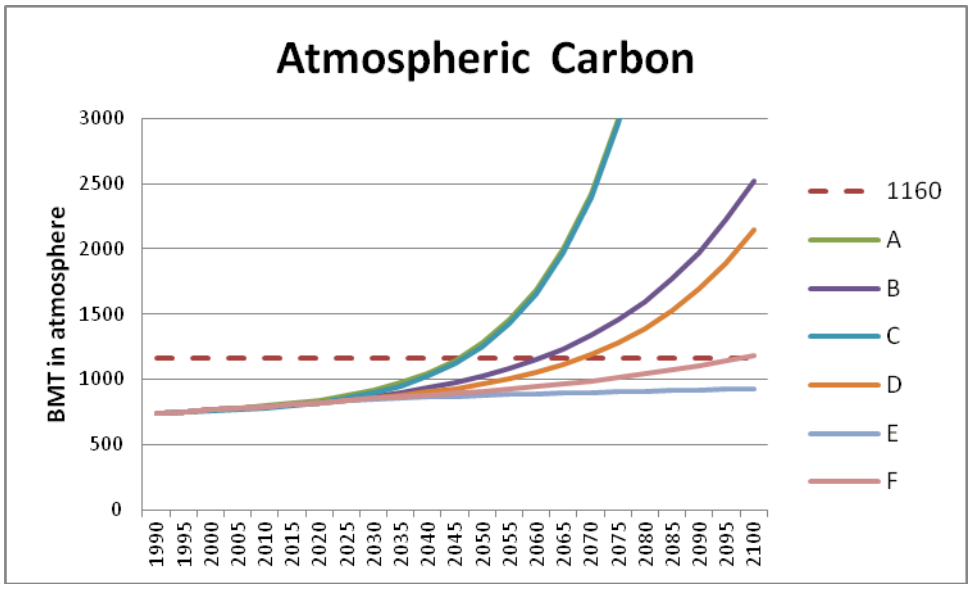
1. The Stella Model

The figure below shows the results of 6 STELLA model runs under the following conditions:

- A = Baseline case. No population control; no carbon reduction policies in either world; 2% annual growth in per capita energy in Developed nations, 4% annual growth in per capita energy in Underdeveloped nations

- B = Baseline case, but with kbr = 0.1, which means population is stabilising by 2030
- C = Baseline case, with no population control, but with burning of forests completely stopped
- D = Baseline case, but with kbr=0.1 and with 4% per year reduction in carbon intensity of the economy of the developed nations, but not developing nations, beginning 2020
- E = Same as D, but also with 4% per year reduction in the carbon intensity of the developing nations, beginning in 2020
- F = Same as E, but with developing nations having a 2% (instead of 4%) per year reduction in carbon intensity, beginning in 2030



2. For the classroom discussion:

1. What is the problem being solved, or aim to be achieved?
2. What is the risk (e.g. probability and severity) being addressed?
3. Who are you?
4. Why are you interested in contributing to a solution, and what will incentivise you?
5. Under what authority do you act?
6. To what aspects of the problem/solution can you contribute (e.g. emissions reduction, atmospheric reduction, reduction of solar insolation, reduction of vulnerability)?
7. What are all of the Attributes in which you have an interest?
8. How will you consider all of these attributes simultaneously?
9. What are the Drivers, Pressures, States, Impacts and Responses associated with this issue?
10. What specific actions are you proposing to contribute to a solution?
11. How will these actions lead (qualitatively and quantitatively) to achievment of the aim(s)?
12. What is your policy, strategy, action plan, instrument, mechanism for carrying out these actions?
13. Why do you believe these actions will help achieve the aim(s)?
14. Do your actions require coordination with those of other actors? If yes, how is this coordination achieved?

3. Here are some equations:

Emissions (sources):

Emissions (tCO_2/year) = Per capita energy demand (kWh/person-year) x Population (persons) x Emissions Factor (tCO_2/kWh)

which we can also complicate slightly: Emissions (tCO_2/year) = Per capita final end use energy demand (kWh/person-year) x Population (persons) x Emissions Factor (tCO_2/kWh) / Efficiency (no units)

Capture and sequestration (sinks):

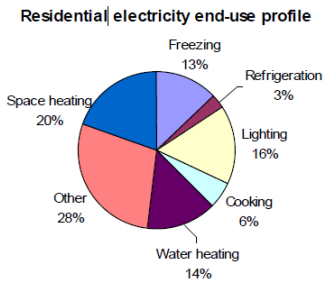
Rate of movement from Air to Vegetation (tCO_2/year) = $\sum$ Net Primary Productivity (tCO_2/m^2-year) x Area (m^2)

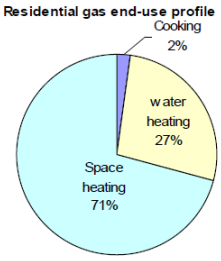
where the sum ($\sum$) is over all categories of land (vegetation)

4. Consider a Decision matrix:

	Feasibility				Cost		Effectiveness		
Option	Political	Social	Technological	Legal	Microeconomic	Macroeconomic	Policy	Source Reduction	Sink Increase
Improved efficiency of Residential heating									
Improved efficiency of Commercial lighting									
Reduced VMT in the Transport sector									
Increased re-forestation of land									

5. And then some numbers to use:





Source: ECI, 20

Table 3. Energy consumption and CO_2 emissions in the UK commercial office, retail and warehouse building stock.

	Commercial offices			Retail			Warehouses		
	Fossil fuels (PJ)	Electricity (PJ)	CO_2 (kT)	Fossil fuels (PJ)	Electricity (PJ)	CO_2 (kT)	Fossil fuels (PJ)	Electricity (PJ)	CO_2 (kT)
Heating	46	5	3680	46	15	4667	18	2	2931
Hot water	5	0	469	7	2	610	3	0.6	109
Catering	3	3	370	3	5	1957	-	1	285
Light	-	16	2238	-	44	5373	-	15	3071
Cooling	-	11	1319	-	4	721	-	22	658
Small power	-	2	250	-	5	643	0.1	2	335
IT	-	12	1031	-	3	390	-	2	459
Other	-	2	184	-	2	378	-	-	1
Process	-	3	7	-	3	352	0.6	6	665
Unknown	-	0.3	121	-	1	77	-	-	-
Total	**54.0**	**56**	**9669**	**55**	**82**	**15237**	**22**	**50**	**8515**

Based on Pout *et al.* (1998), *op cit.*