THEME 2

Regenerative development to reverse climate change: Quantity and quality of soil carbon sequestration control rates of CO_2 and climate stabilization at safe levels

Thomas J. F. Goreau
Soil Carbon Alliance

INTRODUCTION

How quickly can safe levels of CO_2 be reached? Scientifically-sound CO_2 levels to prevent extinction of coral reefs and flooding of billions of people on low lying coasts match pre-industrial levels of 260 ppm, based on nearly a million years of long term climate records. Proposals that claim that 2 degrees C warming or 350 ppm are “acceptable” sentence coral reefs and low lying countries to death. The last time global temperatures were 1-2 C warmer than today, sea levels were 6-8 meters higher, equatorial coral reefs died from heat, crocodiles and hippotamuses lived in London, England, yet CO_2 was only 270 ppm. Steady-state temperature and sea level for TODAY’S 400 ppm CO_2 level are around 17 degrees C warmer and 23 meter higher than now! It takes thousands of years for the deep ocean to warm up, only then we will feel full impacts. IPCC estimates don’t include this. Carbon farming can stabilize CO_2 in decades if quality and quantity of carbon farming practices are increased. Failure will result in runaway climate overshoot that could last millions of years. The longer action is delayed, the more difficult and costly stabilization will be, until it finally becomes impossible. Two strategies maximize soil carbon sequestration cost-effectiveness: biochar and marine wetlands: biochar carbon is stable for thousands to millions of years, whereas marine wetland peats are the richest soils in carbon because lack of oxygen prevents decomposition.

OBJECTIVES

Identify scientifically-sound safe CO_2 levels from climate records and determine how quickly CO_2 can be stabilized to prevent extinction of coral reefs and flooding of low-lying coasts, based on quantity and quality of soil carbon sequestration and global atmospheric CO_2 input-output models. Separate soil quantity and quality carbon parameters, and evaluate their optimization for fastest and most effective reduction of CO_2 to safe levels.

Biochar can be applied to any soil and is best made from invasive weeds preventing ecosystem recovery. Biochar energy is renewable and carbon negative. Biochar greatly increases soil nutrient and water holding capacity, but is effective only if mature and charged with minerals from rock powder and compost. Raw biochar inhibits growth. Those using raw biochar instead of mature biochar, get negative results instead of positive ones.

MAIN RESULTS

Soil has nearly 5 times more carbon than atmosphere or biomass, with around half in wetlands, the richest carbon soils. Half are marine: mangroves, salt marshes, and sea grasses, covering around 1% of Earth’s surface and hold more carbon than the atmosphere, burying around half the carbon in the ocean. Marine wetlands are the most rapidly vanishing

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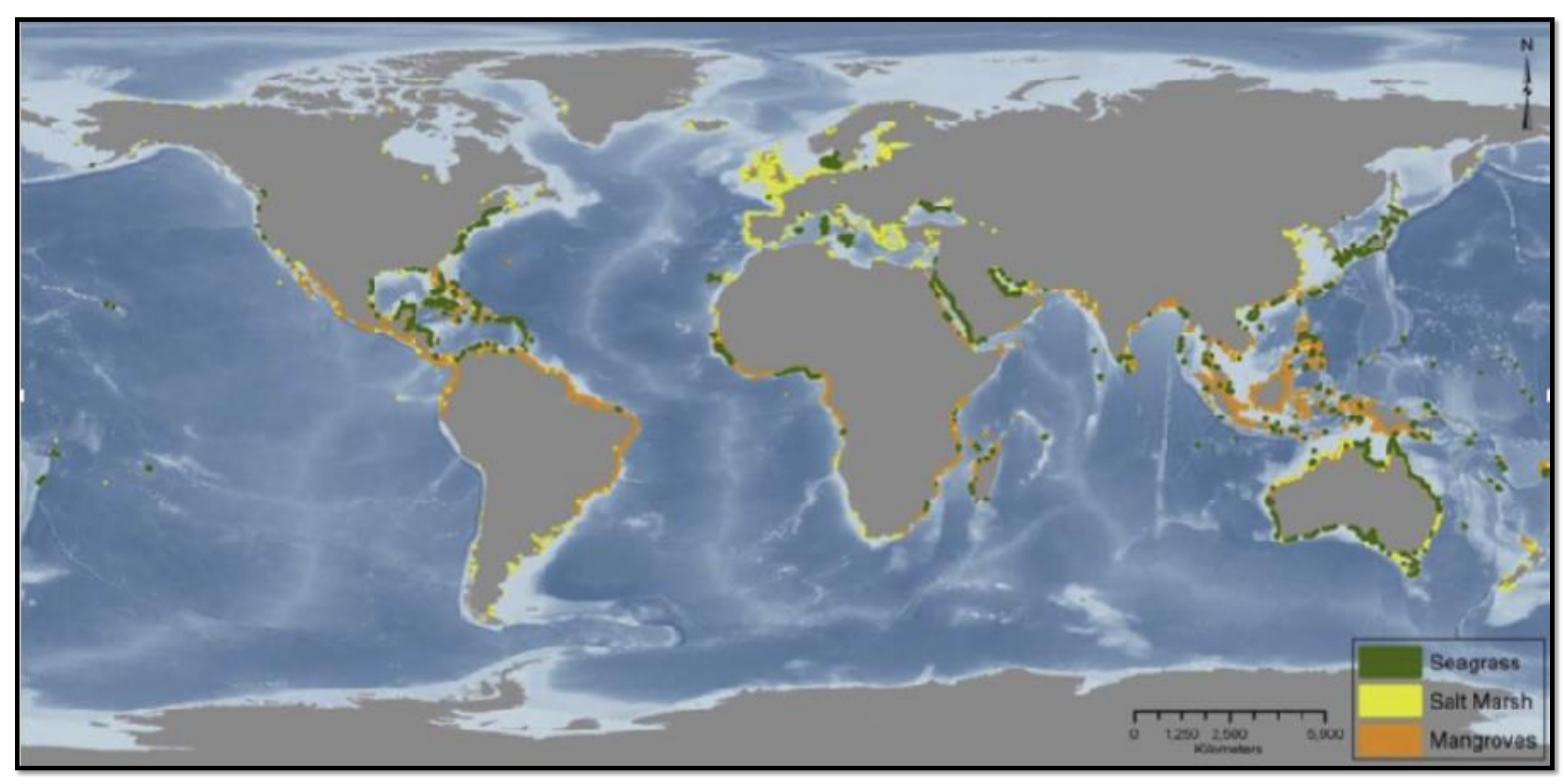
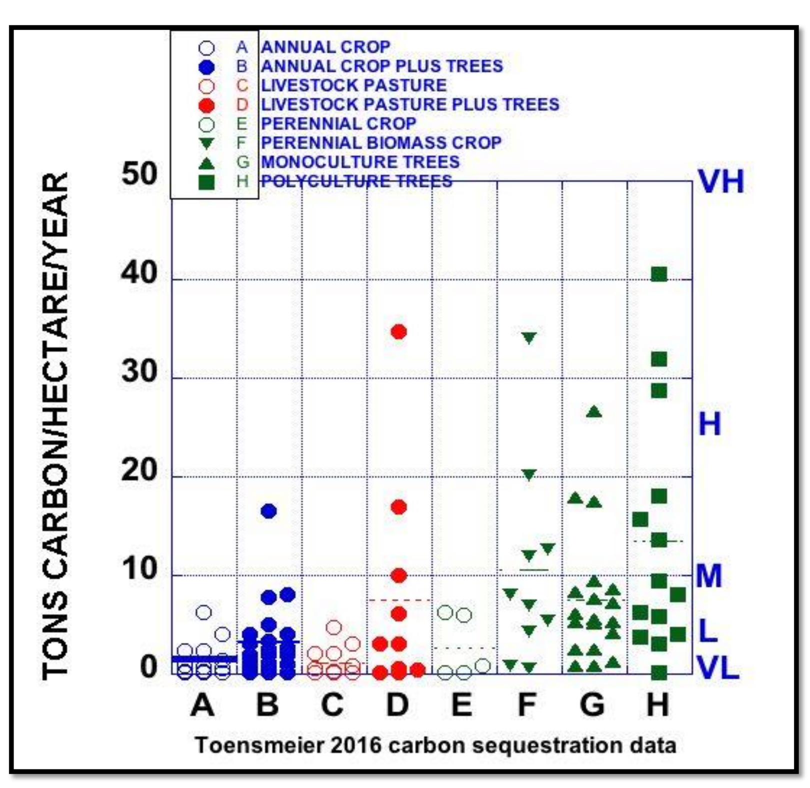
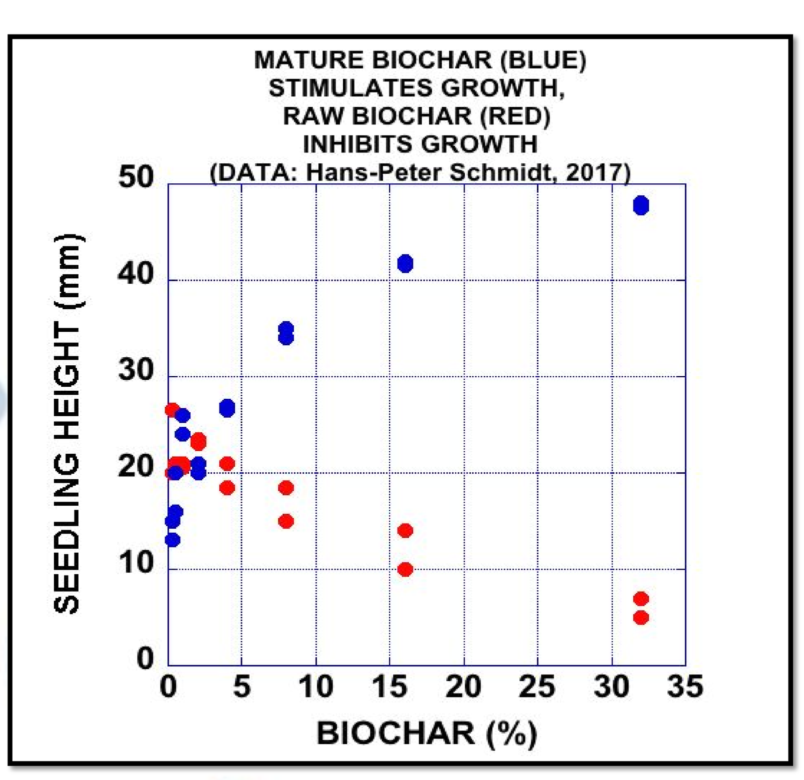
ecosystems, their restoration would provide largest carbon sinks in the smallest areas for the least costs, restoring critical fisheries nurseries and protecting coastlines from erosion. Most efforts to restore marine peat soils fail because new plants wash away before their roots can grow. These problems are overcome with Biorock elestimulation methods, allowing sea grass, salt marsh, and mangroves to be grown where all other methods fail, and expanding carbon-rich ecosystems seawards where they are rapidly eroding away.

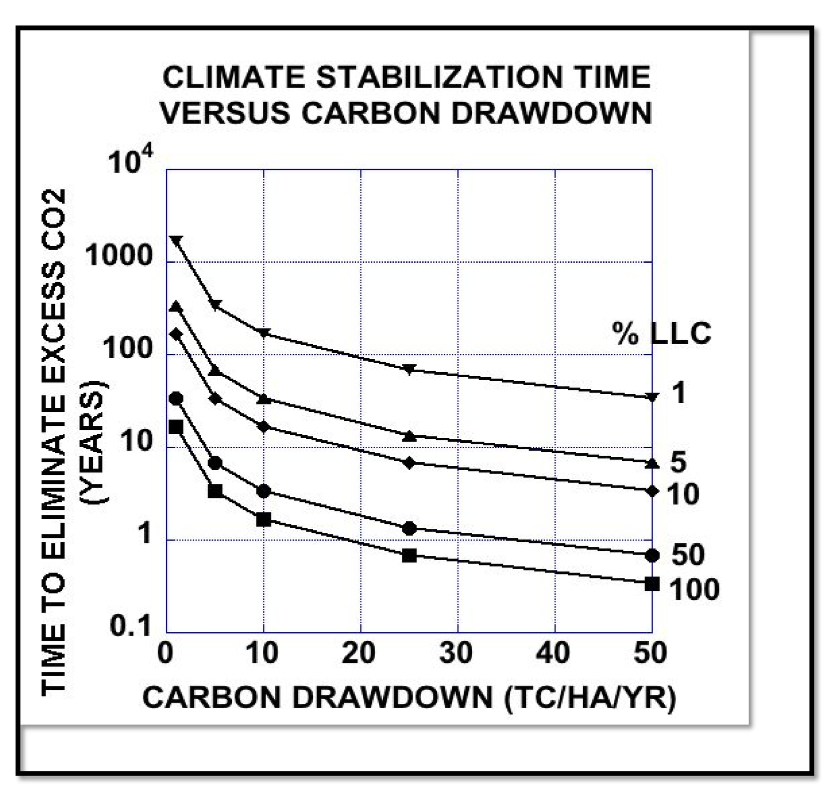
Map 1: Mangroves, salt marshes, and sea grasses cover about 1% of the earth but their soils hold as much carbon as the atmosphere or biosphere

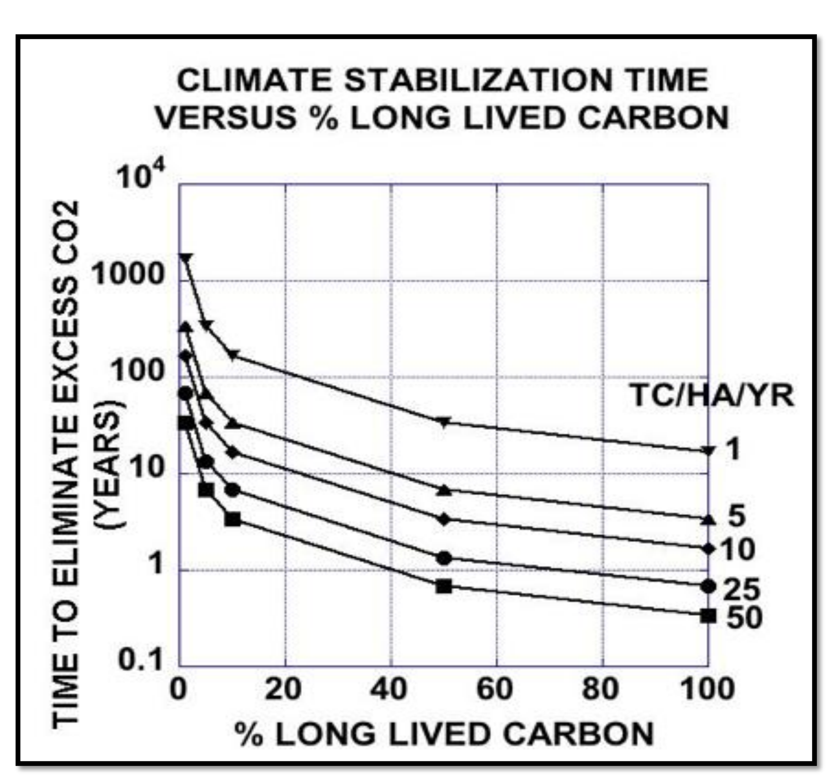






Graph 1 (a+b): Rate of carbon burial as a function of land management, and effects of raw and mature biochar on seedling growth





Graph 2 (a+b): Time to stabilize CO_2 at safe levels as a function of the rate of carbon drawdown, and as a function of the % of long lived soil carbon

CONCLUSION

Regenerative development strategies increase soil carbon storage to reverse climate change and stabilize CO_2, temperature, and sea level at safe levels within decades. Emissions reductions alone cannot reduce CO_2 to safe levels on any time scale. Carbon farming can store CO_2 excess within decades, and produce carbon-negative sustainable energy, if long lived carbon is increased. Regeneration of mangroves, sea grass, and salt marsh peats could sequester the needed carbon in around 1% of the earth’s surface. The Regenerative Development to Reverse Climate Change strategy of the Commonwealth Secretariat, 52 countries and 2.5 billion people, proposed at UNFCCC in Fiji in December 2017, aims to solve the problem of runaway climate change for future generations by large-scale increase of biomass and soil carbon sinks.