DOWNLOAD PDF BE COOL DESPITE GLOBAL WARMING

Chapter 1 : Cool summer doesnâ€™t invalidate climate change - The Boston Globe

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Click search or press enter Global Warming vs. But years ago, most scientists believed that Earth had been steadily cooling since it was formed. When Louis Agassiz presented the concept of a Great Ice Age to the Swiss Society of Natural Sciences in , his suggestion that the planet had turned colder and then warmed up again was met with skepticism and even hostility, triggering years of fierce scientific debate before the idea was accepted. Exactly why our planet occasionally cools down has taken more than a century to work out. This constant snow cover reflects a great deal of sunlight, cooling things down even more, and a new ice age begins. Given how catastrophic another ice age could be, one might be tempted to ask whether a human-caused increase in atmospheric and ocean temperatures will actually be a boon. Temperature increases over the 21st century will probably be two and a half to five times as large,because greenhouse gases like carbon dioxide allow sunlight to penetrate the atmosphere but make it harder for outgoing infrared radiation to escape. Analyses of air trapped in glacial ice over the last , years show that atmospheric carbon dioxide generally ranged between and parts per million by volume ppmv ; increases in these levels were slightly preceded by increases in temperature caused by natural orbital shifts. During this period, global temperature varied by about 12 oC. Now, carbon levels are approaching ppmv as the burning of fossil fuels pumps more and more carbon dioxide into the atmosphere. Even if the rate of growth could be moderated enough to stabilize levels at about ppmv, average temperatures might well rise by about 5 oCâ€”with devastating effects for us earthlings, such as rising sea levels and dramatic changes in weather patterns. But even that warming will not stave off the eventual return of huge glaciers, because ice ages last for millennia and fossil fuels will not. In about years, all available fossil fuels may well have been consumed. Over the following centuries, excess carbon dioxide will naturally dissolve into the oceans or get trapped by the formation of carbonate minerals. In about 2, years, when the types of planetary motions that can induce polar cooling start to coincide again, the current warming trend will be a distant memory. This means that humanity will be hit by a one-two punch the likes of which we have never seen. Nature is as unforgiving to men as it was to dinosaurs; advanced civilization will not survive unless we develop energy sources that curb the carbon emissions heating the planet today and help us fend off the cold when the ice age comes. MIT alumni could play a prominent part in discovering the technology needed to keep us all going. And there are fortunes to be made from the effort. Will you lead or follow? Join us at EmTech Digital

Chapter 2 : Global Warming Facts: 24 Facts about Global Warming â†•FACTSlidesâ†’

Since the Maunder Minimum, global average temperatures have been on the rise, driven by climate change. Though a new decades-long dip in solar radiation could slow global warming somewhat, it.

How global warming works? All those bombs going off, all those rockets, all those planes and helicopters. All that fuel of various kinds being used. It pollutes the air and water of this very fragile and interconnected planet. These gases are required for the presence of human life on earth. However, global warming is happening due to over-emittance of these gases. Emissions like carbon dioxide, nitrous oxide and other greenhouses gases will remain in the atmosphere for many years making impossible to eliminate global warming for several decades. According to IPCC report, sea levels will rise by inches by the end of this century due to global warming. Since , the average temperature has risen by 1. The last two decades of the 20th century have been hottest in the last years, according to climate studies. The Arctic is one of the worst places to be effected by global warming. According to the multinational Arctic Climate Impact Assessment report compiled between and , the average temperature in Alaska, Western Canada and Russia have risen at twice the global average. The Arctic ice is melting rapidly. By the region is expected to have a completely ice free summer, or even earlier. The Montana Glacier National Park has only 25 glaciers instead of that were there in the year Due to global warming and pollution , coral reefs are suffering the worst bleaching with the highest dying record since Global warming that is causing extreme weather changes has shown it implications in the way of forest fires, heat waves and severe tropical storms throughout the world. There has been a tremendous increase of water vapor, carbon dioxide, methane nitrous oxide and especially greenhouse gases due to polluting substances emitted as a result of industrialization, pollution, deforestation. Sea levels have risen about 7 inches in the in the last years, which is more than the previous years combined. The rising sea levels due to global warming could threaten the lives of people living along the coastal areas. Around million people live with 3 feet of sea level and many cities of the world are located near such vulnerable coastal areas. Melting of glaciers will cause sea levels to rise on one hand and water shortages in areas that depend on natural sources of water. More than 1 million species have become extinct due to disappearing habitats, ecosystems acidic oceans all caused due to global warming. Increasing temperatures will release more greenhouse gases, unlock methane, and cause more evaporation of water. The rate at which carbon dioxide is being dumped in to the environment is tons per second until the records. The carbon dioxide levels in the 20th century have been highest in , years. Due to industrial revolution, the burning of fossil fuels like coal, oil and gas started on a massive scale. This not only increased greenhouse gases but was also responsible for large scale deaths due to asthma and other respiratory diseases. Human activities release around 37 billion metric tons of carbon dioxide per year. By year , the average temperature will rise by 5. Each year of the 21st century ranks amongst 14 hottest years since Fossil fuels are the most dangerous contributors to global warming. Between , the heat related deaths will rise by , Global warming is causing the colder areas of the world to become more hot, thereby becoming more vulnerable to diseases. Droughts, hurricanes, wildfires, extinction on endangered species, melting of polar ice caps, storms are few of the effects of global warming. The heat trapping gases have been increasing in the atmosphere at an alarming rate. The presence of large number of these gases has resulted in enhanced greenhouse effect. Heat waves caused by global warming is responsible for many heat related illness and deaths. Global warming can lead to massive food and water shortages and has a life threatening impact on the wildlife. If these figures do not startle, then it will be extremely difficult to prevent the world from collapsing from global warming. Many schools, organizations, government bodies etc are making efforts to encourage people to take steps that would prevent them from taking any action that would lead to global warming. The most important consideration however is to feel for the problem and to be fully awakened to the situation. Unless the critical issue of global warming does not hit every person on earth, it will be very difficult to prevent the world from burning due to global warming in the near future.

Chapter 3 : Global warming - Wikipedia

Didn't find what you're looking for? Try adding this search to your want list. Millions of books are added to our site everyday and when we find one that matches your search, we'll send you an e-mail. Best of all, it's free. A special order item has limited availability and the seller may source.

Scroll to top of page Matthew J. But how can summer be over when it never really began? If you feel cheated â€" where were the scorchers and leaden humid nights? July and August really did feel more like an extension of spring than a separate season. The Boston area had but four days over 90 degrees; usually it has Average temperatures for the summer were well below normal too. This, of course, followed on the heels of a cold and snowy winter that felt like it would never end. So much for this global warming nonsense, huh? If climate change is real â€" if the world is supposedly heating up â€" then how come last winter was so long and our summer so cool? In fact, climate change proceeds apace. Our cool summer offers proof. Get Today in Opinion in your inbox: Sign Up Thank you for signing up! Sign up for more newsletters here The world continues to get warmer. Of that, there is no doubt. And the impacts of that rise are now being observed everywhere. The oceans are warmer. Ice sheets in Greenland, the Antarctic, and Arctic are getting smaller. The acidity of the oceans caused by the absorption of carbon dioxide has gone up 30 percent since the mids. Sea levels are rising too â€" 6. Extreme weather events are on the rise. So why did we have such a cold winter and cool summer? It all has to do with the polar vortex. The vortexes there are two, north and south are like slow-moving cyclones high in the atmosphere that circle the poles. But, in the case of the Arctic, the impacts from the vortex to the lower levels of the atmosphere usually stay close to the pole because warmer air in the continental United States, acting as a front, keeps them there. But â€" thanks to global climate change â€" the Arctic is actually warming up faster than the rest of the world. The reason is that ice reflects the sun, while water absorbs it. That makes the difference in temperatures between the continent and the Arctic less, and so now the colder air on occasion swoops lower. Thus, the seeming contradiction: Our cold weather proves global warming. The fact that such contradictions exist underscores the complexity of figuring out global climate change. If you count yourself a climate-change skeptic, read the full UN report. Tom Keane can be reached at tomkeane tomkeane.

Chapter 4 : How do we know more CO2 is causing warming?

Until we can shift our economy over to greener energy sources, global warming will be a problem, regardless of how warm or cold it is outside. CONTACTS: NASA, blog.quintoapp.com ; NOAA, blog.quintoapp.com

Two millennia of mean surface temperatures according to different reconstructions from climate proxies , each smoothed on a decadal scale, with the instrumental temperature record overlaid in black. Multiple independently produced datasets confirm that from to the global average land and ocean surface temperature increased by 0. The rest has melted ice and warmed the continents and the atmosphere. Regional effects of global warming and Cold blob North Atlantic Difference between average temperature in â€" compared to the period, showing strong arctic amplification. Global warming refers to global averages. It is not uniform around the world: Although more greenhouse gases are emitted in the Northern than in the Southern Hemisphere, this does not contribute to the difference in warming because the major greenhouse gases persist long enough to diffuse within and between the two hemispheres. One climate commitment study concluded that if greenhouse gases were stabilized at year levels, surface temperatures would still increase by about 0. Some of this surface warming would be driven by past natural forcings which have not yet reached equilibrium in the climate system. Some climatologists have criticized the attention that the popular press gives to "warmest year" statistics. Attribution of recent climate change By itself, the climate system may generate random changes in global temperatures for years to decades at a time, but long-term changes emanate only from so-called external forcings. It was proposed by Joseph Fourier in , discovered in by John Tyndall , [63] was first investigated quantitatively by Svante Arrhenius in , [64] and the hypothesis was reported in the popular press as early as The rest of this increase is caused mostly by changes in land-use, particularly deforestation. According to professor Brian Hoskins , this is likely the first time CO2 levels have been this high for about 4. Attributions of emissions due to land-use change are subject to considerable uncertainty. Atmospheric particles from these and other sources could have a large effect on climate through the aerosol indirect effect. They exert a cooling effect by increasing the reflection of incoming sunlight. Removal by clouds and precipitation gives tropospheric aerosols an atmospheric lifetime of only about a week, while stratospheric aerosols can remain for a few years. Carbon dioxide has a lifetime of a century or more, and as such, changes in aerosols will only delay climate changes due to carbon dioxide. 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, a phenomenon known as the Twomey effect. Indirect effects of aerosols represent the largest uncertainty in radiative forcing. Atmospheric soot directly absorbs solar radiation, which heats the atmosphere and cools the surface. Contribution of natural factors and human activities to radiative forcing of climate change. Climate change feedback , Climate sensitivity , and Arctic amplification The dark ocean surface reflects only 6 percent of incoming solar radiation, whereas sea ice reflects 50 to 70 percent. Positive feedbacks increase the response of the climate system to an initial forcing, while negative feedbacks reduce it. Other factors being equal, a higher climate sensitivity means that more warming will occur for a given increase in greenhouse gas forcing. More research is needed to understand the role of clouds [] and carbon cycle feedbacks in climate projections. Another study conducted by Harvard researchers suggests that increased water vapor injected into the stratosphere , due to rising temperatures, increases ozone depletion , subsequently raising the odds of skin cancer and damaging crops. Projected change in annual mean surface air temperature from the late 20th century to the middle 21st century, based on a medium emissions scenario SRES A1B. Global climate model A climate model is a representation of the physical, chemical and biological processes that affect the climate system. Instead the models predict how greenhouse gases will interact with radiative transfer and other physical processes. Warming or cooling is thus a result, not an assumption, of the models. Although these models do not unambiguously attribute the warming that occurred from approximately to to either natural variation or human effects, they do indicate that the warming since is dominated by anthropogenic greenhouse gas emissions. Observed Arctic shrinkage has been faster than that predicted. Effects of global warming Projections of global mean sea level rise by Parris and others. Map of the Earth

with a six-meter sea level rise represented in red. Sparse records indicate that glaciers have been retreating since the early s. Biosphere Overall, it is expected that climate change will result in the extinction of many species and reduced diversity of ecosystems. Geological Survey projects that two-thirds of polar bears will disappear by Physical impacts of climate change and Climate change and ecosystems The environmental effects of global warming are broad and far reaching. They include the following diverse effects: Arctic sea ice decline , sea level rise , retreat of glaciers: Global warming has led to decades of shrinking and thinning in a warm climate that has put the Arctic sea ice in a precarious position, it is now vulnerable to atmospheric anomalies. Additionally, sea level rise has accelerated from to Data analysis of extreme events from until suggests that droughts and heat waves appear simultaneously with increased frequency. In terrestrial ecosystems , the earlier timing of spring events, as well as poleward and upward shifts in plant and animal ranges, have been linked with high confidence to recent warming. On the timescale of centuries to millennia, the magnitude of global warming will be determined primarily by anthropogenic CO2 emissions. This could lead to landslides and increased seismic and volcanic activities. Tsunamis could be generated by submarine landslides caused by warmer ocean water thawing ocean-floor permafrost or releasing gas hydrates. Climate change could result in global, large-scale changes in natural and social systems. Examples of abrupt climate change are the rapid release of methane and carbon dioxide from permafrost , which would lead to amplified global warming. Another example is the possibility for the Atlantic Meridional Overturning Circulation to slow- or shutdown see also shutdown of thermohaline circulation. Effects of global warming on humans , Effects of global warming on human health , Climate change and national security , Climate refugee , Climate change adaptation , and Economics of global warming The effects of climate change on human systems , mostly due to warming or shifts in precipitation patterns, or both, have been detected worldwide. The future social impacts of climate change will be uneven across the world.

Chapter 5 : Global Warming vs. the Next Ice Age - MIT Technology Review

Just because the U.S. experiences cold snaps across large swathes of the country doesn't mean global warming isn't happening.

New calculations by the author indicate that if the world continues to burn fossil fuels at the current rate, global warming will rise to two degrees Celsius by , crossing a threshold that will harm human civilization. To avoid the threshold, nations will have to keep carbon dioxide levels below parts per million. Such reassuring claims about climate abound in the popular media, but they are misleading at best. Global warming continues unabated, and it remains an urgent problem. The important question is, What does the short-term slowdown portend for how the world may warm in the future? In response to the data, the IPCC in its September report lowered one aspect of its prediction for future warming. Its forecasts, released every five to seven years, drive climate policy worldwide, so even the small change raised debate over how fast the planet is warming and how much time we have to stop it. The IPCC has not yet weighed in on the impacts of the warming or how to mitigate it, which it will do in reports that were due this March and April. Yet I have done some calculations that I think can answer those questions now: If the world keeps burning fossil fuels at the current rate, it will cross a threshold into environmental ruin by The upturned blade of the stick, at the right, indicated an abrupt and unprecedented rise since the mids. The graph became a lightning rod in the climate change debate, and I, as a result, reluctantly became a public figure. In its September report, the IPCC extended the stick back in time, concluding that the recent warming was likely unprecedented for at least 1, years. Although the earth has experienced exceptional warming over the past century, to estimate how much more will occur we need to know how temperature will respond to the ongoing human-caused rise in atmospheric greenhouse gases, primarily carbon dioxide. ECS is a common measure of the heating effect of greenhouse gases. The preindustrial level of CO2 was about parts per million ppm , so double is roughly ppm. The more sensitive the atmosphere is to a rise in CO2, the higher the ECS, and the faster the temperature will rise. ECS is shorthand for the amount of warming expected, given a particular fossil-fuel emissions scenario. It is difficult to determine an exact value of ECS because warming is affected by feedback mechanisms, including clouds, ice and other factors. Different modeling groups come to different conclusions on what the precise effects of these feedbacks may be. Clouds could be the most significant. They can have both a cooling effect, by blocking out incoming sunlight, and a warming effect, by absorbing some of the heat energy that the earth sends out toward space. Which of these effects dominates depends on the type, distribution and altitude of the cloudsâ€”difficult for climate models to predict. Other feedback factors relate to how much water vapor there will be in a warmer atmosphere and how fast sea ice and continental ice sheets will melt. The IPCC based the lowered bound on one narrow line of evidence: Many climate scientistsâ€”myself includedâ€”think that a single decade is too brief to accurately measure global warming and that the IPCC was unduly influenced by this one, short-term number. Furthermore, other explanations for the speed bump do not contradict the preponderance of evidence that suggests that temperatures will continue to rise. Natural variability in the amount of heat the oceans absorb may have played a role. Finally, one recent study suggests that incomplete sampling of Arctic temperatures led to underestimation of how much the globe actually warmed. None of these plausible explanations would imply that climate is less sensitive to greenhouse gases. When all the forms of evidence are combined, they point to a most likely value for ECS that is close to three degrees C. What would it mean if the actual ECS were half a degree lower than previously thought? Would it change the risks presented by business-as-usual fossil-fuel burning? How quickly would the earth cross the critical threshold? A Date with Destiny: ECS is a guide to when that will happen if we continue emitting CO2 at our business-as-usual pace. I recently calculated hypothetical future temperatures by plugging different ECS values into a so-called energy balance model, which scientists use to investigate possible climate scenarios. The computer model determines how the average surface temperature responds to changing natural factors, such as volcanoes and the sun, and human factorsâ€”greenhouse gases, aerosol pollutants, and so on. Although climate models have critics, they reflect our best ability to describe how the climate system works, based on physics, chemistry and biology.

And they have a proved track record: I then instructed the model to project forward under the assumption of business-as-usual greenhouse gas emissions. The curves for an ECS of 2. The curves for a substantially lower 1. To my wonder, I found that for an ECS of three degrees C, our planet would cross the dangerous warming threshold of two degrees C in , only 22 years from now. When I considered the lower ECS value of 2. So even if we accept a lower ECS value, it hardly signals the end of global warming or even a pause. Instead it simply buys us a little bit of timeâ€"potentially valuable timeâ€"to prevent our planet from crossing the threshold. Cautious Optimism These findings have implications for what we all must do to prevent disaster. An ECS of three degrees C means that if we are to limit global warming to below two degrees C forever, we need to keep CO2 concentrations far below twice preindustrial levels, closer to ppm. Ironically, if the world burns significantly less coal, that would lessen CO2 emissions but also reduce aerosols in the atmosphere that block the sun such as sulfate particulates , so we would have to limit CO2 to below roughly ppm. We are well on our way to surpassing these limits. In atmospheric CO2 briefly reached ppm for the first time in recorded historyâ€"and perhaps for the first time in millions of years, according to geologic evidence. To avoid breaching the ppm threshold, fossil-fuel burning would essentially have to cease immediately. To avoid the ppm threshold, global carbon emissions could rise only for a few more years and then would have to ramp down by several percent a year. That is a tall task. If the ECS is indeed 2. Even so, there is considerable reason for concern. The conclusion that limiting CO2 below ppm will prevent warming beyond two degrees C is based on a conservative definition of climate sensitivity that considers only the so-called fast feedbacks in the climate system, such as changes in clouds, water vapor and melting sea ice. Some climate scientists, including James E. Hansen, former head of the nasa Goddard Institute for Space Studies, say we must also consider slower feedbacks such as changes in the continental ice sheets. When these are taken into account, Hansen and others maintain, we need to get back down to the lower level of CO2 that existed during the midth centuryâ€"about ppm. It is based on when most of the globe will be exposed to potentially irreversible climate changes. Yet destructive change has already arrived in some regions. In the Arctic, loss of sea ice and thawing permafrost are wreaking havoc on indigenous peoples and ecosystems. In low-lying island nations, land and freshwater are disappearing because of rising sea levels and erosion. For these regions, current warming, and the further warming at least 0. Let us hope that a lower climate sensitivity of 2. If so, it offers cautious optimism. It provides encouragement that we can avert irreparable harm to our planet. That is, ifâ€"and only ifâ€"we accept the urgency of making a transition away from our reliance on fossil fuels for energy.

Chapter 6 : Global cooling - Is global warming still happening?

"We find that the noticeable warming (> K) started sporadically over the global land and accelerated until around ," the study continues.

Surface temperatures can show short-term cooling when heat is exchanged between the atmosphere and the ocean, which has a much greater heat capacity than the air. No climate model has predicted a cooling of the Earth â€" quite the contrary. And this means that the projections of future climate are unreliable. Global warming is by definition global. The entire planet is accumulating heat due to an energy imbalance. The atmosphere is warming. Oceans are accumulating energy. Land absorbs energy and ice absorbs heat to melt. This new research combines measurements of ocean heat, land and atmosphere warming and ice melting to find that our climate system continued to accumulate heat through to Also see this graphic that shows the ocean heating in two layers, meters and meters deep. So why do surface temperature records show as the hottest year on record? Hence, relatively small exchanges of heat between the atmosphere and ocean can cause significant changes in surface temperature. Consequently, we experienced above-average surface temperatures. Conversely, the last few years have seen moderate La Nina conditions which had a cooling effect on global temperatures. And the last few months have swung back to warmer El Nino conditions. This has coincided with the warmest June-August sea surface temperatures on record. This internal variation where heat is shuffled around our climate is the reason why surface temperature is such a noisy signal. Figure 1 also underscores just how much global warming the planet is experiencing. In more meaningful terms, the planet has been accumulating energy at a rate of , gigawatts. Considering a typical nuclear power plant has an output of 1 gigawatt, imagine , nuclear power plants pouring their energy output directly into our oceans. Our climate is still accumulating heat. Global warming is still happening. Moreover, even if we focus exclusively on surface and lower atmosphere temperatures, the warming continues. A month running average was applied to each dataset.

Chapter 7 : Global fisheries could still become more profitable despite global warming

Nations around the world are upping their game in the fight against climate change, even as President Trump recently announced the U.S.'s withdrawal from the Paris Agreement. And despite this.

An enhanced greenhouse effect from CO2 has been confirmed by multiple lines of empirical evidence. Increasing CO2 has little to no effect "While major green house gas H2O substantially warms the Earth, minor green house gases such as CO2 have little effect The 6-fold increase in hydrocarbon use since has had no noticeable effect on atmospheric temperature In other words, armed only with a theory, we should be able to make predictions about a subject. The effect of adding man-made CO2 is predicted in the theory of greenhouse gases. This theory was first proposed by Swedish scientist Svante Arrhenius in , based on earlier work by Fourier and Tyndall. Many scientist have refined the theory in the last century. Climate models have predicted the least temperature rise would be on average 1. What Goes Downâ€¦ The greenhouse effect works like this: Energy arrives from the sun in the form of visible light and ultraviolet radiation. The Earth then emits some of this energy as infrared radiation. There should be some evidence that links CO2 to the temperature rise. So far, the average global temperature has gone up by about 0. Two-thirds of the warming has occurred since , at a rate of roughly 0. The connection can be found in the spectrum of greenhouse radiation. Using high-resolution FTIR spectroscopy, we can measure the exact wavelengths of long-wave infrared radiation reaching the ground. Spectrum of the greenhouse radiation measured at the surface. Greenhouse effect from water vapour is filtered out, showing the contributions of other greenhouse gases Evans Sure enough, we can see that CO2 is adding considerable warming, along with ozone O3 and methane CH4. We can examine the spectrum of upward long-wave radiation in and to see if there are changes. Change in spectrum from to due to trace gases. This time, we see that during the period when temperatures increased the most, emissions of upward radiation have decreased through radiative trapping at exactly the same wavenumbers as they increased for downward radiation. The same greenhouse gases are identified: CO2, methane, ozone etc. The Empirical Evidence As temperatures started to rise, scientists became more and more interested in the cause. Many theories were proposed. All save one have fallen by the wayside, discarded for lack of evidence. One theory alone has stood the test of time, strengthened by experiments. We know CO2 absorbs and re-emits longwave radiation Tyndall. The theory of greenhouse gases predicts that if we increase the proportion of greenhouse gases, more warming will occur Arrhenius. Scientists have measured the influence of CO2 on both incoming solar energy and outgoing long-wave radiation. Less longwave radiation is escaping to space at the specific wavelengths of greenhouse gases. Increased longwave radiation is measured at the surface of the Earth at the same wavelengths. These data provide empirical evidence for the predicted effect of CO2.

Chapter 8 : Earth Will Cross the Climate Danger Threshold by - Scientific American

By contrast, the dismissive group, or "Cool Skeptics," worries little to not at all about global warming. Its members uniformly believe that news reports about global warming exaggerate the problem and doubt global warming will pose a serious threat in their lifetime.

Chapter 9 : Why Global Warming Can Mean Harsher Winter Weather - Scientific American

To look at mean global temperature trends, this linear warming of deg C/ year can be removed by de-trending the anomaly, which gives the oscillating global temperature anomaly pattern. This pattern shows global cooling and warming phases of about 30 year duration, and the current trend is global cooling until