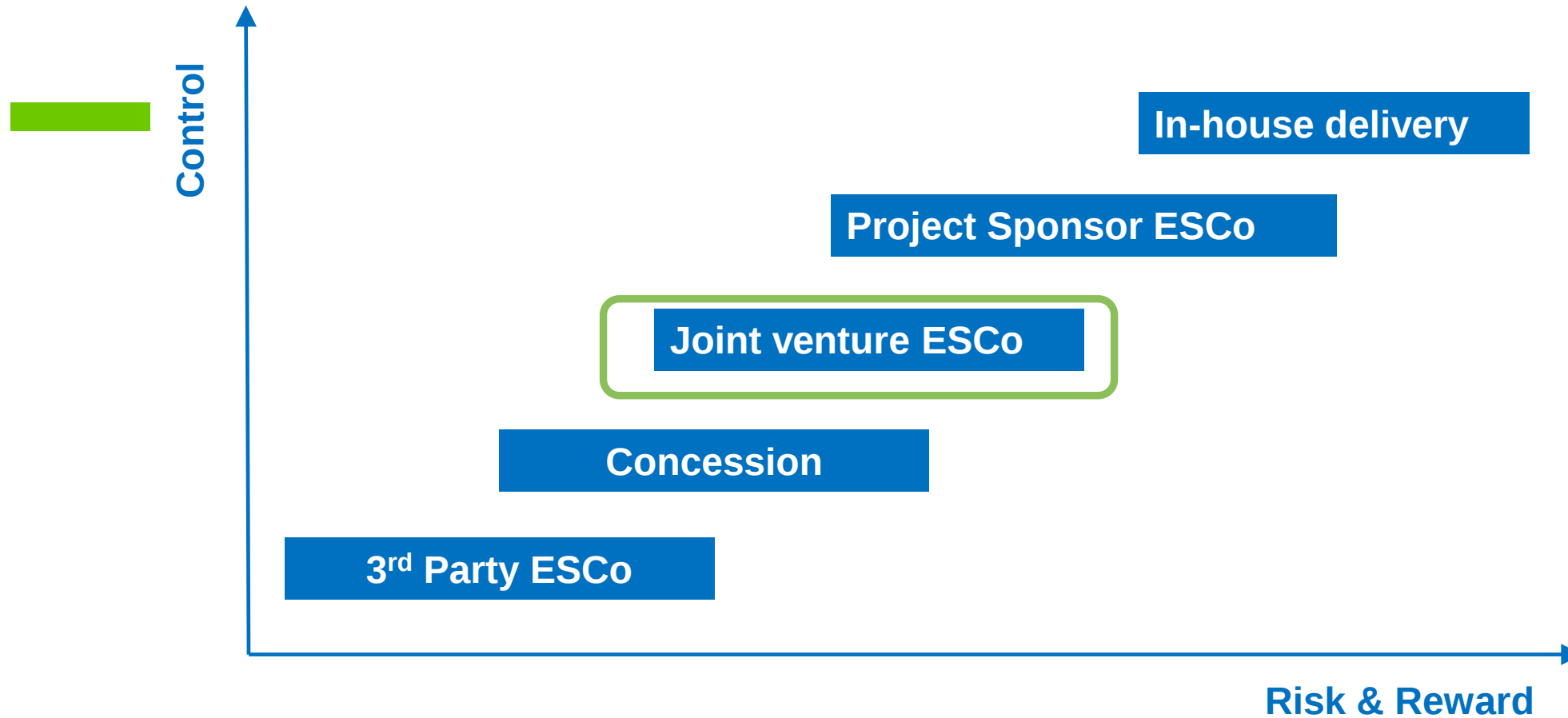


New Challenges

- Become Zero Net Carbon by 2030
 - Develop 15 heat networks across Islington
 - Expand Bunhill
 - Decarbonise the heat
 - Adopt new metering regulation
 - Retrofit 1000's of properties
 - ...
-
- All of that without ANY capital funds



Think differently





GreenSCIES

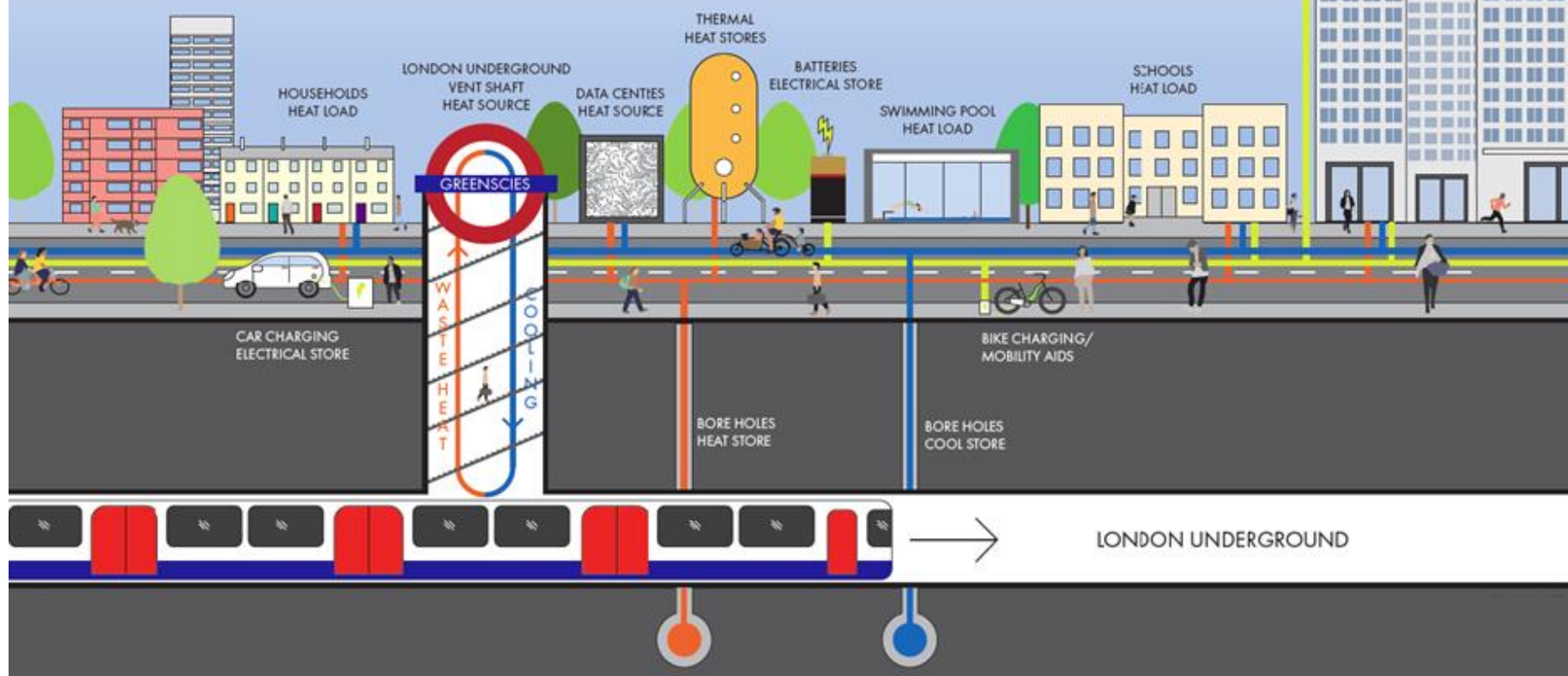
ON ENERGY



ISLINGTON

HEAT LOOP CONCEPT DIAGRAM

- HEATING
- COOLING
- ELECTRICITY



ON ENERGY

ISLINGTON



GreenSCIES aims to deliver a technically and commercially viable integrated, local, smart energy network

➤ **Deliver low carbon, affordable energy**

1. Efficient use of heat

Capturing **waste heat** and using **renewable energy sources**

2. Balancing loads

Delivering **low carbon heating & cooling** by sharing heat between applications

3. Integration of new technologies

Transition to **EV and V2G**

➤ **Design able to be used & operated in an urban environment**

- **5th generation district heating network** with energy storage and AI optimization

➤ **Develop a local energy market**

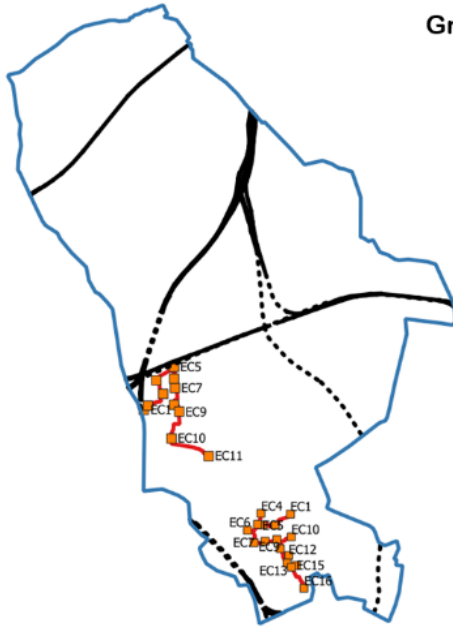
- Engaging stakeholders & develop a suitable **business model**

➤ **Pathway for Replicability**



Identification of benefits & impacts

GreenSCIES 1 smart energy networks currently covers approximately 8% of LBI



> 10,000 residents connected to the network



Low carbon heating and cooling to more than 3500 homes



Renewable power generation enough to supply nearly 500 homes



> 160 new EVs connected to the smart energy network

Estimated total carbon savings > 80%
Operational revenue increase > £2,000,000/year
End user bill costs reduced by 25% in total

Boroughs /Councils involved	No of residents connected	No of homes (social, private)	No of business/ commercial / non domestic	Energy sources	Addressing fuel poverty [number of residents]	Technologies to be included/+explored	Integration readiness level (IRL)*	Potential carbon savings [tonnes of CO2e] (Current carbon factors)	Estimated potential pollution emission reduction in area [%]	Potential revenue savings [£/year]	Meeting 3rd 4th & 5th carbon budgets and delivering zero carbon by 2050
GreenSCIES1 (Conceptual design for two clusters in Islington)	Islington	>10,000	>3,500	8 (TfL, Level3, Volta, Museum, 5 Schools/ University)	Solar, Ground water, London Underground, Data centres	2000 (20% of 10,000)	Heat pumps, PV, Batteries, Ecars, V2G, Thermal and electrical stores, Smart control	4	9,100 (>80% reduction)	6	>2,000,000



Thank you!





Fredrik Block

Portfolio manager at the
City of Gothenburg

Gothenburg's Green Bonds



City of
Gothenburg

Green Bonds

Fredrik Block
Portfolio Manager

May 2020

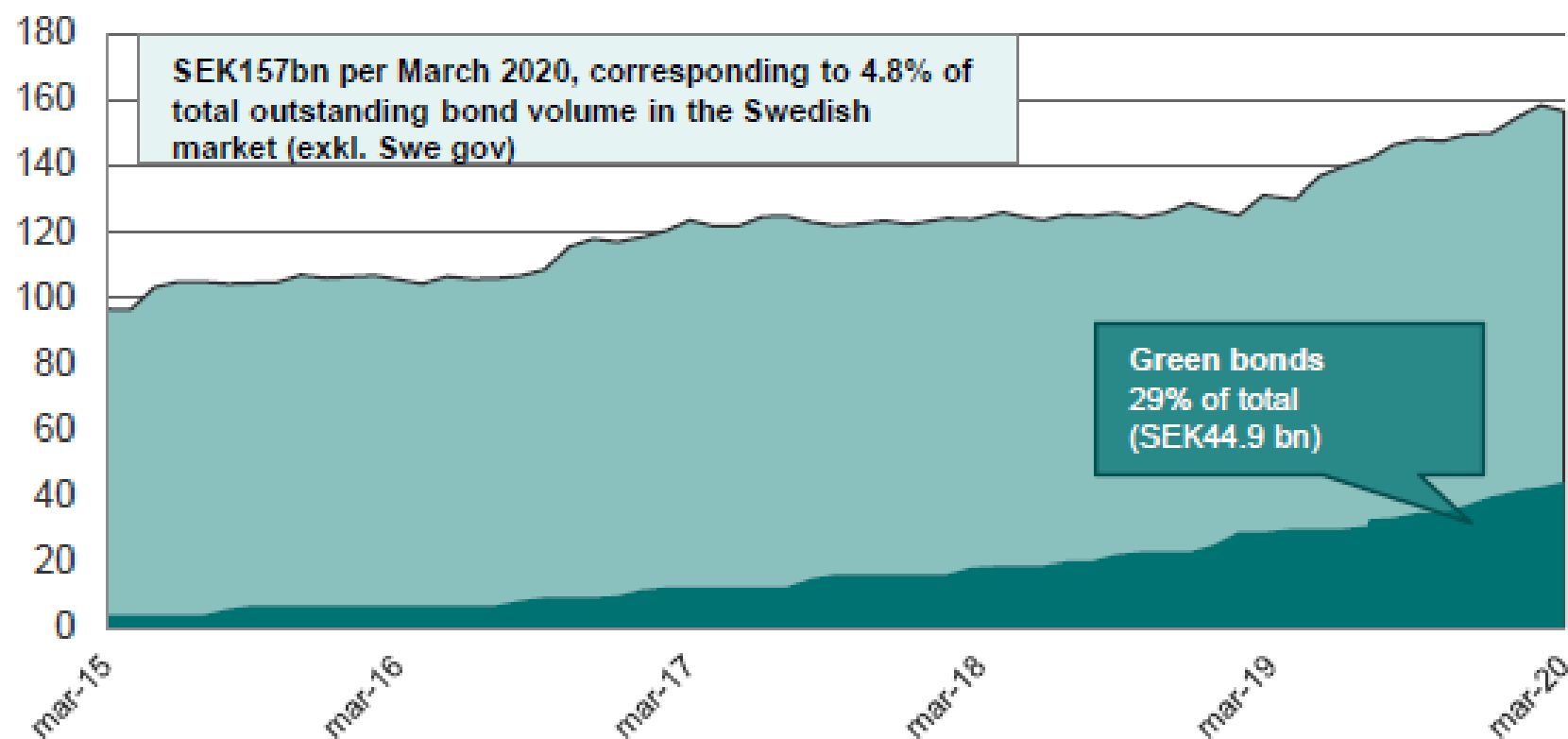
”Gothenburg, Sweden...greenest city on Earth”



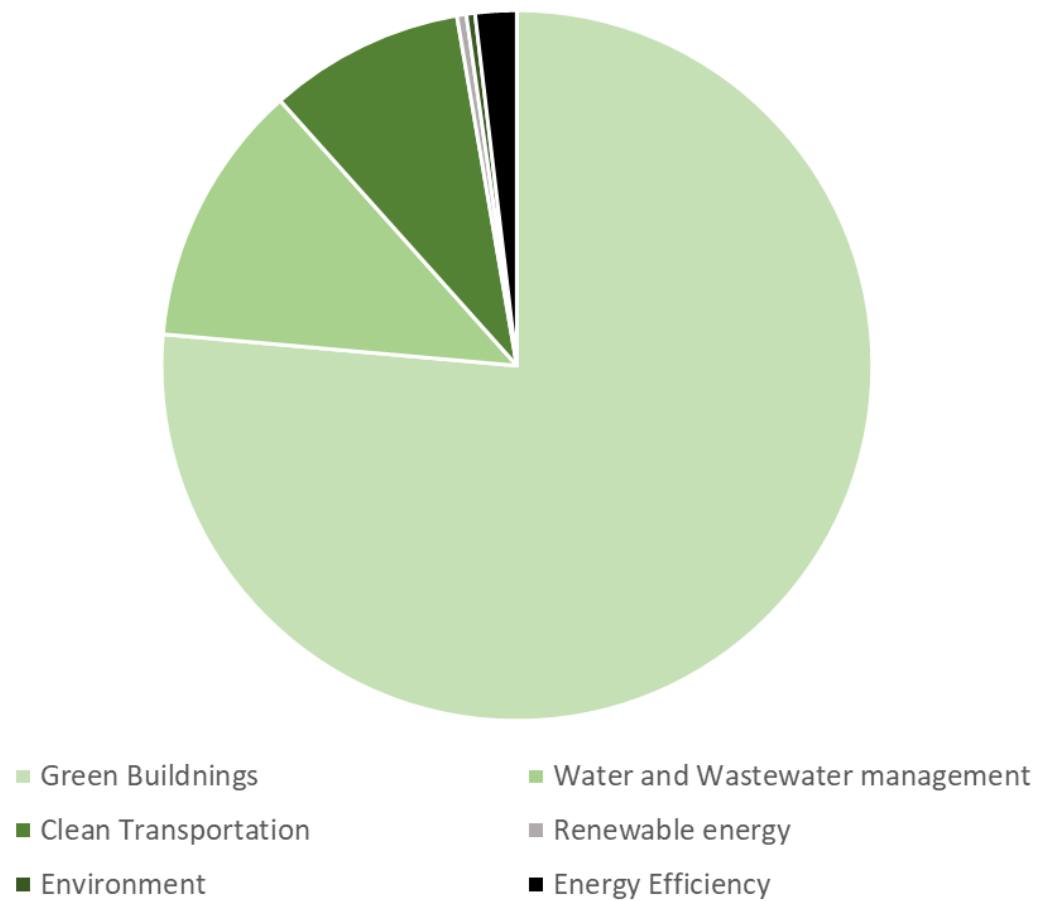
Please read more at;

<https://edition.cnn.com/travel/article/gothenburg-sweden-things-to-do/index.html>

Green bonds continue to increase among Swedish municipalities and counties



Green Investment Portfolio 10,3 billion SEK





Green Bond Process





City of
Gothenburg

CITY OF GOTHENBURG GREEN BOND FRAMEWORK

SEPTEMBER 2019

04. City of Gothenburg Green Bonds

05. Use of Proceeds

06. Green Project Categories

06. Renewable Energy

07. Green Buildings

08. Energy Efficiency

09. Clean Transportation

10. Waste Management

11. Water & Wastewater management

12. Sustainable Land Use & Environmental Management

13. Climate Change Adaptation

14. Green Project Evaluation & Selection

14. Management of Proceeds

15. Reporting & Transparency

17. External Review



Green Bond Project Selection Process Flowchart



Guidelines:

- EU Law
- Miljöbalken Sweden
- Over all environmental strategy
- Environmental Programme and Climate Strategy
- Applicable environmental plans and decisions

Selection according to the criteria by:

1. City office (Urban Development and Treasury Department)
2. Environmental Administration
3. Final approval by the City Executive Board

How do we get more greens balls into the funnel?

Widening the funnel outlet is greenwashing

Green Bond Impact Report 2018



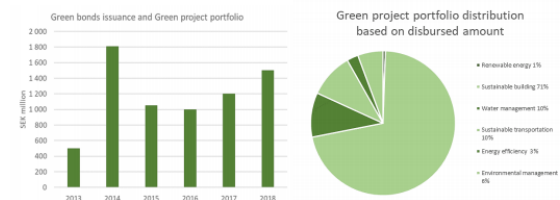
*“It is a city that has sustainability in its DNA
and is always eager to share best practice”*

Gothenburg – GDS-Index Leadership Award 2018

City of Gothenburg reports its Green Bonds impact in accordance with the *Nordic Public Sector Issuers' Position Paper on Green Bonds Impact Reporting*, published in October 2017, updated in January 2019, by a group of Nordic public sector green bond issuers. If we deviate from the Position Paper recommendations in our reporting, this will be indicated.



Executive Summary, as of 31 Dec 2018



Project category	GHG emissions reduced/avoided, tonnes CO ₂ e/year	Outstanding disbursed amount to projects, SEK mn	Impact, tonnes CO ₂ e per SEK mn
Renewable energy	2090	38	55
Sustainable building	682	4917	0,14
Water management	n/a	685	n/a
Sustainable transportation	217	396	0,55
Energy efficiency	1356	177	7,7
Environmental management	n/a	389	n/a
Total	4345	6602	n/a

Disbursed amounts with CO₂ impact, SEKmn	5528	
Impact, tonnes CO₂e per SEK mn		0,8
Annual renewable energy generation, MWh		5500
Annual energy reduced/avoided MWh		7075

* This table presents the calculated impact in terms of CO₂ reduced or avoided. Aggregated project data reported represent both ex-ante estimates and ex-post outcomes. For information on additional project impact, see page 12-14.

Impact attributable to green bond investors*	97,6%
* Total outstanding disbursed amounts to projects divided by total outstanding green bonds	
Whereof impact attributable to Green Bond SEK 250 mn maturing 3 October, 2019	3,46%
Whereof impact attributable to Green Bond SEK 250 mn maturing 3 October, 2019	3,46%
Whereof impact attributable to Green Bond SEK 1500 mn maturing 3 June, 2020	20,74%
Whereof impact attributable to Green Bond SEK 310 mn maturing 3 June, 2020	4,29%
Whereof impact attributable to Green Bond SEK 1050 mn maturing 3 June, 2021	14,52%
Whereof impact attributable to Green Bond SEK 1000 mn maturing 15 June, 2022	13,83%
Whereof impact attributable to Green Bond SEK 1200 mn maturing 14 June, 2023	16,59%
Whereof impact attributable to Green Bond SEK 500 mn maturing 5 November, 2024	6,91%
Whereof impact attributable to Green Bond SEK 1000 mn maturing 5 November, 2024	13,83%

Key procedural aspects

- The City of Gothenburg's Green Project portfolio exclusively consists of loans to the administration and companies within the municipality.
- Each loan is selected according to the Green Bonds framework available at <http://finans.goteborg.se/en/greenbonds/green-bond-framework/>
- The City of Gothenburg reports on a portfolio basis, and in Swedish kronor (SEK)
- For this document, the reporting period ends on 31 December 2018

Fred's Fast Five;

Does your organization finance investments by bonds or loans?

Does your organization have an overall green ambition?

What investment projects could be considered green?

Set up a Green Bond Framework, the bank's experts will do most of the work.

Pass on the small discount received when issuing green bonds to those who delivered the green projects.



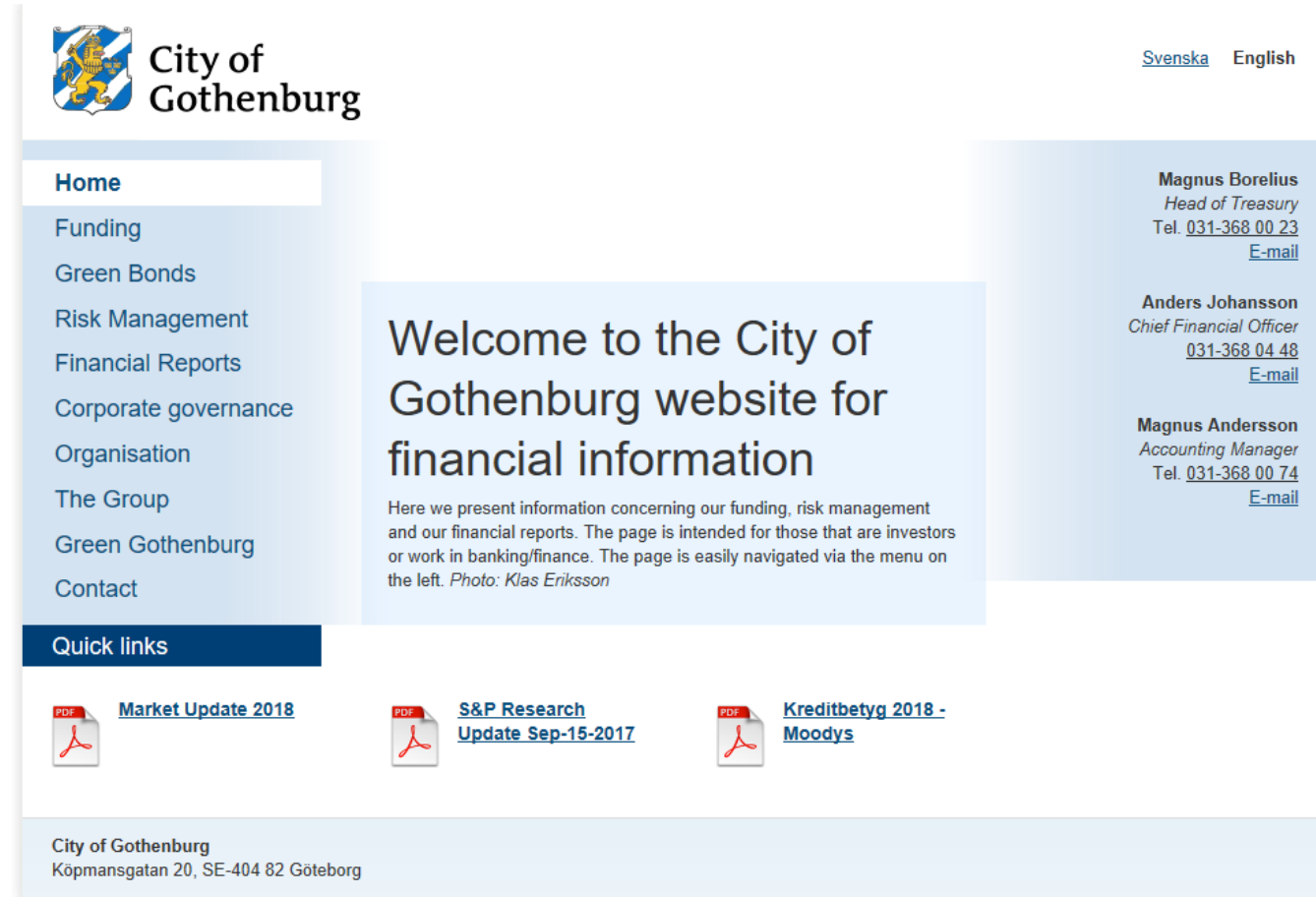
Decision by the City Council 2019-03-28

The **Environment and Climate Committee** is commissioned to revise the City of Gothenburg's climate strategy program based on the goal of 1.5-degree heating in connection with the revision of the environmental program.

The revision should include that the City of Gothenburg should have local transports that are fossil-free in 2030, and that the entire City of Gothenburg's **vehicle fleet is fossil-free at the latest by 2023**.

The City Council is commissioned to set up a special political working group that will have the overall responsibility to prepare and propose broadly acceptable measures to the municipal government and the municipal council for the city to come down **quickly** to the emission levels required to reach the **1.5-degree target**.

Investor relations



The screenshot shows the 'Investor relations' page of the City of Gothenburg website. At the top left is the City of Gothenburg logo and name. To the right are links for 'Svenska' and 'English'. A left-hand navigation menu lists: Home, Funding, Green Bonds, Risk Management, Financial Reports, Corporate governance, Organisation, The Group, Green Gothenburg, and Contact. Below this is a 'Quick links' section with three PDF icons and links: 'Market Update 2018', 'S&P Research Update Sep-15-2017', and 'Kreditbetyg 2018 - Moody's'. The main content area has a large heading 'Welcome to the City of Gothenburg website for financial information' followed by a paragraph: 'Here we present information concerning our funding, risk management and our financial reports. The page is intended for those that are investors or work in banking/finance. The page is easily navigated via the menu on the left. Photo: Klas Eriksson'. On the right side, there are three contact blocks for Magnus Borelius (Head of Treasury), Anders Johansson (Chief Financial Officer), and Magnus Andersson (Accounting Manager), each with their telephone number and an 'E-mail' link. The footer contains the address: 'City of Gothenburg, Köpmansgatan 20, SE-404 82 Göteborg'.

City of Gothenburg

[Svenska](#) [English](#)

Home
Funding
Green Bonds
Risk Management
Financial Reports
Corporate governance
Organisation
The Group
Green Gothenburg
Contact

Quick links

 [Market Update 2018](#)  [S&P Research Update Sep-15-2017](#)  [Kreditbetyg 2018 - Moody's](#)

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Here we present information concerning our funding, risk management and our financial reports. The page is intended for those that are investors or work in banking/finance. The page is easily navigated via the menu on the left. Photo: Klas Eriksson

Magnus Borelius
Head of Treasury
Tel. [031-368 00 23](tel:031-3680023)
[E-mail](#)

Anders Johansson
Chief Financial Officer
[031-368 04 48](tel:031-3680448)
[E-mail](#)

Magnus Andersson
Accounting Manager
Tel. [031-368 00 74](tel:031-3680074)
[E-mail](#)

City of Gothenburg
Köpmansgatan 20, SE-404 82 Göteborg

Please visit <http://finans.goteborg.se/>



Contact:

Fredrik Block
Portfolio Manager
+46 31 368 02 91



fredrik.block@stadshuset.goteborg.se

www.finans.goteborg.se



Thank you!

www.celsiuscity.eu - [@celsiuscity](https://twitter.com/celsiuscity) –

celsius@johannebergsciencepark.com



BAX & COMPANY 
VALUE FROM SCIENCE AND TECHNOLOGY



**City of
Gothenburg**



ISLINGTON



Magnus Andersson

Partner

+46 766 36 53 02

magnus.andersson@imcg.se

www.imcg.se

Sweden

Odinsgatan 20A
411 03 Göteborg

UK

P.O Box 78, Limpsfield
Oxted, Surrey RH8 OFH

