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# CLIMATE CHANGE AND GLOBAL WARMING

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### Negative greenhouse gas emissions: Options to make that real

Among many other information in my understanding the most important result of the United Nations framework convention on climate change is that limiting further greenhouse gas emissions is simply insufficient to make the survival of mankind possible. In near future, i.e., starting at about 2050, we need negative emissions and the time frame for developing the corresponding technologies is closing rapidly. Unfortunately since fall 2016, the melting process of both polar ice caps accelerated dramatically. If this continues, the nightmare of an ice-free arctic ocean anticipated for about 2050 could become real already during the next 3 years, i.e., 30 years earlier, which means, it could be the beginning of a dominating positive feedback process. Published models show planet earth will reach something between +5 and +7 degrees above the global mean temperature of the preindustrial era, i.e., about 1750, latest 1815 at the next turn of the century. Similar conditions already existed in geological history. There were 5 mass extinction events. Last time it happened at the Permian-Triassic-extinction event, 252 Mio years ago, as a result 98.5% of all species became extinct. Unfortunately all our recent technological tools, as e.g., replacing elder combustion techniques by higher developed new ones, extended use of renewable energies etc., are completely insufficient to reach that goal. The 6th mass extinction event is nothing which we can prevent to start. It is already running. Following recent studies the loss of species per time is already about factor 2 or higher than at the Permian-Triassic-extinction-event. During the last 200 years we have simply used our atmosphere as a waste disposal site. We simply need removing and save underground storage of greenhouse gasses. Therefore it is time to switch the anti-global warming strategy from technologies for limiting further continued positive emissions to techniques for real negative emissions. We have to realize man made global warming is so fast that it is much outside any equilibrium. That means we have only a chance for a further sustainable development if we restore our atmosphere as fast as possible back to its stage of 1815, best much earlier than 2050, if possible. It is time to concentrate on our resources to face this challenge. The fastest and cheapest way for reaching negative emissions is massive reforestration. Unfortunately this is not enough because only about the half of the amount of atmospheric greenhouse gases are the result of deforestation and human land use. Technological sequestration means washing out greenhouse gases, chemical reduction to long-term stable compounds and elements and its reliable storage. But there is a powerful opponent, the entropy. Any concentration process is accompanied by reducing the entropy, i.e., it is energy consuming. That means first of all it requires a lot of energy in addition to that part which our society is consuming right now and in future.

### Biography

Hans J Mueller has completed his PhD in Geophysics at the Academy of Sciences, Berlin, Germany in 1988. During the last 30 years, he published multiple papers in reputed journals about high pressure geophysics, mineral physics and the deep interior of terrestrial planets.

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