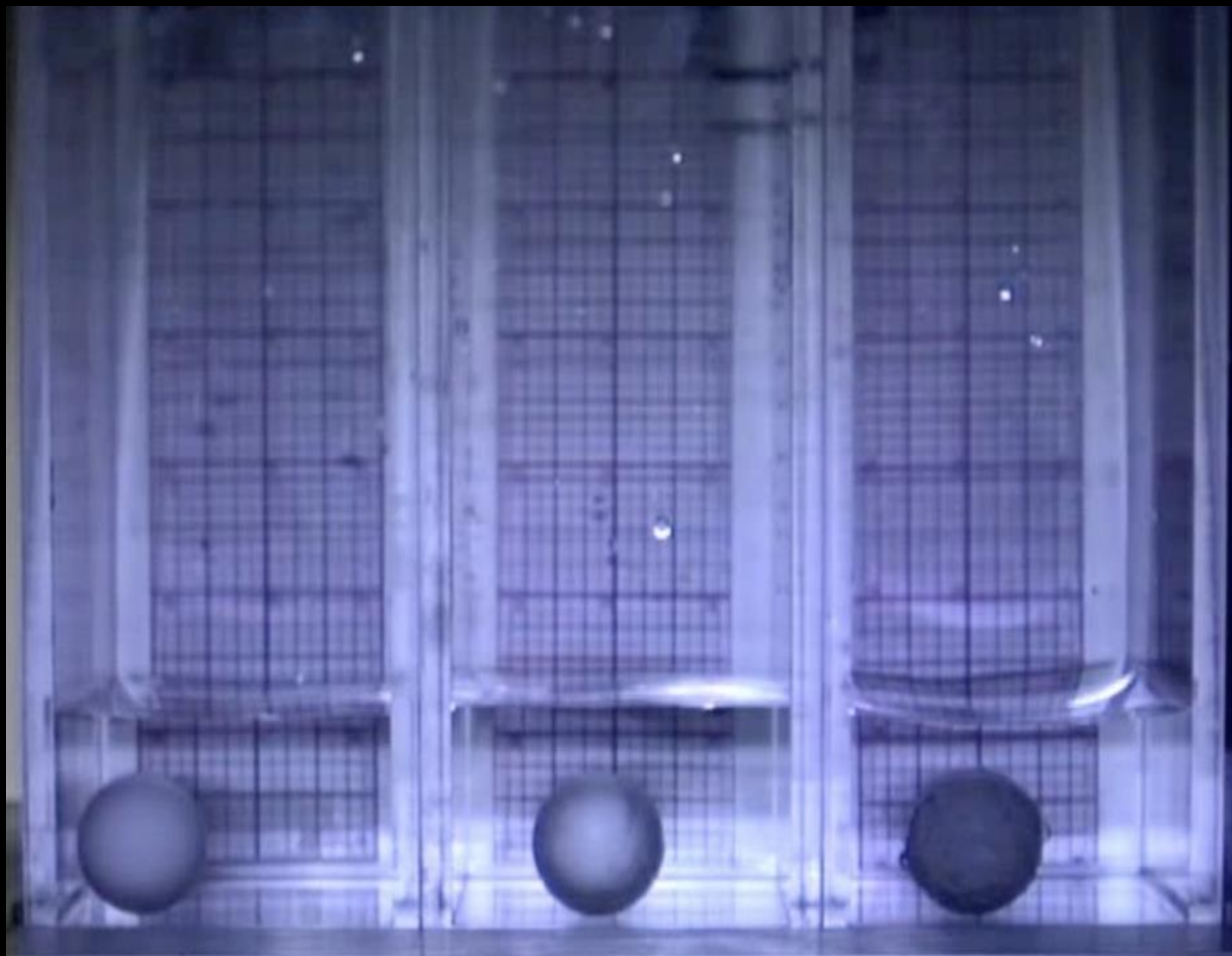




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The Climate Change Crisis: A Tipping Point for sustaining Life on the Planet Earth

Will technological advances and sustainable public policy save our species? (Part I of a Series)

Irshad Ahmed^{1,*}

¹ President & CEO of Cetyl Energy Inc., Cambridge, MA, USA

*Corresponding Author: irshad.ahmed@sloan.mit.edu

FORBES recently declared 2018 as the year when the planet Earth reached its tipping point on climate change. The Intergovernmental Panel on Climate Change (IPCC), an international body of leading scientists that provides an objective view on climate change, confirmed that 2018 was the year that tipped the equilibrium of the global climate toward destabilization to sustain a healthy living environment for human life on Earth. In other words, the year 2018 marked a pivotal point in human history when we needed to take decisive action to prevent a long-term negative impact on our food supply, human health, and life sustaining environment of this planet.

While there are several contributing factors for climate change, emissions of harmful air pollutants such as carbon dioxide, nitrogen oxides and fine particulate matter (PM 2.5) remain at the heart of rising ocean temperatures and shift in climate patterns around the globe. Rising atmospheric CO₂ level is increasing the base Earth temperature causing rise in sea levels—submerging habitable lands and generating severe weather events causing severe flooding and droughts disrupting food supply and habitations. Poor air and water quality in all major cities worldwide is responsible for links to asthma in small children, elevated cancer cases and premature defects in new born babies.

According to IPCC conclusions, the world must make rapid, far-reaching changes to energy, transportation and other systems to hold global warming below an increase of 1.5 degrees Celsius, or 2.7 degrees Fahrenheit, a key threshold in the Paris climate accord that majority of the nations are signatories to. While all nations of the world contribute to the climate change problem, it is the fastest growing economies with large population have a disproportionate negative impact. Over the past 100 years, the primary actors have changed their leading role. At the turn of the industrial revolution, United Kingdom (England) was the leading contributor of emissions. By the turn of the last century, the United States surpassed all other countries in the world to become the largest contributor of greenhouse gas emissions. As early as the year 2005, China has emerged as the leading emitter of greenhouse gas emissions. In the just past 10 years, China not only surpassed all other nations in pollution, its rapid GDP growth has accelerating its carbon footprint at an unprecedented rate that has never been witnessed by mankind—emitting over 29% of all global emissions—emitting ~10 billion MT of CO₂ annually. The following chart shows a list of major countries contributing to global warming (2017 data).

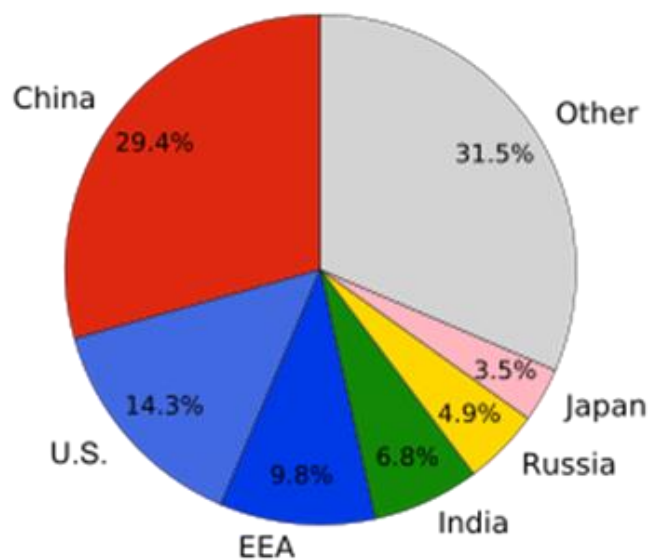
What can we do now?

Humans throughout the history have found creative innovative solutions to the problems we faced. We can overcome the odds of mass extinction of our species through a combination of:

- Sound public policy at both national and global levels;
- Innovation in the field of alternate technology that will socially and economically transfer our dependence on fossil energy to renewable energy sources.

Fortunately, almost all major nations around the world have recognized the existential threat of climate change and its impact on human health and survival. As a result, both United Nation's led as well as NGOs are taking decisive actions to curb emissions from industrial, transport, and residential sources. General public is getting aware of the issues and through education we can significantly reduce the "individual footprint" from each person.

Technological advances are being undertaken not only by research institution, this decade has seen a rapid emergence of private companies, including all major oil companies to invest substantially in the next generation of renewable energy technologies. The fossil fuels industry is hedging its bets on an energy future that will be led by renewable energy technologies slowly but surely be replacing fossil-based fuels and chemicals industry.



Public Policy

As of March 2019, 195 countries have signed the Paris Agreement (also known as Paris Accord) within the United Nations Framework Convention on Climate Change (UNFCCC). The Paris Agreement's long-term temperature goal is to keep the increase in global average temperature to well below 2 °C above pre-industrial levels; and to pursue efforts to limit the increase to 1.5 °C, recognizing that this would substantially reduce the risks and impacts of climate change. While the United States withdrew from the Paris Accord in 2017, the already implemented programs to combat climate change are effective. In the United States, the Energy Policy Act of 2007 and the Renewable Fuels Standard has set a target to replace 25% of all transportation liquid fuels by biofuels such as ethanol and biodiesel by 2022. This translates to producing and replacing 36 billion gallons of fossil fuels with biofuels. As of 2018, the United States biofuels industry produced over 21 billion gallons of ethanol that is blended at 10% ration in all gasoline sold in the United States as well as replacing a substantial chunk of diesel fuel used by our massive transportation trucking industry.

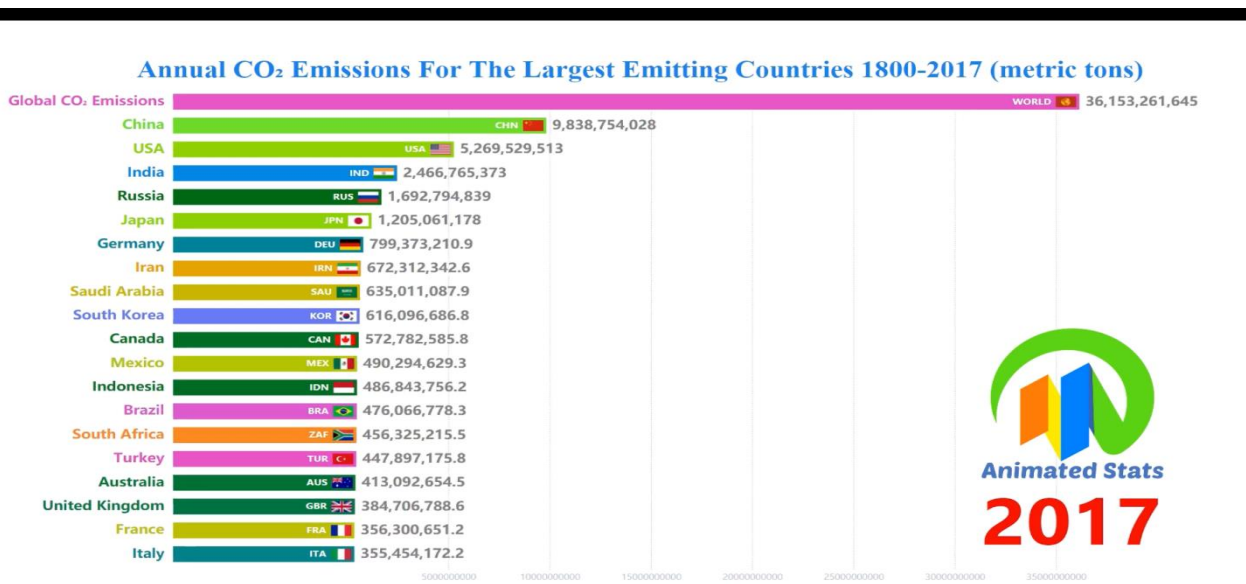
The European Union has long been committed to international efforts to tackle climate change and felt the duty to set an example through robust policymaking at home. EU has implemented a comprehensive package of policy measures to reduce greenhouse gas emissions, which have been initiated through the European Climate Change Program (ECCP). Each of the EU Member States has also put in place its own domestic actions that build on the ECCP measures or complement them. Some of the EU initiatives include directives to promote electricity from renewable energy, voluntary commitments by car makers to reduce CO 2 emissions by 25% and proposals on the taxation of energy products.

India’s National action plan on climate change (NAPCC) and Chinese recent efforts to address climate change shed hope on a carbon neutral future. Attitudes of the Chinese government on climate change, specifically regarding the role of China in climate change action, have shifted notably in recent years. Historically, climate change was largely seen as a problem that has been created by and should be solved by industrialized countries; in 2015, China said it supports the "common but differentiated responsibilities" principle, which holds that since China is still developing, its abilities and capacities to reduce emissions are comparatively lower than developed countries'. As a leading manufacturer of industrial equipment, China is indirectly contributing to combat climate change through mass production of windmills and solar panels. As the world’s manufacturing hub, China is in a unique position to change the course of global emissions.

Technological Advances

One of the largest contributors of air emissions that are mostly responsible for climate change on the global scale is the transportation sector. From trucks to passenger vehicles, and from ocean liners and cargo ships, as well as air transport generate massive amount of CO2 emissions. Most of world’s electricity is produced from coal, oil or natural gas—all non-renewable sources.

Advances in fermentation and bioprocessing systems are shifting biofuels production from waste biomass sources, such as wood waste, municipal solid waste and agricultural crop residues. Also, improving economics of solar panels and wind turbines are allowing for an increased replacement of traditional electricity generation. Geothermal and hydropower is increasingly contributing to clean power generation. Waste- to-Energy projects are diverting large amounts of municipal and industrial waste streams to produce fuels, chemicals and power.



SOURCE: Animated Stats and US Environmental protection Agency, Washington, DC, 2018

According to the U.S. Energy Information Administration, electricity generation in the United States in 2018 was 63.5% from fossil fuels, 19.3% from nuclear energy, and 17.1% from renewable energy sources. Among renewable energy, the main sources were 7% hydropower, 6.6% wind, and 1.6% solar power. Of fossil fuels, natural gas was at a record high of 35%, while coal saw an all-time post-WW2 record low of 27% in 2018. While the contribution of renewable energy source is small, it is certainly positive.

By the end of 2018, 156 global corporations — many based in the United States — have committed themselves to 100% renewable energy. Corporate procurement continues to increase, and asset management companies are collecting renewable energy portfolios. One example is Goldman Sachs, which has acquired 76 solar energy projects found on 143 sites. Investment in renewable energy in the United States exceeded \$40 billion in both 2017 and 2018, and total private investment in renewable

energy could reach a cumulative \$1 trillion between 2018 and 2030 (source: prescouter).

In conclusion, emerging policies, advancements in technology, increases in investment, and more social awareness will most likely cause an increase in renewable energy growth in 2019 in the United States. The decrease in renewable energy costs, in addition to favorable federal policies, is also likely to stimulate renewable demand.

While we may have pushed past the tipping point on climate change, I remain optimistic that human ingenuity coupled with technological advances and sound global public policy will not only save planet but can propel our species to a healthy and happy future. I believe this crisis will bring mankind closer and has the potential to unite us under a common cause. In my opinion, this climate change crisis will not kill us but will make us strong—Climate Strong!

