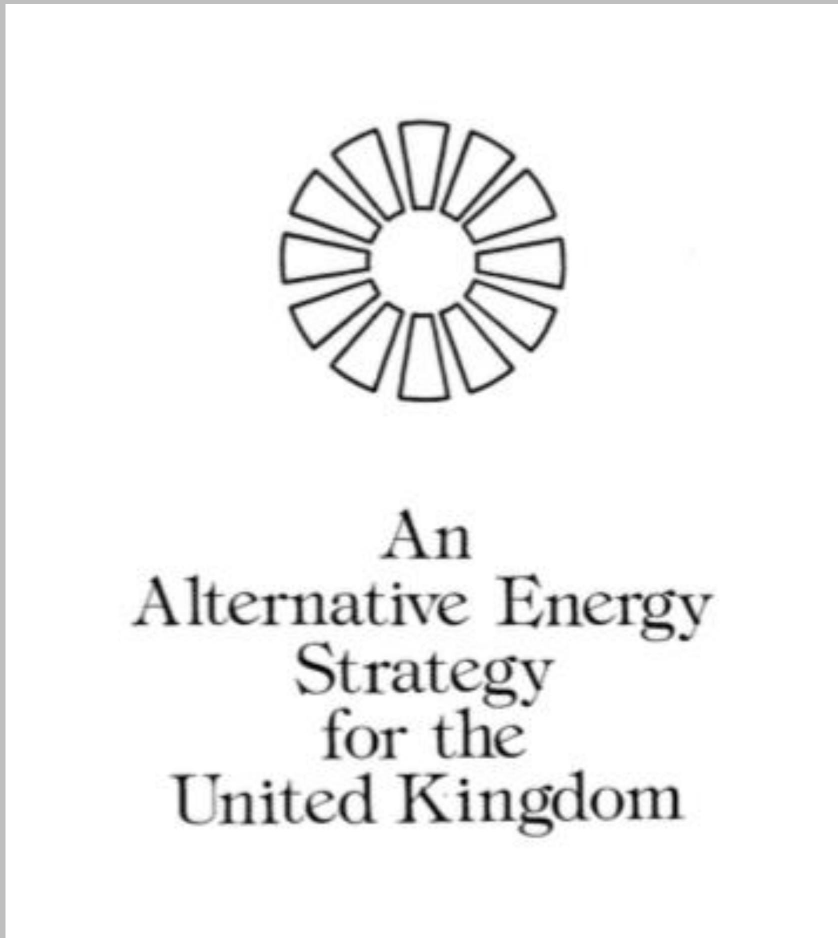
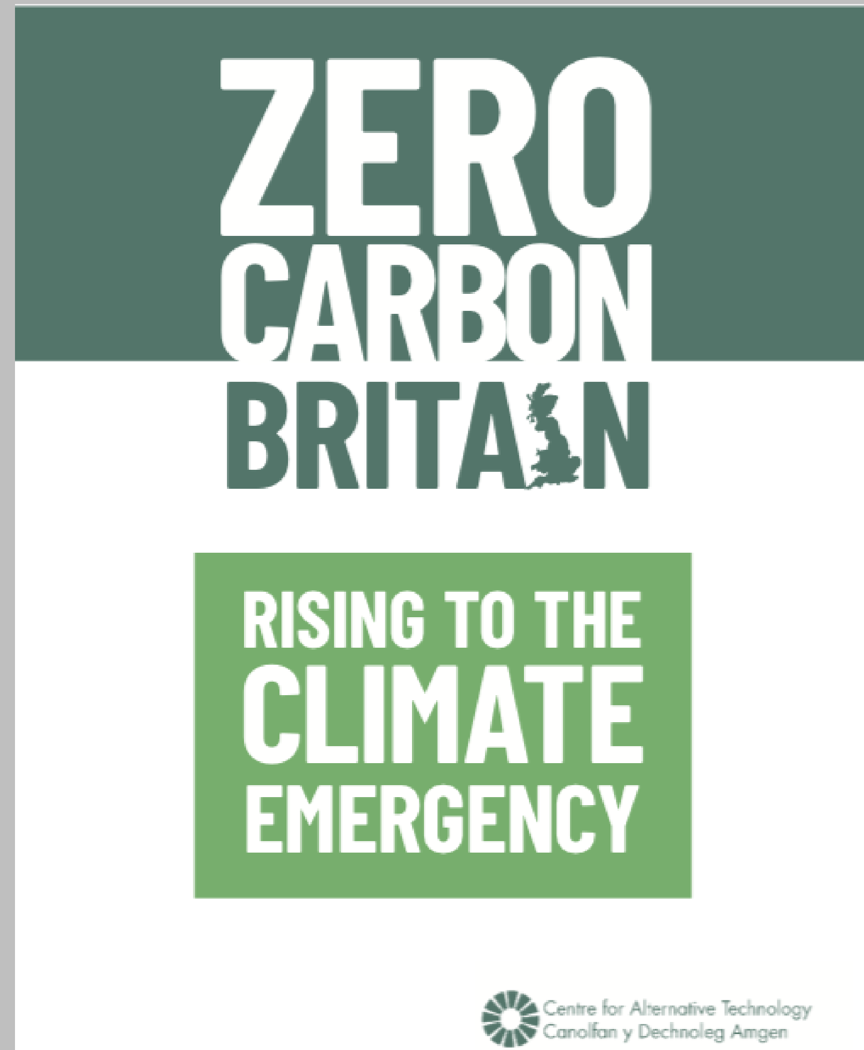


Centre for Alternative Technology
1977

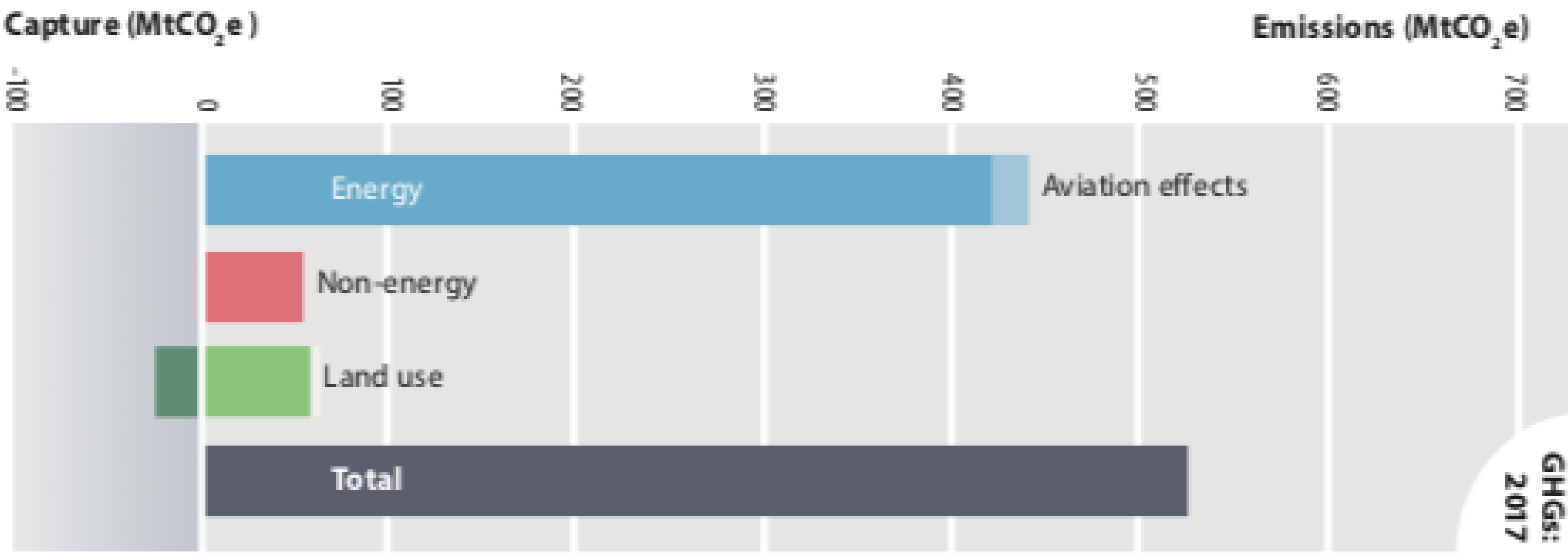


CAT 2019

https://cat.org.uk/new-report-zero-carbon-britain-rising-to-the-climate-emergency/

- Starting point for discussion
- Not a perfect blueprint or a road map of how to get there
- Based on proven technologies
- Somewhat cautious in lifestyle changes
- Pretty honest about what is not included

Where are we now?



Greenhouse gas emissions – $MtCO_2e$

$MtCO_2e$ = million tonnes CO_2 equivalent
(includes methane and other greenhouse gases)

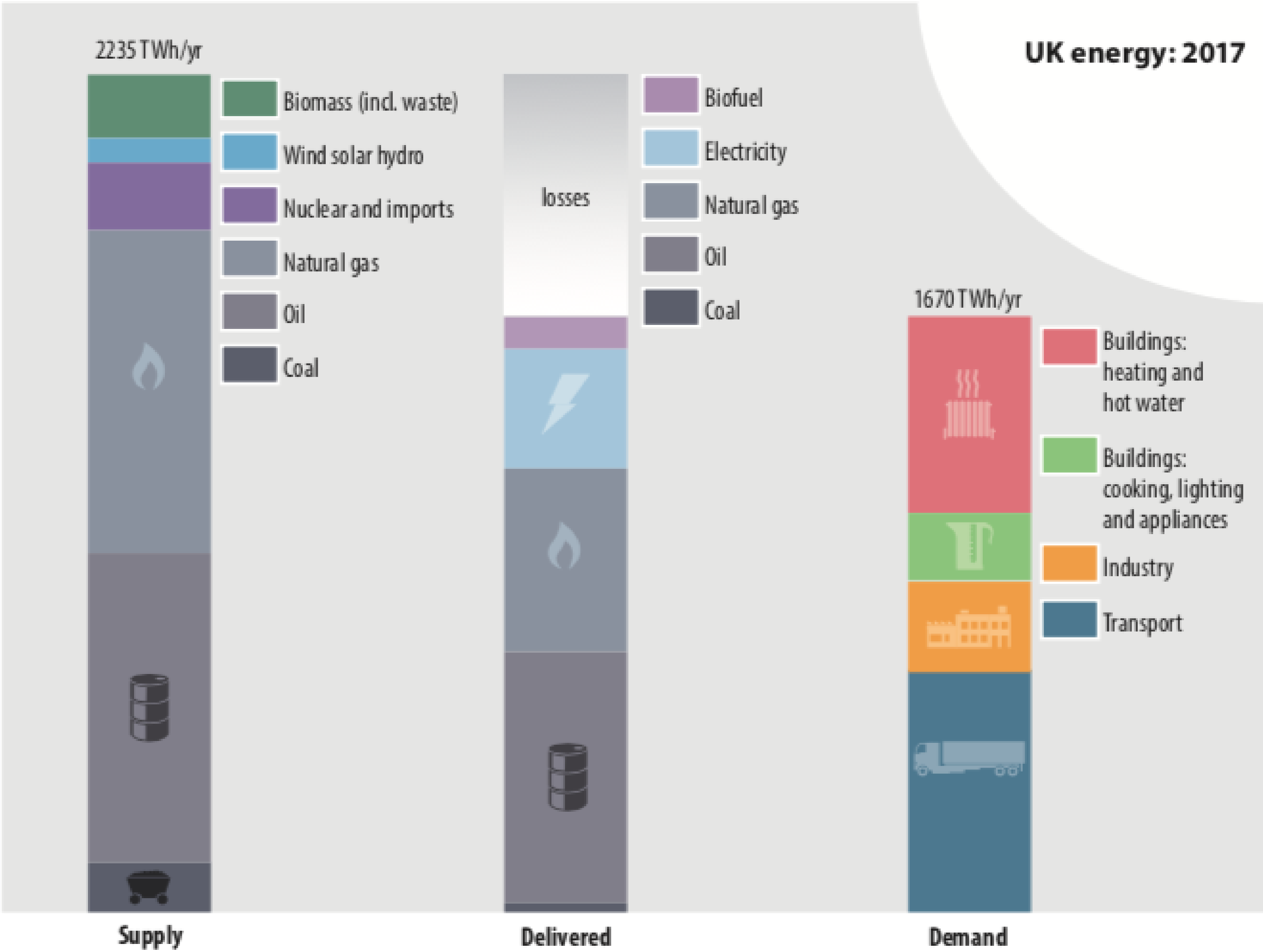
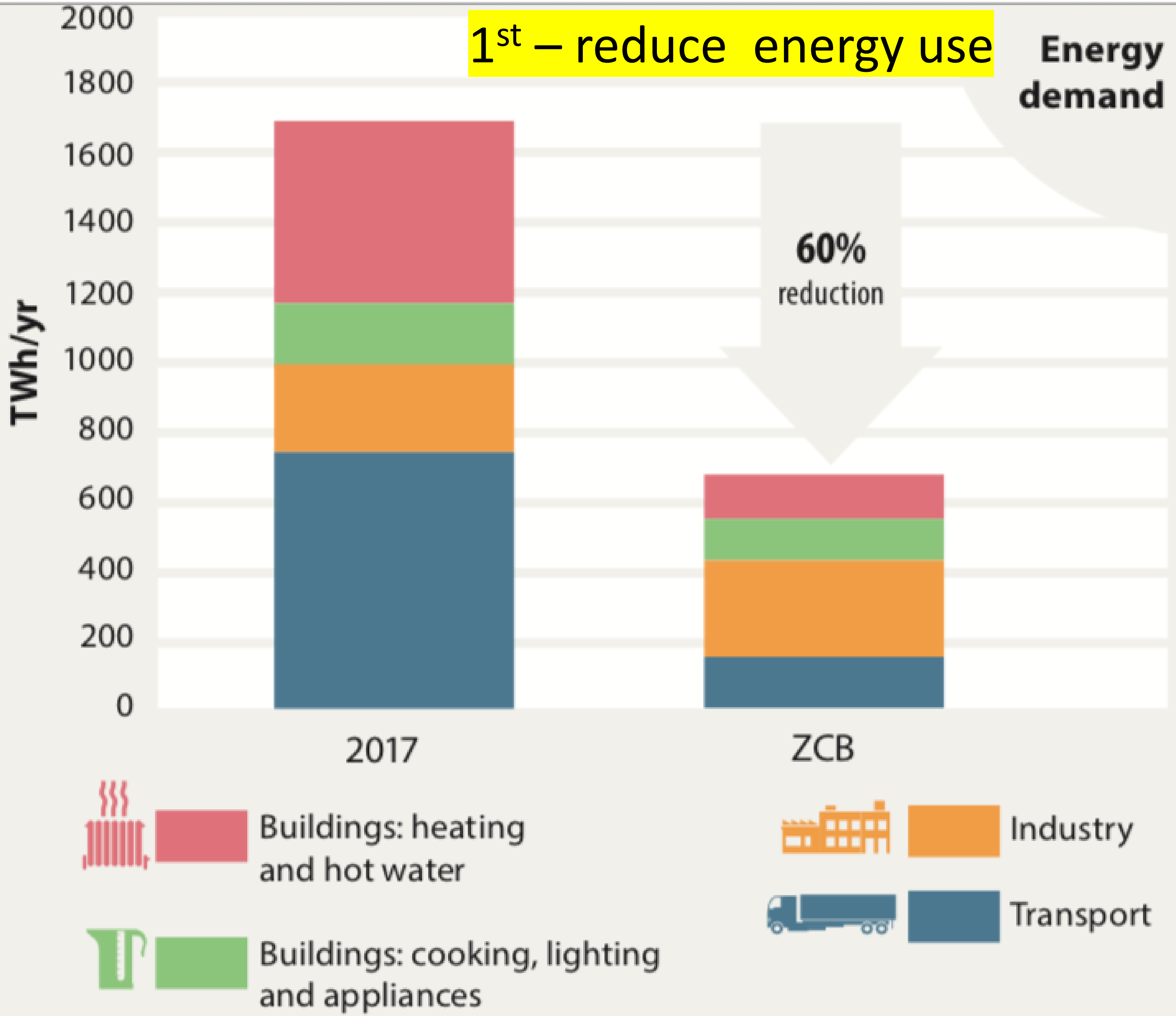


Figure 3.2: UK primary energy supply, delivered fuel mix and energy demand in 2017 (BEIS, 2018; BEIS, 2018a).

1st – reduce energy use



Reduce energy use in buildings

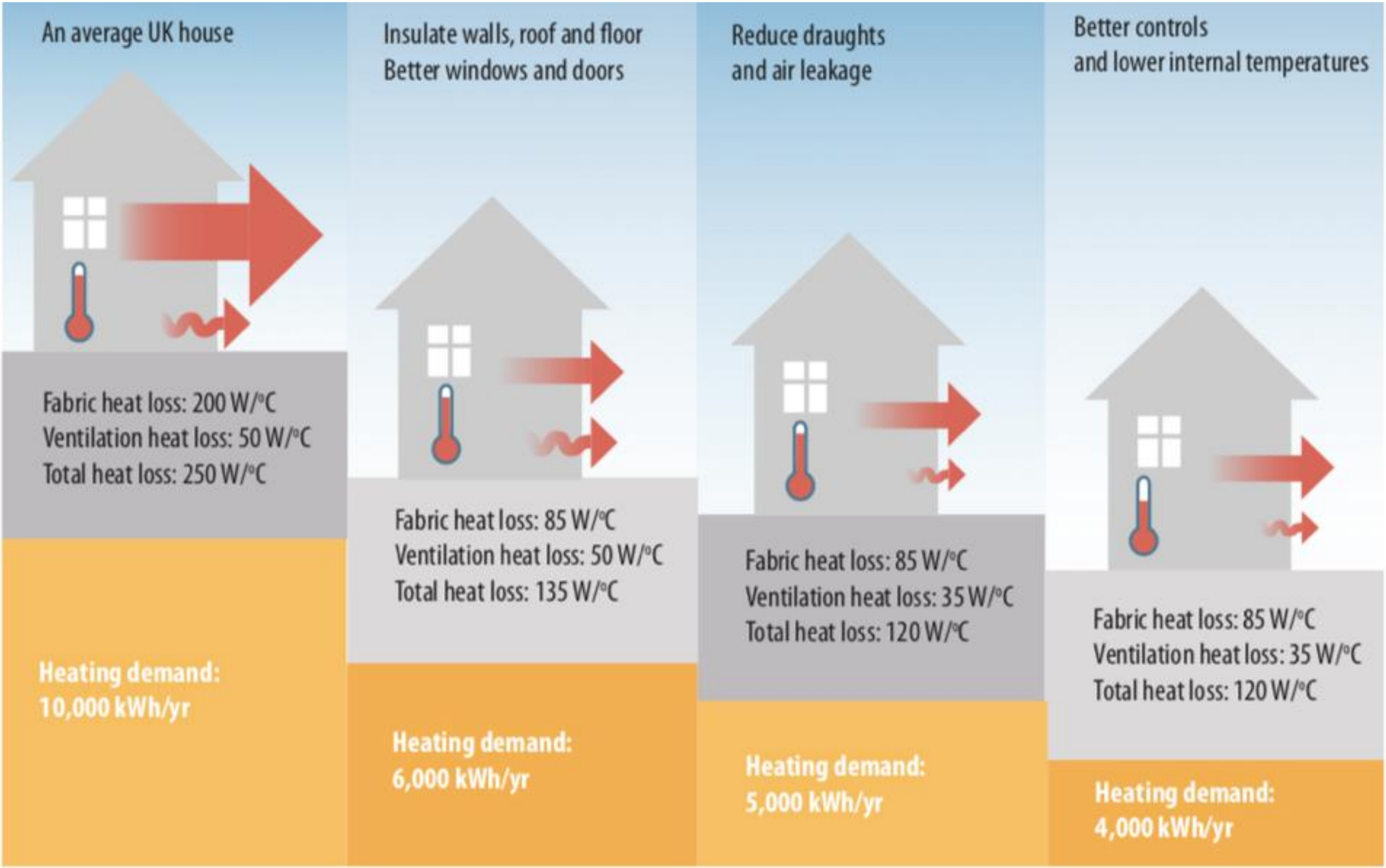


Figure 3.7: The impact of measures that reduce a building's heat loss and heating demand.

Stuff - industry

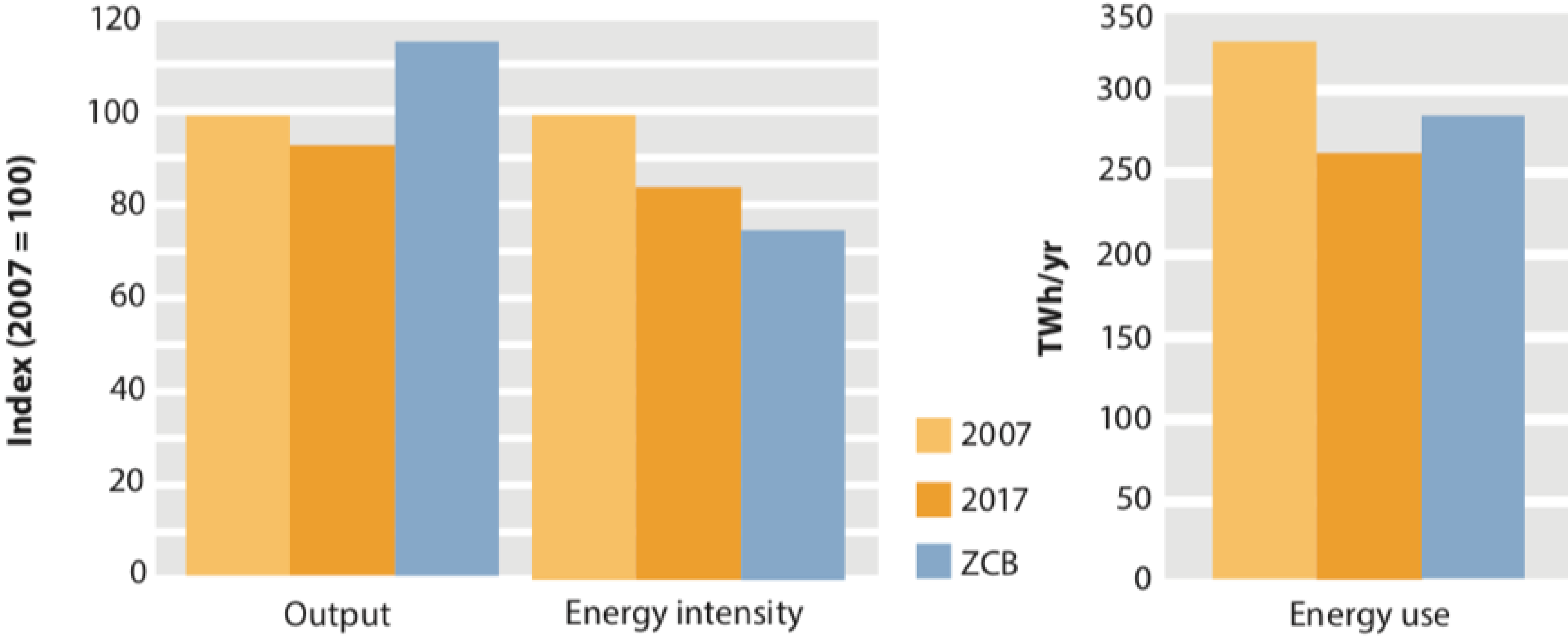


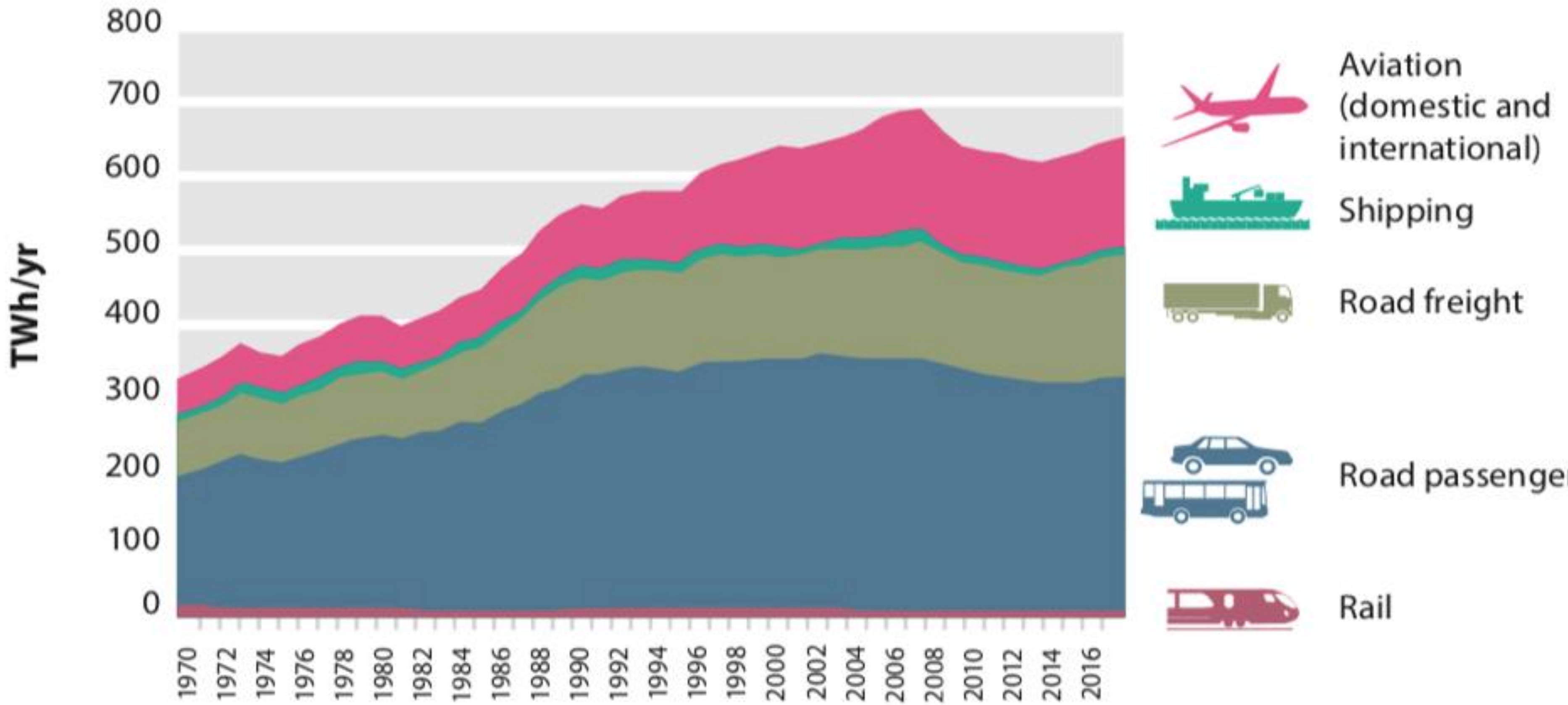
Figure 3.8: The amount of 'stuff' produced by UK industry (output), the energy used per unit of output (energy intensity), and the total UK industrial energy use for 2007 (representing pre-recession levels), 2017 (BEIS, 2018) and in our scenario.

ZCB does not deal with the CO_2 emissions from the stuff we buy that is produced outside the UK

Assumes other countries will decarbonise

It does change the fuels used to decarbonise

Where are we now? - transport



igure 3.11: Energy demand for UK transport over recent decades (excludes international shipping
BEIS, 2018)).

20% of aviation domestic, 80% international

Transport – 1st - reduce use and change mode

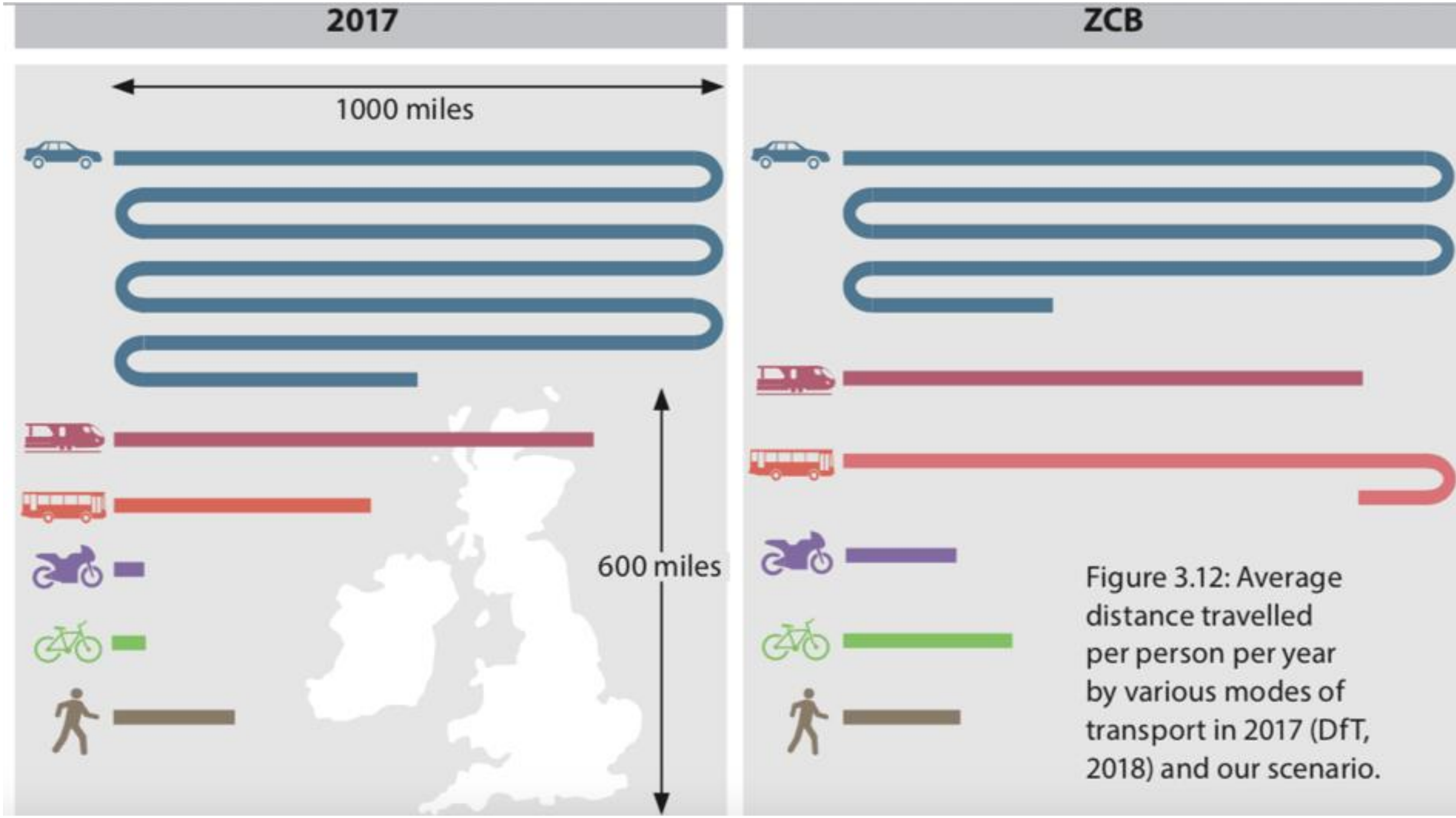


Figure 3.12: Average distance travelled per person per year by various modes of transport in 2017 (DfT, 2018) and our scenario.

Total distance reduced by about 13%.
Still a lot of car travel

Increase in coach/bus use
Mostly electric
Some hydrogen

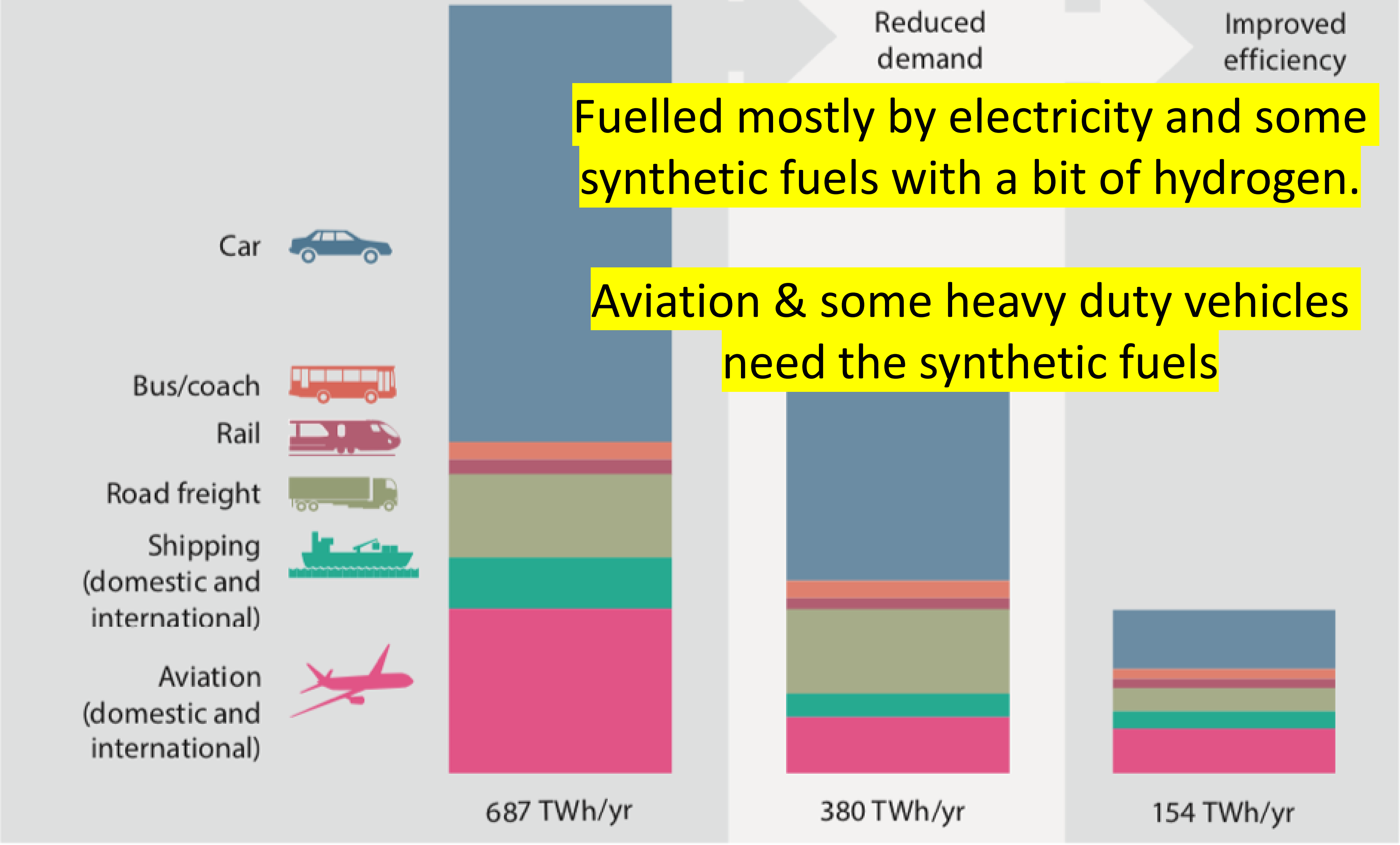


Figure 3.13: Reduction in energy demand for transport in our scenario, shown in two stages: firstly with only the impact of reduced distances travelled and higher occupancy levels; secondly, adding the impact of higher vehicle efficiencies (initial figures from BEIS, 2018; DfT, 2018).

Only essential domestic aviation, 2/3 decrease in international aviation

Where can we get energy from?

What renewable resources are available?

The size of each resource?

Predictability of supply?

Balance of supply and demand?

What impacts?

Lifecycle CO_2e emissions per unit of energy?

Cost?

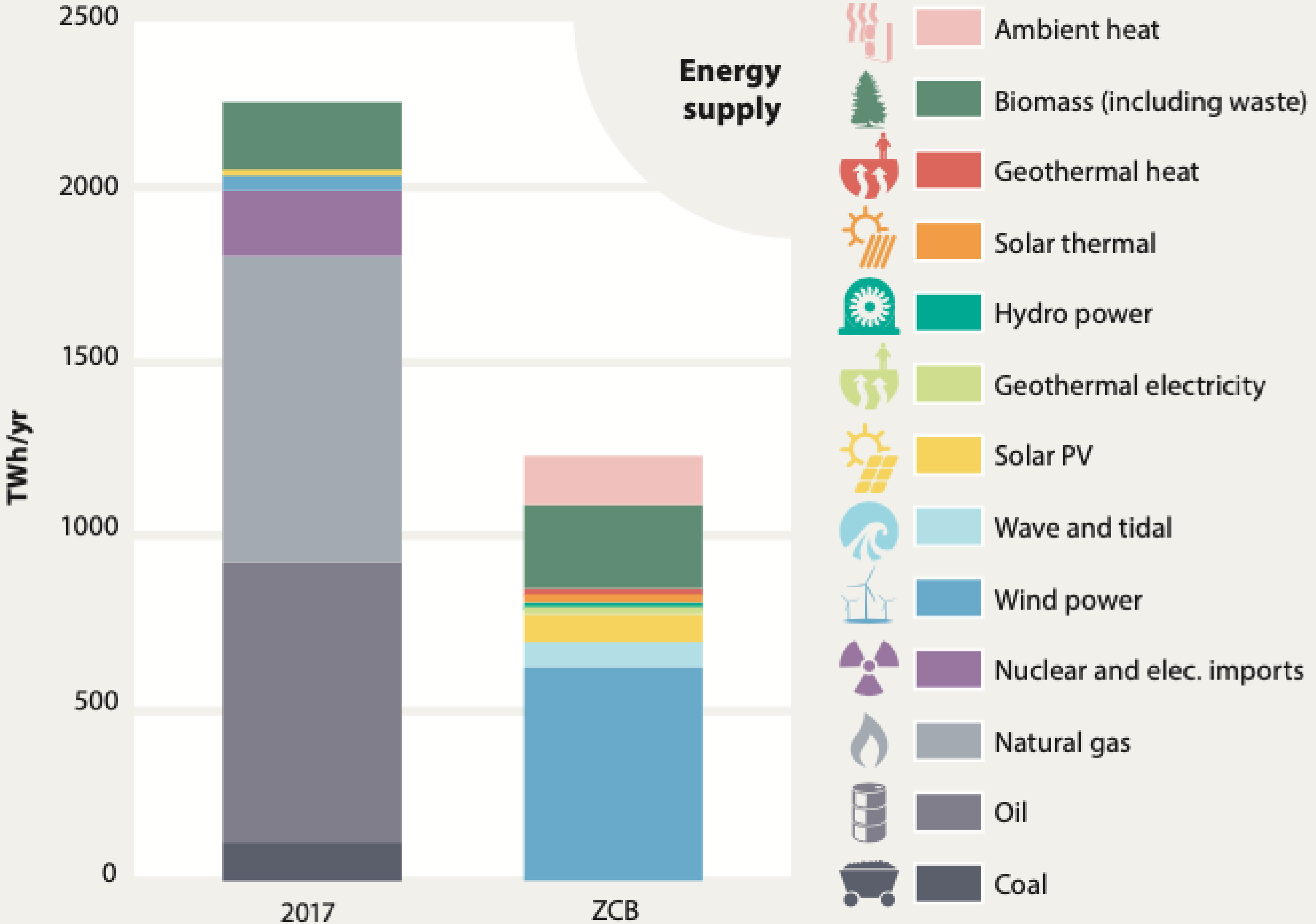
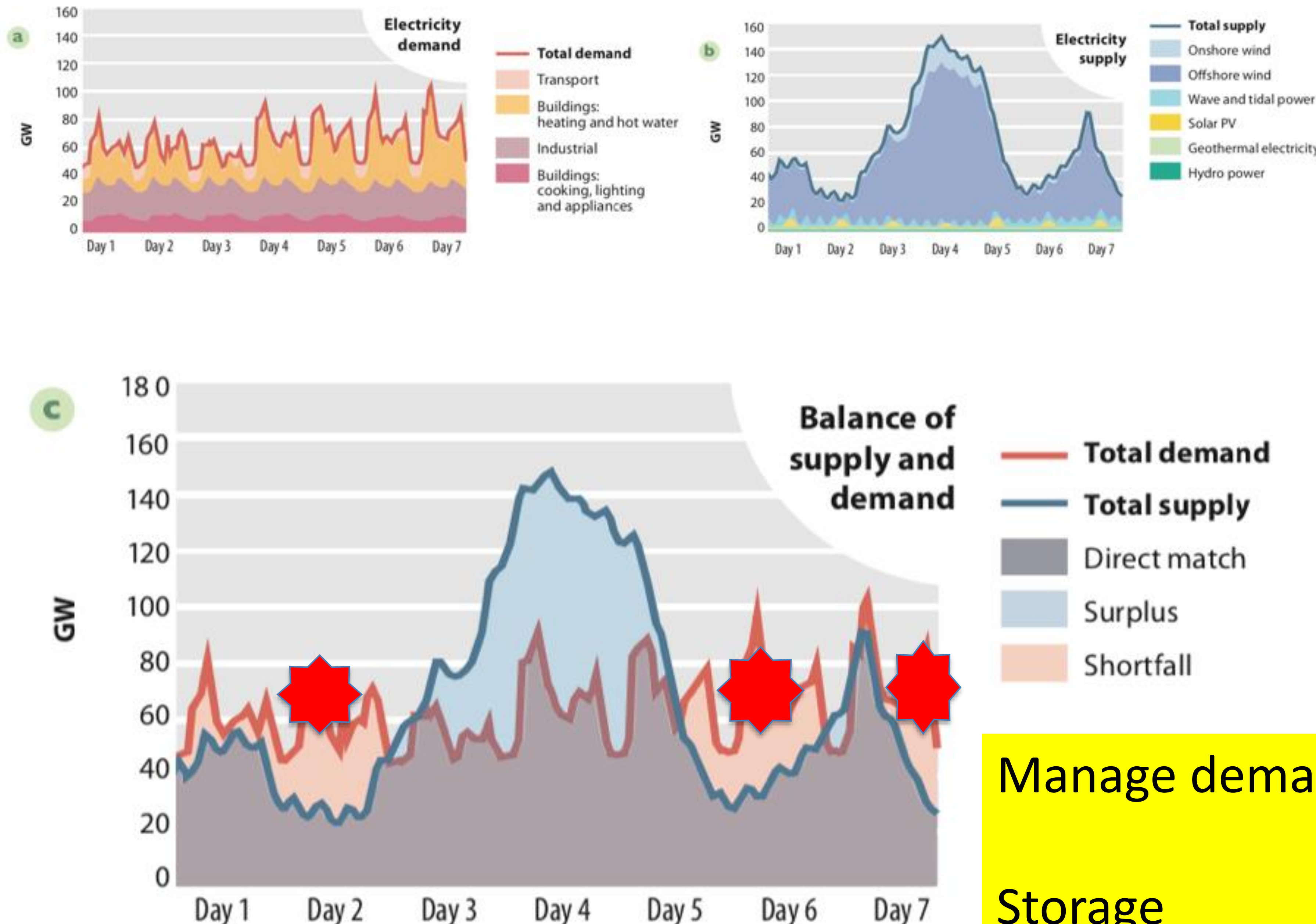


Figure 3.15: Energy supply in 2017 (BEIS, 2018a) and in our scenario.

We can produce enough energy

The question is
can we produce enough energy at all times –

even when the wind isn’t blowing, the sun isn’t shining and our energy demand is high.



Manage demand

Storage

Figure 3.19 a, b, and c: An example of 168 hours (7 days from the 13th – 19th December 2010) of (a) electricity demand, (b) electricity supply, and (c) the balance between them. Supply and demand are modelled using ten years worth of hourly

Smart appliances and short and long-term storage are necessary for a 100% renewable energy system

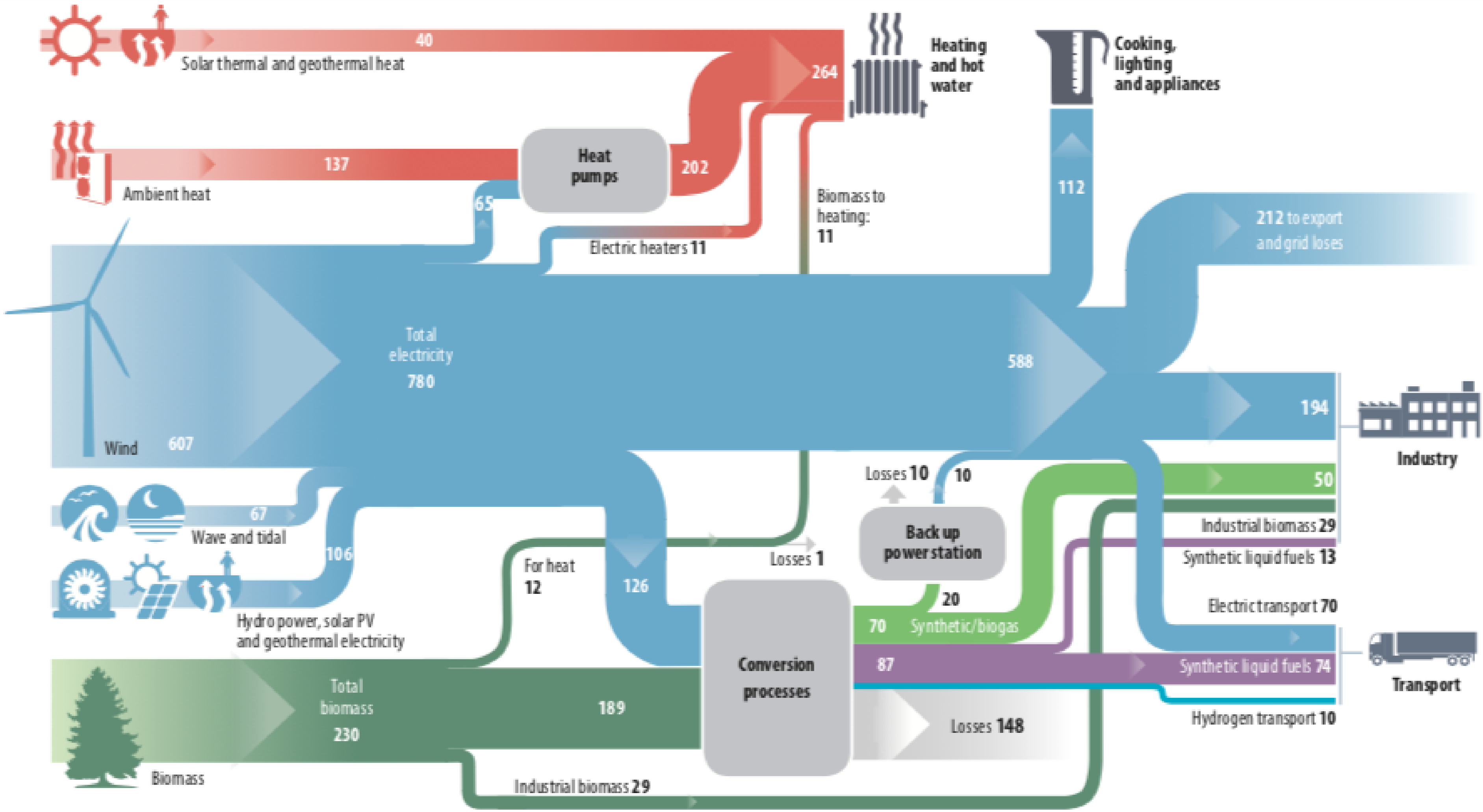


Figure 3.18: Energy flows in our scenario – from supply to demand. Numbers used here are rounded up or down to the nearest TWh and so inputs and outputs may not add up exactly.

Land use – where we are now

42% of food and 85% of timber imported
Does not include land used in other countries to provide food etc. for us

Figure 3.3: Approximate land use today (not including water courses and coastal areas). Based on data from Morton et al. (2008), Forestry Commission (2007), DEFRA (2012), NERC (2008), Bain et al. (2011) and Read et al. (2009).

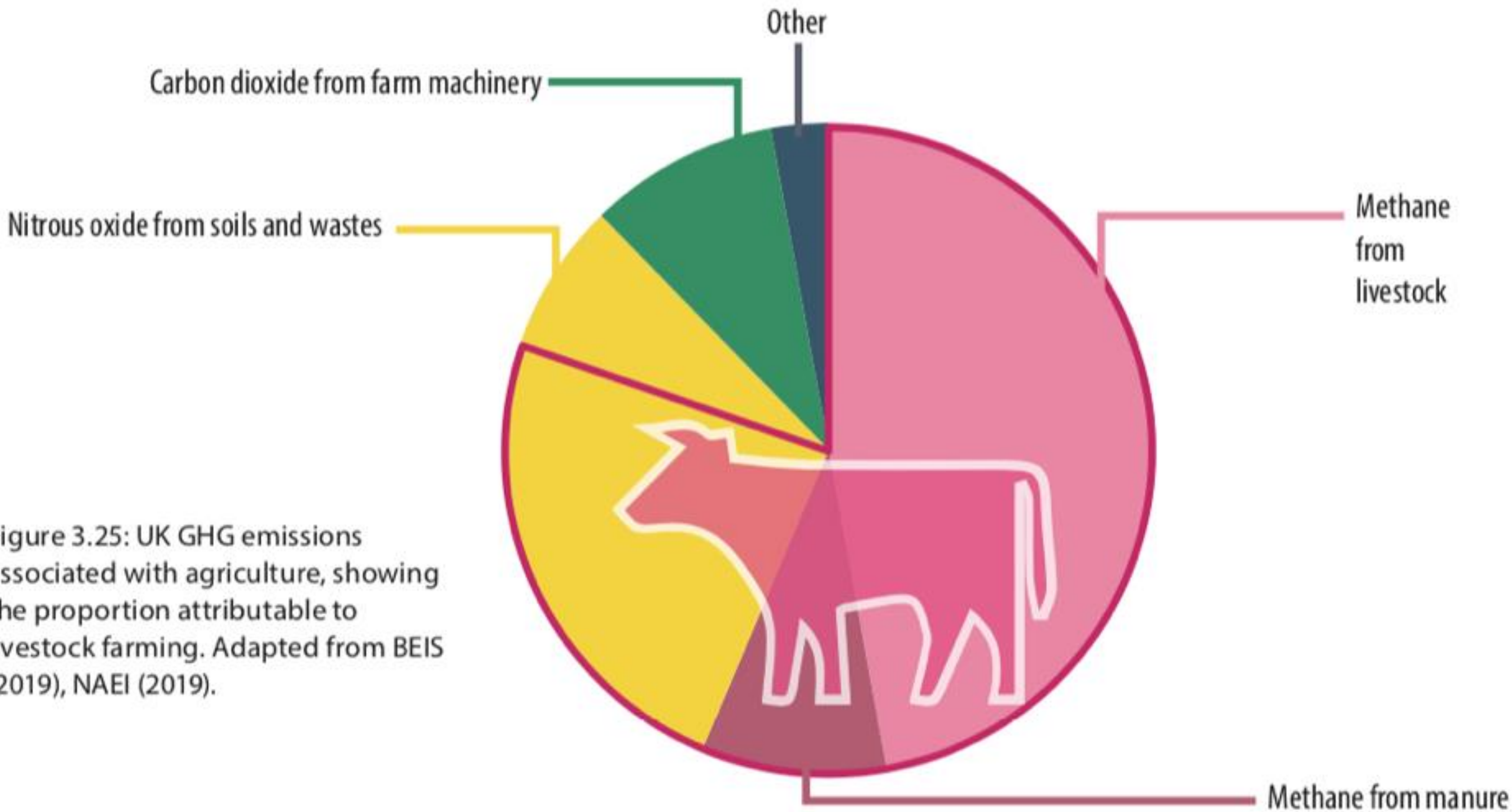


Figure 3.25: UK GHG emissions associated with agriculture, showing the proportion attributable to livestock farming. Adapted from BEIS (2019), NAEI (2019).

Methane matters

Ruminants (cattle, sheep & goats) belch significant amounts of methane

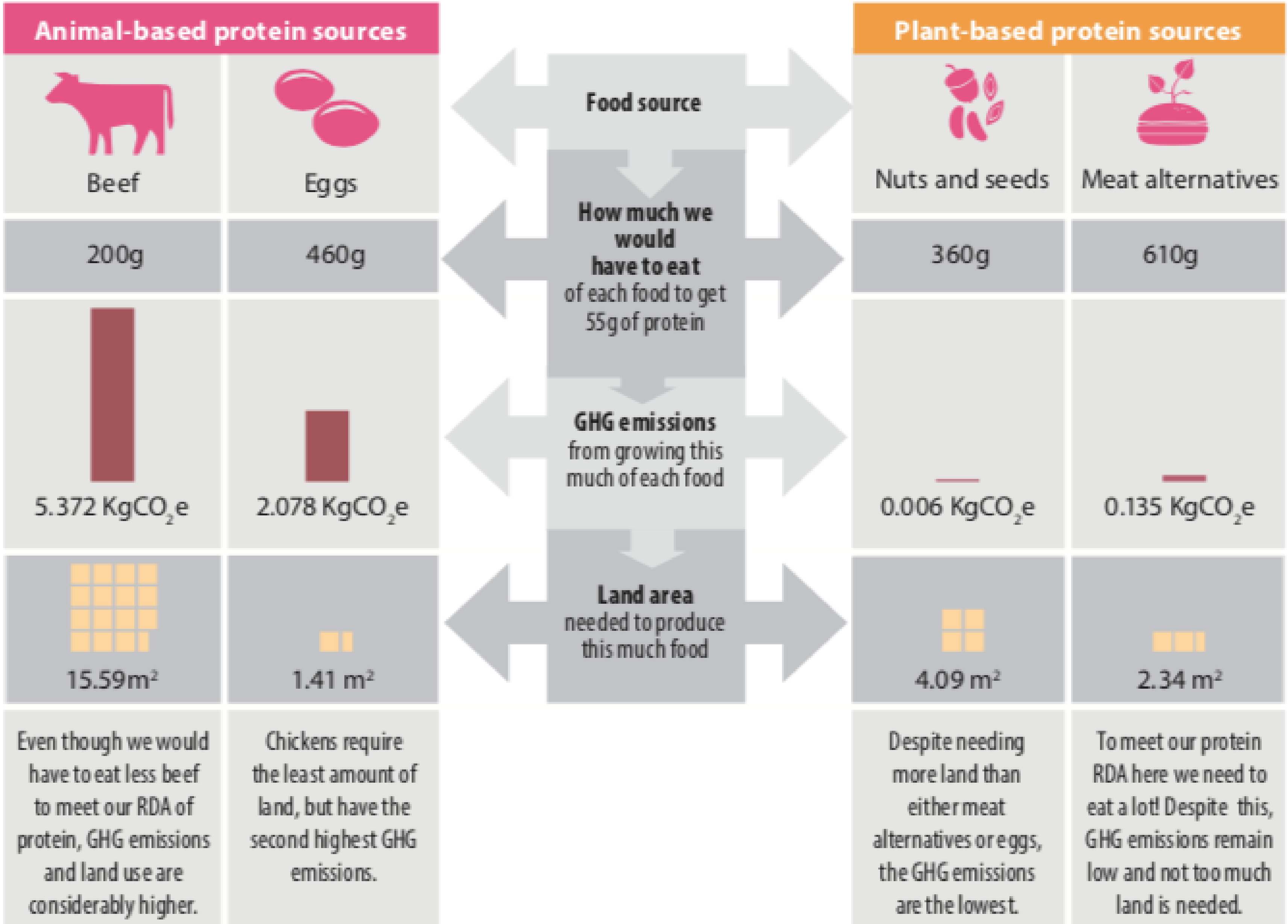


Fig 3.26: Comparison of four different high protein food sources: how much would need to be eaten to meet the recommended daily amount (RDA), the associated GHG emissions and land used.

Possible diet – for health as well as carbon reduction

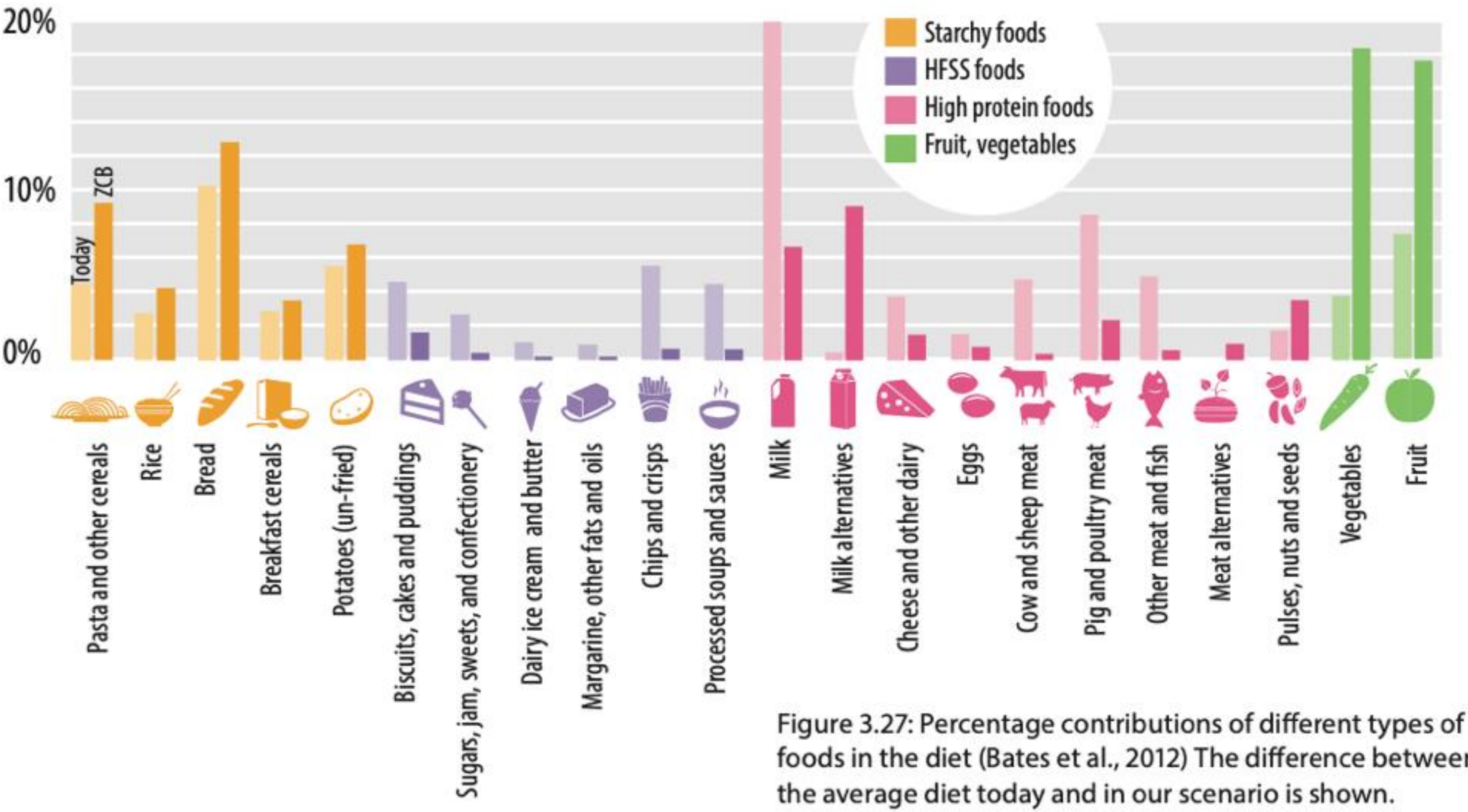
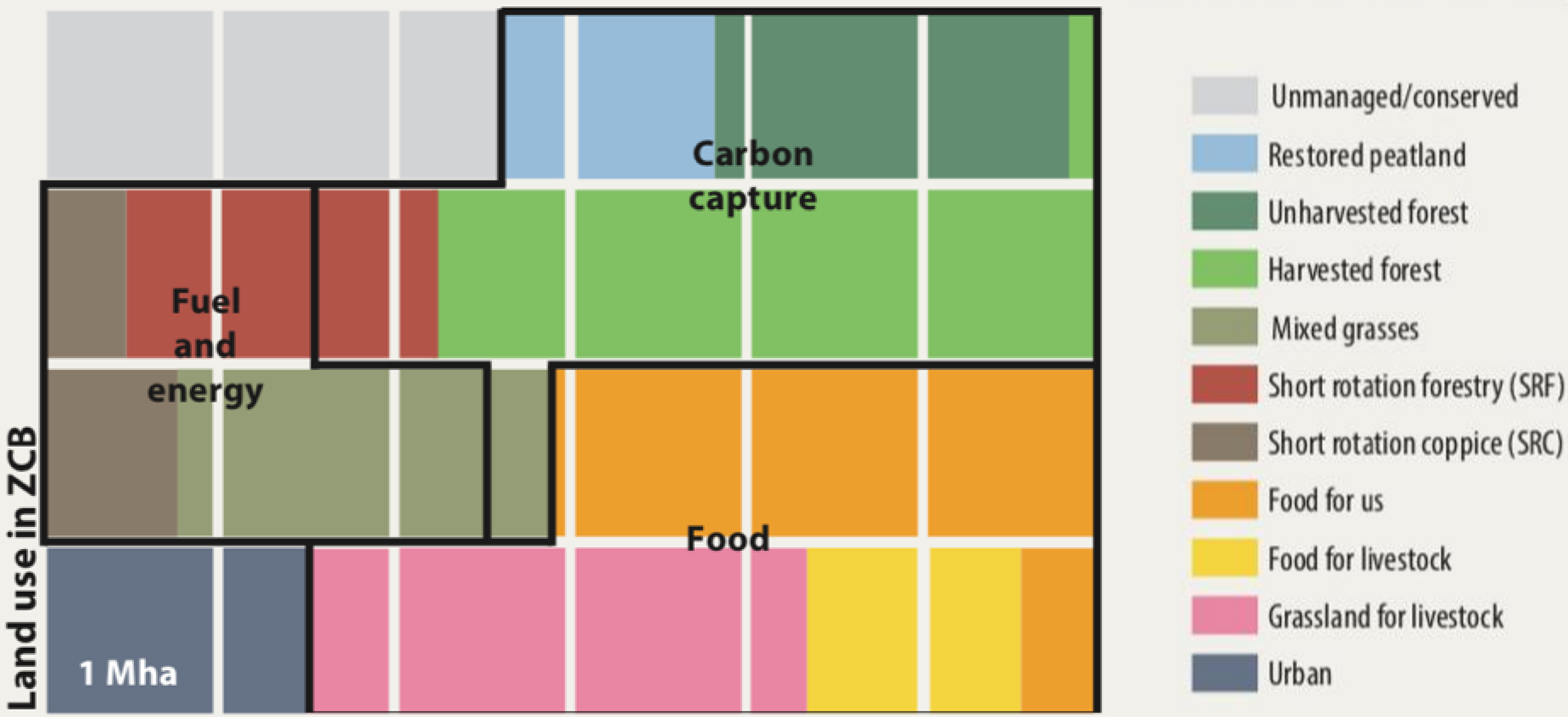


Figure 3.27: Percentage contributions of different types of foods in the diet (Bates et al., 2012) The difference between the average diet today and in our scenario is shown.

Land use summary:



Land use – energy crops

- Grazing land converted to growing grasses (including miscanthus), coppice and short rotation forestry
- Ploughing up grassland minimised

Land use – timber, peat & biodiversity

- Forest area doubled – about 1/3 unharvested, 2/3 harvested for timber
- Increased timber use in buildings
- Restoration of peatlands

Why peatland?

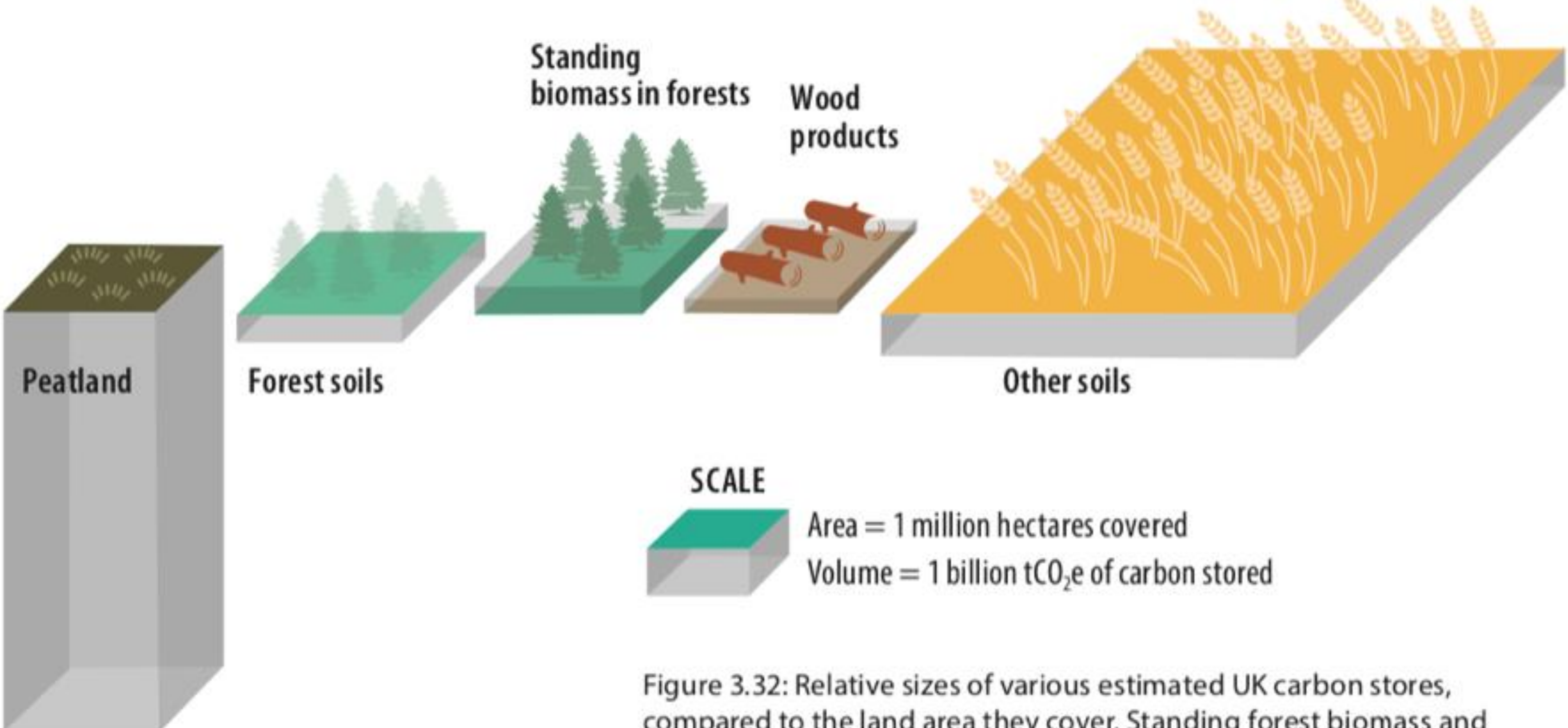


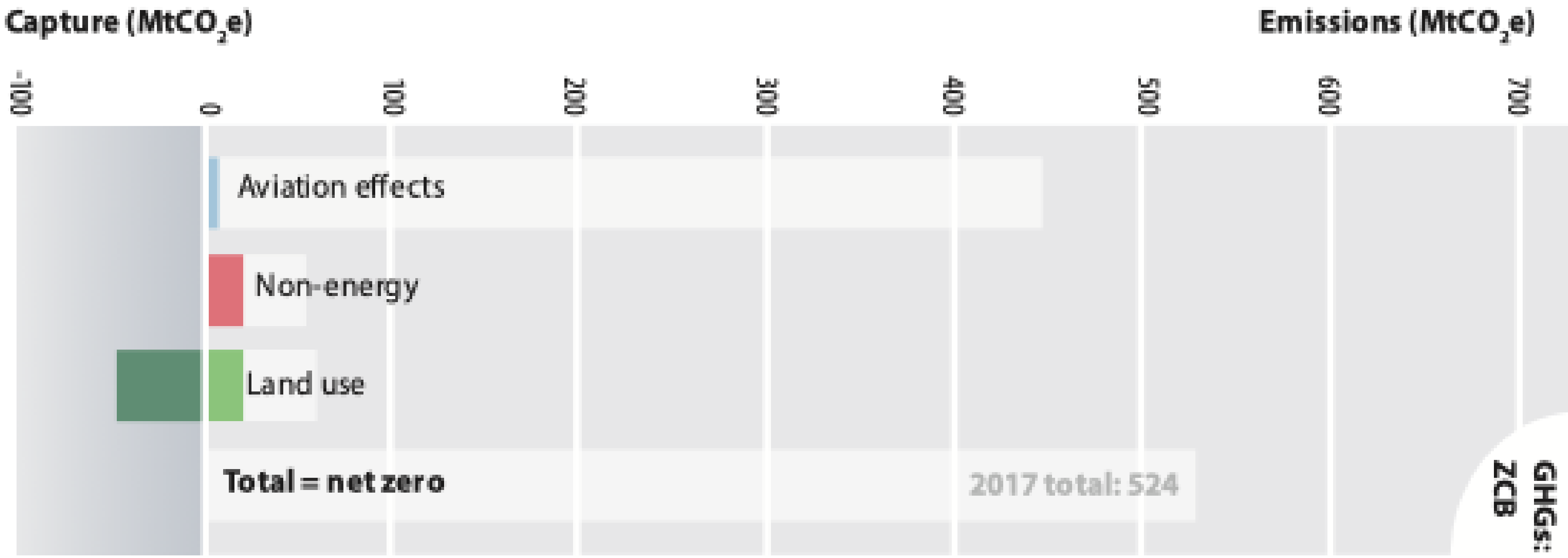
Figure 3.32: Relative sizes of various estimated UK carbon stores, compared to the land area they cover. Standing forest biomass and wood products show the carbon store above the ground level.

Energy crops

Synthetic gas and liquid fuels for aviation, some vehicles and industrial processes

Described as “ ‘carbon neutral’.
The CO_2 emitted by burning them was initially taken in by the biomass as it grew, and the electricity used is produced from renewables. Over the long-term there is no net increase of GHG emissions in the atmosphere.”

But they are inefficient processes and what about global land use?



Carbon captured and greenhouse gas emissions for the UK in this scenario relative to 2017, including international aviation & shipping & the enhanced effect of emissions from aviation. Total emissions sum to net zero.

What’s our global fair share?

Maybe that land used for fuel for flying should be used to produce food to export or……

The Ecological Footprint