

**systems@play**

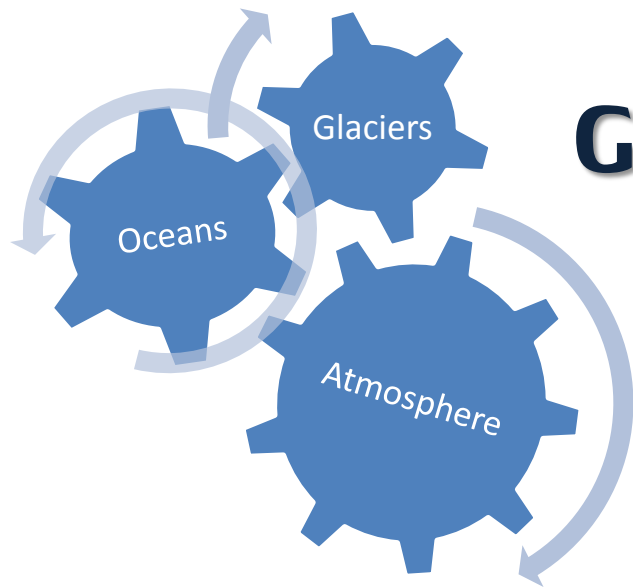
*Climate of Change*  
InTeGrate Module  
**Unit 5**

# Our Climate in Context

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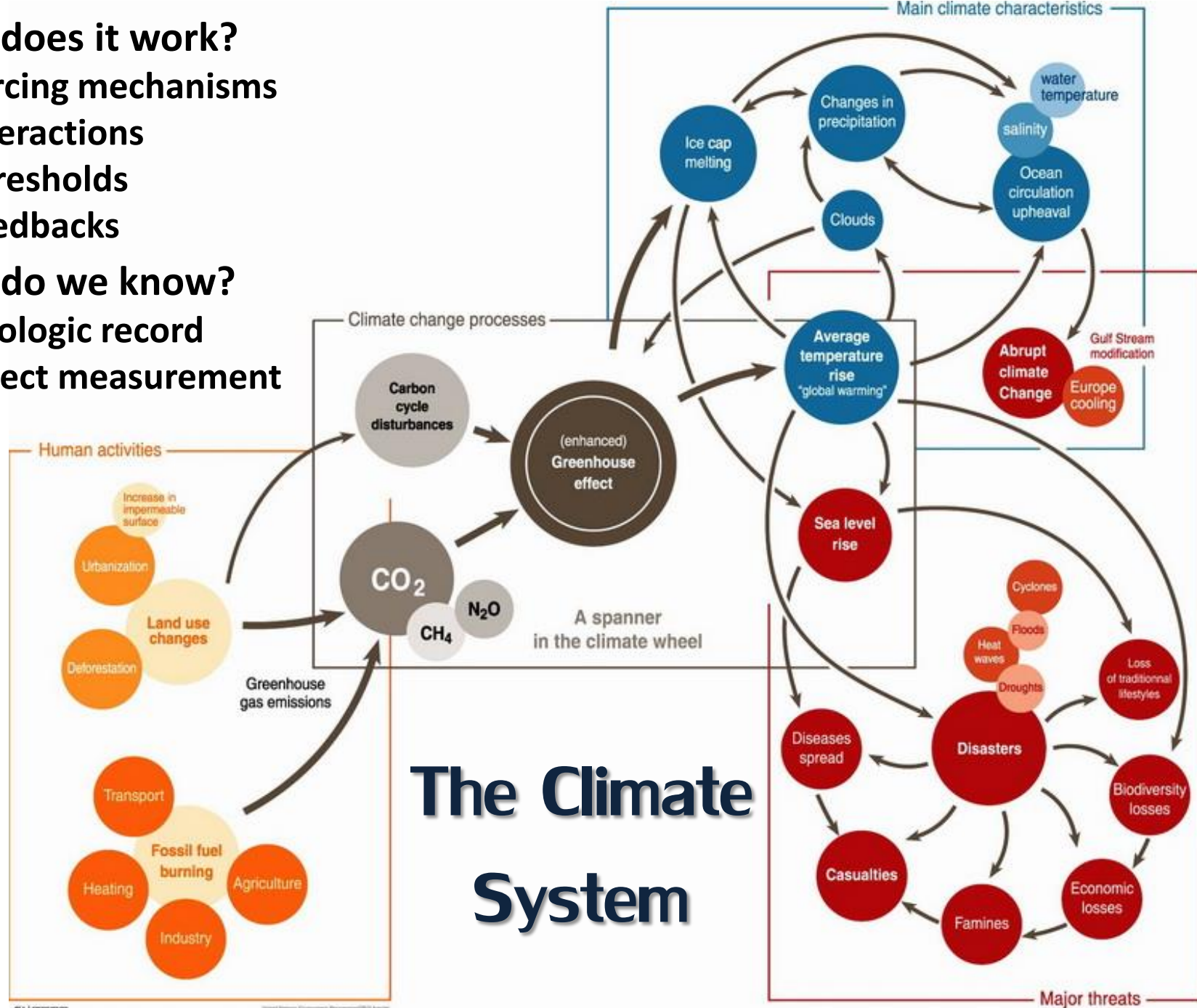
**GREENPEACE**



## Goals

- List and describe climate system processes that complicate its interpretation.
- Explain the connection between climate records, human choices, & climate projections.
- Interpret a graph of atmospheric greenhouse gas concentration.
- Describe the structure of a climate model, & the connection between the climate system we know & our possible futures.

- **How does it work?**
  - Forcing mechanisms
  - Interactions
  - Thresholds
  - Feedbacks
- **How do we know?**
  - Geologic record
  - Direct measurement





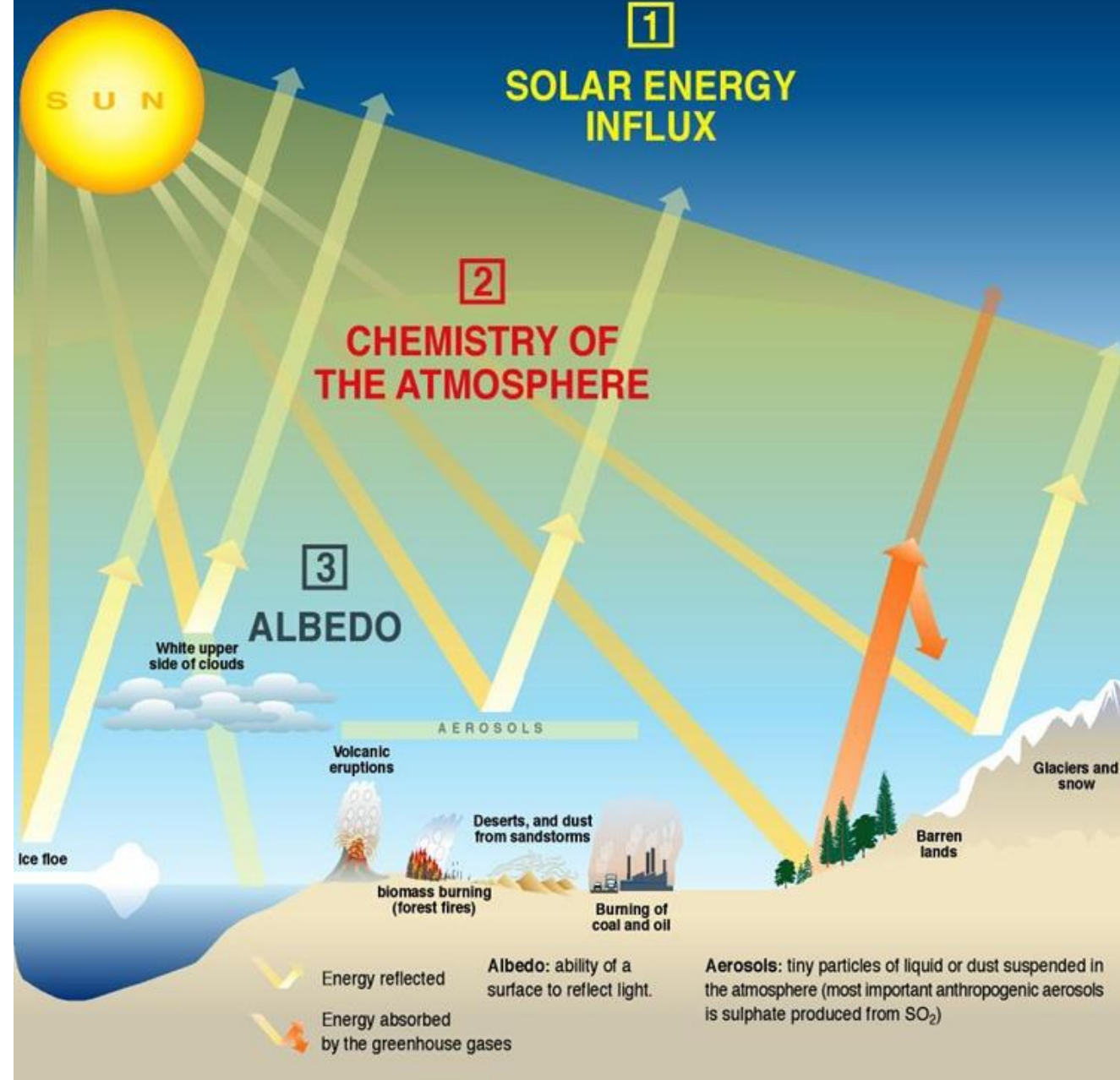
## The Three Factors

**1**  
**SOLAR ENERGY INFLUX**

**2**  
**CHEMISTRY OF THE ATMOSPHERE**

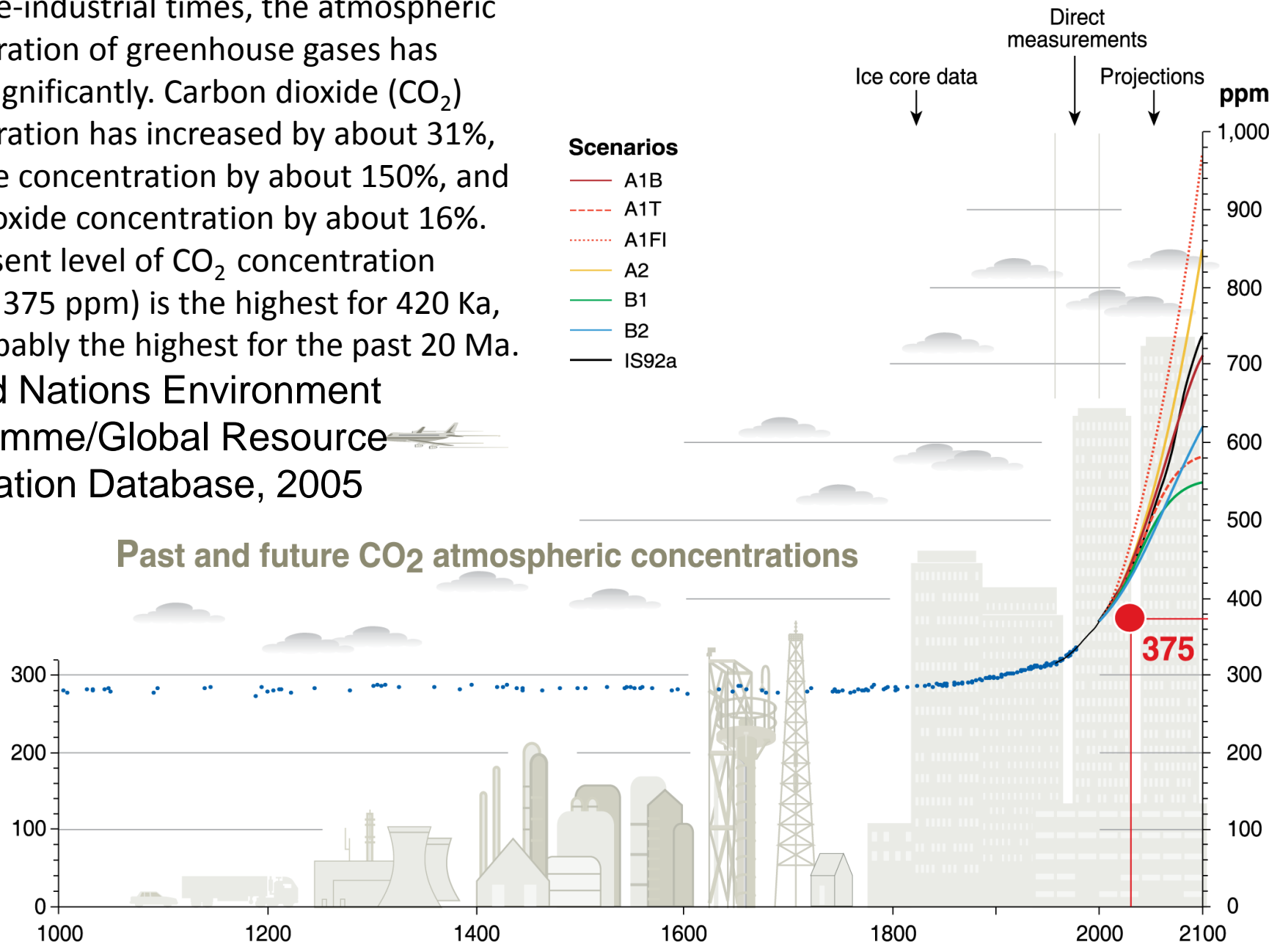
**3**  
**ALBEDO**

**Influencing our  
Energy Balance**



Since pre-industrial times, the atmospheric concentration of greenhouse gases has grown significantly. Carbon dioxide (CO<sub>2</sub>) concentration has increased by about 31%, methane concentration by about 150%, and nitrous oxide concentration by about 16%. The present level of CO<sub>2</sub> concentration (around 375 ppm) is the highest for 420 Ka, and probably the highest for the past 20 Ma.

-United Nations Environment Programme/Global Resource Information Database, 2005



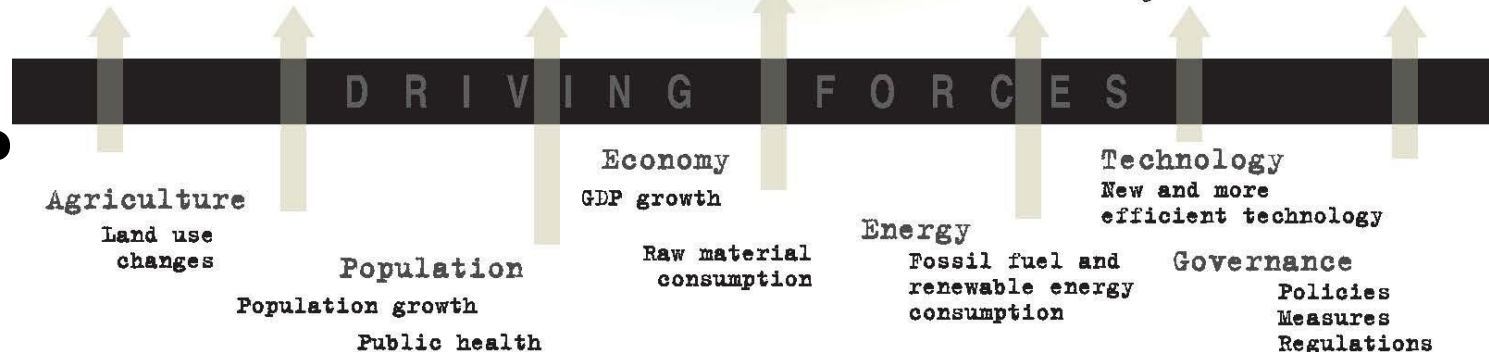
# Science of Scenarios

The **A1 scenario** describes a future world of very rapid economic growth, a global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies. Specific regional patterns tend to disappear as a result of increased cultural and social interaction. The gap between regions, regarding the per capita income, reduces substantially. This scenario develops into three groups that describe alternative in the development of energy supply: fossil intensive (FI), non-fossil energy sources, or a balance (B) across all sources.

The **A2 scenario** describes a very heterogeneous world, based on the continued separation and preservation of local identities. Fertility patterns across regions converge very slowly, which results in a continuously increasing population. Economic development is regionally oriented and per capita economic growth and technological change more fragmented and slower than in the A1 scenario.

The **B1 scenario** describes a convergent world with a global population that peaks in mid-century and declines thereafter (as in the A1 scenario), but with rapid change in economic structures toward a service and information economy, with reductions in consumption and the introduction of clean and resource-efficient technologies. The emphasis is on global solutions to economic, social, and environmental sustainability, including improved equity, but without additional climate initiatives.

The **B2 scenario** describes a world in which the emphasis is on local solutions to economic, social, and environmental sustainability rather than the global approach in B1. It is a world with a continuously increasing global population, but at a slower rate than other scenarios, intermediate levels of economic development, and slow but diverse technological change. Society is oriented towards environmental protection and social equity, and focuses on the local and regional level.



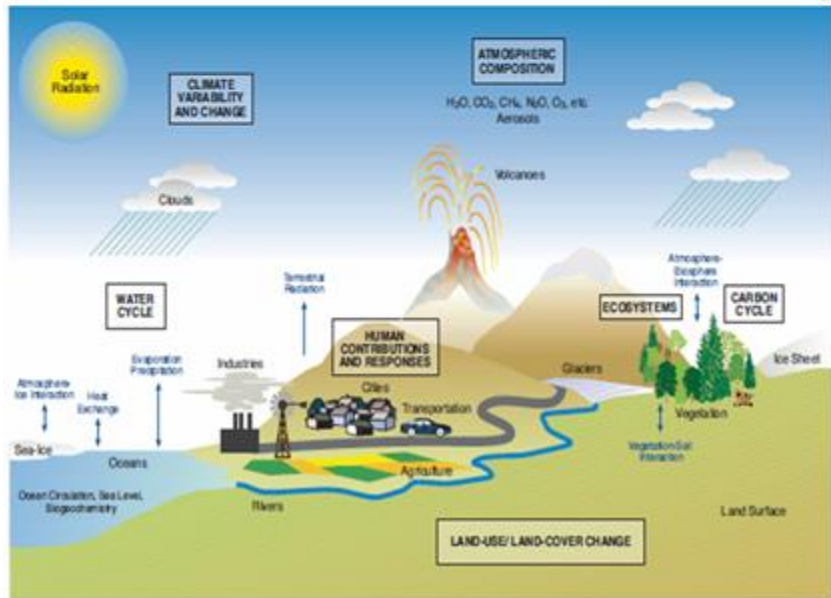
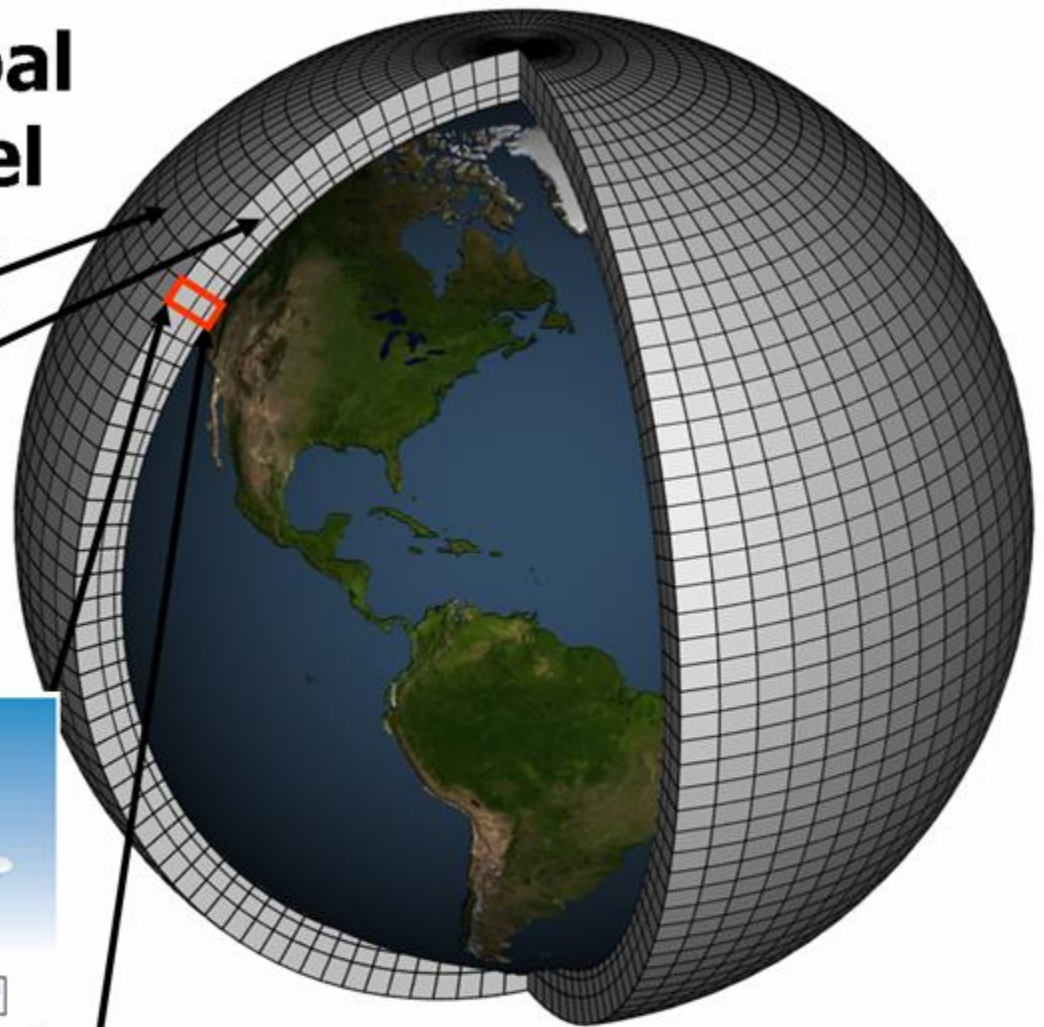
- Who's driving?
- Where are we going?
- Are we there yet?



# Schematic for Global Atmospheric Model

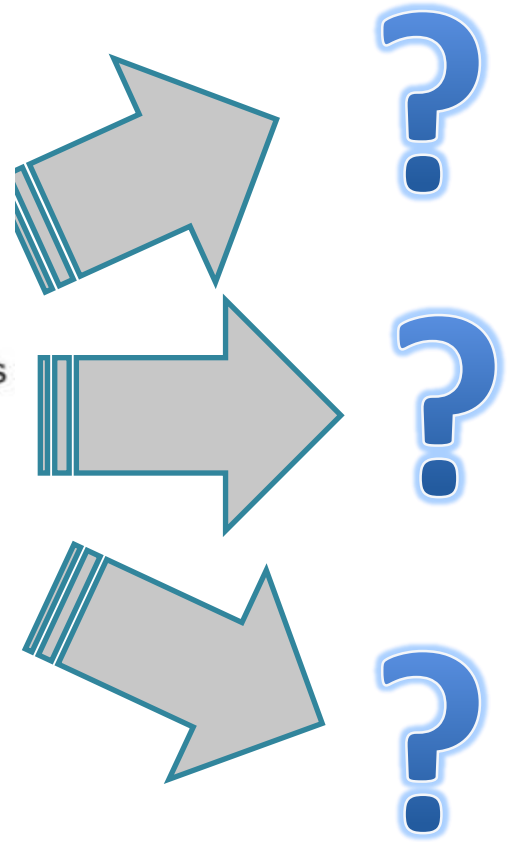
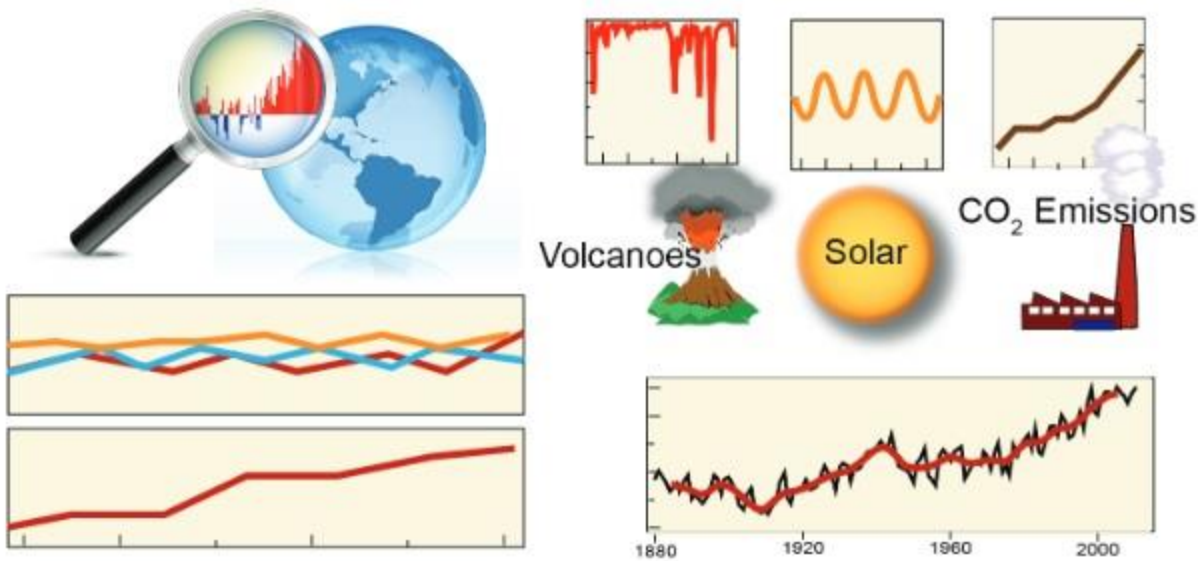
Horizontal Grid (Latitude-Longitude)

Vertical Grid (Height or Pressure)



The global climate system comprises many interrelated processes and is described in the most sophisticated models as numerous interactive systems. Each can be modeled alone, but an accurate depiction of the climate necessarily employs them together

# Your Climate Model!





## Slide Sources:

1. Ice sculptures - Image credit: Greenpeace / Lu Guang  
<http://www.greenpeace.org/international/en/multimedia/photos/in-beijing-melting-ice-sculptu/>
2. The climate system graphic – Image credit: UNEP/GRID-Arendal  
<http://www.grida.no/publications/vg/climate2/>
3. Energy balance graphic – Image credit: UNEP/GRID Arendal  
<http://www.grida.no/publications/vg/africa/page/3111.aspx>
4. Carbon dioxide concentrations graph – Image credit: Philippe Rekacewicz, Emmanuelle Bournay, UNEP/GRID-Arendal  
[http://www.grida.no/graphicslib/detail/past-and-future-co2-concentrations\\_a92d](http://www.grida.no/graphicslib/detail/past-and-future-co2-concentrations_a92d)
5. Science of scenarios graphic – Image credit: UNEP/GRID-Arendal  
[http://www.grida.no/graphicslib/detail/back-to-the-future-the-science-of-building-scenarios\\_b43f#](http://www.grida.no/graphicslib/detail/back-to-the-future-the-science-of-building-scenarios_b43f#)
6. Global Atmospheric model - Source:  
[http://en.wikipedia.org/wiki/Climate\\_model#mediaviewer/File:Global\\_Climate\\_Model.png](http://en.wikipedia.org/wiki/Climate_model#mediaviewer/File:Global_Climate_Model.png)
7. Your climate model graphic – Image credit: National Climate Assessment and Development Advisory Committee,  
<http://www.globalchange.gov/sites/globalchange/files/NCAJan11-2013-publicreviewdraft-appendix2-climateprimer.pdf>