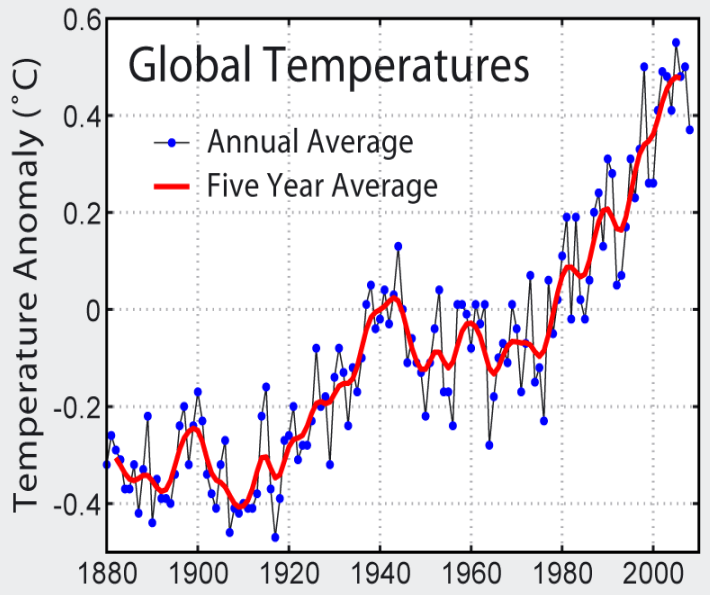


# Scenarios and RCPs

# Where we are...

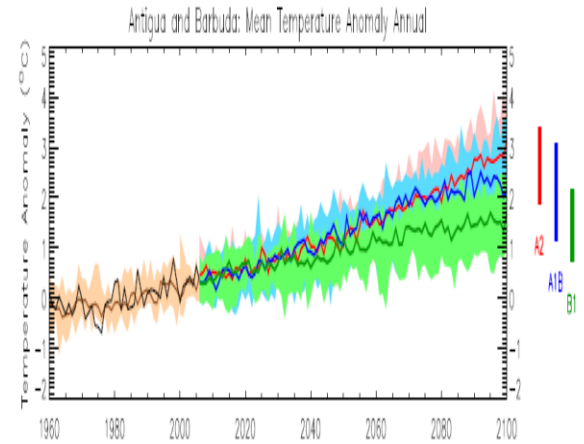
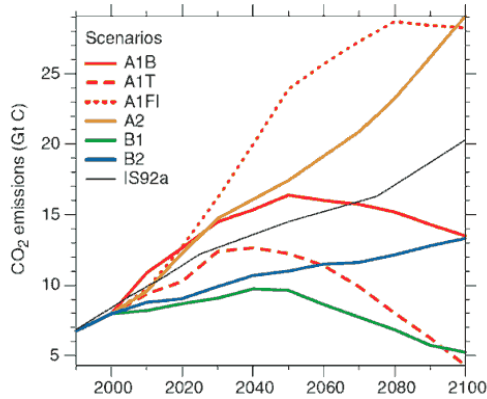


So we know that the climate of the world and of our region and country has changed under global warming.

We also have been convinced that it will continue to change.

**What we want to know is what will that future change look like?**

# To answer the question...



**Models**



**Scenarios**



**Future Climate**

**Temperature**  
**Rainfall**  
**Sea Level Rise**

**Three things about scenarios...**

# 1. They are storylines about how the world will develop...

When the IPCC was beginning to write Assessment Reports, they commissioned scenarios...

Literally, they convened scientists and modellers, provided terms of reference, and set them task of developing scenarios of future emissions. They then approved scenarios for use in modelling studies and used results in reports.

# 1. They are storylines about how the world will develop...

- **1990 IPCC SA90 scenarios:** 1990 FAR uses analogue and equilibrium climate scenarios for impact assessment
- **1992 IPCC IS92 scenarios:** BAUs energy and economic futures: no climate policies SAR, TAR, AR4
- **2000 IPCC SRES scenarios:** storylines/narratives of the future; open process involving many different modelling teams → TAR, AR4
- **Others:** academic (1/2/4xCO<sub>2</sub>), Stabilization Pathways (S, WRE, SP), etc.

## 2. They are emissions scenarios...

- **SRES** stands for the **Special Report on Emissions Scenarios**.
- **BUT** to get the emissions they first have to assume a range of possible socioeconomic futures.

What socioeconomic **driving factors** can change emissions in the future?



How are these likely to change?

What will emissions look like under these changes?

## 2. They are emissions scenarios...

So take **driving factors**... look how they change... get different scenarios...

Scenario Group	A1			A1	B1	B2
	A1F1	A1B	A1T	A2	B1	B2
Population growth	low	low	low	high	low	medium
GDP growth	very high	very high	very high	medium	high	medium
Energy use	very high	very high	high	high	low	medium
Land- use changes	low- medium	low	low	medium/high	high	medium
Resource availability	high	medium	medium	low	low	medium
Pace and direction of technological change favouring	rapid	rapid	rapid	slow	medium	medium
	coal	balanced	non-fossils	regional	efficiency & dematerialization	dynamics as usual



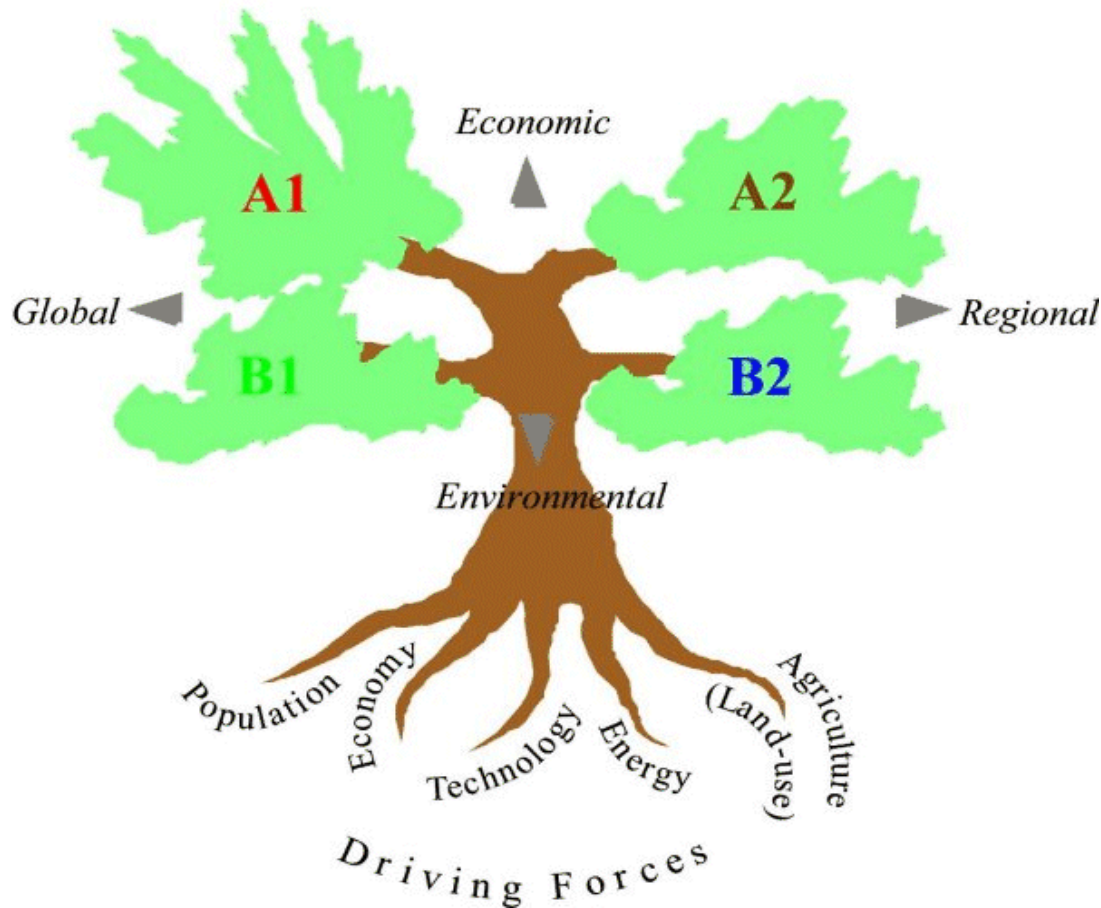
## 2. They are emissions scenarios...

For convenience they divided range of possibilities into families with letter names.. .

Scenario Group	A1			A1	B1	B2
	A1F1	A1B	A1T	A2	B1	B2
Population growth	low	low	low	high	low	medium
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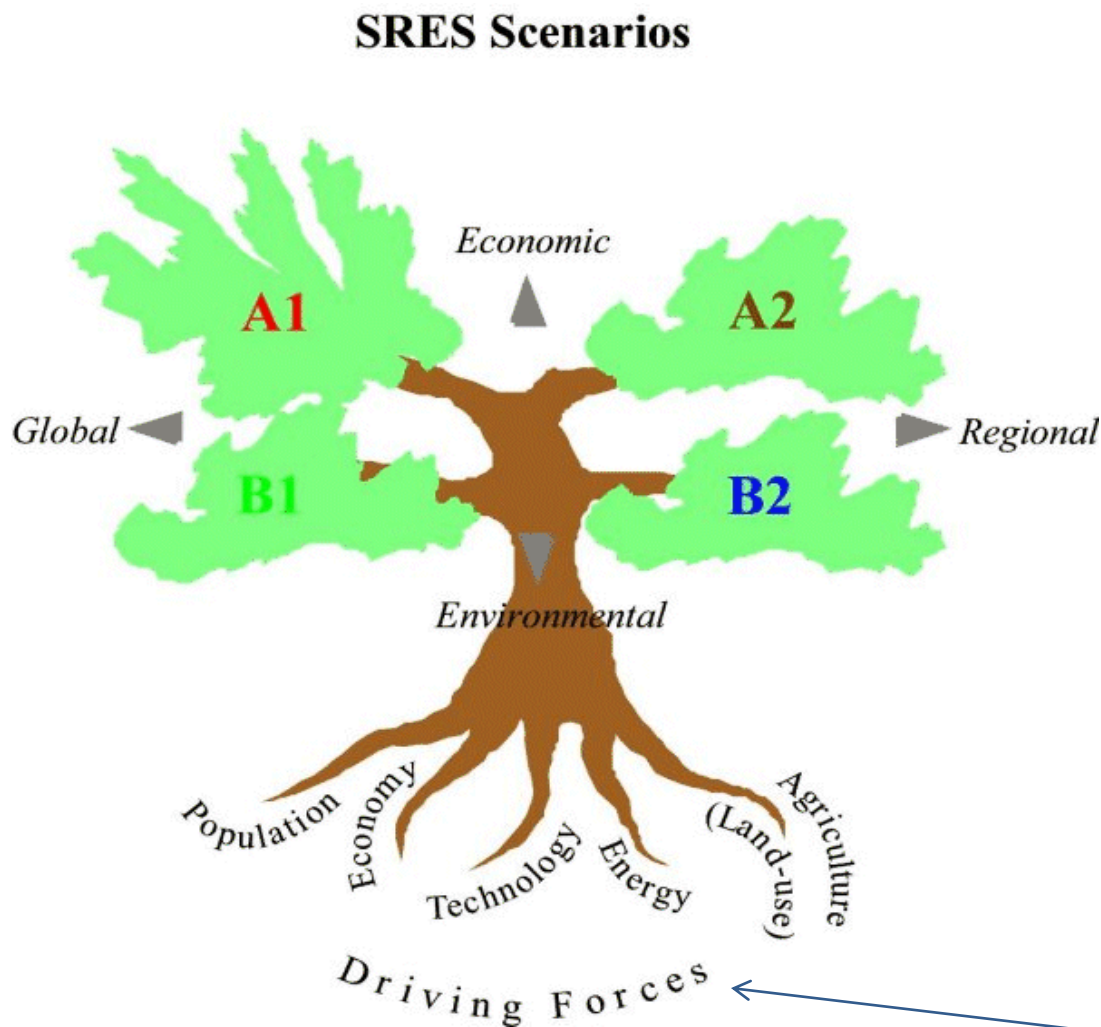
## 2. They are emissions scenarios...

### SRES Scenarios



Can use Tree  
to represent...

## 2. They are emissions scenarios...



↑

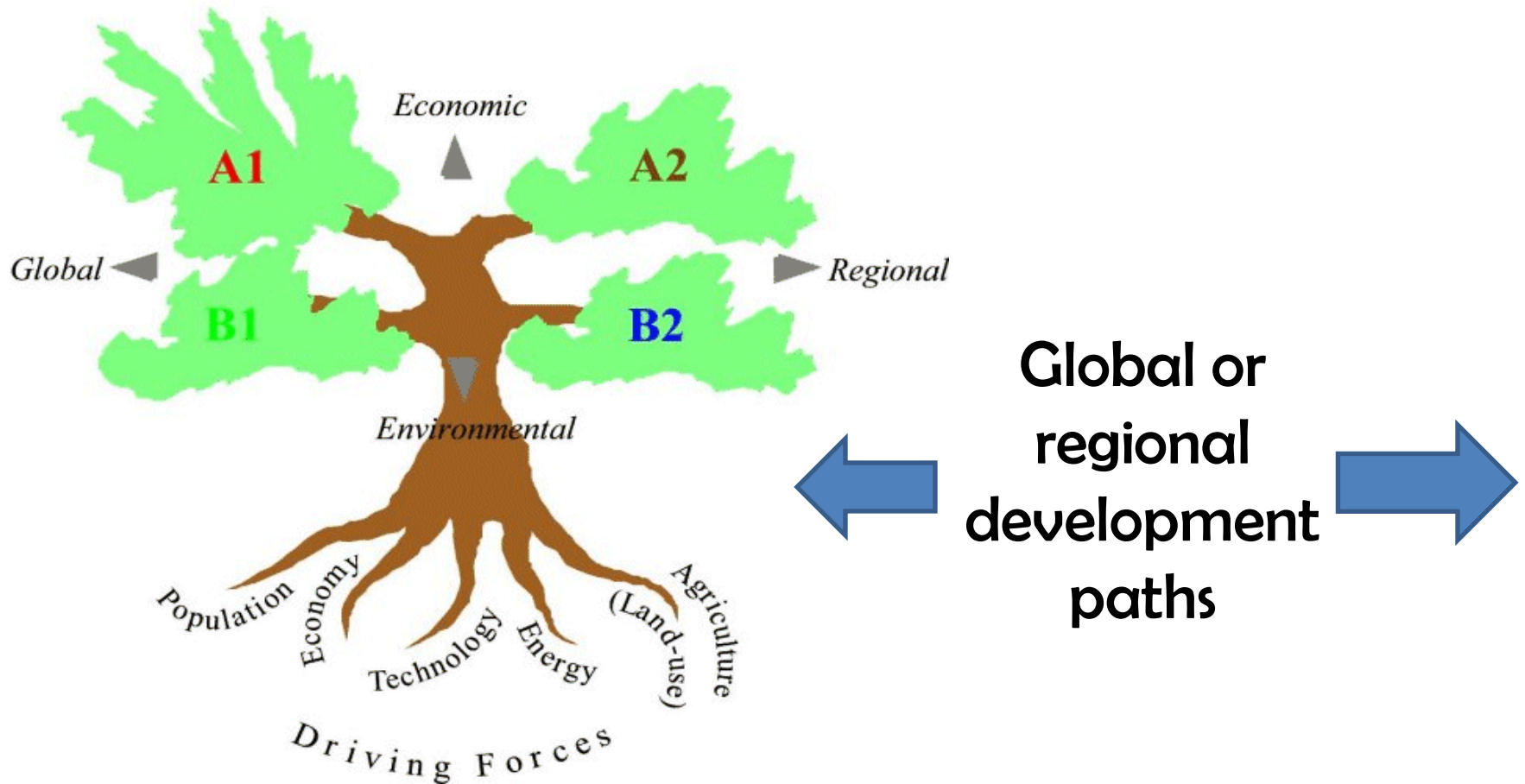
**Future world  
driven by economic  
concerns or  
environmental  
concerns**

↓

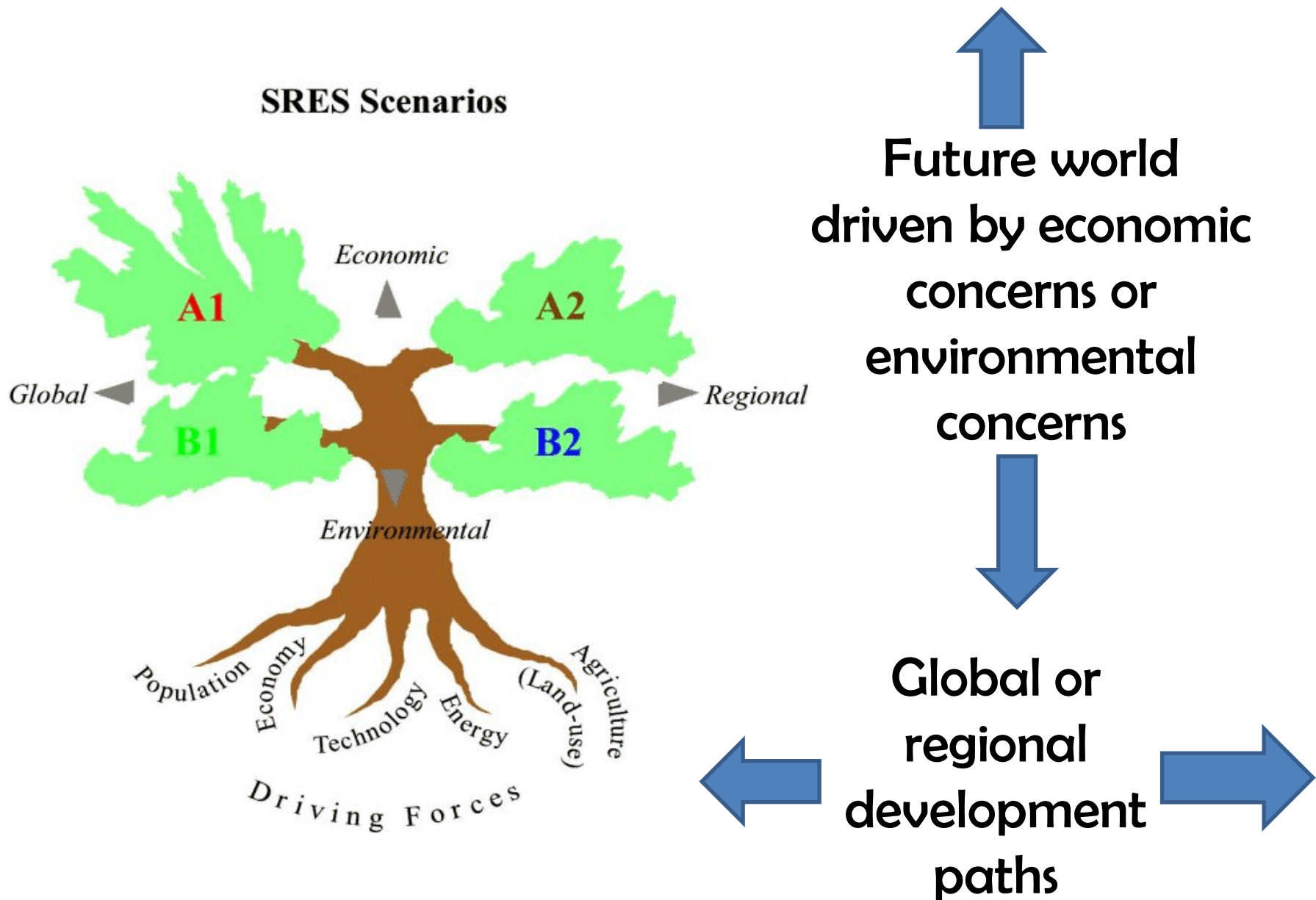
← **Driving forces**

## 2. They are emissions scenarios...

### SRES Scenarios

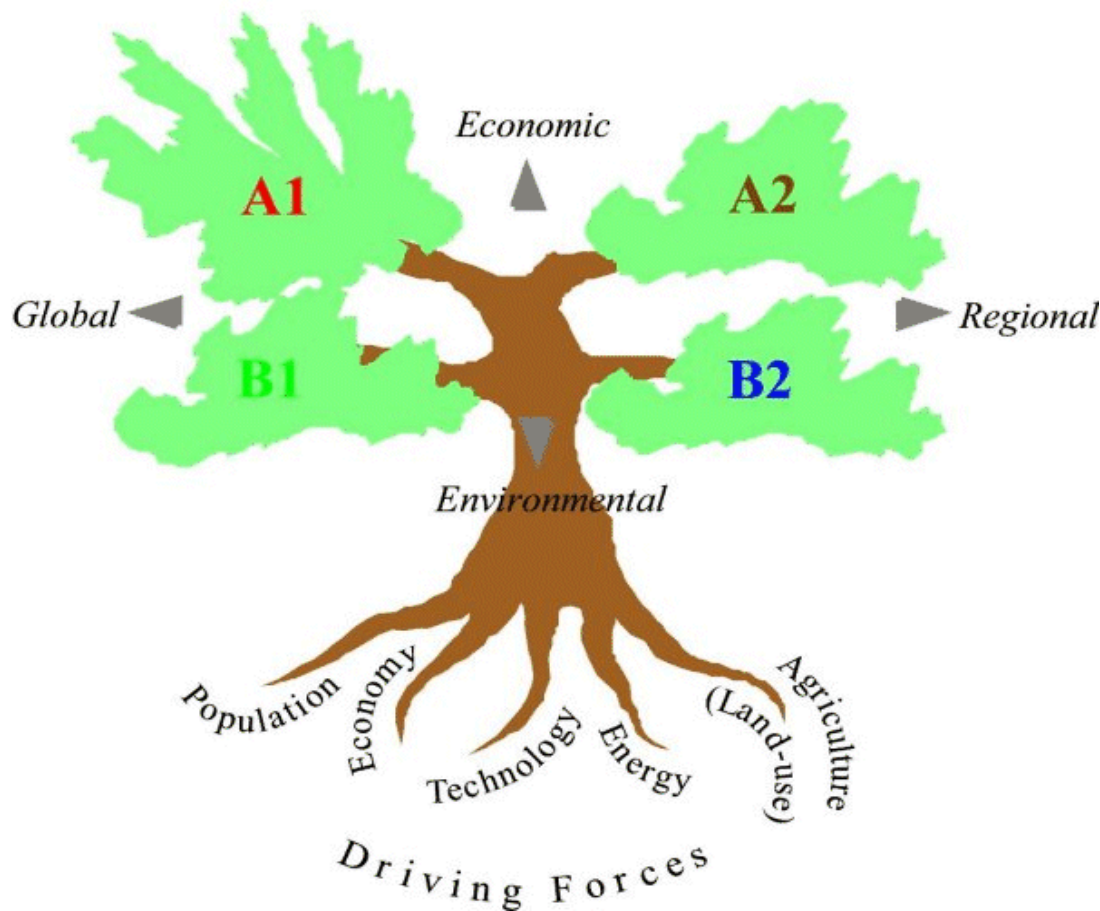


## 2. They are emissions scenarios...



## 2. They are emissions scenarios...

### SRES Scenarios

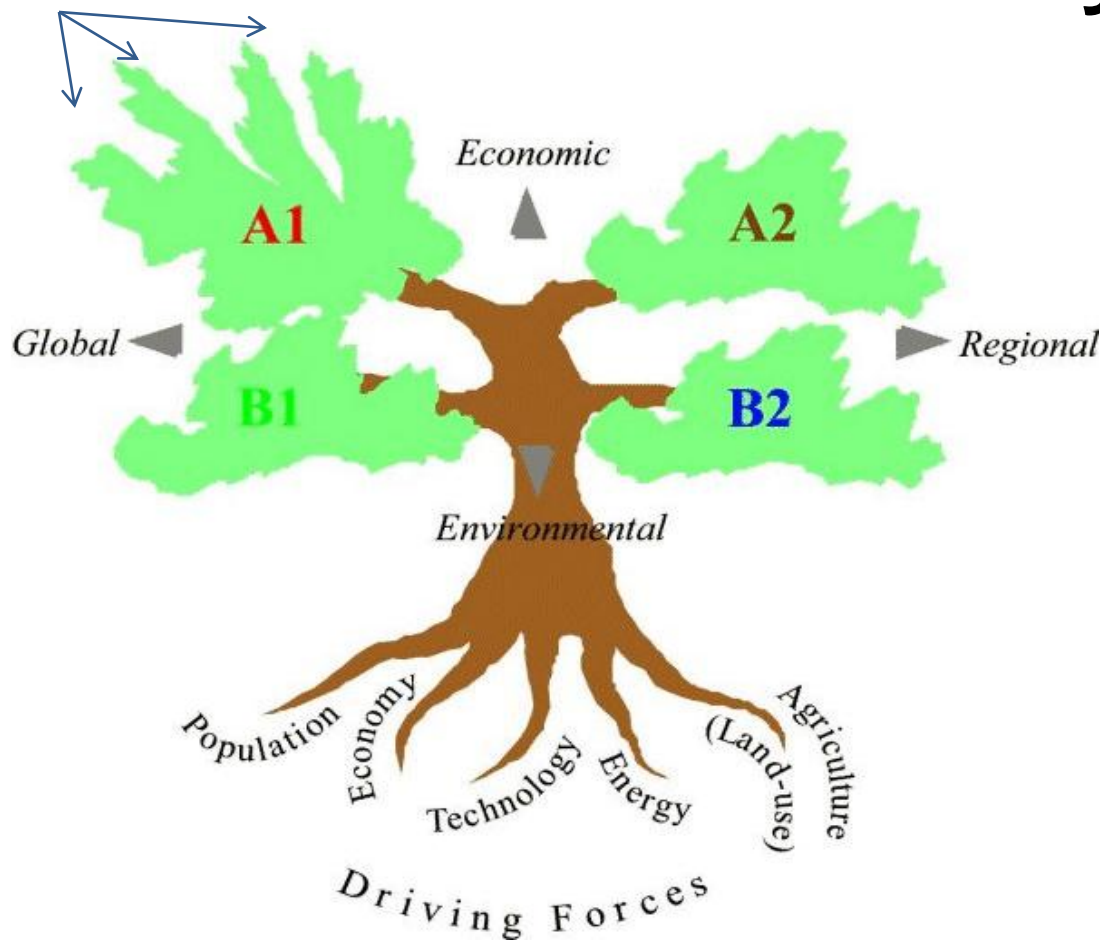


So each family has a distinct story line

The **A1** storyline and scenario family describes a future world of **very rapid economic growth**, low population growth, and the rapid introduction of new and more efficient technologies. Major underlying themes are **convergence among regions**, capacity building, and increased cultural and social interactions, with a **substantial reduction in regional differences** in per capita income.

## 2. They are emissions scenarios...

### Sub paths



So each family has a distinct story line

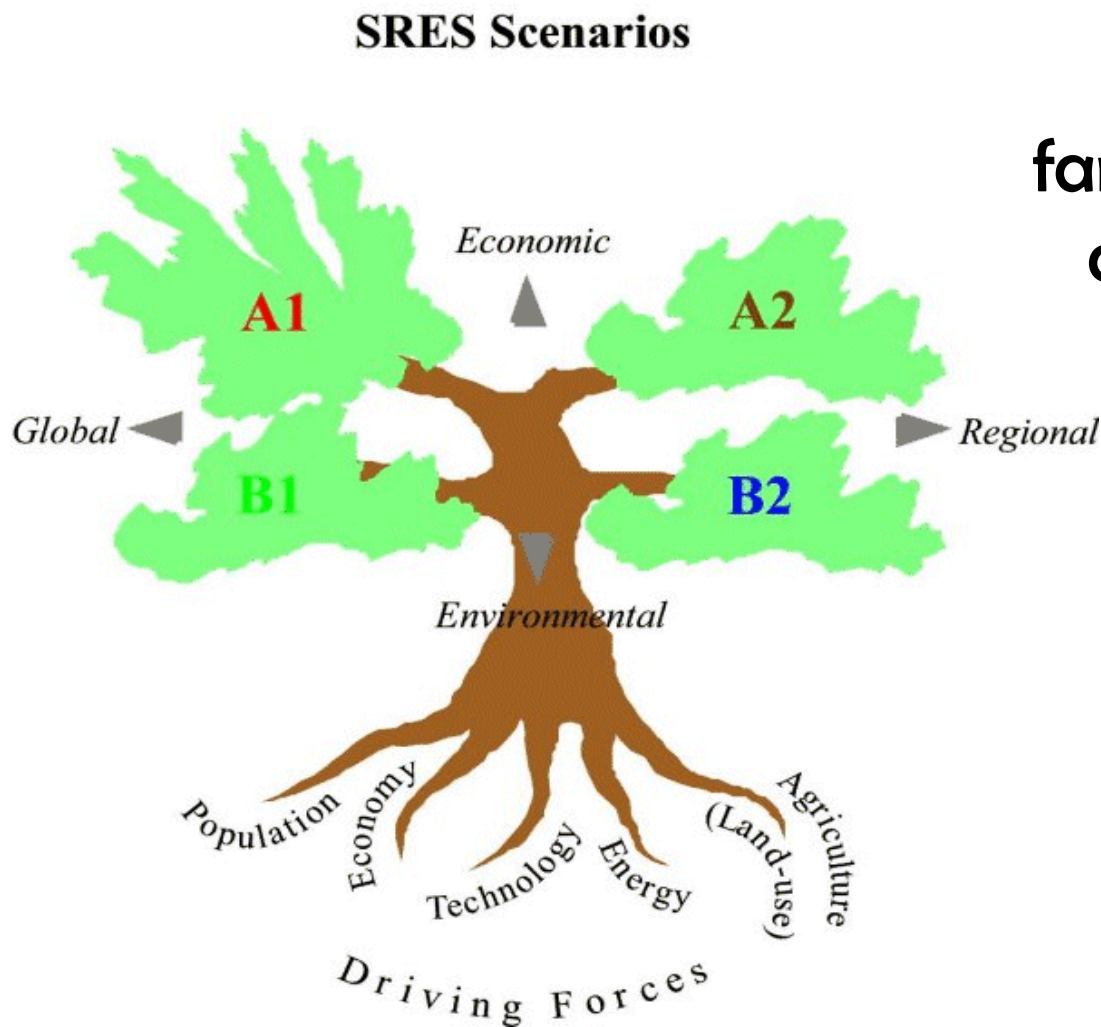
The **A1** also has sub paths dependent on technological route taken with respect to energy.

**A1T** - technological change in energy end-use technologies and hence lower energy demand .

**A1F1** - use and proliferation of fossil fuels

**A1B** - a representative “balance” between the A1T and A1F1.

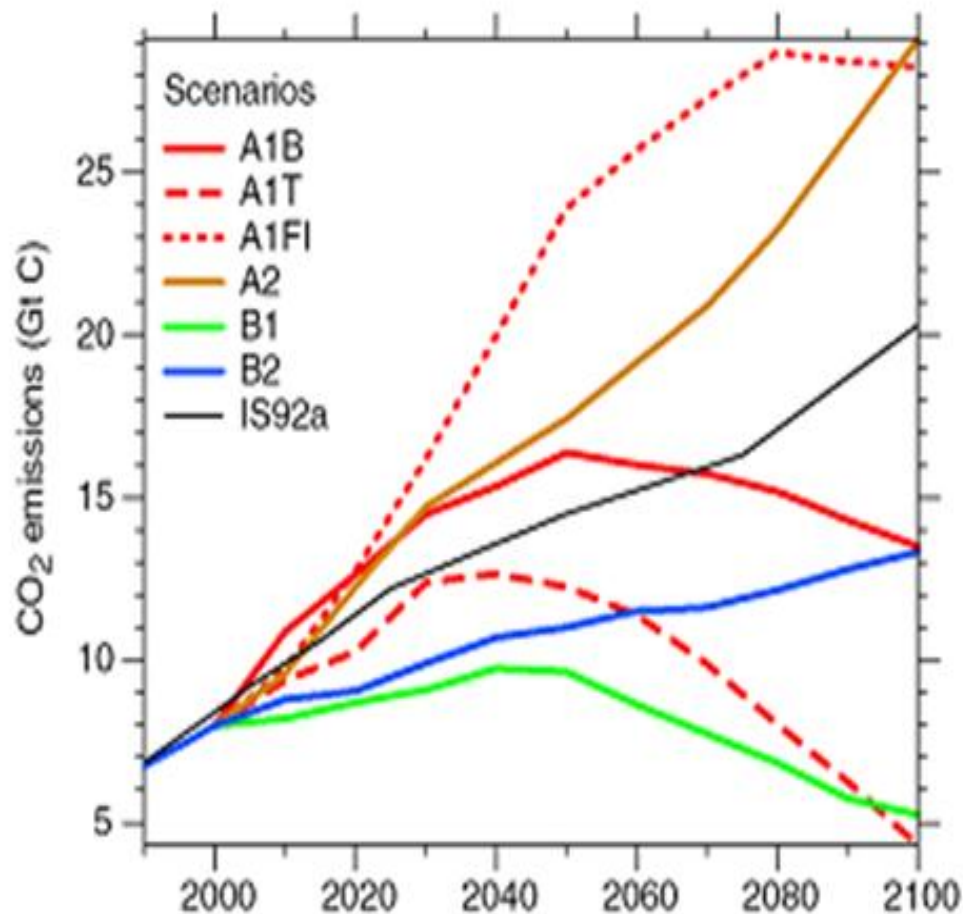
## 2. They are emissions scenarios...



And each scenario family corresponds with a different emissions future.



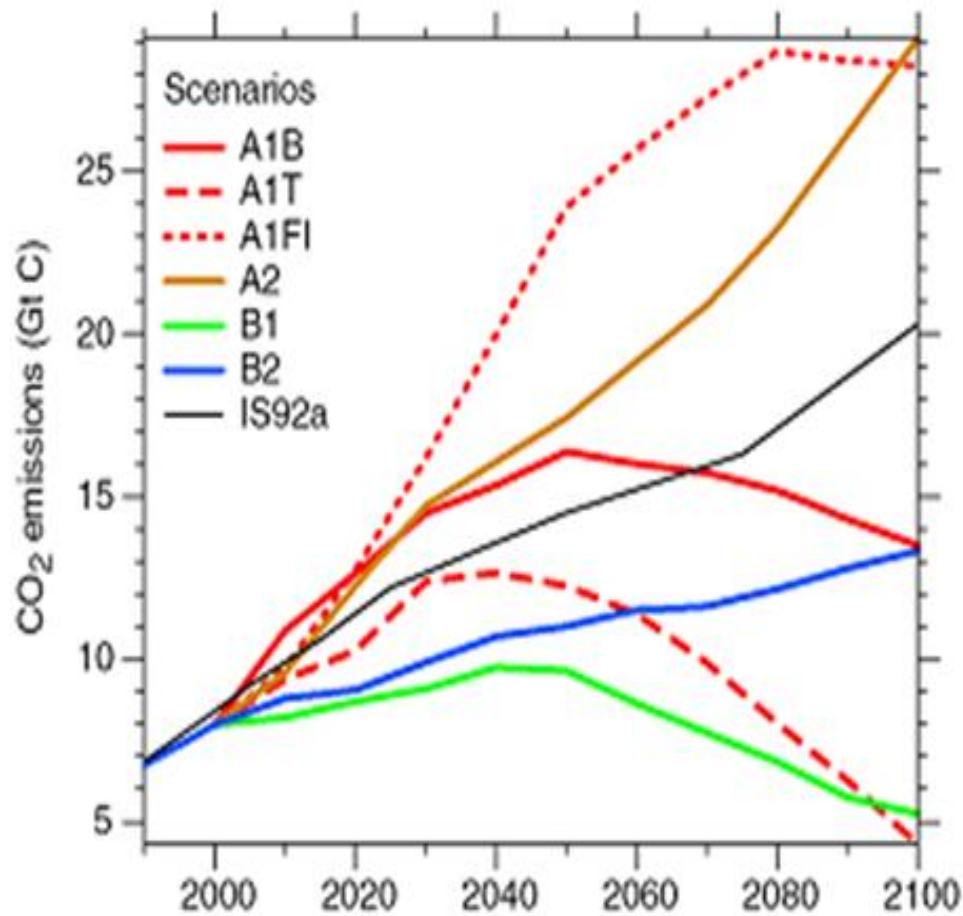
## 2. They are emissions scenarios...



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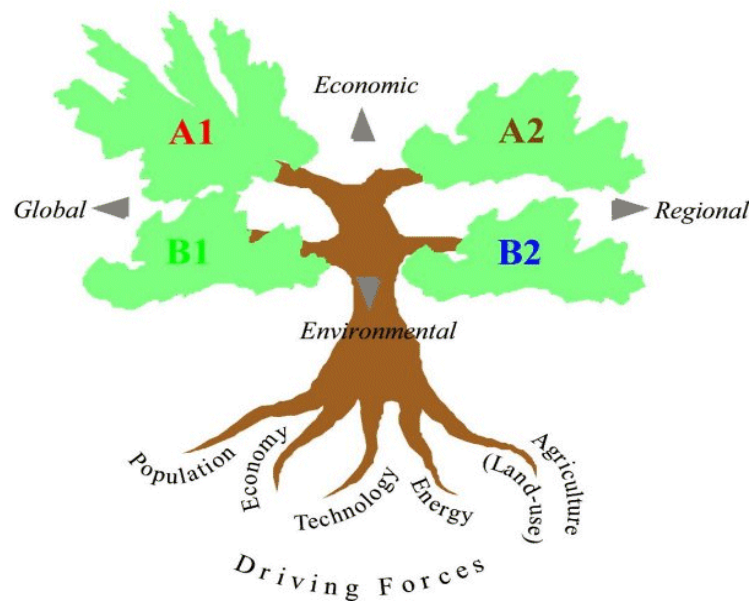
**Make sense?**

## 2. They are emissions scenarios...

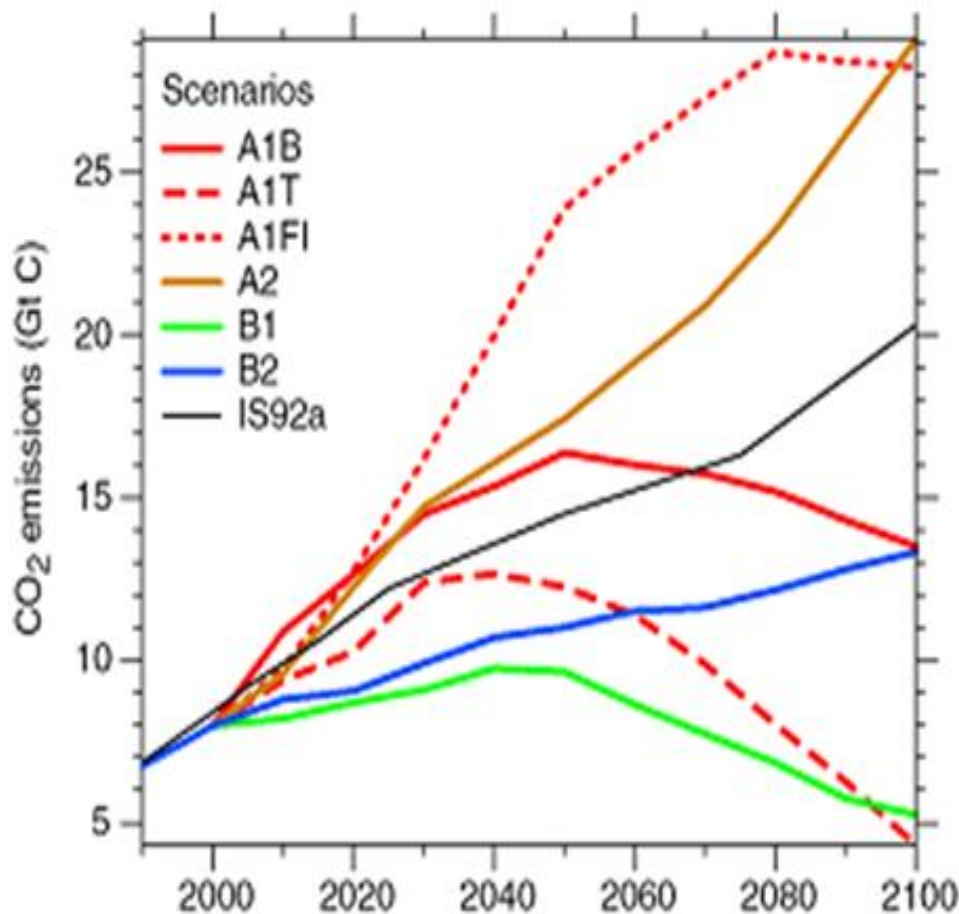


And each scenario family corresponds with a different emissions future.

SRES Scenarios



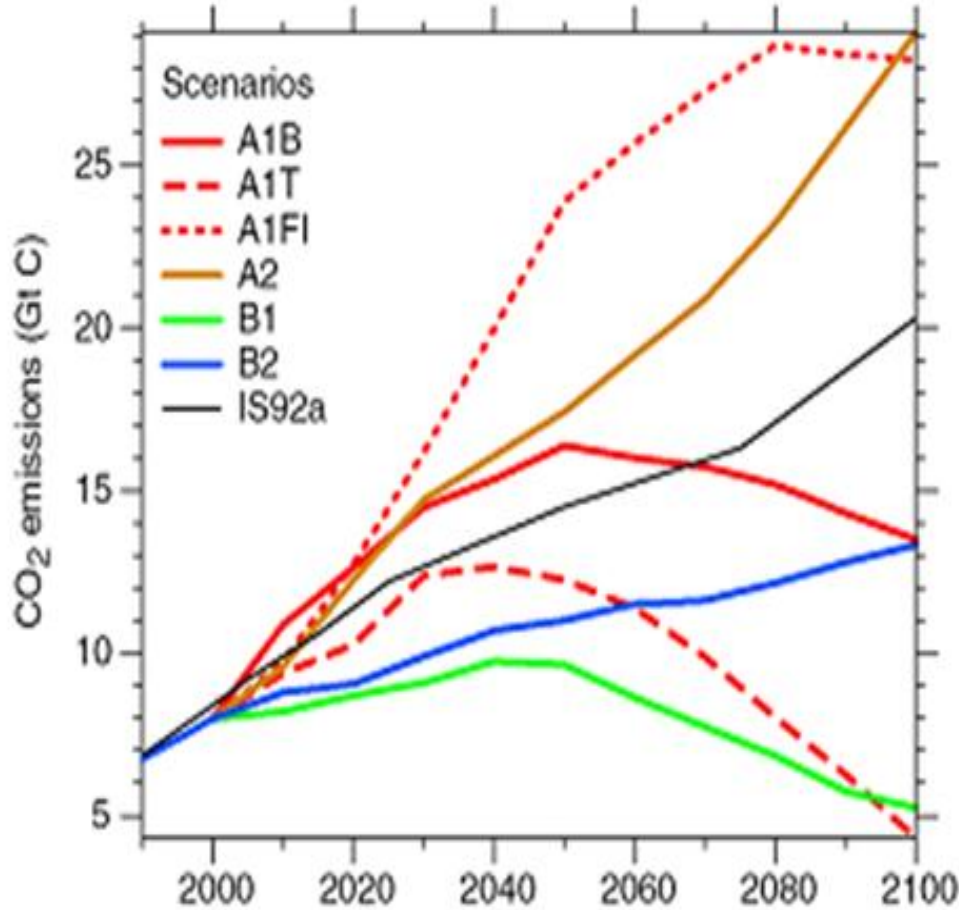
## 2. They are emissions scenarios...



**A's generally higher emission future (more severe) than B's (less severe).**

**None assumes any policy to curb emissions.**

### 3. They are all plausible...



So plug in models to get future climate!

Model + Scenario = Future

Ideally then we should simulate all of them to come up with the range of possible futures.

**One more thing...**

**Some new scenarios...**

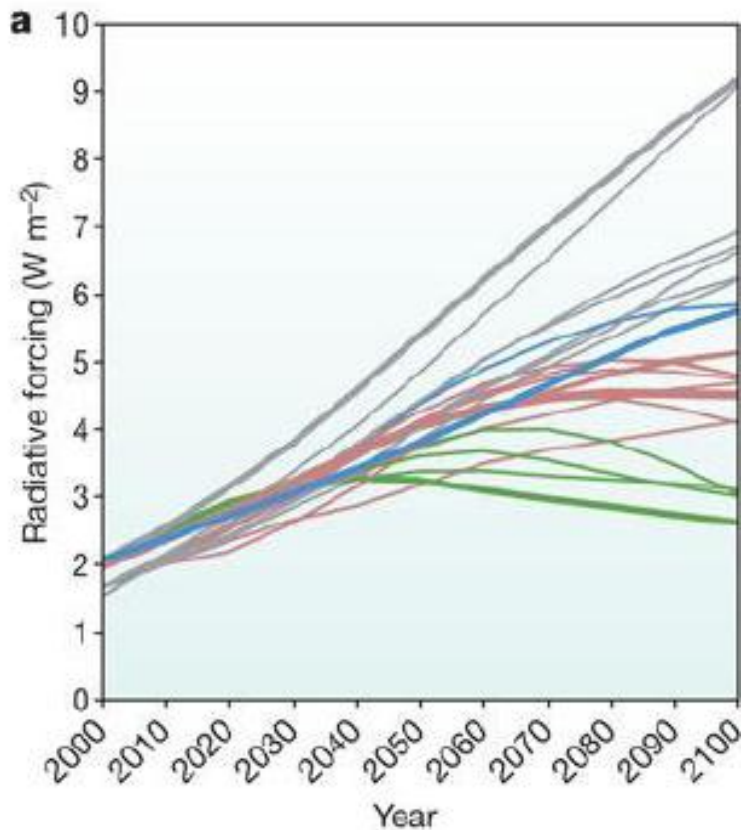
# Representative Concentration Pathways (RCPs)

Research community in charge of the scenario development. IPCC is limiting its role to *catalyzing and assessing the large and growing scenario literature*

The *road to new emission scenarios is still long*: “started” in 01/2005 with IPCC Expert Meeting on Emissions Scenarios, followed by further IPCC Workshops/Expert Meetings on New Emissions Scenarios in 06/2005 and 09/2007...

The AR5 will build on the RCPs, which for the first time will include scenarios that *explore approaches to climate change mitigation in* addition to the traditional “no climate policy” scenarios.

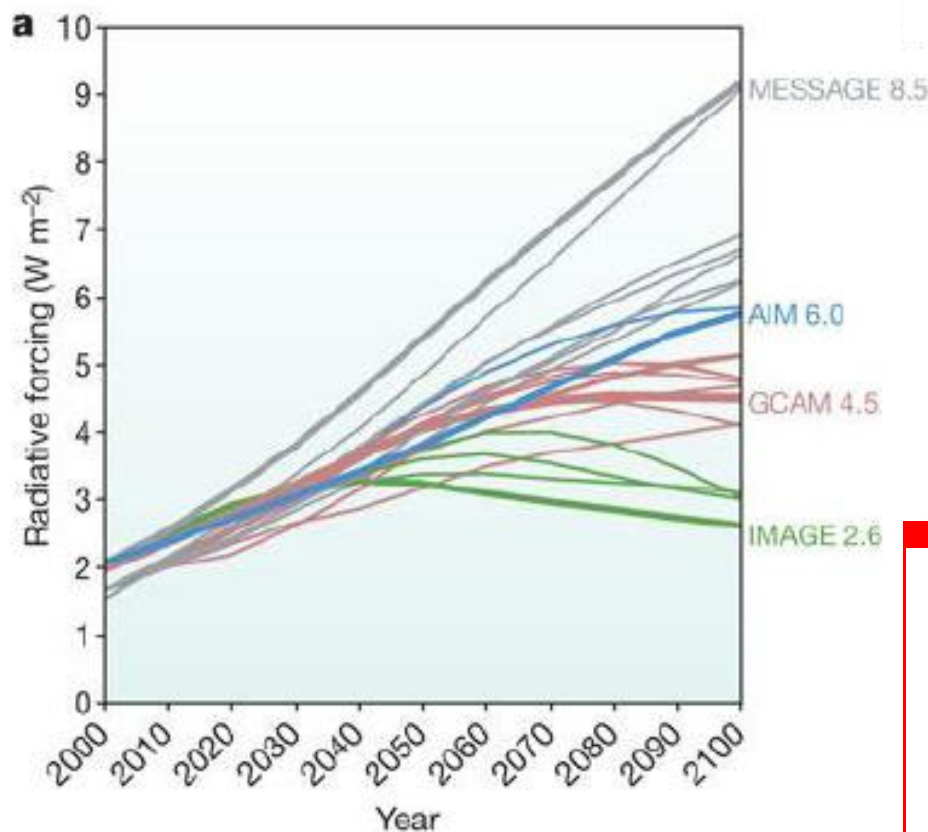
# Representative Concentration Pathways (RCPs)



Radiative Forcing

Examine range of possible paths of radiative forcing as seen in the science literature.

# Representative Concentration Pathways (RCPs)



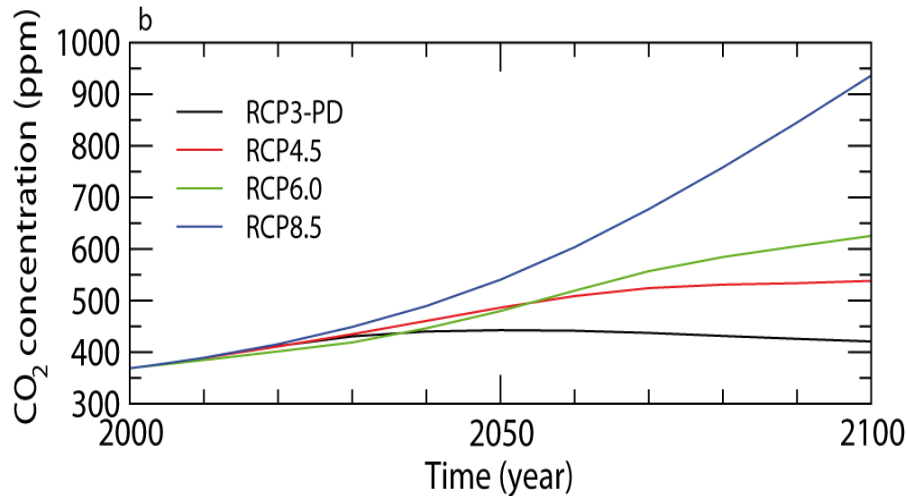
Radiative Forcing

Examine range of possible paths of radiative forcing as seen in the science literature. **Choose 4**

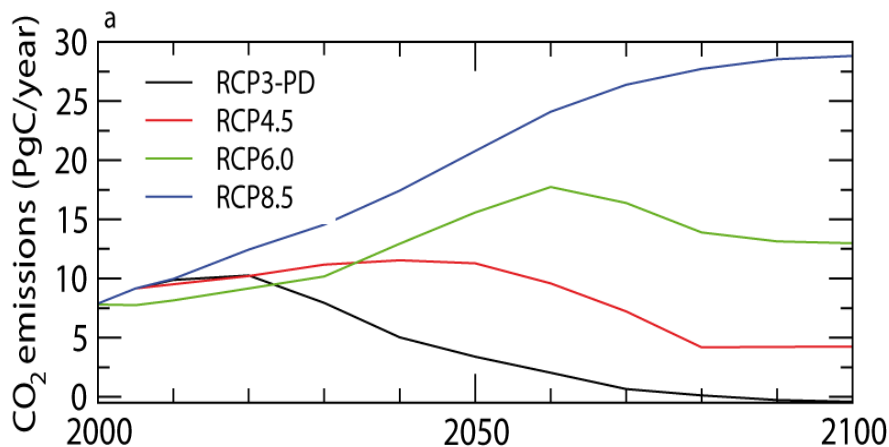
Name	Radiative forcing
RCP8.5	$>8.5 W m^{-2}$ in 2100
RCP6.0	$\sim 6 W m^{-2}$ at stabilization after 2100
RCP4.5	$\sim 4.5 W m^{-2}$ at stabilization after 2100
RCP2.6	Peak at $\sim 3 W m^{-2}$ before 2100 and then declines



# Representative Concentration Pathways (RCPs)

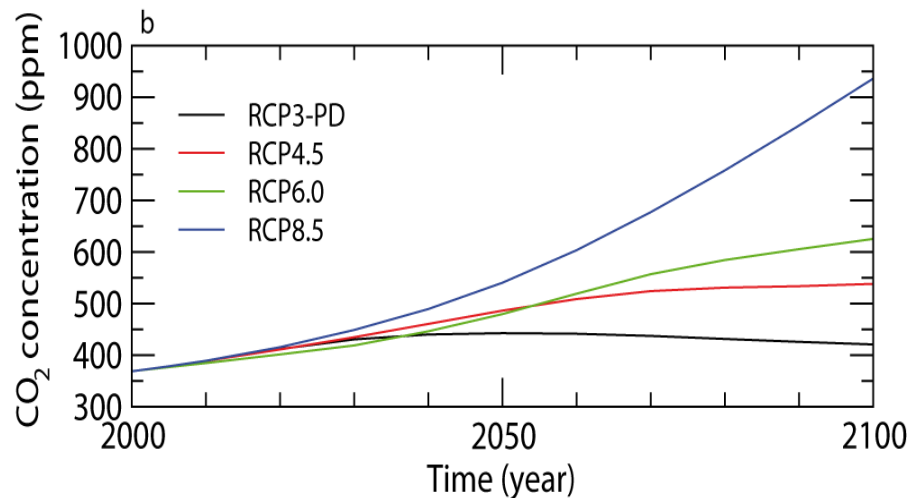


As before get corresponding emissions.



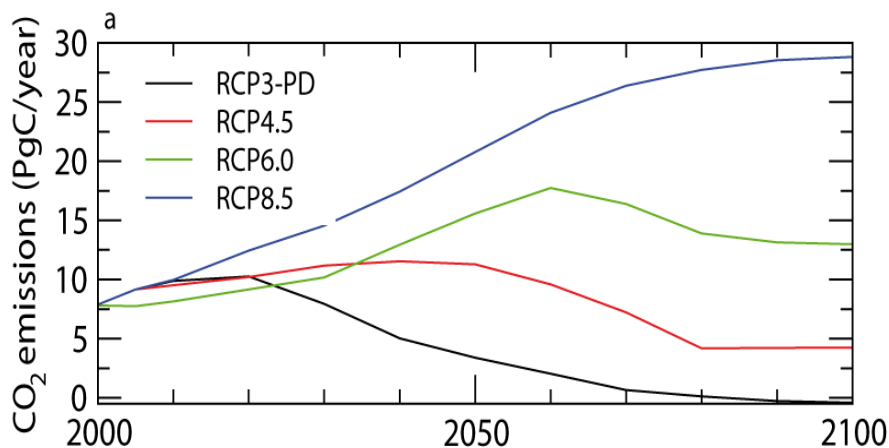
Name	Concentration (p.p.m.)
RCP8.5	>1,370 CO <sub>2</sub> -equiv. in 2100
RCP6.0	~850 CO <sub>2</sub> -equiv. (at stabilization after 2100)
RCP4.5	~650 CO <sub>2</sub> -equiv. (at stabilization after 2100)
RCP2.6	Peak at ~490 CO <sub>2</sub> -equiv. before 2100 and then declines

# Representative Concentration Pathways (RCPs)



**As before get corresponding emissions.**

The lowest scenario is consistent with the aims to limit the increase of global mean temperature to less than 2°C.



# Representative Concentration Pathways (RCPs)

**Plug emissions into models to get future climate.**

**Model + Scenario = Future**

# Representative Concentration Pathways (RCPs)

**Very New:** Scenario development process of new scenarios *close to be finalized, incl. storylines/narratives up to 2100 & extensions beyond 2100.*

The assessment in **IPCC AR5** will build on the RCPs, which for the first time include scenarios that *explore approaches to climate change mitigation in addition to the traditional “no climate policies” scenarios.*

“Old” IPCC emissions scenarios (**SRES**) still important in the process

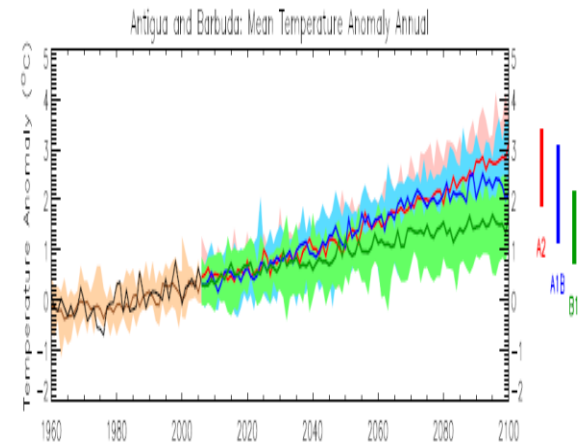
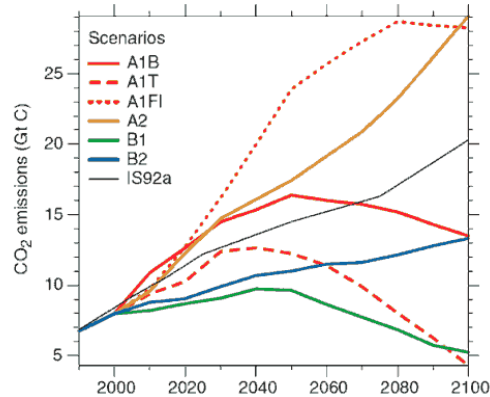
# Summary

**Scenarios are storylines of how world will develop in future. Need them to get future emissions.**

**Basically two main types will often hear about:  
SRES (A and B families) and RCPs**

# Summary

Once you have scenarios...



**Model**

**+**

**Scenarios**

**=**

**Future**

**Thank You**