Game over for the climate

The earth is currently in the part of its long-term orbit cycle where temperatures would normally be cooling. But they are rising -- and it's because we are forcing them higher with fossil fuel emissions.

JAMES HANSEN

GLOBAL warming isn't a prediction. It is happening. That is why I was so troubled to read a recent interview with President Obama in Rolling Stone in which he said that Canada would exploit the oil in its vast tar sands reserves "regardless of what we do."

If Canada proceeds, and we do nothing, it will be game over for the climate.

Canada's tar sands, deposits of sand saturated with bitumen, contain twice the amount of carbon dioxide emitted by global oil use in our entire history. If we were to fully exploit this new oil source, and continue to burn our conventional oil, gas and coal supplies, concentrations of carbon dioxide in the atmosphere eventually would reach levels higher than in the Pliocene era, more than 2.5 million years ago, when sea level was at least 50 feet higher than it is now. That level of heat-trapping gases would assure that the disintegration of the ice sheets would accelerate out of control. Sea levels would rise and destroy coastal cities. Global temperatures would become intolerable. Twenty to 50 percent of the planet's species would be driven to extinction. Civilization would be at risk.

That is the long-term outlook. But near-term, things will be bad enough. Over the next several decades, the Western United States and the semi-arid region from North Dakota to Texas will develop semi-permanent drought, with rain, when it does come, occurring in extreme events with heavy flooding. Economic losses would be incalculable. More and more of the Midwest would be a dust bowl. California's Central Valley could no longer be irrigated. Food prices would rise to unprecedented levels.

If this sounds apocalyptic, it is. This is why we need to reduce emissions dramatically. Obama has the power not only to deny tar sands oil additional access to Gulf Coast refining, which Canada desires in part for export markets, but also to encourage economic incentives to leave tar sands and other dirty fuels in the ground.

The global warming signal is now louder than the noise of random weather, as I predicted would happen by now in the journal Science in 1981. Extremely hot summers have increased noticeably. We can say with high confidence that the recent heat waves in Texas and Russia, and the one in Europe in 2003, which killed tens of thousands, were not natural events -- they were caused by human-induced climate change.

We have known since the 1800s that carbon dioxide traps heat in the atmosphere. The right amount keeps the climate conducive to human life. But add too much, as we are doing now, and temperatures will inevitably rise too high. This is not the result of natural variability, as some argue. The earth is currently in the part of its long-term orbit cycle where temperatures would normally be cooling. But they are rising -- and it's because we are forcing them higher with fossil fuel emissions.

The concentration of carbon dioxide in the atmosphere has risen from 280 parts per million to 393 p.p.m. over the last 150 years. The tar sands contain enough carbon -- 240 gigatons -- to add 120 p.p.m. Tar shale, a close cousin of tar sands found mainly in the United States, contains at least an additional 300 gigatons of carbon. If we turn to these dirtiest of fuels, instead of finding ways to phase out our addiction to fossil fuels, there is no hope of keeping carbon concentrations below 500 p.p.m. -- a level that would, as earth's history shows, leave our children a climate system that is out of their control.

We need to start reducing emissions significantly, not create new ways to increase them. We should impose a gradually rising carbon fee, collected from fossil fuel companies, then distribute 100 percent of the collections to all Americans on a per-capita basis every month. The government would not get a penny. This market-based approach would stimulate innovation, jobs and economic growth, avoid enlarging government or having it pick winners or losers. Most Americans, except the heaviest energy users, would get more back than they paid in increased prices. Not only that, the reduction in oil use resulting from the carbon price would be nearly six times as great as the oil supply from the proposed pipeline from Canada, rendering the pipeline superfluous, according to economic models driven by a slowly rising carbon price.

But instead of placing a rising fee on carbon emissions to make fossil fuels pay their true costs, leveling the energy playing field, the world's governments are forcing the public to subsidize fossil fuels with hundreds of billions of dollars per year. This encourages a frantic stampede to extract every fossil fuel through mountaintop removal, longwall mining, hydraulic fracturing, tar sands and tar shale extraction, and deep ocean and Arctic drilling.

Obama speaks of a "planet in peril," but he does not provide the leadership needed to change the world's course. Our leaders must speak candidly to the public -- which yearns for open, honest discussion -- explaining that our continued technological leadership and economic well-being demand a reasoned change of our energy course. History has shown that the American public can rise to the challenge, but leadership is essential.

The science of the situation is clear -- it's time for the politics to follow. This is a plan that can unify conservatives and liberals, environmentalists and business. Every major national science academy in the world has reported that global warming is real, caused mostly by humans, and requires urgent action. The cost of acting goes far higher the longer we wait -- we can't wait any longer to avoid the worst and be judged immoral by coming generations.

The writer directs the NASA Goddard Institute for Space Studies and is the author of Storms of My Grandchildren.

URBAN HEAT AND AIR POLLUTION

Trees imperative for cooling and cleaning

Trees reduce gaseous air pollution...They also remove pollution by intercepting airborne particles.

PROBIR KUMAR SARKER

PARALLEL to the fastest growth of urbanisation, its adverse impact on the population and environment is also amplified these days thanks to the increasing number of vehicles, haphazard establishment of industries and congested residential units.

Besides experiencing a degrading living standard in the city areas due to air pollution and other anomalies, people are also facing unfavourable weather condition in the dry season. The extent of air pollution and emission of toxic gases into the air, including the greenhouse gases like carbon dioxide, carbon monoxide and sulphur dioxide, is higher in dry weather compared to the rainy season.

Trees, shrubs and vines play the pivotal role by absorbing much of the heat and pollutants in the air, and giving people respite from damaging agonies.

The adversaries of summer are so high in cities that it clearly draws a differential line between the air and surface temperatures of urban areas and that of rural areas. And thus the extent of air pollution, heat-related illness and mortality are high while energy demand and air conditioning cost are on the rise.

In the city areas, heat is formed because of the absence of natural land cover and excess of built areas like metalled roads, pavements, buildings and other infrastructure -- the main elements of growing urbanisation. All these -- paradoxically, for a better living -- lead to the minimisation of necessary greenery or their displacement.

As a result, the overall environment and weather conditions change significantly -- unfavourably. In this situation with decrease or absence of the natural cooling effects of shading and evaporation of water from soil and leaves, tall buildings and narrow streets can heat air that is trapped between them and reduce wind flow while released heat from vehicles, factories, and air conditioners may add to that, further increasing temperatures.

Congested concrete structures conserve heat to the inconvenience of urban dwellers.

Hot weather may prevail during day and night compared to rural areas which cool off faster at night than cities. The stored heat in city roads and buildings is the reason behind the slow change in temperature in the evening.

Even though there are provisions in construction rules that open spaces must be left there for greenery and proper penetration of water into the ground, they are hardly maintained by the initiators of commercial or industrial and even residential units. At present, however, some newly built residential areas have adopted some plantation for relief.

In addition, more and more age-old and broadleaf trees are felled everyday for construction of structures, while the rate of plantation is very low and insignificant. Thus, it can be seen that trees are fading away from the fastest-growing urban areas where both heat and air pollution is prominent.

Unless there were public parks and some roads lined with hundreds of large trees giving shade and contributing in cooling the air of the cities, the situation would have been simply unbearable.

Because of an increase in urban temperatures, people suffer from different complications including heat stroke, physiological disruption, organ damage, and even death. The elderly and children are highly vulnerable in such case.

Moreover, it has some financial drawbacks too. As the heat mounts, people in the urban areas undergo more spending for the summertime cooling which also triggers emission of harmful pollutants.

Studies say higher temperatures also accelerate the chemical reaction that produces ground-level ozone, or smog.

Greenery -- a universal solution

To create a better living place amid up-and-coming urbanisation, the culture of plantation of trees and vegetation has been widespread all over the world. But the scenario is grave in our urban areas where people prefer utilising every single inch of their land by erecting structures.

Moreover, urban design and layout must be modified, and efficient heating and cooling systems chosen to ensure a congenial environment. Vegetation also ensures better soil structure.

Apart from applying this in residential facilities, cool paving materials should be used for roads, sidewalks, and parking lots as heat mitigation measures so that people may walk in a relatively cooler space and vehicles parked do not make much of evaporative emissions.

Tree canopies also affect wind speed, its relative humidity and turbulence, as well as surface roughness.

However, although trees usually contribute to cooling summer air temperatures, their presence can increase air temperatures in some instances. In areas with scattered tree canopies, radiation can reach and heat ground surfaces; at the same time, the canopy may reduce atmospheric mixing such that cooler air is prevented from reaching the area, studies say.

While planting trees, its placement should be considered so that shades are found to be beneficial and vegetation blocks the sun's ray, minimising heat transfer inside buildings thus reducing the need for air conditioning.

In our cities, trees should shade the east, and especially west, walls to maximise savings on cooling. Planting trees directly to the south may provide little shade in the summertime and block desired sun in the wintertime.

Experts suggest that large, healthy and broadleaf trees work well as they balance energy requirements over the course of a year. In summer, foliage cools buildings by blocking solar radiation. In winter, after the leaves have fallen, the sun's energy passes through the trees and helps to warm buildings.

Locale for outdoor plantation is also crucial because of the concrete pavements, bituminous roads and vehicular pollution. To be benefited in terms of air quality, long-life trees should be planted in polluted areas or heavily populated areas, when the pollutant sensitive species should be avoided.

Meanwhile, trees emitting Volatile Organic Compounds (VOCs) should be averted as they contribute to the formation of ozone and carbon monoxide.

Trees reduce gaseous air pollution primarily by uptake via leaf stomata, and some gases are removed by the plant surface. They also remove pollution by intercepting airborne particles. Some particles can be absorbed into the tree. The intercepted particle often is resuspended to the atmosphere, washed off by rain, or dropped to the ground with leaf and twig fall.

As the significance of greenery will never decrease, it is the duty of all to ensure presence of trees around us, conserve and help them grow and help the present and future generations live in a congenial atmosphere keeping pollution and temperature at a tolerable level.

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Treelined streets not only add to serenity but provide cooling effect to urban surrounding.

The more an urban area is interspersed by greenery the better it is for reducing its heat and air pollution.