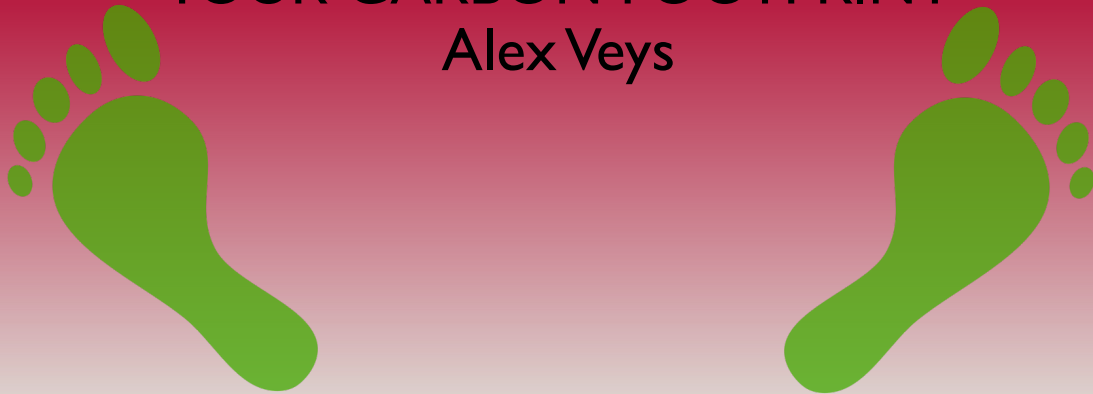


# CLIMATE CHANGE YOUR CARBON FOOTPRINT

Alex Veys



- Experience: masters in Sustainable Energy Futures from Imperial College in 2007/8
- Thesis - A Financial Accounting based model of Carbon Footprinting using an example in the Built Environment

## CO<sub>2</sub> AND OTHER GREEN HOUSE GASES



- CO<sub>2</sub>: 0.04% of atmospheric gas, (O<sub>2</sub> 21%)
- GHG's absorb infrared radiation from earth and re-radiate it in all directions
- Many, many GHG's - aggregated in terms of CO<sub>2</sub>e

	Impact over 100yrs	Impact over 20 yrs
Carbon Dioxide	1	1
Methane	28	80
Nitrous Oxide	270	similar

Methane lasts about 10yrs in atmosphere whereas Nitrous Oxide lasts over 100 yrs hence difference in impact

<https://unfccc.int/process/transparency-and-reporting/greenhouse-gas-data/greenhouse-gas-data-unfccc/global-warming-potentials>  
chrome-

extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29\_1.pdf

chrome-

extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.fluorocarbons.org/wp-content/uploads/2020/07/2021-10-08-Learn-About\_Selecting-and-Using-GWP-values-for-Refrigerants.pdf

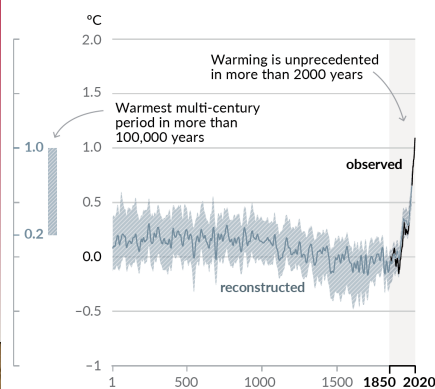
# GLOBAL SURFACE TEMPERATURES AND SCIENTIFIC MODELS



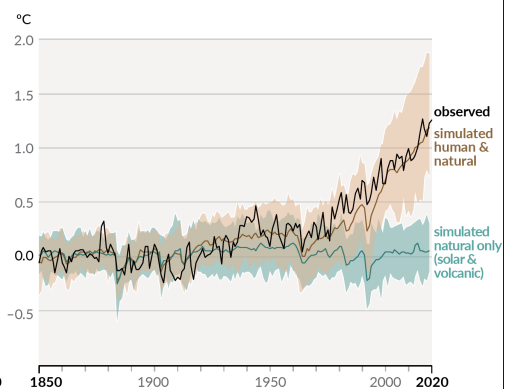
**Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years**

**Changes in global surface temperature relative to 1850–1900**

(a) Change in global surface temperature (decadal average) as **reconstructed** (1–2000) and **observed** (1850–2020)



(b) Change in global surface temperature (annual average) as **observed** and simulated using **human & natural** and **only natural** factors (both 1850–2020)



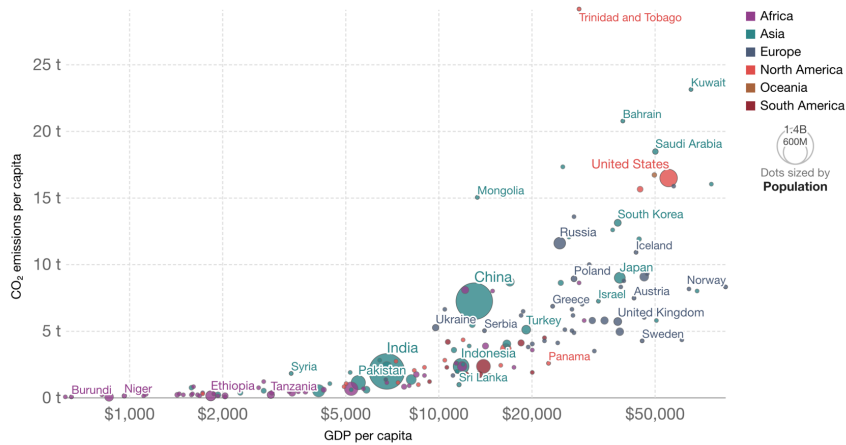
---Scientific models excluding human impacts implies no change in global temperature

---Models including human impacts maps well onto actual temperature change

## CO<sub>2</sub> EMISSIONS VS GDP: MORE MONEY - MORE EMISSIONS

### CO<sub>2</sub> emissions per capita vs GDP per capita, 2018

This measures CO<sub>2</sub> emissions from fossil fuels and cement production only – land use change is not included. Gross domestic product (GDP) per capita is measured in international-\$ in 2011 prices to adjust for price differences between countries and adjust for inflation.



---There is a link between CO<sub>2</sub> emissions and GDP/ Capita ie increased personal wealth leads to greater carbon emissions

---UK looks OK with low emissions relative to similar wealthy nations

BUT

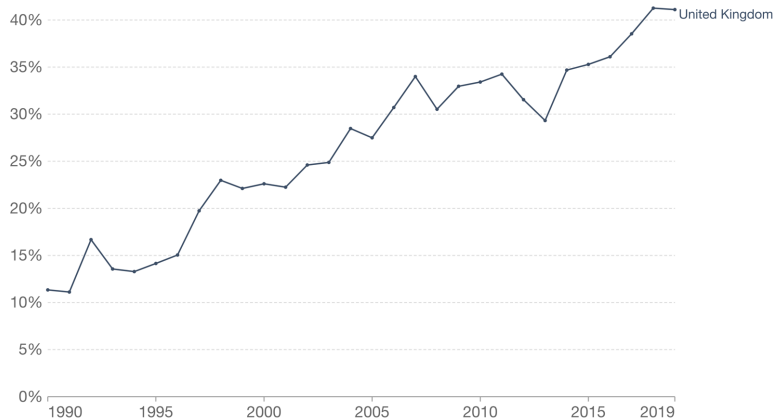
## GROWTH OF IMPORTED EMISSIONS



### CO<sub>2</sub> emissions embedded in trade

Share of carbon dioxide (CO<sub>2</sub>) emissions embedded in trade, measured as emissions exported or imported as the percentage of domestic production emissions. Positive values (red) represent net importers of CO<sub>2</sub> (i.e. "20%" would mean a country imported emissions equivalent to 20% of its domestic emissions). Negative values (blue) represent net exporters of CO<sub>2</sub>.

Our World in Data



Source: Our World in Data based on the Global Carbon Project

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/ • CC BY

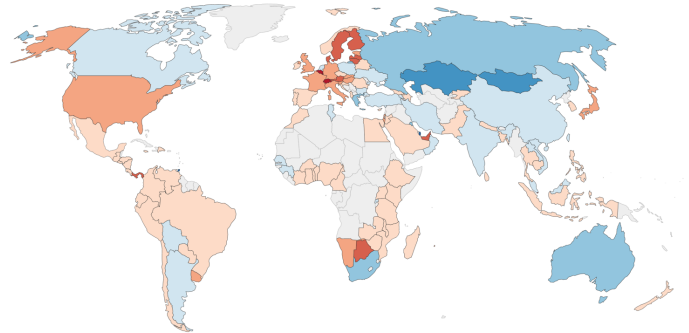
- No as good as it seems
- Although UK in 1990 emitted 10t/person but now 5t/person
- UK has increased its imported emissions from 10% in 1990 to 40% equivalent to about 7t/person. (Note that per capita emissions are similar now to those in 1870 when we used a lot of coal for power)
- The world currently emits about 48.9bt CO<sub>2</sub>e (CO<sub>2</sub>: 35bt/ Methane 8bt/ N<sub>2</sub>O 3bt etc)
- The UK emits about 342mt of CO<sub>2</sub> (less than 1% of global emissions) or 424mt CO<sub>2</sub>e

## BAD NEWS FOR THE UK

### Imported or exported CO<sub>2</sub> emissions per capita, 2019

CO<sub>2</sub> emissions embedded in trade, measured as the net import-export balance in tonnes of CO<sub>2</sub> per capita. Positive values (red) show net importers of CO<sub>2</sub> (i.e. '1 tonne' means a country net imported 1 tonne of CO<sub>2</sub> per capita). Negative values (blue) show net exporters of CO<sub>2</sub>.

Our World  
in Data



Source: Our World in Data based on the Global Carbon Project

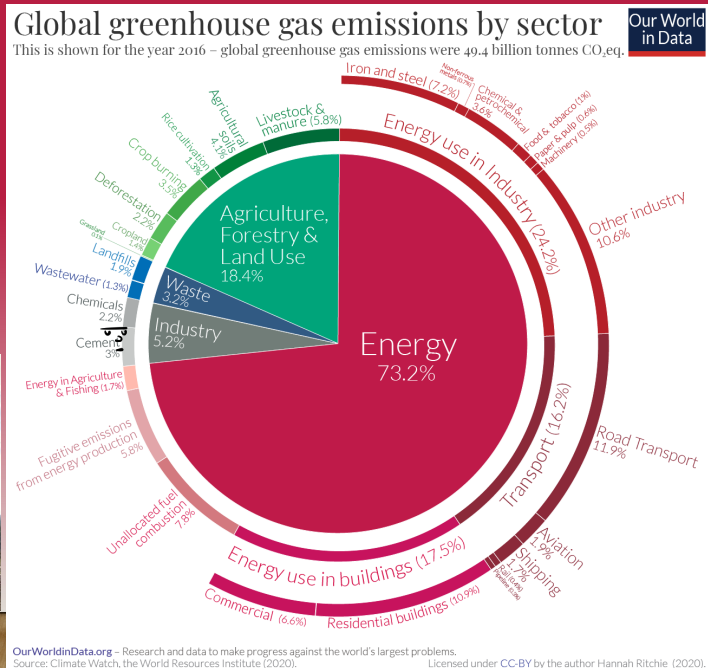
OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY



---UK not alone in importing CO<sub>2</sub> which includes most of Europe and the USA

---China/ Australia/ Canada big exporters: China because of manufacturing, Aus and Can because of hydrocarbon exports

## WHERE DO EMISSIONS COME FROM



- Big messages:
- 3\4 of emissions are from energy use and 18% land use
- Personal emissions as part of the pie
  - <12% transport
  - 11% Residential buildings
  - <6% Livestock
- The other 70% we get from purchase of goods and services including “government” emissions
- Data from Climate Watch 2016 data

## RESPONSIBILITY AND MEASUREMENT

- Policy
  - Government policy
  - Personal/ family policy
- Measurement
  - Carbon Footprint: CO<sub>2</sub>e
  - Ecological footprint: Worlds



- Who is responsible and where to start
- Measure first using
  - Carbon footprint in terms of tones of CO<sub>2</sub>e or
  - Environmental footprint/ Ecological footprint in terms of Worlds (Definition of Worlds: How many Earths do we need if everybody on the planet lived like you)



## BUT IF WE WANT TO GET TO NET ZERO:WHAT DO WE HAVE TO DO

- Energy
  - Transport
  - Heating and cooling
  - New goods
  - New buildings
- Food
  - Diet

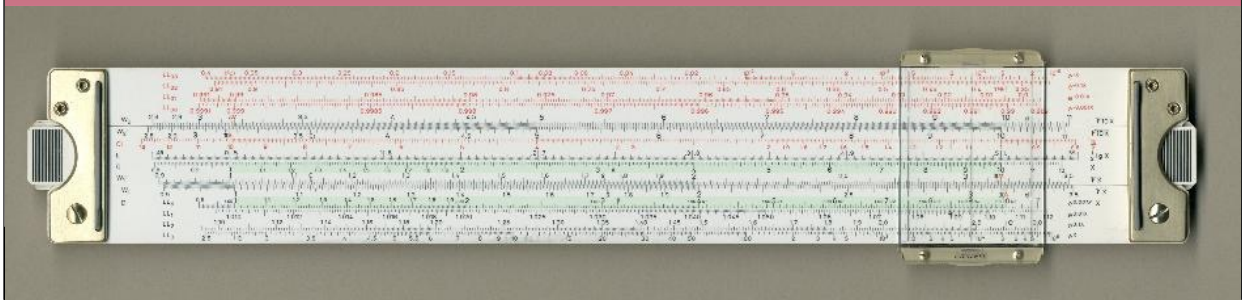


- Remember 30% personal running costs
- 70% purchases of goods and services
- Nevertheless:
- Reduce use of energy and delay or refuse purchase of embedded carbon
- Change diet

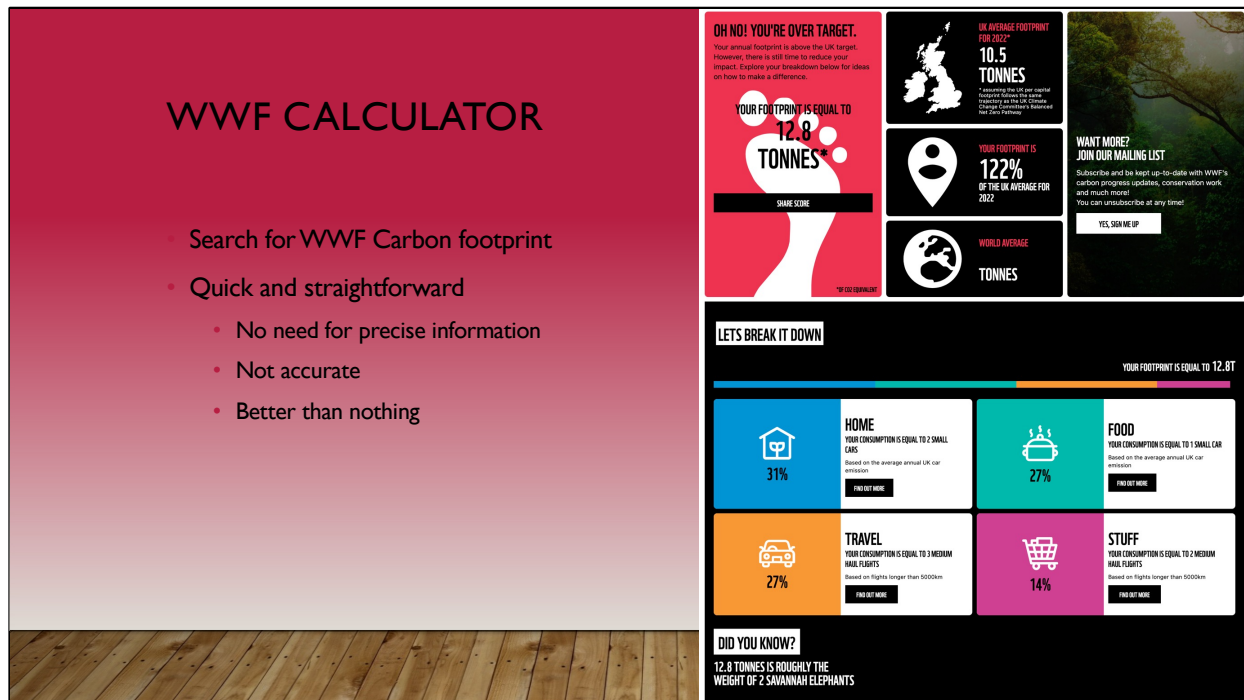
## SO:WHAT IS YOUR CARBON FOOTPRINT

WWF

- Carbonfootprint
- Footprintcalculator.org



Three footprint calculators follow



Includes:

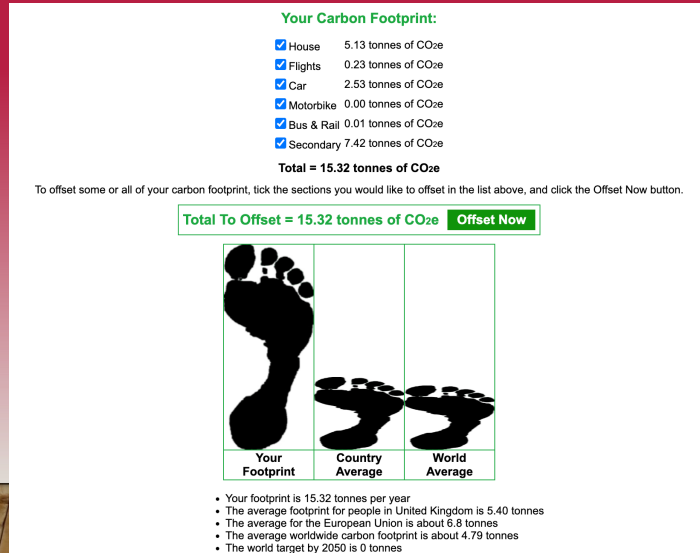
- Diet and food
- Travel and offsets
- House size, heating, insulation etc
- Stuff eg Clothing, pets and recycling

Output

- Footprint relative to others in the UK people
- Breakdown of CO2 budget

## “CARBONFOOTPRINT” CALCULATOR

- Search for carbonfootprint.com
- More complex
- Not as user friendly as WWF
- More detail needed
- More accurate



Need more info to complete such as  
 Kwh on heating and electricity  
 Type of car and miles  
 Spend on food, clothes, pubs and cars

A better indicator  
 But, more clunky

## “FOOTPRINT” CALCULATOR

- Search for footprintcalculator.org
- Orientated to a US person
- Similar in concept to WWF site
- Uses Worlds rather than tonnes of CO<sub>2e</sub>
- Not accurate



Output is the Environmental footprint or Ecological footprint

American orientated

Does not include large purchases

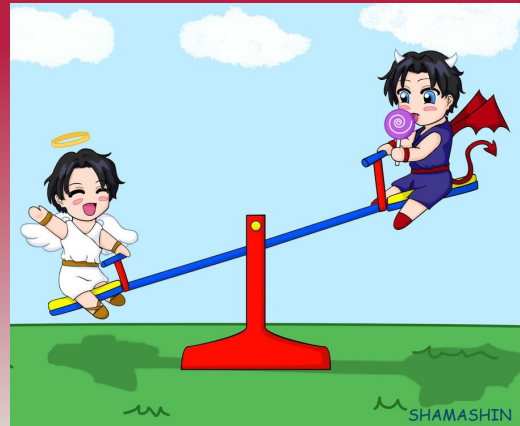
1 World = approximately 1.6-2.2T Co2

## SO WHAT

- All have benefits and issues
- More data means
  - More accuracy
  - Likely greater footprint
- Calculating a footprint is very difficult as the world is very complex
- Can be designed to make you feel guilty
- Don't necessarily say what to do

## WHAT DO FOOTPRINT CALCULATORS CAPTURE AND WHAT DO THEY NOT

- Running costs: generally yes
  - Energy
  - Travel
- Capital costs: not always
  - Embedded cost of buying goods
  - Buying a new car
  - Building a new house



---30%v running costs - 70% purchases

---Cars embedded carbon cost either in proportion to their cost (720kg CO<sub>2</sub>e/ £1000) or to their weight 10T CO<sub>2</sub>/ Tonne of car

---Electric cars are currently heavier and more costly than conventional cars for the same type of vehicle therefore more carbon intensive

---Grid electricity equates to 50gCO<sub>2</sub>/ km

---So it can take 50,000 to 70,000 miles for an electric car to break even with a conventional car depending on the comparison

--- A 400m<sup>2</sup> office block (think a large house) uses about 172T of CO<sub>2</sub> to build. This is the same as a good diesel car emitting about 130gCO<sub>2</sub>/km driving 33 times round the world

---Retrofitting a house would not need nearly as much carbon (which is mainly in the concrete foundations, steel and glass)

-----would likely get the majority of the insulation and heating benefits

-----meaning breakeven would take several decades if not a century depending on assumption and changes to electric grid intensity or replacing natural gas with hydrogen.

## POSITIVES

- Better to know than not
- Knowledge empowers you to make decisions
- It could save you money



## COST OF CUTTING EMISSIONS

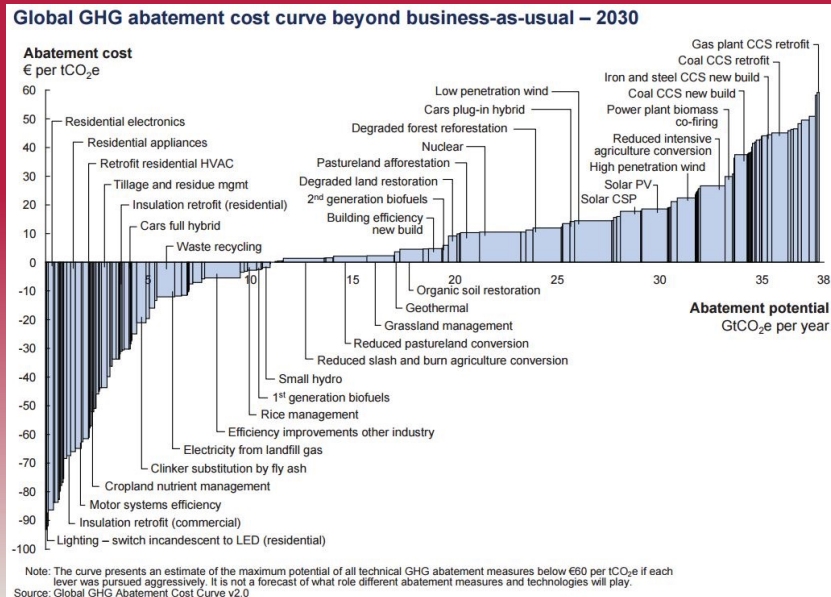


Chart shows the cost of making change from saving money on left to costing money on right

Eg on left

LED light bulbs  
Better heating systems  
Insulation

RHS

Carbon capture and Storage  
Solar PV but even this is positive now with cheaper panels

## WHAT CAN YOU DO PART I

- Keep your car longer
- Retrofit your house: don't build/ rebuild
- Where you can: insulate and use PV and Air/ Ground source heat pumps
- Travel less/ more slowly
- Eat less meat (better quality?)
- Modify, maintain and reuse

<https://www.treehugger.com/the-carbon-footprint-of-a-renovation-vs-new-construction-4857500>

## WHAT CAN YOU DO PART 2

- Lobby
- Vote



We are talking about future of humankind on the planet (ref James Lovelock and GAIA)

Government and world policy must change so that capital is driven away from fossil fuels to renewables and reduced purchase of embedded carbon

Ensure that anyone from parish council to MP's have robust green policies

## OFFSETS AND GREEN ENERGY

### Offsets

- Are they a good thing?
- Or just a way to allow Business as Usual and avoid making difficult decisions?
  - The Integrity Council for the Voluntary Carbon Market
  - Voluntary Carbon Markets Integrity Initiative
- Green energy tariffs
  - What do they achieve?

REGOS Renewable energy guarantee of origin certificates: may be used to double count green electricity

Is your green energy supplier building more renewables because it is this that is going to drive change

Two new standards being launched at the end of the year

ICVCM [ICVCM - Build integrity and scale will follow](#) The Integrity Council for the Voluntary Carbonmarket: focuses on the integrity of the supply side, and was set up by Mark Carney and Bill Winters (CEO of Standard Chartered).

VCMI [VCMI - Accelerating credible net-zero climate action \(vcmintegrity.org\)](https://vcmintegrity.org) Volunatry carbon Markets Integrity Initiative: set up at COP last year, under guidance of the UK government, and sets out best practice for offset buyers. Both entities expect to publish final guides by year end.

## CONCLUSION

- Keep your eye on what matters
- Watch the 70% and be an advocate to ensure policies align with the future of humankind.
- Personal Policy
  - Reduce energy use (at home and whilst traveling as well as purchases especially big items)
  - Reuse stuff or give it to someone who will use it
  - Repair stuff (find someone who can if you can't)
  - Recycle where you can't do any of the above

Reduce/ Refuse (use less energy by insulating, traveling less/ buy less often and don't be tempted by consumerism)

Reuse (how can you reuse "stuff")

Repair (rather than throw it away, can it be repaired: includes houses and cars)

Recycle take advantage of facilities/ could be recycling bins or home compost bins)