Much Ado about Warming

Reducing greenhouse gas emissions will do little to stop global climate change or solve the world's more-pressing environmental problems.

BY INDUR M. GOKLANY

A major argument for making immediate and significant reductions in greenhouse gas emissions is that human-induced climate change—on top of other environmental problems—may overwhelm human and natural systems by increasing the prevalence of climate-sensitive diseases, reducing agricultural productivity in developing countries, raising sea levels, and altering ecosystems, forests, and biodiversity worldwide. But even assuming that human-induced climate change might prove to be the proverbial last straw, there are other, more-efficient approaches to saving the camel's back.

Instead of lightening or eliminating the last straw—analogous to reducing or halting climate change—we could save the camel's back by reducing its cumulative burden, by strengthening its back so that it can better withstand the total burden, or by sharing its burden with other camels. These alternative concepts can be used to devise policies to address the issue of climate change and would, in effect, lighten the cumulative environmental and public health burden on the globe, reducing vulnerability and increasing adaptability to climate change while, incidentally, also decreasing greenhouse gas emissions. We can, for example, reduce the cumulative ecological or public health burden by reducing existing threats so the Earth can bear a heavier load from any new or increased threats that might be generated by future global warming. Similarly, since climate change could create regional winners and losers, we could spread the burden more evenly through trade. As we shall see, these alternative approaches are in many respects superior to the single-minded pursuit of reductions in climate change.

The Present: The Bad News

Over the last century or more, the globe has warmed 0.4 to 0.8 degrees Celsius (0.7 to 1.4 degrees Fahrenheit), according to the Intergovernmental Panel on Climate Change (IPCC), an international panel established to examine the science and impacts of climate change. This change, perhaps, is due to man's influence.[1] Over this period, some climate-sensitive environmental indicators or sectors of the economy have worsened, but so far anthropogenic warming has had little to do with these declines.

Consider, for instance, that while sea level has risen a modest 8 inches in the past century, it's not clear what portion of that rise, if any, is due to

global warming. Regardless, its current impacts on coasts and coastal resources are small compared with those arising from other human activities such as development; extraction of oil, gas, and water resources; overfishing; agricultural runoff; and damming of rivers upstream of estuaries.[2]

Meanwhile, forested area declined by 190 million hectares (470 million acres) in developing nations between 1980 and 1995. This decline, which occurred largely because increases in food demand outstripped increases in agricultural yield, is unrelated to global warming. During the same period, forest cover in developed nations expanded by 20 million hectares (50 million acres) mainly because of technology-based, high-yield agriculture.[3] Conversion of forests and other habitat to agricultural uses is the greatest current and future threat to global biodiversity as well as to carbon stores and sinks.[4]

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The Present: The Good News

For other critical climate-sensitive sectors and indicators, matters have actually improved. Global agricultural productivity has never been higher, for instance. An acre of cropland sustains about twice as many people today as it did in 1900. People have never been fed better or more cheaply. Between 1961 and 1998, food supplies per person increased 24 percent, although the population almost doubled; and between 1969-71 and 1995-97, the number of people in developing countries suffering from chronic hunger declined from 35 percent to 19 percent.[5]

In the richer countries, deaths due to climate-sensitive infectious and parasitic diseases are now the exception rather than the rule and are declining in most developing countries thanks to better nutrition and public-health measures. Accordingly, from the early 1950s to 1998, overall death rates in developing countries dropped by more than half, and global life expectancy at birth increased from 46.5 to 66.9 years.[6]

At the same time, increased population and wealth have put more property at risk. This has contributed to an increase in U.S. property losses from floods and hurricanes over the last century but, significantly, there are no clear trends in losses in terms of the fraction of wealth. More important, based upon nine-year averages, death rates due to hurricanes, tornados, floods, and lightning decreased between 60 and 99 percent, compared with their earlier peaks during this century, while overall deaths declined between 46 and 97 percent.[7]

Thus, despite any warming, by virtually any climate-sensitive measure of human well-being, the average person's welfare has improved over the last century.[8] While some credit for increasing agricultural and forest productivity is probably due to higher carbon dioxide concentrations and higher wintertime temperatures,[9] most of these improvements in climate-sensitive indicators are due to technological progress driven by market- and science-based economic growth, technology, and trade. Such progress has also reduced the vulnerability of the human enterprise to the effects of climate change.[10] As a result, technological progress has so far had a greater impact on the climate-sensitive sectors than has climate change itself.[11] But what about the future?

Uncertainty of Change

The projections of the potential impacts of climate change provided below are based on the IPCC's Second Assessment Report from 1995. However, since this paper was first written, the IPCC's Third Assessment Report has been released. Although the third report raises the upper limit for the range of future climate change projections in 2100 to 5.8 degrees Celsius, it also notes that "on time scales of a few decades, the current observed rate of warming...suggests that anthropogenic warming is likely to lie in the range of 0.1 to 0.2 degrees Celsius per decade over the next few decades."[12] Thus, the "likely" estimates of climate change impacts over the next few decades ought to be based on scenarios that correspond to globally averaged temperature changes of 0.1 to 0.2 degrees Celsius per decade. But the scenarios employed in most impact studies reported in the second report actually exceeded that range.[13] In any case, the conclusions of the third report with respect to future impacts are qualitatively similar to those in the second, except the third report seems more upbeat about timber supply increasing due to climate change, and the new estimate for sea level rise (0.09 to 0.88 meters, or 4 to 35 inches) is marginally lower than that contained in the second report (0.13 to 0.94 meters, or 5 to 37 inches).[14] Moreover, as I shall show, the precise level of future impacts does not affect the validity of the rationale for the policy approaches recommended here.

IPCC'S 1995 Second Assessment Report found that:

- In the absence of warming, global

production would have to increase 83 percent from 1990 to 2060 to meet the additional food demand from a larger and wealthier population.[15] Such an increase is more likely if sufficient economic resources are available to develop, acquire, and operate the technologies and infrastructure necessary to increase food production.[16] Global warming may cause agricultural production to decline in developing countries but increase in the developed countries with a net change of -2 to +1 percent in 2060. Thus, a downturn in economic growth and technological change—or an interruption of voluntary trade of food supplies from areas with surpluses to deficit areas—is more likely to create a future food crisis than any potential global warming.[17]

- If all else remains the same, by 2050, the global forest area may increase 1 percent to 9 percent due to global warming alone. But if greater agricultural and other human needs increase the demand on land, forest cover may decline by 25 percent, putting enormous pressure on global biodiversity.[18]
- Sea level may rise 3 to 19 inches, with a "best estimate" of 10 inches by 2060 and about twice that by 2100.[19] The global cost estimate for protecting against a 20-inch rise in 2100 is about $1 billion per year,[20] or less than 0.005 percent of the overall global economic product.[21]
- By 2060, incidences of malaria, one of the most common and dreaded climate-sensitive infectious diseases, may increase by about 5 to 8 percent of the base rate in the absence of warming. That increase may double by 2100.[22] Other parasitic and infectious diseases which likewise might be climate sensitive can be assumed to increase as well.
- The frequency and magnitude of extreme weather events, such as tornados, hurricanes, and cyclones, may or may not increase.[23]

The Larger Threat

Unfortunately, stabilizing greenhouse gas concentrations immediately—impossible though it might be—would do little or nothing over the next several decades to solve those problems frequently invoked to justify actions to reduce anthropogenic warming, except for sea level rise. Land and water conversion will continue almost unabated, with little or no reduction in the threats to forests, biodiversity, and carbon stores and sinks. And reducing global warming won't substantically improve the food security of a larger world population, if at all. Nor would incidence rates of infectious and parasitic diseases be altered by much.

Anthropogenic climate change is not now as urgent as other global environmental or public health problems.

Moreover, poorer nations are generally expected to be most vulnerable to warming, not because their climate change is expected to be inherently greatest, but because of a deeper disease: poverty. They lack the economic resources to easily develop or afford the technologies needed to adapt to or cope with any adversity. They also lack the funds to purchase food surpluses produced elsewhere to make up for projected shortfalls.[24] Hence, even if climate change were halted, poorer nations would continue to be vulnerable to all kinds of adversity, whether from natural or human-made causes.

Both historical trends and future projections of impacts indicate that anthropogenic climate change is not now—nor is it likely to be in the foreseeable future—as urgent as other global environmental or public health problems. It has been argued, however, that climate change, heaped on top of the other environmental problems, may be the last straw, particularly with respect to forests, ecosystems, and biodiversity. To many, this suggests that immediate action ought to be taken to curtail greenhouse gas emissions. I am suggesting, instead, that sweeping action to control greenhouse gas emissions would not be the most efficient or effective course of action now or for the next several decades.

There are several approaches to dealing with the problem of global climate change; none of them needs to be mutually exclusive. The first and most-common approach is to concentrate only on reducing or eliminating human-caused global climate change. Another, more fruitful, approach would be to lighten the entire environmental burden before global climate change causes significant and irreparable damage. Consider malaria, for instance. Under the first approach, which focuses on emission reductions, one would, at most, eliminate the 50 to 80 million potential extra cases of malaria owing to climate change in 2100 by eliminating climate change—itself an impossibility.

By contrast, under the second approach, one would attempt to reduce the total number of cases of malaria, whether it is 500 million in 2000 or nearly 600 million in 2100. This approach has several advantages.

First, even a small reduction in the baseline—or non-climate-change-related—rate could provide greater aggregate public-health benefits than a large reduction in the additional cases due to climate change. Assuming either linear or exponential growth in

the relative number of additional malaria cases due to climate change, reducing the number of baseline malaria cases by an additional 0.2 percent per year between now and 2100 would more than compensate for any increases due to climate change.

Second, resources employed to reduce the base rate would provide substantial benefits to humanity decades before any significant benefits are realized from limiting climate change. Considering that a million Africans die from malaria annually and that it costs $8 to save a life-year from malaria,[25] humanity would be better served if $1 billion were spent now to reduce malaria rather than on limiting climate change to curb, at least in part, potential increases in malaria decades from now. Moreover, the benefits of reducing malaria in Africa today under the second approach are real and much more certain, and likely to occur decades sooner, than the benefits of reducing the extra cases due to climate change under the first approach.

Third, the technologies developed and public-health measures implemented to reduce the base rate would themselves serve to limit additional cases due to climate change when, and if, they occur.

Fourth, reducing the base rate would serve as an insurance policy against adverse impacts of climate change, whether that change is due to anthropogenic or natural causes or if the changes occur more rapidly than the IPCC's "best estimates" predict. In effect, by reducing the base rate today, one would also help solve the cumulative malaria problem of tomorrow, regardless of its cause.

Fifth, because of the inertia of the climate system, it is unrealistic to think that future climate change could be completely eliminated, even if global greenhouse gas emissions were to be frozen immediately at today's level. But experience with the Kyoto protocol indicates how unrealistic such a freeze would be. This protocol, agreed to in 1997, initially called for 38 developed countries to reduce their aggregate emissions by 5 percent below 1990 levels by 2008-2012. However, the rest of the world, which contributes about 37 percent of global carbon emissions from fossil fuel combustion, gets a bye under the protocol. Moreover, emissions from the countries targeted under the protocol have actually grown since 1997, and the United States, with 25 percent of global emissions, has effectively withdrawn from it on the grounds that the protocol's targets and timetables would place an unreasonable burden on the U.S. economy for very little gain. Studies indicate that, even with U.S. participation, full adherence to the protocol would have reduced the projected temperature increase for 2100 by between only 3 and 10 percent, which would have a minimal impact on improving environmental or human well-being.[26]

Advocates argue that unless greenhouse gas emission reductions commence now, those reductions may come too late to do any good.

Targeting the Whole Problem

The second policy approach outlined above for malaria, which seeks to reduce the cumulative problem rather than just that relatively small portion caused by climate change, would reduce the vulnerability of human and natural systems, regardless of the sources of stress. It would also strengthen the ability to cope not only with climate change but with other, currently more urgent, environmental stressors and public health problems such as other climate-sensitive infectious and parasitic diseases, habitat modification, or diversion of water to human activities.

The same logic holds for other climate-sensitive problems and sectors where factors unrelated to climate change are expected to dominate for the next several decades. These sectors include agriculture, food security, forests, ecosystems, and biodiversity.

Advocates of immediate greenhouse gas controls argue that regardless of how urgent climate change might be over the next several decades, unless greenhouse gas emission reductions commence now, those reductions may come too late to do any good. The reason, so these advocates claim, is the inertia of the climate and energy systems.

Even if it takes 50 years to replace human energy systems from start to finish,[27] we could nevertheless wait an additional couple of decades before initiating control actions beyond what would be obtained automatically through continuing, long-term improvements in technologies.[28] In fact, in currently developed countries, carbon emissions per unit of economic output, measured as gross domestic product, have declined 1.3 percent per year for the past century-and-a-half.[29]

Moreover, even if climate change is completely halted, the major, imminent threats to global forests, ecosystems, biodiversity, carbon sinks and stores, and global food security would persist, and the underlying problems of malaria or other infectious and parasitic diseases would be undiminished. In fact, the world would be beset by the very same catastrophes that efforts

to control climate change seek to avoid. The basic issue, therefore, comes down to solving the urgent problems of today and tomorrow, while also enhancing our ability to address the serious problems of the day after.

More from Less

There are two complementary approaches to addressing this issue. First, we can focus on fixing current environmental problems, particularly those that might be aggravated by climate change. With respect to the interrelated problems of agriculture, food security, deforestation, and biodiversity, this means attacking their major causes, namely, the conversion of land and water to satisfy the demands of a larger and wealthier population for food, fiber, and timber. Some analysts contend that it is necessary to decrease demand by reducing populations and by modifying dietary and consumption habits.[30] This is easier said than done.

In a democratic society, where families are free, within the constraints of the market, to choose the number of their offsprings, their diets, and their consumption patterns, it is unlikely that such recommendations will have a significant impact since they ignore human nature.

An alternative approach—and one, arguably, more likely to succeed because it accepts the flaws of human nature—would be to produce, in an environmentally sound manner, more food, timber, and other products per unit of land or water diverted to human use. Such increases in productivity would limit conversion of land and water for human uses while helping meet human demands.

Assuming that the global population will be 8.9 billion in 2050, that food supplies per capita would increase at the historical rate maintained between 1969-71 and 1996-98, and that new cropland will, on average, be just as productive as cropland in 1997, I estimate that in 2050, if net agricultural productivity does not increase, cropland would have to increase globally by at least 106 percent or 1,600 million hectares—an area equal to the combined land mass of China and Brazil—beyond the 1997 level of 1,510 million hectares. Much of this would necessarily have to come from forested areas.[31]

On the other hand, a productivity increase of 1 percent per year from 1997 to 2050 would reduce additional cropland requirements to 325 million hectares, while a productivity increase of 1.5 percent per year would give back 98 million hectares of cropland to forests and other uses.[32]

Such increases in productivity are plausible given the numerous existing, but unused, opportunities to enhance productivity in an environmentally sound manner. Furthermore, it is reasonable to assume that technological change has yet to run its course. But to capitalize on these opportunities and to increase productivity, economic growth is essential. Such growth will generate the investments needed for researching, developing, acquiring, and operating more-productive technologies. It will also help support additional infrastructure necessary for the efficient functioning of the food and agricultural sector. By 2050, an estimated $250 billion may have to be invested annually in developing countries' food and agricultural sectors.[33]

To increase agricultural and forest productivity, some of these investments should be used to bolster research and development, for instance, on precision farming, integrated pest management, and methods to reduce post-harvest and end-use crop and timber losses. Greater emphasis should also be placed on increasing productivity in sub-optimal conditions—that is, on lands that are less than ideal for farming. Such lands might become more prevalent as a result of climate change, which can increase the incidence of drought due to higher temperatures and redistribution of precipitation, prolonged submergence of coastal and other low-lying areas, higher salinity because of greater evaporation and saltwater intrusion in coastal agricultural areas, and higher levels of CO_2. And biotechnology can play a crucial role in improving productivity under such adverse soil and climatic conditions.[34]

Any increase in developing countries' food deficits due to climate change can be addressed through trade.

Such measures, in addition to enhancing food security and limiting forest conversion, would also reduce CO_2 emissions, habitat modification, and fragmentation of the landscape. This fragmentation would otherwise add to the existing barriers to natural migration and dispersion of species threatened by climate changes. Notably, the United Nations Framework Convention on Climate Change refers to allowing ecosystems to adapt naturally to climate change.[35]

Finally, increased agricultural productivity would lower the demand for cropland, which would reduce land prices and decrease the cost of purchasing or reserving land for conservation, carbon sequestration, or both.

Reducing Vulnerability

Another measure that would address both existing and future problems is freer and unsubsidized trade. Developing nations currently import 10 percent of the grain they consume.[36] Their future food deficits are expected to grow because increases in food demand are expected to outstrip increases in productivity. These problems could be further aggravated by global warming. On the other hand, climate change could increase developed countries' surpluses by extending the growing season, expanding the range of arable land northward, and in some regions increasing the amount of precipitation.

Any increase in developing countries' food deficits due to climate change can be addressed in exactly the same way as current imbalances in production are addressed today, namely, through trade. Trade allows surpluses to flow voluntarily to deficit areas. But to be able to afford such trade, developing countries will need to expand the non-food sectors of their economies. This is yet another reason for increasing economic growth, particularly in developing countries.[37]

The second complementary approach to addressing social and environmental problems—whether they arise today, tomorrow, or in the future—and regardless of whether they can be linked to climate change, would be to reduce the vulnerability of society through a generic increase in its resilience to adversity.[38]

If we look around the world today, we find that almost every indicator of human or environmental well-being improves with wealth. Poorer countries have less food available per capita; they are hungrier and more malnourished; their air and water is more polluted; and they are more prone to death and disease from climate-sensitive infectious and parasitic diseases. Consequently, they have higher mortality rates and lower life expectancies.[39]

These populations are more vulnerable to any adversity because they are short on the fiscal and human-capital resources needed to create, acquire, and use new and existing technologies to cope with that adversity. Similarly, poorer countries are expected to have the greatest vulnerability to climate change, not because climate change there is expected to be larger, but because they lack the resources to adapt adequately. As a consequence, economic growth, by enhancing technological change, would make society more resilient and less vulnerable to adversity in general and to climate change in particular.

Is the Last Straw Sufficient?

Although for the next several decades, climate change may not be as urgent as other environmental and public health problems, it could be the proverbial last straw, particularly for natural ecosystems and biodiversity. However, just eliminating the last straw does little good if the camel's back breaks before that straw materializes. It may be equally futile to reduce the rate of global climate change if, over the foreseeable future, the cumulative load of current environmental insults proves much worse—and more immediate—than the effects of global warming. This seems quite possible given that for the next several decades, the magnitude of the impacts of climate change seem relatively modest compared with other environmental problems.

Instead of focusing primarily on reducing greenhouse gas emissions, we must reduce the cumulative burden we place on the Earth's ecosystems and public health. We must strengthen the institutions that support economic growth and technological change. And we must strengthen the Earth's and humankind's resilience and adaptability. Indeed, by reducing vulnerability and increasing adaptability, we might also—consistent with the stated ultimate goal of the UN Framework Convention on Climate Change—raise the level at which atmospheric greenhouse gas concentrations might become dangerous to the Earth and its inhabitants.■

Indur M. Goklany is assistant director of Science and Technology in the Department of the Interior, Washington, D.C.[40]

NOTES

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40. Views expressed here are those of the author and not necessarily those of the Department of the Interior or any other unit of the federal government.