Global warming essay

Business, Management

Global warming is the increase in the average temperature of the Earth’s near-surface air and oceans in recent decades and its projected continuation. Global average air temperature near the Earth’s surface rose 0. 74 ± 0. 18 °C (1. 3 ± 0. 32 °F) during the past century. The Intergovernmental Panel on Climate Change (IPCC) concludes, “ most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations,”[1] which leads to warming of the surface and lower atmosphere by increasing the greenhouse effect.

Natural phenomena such as solar variation combined with volcanoes have probably had a small warming effect from pre-industrial times to 1950, but a cooling effect since 1950. The basic conclusions have been endorsed by at least 30 scientific societies and academies of science, including all of the national academies of science of the major industrialized countries. The American Association of Petroleum Geologists is the only scientific society that rejects these conclusions,[2][3] and a few individual scientists also disagree with parts of them. 4] Climate models referenced by the IPCC project that global surface temperatures are likely to increase by 1.

1 to 6. 4 °C (2. 0 to 11. 5 °F) between 1990 and 2100. [1] The range of values reflects the use of differing scenarios of future greenhouse gas emissions and results of models with differences in climate sensitivity. Although most studies focus on the period up to 2100, warming and sea level rise are expected to continue for more than a millennium even if greenhouse gas levels are stabilized.

[1] This reflects the large heat capacity of the oceans. An increase in global temperatures can in turn cause other changes, including sea level rise, and changes in the amount and pattern of precipitation. There may also be changes in the frequency and intensity of extreme weather events, though it is difficult to connect specific events to global warming.

Other effects may include changes in agricultural yields, glacier retreat, reduced summer streamflows, species extinctions and increases in the ranges of disease vectors. Remaining scientific uncertainties include the exact degree of climate change expected in the future, and how changes will vary from region to region around the globe. There is ongoing political and public debate regarding what, if any, action should be taken to reduce or reverse future warming or to adapt to its expected consequences. Most national governments have signed and ratified the Kyoto Protocol aimed at combating greenhouse gas emissions. Causes Causes [pic] [pic] Carbon dioxide during the last 400, 000 years and the rapid rise since the Industrial Revolution; changes in the Earth’s orbit around the Sun, known as Milankovitch cycles, are believed to be the pacemaker of the 100, 000 year ice age cycle. Main articles: Attribution of recent climate change and scientific opinion on climate change The climate system varies through natural, internal processes and in response to variations in external forcing factors including solar activity, volcanic emissions, variations in the earth’s orbit (orbital forcing) and greenhouse gases. The detailed causes of the recent warming remain an active field of research, but the scientific consensus[7] identifies increased levels of greenhouse gases due to human

activity as the main influence. This attribution is clearest for the most recent 50 years, for which the most detailed data are available.

Contrasting with the scientific consensus, other hypotheses have been proposed to explain some of the observed increase in global temperatures, including: the warming is within the range of natural variation; the warming is a consequence of coming out of a prior cool period, namely the Little Ice Age; or the warming is primarily a result of variances in solar radiation. [8] None of the effects of forcing are instantaneous. Due to the thermal inertia of the Earth’s oceans and slow responses of other indirect effects, the Earth’s current climate is not in equilibrium with the forcing imposed. Climate commitment studies indicate that even if greenhouse gases were stabilized at present day levels, a further warming of about 0.

5 °C (0. 9 °F) would still occur. [9] Greenhouse gases in the atmosphere Main article: Greenhouse effect [pic] [pic] Recent increases in atmospheric carbon dioxide (CO2). The monthly CO2 measurements display small seasonal oscillations in an overall yearly uptrend; each year’s maximum is reached during the northern hemisphere’s late spring, and declines during the northern hemisphere growing season as plants remove some CO2 from the atmosphere. The greenhouse effect was discovered by Joseph Fourier in 1824 and was first investigated quantitatively by Svante Arrhenius in 1896. It is the process by which absorption and emission of infrared radiation by atmospheric gases warms a planet’s atmosphere and surface. Greenhouse gases create a natural greenhouse effect, without which, mean temperatures

on Earth would be an estimated 30 °C (54 °F) lower, so that Earth would be uninhabitable.

10] Thus scientists do not “ believe in” or “ oppose” the greenhouse effect as such; rather, the debate concerns the net effect of the addition of greenhouse gases, while allowing for associated positive and negative feedback mechanisms. On Earth, the major natural greenhouse gases are water vapor, which causes about 36–70% of the greenhouse effect (not including clouds); carbon dioxide (CO2), which causes 9–26%; methane (CH4), which causes 4–9%; and ozone, which causes 3–7%. The atmospheric concentrations of CO2 and CH4 have increased by 31% and 149% respectively above pre-industrial levels since 1750. 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. From less direct geological evidence it is believed that CO2 values this high were last attained 20 million years ago. [11] “ About three-quarters of the anthropogenic [man-made] emissions of CO2 to the atmosphere during the past 20 years are due to fossil fuel burning.

The rest of the anthropogenic emissions are predominantly due to land-use change, especially deforestation. [12] The present atmospheric concentration of CO2 is about 383 parts per million (ppm) by volume. [13] Future CO2 levels are expected to rise due to ongoing burning of fossil fuels and land-use change. The rate of rise will depend on uncertain economic, sociological, technological, natural developments, but may be ultimately limited by the availability of fossil fuels. The IPCC Special Report on

Emissions Scenarios gives a wide range of future CO2 scenarios, ranging from 541 to 970 ppm by the year 2100. [14] Fossil fuel eserves are sufficient to reach this level and continue emissions past 2100, if coal, tar sands or methane clathrates are extensively used. [15] Positive feedback effects such as the expected release of CH4 from the melting of permafrost peat bogs in Siberia (possibly up to 70, 000 million tonnes) may lead to significant additional sources of greenhouse gas emissions[16] not included in climate models cited by the IPCC.

[1] Feedbacks The effects of forcing agents on the climate are complicated by various feedback processes. One of the most pronounced feedback effects relates to the evaporation of water. CO2 injected into the atmosphere causes a warming of the atmosphere and the earth’s surface. The warming causes more water to be evaporated into the atmosphere. Since water vapor itself acts as a greenhouse gas, this causes still more warming; the warming causes more water vapor to be evaporated, and so forth until a new dynamic equilibrium concentration of water vapor is reached at a slight increase in humidity and with a much larger greenhouse effect than that due to CO2 alone.

[17] This feedback effect can only be reversed slowly as CO2 has a long average atmospheric lifetime. Feedback effects due to clouds are an area of ongoing research and debate. Seen from below, clouds absorb infrared radiation and so exert a warming effect. Seen from above, the same clouds reflect sunlight and so exert a cooling effect.

Increased global water vapor concentration may or may not cause an increase in global average cloud cover. The net effect of clouds thus has not been well modeled, however, cloud feedback is second only to water vapor feedback and is positive in all the models that contributed to the IPCC Fourth Assessment Report. 17] Another important feedback process is ice-albedo feedback. [18] The increased CO2 in the atmosphere warms the Earth's surface and leads to melting of ice near the poles. As the ice melts, land or open water takes its place. Both land and open water are on average less reflective than ice, and thus absorb more solar radiation.

This causes more warming, which in turn causes more melting, and this cycle continues. Positive feedback due to release of CO2 and CH4 from thawing permafrost is an additional mechanism contributing to warming. Possible positive feedback due to CH4 release from melting seabed ices is a further mechanism to be considered. Effects of global warming From Wikipedia, the free encyclopedia Jump to: navigation, search Further information: Global warming [pic] [pic] The net impact of global warming so far has been modest, but near-future effects are likely to become significantly negative, with large-scale extreme impacts possible by the end of the century.

The predicted effects for the environment and for human life are numerous and varied. The main effect is an increasing global average temperature. From this flow a variety of resulting effects, namely, rising sea levels, altered patterns of agriculture, increased extreme weather events, and the expansion of the range of tropical diseases. In some cases, the effects may

already be occurring, although it is generally difficult to attribute specific natural phenomena to long-term global warming.

A summary of possible effects and our current understanding can be found in the report of the Intergovernmental Panel on Climate Change (IPCC) Working Group II;[1] a discussion of projected climate changes is found in Working Group I. 2] The more recent IPCC Fourth Assessment Report outlines the latest agreed international thinking. Scientific and business groups in individual countries are also producing reports on the effects of global warming on their nation, such as in Australia. Proposed responses to the effects of global warming include mitigation and adaptation.

[pic][edit] Overview Projected climate changes due to global warming have the potential to lead to future large-scale and possibly irreversible changes in our climate resulting in impacts at continental and global scales. Examples of projected climate changes include: significant slowing of the ocean circulation that transports warm water to the North Atlantic, • large reductions in the Greenland and West Antarctic Ice Sheets, • accelerated global warming due to carbon cycle feedbacks in the terrestrial biosphere, and • releases of terrestrial carbon from permafrost regions and methane from hydrates in coastal sediments. The likelihood, magnitude, and timing of many of these changes is uncertain. However, the probability of one or more of these changes occurring is likely to increase with the rate, magnitude, and duration of climate change. Additionally, the United States National Academy of Sciences has warned, “ greenhouse warming and other human alterations

of the earth system may increase the possibility of large, abrupt, and unwelcome regional or global climatic events. .

. . Future abrupt changes cannot be predicted with confidence, and climate surprises are to be expected. “[3] It is not possible to be certain whether there will be any positive benefits of global warming.

What is known is that some significant negative impacts are projected and these drive most of the concern about global warming and motivates attempts to mitigate or adapt to the effects of global warming. Almost all scientists agree, however, that the negative effects would outweigh the positive effects. [citation needed] Most of the consequences of global warming would result from one of three physical changes: sea level rise, higher local temperatures, and changes in rainfall patterns. Sea level is generally expected to rise 18-59 cm by the end of the century. [4] [edit] Effects on weather [pic] [pic] Global warming is responsible in part for some trends in natural disasters such as extreme weather.

Pascal Peduzzi (2004) “ Is climate change increasing the frequency of hazardous events? Environment Times UNEP/GRID-Arendal Increasing temperature is likely to lead to increasing precipitation [5] [6] but the effects on storms are less clear. Extratropical storms partly depend on the temperature gradient, which is predicted to weaken in the northern hemisphere as the polar region warms more than the rest of the hemisphere [7]. [edit] More extreme weather [pic] [pic] This image shows the conclusions of Knutson and Tuleya (2004) that maximum intensity reached by tropical storms is likely to undergo an increase, with a significant increase in the

number of highly destructive category 5 storms. Storm strength leading to extreme weather is increasing, such as the Emanuel (2005) “ power dissipation index” of hurricane intensity[8]. Kerry Emmanuel in Nature writes that hurricane power dissipation is highly correlated with temperature, reflecting global warming. Hurricane modeling has produced similar results, finding that hurricanes, simulated under warmer, high-CO2 conditions, are more intense than under present-day conditions; there is less confidence in projections of a global decrease in numbers of hurricanes.

Worldwide, the proportion of hurricanes reaching categories 4 or 5 – with wind speeds above 56 metres per second – has risen from 20% in the 1970s to 35% in the 1990s. [9] Precipitation hitting the US from hurricanes increased by 7% over the twentieth century [10]. See also Time Magazine’s “ Global Warming: The Culprit? ” and [1]. (The extent to which this is due to global warming as opposed to the Atlantic Multidecadal Oscillation is unclear.) Catastrophes resulting from extreme weather are exacerbated by increasing population densities.

The World Meteorological Organization[2] and the U. S. Environmental Protection Agency [3] have linked increasing extreme weather events to global warming, as have Hoyos et al. (2006), writing that the increasing number of category 4 and 5 hurricanes is directly linked to increasing temperatures. [4] Thomas Knutson and Robert E. Tuleya of the NOAA stated in 2004 that warming induced by greenhouse gas may lead to increasing occurrence of highly destructive category-5 storms. [5] Vecchi and Soden

find that wind shear, the increase of which acts to inhibit tropical cyclones, also changes in model-projections of global warming.

There are projected increases of wind shear in the tropical Atlantic and East Pacific associated with the deceleration of the Walker circulation, as well as decreases of wind shear in the western and central Pacific[6]. The study does not make claims about the net effect on Atlantic and East Pacific hurricanes of the warming and moistening atmospheres, and the model-projected increases in Atlantic wind shear. [11] A substantially higher risk of extreme weather does not necessarily mean a noticeably greater risk of slightly-above-average weather[12].

However, the evidence is clear that severe weather and moderate rainfall are also increasing. Stephen Mwakifwamba, national co-ordinator of the Centre for Energy, Environment, Science and Technology – which prepared the Tanzanian government's climate change report to the UN – says that change is happening in Tanzania right now. " In the past, we had a drought about every 10 years", he says. " Now we just don't know when they will come. They are more frequent, but then so are floods. The climate is far less predictable.

We might have floods in May or droughts every three years. Upland areas, which were never affected by mosquitoes, now are. Water levels are decreasing every day. The rains come at the wrong time for farmers and it is leading to many problems"[13]. Greg Holland, director of the Mesoscale and Microscale Meteorology Division at the National Center for Atmospheric Research in Boulder, Colorado, said on April 24, 2006, " The hurricanes we

are seeing are indeed a direct result of climate change," and that the wind and warmer water conditions that fuel storms when they form in the Caribbean are, " increasingly due to greenhouse gases. There seems to be no other conclusion you can logically draw. " Holland said, " The large bulk of the scientific community say what we are seeing now is linked directly to greenhouse gases. " [14] (See also " Global warming? " in tropical cyclone) [edit] Increased evaporation [pic] [pic] Increasing water vapor at Boulder, Colorado.

Over the course of the 20th century, evaporation rates have reduced worldwide [15]; this is thought by many to be explained by global dimming. As the climate grows warmer and the causes of global dimming are reduced, evaporation will increase due to warmer oceans. Because the world is a closed system this will cause heavier rainfall and more erosion, and in more vulnerable tropical areas (especially in Africa), desertification due to deforestation. Many scientists think that it could result in more extreme weather as global warming progresses. The IPCC Third Annual Report says: "...

global average water vapor concentration and precipitation are projected to increase during the 21st century. By the second half of the 21st century, it is likely that precipitation will have increased over northern mid- to high latitudes and Antarctica in winter. At low latitudes there are both regional increases and decreases over land areas. Larger year to year variations in precipitation are very likely over most areas where an increase in mean

precipitation is projected” [16] [17]. [edit] Cost of more extreme weather Choi and Fisher, writing in Climate Change, vol.

58 (2003) pp. 149, predict that each 1% increase in annual precipitation would enlarge the cost of catastrophic storms by 2. 8%. The Association of British Insurers has stated that limiting carbon emissions would avoid 80% of the projected additional annual cost of tropical cyclones by the 2080s. The cost is also increasing partly because of building in exposed areas such as coasts and floodplains. The ABI claims that reduction of the vulnerability to some inevitable impacts of climate change, for example through more resilient buildings and improved ? ood defences, could also result in considerable cost-savings in the longterm. [18] [edit] Destabilization of local climates [pic] [pic] The first recorded South Atlantic hurricane, “ Catarina”, which hit Brazil in March 2004 In the northern hemisphere, the southern part of the Arctic region (home to 4, 000, 000 people) has experienced a temperature rise 1 °C to 3 °C (1. 8 °F to 5.

°F) over the last 50 years. Canada, Alaska and Russia are experiencing initial melting of permafrost. This may disrupt ecosystems and by increasing bacterial activity in the soil lead to these areas becoming carbon sources instead of carbon sinks [19]. A study (published in Science) of changes to eastern Siberia’s permafrost suggests that it is gradually disappearing in the southern regions, leading to the loss of nearly 11% of Siberia’s nearly 11, 000 lakes since 1971 [20]. At the same time, western Siberia is at the initial stage where melting permafrost is creating new lakes, which will eventually start disappearing as in the east.

Western Siberia is the world’s largest peat bog, and the melting of its permafrost is likely to lead to the release, over decades, of large quantities of methane—creating an additional source of greenhouse gas emissions [21]. Hurricanes were thought to be an entirely North Atlantic phenomenon. In April 2004, the first Atlantic hurricane to form south of the Equator hit Brazil with 40 m/s (144 km/h) winds; monitoring systems may have to be extended 1, 600 km (1000 miles) further south [22].

[edit] Oceans [edit] Sea level rise pic] [pic] Sea level has been rising 0. 2 cm/year, based on measurements of sea level rise from 23 long tide gauge records in geologically stable environments Main article: Sea level rise With increasing average global temperature, the water in the oceans expands in volume, and additional water enters them which had previously been locked up on land in glaciers, for example, the Greenland and the Antarctic ice sheets. An increase of 1. 5 to 4. 5 °C is estimated to lead to an increase of 15 to 95 cm (IPCC 2001). The sea level has risen more than 120 metres since the peak of the last ice age about 18, 000 years ago.

The bulk of that occurred before 6000 years ago. From 3000 years ago to the start of the 19th century, sea level was almost constant, rising at 0. 1 to 0. 2 mm/yr; since 1900, the level has risen at 1–2 mm/yr [23]; since 1992, satellite altimetry from TOPEX/Poseidon indicates a rate of about 3 mm/yr [24].

The Independent reported in December 2006 that the first island claimed by rising sea levels caused by global warming was Lohachara Island in the Sundarbans in Bay of Bengal. Lohachara was home to 10, 000. [25] Earlier

reports suggested that it was permanently flooded in the 1980s due to a variety of causes[26], that other islands were also affected and that the population in the Sundarbans had more than tripled to over 4 million. [27] [edit] Temperature rise The temperature of the Antarctic Southern Ocean rose by 0.

17 °C (0. 31 °F) between the 1950s and the 1980s, nearly twice the rate for the world's oceans as a whole [28]. As well as effects on ecosystems (e. g. y melting sea ice, affecting algae that grow on its underside), warming could reduce the ocean's ability to absorb CO2. More important for the United States may be the temperature rise in the Gulf of Mexico. As hurricanes cross the warm Loop Current coming up from South America, they can gain great strength in under a day (as did Hurricane Katrina and Hurricane Rita in 2005), with water above 85 °F seemingly promoting Category 5 storms. Hurricane season ends in November as the waters cool.

[edit] EcosystemsRising temperatures are beginning to have a noticeable impact on birds. Secondary evidence of global warming — lessened snow cover, rising sea levels, weather changes — provides examples of consequences of global warming that may influence not only human activities but also the ecosystems. Increasing global temperature means that ecosystems will change; some species are being forced out of their habitats (possibly to extinction) because of changing conditions, while others are flourishing. Few of the terrestrial ecoregions on Earth could expect to be unaffected. Many of the species at risk are arctic and antarctic fauna such as polar bears, emperor penguins, many salt wetland flora and fauna species,

and any species that inhabit the low land areas near the sea. Species that rely on cold weather conditions such as gyrfalcons, and snowy owls that prey on lemmings that use the cold winter to their advantage will be hit hard.

[citation needed] Butterflies have shifted their ranges northward by 200 km in Europe and North America. Plants lag behind, and larger animals' migration is slowed down by cities and highways. In Britain, spring butterflies are appearing an average of 6 days earlier than two decades ago [35]. In the Arctic, the waters of Hudson Bay are ice-free for three weeks longer than they were thirty years ago, affecting polar bears, which prefer to hunt on sea ice. [36]. Two 2002 studies in Nature (vol 421) [37] surveyed the scientific literature to find recent changes in range or seasonal behaviour by plant and animal species. Of species showing recent change, 4 out of 5 shifted their ranges towards the poles or higher altitudes, creating " refugee species".

Frogs were breeding, flowers blossoming and birds migrating an average 2. days earlier each decade; butterflies, birds and plants moving towards the poles by 6. 1 km per decade [38]. A 2005 study concludes human activity is the cause of the temperature rise and resultant changing species behaviour, and links these effects with the predictions of climate models to provide validation for them [39]. Grass has become established in Antarctica for the first time.

[40] Forests in some regions potentially face an increased risk of forest fires. The 10-year average of boreal forest burned in North America, after several decades of around 10, 000 km? (2. million acres), has increased steadily since 1970 to more than 28, 000 km? (7 million acres) annually. [41]. This

change may be due in part to changes in forest management practices. Also note forest fires since 1997 in Indonesia. The fires are started to clear forest for agriculture. These occur from time to time and can set fire to the large peat bogs in that region.

The CO2 released by these peat bog fires has been estimated, in an average year, to release 15% of the quantity of CO2 produced by fossil fuel combustion. See BBC article for more details. http://news. bbc.

co. uk/1/hi/sci/tech/4208564. tm [edit] Glacier retreat Main article: Retreat of glaciers since 1850 [pic] [pic] A map of the change in thickness of mountain glaciers since 1970.

Thinning in orange and red, thickening in blue. [pic] [pic] Lewis Glacier, North Cascades, WA USA is one of five glaciers in the area that melted away In historic times, glaciers grew during the Little Ice Age, a cool period from about 1550 to 1850. Subsequently, until about 1940, glaciers around the world retreated as climate warmed. Glacier retreat declined and reversed, in many cases, from 1950 to 1980 as a slight global cooling occurred. Since 1980, glacier retreat has become increasingly rapid and ubiquitous, so much so that it has threatened the existence of many of the glaciers of the world.

This process has increased markedly since 1995. [42] Excepting the ice caps and ice sheets of the Arctic and Antarctic, the total surface area of glaciers worldwide has decreased by 50% since the end of the 19th century [43]. Currently glacier retreat rates and mass balance losses have been increasing in the Andes, Alps, Himalaya’s, Rocky Mountains and North Cascades. As of

March 2005, the snow cap that has covered the top of Mount Kilimanjaro for the past 11, 000 years since the last ice age has almost disappeared [44].

The loss of glaciers not only directly causes landslides, flash floods and glacial lake overflow[45], but also increases annual variation in water flows in rivers. Glacier runoff declines in the summer as glaciers decrease in size, this decline is already observable in several regions [46]. Glaciers retain water on mountains in high precipitation years, since the snow cover accumulating on glaciers protects the ice from melting. In warmer and drier years, glaciers offset the lower precipitation amounts with a higher meltwater input [47]. Of particular importance are the Hindu Kush and Himalayan glacial melts that comprise the principal dry-season water source of many of the major rivers of the South, East and Southeast Asian mainland. Increased melting would cause greater flow for several decades, after which " some areas of the most populated regions on Earth are likely to ' run out of water'" as source glaciers are depleted.

48] The recession of mountain glaciers, notably in Western North America, Franz-Josef Land, Asia, the Alps, Indonesia and Africa, and tropical and sub-tropical regions of South America, has been used to provide qualitative support to the rise in global temperatures since the late 19th century. Many glaciers are being lost to melting further raising concerns about future local water resources in these glacierized areas. The Lewis Glacier, North Cascades pictured at right after melting away in 1990 is one of the 47 North Cascade glaciers observed and all are retreating [49]. Despite their proximity and importance to human populations, the mountain and valley glaciers of

temperate latitudes amount to a small fraction of glacial ice on the earth. About 99% is in the great ice sheets of polar and subpolar Antarctica and Greenland. These continuous continental-scale ice sheets, 3 km (1.

8 miles) or more in thickness, cap the polar and subpolar land masses. Like rivers flowing from an enormous lake, numerous outlet glaciers transport ice from the margins of the ice sheet to the ocean. Glacier retreat has been observed in these outlet glaciers, resulting in an increase of the ice flow rate. In Greenland the period since the year 2000 has brought retreat to several very large glaciers that had long been stable. Three glaciers that have been researched, Helheim, Jakobshavns and Kangerdlugssuaq Glaciers, jointly drain more than 16% of the Greenland Ice Sheet. Satellite images and aerial photographs from the 1950s and 1970s show that the front of the glacier had remained in the same place for decades.

But in 2001 it began retreating rapidly, retreating 7. km (4. 5 miles) between 2001 and 2005. It has also accelerated from 20 m (65 ft)/day to 32 m (104 ft)/day. [50] Jakobshavn Isbr? in west Greenland is generally considered the fastest moving glacier in the world.

It had been moving continuously at speeds of over 24 m (78 ft)/day with a stable terminus since at least 1950. In 2002, the 12 km (7. 5 mile) long floating terminus entered a phase of rapid retreat. The ice front started to break up and the floating terminus disintegrated accelerating to a retreat rate of over 30 m (98 ft)/day. The acceleration rate of retreat of Kangerdlugssuaq Glacier is even larger. Portions of the main trunk that were flowing at 15 m (49 ft)/day in 1988-2001 were flowing at 40 m (131 ft)/day in

summer 2005. The front of the glacier has also retreated and has rapidly thinned by more than 100 m (328 ft). [51] Glacier retreat and acceleration is also apparent on two important outlet glaciers of the West Antarctic Ice Sheet.

Pine Island Glacier, which flows into the Amundsen Sea thinned 3. 5 ± 0. 9 m (11. ± 3 ft) per year and retreated five kilometers (3.

1 miles) in 3. 8 years. The terminus of the glacier is a floating ice shelf and the point at which it is afloat is retreating 1.

2 km/year. This glacier drains a substantial portion of the West Antarctic Ice Sheet and has been referred to as the weak underbelly of this ice sheet. [52] This same pattern of thinning is evident on the neighboring Thwaites Glacier cliff. [edit] Forest fires Rising global temperature might cause forest fires to occur on larger scale, and more regularly. This releases more stored carbon into the atmosphere than the carbon cycle can naturally re-absorb, as well as reducing the overall forest area on the planet, creating a positive feedback loop. Part of that feedback loop is more rapid growth of replacement forests and a northward migration of forests as northern latitudes become more suitable climates for sustaining forests. There is a question of whether the burning of renewable fuels such as forests should be counted as contributing to global warming. (Climate Change and Fire) (Climate Roulette: Loss of Carbon Sinks & Positive Feedbacks) (EPA: Global Warming: Impacts: Forests) Feedback Cycles linking forests, climate and landuse activities) [edit] Retreat of sea Ice The sea absorbs heat from the sun, while the ice largely reflects the sun rays back to space.

Thus, retreating sea ice will allow the sun to warm the now exposed sea water, contributing to further warming. The mechanism is the same as when a black car heats up faster in sunlight than a white car. This albedo change is also the main reason why IPCC predict polar temperatures to rise up to twice as much as those of the rest of the world. [edit] Negative feedback effectsFollowing Le Chatelier's principle, the chemical equilibrium of the Earth's carbon cycle will shift in response to anthropogenic CO2 emissions. The primary driver of this is the ocean, which absorbs anthropogenic CO2 via the so-called solubility pump. At present this accounts for only about one third of the current emissions, but ultimately most (~75%) of the CO2 emitted by human activities will dissolve in the ocean over a period of centuries (Archer, 2005; " A better approximation of the lifetime of fossil fuel CO2 for public discussion might be 300 years, plus 25% that lasts forever"). However, the rate at which the ocean will take it up in the future is less certain, and will be affected by stratification induced by warming and, potentially, changes in the ocean's thermohaline circulation.

Also, the thermal radiation of the Earth rises as the temperature to the fourth power. The impact of these negative feedback effects in relation to the positive feedback effects are part of IPCC's global climate models. [edit] Consequences [pic] As recent estimates of the rate of global warming have increased, so have the financial estimates of the damage costs. [59] See also: Economics of global warming edit] Effects on agriculture Main article: Global warming and agriculture For some time it was hoped that a positive effect of global warming would be increased agricultural yields, because of the role of carbon dioxide in photosynthesis, especially in preventing

photorespiration, which is responsible for significant destruction of several crops.

In Iceland, rising temperatures have made possible the widespread sowing of barley, which was untenable twenty years ago. Some of the warming is due to a local (possibly temporary) effect via ocean currents from the Caribbean, which has also affected fish stocks. 70] While local benefits may be felt in some regions (such as Siberia), recent evidence is that global yields will be negatively affected. “ Rising atmospheric temperatures, longer droughts and side-effects of both, such as higher levels of ground-level ozone gas, are likely to bring about a substantial reduction in crop yields in the coming decades, large-scale experiments have shown” [71].

Moreover, the region likely to be worst affected is Africa, both because its geography makes it particularly vulnerable, and because seventy per cent of the population rely on rain-fed agriculture for their livelihoods. Tanzania’s official report on climate change suggests that the areas that usually get two rainfalls in the year will probably get more, and those that get only one rainy season will get far less. The net result is expected to be that 33% less maize —the country’s staple crop—will be grown. [72] [pic] [pic] Ice thicknesses changes from 1950s to 2050s simulated in one of GFDL’s R30 atmosphere-ocean general circulation model experiments Melting Arctic ice may open the Northwest Passage in summer, which would cut 5, 000 nautical miles (9, 000 km) from shipping routes between Europe and Asia.

This would be of particular relevance for supertankers which are too big to fit through the Panama Canal and currently have to go around the tip of South

America. According to the Canadian Ice Service, the amount of ice in Canada’s eastern Arctic Archipelago decreased by 15% between 1969 and 2004. [83] While the reduction of summer ice in the Arctic may be a boon to shipping, this same phenomenon threatens the Arctic ecosystem, most notably polar bears which depend on ice floes. Subsistence hunters such as the Inuit peoples will find their livelihoods and cultures increasingly threatened as the ecosystem changes due to global warming. [edit] Environmental Secondary evidence of global warming — reduced snow cover, rising sea levels, weather changes — provides examples of consequences of global warming that may influence not only human activities but also ecosystems.

Increasing global temperature means that ecosystems may change; some species may be forced out of their habitats (possibly to extinction) because of changing conditions, while others may flourish. Few of the terrestrial ecoregions on Earth could expect to be unaffected. Increasing carbon dioxide may increase ecosystems’ productivity to a point. Ecosystems’ unpredictable interactions with other aspects of climate change makes the possible environmental impact of this is unclear, though. An increase in the total amount of biomass produced may not be necessarily positive: biodiversity can still decrease even though a relatively small number of species are flourishing. [edit] Water scarcity Positive eustasy may contaminate groundwater, affecting drinking water and agriculture in coastal zones. Increased evaporation will reduce the effectiveness of reservoirs.

Increased extreme weather means more water falls on hardened ground unable to absorb it, leading to flash floods instead of a replenishment of soil moisture or groundwater levels. In some areas, shrinking glaciers threaten the water supply. [86] Higher temperatures will also increase the demand for water for the purposes of cooling and hydration. In the Sahel, there has been on average a 25% decrease in annual rainfall over the past 30 years. [edit] Health [edit] Direct effects of temperature riseThe most direct effect of climate change would be the impacts of hotter temperatures themselves. Extreme high temperatures increase the number of people who die on a given day for many reasons: people with heart problems are vulnerable because one’s cardiovascular system must work harder to keep the body cool during hot weather, heat exhaustion, and some respiratory problems increase. Higher air temperature also increase the concentration of ozone at ground level.

In the lower atmosphere, ozone is a harmful polluntant. It damages lung tissues and causes problems for people with asthmas other lung diseases. 89] Rising temperatures have two opposing direct effects on mortality: higher temperatures in winter reduce deaths from cold; higher temperatures in summer increase heat-related deaths. The distribution of these changes obviously differs.

Palutikof et al calculate that in England and Wales for a 1 °C temperature rise the reduced deaths from cold outweigh the increased deaths from heat, resulting in a reduction in annual average mortality of 7000. The European heat wave of 2003 killed 22, 000–35, 000 people, based on normal mortality

rates (Schar and Jendritzky, 2004). It can be said with 90% confidence that past human influence on climate was responsible for at least half the risk of the 2003 European summer heat-wave (Stott et al 2004). However, in the United States, only 1000 people die from the cold each year, while twice that number die from the heat.

[90] The 2006 United States heat wave has killed 139 people in California as of 29 July 2006. [Deaths of livestock have not been well-documented.] Fresno, in the central California valley, had six consecutive days of 110 degree-plus Fahrenheit temperatures. [91] [edit] Impacts of glacier retreatThe continued retreat of glaciers will have a number of different impacts. In areas that are heavily dependent on water runoff from glaciers that melt during the warmer summer months, a continuation of the current retreat will eventually deplete the glacial ice and substantially reduce or eliminate runoff. A reduction in runoff will affect the ability to irrigate crops and will reduce summer stream flows necessary to keep dams and reservoirs replenished.

This situation is particularly acute for irrigation in South America, where numerous artificial lakes are filled almost exclusively by glacial melt. BBC) Central Asian countries have also been historically dependent on the seasonal glacier melt water for irrigation and drinking supplies. In Norway, the Alps, and the Pacific Northwest of North America, glacier runoff is important for hydropower.

Many species of freshwater and saltwater plants and animals are dependent on glacier-fed waters to ensure a cold water habitat that they have adapted

to. Some species of freshwater fish need cold water to survive and to reproduce, and this is especially true with Salmon and Cutthroat trout. Reduced glacier runoff can lead to insufficient stream flow to allow these species to thrive. Ocean krill, a cornerstone species, prefer cold water and are the primary food source for aquatic mammals such as the Blue whale. (CBS) Alterations to the ocean currents, due to increased freshwater inputs from glacier melt, and the potential alterations to thermohaline circulation of the worlds oceans, may impact existing fisheries upon which humans depend as well. The potential for major sea level rise is mostly dependent on a significant melting of the polar ice caps of Greenland and Antarctica, as this is where the vast majority of glacial ice is located. The British Antarctic Survey has determined from climate modeling that for at least the next 50 years, snowfall on the continent of Antarctica should continue to exceed glacial losses from global warming.

The amount of glacial loss on the continent of Antarctica is not increasing significantly, and it is not known if the continent will experience a warming or a cooling trend, although the Antarctic Peninsula has warmed in recent years, causing glacier retreat in that region. (BAS) If all the ice on the polar ice caps were to melt away, the oceans of the world would rise an estimated 70 m (229 ft). However, with little major melt expected in Antarctica, sea level rise of not more than 0. 5 m (1. 6 ft) is expected through the 21st century, with an average annual rise of 0. 0004 m (0. 0013 ft) per year.

Thermal expansion of the world’s oceans will contribute, independent of glacial melt, enough to double those figures. (NSIDC2) [edit] References The

planet is warming, humans are mostly to blame and plants and animals are going to dramatic lengths to cope. That’s the consensus of a number of recent studies that used wildlife to gauge the extent of global warming and its effects. While the topic of climate change is contentious — including whether the planet is actually heating up — a growing number of documented shifts in traits and behaviors in the wild kingdom is leading many scientists to conclude the world is changing in unnatural ways.

Among the changes [see full list]: • Marmots end their hibernations about three weeks earlier now compared to 30 years ago. • Polar bears today are thinner and less healthy than those of 20 years ago. • Many fish species are moving northward in search of cooler waters. A fruitfly gene normally associated with hot, dry conditions has spread to populations living in traditionally cooler southern regions. While we argue ..

. Over the past century, Earth’s average temperature has risen by about 1 degree Fahrenheit and many scientists believe greenhouse gases and carbon dioxide emissions from human activities are to blame. Left unattended, they warn, temperatures may rise by an additional 2-10 degrees by the end of the century. In the leading computer models, it follows that polar ice will melt nd seas would rise drastically, threatening coastal communities around the globe. | | | | Surprising Side Effects of Global | | Warming | | | | Longer Airline Flights Proposed to | | Combat Global Warming | | No Stopping it Now: Seas to Rise 4 | | Inches or More this Century | | Internet Project Concludes Planet | | Could Warm by Nearly 20 Degrees | |

2005 Could Become Warmest on Record| | | | | | | | | A handful of scientists dispute the data. Others say humans aren’t to blame.

Terry Root, an environmental science and policy professor at Stanford University, says that as humans argue about thermometer readings, animals are providing evidence that should be figured in to scientific and political decisions. Animals are “ just reacting to what’s going on out there,” Root says. And if their behavior is very similar to what we expect with what’s going on with global warming — if they’re shifting and they’re moving, if they’re changing their breeding time by 5 days in 10 years — we can use that information to support what the thermometers are also showing. ” Climate change can occur naturally, but what worries many scientists the most — and the reason why they don’t think this is part of a natural cycle — is the rapid rate at which the current changes are happening — changes that are being reflected in the responses of wildlife.

In a 2003 study published in the journal Nature, Root and her colleagues analyzed numerous studies involving wild plant and animals for changes due to global warming. Out of the nearly 1, 500 species examined, the researchers found that about 1, 200 exhibited temperature-related changes consistent with what scientists would expect if they were being affected by global warming. The authors highlighted four possible ways that species might respond to rising temperatures, all of which have been documented by other studies and researchers.