Novel Strategies in Carbon Management

APPRAISAL OF A CARBON MANAGEMENT TOOL / PRACTISE

ASSESSMENT 1 - SEMINAR

SCOTT BARCLAY (S30084519)







CHEVROLET

data.cdp.net

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CDP Cities, States and Regions Open Data Portal

Explore climate change and sustainability data from more than 1,200 city, state and regional governments.

This data is reported by cities through CDP-ICLEI Track, and by states and regions, providing rich insight that is informing policy and investor decisions. Interested in reporting your city, state or region's data? Start now.

Search Datasets

To view latest 2023 insights click here. Browse the categories below to find datasets as far back as 2011 on climate-related risks and opportunities, emissions, mitigation, adaptation, energy, water and more in cities, states and regions worldwide. For guidance on how to access datasets and navigate the site, see our Open Data Portal User Guide. Note: The following figures are based on self reported data from cities, states and regions in 2021.

1,224

706

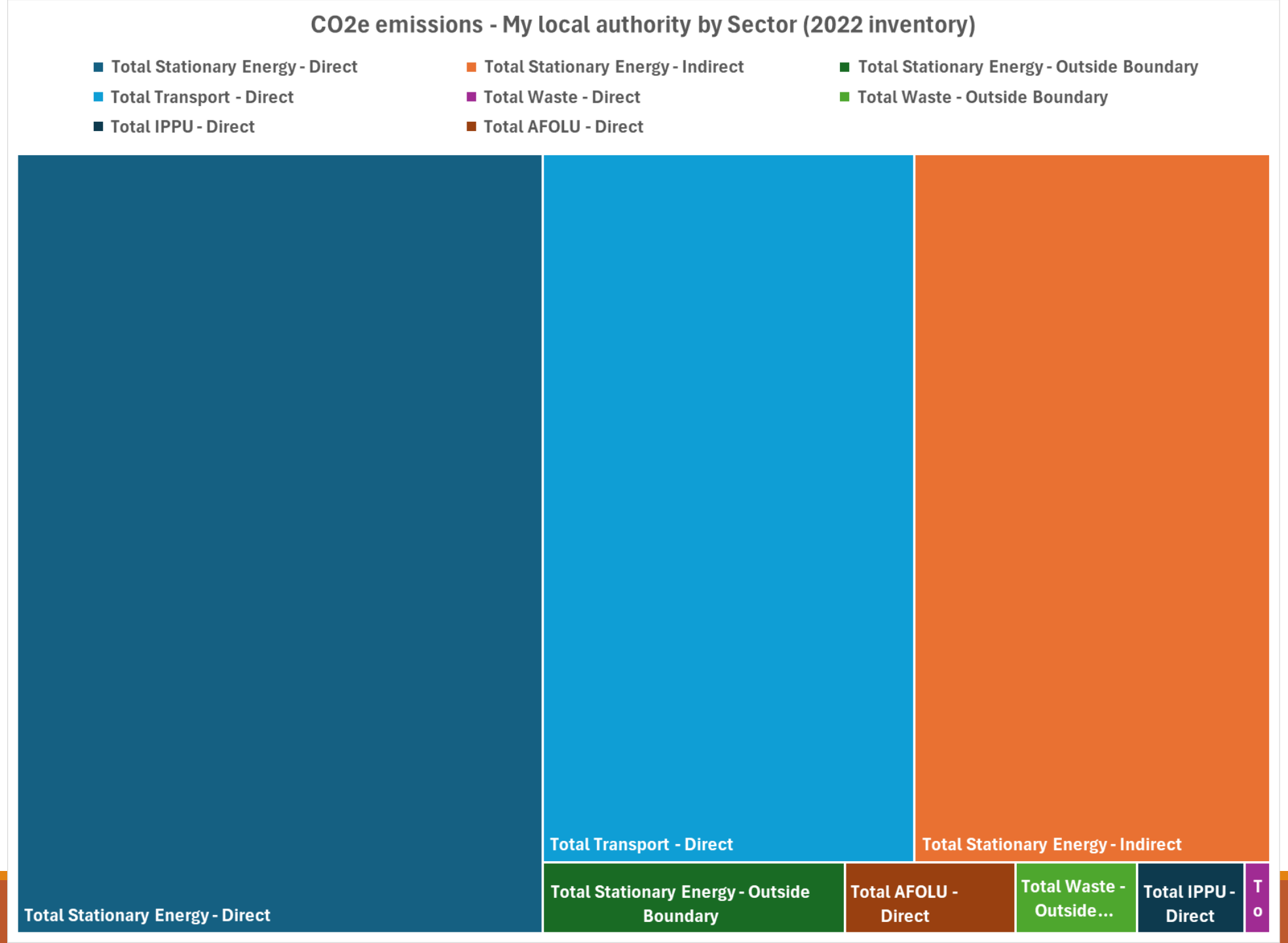
680

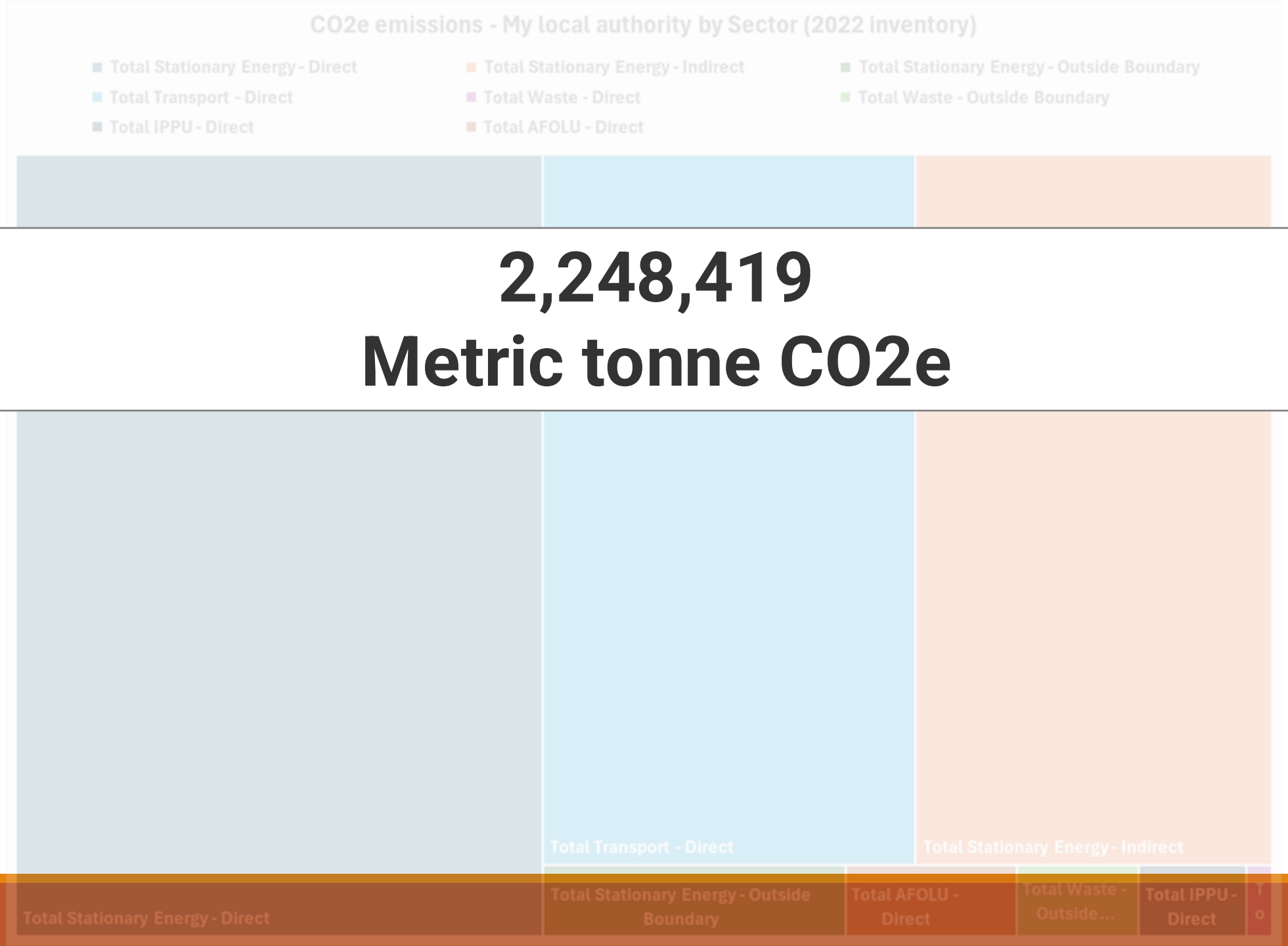
cities, states and regions collaborating with businesses

655

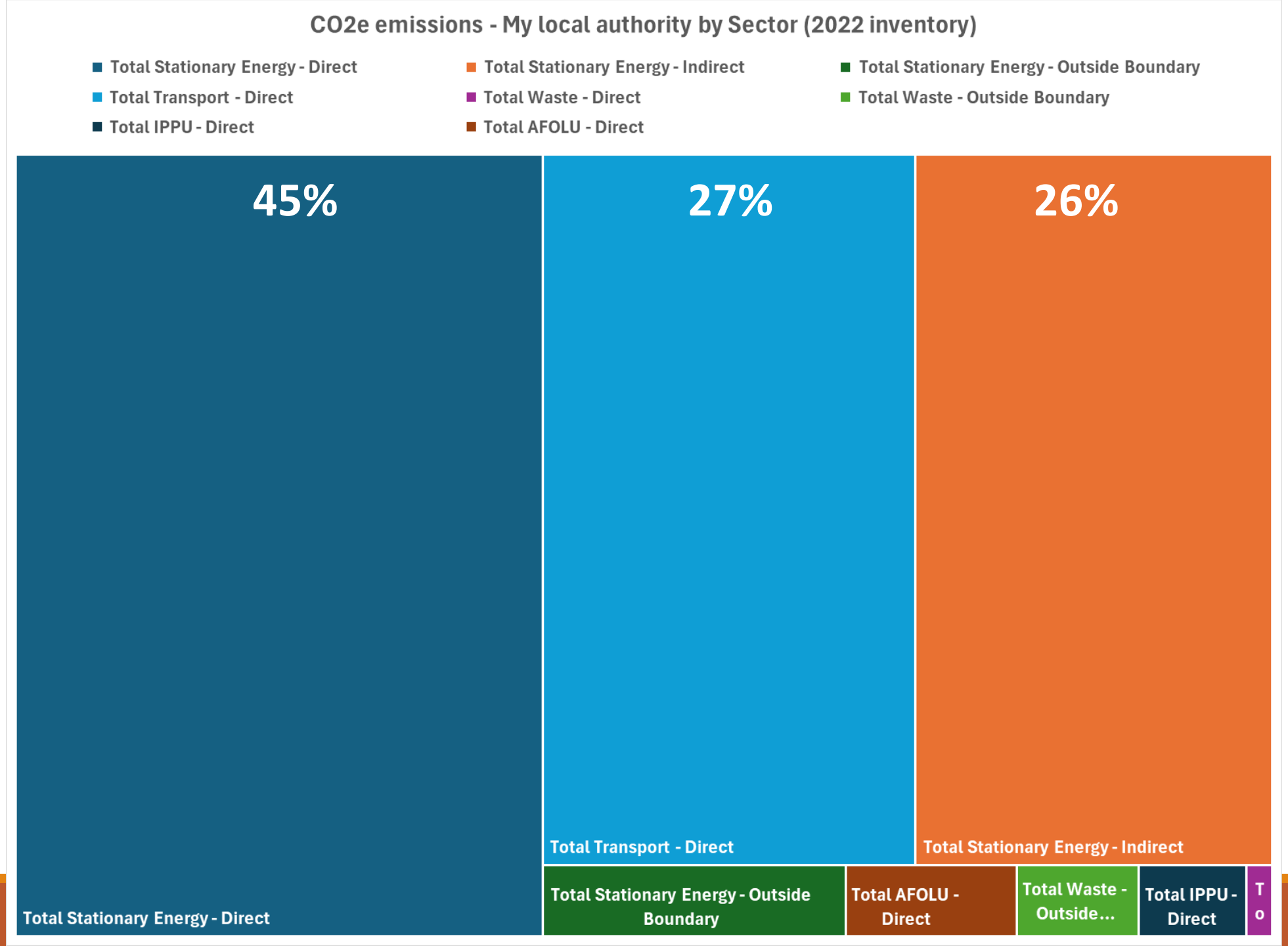
Carbon Disclosure Project (CDP)

- International non-profit organisation for companies' and cities' environmental reporting
- Used by my local authority
- Over 1200 other councils and local authorities globally
- 503 datasets
- Millions of lines


CO2e emissions - My local authority by Sector (2022 inventory)
Total Stationary Energy - Direct
Total Stationary Energy - Indirect
Total Stationary Energy - Outside Boundary
Total Transport - Direct
Total Waste - Direct
Total Waste - Outside Boundary
Total IPPU - Direct
Total AFOLU - Direct
Total Stationary Energy - Direct
Total Transport - Direct
Total Stationary Energy - Indirect
Total Stationary Energy - Outside Boundary
Total AFOLU - Direct
Total Waste - Outside...
Total IPPU - Direct
To



2,248,419
Metric tonne CO2e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Total AFOLU - Direct
45%
27%
26%
Total Stationary Energy - Direct
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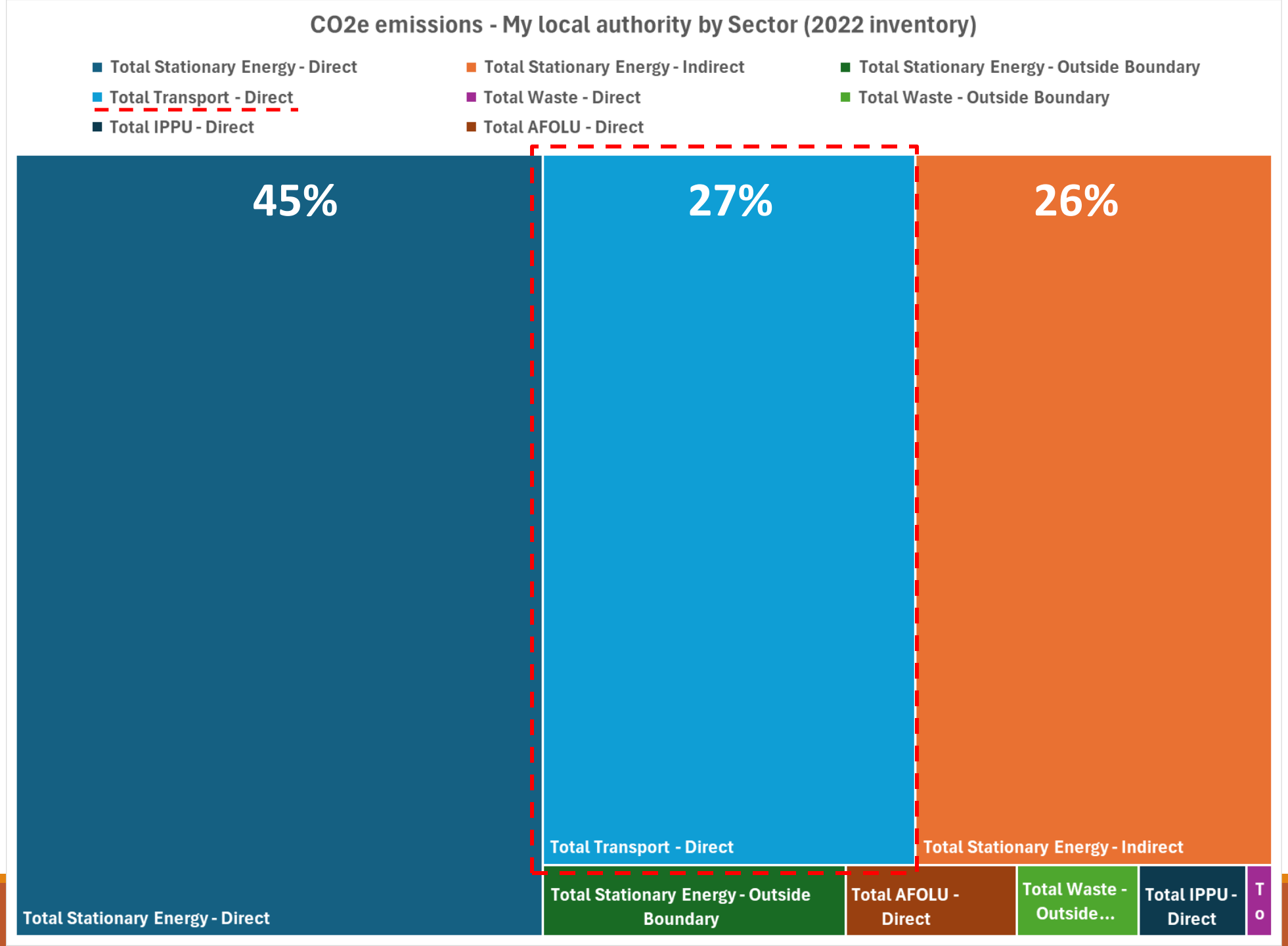
Total AFOLU - Direct
Total Waste - Outside...
Total IPPU - Direct
To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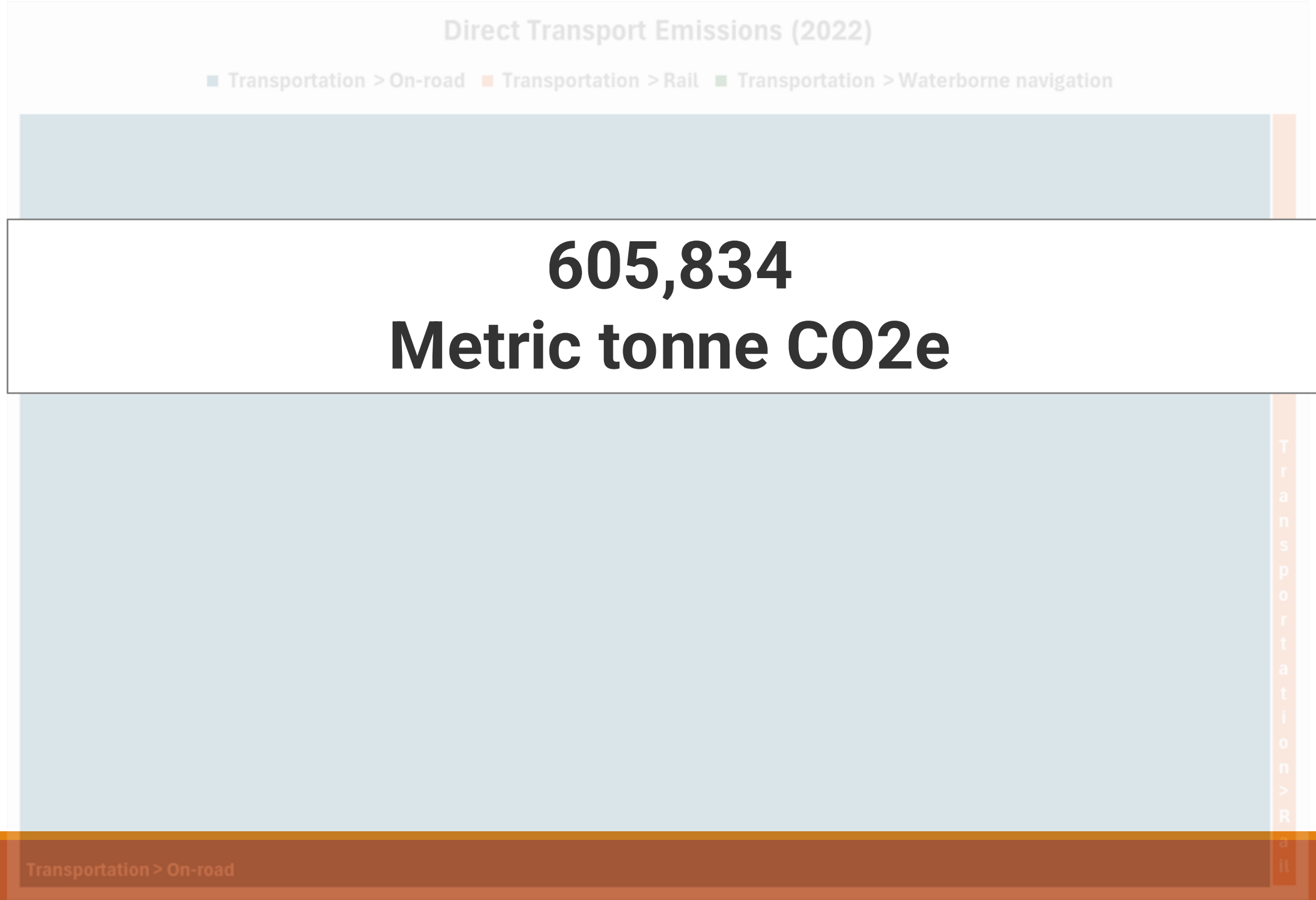
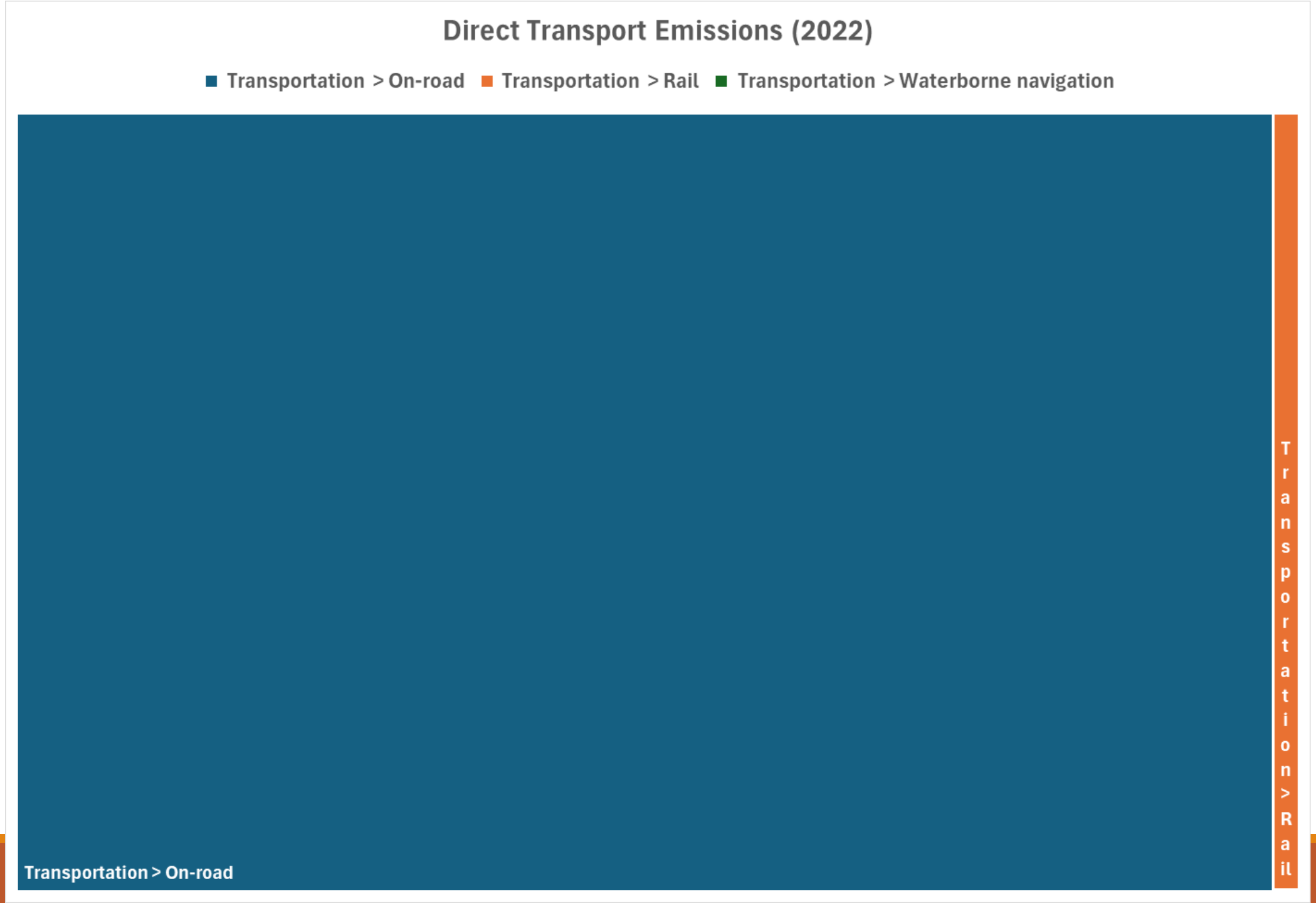
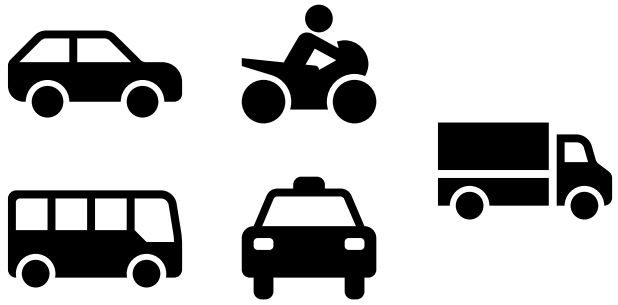
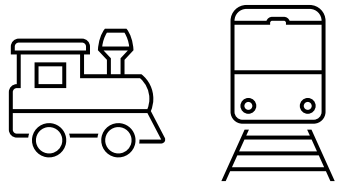


605,834
Metric tonne CO2e


Direct Transport Emissions (2022)
Transportation > On-road
Transportation > Rail
Transportation > Waterborne navigation
Transportation > On-road
Transportation > Rail

Direct Transport Emissions (2022)

Road	Rail	Waterborne
		
597,701 CO2e	8133 CO2e	22 CO2e
98%	2%	0%

Todays Seminar

Reducing Road Transportation CO2e

Using public transportation as a tool

Why is this needed? Facts and Figures

Edinburgh – economic and cultural hub of the region (and country to some extent)

95,000 travel outside to Edinburgh each day – 63,000 by car!

60,000 city residents commute by car each day within Edinburgh

51% of journeys between 1-2km are by car (~4% by bus)*

"Transport emissions, which have been historically difficult to reduce - will need to decrease as much as 12 times the rate than in the last two decades" ***- Edinburgh's 2030 Climate Strategy***

**Share of journeys between 1 and 2 kilometres by main mode in Scotland (Adapted from Transport and Travel in Scotland 2019, Results from Scottish Household Survey: Transport Scotland Statistics)*

Why is this needed? Population Growth

By 2030's, population of:

Edinburgh set to increase to 552,000 (**6.6% increase**)

Midlothian to over 105,000 (**13.8% increase**)

East Lothian to 113,000 (**7.2%**)

West Lothian to 194,000 (**5.9%**)

CO2 and CO2e needing reduced – but population set to grow!

Electric Car Revolution

-Ford delaying its 2030 BEV-only plan “too ambitious”

-Volvo scraps 2030 “Full electric goal” (2021)

-Toyota cuts EV sales targets by a third

-Volkswagen halves EV battery factory capacity “slowing EV market”

-Fiat scraps fully electric Fiat 500 model “due to a lack of orders”

-European Commission revision giving car manufacturers 3 years now, instead of the proposed 1 year, to meet CO_2 emissions targets

-USA, OPEC, OPEC+ Norway and UK set to ramp up oil production

Current state of public transport in Edinburgh

Buses and Trams

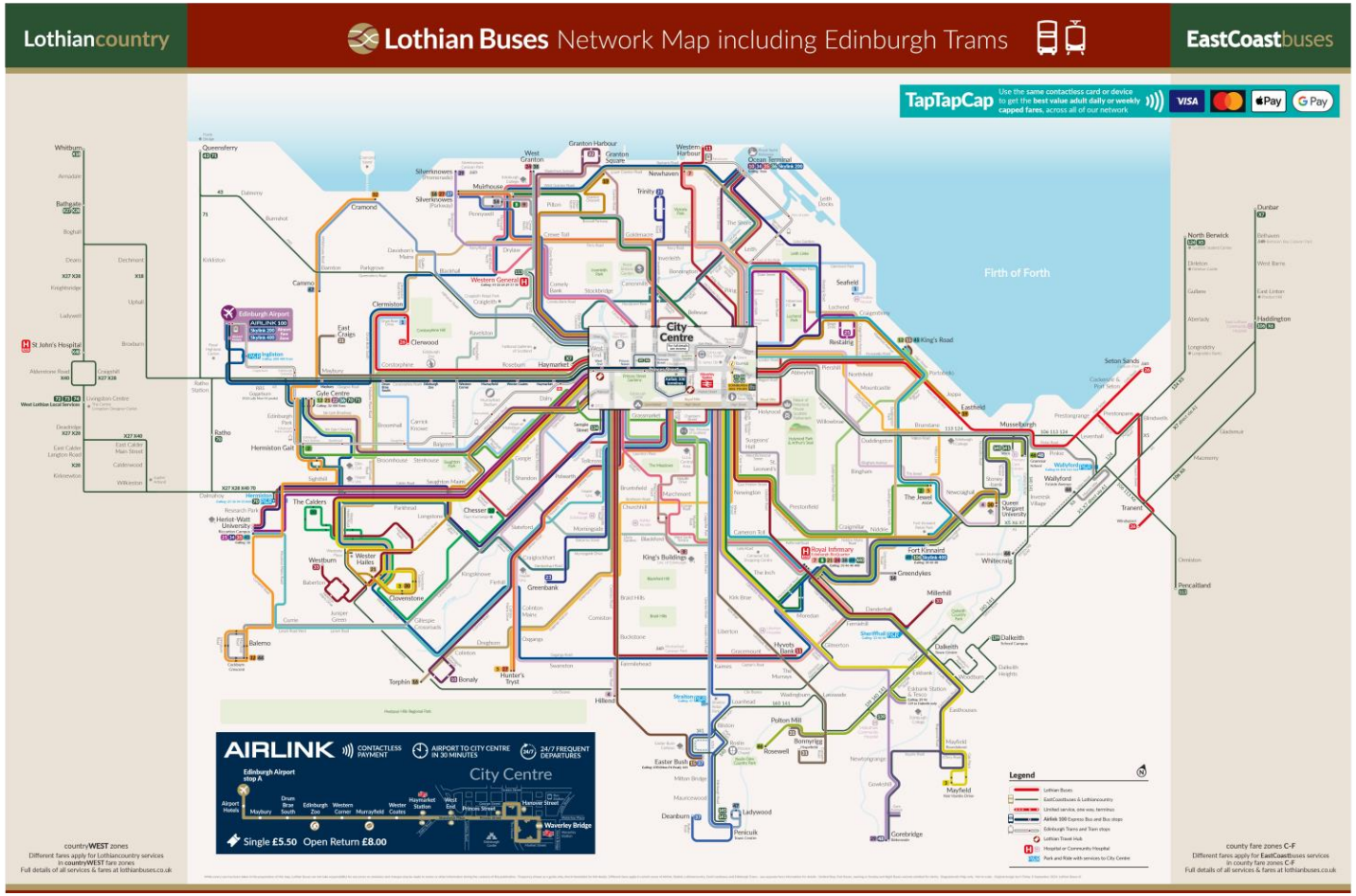
-Lothian Buses

-Fleet of 567 buses

-“Traditional” single and double decker

-Mix of diesel, diesel electric hybrid and full electric

-Ridership for 2023 was 110 million



Bus stock

60 fully electric buses

98 diesel-electric hybrids

400+ diesel only

Bus stock – Fleet Upgrade

Fleet upgrade, removing diesel only and replacing with Hydrogen buses

Used currently in London, Aberdeen, Birmingham, Belfast and Dublin

Supply chain and knowledge already exists

Replacing diesel with hydrogen buses

Case Study by WrightBus (manufacturer) and First Bus (operator) states:

For Aberdeen, switching from diesel to hydrogen fuel cell saves **84 tonnes of carbon**, **per year**, **per bus**.

For Edinburgh, 400 diesel buses, saving 84 tonnes of carbon each =

Saving over <u>33,600</u> tonnes of carbon each year!

Replacing hybrid with hydrogen buses

Case Study by WrightBus (manufacturer) and First Bus (operator) states:

For Aberdeen, switching from diesel to hydrogen fuel cell saves 84 tonnes of carbon, **per year**, **per bus**.

For Edinburgh, 98 hybrid buses, saving 42 tonnes of carbon each

Saving over <u>4116</u> tonnes of carbon each year!

Replacing fleet with hydrogen buses

For Edinburgh alone, 400 diesel buses, saving 84 tonnes of carbon each

Saving over 33,600 tonnes of carbon each year!

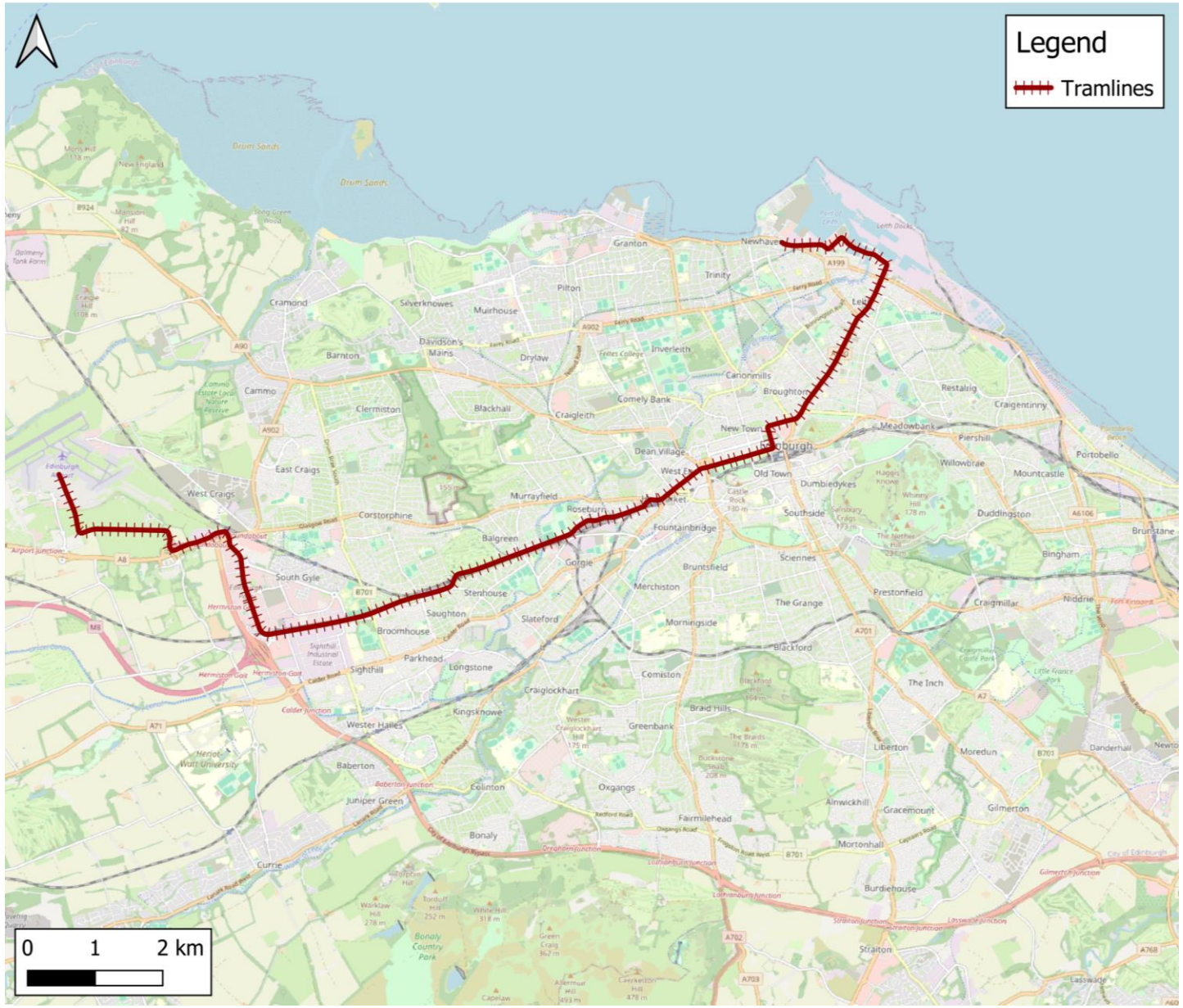
For Edinburgh alone, 98 hybrid buses, saving 42 tonnes of carbon each

Saving over 4116 tonnes of carbon each year!

Saving:
37,716 metric tonnes of CO_2e

Road Transportation:
597,701 metric tonnes of CO_2e

CO_2e Reduction:
6.31%



Current state of public transport in Edinburgh

Buses and **Trams**

Proposed in 1999,
began operation in 2014,
extended 2023.

18.5km tram line

Edinburgh Airport
to Newhaven

27 Urbos 3 trams

42m long

250 capacity
78 seated,170 standing and 2 wheelchair spaces

9.3 million users in 2023

Route and Service Expansion – Light rail

- **Edinburgh Trams**
- Proposed in 1999
- As of today…
- 18.5km tram line
- 1 line
- 23 stations/stops
- All within city boundary
- 9.3 million users in 2023

- **Manchester Metro**
- Operation since 1992
- As of today…
- 103km of track line
- 8 lines
- 99 stations/stops
- Covers city and greater county
- 42 million riders 2023/2024

- **Tyne and Wear Metro**
- Operation since 1980
- As of today…
- 77.5km of track line
- 2 lines
- 60 stations/stops
- Covers city and greater county
- 31 million riders 2023/2024

Route and Service Expansion – Light rail

- **Edinburgh Trams**
- Proposed in 1999
- As of today…
- 18.5km tram line
- 1 line
- 23 stations/stops
- All within city boundary
- 9.3 million users in 2023

- **Nottingham Transit**
- Operation since 2004
- As of today…
- 32km of track line
- 2 lines
- 50 stations/stops
- Covers city and greater county
- 15.5 million riders 2023/2024

- **Dublin Luas**
- Operation since 2004
- As of today…
- 42.1km of track line
- 2 lines
- 67 stations/stops
- Covers city and greater county
- 48.2 million riders 2023

Route and Service Expansion – Light rail

- **Edinburgh Trams**
- Proposed in 1999
- As of today…
- 18.5km tram line
- 1 line
- 23 stations/stops
- All within city boundary
- 9.3 million users in 2023

- **Oslo Metro**
- 85km of track
- Over and underground
- 5 lines
- 101 stations
- Serves 14/15 Oslo boroughs
- 1 neighbouring municipality
- 118 million (2016)

- **Helsinki Tram**
- 110km of track
- 12 lines
- 344 stops
- 57 million (2019)

- **Helsinki Metro**
- 43km track
- 2 lines
- 30 stations
- 93 million (2019)

Route and Service Expansion – Light rail

-Trams, trains, undergrounds are expensive

-Used as a political football

-NIMBY-ism in the community

-Legitimate concerns also within the community

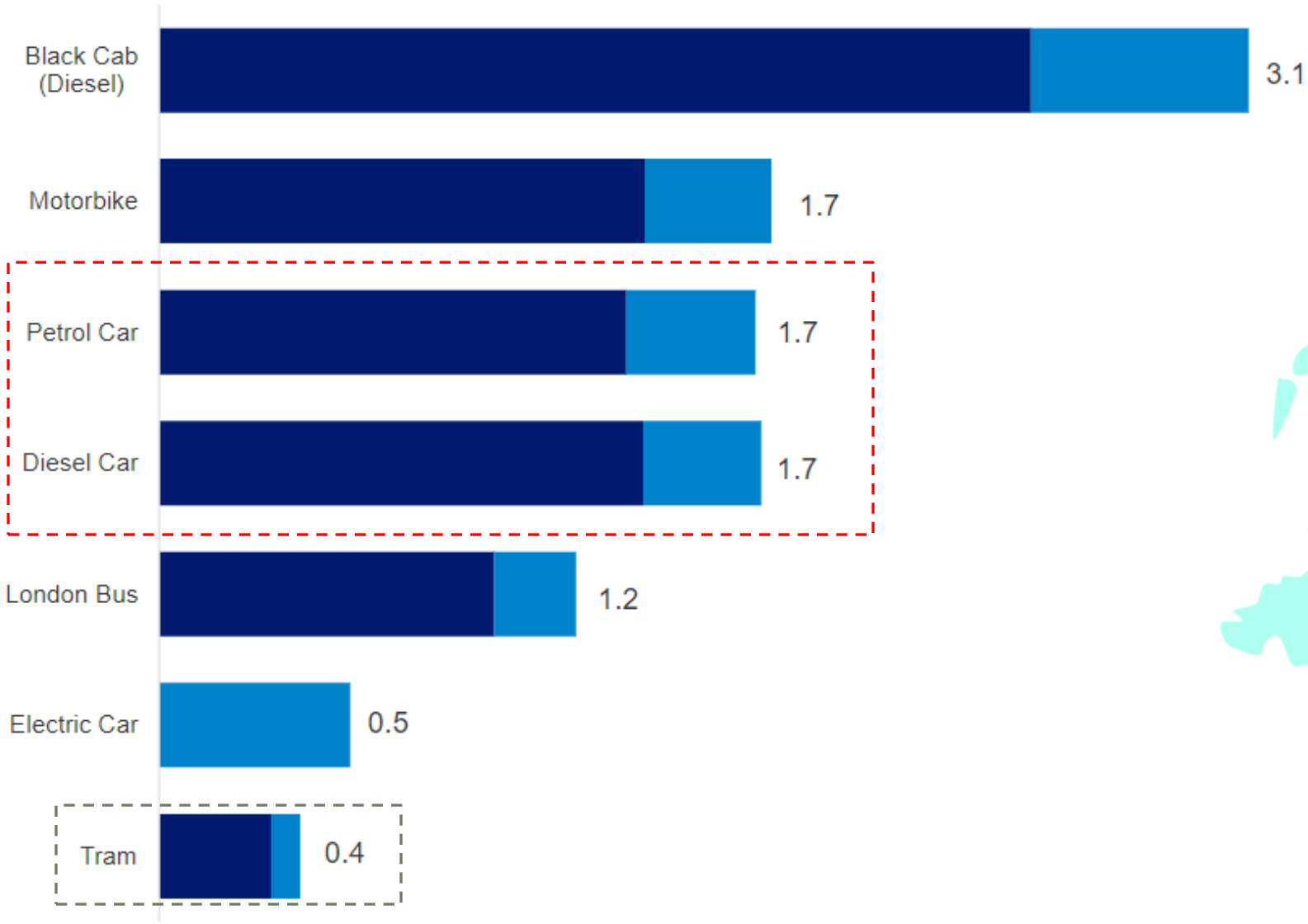
-Alternative to new tracked rapid transit…

Re-open the “south sub” train line

South-Sub

- Existing line and infrastructure already in-place
- 20km of existing track being brought back into public use
- Completely segregated from traffic allow for rapid transit
- Covers areas of high interest such as:
  -City centre
  -Densely populated areas such as Gorgie/Dalry, Morningside, Abbey hill and Portobello
  -Places of learning (Kings Buildings, Napier)
  -Sports stadia (Murrayfield, Tynecastle, Easter Road, Meadowbank)

Croydon to Wimbledon, 2023 (KgCO2e)



https://www.gov.uk/government/statistics/transport-and-environment-statistics-2023/transport-and-environment-statistics-2023

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TRANSPORTATION RESEARCH
AN INTERNATIONAL JOURNAL
Part D: Transport and Environment

Co-Editors-in-Chief: J.X. Cao and Y.-E (Ethan) Ge

Electric and hydrogen buses: Shifting from conventionally fuelled cars in the UK

Table 6. Point emission calculations for a CFV, EV, CFB, EB and HB under the two-degree national grid electricity generation predictions in 2017 and 2050 for the UK ($gCO_2\ km^{-1}$ per person, based on 100% capacity).

Transport Type	2017 ($gCO_2\ km^{-1}$)	2050 ($gCO_2\ km^{-1}$)
Conventionally Fuelled Vehicle	30.0	21.8
Electric Vehicle	15.0	1.1
Conventionally Fuelled Bus	16.3	14.2
Hydrogen Bus	12.9	1.6
Electric Bus	5.3	0.4

https://www.sciencedirect.com/science/article/pii/S136192092030537X#s0045

Volume 15, Issue 1

Bus or Rail: An Approach to Explain the Psychological Rail Factor

- Two separate studies (One in Germany, one in Switzerland)
- Passengers consider rail based public transport to be superior to bus systems
- Preference of 63 percent for regional train and 75 percent for trams compared to bus services

- Ride comfort, smoother, better air quality and ventilation
- More space, ability to move around
- Better leg room for sitting
- Dedicated car-free track, faster, on-time and reliable.

Route and Service Expansion – Tram Bus

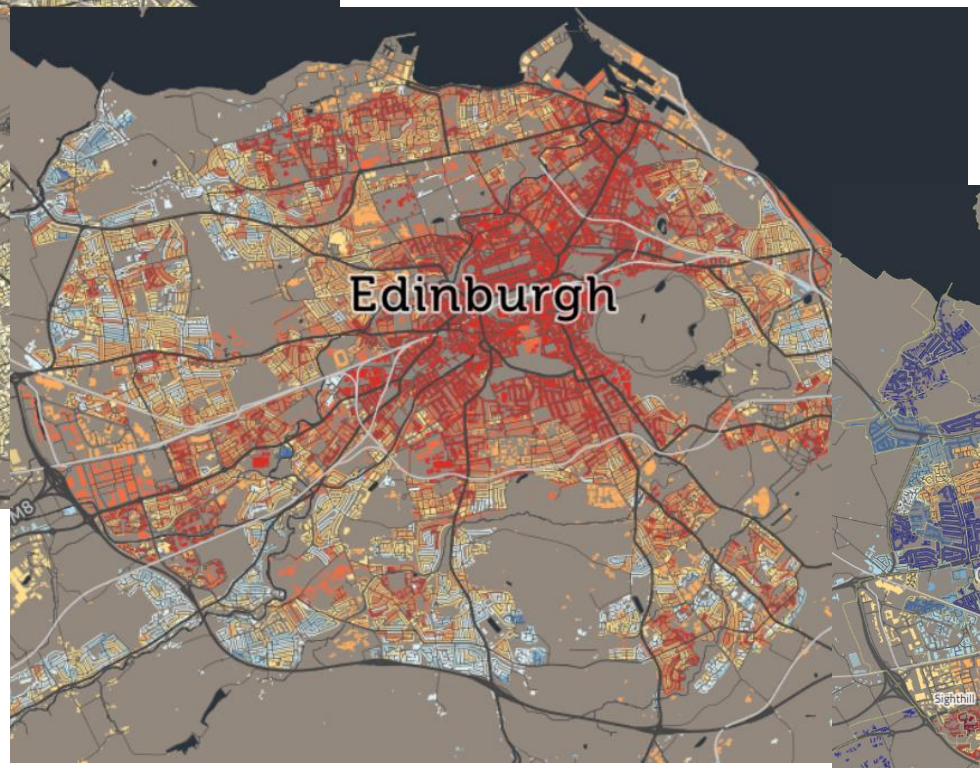
By Van Hool, 24 metres long, can carry 140 passengers, 300km range, re-fuels in just 8 minutes

Used in Basel, Malmo, Metz, Barcelona, Bergen, Luxembourg etc

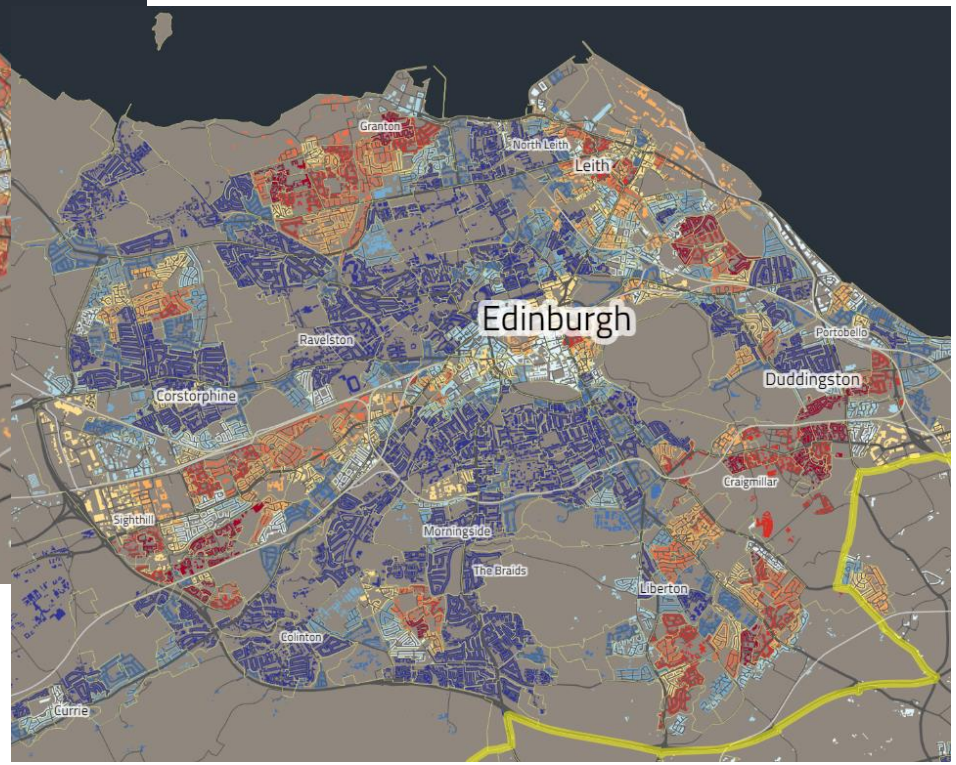
Embark/disembark like a tram, lots of space (elderly, young children, disabled). Emissions free at point of use.

Route and Service Expansion – Tram Bus

Population Density

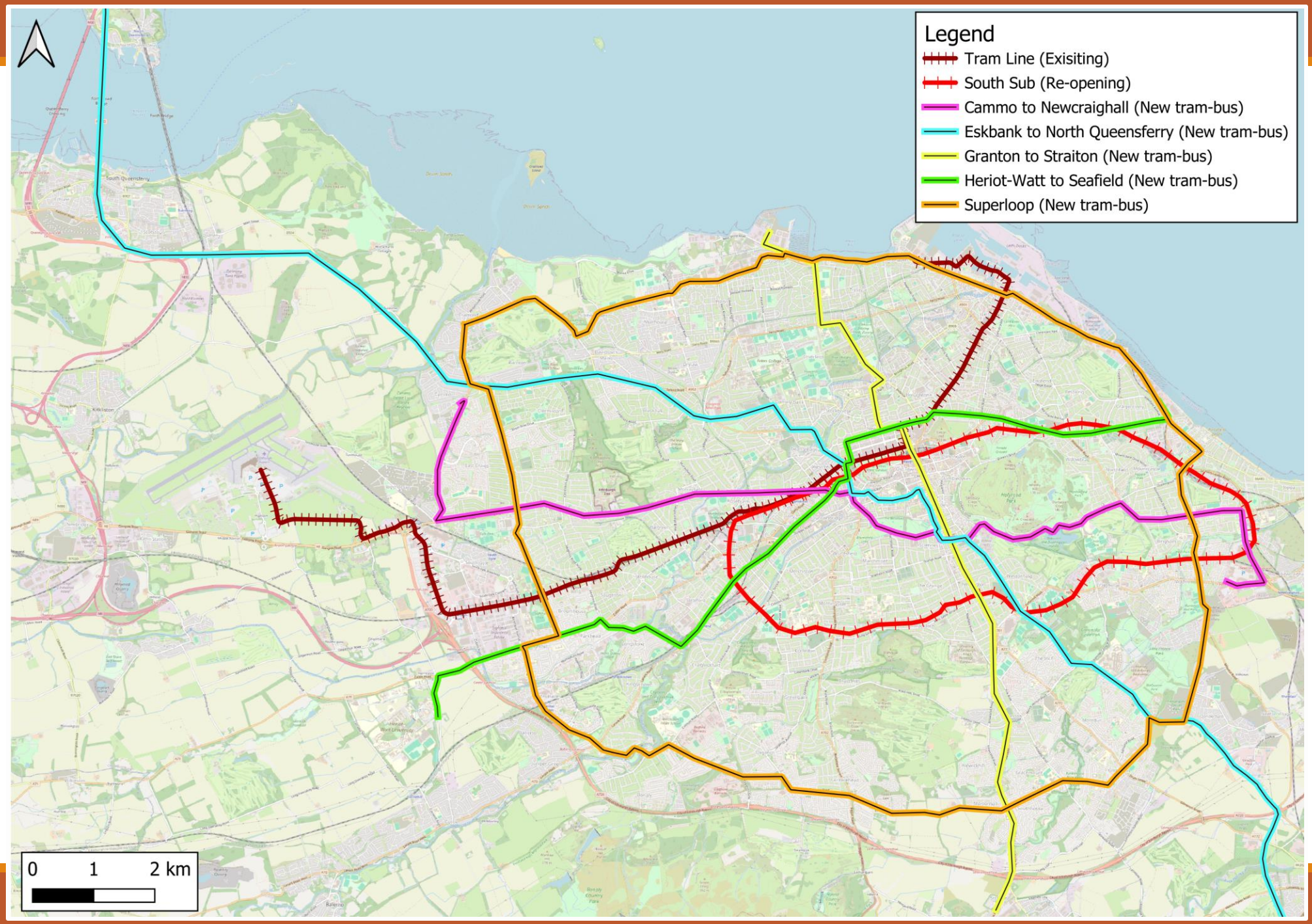


How many people drive to work



SIMD

https://scotland.datashine.org.uk/


Legend
Tram Line (Exisiting)
South Sub (Re-opening)
Cammo to Newcraighall (New tram-bus)
Eskbank to North Queensferry (New tram-bus)
Granton to Straiton (New tram-bus)
Heriot-Watt to Seafield (New tram-bus)
Superloop (New tram-bus)
0
1
2 km

Park & Rides

climate change

Scotland's centre of expertise connecting climate change research and policy

Reducing car use through parking policies: an evidence review

https://www.climatexchange.org.uk/publications/reducing-car-use-through-parking-policies-an-evidence-review/

- P&R's can increase car KM travelled
- Those close to final destinations (town centres, sport stadia etc) can encourage car use
- Findings in N. E England and Norway

- P&R sites should be located close to trip origins so that public transport is used for the majority of journey lengths.
- Planned properly, P&R along with public transportation can decrease car KM and pollution

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Assessment and optimization of parking reservation strategy for Park-and-Ride system emissions reduction

https://www.sciencedirect.com/science/article/pii/S136192092300353X

- From a Chinese study, park and rides need planned
- Increase public transportation utilisation and reduce car KM's travelled
- Poor planning can see increases of CO2e emissions
- Queuing to enter/exit, idling and driving round searching for adequate car parking space

Public Transport and GHG

Net Zero Scotland
Scottish Government

"Replacing car journeys with public transport can help reduce CO2 emissions by 42% if using the bus and 73% if travelling by train."

United Nations

"Shifting from cars to public transportation can reduce up to 2.2 tons of carbon emissions annually per individual. "

WORLD RESOURCES INSTITUTE

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

Public transport is one of the best, most cost-effective solutions available to address today's climate and development challenges.

Views on bus services

Buses run to timetable – 67%

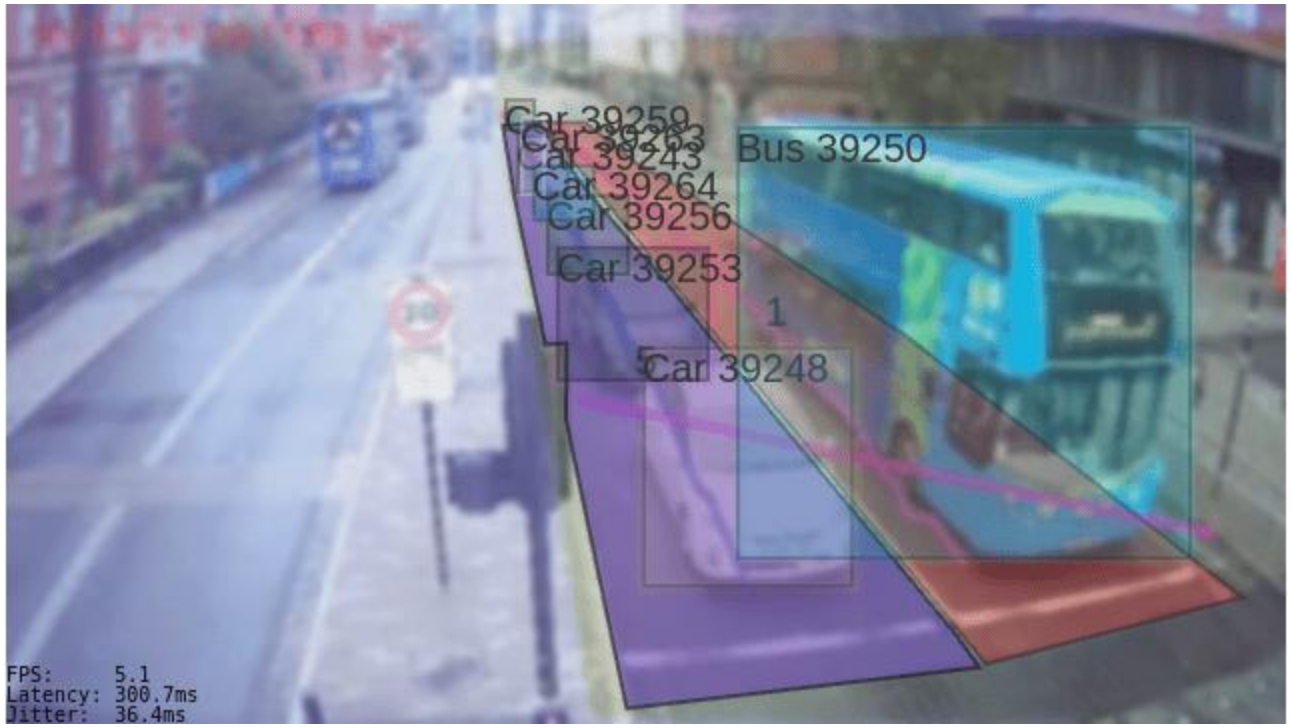
Service is stable – 70%

Bus fares are good value – 62%

Timetable and Service

TfGM A.I Cameras

- Installation of over 100 camera sensors
- Spread across the region, but aimed at traffic “hotspots”
- All sensors connect to each other and a datacentre via the 5G mobile phone network
- Using A.I and machine learning can detect all vehicle types and even pedestrians
- Double win – can reduce congestion, ensuring smooth flow of traffic to reduce idling reducing CO2
- Big win detecting buses, changing traffic light sequences to allow buses (and trams) to move, giving them priority
- Greatly speed up the bus services, keep buses on track with timetables



Encourage people onto public transport from private cars. Makes public transport a credible, speedy alternative.

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

Views on bus services

Buses run to timetable
– 67%

Service is stable
– 70%

Bus fares are good value
– 62%

Luxembourg Free Public Transport

-Unlimited public transport was available for 50,eur per month

-Public transport already subsidised by around 70-90%

-Despite being very affordable and very modern infrastructure

-Very car centric place

-Abolishment of all fares has seen some car reduction

-But results considered low?

-Trips <5km – 4% reduction in cars. 5 <10km – 3% reduction. 10 <25km – 3% reduction. >25km – 4% reduction in car

Edinburgh 2030/2050 Climate Strategy Goals

12.5% reduction in I.C.E car km travelled - 290,000,000 km taken of the road - Equivalent 49,000 metric tonne CO2e

Needs investment in public transport, residents need greater access to public transport (distance to services and cost)

But ultimately public transport won't reach these targets alone

Incentives to use public transport help somewhat

Stronger measures needed (Paris: parking fees for SUV's tripled, parking spaces removed, speed restrictions across the city, cars outright banned for LTZs and school areas (except residents, emergency services), wholly pedestrianised areas and have had huge investment in cycling infrastructure.

Results = last decade Paris car journeys decreased have 45%, public transport usage increased by 30%.

London similar (ULEZ, rapid transit system, active travel) = traffic down 14% in 2022 compared to 2019

Thanks for listening.

Any questions?