ZERO CARBON BRITAIN 2030

A NEW ENERGY STRATEGY

The second report of the Zero Carbon Britain project

introduction

context

Your Turn

powerdown

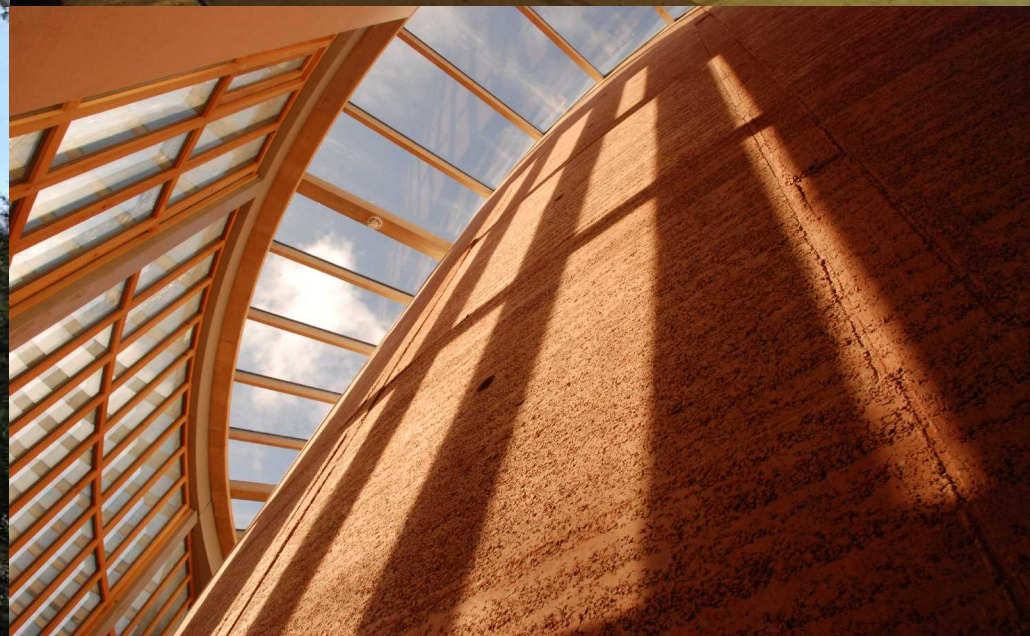
landuse

powerup

Conclusions

Centre for Alternative Technology

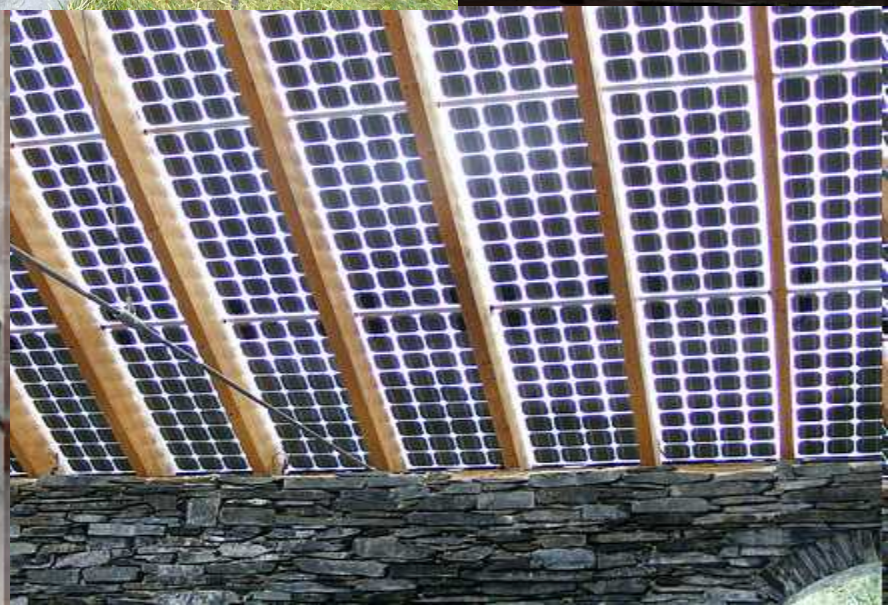
37 Years in Sustainable Architecture



Centre for Alternative Technology

..and Renewable Energy

The first ‘Alternative Energy Strategy’ (1977)



Our wellbeing depends upon

- Climate Security
- Energy Security
- Economic Security
- International Security

Where are we now?

introduction

- Society is now aware of **many** pressing challenges
- Lots of people are clearly doing **lots of great work**
- But what is our **target**?
- How much **time** do we have to get there?
- How does everything **fit together**??

Charting a New Terrain

introduction

- **Back-cast** from where the climate science says we are and need to be
- Bring together the UK's **leading thinkers** in their field including policy makers, scientists, academics, business and NGOs
- Produce an **Evidence-based** solution scenario to foster debate

In collaboration with ...

introduction

NGOs

nef

Smithsonian

NATIONAL ENERGY FOUNDATION

Soil Association

FWA

DESERTEC FOUNDATION

garden organic

Universities

Industry

SUSTRACO

ARUP

BioRegional

riversimple

carbondescent
Delivering a Sustainable Future

npower

Scottish and Southern Energy

wates

Research centres

4CMR

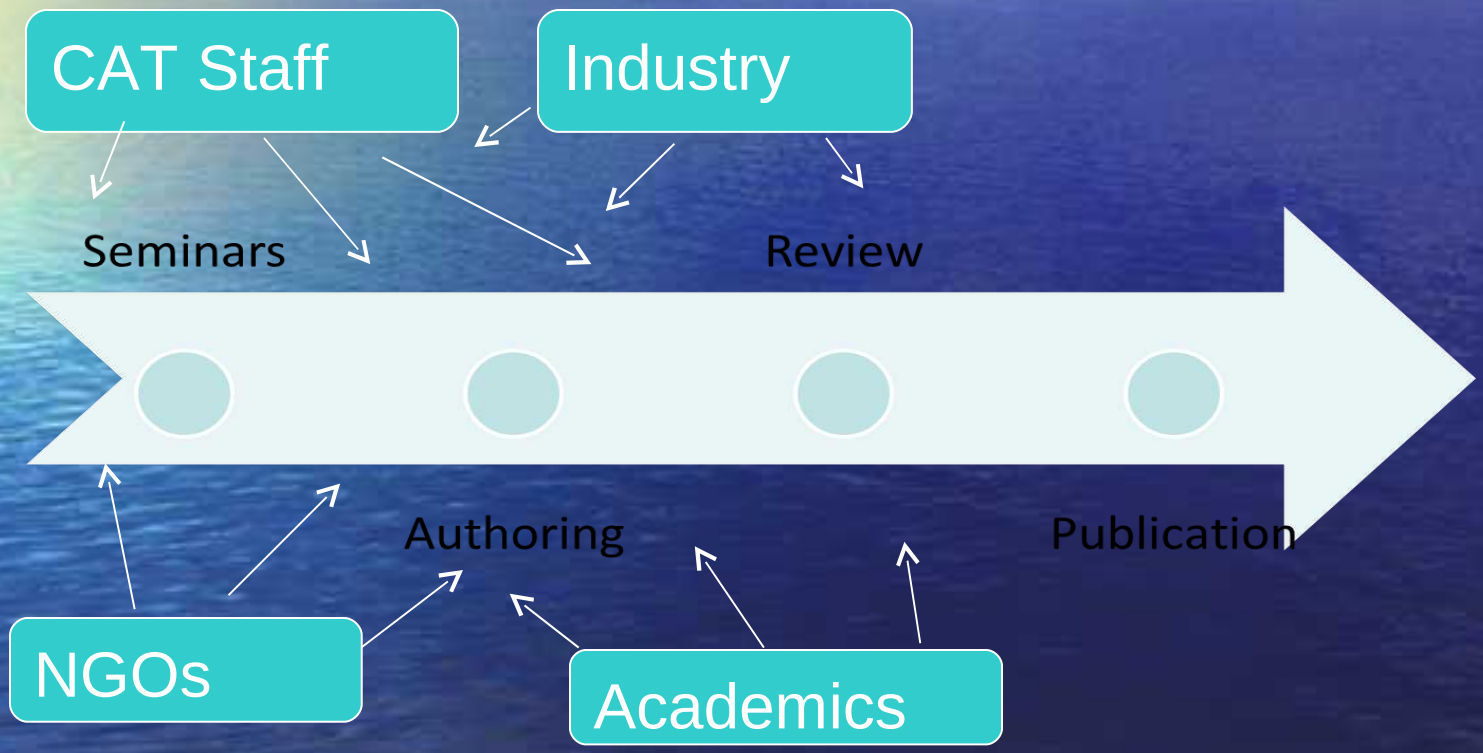
Centre for Transport & Society

publicinterestresearchcentre

EPSRC
Pioneering research and skills

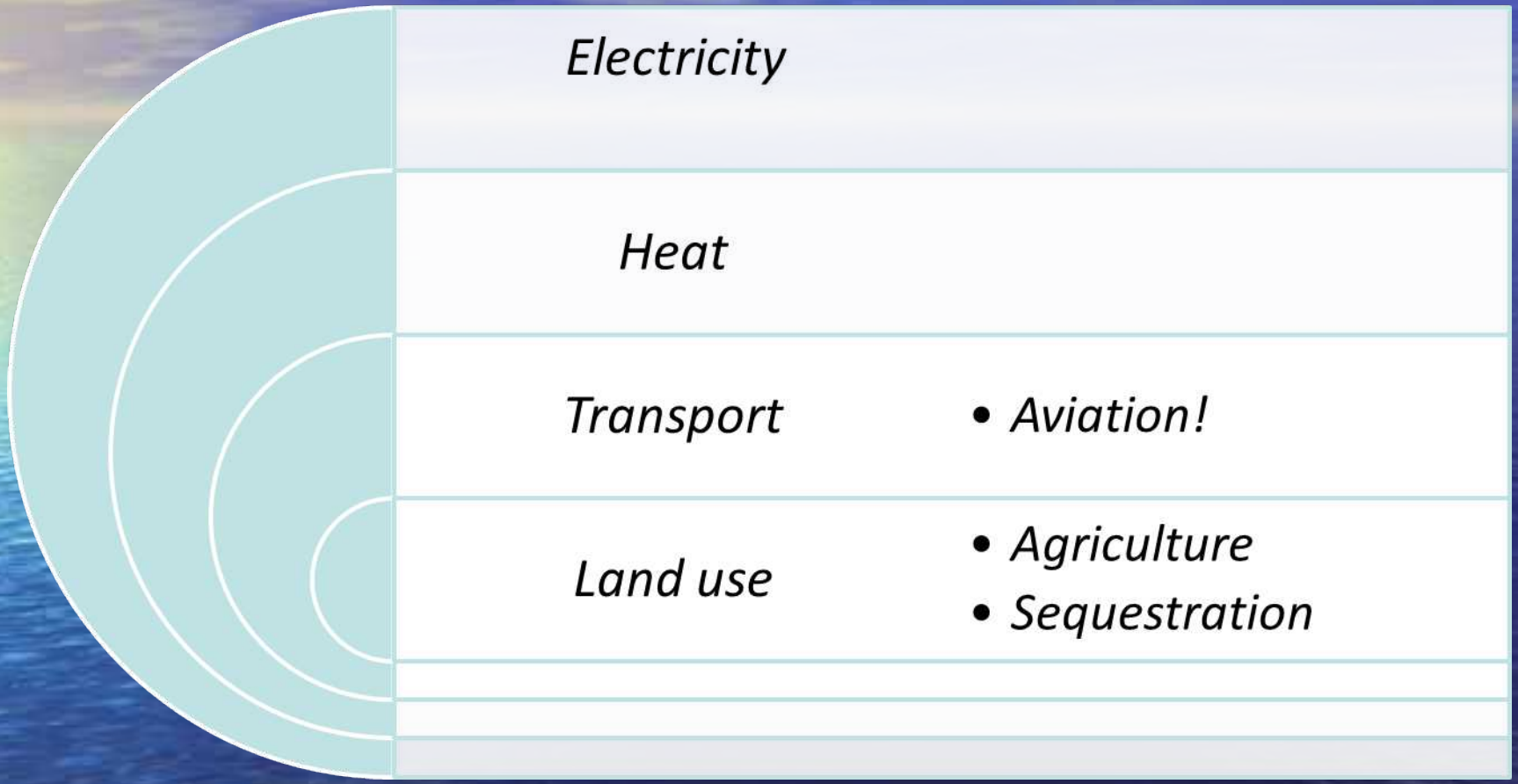
CHATHAM HOUSE

Our 18 month process ...



The scope of the study

introduction



First Fully-Integrated Solution to Climate Change

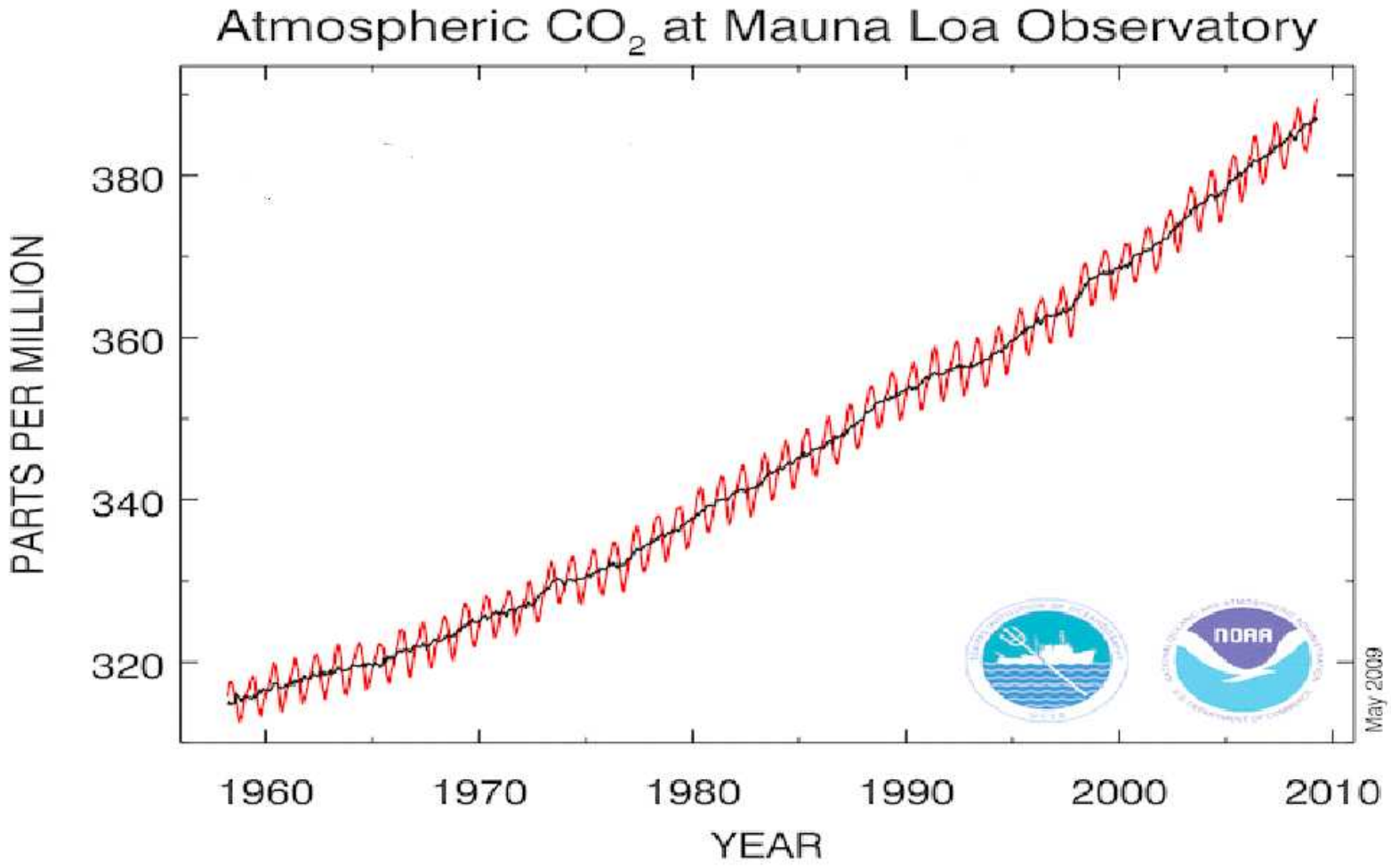
Climate Security

globalcontext

In 1896 Swedish physicist Svante Arrhenius concluded that adding to the greenhouse gas layer through burning fossil fuels would raise the earth’s temperature.

Climate Security

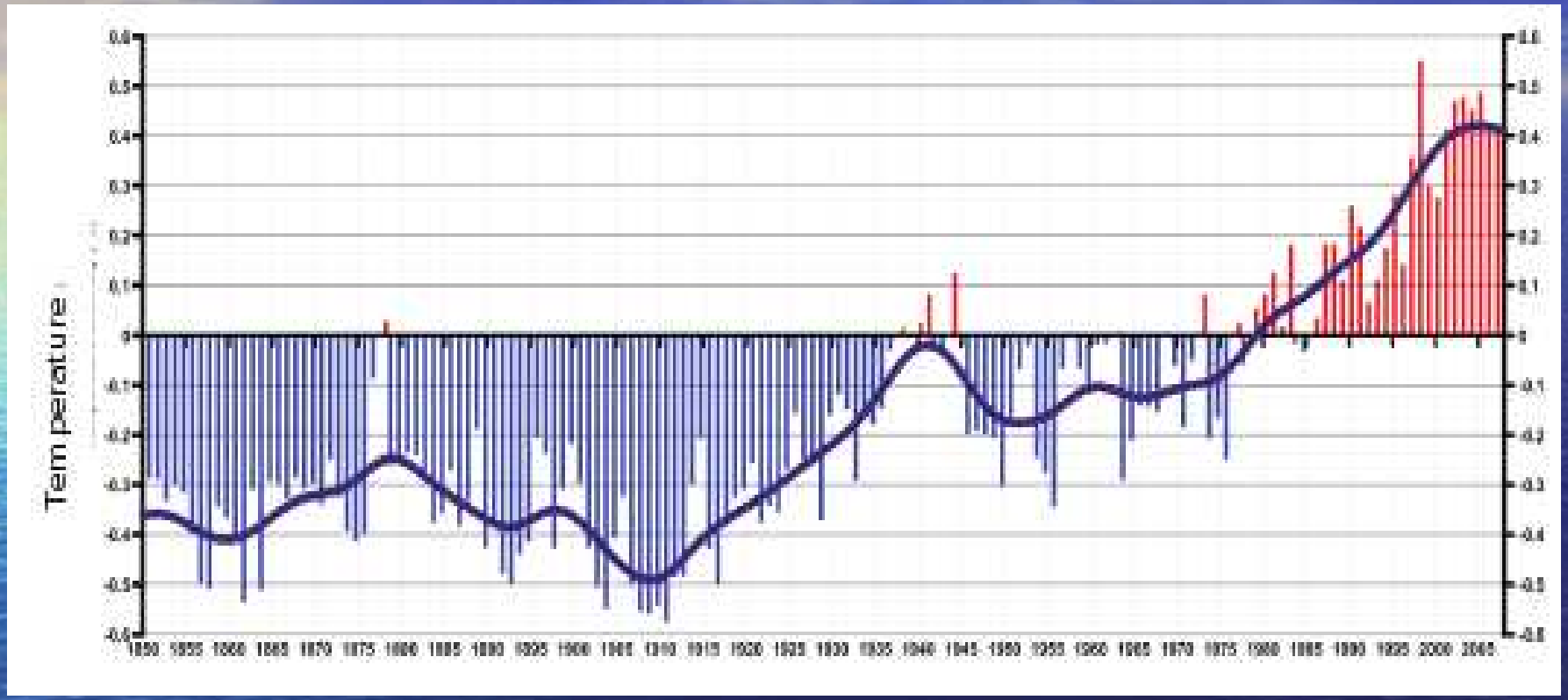
globalcontext



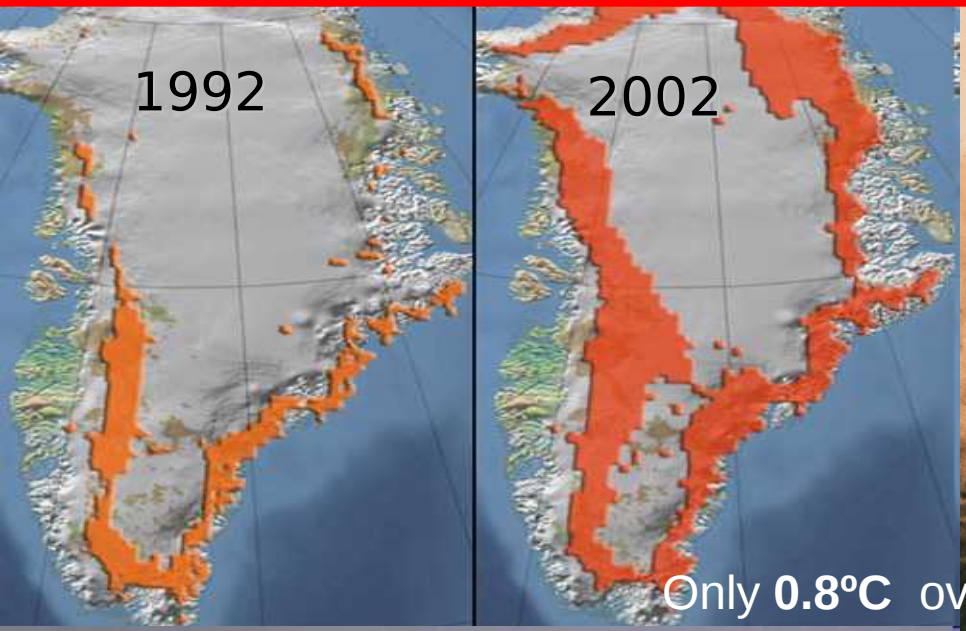
Source: NOAA Earth system Research Lab, Scripps Institution of Oceanography

Climate Security

globalcontext



Global Air Temperatures 1850-2008



Only **0.8ºC** over 1990 levels..

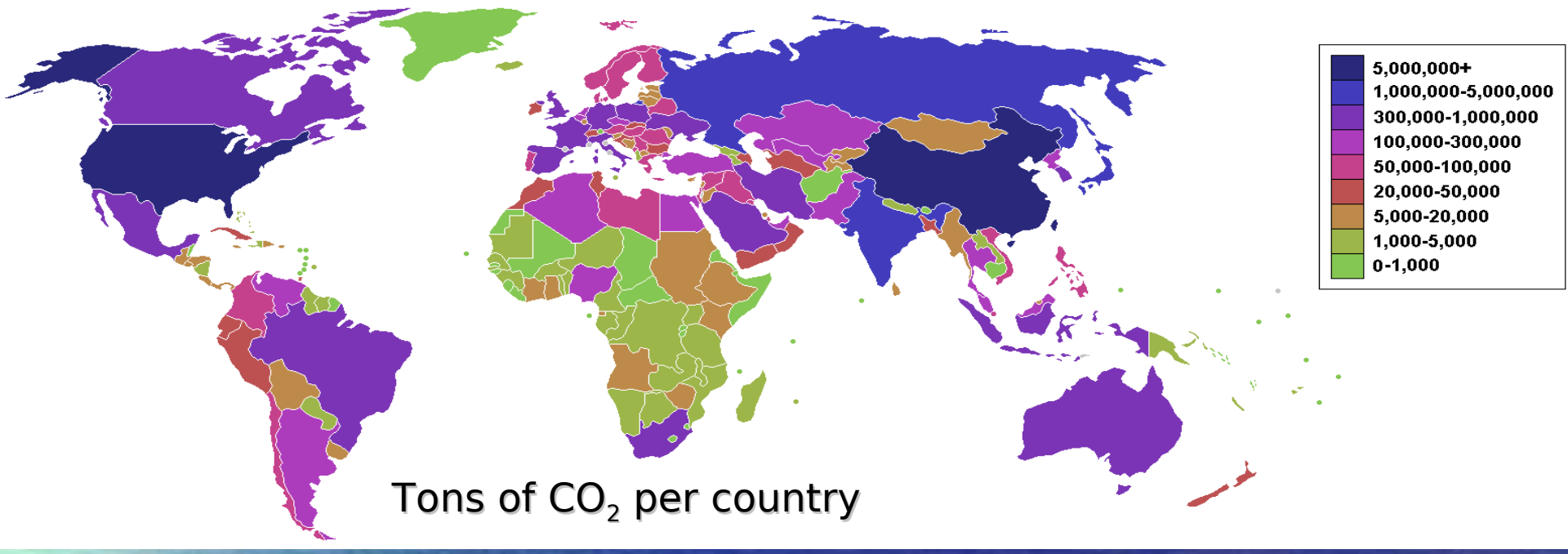
Climate Change

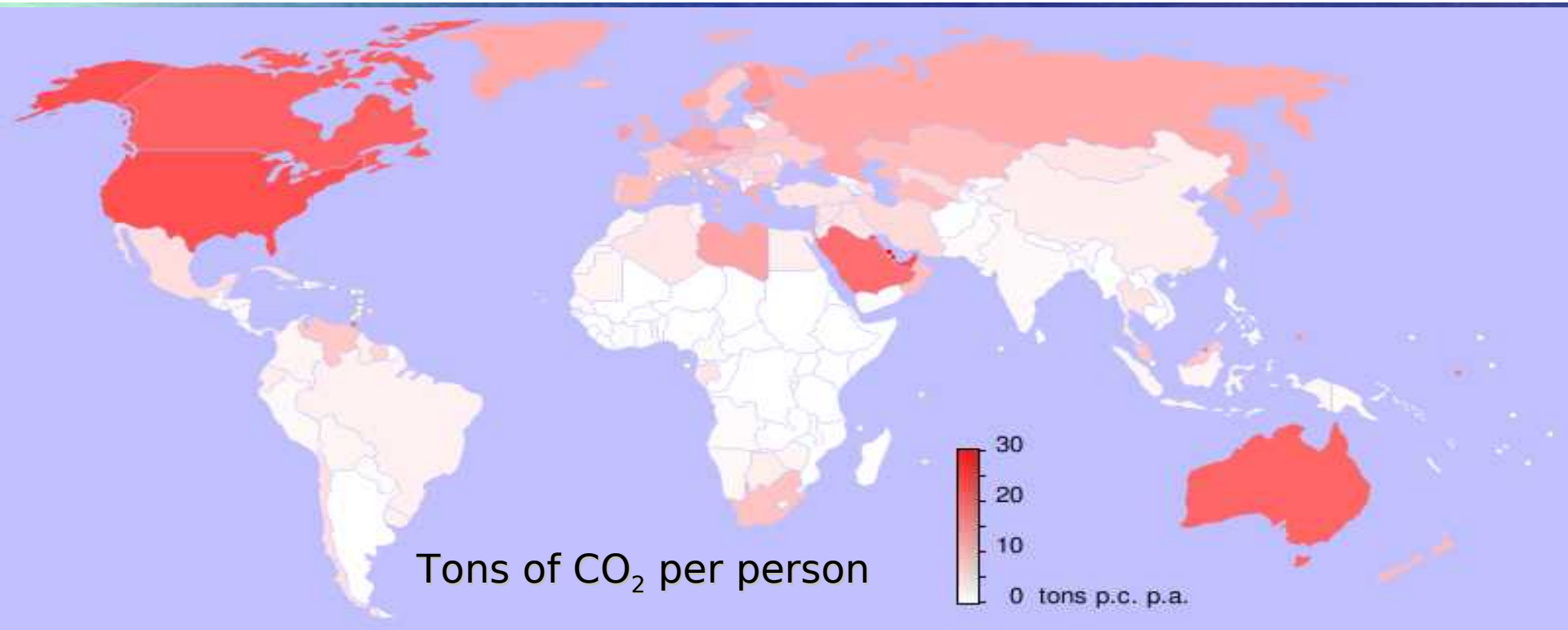
globalcontext

Meinshausen (2009):

*"For an 84% probability of avoiding 2°C of global warming, **global** emissions must be cut by **72%** from 1990 levels by 2050... and emissions must then near zero by 2100 globally."*

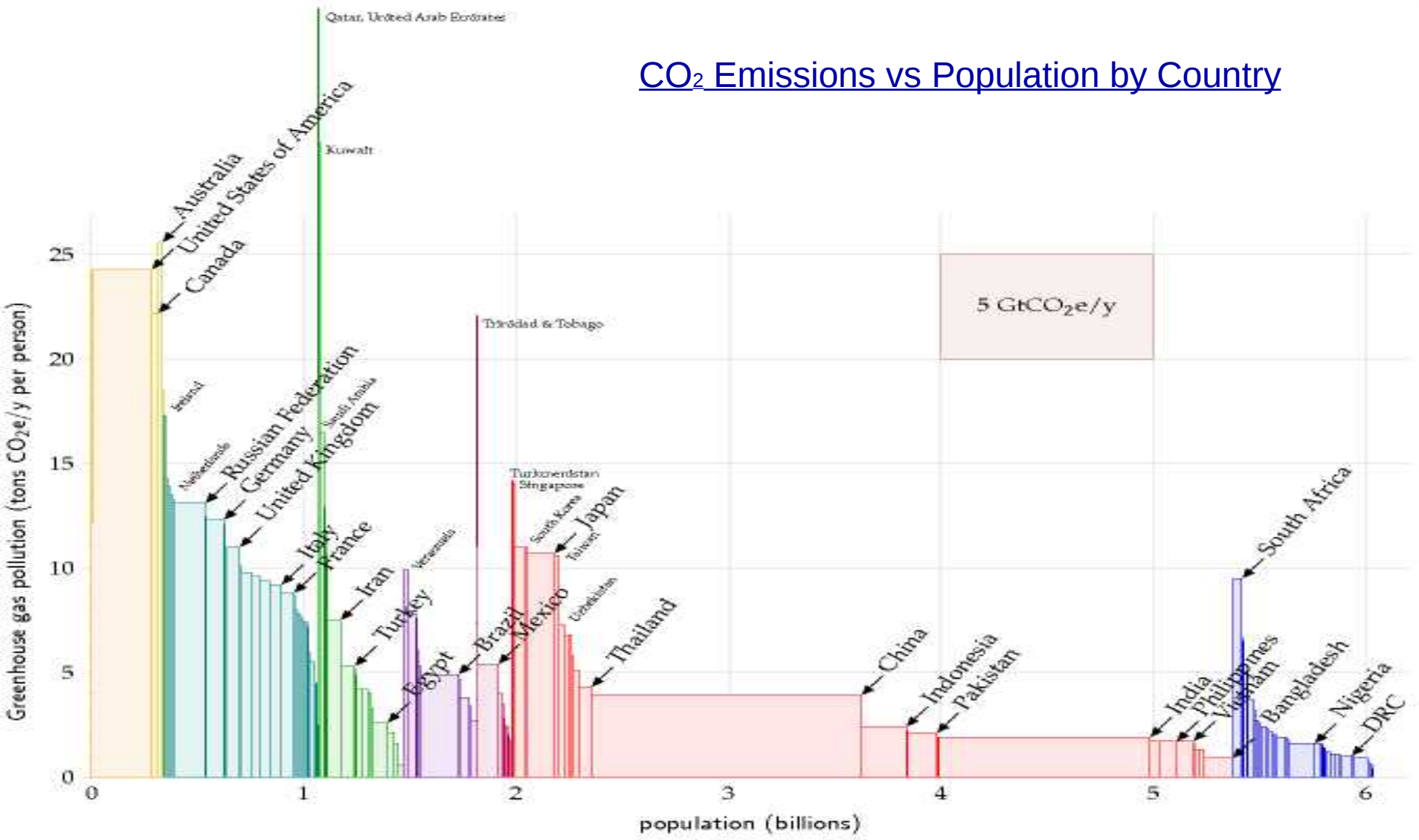
Is 2° enough?


5,000,000+
1,000,000-5,000,000
300,000-1,000,000
100,000-300,000
50,000-100,000
20,000-50,000
5,000-20,000
1,000-5,000
0-1,000
Tons of CO_2 per country


30
20
10
0 tons p.c. p.a.
Tons of CO_2 per person

Who is emitting the CO_2?

globalcontext



2 tonnes/person is sustainable

Source: Sustainable Energy without the Hot Air' – David Mackay (2009)

"Defence": 4

Transporting stuff: 12 kWh/d

Stuff: 48+ kWh/d

Food, farming, fertilizer: 15 kWh/d

Gadgets: 5

Light: 4 kWh/d

Heating, cooling: 37 kWh/d

Jet flights: 30 kWh/d

Car: 40 kWh/d

And how are we emitting ours?

Domestic sector

Non-domestic buildings

Transport

Industrial and commercial processes

Land Use

Imports

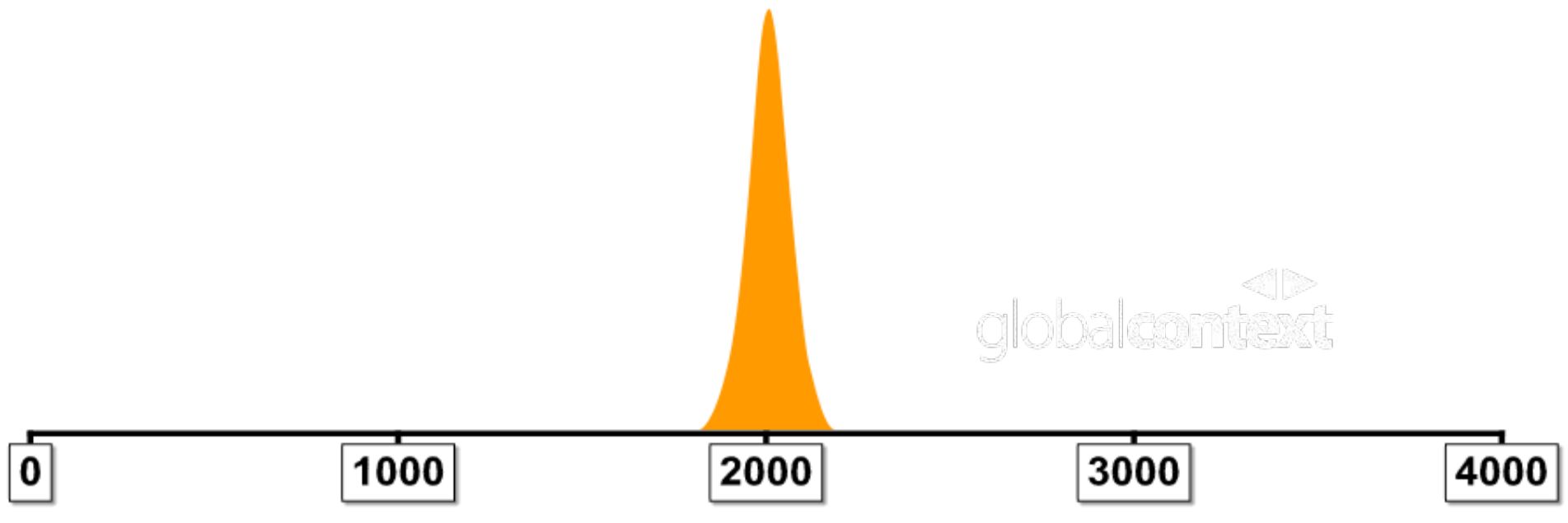
Energy Production

= 637 million tonnes CO_2e

Energy Security

globalcontext

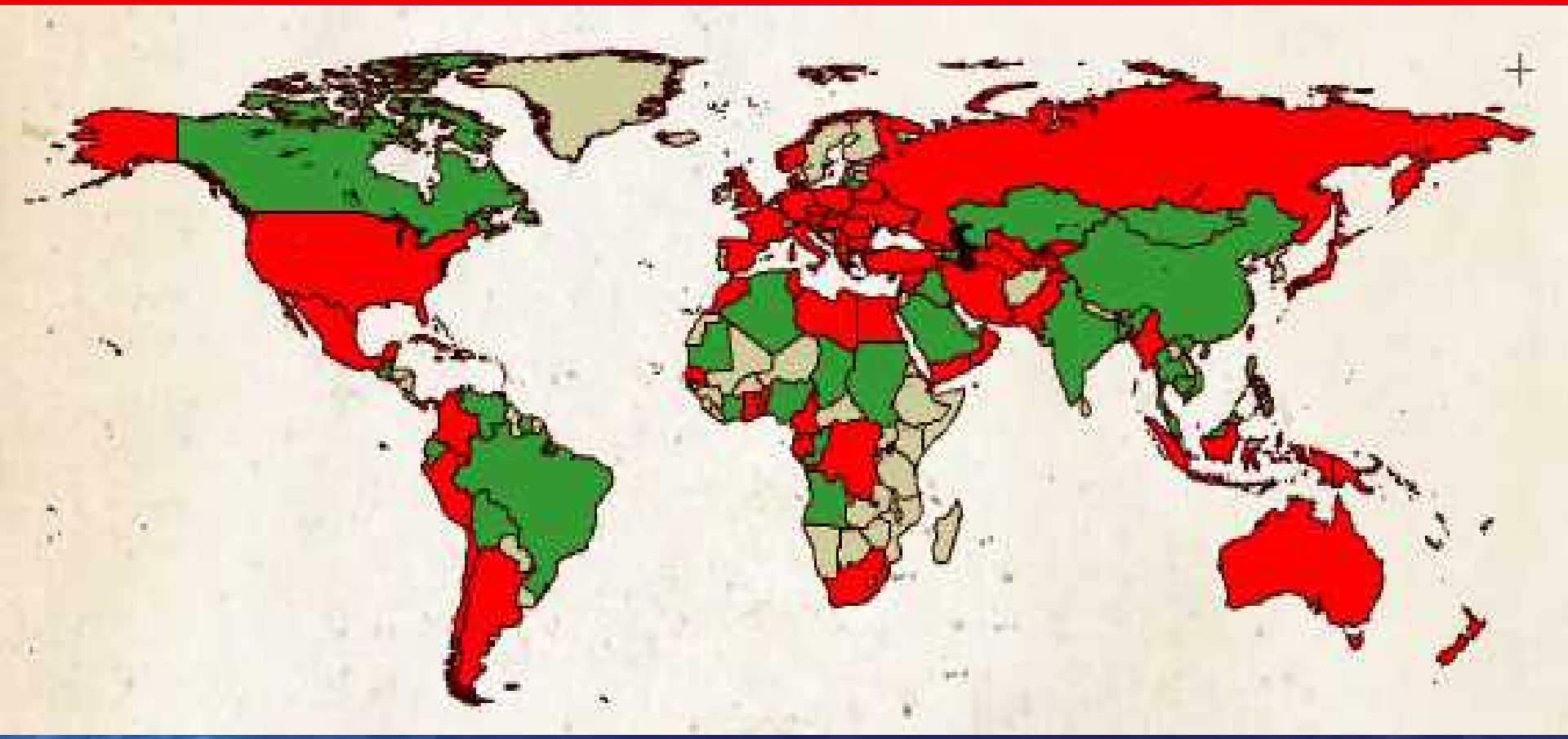
We are here



"One thing is clear; the age of easy oil is **over**" (CEO of Chevron)

Energy Security

globalcontext



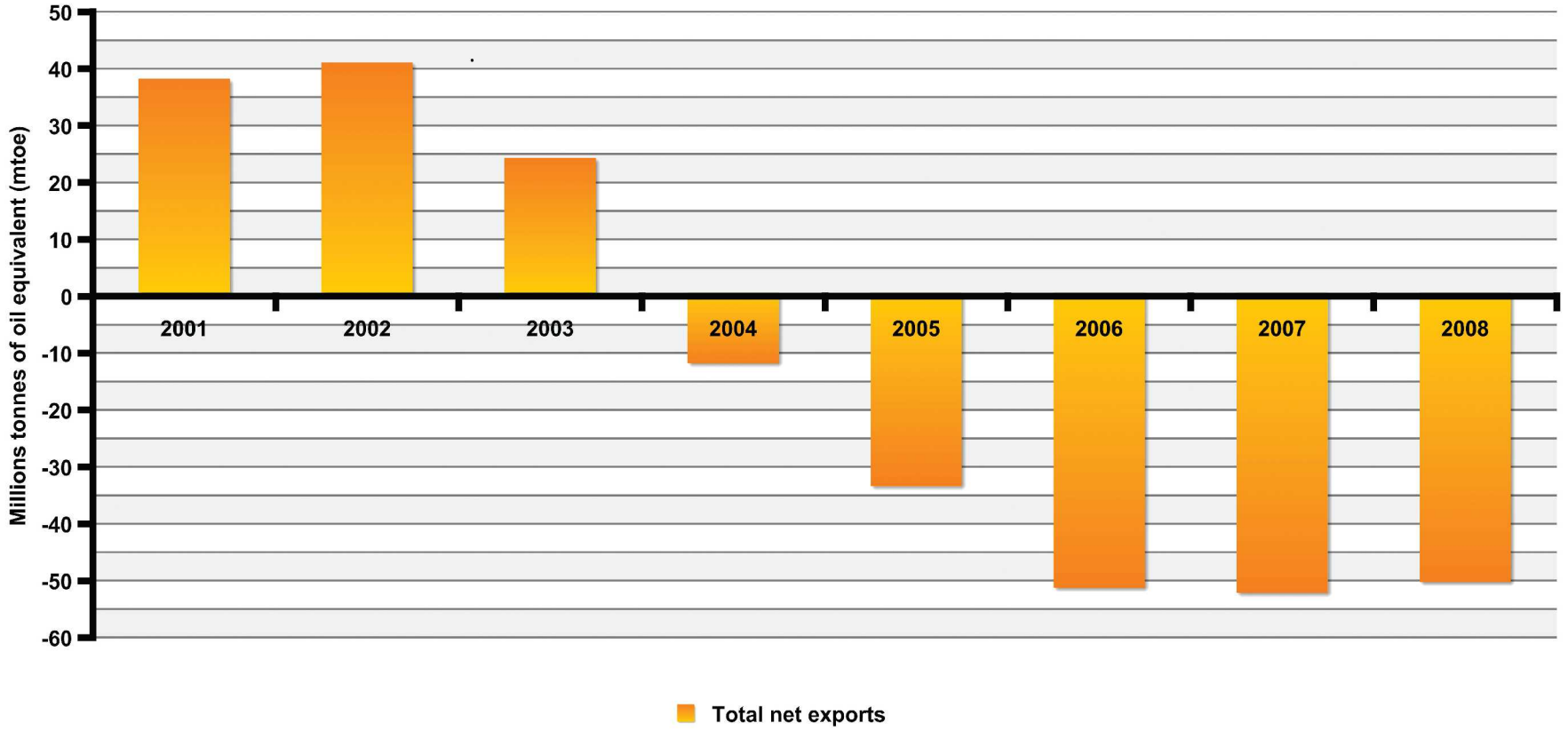
There are currently 98 oil producing countries in the world, of which 60 are now in terminal production decline. (David Strahan)

Source: www.energybulletin.net

Energy Security

globalcontext

British Indigenous Energy Production



Mtoe – Millions of tonnes of oil equivalent

Typical Responses behaviour **change**

"It's not my problem"

"What about China?"

"It's not true anyway ...it can't be"

"I recycle like they told me.."

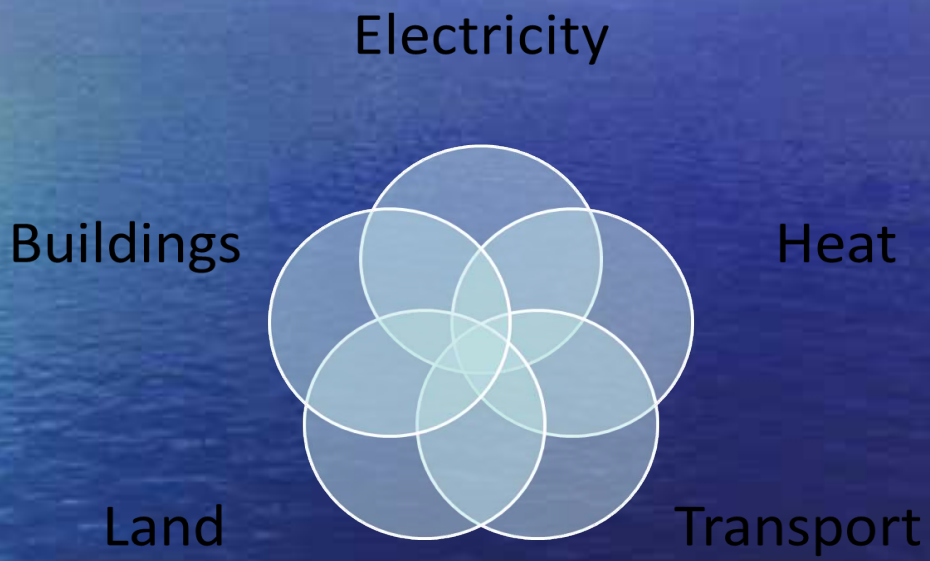
"Fine but what can I do about it ? It's too big.. "

Answers are hard to come by..

You decide..

powerdown

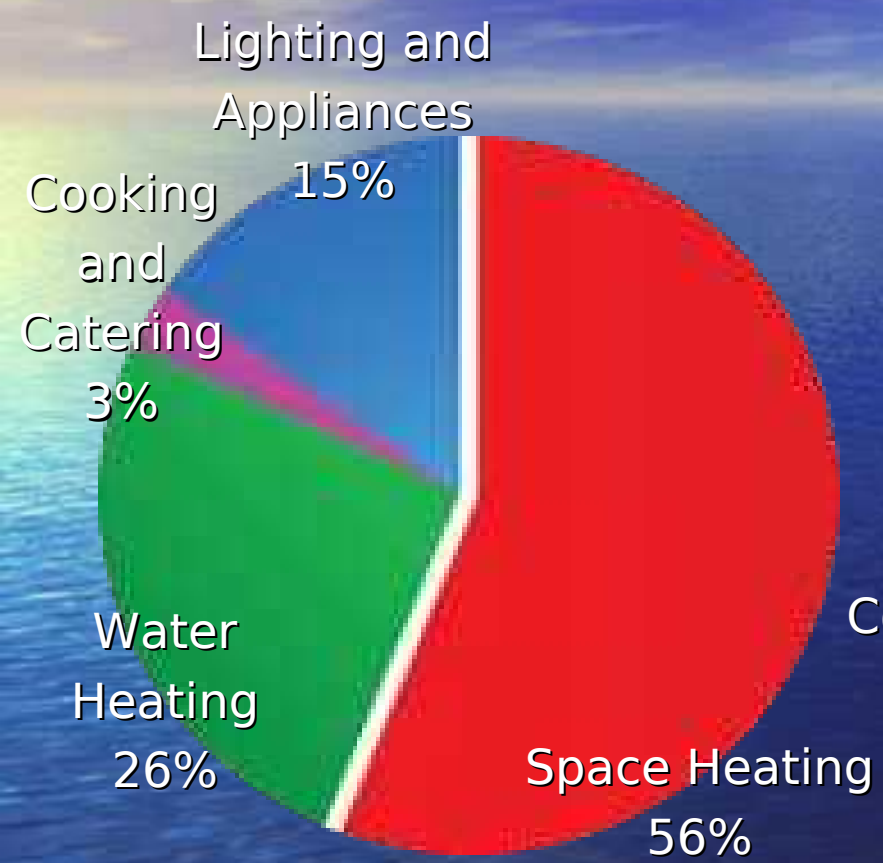
How can the necessary CO_2 cuts be made?



CO_2 efficiency savings

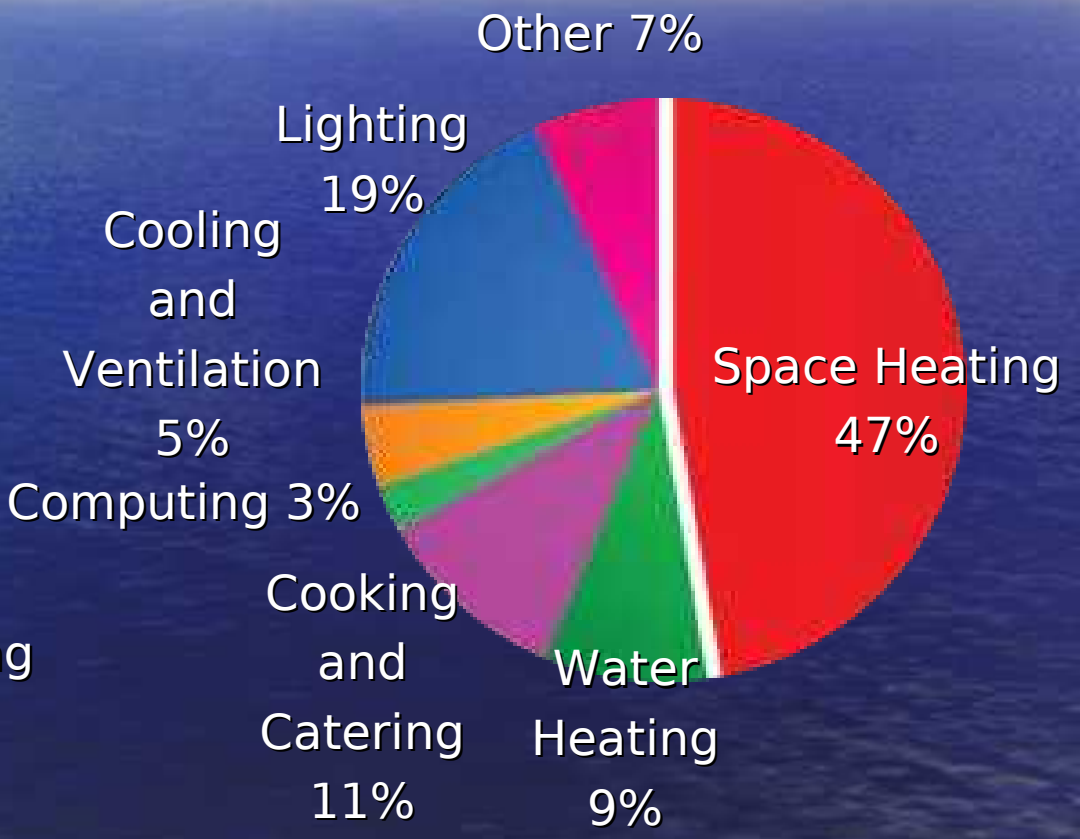
Energy Consumption in the Built Environment

Domestic



(27% UK Emissions)

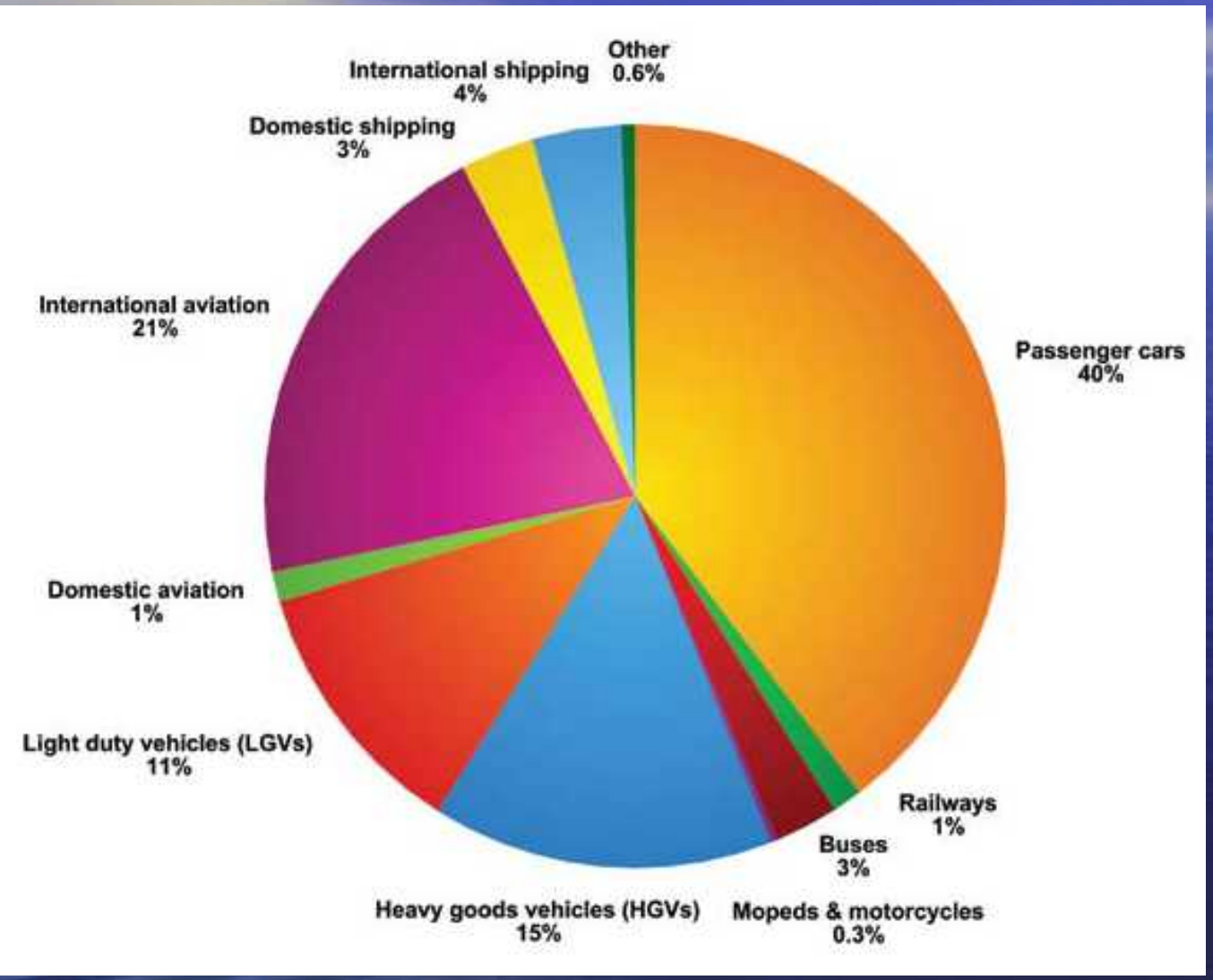
Service Sector



(17% UK Emissions)

CO_2 Emissions from Transport

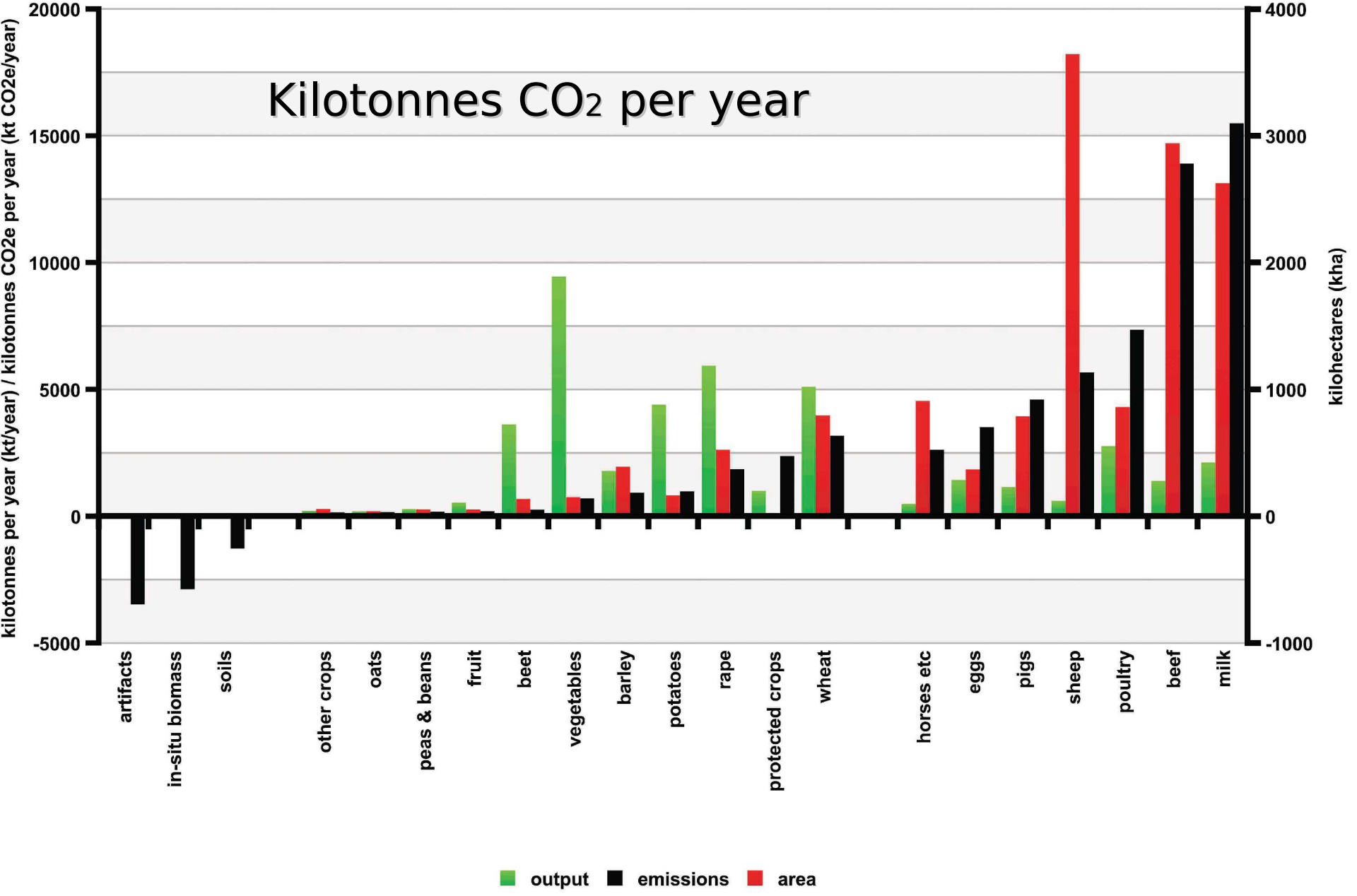
powerdown



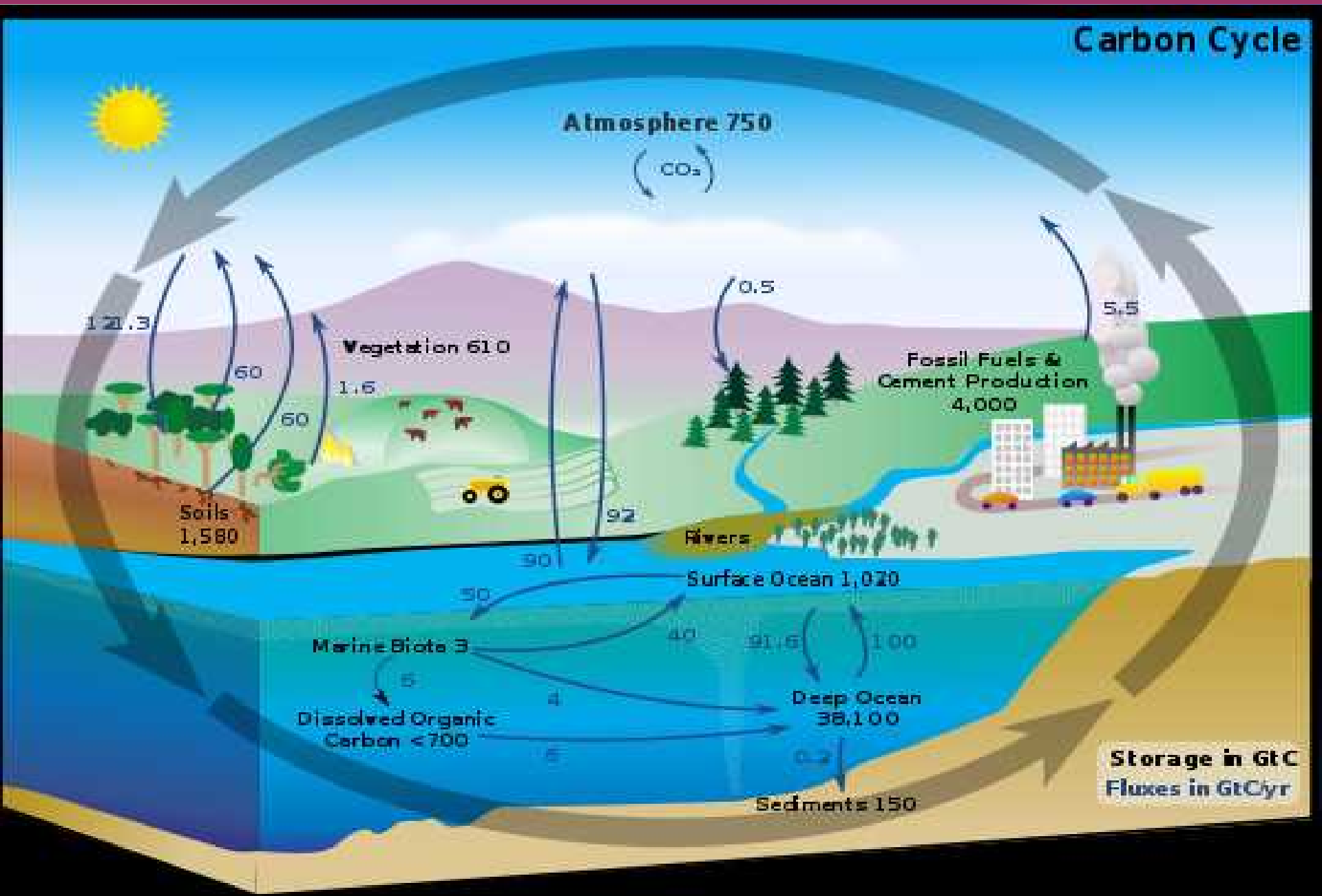
173 million tonnes CO_2 (2006)

Souce: DfT (2008)

Current Land Use

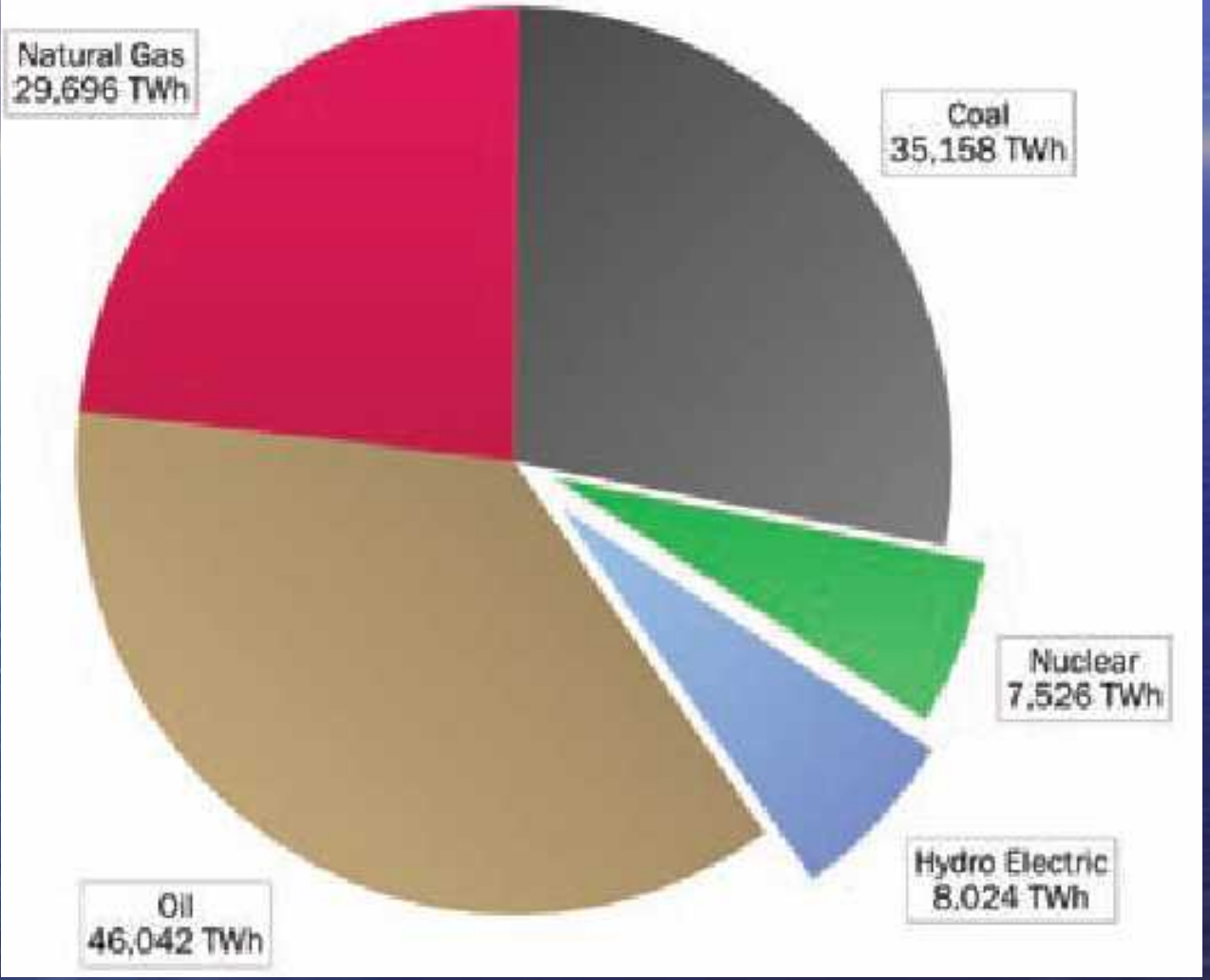


Sequestration

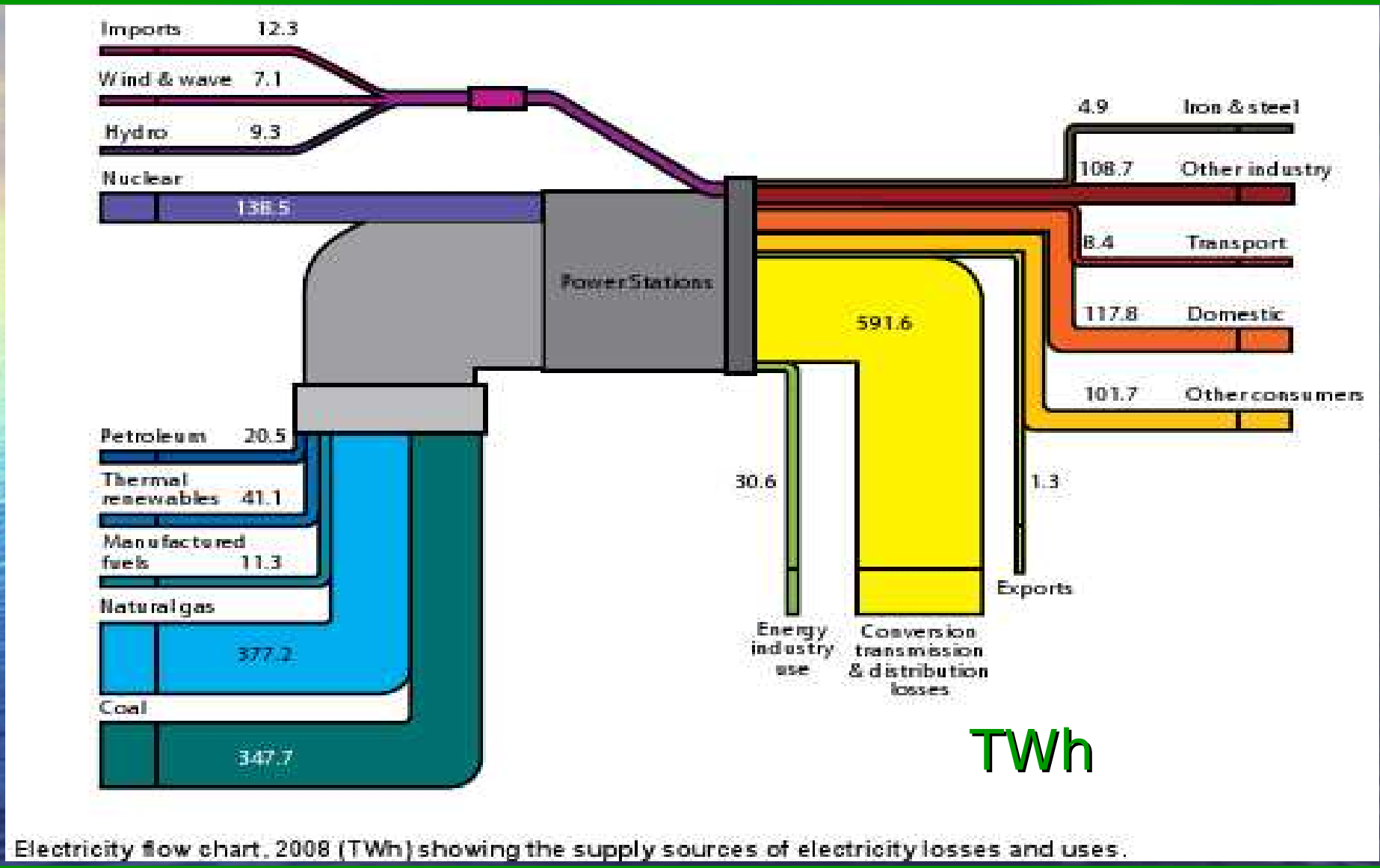


UK Energy Production

powerup



UK Electricity flow chart



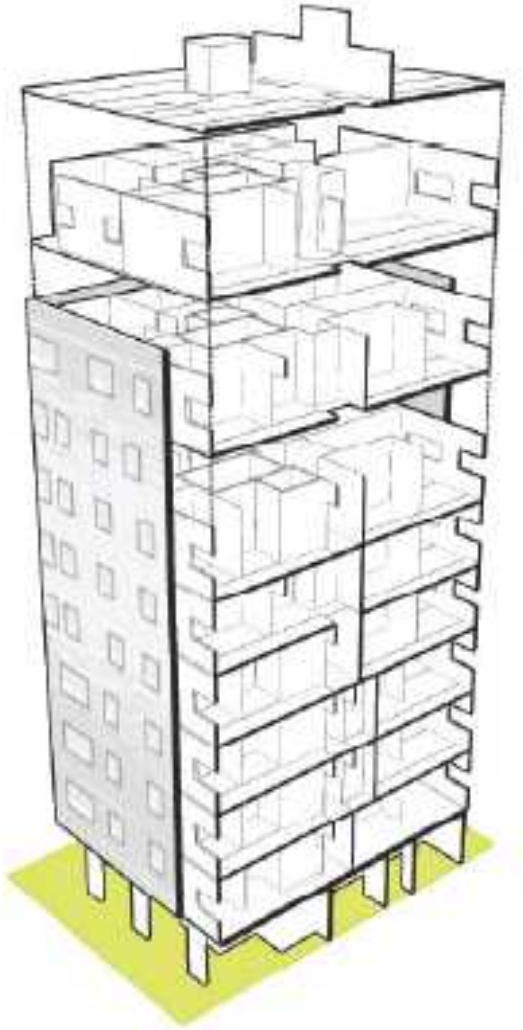
Electricity flow chart, 2008 (TWh) showing the supply sources of electricity losses and uses.

Adapted from DECC 2009


Solutions

Use of Timber

powerdown



Honeycomb structure

Rotated plans

Load-bearing walls, floors and cores

Tallest timber building in the world

architects Waugh Thistleton

Saves on cement emissions + sequesters CO_2

Sustainable Building techniques

powerdown

Built Environment

powerdown

- Focus on fabric & EROEI of a building
- Embodied energy of materials & processes
- 180,000 new sustainably built houses a year

(NB most of building stock for 2030 is already built)

- Retrofit 20 million homes in 20 years
- Natural material selection for both new-build and retro-fit buildings can reduce impacts ***and*** enable the building stock to lock away carbon

Transport

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- Electrification of cars and rail
- Town planning
- 2/3 Less flying
- More efficient public transport

Transport

powerdown

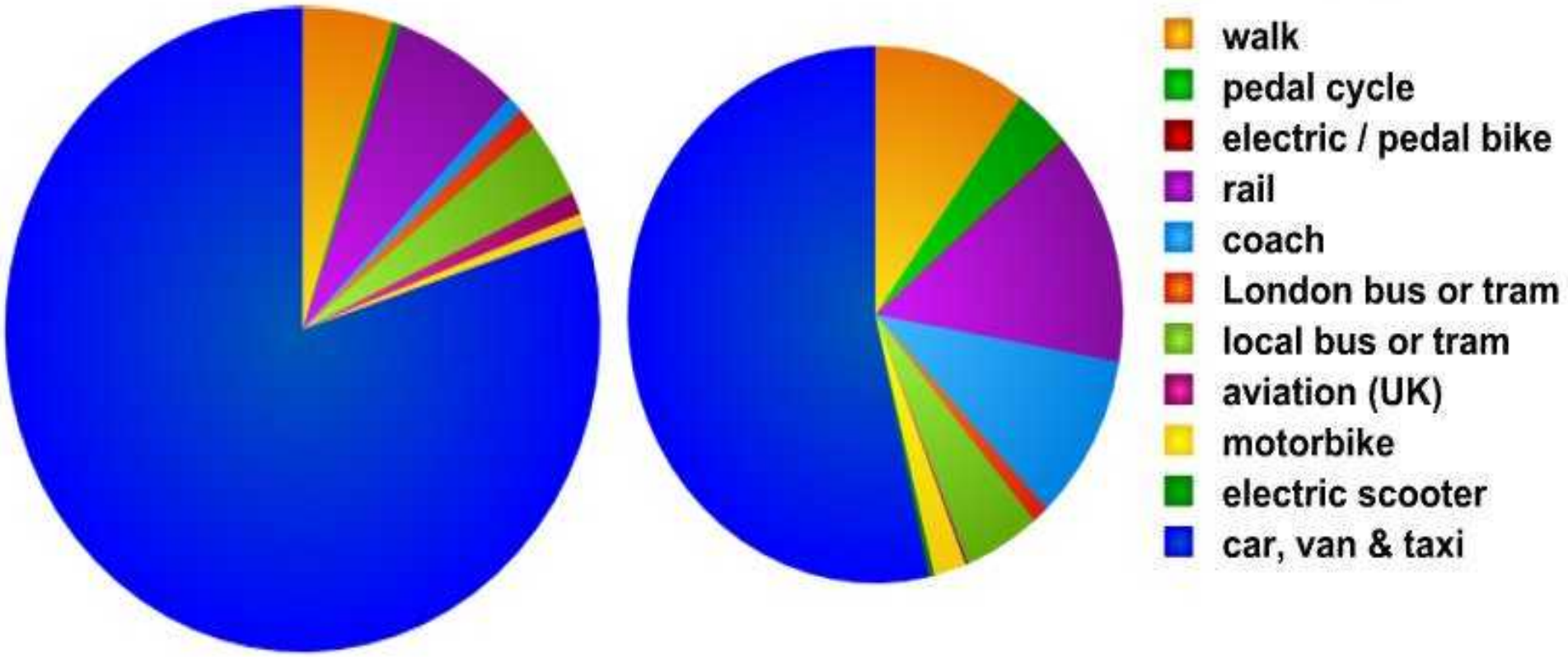
- Weight reduction of vehicles
- Modal shift - private car to public transport
- Shift to walking and cycling
- Hydrogen and second generation biofuels for HGVs and aeroplanes

Transport Modes (km)

powerdown

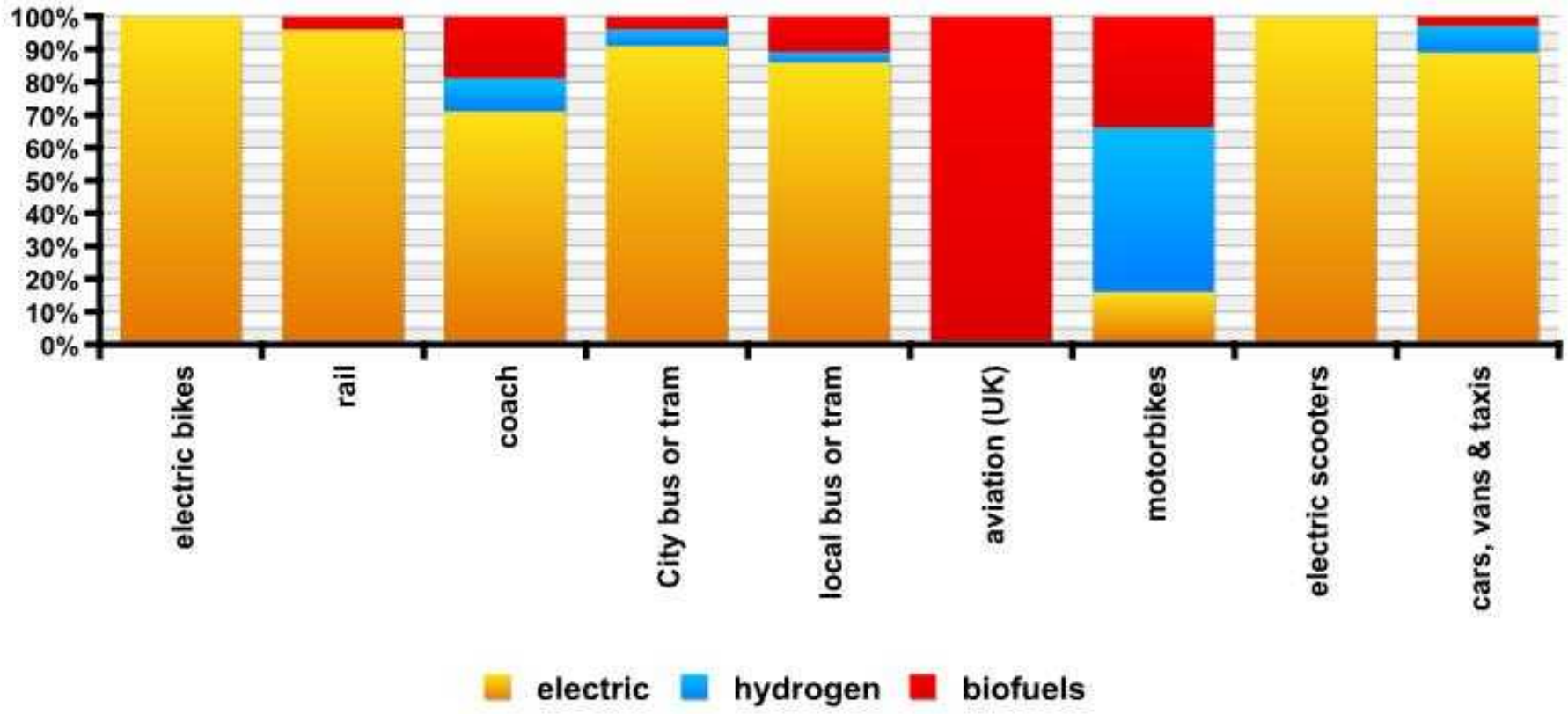
2010

2030

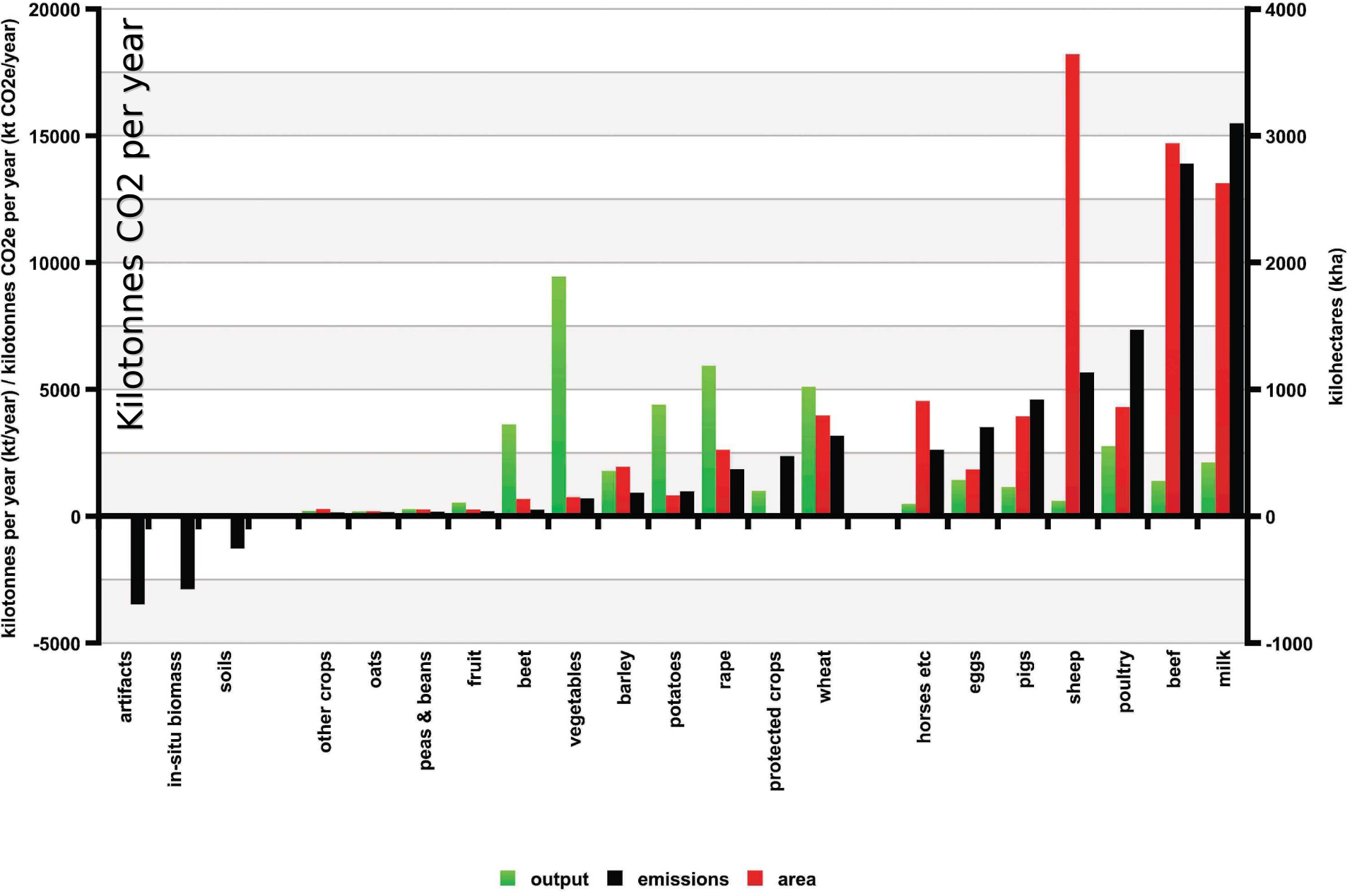


Road Transport Fuel by mode

powerdown



Current Land Use



Agriculture and Land Use

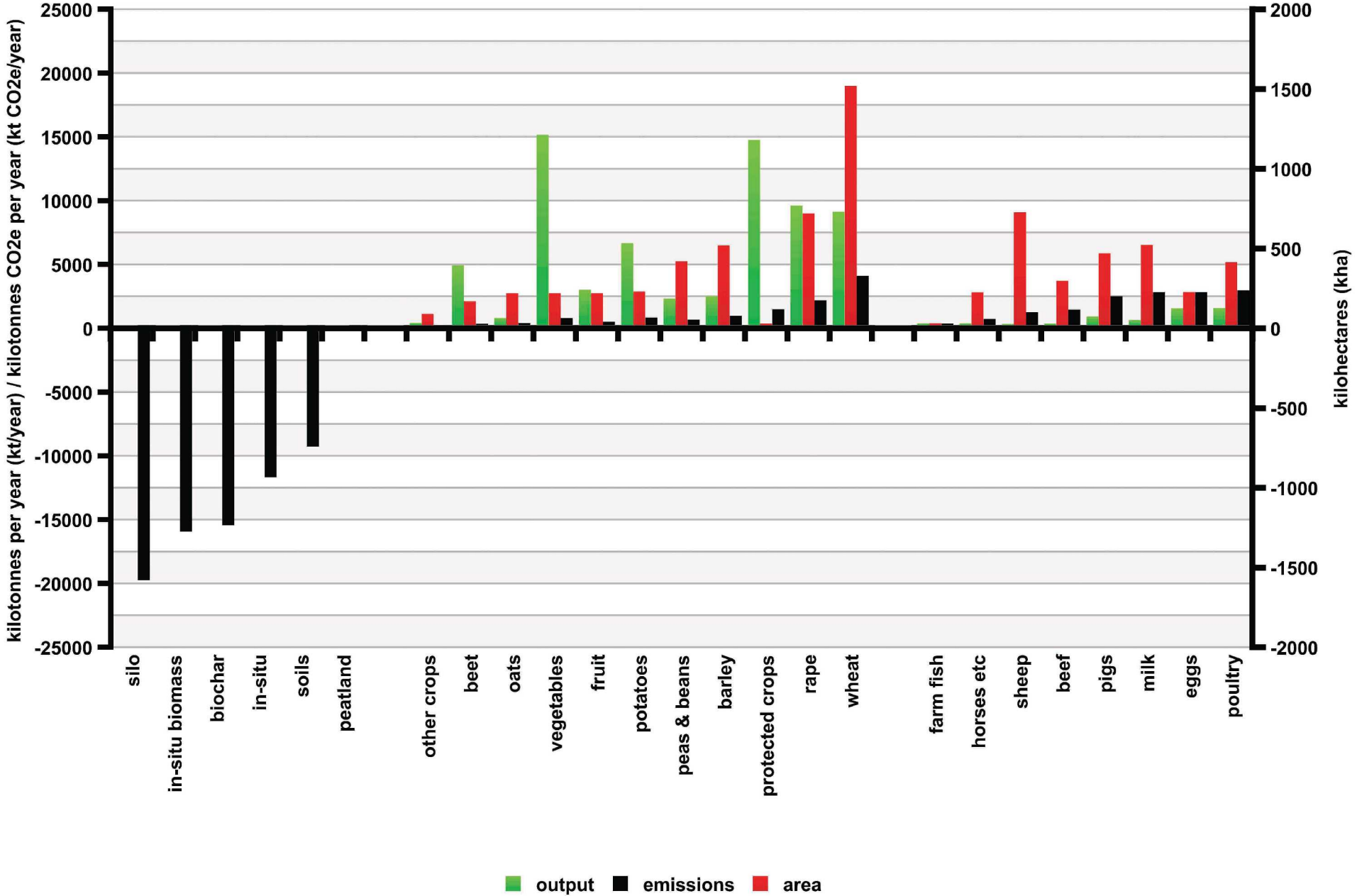
Solutions

- Low-impact farming methods – organic farming, crop rotations
- Anaerobic digesters on farms – gas for heat, fertilizer for crops
- Dietary changes – less meat more pulses (Sunday roasts!)
- National self-sufficiency in food (food security) – buy local

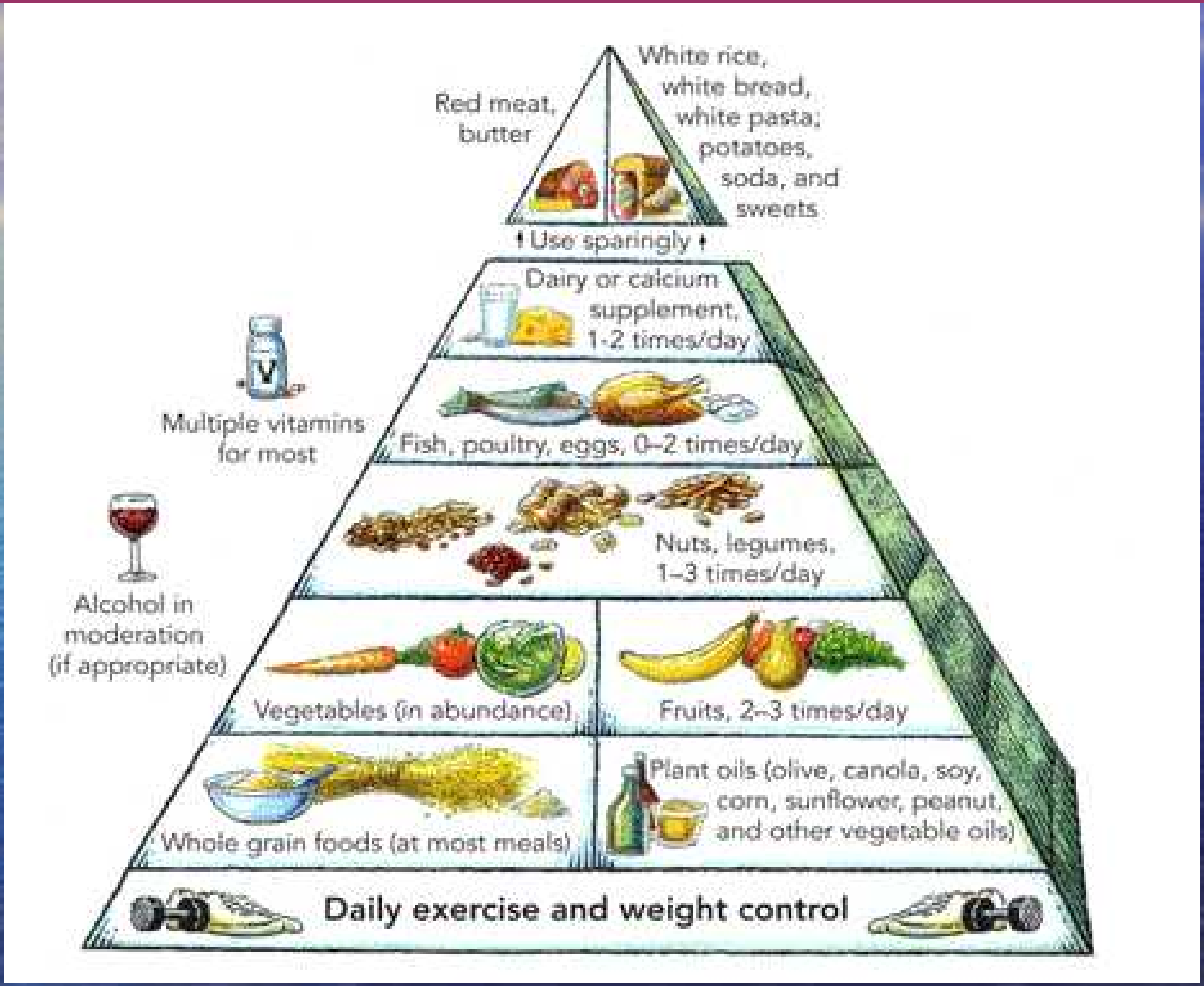
Land-use change

- 80% Decrease in ruminant livestock
- 20% reduction in pigs
- Sequestration of carbon optimised
  - above (inc. buildings) & below ground
  - (biochar).
- Production of biofuels on marginal land
  - miscanthus and willow on 1.67 million ha
- Food security - 15% from EU, 7.5% tropics

2030 Land Use



The Perfect Diet



Source: Harvard School of Public Health

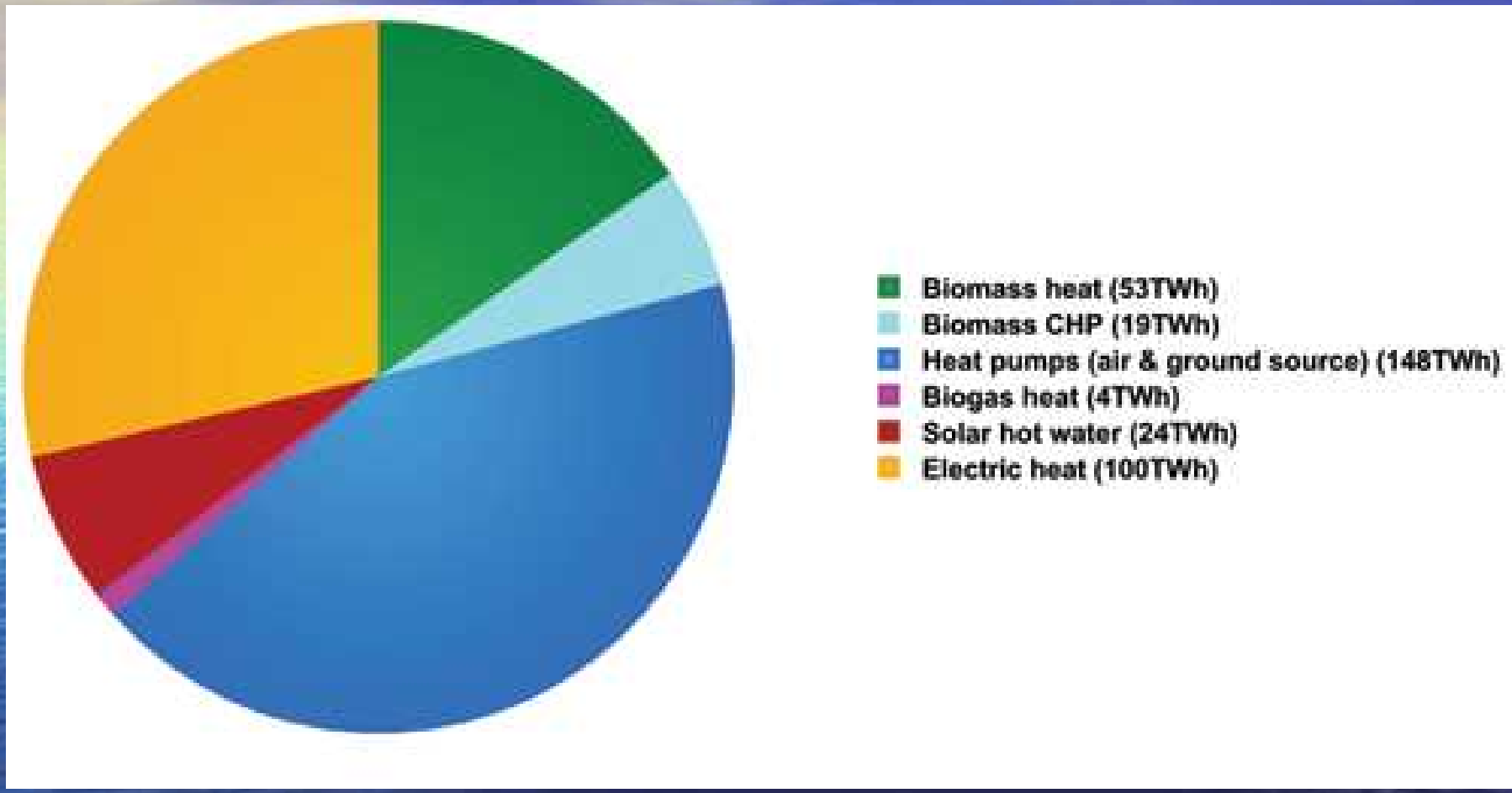
Heat Production

+

CHP

Heat Generation by Technology

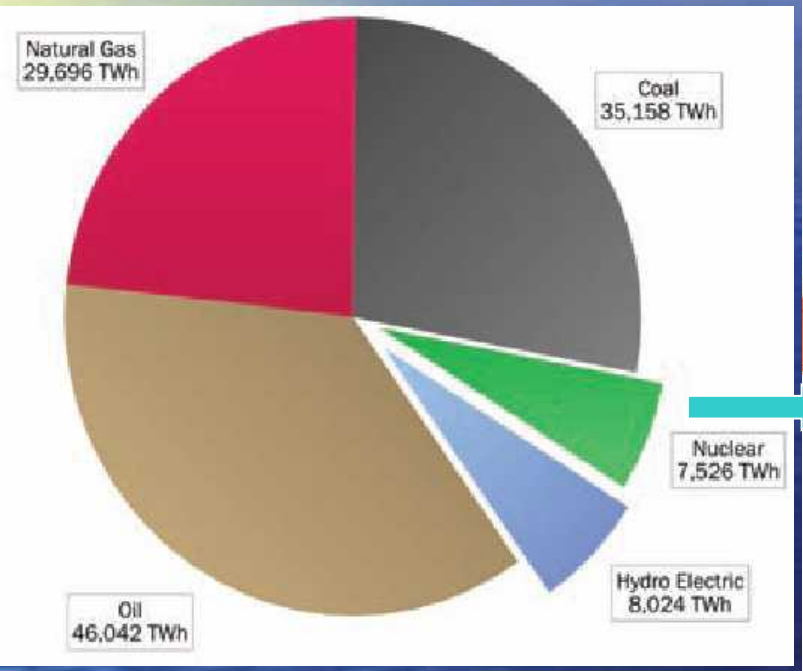
powerup

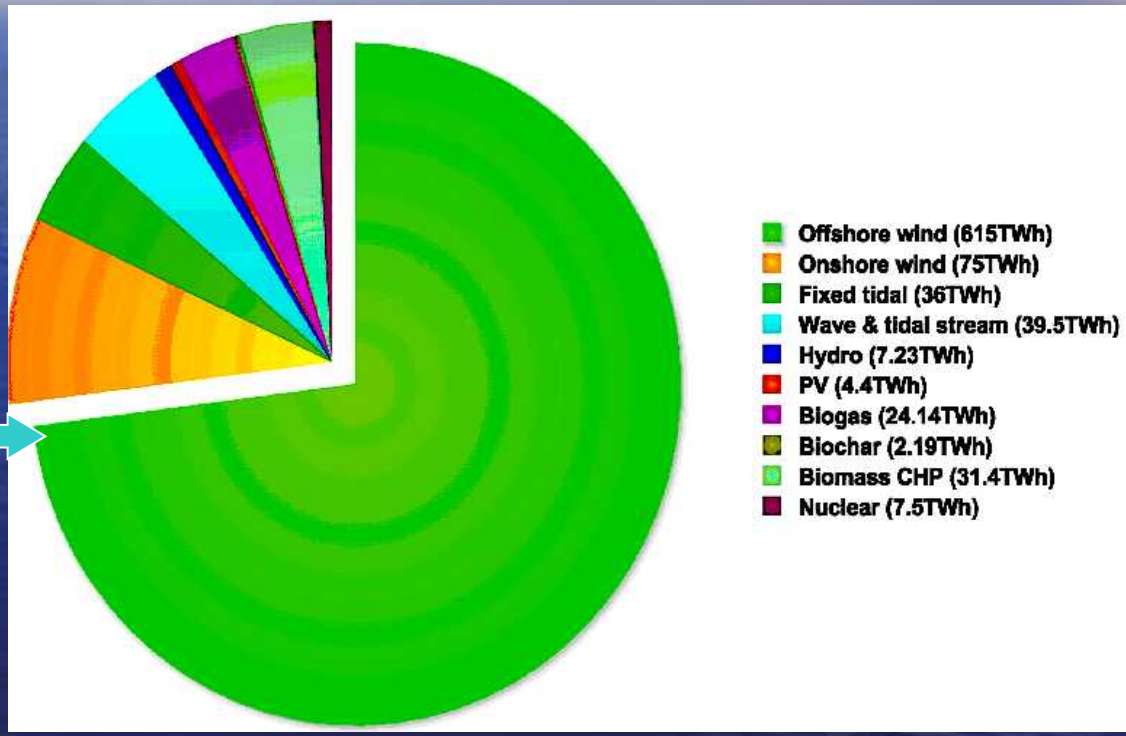


A new energy mix for 2030

2010

2030





Electricity Production from Renewables

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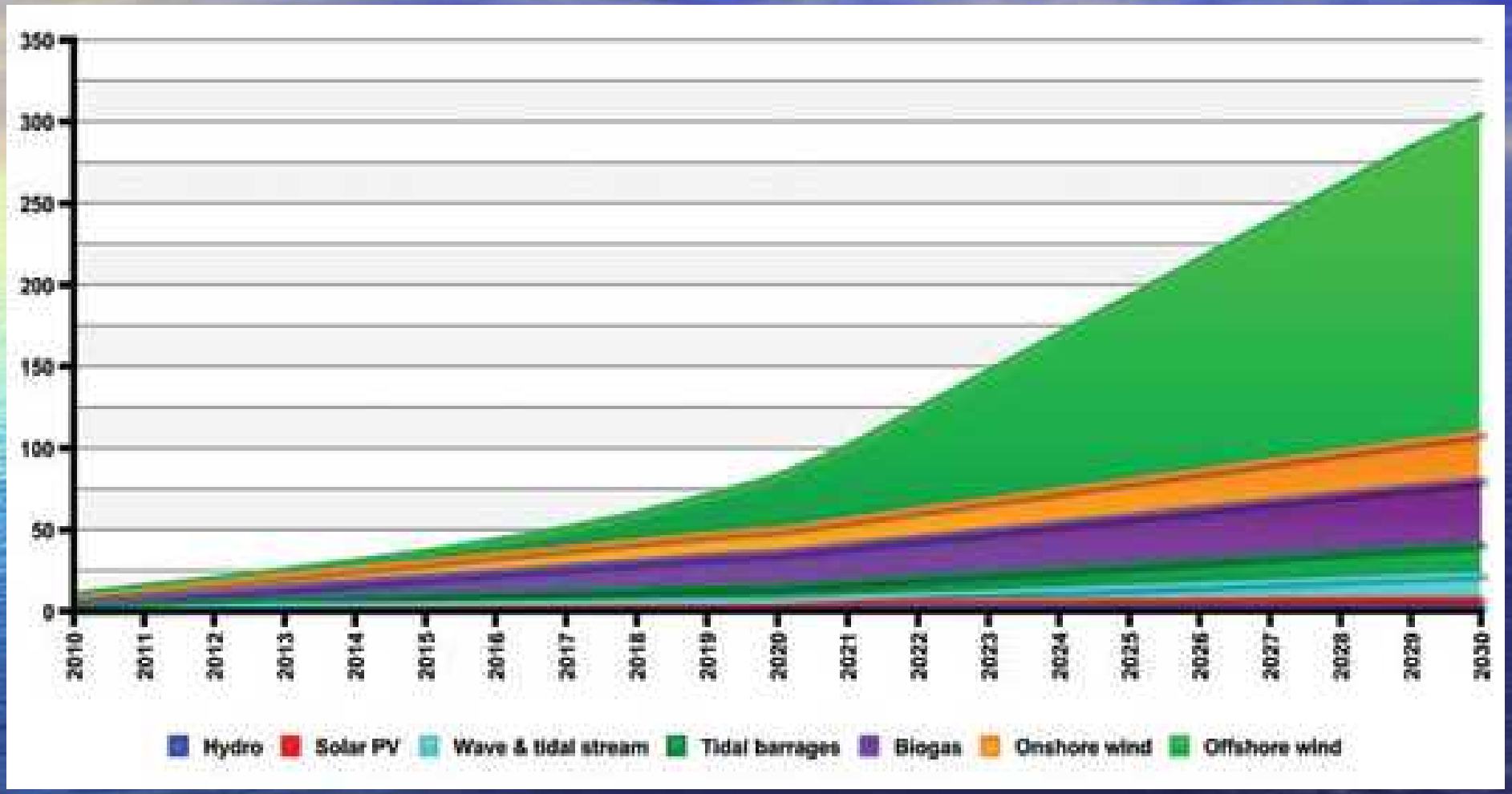
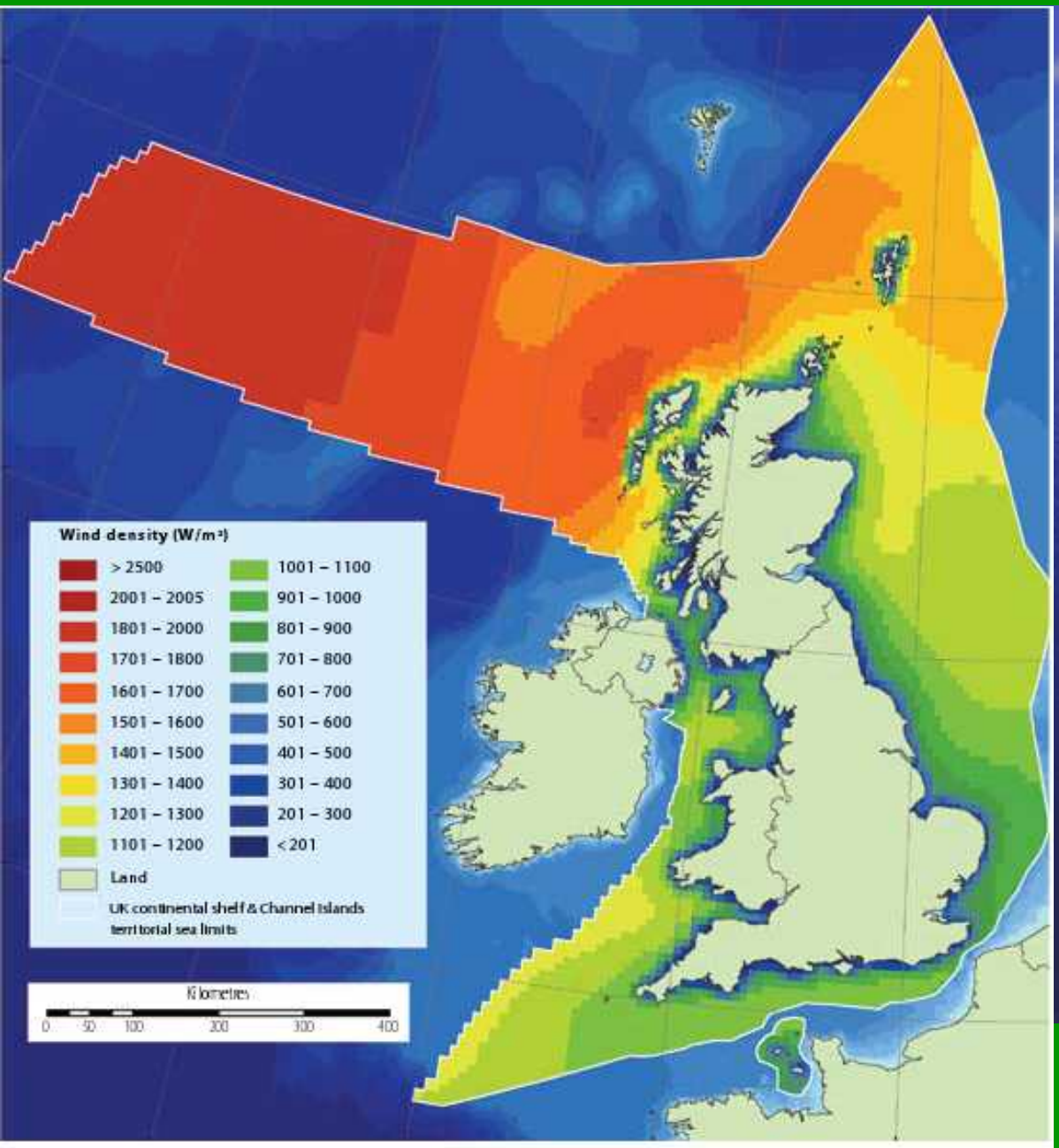


UK Offshore Wind Density



PIRC Report:

The Offshore Valuation

June 2010

Electricity Production from Renewables

powerup

- Double UK electricity output with renewables
- 195 GW of offshore wind

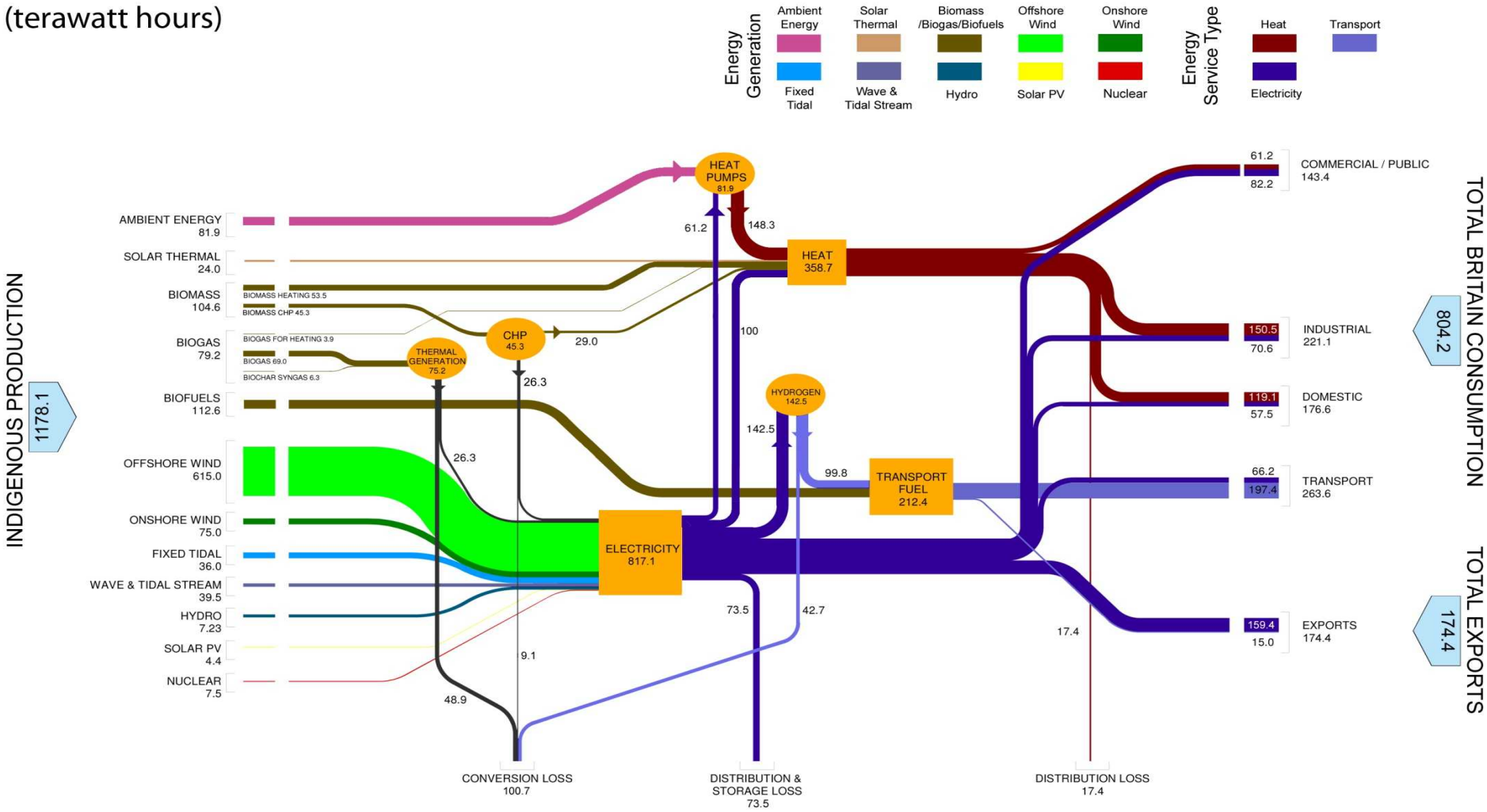
And to balance variability of renewables

- European grid connections to import/export
- Use of smart grids, electric vehicles and smart appliances
- Microgrids and microgeneration

UK Energy Flows 2030

powerup

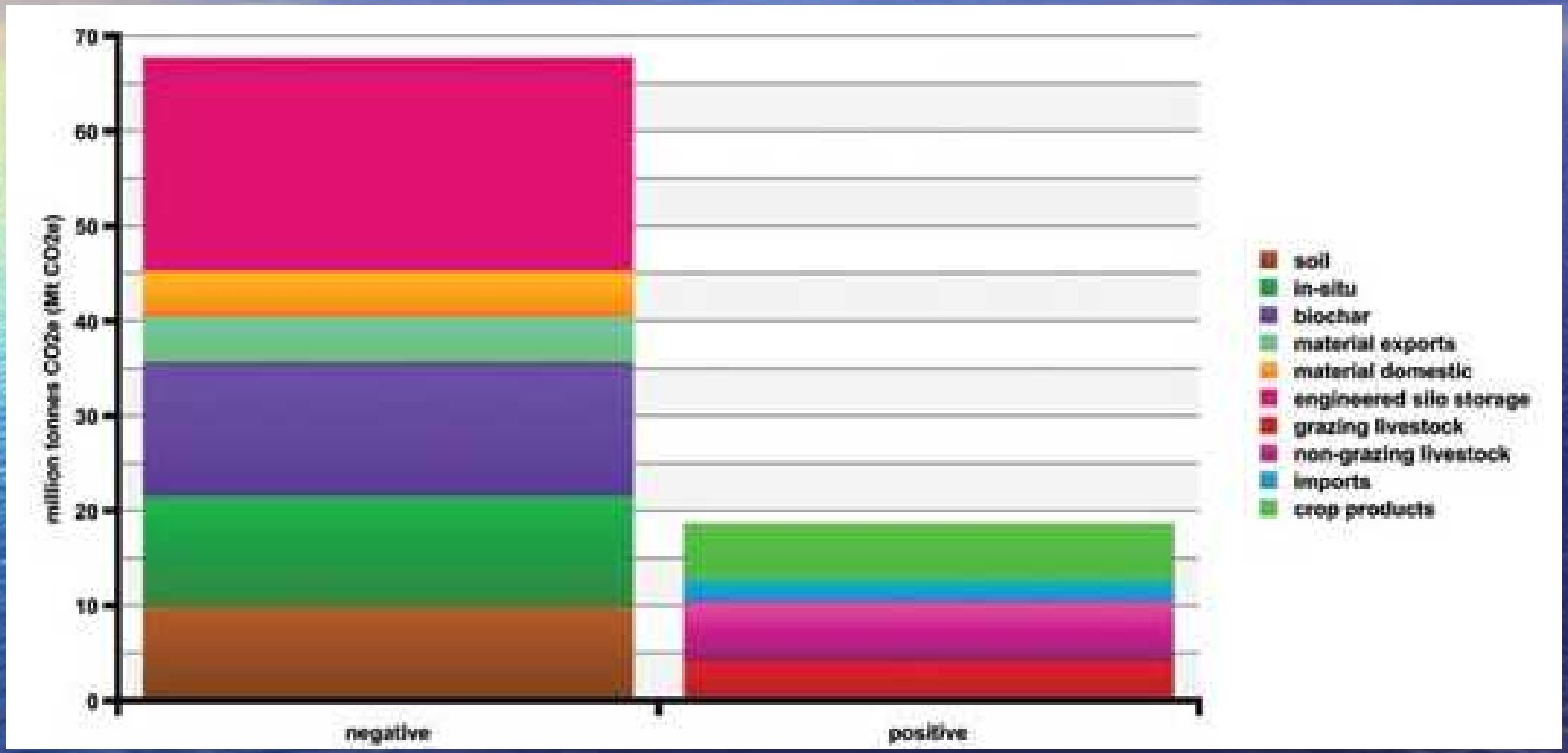
UK **Potential** Energy Flows **2030**
(terawatt hours)



Residual Emissions

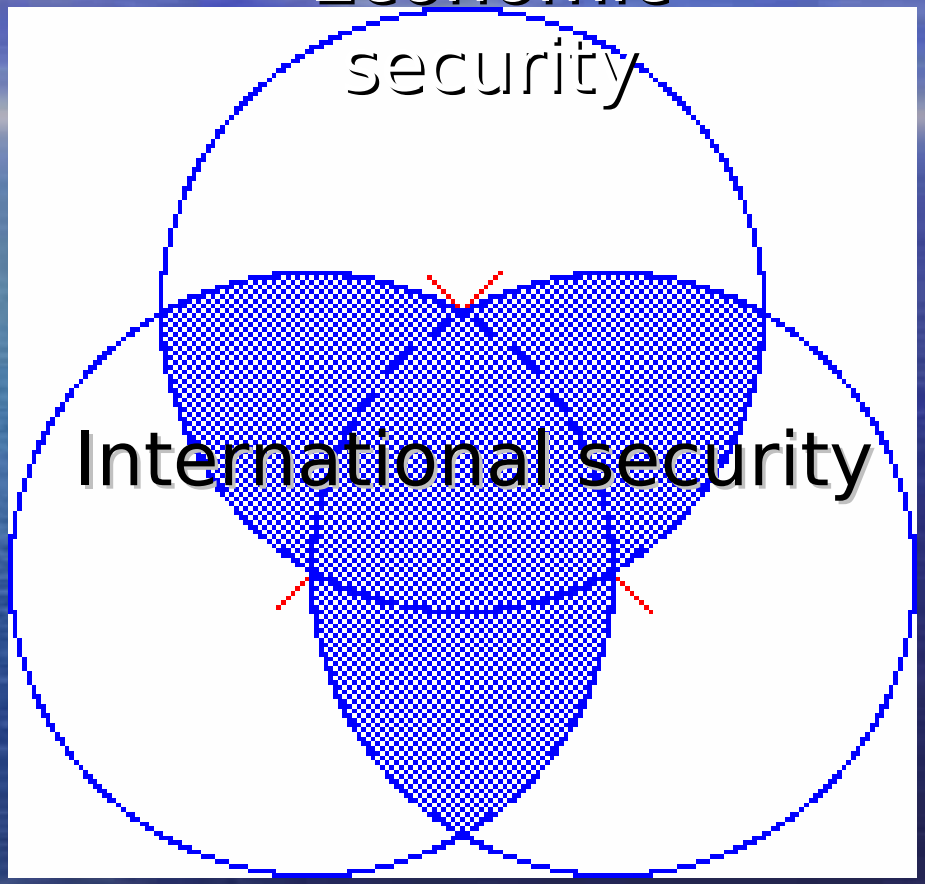
Table ES.3 The greenhouse gas emissions balance sheet for ZCB2030	
	Million tonnes CO_2e
Great Britain: Total emissions in 2007 (including international aviation and shipping split 50/50 between the countries travelled between)	**637**
Residual emissions in ZCB2030: Industry, waste and disused coal mines	**30**
Residual emissions in ZCB2030: Land use and agriculture sector	**17**
Residual emissions in ZCB2030: Miscellaneous and other sectors	**20**
Residual emissions: Grand total	**67**
Percentage of 2007 emissions remaining	**10%**
Carbon sequestration	**- 67**
Net emissions: Final total	**Zero**

Balance of residual emissions by sequestration



In million tonnes of CO_2 equivalent

Integrated Policy Strategy



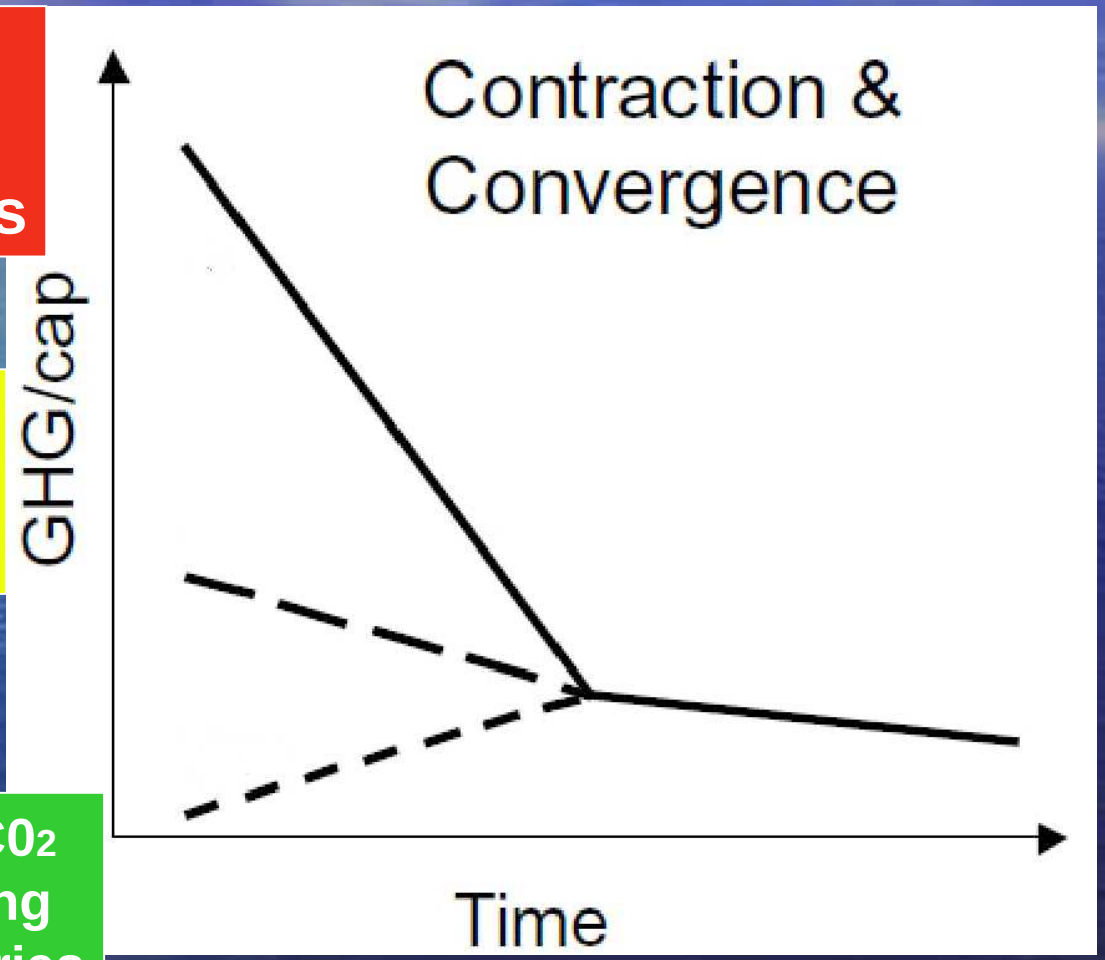
‘solutions-focussed’

International Policy

High $C0_2$ emitting countries

Medium $C0_2$ emitting countries

Low $C0_2$ emitting countries



..2°C

International Policy Frameworks

3 Road Maps:

1 Towards an internationally harmonised carbon price.

2 International agreement on carbon budgets. Individual nations decide their own pricing.

3 No global agreement. Groups of countries create common reduction policies combined with border tax adjustments.

National Policy Mechanisms for a Green New Deal

- Thousands of **new jobs** in all sectors
- Re-skilling Britain
- Balance of payments 2030
- More predictable energy price
- Setting a global lead....

Reasons to be Optimistic

Offshore Valuation Report

Chris Huhne

ZCB2030 to Parliament on Wednesday..

ZeroCarbonBritain2030

If we don’t change the climate will..