SUMMARY OF FEEDBACK-LOOPS EXPONENTIALLY ACCELERATING CLIMATE CHANGE

The 2020 UN Climate Summit stated "by 2030….we will detonate a domino effect of ecosystem failures, one cascading on the other, that we will not be able to recover from."

1) Since **water vapor** is a greenhouse gas, the increase in water vapor content caused by global heating reciprocally causes the atmosphere to warm further, which allows the atmosphere to hold still more water vapor.

2) In regions with strong inversions, such as the polar regions, the LAPSE RATE feedback can be positive because the surface warms faster than higher altitudes, resulting in inefficient longwave cooling.

3) The **slowing and redirection of AMOC ocean currents** which distribute heat around the planet.

4) **Emergence of new soil microbes** which have begun to release increasing amounts of stored carbon from the ground.

5) The **melting of ice and permafrost** at both poles leading to the release of vast stores of methane from beneath melting permafrost and ice. Arctic SEA ICE DECLINE between 1979 and 2011 was responsible for 0.21 (W/m2) of radiative forcing. This is equivalent to a quarter of the impact from CO2 emissions over the same period. The combined change in all sea ice cover between 1992 and 2018 is equivalent to 10% of all the anthropogenic greenhouse gas emissions. Greenland has lost over 500 billion tons of ice in the past 10 years alone. The total loss of the Greenland Ice Sheet is estimated to add 0.13 °C (0.23 °F) to global warming (with a range of 0.04–0.06 °C), while the loss of the West Antarctic Ice Sheet adds 0.05 °C (0.090 °F) (0.04–0.06 °C), and East Antarctic ice sheet 0.6 °C (1.1 °F)[45] Total loss of the Greenland ice sheet would also increase regional temperatures in the Arctic by between 0.5 °C (0.90 °F) and 3 °C (5.4 °F), while the regional temperature in Antarctica is likely to go up by 1 °C (1.8 °F) after the loss of the West Antarctic ice sheet and 2 °C (3.6 °F) after the loss of the East Antarctic ice sheet.

6) Increased wildfires throughout the world (to worst effect in rainforests) releasing massive amounts of carbon into the atmosphere including, unbelievably, arctic wildfires. In June and July 2020 alone NASA estimated that 205 megatons of CO2 were emitted from these fires.

7) **Heatwaves** requiring increased power and water consumption and decreased productivity all contributing to increased global warming.

8) Migrating, reduced, or destroyed animal species and habitats such as during the Australian wildfires of 2019 leading to a breakdown including a fatal **breech between plants and pollinators** leading to breakdown in the fast carbon cycle. As of 2020 nearly 21,000 monitored populations of mammals, fish, birds, reptiles and amphibians, encompassing almost 4,400 species around the world, have declined an average of 68% (1970 – 2016), according to the World Wildlife Fund. Species in Latin America and the Caribbean, as well as global freshwater habitats, were disproportionately impacted, declining, on average, 94% and 84%, respectively.)

9) **Altered weather patterns** leading to loss of life and costly infrastructure damage and increased carbon release from plants and soil.

10) Vastly worsening **insect borne disease vectors** leading to increased migration to cooler climates where increased fossil fuels are burned among other effects. Increasing prevalence and intensity of viral and other diseases due to altered animal/human interactions leading to negative changes in migration patterns and resource utilization.

11) **Increased lower altitude cloud reflectivity.** Low clouds are bright and very reflective, so they lead to strong cooling, while high clouds are too thin and transparent to effectively reflect sunlight, so they cause overall warming.

12) These positive feedbacks include an increase in **wildfire frequency and severity**, substantial losses from tropical rainforests due to fires and drying and tree losses elsewhere. The Amazon rainforest is a well-known example due to its enormous size and importance, and because the damage it experiences from climate change is exacerbated by the ongoing deforestation.

13) Global warming encourages a shift in **plant varieties** mainly favoring plants with less ability to sequester carbon.

14) The IPCC Sixth Assessment Report estimates that **carbon dioxide and methane released from permafrost** could amount to the equivalent of 14–175 billion tons of carbon dioxide per 1 °C (1.8 °F) of warming