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Could We Decrease The Global Earth Temperature by Sequestering Carbon?

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Introduction

Carbon is life in many ways. Carbon, a chemical element like hydrogen or nitrogen, is a fundamental building block of bio molecules. It exists in solid, dissolved, and gaseous forms on Earth. Carbon, for example, is found in graphite and diamond, but it can also react with oxygen molecules to form gaseous carbon dioxide (CO_2).Carbon dioxide is a heat-trapping gas that is produced both naturally and by human activity. Carbon dioxide is produced by humans through the combustion of fossil fuels such as coal, natural gas, and oil for use in power generation and transportation. Carbon dioxide is also released through changes in land use, biologically through oceans, organic matter decomposition, and forest fires. Carbon dioxide and other greenhouse gases that accumulate in the atmosphere can trap heat and contribute to climate change. The only method discussed in this article for reducing the effects of warming in the atmosphere is learning how to capture and store carbon dioxide.

Climate change: Black Carbon foot prints

Climate crisis is on the brink, yet we are so far away from acknowledging it. Varying degree of multitude temperatures is observed in different parts of the world, all of them termed to be unnatural and unbearable for human race. In the coming 30 years, a wave of unrest is arriving, yet we are unprepared for it. According to a study conducted by several scientists at the Mauna Loa Observatory in Hawaii, who have kept an eye on safe concentration of CO_2 levels since 1958, but the results are otherwise!

Ever since May 1965, concentrations of planet warming gases have reached greater heights. This year the monthly average concentration of atmospheric CO_2 at Mauna Loa peaked at 420.99 ppm. Levels of the greenhouse gases are 35% higher than 1965 levels. The challenge of halting the rise in CO_2 seems to be menace as of now because, to limit the warming around 1.5 °C above pre industrial levels of global emissions should reach their peak around 2025, and to reduce it to net zero would require another 25 years. Ozone and

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oxygen atoms are continually interconnected as sun rays break the ozone and turns into nascent oxygen and molecular oxygen. The carbon that stays in the atmosphere is not fixed proportionately that favors accumulation of greenhouse gases (and hence the effect) resulting in warming of earth's surface. Also, alongside the atmospheric release of carbon, Black carbon (soot particles) that release after resulting into a fine particulate of matter, formed due to the incomplete combustion of fossil fuels (Figure 1). The incomplete combustion of fossil fuels contribute to the temperature rise. Emissions are increasing rapidly in many developing countries where air quality is not regulated. As the result of open biomass burning and residential solid fuel combustion, Asia, Africa and Latin America contribute approximately 88% of global black carbon emissions. The rate of decreasing emissions of black carbon has been dramatic especially in countries where proper air regulations are practiced and strict laws are driven

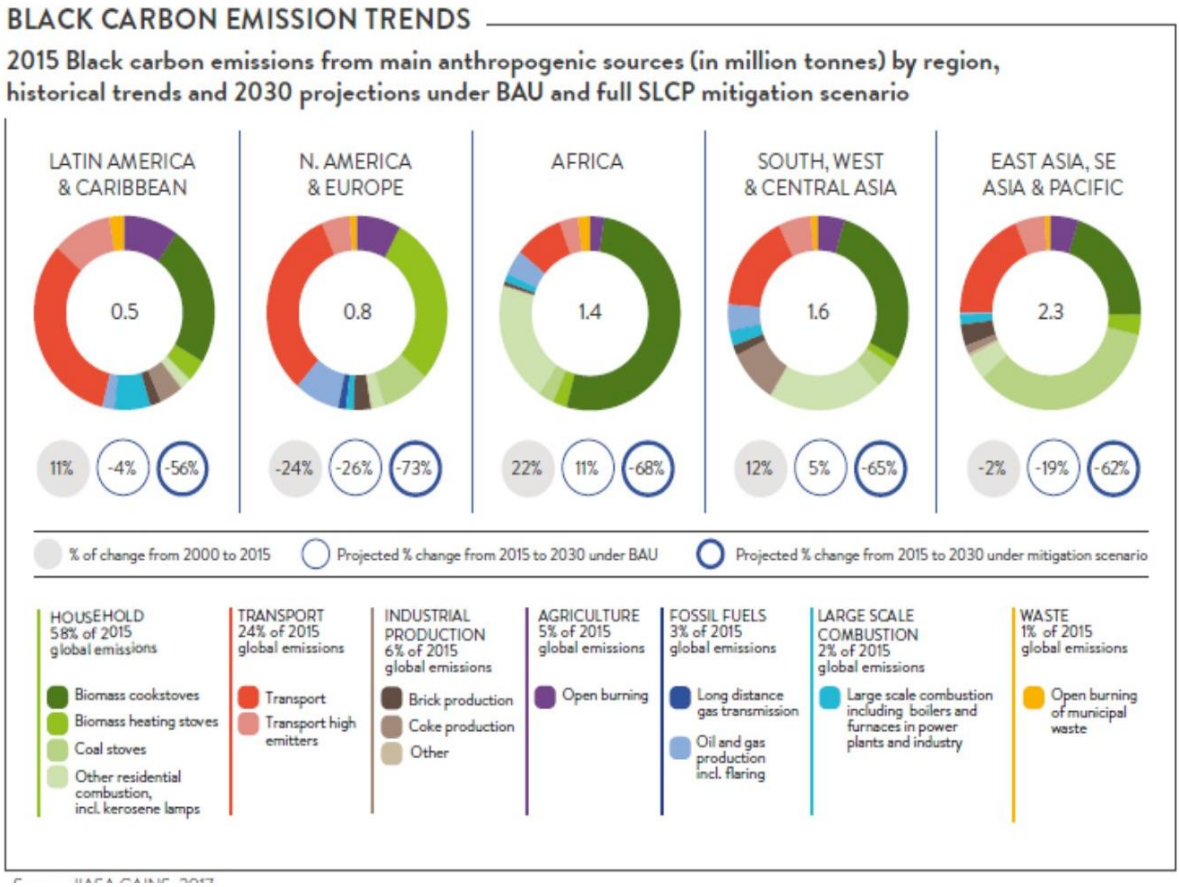

Figure.1. Black Carbon emission from main anthropogenic sources (Source: ccacoalition.org / IIASA GAINS 2017)

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Carbon sequestration: A Band-Aid approach

Carbon sequestration is the intake and storage of the elemental carbon. The most common example in nature is during the photosynthesis process of trees and plants, which store carbon as they absorb carbon dioxide (CO_2) during growth. Because they soak up the carbon that would otherwise rise up and trap heat in the atmosphere, trees and plants are important players in efforts to stave off global warming. This process includes a substantial amount of vegetation cover widespread throughout the ecosystem. However Carbon sequestration, in order to have a vast multitude, requires much more than just capturing the carbon spewing from coal-fired power plants and industrial smokestacks and sequester it by burying it deep within the Earth or the oceans.

It will just be a transient fix to the damage we have done so far! The Bush administration refused to sign onto the Kyoto Protocol, an international agreement adopted in Japan in 1997 calling on countries to limit their emissions of greenhouse gases. Instead, many environmentalists feel, they are pursuing carbon sequestration technology as a quick fix or "Band-Aid" approach that enables them to preserve the existing fossil fuel infrastructure instead of replacing it with clean renewable energy sources or efficiency gains. Carbon sequestration creates a micro-climate over a small area, benefitting the niche of that area. However at ecosystem levels, several components need to interact among one another in order to maintain a niche. The flora components sequester carbon inside the soil. Carbon in order to be harmless, it needs to enter the biotic part or living part of the ecosystem through photosynthesis. Further it needs to be stored in biosphere so that it cannot immediately re-emit back to the atmosphere. The fauna component inside the soil, i.e., microbes help in microbial carbon recycling. Plant organic matter which cannot be broken is stored in soils. This removes the carbon from atmosphere for long periods of time. According to department of energy, there is a strong connection between the makeup of a micro biome and the rate at which leaf litter can be decomposed to carbon dioxide. Microbial traits in biomes links to increased storage of carbon in soils. The idea is to stabilize the carbon in solid and dissolved forms so that it doesn't cause the atmosphere to warm. But this process would be meaningless if the rate of emissions exceed the rate of sequestration. Globally, around 25% of our carbon emissions have historically been captured by earth's forests, farms and grasslands. On the upper layers of stratosphere, oxygen gas is very reactive and they react with another oxygen

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molecule to form ozone. Being an unstable molecule, ozone breaks into nascent oxygen atoms while braking into oxygen molecules again. The covalence nature of carbon binds them together.

Conclusion

The increasing global black carbon emission has created and will create a threat to human life in coming years. It is need of the hour to give this issue a primary focus, so that, the strategies to reduce the emission could be figured out and should be adopted. Carbon sequestration which has gained the limelight in the recent years has significant impact on reducing global carbon emission. Therefore, all the possible practices for carbon sequestration should be adopted by modifying various land use practices.