

The Climate Change Puzzle

Placing pieces into
the picture



To help figure out the bigger picture consider the following 8 Questions



1. Is the climate radically changing
2. Does human activity affect the climate
3. Are we well informed about these influences
4. Are greenhouse gas emissions the only connection
5. How many human activities affect the climate
6. When we clearly understand how human activity affects the climate, do we have some solutions
7. Can we collectively make any difference
8. Will we make all of the necessary changes

Short answer

Yes

Yes

No

No

8 +

Yes

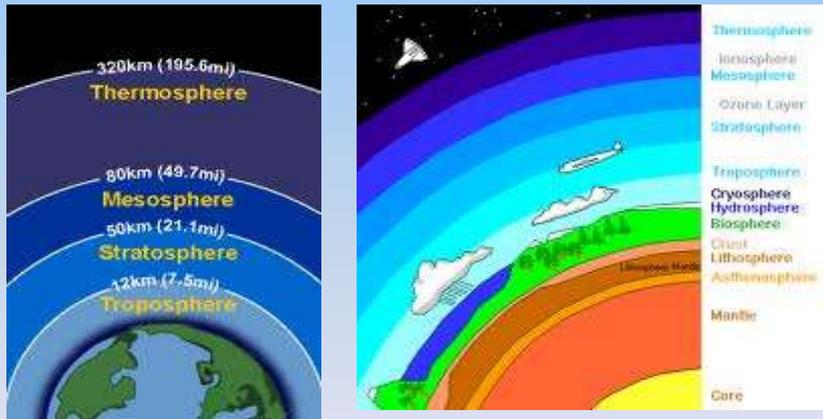
Yes

No

Why is the climate debate so perplexing ?

It's a matter of scale

Traditional graphic images of send a very distorted perspective of the volume of the earth's atmosphere



This graphic is a depiction of the proportion of the earth's atmosphere, relative to the size of the earth

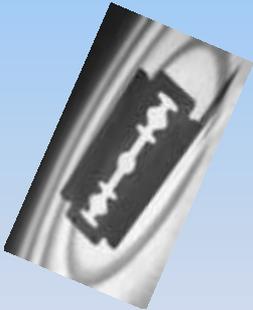
This is the total volume of earth's atmosphere, relative to the volume of the earth. The proportion of the atmosphere we live in is much smaller.



SCIENCEPHOTOLIBRARY

This view from space shows the entire depth of the atmosphere as a thin haze

The portion of the atmosphere that we live in and affect is razor thin from this altitude



This blue line represents the 12,750 kilometer diameter of earth



This thin line represents the 2 kilometres of atmosphere where most people on earth live

Natural forces have affected the climate for millennia.
How could human activity influence the climate on our planet ?

Let's look at this thin line as the atmosphere and some of the influences on the climate



Some of the natural influences on our climate



Sun and solar radiation



Orbit variations



Water, oceans



Vegetation, plants

Geothermal



Eight of the human influences on our climate

- Adding heat and thermal energy
- Transforming hydrologic cycles
- Extracting material from underground
- Causing atmospheric dimming
- Changing the land
- Modifying water
- Adapting vegetation
- Altering the atmosphere



Human influences on our climate

A few examples of human generated heat



1,000 barrels of oil per second

development

energy



coal and natural gas



nuclear

industry



transportation



fire

fry an egg on hot pavement



Human activity changes the earth's hydrologic cycles, causing extremes of heat, cold, drought, and excessive precipitation

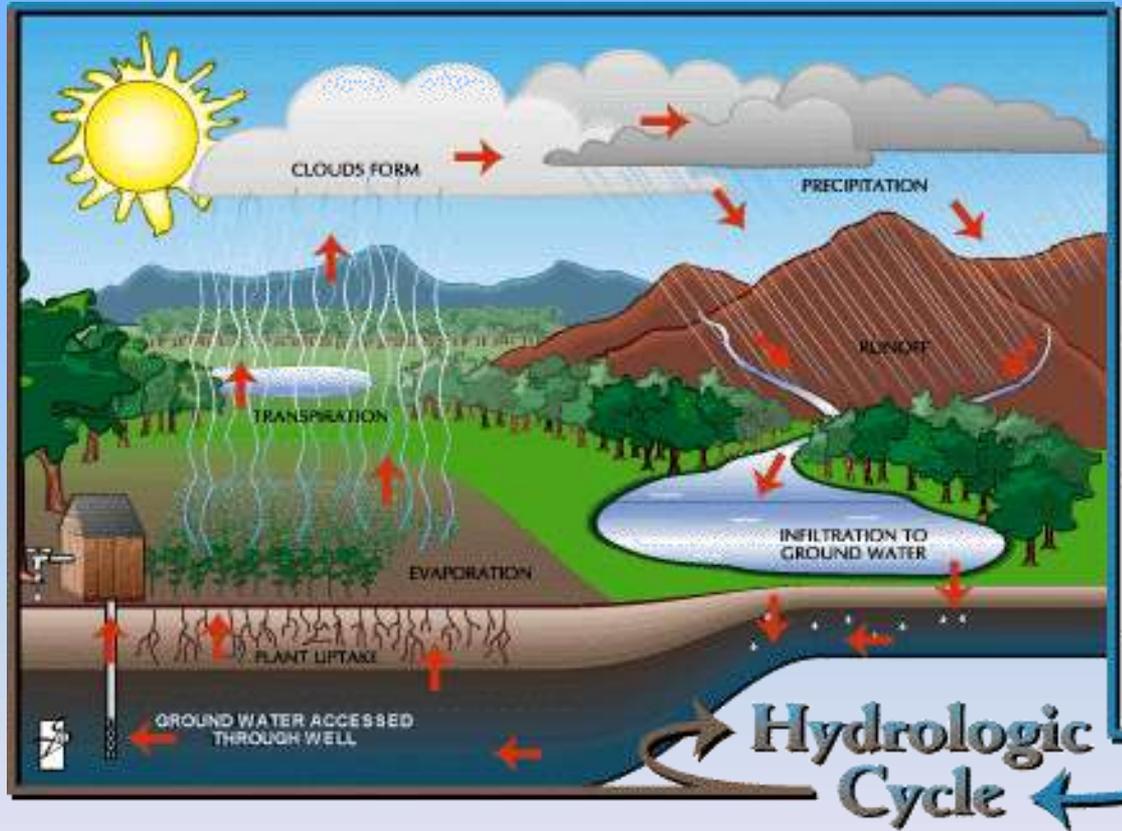
Water as a gas;
Humidity cloud

Water H₂O as a liquid:
*Rain dew stream
ground-water river
lake sea ocean*

Water as a solid:
Snow ice

**T
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An immense amount of thermal energy is transported throughout the hydrologic cycle

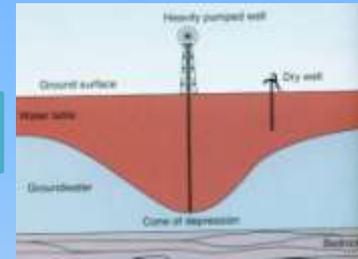
Some of the human activities that affect the hydrologic cycle



Draining water



Pumping water



Removing trees



Altering land



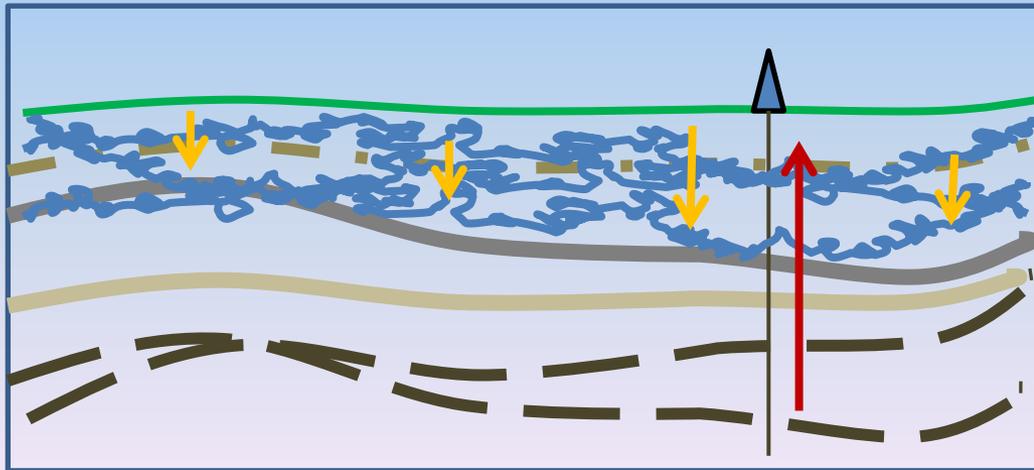
How does the extraction of water, oil and gas affect the climate?



Well This is the first clue

When you suck something from the bottom of a barrel, it lowers the level of the material at the top?

As water, oil / gas is extracted from deep underground, the groundwater levels near the surface decline over time.



Why will extreme climatic events become more frequent?

As groundwater or oil and gas is pumped from wells, and surface water is diverted or drained from the land (dewatering), areas of the earth become arid and dry. Lowering water tables causes the trees and lush succulent vegetation to die off, this in turn results in a reduced evapotranspiration and a diminishing hydrologic cycle.



The amount of succulent vegetation declines as water levels go down



The amount of clouds diminishes as the hydrologic cycle is reduced



The land is drained and wells are drilled deeper to reach the groundwater or oil

The water table declines as the water in the aquifer is used faster than the recharge rate

1860

1880

1900

1920

1940

1960

1980

2000

2020

Timeline

DECLINING HYDROLOGIC CYCLE

- LESS AVAILABLE MOISTURE
- NOMINAL EVAPOTRANSPIRATION
- NOT AS MUCH PRECIPITATION
- Results in:
- EVEN LESS AVAILABLE MOISTURE
- MINIMAL EVAPOTRANSPIRATION
- NO PRECIPITATION



LESS:

CLOUDS

RAIN

STREAMS

FISH

PLANTS

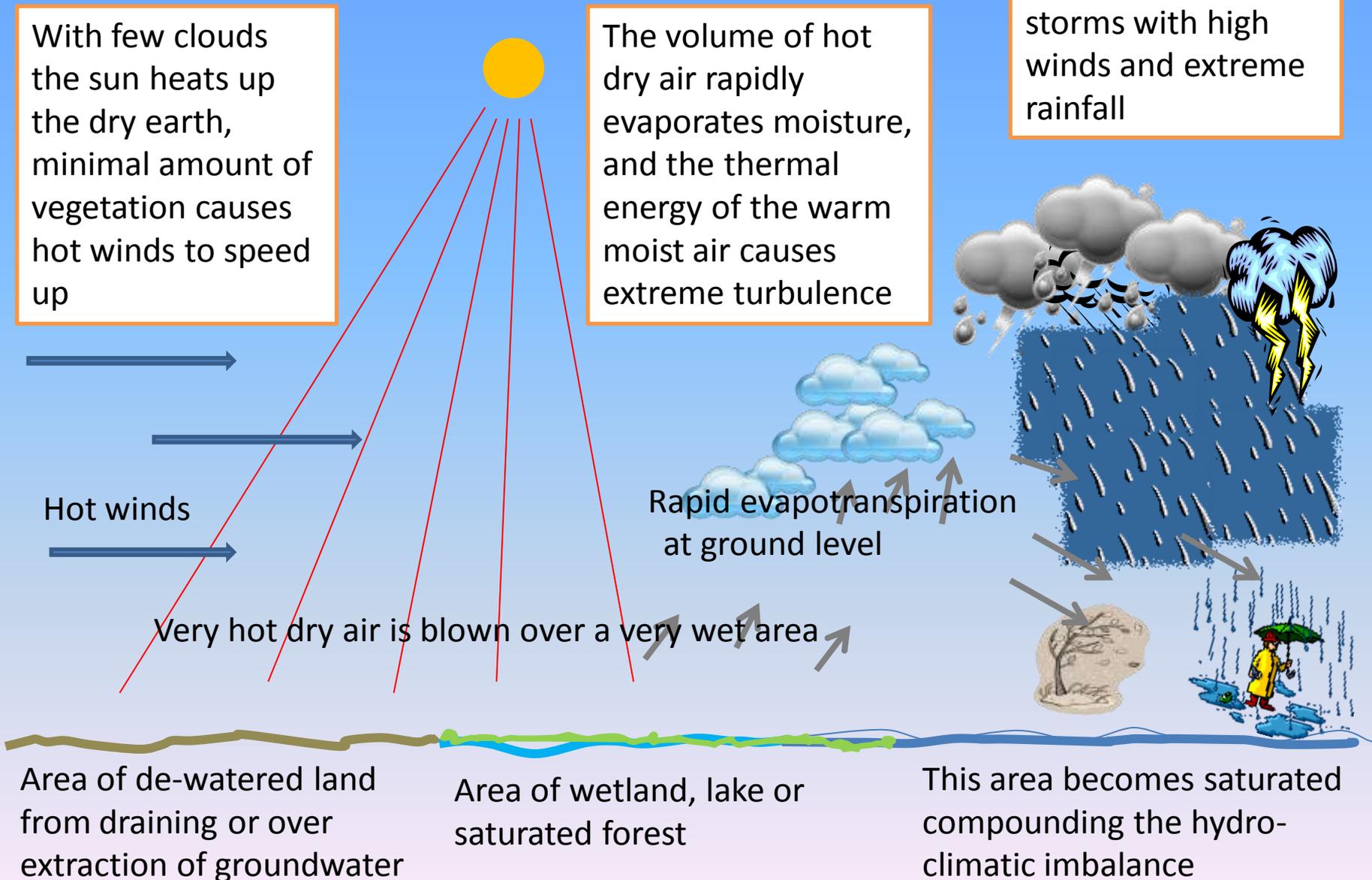
TREES

The compounding effects of de-watering the land causes more extreme climatic conditions

With few clouds the sun heats up the dry earth, minimal amount of vegetation causes hot winds to speed up

The volume of hot dry air rapidly evaporates moisture, and the thermal energy of the warm moist air causes extreme turbulence

Localised intense storms with high winds and extreme rainfall



Area of de-watered land from draining or over extraction of groundwater

Area of wetland, lake or saturated forest

This area becomes saturated compounding the hydro-climatic imbalance

Changing the earth's hydrologic balance causes more extreme climatic conditions



Hurricanes



Flooding

Tornadoes



Drought



Super storms



Atmospheric dimming



A reduction of sunlight reaching the earth's surface can cause cooling and less evapotranspiration

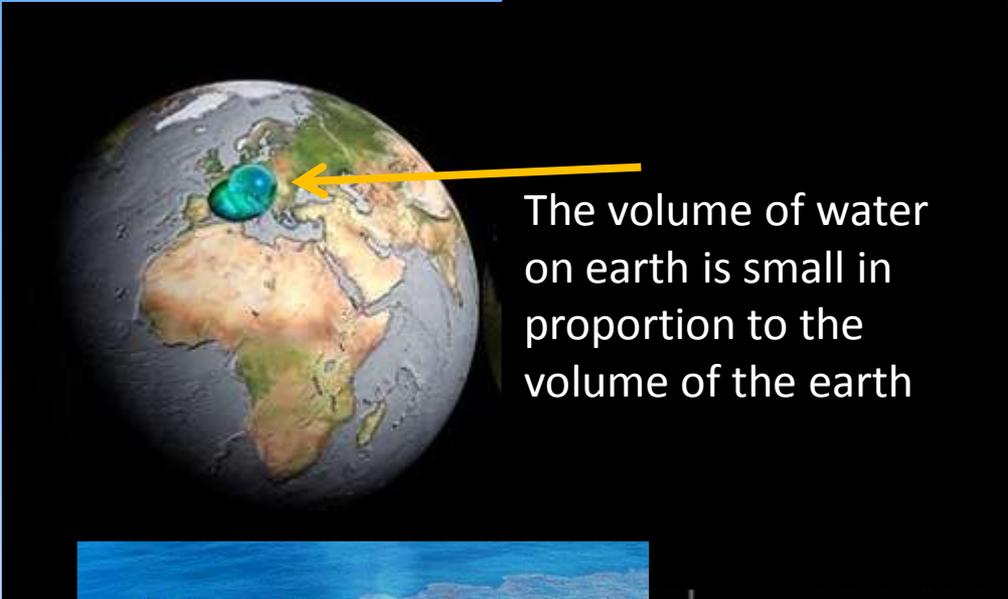
Altering the surface of the land causes climate change.

The compound effects of local land modifications affect the climate on a larger scale



Altering the composition and heating the water on the planet changes the climate

Many human activities affect water chemistry and temperature.



Trees and other plants have an effect on climate, we change the climate when the amount and type of vegetation on the planet is changed .

Plants and particularly trees transpire vast amounts of water into the atmosphere creating humidity, cloud and precipitation.



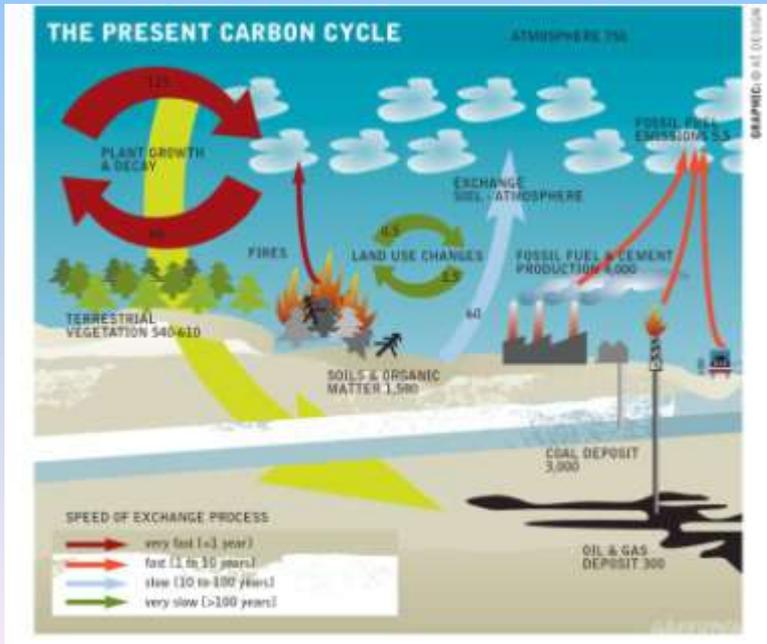
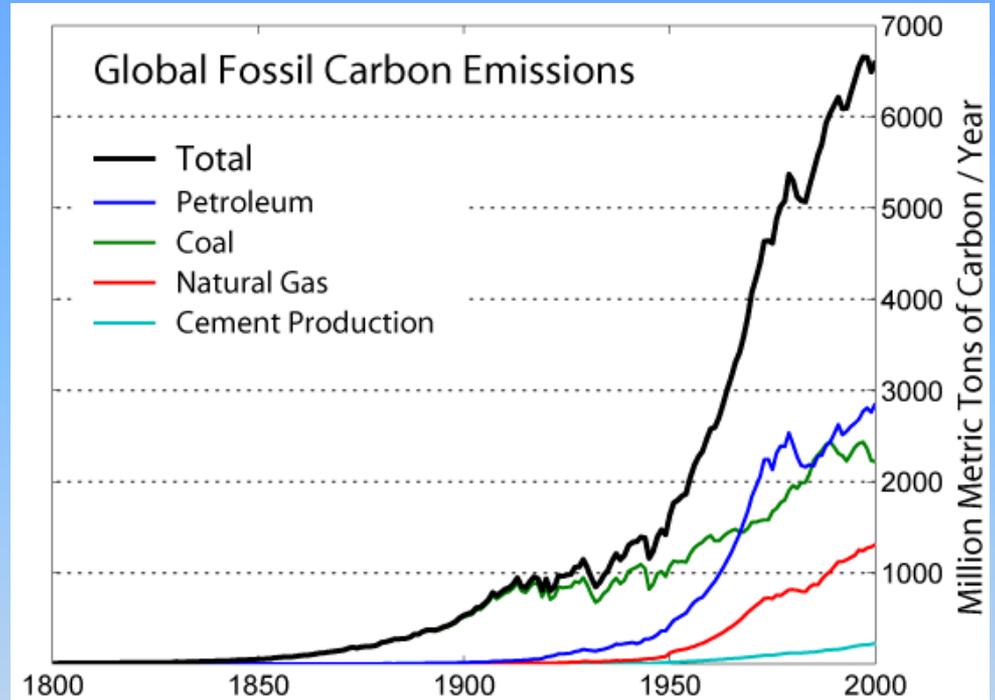
Removing trees also removes clouds and rain



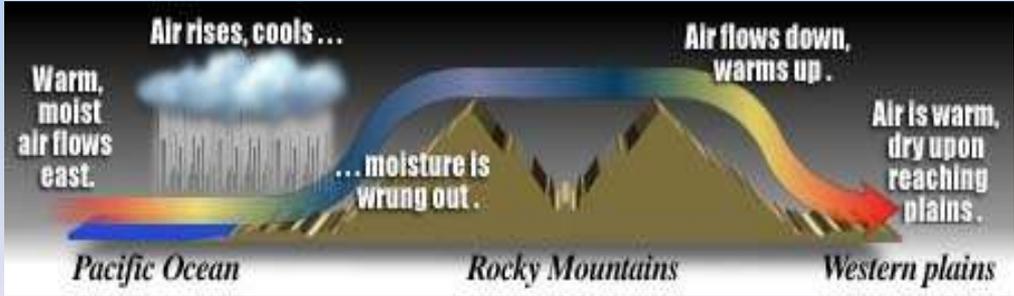
The shade and the cooling effect created by trees has a significant influence on climate.



Altering the composition of the atmosphere



The compounding effects of:
'micro' 'local' 'regional' and 'continental' climate modifications



Climate change actions

Policies



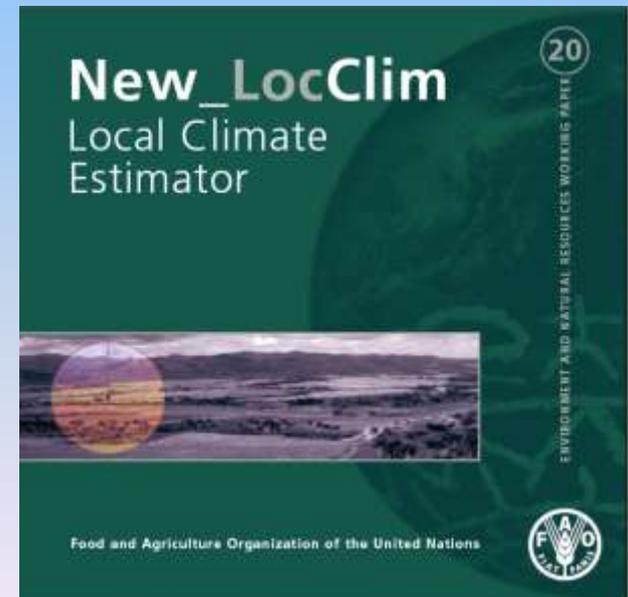
Advocacy



Education



Planning / Action





Thank You

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