

Centre for
Alternative
Technology

University of Bristol
February 2011

ZERO-CARBON BRITAIN: IS IT POSSIBLE?

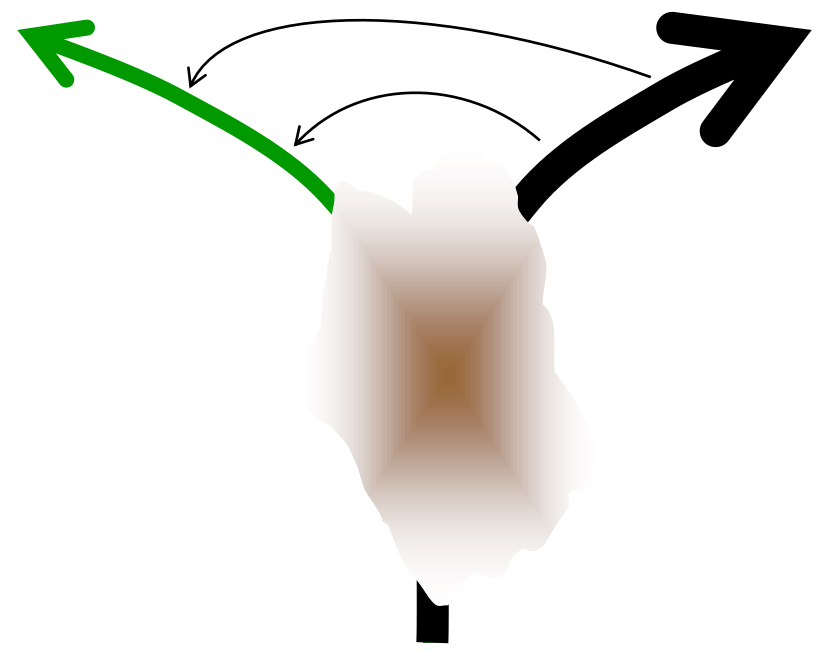
PETER HARPER

THE GREATEST EVER BRANCH-POINT IN HUMAN HISTORY?

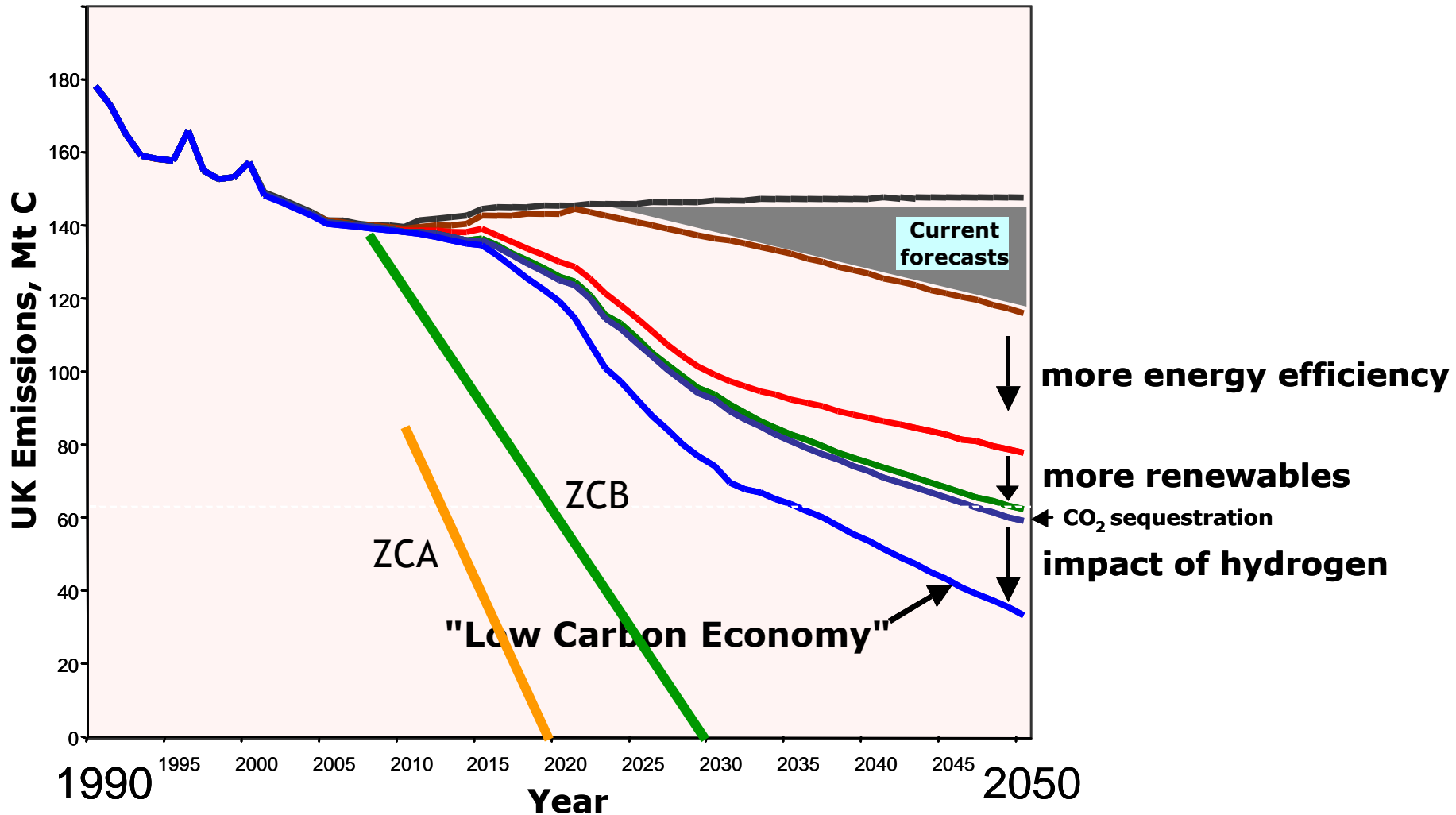
WILL WE RECOGNISE IT?

**MITIGATION
FUTURE**

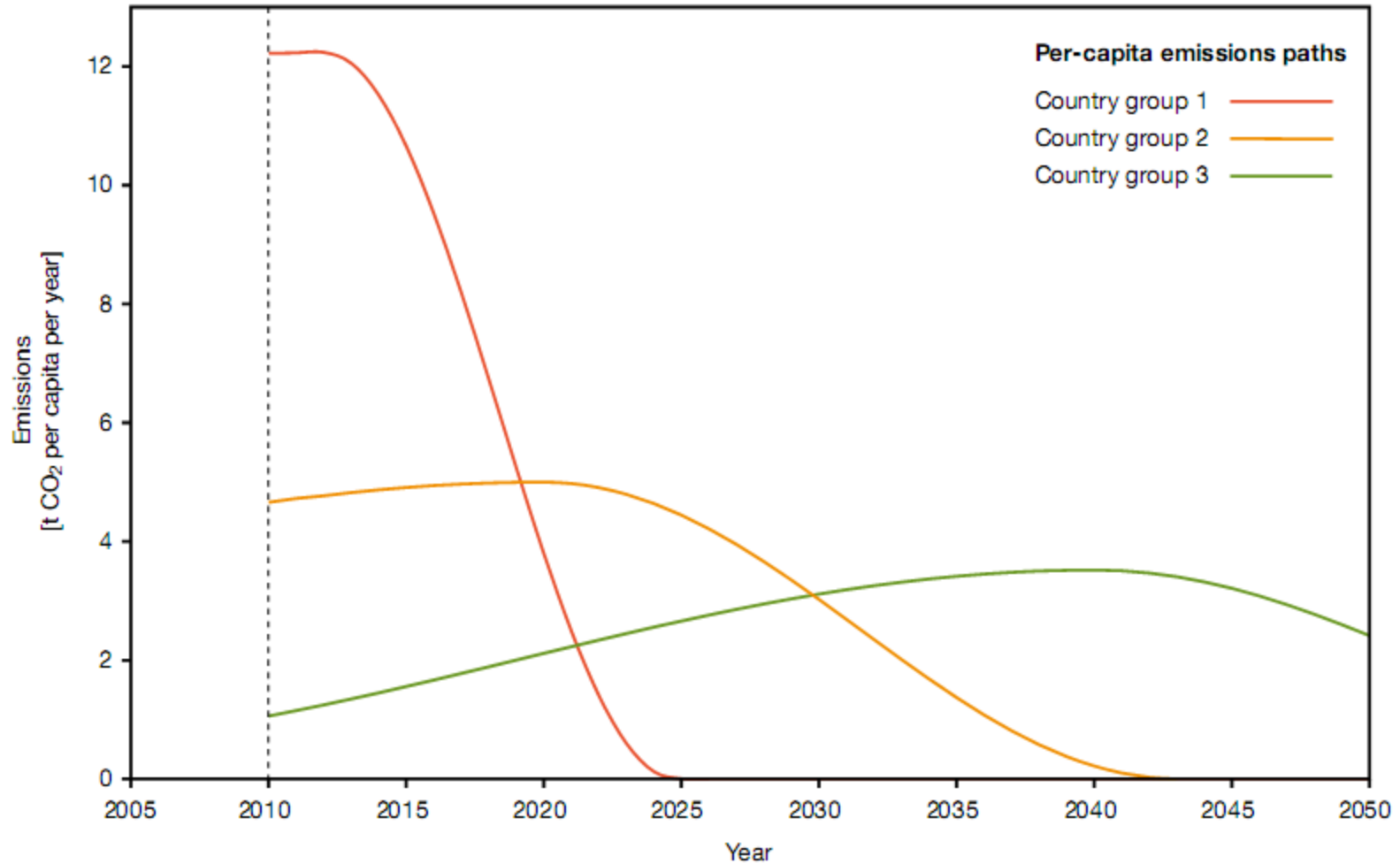
**3-6° FUTURE +
PEAK OIL**



Typical mainstream view

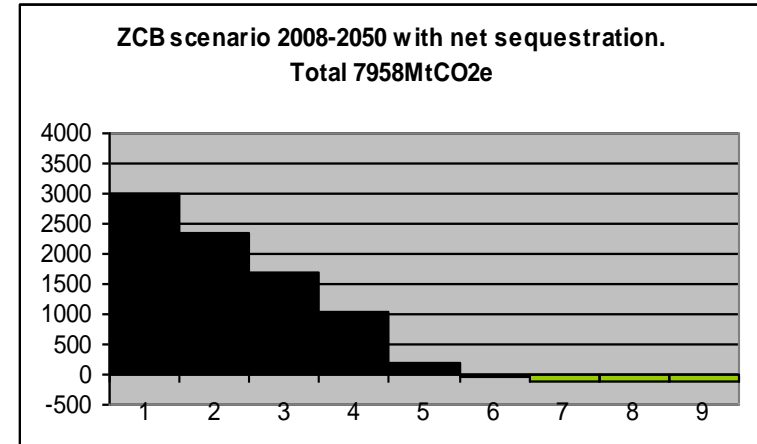
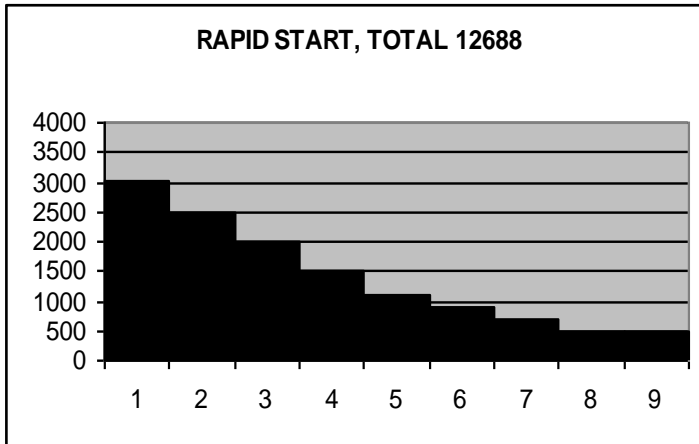
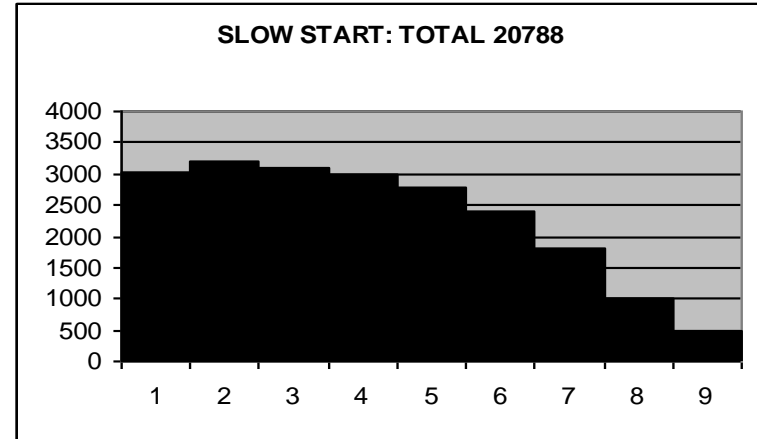
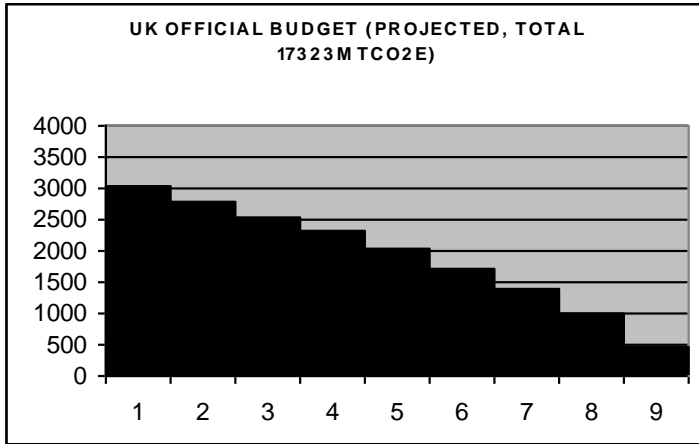


THE 'CARBON BUDGET' APPROACH

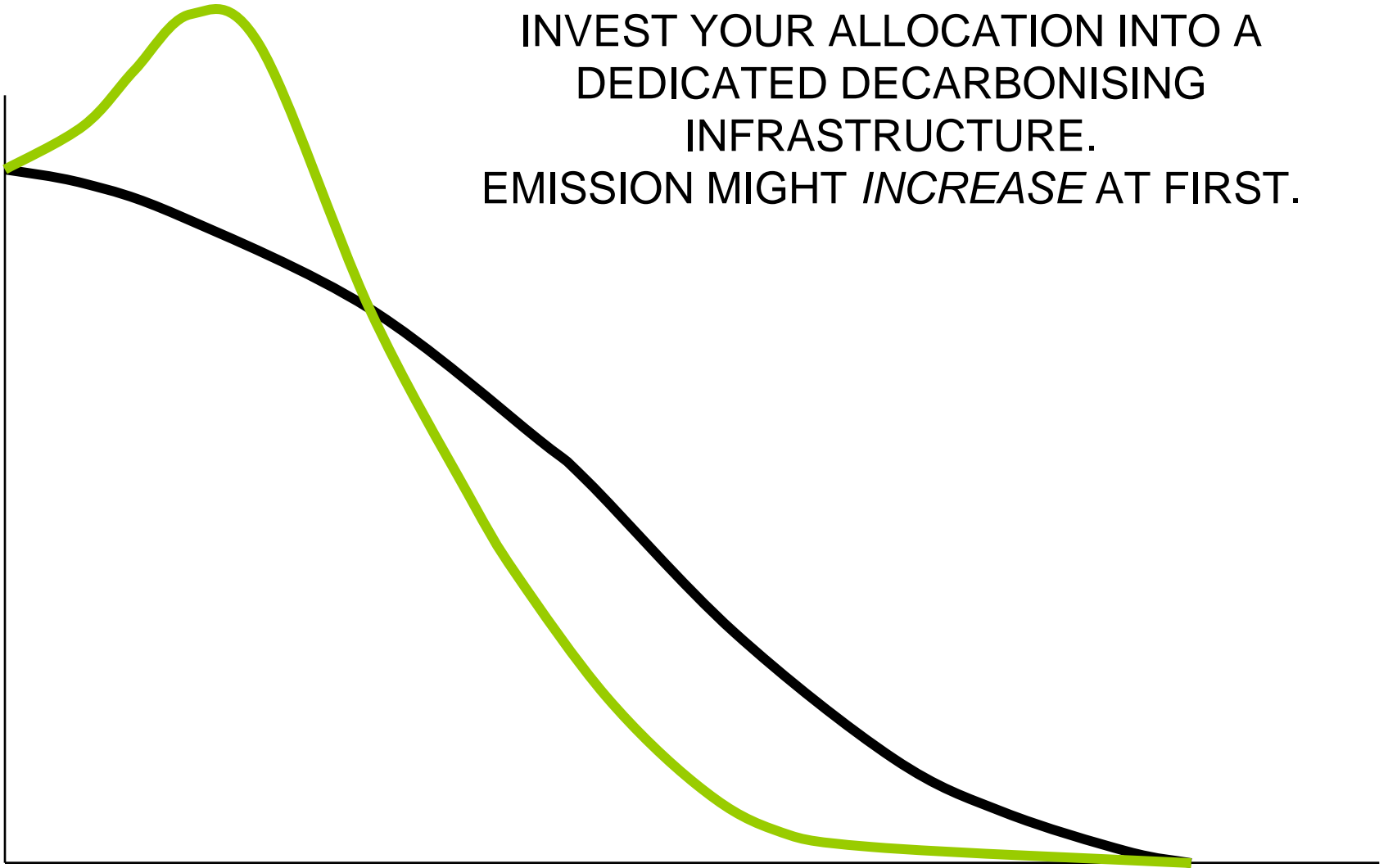


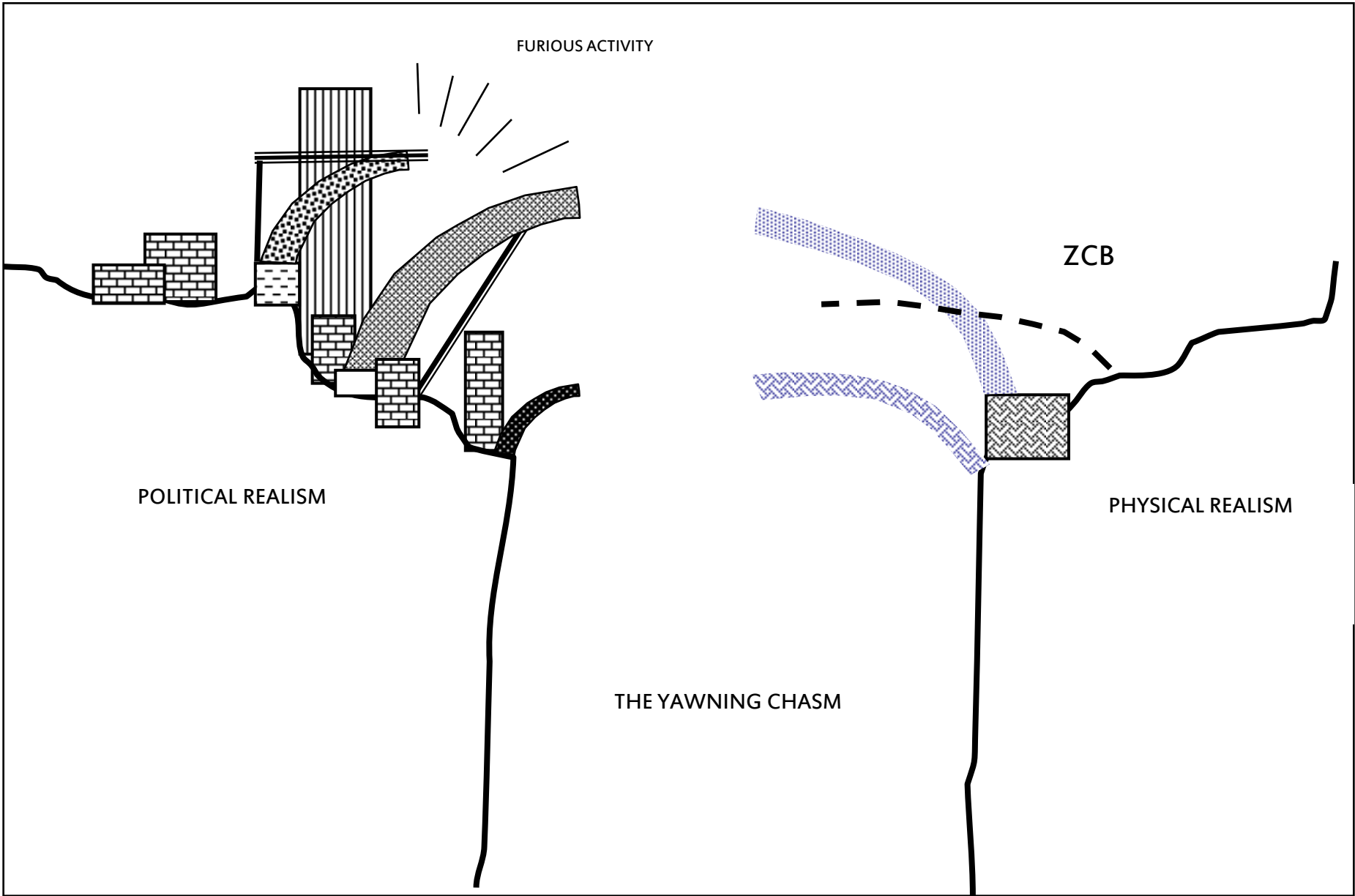
GERMAN ADVISORY COUNCIL ON GLOBAL CHANGE

COMPARE WITH UK NATIONAL POLICY



WITH THE SAME BUDGET, YOU MIGHT
INVEST YOUR ALLOCATION INTO A
DEDICATED DECARBONISING
INFRASTRUCTURE.
EMISSION MIGHT *INCREASE* AT FIRST.





FURIOUS ACTIVITY

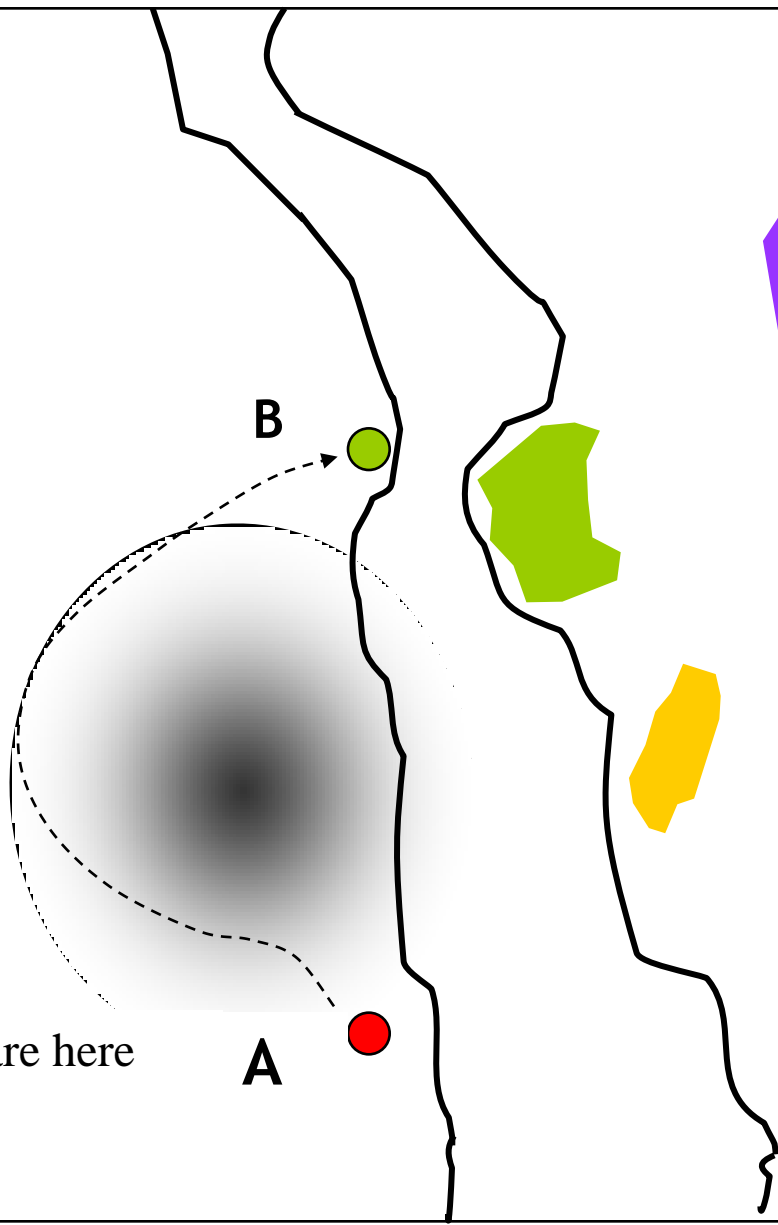
POLITICAL REALISM

THE YAWNING CHASM

ZCB

PHYSICAL REALISM

You are here

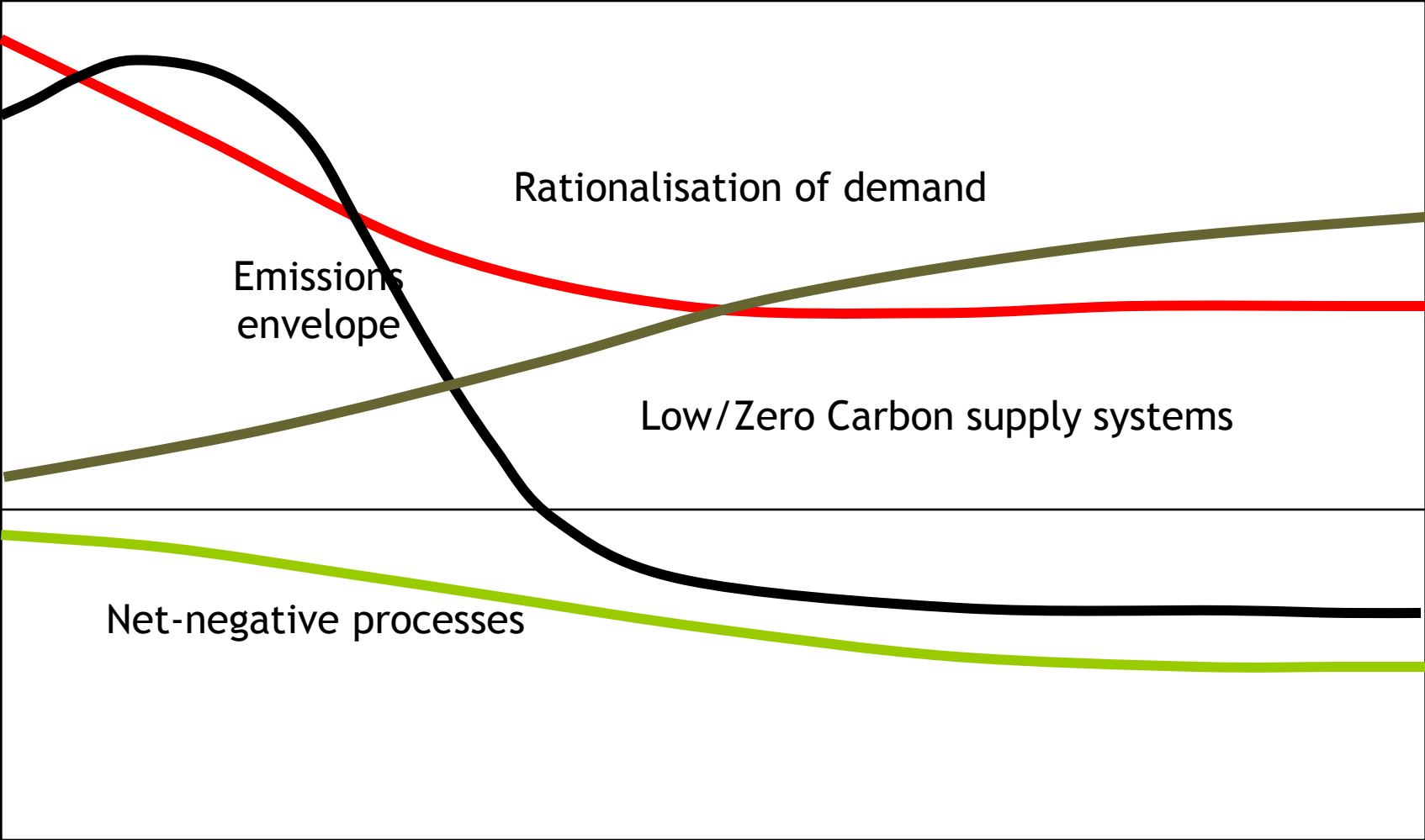


B

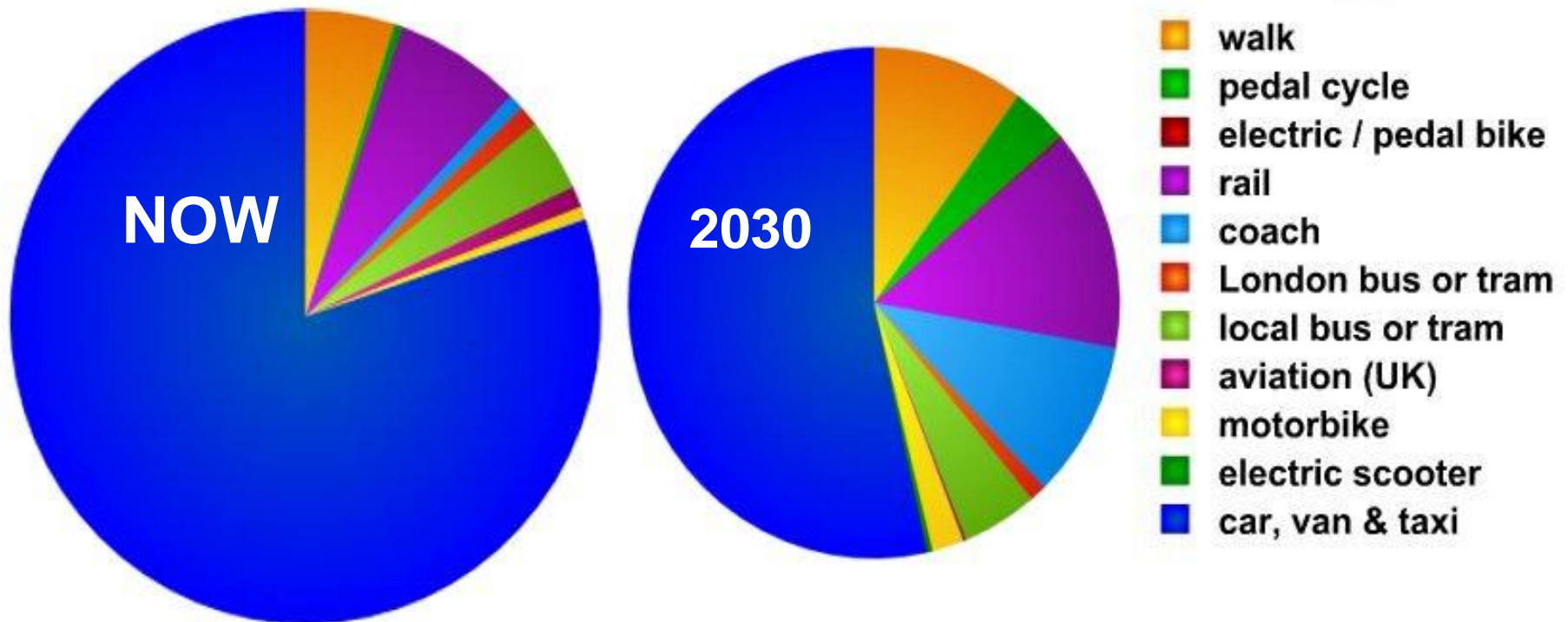
A

Physically feasible
decarbonised worlds

LOGICAL STRUCTURE OF THE APPROACH

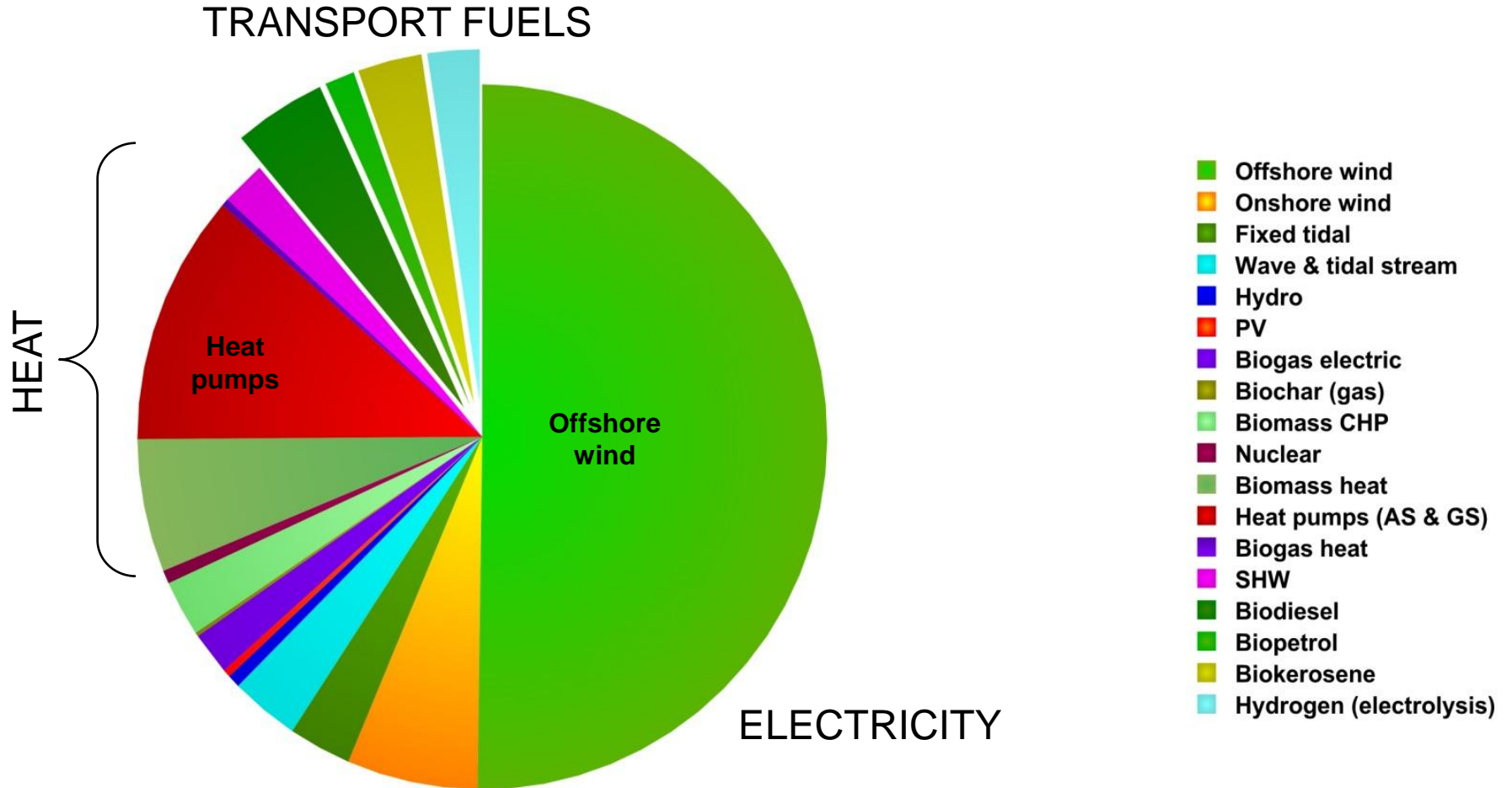


EXAMPLE: Transport - modes (km)

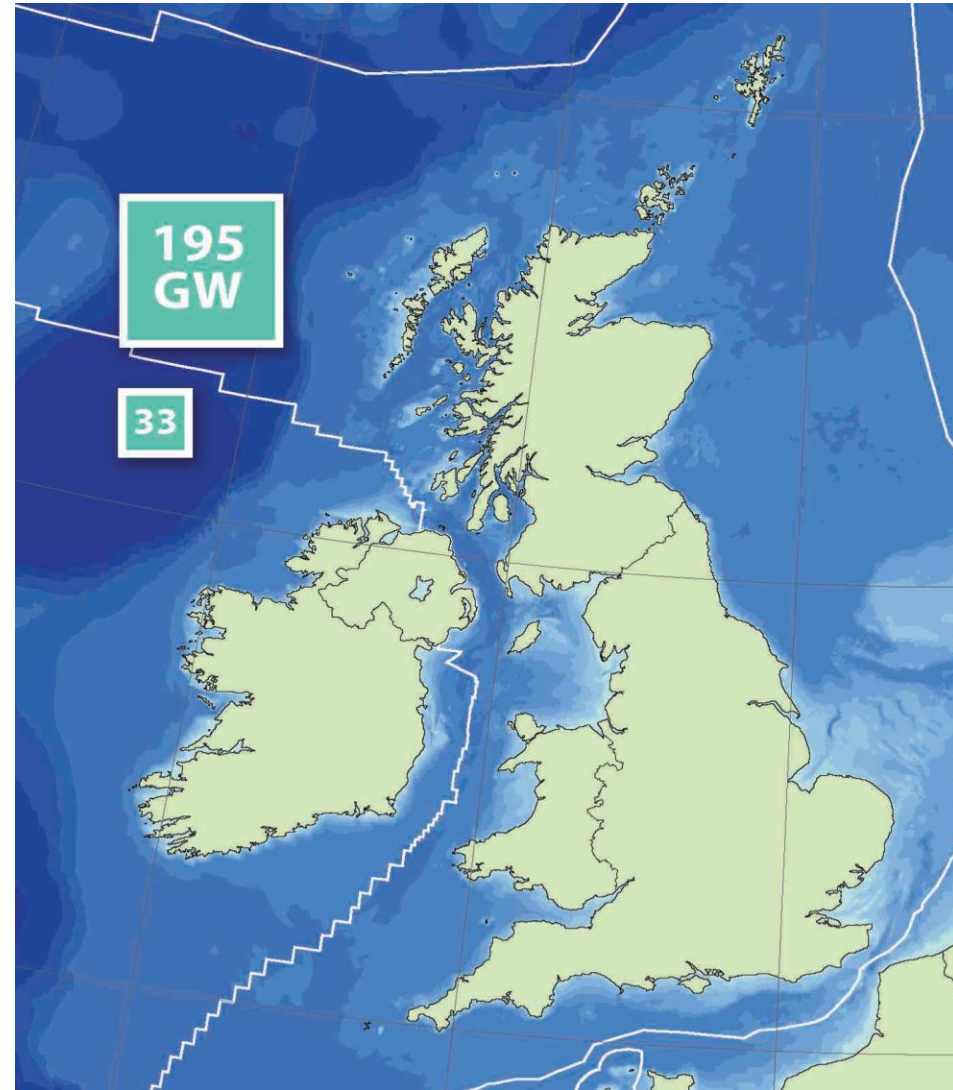


'POWER UP'

VERY ELECTRIC AND MOSTLY 'BIG'

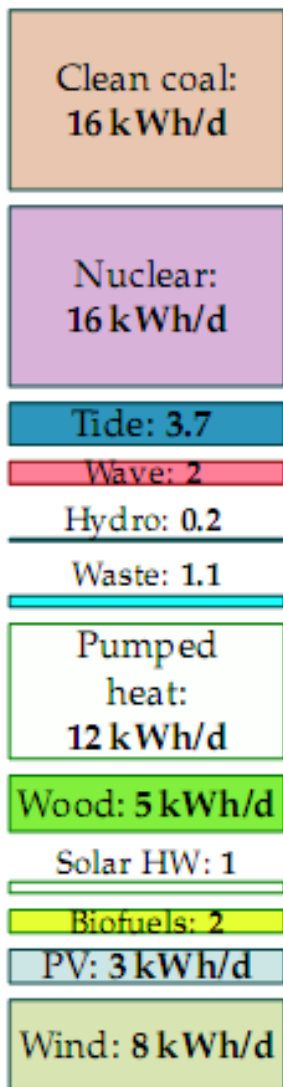


- Built on UK-ERC
'Environmentally Sensitive Scenario'
- Comparable with
'Offshore Valuation'
findings
- Exports of up to 17%
earning £7bn
annually

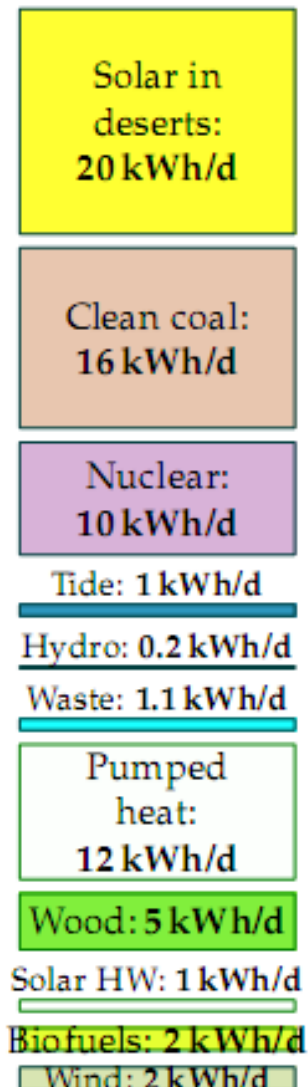


SCENARIOS

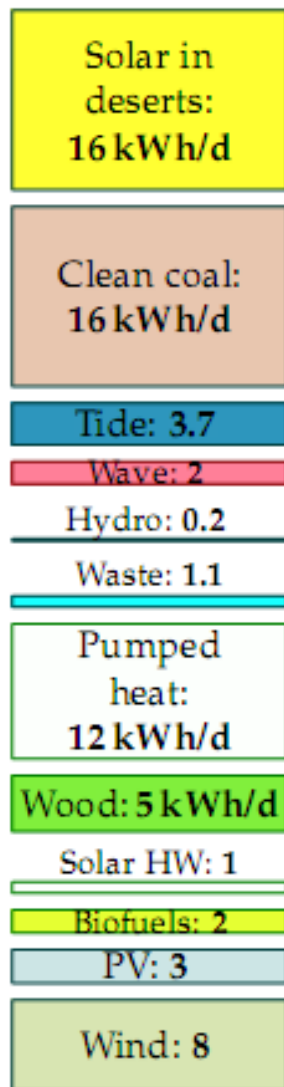
plan D



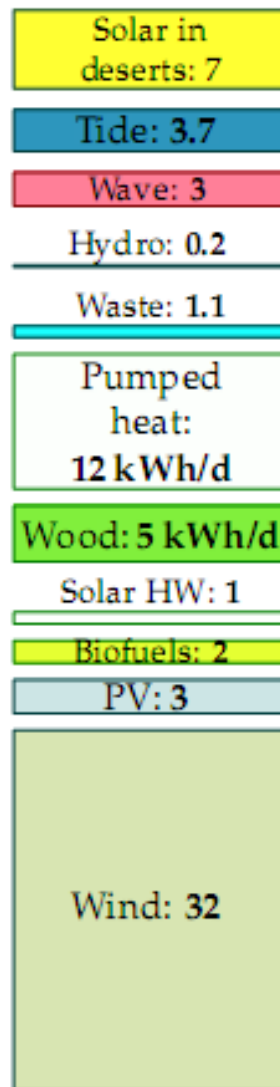
plan N



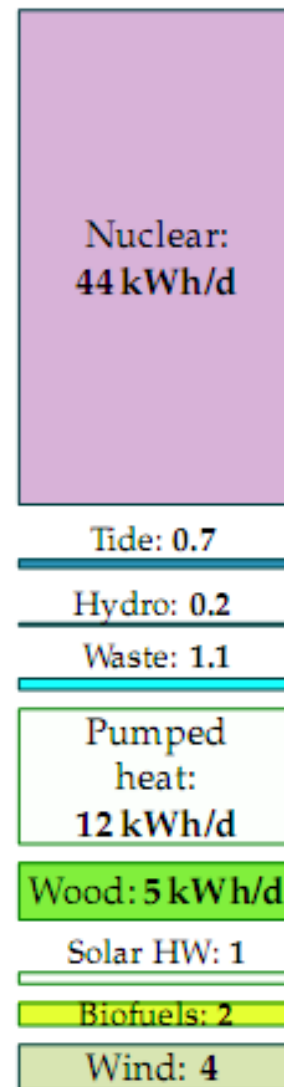
plan L



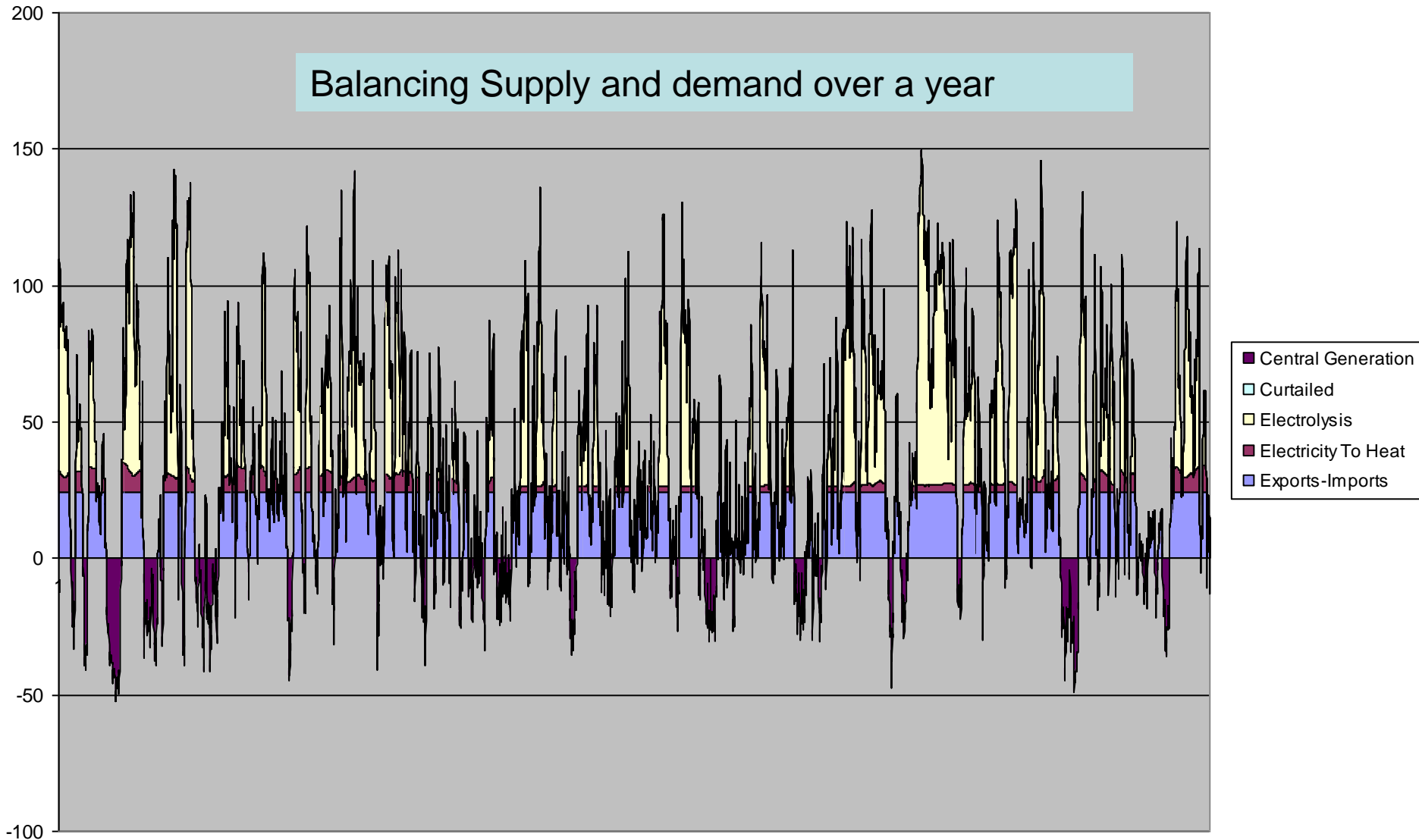
plan G



plan E



Balancing Supply and demand over a year



EU Energy network

- High Voltage DC Grid
- Linking up the offshore wind-farms
- Also linking the winter wind to the summer sun



DESERTEC-EUMENA



Concentrating
Solar Power



Hydro



Photovoltaics



Biomass



Wind



Geothermal

DESERTEC
THE ENERGY PARTNER

CSP collector areas
for electricity



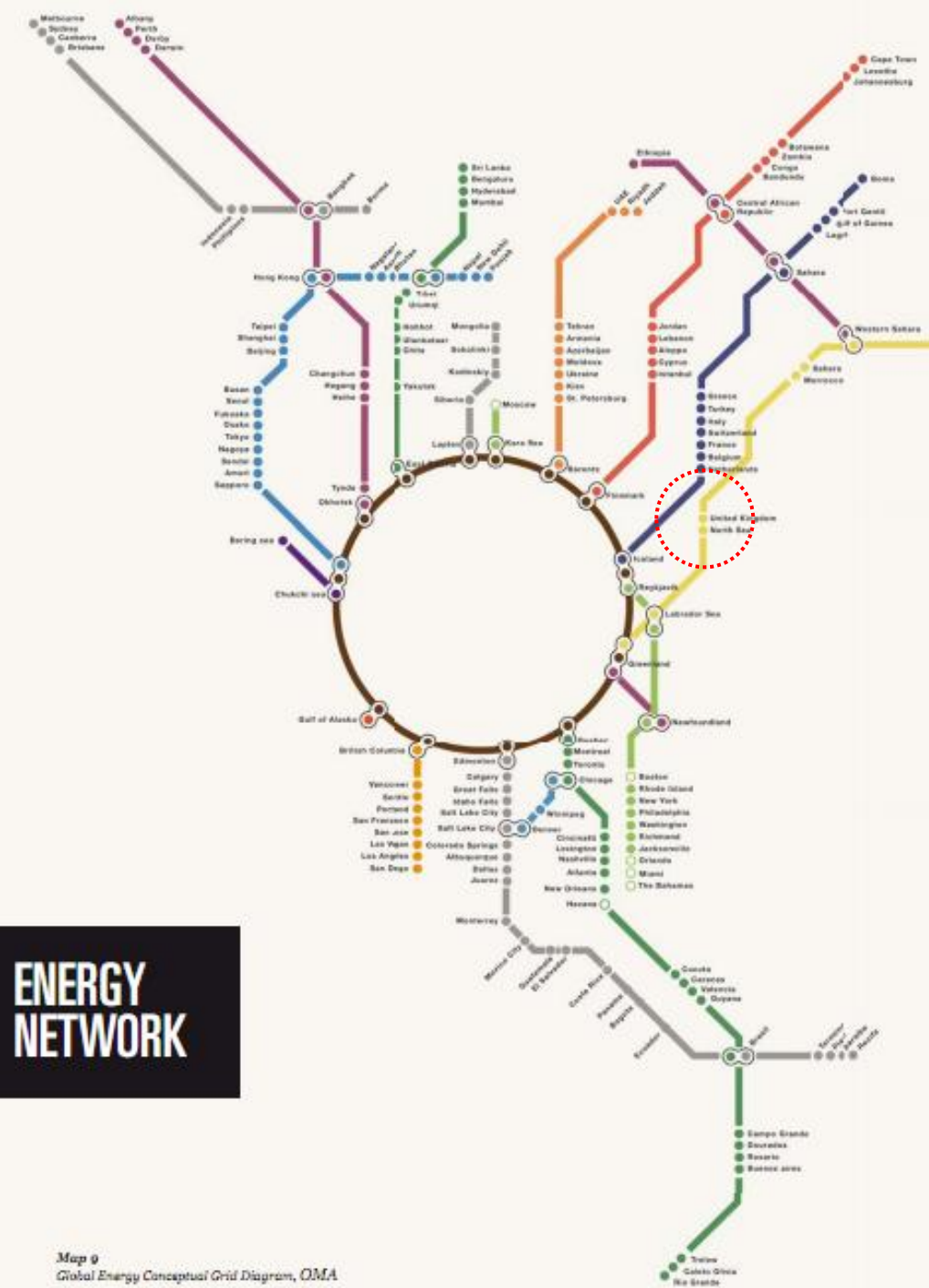
World 2005

EU-25 2005

MENA 2005

TRANS-CSP Riv EUMENA 2050

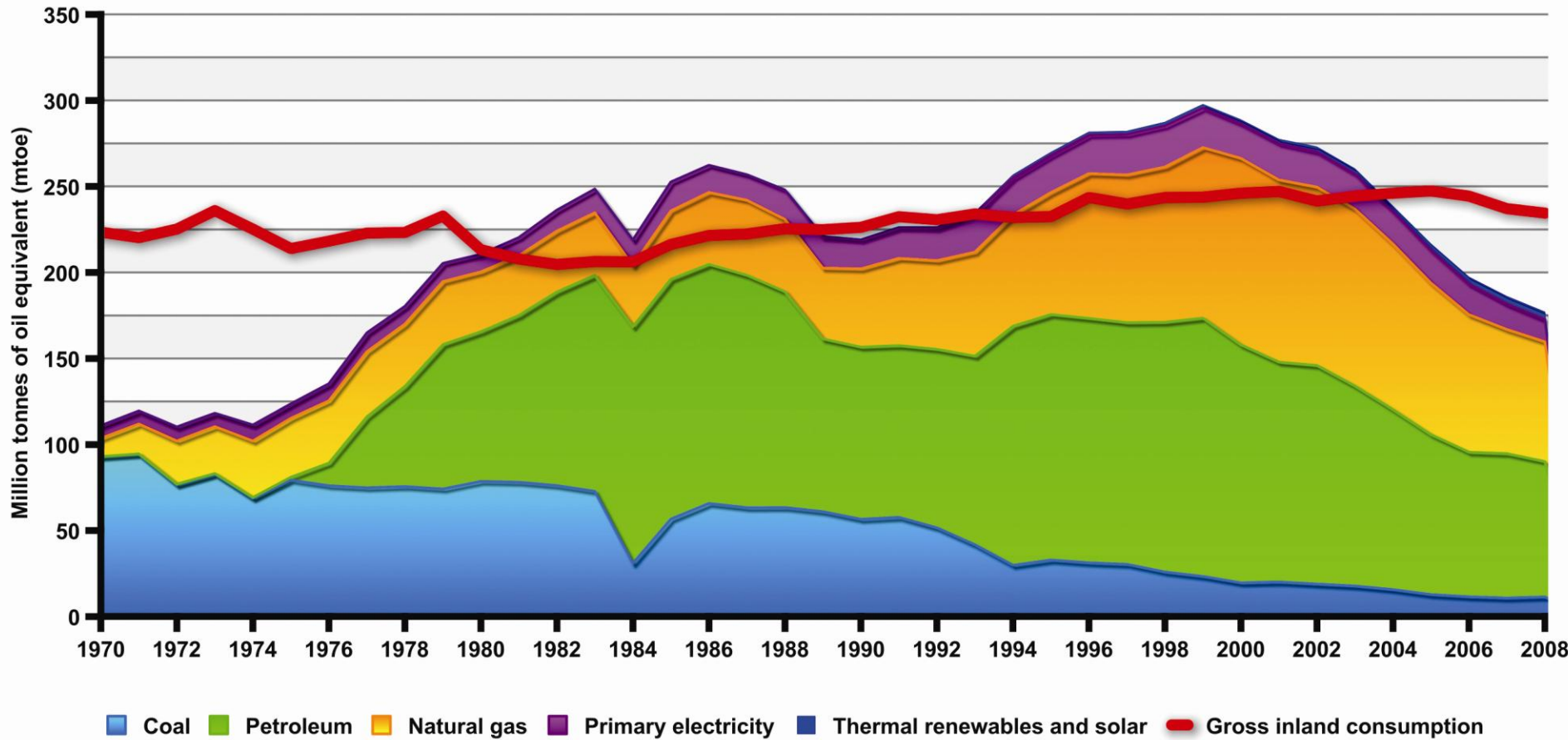


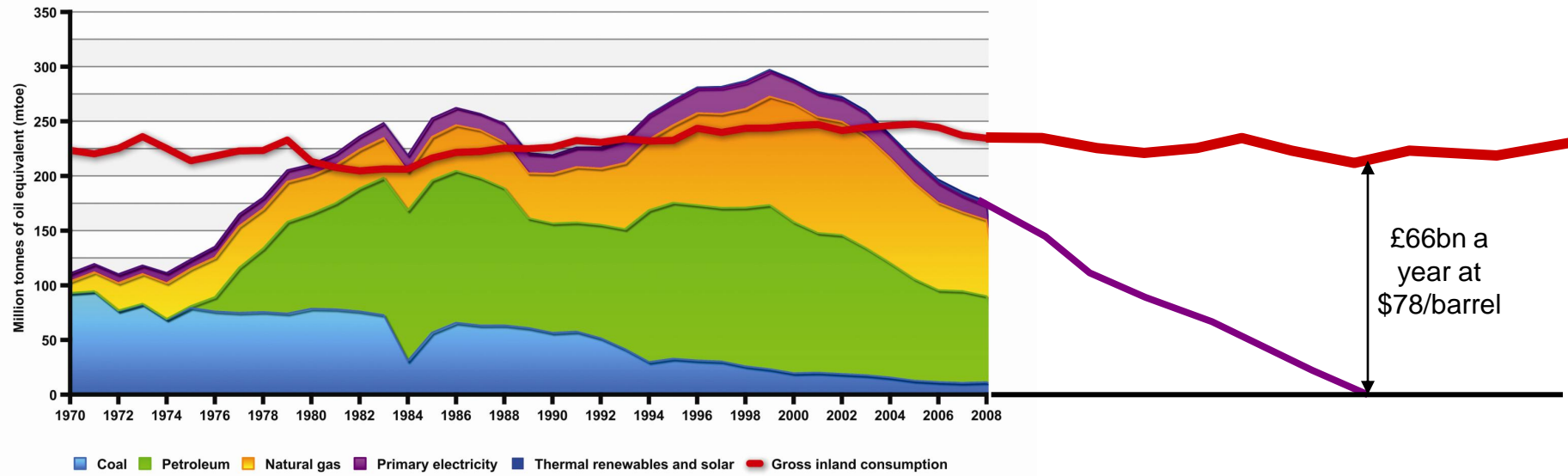


ENERGY NETWORK

Map 9
Global Energy Conceptual Grid Diagram, OMA

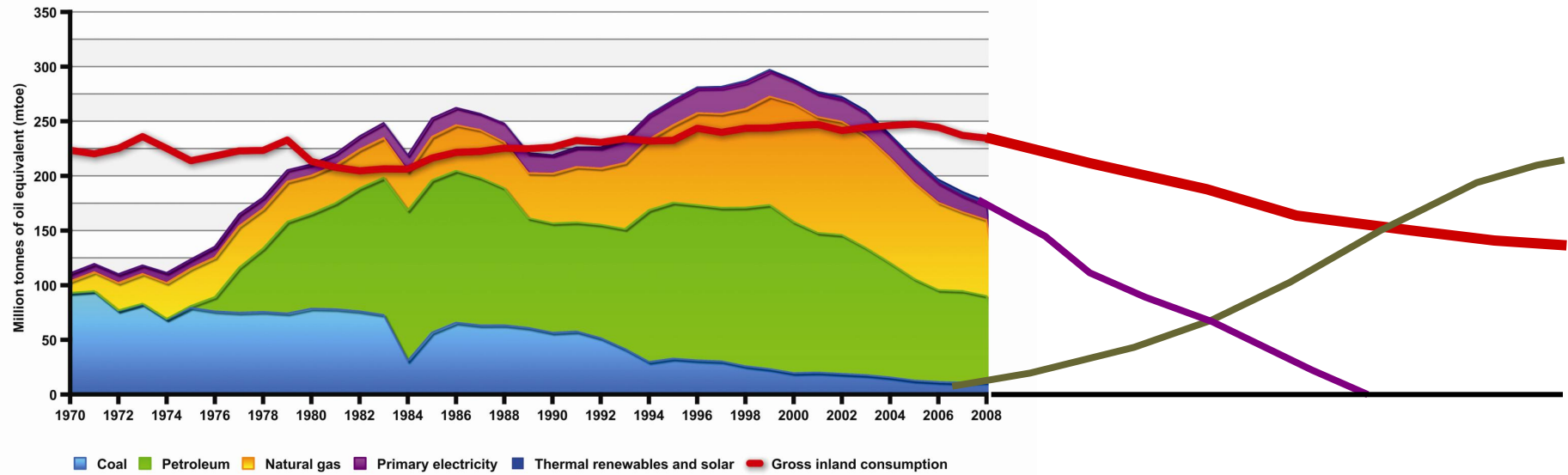
CAN WE AFFORD IT?





£66bn a year at \$78/barrel

NOT A COST - AN INVESTMENT



Tomorrow
£196 million

12

10

Newcastle

14

Manchester

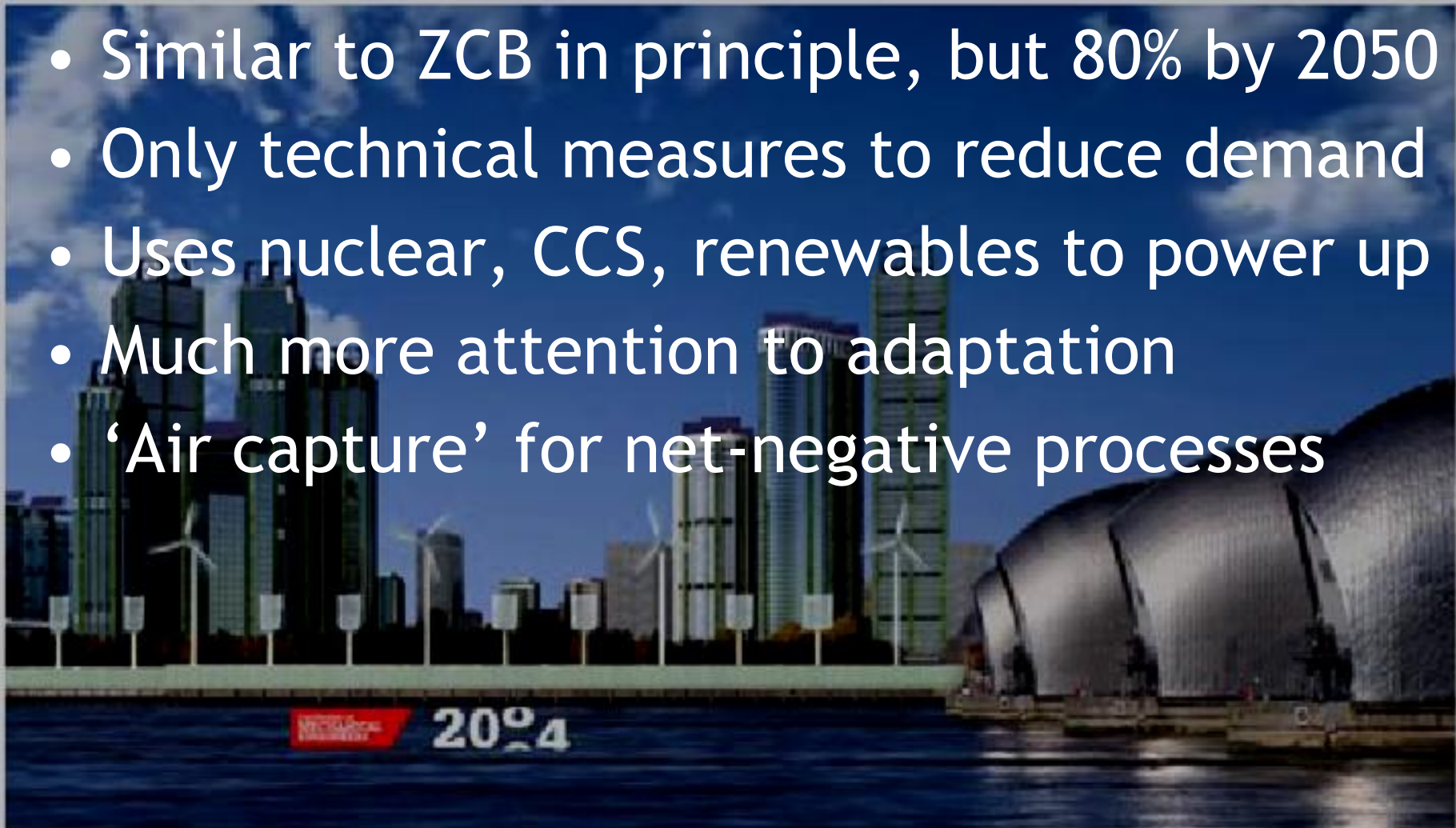
12 PM

TUESDAY

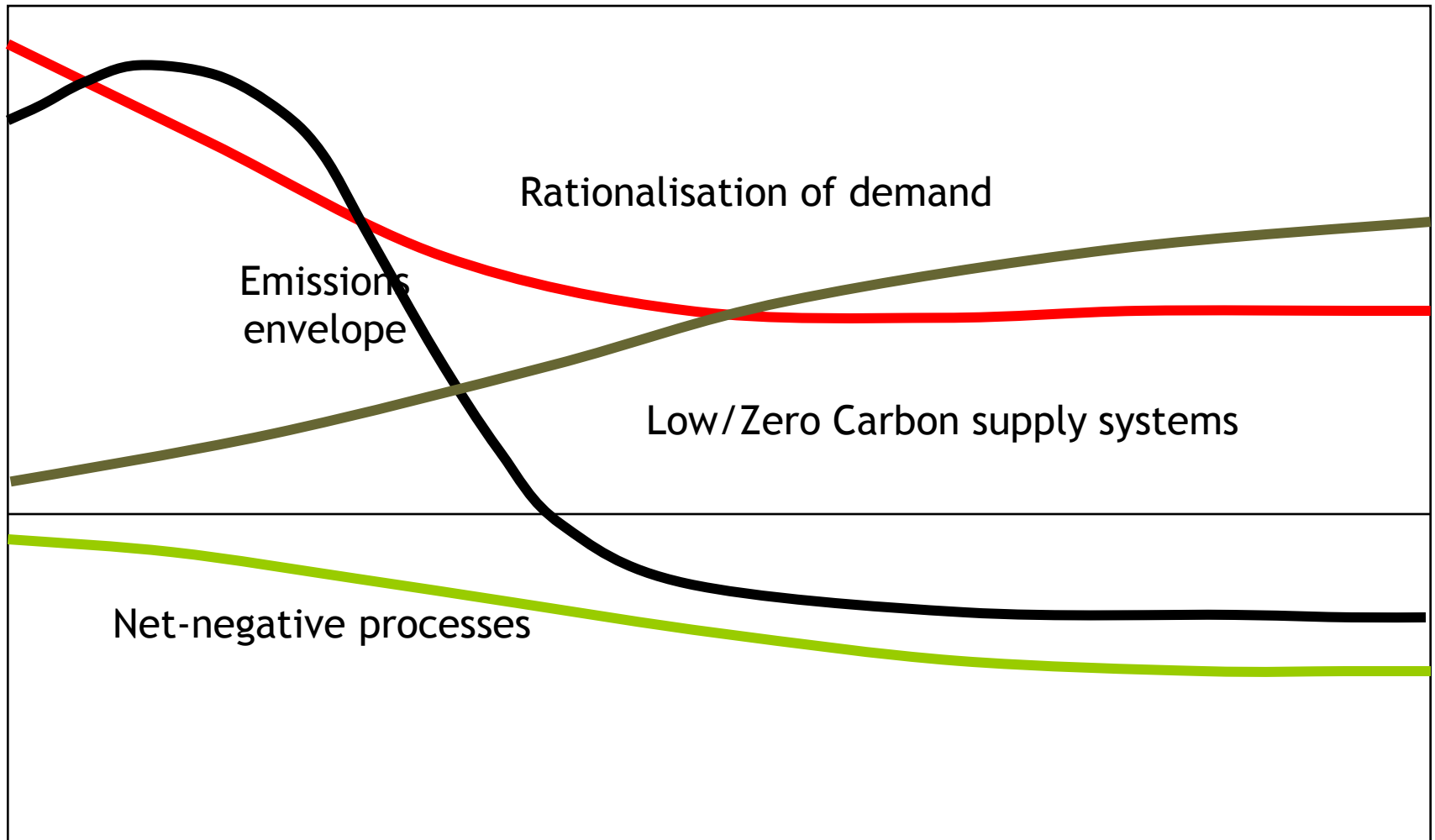


I.Mech.E. “MAG” Model

- Similar to ZCB in principle, but 80% by 2050
- Only technical measures to reduce demand
- Uses nuclear, CCS, renewables to power up
- Much more attention to adaptation
- ‘Air capture’ for net-negative processes



WE NEED SEQUESTRATION, BUT WHAT IF 'AIR CAPTURE' IS NOT FEASIBLE OR SUFFICIENT?



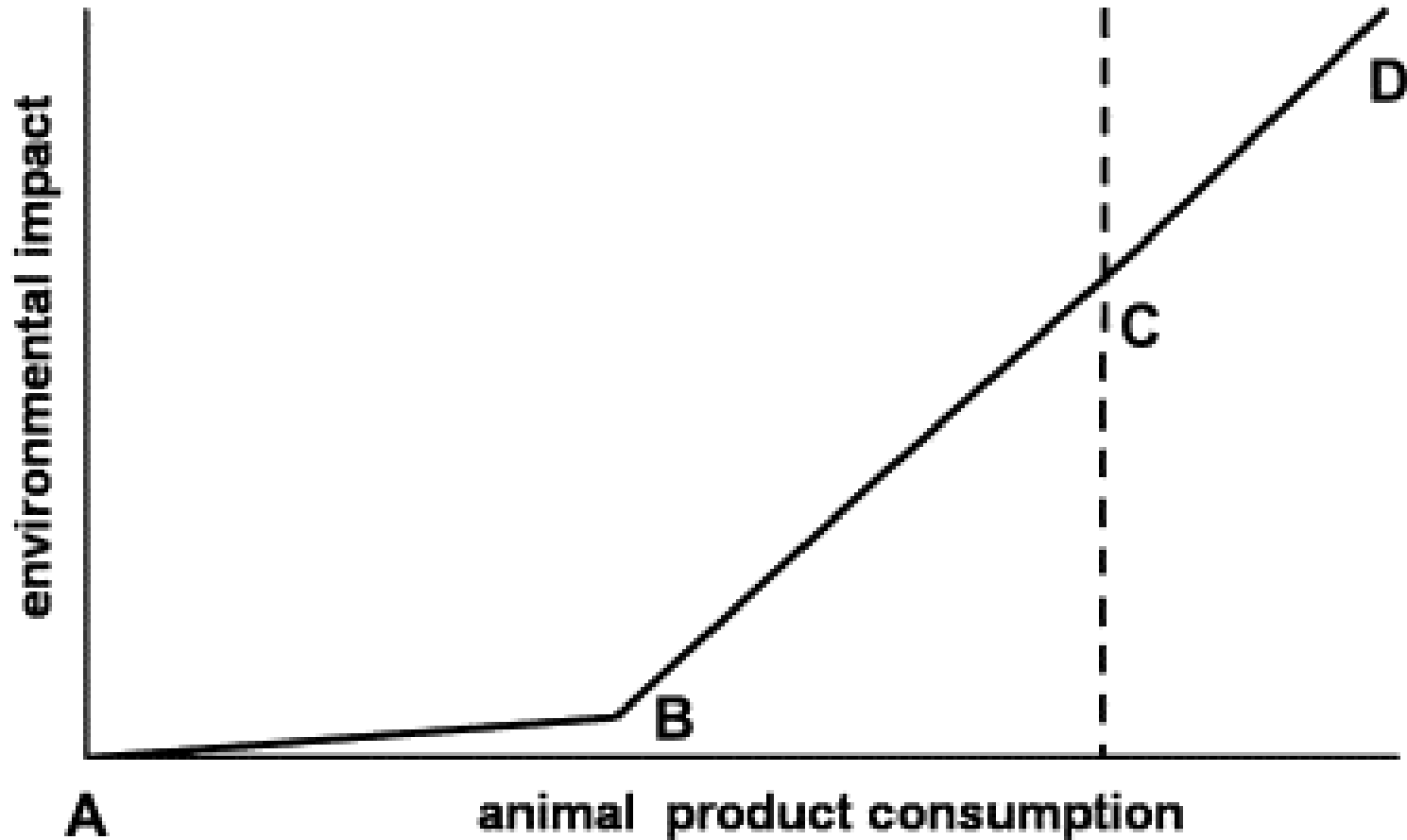
THE LAND SECTOR

- Is unusual is presenting especial difficulties getting to zero
- But also offers many net-negative processes
 - In particular, the soil reservoir is large relative to the atmosphere
- The challenge is to ‘design’ net-negative land systems that continue to serve ‘normal’ functions
- ZCB asks: can the UK provide its own sinks?
- (and provide some energy too?)

THE ELEPHANT IN THE ROOM

- Land-based sequestration (and energy production) is limited by rates of photosynthesis and ‘uses’ a lot of land
- Most of the land in UK is currently used by grazing stock, that are high net emitters
- The ‘obvious solution’ is to replace ruminants with low, zero or negative activities
 - At least partially
- This is a clear hypothesis that invites refutation
- It would in any case be driven by high carbon prices

'DEFAULT MEAT PRODUCTION'

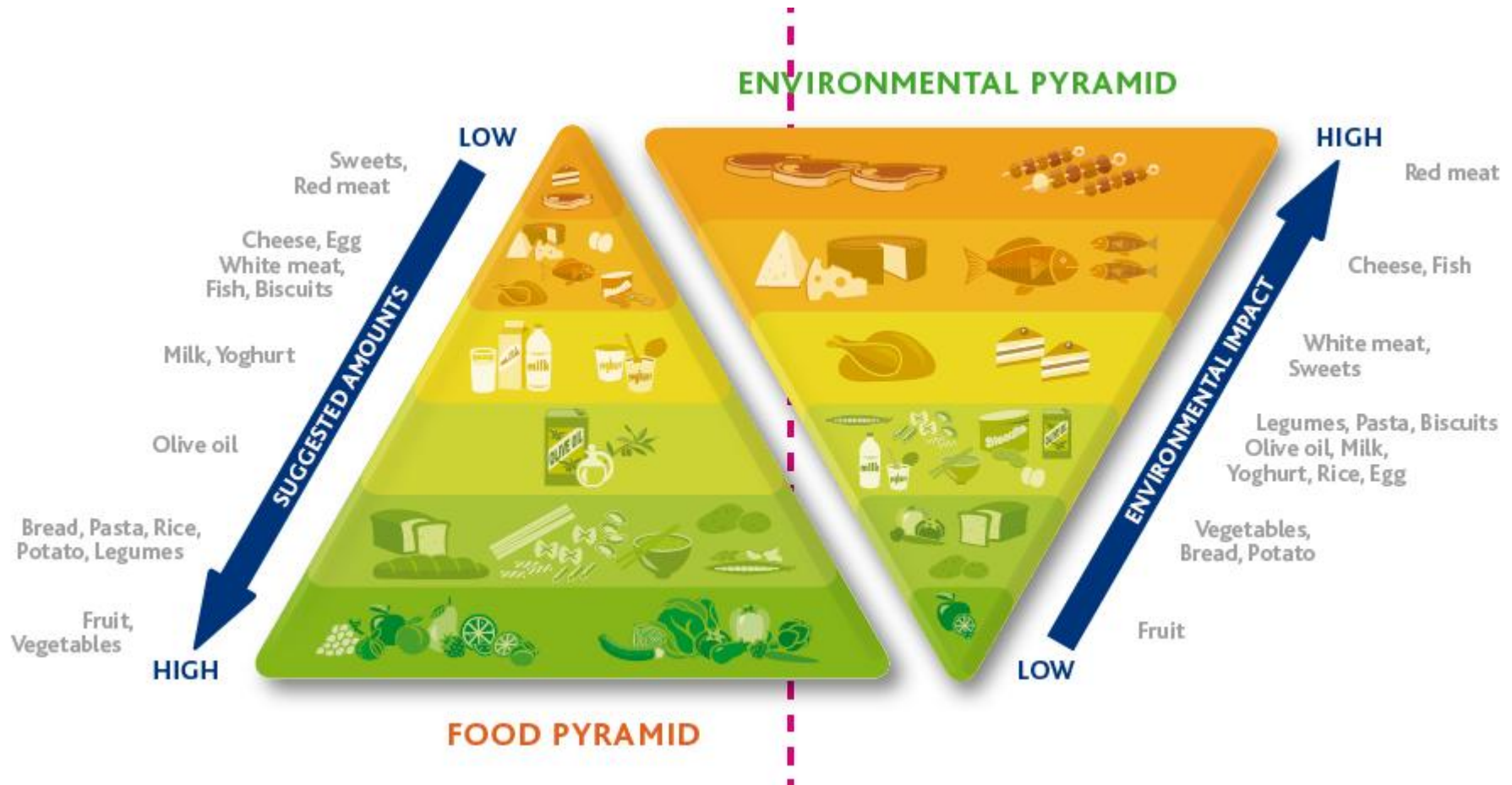


Elferink, E.V., S. Nonhebel and H.C. Moll (2008), *J. Cleaner Production* **16** (12) 1227-1233.

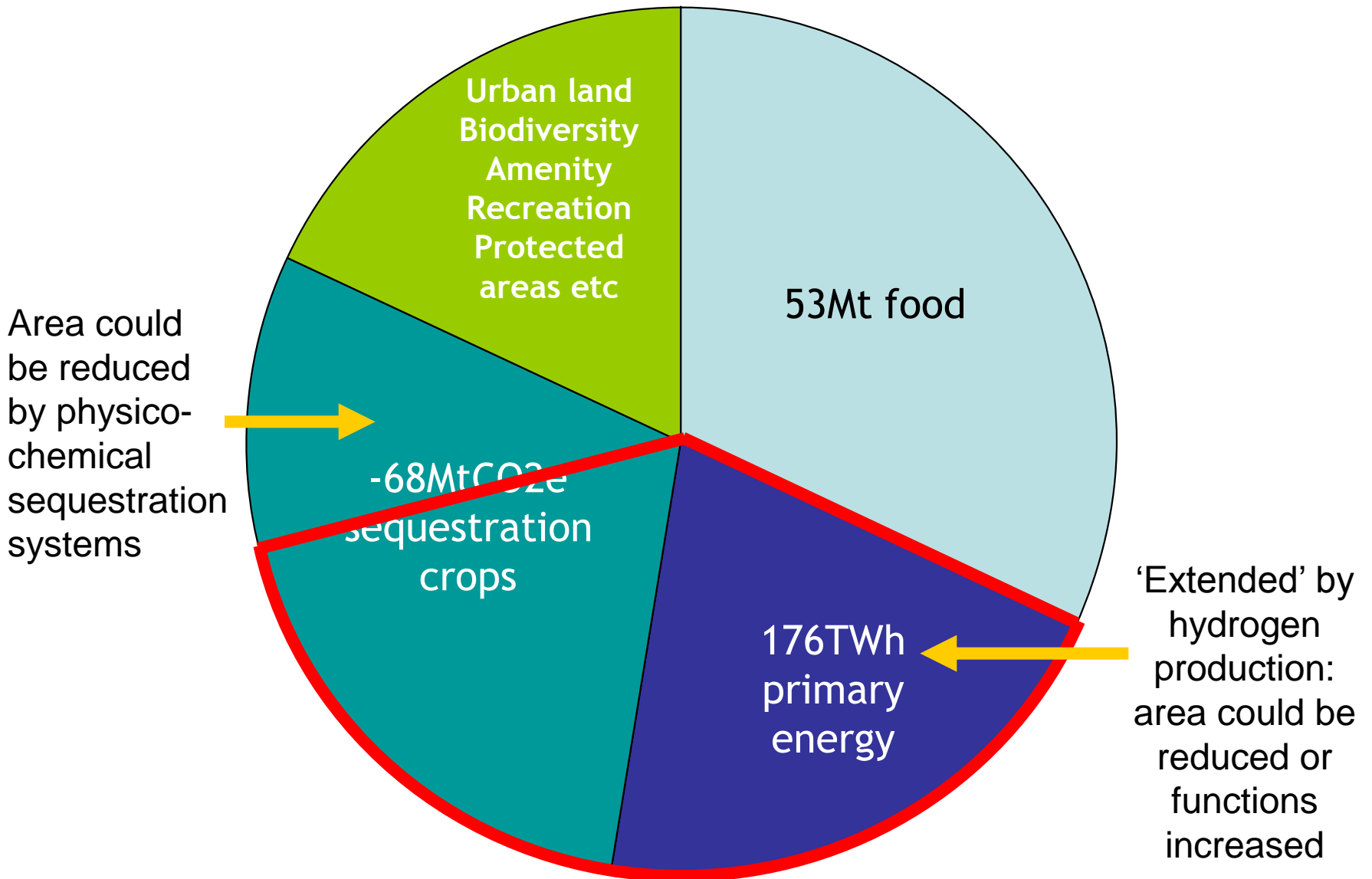
FOOD QUALITY: 'DOUBLE FOOD PYRAMID'

PROPOSED BY BARILLA CENTER

http://www.barillacfn.com/images/download/positionpaper_barillacfn_double-pyramid.pdf

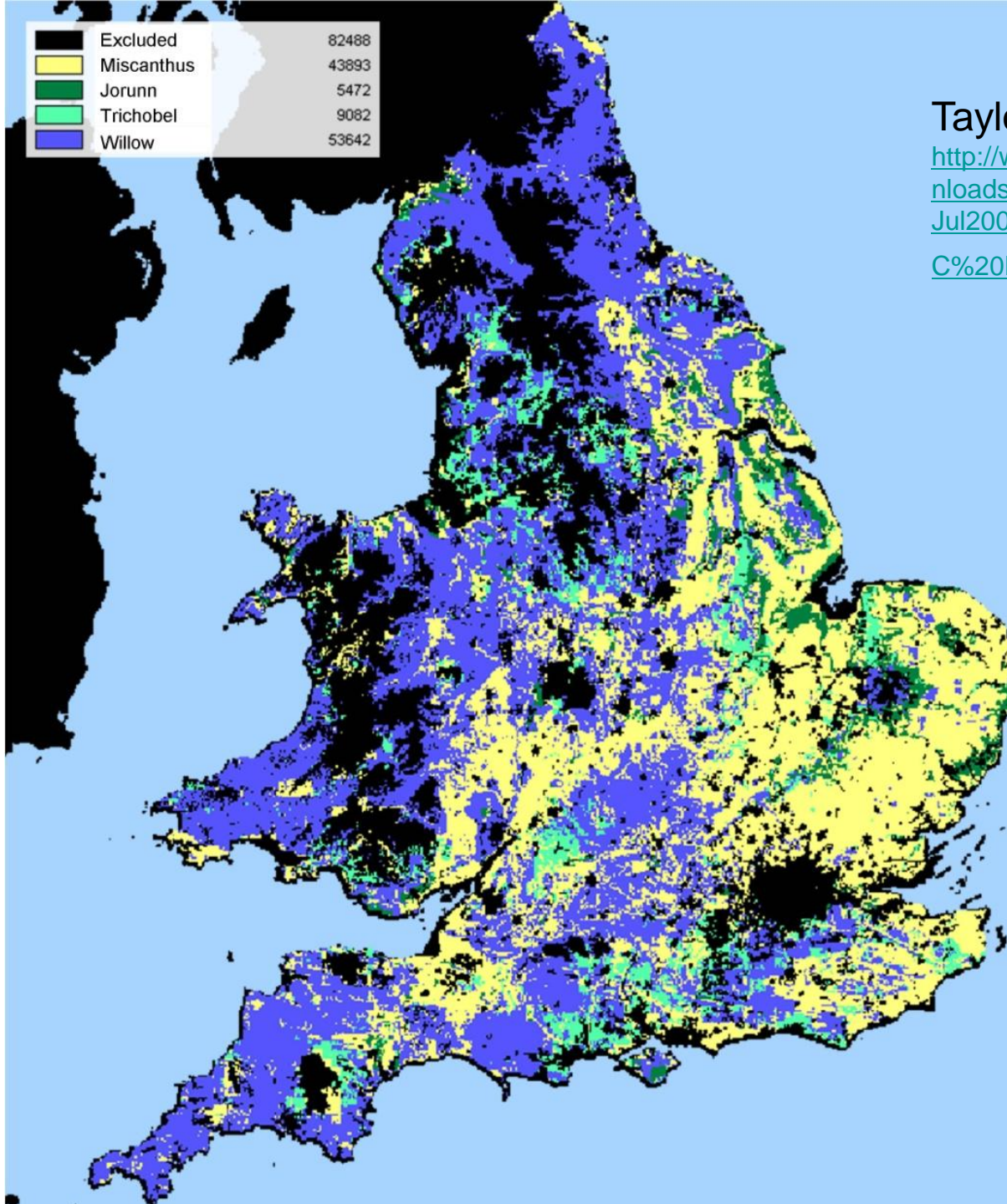


Area functions in the Scenario





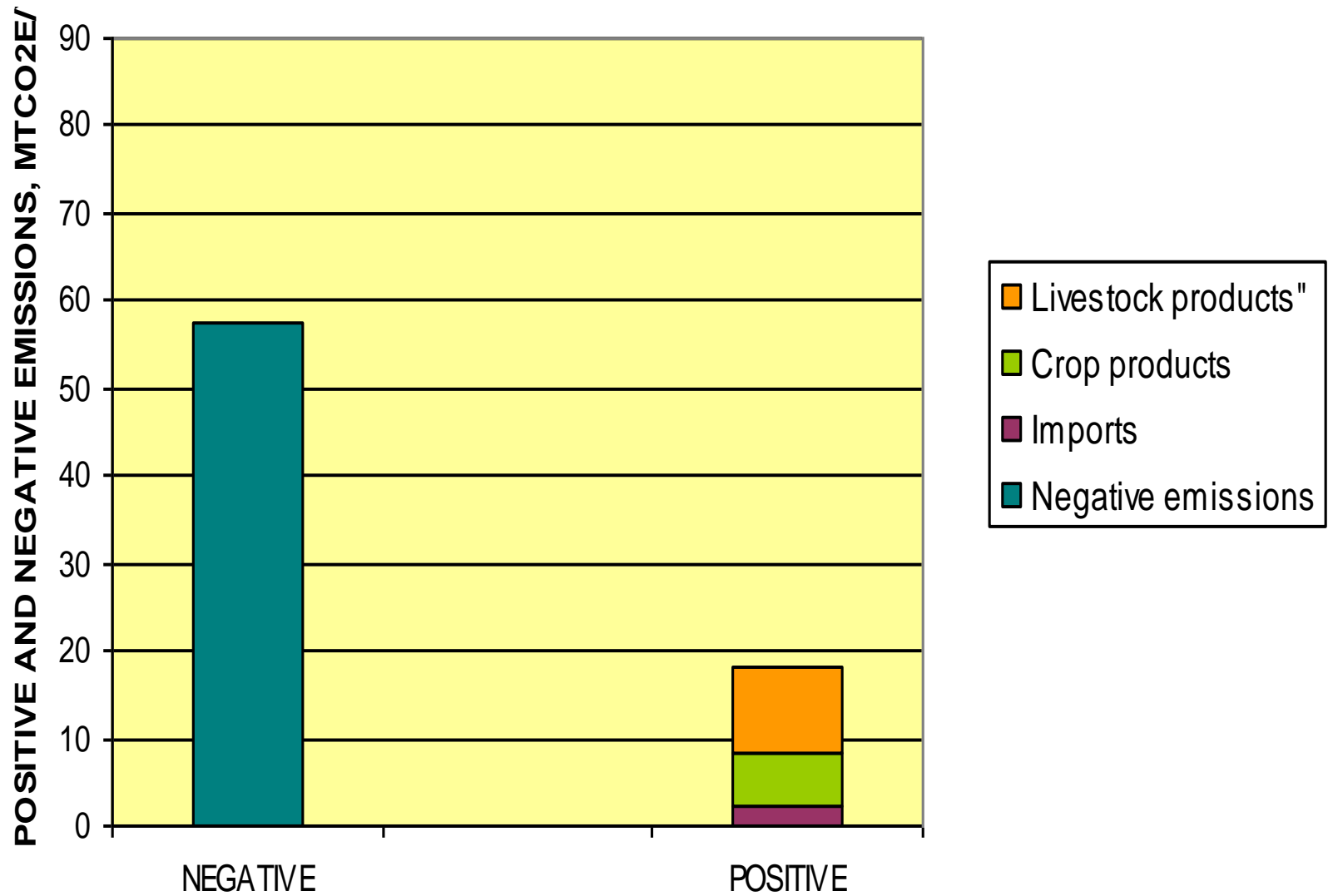
Excluded	82488
Miscanthus	43893
Jorunn	5472
Trichobel	9082
Willow	53642



Taylor, G. (2006)

http://www.tsecbiosys.ac.uk/downloads/Stakeholders_Workshop_Jul2009/28%20July/GTaylor_TSE_C%20BIOSYS%20JUL09.ppt

ZCB LAND-USE SCENARIO: BALANCE OF POSITIVE AND NEGATIVE EMISSIONS



CHALLENGING BUT FUNDAMENTALLY POSITIVE

- Greater energy security
- Deals with Peak Oil/Gas
- Positive balance of payments
- High employment
- Greater food security
- Improved diet
- Probable increase in national biodiversity
- A chance to make the inevitable transition from 'More' to 'Better'
- Better prospects for our grandchildren!

DOWNLOAD THE WHOLE REPORT
FREE FROM

www.zerocarbonbritain.com



THE END

LOTS of it!

...OR CARBON CAPTURE AND STORAGE! ✓

...OR BIOFUELS!

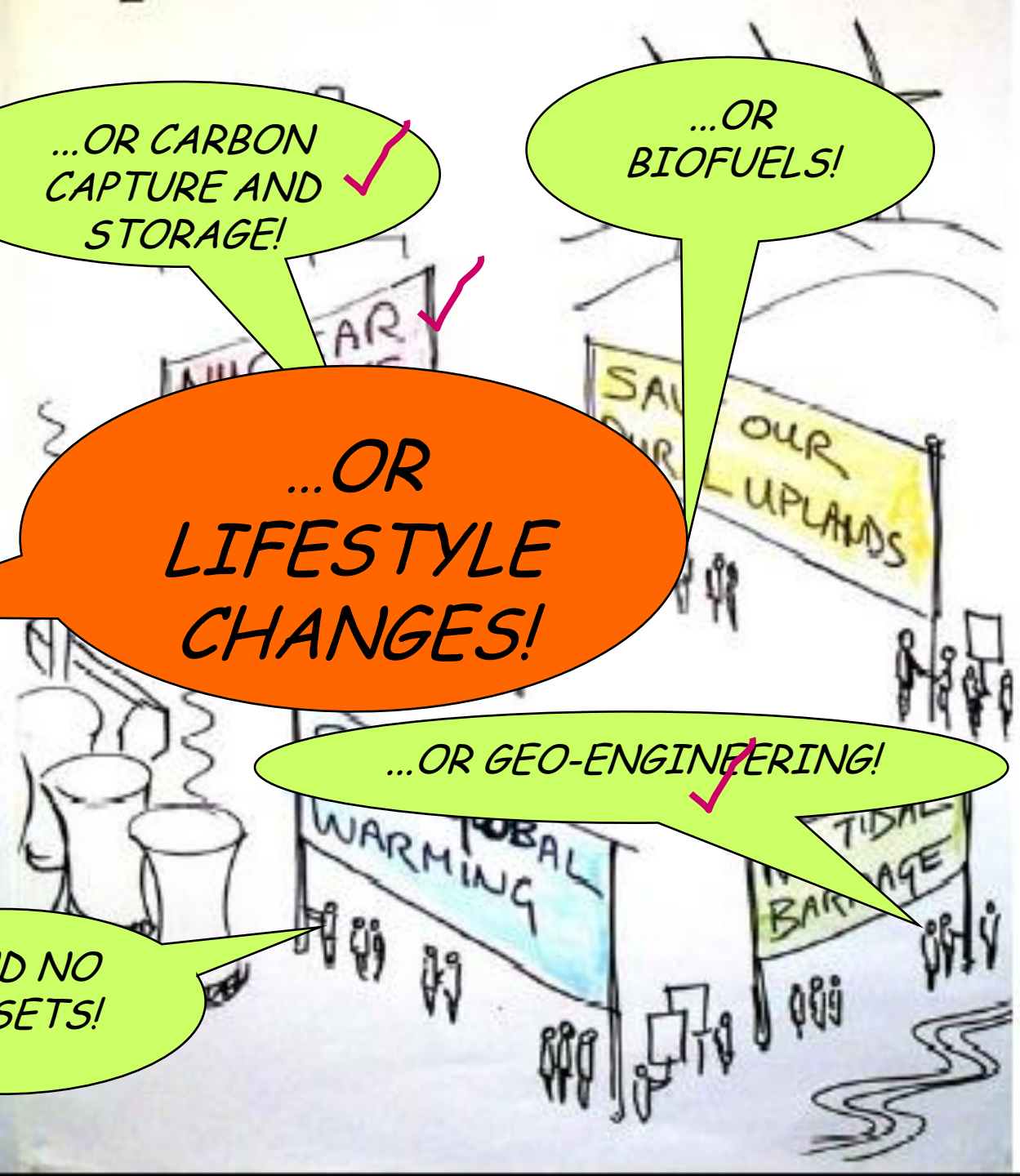
...OR LIFESTYLE CHANGES!

Keep it cheap!

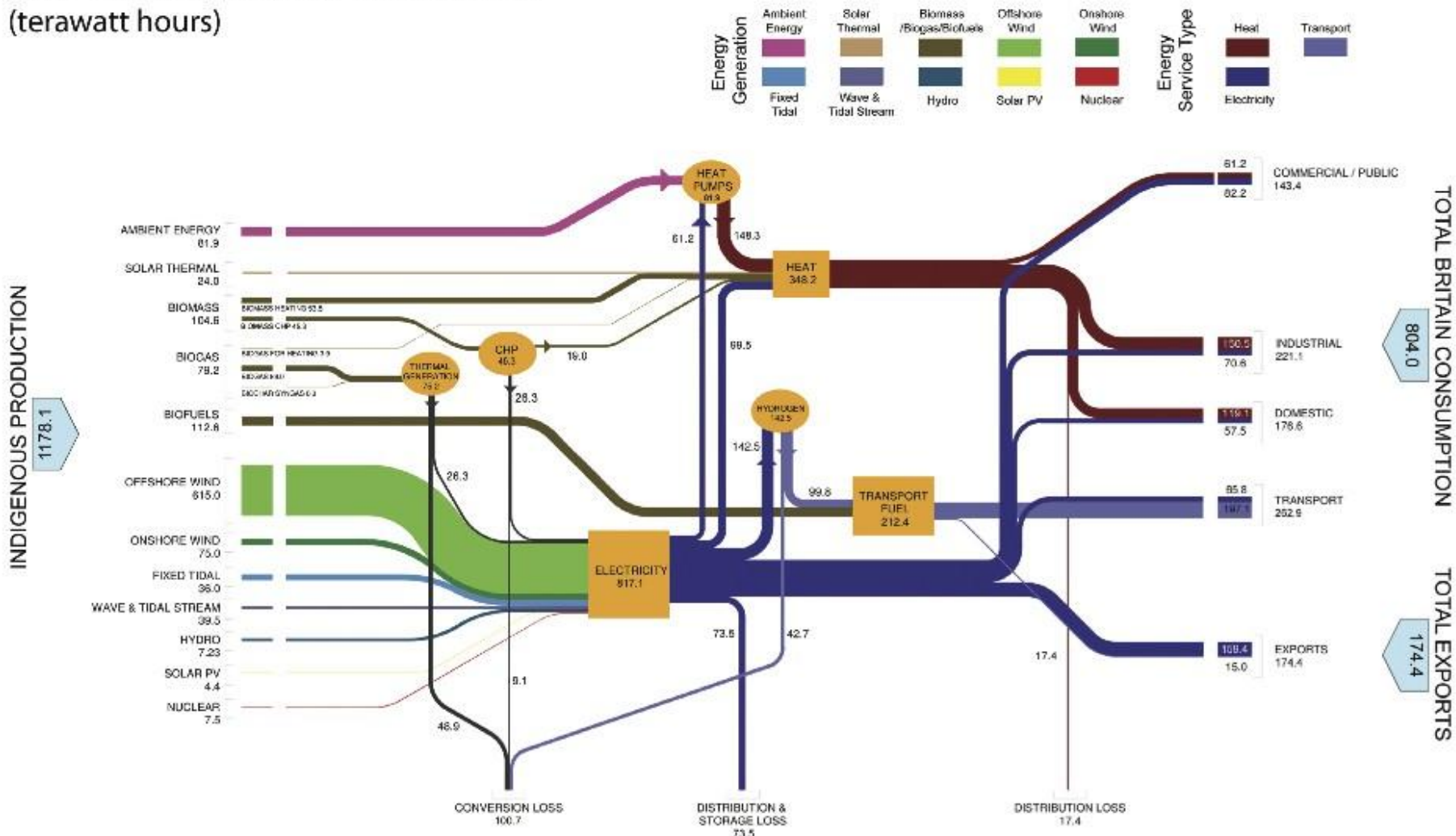
...OR GEO-ENGINEERING! ✓

No Power Cuts! ✓

...AND NO OFFSETS!



UK Potential Energy Flows 2030 (terawatt hours)



**AGRICULTURAL PRODUCTS: GHG EMISSIONS, LAND REQUIREMENT, OUTPUT.
ADJUSTED FOR NUTRITIONAL VALUE AFTER MAILLOT 2009**

