

Study Tips

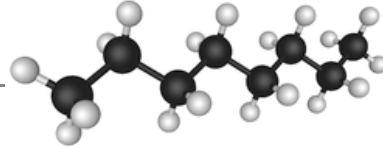
- Some exam questions will relate the lectures to each other
 - Advantages and disadvantages of the different fuels
 - How are they similar and different from each other

Outline

- **1. Non-renewable energy sources**
- **2. Biofuel**
 - What is bioenergy and biofuel
 - Sources of biomass
 - Benefits
- **3. Biofuel- issues**
- Discussion

1. Non-renewable energy sources

Petroleum



- Petroleum= C5 to C18 hydrocarbon chains
 - lower C is natural gas
 - higher C is wax
- From prehistoric algae and plankton → compression and heating

1. Non-renewable energy sources

Gasoline

- Petroleum hydrocarbons (C5-C12) mixed with aromatics (benzene, toluene, naphthalene, etc.)



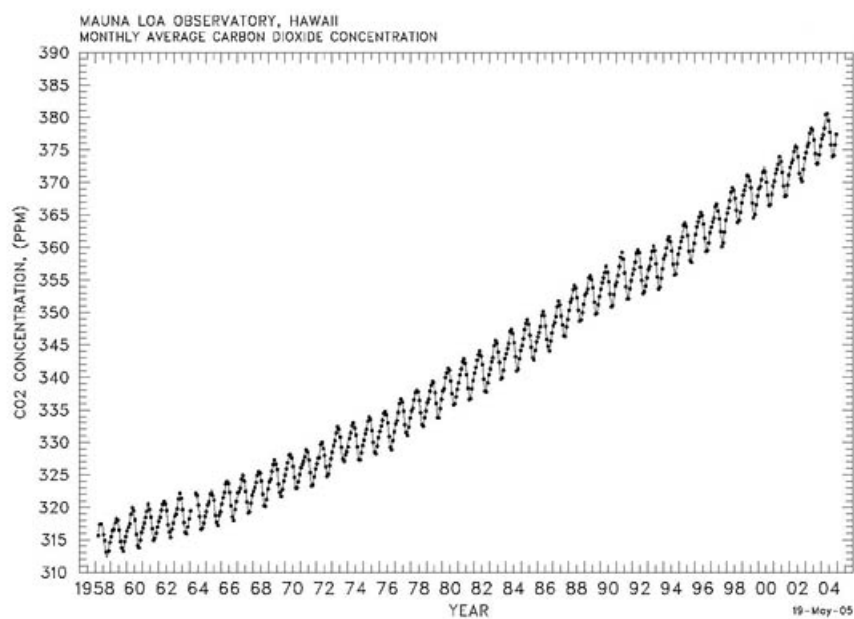
↖ Hazardous chemicals discussed in Phytoremediation Lectures!

1. Non-renewable energy sources
Coal formation from ancient plants



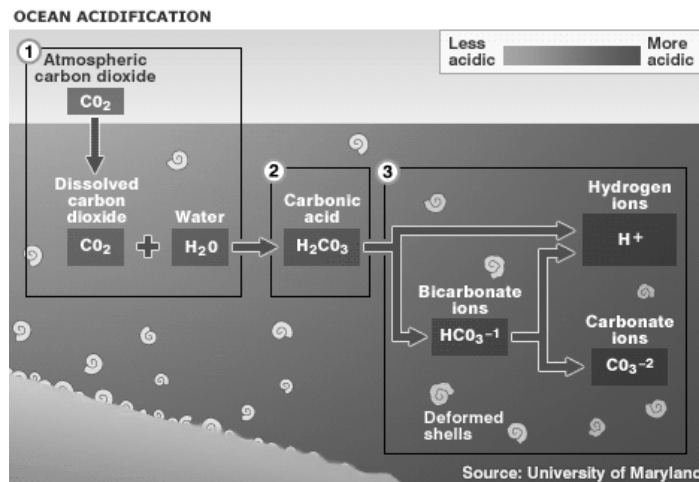
Jungle-like forests of the Carboniferous
Rapid growth rates (no annual rings)

Famous Prof. Revelle graph



Problems with rising CO₂

- Acidification of the oceans
- Warming



Bioenergy Challenges

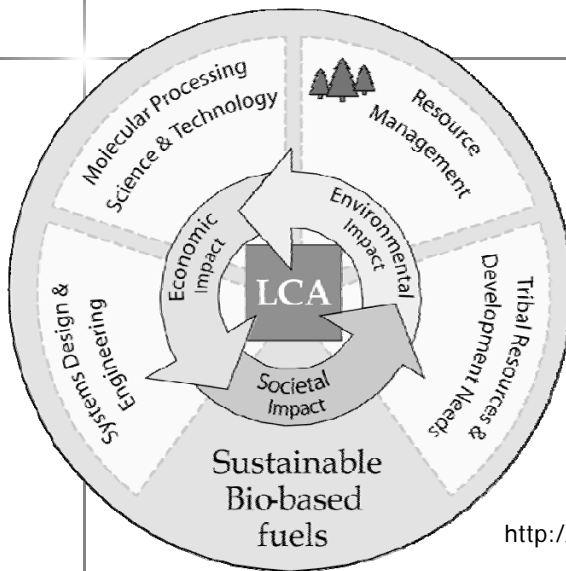
- Grow a billion extra tons of plant biomass
- Do it without affecting the food supply or prices
- Do it in a sustainable manner

Outline

- 1. Non-renewable energy sources
- 2. Bioenergy- benefits
- 3. Bioenergy- issues
 - Challenges/Goals
 - Food vs Fuel debate
 - Lignocellulosic biomass challenges
 - Sustainability

- Discussion

Bioresource-based energy for sustainable societies



- LCA as a core research competency
- Modeling to forecast sustainability of research innovations
- Test-bed designs based on resources and needs of Yakama and Quinault Nations

<http://depts.washington.edu/bioenergy/>