



Ecochurch Talk 15/02/23

Nick O'Riordan

- Church of England policy: net zero by 2030!
- Some challenges for Horsham Parish and all of us
- Heating choices
- Transport choices

Who am I?

- AKC > check 'Nick O'Riordan' on Google, and Wikipedia.de for Germanophones!
- Joined Arup 1977, director 1997-2019, Arup Fellow 2012, 2019>consultant
- 1993-2003: Ground Board of CIRIA (Construction Industry Research and Information Association)
- 2003-2008: Advisory Panel of Rail Research UK
- Engineering & Environment Panel of EPSRC
- Visiting Prof at Southampton Uni, Industrial Fellow at Bristol Uni
- 58th Rankine Lecturer 2018
- Invited lectures all over the place, *including MStTeams now!*



Formation: a classical education

*..it is the greatest happiness of the greatest number
that is the measure of right and wrong*

A Fragment on Government, Jeremy Bentham, 1776



Epicurus



Lucretius: *De rerum natura*



Bentham: Utilitarianism/Enlightened self-interest



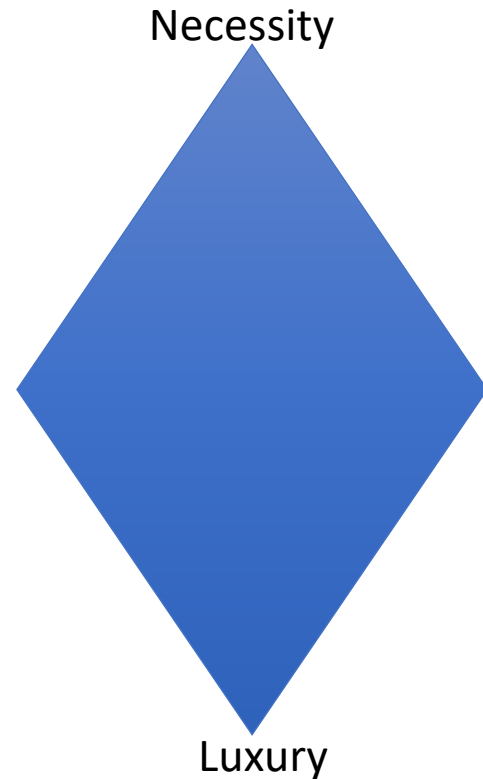
Ove Arup (1895-1988) > staff-owned engineering consultancy



The 'Common Good': SS Paul, Augustine of Hippo

Bentham (1748-1832) 'auto-icon' at UCL

Civilisation: engineering the built environment



- Deal with extreme events
- Maintain existing infrastructure and buildings
- **Enable growth**
- Build new infrastructure
- Build new buildings

Gapminder: world prosperity

- [https://www.gapminder.org/tools/#\\$chart-type=bubbles&url=v1](https://www.gapminder.org/tools/#$chart-type=bubbles&url=v1)

Choices in the modern, post ‘Enlightenment’ world

- Greatest good for the greatest number of people (Bentham, 1776)
- What is ‘good’?
- Who decides what is ‘good’?

“

Tomorrow could be worse. Today’s children and teenagers will face catastrophic consequences unless we take responsibility now, as ‘fellow workers with God’ (Gn 2.4-7), to sustain our world. We frequently hear from young people who understand that their futures are under threat.

For their sake, we must choose to eat, travel, spend, invest and live differently, thinking not only of immediate interest and gains but also of future benefits.

Archbishop of Canterbury,
Pope Francis and Ecumenical
Patriarch Bartholomew, 2021

- 2022 No. 155
- ECCLESIASTICAL LAW, ENGLAND

• **The Faculty Jurisdiction (Amendment) Rules 2022**

- Made (approved by General Synod) 9th February 2022
- Laid before Parliament 23rd February 2022
- Coming into force 1st July 2022
- The Rule Committee, in exercise of the powers conferred by sections 77(1) to (7) and 83(1) and (2) of the Ecclesiastical Jurisdiction and Care of Churches Measure 2018(1), makes the following Rules:
 - Citation, commencement and interpretation
 - 1.—(1) These Rules may be cited as the Faculty Jurisdiction (Amendment) Rules 2022.
 - (2) These Rules come into force on 1st July 2022.
 - (3) In these Rules, a reference to a numbered rule or Schedule is a reference to the rule or Schedule so numbered in the Faculty Jurisdiction Rules 2015(2).
- **Requirement to have due regard to net zero guidance**
- 2.—(1) In rule 2.2 (interpretation), in paragraph (1), at the appropriate place insert—
 - ““net zero guidance” means guidance issued by the Church Buildings Council under section 55 of the Dioceses, Pastoral and Mission Measure 2007(3) on reducing carbon emissions;”

- **From:** Diocese of Chichester <chichester.diocese@cofeportal.org>
Sent: Thursday, November 17, 2022 3:55:51 PM

Subject: Faculty requirements for gas and oil boilers

- Dear Clergy and Churchwardens,
- I hope you are all well.
- We emailed earlier in the year to advise you of the latest changes to the Faculty Jurisdiction Rules, which came into effect on 1st July. Some of those changes were implemented to encourage parishes to make environmentally-friendly choices as part of the Church's commitment to achieving Net Zero carbon emissions by 2030.
- The rules now require that a PCC **must seek a faculty for replacing a fossil fuel heating system with another fossil fuel system**. In applying for such a faculty, PCCs are required to show that they have paid due regard to the Church of England's guidance on heating.
- This guidance urges parishes with failing or defunct gas and oil fired boilers to explore whether they can switch instead to a form of electric heating, such as air or ground source heat pumps, pew heaters, heated seat cushions, or infra-red radiant heaters.
- For some parishes, replacing a gas or oil-fired boiler with a similar boiler may be the only feasible option at this point. If a PCC feels that is the case, it will need to demonstrate its reasoning and justification in the faculty application and show evidence that the PCC has explored more environmentally friendly options.

In other words: this is not 'Business As Usual'!



Routemap to Net Zero Carbon by 2030

Net Zero Carbon church St Michael's and All Angels, Withington

What is 'Net Zero'?

The Church of England defines Net Zero Carbon as the reduction as far as possible of all in-scope carbon emissions (from the oil, gas and electricity we use in our buildings and petrol and diesel transport) and the removal of an equivalent amount of carbon from the atmosphere for the remaining in-scope emissions by use of accredited offsetting schemes.

<https://www.churchofengland.org/about/environment-and-climate-change/net-zero-carbon-routemap>

Church of England: Net Zero by 2030!



IN SCOPE OF TARGET BY 2030

SCOPE 1

Building emissions from oil and gas heating: churches & church buildings; cathedrals; housing; offices; TEs; schools over which the Church has significant influence
Business travel in owned petrol/diesel vehicles



IN SCOPE OF TARGET BY 2030

SCOPE 3

Business travel in non-owned transport



NOT IN SCOPE

aim to missional Influence

Commuting
Congregation travel
Staff and clergy family lifestyles
Church Members' Emissions
Emissions from school buildings over which the Church has little influence



IN SCOPE OF TARGET BY 2030

SCOPE 2

Generation emissions from the electricity we use to run our buildings



IN SCOPE BUT ONLY AFTER 2030

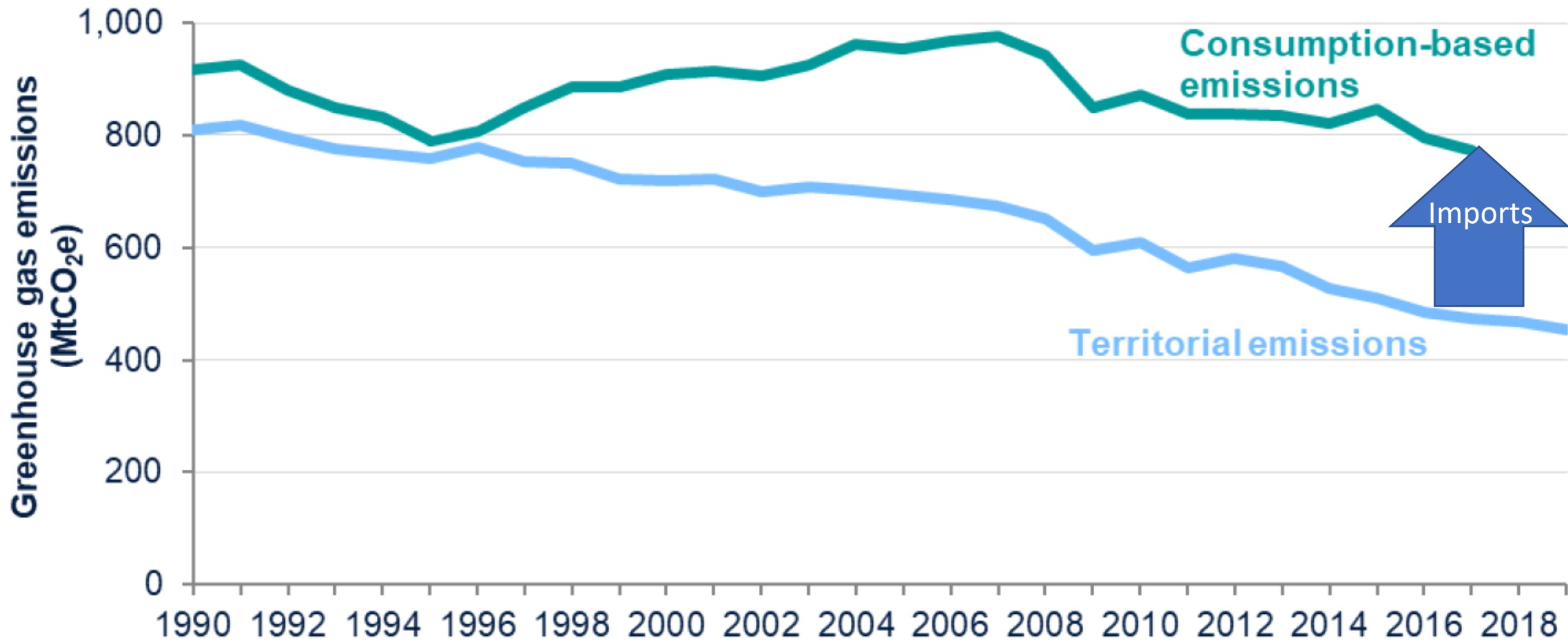
SCOPE 3

Purchasing
Waste
Water
Contractors
IT
Air conditioning gases



For full details of the scope of the Church of England Net Zero Carbon target, see the appendix

UK territorial and consumption-based greenhouse gas emissions, 1990-2019



Source: Department for Business, Energy & Industrial Strategy (Feb 2021)

Territorial average = 6 tonnes CO₂e/person/year

Personal annual carbon footprint

06/02/2023, 10:02

carbonfootprint.com - Carbon Footprint Calculator

Welcome House Flights Car Motorbike Bus & Rail Secondary **Results**

Your Carbon Footprint:

<input checked="" type="checkbox"/> House	1,49 metric tons of CO ₂ e
<input checked="" type="checkbox"/> Flights	5,68 metric tons of CO ₂ e
<input checked="" type="checkbox"/> Car	1,77 metric tons of CO ₂ e
<input checked="" type="checkbox"/> Motorbike	0,00 metric tons of CO ₂ e
<input checked="" type="checkbox"/> Bus & Rail	0,03 metric tons of CO ₂ e
<input checked="" type="checkbox"/> Secondary	2,32 metric tons of CO ₂ e

Total = 11.29 metric tons of CO₂e

To offset some or all of your carbon footprint, click the sections you would like to offset in the list above, and click the Offset Now button.

Total To Offset = 11.29 metric tons of CO₂e [Offset Now](#)

		
Your Footprint	Country Average	World Average

- Your footprint is 11,29 metric tons per year
- The average footprint for people in United Kingdom is 5,40 metric tons
- The average for the European Union is about 6,8 metric tons
- The average worldwide carbon footprint is about 4,79 metric tons
- The worldwide target to combat climate change is 0 metric tons

If you're using a public computer, or want to try again, you can [clear your carbon footprint data](#)

For ideas on how to reduce your carbon footprint, see the [CO₂ Reduction section](#) of our website.

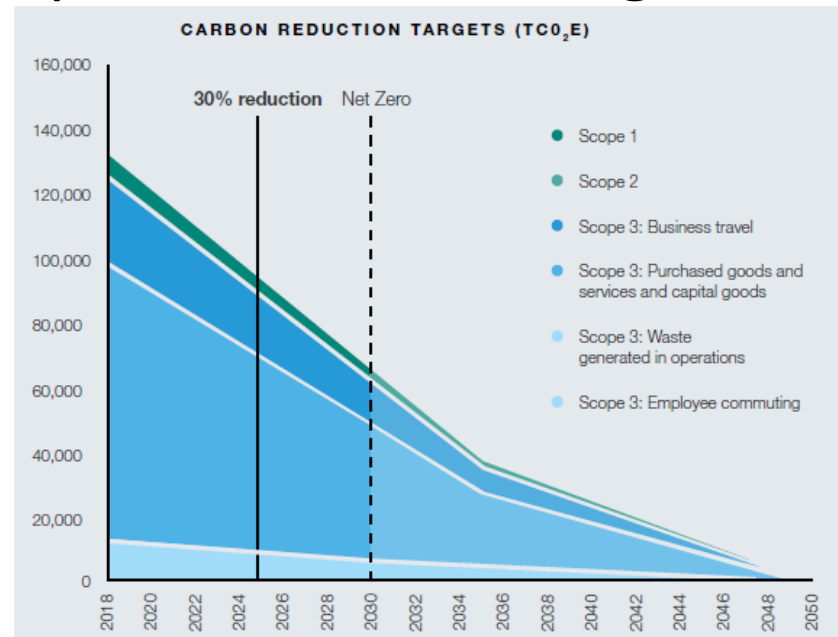
[< Secondary](#)

5 tonnes: business trip to Far East

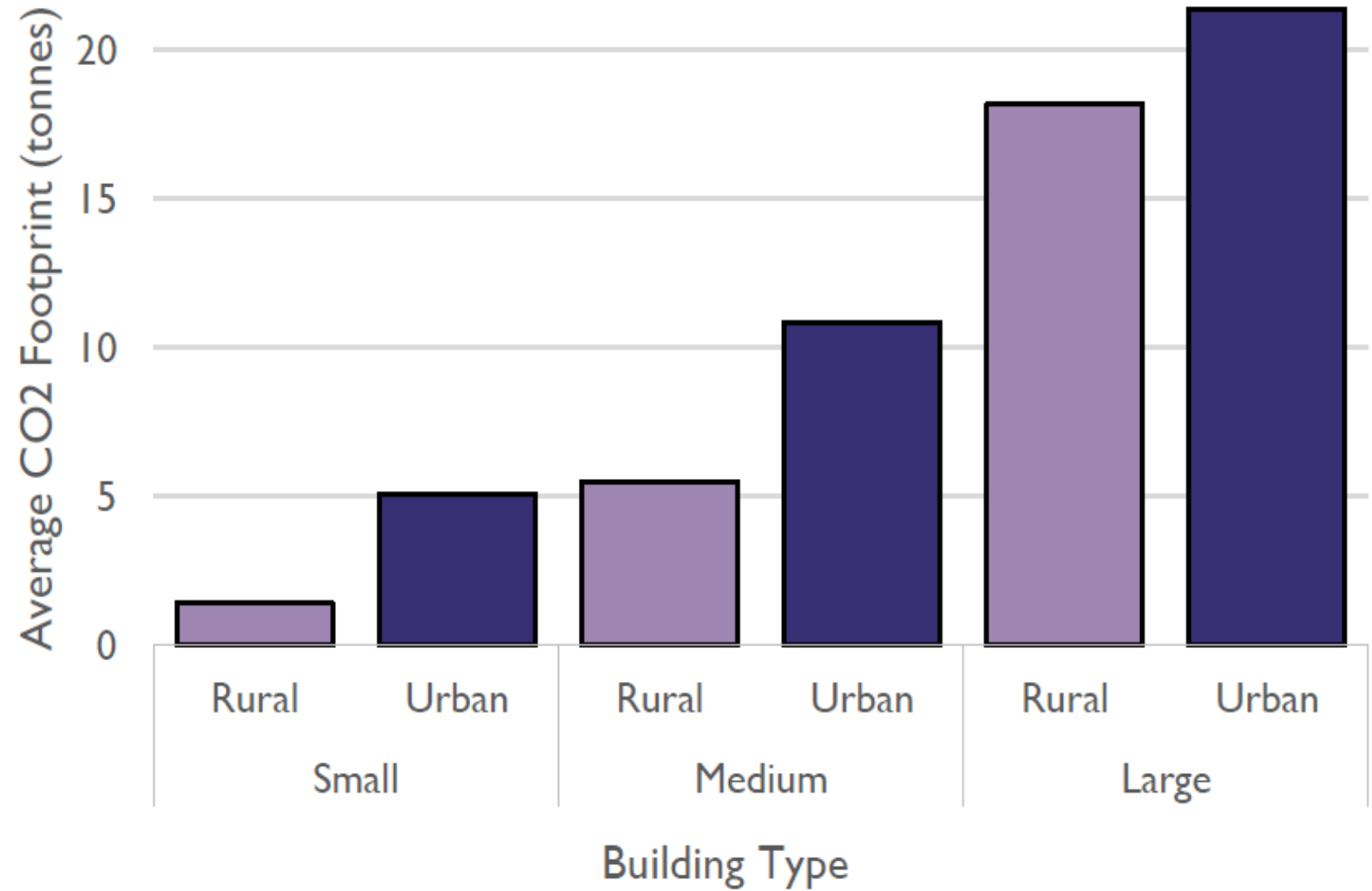
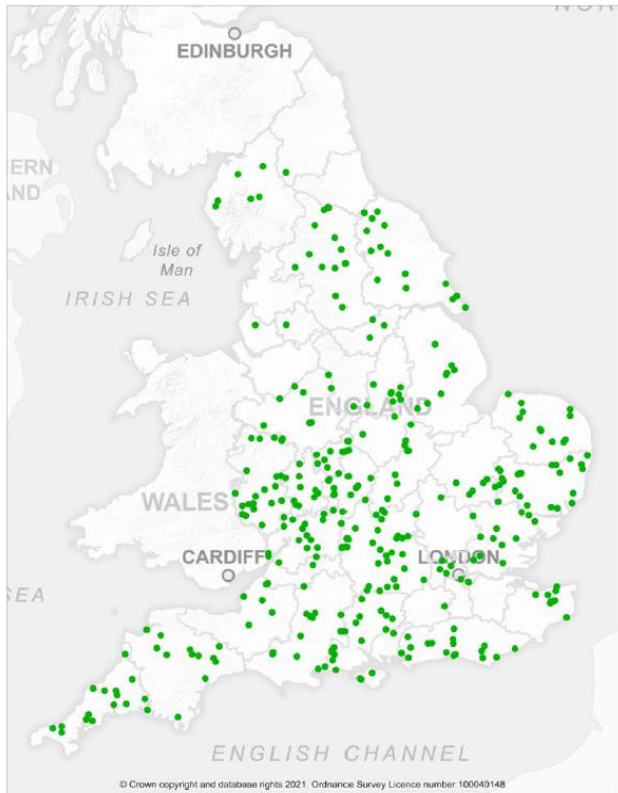
~1 tonne: non-UK origin food

CofE Parish Returns: Energy Footprint report 2020

- Summary: CofE has a turnover of ~ £1bn (about 50% of Arup global turnover)
- Estimated carbon footprint for CofE in England= 140,000 tonnes
- cf Arup globally



CofE Parish Returns: Energy Footprint report on 2020



Horsham Parish consumption: mainly heating, transportation and waste generation

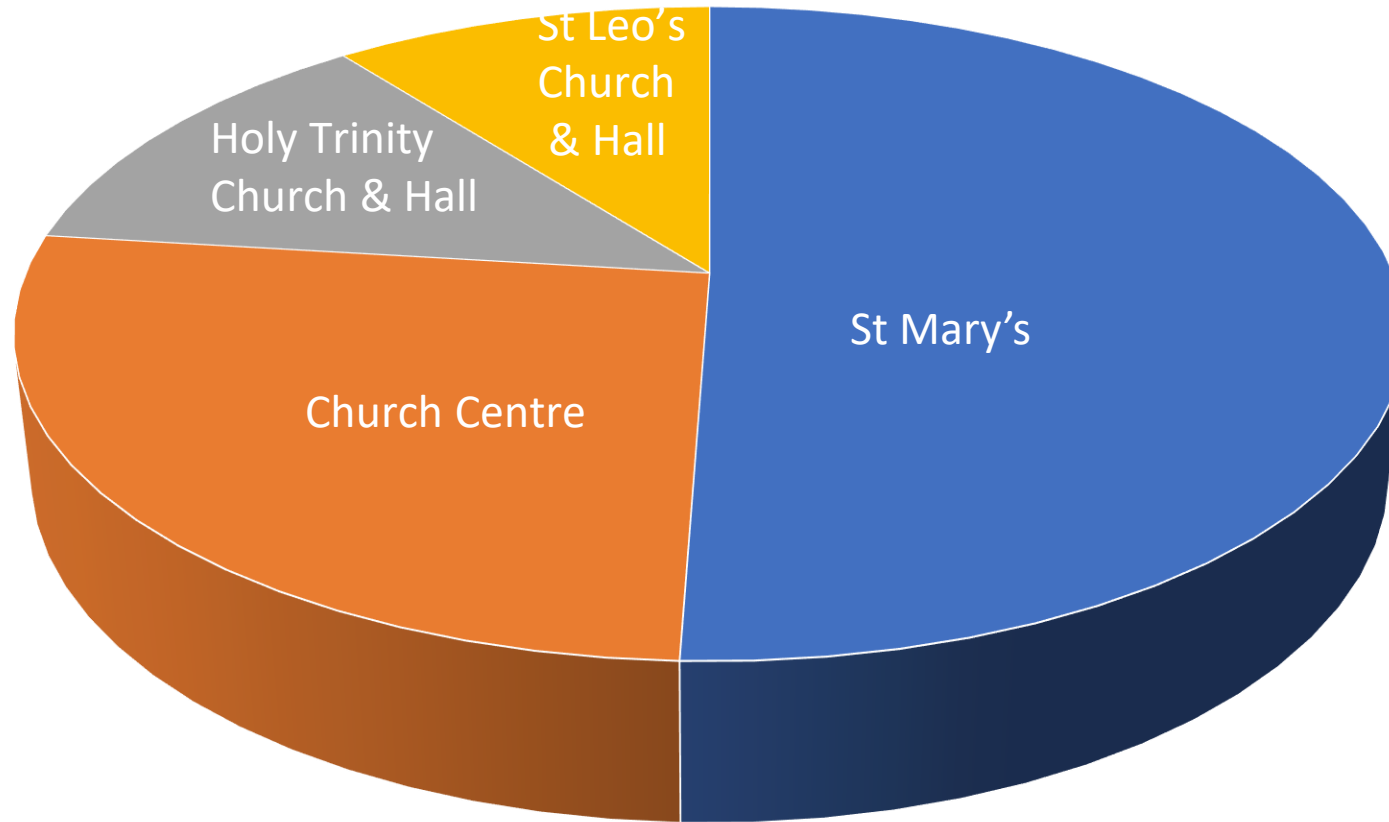
Horsham Parish owns and operates **eight** fossil fuel boilers of which only **one** can be considered 'modern'

Choices: Parish gas and electricity consumption

		2019	2020	2021	2022	2022
St Mary's Church (1,262m²)	Gas (kWh)	262000	122000	168000	179591	Gas: 143 kWh/m² Electricity: 10.3 kWh/m²
	Electricity (kWh)	16800	10500	10200	12945	
Church Centre (494m²)	Gas (kWh)	100000	59000	50000	91225	Gas: 185 kWh/m² Electricity: 18.5 kWh/m²
	Electricity (kWh)	10500	7500	7600	9162	
	Total Carbon footprint	73 tonnes	37.5 tonnes	44.5 tonnes	55.3 tonnes	
		2019	2020	2021	2022	
Holy Trinity Church (300m²)	Gas (kWh)	40500	34700	39200	35000	Gas: 116 kWh/m² Electricity: 14.5 kWh/m²
	Electricity (kWh)	5500	4310	4800	4334	
Church Hall (225m²)	Gas (kWh)	2300	4300	1000	1125	Gas: 5 kWh/m² Electricity: 32 kWh/m²
	Electricity (kWh)	8100	5600	6400	7252	
	Total Carbon footprint	11 tonnes	9.5 tonnes	10 tonnes	9.3 tonnes	
		2019	2020	2021	2022	
St Leonard's Church (300m²)	Gas (kWh)	30000	53000	28500	35074	Gas: 117 kWh/m² Electricity: 17 kWh/m²
	Electricity (kWh)	10000	2900	3800	5025	
	Total Carbon footprint	8 tonnes	10.5 tonnes	6.5 tonnes	8.1 tonnes	

Pie chart!

Total **Annual** Parish energy footprint =381,000 kWh or **76.2 tonnes** of CO₂e/ year



Carbon offsetting of 76 tonnes/year?

- Plant 3000 trees/year somewhere appropriate
- Donate about £1500/year to Climate Stewards/Arocha carbon credit projects
- Or move to reduce consumption

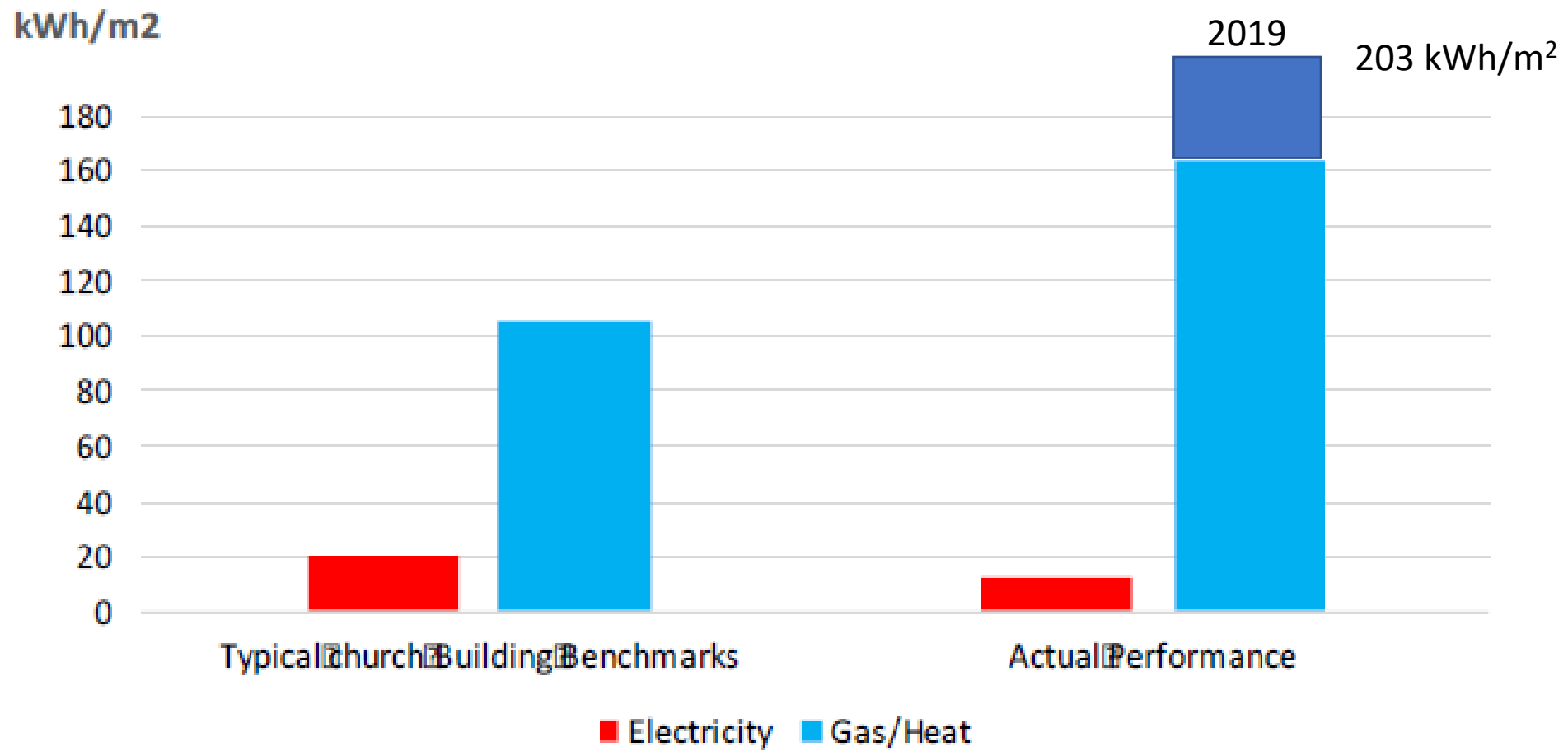


Figure 1 Energy benchmark comparison –Church building

From: *St Mary's Church, Horsham Energy Assessment* SOENECS (2016)

St Mary's Church Energy usage and cost as at January 2023

- Gas 180,000 kWh @ 2.5p/kWh=£4,500
- Electricity 13,000 @ 13.9p/kWh=£1,800

These rates are 3 years old and our contracts expire this summer.

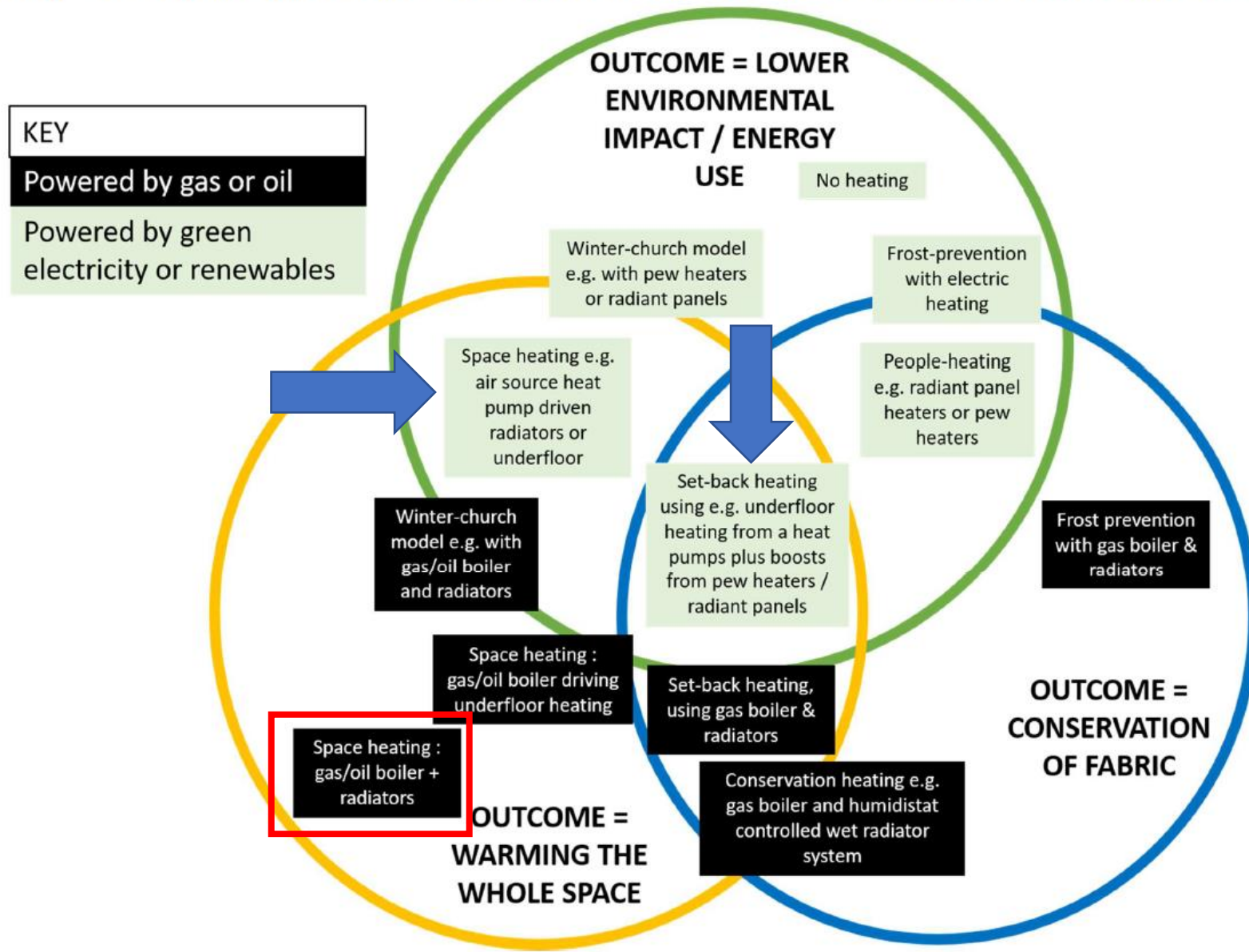
Using current UK govt intervention rates of 7.5p/kWh (G), 21.1p/kWh (E) as a probable minimum*:

Energy Bill for the church alone would rise by **£10,000/year** to £13,500 (G) and £2740(E).

Energy Bill for Church Centre + Church together would rise by **£15,000 /year**

* EDF current Standard (Variable) tariff is 10.3p/kWh(G) and 36p/kWh(E)

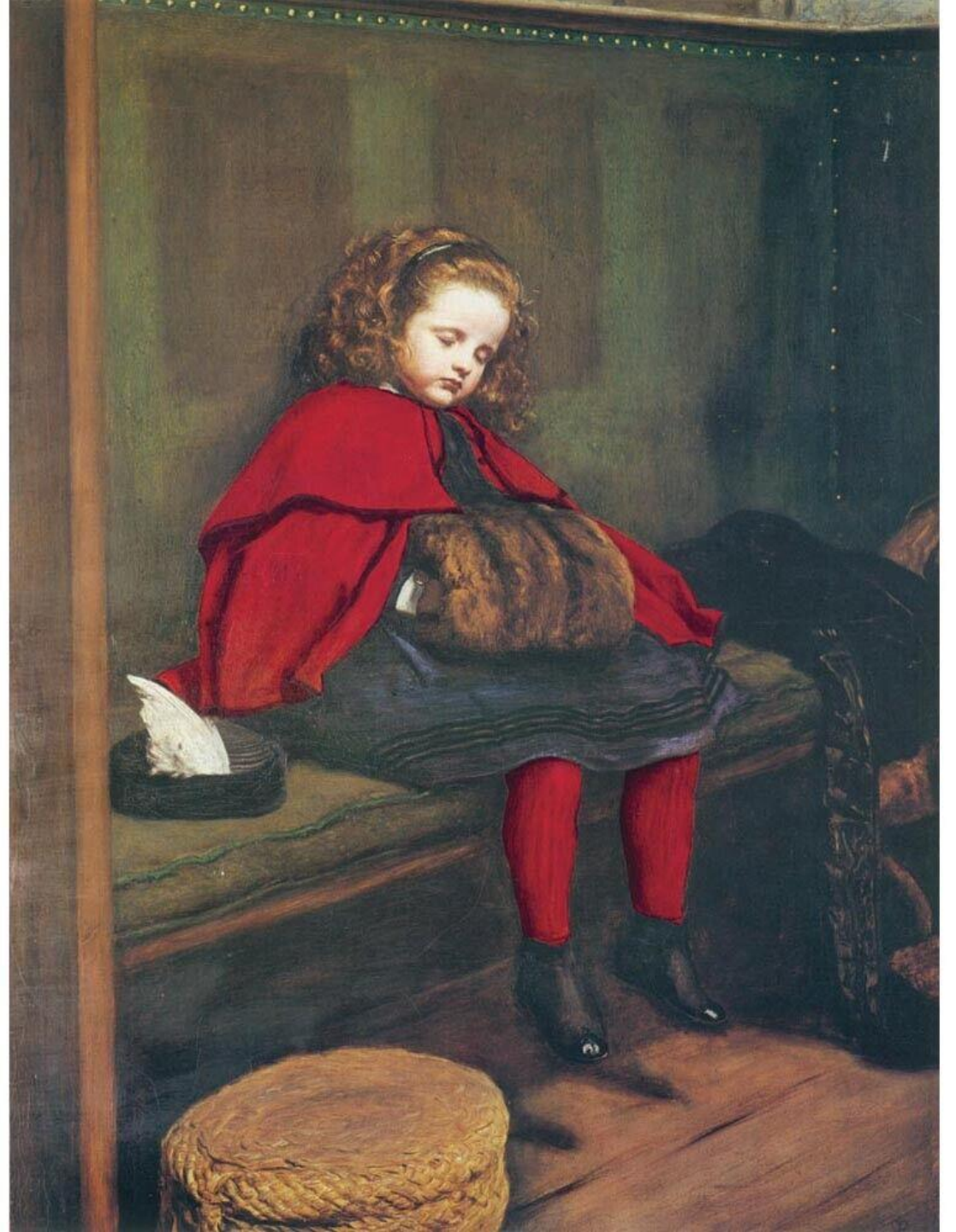
APPENDIX 3 –DIFFERENT HEATING APPROACHES AND ENERGY SOURCES ACHIEVE DIFFERENT OUTCOMES



From: *Review of heating guidance: establishing principles*, Church Buildings Council (2020)

People-heating/
'wrap-up warm'

JE Millais 'First sermon'
(1865)
Second sermon!



Some heating futures in a low carbon economy



Solar panels and storage (easier for non-listed buildings)



Infrared heaters



Air source heat pump



Hydrogen gas boiler (aka 'hopium', better suited to transportation?)

PV solar cell stats at Barnfield

Enlighten will undergo scheduled maintenance between February 3 2023 and Feb 4 2023. This will have no impact on your energy production. No data loss is expected though you may experience slowness with the application during this time period. [x](#)



Nicholas & Christine O'Riordan

Full System

Energy: Lifetime Apr 29, 2014 – Feb 6, 2023 Show Consumption

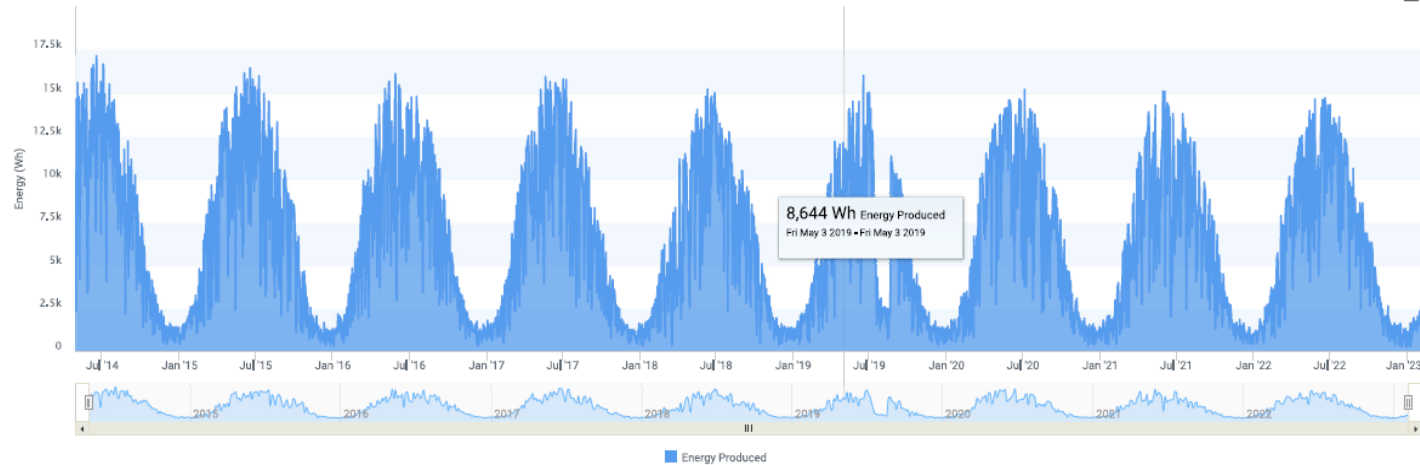
Installed by CJ Solar
April 2014

Address
Edison House, Unit 7, Edison Close
Ransomes Europark
IP3 9GU Ipswich, Suffolk
United Kingdom

Customer Support Email
support@cjsolar.co.uk

Customer Support Phone
01473 276688

Website URL
www.cjsolar.co.uk



Energy: Lifetime

Apr 29, 2014 - Feb 10, 2023

15 Microinverters
1 Gateway Ethernet
Horsham - United Kingdom

3°C

System Normal

Full System

Energy Status

Today

291.00 Wh

Peak: 341.00 W at 9:30 AM
Lowest: 49.00 W at 9:25 AM

Past 7 Days

15.42 kWh

Month To Date

21.70 kWh

Lifetime

19.58 MWh

Microinverter AC Voltage

246.1 V



System Energy
19.6 MWh

Roofscapes

Holy Trinity Church and Hall (50,000 kWh/year)

South facing roof areas = 400m²

300 PV cells (10 x 8, 20 x 11 arrays)

>>60,000 kWh/year



St Leonards Church and Hall (40,000 kWh/year)

South facing roof area = 200m²

150 PV cells (20 x 8 array)

>>30,000 kWh/year



The conundrum at St Mary's

- Use of the church November to April
- Constrained by largely Medieval fabric and difficulty of insulating a Grade 1 listed building
- Smart thermostats can be fitted to control gas boilers for Bethany and part of Church Centre: triggering by motion sensors and learning algorithms, trackable using smartphones
- South aisle: recycle pews and introduce underfloor heating

Plan for 8 to 10 year payback period

**in both
financial and
carbon reduction
terms**

Carbon Investment period of return: some examples

- California High Speed Rail: 8 years
- High Speed 1 (Eurostar, London to Folkestone): 10 to 15 years
- Cross rail/Elizabeth line*: > 60 years
- New Motorway UK: c.15 years
- Nuclear power station in the UK: <1 year (includes deep depository, construction, operation and maintenance)

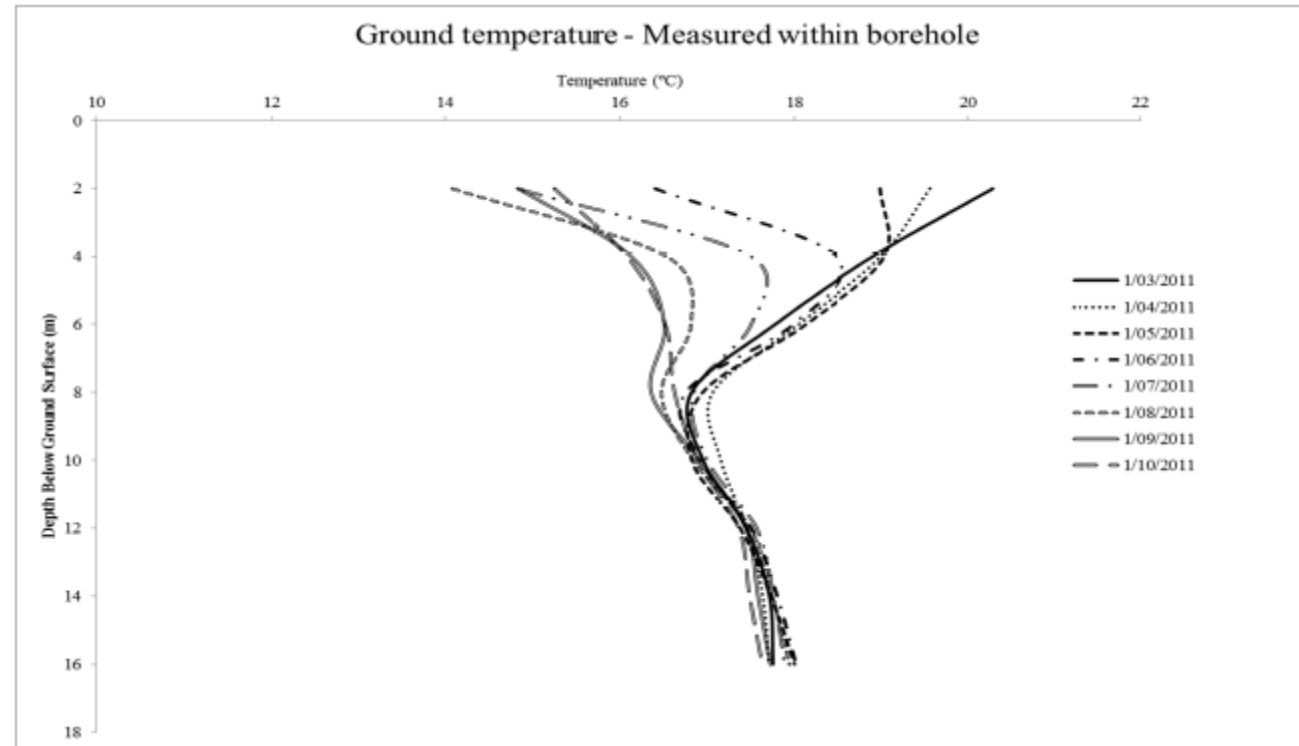
*Ian Lindsey (2012) presentation: Crossrail and the Future of London's Transport.

http://www.ucl.ac.uk/sustainable-cities/results/2062presentations/transport2062_Lindsay.pdf;

Tunnels are always a high carbon investment

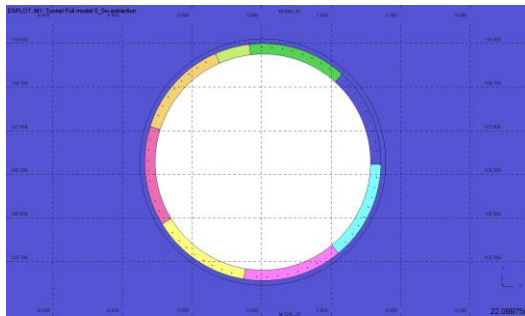
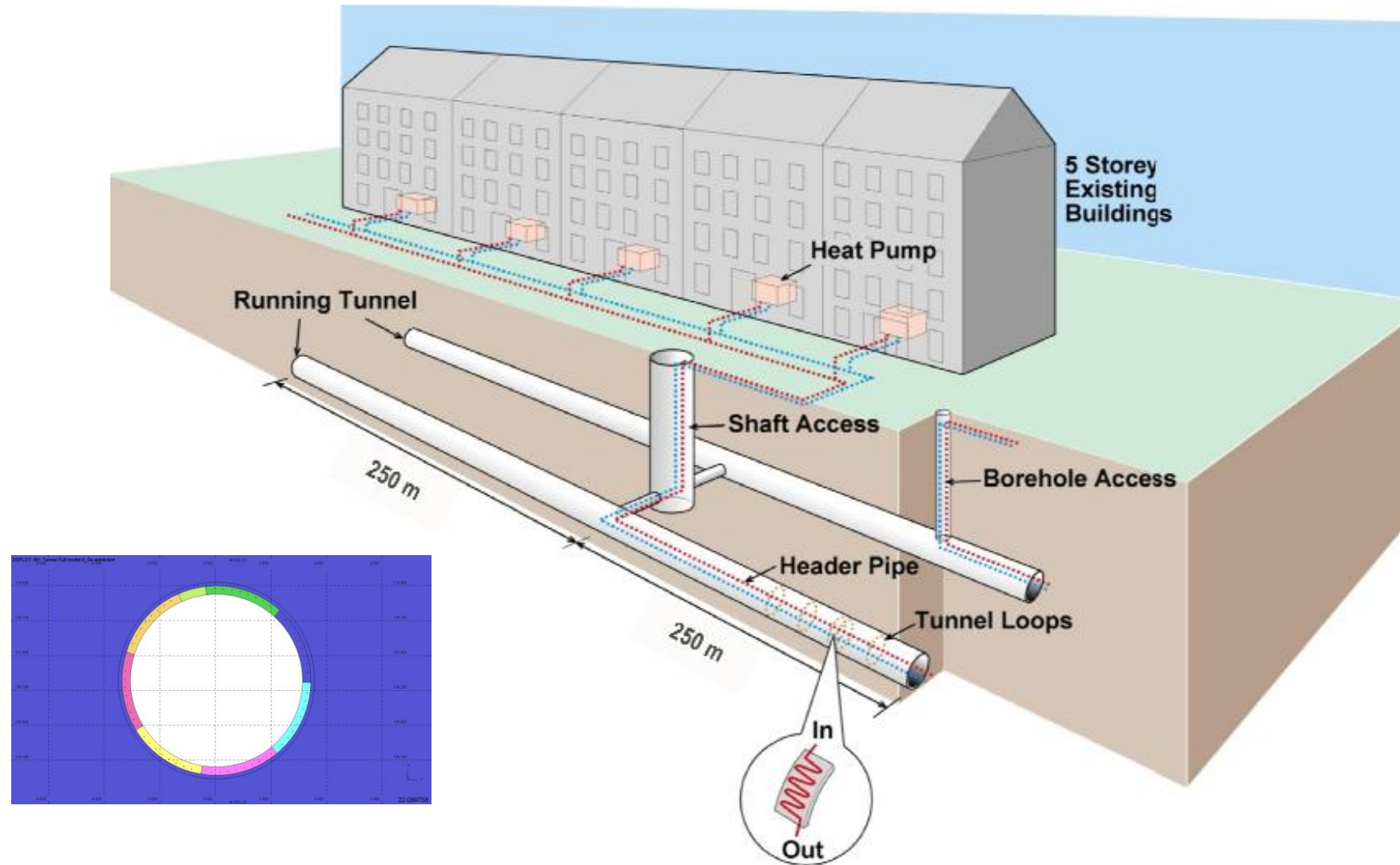
- they should be multi-functional

Natural temperature gradients at shallow depth



Pile test site at Monash Uni, Clayton, after Wang et al (2012)

Multi-functional, co-located buried infrastructure

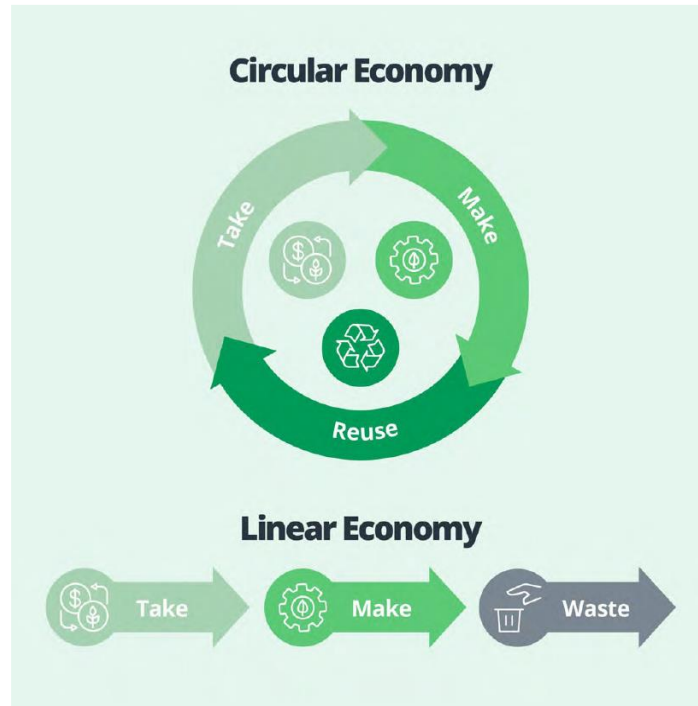


Having a net zero carbon plan is important

- Otherwise opportunities will be lost
- Ad hoc decisions are rarely durable and resilient

Circular economy

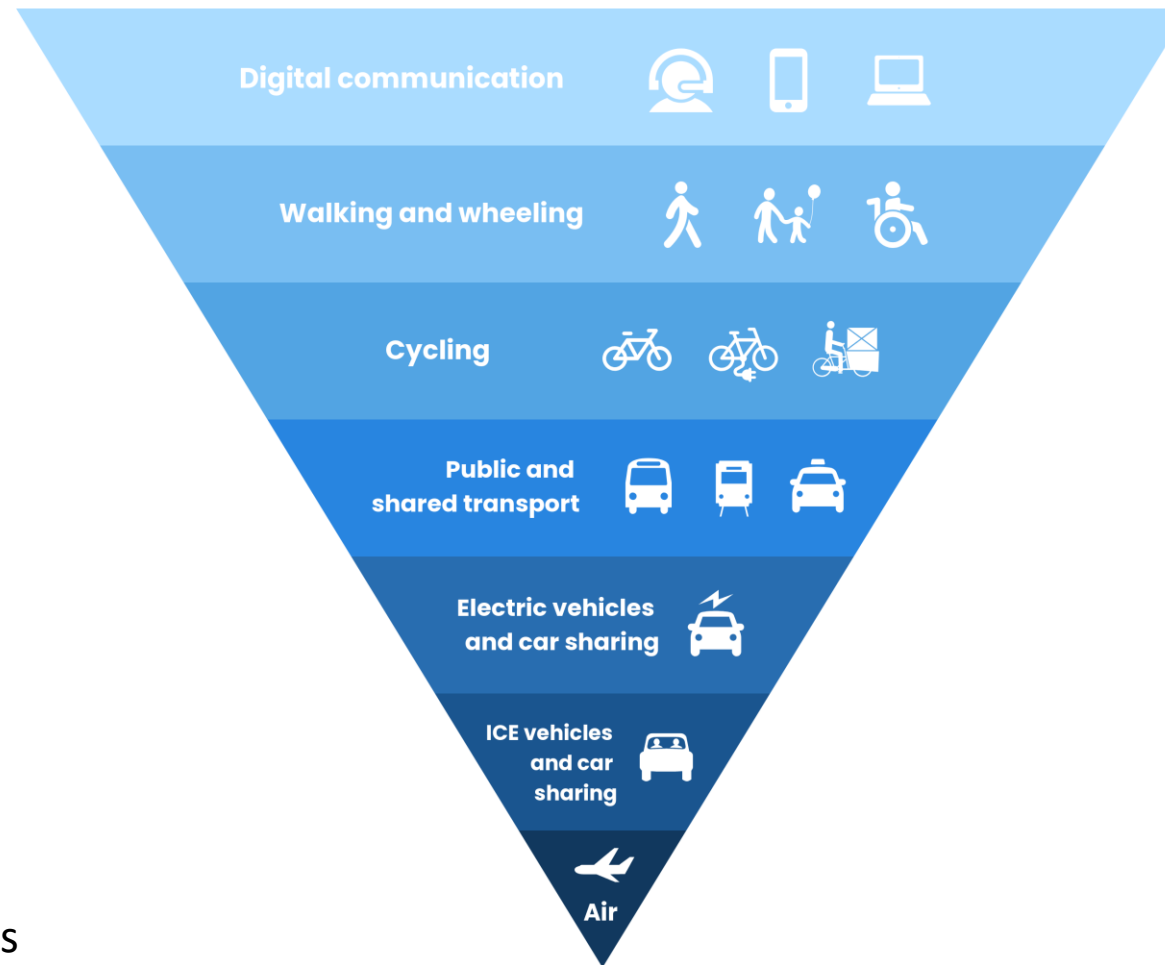
- <https://ellenmacarthurfoundation.org/about-us/what-we-do> globally
- <https://rheapply.com/> in the US
- <https://www.loopfront.com/> in Denmark
- <https://www.youtube.com/watch?v=65Vt-mTYfW4> cradle to cradle carpetting



Transport choices:

travel hierarchy

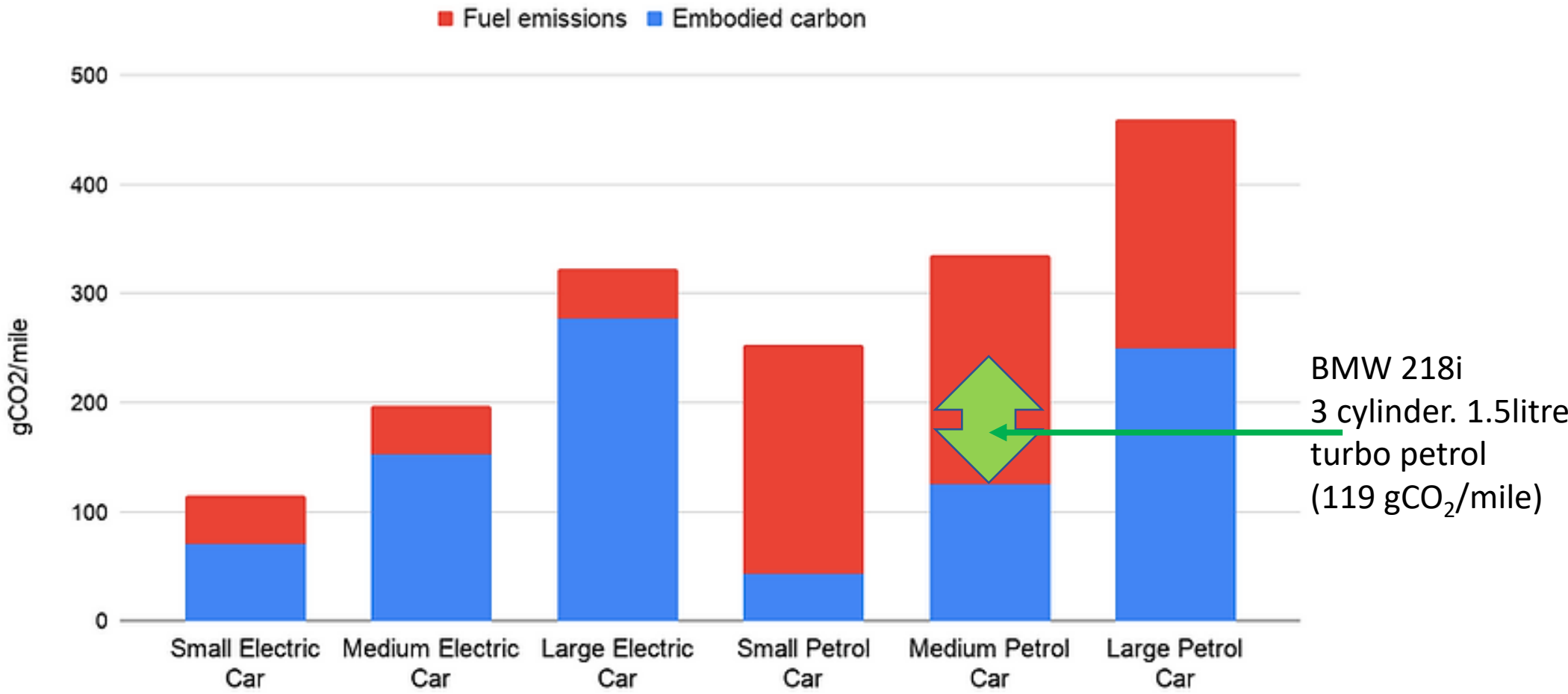
Imparting information

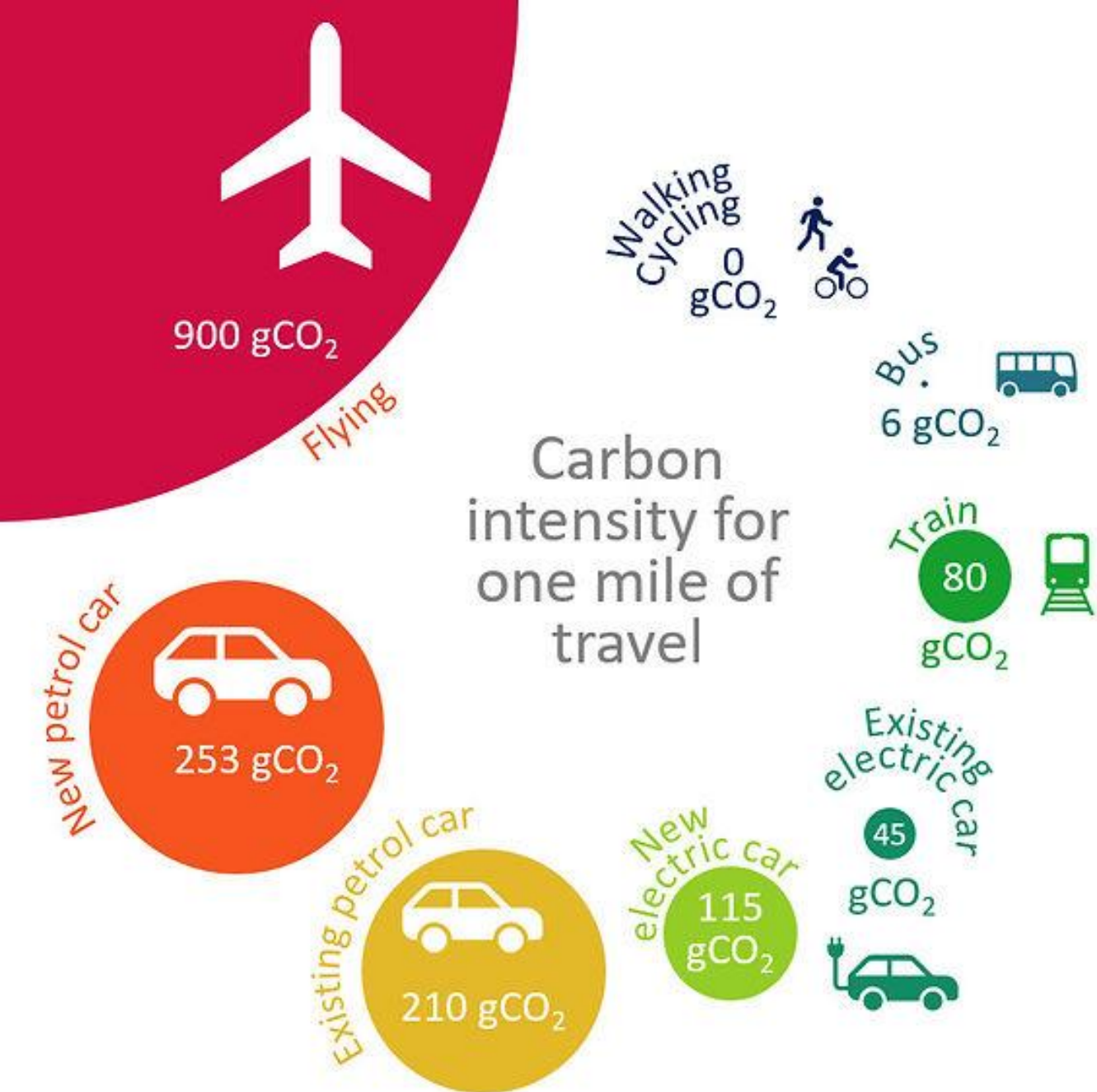


Influencing/changing hearts and minds

New Cars: 200,000 miles before taken to scrap/recycling

Comparison of carbon dioxide emission of new vehicles





If you need a new car: buy electric, but buy pre-owned!

Summary

- Church of England is aiming for Net Zero Carbon by 2030
- At St Mary's can set an example of good, sustainable behaviour:
- **Recognise** that 'business as usual' is no longer an option
- **Plan** to remove fossil fuel boilers from our buildings
- **Reduce** waste and consumption
- **Reuse** and repurpose
- **Recycle**, increase our participation in the Circular Economy



Absolutely: reduce carbon!

Any questions?