



## The Emails from the University of East Anglia's Climatic Research Unit

On or about November 19, 2009, as yet unknown persons hacked into an email server at the University of East Anglia's Climatic Research Unit (CRU) in Norwich, U.K. The CRU is an academic department specializing in climate research and is particularly known for reconstructing past global surface temperatures on the decade to millennium time scales. The CRU is one of three organizations worldwide that have independently compiled thermometer measurements of local temperatures from around the world to reconstruct the history of average global surface temperature for the past 130 - 150 years. The other two groups are in the United States (NOAA's National Climatic Data Center and the NASA Goddard Institute for Space Studies). From a much larger number of emails, the hackers selected and posted more than 1000 on a publicly accessible file server in Russia. The vast majority of the 1000+ emails are routine and unsuspecting. Perhaps one or two dozen of the email exchanges give the appearance of controversy, though no unethical behavior has yet been documented. Professor Phil Jones, director of the CRU, was involved in most of these email exchanges. He has temporarily stepped down as the CRU director pending the outcome of an independent investigation instigated by the university.

Although a small percentage of the emails are impolite and some express animosity toward opponents, when placed into proper context they do not appear to reveal fraud or other scientific misconduct by Dr. Jones or his correspondents. The most common accusations of misconduct center around two general themes:

### 1. *Purported mishandling and/or suppression of data:*

- In an email dated Nov. 12, 1999, Prof. Phil Jones stated that he had used a "trick" to "hide the decline." The email does not say what decline he was talking about, so it has been widely misreported that he was hiding a decline in temperatures. Those reports are not correct, nor is it accurate to say that he was actually hiding data, even though he chose the word. The word "trick" was used as it is in common parlance to mean a clever solution to a problem (e.g., "I know a trick to get that stain off your shirt."). The decline he said he was hiding referred to one series of high-latitude tree ring data from 1960 to 1994 that did not follow measured temperatures at the same locations, even though they had followed measured temperatures for about a century before 1960. That set of tree ring data incorrectly implied a downward temperature trend after 1960. It cannot be said that Jones was literally hiding this fact because two years before he wrote this email he was a co-author on the first paper to document this "divergence" issue. That paper, published in *Nature* in February of 1998, concluded publicly that these post-1960 tree ring data produce inaccurate temperature estimates (<http://www.nature.com/nature/journal/v391/n6668/full/391678a0.html>). Hence, "hiding" this decline simply meant following the advice that Jones and colleagues had already aired in the peer-reviewed literature two years earlier. Many more papers have since been published on the same topic.
- The CRU is barred by non-publication agreements with some countries meteorological services from releasing to the public a small amount (less than 5%) of the weather station



data the CRU uses to estimate land-surface temperature trends. The university has confirmed that the CRU is legally barred from releasing these data. A few commentators have used this situation as a basis for accusing the CRU of suppressing data.

- Another data handling accusation involves the admitted deletion of “less than 5%” of weather station data from the CRU surface temperature database in the 1980s. This deletion was not from the original data logs for individual weather stations. Instead, it was only from the database that CRU staff collated for their use in estimating global surface temperatures. The data were deleted because a documented quality control process found them to be of insufficient quality. After the data were rejected, they no longer had scientific value. It is important to note that anyone could still retrieve the original data from the original weather station logs. It is also important to note that this took place in the 1980s, when climate change was purely an academic topic accompanied by none of today’s heated political debate. At the time, the scientists did not foresee the need to archive every bit of data regardless of its scientific value.

## 2. *Purported muzzling of scientists skeptical of human-induced global warming:*

- In several emails the authors complain about certain scientific papers and refer to them as “garbage” or other derogatory descriptions. All scientists complain about papers they judge to be inferior and it is commonplace for individual scientists to insult the work of others in private conversation. While disrespectful, this behavior is not suppression, it is not unethical, and it is by no means limited to papers authored by skeptics of human-induced climate change.
- There is an email exchange in which the participants contemplate boycotting a particular science journal and refusing to cite two specific papers they regarded as fatally flawed. It is crucial to understand that the authors of the emails were not contemplating the suppression of a dissenting point of view. Rather, they were reacting to what they considered to be scientific misconduct by the authors of the papers and/or by editors who circumvented the peer review process so as to publish inferior papers that support their own political agendas. One case discussed in the emails, and later documented in news reports and open letters from individuals involved in the events, was so egregious that half the journal’s editorial board resigned in protest when the publisher refused to allow the chief editor to revise the peer review process to make individual board members more accountable ([http://www.sgr.org.uk/climate/StormyTimes\\_NL28.htm](http://www.sgr.org.uk/climate/StormyTimes_NL28.htm)). The publisher later admitted the paper should not have been published and promised to strengthen the peer review process (<http://www.int-res.com/articles/misc/CEditorial.pdf>). The other paper that the email authors contemplated not citing was published without peer review in an obscure journal, of which the chief editor has admitted to using the journal to push her own political agenda (<http://www.arp.harvard.edu/sci/climate/journalclub/ChronicleEd.pdf>).

To interpret this correspondence in proper context, one must recognize that science is a community-based professional enterprise. It is expected and appropriate that investigators



choose in which journals to publish and recommend to their peers in which journals to publish or not publish. The notion of organizing a boycott against any journal that repeatedly departs from accepted scientific standards is both reasonable and ethical. Similarly, when writing their individual research papers, scientists are free to choose which published papers to cite based on their own judgment, and it is not standard practice to cite all relevant publications, since many are redundant and some lack credibility. In this case, the authors were contemplating the refusal to cite two discredited papers in the IPCC Fourth Assessment Report. In the end, since IPCC reports are more inclusive and comprehensive than individual research papers, both of the suspect papers were cited and discussed (p. 466 of the Working Group I report cites Soon and Baliunas, 2003 and McIntyre & McKittrick, 2003; <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter6.pdf>).

The University of East Anglia and the United Nations have launched independent investigations into this matter. The following is a news release from the University of East Anglia (<http://www.uea.ac.uk/mac/comm/media/press/2009/dec/homepagenews/CRUreview>):

“Today the University of East Anglia (UEA) announced that Sir Muir Russell KCB FRSE will head the Independent Review into allegations made against the Climatic Research Unit (CRU).

“The Independent Review will investigate the key allegations that arose from a series of hacked e-mails from CRU. The review will:

1. Examine the hacked e-mail exchanges, other relevant e-mail exchanges and any other information held at CRU to determine whether there is any evidence of the manipulation or suppression of data which is at odds with acceptable scientific practice and may therefore call into question any of the research outcomes.
2. Review CRU’s policies and practices for acquiring, assembling, subjecting to peer review and disseminating data and research findings, and their compliance or otherwise with best scientific practice.
3. Review CRU’s compliance or otherwise with the University’s policies and practices regarding requests under the Freedom of Information Act (‘the FOIA’) and the Environmental Information Regulations (‘the EIR’) for the release of data.
4. Review and make recommendations as to the appropriate management, governance and security structures for CRU and the security, integrity and release of the data it holds.

“Sir Muir will have the discretion to amend or add to the terms of reference if he feels necessary, devise his own methods of working, and call on appropriate expertise in order to investigate the allegations fully.

“The University has asked for the Review to be completed by Spring 2010 and this will be made public along with UEA’s response.”



The following is an excerpt from a news report in the *Guardian* newspaper regarding the UN investigation (<http://www.guardian.co.uk/environment/2009/dec/04/un-panel-uae-hacked-climate-email>):

“Claims that scientists at the University of East Anglia manipulated global warming data to support a theory of man-made climate change will be investigated by a United Nations panel, the university chairman said today.

“Dr Rajendra Pachauri, chairman of the UN's Intergovernmental Panel on Climate Change (IPCC), told BBC Radio 4's *The Report* programme today that the claims were serious and he wanted them investigated.

“We will certainly go into the whole lot and then we will take a position on it,” he said.

“Pachauri, who has chaired the panel since 2002, added: ‘We certainly don't want to brush anything under the carpet. This is a serious issue and we will look into it in detail.’”

Although there is no clear evidence of scientific fraud or misconduct at this early stage, if further investigation were to reveal that misconduct had occurred, the scientific consensus regarding human-induced climate change, as stated by the IPCC, the U.S. National Academy of Sciences, and virtually every relevant scientific body (see listing below), is not likely to be affected. The data sets involved in the discussions have been reproduced independently by other scientists in other countries and yield similar conclusions. Moreover, the data sets discussed in the emails, while relevant, are not essential to our understanding of contemporary climate change. The two data sets highlighted in accusations of misconduct are very limited and consist of:

- High-latitude tree ring data that inaccurately suggest that local temperatures declined after 1960; thermometer readings from the same locations demonstrate that the tree rings accurately reflected local temperatures prior to, but not after 1960.
- A small fraction of the weather station data used by the CRU to estimate global surface temperature change (more information below).

The key point is that those data that comprise the most important evidence for human-induced climate change are not in play in the emails, including those documenting:

- snow and ice cover
- sea level rise
- ocean heat content
- surface temperature records maintained in the U.S. (NASA, NOAA)
- upper and lower atmospheric temperatures monitored by satellites
- atmospheric water vapor
- greenhouse gases
- solar activity
- modeling experiments



As a result, the evidence for rapid warming of the Earth in recent decades remains unequivocal, including:

- Worldwide loss of snow and ice
- Rising sea levels
- Records of rising global surface temperatures maintained in the U.S. by NASA and NOAA

Further, the evidence for human dominance of recent warming remains very strong, including:

- Concomitant warming of the troposphere and cooling of the stratosphere (a greenhouse effect signature)
- Without the strong warming effect of human-induced rise in atmospheric greenhouse gas concentrations, the observed changes in solar activity over the past several decades would have led to a slight cooling of the Earth's surface.
- Climate models only reproduce the warming of the past 50 years when they include the observed rise in atmospheric greenhouse gas concentrations.

## **LIST OF SCIENTIFIC ORGANIZATIONS AFFIRMING HUMAN-INDUCED CLIMATE CHANGE<sup>§</sup>**

### **JOINT SCIENCE ACADEMIES' STATEMENTS**

Since 2001, 32 [national science academies](#) have come together to issue joint declarations confirming anthropogenic global warming, and urging the nations of the world to reduce emissions of greenhouse gases.

- 2001-Following the publication of the [IPCC Third Assessment Report](#), sixteen national science academies issued a joint statement explicitly acknowledging the IPCC position as representing the scientific consensus on climate change science. The sixteen science academies that issued the statement were those of Australia, Belgium, Brazil, Canada, the Caribbean, China, France, Germany, India, Indonesia, Ireland, Italy, Malaysia, New Zealand, Sweden, and the United Kingdom.<sup>[16]</sup>
- 2005-The national science academies of the [G8](#) nations, plus Brazil, China and India, three of the largest emitters of greenhouse gases in the developing world, signed a statement on the global response to climate change. The statement stresses that the scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action<sup>[17]</sup>, and explicitly endorsed the IPCC consensus. The eleven signatories were the science academies of Brazil, Canada, China, France, Germany, India, Italy, Japan, Russia, the United Kingdom, and the United States.
- 2007-In preparation for the [33rd G8 summit](#), the national science academies of the [G8+5](#) nations issued a declaration referencing the position of the 2005 joint science academies' statement, and acknowledging the confirmation of their previous conclusion by recent research. Following the [IPCC Fourth Assessment Report](#), the declaration states, "It is unequivocal that the climate is changing, and it is very likely that this is predominantly caused by the increasing human interference with the atmosphere. These changes will transform the environmental conditions on Earth unless counter-measures are taken."<sup>[18]</sup> The thirteen signatories were the national science academies of Brazil, Canada, China, France, Germany, Italy, India, Japan, Mexico, Russia, South Africa, the United Kingdom, and the United States.
- 2008-In preparation for the [34th G8 summit](#), the national science academies of the G8+5 nations issued a declaration reiterating the position of the 2005 joint science academies' statement, and reaffirming "that



climate change is happening and that anthropogenic warming is influencing many physical and biological systems." Among other actions, the declaration urges all nations to "(t)ake appropriate economic and policy measures to accelerate transition to a [low carbon society](#) and to encourage and effect changes in individual and national behaviour."<sup>[19]</sup> The thirteen signatories were the same national science academies that issued the 2007 joint statement.

- 2009-In advance of the [UNFCCC](#) negotiations to be held in [Copenhagen](#) in December 2009, the national science academies of the G8+5 nations issued a joint statement declaring, "Climate change and sustainable energy supply are crucial challenges for the future of humanity. It is essential that world leaders agree on the emission reductions needed to combat negative consequences of anthropogenic climate change". The statement references the IPCC's Fourth Assessment of 2007, and asserts that "climate change is happening even faster than previously estimated; global CO<sub>2</sub> emissions since 2000 have been higher than even the highest predictions, Arctic sea ice has been melting at rates much faster than predicted, and the rise in the sea level has become more rapid."<sup>[20]</sup> The thirteen signatories were the same national science academies that issued the 2007 and 2008 joint statements.

## GENERAL SCIENCE

### American Association for the Advancement of Science

As the world's largest general scientific society, the [American Association for the Advancement of Science](#) adopted an official statement on climate change in 2006:

The scientific evidence is clear: global climate change caused by human activities is occurring now, and it is a growing threat to society....The pace of change and the evidence of harm have increased markedly over the last five years. The time to control greenhouse gas emissions is now.<sup>[25]</sup>

### European Science Foundation

In 2007, the [European Science Foundation](#) issued a Position Paper on climate change:

There is now convincing evidence that since the industrial revolution, human activities, resulting in increasing concentrations of greenhouse gases have become a major agent of climate change. These greenhouse gases affect the global climate by retaining heat in the troposphere, thus raising the average temperature of the planet and altering global atmospheric circulation and precipitation patterns.

While on-going national and international actions to curtail and reduce greenhouse gas emissions are essential, the levels of greenhouse gases currently in the atmosphere, and their impact, are likely to persist for several decades. On-going and increased efforts to mitigate climate change through reduction in greenhouse gases are therefore crucial.<sup>[26]</sup>

### Federation of Australian Scientific and Technological Societies

In 2008, the [Federation of Australian Scientific and Technological Societies](#) (FASTS) issued a policy statement on climate change:

Global climate change is real and measurable. Since the start of the 20th century, the global mean surface temperature of the Earth has increased by more than 0.7°C and the rate of warming has been largest in the last 30 years.

Key vulnerabilities arising from climate change include water resources, food supply, health, coastal settlements, biodiversity and some key ecosystems such as coral reefs and alpine regions. As the atmospheric concentration of greenhouse gases increases, impacts become more severe and widespread. To reduce the global net economic,



environmental and social losses in the face of these impacts, the policy objective must remain squarely focused on returning greenhouse gas concentrations to near pre-industrial levels through the reduction of emissions.

The spatial and temporal fingerprint of warming can be traced to increasing greenhouse gas concentrations in the atmosphere, which are a direct result of burning fossil fuels, broad-scale deforestation and other human activity.<sup>[27]</sup>

## EARTH SCIENCES

### American Geophysical Union

The [American Geophysical Union](#) (AGU) statement,<sup>[28]</sup> adopted by the society in 2003 and revised in 2007, affirms that rising levels of greenhouse gases have caused and will continue to cause the global surface temperature to be warmer:

The Earth's climate is now clearly out of balance and is warming. Many components of the climate system—including the temperatures of the atmosphere, land and ocean, the extent of sea ice and mountain glaciers, the sea level, the distribution of precipitation, and the length of seasons—are now changing at rates and in patterns that are not natural and are best explained by the increased atmospheric abundances of greenhouse gases and aerosols generated by human activity during the 20th century. [Global average surface temperatures](#) increased on average by about 0.6°C over the period 1956–2006. As of 2006, eleven of the previous twelve years were warmer than any others since 1850. The observed [rapid retreat of Arctic sea ice](#) is expected to continue and lead to the disappearance of summertime ice within this century. Evidence from most oceans and all continents except [Antarctica](#) shows warming attributable to human activities. Recent changes in many physical and biological systems are linked with this regional climate change. A sustained research effort, involving many AGU members and summarized in the 2007 assessments of the Intergovernmental Panel on Climate Change, continues to improve our scientific understanding of the climate.

### European Federation of Geologists

In 2008, the [European Federation of Geologists](#) (EFG) issued the position paper *Carbon Capture and geological Storage* :

The EFG recognizes the work of the IPCC and other organizations, and subscribes to the major findings that climate change is happening, is predominantly caused by anthropogenic emissions of CO<sub>2</sub>, and poses a significant threat to human civilization.

It is clear that major efforts are necessary to quickly and strongly reduce CO<sub>2</sub> emissions. The EFG strongly advocates renewable and sustainable energy production, including geothermal energy, as well as the need for increasing energy efficiency.

CCS [Carbon Capture and geological Storage] should also be regarded as a bridging technology, facilitating the move towards a carbon free economy.<sup>[29]</sup>

### European Geosciences Union

In 2005, the Divisions of Atmospheric and Climate Sciences of the [European Geosciences Union](#) (EGU) issued a position statement in support of the [joint science academies' statement](#) on global response to climate change. The statement refers to the [Intergovernmental Panel on Climate Change](#) (IPCC), as "the main representative of the global [scientific community](#)", and asserts that the IPCC

represents the state-of-the-art of climate science supported by the major science academies around the world and by the vast majority of science researchers and investigators as documented by the [peer-reviewed](#) scientific literature.<sup>[30]</sup>





Additionally, in 2008, the EGU issued a position statement on [ocean acidification](#) which states, "Ocean acidification is already occurring today and will continue to intensify, closely tracking [atmospheric CO<sub>2</sub>](#) increase. Given the potential threat to [marine ecosystems](#) and its ensuing impact on human society and economy, especially as it acts in conjunction with [anthropogenic global warming](#), there is an urgent need for immediate action." The statement then advocates for strategies "to limit future release of CO<sub>2</sub> to the atmosphere and/or enhance removal of excess CO<sub>2</sub> from the atmosphere."<sup>[31]</sup>

### **Geological Society of America**

In 2006, the [Geological Society of America](#) adopted a position statement on global climate change:

The Geological Society of America (GSA) supports the scientific conclusions that Earth's climate is changing; the climate changes are due in part to human activities; and the probable consequences of the climate changes will be significant and blind to geopolitical boundaries. Furthermore, the potential implications of global climate change and the time scale over which such changes will likely occur require active, effective, long-term planning.<sup>[32]</sup>

### **Geological Society of Australia**

In July 2009, the [Geological Society of Australia](#) issued the position statement *Greenhouse Gas Emissions and Climate Change*:

Human activities have increasing impact on Earth's environments. Of particular concern are the well-documented loading of carbon dioxide (CO<sub>2</sub>) to the atmosphere, which has been linked unequivocally to burning of fossil fuels, and the corresponding increase in average global temperature. Risks associated with these large-scale perturbations of the Earth's fundamental life-support systems include rising sea level, harmful shifts in the acid balance of the oceans and long-term changes in local and regional climate and extreme weather events.

GSA therefore recommends...strong action be taken at all levels, including government, industry, and individuals to substantially reduce the current levels of greenhouse gas emissions and mitigate the likely social and environmental effects of increasing atmospheric CO<sub>2</sub>.<sup>[33]</sup>

### **International Union of Geodesy and Geophysics**

In July 2007, the [International Union of Geodesy and Geophysics](#) (IUGG) adopted a resolution titled "The Urgency of Addressing Climate Change". In it, the IUGG concurs with the "comprehensive and widely accepted and endorsed scientific assessments carried out by the Intergovernmental Panel on Climate Change and regional and national bodies, which have firmly established, on the basis of scientific evidence, that human activities are the primary cause of recent climate change." They state further that the "continuing reliance on combustion of fossil fuels as the world's primary source of energy will lead to much higher atmospheric concentrations of greenhouse gasses, which will, in turn, cause significant increases in surface temperature, sea level, ocean acidification, and their related consequences to the environment and society."<sup>[34]</sup>

### **National Association of Geoscience Teachers**

In July 2009, the [National Association of Geoscience Teachers](#) (NAGT) adopted a position statement on climate change in which they assert that "Earth's climate is changing [and] "that present warming trends are largely the result of human activities":

NAGT strongly supports and will work to promote education in the science of climate change, the causes and effects of current global warming, and the immediate need for policies and actions that reduce the emission of greenhouse gases.<sup>[35]</sup>

## **METEOROLOGY AND OCEANOGRAPHY**

### **American Meteorological Society**





The [American Meteorological Society](#) (AMS) statement adopted by their council in 2003 said:

There is now clear evidence that the mean annual temperature at the Earth's surface, averaged over the entire globe, has been increasing in the past 200 years. There is also clear evidence that the abundance of greenhouse gases in the atmosphere has increased over the same period. In the past decade, significant progress has been made toward a better understanding of the climate system and toward improved projections of long-term climate change... Human activities have become a major source of environmental change. Of great urgency are the climate consequences of the increasing atmospheric abundance of greenhouse gases... Because greenhouse gases continue to increase, we are, in effect, conducting a global climate experiment, neither planned nor controlled, the results of which may present unprecedented challenges to our wisdom and foresight as well as have significant impacts on our natural and societal systems.<sup>[36]</sup>

#### **Australian Meteorological and Oceanographic Society**

The [Australian Meteorological and Oceanographic Society](#) has issued a *Statement on Climate Change*, wherein they conclude:

Global climate change and global warming are real and observable ... It is highly likely that those human activities that have increased the concentration of greenhouse gases in the atmosphere have been largely responsible for the observed warming since 1950. The warming associated with increases in greenhouse gases originating from human activity is called the enhanced [greenhouse effect](#). The atmospheric concentration of carbon dioxide has increased by more than 30% since the start of the industrial age and is higher now than at any time in at least the past 650,000 years. This increase is a direct result of burning fossil fuels, broad-scale [deforestation](#) and other human activity."<sup>[37]</sup>

#### **Canadian Foundation for Climate and Atmospheric Sciences**

In November 2005, the [Canadian Foundation for Climate and Atmospheric Sciences](#) (CFCAS) issued a letter to the [Prime Minister of Canada](#) stating that

We concur with the climate science assessment of the Intergovernmental Panel on Climate Change (IPCC) in 2001 ... We endorse the conclusions of the IPCC assessment that 'There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities'. ... There is increasingly unambiguous evidence of changing climate in Canada and around the world. There will be increasing impacts of climate change on Canada's natural ecosystems and on our socio-economic activities. Advances in climate science since the 2001 IPCC Assessment have provided more evidence supporting the need for action and development of a strategy for adaptation to projected changes.<sup>[38]</sup>

#### **Canadian Meteorological and Oceanographic Society**

CMOS endorses the process of periodic climate science assessment carried out by the Intergovernmental Panel on Climate Change and supports the conclusion, in its Third Assessment Report, which states that the balance of evidence suggests a discernible human influence on global climate.<sup>[39]</sup>

#### **Royal Meteorological Society (UK)**

In February 2007, after the release of the IPCC's Fourth Assessment Report, the [Royal Meteorological Society](#) issued an endorsement of the report. In addition to referring to the IPCC as "world's best climate scientists", they stated that climate change is happening as "the result of emissions since industrialization and we have already set in motion the next 50 years of global warming – what we do from now on will determine how worse it will get."<sup>[40]</sup>

#### **World Meteorological Organization**

In its *Statement at the Twelfth Session of the Conference of the Parties to the U.N. Framework Convention on Climate Change* presented on November 15, 2006, the [World Meteorological Organization](#) (WMO) confirms the



need to “prevent dangerous anthropogenic interference with the climate system.” The WMO concurs that “scientific assessments have increasingly reaffirmed that human activities are indeed changing the composition of the atmosphere, in particular through the burning of fossil fuels for energy production and transportation.” The WMO concurs that “the present atmospheric concentration of CO<sub>2</sub> was never exceeded over the past 420,000 years;” and that the IPCC “assessments provide the most authoritative, up-to-date scientific advice.” <sup>[41]</sup>

## PALEOCLIMATOLOGY

### American Quaternary Association

The [American Quaternary Association](#) (AMQUA) has stated

Few credible Scientists now doubt that humans have influenced the documented rise of global temperatures since the Industrial Revolution,” citing “the growing body of evidence that warming of the atmosphere, especially over the past 50 years, is directly impacted by human activity.” <sup>[42]</sup>

### International Union for Quaternary Research

The statement on climate change issued by the [International Union for Quaternary Research](#) (INQUA) reiterates the conclusions of the IPCC, and urges all nations to take prompt action in line with the [UNFCCC](#) principles.

Human activities are now causing atmospheric concentrations of greenhouse gasses - including carbon dioxide, methane, tropospheric ozone, and nitrous oxide - to rise well above pre-industrial levels....Increases in greenhouse gasses are causing temperatures to rise...The scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action....Minimizing the amount of this carbon dioxide reaching the atmosphere presents a huge challenge but must be a global priority. <sup>[43]</sup>

## BIOLOGY AND LIFE SCIENCES

### American Association of Wildlife Veterinarians

The [American Association of Wildlife Veterinarians](#) (AAWV) has issued a position statement regarding "climate change, wildlife diseases, and wildlife health":

There is widespread scientific agreement that the world’s climate is changing and that the weight of evidence demonstrates that [anthropogenic](#) factors have and will continue to contribute significantly to global warming and climate change. It is anticipated that continuing changes to the climate will have serious negative impacts on public, animal and [ecosystem](#) health due to [extreme weather](#) events, changing [disease transmission](#) dynamics, emerging and re-emerging [diseases](#), and alterations to [habitat](#) and ecological systems that are essential to [wildlife conservation](#). Furthermore, there is increasing recognition of the inter-relationships of human, [domestic animal](#), wildlife, and ecosystem health as illustrated by the fact the majority of recent emerging diseases have a wildlife origin. <sup>[44]</sup>

### American Society for Microbiology

In 2003, the [American Society for Microbiology](#) issued a public policy report in which they recommend “reducing net anthropogenic CO<sub>2</sub> emissions to the atmosphere” and “minimizing anthropogenic disturbances of” atmospheric gases. <sup>[45]</sup>

Carbon dioxide concentrations were relatively stable for the past 10,000 years but then began to increase rapidly about 150 years ago...as a result of fossil fuel consumption and land use change. <sup>[46]</sup>

Of course, changes in atmospheric composition are but one component of global change, which also includes disturbances in the physical and chemical conditions of the oceans and land surface. Although global change has



been a natural process throughout Earth's history, humans are responsible for substantially accelerating present-day changes. These changes may adversely affect human health and the [biosphere](#) on which we depend.<sup>[47]</sup>

Outbreaks of a number of diseases, including [Lyme disease](#), [hantavirus infections](#), [dengue fever](#), [bubonic plague](#), and [cholera](#), have been linked to climate change.<sup>[48]</sup>

#### **Australian Coral Reef Society**

In 2006, the [Australian Coral Reef Society](#) issued an official communique regarding the [Great Barrier Reef](#) and the "world-wide decline in [coral reefs](#) through processes such as [overfishing](#), runoff of nutrients from the land, [coral bleaching](#), global climate change, [ocean acidification](#), [pollution](#)", etc.:

There is almost total [consensus](#) among experts that the earth's climate is changing as a result of the build-up of greenhouse gases. The IPCC (involving over 3,000 of the world's experts) has come out with clear conclusions as to the reality of this phenomenon. One does not have to look further than the collective [academy of scientists](#) worldwide to see the string (of) statements on this worrying change to the earth's atmosphere.

There is broad scientific consensus that coral reefs are heavily affected by the activities of man and there are significant global influences that can make reefs more vulnerable such as global warming....It is highly likely that coral bleaching has been exacerbated by global warming.<sup>[49]</sup>

#### **Institute of Biology (UK)**

The UK's [Institute of Biology](#) states "there is scientific agreement that the rapid global warming that has occurred in recent years is mostly anthropogenic, *ie* due to human activity." As a consequence of global warming, they warn that a "rise in sea levels due to melting of ice caps is expected to occur. Rises in temperature will have complex and frequently localised effects on weather, but an overall increase in extreme weather conditions and changes in precipitation patterns are probable, resulting in flooding and drought. The spread of [tropical diseases](#) is also expected." Subsequently, the [Institute of Biology](#) advocates policies to reduce "greenhouse gas emissions, as we feel that the consequences of climate change are likely to be severe."<sup>[50]</sup>

#### **Society of American Foresters**

In 2008, the [Society of American Foresters](#) (SAF) issued two position statements pertaining to climate change in which they cite the IPCC and the UNFCCC:

Forests are shaped by climate....Changes in temperature and precipitation regimes therefore have the potential to dramatically affect forests nationwide. There is growing evidence that our climate is changing. The changes in temperature have been associated with increasing concentrations of atmospheric carbon dioxide (CO<sub>2</sub>) and other GHGs in the atmosphere.<sup>[51]</sup>

Forests play a significant role in offsetting CO<sub>2</sub> emissions, the primary anthropogenic GHG.<sup>[52]</sup>

#### **The Wildlife Society (international)**

[The Wildlife Society](#) has issued a position statement titled *Global Climate Change and Wildlife*.<sup>[53]</sup>

Scientists throughout the world have concluded that climate research conducted in the past two decades definitively shows that rapid worldwide climate change occurred in the 20th century, and will likely continue to occur for decades to come. Although climates have varied dramatically since the earth was formed, few scientists question the role of humans in exacerbating recent climate change through the emission of greenhouse gases. The critical issue is no longer "if" climate change is occurring, but rather how to address its effects on [wildlife](#) and [wildlife habitats](#).

The statement goes on to assert that "evidence is accumulating that [wildlife](#) and [wildlife habitats](#) have been and will continue to be significantly affected by ongoing large-scale rapid climate change."



The statement concludes with a call for “reduction in anthropogenic (human-caused) sources of carbon dioxide and other greenhouse gas emissions contributing to global climate change and the conservation of CO<sub>2</sub>-consuming [photosynthesizers](#) (i.e., plants).”

## HUMAN HEALTH

### American Academy of Pediatrics

In 2007, the [American Academy of Pediatrics](#) issued the policy statement *Global Climate Change and Children's Health*:

There is broad scientific consensus that Earth's climate is warming rapidly and at an accelerating rate. Human activities, primarily the burning of fossil fuels, are very likely (>90% probability) to be the main cause of this warming. Climate-sensitive changes in ecosystems are already being observed, and fundamental, potentially irreversible, ecological changes may occur in the coming decades. Conservative environmental estimates of the impact of climate changes that are already in process indicate that they will result in numerous health effects to children.

Anticipated direct health consequences of climate change include injury and death from [extreme weather events](#) and [natural disasters](#), increases in climate-sensitive [infectious diseases](#), increases in [air pollution–related illness](#), and more heat-related, potentially fatal, illness. Within all of these categories, children have increased vulnerability compared with other groups.<sup>[54]</sup>

### American College of Preventive Medicine

In 2006, the [American College of Preventive Medicine](#) issued a policy statement on “Abrupt Climate Change and Public Health Implications”:

The American College of Preventive Medicine (ACPM) accept the position that global warming and climate change is occurring, that there is potential for abrupt climate change, and that human practices that increase greenhouse gases exacerbate the problem, and that the [public health](#) consequences may be severe.<sup>[55]</sup>

### American Medical Association

In 2008, the [American Medical Association](#) issued a policy statement on global climate change declaring that they: Support the findings of the latest Intergovernmental Panel on Climate Change report, which states that the Earth is undergoing adverse global climate change and that these changes will negatively effect public health.

Support educating the medical community on the potential adverse public health effects of global climate change, including topics such as population displacement, flooding, infectious and vector-borne diseases, and healthy water supplies.<sup>[56]</sup>

### American Public Health Association

In 2007, the [American Public Health Association](#) issued a policy statement titled “Addressing the Urgent Threat of Global Climate Change to Public Health and the Environment”:

The long-term threat of global climate change to global health is extremely serious and the fourth IPCC report and other scientific literature demonstrate convincingly that anthropogenic [GHG emissions](#) are primarily responsible for this threat....US policy makers should immediately take necessary steps to reduce US emissions of GHGs, including carbon dioxide, to avert dangerous climate change.<sup>[57]</sup>

### Australian Medical Association



In 2004, the [Australian Medical Association](#) issued the position statement *Climate Change and Human Health* in which they recommend policies "to mitigate the possible consequential health effects of climate change through improved energy efficiency, clean energy production and other emission reduction steps."<sup>[58]</sup>

This statement was revised again in 2008:

The world's climate – our life-support system – is being altered in ways that are likely to pose significant direct and indirect challenges to health. While 'climate change' can be due to natural forces or human activity, there is now substantial evidence to indicate that human activity – and specifically increased greenhouse gas (GHGs) emissions – is a key factor in the pace and extent of global temperature increases.

Health impacts of climate change include the direct impacts of extreme events such as storms, floods, [heatwaves](#) and fires and the indirect effects of longer-term changes, such as drought, changes to the [food](#) and [water supply](#), resource conflicts and population shifts.

Increases in average temperatures mean that alterations in the geographic range and seasonality of certain infections and diseases (including vector-borne diseases such as [malaria](#), [dengue fever](#), [Ross River virus](#) and food-borne infections such as [Salmonellosis](#)) may be among the first detectable impacts of climate change on human health.

Human health is ultimately dependent on the health of the planet and its ecosystem. The AMA believes that measures which mitigate climate change will also benefit public health. Reducing GHGs should therefore be seen as a public health priority.<sup>[59]</sup>

#### **World Federation of Public Health Associations**

In 2001, the [World Federation of Public Health Associations](#) issued a policy resolution on global climate change:

Noting the conclusions of the [United Nations'](#) Intergovernmental Panel on Climate Change (IPCC) and other climatologists that anthropogenic greenhouse gases, which contribute to global climate change, have substantially increased in atmospheric concentration beyond natural processes and have increased by 28 percent since the industrial revolution....Realizing that subsequent health effects from such perturbations in the climate system would likely include an increase in: heat-related mortality and morbidity; vector-borne infectious diseases,... [water-borne diseases](#)...(and) malnutrition from threatened agriculture....the World Federation of Public Health Associations...recommends precautionary primary preventive measures to avert climate change, including reduction of greenhouse gas emissions and preservation of greenhouse gas sinks through appropriate energy and land use policies, in view of the scale of potential health impacts....<sup>[60]</sup>

#### **World Health Organization**

In 2008, the [United Nations'](#) [World Health Organization](#) issued their report *Protecting health from climate change*:

There is now widespread agreement that the earth is warming, due to emissions of greenhouse gases caused by human activity. It is also clear that current trends in energy use, development, and population growth will lead to continuing – and more severe – climate change.

The changing climate will inevitably affect the basic requirements for maintaining health: clean air and water, sufficient food and adequate shelter. Each year, about 800,000 people die from causes attributable to [urban air pollution](#), 1.8 million from [diarrhoea](#) resulting from lack of access to clean water supply, sanitation, and poor hygiene, 3.5 million from [malnutrition](#) and approximately 60,000 in natural disasters. A warmer and more variable climate threatens to lead to higher levels of some air pollutants, increase transmission of diseases through unclean water and through contaminated food, to compromise agricultural production in some of the least developed countries, and increase the hazards of extreme weather.<sup>[61]</sup>



## MISCELLANEOUS

### American Astronomical Society

The [American Astronomical Society](#) has endorsed the AGU statement.<sup>[62]</sup>

In endorsing the "Human Impacts on Climate" statement [issued by the American Geophysical Union], the AAS recognizes the collective expertise of the AGU in scientific subfields central to assessing and understanding global change, and acknowledges the strength of agreement among our AGU colleagues that the global climate is changing and human activities are contributing to that change.

### American Chemical Society

The [American Chemical Society](#) stated:

Careful and comprehensive scientific assessments have clearly demonstrated that the Earth's climate system is changing rapidly in response to growing atmospheric burdens of greenhouse gases and absorbing aerosol particles (IPCC, 2007). There is very little room for doubt that observed climate trends are due to human activities. The threats are serious and action is urgently needed to mitigate the risks of climate change.

The reality of global warming, its current serious and potentially disastrous impacts on Earth system properties, and the key role emissions from human activities play in driving these phenomena have been recognized by earlier versions of this ACS policy statement (ACS, 2004), by other major scientific societies, including the American Geophysical Union (AGU, 2003), the American Meteorological Society (AMS, 2007) and the American Association for the Advancement of Science (AAAS, 2007), and by the U. S. National Academies and ten other leading national academies of science (NA, 2005).<sup>[63]</sup>

### American Institute of Physics

The Governing Board of the [American Institute of Physics](#) endorsed the AGU statement on human-induced climate change.<sup>[64]</sup>

The Governing Board of the American Institute of Physics has endorsed a position statement on climate change adopted by the American Geophysical Union (AGU) Council in December 2003.

### American Physical Society

In November 2007, the [American Physical Society](#) (APS) adopted an official statement on climate change:

Emissions of greenhouse gases from human activities are changing the atmosphere in ways that affect the Earth's climate. Greenhouse gases include carbon dioxide as well as methane, nitrous oxide and other gases. They are emitted from fossil fuel combustion and a range of industrial and agricultural processes.

The evidence is incontrovertible: Global warming is occurring. If no mitigating actions are taken, significant disruptions in the Earth's physical and ecological systems, social systems, security and human health are likely to occur. We must reduce emissions of greenhouse gases beginning now.<sup>[65]</sup>

### American Statistical Association

On November 30, 2007, the [American Statistical Association](#) Board of Directors adopted a statement on climate change:

The ASA endorses the IPCC conclusions.... Over the course of four assessment reports, a small number of statisticians have served as authors or reviewers. Although this involvement is encouraging, it does not represent the full range of statistical expertise available. ASA recommends that more statisticians should become part of the IPCC process. Such participation would be mutually beneficial to the assessment of climate change and its impacts and also to the statistical community.<sup>[66]</sup>



### **Engineers Australia (The Institution of Engineers Australia)**

"[Engineers Australia](#) believes that Australia must act swiftly and proactively in line with global expectations to address climate change as an economic, social and environmental risk... We believe that addressing the costs of atmospheric emissions will lead to increasing our competitive advantage by minimising risks and creating new economic opportunities. Engineers Australia believes the Australian Government should ratify the Kyoto Protocol."<sup>[67]</sup>

### **International Association for Great Lakes Research**

In February 2009, the [International Association for Great Lakes Research](#) (IAGLR) issued a Fact Sheet on climate change:

While the Earth's climate has changed many times during the planet's history because of natural factors, including volcanic eruptions and changes in the Earth's orbit, never before have we observed the present rapid rise in temperature and carbon dioxide (CO<sub>2</sub>).

Human activities resulting from the industrial revolution have changed the chemical composition of the atmosphere....Deforestation is now the second largest contributor to global warming, after the burning of fossil fuels. These human activities have significantly increased the concentration of "greenhouse gases" in the atmosphere.

As the Earth's climate warms, we are seeing many changes: stronger, more destructive hurricanes; heavier rainfall; more disastrous flooding; more areas of the world experiencing severe drought; and more heat waves.<sup>[68]</sup>

---

§ [http://en.wikipedia.org/wiki/Scientific\\_opinion\\_on\\_climate\\_change](http://en.wikipedia.org/wiki/Scientific_opinion_on_climate_change), retrieved on Dec. 5, 2009.