

## CLIMATE CHANGE AND PROTECTION OF THE HABITAT THAT SUSTAIN US: WHAT CAN BE ACCOMPLISHED?

■ VEERABHADRAN RAMANATHAN

I will begin with a report by the working group on *The Fate of Mountain Glaciers in the Anthropocene* commissioned by the Pontifical Academy of Sciences. The report was published on May 11, 2011 and was based on a workshop held at the Vatican from April 2 to 4, 2011. The report began with a declaration, reproduced in full below:



Morteratsch glacier (Alps). Courtesy of J. Alean, SwissEduc

### DECLARATION BY THE WORKING GROUP

WE CALL ON ALL PEOPLE AND NATIONS to recognise the serious and potentially irreversible impacts of global warming caused by the anthropogenic emissions of greenhouse gases and other pollutants, and by changes in forests, wetlands, grasslands, and other land uses. We appeal to all nations to develop and implement, without delay, effective and fair policies to reduce the causes and impacts of climate change on communities and ecosystems, including mountain glaciers and their watersheds, aware that we all live in the same home. By acting now, in the spirit of common but differentiated responsibility, we accept our duty to one another and to the stewardship of a planet blessed with the gift of life.

We are committed to ensuring that all inhabitants of this planet receive their daily bread, fresh air to breathe and clean water to drink as we are aware that, if we want justice and peace, we must protect the habitat that sustains us. The believers among us ask God to grant us this wish.

The declaration, unlike any that has been published on the topic of climate change, is extraordinary because the working group consisted of natural scientists with expertise in climate sciences, glaciology, physics and chemistry, including several non-believers. Why did this group sign such a declaration? Is it an act of desperation by scientists in despair due to lack of any meaningful actions to mitigate disastrous climate change? I certainly cannot answer this question, but I will attempt an explanation of why, as one of three Co-Chairs of this working group, I actively and enthusiastically helped in formulating this declaration. I must begin with a brief background of the nature of human influence on past and future climate change. I then will introduce a new development in climate mitigation that offers great promise for a way out of the current gridlock in climate negotiations.

The Greenhouse Blanket: Any substance we burn, be it fossil fuels or trees, turns into carbon dioxide gas. The chemical symbol is  $\text{CO}_2$ . Once let into the atmosphere, about 50% stays for a century or longer and about 20% for thousand years or more. As a result  $\text{CO}_2$  accumulates in the air for centuries or more and covers the planet like a blanket. Since the time James Watt invented the steam engine in the eighteenth century, the accumulated  $\text{CO}_2$  blanket in the air weighs a staggering one trillion tons today. Why should we worry about this massive blanket? Basic quantum mechanical data show that  $\text{CO}_2$  is very effective in trapping the heat (as infra red energy) given off by the planet... heat which would have otherwise escaped to space. Just like a blanket which keeps us warm by trapping body heat, the addition of the manmade  $\text{CO}_2$  blanket warms the planet. This in short is the theory that links the added greenhouse effect to global warming. The fact that added  $\text{CO}_2$  can lead to a large global warming was calculated 116 years ago by the Swedish Nobelist Svante Arrhenius.

Global Warming: How large and how soon? We have already added enough greenhouse gases to warm the planet by about  $2.50^\circ\text{C}$  compared to the pre-industrial temperatures. The planet has already warmed by about  $0.750^\circ\text{C}$  during the twentieth century and according to my prediction (made in 2010) the cumulative warming is likely to reach  $20^\circ\text{C}$  by 2050. If indeed the warming exceeds  $20^\circ\text{C}$  in the coming decades, the planet would be much warmer than any temperature it has experienced in the last few million years. This is because the planet's climate oscillates between glacial periods (when it is colder) and inter-glacial periods (when it is warmer). The temperature during the inter-glacial is warmer than the glacial by about  $30^\circ\text{C}$  to  $50^\circ\text{C}$ . We are currently in an inter-glacial period, called the Holocene, and have enjoyed the relatively stable and warm climate of the Holocene for the last 5000 years or more.

Unmanageable Habitat Destruction: Heating the planet another 20°C beyond the warm Holocene, would push the planet including the glaciers, sea level and the complex eco systems beyond any thresholds or extremes these systems may have experienced in the last few million years. Also because of the long lifetime of carbon dioxide, the changes, once triggered, could last for thousand years or more. The warmer climate would make the air significantly more humid which would intensify heat waves, storms and precipitation, wipe out low lying coastal area and small island nations, threaten the water and food security of the vulnerable 3 billion who live on less than few dollars a day. It is due to such likely unmanageable changes that the world leaders, including all of the leaders from the industrialized nations and all of the leaders from developing and emerging economies, signed an accord in 2009 at Copenhagen that declared:

We underline that climate change is one of the greatest challenges of our time” in its opening paragraph, followed by the second paragraph which begins with “We agree that deep cuts in global emissions are required according to science, and as documented by the IPCC Fourth Assessment Report with a view to reduce global emissions so as to hold the increase in global temperature below 2 degrees Celsius, and take action to meet this objective consistent with science and on the basis of equity.

Why have we not taken any mitigation actions on carbon dioxide? The carbon dioxide problem is hard to fix, however, because it comes mainly from the burning of fossil fuels, which is so essential to modern life and commerce. It will take decades and trillions of dollars (about \$45 trillions from now until 2050, according to the International Energy Agency) to convert all the world’s fossil-fuel-based energy systems to cleaner systems like solar, geo-thermal and wind power. Diplomats have struggled to slow global warming for more than two decades. Two major treaties have been negotiated to achieve that goal, the 1992 UN Framework Convention on Climate Change and the 1997 Kyoto Protocol. These treaties have expired and in the meantime fossil fuel consumption, emissions of carbon dioxide and the thickness of the CO<sub>2</sub> blanket in the air have continued to increase at alarming rates. And last year, at the UN Climate Change Conference in Durban, diplomats have agreed to start talking about yet another treaty. It is not clear how long these negotiations will continue and we begin to actually reduce consumption of fossil fuels and switch to renewable fuels. The record heat in March 2012, which broke more than 15,000 records in the US, gives this issue a sense of urgency. But we don’t have to wait. We can put a fast-track action in the meantime.

A practical and proven action plan to slow down global warming: There is a practical and proven way to slow down global warming during our life-

time. It could cut warming in the coming decades by almost half and slow down the melting of glaciers and snow packs worldwide. We can also delay sea level rise and give several island nations such as the Maldives and Sri Lanka few more decades to adapt. This new solution is called mitigation of short-lived climate pollutants, or, SLCPs. In fact this is the first time mitigation of air pollution has emerged as a viable way to mitigate climate change. *The NYTimes* (Feb 17, 2012) referred to it as “the Second front in our war against climate change”.

So far this solution was buried in the literature in hundreds of scientific papers. The first study which set the stage for this solution was published in 1975 (Ramanathan, *Science*, 1975). Two months ago on Feb 16, 2012, Secretary of State of Clinton, along with the UN and six other governments, formed a coalition to take this solution forward. Three weeks ago President Obama included this solution in a declaration of North American heads of state. Last week at the Stockholm+40 meeting attended by the prime ministers of China, Sweden and other countries, a declaration was announced of action plans for environmental sustainability that included SLCPs as a valuable example of sustainability actions.

Let me describe what this solution is: Until now policy makers have focused primarily on cutting down carbon dioxide emissions. It turns out at least 40% (and likely 50%) of the current global warming is caused by four other pollutants: The four pollutants are: 1) methane gas that leaks from our landfills, gas pipes and agriculture fields. Cattles are also another important source; 2) black carbon particles in dark soot from diesel trucks and from cook stoves burning fire-wood and solid coal; 3) Ozone produced in smog by noxious gases from tail pipes and biomass burning; and 4) hydrofluorocarbons (HFCs) used in refrigerators and spray cans. A huge bonus of actions to reduce these pollutants is a payoff perceptible within a matter of months to a decade. We know how to reduce them drastically. For example, California has reduced its diesel black carbon emissions by 50% in twenty years.

Saving climate also saves our lives! A major source of black carbon and ozone is cooking with solid biomass such as dung and firewood. Inhalation of the smoke kills millions of women and children every year (Slide 3). Cleaner cook stoves are now available which has been shown to drastically cut down the climate warming pollutants ([www.projectsurya.org](http://www.projectsurya.org)). If scaled up to the 2.7 billion who depend on these biomass fuels, it can save about 4 million lives every year.

In this new second front in our fight against climate change, all we are asking people and leaders to do is: *Please clean up the air*. In so doing, we will protect the beautiful natural icons of this planet such as blue skies, the

glaciers in the Himalayan-Tibetan and Alps mountain ranges. In addition to saving lives, we can save 100 million tons of crops every year.

Our optimism derives from the fact that it does not require global treaties or protocols that require signatures from hundred or more nations. The case can persuasively be made to the developed and developing countries that it is clearly in their own interest to adopt practical and affordable measures, because of the huge benefits to health, food and water security. It does require bottom-up efforts from networks of local decision makers, engineers, air pollution experts that translate scientific knowledge into actions in the field. Civil societies can exploit social networks and play a large role in such knowledge to action networks. There is no advocacy group out there devoted to the cause of poor health, nor any pro-pollution lobby. Thus we feel that what we propose would find nearly universal support. But success would require the embrace of the United States, India, China and European Union.

The Vatican Declaration: I will return to the question I posed in the opening paragraph. Scientists often struggle wondering if it is their place to tell the public what it should be doing to stop global warming. The declaration and the debate among the working group members that preceded it, opened my eyes to the vital role that spiritual/religious leaders can play in this war against climate change. For it is the spiritual leaders who have the moral authority to exhort citizens and their leaders to be better stewards of the planet and remind them of their universal responsibility to protect the planet's environment. Spiritual leaders can exert their moral authority to also effect action among their followers. The Vatican, for one, has been a great leader in this arena, convening the working group to address the plight of Mountain Glaciers including the Alps and the Himalayas... issues in which environment, human well being and universal responsibility converge. Society can score a victory against this global threat. Perhaps the short-lived climate pollutant actions proposed here will be the wedge that lets us come back to the original problem that has so divided us: what to do about carbon dioxide emissions from fossil fuels. Meaningful reductions in CO<sub>2</sub> emissions must begin now to win the war against climate change.