

**Testimony by Professor Mario Molina
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**Hearing of
The Select Committee on Energy Independence and Global Warming
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Good morning, Mr. Chairman and members of the Committee. My name is Mario Molina; I am a Professor at the University of California, San Diego, and President of the Mario Molina Center for Studies in Energy and the Environment in Mexico City.

I will attempt to summarize and briefly discuss here various questions concerning the current state of knowledge related to the climate change threat, adding as well some comments on the lessons we have learned from the stratospheric ozone depletion issue that might be relevant to the climate change problem.

Integrity of climate change science

In various media reports, as well as in the Halls of Congress, some groups have stated in recent months that the basic conclusion of climate change science is no longer valid, namely that the climate is changing as a consequence of human activities with potentially serious consequences for society. Among others, the basis of these allegations is the discovery of some errors and supposed errors in the last report of the Intergovernmental Panel on Climate Change (IPCC), which was released in 2007.

However, several groups of scientists have recently pointed out that the scientific consensus remains unchanged and has not been affected by these allegations: it is now well established that the accumulation of greenhouse gases resulting from human activities is causing the average surface temperature of the planet to rise at a rate outside of natural variability. I fully agree with this conclusion.

There are in fact some errors in the IPCC report, but they certainly do not affect the main conclusion. I will not review the nature of these errors here: they have been discussed in detail elsewhere. I just want to note that they do not appear in the Summary for Policy Makers of Working Group I, which is where the scientific consensus referred to in the previous paragraph is described in detail. On the other hand, the science of climate change has continued to evolve: new findings since 2007 indicate that the impacts of climate change are expected to be significantly more severe than previously thought. This has been documented, among others, by my colleagues at MIT and at the Scripps Institution of Oceanography.

Uncertainties in climate change science

There appears to be a gross misunderstanding of the nature of climate change science among those that have attempted to discredit it. They convey the idea that the science in question behaves like a house of cards: if you remove just one of them, the whole structure falls apart. However, this is certainly not the way the science of complex systems has evolved. A much better analogy is a jigsaw puzzle: many pieces are missing, and some might even be in the wrong place, but there is little doubt that the overall image is clear, namely that climate change is a serious threat that needs to be urgently addressed. It is also clear that modest amounts of warming will have both positive and negative impacts, but above about 4 or 5 degrees Fahrenheit most impacts turn negative for many ecological systems, and for most nations.

The scientific community is of course aware that the current understanding of the science of climate change is far from perfect and that much remains to be learned, but enough is known to estimate the probabilities that certain events will take place if society continues with “business as usual” emissions of greenhouse gases. As expressed in the IPCC report, the scientific consensus is that there is at least a 9 out of 10 chance that the observed increase in global average temperature since the industrial revolution is a consequence of the increase in atmospheric concentrations of greenhouse gases caused by human activities. The existing body of climate science, while not comprehensive and with still many questions to be answered, is robust and extensive, and is based on many hundreds of studies conducted by thousands of highly trained scientists, with transparent methodologies, publication in public journals with rigorous peer review, etc. And this is precisely the information that society and decision makers in government need in order to assess the risk associated with the continued emissions of greenhouse gases. I would like to emphasize that policy decisions about climate change have to be made by society at large, and more specifically by policymakers; scientists, engineers, economists and other climate change experts should merely provide the necessary information. In my opinion, even if there is a mere 50% probability that the changes in climate that have taken place in recent decades are caused by human activities, society should adopt the necessary measures to reduce greenhouse emissions; but here I am speaking as an individual, not as a scientist.

In fact, recent scientific studies have pointed out that the risk of runaway or abrupt climate change increases rapidly if the average temperature increases above about 8 to 10 degrees Fahrenheit. Certain so-called “tipping points” could then be reached, resulting in practically irreversible and potentially catastrophic changes to the Earth’s climate system, with devastating impacts on ecosystems and biodiversity. These changes could induce severe flood damage to urban centers and island nations as sea level rises, as well as significantly more destructive extreme weather events such as droughts and floods, etc.

Economic considerations

I would also like to mention that some groups have stated that society cannot afford the cost of taking the necessary steps to reduce the harmful emissions.

There are indeed significant uncertainties about the availability and costs of energy-supply and energy-end-use technologies that might be brought to bear to achieve much lower greenhouse-gas emissions than those expected on the “business as usual” trajectory. And yet, the consensus among experts is that a reasonable target to prevent dangerous interference with the climate system is to limit the average surface temperature increase above pre-industrial levels to about 4 degrees Fahrenheit; the cost is indeed significant, but only of the order of 1 to 2% of global GDP, and is very likely smaller than the cost associated with the negative impacts of climate change. Furthermore, besides economic considerations there is an imperative ethical reason to address the problem effectively: our generation has the responsibility to preserve an environment that will not make it unnecessarily difficult for future generations in our planet to have an environment and natural resources suitable for the continued improvement of their economic well being.

There is yet another excuse for inaction on the climate change issue that is sometimes presented by the critics, namely that climate change is not the only problem facing society, and hence that other more urgent problems such as poverty should be addressed first. Most of us agree, of course, that there are other problems and that society should strive vigorously to achieve, for example, the Millennium Development Goals articulated by the United Nations. But it would be an error to address these problems sequentially; in fact, if some of the changes to the climate system expected to occur as a consequence of continued emissions actually materialize it will be much harder for many sectors of society to reach the desired standard of living.

Lessons learned from the Montreal Protocol and the stratospheric ozone depletion issue

The global problem caused by greenhouse gas emissions has many similarities to the stratospheric ozone problem. In both cases it is crucial to change business as usual by collaboration between nations as one global community. But the quick, effective and highly successful implementation of the Montreal Protocol to protect the ozone layer stands in stark contrast to the Kyoto Protocol, the international treaty developed in 1997 to address the climate change challenge that is currently being reassessed: society has yet to find a better way to agree on effective actions on climate change.

On the other hand, the extent of change necessary to phase out the ozone-depleting chemicals was relatively small and relatively easy to monitor. The ozone-depleting chemicals (mostly CFCs) were used mainly as refrigerants, solvents and as propellants for spray cans, and could be replaced with other compounds that industry was able to develop on a relatively short time scale. In contrast, climate change is caused mainly by activities related to the production and consumption of fossil fuel energy, which has so far been essential for the functioning of our

industrialized society. Effective action therefore requires a major transformation not only in a few industries, but in a great number of activities of society.

Clearly, economic development cannot continue along the same path it has followed in the past, and something has to change quite drastically. While most developed nations agree that for equity reasons they have to enable this change by providing economic resources and technology transfer to developing nations, the main problems that are being currently experienced with international negotiations result from excessive demands from some industrialized countries for “binding commitments” by all developing nations, as well as excessive demands by some developing nations for economic contributions as a condition for change. But the Montreal Protocol stands out as an example that demonstrates that an effective international agreement can indeed be negotiated. An important precedent from the Montreal Protocol is the creation of the “Multilateral Fund”, which was instrumental to effectively address the stratospheric ozone question by providing resources to developing nations to achieve a smooth transition to a CFC-free society. The stratospheric ozone and the climate change problems are truly global: in the case of stratospheric ozone the nations of the world realized that they all would benefit from an effective international treaty, and that they would all lose if no agreement was reached. Thus, I believe that negotiating an effective climate change treaty is feasible, although very challenging. Nevertheless, such a treaty would undoubtedly benefit the entire world, as was the case with the Montreal Protocol.