Haddenham Parish Climate Emergency

Year 0

Report 6/1/20

Parish Council Meeting

HADDENHAM
Parish Council

Nota Bene

This is, and will always be, a work-in-progress. If you spot any errors, have better data and/or ideas and suggestions please alert both d.ohanlon@haddenham-bucks-pc.gov.uk & clerk@haddenham-bucks-pc.gov.uk

Updates and corrected versions will be issued

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What's the rush?

Is this really an "emergency"?

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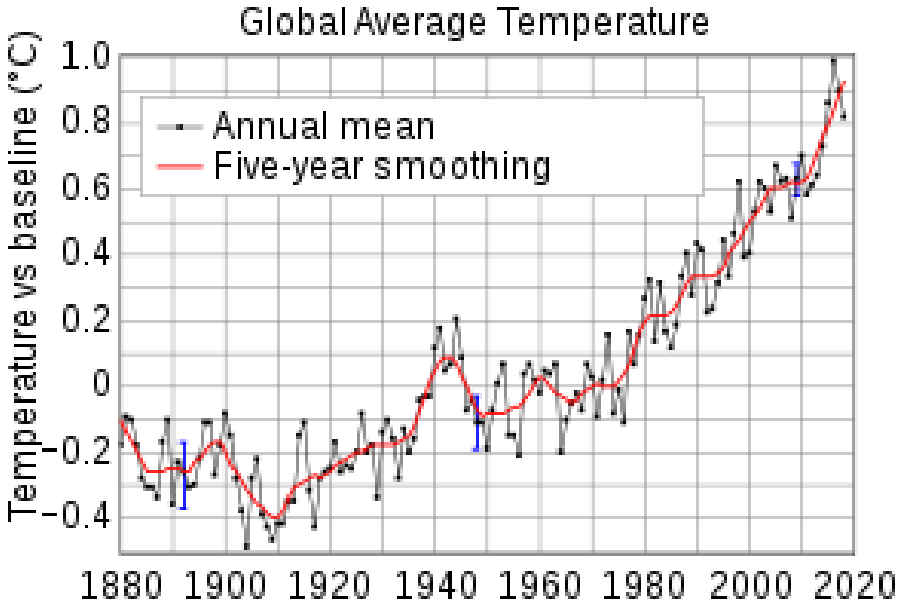
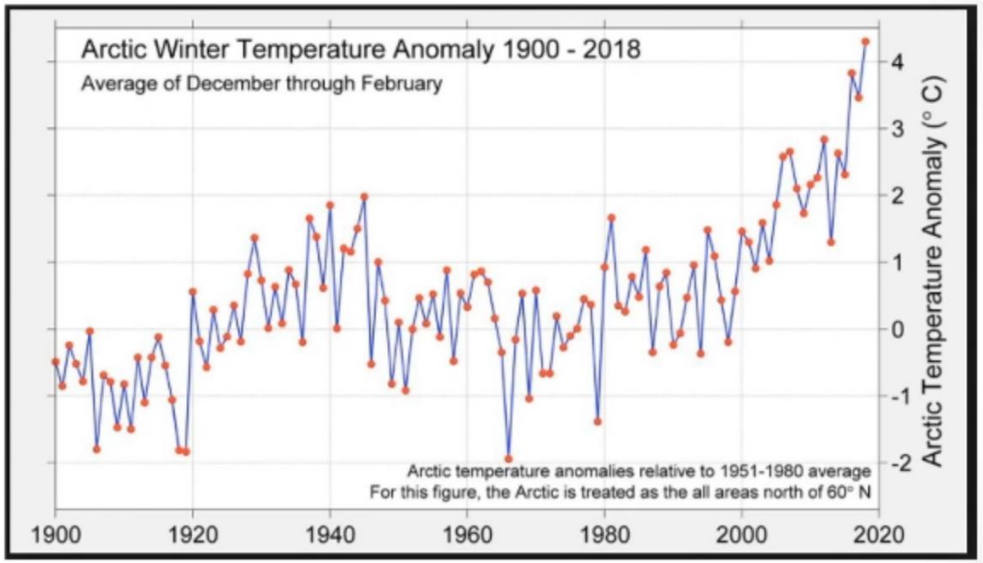
The Arctic is Warming Faster Than The Global Average And The Ice Is Melting





These two graphs look the same – showing temperature rising in the last few decades.
But the scales are different:

the global temperature on the left is from -0.5°C to + 1°C

the Arctice temperature on the right is from -2.5°C to +4.25°C

You'll notice the Arctic rise is all in the past 18 years

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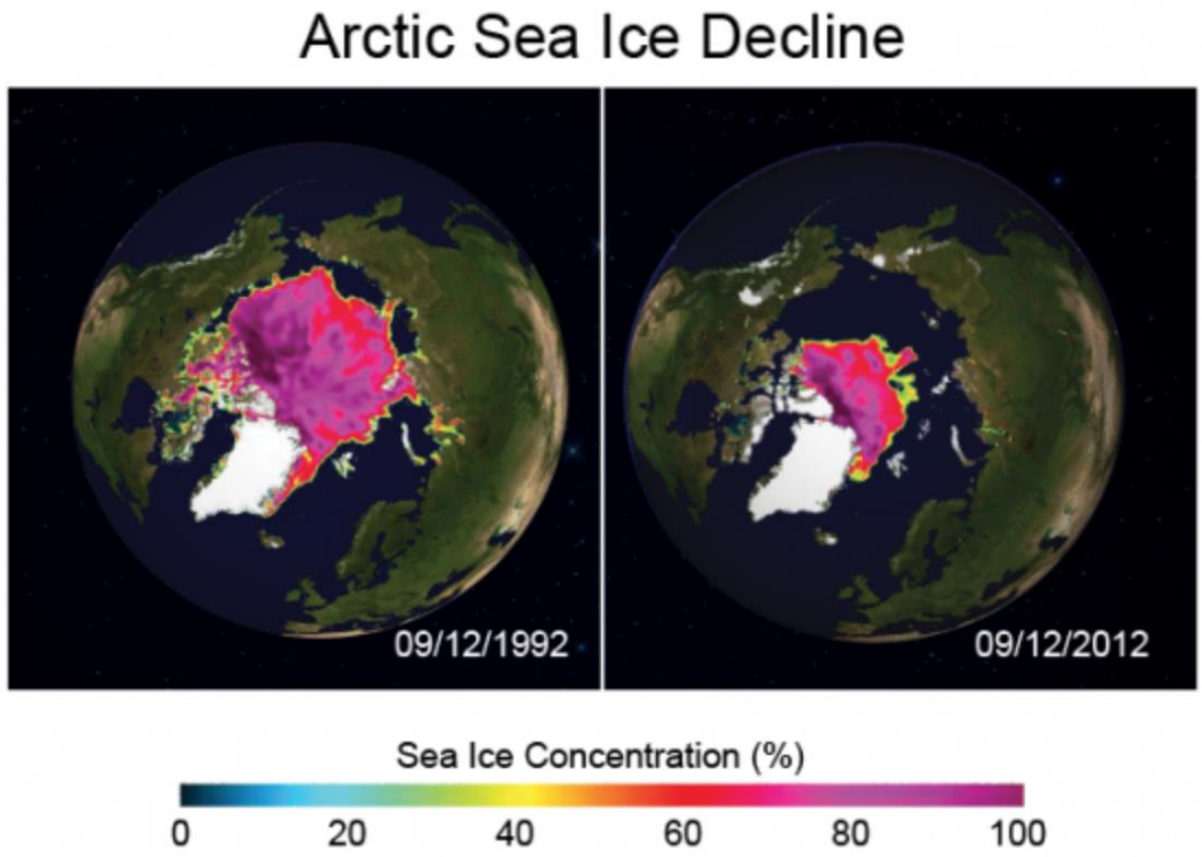
Source:NASA
https://data.giss.nasa.gov/gistemp/

Sea Ice Decline Reduces Heat Reflection & Accelerates the Warming



Ice reflects the suns heat, while sea water absorbs it. This causes a vicious cycle

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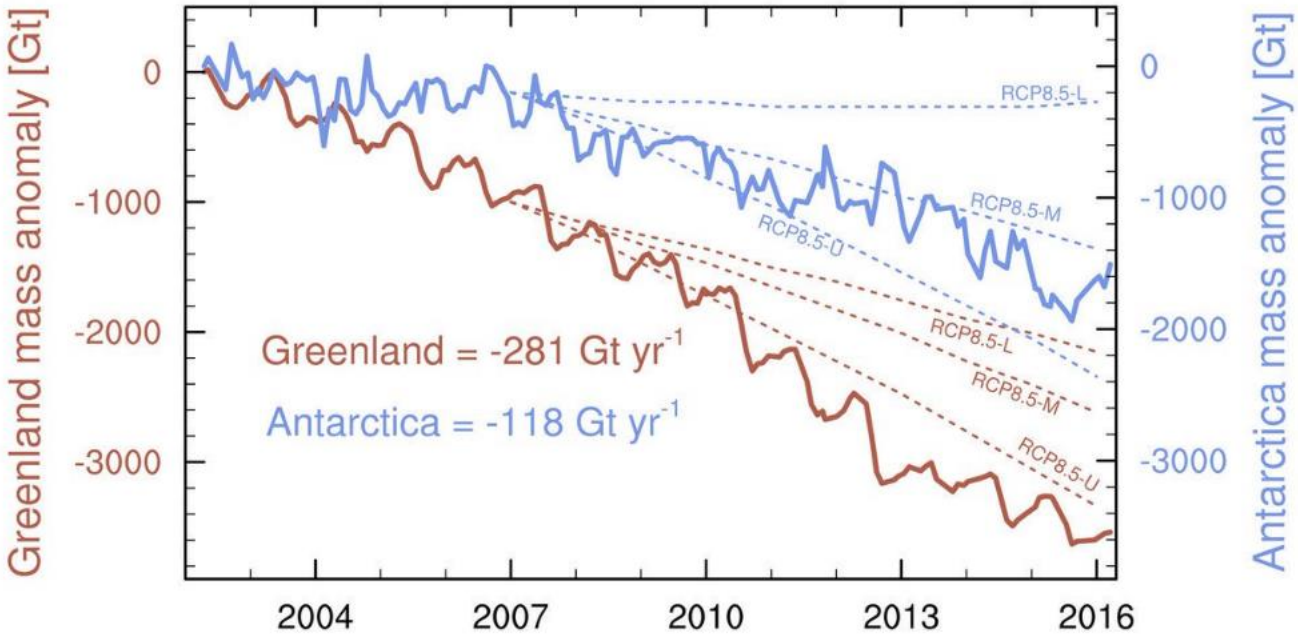
Source: globalchange.org "Climate Change Impacts in the United States: The Third National Climate Assessment" https://www.globalchange.gov/browse/reports/climate-change-impacts-united-states-third-national-climate-assessment-0

Sea Ice Decline Doesn't Raise Sea Levels
But Greenland's Ice Melting Does

If all of Greenland's ice melts it will raise global sea levels by 7 metres (23 ft)



Graph shows ice loss of both Greenland & the Antarctic
Lines such as RCP8.5 show the modelled predictions from 2007 of the Lower [L], Medium [M] and Upper [U] amounts of ice expected to be lost
The actual loss has exceeded the worst-case prediction

Units are Giga [billions of] tonnes [Gt] of ice per annum [yr^{-1}]

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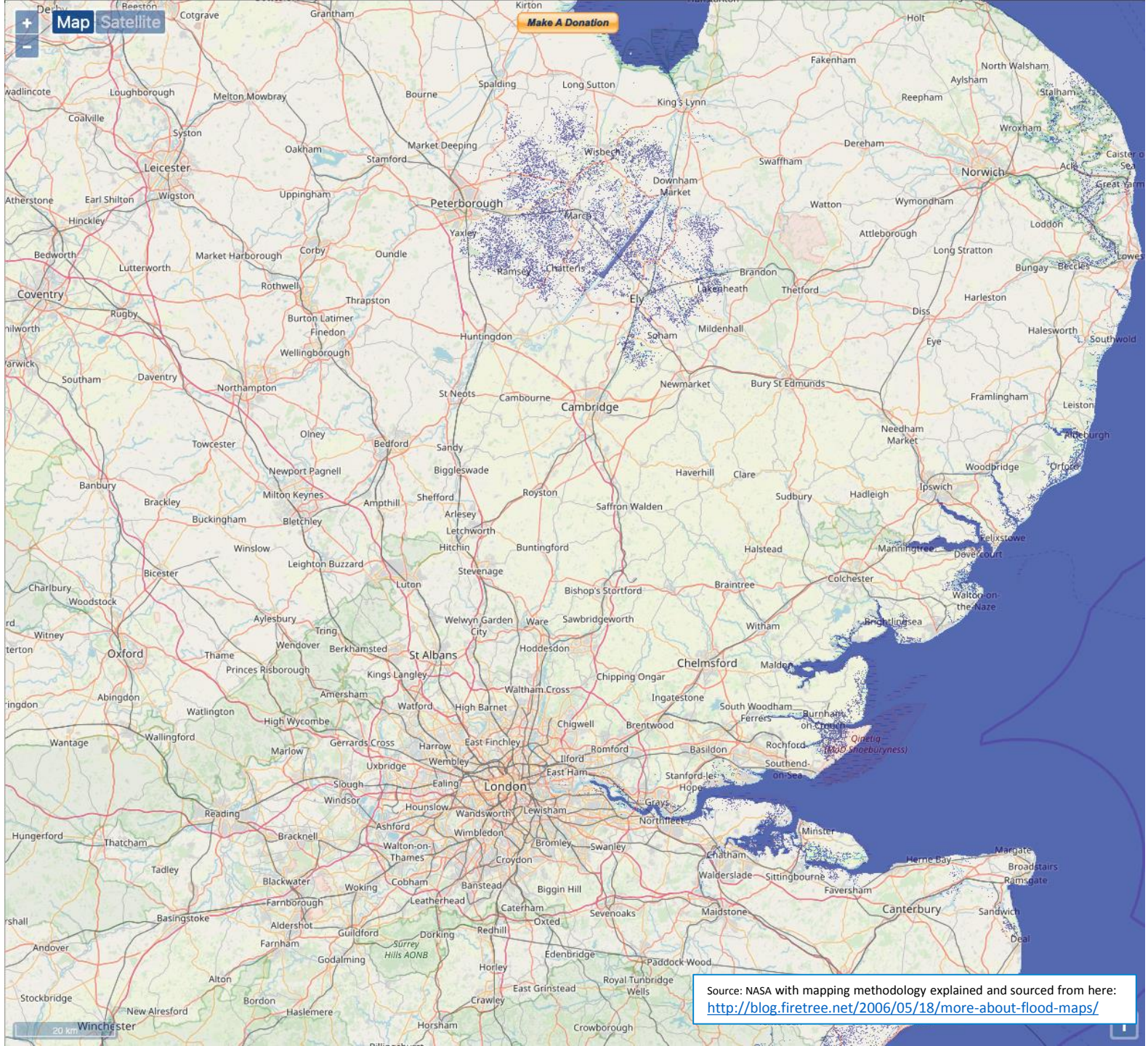
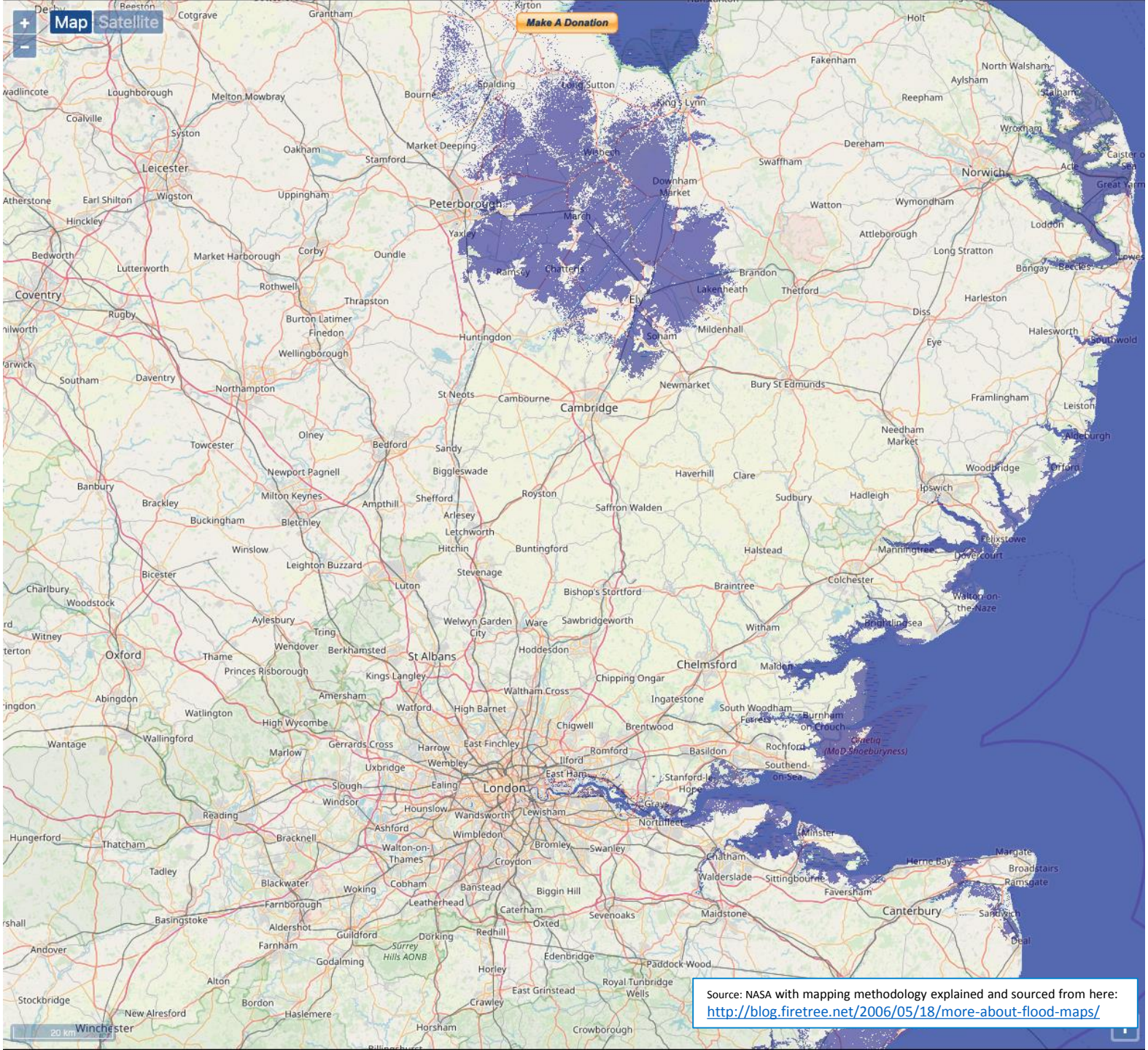
Source: NASA
https://gracefo.jpl.nasa.gov/resources/33/greenland-ice-loss-2002-2016/

The UK today


Map
Satellite
Make A Donation
Cambridge
Peterborough
Norwich
Leicester
Coventry
Northampton
Oxford
St Albans
London
Chelmsford
Canterbury
Winchester
Source: NASA with mapping methodology explained and sourced from here:
http://blog.firetree.net/2006/05/18/more-about-flood-maps/

The UK with a 2 metre rise in sea level



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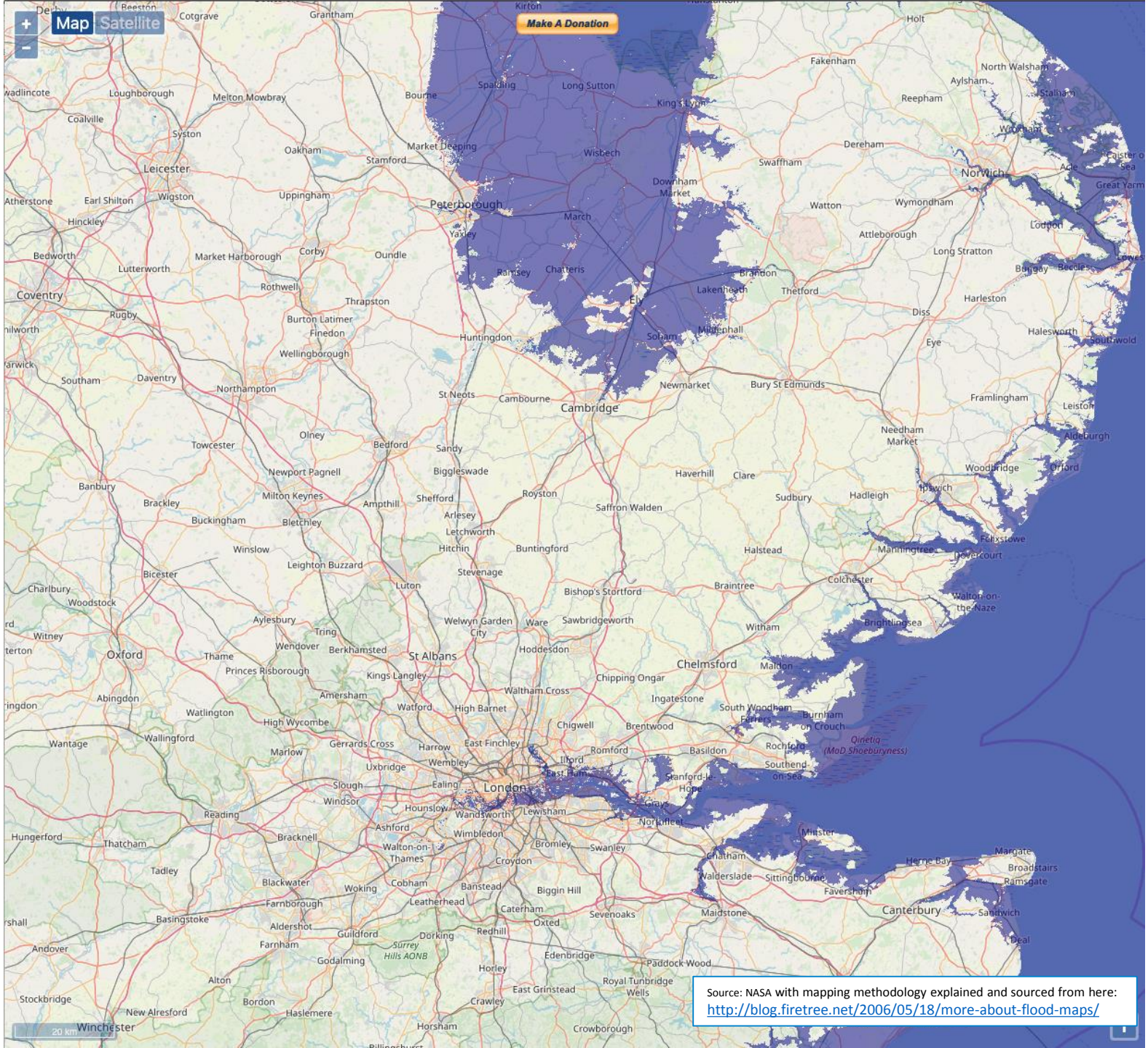
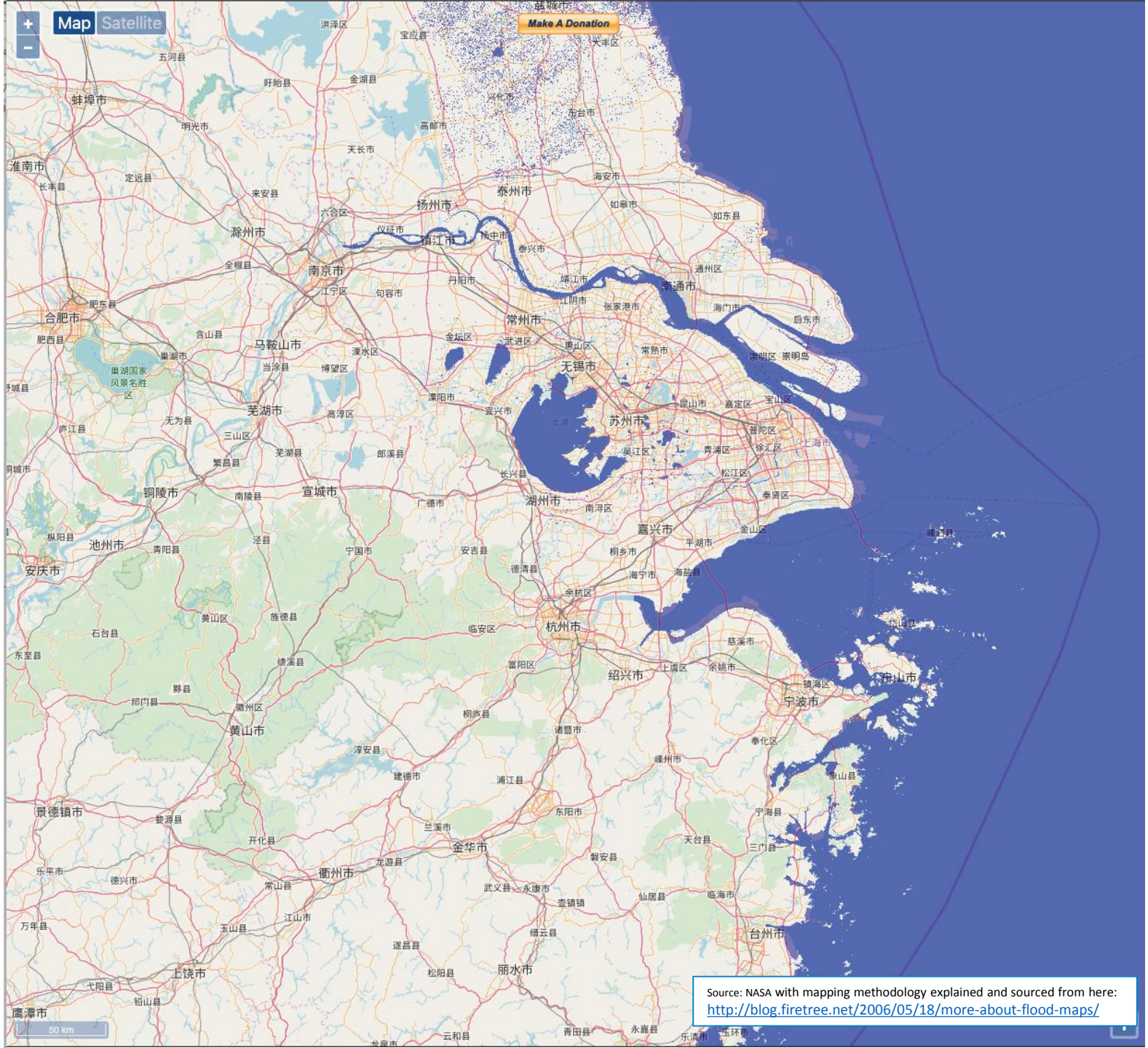


Shanghai today



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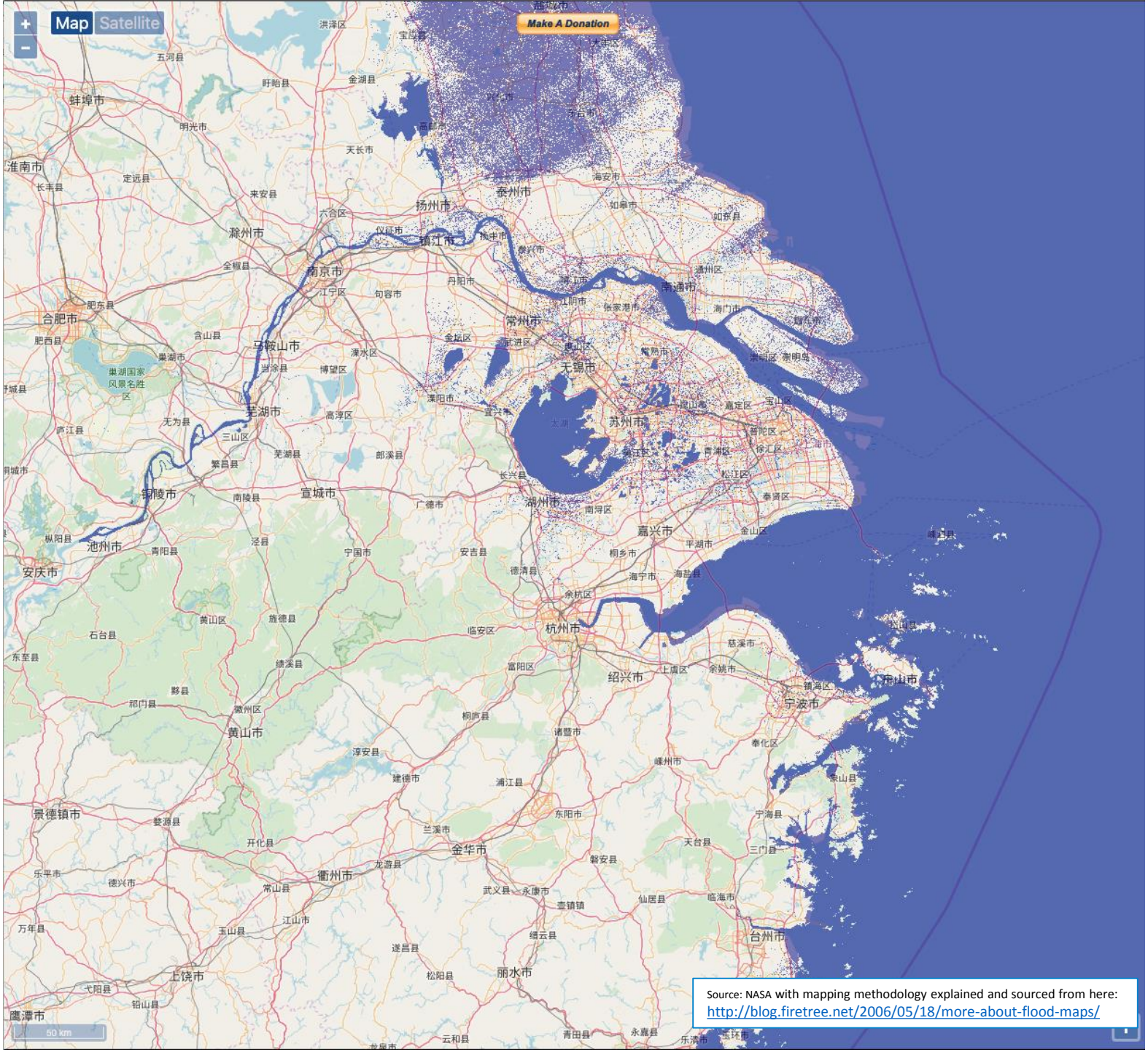

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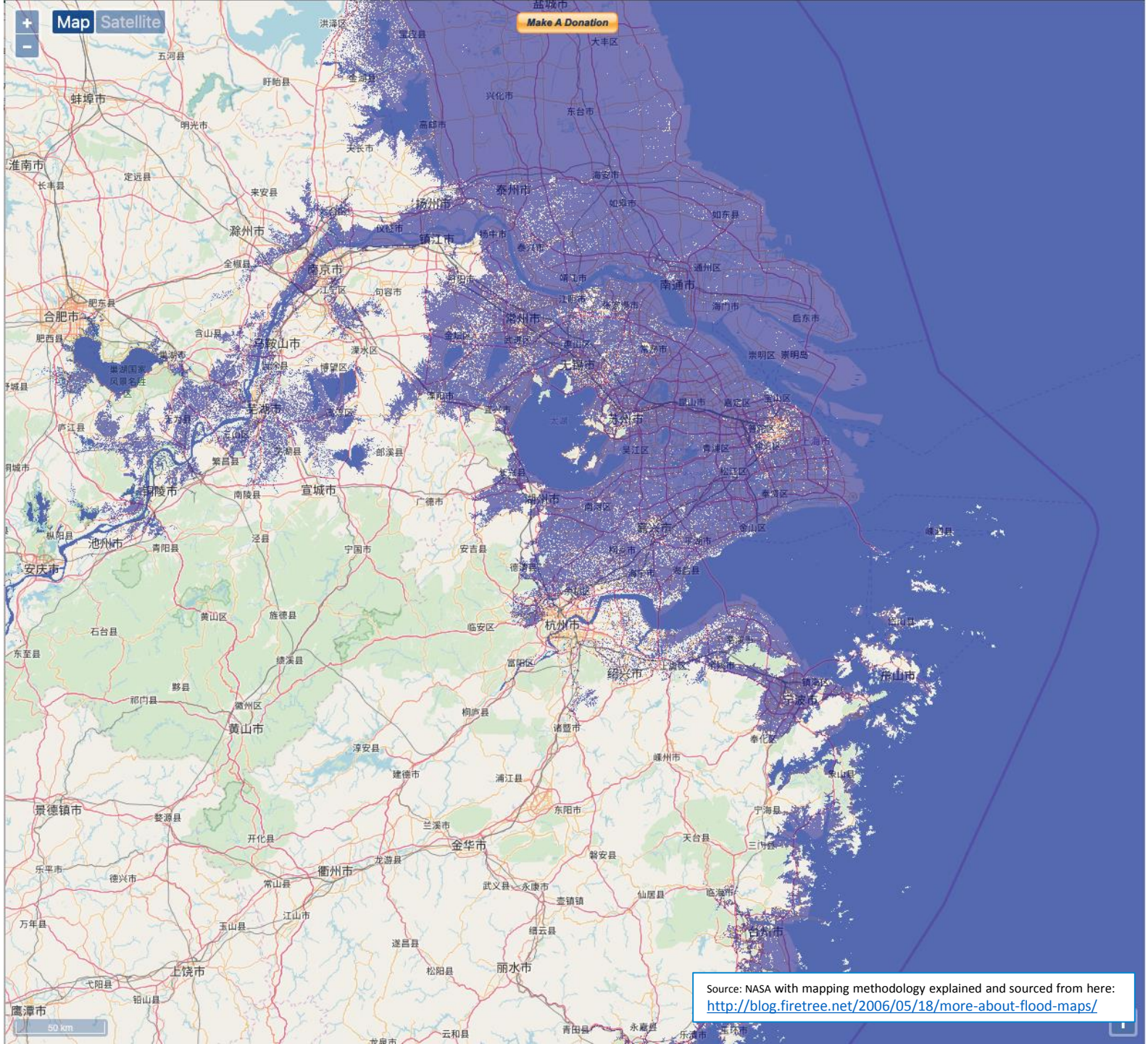
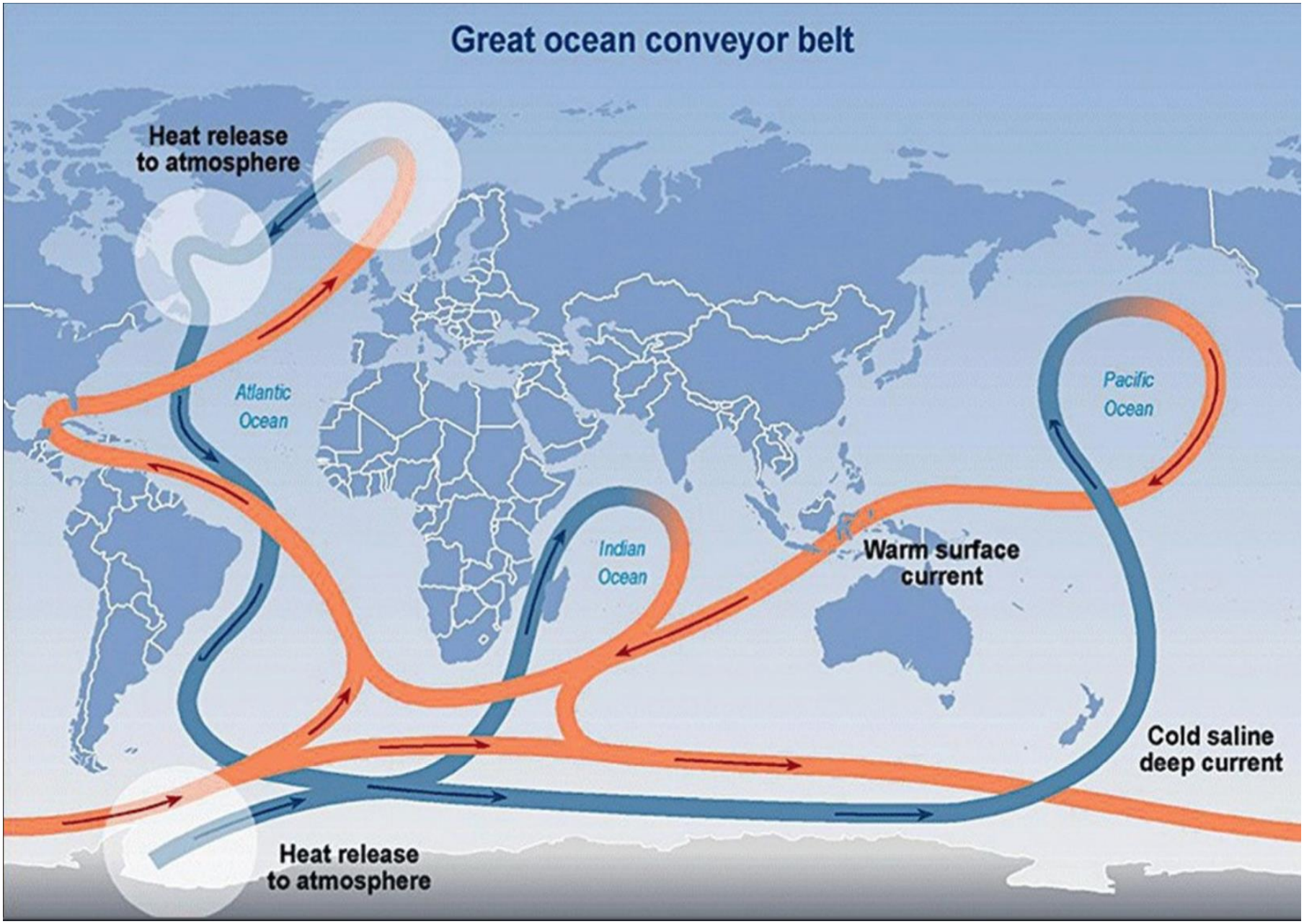


Also, Greenland's glaciers melting is likely to "switch off" the Gulf Stream

This would leave the UK without its warming effect

The UK is at the same latitude as parts of Canada and Siberia that are quite cold



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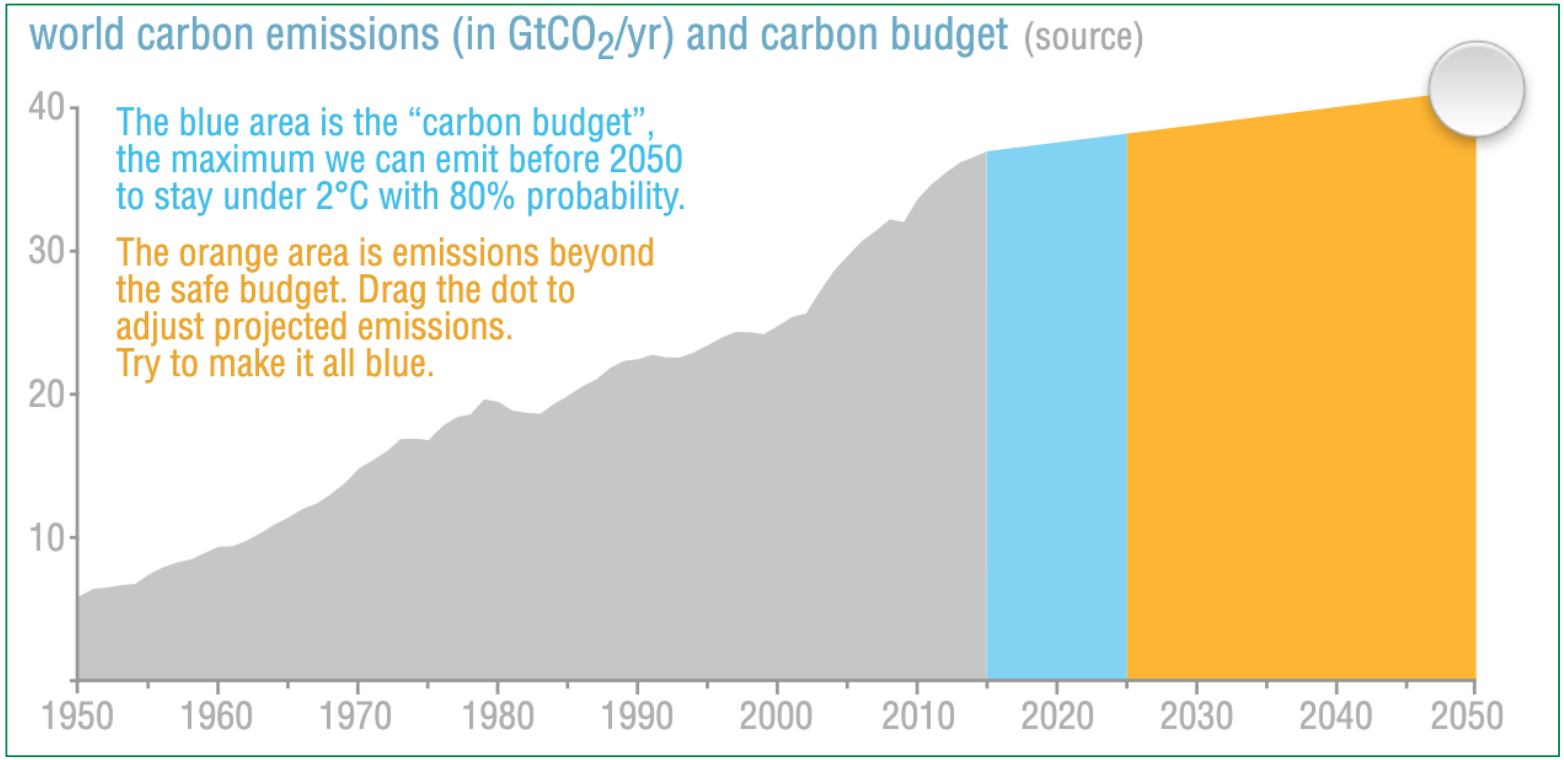
Source: UN Intergovernmental Panel on Climate Change [IPCC] via Smithsonian Magazine
https://www.smithsonianmag.com/smart-news/ocean-current-keeps-europe-warm-weakening-180968784/

Why it's an emergency

We have models of what is needed to stop this happening.

This interactive (on its source webpage) shows how long we have

Business as usual would mean we get to a 2 degree rise by the mid 2020's



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Sources : All via http://worrydream.com/ClimateChange/
Carbon Brief "Analysis: Why the UK's CO2 emissions have fallen 38% since 1990"
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Global_Carbon_Budget_2014_v1.1.xlsx C. Le Quere, et al, Global Carbon Budget 2014. Earth System Science Data, doi:10.5194/essd-7-47-2015
carbon emissions 2014-2050: interpolated from "IEA 4DS" scenario
http://www.iea.org/etp/explore/
carbon budget 2000-2050:
http://www.carbontracker.org/wp-content/uploads/2014/09/Unburnable-Carbon-Full-rev2-1.pdf
Carbon Tracker Initiative, Unburnable Carbon (citing
http://www.nature.com/nature/journal/v458/n7242/full/nature08017.html)
"The Potsdam Climate Institute has calculated a global carbon budget for the world to stay below 2C of warming. This uses probabilistic climate change modelling to calculate the total volume of carbon dioxide (CO2) emissions permitted in the first half of the 21st century to achieve the target. This revealed that to reduce the chance of exceeding 2 C warming to 20%, the global carbon budget for 2000-2050 is 886 GtCO2."
carbon budget 2015-2050: From the 886 GtCO2 budget for 2000-2050, I subtracted out the 440 GtCO2 already spent 2000-2014, leaving 446 GtCO2 remaining for 2015-2050.

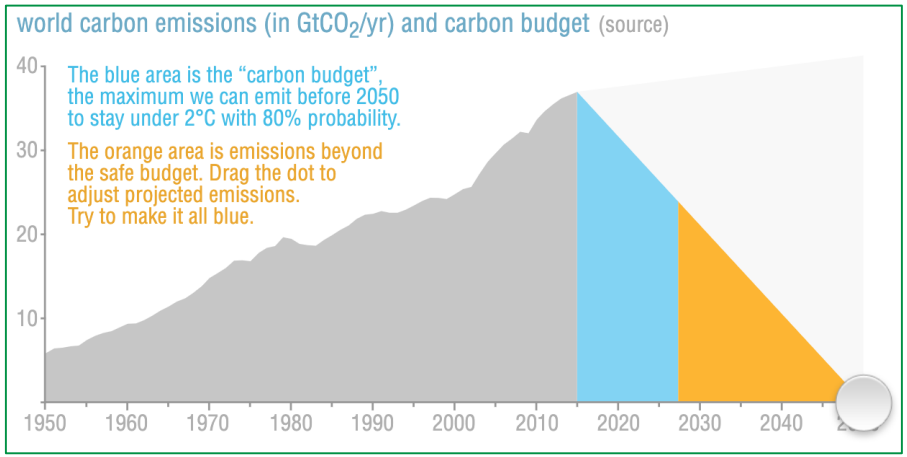
Why it's an emergency

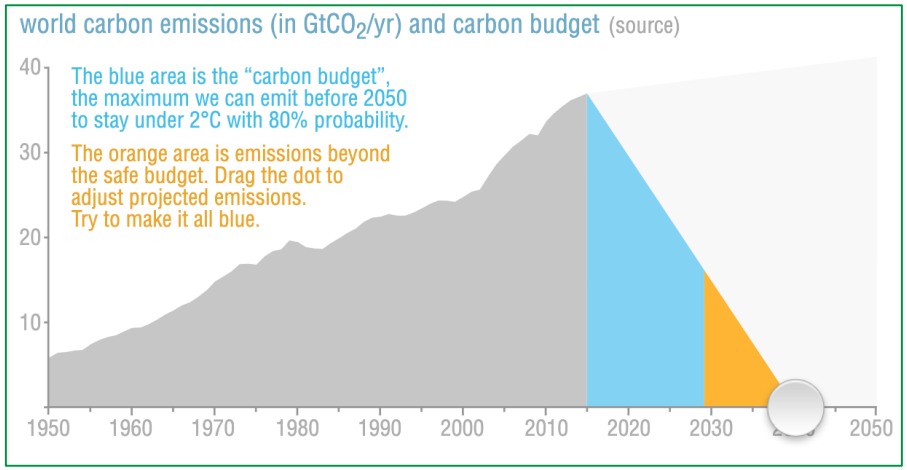
The UK target of 2050 sounds ambitious.

Many say it's too ambitious.

But that rate of change will only delay crossing the 2 degree threshold by about 3 years

2040 is also not adequate as a target





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Carbon Tracker Initiative, Unburnable Carbon (citing http://www.nature.com/nature/journal/v458/n7242/full/nature08017.html)

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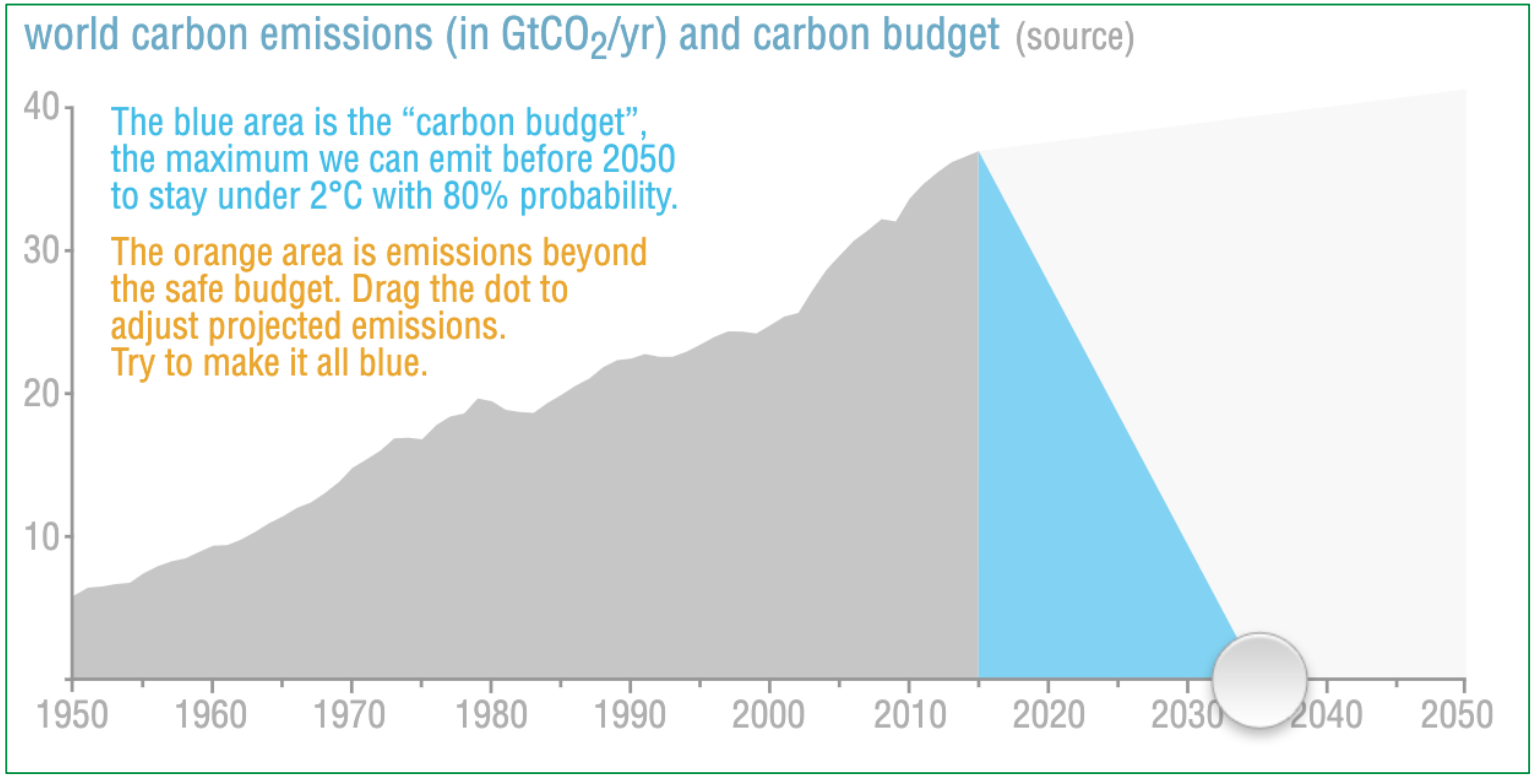
Why it's an emergency

2035 is the latest we can get to zero carbon and not pass a point of no return to a climate that melts the ice and more generally will be hostile to human life

We are adopting 2030 because so far climate change has happened at a faster rate than the scientists' models have suggested



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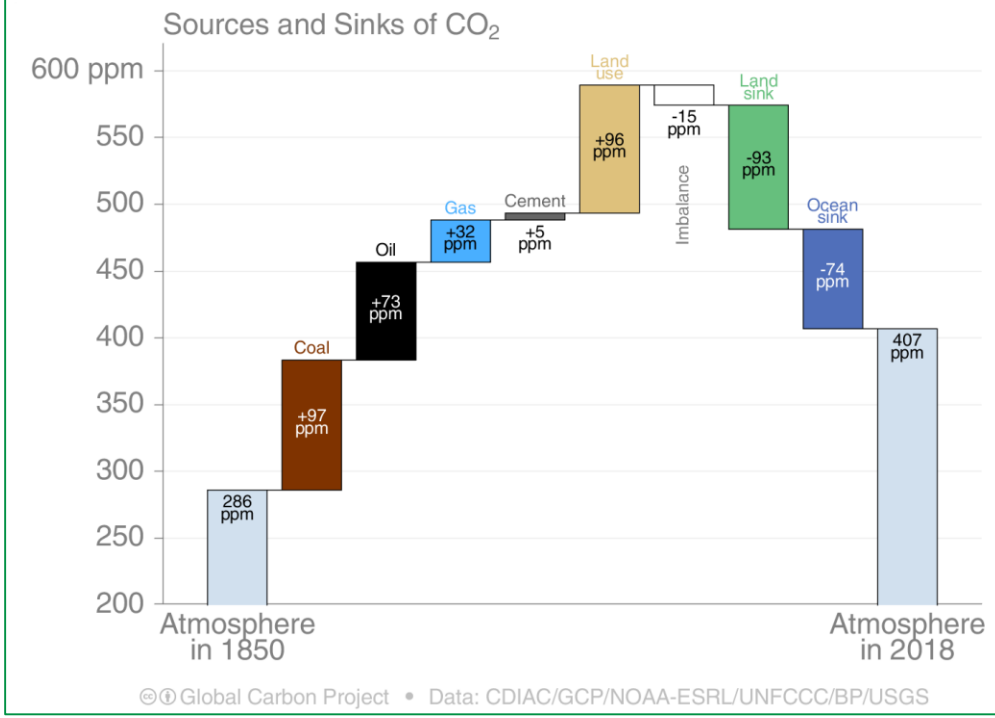
Zero carbon is actually not even enough

Getting to zero carbon only actually stops things getting worse.

Extreme weather, semi-melted ice caps already are in place.

We will need to become carbon negative to get the CO_2 in the atmosphere back down to the levels that existed before we blundered into making them so high

The cumulative contributions to the global carbon budget from 1850
The carbon imbalance represents the gap in our current understanding of sources & sinks



Sources: The Global Carbon Project "GCP Carbon Budget 2019" https://www.globalcarbonproject.org/carbonbudget/19/presentation.htm "CDIAC; NOAA-ESRL; Houghton and Nassikas 2017; Hansis et al 2015; Joos et al 2013; Khatiwala et al. 2013; DeVries 2014; Friedlingstein et al 2019; Global Carbon Budget 2019

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Achieving Zero-Carbon for Haddenham Parish by 2030

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Strategy

Objective:

Haddenham Parish to be carbon neutral by 2030

Diagnosis:

The main obstacles are:

- Lack of knowledge regarding what action(s) will make most difference (& when to take them)
- The inertia of existing habits

Guiding Policy:

- Use an evidence-based approach to identify the fewest & highest-impact actions for residents to take to deliver the objective
- Package these as initiatives using a "pilot" structure and enroll early adopters via multiple existing social networks in the parish

Strategy

Specific Actions:

1. Identify main sources of emissions
2. Recognise which will be affected by other players / technological change / govt action, & when
3. Identify where behavioural change of residents, HPC and organisations within HPC's sphere of influence can have the most impact per £ spent and volunteer hour given
4. Create a decadal calendar of initiatives with a maximum of four at any one time (the four not including research or HPC lobbying government of other bodies)
5. For each pilot - Contact all existing social networks in Haddenham (real life & virtual). Engage with each & enroll only the genuine enthusiasts for that pilot
6. For each pilot - enable, measure, receive feedback, reflect & improve

Addressing Main Obstacle #1

Lack of knowledge regarding what action(s) will make most difference (& when to take them)

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The basic maths

Carbon emissions are measured in tonnes (t), kilotonnes (kt) or megatonnes (Mt) of carbon dioxide (CO_2) per annum (y^{-1})

On average in 2019 UK emissions per capita were around 8.6 tCO_2y^{-1}

Woodland & forests take in [sequester] CO_2 and release oxygen

One hectare (2.47 acres) takes in approx. 5.3 tCO_2y^{-1}

The task is to reduce the parish's CO_2 emissions as far as possible by 2030 and to plant enough trees to offset the residual emissions

By 2030 we will have approx. 3,300 dwellings (up from 2,200) in Haddenham which at UK average household size (2.40 ppl/hhld) means we will have a population just over 7,900

The table on the right shows the parish's total emission in 2030 depending on how much we can reduce per capita emissions from current levels and the hectares of woodland needed to offset them

The land area of the parish is around 1,300 hectares

Emissions in Haddenham in 2030 depending on reductions in CO2 emissions achieved

% of 2019 emissions per cap	Emissions (tCO2y-1)	Hectares of woodland required
100%	68,100	12,780
95%	64,700	12,140
90%	61,300	11,500
85%	57,900	10,860
80%	54,500	10,230
75%	51,100	9,590
70%	47,700	8,950
65%	44,300	8,310
60%	40,900	7,670
55%	37,500	7,040
50%	34,100	6,400
45%	30,700	5,760
40%	27,200	5,100
35%	23,800	4,470
30%	20,400	3,830
25%	17,000	3,190
20%	13,600	2,550
15%	10,200	1,910
10%	6,800	1,280

Sources: DEFRA "Final UK greenhouse gas emissions national statistics: 1990-2017"
https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-2017
ONS "Figure 1: The UK's population has grown year-on-year since 1982"
https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/articles/overviewoftheukpopulation/august2019
Forestry Commission " "Table 4.3a Woodland Carbon Code projects1 in the UK
https://www.forestresearch.gov.uk/documents/5267/ch4_climatechange_FS2018.pdf
Land Insight / HPC analysis

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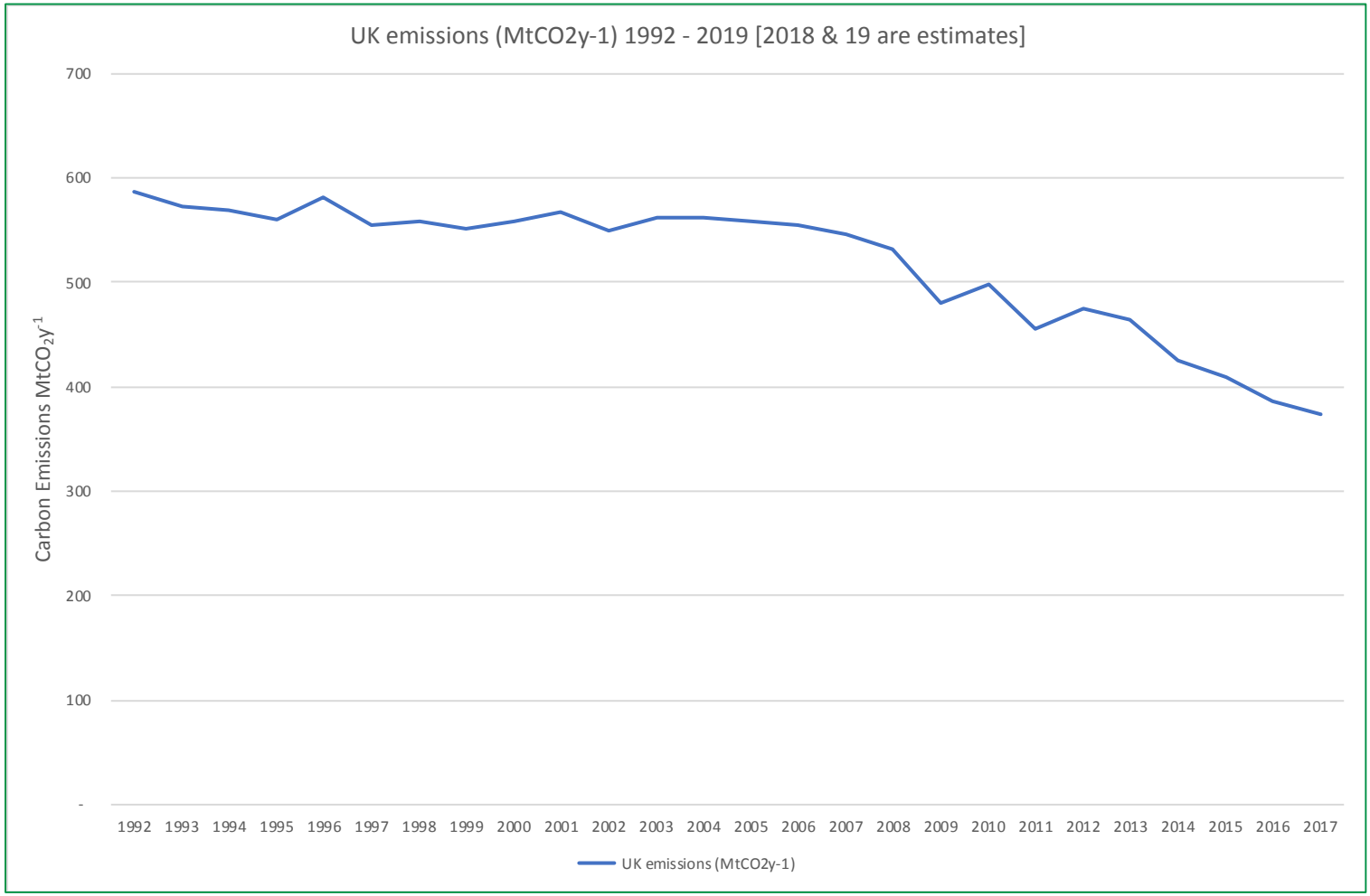
UK CO_2 emissions

You've probably heard that the UK has been dramatically reducing its carbon emissions

This is true

But there's a "but"



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Source: DEFRA "Final UK greenhouse gas emissions national statistics: 1990-2017"
https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-2017

There are three types of emissions

Greenhouse gas emissions are categorised into three groups or 'scopes' by the most widely-used international accounting tool, the Greenhouse Gas (GHG) Protocol. Scope 1 covers direct emissions from owned or controlled sources. Scope 2 covers indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed by the reporting company. Scope 3 includes all other indirect emissions that occur in a company's value chain.

Scope 1	Scope 2	Scope 3
Fuel combustion Company vehicles Fugitive emissions	Purchased electricity, heat and steam	Purchased goods and services Business travel Employee commuting Waste disposal Use of sold products Transportation and distribution (up- and downstream) Investments Leased assets and franchises

And much of the Scope 3 emissions - food, goods & services - we consume comes from outside the UK

Please note: These definitions, courtesy of the Carbon Trust, talk in terms of corporations but the definitions apply equally to individuals or organisations of any kind. "Fugitive emissions" in plain English means gas leaks.

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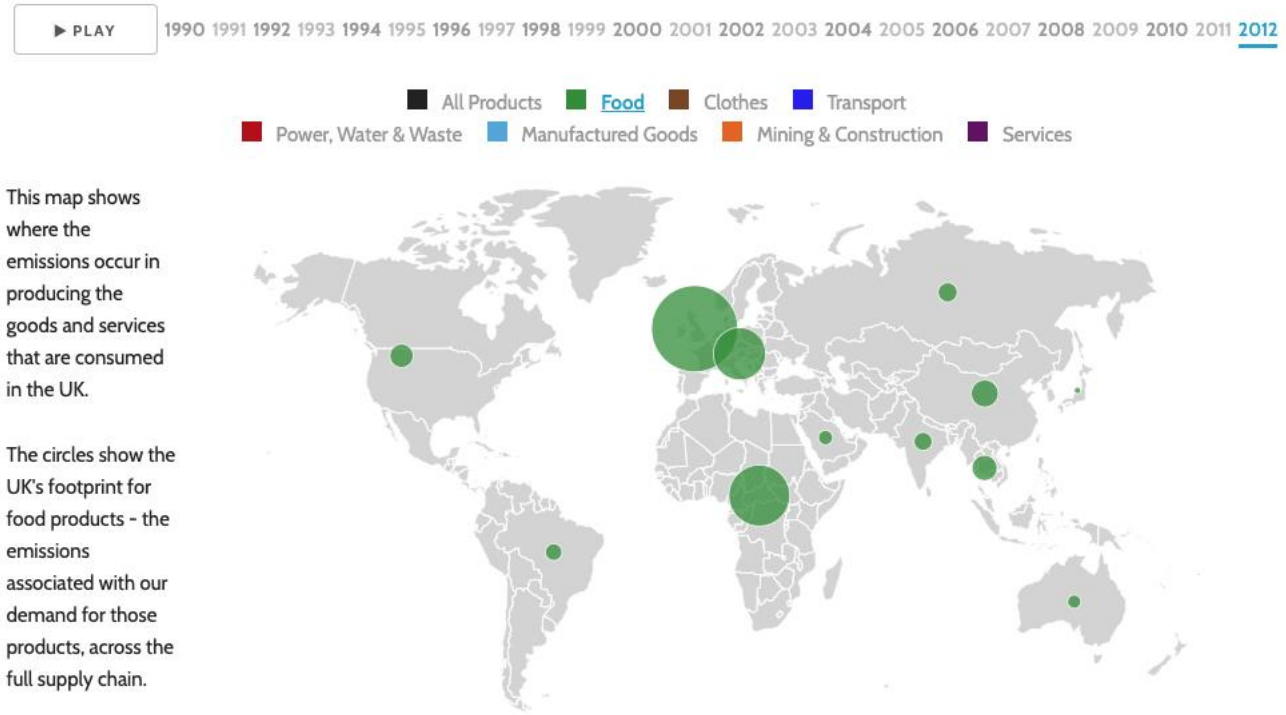
Source: Carbon Trust
https://www.carbontrust.com/resources/faqs/services/scope-3-indirect-carbon-emissions/

Sources of the UK's carbon footprint



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Source: University of Leeds: "Exploring the UK's Carbon Footprint" http://www.emissions.leeds.ac.uk/chart2.html

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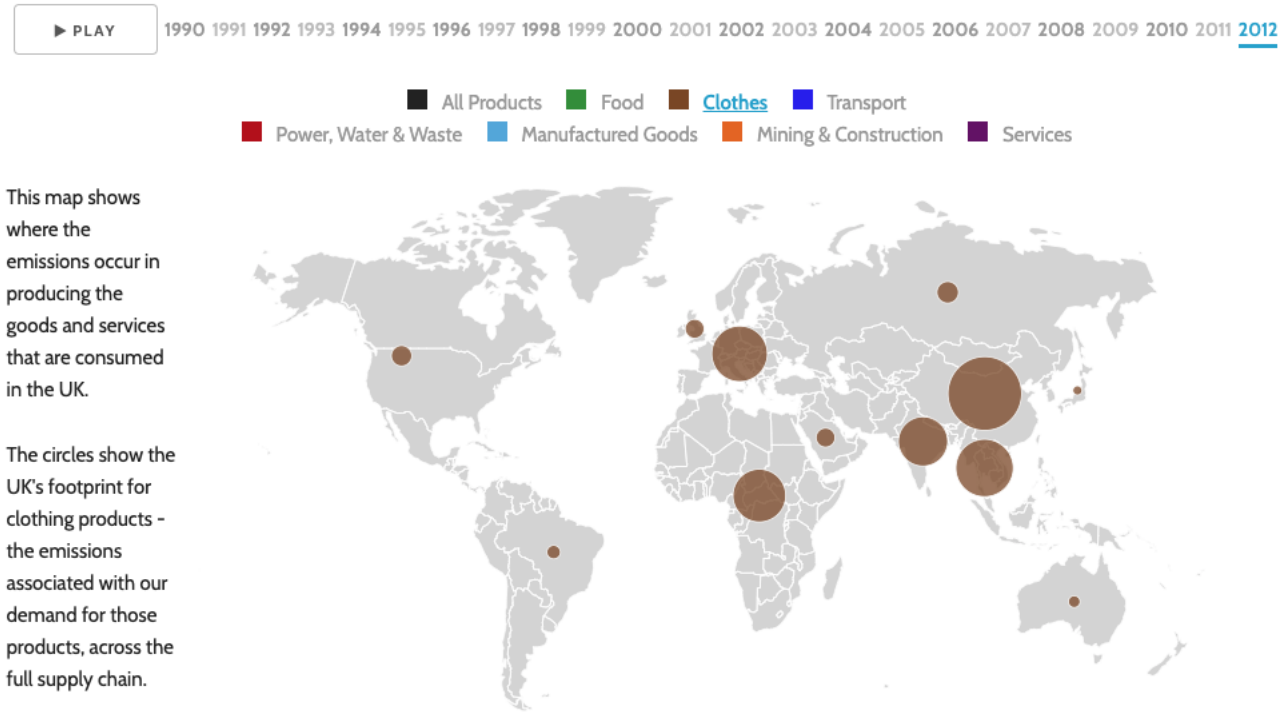

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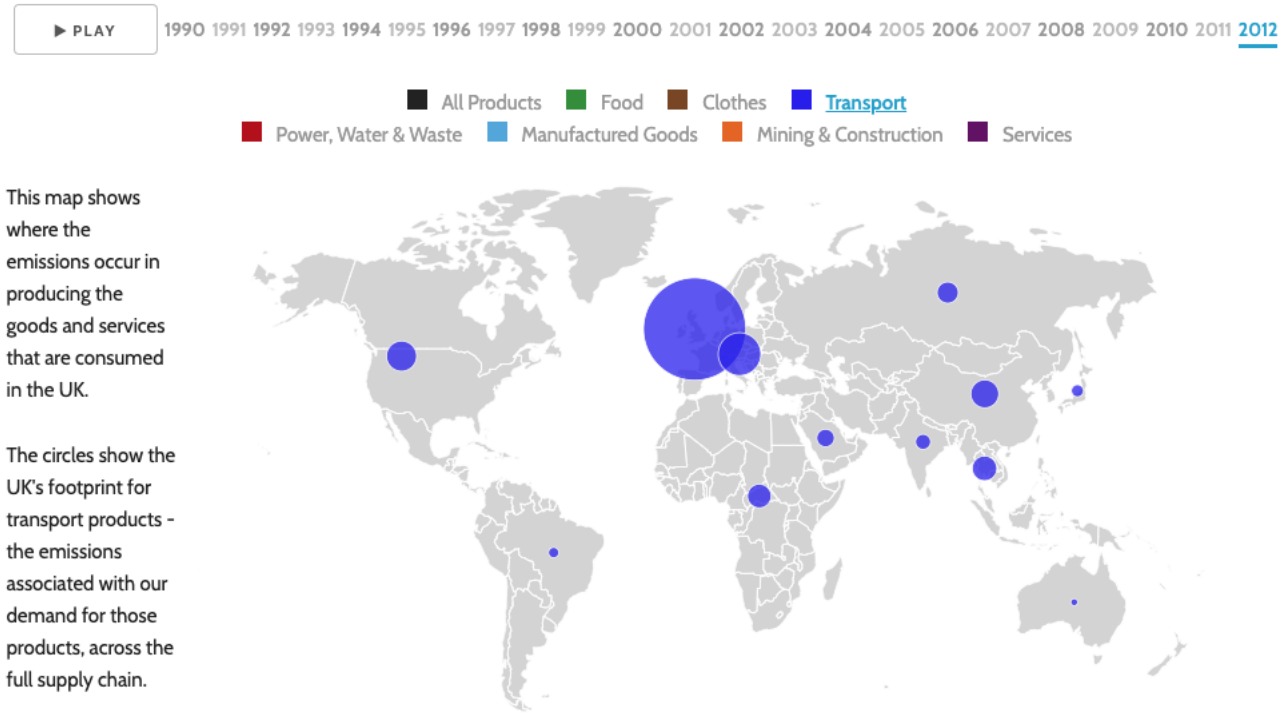

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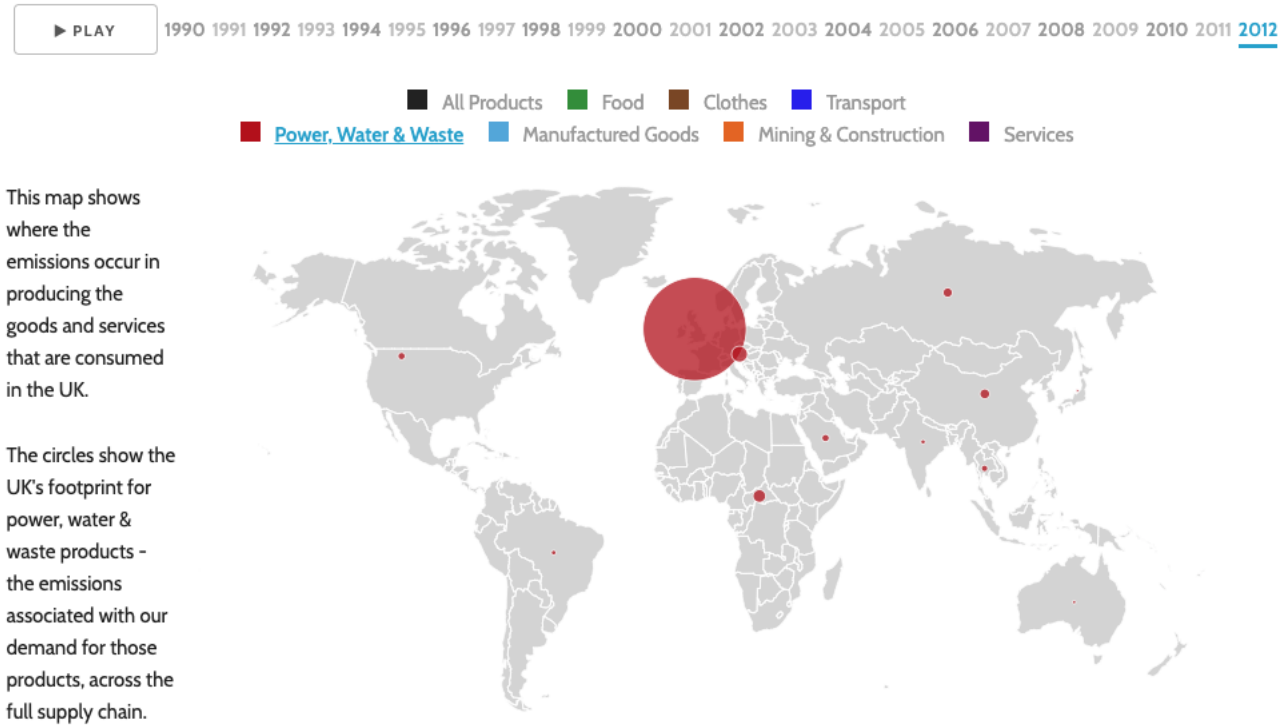

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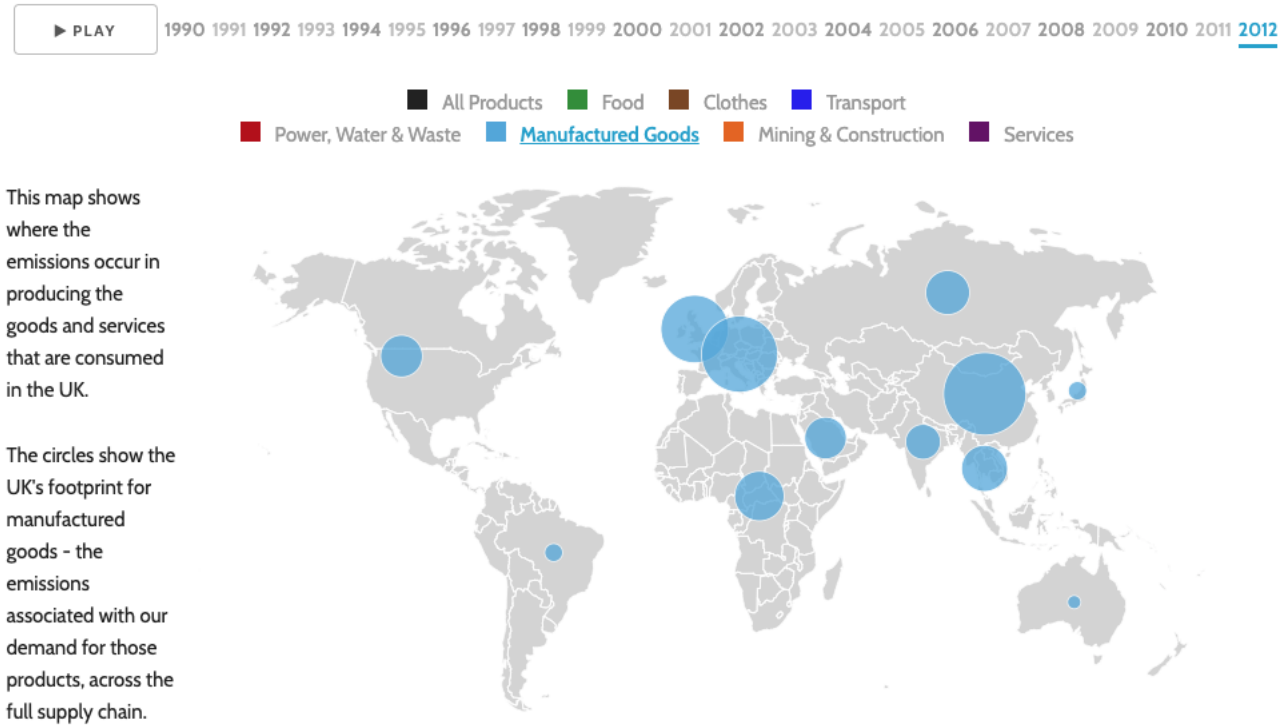

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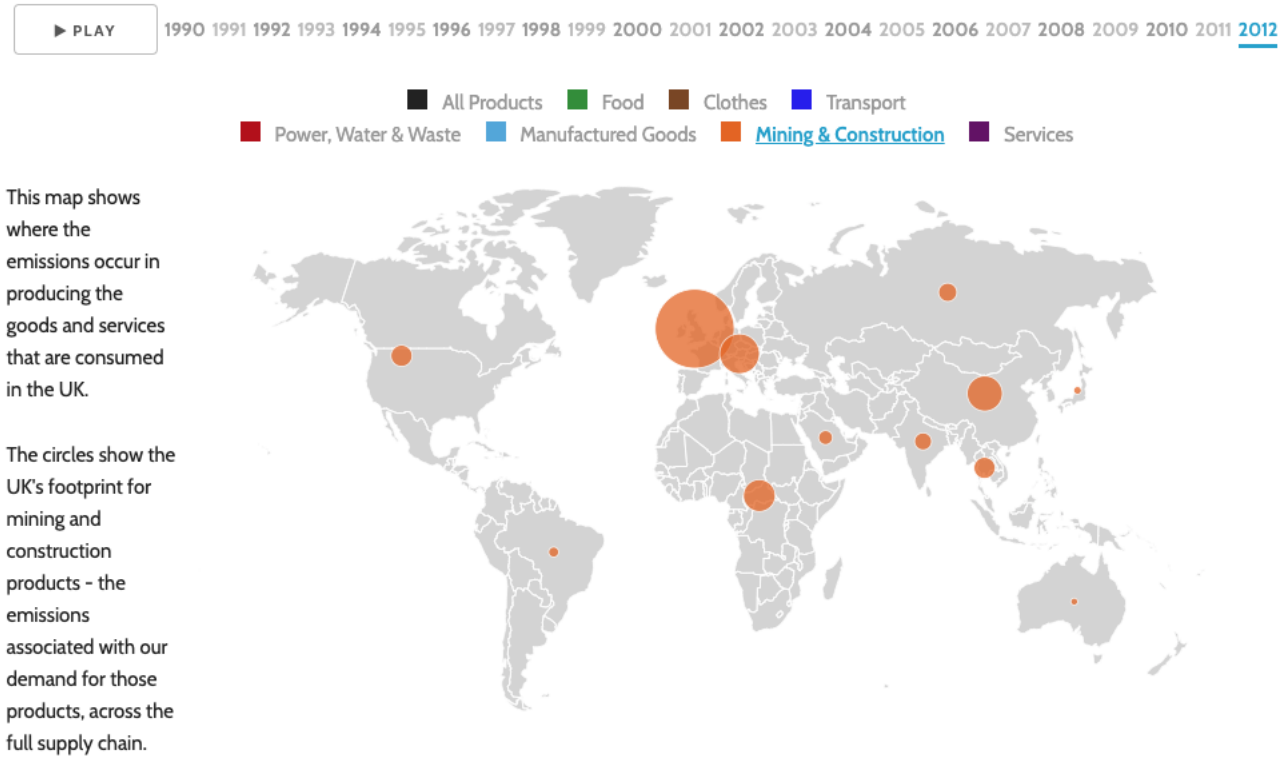

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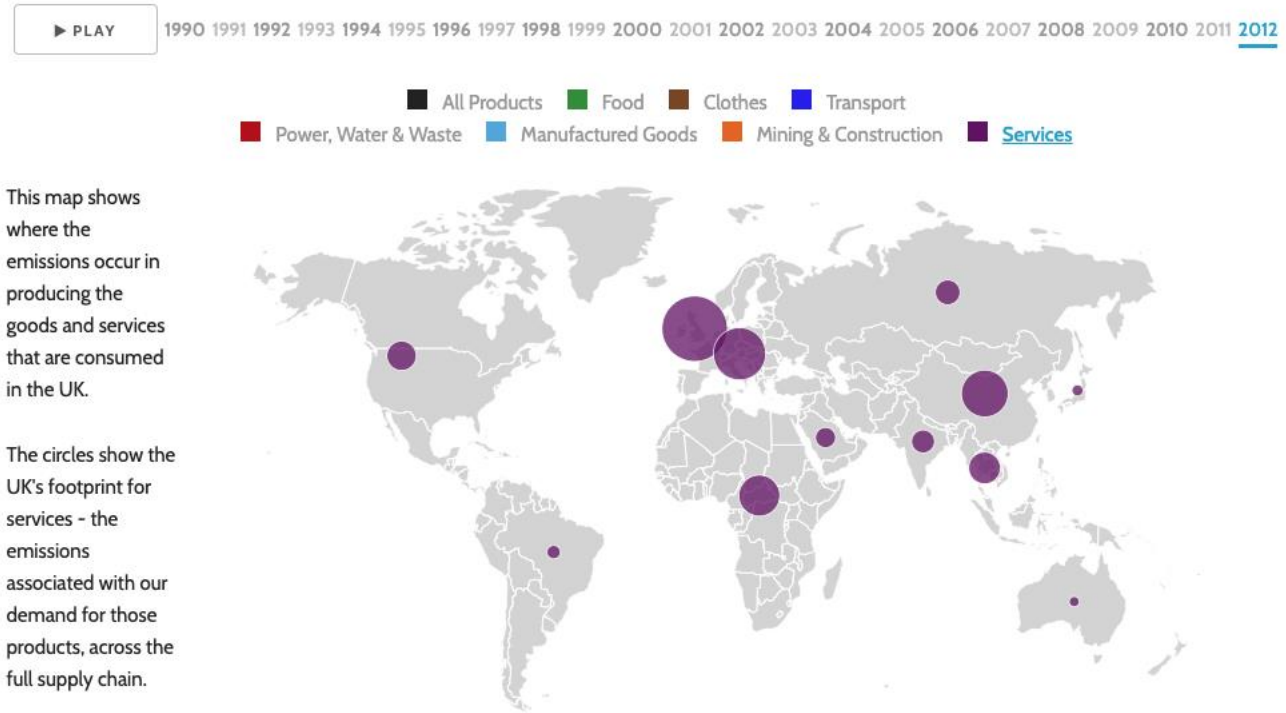

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Source: University of Leeds: "Exploring the UK's Carbon Footprint" http://www.emissions.leeds.ac.uk/chart2.html

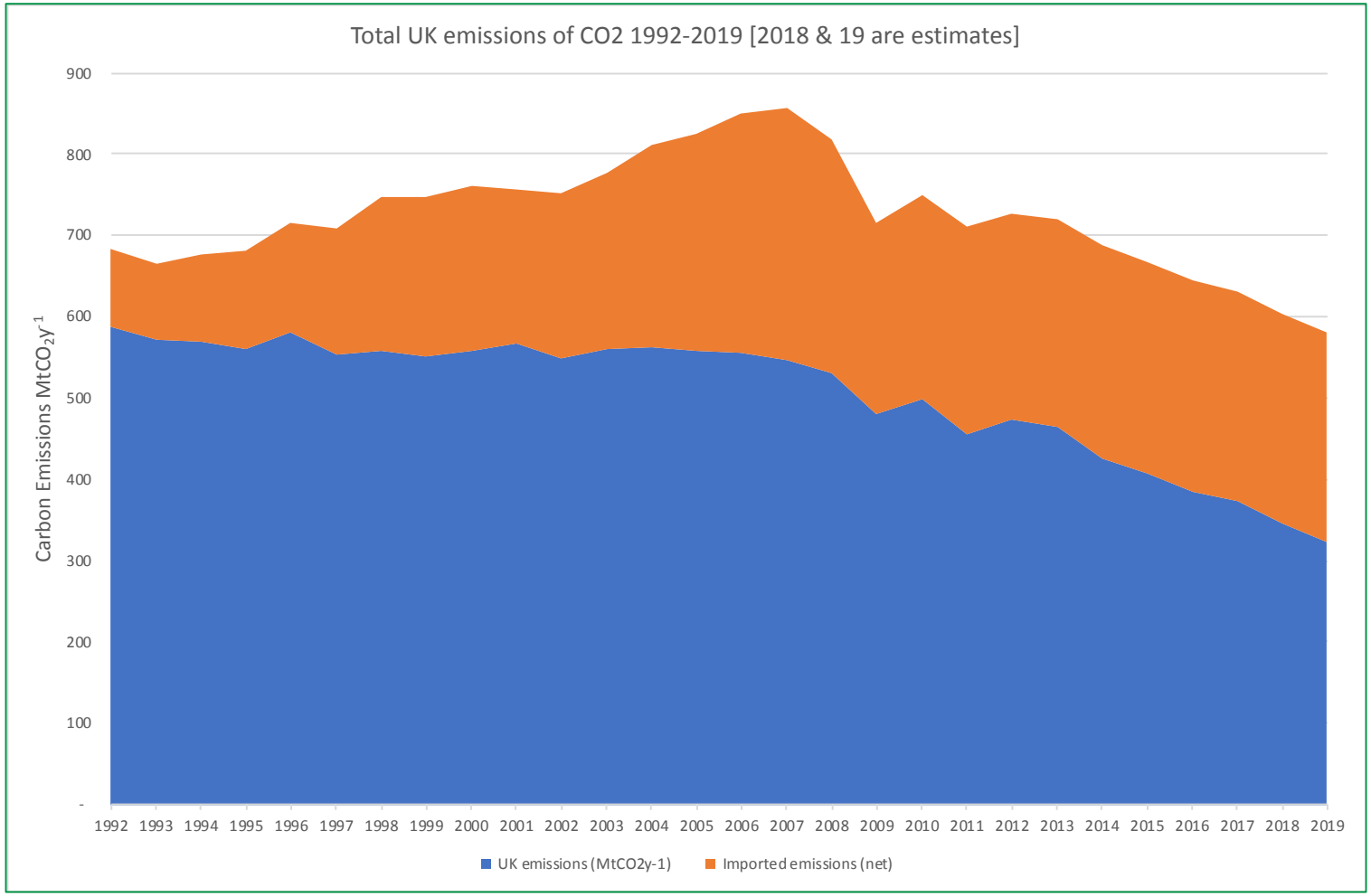
Total UK CO_2 emissions

So the emissions created by what we consume have to be included

(and what we produce, but people in other countries consume, of course are excluded)

It turns out that the UK is the second biggest importer of CO_2 emissions in the world

So UK emissions didn't peak in the 1980's but in 2007



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Source: DEFRA "Final UK greenhouse gas emissions national statistics: 1990-2017"
https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-2017

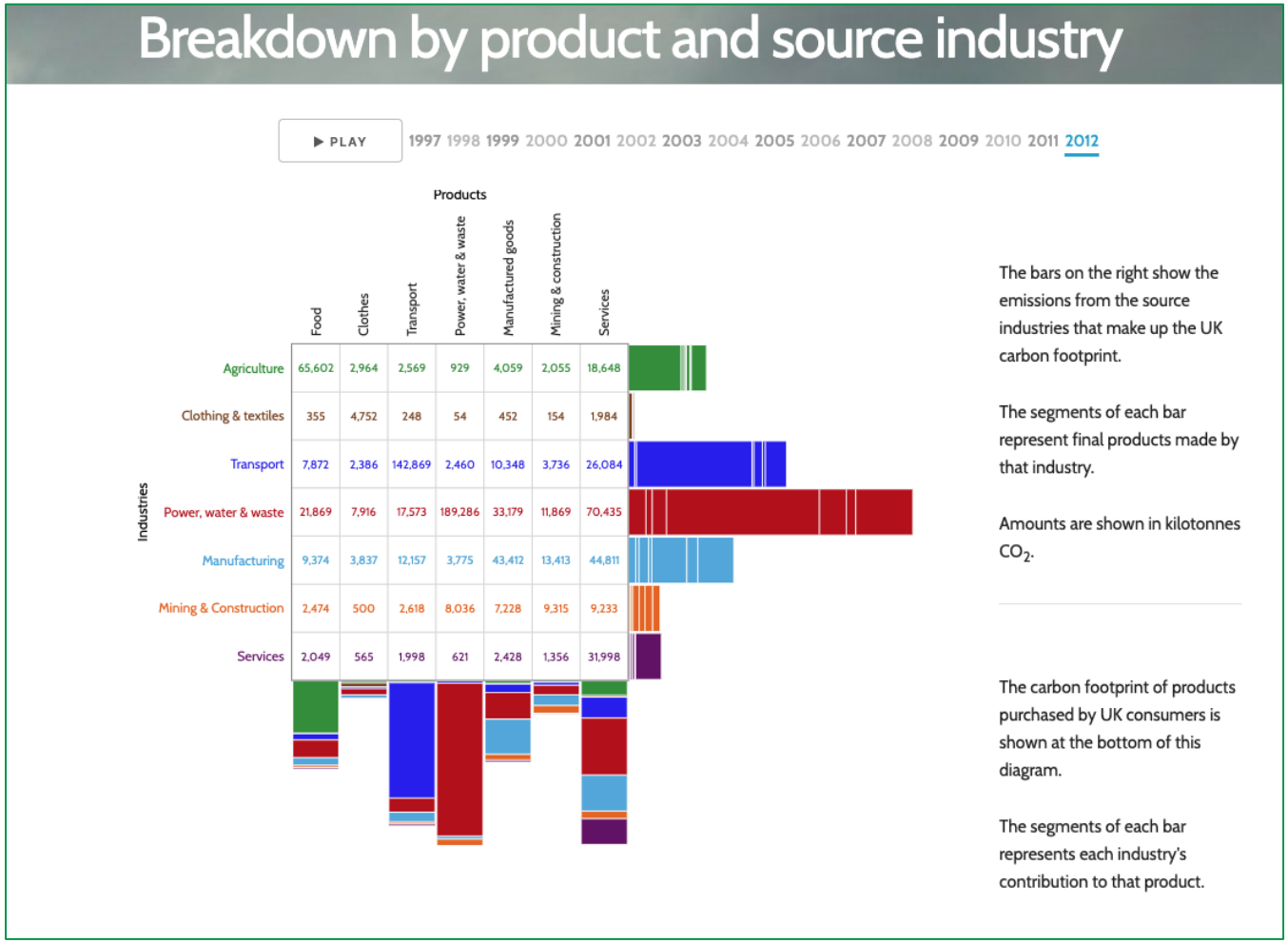
How total UK CO_2 emissions break down

This rather complicated looking graph shows (in kilotonnes of CO_2 per annum the UK's carbon emissions (including net imports) by industry producing them (reading horizontally), and by type of consumption (reading vertically)

SO, add the columns and you can see the composition of consumed emissions, and where they arise

Note this analysis is from 2012. There seems to be no subsequent update or equivalent analysis available!

This enables us to identify the "big items" where action can make a real impact on our emissions



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Source: University of Leeds: "Exploring the UK's Carbon Footprint"
http://www.emissions.leeds.ac.uk/chart3.html

How total UK CO_2 emissions breakdown

Let's simplify those numbers by turning them into percentages of our emissions

NB where the numbers apparently don't add up this is due to roundings

		Consumption							
		Food	Clothes	Transport	Power, water & waste	Manufactured goods	Mining & construction	Services	
Production	Agriculture	8%	0%	0%	0%	0%	0%	2%	**11%**
	Clohing & textiles	0%	1%	0%	0%	0%	0%	0%	**1%**
	Transport	1%	0%	17%	0%	1%	0%	3%	**23%**
	Power, water & waste	3%	1%	2%	22%	4%	1%	8%	**41%**
	Manufacturing	1%	0%	1%	0%	5%	2%	5%	**15%**
	Mining & construction	0%	0%	0%	1%	1%	1%	1%	**5%**
	Services	0%	0%	0%	0%	0%	0%	4%	**5%**
		13%	**3%**	**21%**	**24%**	**12%**	**5%**	**24%**	**100%**

HADDENHAM Parish Council

Source: University of Leeds: "Exploring the UK's Carbon Footprint"
http://www.emissions.leeds.ac.uk/chart3.html
HPC analysis

Power, water & waste

Heating & lighting homes is the biggest source of emissions

BUT!!!.....

		Consumption							
		Food	Clothes	Transport	Power, water & waste	Manufactured goods	Mining & construction	Services	
Production	Agriculture	8%	0%	0%	0%	0%	0%	2%	**11%**
	Clohing & textiles	0%	1%	0%	0%	0%	0%	0%	**1%**
	Transport	1%	0%	17%	0%	1%	0%	3%	**23%**
	Power, water & waste	3%	1%	2%	22%	4%	1%	8%	**41%**
	Manufacturing	1%	0%	1%	0%	5%	2%	5%	**15%**
	Mining & construction	0%	0%	0%	1%	1%	1%	1%	**5%**
	Services	0%	0%	0%	0%	0%	0%	4%	**5%**
		13%	**3%**	**21%**	**24%**	**12%**	**5%**	**24%**	**100%**

HADDENHAM Parish Council

Source: University of Leeds: "Exploring the UK's Carbon Footprint"
http://www.emissions.leeds.ac.uk/chart3.html
HPC analysis

Power, water & waste - Electricity

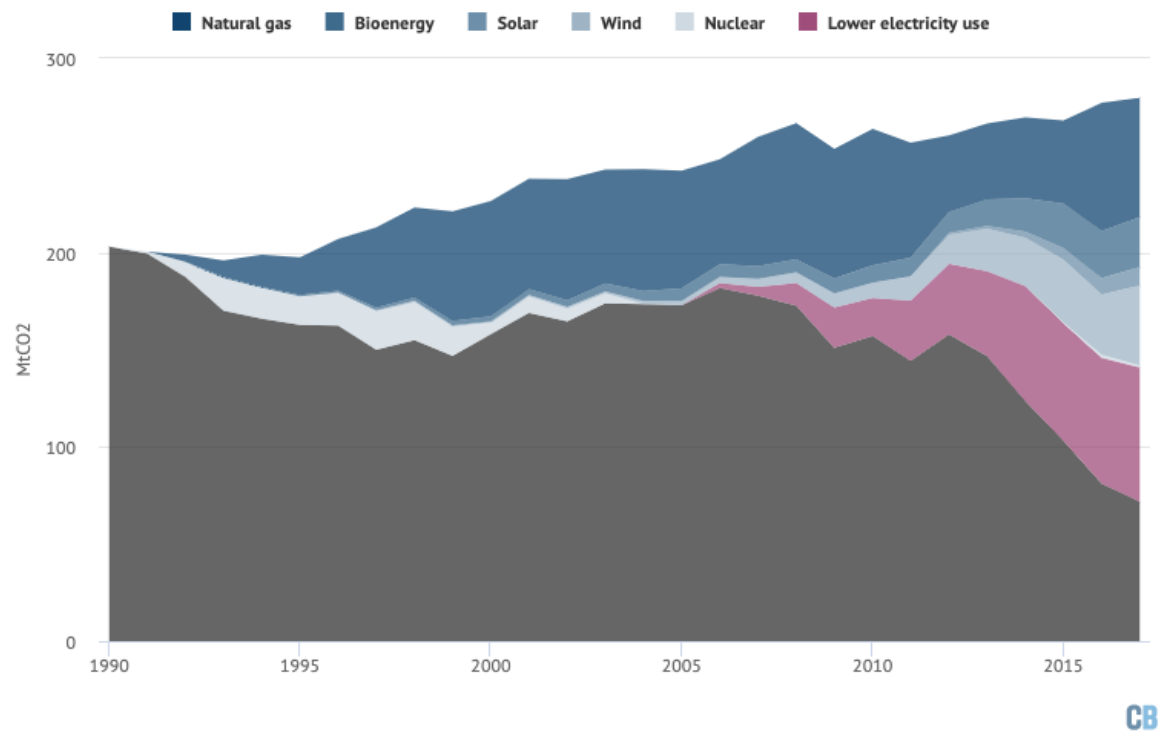
Heating & lighting homes is the biggest source of emissions

BUT!!!....

The electricity side of the industry has reduced its emissions by 60% (that's the dark grey area – the other colours show sources of reduced compared with "business as usual"

By 2030 90% of UK electricity will be carbon neutral

It's notable how much electricity-related emissions have reduced since 2012 – the date of the data on the previous slide. So Power, Water & Waste may no longer be the biggest source of emissions



Annual UK CO2 emissions in MtCO2 from electricity generation in black, with estimated reductions from gas, bioenergy, solar, wind, nuclear and reduced electricity use. Chart by Carbon Brief using Highcharts.

HADDENHAM Parish Council

Source: Carbon Brief "Analysis: Why the UK's CO2 emissions have fallen 38% since 1990" https://www.carbonbrief.org/analysis-why-the-uks-co2-emissions-have-fallen-38-since-1990

Power, water & waste - Electricity

Given the reductions in electricity-related emission to -date and projected to 2030, it is gas where householder action will make a difference

Table 1: UK annual greenhouse gas emissions, 1990-2018, headline results

								MtCO2e
	1990	**1995**	**2000**	**2005**	**2010**	**2015**	**2017**	**2018 (p)**
Energy supply	242.1	210.3	204.0	219.1	197.3	137.6	106.0	98.3
from power stations	*203.0*	*163.0*	*158.7*	*173.1*	*157.3*	104.1	72.4	65.2
other Energy supply	*39.1*	*47.3*	*45.3*	*46.0*	*40.0*	33.4	33.5	33.1
Business	111.9	108.9	108.7	96.9	78.2	69.5	66.1	65.9
Transport	125.4	126.8	131.0	134.3	123.4	122.2	124.6	121.4
Public	13.4	13.2	12.1	11.1	9.4	7.9	7.8	8.1
Residential	78.3	79.6	85.6	82.5	84.5	64.5	64.1	65.9
Agriculture	6.5	6.5	5.5	6.1	5.4	5.5	5.6	5.6
Industrial process	19.4	17.7	16.9	16.3	10.6	12.1	10.2	10.0
Waste management	1.3	1.0	0.5	0.4	0.3	0.2	0.3	0.3
LULUCF	-2.0	-3.9	-6.0	-8.9	-10.7	-11.2	-11.3	-11.3
Total CO_2	**596.3**	**560.1**	**558.3**	**557.9**	**498.3**	**408.3**	**373.2**	**364.1**
Other greenhouse gases	198.0	185.4	149.2	125.8	102.5	89.6	87.0	84.4
Total greenhouse gases	**794.4**	**745.6**	**707.5**	**683.7**	**600.9**	**498.0**	**460.2**	**448.5**

HADDENHAM Parish Council

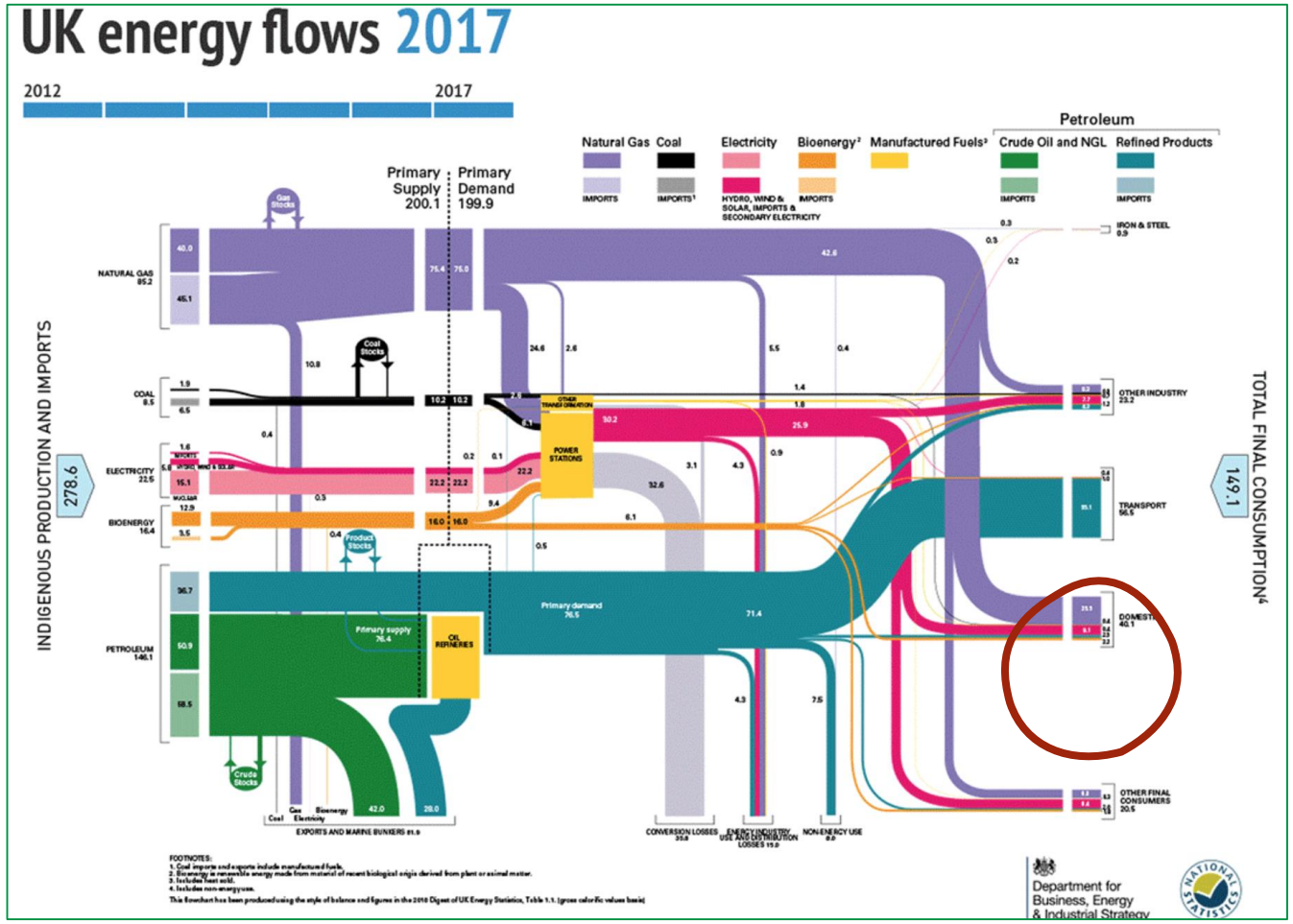
Source: Carbon Brief "Analysis: Why the UK's CO2 emissions have fallen 38% since 1990" https://www.carbonbrief.org/analysis-why-the-uks-co2-emissions-have-fallen-38-since-1990

Power, water & waste - Gas

HOWEVER the technology & policy to fund & enable the switch from gas boilers to electric heat pumps at scale will not be ready until circa 2023

So this project will wait until then unless govt / technology enables mass action sooner

Action: There will be a project to enable and encourage the switch from gas boilers to electric heat pumps, probably from 2023 onwards



NB The chart shows the sources of energy in the UK, where it is ultimately consumed, and the flows in-between. It's generally for information for those interested but it shows the predominance of gas in domestic consumption

HADDENHAM Parish Council

Source: Carbon Brief "Six charts show mixed progress for UK renewables"
https://www.carbonbrief.org/six-charts-show-mixed-progress-for-uk-renewables

Transport

Transport is the second highest single source of emissions

But how does it break down?

		Consumption							
		Food	Clothes	Transport	Power, water & waste	Manufactured goods	Mining & construction	Services	
Production	Agriculture	8%	0%	0%	0%	0%	0%	2%	**11%**
	Clohing & textiles	0%	1%	0%	0%	0%	0%	0%	**1%**
	Transport	1%	0%	17%	0%	1%	0%	3%	**23%**
	Power, water & waste	3%	1%	2%	22%	4%	1%	8%	**41%**
	Manufacturing	1%	0%	1%	0%	5%	2%	5%	**15%**
	Mining & construction	0%	0%	0%	1%	1%	1%	1%	**5%**
	Services	0%	0%	0%	0%	0%	0%	4%	**5%**
		13%	**3%**	**21%**	**24%**	**12%**	**5%**	**24%**	**100%**

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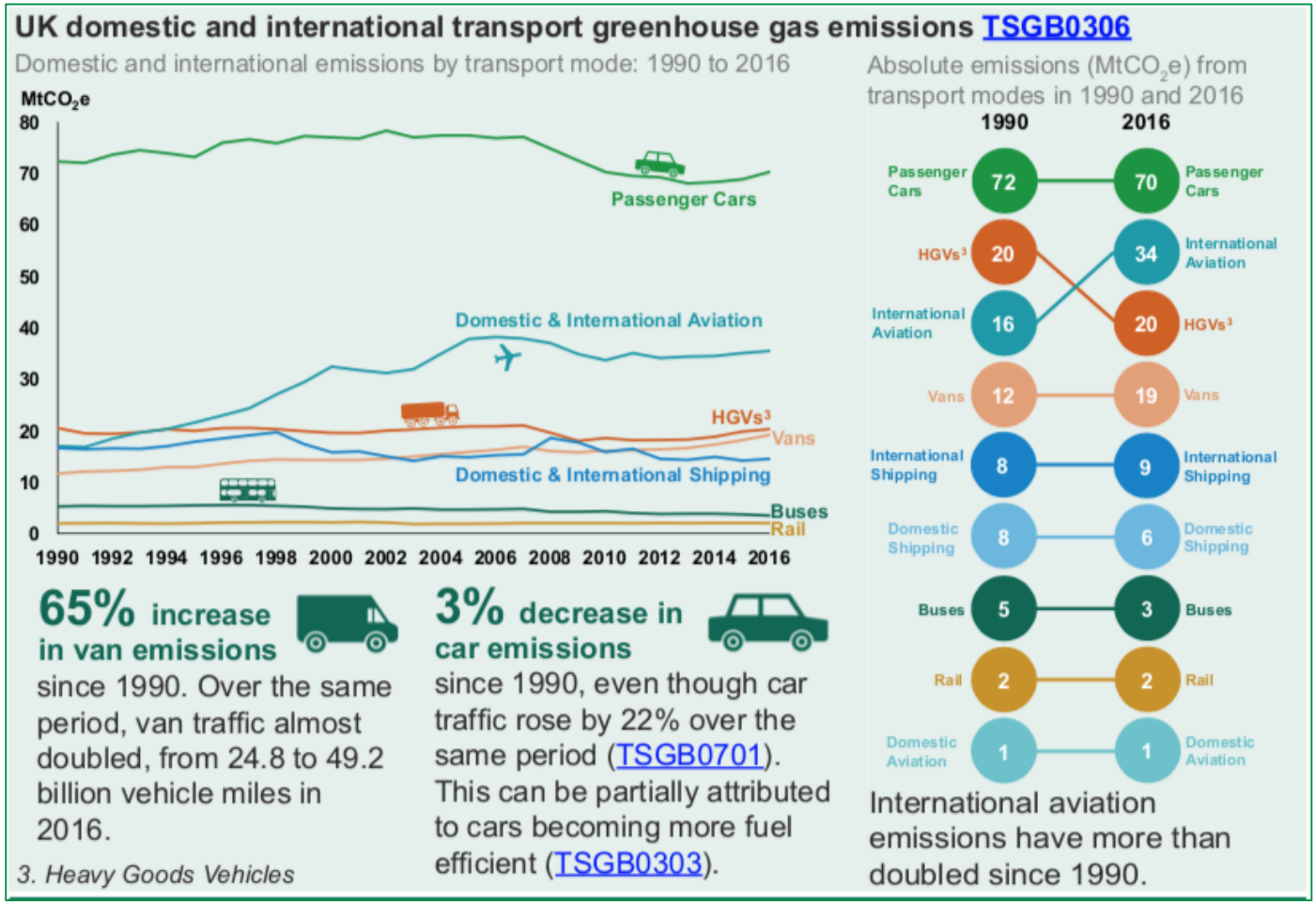
Source: University of Leeds: "Exploring the UK's Carbon Footprint"
http://www.emissions.leeds.ac.uk/chart3.html
HPC analysis

Transport – by mode

Cars and aviation are the main items



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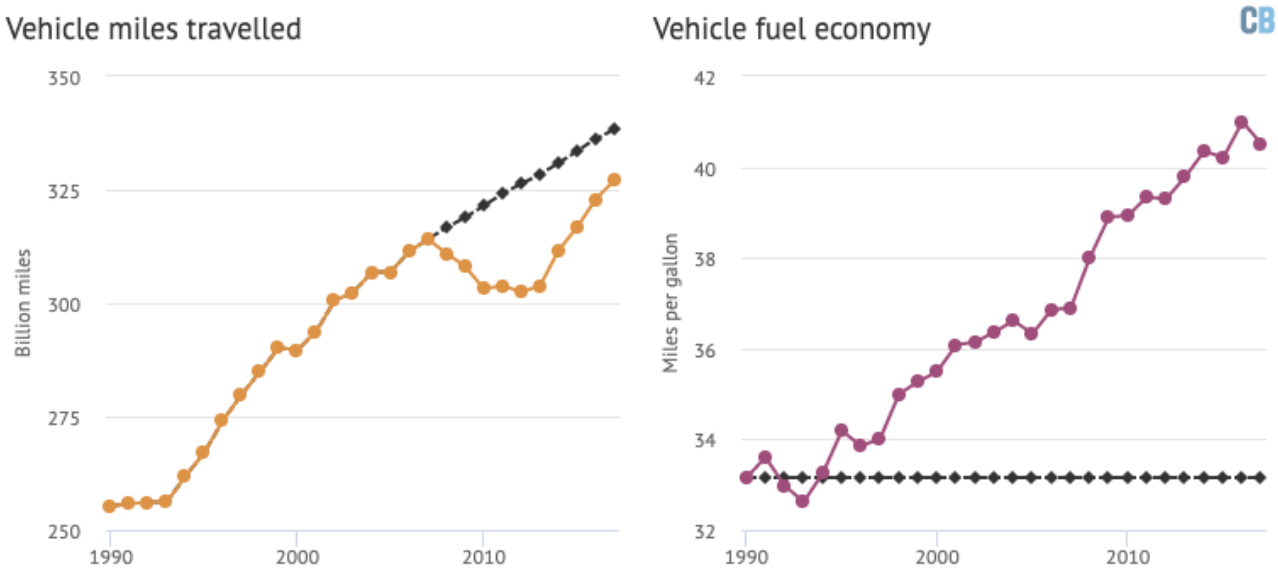
Sources: Department of Transport "Transport Statistics Great Britain 2018 Energy and Environment"
https://www.gov.uk/government/statistics/transport-statistics-great-britain-2018
RAC Foundation "Car Ownership in Great Britain" 2018
https://www.racfoundation.org/wp-content/uploads/2017/11/car-ownership-in-great-britain-leibling-171008-report.pdf

Transport – Cars

Car emissions are unchanged over 25 years as increased usage has offset improved fuel efficiency



Annual miles travelled and vehicle fuel economy (in miles per gallon). Black lines in each plot represent the business as usual scenario: 1990 fuel economy levels and fixed per-capita miles traveled after 2007. Note the truncated y-axes. Data from the UK Department for Transport; chart by Carbon Brief using Highcharts.

HADDENHAM Parish Council

Source: Carbon Brief "Analysis: Why the UK's CO2 emissions have fallen 38% since 1990" https://www.carbonbrief.org/analysis-why-the-uks-co2-emissions-have-fallen-38-since-1990

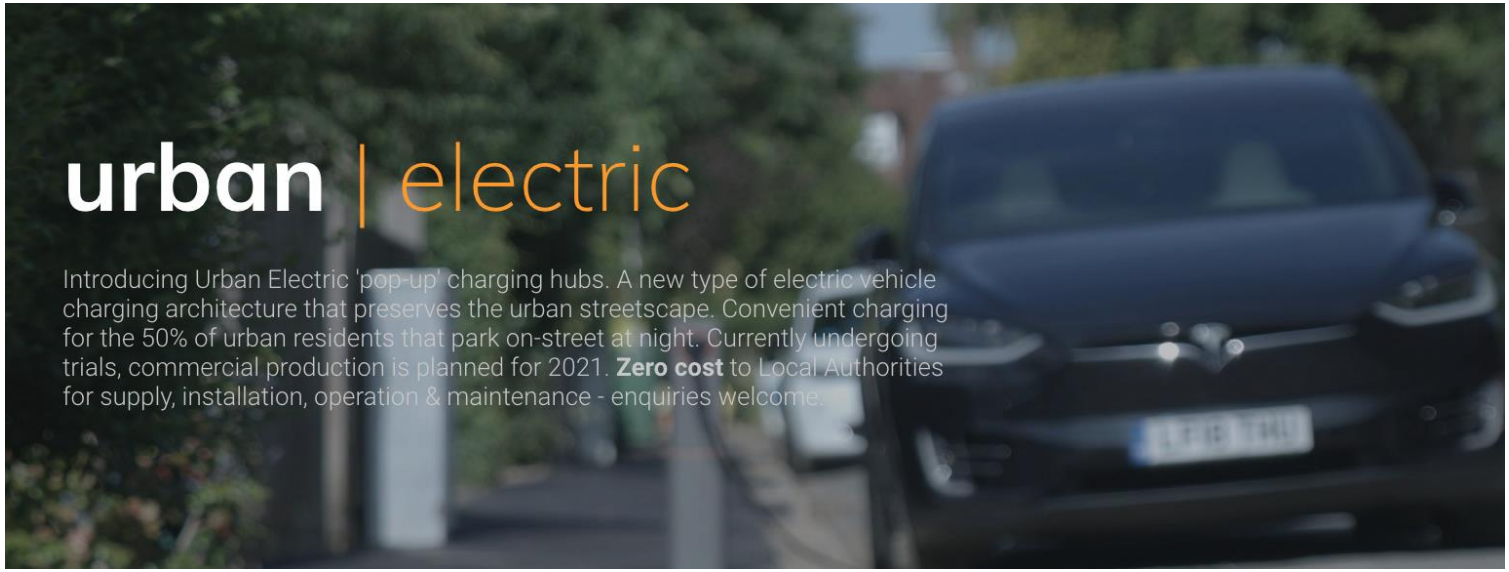
Transport – Electric cars

Given electricity will be from 90% carbon zero sources by 2030, and that the average car is scrapped after 16 years and has 4 owners, there is the potential to cut emissions from cars to single figure $MtCO_2e$ by 2030, or about 90%

Actions:

Ensure there are no planning obstacles to off-street home charging stations

Provide on-street rapid charging for those without off-street parking



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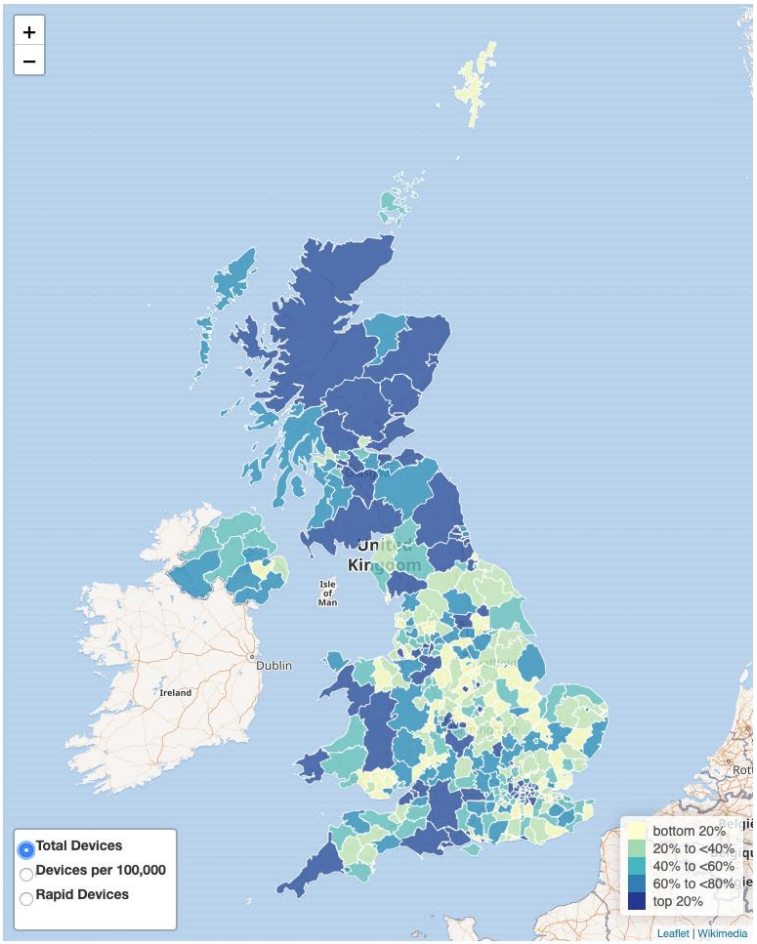
Sources: Department of Transport "Transport Statistics Great Britain 2018 Energy and Environment"
https://www.gov.uk/government/statistics/transport-statistics-great-britain-2018
RAC Foundation "Car Ownership in Great Britain" 2018
https://www.racfoundation.org/wp-content/uploads/2017/11/car-ownership-in-great-britain-leibling-171008-report.pdf
Urban Electric [commercial website]
https://www.urbanelectric.london/

Transport – Public charging points

Action:

We should also pressure Unitary Buckinghamshire Council (UBC) to roll out public charging points.



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Sources: Department of Transport "EV Charging Map"
http://maps.dft.gov.uk/ev-charging-map/

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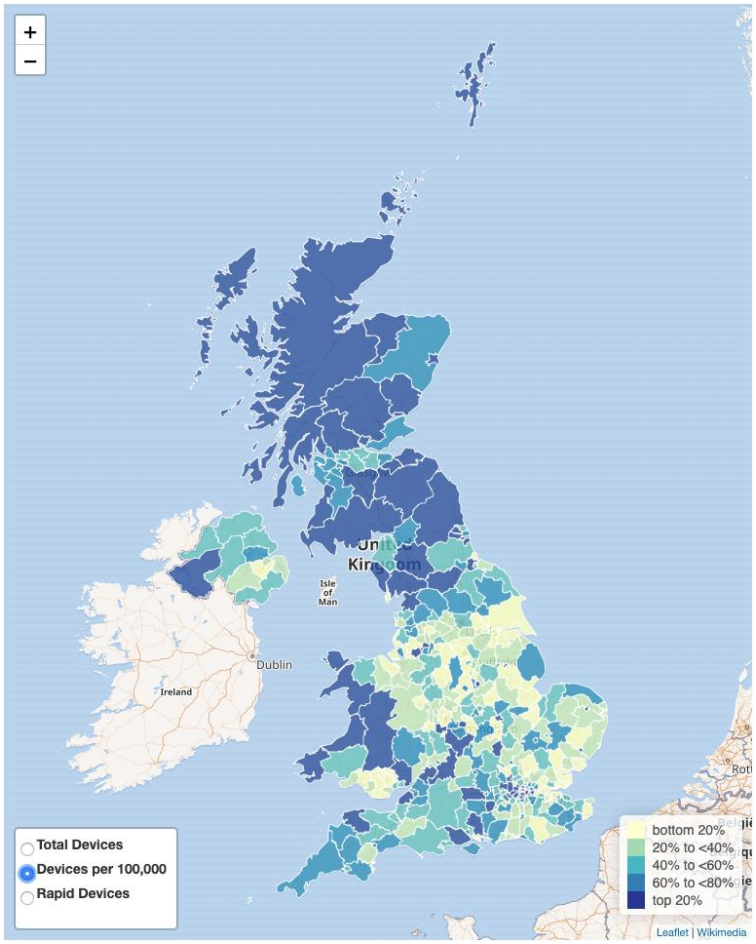

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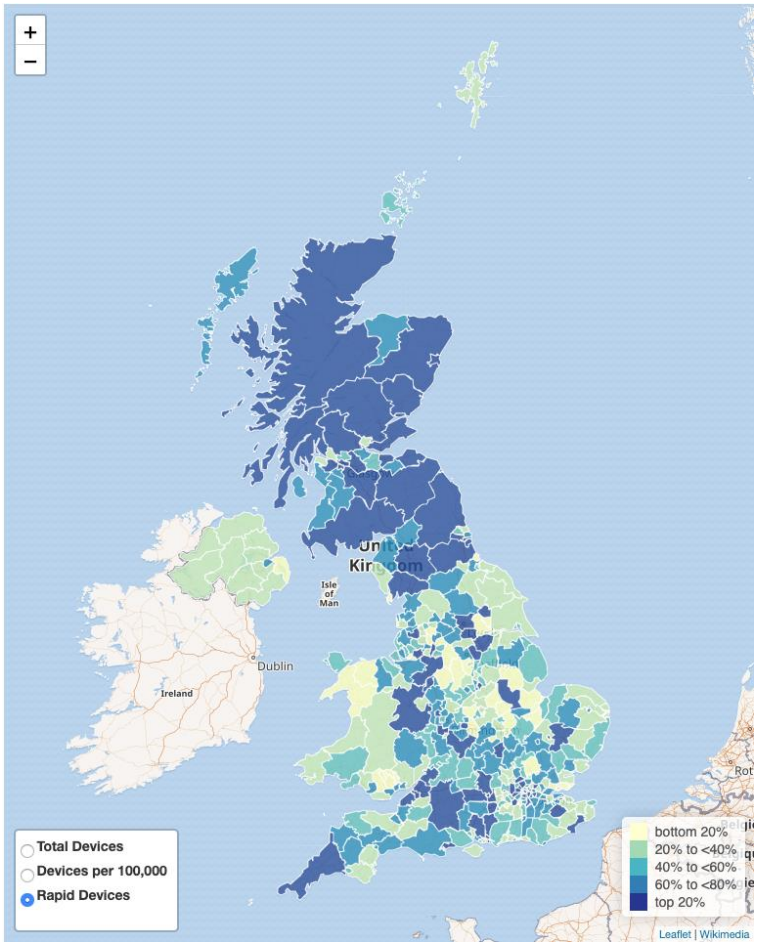

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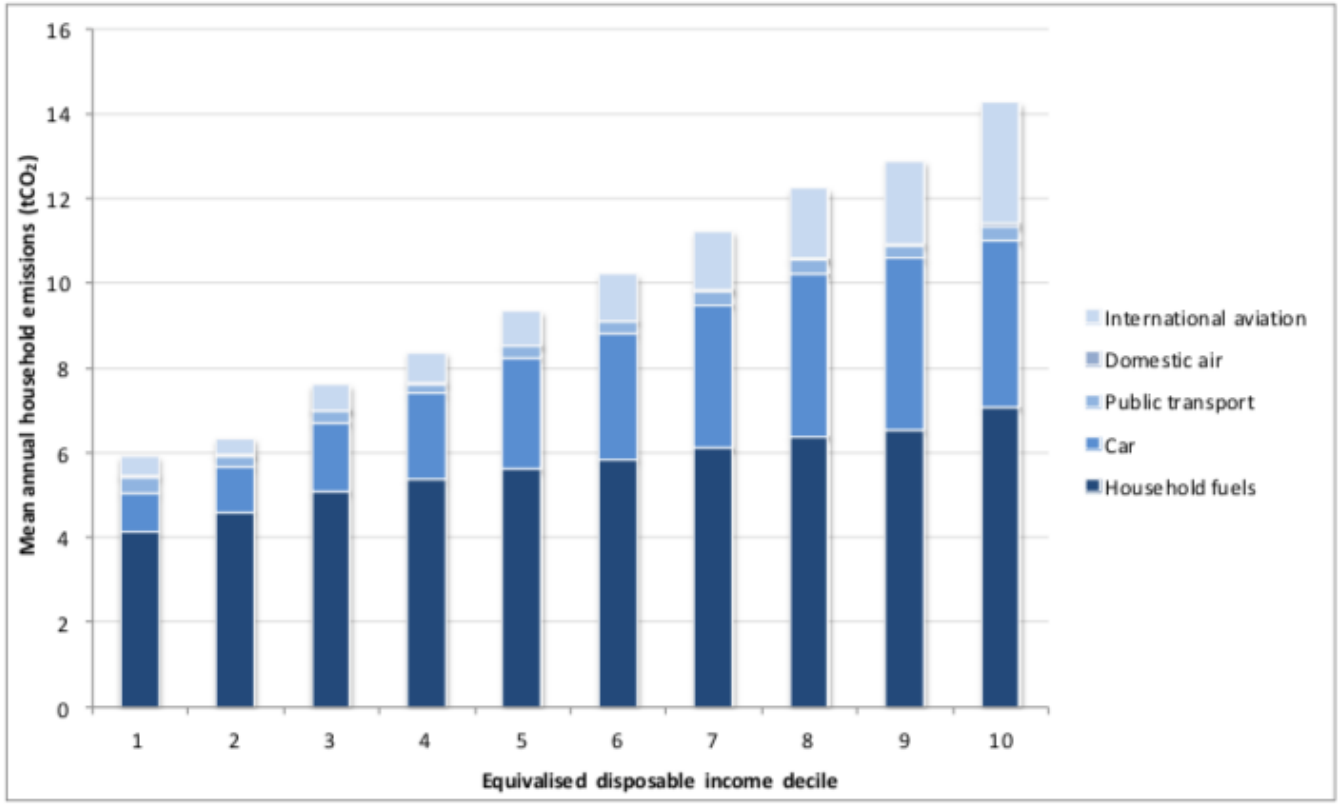
Sources: Department of Transport "EV Charging Map"
http://maps.dft.gov.uk/ev-charging-map/

Aviation emissions vary considerably by circumstances

By income

Figure 3: Mean annual CO_2 emissions from all sources by equivalised household disposable income decile



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Source: DEFRA "Final UK greenhouse gas emissions national statistics: 1990-2017" https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-2017

Aviation emissions vary considerably by circumstances

By family structure, and so on

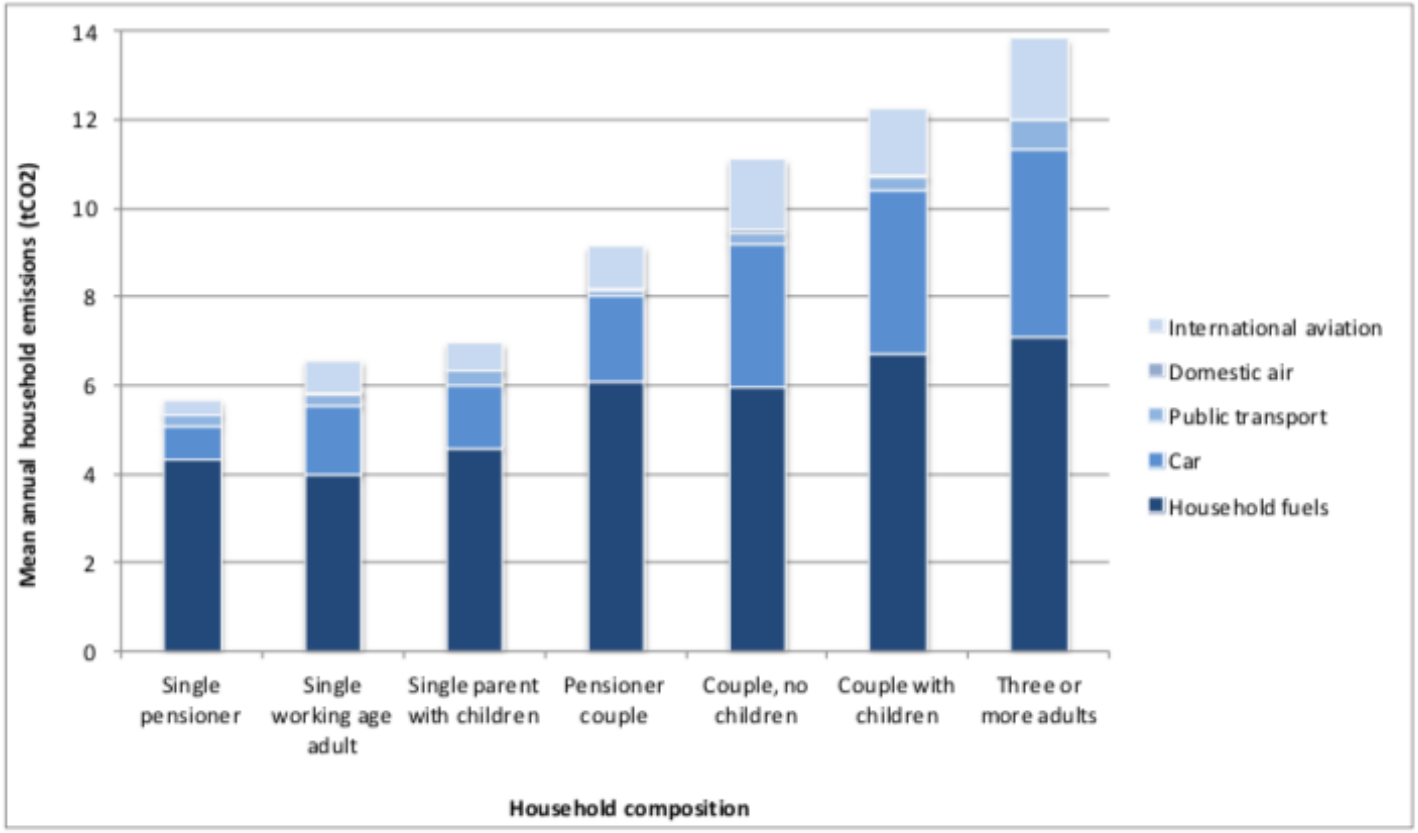
Ideally this topic will be tackled by national / industry sector actions.

However, in the absence of these thus far…

Action: Conduct focus groups /depth interviews / informal research among residents who use international aviation in order to better diagnose the issues

Action: Seek expertise from elsewhere and/or through desk research to elicit insights

Figure 8: Mean annual CO_2 emissions by source and household type



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Source: JRF "The Distribution Of Household Co2 Emissions In Great Britain" March 2013
https://www.jrf.org.uk/report/distribution-household-co2-emissions-great-britain

Food

Food is the third largest homogenous source of emissions – there may be significant "hotspots" in manufactured goods and services, and more work will be done to establish if so, and what

		Consumption							
		Food	Clothes	Transport	Power, water & waste	Manufactured goods	Mining & construction	Services	
Production	Agriculture	8%	0%	0%	0%	0%	0%	2%	**11%**
	Clohing & textiles	0%	1%	0%	0%	0%	0%	0%	**1%**
	Transport	1%	0%	17%	0%	1%	0%	3%	**23%**
	Power, water & waste	3%	1%	2%	22%	4%	1%	8%	**41%**
	Manufacturing	1%	0%	1%	0%	5%	2%	5%	**15%**
	Mining & construction	0%	0%	0%	1%	1%	1%	1%	**5%**
	Services	0%	0%	0%	0%	0%	0%	4%	**5%**
		13%	**3%**	**21%**	**24%**	**12%**	**5%**	**24%**	**100%**

HADDENHAM Parish Council

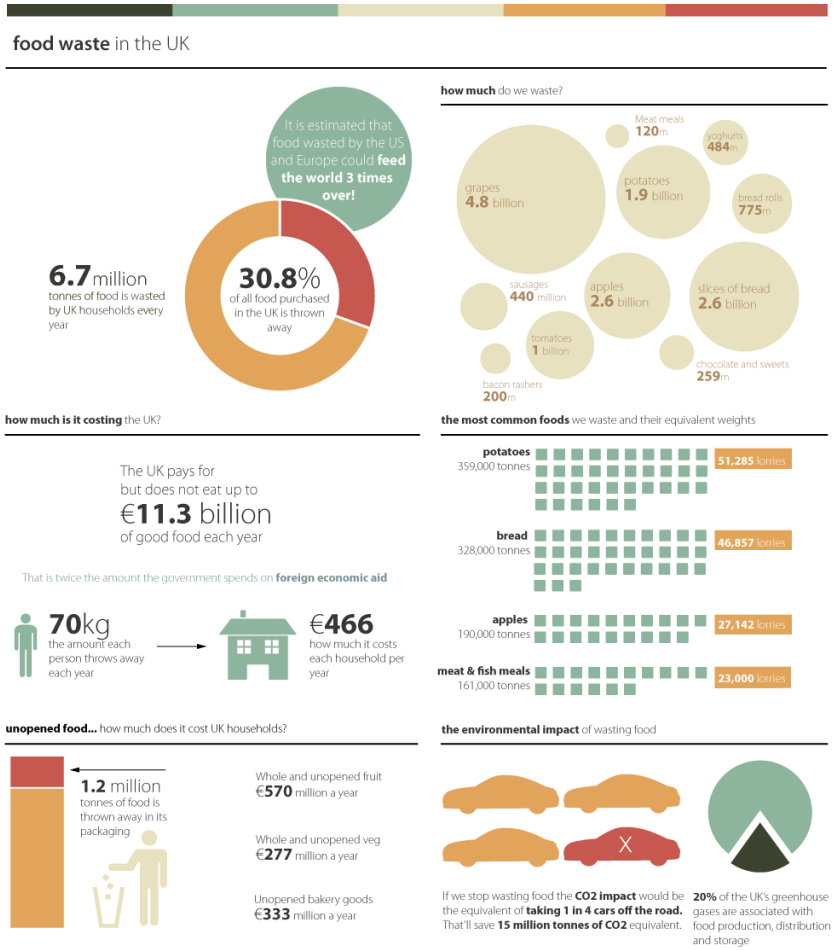
Source: University of Leeds: "Exploring the UK's Carbon Footprint"
http://www.emissions.leeds.ac.uk/chart3.html
HPC analysis

Food waste

Food is the third largest homogenous source of emissions[1]

Action:

Create pilot in Q1 (calendar) 2020 to eradicate food waste in Haddenham and at the shops & farms where Haddenham residents buy their food.



Footnote
1. There may be significant "hotspots" in manufactured goods and services, and more work will be done to establish if so, and what.

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Source: University of Leeds: "Exploring the UK's Carbon Footprint" https://en.wikipedia.org/wiki/Food_waste_in_the_United_Kingdom#/media/File:Food_Waste_in_the_UK.png

Food labelling

Labelling food to show its carbon footprint has been discussed at least since 2010 by UK governments

Simple rules of thumb such as food miles are known to be poor guides as often it is better in emissions terms to buy food grown overseas in season than to buy polytunnel-produced food grown here or in nearby countries such as The Netherlands

Action: Run a pilot to optimise response to carbon labelling of food when introduced circa 2023. This will be a complement to national action and timing will be dictated by when legislation comes into force

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Summary of Proposed Actions & Estimated Impacts So Far

HDM Food waste initiative

Eradicating food waste would be a 23% reduction in food-related emissions

Enabling EVs via charging point provision & removal of obstacles – 90% take-up by 90% who change vehicle reduces transport-related emissions by 47%

De-carbonisation of electricity generation by market forces & govt reduces power emissions by 54%

Switching 80% of hhlds who have gas boilers to electric heat pumps reduces power emissions by 26% with half attributable to local enabling action

	Per cap	Per hhld	HDM now	HDM 2030 BAU	Reduction w/o HDM action	Reduction from currently-proposed HDM action	HDM 2030 so far
Food	1.10	2.63	6,400	8,700		-23%	6,700.00
Clothes	0.23	0.55	1,300	1,800			1,800.00
Transport	1.80	4.33	10,500	14,300		-47%	7,600.00
Power, water & waste	2.05	4.93	11,900	16,300	-67%	-13%	3,200.00
Manufactured goods	1.01	2.43	5,900	8,000			8,000.00
Mining & construction	0.42	1.01	2,400	3,300			3,300.00
Services	2.03	4.88	11,800	16,100			16,100.00
	8.65	20.76	50,200	68,500	-16%	-16%	46,700.00

% of 2019 emissions per cap	Emissions (tCO2y-1)	Hectares of woodland required
100%	68,500	12,850
95%	65,100	12,210
90%	61,700	11,580
85%	58,200	10,920
80%	54,800	10,280
75%	51,400	9,640
70%	48,000	9,010
68%	46,600	8,740
60%	41,100	7,710
55%	37,700	7,070
50%	34,300	6,440
45%	30,800	5,780
40%	27,400	5,140
35%	24,000	4,500
30%	20,600	3,860
25%	17,100	3,210
20%	13,700	2,570
15%	10,300	1,930
10%	6,900	1,290

Residual emissions of 46,600 $MtCO_2y^{-1}$ require 8,740ha of woodland to offset

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Woodland offset

Quantification of the carbon sequestration offered by woodland is sparse with a range of figures being proposed

This report uses verified numbers from The Forestry Commission Woodland Carbon Code Project which implies 5.3 tCO_2y^{-1} per hectare but figures as high as 10 tCO_2y^{-1} or as low as 2.5 can be found

Clearly much depends on the soil, aspect, type of tree and we will need to acquire expertise so we can make wise decisions

Forestry Statistics 2018

Table 4.3a Woodland Carbon Code projects[1] in the UK

	Verified	Validated only	Awaiting validation	Total
Number of projects				
March 2012	0	11	46	57
March 2013	0	36	69	105
March 2014	0	67	135	202
March 2015	0	100	99	199
March 2016	1	121	108	230
March 2017	3	140	107	250
March 2018	37	119	83	239
Area of woodland (hectares)				
March 2012	0	795	1 972	2 767
March 2013	0	1 488	2 073	3 561
March 2014	0	2 824	12 576	15 401
March 2015	0	3 322	12 063	15 385
March 2016	5	4 749	11 087	15 841
March 2017	148	4 993	11 028	16 170
March 2018	1 578	3 680	10 868	16 125
Projected carbon sequestration[2] (thousand tonnes of carbon dioxide equivalent)				
March 2012	0	354	930	1 283
March 2013	0	655	1 137	1 792
March 2014	0	1 323	4 364	5 687
March 2015	0	1 588	4 091	5 679
March 2016	2	2 278	3 519	5 799
March 2017	79	2 385	3 476	5 940
March 2018	713	1 790	3 285	5 788

Source: Forestry Commission

HADDENHAM Parish Council

Forestry Commission " "Table 4.3a Woodland Carbon Code projects1 in the UK
https://www.forestresearch.gov.uk/documents/5267/ch4_climatechange_FS2018.pdf

Woodland offset – Carbon Credits

Woodlands have long been a form of investment and the need for carbon offset and government encouragement of new planting has added to this

However a business case for both the Parish and for landowners is still to be developed and the Forestry Commission is likely to be an early port of call for advice

Forestry Commission

Research Note

Assessing the investment returns from timber and carbon in woodland creation projects

Richard Haw August 2017

Financial returns from woodland creation have traditionally been generated from sales of timber. In recent years, the voluntary carbon market has established and grown in the UK and landowners can now generate additional revenue from the sale of carbon. The sale of carbon 'credits' allows landowners to increase their financial returns by creating woodlands for both timber and non-timber objectives. Even at conservative yield classes and low carbon prices, woodlands can generate £400–£1300 of extra income per hectare when carbon credits are included, and much more for higher yield classes or carbon prices. The costs and benefits of woodland creation projects can vary significantly. However, this Research Note shows that, based on conservative assumptions for the five woodland types analysed here, the net present value for woodland creation increased by around 40–70% for some projects and enabled other projects to produce positive returns from the inclusion of carbon revenue. The analysis also shows that financial returns from commercial rotations can be increased by selecting a longer rotation length that will sequester more carbon. Even at low carbon prices, the extra carbon revenue generated from increasing the rotation length by five years outweighs the reduction in timber value from delayed harvesting. At higher carbon prices a further increase in rotation length could also be substantiated.

Box 2 Planting and establishment costs

Operations included in each of the five woodland types were drainage, fencing, insurance, plan preparation costs, beating up, plants and planting costs, general maintenance, ground preparation, establishment phase maintenance costs and weeding. The three broadleaved sites also contained costs for marking out, stakes, tubing and spiral guards. The two commercial (conifer) sites also contained costs for roading. The table below summarises the undiscounted costs for the planting and establishment phase (15 years) and the total lifetime of the whole woodland, as well as per hectare for broad comparisons.

Woodland type	Whole woodland		Per hectare	
	Total lifetime costs	Planting and establishment costs	Total lifetime costs	Planting and establishment costs
Farm woodland: managed for mixed objectives	£41 600	£23 100	£13 900	£7 700
Broadleaved woodland: managed for game and biodiversity	£49 300	£20 000	£9 900	£4 000
Broadleaved woodland: managed for timber	£66 900	£35 600	£13 400	£7 100
Upland conifer: managed for timber	£342 600	£170 900	£6 900	£3 400
Lowland conifer: managed for timber	£96 600	£51 700	£9 700	£5 200

grant rates (based on information from the Forestry Commission Grants and Licensing team). Maintenance payments of £200/ha for 10 years have also been included. In Scotland 80% of establishment and maintenance costs have been applied. In addition, landowners can usually retain farming subsidies, such as the basic payment, for a number of years following woodland creation. These have not been included.

Timber prices

Box 3 shows the size–price curves applied for typical softwood (conifer) and hardwood (broadleaved) harvests. A further set of prices is also included for 'quality hardwoods' as the price of hardwood timber can vary significantly depending on the end-product quality as a result of the management regime.

Carbon prices

The analysis is based on carbon prices of £3, £6 and £9/tCO_2e paid up front to the landowners, via a project developer, for woodland creation. These prices broadly reflect a range of prices paid at present (2017). The Department for Business, Energy & Industrial Strategy publishes annually updated figures (previously produced by DECC) that reflect the cost of reducing emissions in order to meet UK climate change targets. A price of £60/tCO_2e has also been included to indicate this wider value of carbon sequestration to society. In reality, market prices are significantly short of this level but it does indicate the scale of benefit that investment in woodland creation provides to society.

Additional revenue sources

There are a number of other potential financial benefits for landowners creating woodlands. There may be additional benefits to farms from scaling back on activity no longer required and from shelter provided by woodlands. The presence of woodlands on farms has been shown to add to overall property values and many woodland owners also derive income from game shooting (John Clegg Consulting, 1993). Planting woodlands near rivers could also improve local water qualities and/or reduce water flows and risks of flooding, which can attract further grant funding and in some cases payments from water utility companies. None of these sources of income have been included in this analysis.

Carbon value of the woodland types

Table 2 shows the amount of claimable carbon sequestered by the different woodland types, based on the yield classes shown in Box 1, and its value at selected carbon prices. Even at low carbon prices it is possible to generate a significant amount of additional income from sales of voluntary carbon credits. The carbon sequestration that can be claimed for commercial woodlands is generally lower. Not all of the carbon sequestered can be claimed

Table 2 Carbon value of woodland.

Woodland type	Area	Claimable tCO_2 sequestered		Carbon value of woodland/ha			
	ha	per ha	total	£3	£6	£9	£60
Farm woodland	3	450	1 300	£1 300	£2 700	£4 000	£26 900
Broadleaved woodland (G/B)	5	330	1 700	£1 000	£2 000	£3 000	£20 000
Broadleaved woodland (T)	5	200	1 000	£600	£1 200	£1 800	£12 300
Upland conifer	50	130	6 300	£400	£800	£1 100	£7 600
Lowland conifer	10	240	2 400	£700	£1 400	£2 200	£14 400

Note: rounding has been applied to the tCO_2 and carbon value figures.

HADDENHAM Parish Council

Forestry Commission "Assessing the investment returns from timber and carbon in woodland creation projects" https://www.forestresearch.gov.uk/research/assessing-the-investment-returns-from-timber-and-carbon-in-woodland-creation-projects/

Woodland offset – ReLeaf

ReLeaf is a local group already working with the Parish Council on planting trees as an offset for carbon emissions.

The group has expertise in this area and has already identified sources of advice, resources and funding for starting and scaling up the planting requirement within the parish boundary and beyond

More details about woodland offset can be found in its live proposal document in the URL on this page

reLEAF HADDENHAM

Releaf - Proposal for a tree planting programme in Haddenham

Why plant trees?

Planting billions of trees across the world is by far the biggest and cheapest way to tackle the climate crisis, according to scientists. "This new quantitative evaluation shows [forest] restoration isn't just one of our climate change solutions, it is overwhelmingly the top one," according to Prof Tom Crowther at the Swiss university ETH Zürich, who led the research. "What blows my mind is the scale. I thought restoration would be in the top 10, but it is overwhelmingly more powerful than all of the other climate change solutions proposed."

Tree planting is "a climate change solution that doesn't require President Trump to immediately start believing in climate change, or scientists to come up with technological solutions to draw carbon dioxide out of the atmosphere", Crowther said. "It is available now, it is the cheapest one possible and every one of us can get involved." The study was published on 05/07/19 in the journal Science - you can read the abstract here https://science.sciencemag.org/content/365/6448/76 You can read some further discussion of the study here https://www.theguardian.com/environment/2019/jul/04/planting-billions-trees-best-tackle-climate-crisis-scientists-canopy-emissions

Wood is 50% carbon, so trees are a great carbon store. Their respiration also converts CO2 into oxygen. Trees are one of the few things that can actually take carbon out of the atmosphere and store it for the long term (carbon sequestration). Trees also build soil, stabilise local climates, mitigate flood water, help wildlife, provide food and wood. There are other benefits such as beauty and local amenity use, so wherever we can find space we should plant a native or fruit bearing tree. Better still, plant many. And then care for them.

Many organisations are starting tree planting campaigns, for example water companies have announced plans to plant 11 million new trees in England by 2030 to help the industry's effort to become carbon neutral. https://www.independent.co.uk/environment/trees-planted-england-water-companies-a9061296.html

Ethiopia is in the middle of a campaign to plant 4 billion trees between May and October, they planted more than 350 million trees in a single day! https://www.independent.co.uk/news/world/africa/ethiopia-trees-plant-world-record-abiy-ahmed-a9025896.html

HADDENHAM Parish Council

Source: ReLeaf Haddenham
https://docs.google.com/document/d/1BVODH5CjQsR0V8bdu4LJ8zrTfOUfBKSmfrskTMPKilM/edit

Woodland offset in the Parish

Approx 150 hectares (370 acres) of land in the parish is at our borders and is in Flood Zones 2 or 3.

It is likely therefore that a business case can be made to the landowners for these areas of land to be planted as woodland

Key

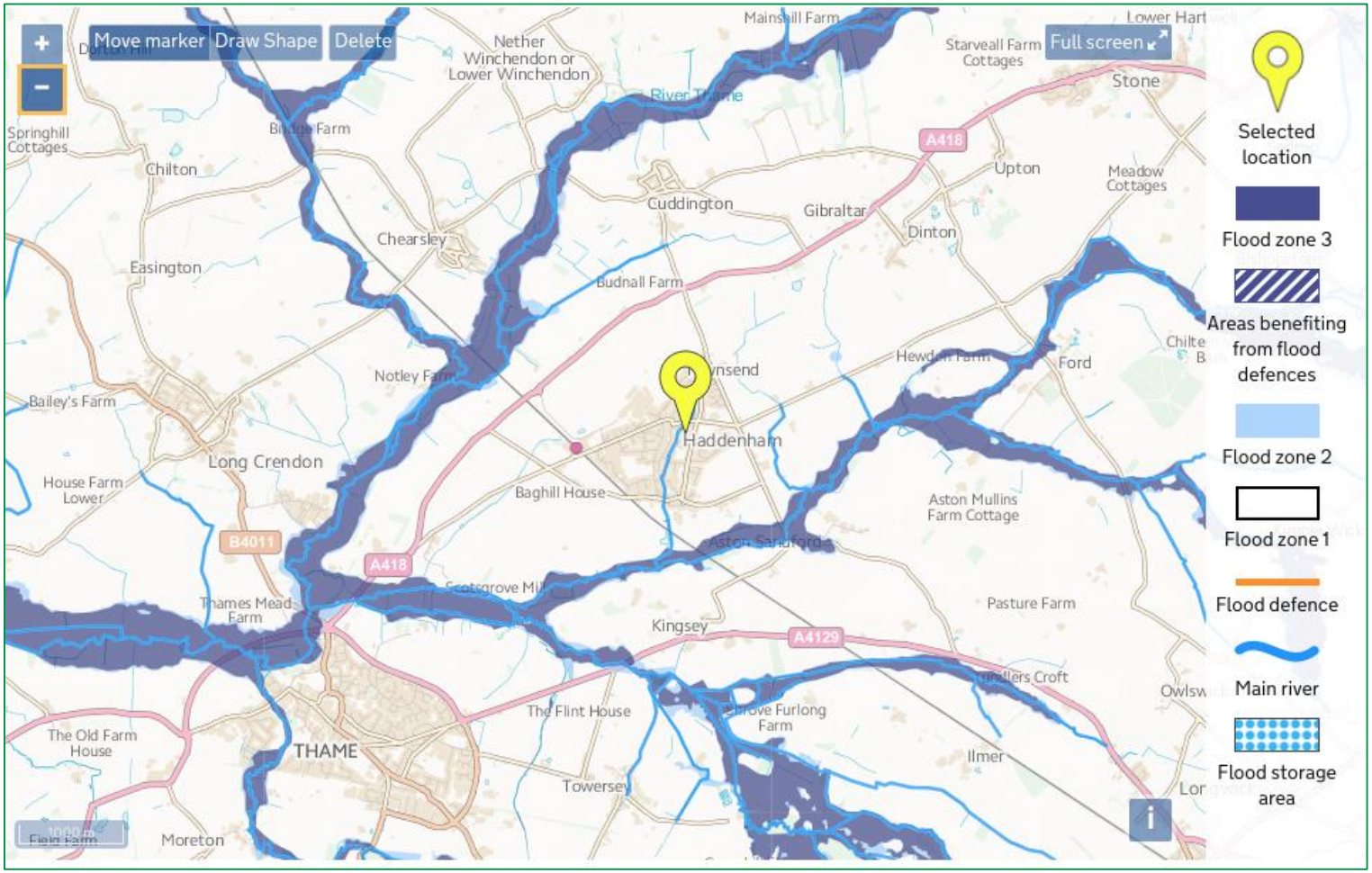
- Flood plain outside the Parish of Haddenham
- Flood plain within the Parish of Haddenham

HADDENHAM Parish Council

Sources: Land Insight, The Environment Agency, HPC analysis

Woodland offset adjacent to the Parish

If landowner reaction is positive and experts deem it feasible, it may be possible to also extend the programme to the flood plains across the parish borders in Aston Sandford, Kingsey, Thame, Long Crendon, Chearsley & Cuddington

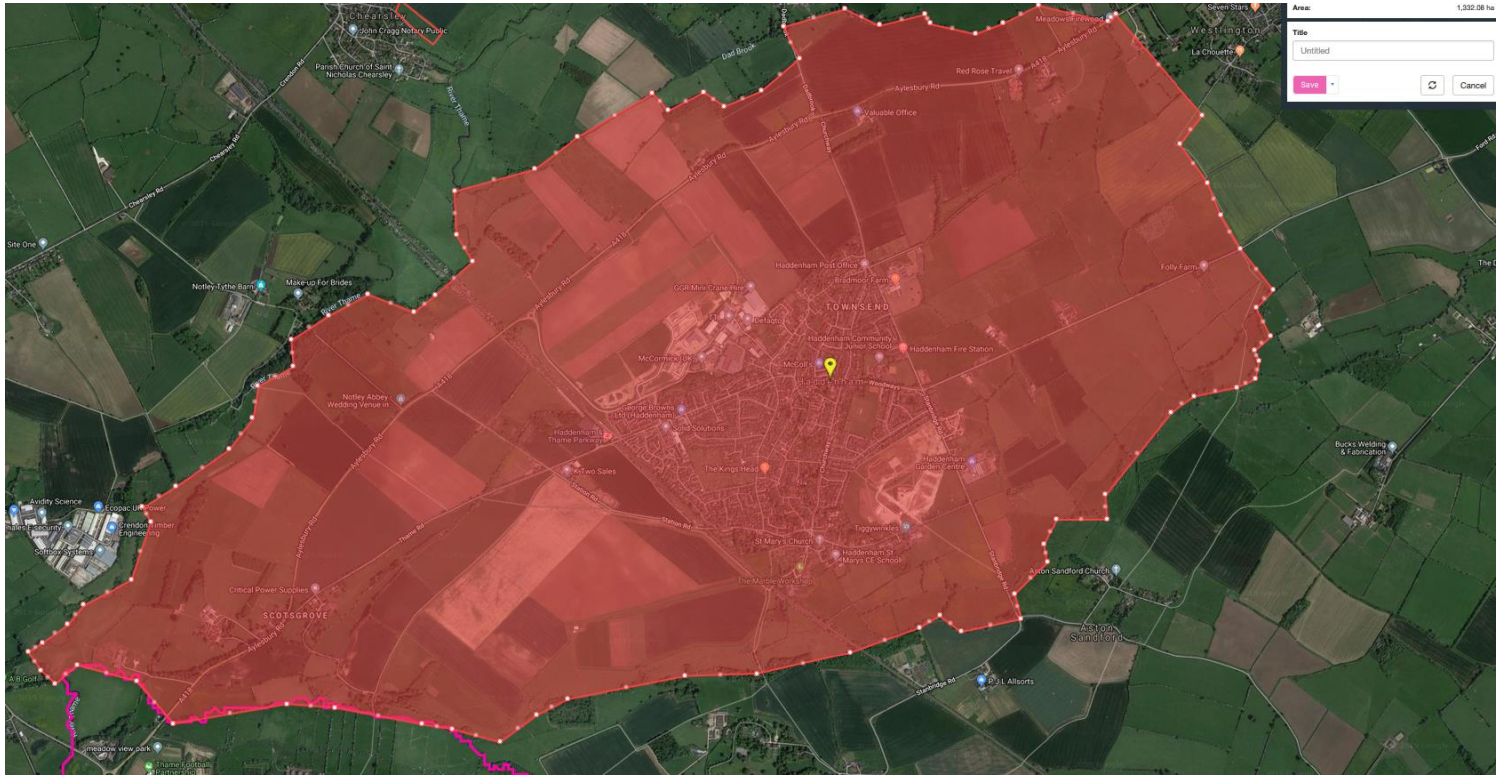


HADDENHAM Parish Council

Source: The Environment Agency
https://flood-map-for-planning.service.gov.uk/confirm-location?easting=474147&northing=208729&placeOrPostcode=HP17%208NF

Land use in the Parish

The parish covers an area of approx. 1,330 hectares (3,285 acres)



HADDENHAM Parish Council

Sources: Land Insight, The Environment Agency, HPC analysis

Land use in the Parish

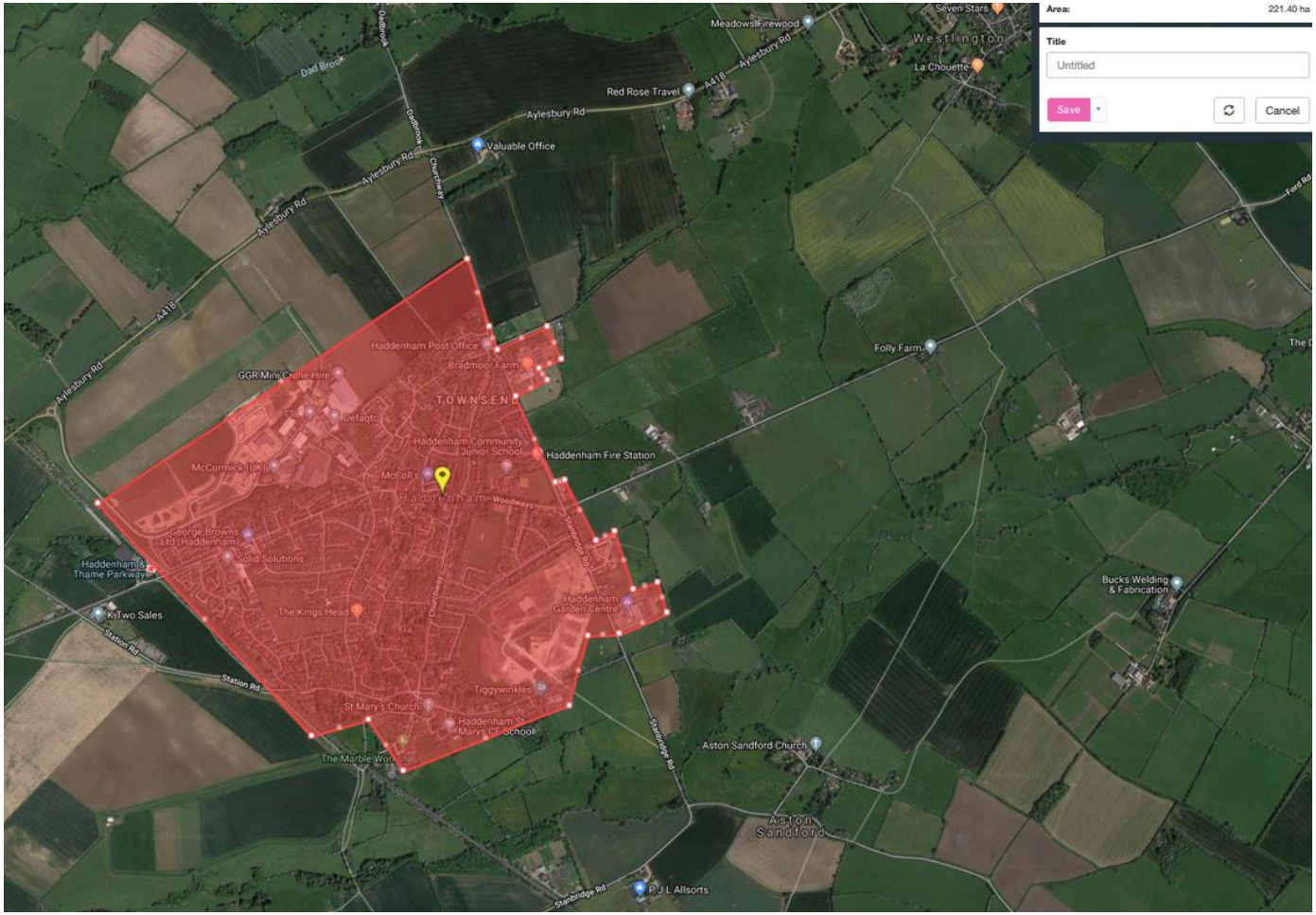
The built-up area, including the new developments, accounts for circa 220 hectares (544 acres)

This means there is approx. 960 hectares (2,370 acres) that is neither built-up nor in the flood plain

Grassland does have the potential to contribute as a carbon sink but agricultural land is usually a net emitter, especially if cattle or sheep are farmed

Work to assess the impact of this land, and its potential is still to be done

Action: To the extent woodland is needed in excess of what can be planted in the parish, the emissions will have to be offset elsewhere and a business plan for doing so will be needed



HADDENHAM Parish Council

Sources: Land Insight, The Environment Agency, HPC analysis

Addressing Main Obstacle #2

The inertia of existing habits

HADDENHAM
Parish Council

A pilot of enthusiasts for each initiative

We will use a pilot structure for generating behavioural change in the village

We will NOT seek to persuade, cajole or shame anyone into action as these approaches are respectively very difficult to pull off, annoying and counter-productive

Piloting involves finding people who have an immediate personal enthusiasm for participating in the specific initiative

Consequently their mindset is to help, report things that don't work in a constructive fashion with ideas for solving the problem, and they are likely to talk with enthusiasm about what they are doing to their friends and neighbours

It is more than likely that the participants on each pilot will be different people

Some people will not want to be involved at all. Ever. This is fine and no energy should be expended worrying about this nor on trying to specifically change their behaviour

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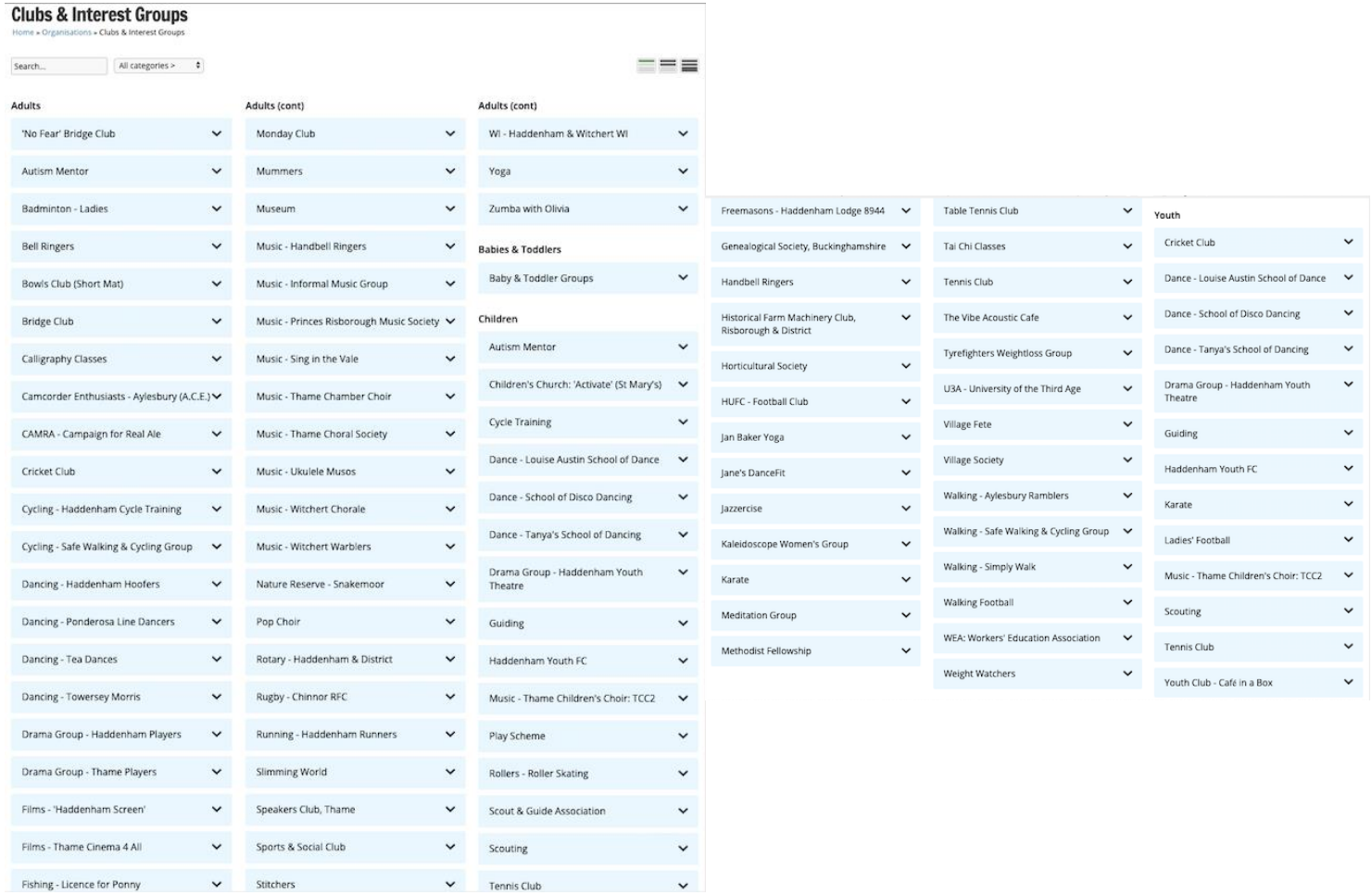
Source: Haddenham.net
https://www.haddenham.net/

Recruit only enthusiasts for each pilot across as many existing social networks as possible

One of the many benefits of a "pilot" structure is that the activity becomes the communication about the activity.

Rather than broadcast "one-to-many", the communication is "many-to-many" as participants are dispersed across the village's many existing social networks, and given they have joined the pilot because they are enthusiastic about it, not because they've had their arm twisted, the communication is positive and the mere fact of it nudges others into being more likely to join in

The main driver of most people's behavior is other people's behavior. Especially other people with whom they have things in common



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Source: Haddenham.net
https://www.haddenham.net/

Decadal Calendar

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Decadal Calendar

Topic	Action	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Food	Eradicate food waste											
	Change food mix											
	Carbon footprint											
Home Fuel	Gas Boiler / Heat Pump switch											
	Lobby UBC & MHCLG re CLT											
Transport	Lobby UBC & MHCLG re any planning impediments to EVs											
	Lobby UBC re charging infrastructure											
	Install network ourselves wih commercial partner											
	Aviation Use - Resident Research											
Manufactured Goods												
Services												
Carbon sinks	Woodland Offset											

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