City-zen 'Preston' Roadshow

Team
Experts:
Prof.Dr. Andy vd Dobbelsteen
Dr. Andy Jenkins
Prof. Greg Keeffe
Prof.Dr. Craig L.Martin
Dr. Riccardo Pulselli
Egon Troch
Dr. Han Vandevyvere
Jan Verheyen

Fun-shop Facilitators:
Ekta Kapoor
Lorena Montenegro
Carmen Ramkhelawan
Liesanne Wieleman
Tania Cecilia Cortes Vargas
Linda Vos

This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 608702

European Commission

CITY-zen New urban energy ROADSHOW

City-zen Roadshow Leader – Prof.Dr. Craig Martin

Preston, UK, November 2018

Aims

Co-creative

Global / local expertise combine to reach zero energy.

Home-grown solutions.

CITY-zen
New urban energy
ROADSHOW

City-zen Roadshow Leader – Prof.Dr. Craig Martin

Preston, UK, November 2018

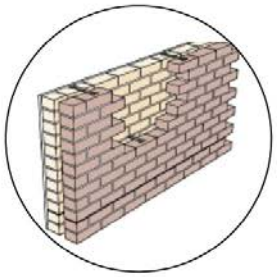
What we have learned?

Challenges

No playgrounds


Cars dominate


Hard surfaces


Poor insulation


Flood risks

Potentials

Multi-cultural


Unsused space


Local initiatives


Victorian housing (repetition)


Urban farming

Not sacrifice.

Understanding the 'cost' of not doing something.

- Health
- Enjoyment
- Economic future
- Family future
- Survival!

CITY-zen
New urban energy
ROADSHOW

What went on…

Mon 12th Nov
'Walk'

CITY-zen
New urban energy
ROADSHOW

City-zen Roadshow Leader – Prof.Dr. Craig Martin

Preston, UK, November 2018

What went on…

Preston City Council

studioJB

uclan University of Central Lancashire

Cassidy+Ashton C+A

Let's GROW PRESTON

S.W.A.T STUDIO

recyclinglives

Mon 12th Nov
'Talk'

CITY-zen New urban energy ROADSHOW

City-zen Roadshow Leader – Prof.Dr. Craig Martin

Preston, UK, November 2018

What went on…

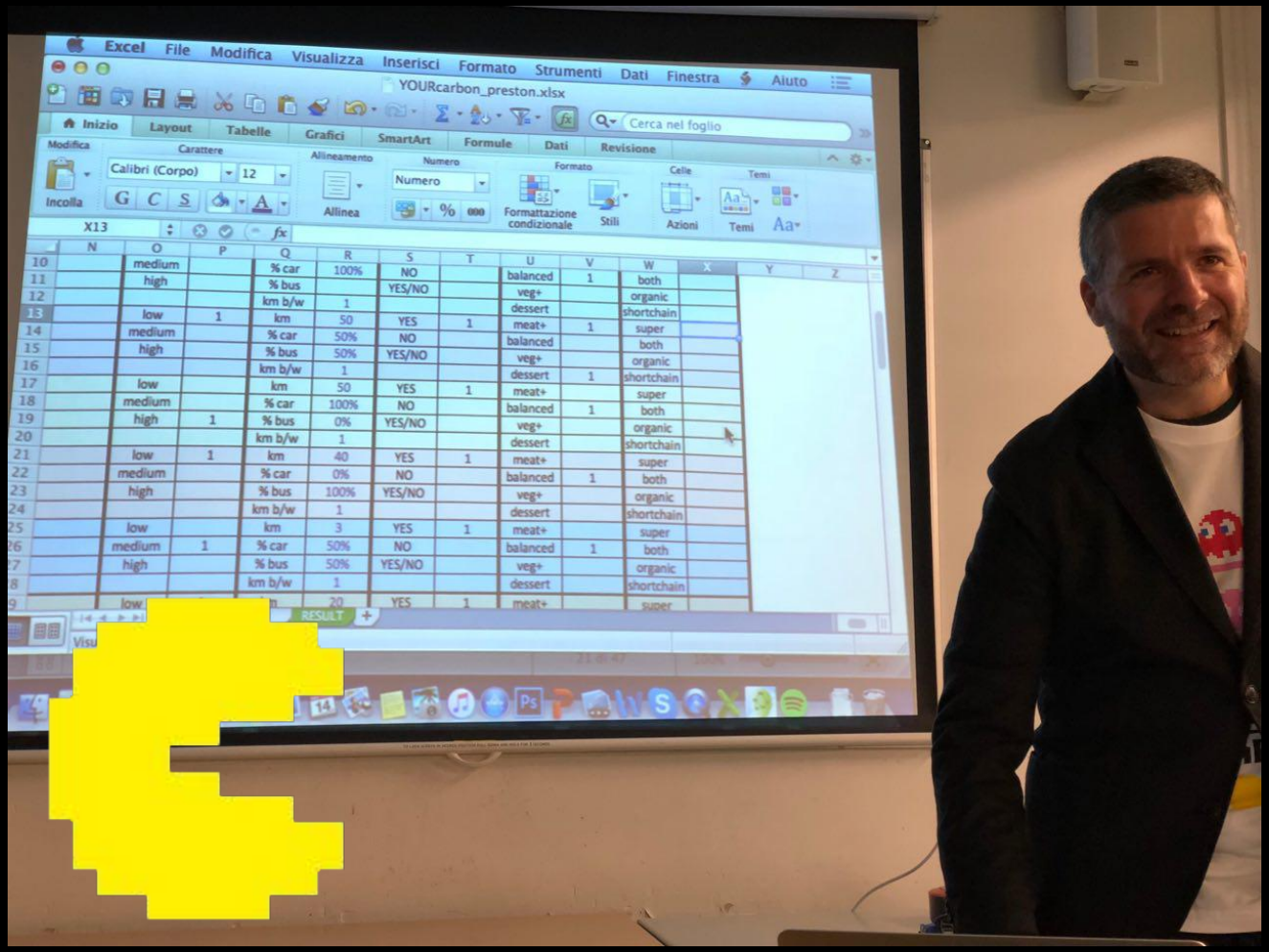
FUN-SHOP ‘Drop-Ins’

CITY-zen
New urban energy
ROADSHOW

City-zen Roadshow Leader – Prof.Dr. Craig Martin

Preston, UK, November 2018

What went on…



FUN-SHOP ‘Drop-Ins’

City-zen Roadshow Leader – Prof.Dr. Craig Martin

Preston, UK, November 2018

Carbon accounting

CO_2-eq

CO_2 CH_4 N_2O

UNIT kg CO_2-eq

GWP CO_2 = 1
GWP CH_4 = 34
GWP N_2O = 298

EMISSION FACTORS

CITY-zen New urban energy ROADSHOW

Raw data in Preston

HOUSEHOLD

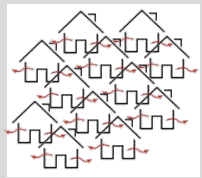
Household: 1

Citizens: 2.34

NEIGHBOURHOOD

Households: 1500

Citizens: 3645



PRESTON

Households: 57,567

Citizens: 140,189

	HOUSEHOLD	NEIGHBOURHOOD	PRESTON
Electricity	3550 kWh/yr	5.3 GWh/yr	204 GWh/yr
Natural gas	11600 kWh/yr	17.5 GWh/yr	672 GWh/yr
Mobility	14000 km/yr passenger car only	21M km/yr	807M km/yr
Waste	661 kg/house yr 51% landfilled 31% recycled	991 t/yr	38 k t/yr
Water	131 m3/house yr	196 k m3 yr	7.5 M m3 yr

Raw data & scale

HOUSEHOLD

NEIGHBOURHOOD

PRESTON CITY

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Carbon Footprint per household

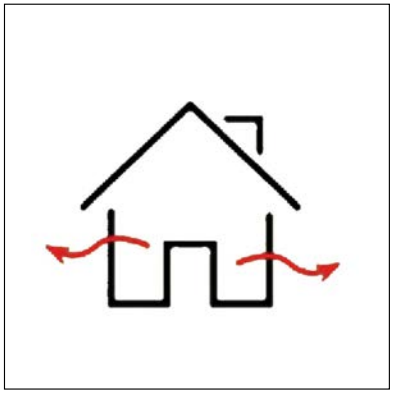
HOUSEHOLD

Household: 1

Citizens: 2.34

7.00 t CO_2-eq

Electricity: 3550 kWh/yr	**1126 kg CO_2-eq**	**16 %**	TU Delft energy simulation
Natural gas: 11600 kWh/yr	**2939 kg CO_2-eq**	**42 %**	TU Delft energy simulation
Mobility: 14000 km/yr	**2378 kg CO_2-eq**	**34 %**	Avg EU (46% petrol, 52% diesel, 2% lgp)
Waste: 661 kg/house yr	**489 kg CO_2-eq**	**7 %**	Lancashire.gov.uk (51% landfilled, 31% recycled, 18% other)
Water: 131 m3/house yr	**77 kg CO_2-eq**	**1 %**	Lancashire.gov.uk



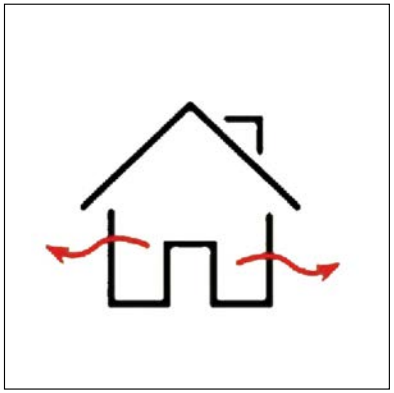
Typical household Carbon Footprint

CITY-zen New urban energy ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Carbon Footprint per household



Typical household
Carbon Footprint

7.00 t CO_2eq / yr

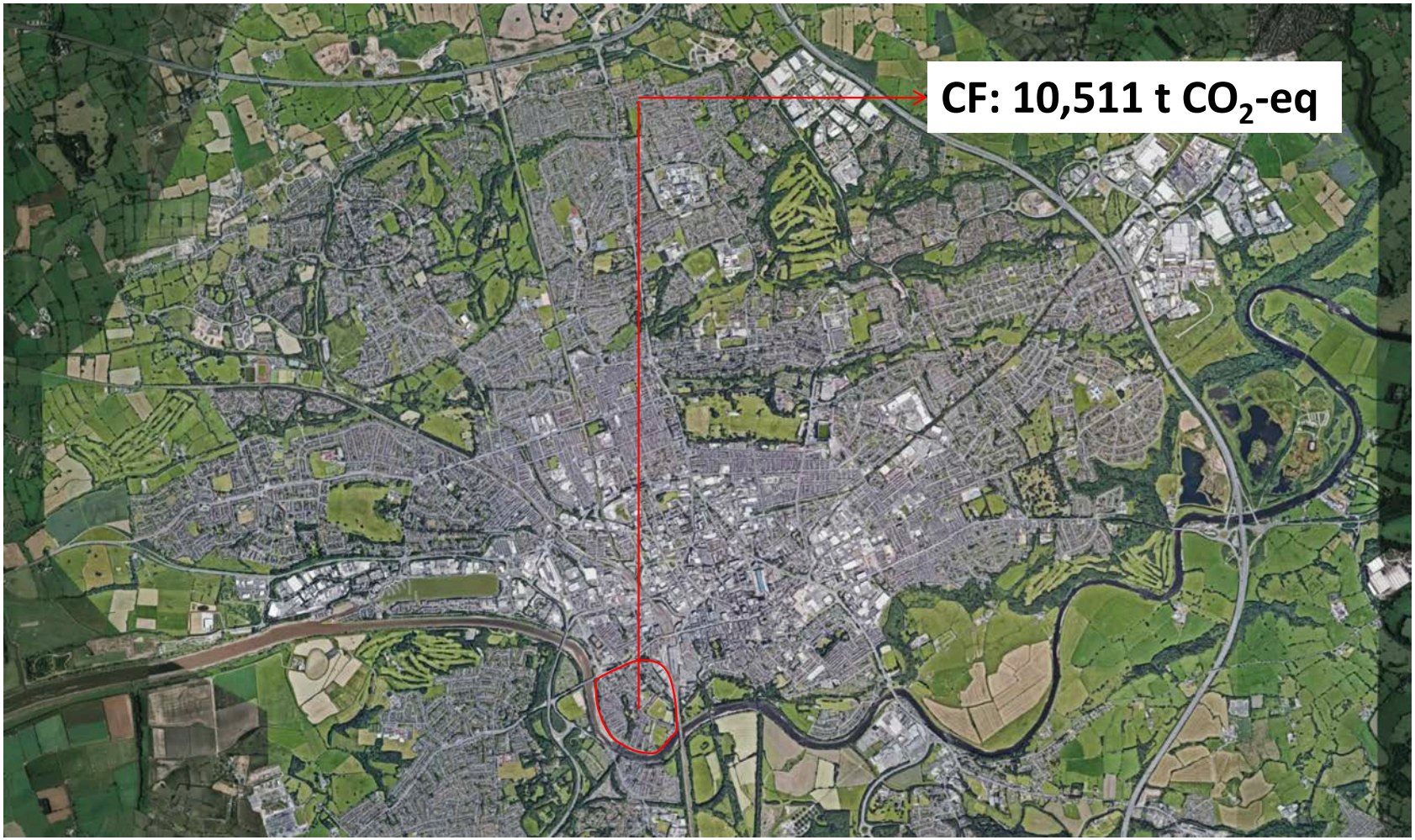
= 1.3 football fields

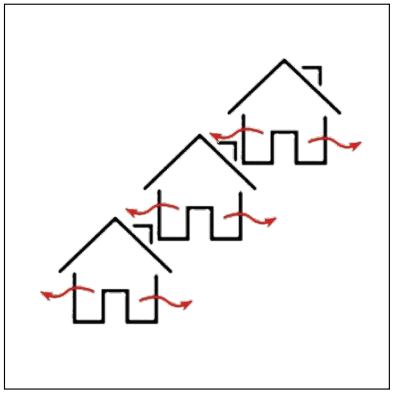
CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Carbon Footprint of the Broadgate neighbourhood





BROADGATE

- 3645 inhabitants
- 1500 households
- 2.6% Preston houses
- 40 ha area
- 91 inhab./ha

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Carbon Footprint of the Broadgate neighbourhood

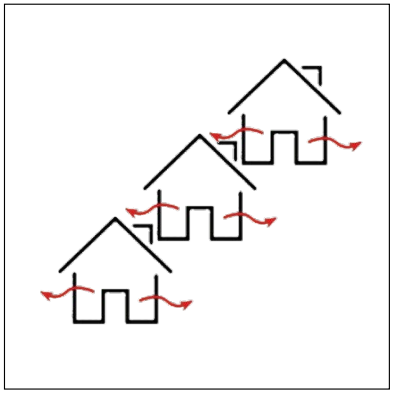
NEIGHBOURHOOD

Households: 1500

Citizens: 3645

10,511 t CO_2-eq

Electricity: 5.3 GWh/yr	**1688 t CO_2-eq**	**16 %**	TU Delft energy simulation
Natural gas: 17.5 GWh/yr	**4408 t CO_2-eq**	**42 %**	TU Delft energy simulation
Mobility: 21M km/yr	**3567 t CO_2-eq**	**34 %**	Avg EU (46% petrol, 52% diesel, 2% lgp)
Waste: 991 t/yr	**733 t CO_2-eq**	**7 %**	Lancashire.gov.uk (51% landfilled, 31% recycle, 18% other)
Water: 196 k m3 yr	**115 t CO_2-eq**	**1 %**	Lancashire.gov.uk



BROADGATE

3645 inhabitants

1500 households

2.6% Preston houses

40 ha area

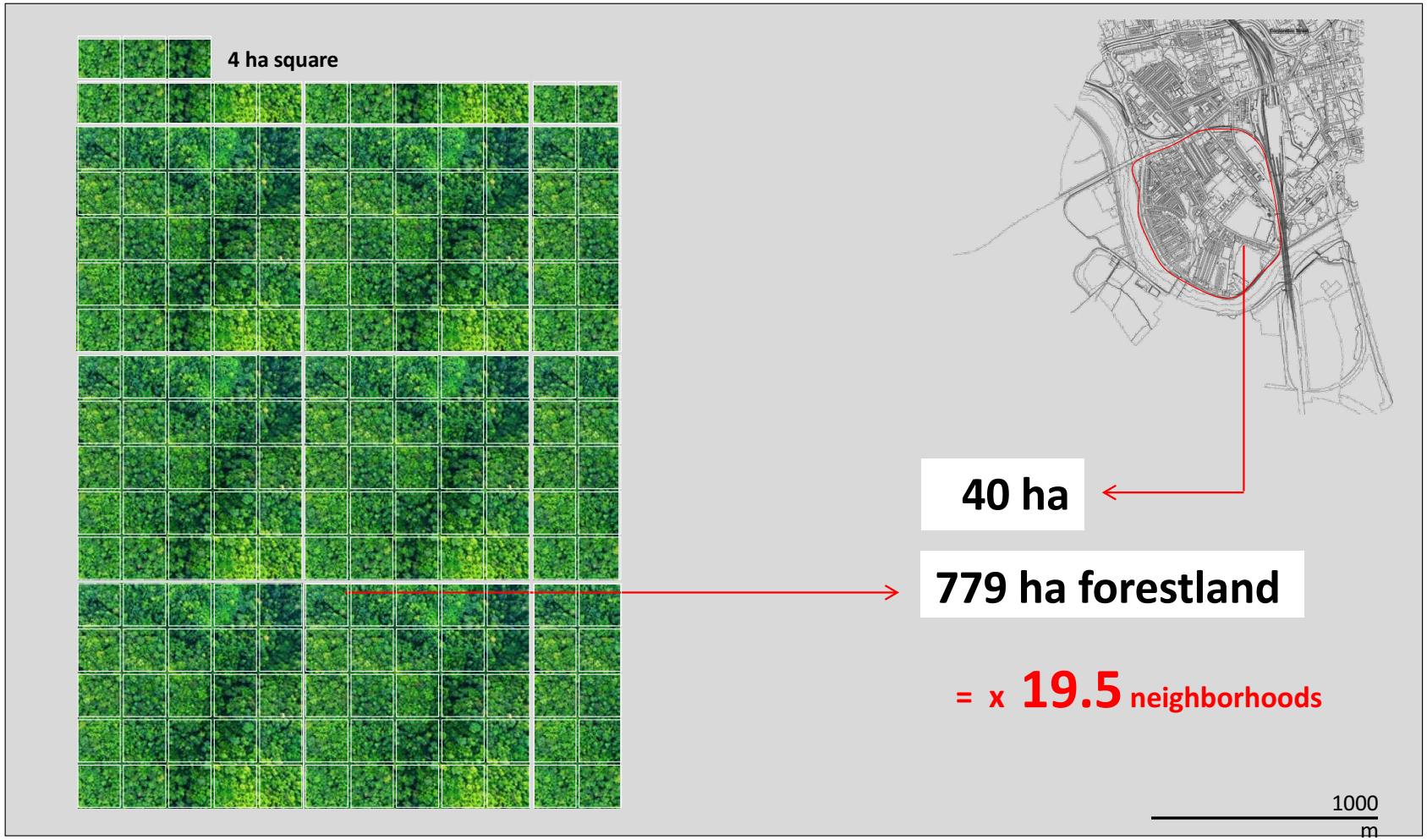
91 inhab./ha

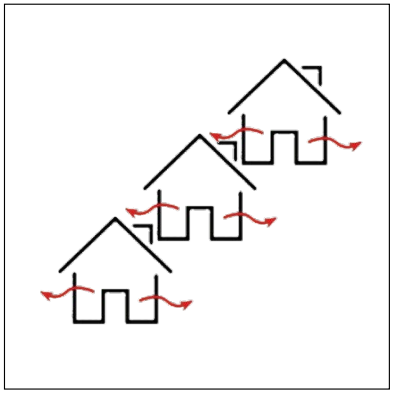
CITY-zen New urban energy ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Carbon Footprint of the Broadgate neighbourhood





BROADGATE

C.F = 10.5 kt CO_2-eq

40 ha area

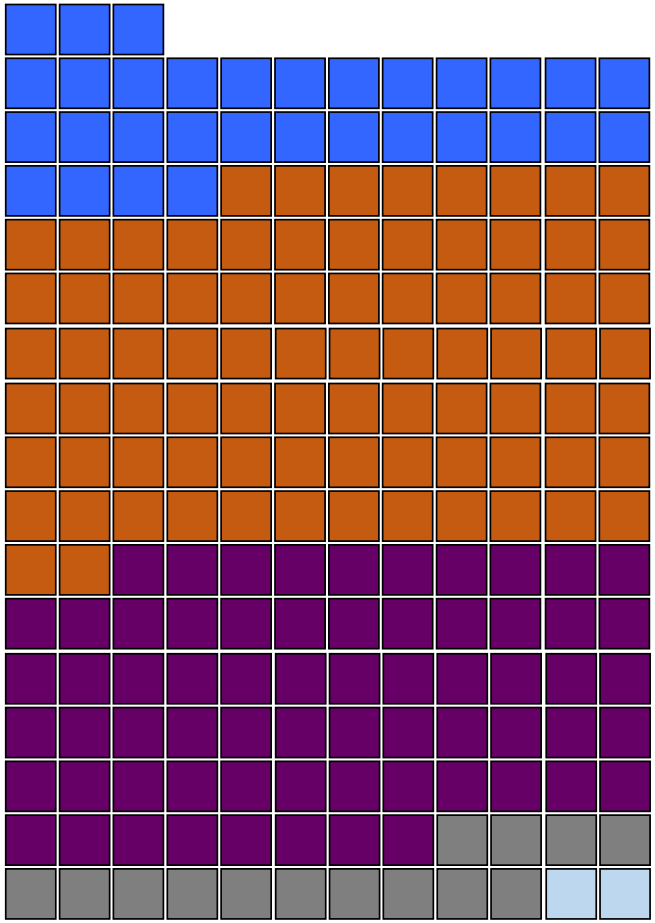
779 ha forestland

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Carbon Footprint of the Broadgate neighbourhood



16% ELECTRICITY

42% NATURAL GAS

34% MOBILITY

7% WASTE

1% WATER

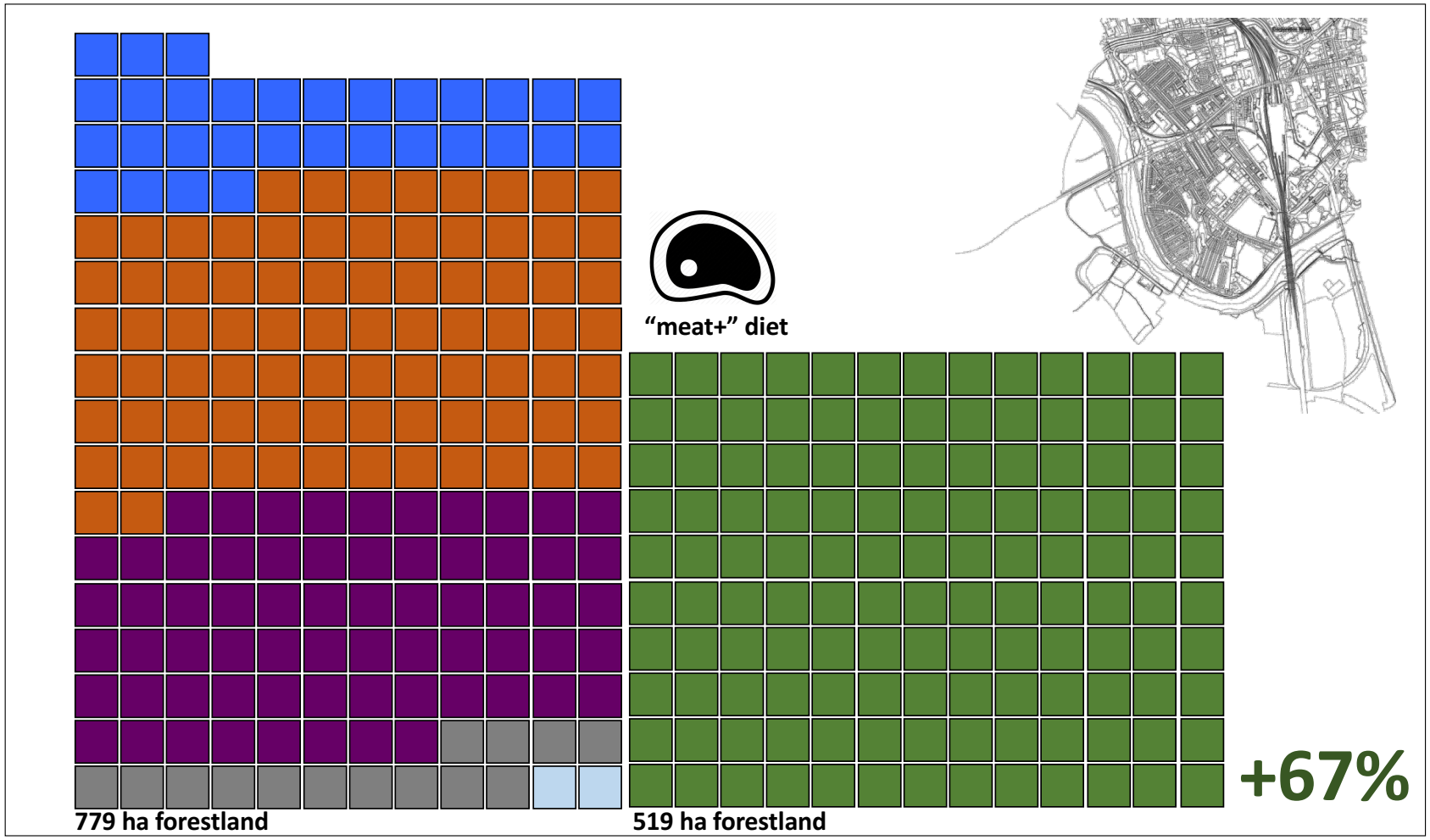
ELECTRICITY
NATURAL GAS
MOBILITY
WASTE
WATER
FOOD

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Food impact (meat+ diet)



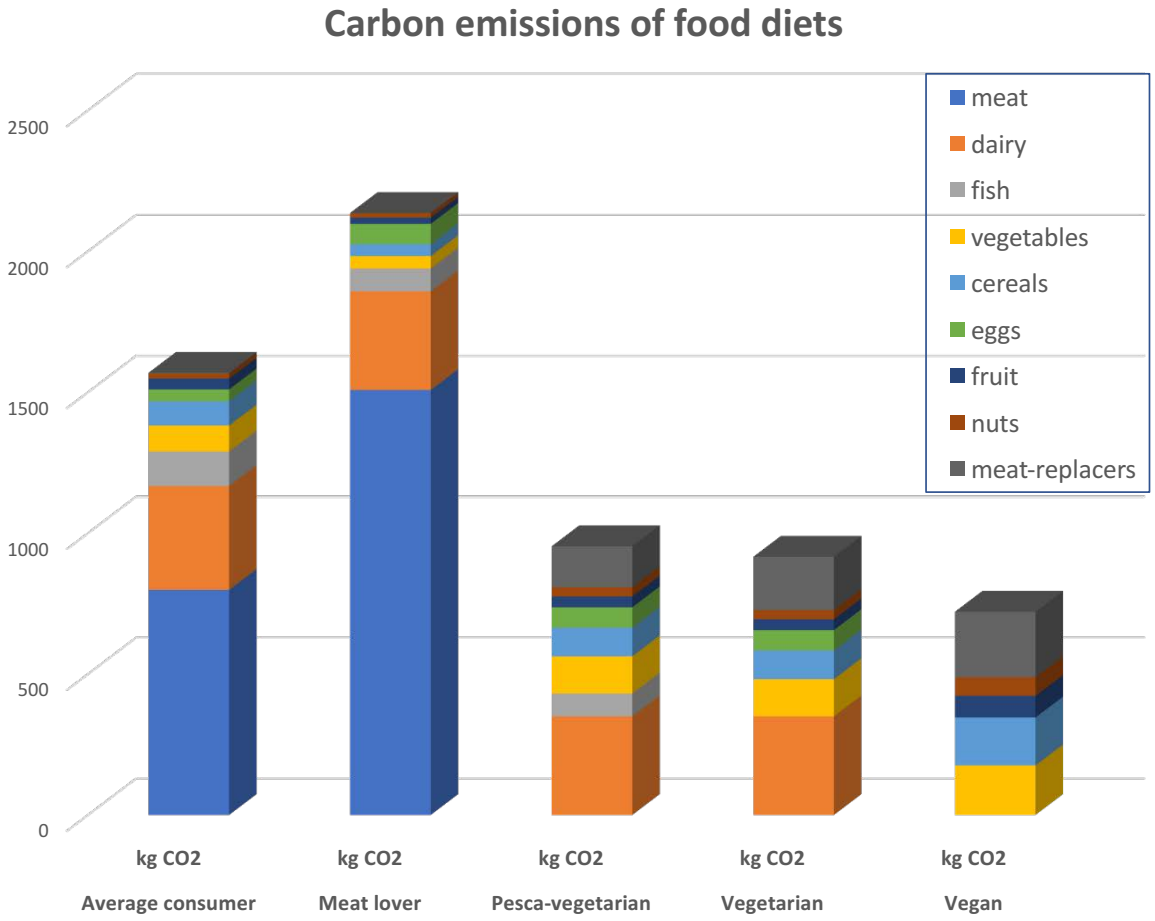
ELECTRICITY
NATURAL GAS
MOBILITY
WASTE
WATER
FOOD

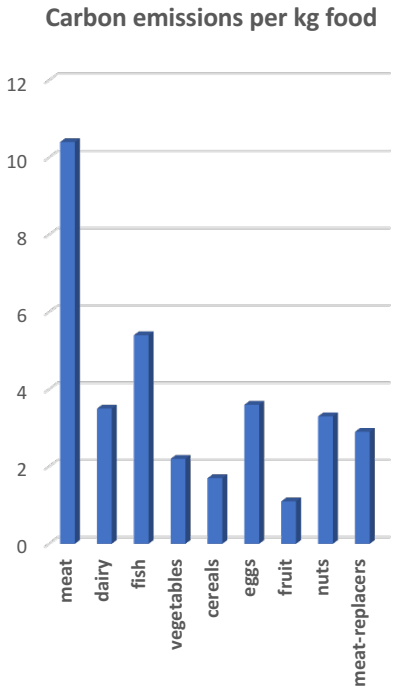
CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

So we start with food...



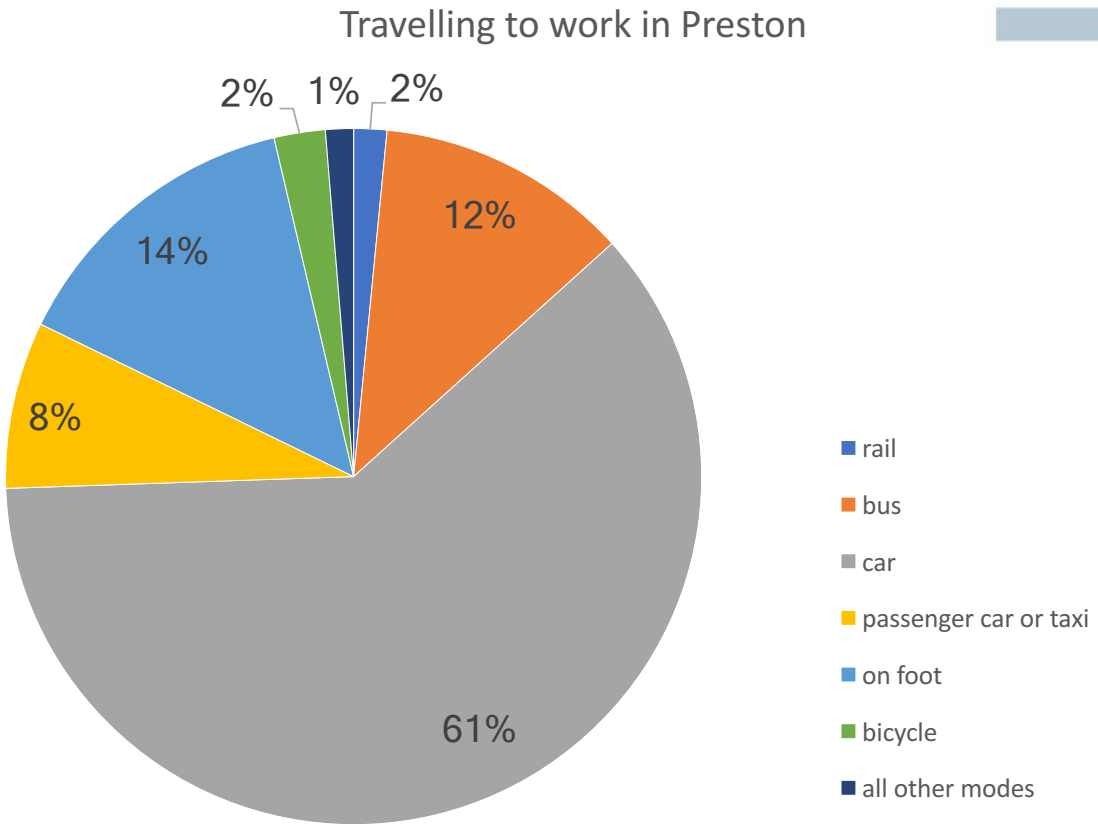


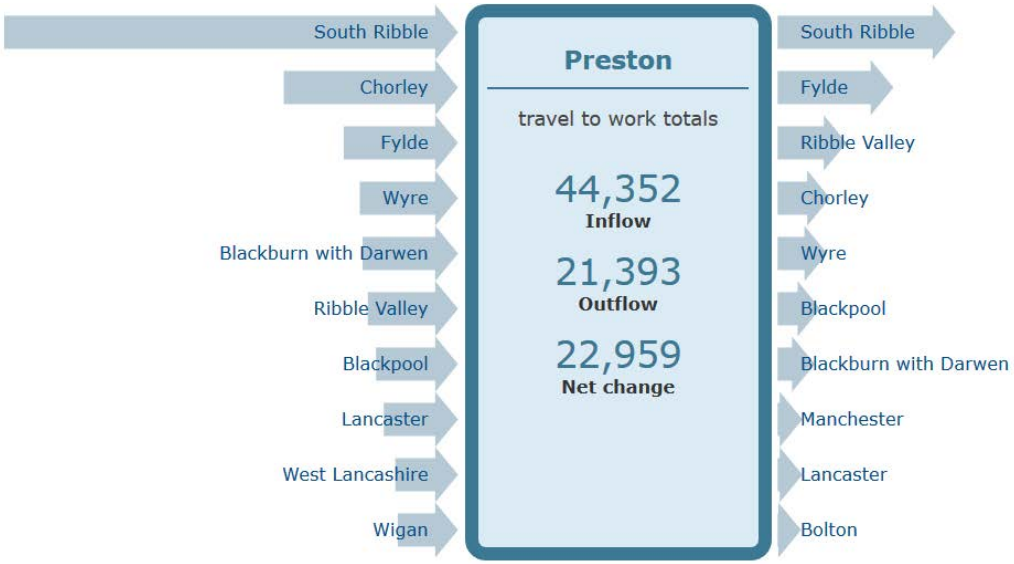
CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Preston mobility today





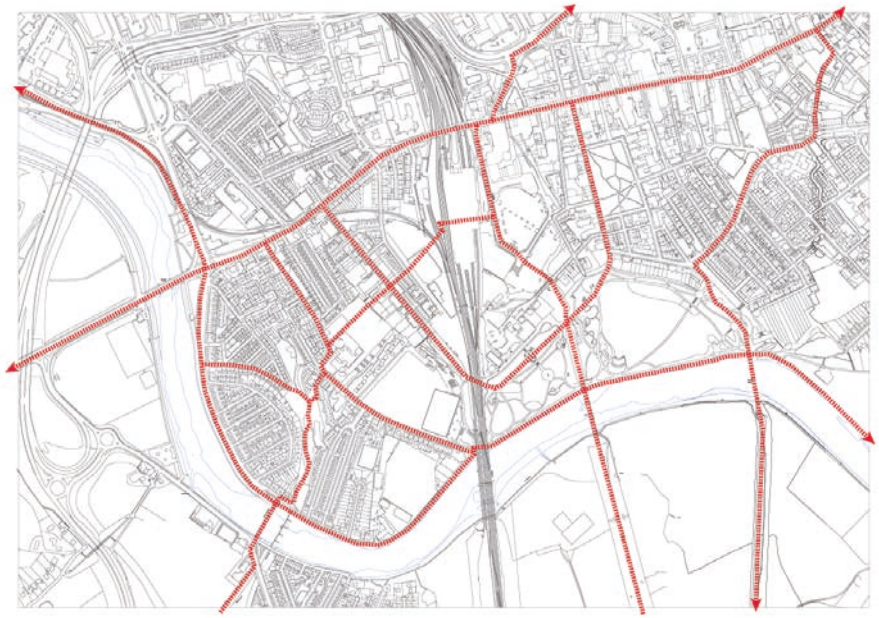
50% of Preston workers live within 5 km distance!

CITY-zen
New urban energy
ROADSHOW

Preston mobility solutions

Connection with city centre

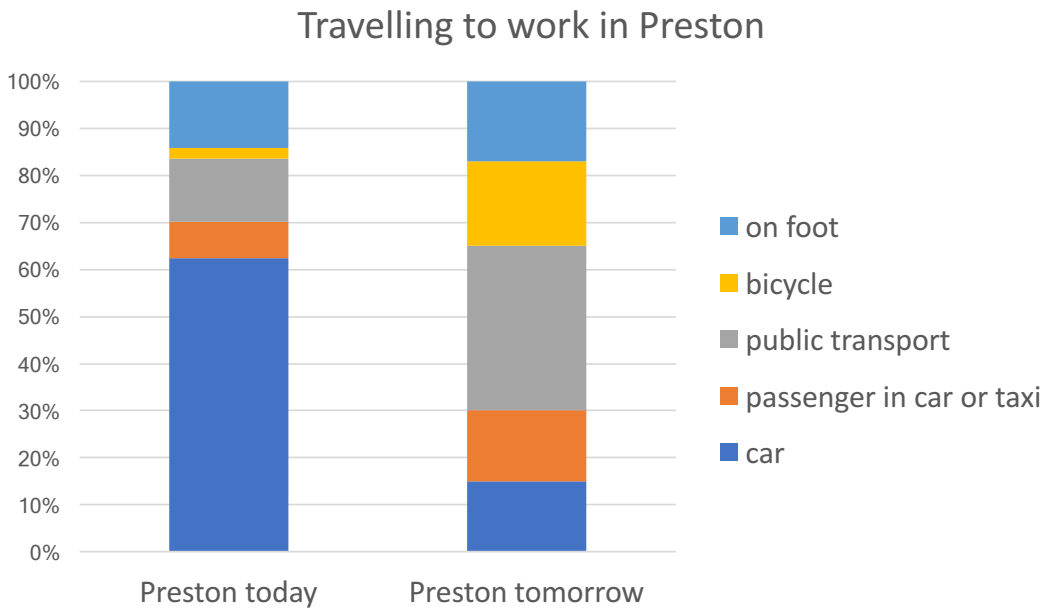
- By light rail with cheap park+rides
- By bicycle paths
- Less visiting cars in the centre
- Clean air
- Fast access to city
- Investment in local economy



Mobility strategy: Egon Troch, Th!nk-E, Belgium

Preston, UK, November 2018

Preston mobility tomorrow



Low air quality, limited movement
Traffic jams
85 people killed or seriously injured (2016)
100 M£ per year on foreign fossil fuel
560 MWh of fossil fuel per year
150000 ton CO_2 per year

Better health
Improved reachability
Safe mobility
Better for local economy
340 MWh of renewable energy per year
0 ton CO_2 per year

Mobility strategy: Egon Troch, Th!nk-E, Belgium

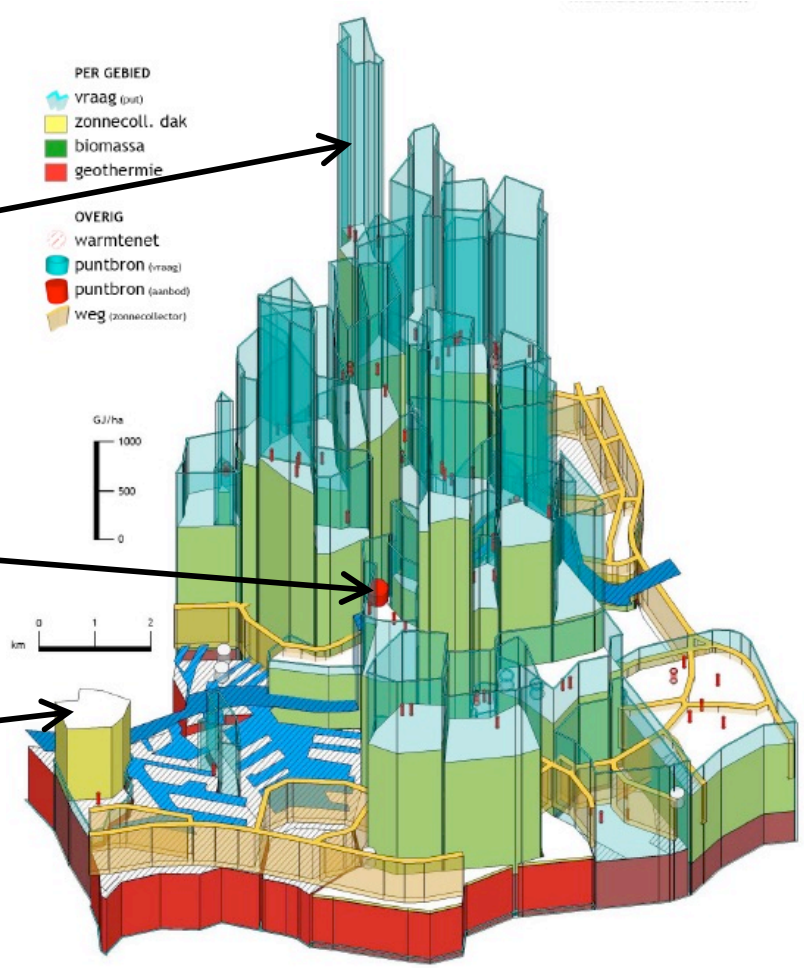
Preston, UK, November 2018

Making the built environment energetically smarter

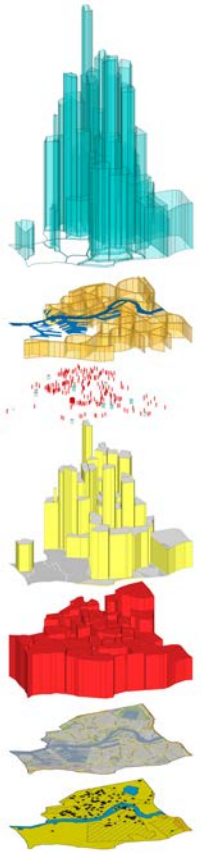
Reduce
reduce the demand

Reuse
attune programmatically,
exchange, cascade, store

Produce
produce renewable energy



Heat map of Rotterdam [Broersma et al. 2010]



CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Reduce

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Reducing the energy demand

- **How far can we go with energy savings in the existing built environment?**
  This depends on type of neighbourhood, year of construction, building technology

- **General measures for existing buildings**
  - Post-insulation measures to the building envelope (cavity filling, wrapping, internal layers, crawl space foundation, entrance portals, conservatories)
  - Dynamic insulation: thick curtains, window shutters
  - Double or triple glazing, high-performance glass
  - Low-temperature heating: underfloor heating, air heating
  - Energy-efficient lighting, LED or e-saving fluorescent lighting
  - Energy-efficient appliances: washing machines, dishwashers, tellies, fridges
  - Exciting things: greenhouse over the building

CITY-zen
New urban energy
ROADSHOW

Example: the Home with a Skin (Prêt-à-Loger)

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Reuse

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

The different solutions under 'reduce'

- **Attune**
  - Programmatically combine urban functions that can be energetically in balance.
  - Combine functions in a building that can balance the demand, and use a central plant.
  - Apply peak shaving: use electricity when it is abundant and wait when it is short.

- **Exchange**
  - Reuse waste heat from exhaust air, waste water, sewage etc.
  - Exchange excessive heat with places with heat shortage.

- **Cascade**
  - Reuse waste heat at a lower temperature in a different function
  - Reuse waste heat from that, with an even lower temperature, in a next function.

- **Store**
  - Store residual energy, heat and electricity, diurnally.
  - Store residual energy, heat and electricity, interseasonally.

CITY-zen
New urban energy
ROADSHOW

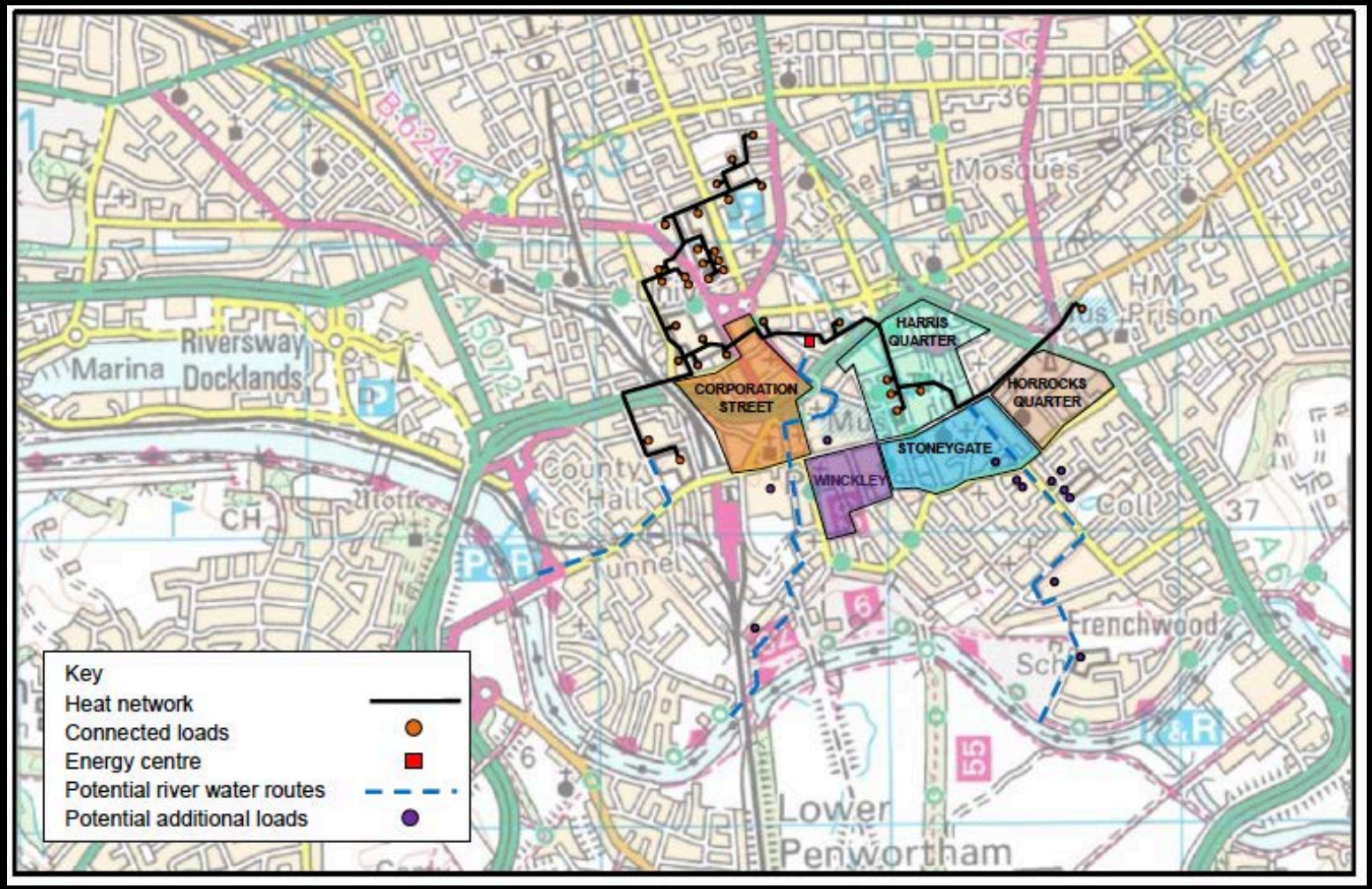
Parts of Preston that require sustainable heat

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

The Preston heat network



Preston City Centre Energy Master Plan [AECON 2018] identifies the need and possibility of **heat networks** in the city.

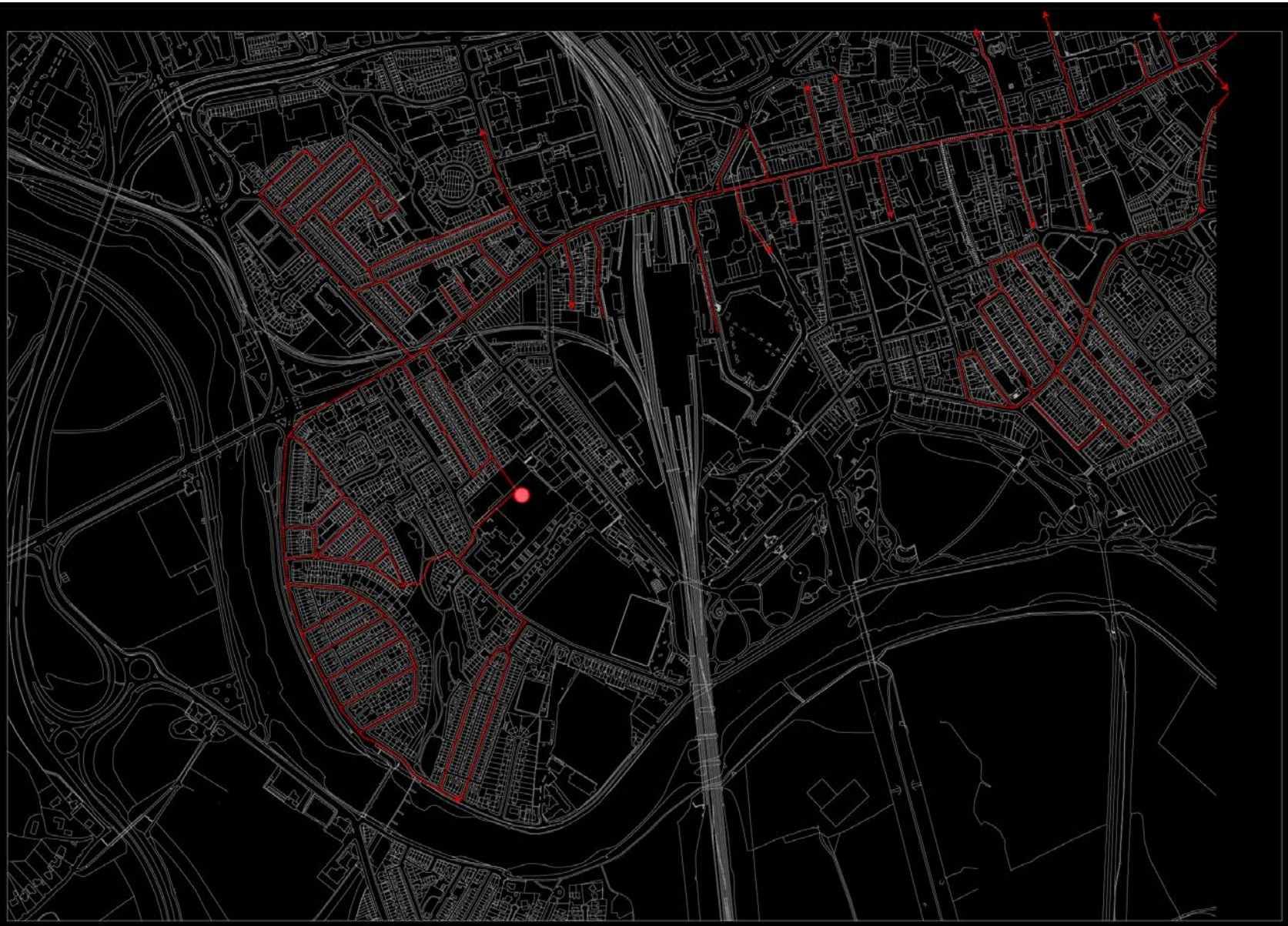
It identifies the following areas suited for a heat network:

- City centre
- UCLAN North
- UCLAN South
- Cardinal Newman

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018



CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

The plan

1. The Preston HT heat network
- Fed by Recycling Lives (waste), biomass (in wintertime) and HT geothermal heat.
- Running from Recycling Lives towards the inner city, along Fishergate, to Broadgate.
- Supplying historic areas and neighbourhoods with too large a renovation challenge.

2. MT connections by return pipes of the HT heat network
- MT return temperature from HT supply.
- For newer inner-city developments and neighbourhoods renovated moderately.
- Eventually, a LT return will arrive at Recycling Lives, which is favourable.

3. Local MT heat grids
- Supplied by MT geothermal heat, solar heat (collectors and PVT), stored inter-seasonally at local energy facilities.
- Supplying neighbourhoods renovated moderately.

4. Local LT heat grids
- Supplied by LT sources as water, soil, datacentres, greenhouses, supermarkets etc.
- Supplying neighbourhoods renovated seriously.
- Individual heat pumps can boost up to hot water purposes.

HT: high-temperature
70+°C
challenged buildings, poorly insulated

MT: mid-temperature
40-70°C
recent buildings, better insulated

LT: low-temperature
25-40°C
highly efficient, well-insulated buildings

CITYzen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Produce

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Solar potential

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Solar study

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

Solar potential of Broadgate

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Solar power from roofs

$E = A \times I_s \times \eta$ (energy = area x solar irradiation x PV panel efficiency)

- Suitable roof area:
  - SE/SW: 21,416 m^2, 90% efficiency → 19,274 m^2 @100%
  - E/W: 8284 m^2, 70% efficiency → 5,799 m^2 @100%
  - S/flat: 6,122 m^2, 100% efficiency
- Solar irradiation, estimated: 800 kWh/m^2 (horizontal)
- PV panel efficiency (all included): 16% (monocrystalline)
- 50% heritage/architecture sensitive → BIPV, thin-film PV, with 12% efficiency

Energy potential:
E = 31,195 m^2 x 800 kWh/m^2 x 0.14 = 3.5 10^6 kWh = **3.5 GWh/year**

CITY-zen
New urban energy
ROADSHOW

Solar power from facades

- Also vertical surfaces can be used for PV-panels or BIPV.
  - Efficiency of vertical planes (E, S, W): 0.6*16% = 9.6%
  - Suited facades of buildings ≥ 3 floors: 3,403 m^2

Energy potential from facades:
E = 3,403 m^2 * 800 m^2 * 0.096 = **0.26 GWh/year**

Total solar energy potential: E = 3.5 + 0.26 = **3.76 GWh/year**

For Broadgate only

CITY-zen
New urban energy
ROADSHOW

Biomass potential in the Broadgate vicinity

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

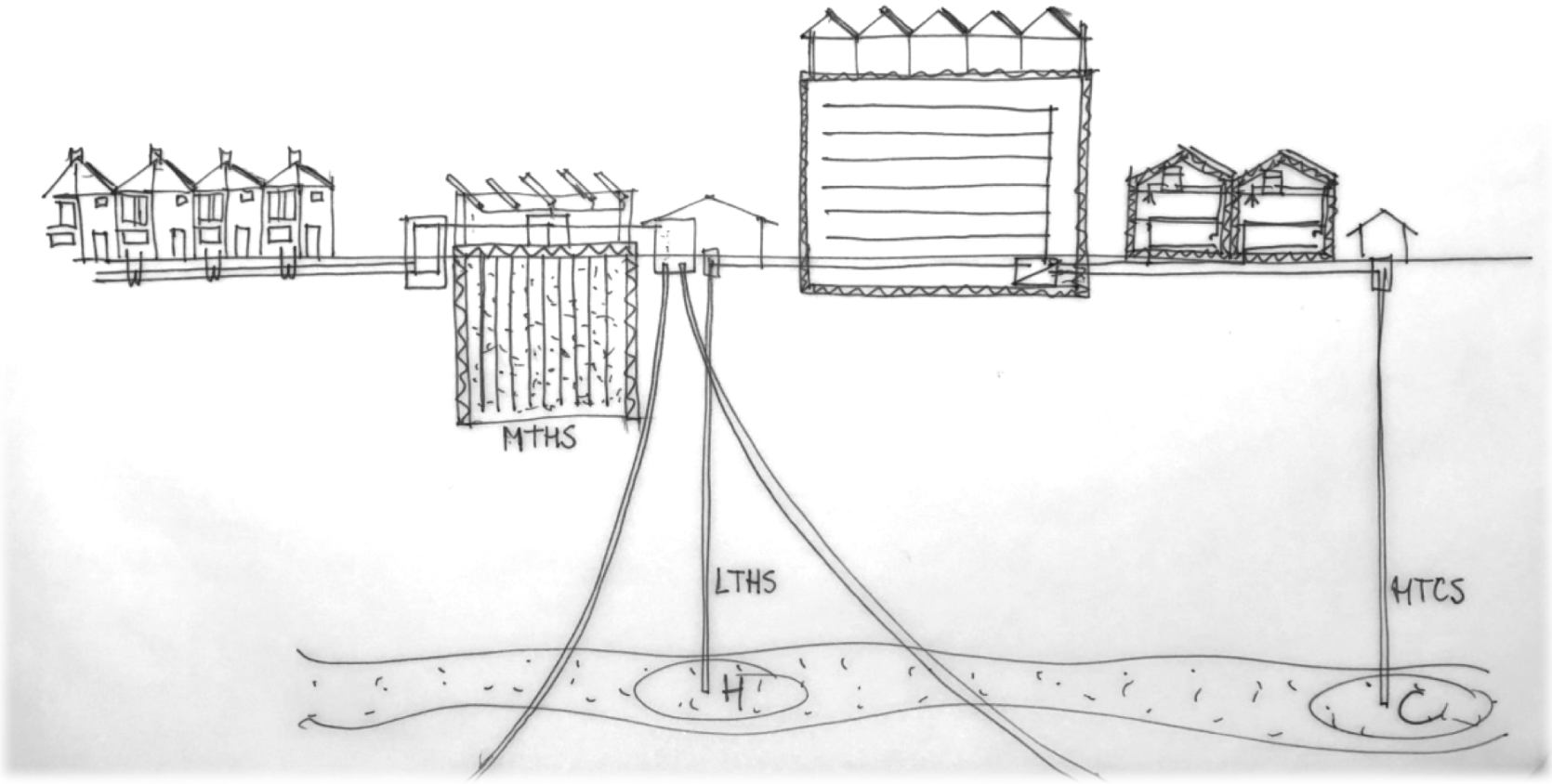
Beautiful parks and greens with biomass (from cuttings)

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Geothermal options for Broadgate



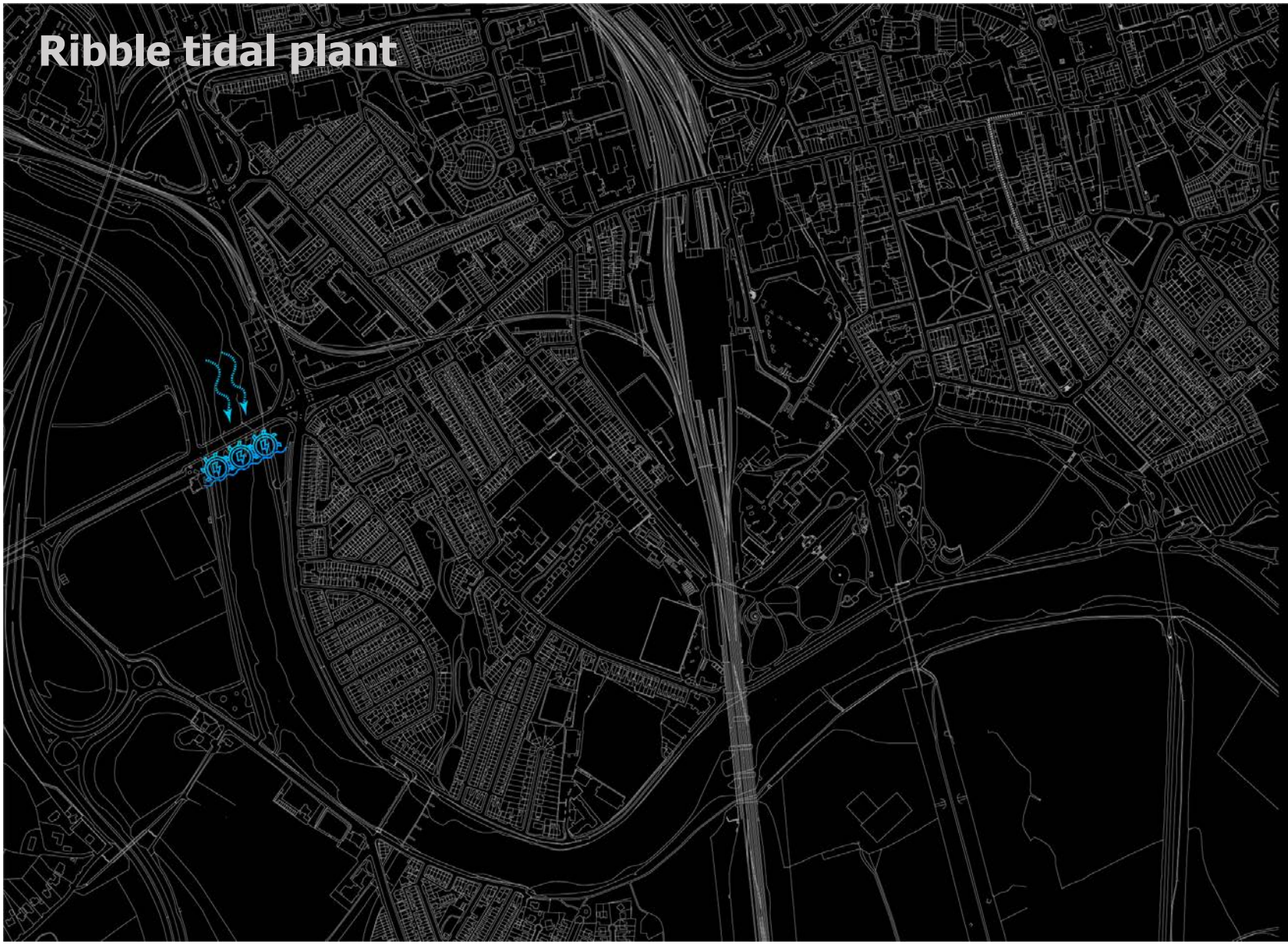
- Deep geothermal (500-5000 m) 40-120°C
- Middle level (100-500 m) 15-40°C suited for ATES
- Shallow soil (0-100 m) 5-15°C suited for BTES
- Ecovat storage solutions (MT, 40-70°C)

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Ribble tidal plant



CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

Tidal energy plant in the Ribble River

E = M x **g** x Δ**h** x **η** (energy = mass x gravity x height difference x turbine efficiency)

- Tidal difference: approx. 3.6 m on average; 1.8 m plus, 1.8 m minus
- River cross section: 50 m x 1.8 m flowing in or out
- Tidal speed: 7 km/h max, 3.5 km/h on average (this is approx. 2 m/s)
  Distance covered 3.5 km/h = 84 km/day
- 84,000 m x 50 m x 1.8 m = 7,560,000 m^3/day
- 7,560,000 m^3 x 1027 kg/m^3 = 7,764,000,000 kg of salt water mass @10°C
- 60% turbine efficiency

Total energy potential: E = 7.76 10^9 x 9.82 x 1.6 x 0.6 = 73.2 10^9 J = 73.2 GJ/day
→ 26.7 TJ per year = **96.2 GWh per year**

For Preston as a whole → 96.2*0.026 = 2.5 GWh for Broadgate

CITY-zen
New urban energy
ROADSHOW

Wind turbines planned around Broadgate

CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

Wind energy

E = # x **P** x **h** (energy = number of turbines x turbine power x operation hours)

- Possible # of wind turbines: PM1 large ones, PM2 modest ones
- Turbine power: 3 MW (large ones), 1 MW (modest ones)
- Operation hours, pessimistic estimation: 1500 hours

Total energy potential:

E = 15 x 3 x 1500 + 4 x 1 x 1500 = 67.5 10^3 + 6 10^3 MWh = **73.5 GWh/year**

For Preston as a whole → 73.5*0.026 = 1.9 GWh for Broadgate

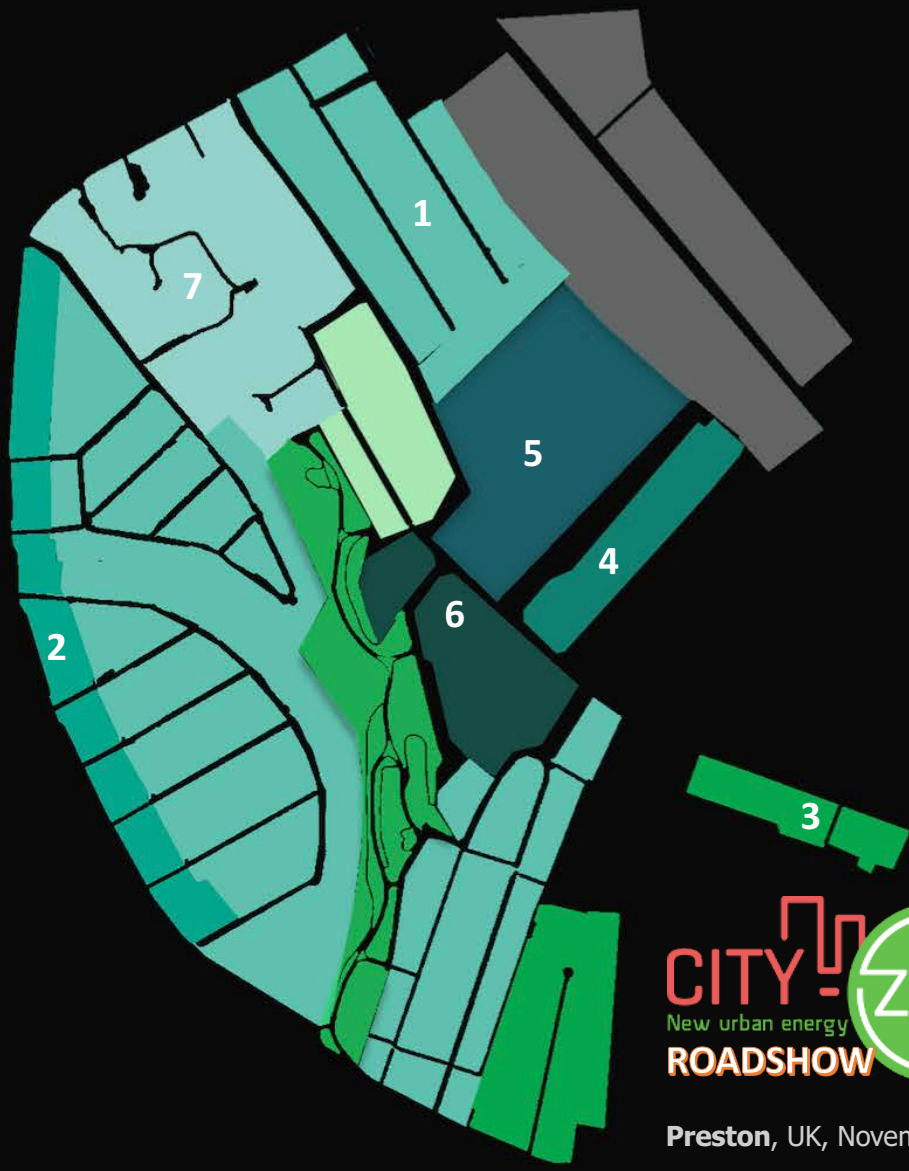
CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Broadgate neighbourhoods

1. Terraced mirrored houses at **Lauderdale / Grafton Street**
2. Terraced houses next to the river at **Broadgate Boulevard**
3. Terraced houses near The Continental at **South Meadow Lane**
4. Apartment blocks of **Meadow Court**
5. The **Gujarat / St. Stephen's** Community Centre
6. Social housing at **Hassett Close**
7. The **Beech Street** neighbourhood



CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

1. Lauderdale / Grafton Street

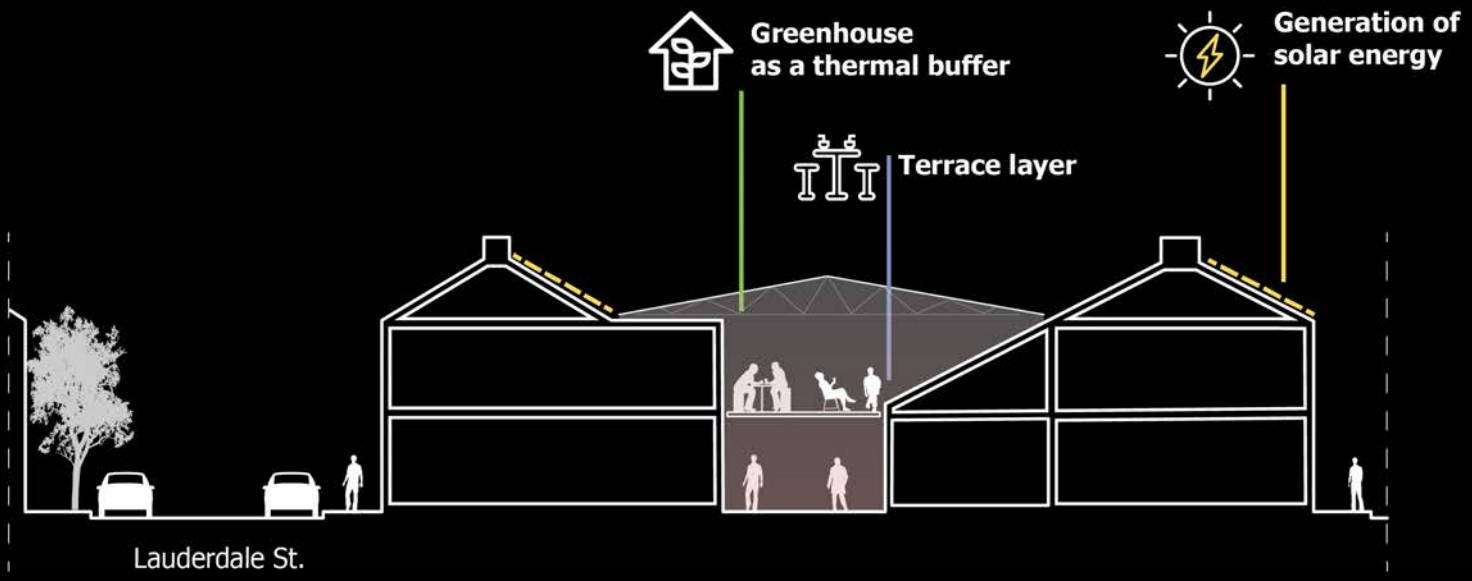
Waste dump behind and in front of the houses

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Solution



CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

2. Broadgate Boulevard

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

Build a bike road and people will bike...
(Copenhagen wisdom)

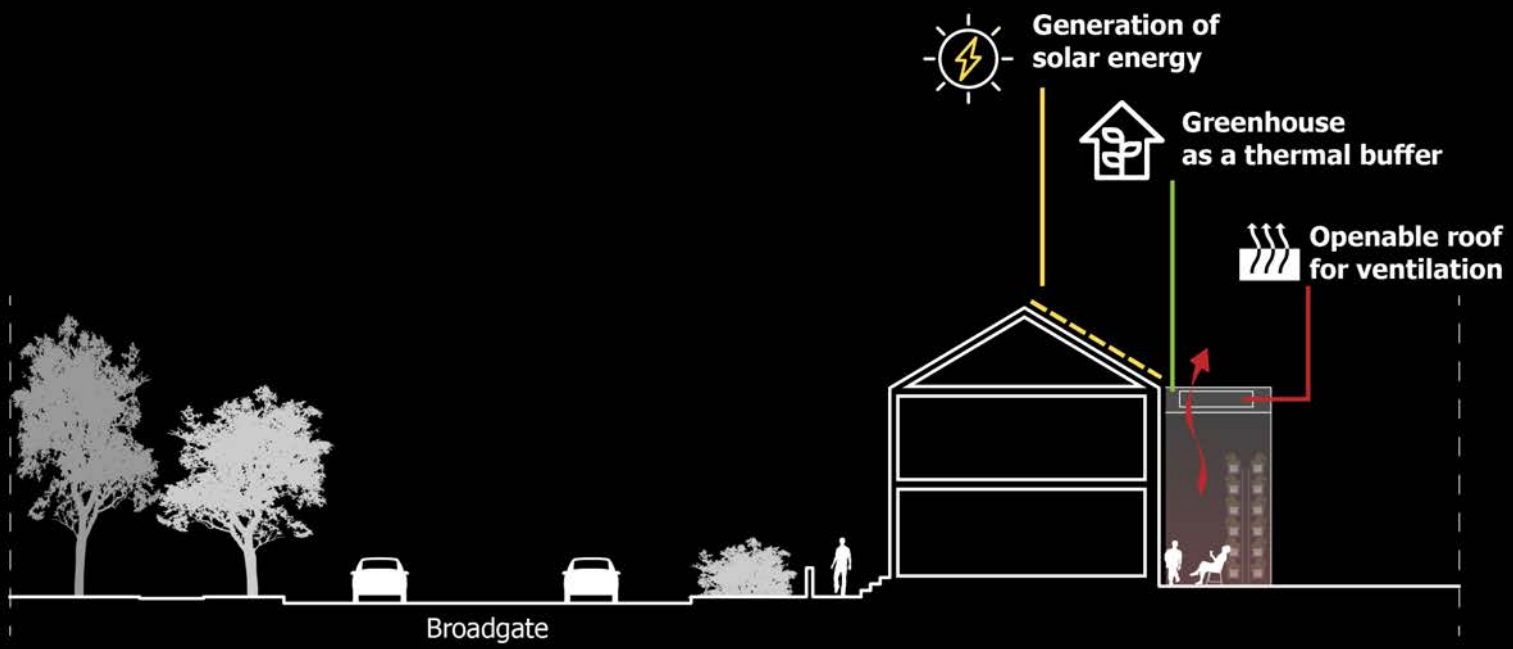
Potentially the Chiswick of Preston (not now)

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Solution



CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

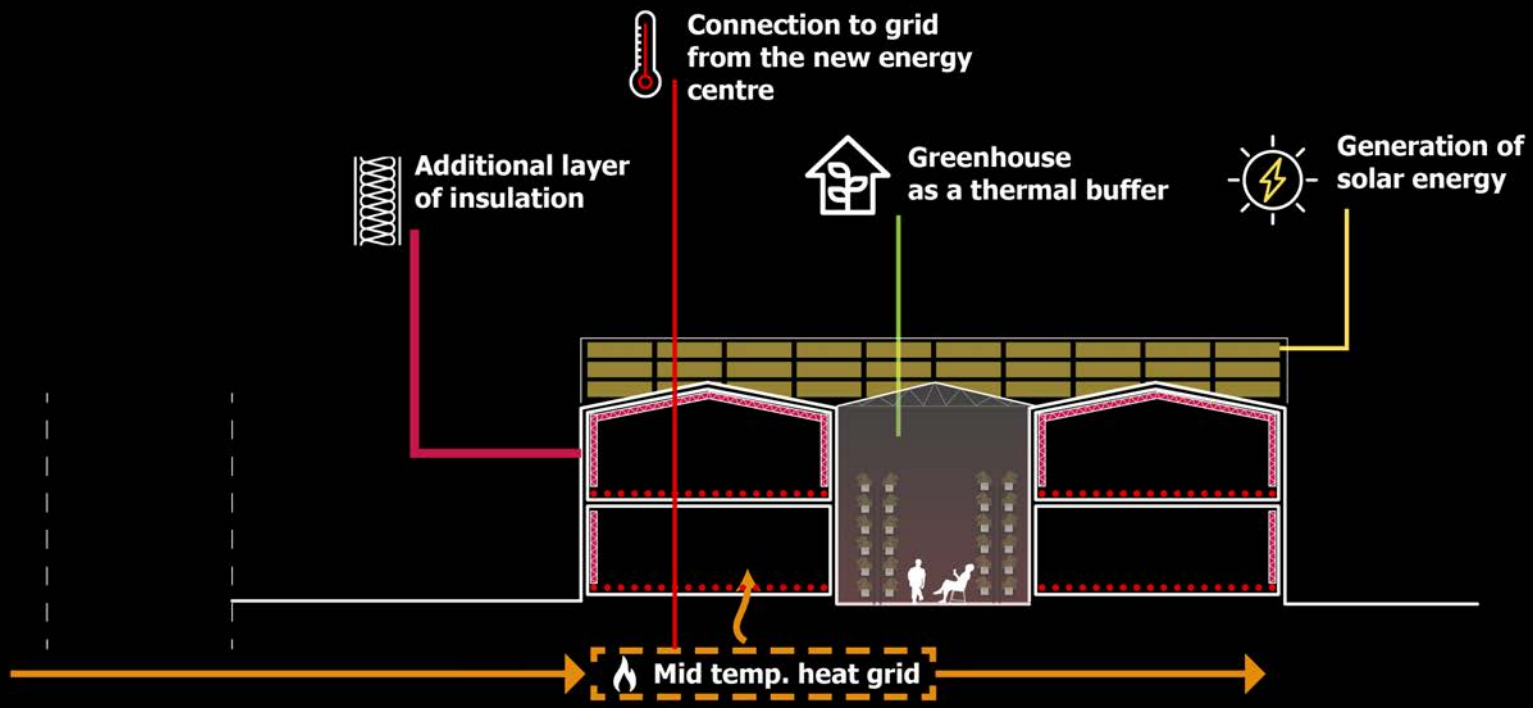
3. South Meadow Lane

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Solution



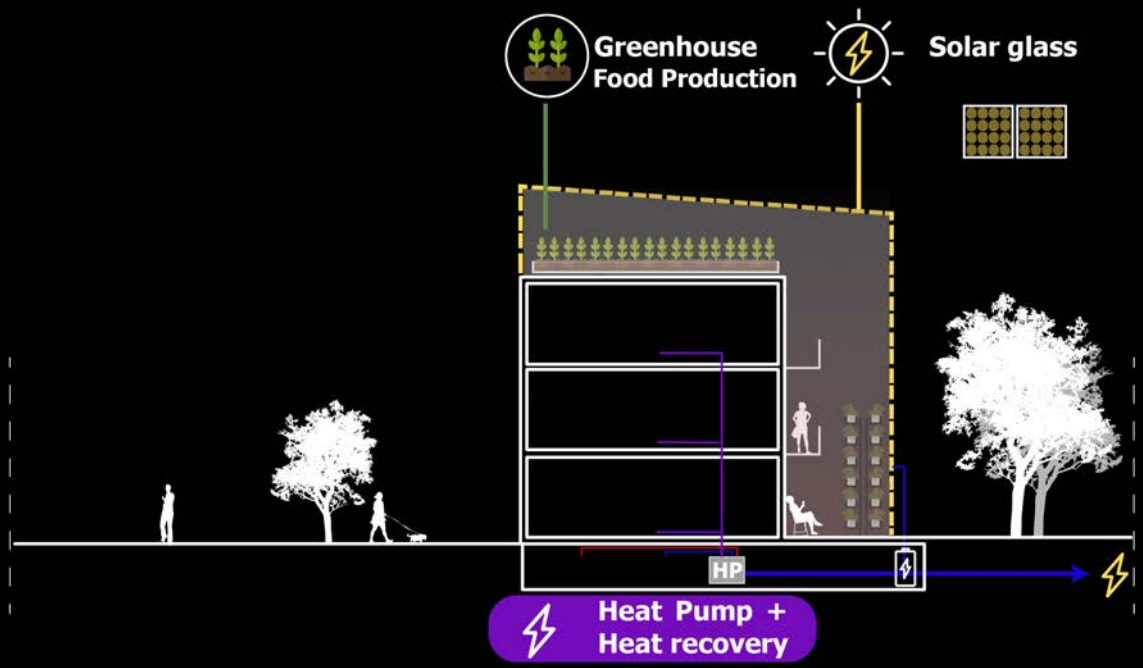
CITY-zen
New urban energy
ROADSHOW

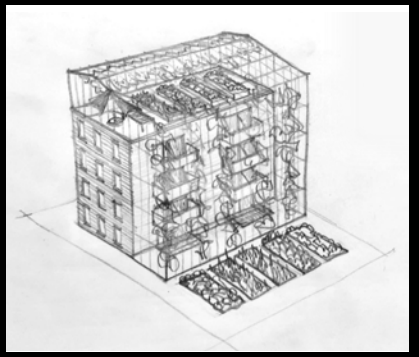
Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

4. Meadow Court

Solution





CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

5. Gujarat / St. Stephen's Community Centre

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

6. Gujarat / St. Stephen's Community Centre

- **A new centre for the whole district of Broadgate**

- **Inframedion**
  - Neighbourhood energy facility: local low-temperature and mid-temperature network
  - Geothermal heat source (700-1000 m deep, 50-60°C)
  - Inter-seasonal heat storage (Ecovat for MT heat, ATES for LT heat)
  - Separated waste collection and processing, second-hand shops
  - Waste water treatment (grey water) with nutrient recovery and biogas production

- **Social community centre**

HT: high-temperature
70+°C
challenged buildings,
poorly insulated

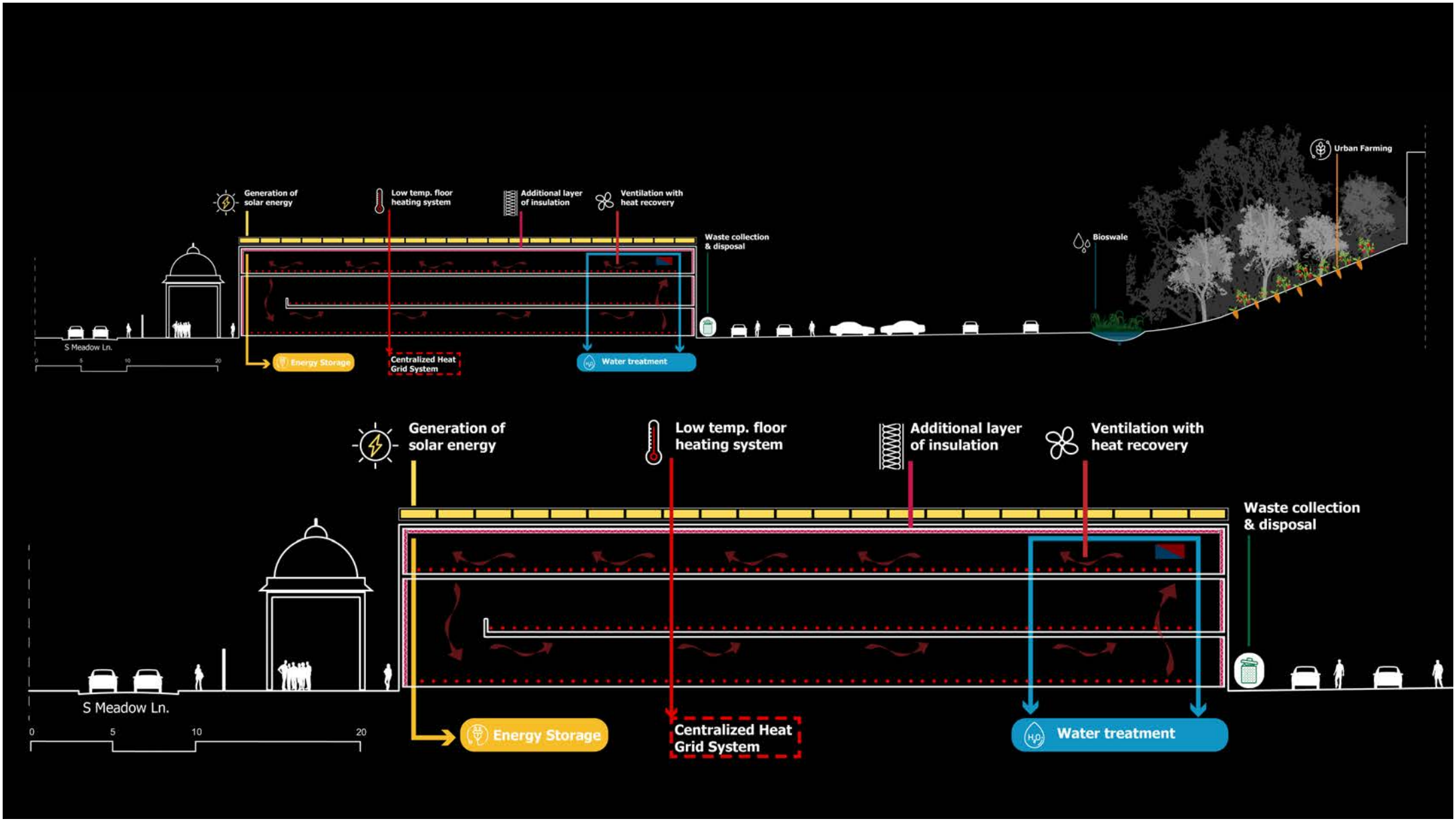
MT: mid-temperature
40-70°C
recent buildings,
better insulated

LT: low-temperature
25-40°C
highly efficient, well-insulated buildings

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018


Generation of solar energy
Low temp. floor heating system
Additional layer of insulation
Ventilation with heat recovery
Waste collection & disposal
Bioswale
Urban Farming
S Meadow Ln.
0
5
10
20
Energy Storage
Centralized Heat Grid System
Water treatment

Local MT/LT heat network from the Gujarat/St. Stephen facility

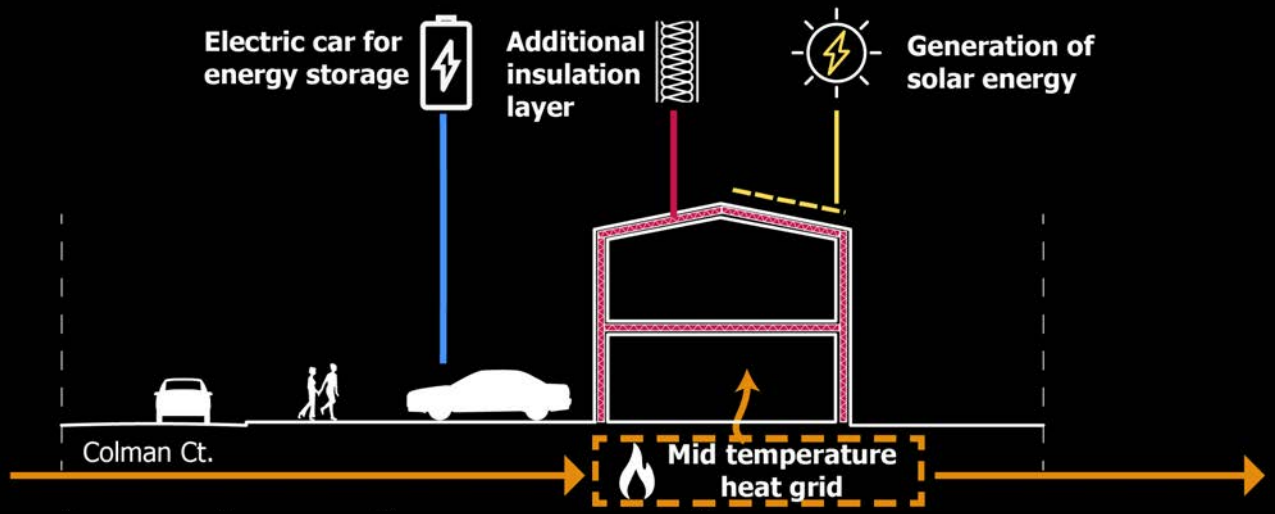
Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

6. Hassett Close – social and sheltered housing

Solution



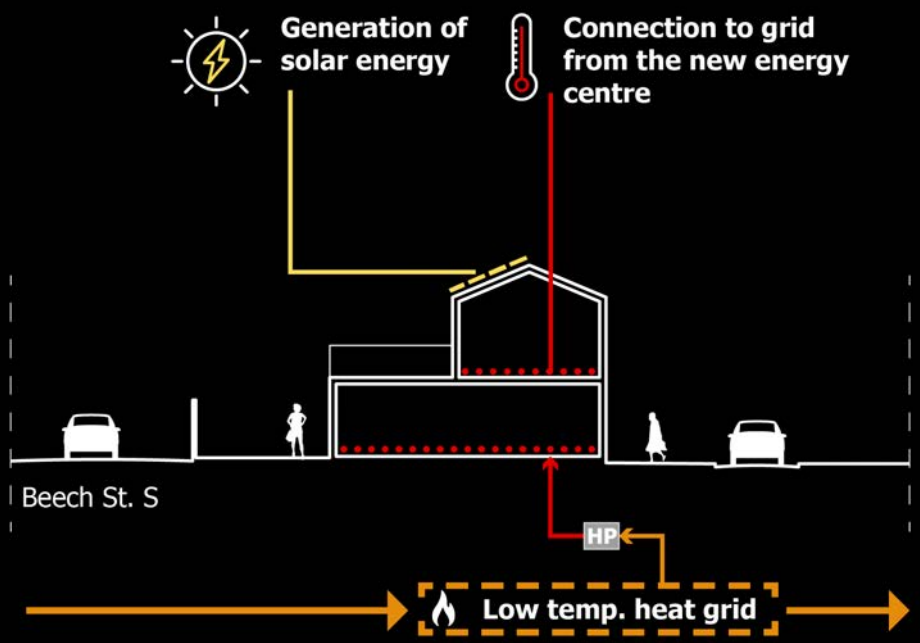
CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

7. Beech Street neighbourhood

Solution



CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Greg Keeffe Urban Design Strategy

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

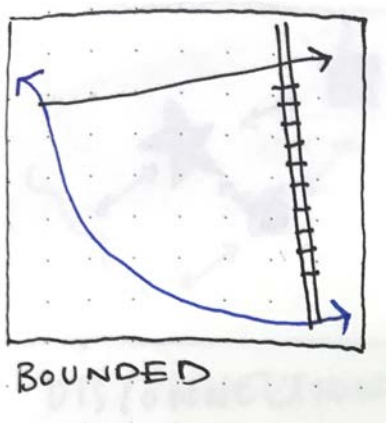
QUEEN'S UNIVERSITY BELFAST

Professor of
Architecture + Urbanism
Head of School,
Natural and
Built Environment

CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

Urban Design: Context. Form of the neighbourhood



Context

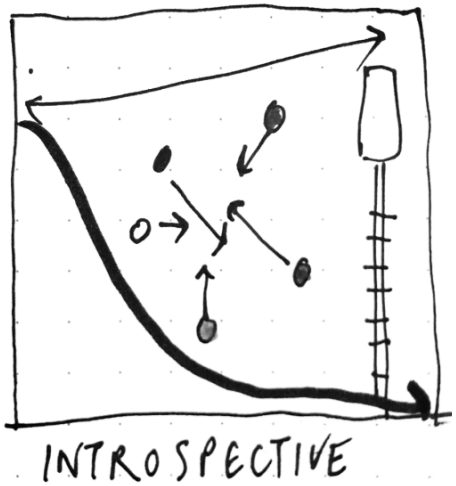
Form - Bounded
- Road
- River
- Train
- City

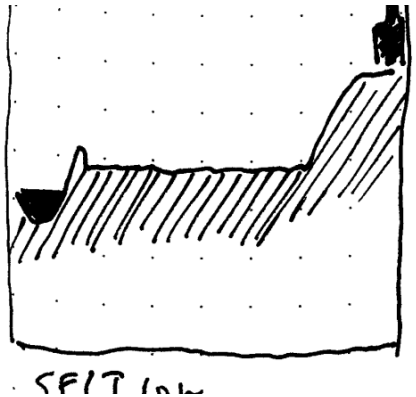
Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Context

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

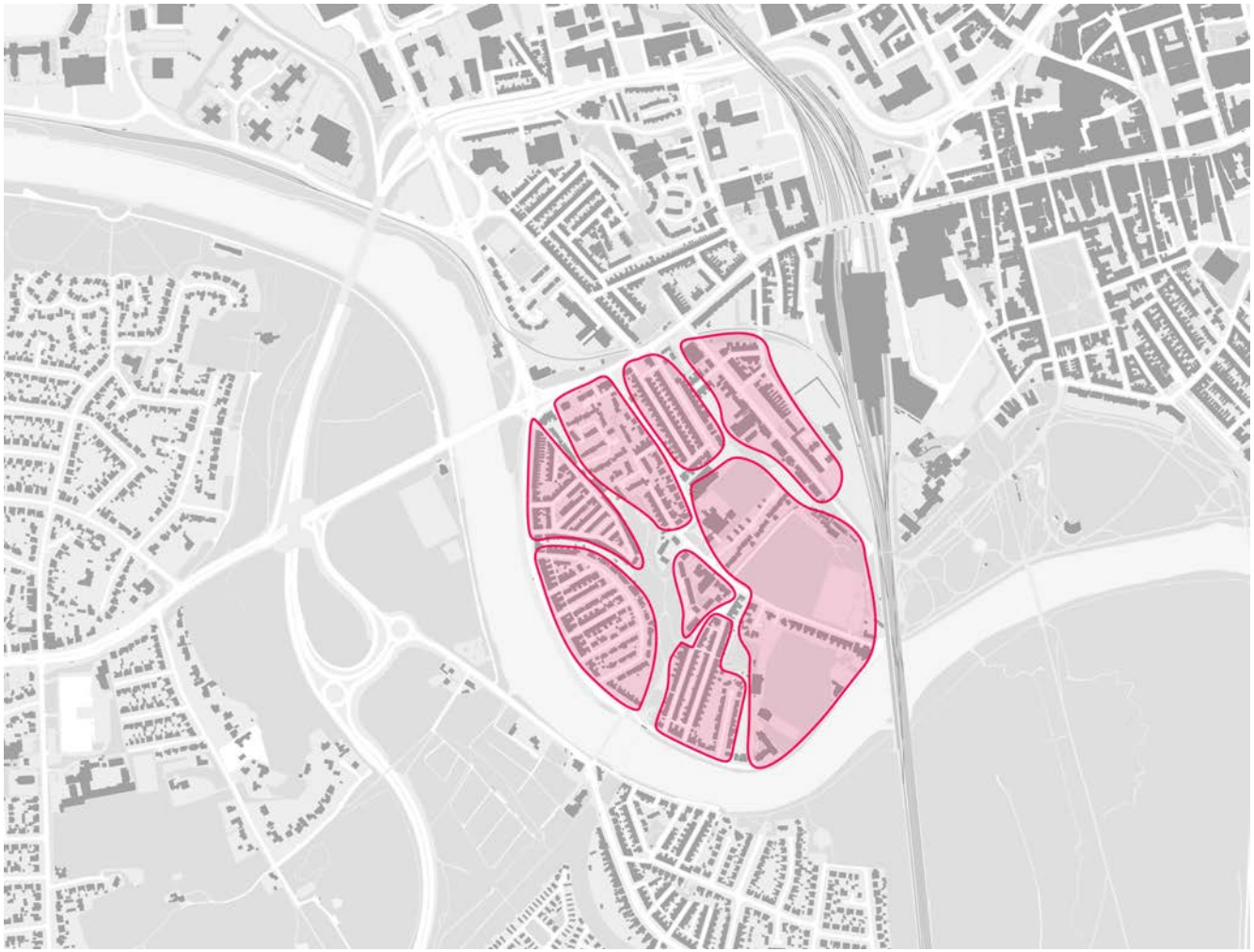




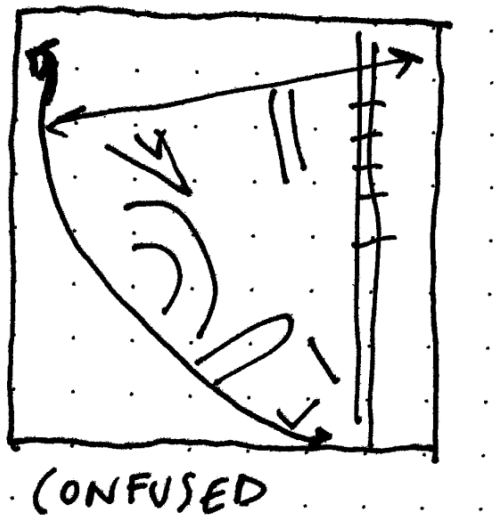
CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

Urban Design: Context



Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.



Context - Morphology

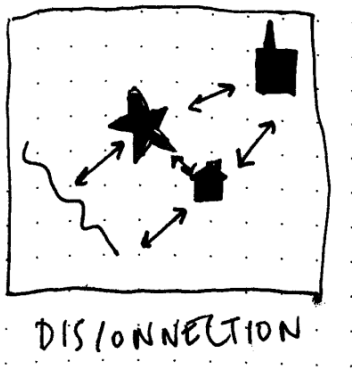
Many conflicting urban layouts

CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

Urban Design: Context

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

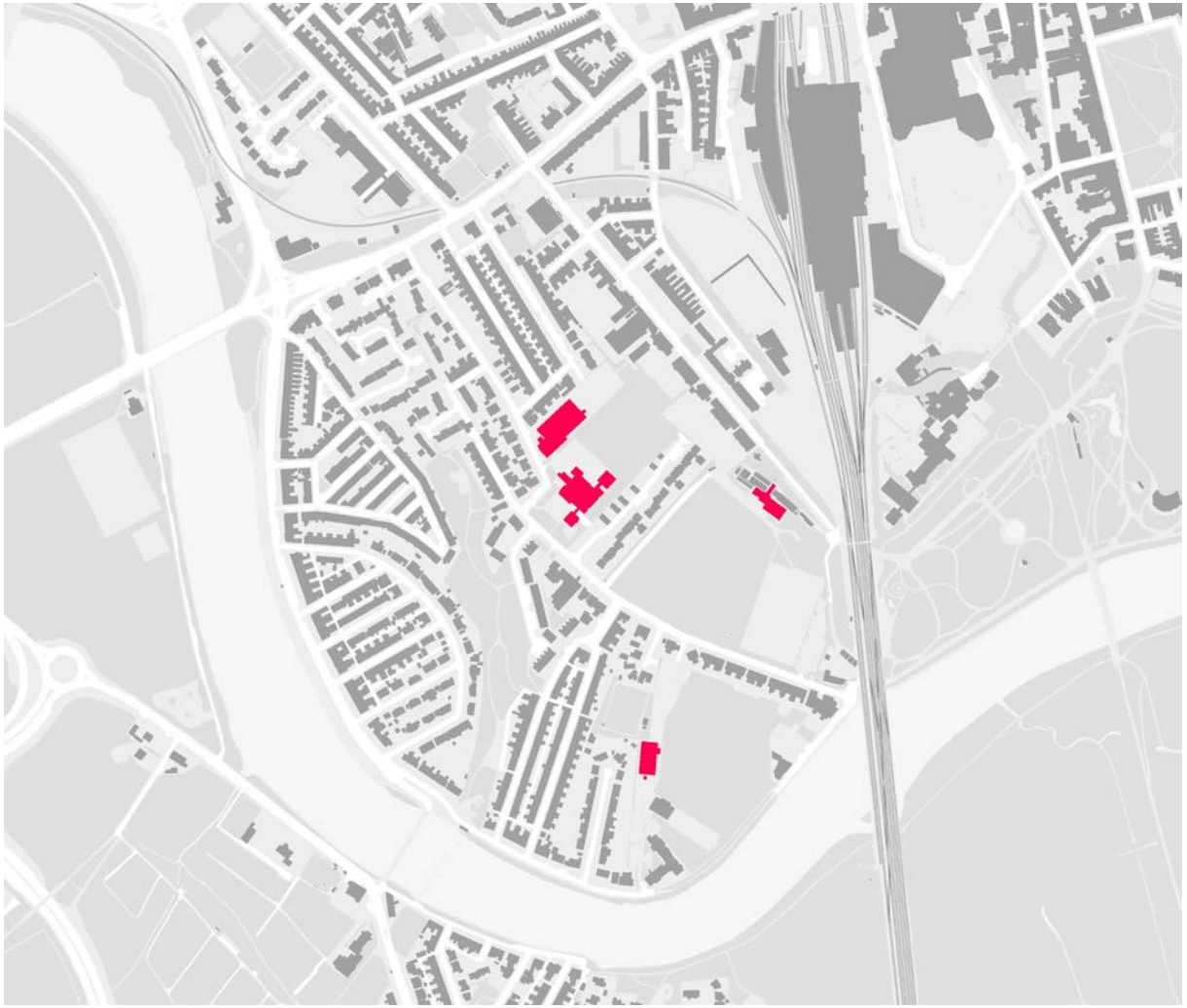


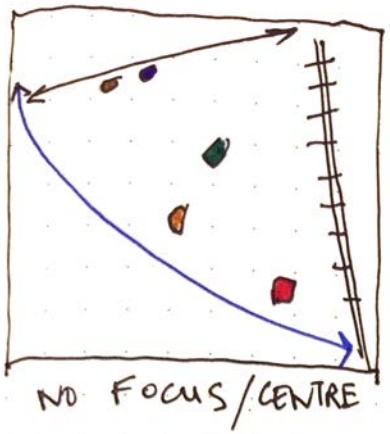
Morphology- Disconnected

CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

Urban Design: Context





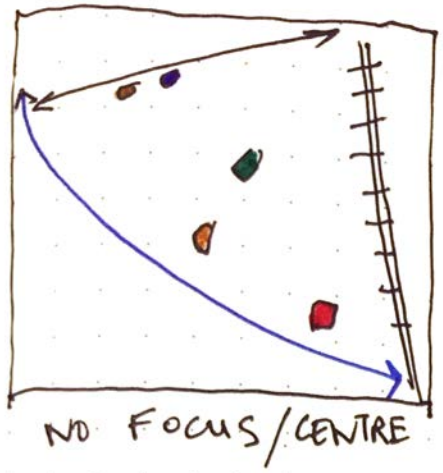
Context – Content

Low density. 37 home/ha
No other functions
No focus
Functions externalized

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Context



Context – Content

Low density. 37 home/ha
Mainly housing -
poor choice –
not urban

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Issues

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

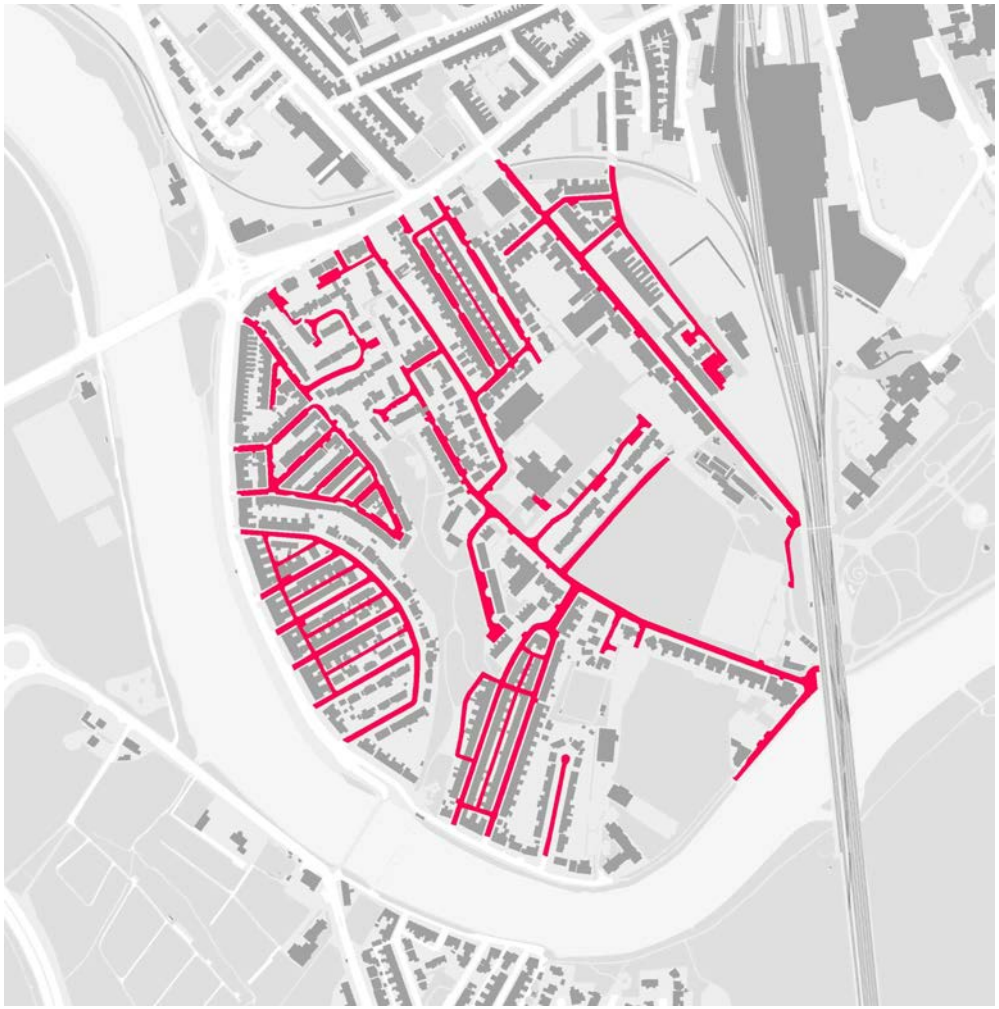
Issues

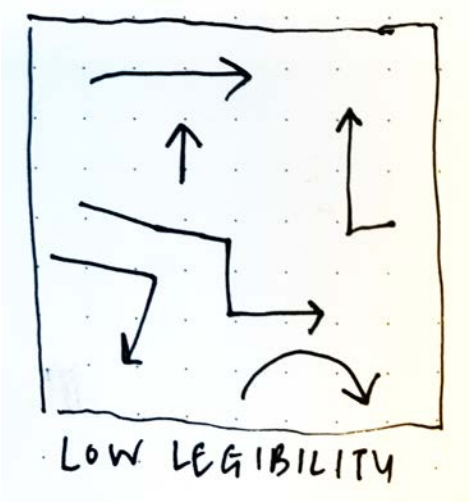
Poor stock
Energetically.
Market.
little economic investment

CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

Urban Design: Issues





Crescent
Squish
Ladders
Higgledy Piggledy
Loopville
Stuff

Issues

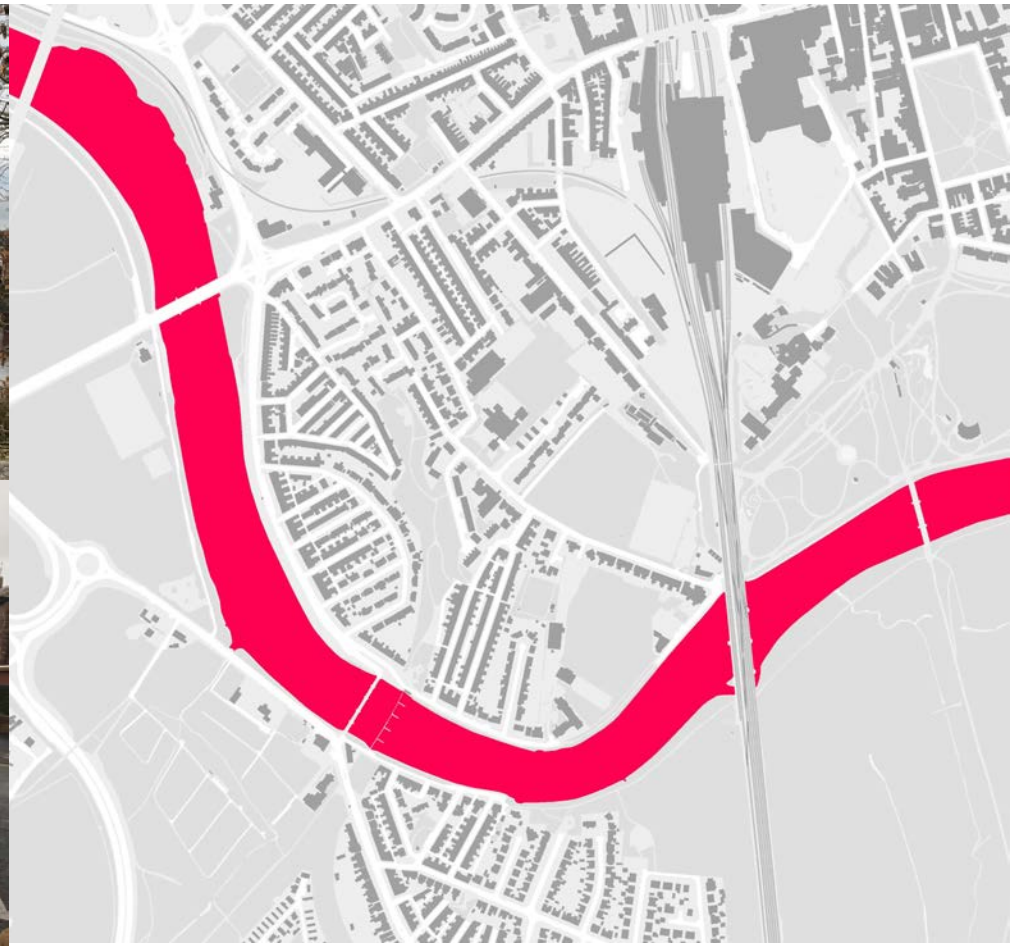
Low legibility of space difficult to address.

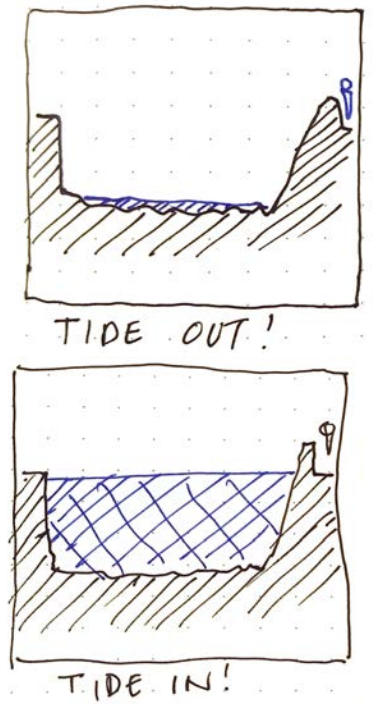
CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Issues



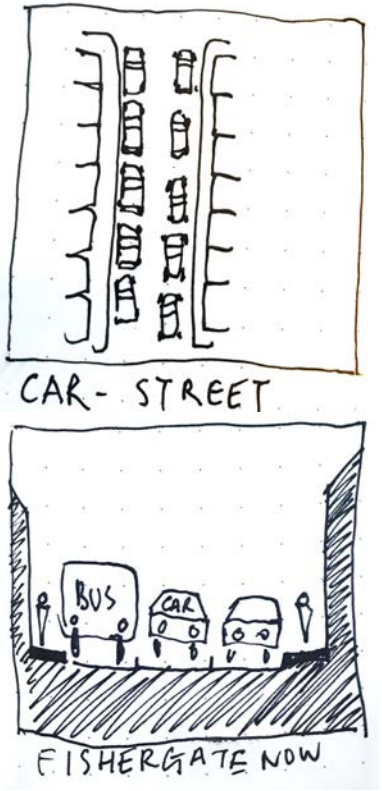


Issues
River -
What river? –
River seen as a danger

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Issues

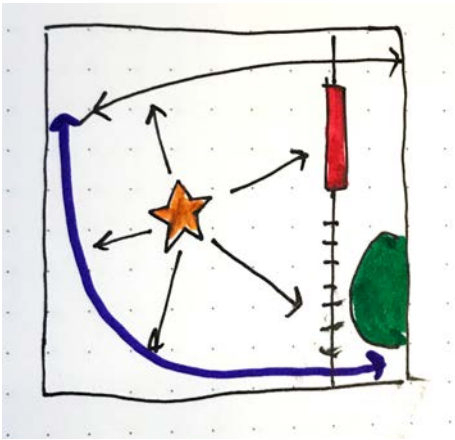


Issues
Car – Road dominating
Car - Street parking

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions



Solutions
Connect….

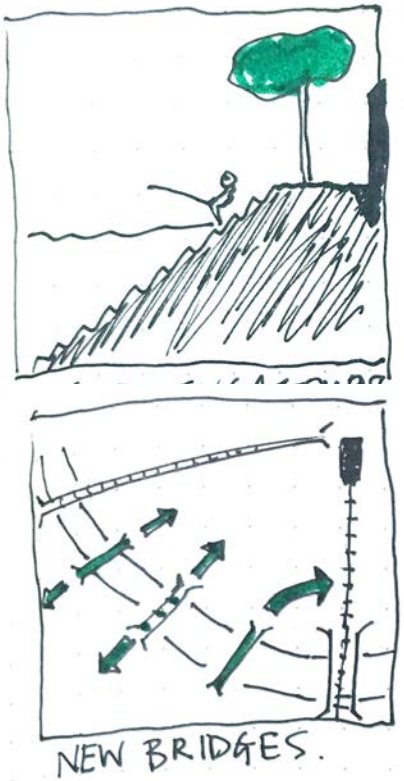
To the city
To itself

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

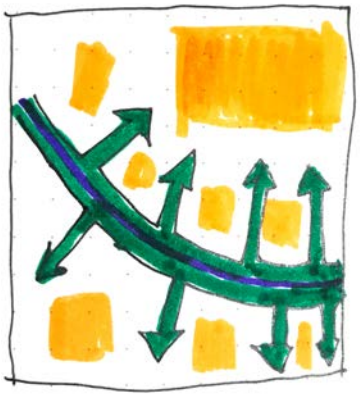


To the river
To the greenspace

CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

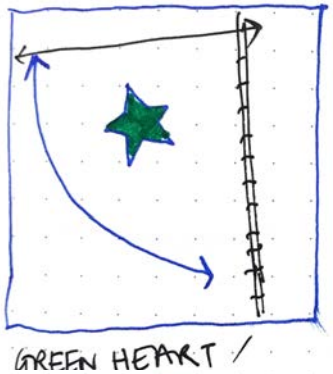
Urban Design: Solutions



Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions



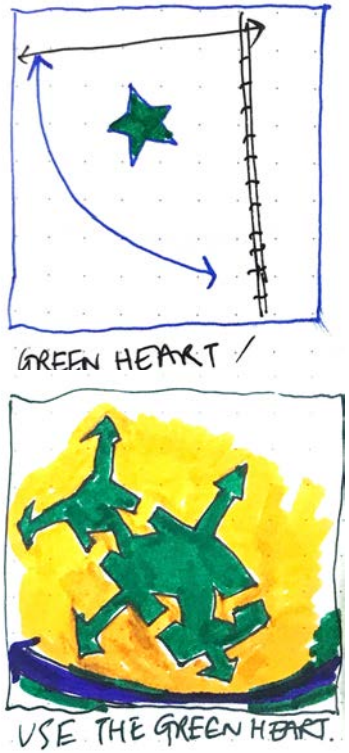
Connect
To greenspace
Greenspace to communi

CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions

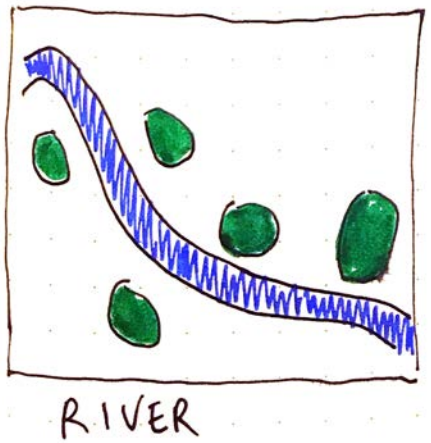


Connect
To greenspace
Greenspace to communi

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions

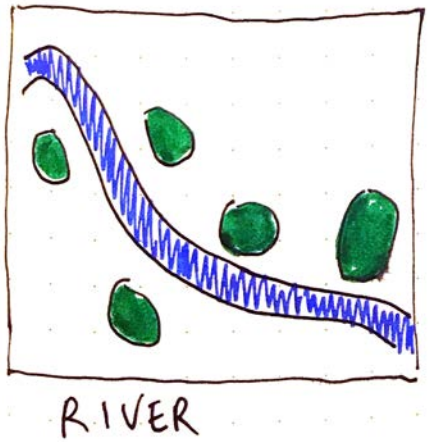


CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions



Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

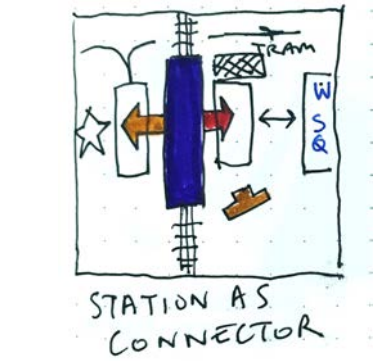
Urban Design: Solutions

Connect to city
New gateway

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions



Connect to city

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions

Connect to city
New gateway

CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions

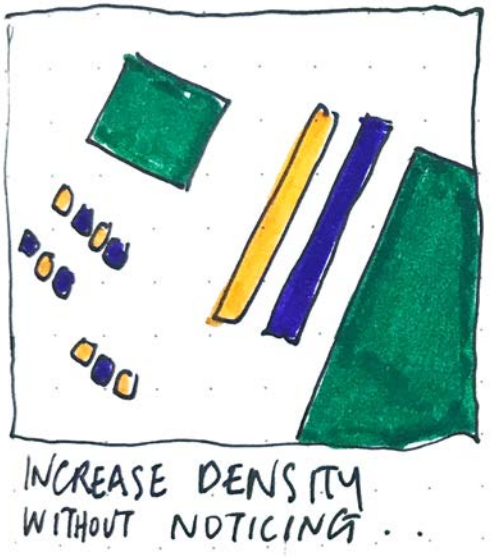
Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Tram station

CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

Urban Design: Solutions



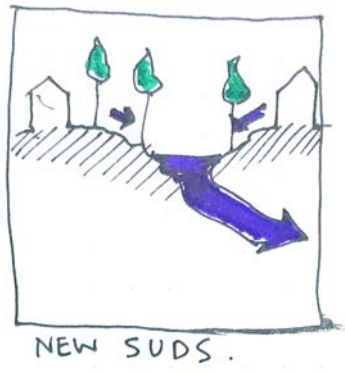
Solutions
Increase density.
by stealth

CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions



CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions

Give people
Green space

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions

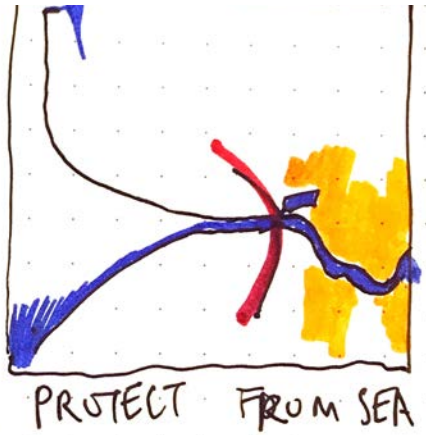
Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Free greenspace
for kids

CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

Urban Design: Solutions

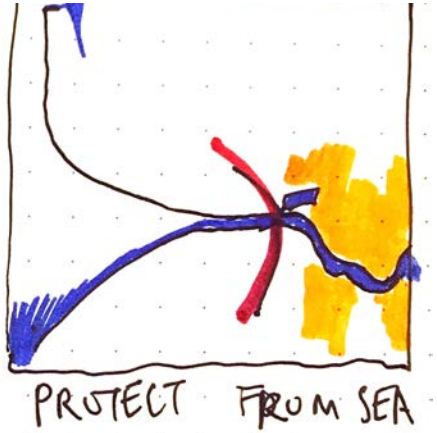


CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions

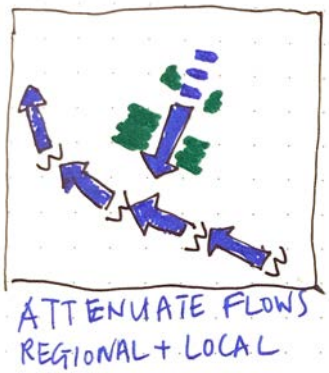


CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions



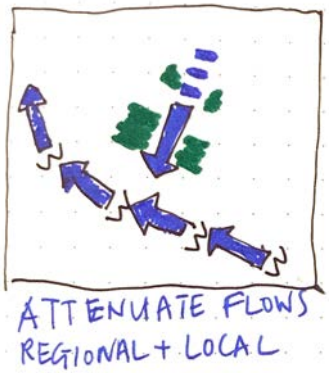
Solutions
Sort out the river
Weirs
City attenuation

CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions



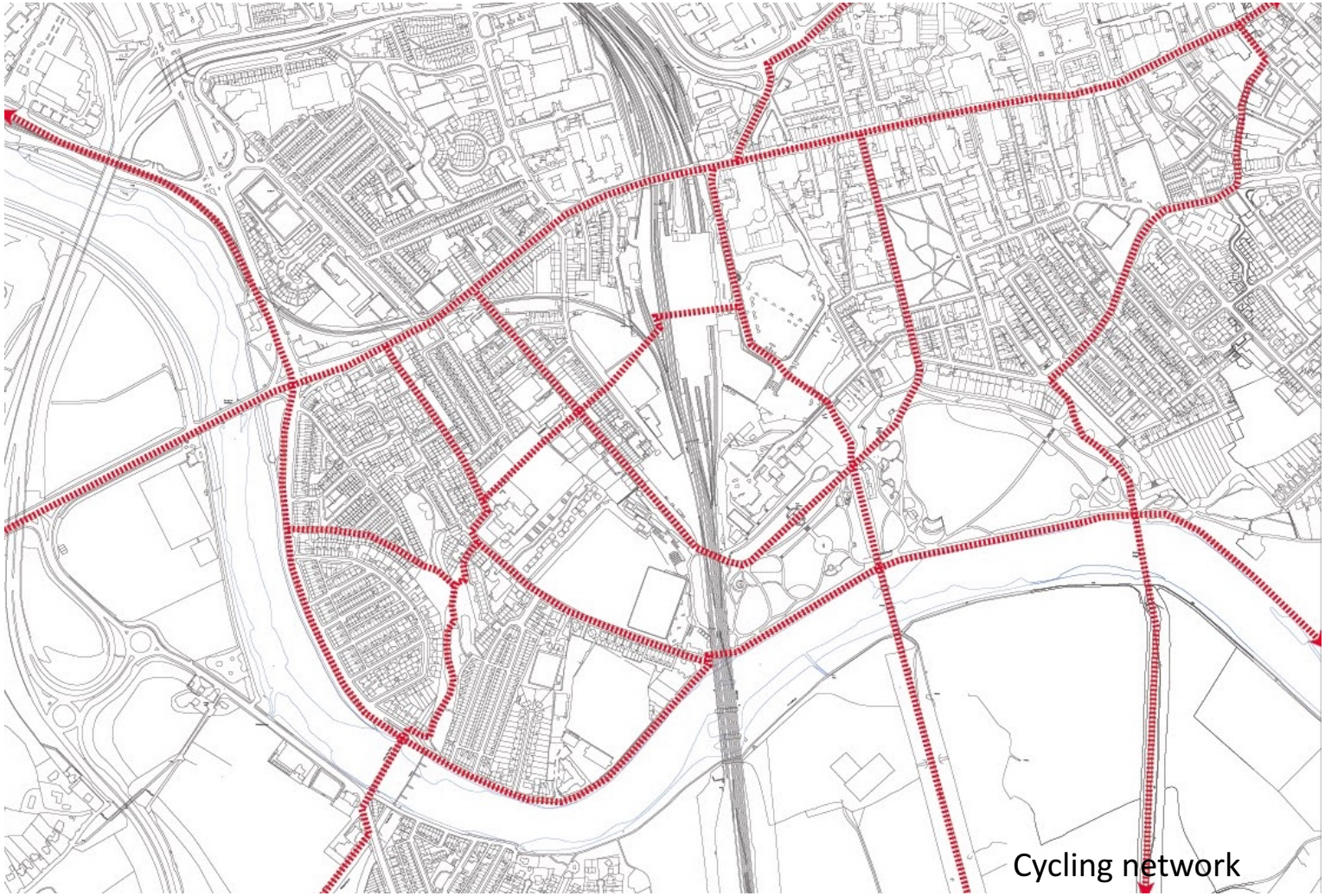
Solutions
Sort out the river
Weirs
City attenuation

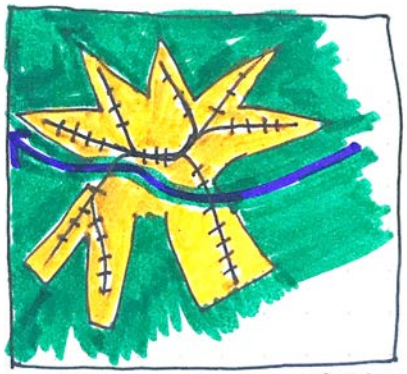
CITY-zen
New urban energy
ROADSHOW

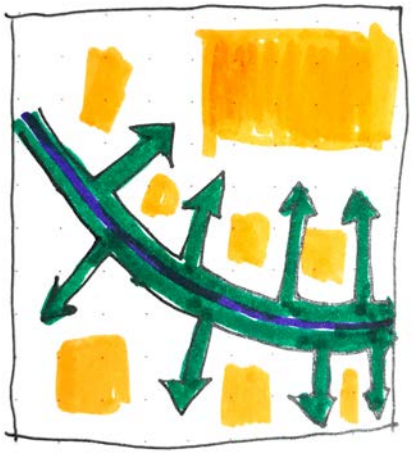
Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions





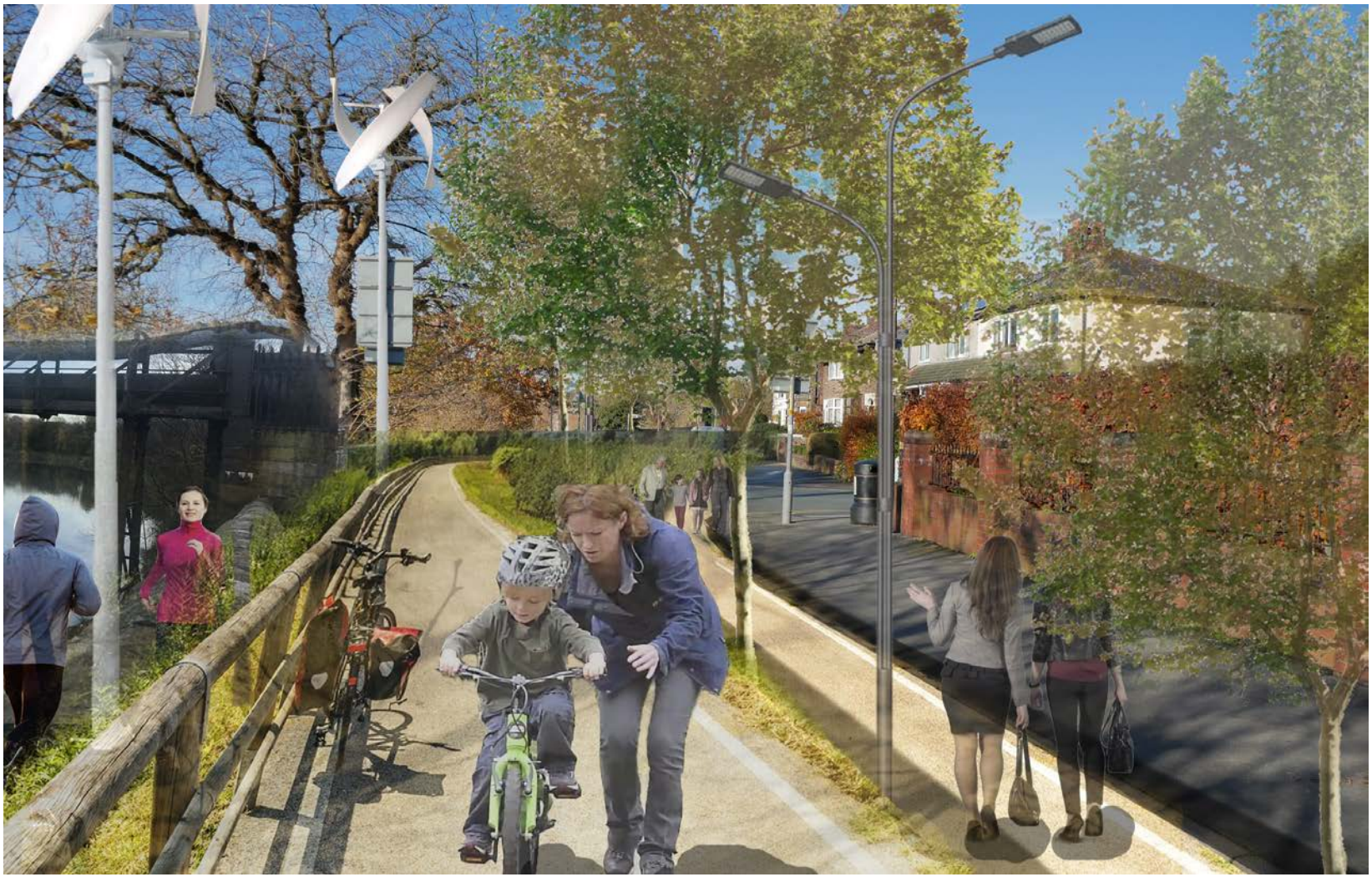


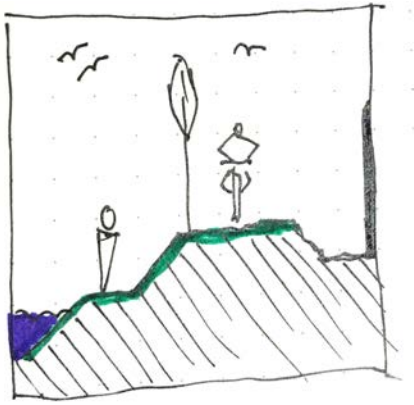
CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions





Solutions

Sort out the river.

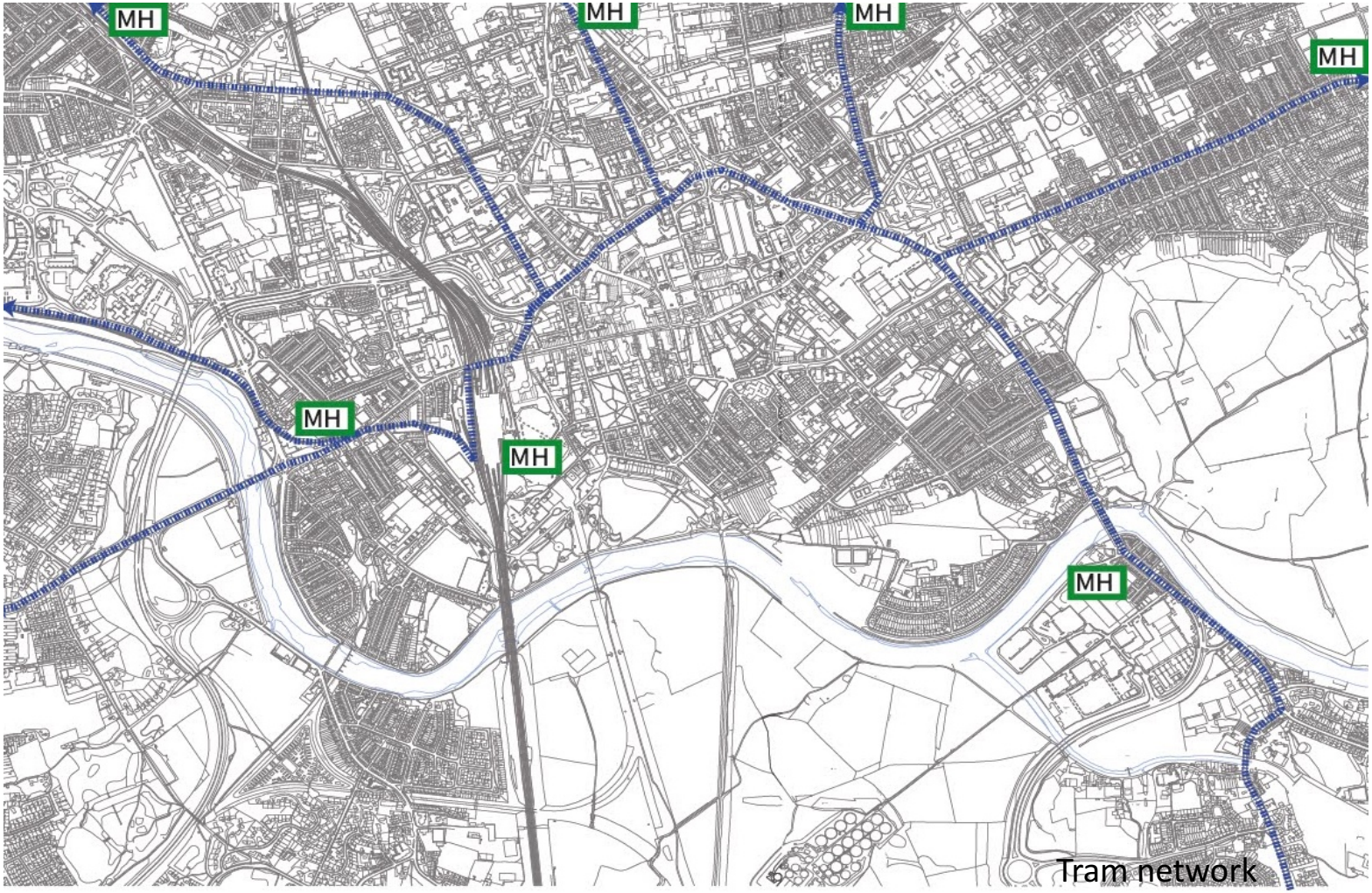
new boulevard cycling
softer engagement
energy landscape. Turbines

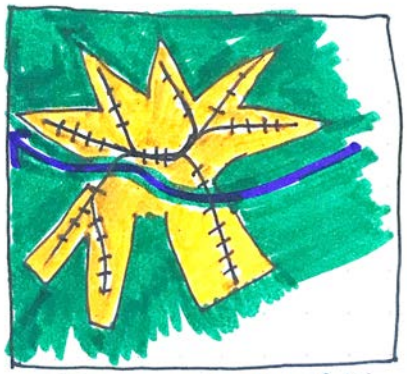
CITY-zen
New urban energy
ROADSHOW

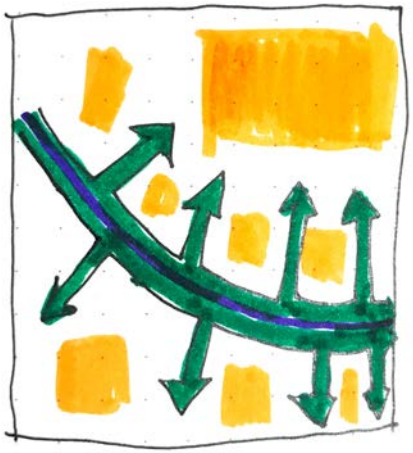
Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions





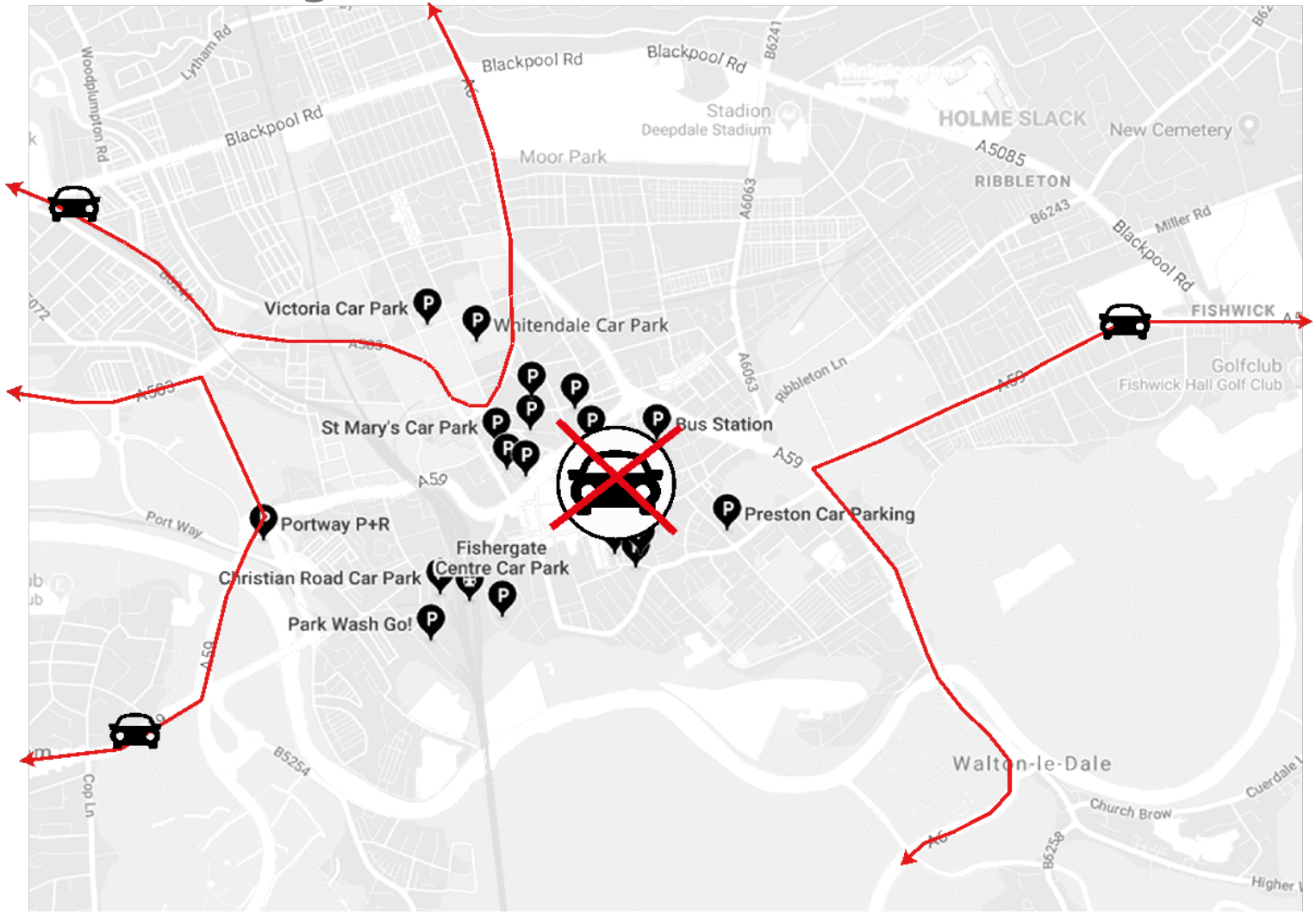


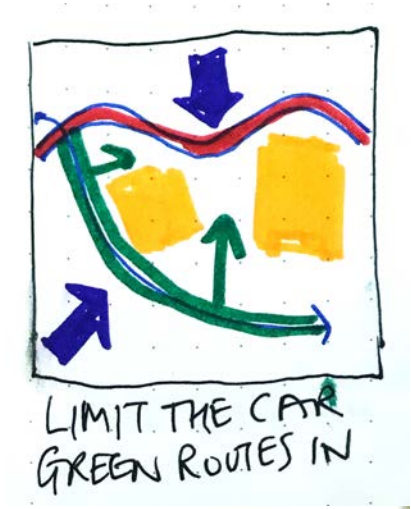
CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions





CITY zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions

CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions

CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions

Centre of the neighbourhood.

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions

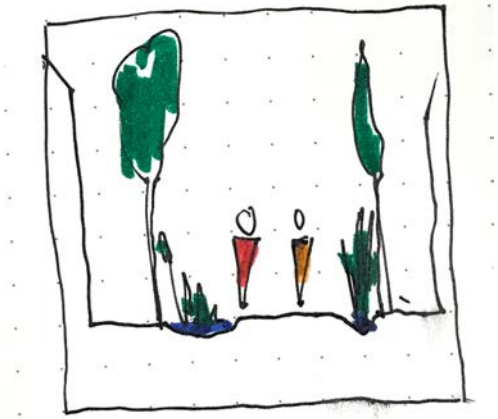
Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

New neighbourhood
Centre:
Creche
Shops, Public space

CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

Urban Design: Solutions



Solutions

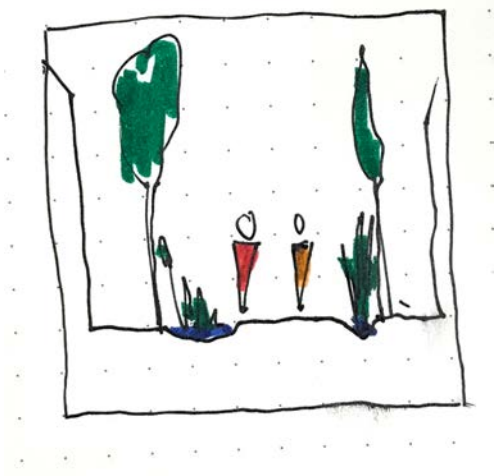
Neighbourhood shared space

CITY-zen New urban energy ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Solutions



Solutions

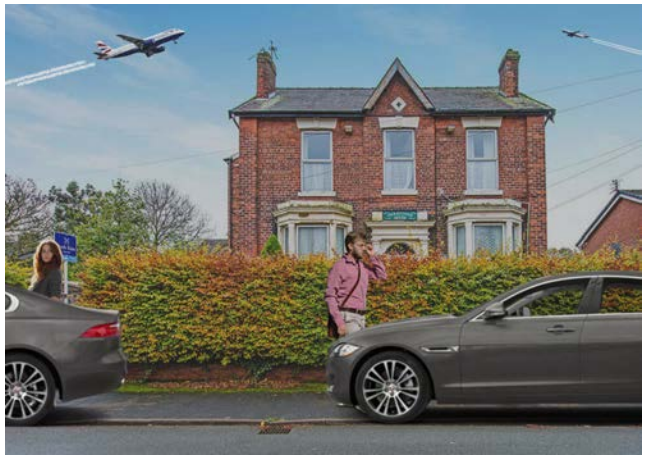
Neighbourhood shared space

CITY-zen New urban energy ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Real lives



"Hi I'm John,
I work as a lung consultant I the hospital. I live in South Ribble. I see daily, the issues air pollution causes in the population, particularly in the inner-city.

Being forced to drive my diesel Audi everyday was killing me: I wanted for some time to make a difference, but my wife said it was too dangerous to cycle to work. The new cycleway along green routes and through Broadgate allows me a safe and faster way to town, without polluting. I'm feeling fitter myself.

Stopping on the way home to pick up some Okra, made me realise that people aren't just a pair of lungs."

CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Real lives

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Hi I'm Deepti,

"I've lived in Broadgate for some time, and my kids are teenagers, so I have a little more time on my hands than I used to have. I've started my own urban farm growing hard-to-get Asian vegetables, which I sell at the weekend in the new public space.

I'm meeting so many more people now, and the new public park allows my kids to hang out in the evening without annoying people. The new river works are much safer, and I don't worry about my kids drowning any more. "

CITY-zen
New urban energy
ROADSHOW

Preston, UK, November 2018

Urban Design: Real lives

Hi, I'm Satish,
"I've just graduated from UCLAN and I'm working in IT in the city. I like the urban lifestyle and I'm a fitness geek. I row on the River, play Cricket and cycle. Broadgate is a great place to live: I have all the urban stuff, but I'm also part of a great community, and I help out at the Gujarat Centre.

The mix of urban and rural, and old and new cultures is perfect for me… housing is cheap and with low energy costs and no need for a car, I'm saving to buy my own place.

The electric car share is great: I can hire a van to go mountain-biking in Gisburn with my mates, and a hatchback to take my mum to the Trafford Centre."

CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Real lives

"Hi, I'm Lauren,
I'm a young mum and I live with my partner and my two kids (5 and 1) in Broadgate. It's a very green neighbourhood, and brilliant for families. I can leave the youngest at the new creche and my 5-year old at School and go to work in the shop on Fishergate, knowing that they're nearby.

My partner cycles to BAE Warton on green routes each day, and we go cycling with the kids upstream for miles without seeing a car.

The new streets are car-free, so the kids will be able to play outside without me worrying and the urban greenery cleans the air and connects us with nature. Our house is fossil free, so it costs nothing to run.

It's great to have such a compact lifestyle, with no need for a car…"

CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Celebrate and enjoy your amazing city!

CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Celebrate and enjoy your amazing city!

But what's the cost
Of doing it???

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

Preston, UK, November 2018

Urban Design: Celebrate and enjoy your amazing city!

But what's the cost
Of NOT doing it?
Socially….
Economically….
Climatically…..

CITY-zen
New urban energy
ROADSHOW

Urban design strategy: Prof Greg Keeffe, Queens University, Belfast.

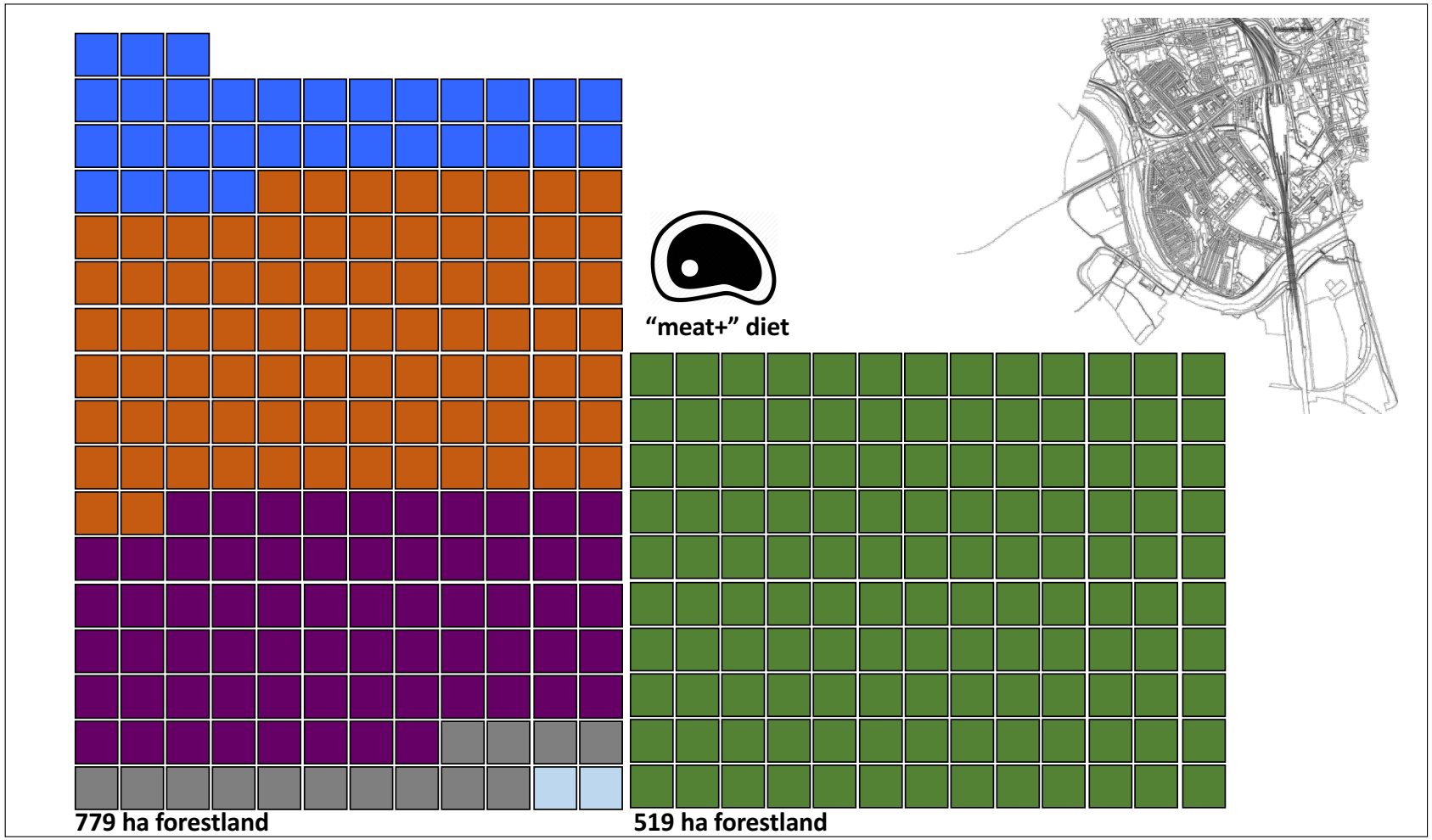
Preston, UK, November 2018

Now, let's see how much of the carbon emissions can be reduced…

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Food impact (meat+ diet)



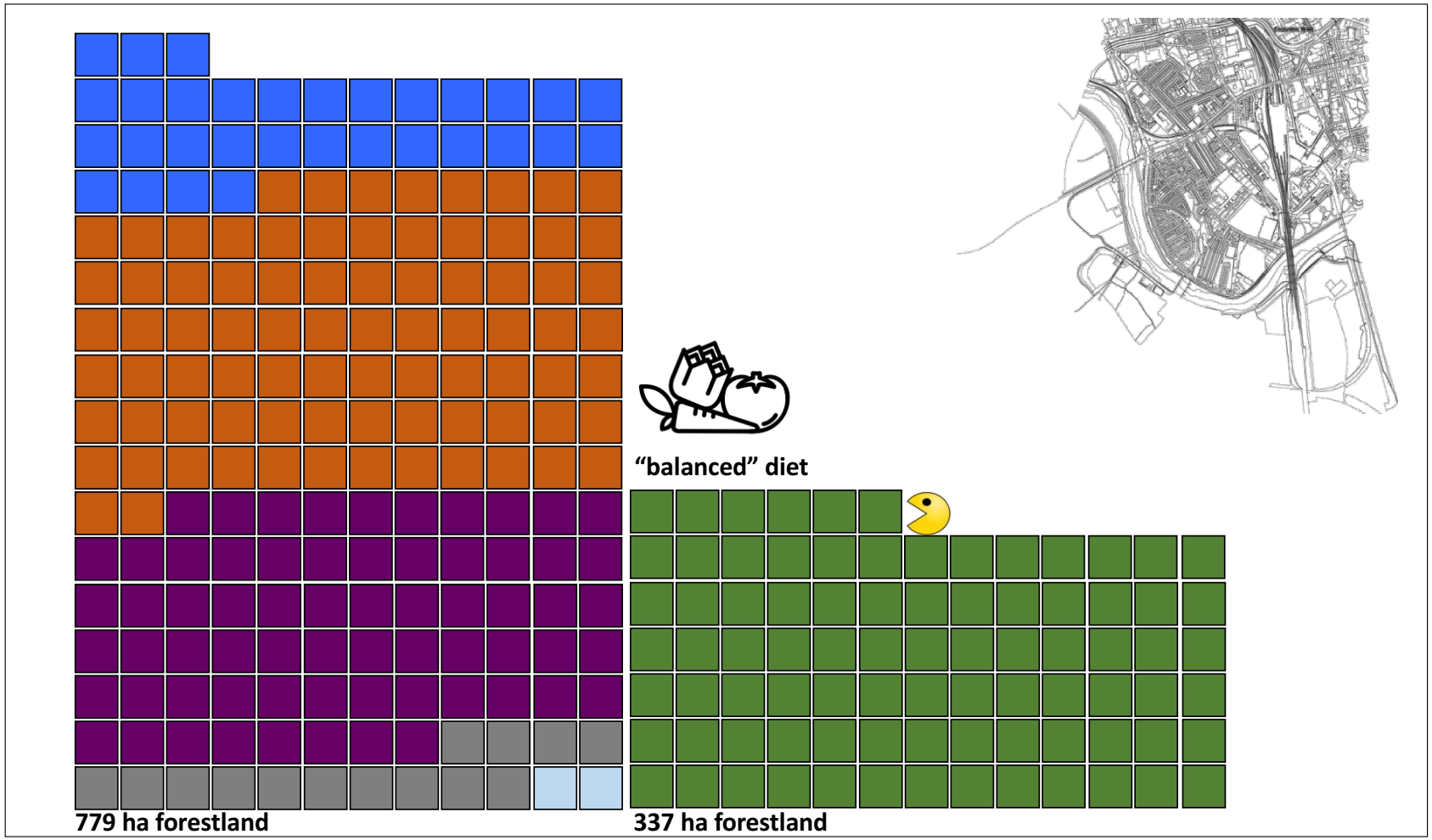
ELECTRICITY
NATURAL GAS
MOBILITY
WASTE
WATER
FOOD

CITY-zen
New urban energy
ROADSHOW

Energy strategy: Prof Andy van den Dobbelsteen, Delft University of Technology

Preston, UK, November 2018

Food impact (balanced diet)



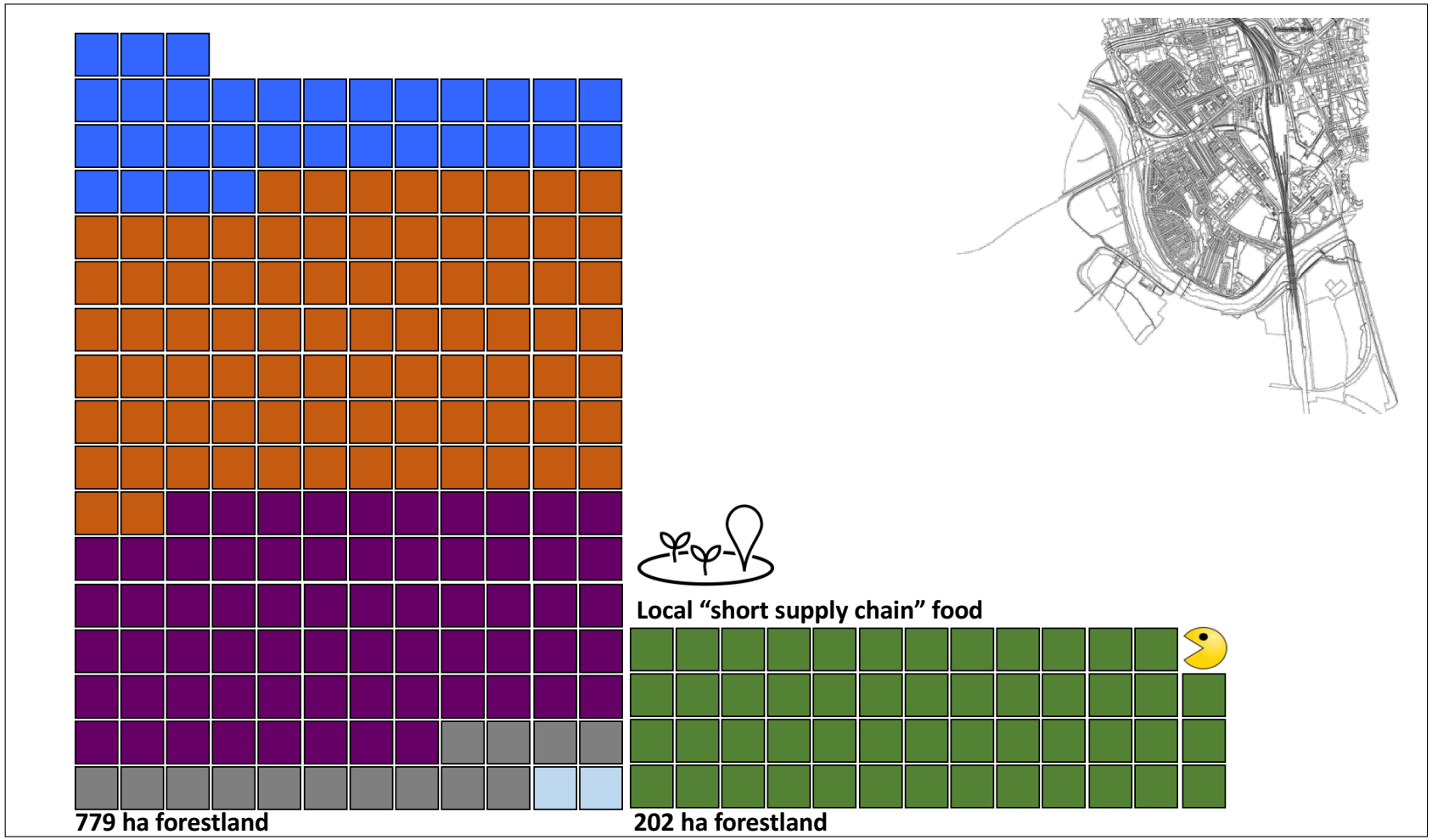
ELECTRICITY
NATURAL GAS
MOBILITY
WASTE
WATER
FOOD

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Food impact (short supply chain)



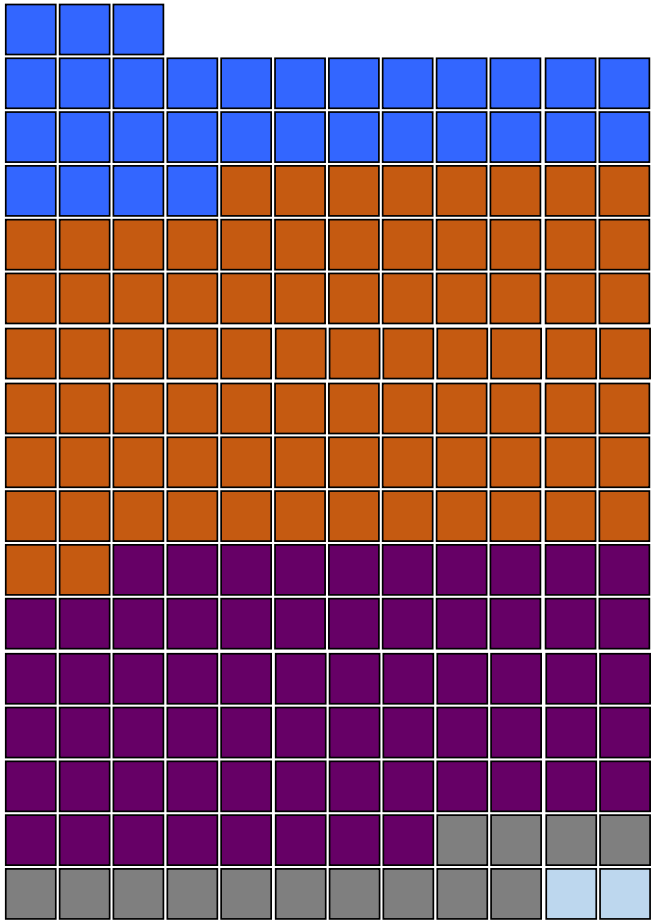
ELECTRICITY
NATURAL GAS
MOBILITY
WASTE
WATER
FOOD

CITY-zen
New urban energy
ROADSHOW

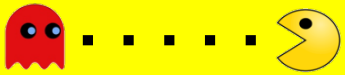
Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

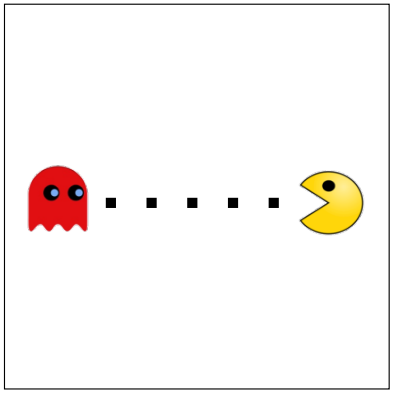
Preston, UK, November 2018

Carbon Footprint mitigation of the Broadgate neighbourhood



Let's start





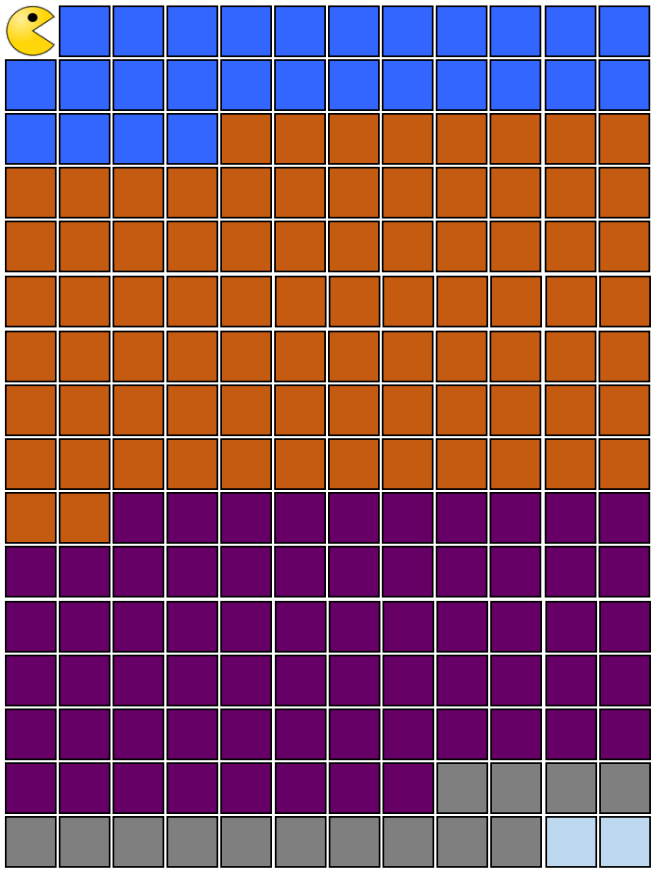
- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE
- WATER

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

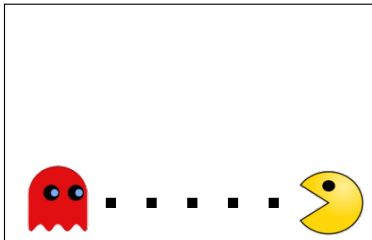
Carbon Footprint mitigation of the Broadgate neighbourhood



1

Energy saving
e.g. LED light

50% involved households
-25% electricity demand



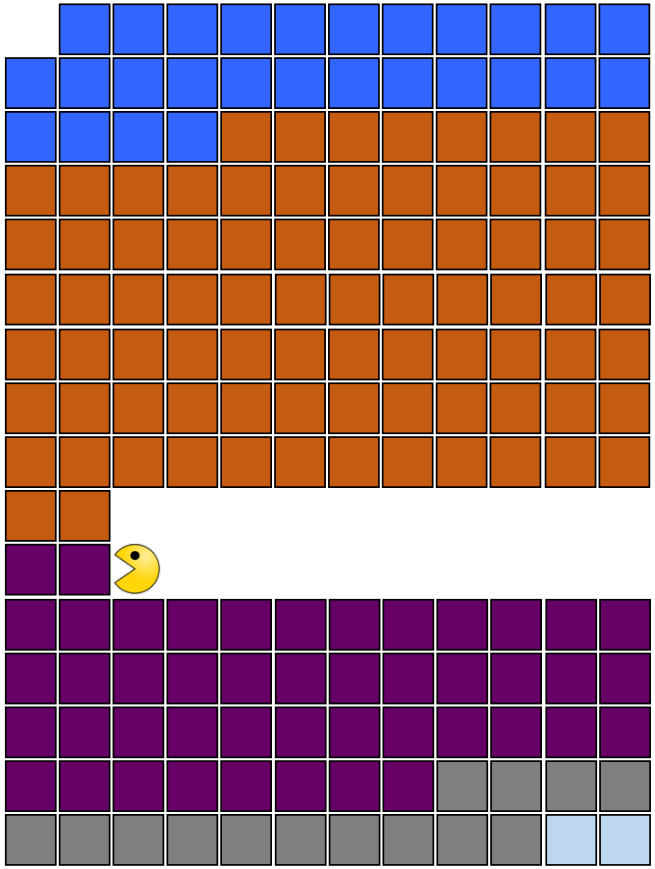
- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE
- WATER

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

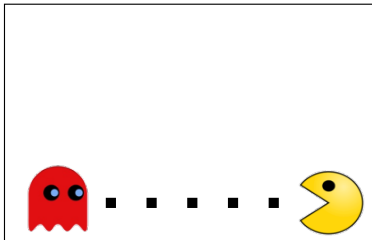
Carbon Footprint mitigation of the Broadgate neighbourhood



2

Bike/walk to school/work

30% involved households
-100% fuel for car driving



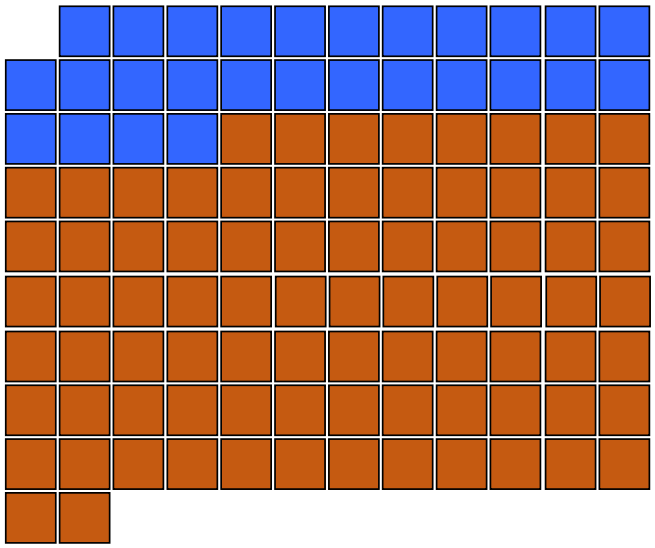
- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE
- WATER

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

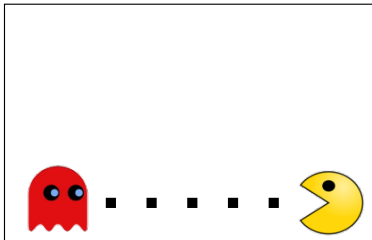
Carbon Footprint mitigation of the Broadgate neighbourhood



3

Public transport
+ behaviour + policy

50% involved households
-100% fuel for car driving



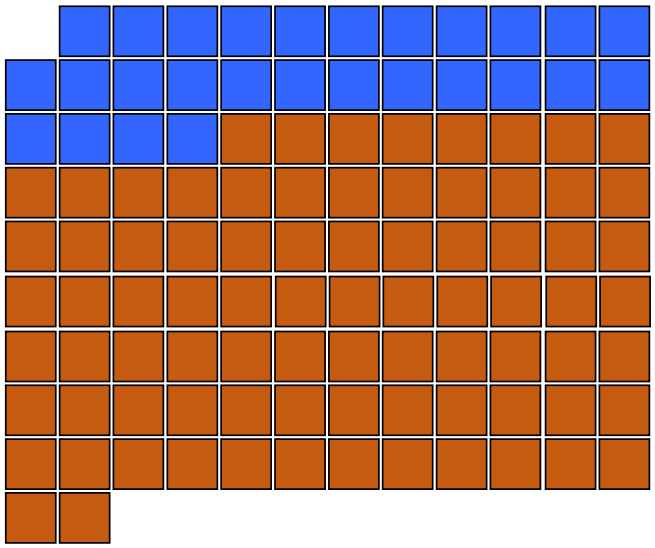
- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE
- WATER

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Carbon Footprint mitigation of the Broadgate neighbourhood



4

Waste reduction / reuse
+ behaviour + policy

100% involved households
-30% landfilled waste

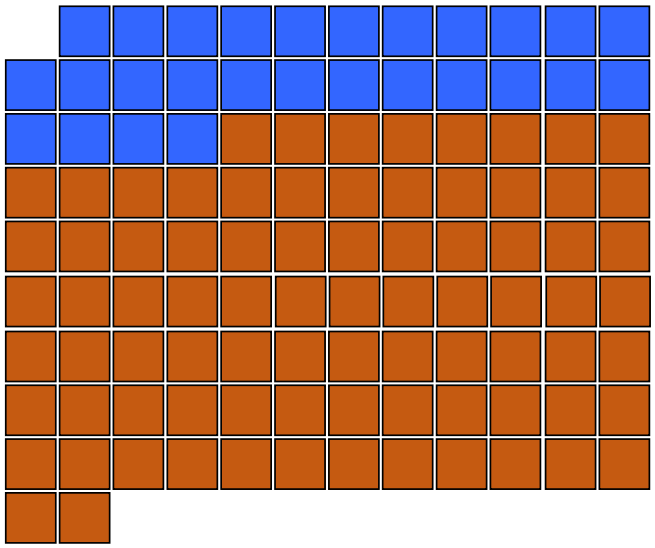
- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE
- WATER

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

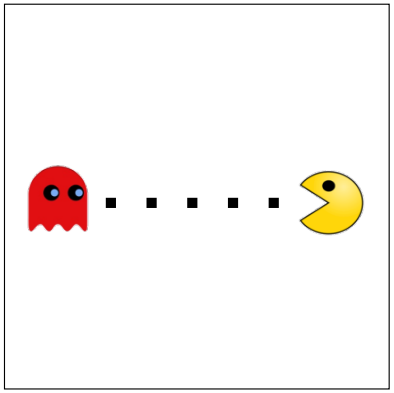
Carbon Footprint mitigation of the Broadgate neighbourhood



5

Less landfilled waste
+ behaviour + policy

100% involved households
-60% landfilled waste



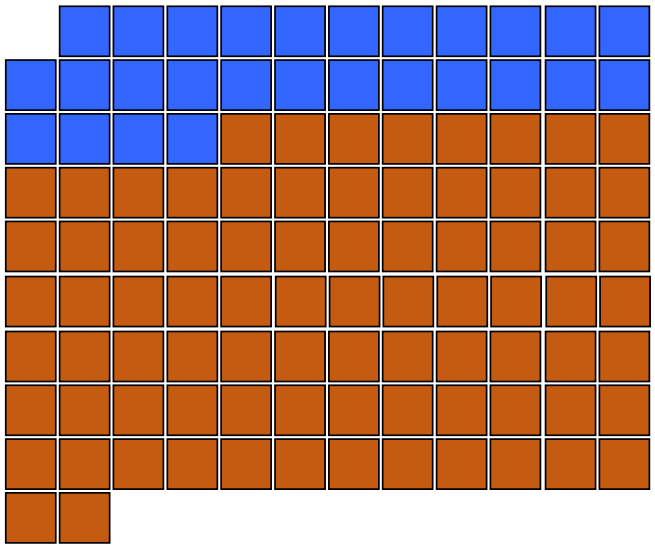
- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE
- WATER

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

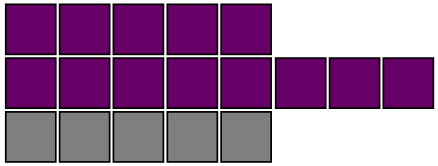
Carbon Footprint mitigation of the Broadgate neighbourhood

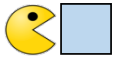


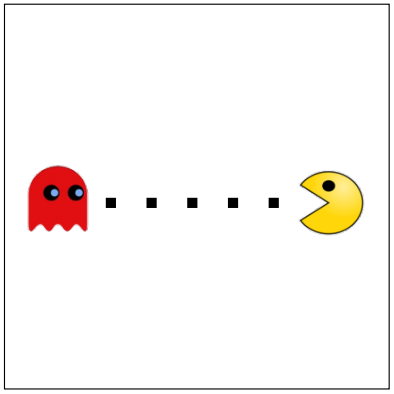
6

Water use reduction
+ behaviour + technological

100% involved households
-30% water use
(e.g. rainwater collection)







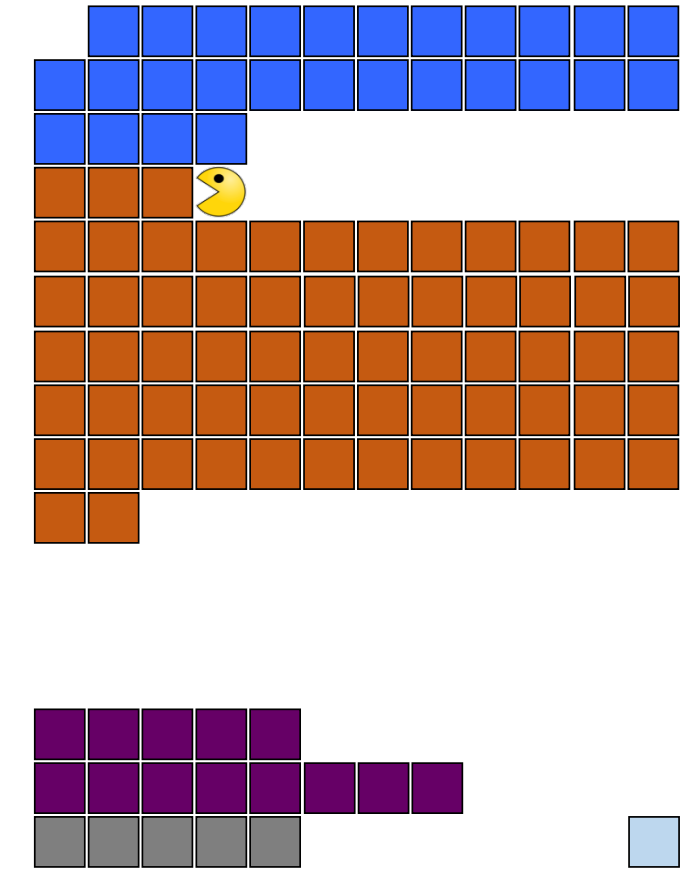
- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE
- WATER

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

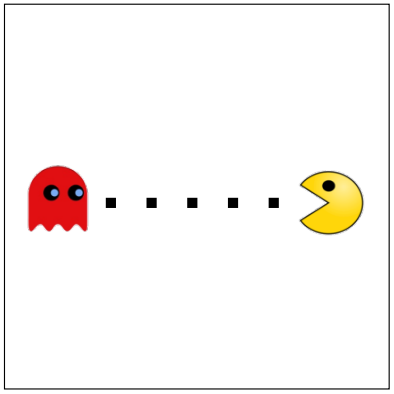
Carbon Footprint mitigation of the Broadgate neighbourhood



7

Building insulation
technological

50% involved households
-50% heat demand



- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE
- WATER

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Carbon Footprint mitigation of the Broadgate neighbourhood

8

PV on roofs

Renenwable energy generation

65% involved households
3.5 GWh electricity generation

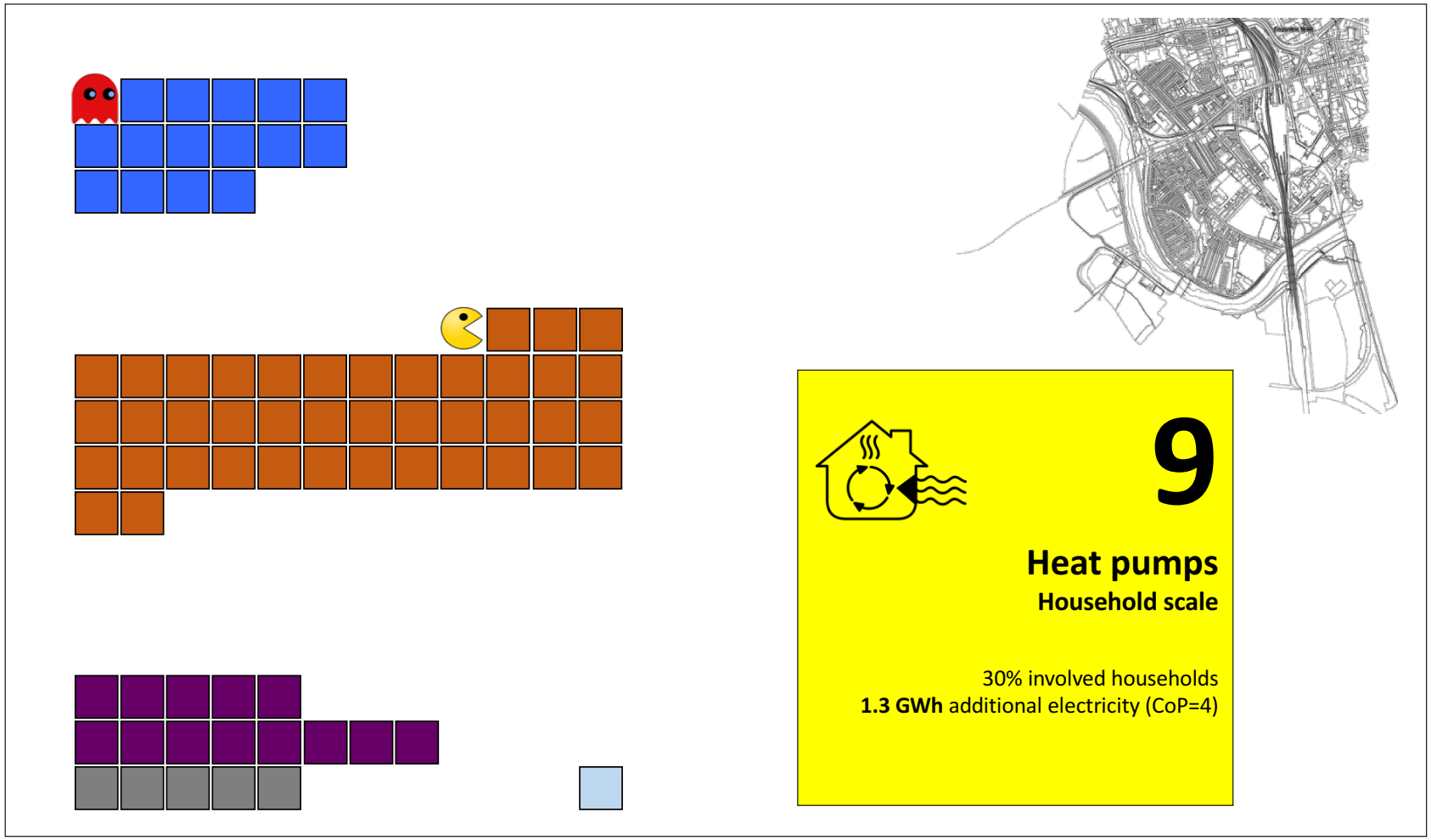
- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE
- WATER

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Carbon Footprint mitigation of the Broadgate neighbourhood



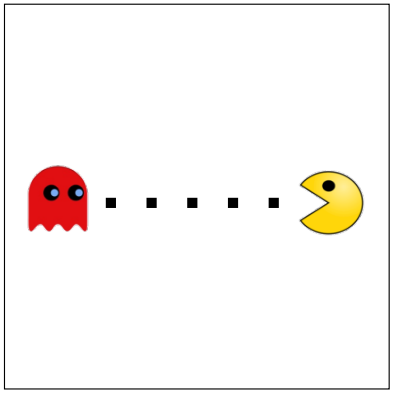
9

Heat pumps

Household scale

30% involved households

1.3 GWh additional electricity (CoP=4)



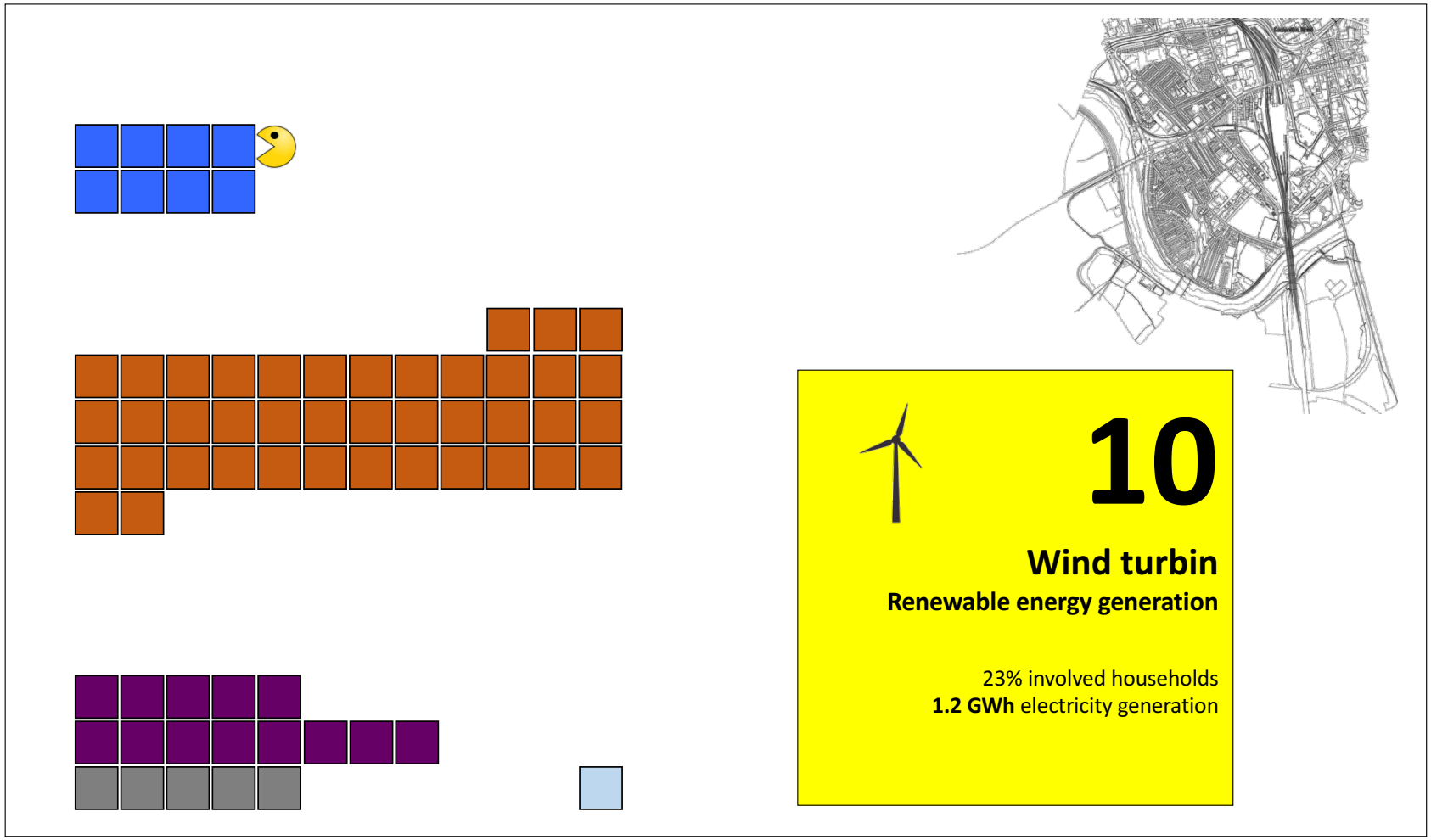
- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE
- WATER

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Carbon Footprint mitigation of the Broadgate neighbourhood

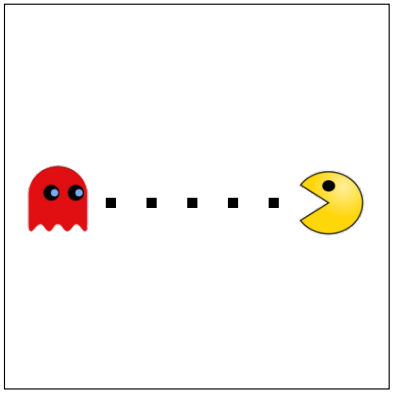


10

Wind turbin

Renewable energy generation

23% involved households
1.2 GWh electricity generation



- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE
- WATER

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Carbon Footprint mitigation of the Broadgate neighbourhood

11

District Heating Network

Renewable energy generation

50% involved households
8.5 GWh heat generation
(biomass)

ELECTRICITY
NATURAL GAS
MOBILITY
WASTE
WATER

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Carbon Footprint mitigation of the Broadgate neighbourhood

12

Transition to electric mobility

20% involved households
0.7 GWh electricity (0.16kWh/lkm)

- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE
- WATER

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Carbon Footprint mitigation of the Broadgate neighbourhood

13

Tidal energy

Renewable energy generation

38% equivalent households
2.0 GWh electricity

ELECTRICITY
NATURAL GAS
MOBILITY
WASTE
WATER

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

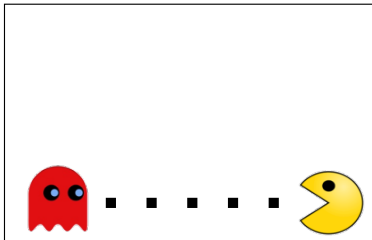
Carbon Footprint mitigation of the Broadgate neighbourhood

14

Urban forestry

Carbon footprint offset

23 ha forestland



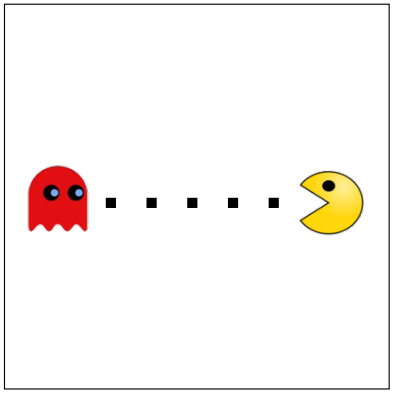
- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE
- WATER

CITY-zen
New urban energy
ROADSHOW

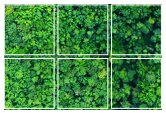
Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018

Carbon Footprint mitigation of the Broadgate neighbourhood



- ELECTRICITY
- NATURAL GAS
- MOBILITY
- WASTE
- WATER

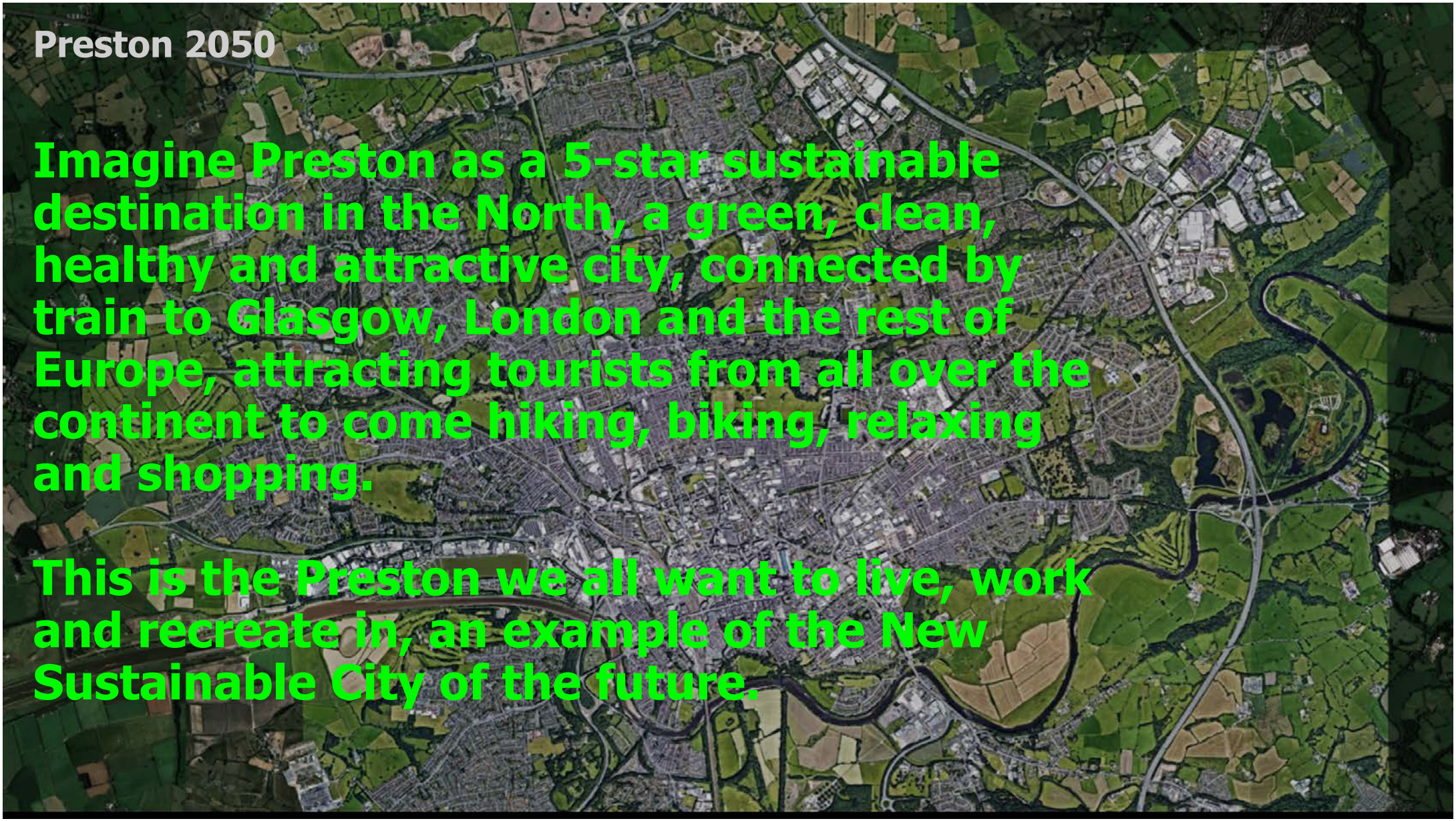


It may be Broadgate 2050!

CITY-zen
New urban energy
ROADSHOW

Carbon accounting: Dr. Riccardo M. Pulselli, University of Siena, Siena

Preston, UK, November 2018


Preston 2050
Imagine Preston as a 5-star sustainable destination in the North, a green, clean, healthy and attractive city, connected by train to Glasgow, London and the rest of Europe, attracting tourists from all over the continent to come hiking, biking, relaxing and shopping.
This is the Preston we all want to live, work and recreate in, an example of the New Sustainable City of the future.

Lead, not follow…

Web:
https:// www.cityzen-smartcity.eu/nl/home-nl/

@CityzenRoadshow

@CityzenRoadshow

cityzenroadshow

Roadshow Contacts:
Prof.Dr. Craig Martin – Roadshow Leader (*e*: c.l.martin@tudelft.nl)
Tamar Raey – Roadshow Contact, PCC (*e*: T.Reay@preston.gov.uk)

CITY-zen
New urban energy
ROADSHOW


Thank you!