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# FLAIR

ROTARY INTERNATIONAL DISTRICT 3291 KOLKATA ANDAMANS SOUTH BENGAL

Special Issue
16th September, 2009
**World Ozone Day**

Bulletin of:

## ROTARACT CLUB OF UTTARPARA

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Rotary International District 3291

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Special Bulletin on :

# GLOBAL WARMING

*Act with Integrity. Serve with Love. Work for Peace. Follow your dreams.*

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*Theme for the RotaYear:* ***Make a difference today for a better tomorrow***

We meet every Saturday at 6:30 PM
Venue: Uttarpara House Owners Association Hall, Uttarpara (Near Gauri Bus Stop and Gana Bhawan)

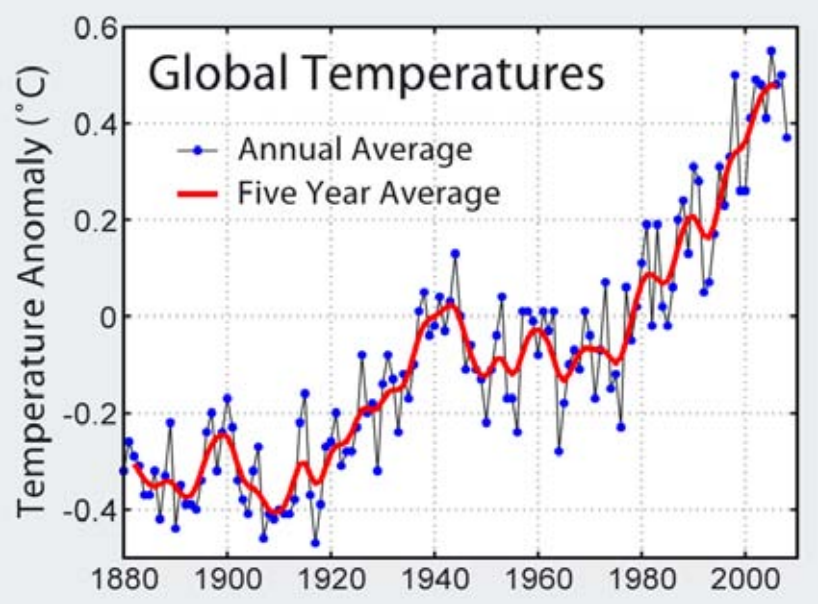
# GLOBAL WARMING

Global warming is the increase in the average temperature of the Earth's near-surface air and oceans since the mid-20th century and its projected continuation. Global surface temperature increased 0.74 ± 0.18 °C (1.33 ± 0.32 °F) during the last century. The Intergovernmental Panel on Climate Change (IPCC) concludes that increasing greenhouse gas concentrations resulting from human activity such as fossil fuel burning and deforestation caused most of the observed temperature increase since the middle of the 20th century. The IPCC also concludes that variations in natural phenomena such as solar radiation and volcanoes produced most of the warming from pre-industrial times to 1950 and had a small cooling effect afterward. These basic conclusions have been endorsed by more than 45 scientific societies and academies of science, including all of the national academies of science of the major industrialized countries. A small number of scientists dispute the consensus view.

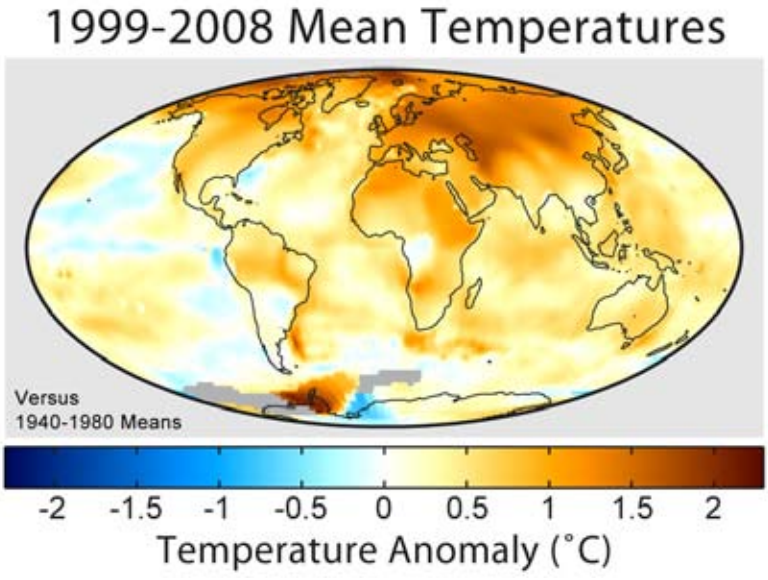
Climate model projections summarized in the latest IPCC report indicate that the global surface temperature will probably rise a further 1.1 to 6.4 °C (2.0 to 11.5 °F) during the twenty-first century. The uncertainty in this estimate arises from the use of models with differing sensitivity to greenhouse gas concentrations and the use of differing estimates of future greenhouse gas emissions. Some other uncertainties include how warming and related changes will vary from region to region around the globe. Most studies focus on the period up to the year 2100. However, warming is expected to continue beyond 2100 even if emissions stop, because of the large heat capacity of the oceans and the long lifetime of carbon dioxide in the atmosphere.

An increase in global temperature will cause sea levels to rise and will change the amount and pattern of precipitation, probably including expansion of subtropical deserts. The continuing retreat of glaciers, permafrost and sea ice is expected, with warming being strongest in the Arctic. Other likely effects include increases in the intensity of extreme weather events, species extinctions, and changes in agricultural yields.

Political and public debate continues regarding climate change, and what actions (if any) to take in response. The available options are mitigation to reduce further emissions; adaptation to reduce the damage caused by warming; and, more speculatively, geoengineering to reverse global warming. Most national governments have signed and ratified the Kyoto Protocol aimed at reducing greenhouse gas emissions.




Global mean surface temperature difference from the average for 1961–1990




This figure shows the difference in instrumentally determined surface temperatures between the period January 1999 through December 2008 and "normal" temperatures at the same locations, defined to be the average over the interval January 1940 to December 1980. The average increase on this graph is 0.48 °C, and the widespread temperature increases are considered to be an aspect of global warming.

# CAUSES OF GLOBAL WARMING

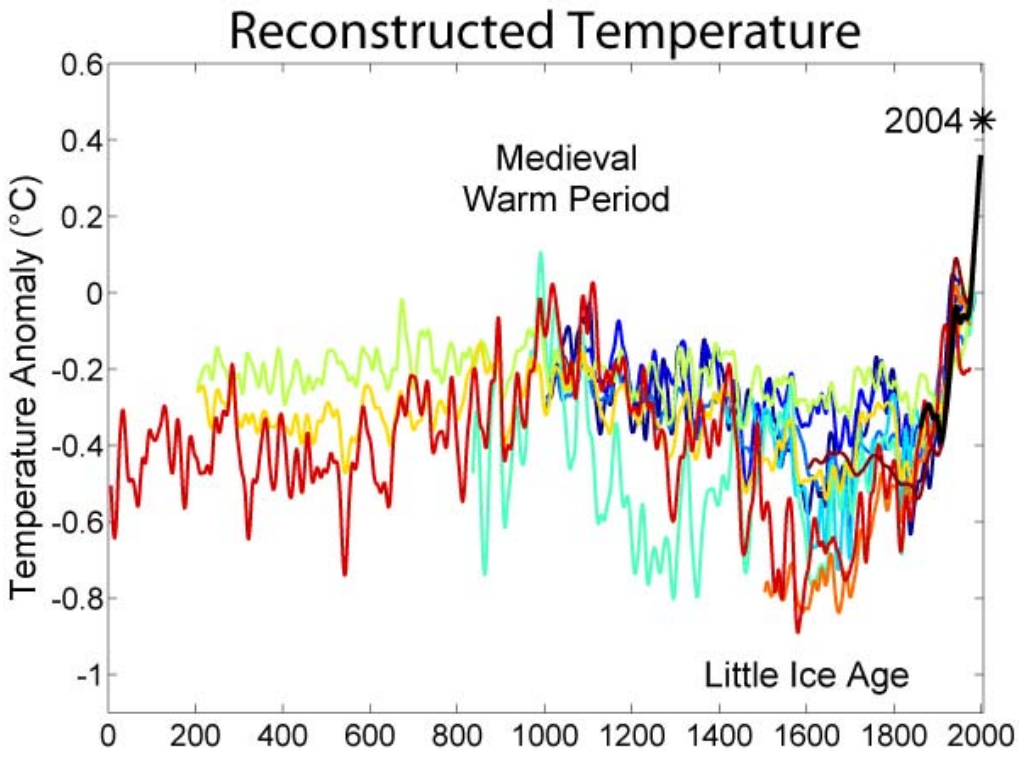
## TEMPERATURE CHANGES

The most commonly discussed measure of global warming is the trend in globally averaged temperature near the Earth's surface. Expressed as a linear trend, this temperature rose by 0.74°C ±0.18°C over the period 1906-2005. The rate of warming over the last 50 years of that period was almost double that for the period as a whole (0.13°C ±0.03°C per decade, versus 0.07°C ± 0.02°C per decade). The urban heat island effect is estimated to account for about 0.002 °C of warming per decade since 1900. Temperatures in the lower troposphere have increased between 0.12 and 0.22 °C (0.22 and 0.4 °F) per decade since 1979, according to satellite temperature measurements. Temperature is believed to have been relatively stable over the one or two thousand years before 1850, with regionally-varying fluctuations such as the Medieval Warm Period or the Little Ice Age.

Based on estimates by NASA's Goddard Institute for Space Studies, 2005 was the warmest year since reliable, widespread instrumental measurements became available in the late 1800s, exceeding the previous record set in 1998 by a few hundredths of a degree. Estimates prepared by the World Meteorological Organization and the Climatic Research Unit concluded that 2005 was the second warmest year, behind 1998. Temperatures in 1998 were unusually warm because the strongest El Niño in the past century occurred during that year.

Temperature changes vary over the globe. Since 1979, land temperatures have increased about twice as fast as ocean temperatures (0.25 °C per decade against 0.13 °C per decade). Ocean temperatures increase more slowly than land temperatures because of the larger effective heat capacity of the oceans and because the ocean loses more heat by evaporation. The Northern Hemisphere warms faster than the Southern Hemisphere because it has more land and because it has extensive areas of seasonal snow and sea-ice cover subject to the ice-albedo feedback. Although more greenhouse gases are emitted in the Northern than Southern Hemisphere this does not contribute to the difference in warming because the major greenhouse gases persist long enough to mix between hemispheres.

The thermal inertia of the oceans and slow responses of other indirect effects mean that climate can take centuries or longer to adjust to changes in forcing. Climate commitment studies indicate that even if greenhouse gases were stabilized at 2000 levels, a further warming of about 0.5 °C (0.9 °F) would still occur.




Two millennia of mean surface temperatures according to different reconstructions, each smoothed on a decadal scale. The unsmoothed, annual value for 2004 is also plotted for reference.

## RADIATIVE FORCING

External forcing is a term used in climate science for processes external to the climate system (though not necessarily external to Earth). Climate responds to several types of external forcing, such as changes in greenhouse gas concentrations, changes in solar luminosity, volcanic eruptions, and variations in Earth's orbit around the Sun.[2] Attribution of recent climate change focuses on the first three types of forcing. Orbital cycles vary slowly over tens of thousands of years and thus are too gradual to have caused the temperature changes observed in the past century.

# GREENHOUSE GASES

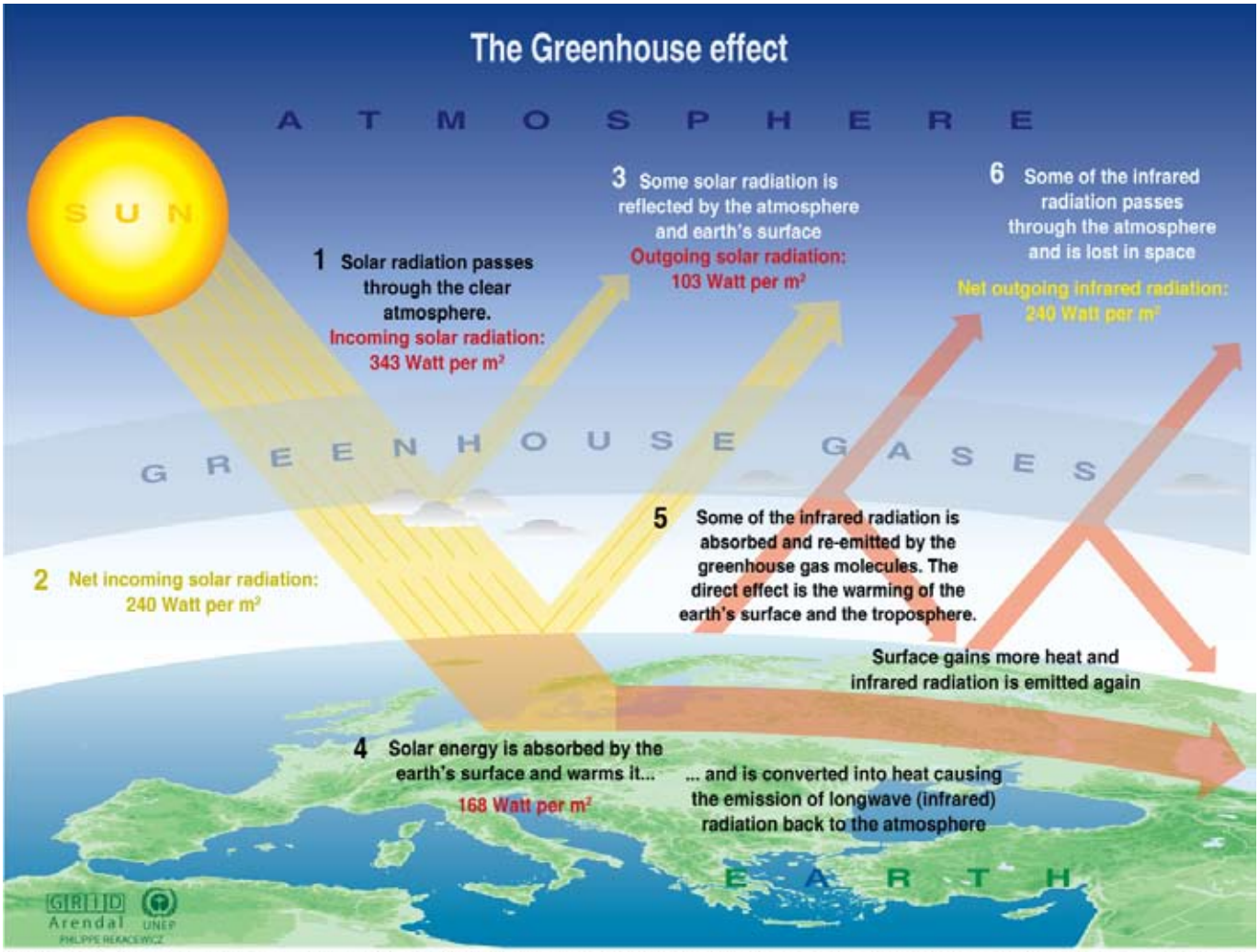
The greenhouse effect is the process by which absorption and emission of infrared radiation by gases in the atmosphere warm a planet's lower atmosphere and surface. It was discovered by Joseph Fourier in 1824 and was first investigated quantitatively by Svante Arrhenius in 1896. Existence of the greenhouse effect as such is not disputed, even by those who do not agree that the recent temperature increase is attributable to human activity. The question is instead how the strength of the greenhouse effect changes when human activity increases the concentrations of greenhouse gases in the atmosphere.

Naturally occurring greenhouse gases have a mean warming effect of about 33 °C (59 °F). The major greenhouse gases are water vapor, which causes about 36–70 percent of the greenhouse effect; carbon dioxide ($CO_2$), which causes 9–26 percent; methane ($CH_4$), which causes 4–9 percent[not in citation given]; and ozone ($O_3$), which causes 3–7 percent. Clouds also affect the radiation balance, but they are composed of liquid water or ice and so are considered separately from water vapor and other gases.

Human activity since the Industrial Revolution has increased the amount of greenhouse gases in the atmosphere, leading to increased radiative forcing from $CO_2$, methane, tropospheric ozone, CFCs and nitrous oxide. The concentrations of $CO_2$ and methane have increased by 36% and 148% respectively since the mid-1700s. These levels are considerably higher than at any time during the last 650,000 years, the period for which reliable data has been extracted from ice cores. Less direct geological evidence indicates that $CO_2$ values this high were last seen approximately 20 million years ago. Fossil fuel burning has produced about three-quarters of the increase in $CO_2$ from human activity over the past 20 years. Most of the rest is due to land-use change, particularly deforestation.

$CO_2$ concentrations are continuing to rise due to burning of fossil fuels and land-use change. The future rate of rise will depend on uncertain economic, sociological, technological, and natural developments. Accordingly, the IPCC Special Report on Emissions Scenarios gives a wide range of future $CO_2$ scenarios, ranging from 541 to 970 ppm by the year 2100. Fossil fuel reserves are sufficient to reach these levels and continue emissions past 2100 if coal, tar sands or methane clathrates are extensively exploited.

The destruction of stratospheric ozone by chlorofluorocarbons is sometimes mentioned in relation to global warming. Although there are a few areas of linkage, the relationship between the two is not strong. Reduction of stratospheric ozone has a cooling influence, but substantial ozone depletion did not occur until the late 1970s. Tropospheric ozone contributes to surface warming.




Sources: Okanagan university college in Canada, Department of geography, University of Oxford, school of geography; United States Environmental Protection Agency (EPA), Washington; Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge university press, 1996.

# AEROSOLS and SOOT

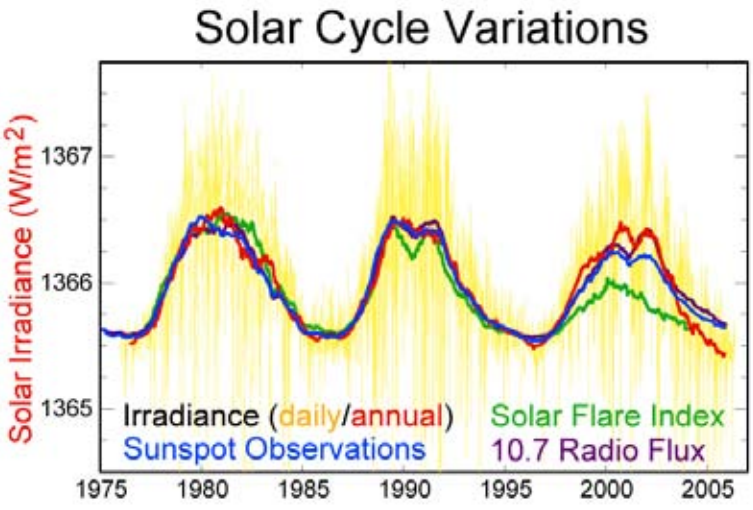
Global dimming, a gradual reduction in the amount of global direct irradiance at the Earth's surface, has partially counteracted global warming from 1960 to the present. The main cause of this dimming is aerosols produced by volcanoes and pollutants. These aerosols exert a cooling effect by increasing the reflection of incoming sunlight. James Hansen and colleagues have proposed that the effects of the products of fossil fuel combustion—CO2 and aerosols—have largely offset one another in recent decades, so that net warming has been driven mainly by non-CO2 greenhouse gases.

In addition to their direct effect by scattering and absorbing solar radiation, aerosols have indirect effects on the radiation budget. Sulfate aerosols act as cloud condensation nuclei and thus lead to clouds that have more and smaller cloud droplets. These clouds reflect solar radiation more efficiently than clouds with fewer and larger droplets. This effect also causes droplets to be of more uniform size, which reduces growth of raindrops by collision-coalescence. Clouds modified by pollution have been shown to produce less drizzle, making the cloud brighter and more reflective to incoming sunlight, especially in the near-infrared part of the spectrum.

Soot may cool or warm, depending on whether it is airborne or deposited. Atmospheric soot aerosols directly absorb solar radiation, which heats the atmosphere and cools the surface. Regionally (but not globally), as much as 50% of surface warming due to greenhouse gases may be masked by atmospheric brown clouds. When deposited, especially on glaciers or on ice in arctic regions, the lower surface albedo can also directly heat the surface. The influences of aerosols, including black carbon, are most pronounced in the tropics and subtropics, particularly in Asia, while the effects of greenhouse gases are dominant in the extratropics and southern hemisphere.


Ship tracks over the Atlantic Ocean on the east coast of the United States. The climatic impacts from aerosol forcing could have a large effect on climate through the indirect effect.

# SOLAR VARIATION




Variations in solar output have been the cause of past climate changes. Although solar forcing is generally thought to be too small to account for a significant part of global warming in recent decades, a few studies disagree, such as a recent phenomenological analysis that indicates the contribution of solar forcing may be underestimated.

Greenhouse gases and solar forcing affect temperatures in different ways. While both increased solar activity and increased greenhouse gases are expected to warm the troposphere, an increase in solar activity should warm the stratosphere while an increase in greenhouse gases should cool the stratosphere. Observations show that temperatures in the stratosphere have been steady or cooling since 1979, when satellite measurements became available. Radiosonde (weather balloon) data from the pre-satellite era show cooling since 1958, though there is greater uncertainty in the early radiosonde record.

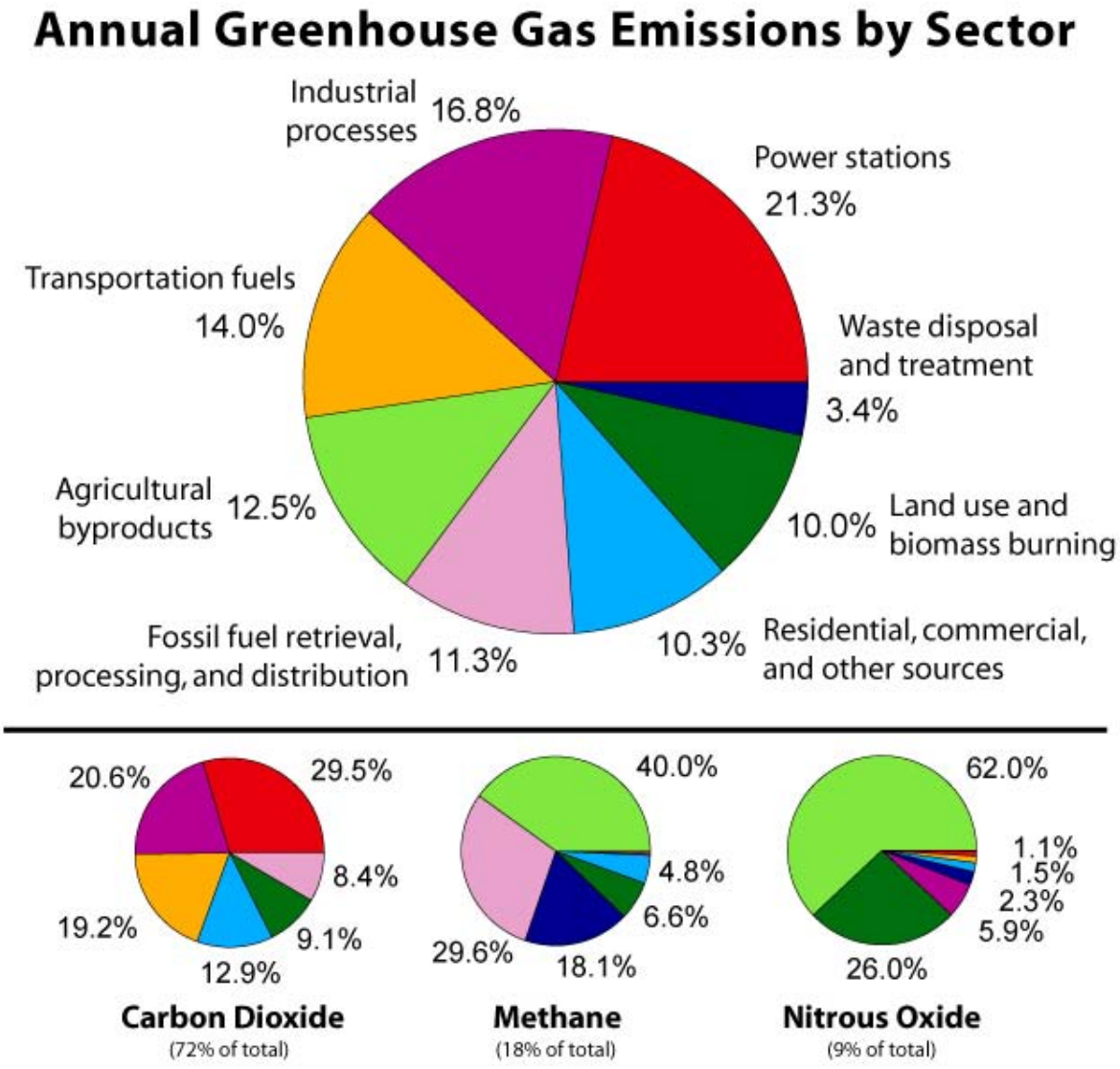
A related hypothesis, proposed by Henrik Svensmark, is that magnetic activity of the sun deflects cosmic rays that may influence the generation of cloud condensation nuclei and thereby affect the climate. Other research has found no relation between warming in recent decades and cosmic rays. A recent study concluded that the influence of cosmic rays on cloud cover is about a factor of 100 lower than needed to explain the observed changes in clouds or to be a significant contributor to present-day climate change.

# LIVESTOCK and LAND USE

Climate change is attributed to land use for two main reasons. While 66% of anthropogenic CO2 emissions over the last 250 years have resulted from burning fossil fuels, 33% have resulted from changes in land use, primarily deforestation. Deforestation both reduces the amount of carbon dioxide absorbed by deforested regions and releases greenhouse gases directly, together with aerosols, through biomass burning that frequently accompanies it. A second reason that climate change has been attributed to land use is that the terrestrial albedo is often altered by use, which leads to radiative forcing. This effect is more significant locally than globally.

Worldwide, livestock production occupies 70% of all land used for agriculture, or 30% of the ice-free land surface of the Earth. Scientists attribute more than 18% of anthropogenic greenhouse gas emissions to livestock and livestock-related activities such as deforestation and increasingly fuel-intensive farming practices. Specific attributions to the livestock sector include:

* 9% of global carbon dioxide emissions
* 35-40% of global methane emissions (chiefly due to enteric fermentation and manure)
* 64% of global nitrous oxide emissions, chiefly due to fertilizer use.



# EFFECTS OF GLOBAL WARMING

## SPREAD OF DISEASE

As northern countries warm, disease carrying insects migrate north, bringing plague and disease with them. Indeed some scientists believe that in some countries thanks to global warming, malaria has not been fully eradicated.

## WARMER WATERS AND MORE HURRICANES

As the temperature of oceans rises, so will the probability of more frequent and stronger hurricanes. We saw in this in 2004 and 2005.

## INCREASED PROBABILITY AND INTENSITY OF DROUGHTS AND HEAT WAVES

Although some areas of Earth will become wetter due to global warming, other areas will suffer serious droughts and heat waves. Africa will receive the worst of it, with more severe droughts also expected in Europe. Water is already a dangerously rare commodity in Africa, and according to the Intergovernmental Panel on Climate Change, global warming will exacerbate the conditions and could lead to conflicts and war.

## ECONOMIC CONSEQUENCES

Most of the effects of anthropogenic global warming won't be good. And these effects spell one thing for the countries of the world: economic consequences. Hurricanes cause do billions of dollars in damage, diseases cost money to treat and control and conflicts exacerbate all of these.


## POLAR ICE CAPS MELTING

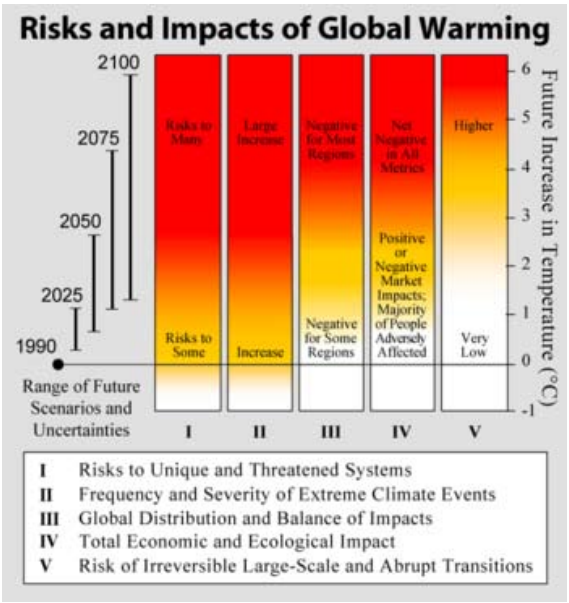
The ice caps melting is a four-pronged danger.

First, it will raise sea levels. There are 5,773,000 cubic miles of water in ice caps, glaciers, and permanent snow. According to the National Snow and Ice Data Center, if all glaciers melted today the seas would rise about 230 feet. Luckily, that's not going to happen all in one go! But sea levels will rise.

Second, melting ice caps will throw the global ecosystem out of balance. The ice caps are fresh water, and when they melt they will desalinate the ocean, or in plain English - make it less salty. The desalinization of the gulf current will "screw up" ocean currents, which regulate temperatures. The stream shutdown or irregularity would cool the area around north-east America and Western Europe. Luckily, that will slow some of the other effects of global warming in that area!

Third, temperature rises and changing landscapes in the artic circle will endanger several species of animals. Only the most adaptable will survive.

Fourth, global warming could snowball with the ice caps gone. Ice caps are white, and reflect sunlight, much of which is relected back into space, further cooling Earth. If the ice caps melt, the only reflector is the ocean. Darker colors absorb sunlight, further warming the Earth.



# WARMING ON OTHER PLANETS

Over the last two decades, proxy evidence of local or planetary warming has been observed on Mars, Pluto, Jupiter, and Neptune's largest moon Triton. It has sometimes been asserted in the popular press that this points to a solar explanation for the recent warming on Earth. Physicist Khabibullo Abdusamatov claims that solar variation has caused global warming on Earth, and that the coincident warmings "can only be a straightline consequence of the effect of the one same factor: a long-time change in solar irradiance." This view is not accepted by other scientists. Planetary physicist Colin Wilson responded, "His views are completely at odds with the mainstream scientific opinion," and climate scientist Amato Evan stated, "the idea just isn't supported by the theory or by the observations." Charles Long of Pacific Northwest National Laboratory, who studies radiative transfer, says "That's nuts ... It doesn't make physical sense that that's the case." Jay Pasachoff, an astronomy professor at Williams College, said that Pluto's global warming was "likely not connected with that of the Earth. The major way they could be connected is if the warming was caused by a large increase in sunlight. But the solar constant — the amount of sunlight received each second — is carefully monitored by spacecraft, and we know the Sun's output is much too steady to be changing the temperature of Pluto." Instead, scientific opinion is that these changes are caused by other factors, such as orbital irregularities or (in the case of Mars) changes in albedo as a result of dust storms.

# Focus shifts to India & China in fight against global warming

Alister Doyle
NUSA DUA

**ECO-FRIENDLY**

**A group of senior officials, scheduled to meet next week, will study ways to transfer clean technologies, such as solar panels or wind turbines, to developing nations**

A 190-NATION climate meeting in Bali began a hunt for a new global deal to fight global warming by 2009 on Tuesday with skirmishing about how far China and India should curb surging greenhouse gas emissions.

"The conference got off to a very encouraging start," said Yvo de Boer, head of the UN Climate Change Secretariat of the December 3-14 meeting of 10,000 participants that will try to launch talks on a climate pact to succeed the UN's Kyoto Protocol. After an opening day dominated by ceremony, governments set up a "special group" to look at options for launching two years of talks meant to bind the US and developing nations led by China and India more firmly into fighting climate change. De Boer said the group of senior officials would report back to 130 environment ministers who will arrive next week at the talks in a luxury Indonesian beach resort. The meeting also agreed to study ways to do more to transfer clean technologies, such as solar panels or wind turbines, to developing nations. Such a move is a key to greater involvement by developing nations in a new pact beyond Kyoto.

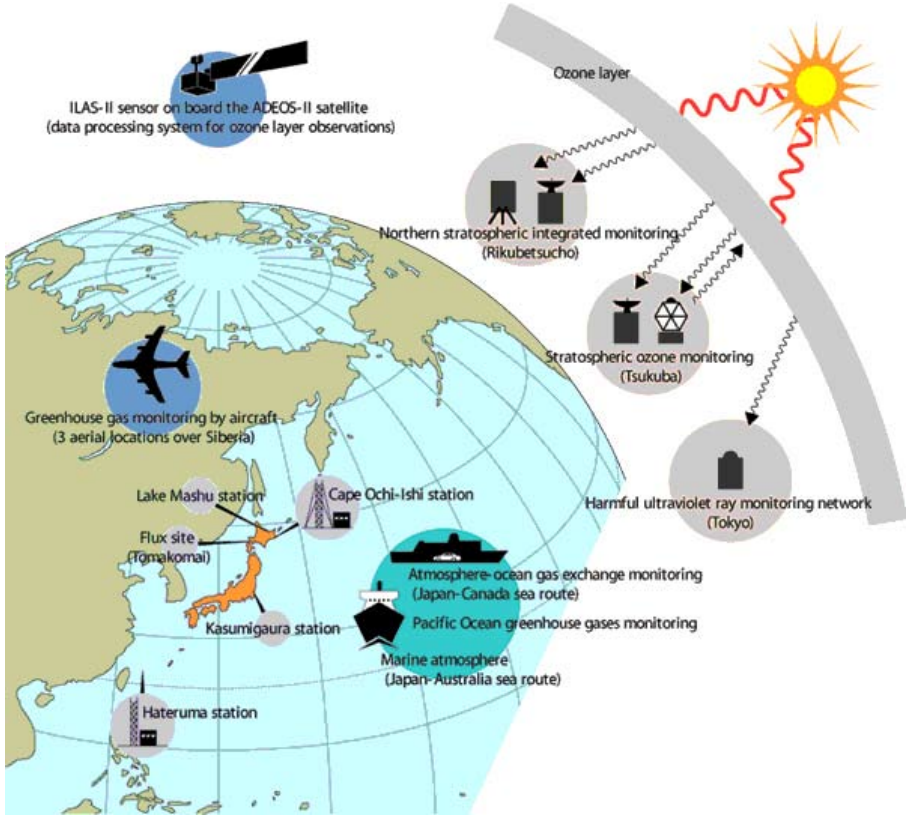
The Kyoto Protocol now binds 36 rich nations to curb emissions of greenhouse gases, mainly from burning fossil fuels, by 5% below 1990 levels by 2008-12 in a step to curb droughts, floods, heatwaves and rising seas. The Bali talks seek a mandate to widen Kyoto to all nations beyond 2012. Of the top world's top five emitters Kyoto only cuts Japan's greenhouse gases, with the US outside the pact, and China, India exempt and Russia facing easy caps.

But there was controversy about how to share out the burden. Environmentalists accused Kyoto nations Japan and Canada of asking China and India to do too much. Canada said in a submission to the talks that "to be effective, a new international framework must include emission reduction obligations for all the largest emitting economies". It did not mention deeper cuts for rich nations beyond 2012.

And Japan on Monday called on all parties to "effectively participate and will contribute substantially".

China and India say that rich nations must take on far deeper cuts in emissions and that they cannot take on caps yet because they need to burn more fossil fuels to end poverty. "Canada and Japan are saying nothing about legally binding emission reductions for themselves after 2012," said Steven Guilbeault of environmental group Equiterre. "They are trying to shift the burden to China and India."

De Boer played down the objections, saying that all nations were merely laying out ideas. "A marriage contract is not something to discuss on a first date," he said. "No proposals have formally been made." In Australia, new climate minister Penny Wong said Australia hoped to be a leader at the Bali talks after Australia ratified the Kyoto Protocol on Monday, leaving the US alone in opposition among rich nations. "We have already said we would expect binding commitments to be on the table for both developed and developing nations," she said, adding the nature of those commitments would be the subject of negotiations. — Reuters



# MITIGATION OF GLOBAL WARMING

Many efforts are being made by various nations to cut down the rate of global warming. One such effort is the Kyoto agreement that has been made between various nations to reduce the emissions of various green house gases. Also many non profit organizations are working for the cause. Al Gore was one of the foremost U.S. politicians to heave an alarm about the hazards of global warming. He has produced a significantly acclaimed documentary movie called "An Inconvenient Truth," and written a book that archives his advice that Earth is dashing toward an immensely warmer future. Al Gore, the former vice president of United States has given various speeches to raise an awareness of global warming. He has warned people about the ill effects of Global warming and its remedies.

But an interesting side of the global warming episode is that there are people who do not consider global warming as something that is creating a problem. Skeptics of global warming think that global warming is not an ecological trouble. According to the global warming skeptics, the recent enhancement in the earth's average temperature is no reason for alarm. According to them earth's coastlines and polar ice caps are not at a risk of vanishing. Global warming skeptics consider that the weather models used to establish global warming and to forecast its impacts are distorted. According to the models, if calculations are made the last few decades must have been much worse as compared to actually happened to be. Most of the global warming skeptics believe that the global warming is not actually occurring. They stress on the fact the climatic conditions vary because of volcanism, the obliquity cycle, changes in solar output, and internal variability. Also the warming can be due to the variation in cloud cover, which in turn is responsible for the temperatures on the earth. The variations are also a result of cosmic ray flux that is modulated by the solar magnetic cycles.

BedZED zero-energy housing in the UK

## BUILDING DESIGN

Emissions from housing are substantial, and government-supported energy efficiency programmes can make a difference.

New buildings can be constructed using passive solar building design, low-energy building, or zero-energy building techniques, using renewable heat sources. Existing buildings can be made more efficient through the use of insulation, high-efficiency appliances (particularly hot water heaters and furnaces), double- or triple-glazed gas-filled windows, external window shades, and building orientation and siting. Renewable heat sources such as shallow geothermal and passive solar energy reduce the amount of greenhouse gasses emitted. In addition to designing buildings which are more energy efficient to heat, it is possible to design buildings that are more energy efficient to cool by using lighter-coloured, more reflective materials in the development of urban areas (e.g. by painting roofs white) and planting trees. This saves energy because it cools buildings and reduces the urban heat island effect thus reducing the use of air conditioning.

## TRANSPORT

Modern energy efficient technologies, such as plug-in hybrid electric vehicles, and development of new technologies, such as hydrogen cars, may reduce the consumption of petroleum and emissions of carbon dioxide.

A shift from air transport and truck transport to electric rail transport would reduce emissions significantly.

Increased use of biofuels (such as biodiesel and biobutanol, that can be used in 100% concentration in today's diesel and gasoline engines) could also reduce emissions if produced environmentally efficiently, especially in conjunction with regular hybrids and plug-in hybrids.

For electric vehicles, the reduction of carbon emissions will improve further if the way the required electricity is generated is low-carbon (from renewable energy sources).

Effective urban planning to reduce sprawl would decrease Vehicle Miles Travelled (VMT), lowering emissions from transportation. Increased use of public transport can also reduce greenhouse gas emissions per passenger kilometer.

Bicycles have almost no carbon footprint compared to cars.

# ALTERNATIVE ENERGY SOURCES

## NUCLEAR POWER

Nuclear power currently produces over 15% of the world's electricity. Due to its low emittance of greenhouse gases (comparable to wind power) and reliability it is seen as a possible alternative to fossil fuels, but is controversial for reasons of capital cost and possible environmental impacts. Also, there are political impacts in some countries.

## RENEWABLE ENERGY

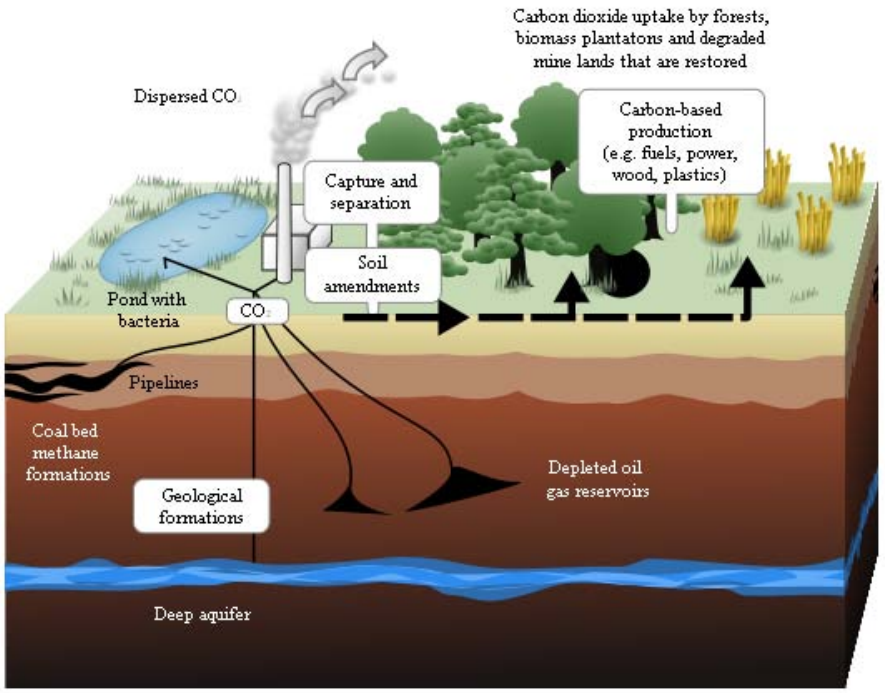
One means of reducing carbon emissions is the development of new technologies such as renewable energy such as wind power. Most forms of renewable energy generate no appreciable amounts of greenhouse gases except for biofuels derived from biomass.

Helioculture is a newly developed process which is claimed to be able to produce 20,000 gallons of fuel per acre per year, and which removes carbon dioxide from the air as a feedstock for the fuel.

## CARBON CAPTURE AND STORAGE

Carbon capture and storage (CCS) is a plan to mitigate climate change by capturing carbon dioxide (CO2) from large point sources such as power plants and subsequently storing it away safely instead of releasing it into the atmosphere. Technology for capturing of CO2 is already commercially available for large CO2 emitters, such as power plants. Storage of CO2, on the other hand is a relatively untried concept and as yet (2007) no powerplant operates with a full carbon capture and storage system. When this technique is used with biomass, the technique is known as biomass energy with carbon capture and storage and may be carbon negative.

CCS applied to a modern conventional power plant could reduce CO2 emissions to the atmosphere by approximately 80-90% compared to a plant without CCS.



# ELIMINATING WASTE METHANE

Methane is a significantly more powerful greenhouse gas than carbon dioxide. Burning one molecule of methane generates one molecule of carbon dioxide. Accordingly, burning methane which would otherwise be released into the atmosphere (such as at oil wells, landfills, coal mines, waste treatment plants, etc.) provides a net greenhouse gas emissions benefit. However, reducing the amount of waste methane produced in the first place has an even greater beneficial impact, as might other approaches to productive use of otherwise-wasted methane.

In terms of prevention, vaccines are in the works in Australia to reduce significant global warming contributions from methane released by livestock via flatulence and eructation.

# REFORESTATION AND AVOIDED DEFORESTATION

Almost 20% (8 GtCO2/year) of total greenhouse-gas emissions were from deforestation in 2007. The Stern Review found that, based on the opportunity costs of the landuse that would no longer be available for agriculture if deforestation were avoided, emission savings from avoided deforestation could potentially reduce CO2 emissions for under $5/tCO2, possiblly as little as $1/tCO2. Afforestation and reforestation could save at least another 1GtCO2/year, at an estimated cost of $5/tCO2 to $15/tCO2. The Review determined these figures by assessing 8 countries responsible for 70% of global deforestation emissions.

Pristine temperate forest has been shown to store three times more carbon than IPCC estimates took into account, and 60% more carbon than plantation forest. Preventing these forests from being logged would have significant effects.

Further significant savings from other non-energy-related-emissions could be gained through cuts to agricultural emissions, fugitive emissions, waste emissions, and emissions from various industrial processes.

# GOVERNMENTAL AND INTERGOVERNMENTAL ACTION

## KYOTO PROTOCOL

The main current international agreement on combating climate change is the Kyoto Protocol, which came into force on 16 February 2005. The Kyoto Protocol is an amendment to the United Nations Framework Convention on Climate Change (UNFCCC). Countries that have ratified this protocol have committed to reduce their emissions of carbon dioxide and five other greenhouse gases, or engage in emissions trading if they maintain or increase emissions of these gases.

## COPENHAGEN 2009

The first phase of the Kyoto Protocol expires in 2012. The United Nations Climate Change Conference in Copenhagen in December 2009 will be the next in an annual series of UN meetings that followed the 1992 Earth Summit in Rio. In 1997 the talks led to the Kyoto Protocol, Copenhagen is the world's chance to agree a successor to Kyoto that will bring about meaningful carbon cuts.

# ENCOURAGING USE CHANGES

## CARBON EMISSIONS TRADING

The European Union Emission Trading Scheme (EU ETS) is the largest multi-national, greenhouse gas emissions trading scheme in the world. It commenced operation on 1 January 2005, and all 25 member states of the European Union participate in the scheme which has created a new market in carbon dioxide allowances estimated at 35 billion Euros (US$43 billion) per year. The Chicago Climate Exchange was the first (voluntary) emissions market, and is soon to be followed by Asia's first market (Asia Carbon Exchange). A total of 107 million metric tonnes of carbon dioxide equivalent have been exchanged through projects in 2004, a 38% increase relative to 2003 (78 Mt CO2e).

With the creation of a market for trading carbon dioxide emissions within the Kyoto Protocol, it is likely that London financial markets will be the centre for this potentially highly lucrative business; the New York and Chicago stock markets may have a lower trade volume than expected as long as the US maintains its rejection of the Kyoto).

Twenty three multinational corporations have come together in the G8 Climate Change Roundtable, a business group formed at the January 2005 World Economic Forum. The group includes Ford, Toyota, British Airways and BP. On 9 June 2005 the Group published a statement stating that there was a need to act on climate change and claiming that market-based solutions can help. It called on governments to establish "clear, transparent, and consistent price signals" through "creation of a long-term policy framework" that would include all major producers of greenhouse gases.

## CARBON TAX

In 1991, Sweden introduced the world's first carbon tax. The UK has had a Climate Change Levy on fossil-fuel-based electricity generation since 2001. Plans for a carbon tax in New Zealand were abandoned after the 2005 elections.

In May 2008, the Bay Area Air Quality Management District, which covers nine counties in the San Francisco Bay Area, passed a carbon tax of 4.4 cents per ton.

# NON-GOVERNMENTAL APPROACHES

## LEGAL ACTION

In some countries, those affected by climate change may be able to sue major producers, in a parallel to the lawsuits against tobacco companies. Although proving that particular weather events are due specifically to global warming may never be possible, methodologies have been developed to show the increased risk of such events caused by global warming.

For a legal action for negligence (or similar) to succeed, "Plaintiffs … must show that, more probably than not, their individual injuries were caused by the risk factor in question, as opposed to any other cause. This has sometimes been translated to a requirement of a relative risk of at least two." Another route (though with little legal bite) is the World Heritage Convention, if it can be shown that climate change is affecting World Heritage Sites like Mount Everest.

Legal action has also been taken to try to force the U.S. Environmental Protection Agency to regulate greenhouse gas emissions under the Clean Air Act, and against the Export-Import Bank and OPIC for failing to assess environmental impacts (including global warming impacts) under NEPA.

According to a 2004 study commissioned by Friends of the Earth, ExxonMobil and its predecessors caused 4.7 to 5.3 percent of the world's man-made carbon dioxide emissions between 1882 and 2002. The group suggested that such studies could form the basis for eventual legal action.

## PERSONAL CHOICES

While many of the proposed methods of mitigating global warming require governmental funding, legislation and regulatory action, individuals and businesses can also play a part in the mitigation effort. Environmental groups encourage individual action against global warming, often aimed at the consumer. Common recommendations include lowering home heating and cooling usage, burning less gasoline, supporting renewable energy sources, buying local products to reduce transportation, turning off unused devices, and various others. A geophysicist at Utrecht University has urged similar institutions to hold the vanguard in voluntary mitigation, suggesting the use of communications technologies such as videoconferencing to reduce their dependence on long-haul flights.

# TEN THINGS YOU CAN DO TO HELP CURB GLOBAL WARMING

The choices we make and the products we buy test our commitment to maintain a healthy planet. When we burn fossil fuels—such as oil, coal, and natural gas—to run our cars and light our homes, we pump carbon dioxide (CO2) into the air. This thickens the heat-trapping blanket that surrounds the planet, causing global warming.
Choosing modern technology can reduce our use of fossil fuels and help protect the planet. These ten steps will help curb global warming, save you money, and create a safer environment for the onefuture.

**Drive Smart!**
A well-tuned car with properly inflated tires burns less gasoline—cutting pollution and saving you money at the pump. If you have two cars, drive the one with better gas mileage whenever onepossible. Better yet, skip the drive and take public transit, walk, or bicycle when you can.

**Buy Local and Organic**
Did you know the average American meal travels more than 1,500 miles from the farm to your plate? Think of all the energy wasted and pollution added to the atmosphere - not to mention all the pesticides and chemicals used to grow most produce! So go to your local organic farmer to oneget your fruits and veggies.

**Support clean, renewable energy.**
Renewable energy solutions, such as wind and solar power, can reduce our reliance on coal-burning power plants, the largest source of global warming pollution in the United States. Call your local utility and sign up for renewable energy. If they don't offer it, ask them why not?
Also, support a national renewable electricity standard (RES). The Energy Bill signed in 2007 lacked key components that address our energy security and global warming emissions: a renewable electricity standard of 15% by 2020 and a tax package that will provide investment incentives for clean energy alternatives. Use our action center to urge your members of congress oneto support the renewable electricity standard and tax package.

**Replace incandescent light bulbs with compact fluorescent bulbs.**
Especially those that burn the longest each day. Compact fluorescents produce the same amount of light as normal bulbs, but use about a quarter of the electricity and last ten times as long. Each switch you make helps clean the air today, curb global warming, and save you money on your electricity bill.

**Saving energy at home is good for the environment and for your wallet.**
Start with caulking and weather-stripping on doorways and windows. Then adjust your thermostat and start saving. For each degree you lower your thermostat in the winter, you can cut your energy bills by 3 percent. Finally, ask your utility company to do a free energy audit of your onehome to show you how to save even more money.

**Become a smart water consumer.**
Install low-flow showerheads and faucets and you'll use half the water without decreasing performance. Then turn your hot water heater down to 120°F and see hot-water costs go down by as much as 50 percent.

**Buy energy-efficient electronics and appliances.**
Replacing an old refrigerator or an air conditioner with an energy-efficient model will save you money on your electricity bill and cut global warming pollution. Look for the Energy Star label on new appliances or find the most energy-efficient products.

**Plant a Tree, protect a forest.**
Protecting forests is a big step on the road to curbing global warming. Trees "breathe in" carbon dioxide, but slash-and-burn farming practices, intensive livestock production, and logging have destroyed 90 percent of the native forests in the United States. And you can take action in your own backyard — planting shade trees around your house will absorb CO2, and slash your summer air-conditioning bills.

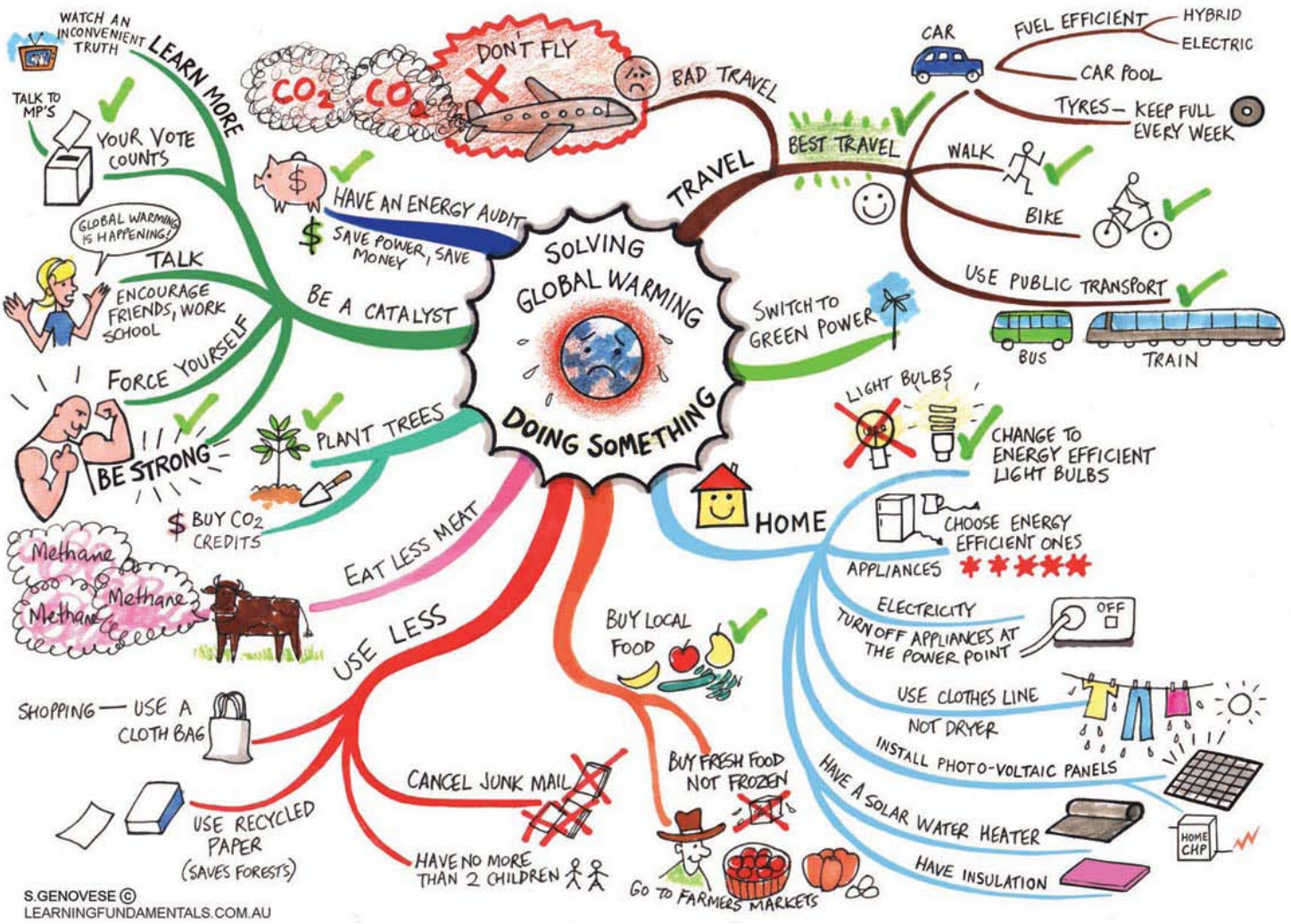
**Reduce! Reuse! Recycle!**
Producing new paper, glass, and metal products from recycled materials saves 70 to 90 percent of the energy and pollution, including CO2, that would result if the product came from virgin materials. Recycling a stack of newspapers only 4 feet high will save a good-sized tree. onePlease...buy recycled products!

**Mount a local campaign against global warming.**
Educate your community about how it can cut global warming pollution. Support measures at the national, state, and local level that:

* Make automobiles go further on a gallon of gas;
* Accelerate the use of clean, renewable energy sources, such as solar and wind;
* Increase energy efficiency and conservation; and
* Preserve forests around the world.

MAKE A COOL CITY……..

# In a nutshell.....





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