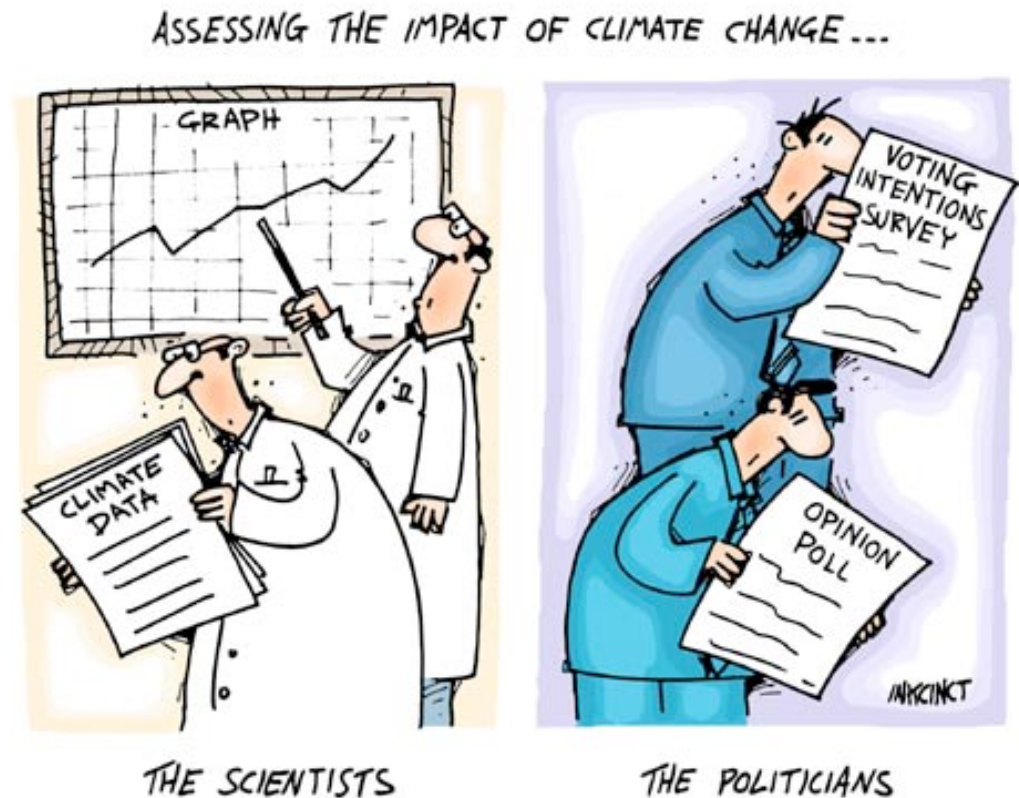


# Responding to Climate Change

Gloom & Doom of Climate Change

What Can Be Done?

Final Project Stuff.



Hypothetical....

Rob could lose a few pounds.

Possible Solutions? (good points & bad points)

Change Habits

- no more NYS Wieners

Medical Procedures

- Lipo-suck 4000

What can we do about Global Environmental Change?

Change Habits

- Reduce emissions

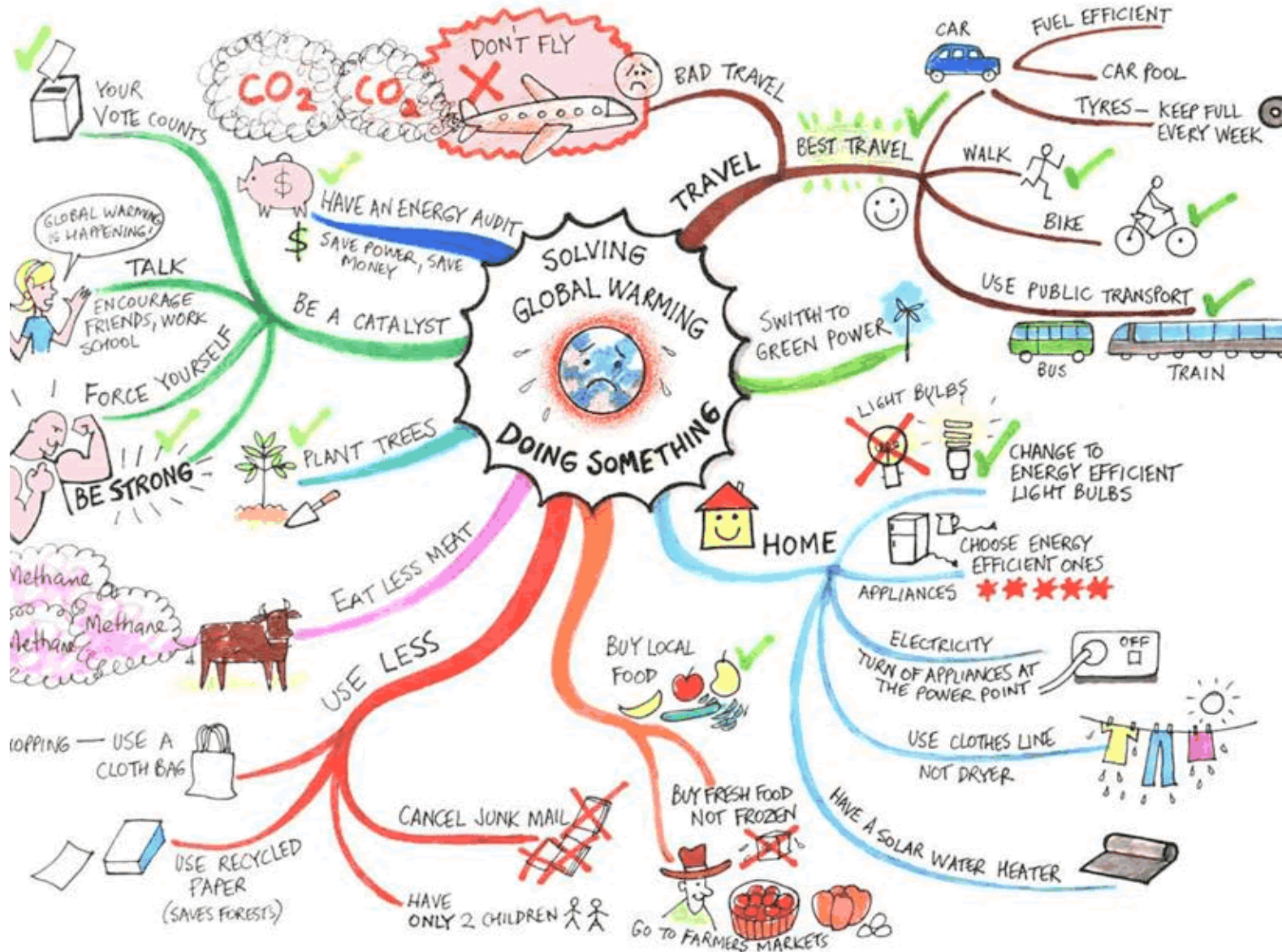
Geo-Engineering

- Human ingenuity

# Global Warming – What Can Be Done?

3

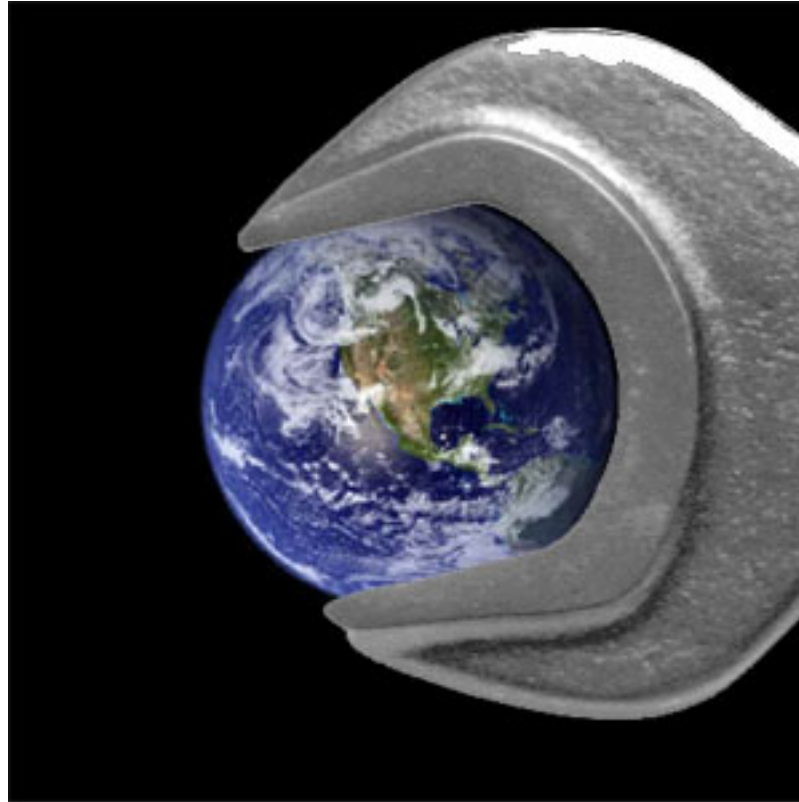
## Change Habits



# Global Warming – What Can Be Done?

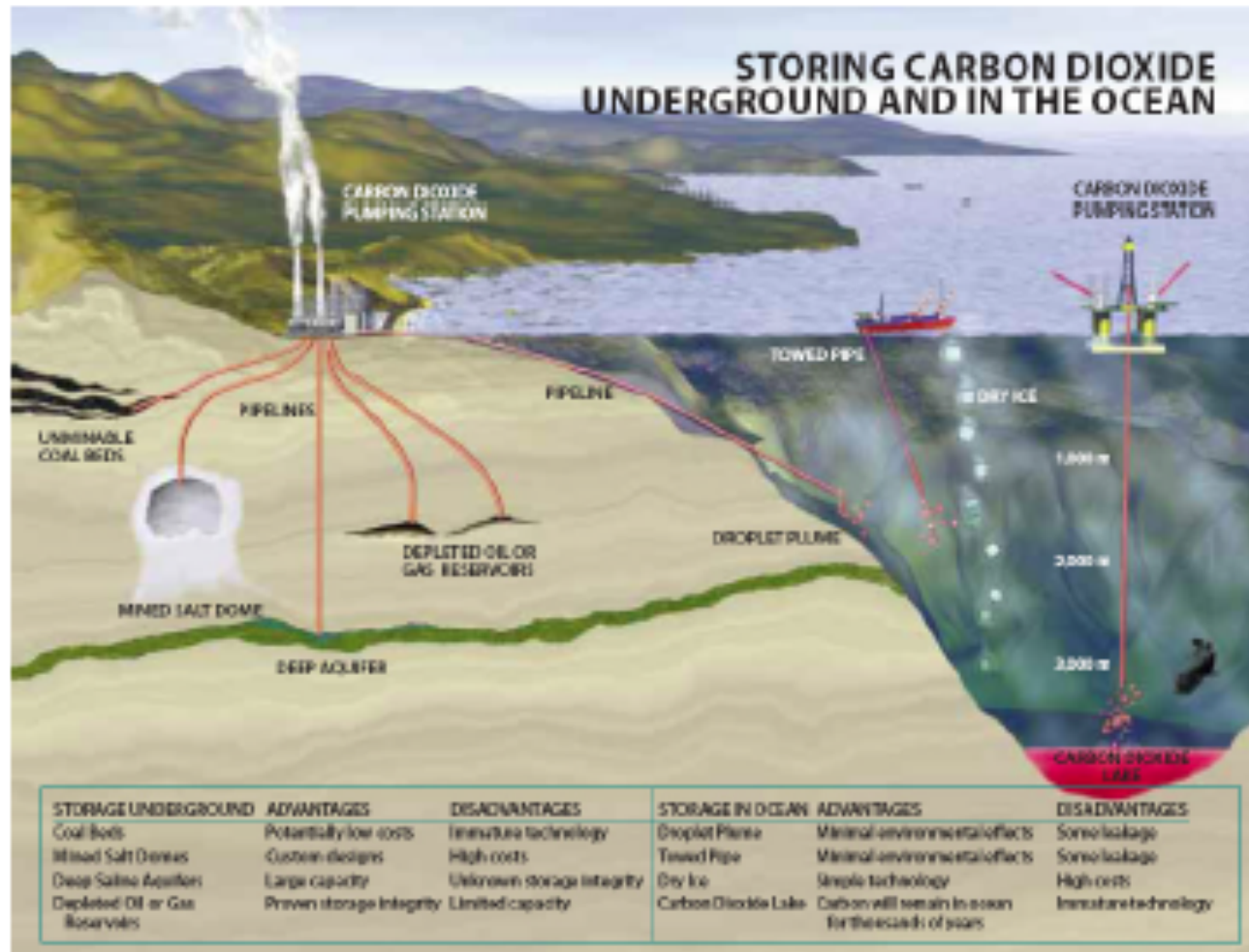
4

## Geo-Engineering





## Where to Place the Sequestered Carbon?



STORAGE SITES for carbon dioxide in the ground and deep sea should help keep the greenhouse gas out of the atmosphere where it

now contributes to climate change. The various options must be scrutinized for cost, safety and potential environmental effects.

## CO<sub>2</sub> Capture and Storage (CCS) Costs:

CCS component	Cost range	
Capture from a power plant	15–75 US\$/tCO <sub>2</sub> net captured	~\$45/ ton
Capture from gas processing or ammonia production	5–55 US\$/tCO <sub>2</sub> net captured	
Capture from other industrial sources	25–115 US\$/tCO <sub>2</sub> net captured	
Transportation	1–8 US\$/tCO <sub>2</sub> transported per 250 km	~\$4.5/ ton
Geological storage	0.5–8 US\$/tCO <sub>2</sub> injected	~\$4.5/ ton
Ocean storage	5–30 US\$/tCO <sub>2</sub> injected	
Mineral carbonation	50–100 US\$/tCO <sub>2</sub> net mineralized	

Cost of capture: ~\$54 / ton CO<sub>2</sub> × 9.1 × 10<sup>9</sup> tons C / yr = \$ 491 billion

Present cost of fossil fuel: \$ 103 / barrel ≈ \$889 / ton

World GDP, 2010: \$ 63.1 trillion      CO<sub>2</sub> capture = 0.8 % of world GDP  
= 6 % of cost, barrel of oil



Ross & Tim  
back of the  
envelope  
analysis



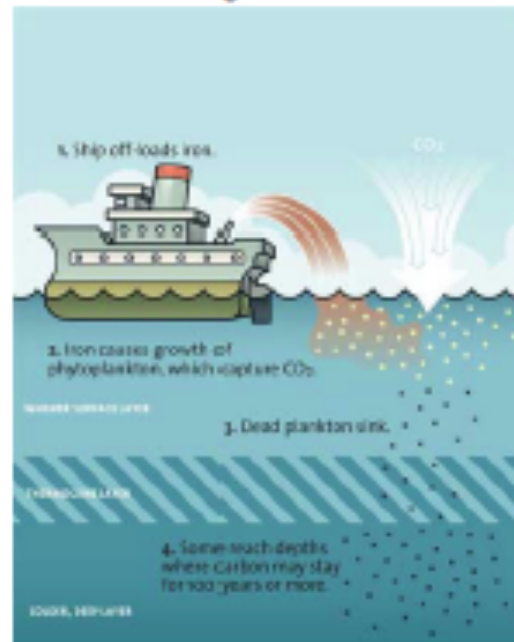
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

Carbon Dioxide Capture and Storage



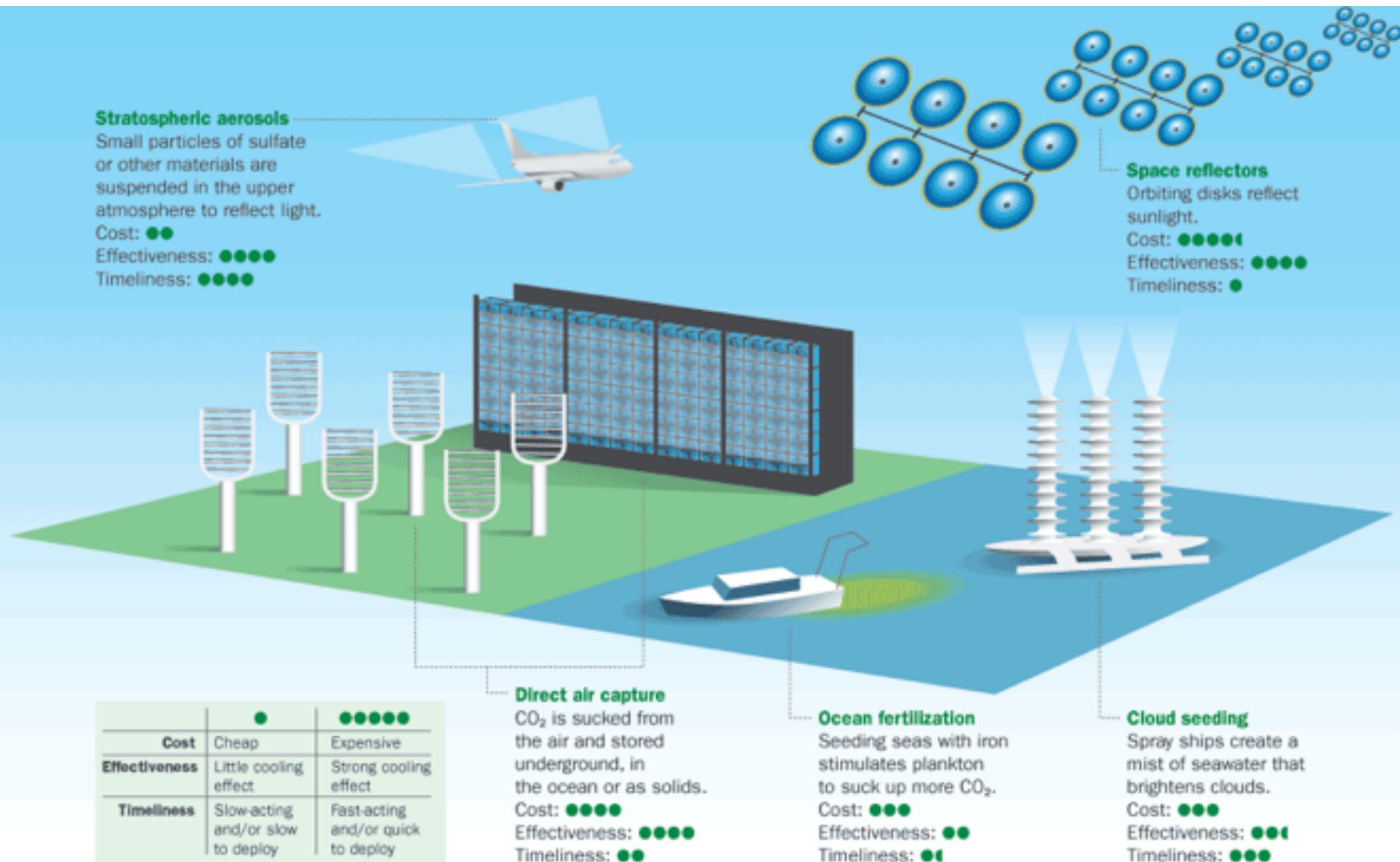
## Sequestration of CO<sub>2</sub> from the Atmosphere: Oceanic Biology

- Iron's importance to phytoplankton growth and photosynthesis in the ocean dates back to the 1930s, when English biologist Joseph Hart speculated that the ocean's great "desolate zones" (areas apparently rich in nutrients, but lacking in plankton activity or other sea life) might be due to an iron deficiency
- This observation has led to speculation by numerous scientists that "tanker loads" of iron powder, deposited in the right place and time, would increase oceanic dissolved iron content enough to turn these "desolate regions" into oceanic biological havens



# Global Warming – What Can Be Done?

8



**Five ways to save the planet** The United Kingdom's Royal Society has rated geoengineering techniques according to cost, effectiveness (cooling power) and timeliness (considering both how quickly a technology could be deployed and how fast it would cause cooling).



## Gloom & Doom of Climate Change

- sea level rise, drought, floods, severe weather, disease

## What Can Be Done?

- change behavior
- geo-engineering

## Gloom & Doom of Climate Change

- sea level rise, drought, floods, severe weather, disease

## What Can Be Done?

- change behavior
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# Project Topics

## **Global Warming**

Insect-Borne Infectious Diseases  
Declining Winter Sports  
Recreation Changes  
Heat Waves  
Energy Demands

## **Sea Level Rise**

Beach Replenishment  
National Flood Insurance Program  
Business & Gov't Infrastructure

## **Extreme Weather**

Beach Replenishment  
National Flood Insurance Program  
Drought/Floods/Tornados/Hurricanes

## **Corporate Globalization**

Aquaculture?

## **Ecosystem Disruption**

Insect-Borne Infectious Diseases  
Invasive Species  
Fish & Shellfish  
Maple Syrup

## **Societal Institutions**

Economy  
Education  
Family  
Government/Politics  
Religion

## **Geography**

Rhode Island  
New England  
East Coast  
U.S.  
Global