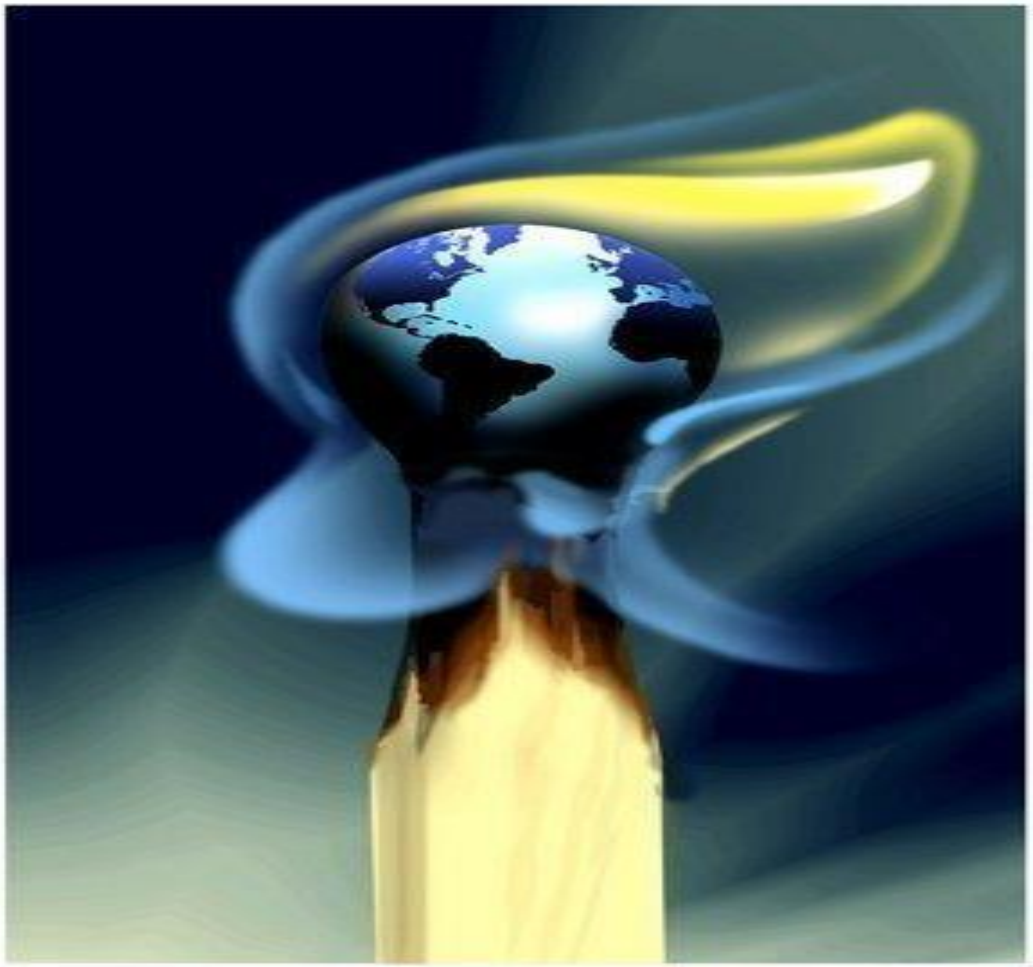
GLOBAL WARMING



Nivedita Kaul
Assistant Professor
Dept. of Civil Engineering
MNIT Jaipur

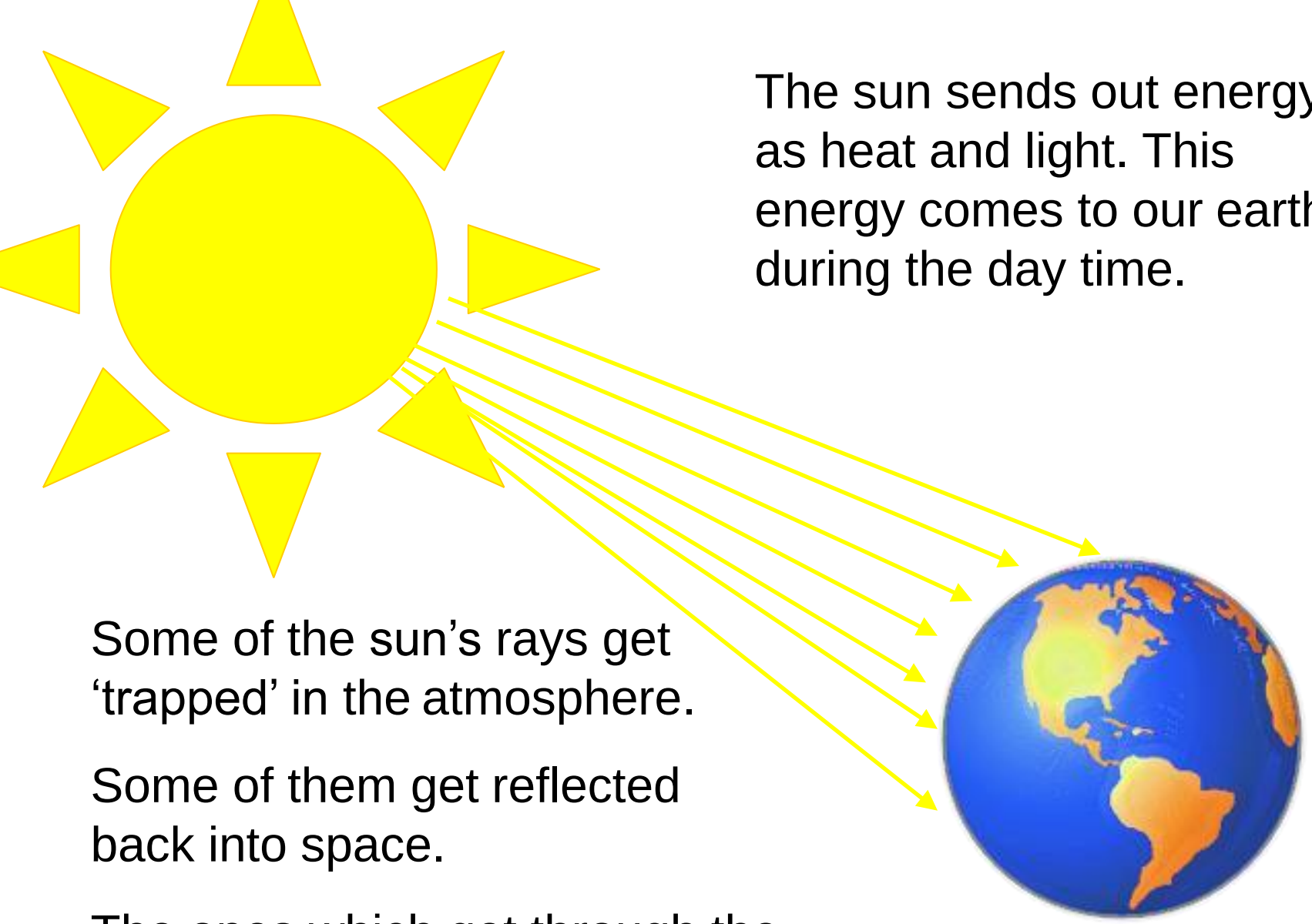
Topics covered

- What is Global Warming
- Causes
- Effects
- Mitigation Measures
- Conclusion

Global Warming:

- The term "global warming" refers
  - to an increase in Earth's mean global temperature
  - because a part of Earth's outgoing infrared radiation is retained by several trace gases in the atmosphere whose concentrations have been increasing because of human industrial, commercial, and agricultural activities.
  - These gases have the ability to absorb radiation, leading to the tendency of the atmosphere to create warmer climates than would otherwise be the case.
  - Most important naturally occurring trace gases –water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3).
  - In addition, there are some industrial gases that are extremely effective absorbers of the radiation. Important among these are chlorofluorocarbons (CFCs),

The sun sends out energy as heat and light. This energy comes to our earth during the day time.

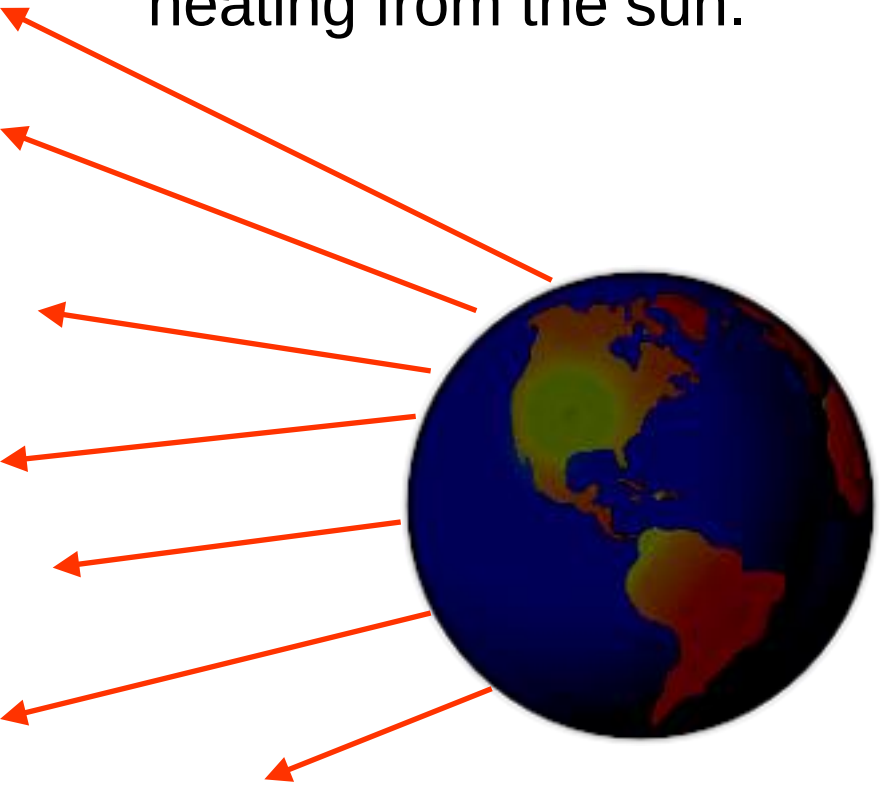


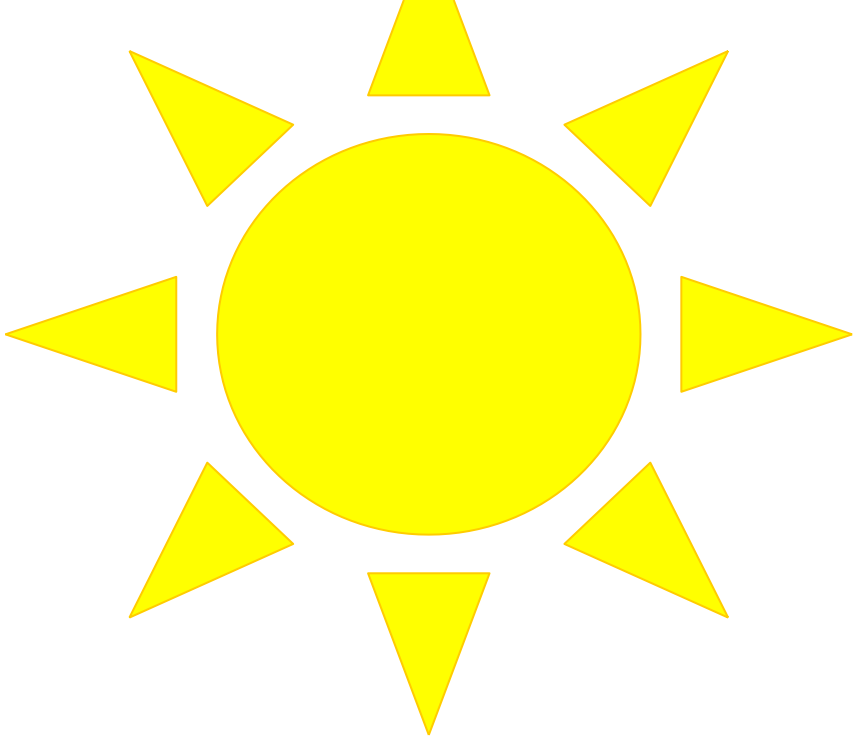
Some of the sun's rays get 'trapped' in the atmosphere.

Some of them get reflected back into space.

The ones which get through the atmosphere warm the earth up.

All the time, the earth radiates heat into space, which cools it down. We only really notice this at night, when there is no heating from the sun.





Some of the heat going out is trapped by the atmosphere. This is what makes our planet warm enough to live on.

But if too much heat is trapped, our planet will warm up and the climate will change.

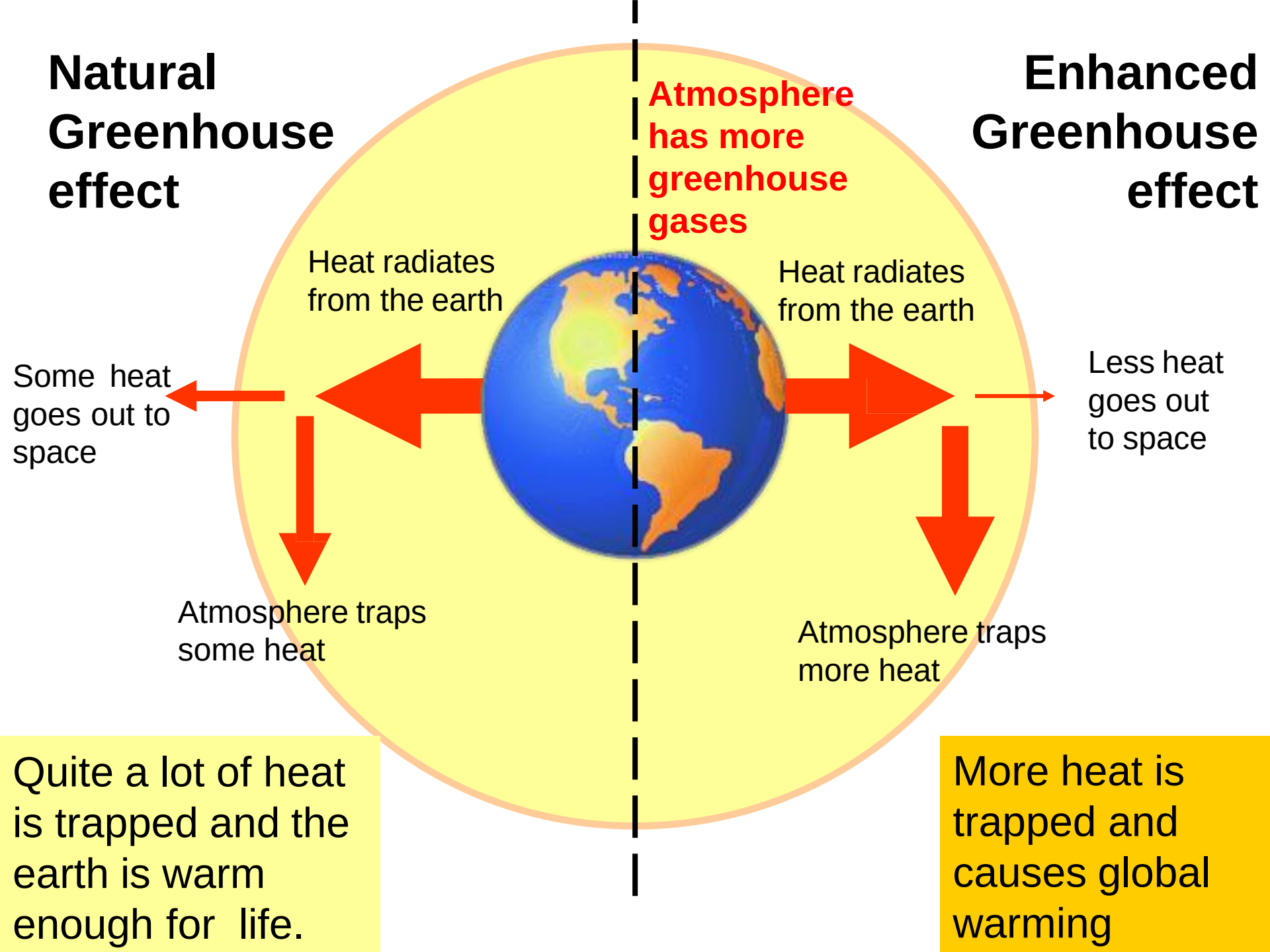
What is the atmosphere and why does it trap heat?

The atmosphere is the air around the surface of the earth. It is made from a mixture of gases. We need it for animals and plants to survive.

Some of the gases act like a blanket, trapping heat. These gases are called **‘greenhouse gases’**.

This is known as the ‘**Natural Greenhouse Effect’.** Without it, the earth would be much colder.

(the atmosphere is really much thinner than it looks above)


Natural Greenhouse effect
Enhanced Greenhouse effect
Atmosphere has more greenhouse gases
Heat radiates from the earth
Heat radiates from the earth
Some heat goes out to space
Less heat goes out to space
Atmosphere traps some heat
Atmosphere traps more heat
Quite a lot of heat is trapped and the earth is warm enough for life.
More heat is trapped and causes global warming

Which gases in the atmosphere trap heat?

The atmosphere is made of 78% Nitrogen and 21% Oxygen. But these gases **don't** trap heat and cause global warming or climate change.

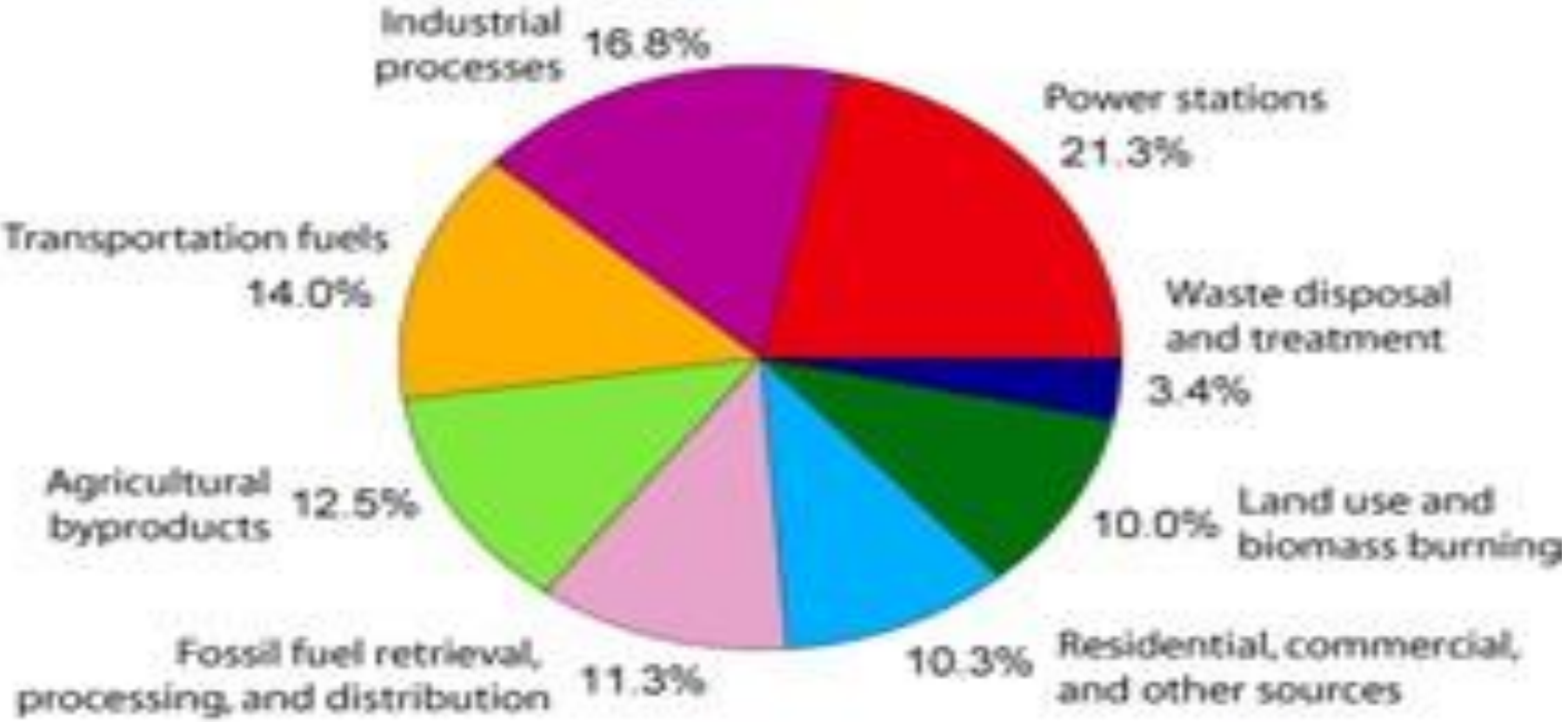
What % of the atmosphere is left?

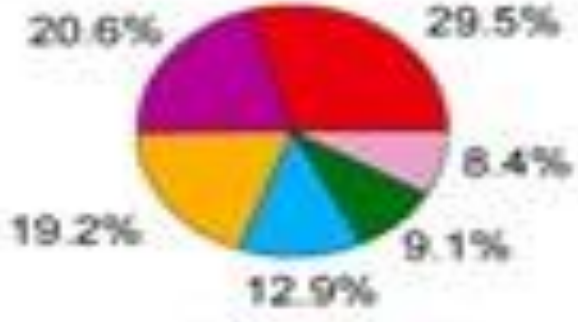
The gases which trap heat make up less than 1% of the atmosphere! They are called the 'greenhouse gases'.

The main greenhouse gases are:
Carbon dioxide
Methane
Nitrous oxide
Ozone
Water vapour

Human activity increases the amount of these gases in the atmosphere

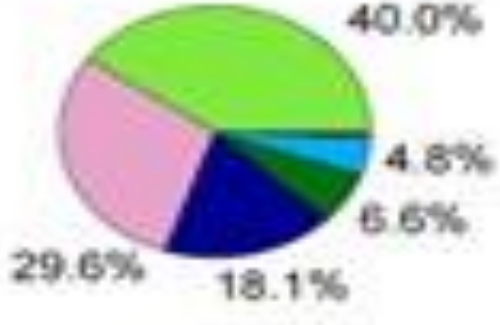
Annual Greenhouse Gas Emissions by Sector





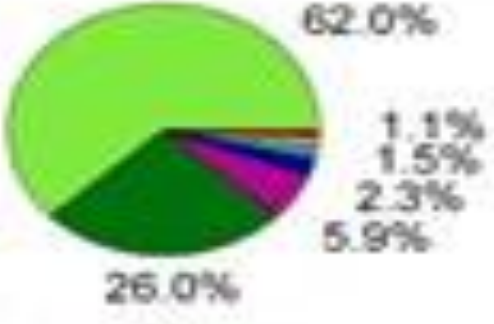
Carbon Dioxide

(72% of total)



Methane

(18% of total)



Nitrous Oxide

(9% of total)

Sources of GHGs

HFC- Freons or Hydrofluorocarbons

PFC - Perfluorocarbons

Carbon Dioxide

Fuels for Energy and Transport, Manufacturing Processes

Nitrous Oxide

Chemical manufacture and agriculture

HFCs

Refrigerants, chemical manufacture, foams & aerosols

PFCs

Aluminium manufacture, electronics manufacture

Methane

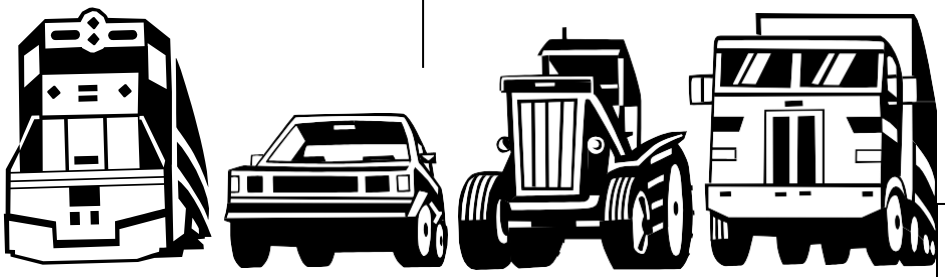
Waste (Landfills, natural activity)

Sulphur hexafluoride

Magnesium smelting, high voltage switchgear, electronics manufacturing

Causes

Burning **fossil fuels** releases the carbon dioxide stored millions of years ago. Most of the increased carbon dioxide comes from fossil fuels



Deforestation releases the carbon stored in trees. Less trees also means less **carbon dioxide** can be removed from the atmosphere.

Global warming potentials of some Greenhouse Gases (source: IPCC, 2007)

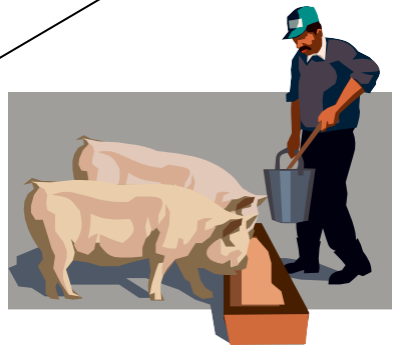
GHG	Global Warming Potential
CO_2	1
CH_4	21
N_2O	310
HFCs	140 – 11,700
PFCs	6,500 – 9,200
SF_6	23,900

Factors used to convert into CO_{2e}

How do humans increase methane levels in the atmosphere?

Methane is produced when bacteria rot **organic matter**

Increased rice growing

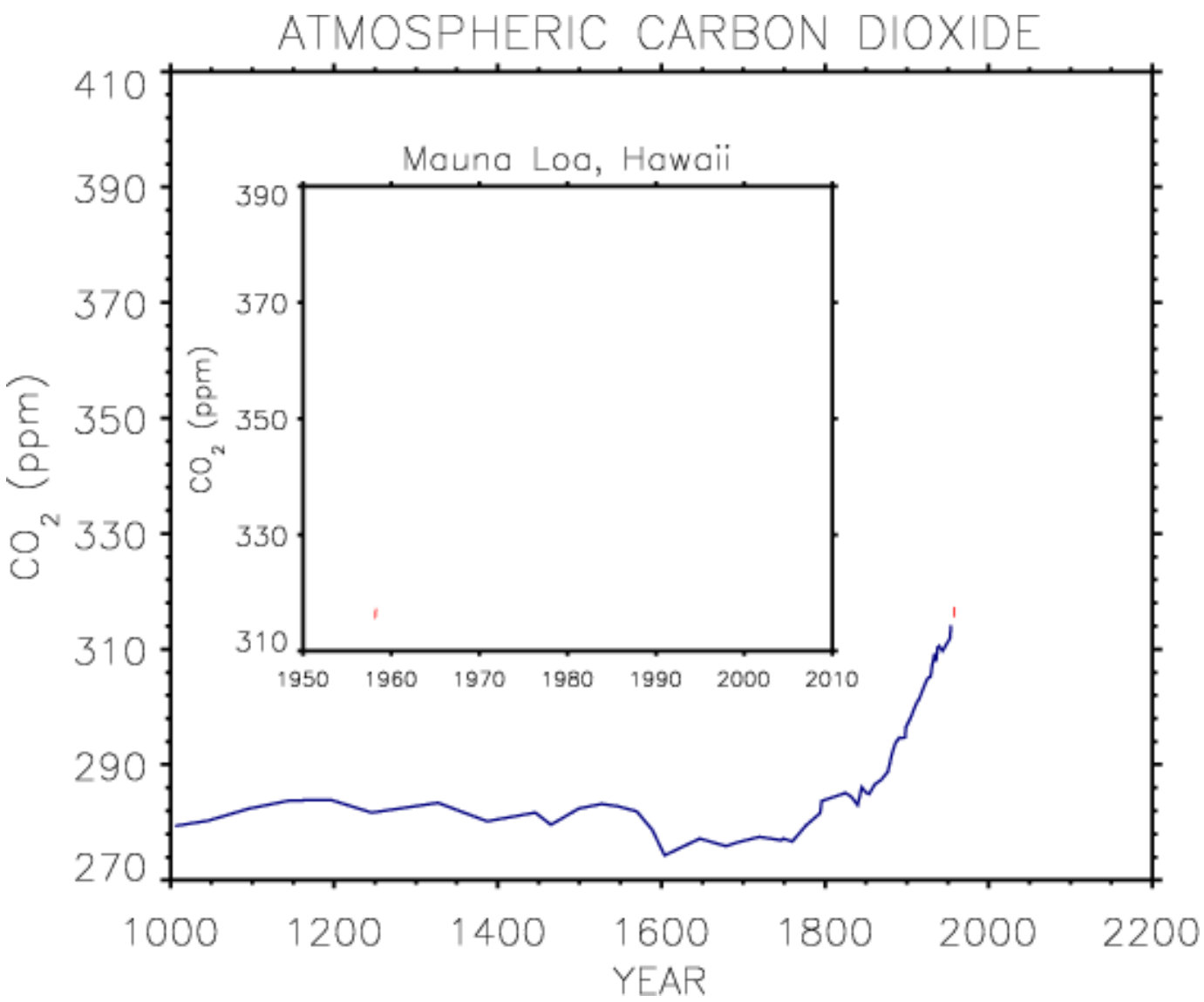


Increased livestock farming

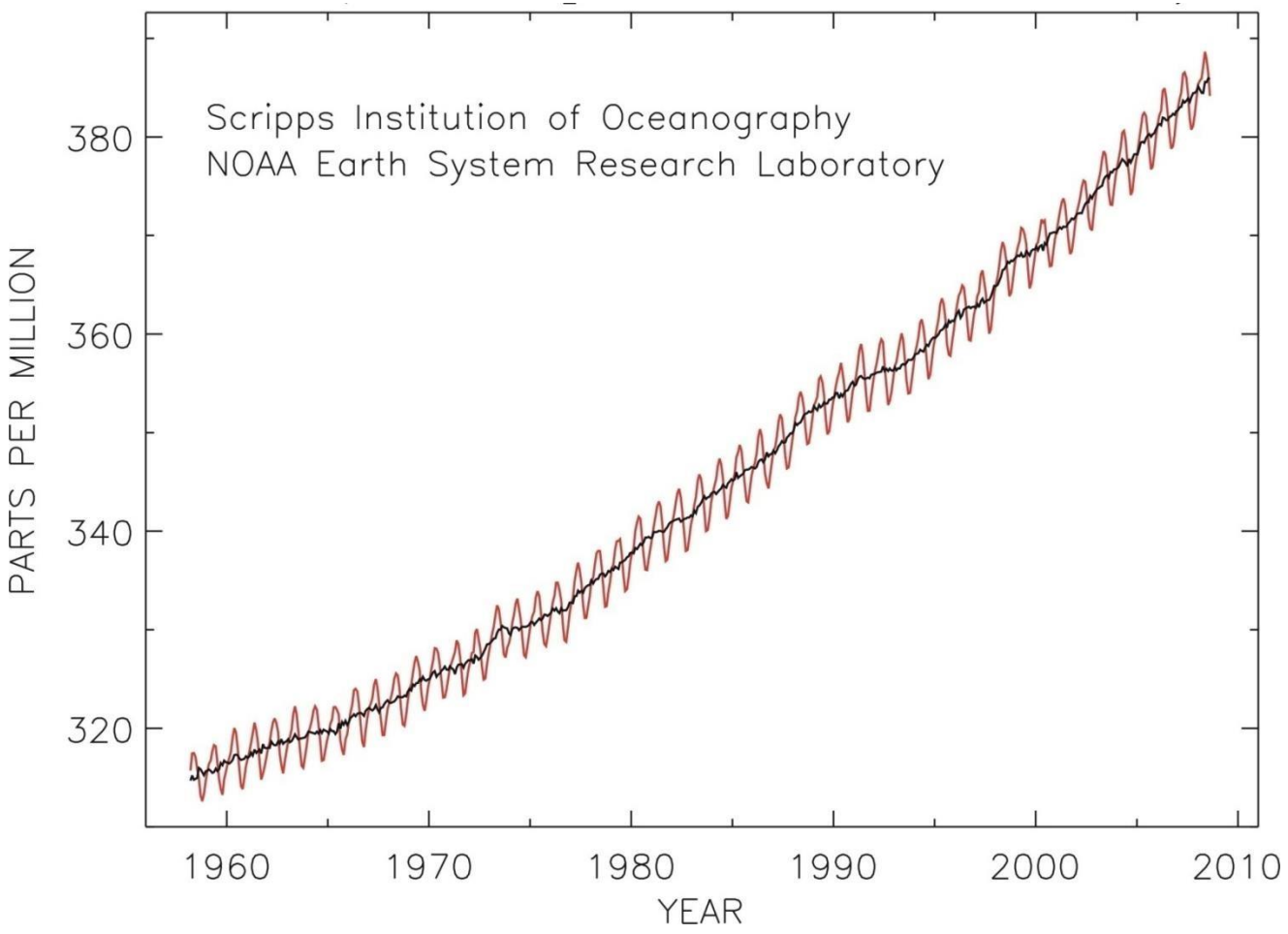
Increased rubbish in landfill

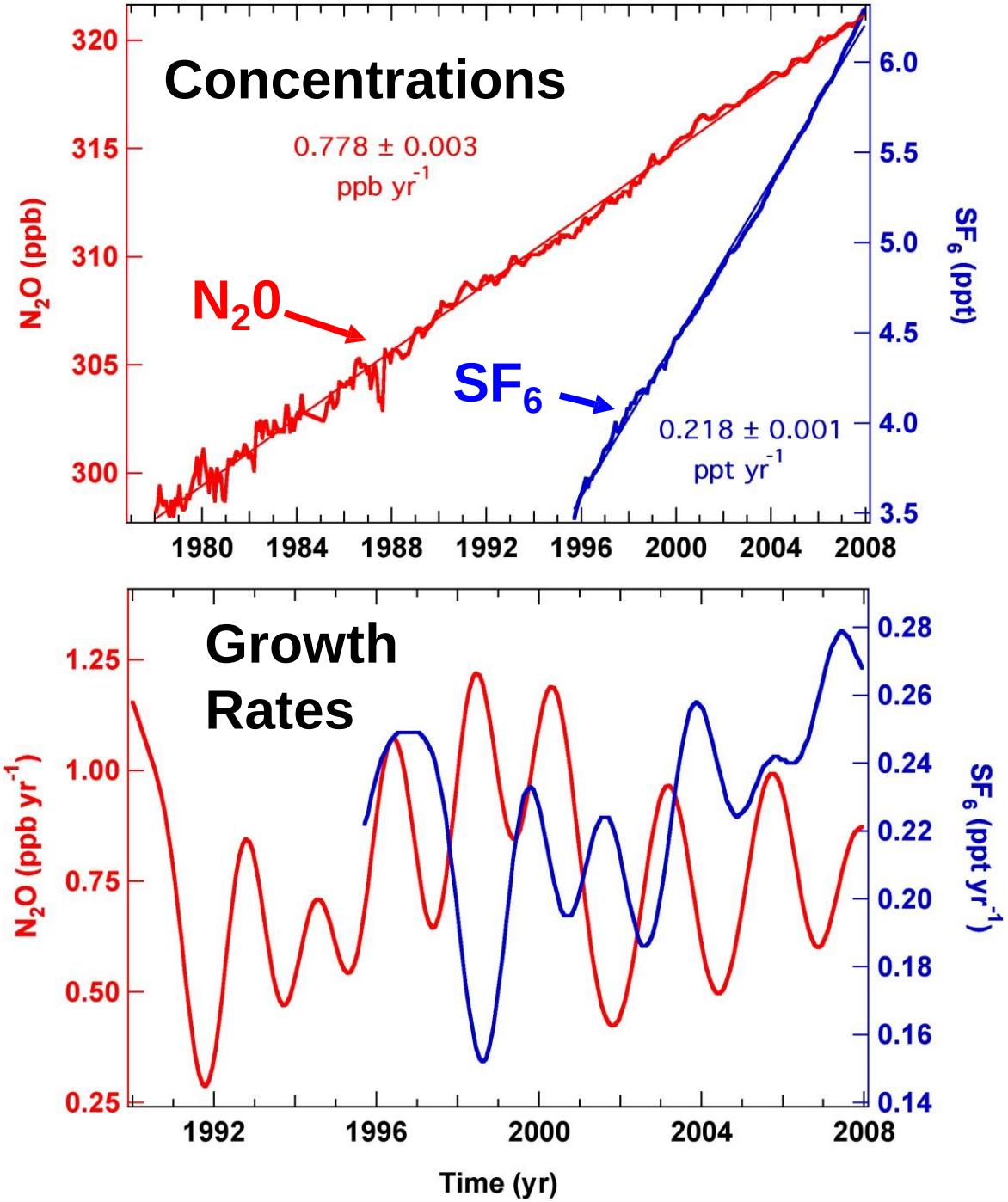
Methane is also released when **fossil fuels are extracted**

The amount of **methane** in the atmosphere has increased by two and a half times since the Industrial Revolution.


ATMOSPHERIC CARBON DIOXIDE
Mauna Loa, Hawaii
CO2 (ppm)
410
390
370
350
330
310
290
270
1000
1200
1400
1600
1800
2000
2200
YEAR
390
370
350
330
310
1950
1960
1970
1980
1990
2000
2010

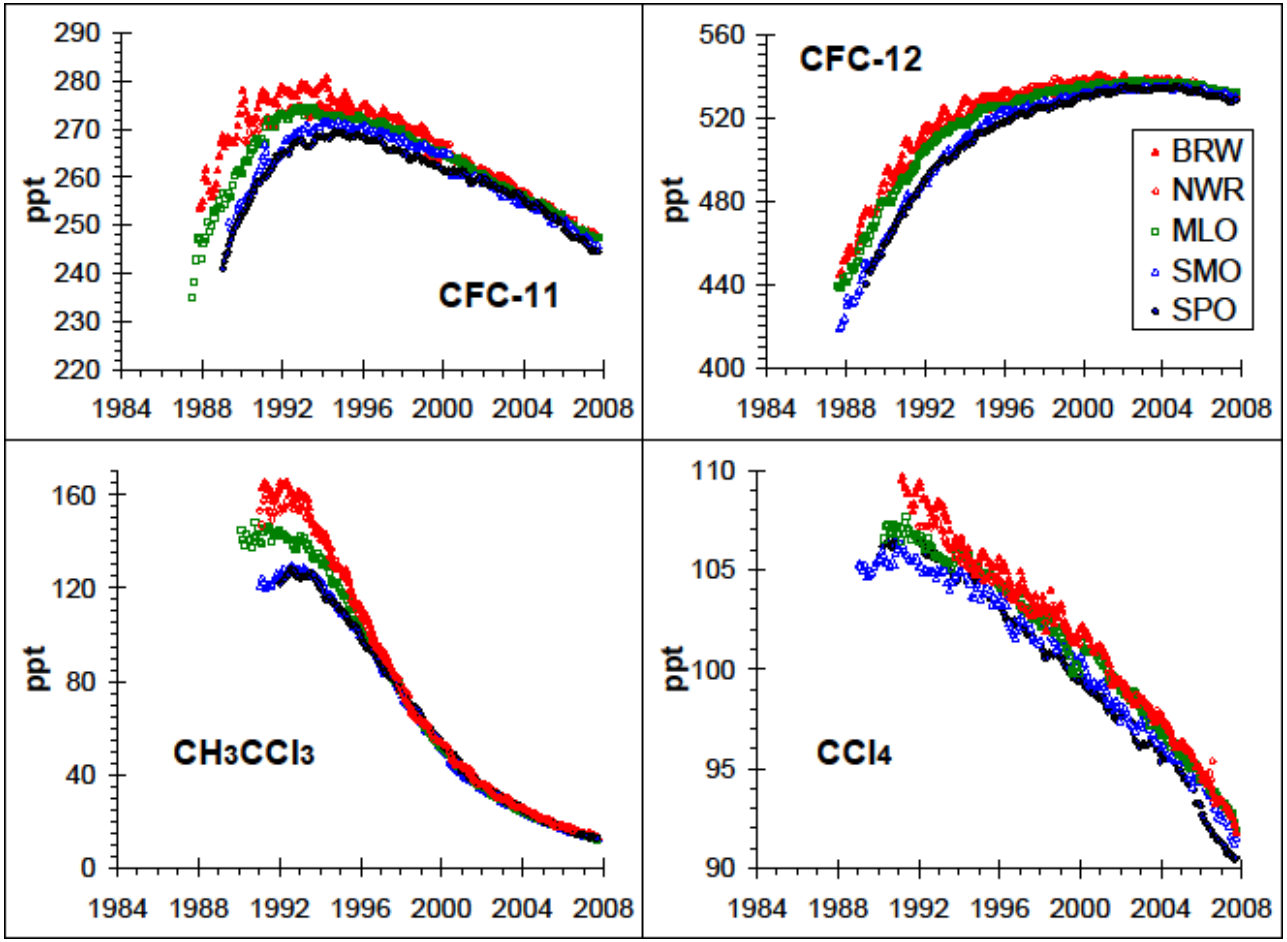
Atmospheric Carbon Dioxide, Mauna Loa, Hawaii

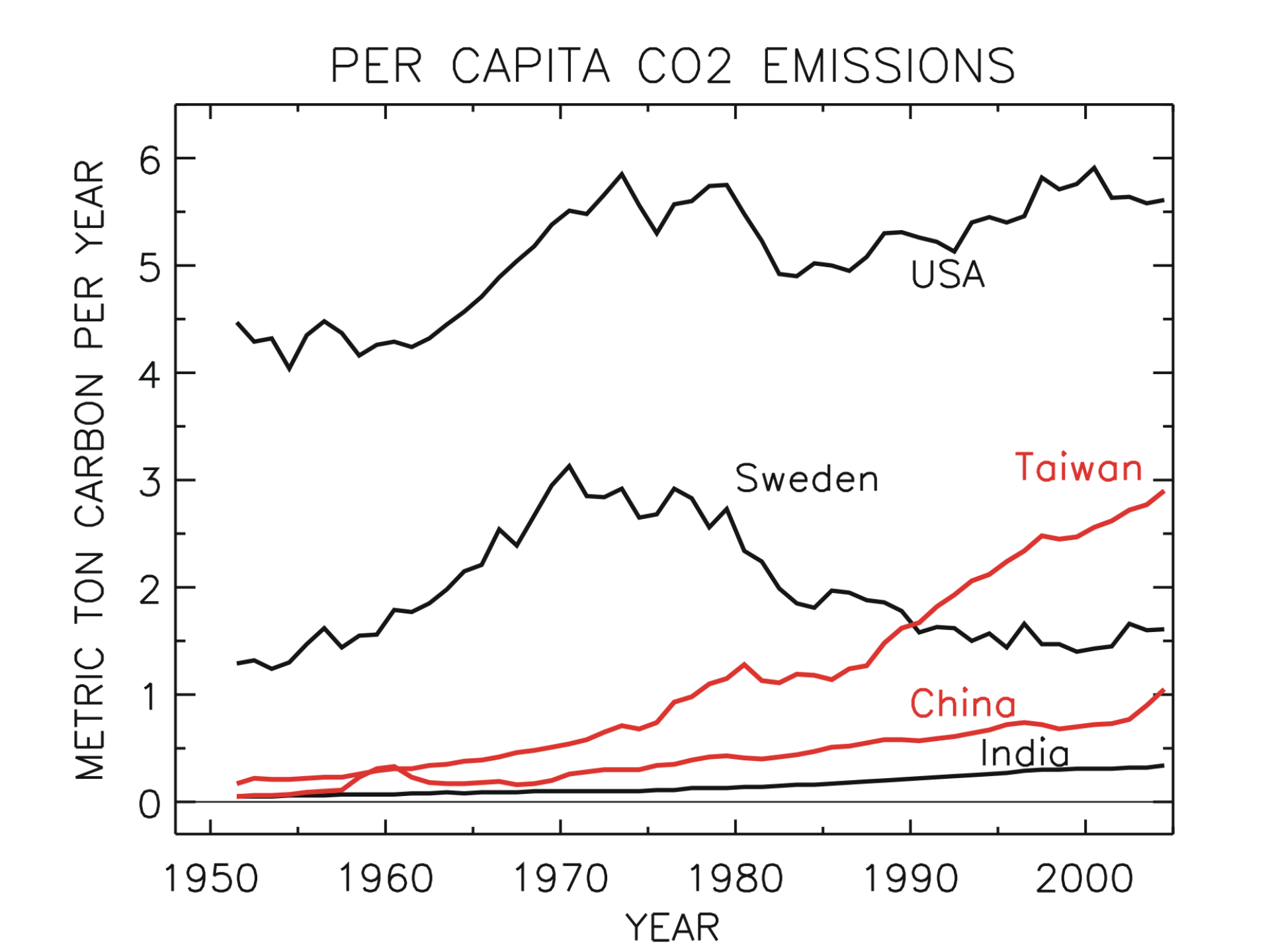




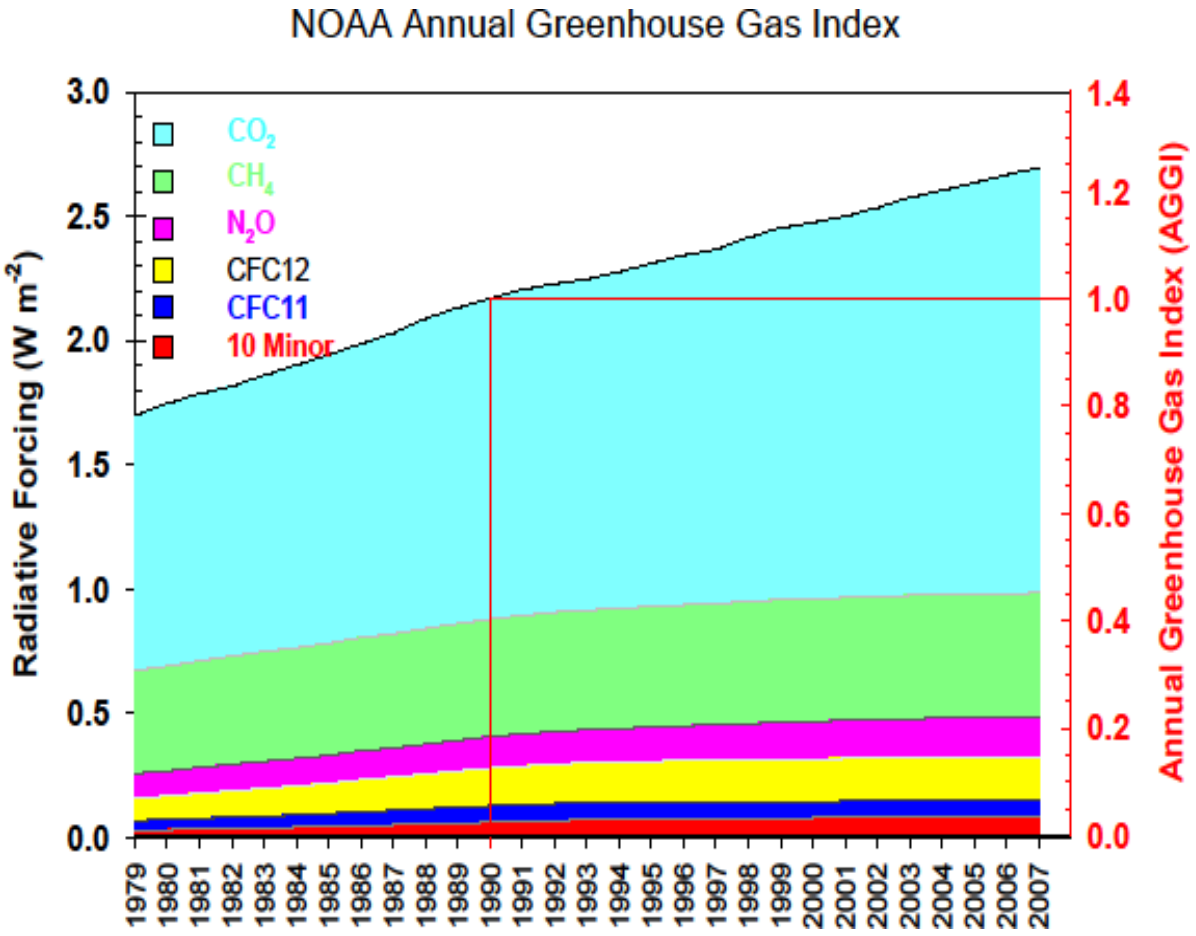
N_20 and SF_6 Important greenhouse gases are steadily increasing.

Global CFC Trends: CFCs Destroy Stratospheric Ozone




PER CAPITA CO2 EMISSIONS
METRIC TON CARBON PER YEAR
0
1
2
3
4
5
6
1950
1960
1970
1980
1990
2000
YEAR
USA
Sweden
Taiwan
China
India

NOAA Greenhouse Gas Index



Effects of global warming

- Melting of glaciers
- Submergence of land
- Environmental refugees
- Relocation of precipitation
- Diseases
- Scarcity of food and water
- Rise in prices
- Survival of fittest

Pictorial Presentation on Effects of Global Warming

Cackling Hatchlings

Aleutian Cackling Geese

Open areas decreased by 34%

Wet areas decreased by 88%

- Loss of habitat
- Effects ecotourism
- Unemployment
- Social problems

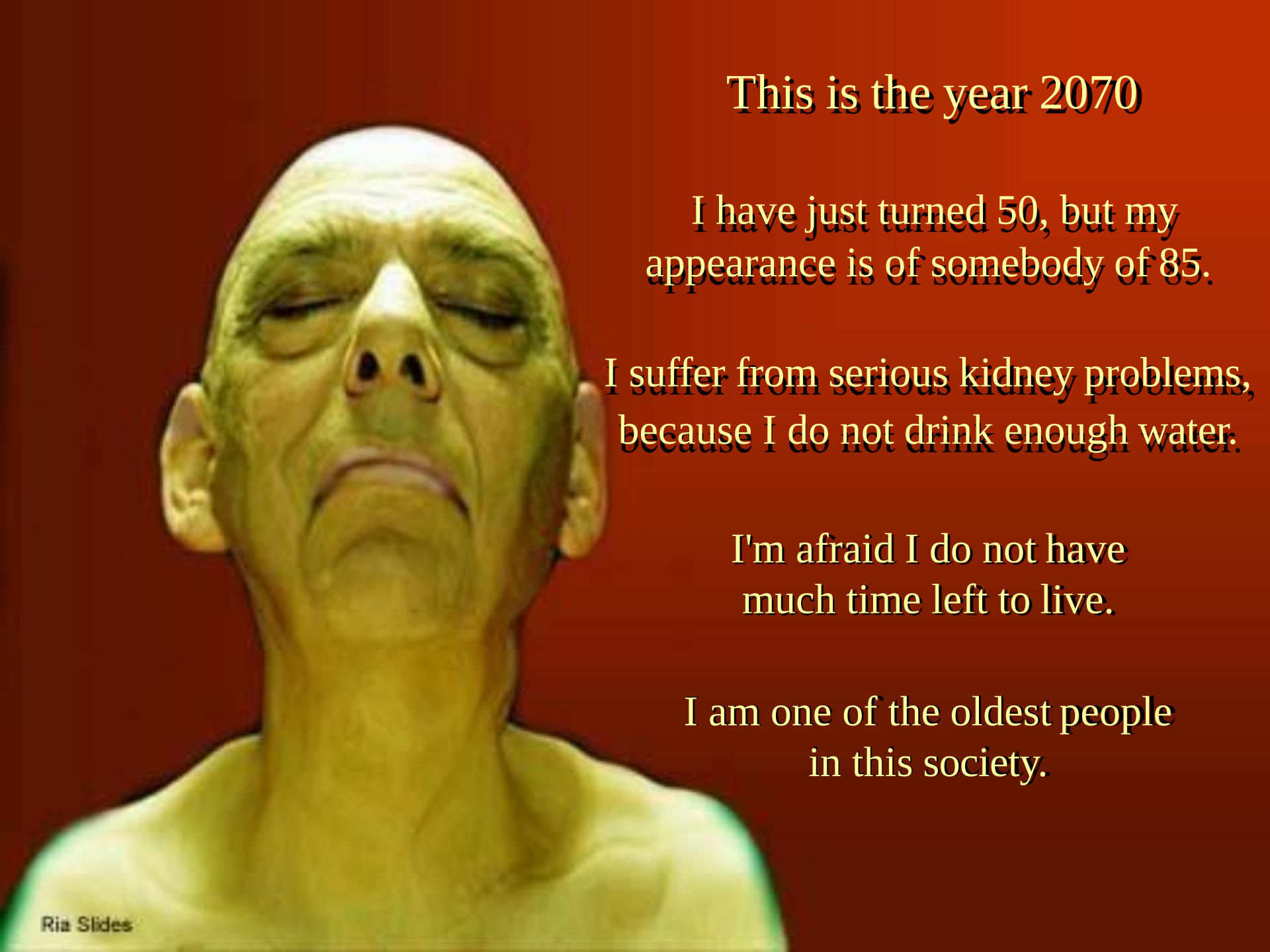
Kyoto Protocol

- The **Kyoto Protocol** is a protocol to the United Nations Framework Convention on Climate Change (UNFCCC or FCCC), aimed at combating global warming.
- The Protocol was initially adopted on 11 December 1997 in Kyoto, Japan and entered into force on 16 February 2005. As of November 2009, **187** states have **signed** and ratified the protocol.
- The most **notable non-member** of the Protocol is the **United States**, which is a signatory of UNFCCC and was responsible for 36.1% of the 1990 emission levels.

Summary of Effects

LETTER WRITTEN IN THE YEAR 2070

Article published in the magazine "Crónicas de los Tiempos“, in April 2002.


This is the year 2070
I have just turned 50, but my appearance is of somebody of 85.
I suffer from serious kidney problems, because I do not drink enough water.
I'm afraid I do not have much time left to live.
I am one of the oldest people in this society.
Ria Slides

I remember when I was a child of 5.

Everything was very different then.

There were lots of trees in the parks, houses with beautiful gardens,
and I could enjoy having a shower for half an hour.
Nowadays we use towels with mineral oil to clean our skin.

Before, women had beautiful hair.

Now, we have to shave our heads to keep them clean without the use of water.

Then, my father washed his car with water coming out of a hosepipe.

Now, my son does not believe that water could be wasted

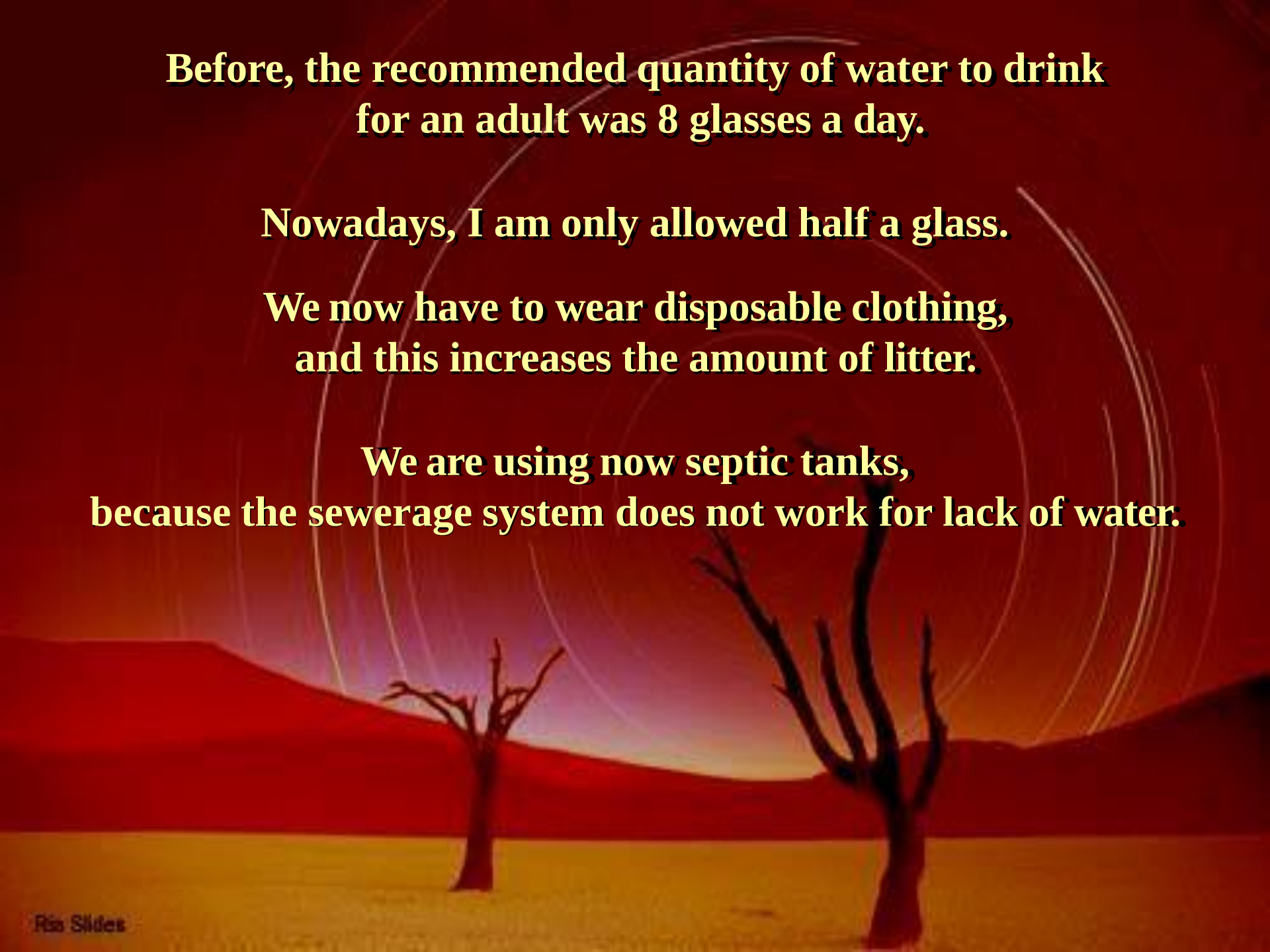
I remember there were
SAVE WATER
warnings on outside posters, radio and TV, but nobody paid attention. We thought that water
was to last forever.

Now, all the rivers, lakes, dams and underground water beds are either dry or contaminated.

Industry came virtually to a standstill and unemployment reached dramatic proportions.
Desalination plants are the main source of employment and workers receive part of their salary in drinkable water.

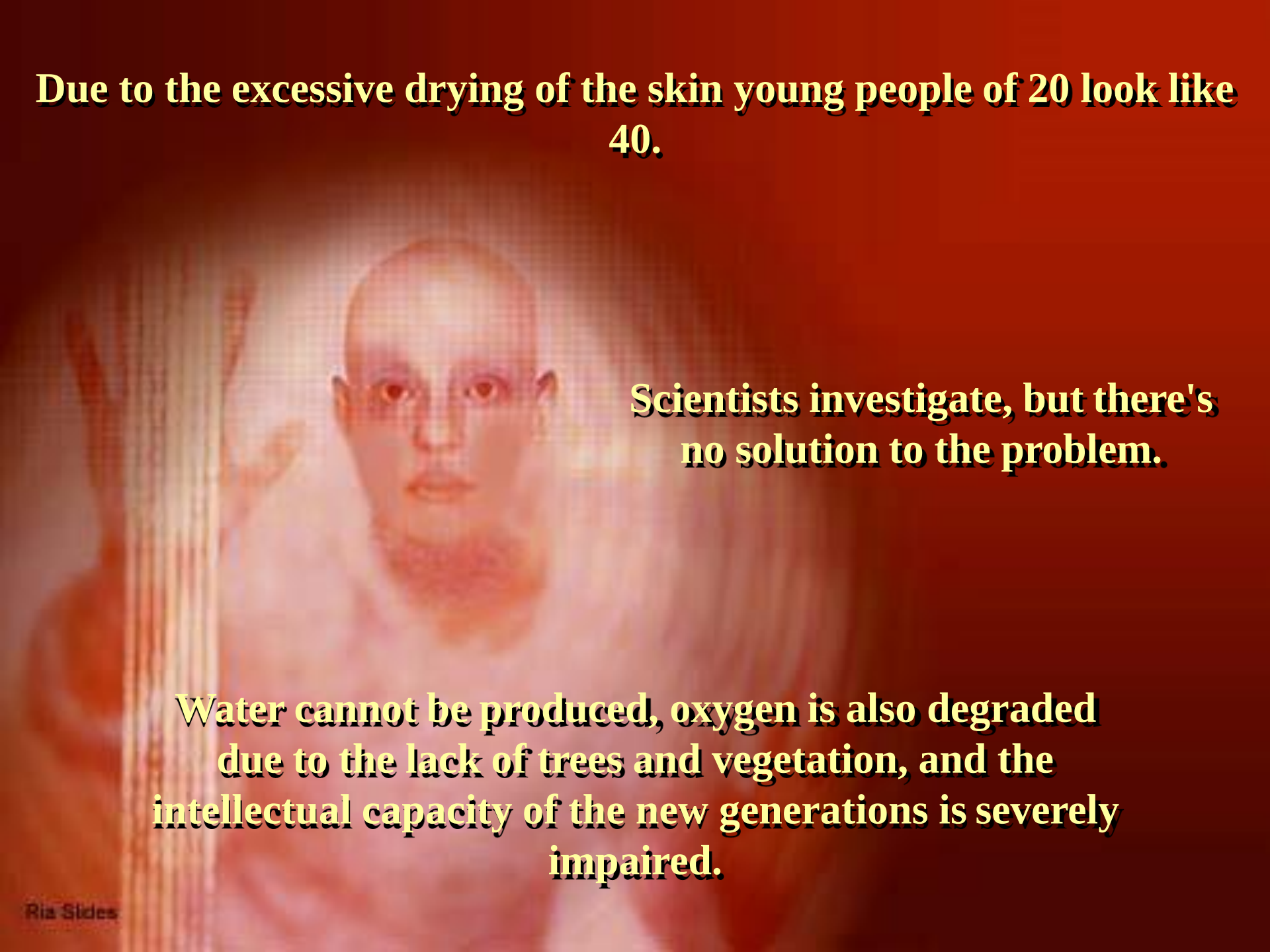
Assaults at gun point on the streets for a jerrycan of water are very common.

Food is 80% synthetic.


Before, the recommended quantity of water to drink
for an adult was 8 glasses a day.
Nowadays, I am only allowed half a glass.
We now have to wear disposable clothing,
and this increases the amount of litter.
We are using now septic tanks,
because the sewerage system does not work for lack of water.
Ris Slides

The outside appearance of the population is horrible: wrinkled, emaciated bodies, due to dehydration, full of sores caused by ultra violet radiation,
now stronger without the protective shield of the ozone layer.
Skin cancer, gastrointestinal infections and of the urinary tracts are the main causes of death.

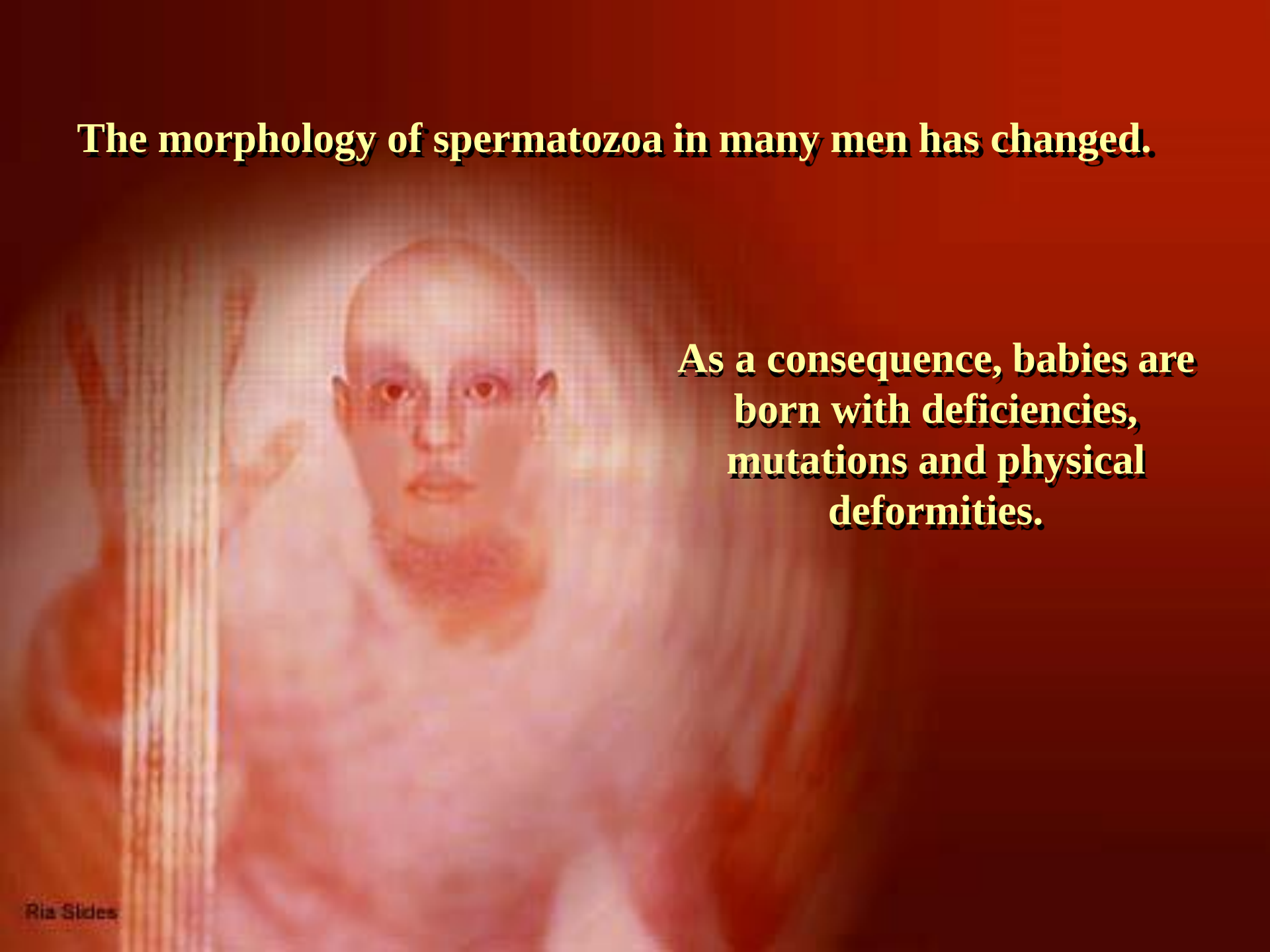
Due to the excessive drying of the skin young people of 20 look like 40.



Scientists investigate, but there's no solution to the problem.

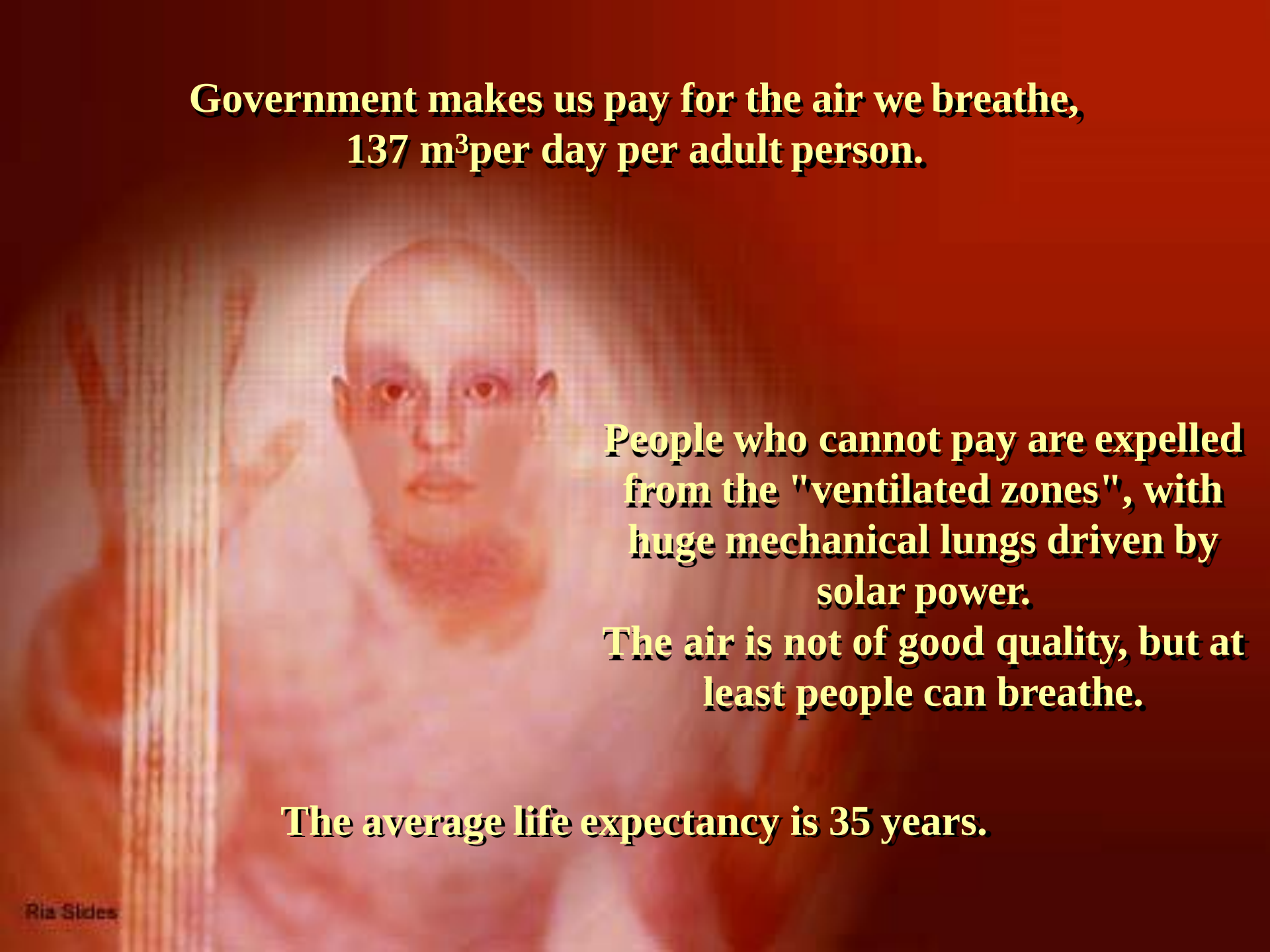
Water cannot be produced, oxygen is also degraded due to the lack of trees and vegetation, and the intellectual capacity of the new generations is severely impaired.

The morphology of spermatozoa in many men has changed.



As a consequence, babies are born with deficiencies, mutations and physical deformities.

Ria Slides


Government makes us pay for the air we breathe,
137 m³per day per adult person.
People who cannot pay are expelled from the "ventilated zones", with huge mechanical lungs driven by solar power.
The air is not of good quality, but at least people can breathe.
The average life expectancy is 35 years.
Ria Sides

In some countries, where there are still some green zones crossed by rivers, these are guarded by heavy armed soldiers.

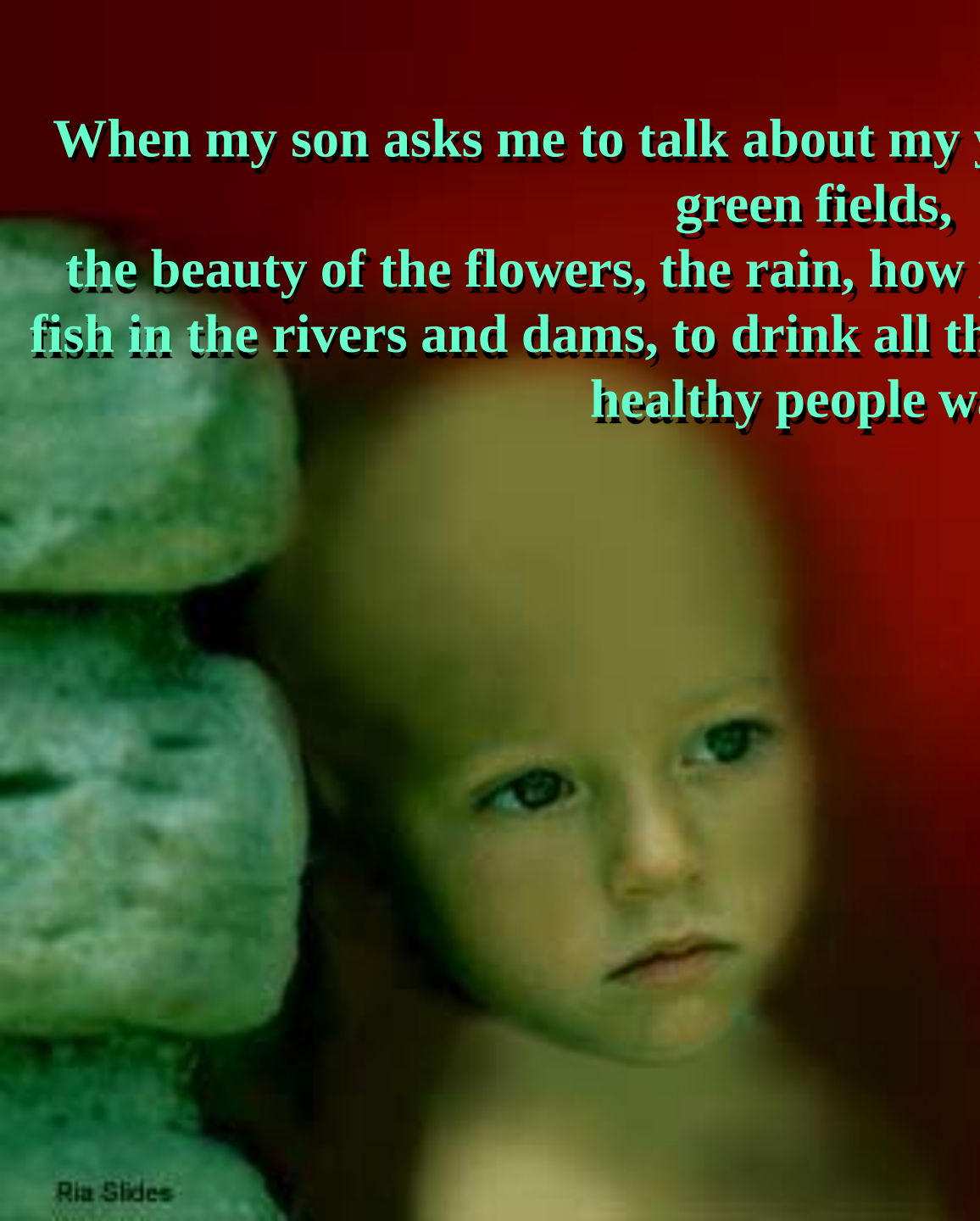
Water became a very coveted treasure, more precious
than gold and diamonds.

Where I live, there are no trees, because it seldom rains.
When it happens to register some precipitation, it is of acid rain.

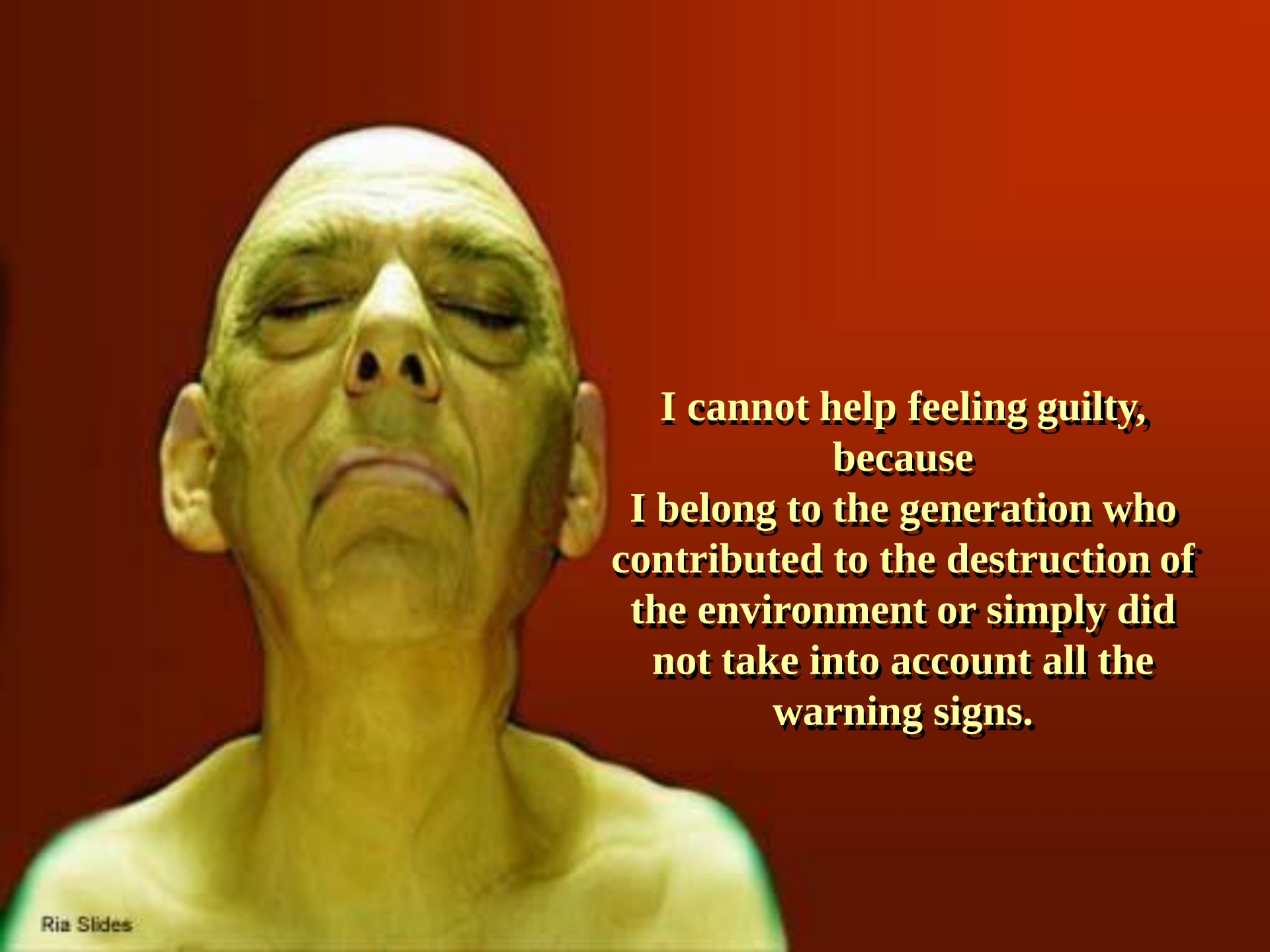
The seasons have been severely affected by the atomic tests and by contamination from the 20th century polluting industries.

We were warned to look after the environment, but nobody cared.

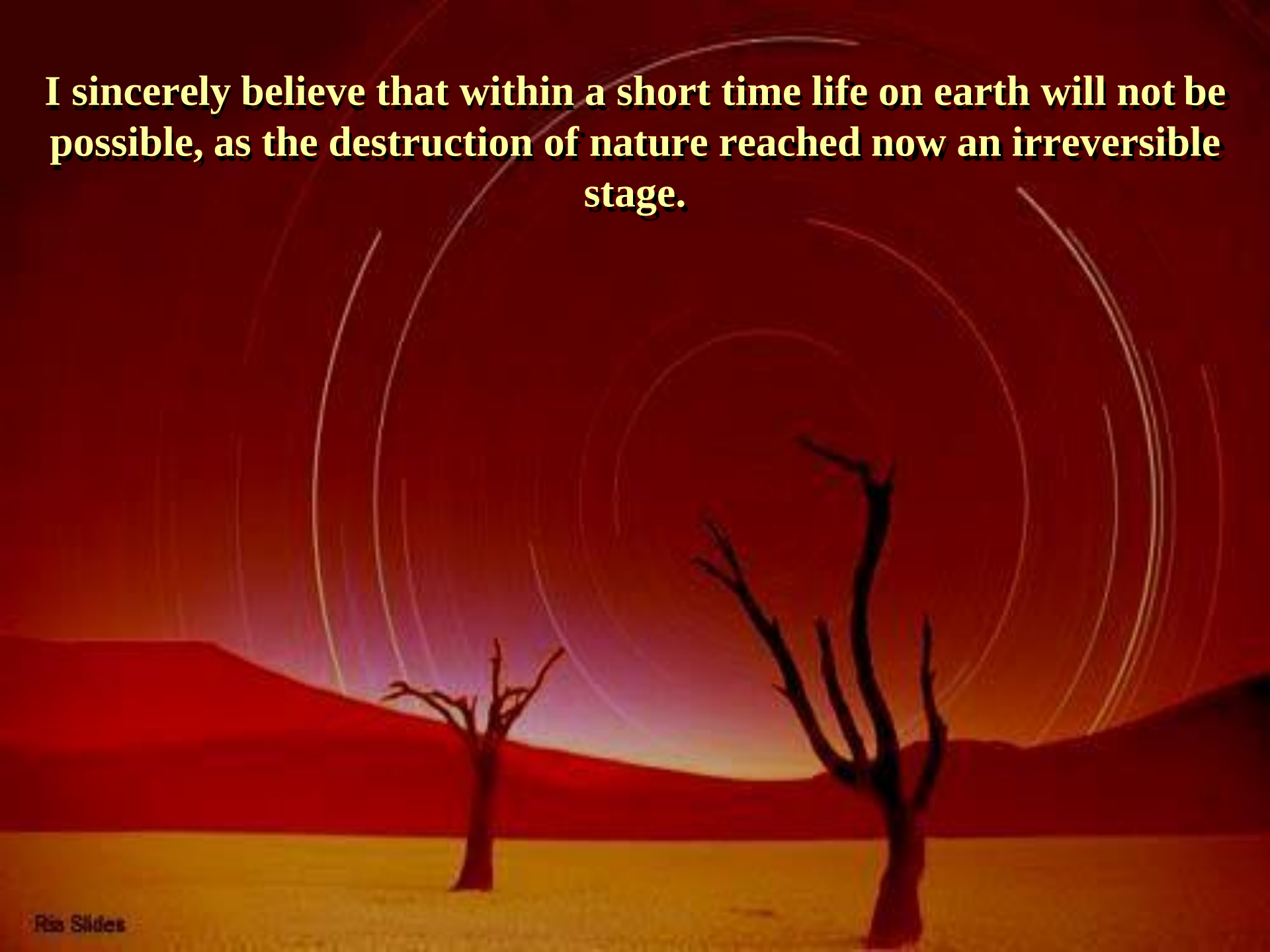
When my son asks me to talk about my youth, I tell him about the green fields,
the beauty of the flowers, the rain, how pleasant was to swim and fish in the rivers and dams, to drink all the water we could, and how healthy people was.

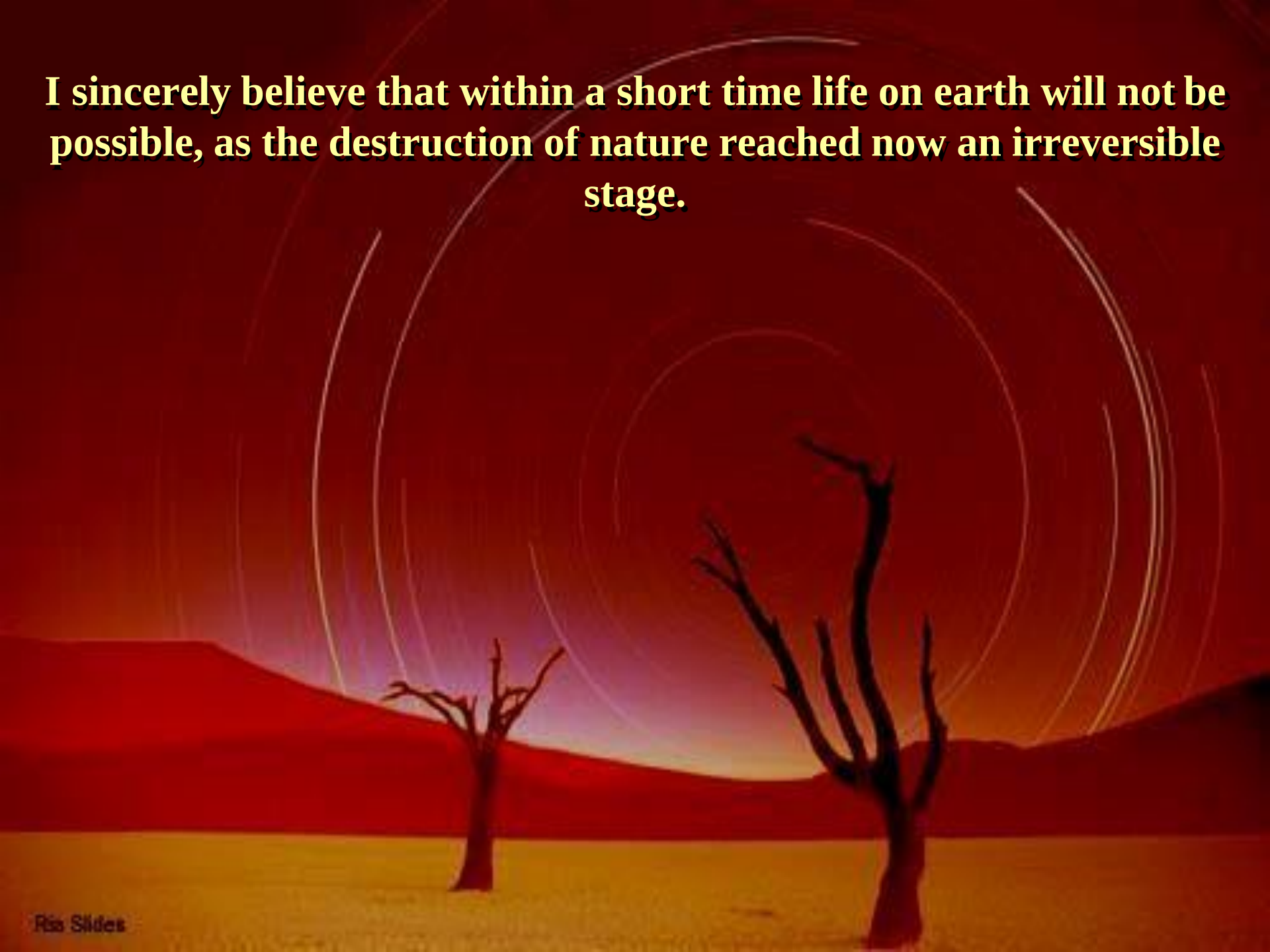



He asks: Daddy! Why there is no water?
Then, I feel a lump in my throat!
Ria Slides


I cannot help feeling guilty, because
I belong to the generation who contributed to the destruction of the environment or simply did not take into account all the warning signs.
Ria Slides

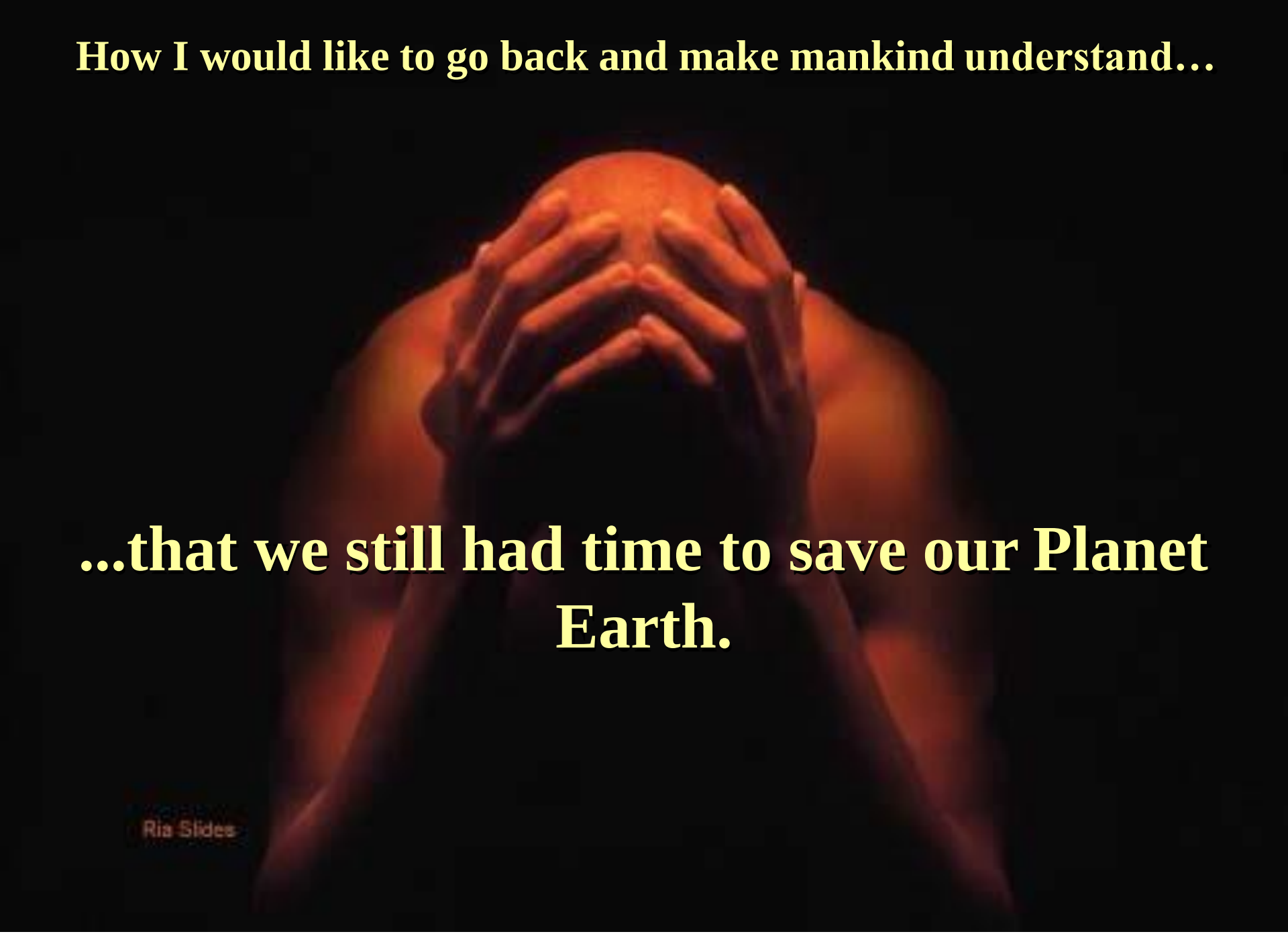

Ria Slides
Now our children
pay a very high price!


I sincerely believe that within a short time life on earth will not be possible, as the destruction of nature reached now an irreversible stage.
Ris Slides


I sincerely believe that within a short time life on earth will not be possible, as the destruction of nature reached now an irreversible stage.
Ris Slides

This show was made by a very talented person, named A P J AbdulKalam

How I would like to go back and make mankind understand…

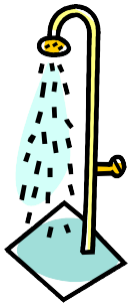


...that we still had time to save our Planet Earth.

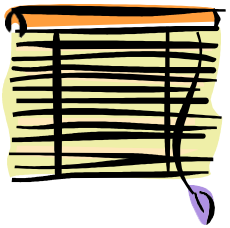

What can we do to help solve the problem?

Simple Things To Do

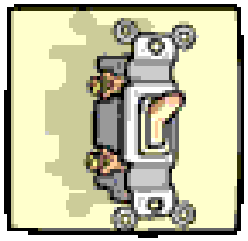
Turn off your computer or the TV when you're not using it.



Take shorter showers. Heating water uses energy.



Keep rooms cool by closing the blinds, shades, or curtains.



Turn off the lights when you leave a room.

Use compact fluorescent bulbs.

Be Bulb Smart—Use CFLs

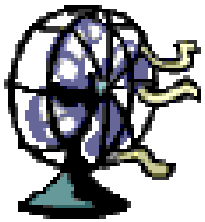
What's the difference?

Incandescent

Compact Fluorescent

- **1,430 lbs. CO_2 pollution avoided**
- **$30 saved**

Simple Things To Do



Dress lightly when it's hot instead of turning up the air conditioning. Or use a fan.

Dress warmly when it's cold instead of turning up the heat.

Offer to help your parents keep the air filters on your AC and furnace clean.

Walk short distances instead of asking for a ride in the car.

Plant a tree.

Recycle.

Conclusions

Global warming is well understood, it has been detected, and the forecast for the end of the century is frightening.

CO_2 emission will continue to effect climate for hundreds of thousands of years into the future.

Sea level may ultimately rise 100 times more than the forecast for the year 2100.

Thank You