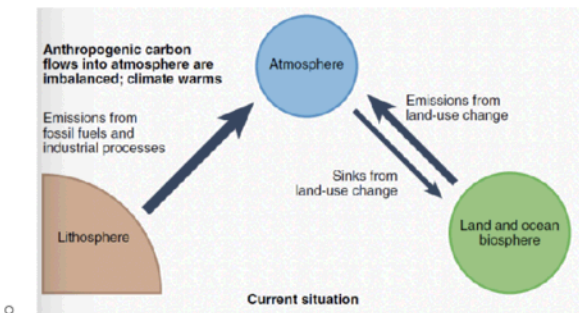


- Global sea levels have risen over 9 inches since late 19th century
  - Due to thermal expansion + melting ice from land and glaciers
    - Thermal expansion contributed to 40% of sea level rise since 1980, remainder due to melting ice from land
  - Storm-surge effects are increased within low-lying coastal areas
- 4) Ecosystem Effects:
  - Animals incl polar bears depend on sea ice to live
  - INCREASING CO<sub>2</sub> resulted in ocean acidification – DECREASE in pH caused by absorption of CO<sub>2</sub>
    - Decrease in pH = 30% increase in acidity + **interferes w/ calcium carbonate shell formation**, base of marine food chain
  - Global warming altering seasonal behavior + geographic range of species
  - Phenology: **seasonal timing of biological activities**, such as breeding, flowering, and migration of various species
    - Affected by climate change – species migrating poleward + breeding earlier
  - Ranges of midlatitude species moving towards poles + to higher/cooler elevations

## What About The Future?

- Computer simulation models to forecast:
  - 1) Future economic activity, energy sources, population growth, land-use patterns, + other human factors = estimates for emissions until 2100
  - 2) General Circulation Models (GCMs) use mathematical equations to simulate as many physical/chemical processes in atmosphere as possible
  - 3) Which emissions scenarios needed to achieve climate goals
- From emissions reduction perspective, data are not promising → interest in “negative emissions” and “net zero”



- Mitigation: **direct actions taken to reduce threat posed by carbon emissions**
- Must avoid emitting ~200 billion tons (Pg) of carbon over next 50 years
- By being more efficient in energy use, emissions could be reduced by 16 Pg
- Four Areas:
  - 1) Transport Efficiency (more efficient planes/cars)