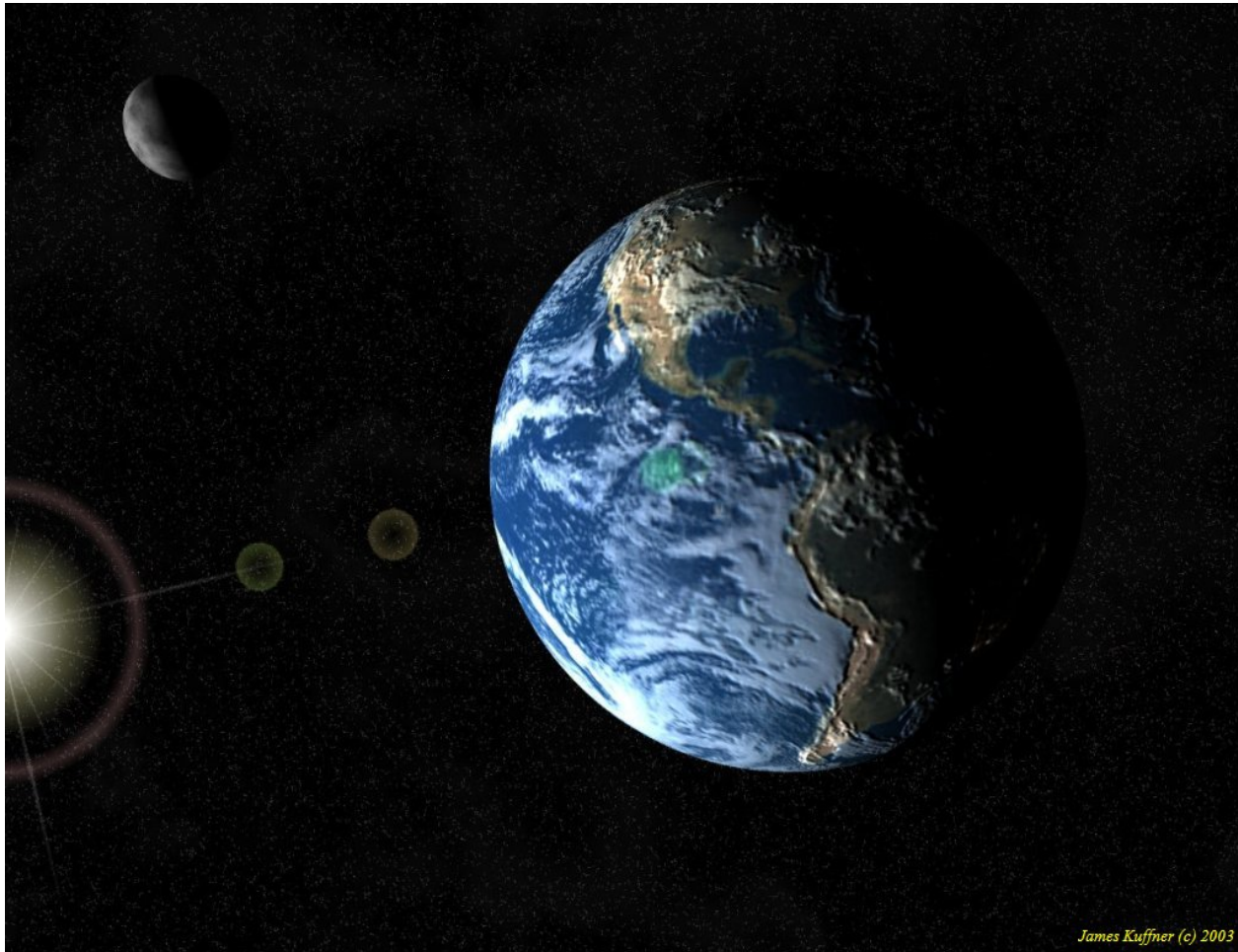


# *REWILDING*

*BALANCING THE NATURAL CARBON CYCLE*

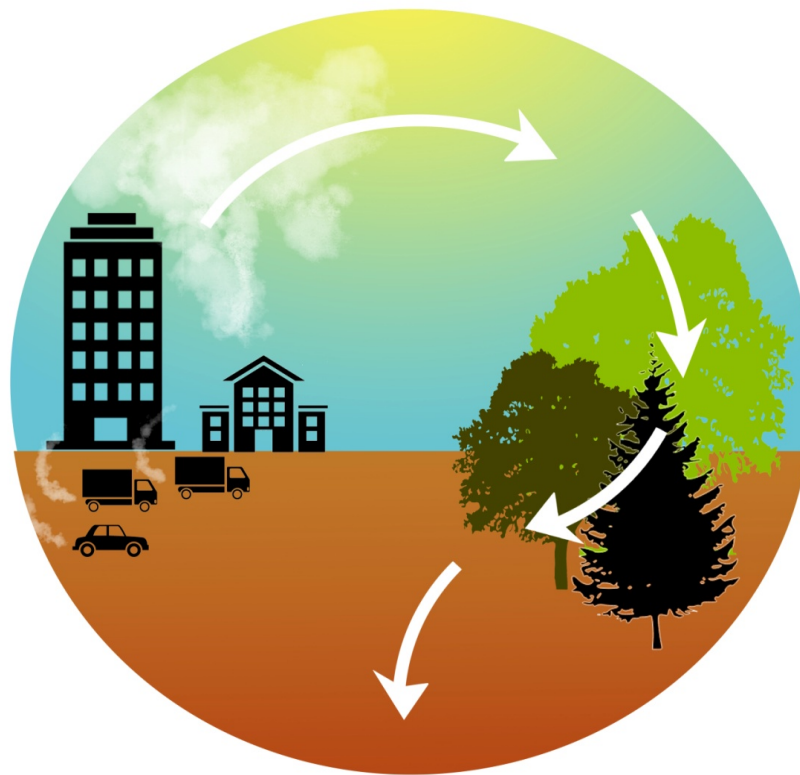
*RICHARD IREDALE, ARCHITECT*



*James Kuffner (c) 2003*

# Rewilding:

## Encouraging Plant Systems and Topsoil Formation



# *Greening cities, forests and farms*

- Cheongecheon River restoration, Seoul south Korea







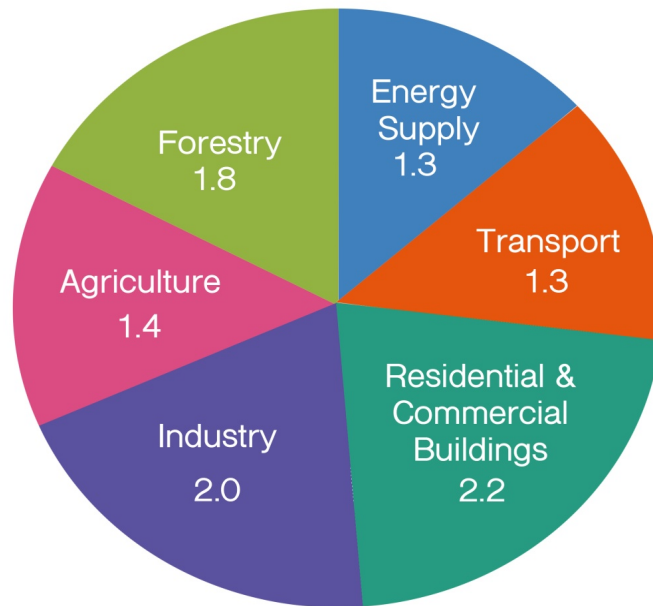






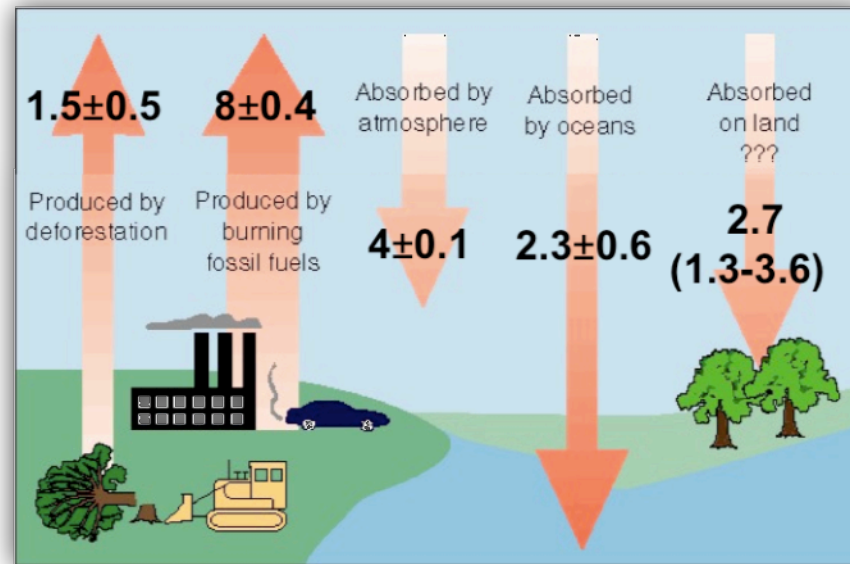
# *Global Warming*

Today: 10 Tons of GHG Emmissions

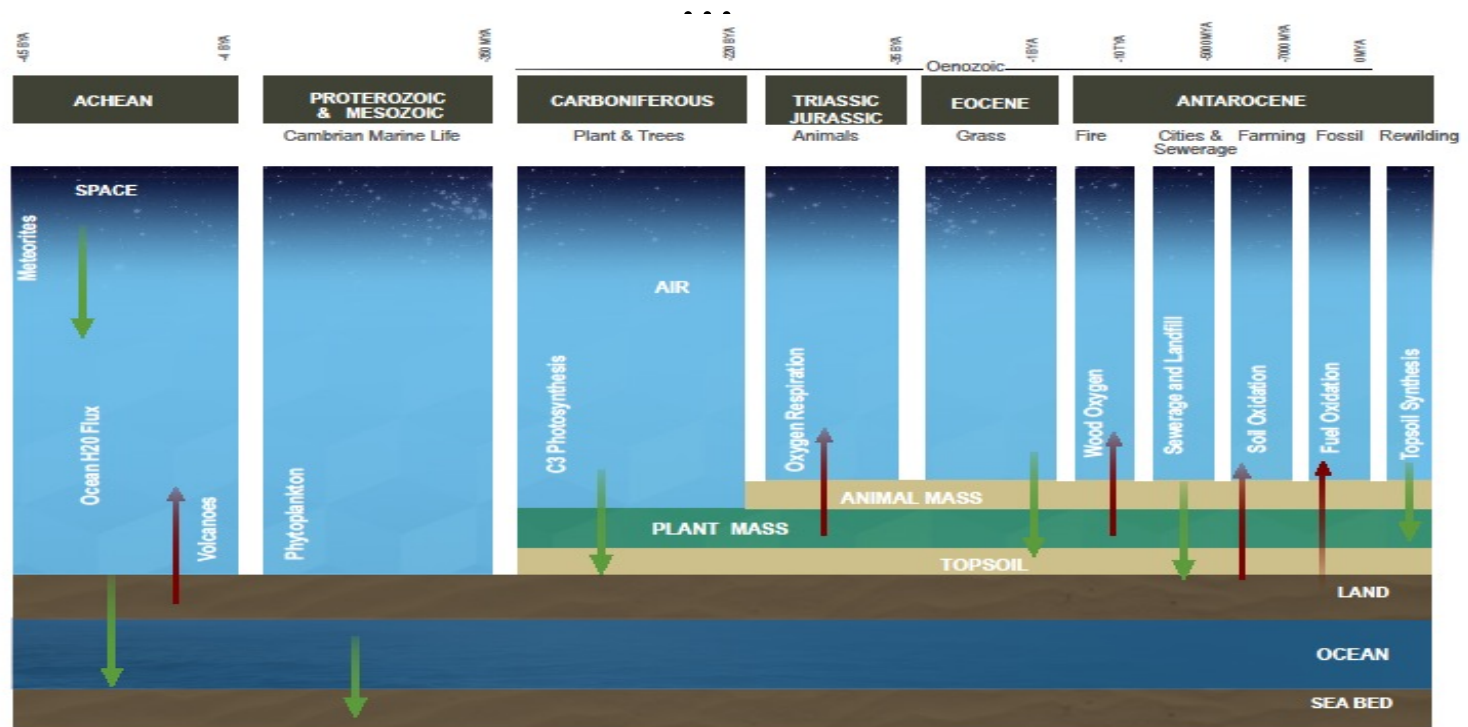




... *5 billion tons too much carbon*



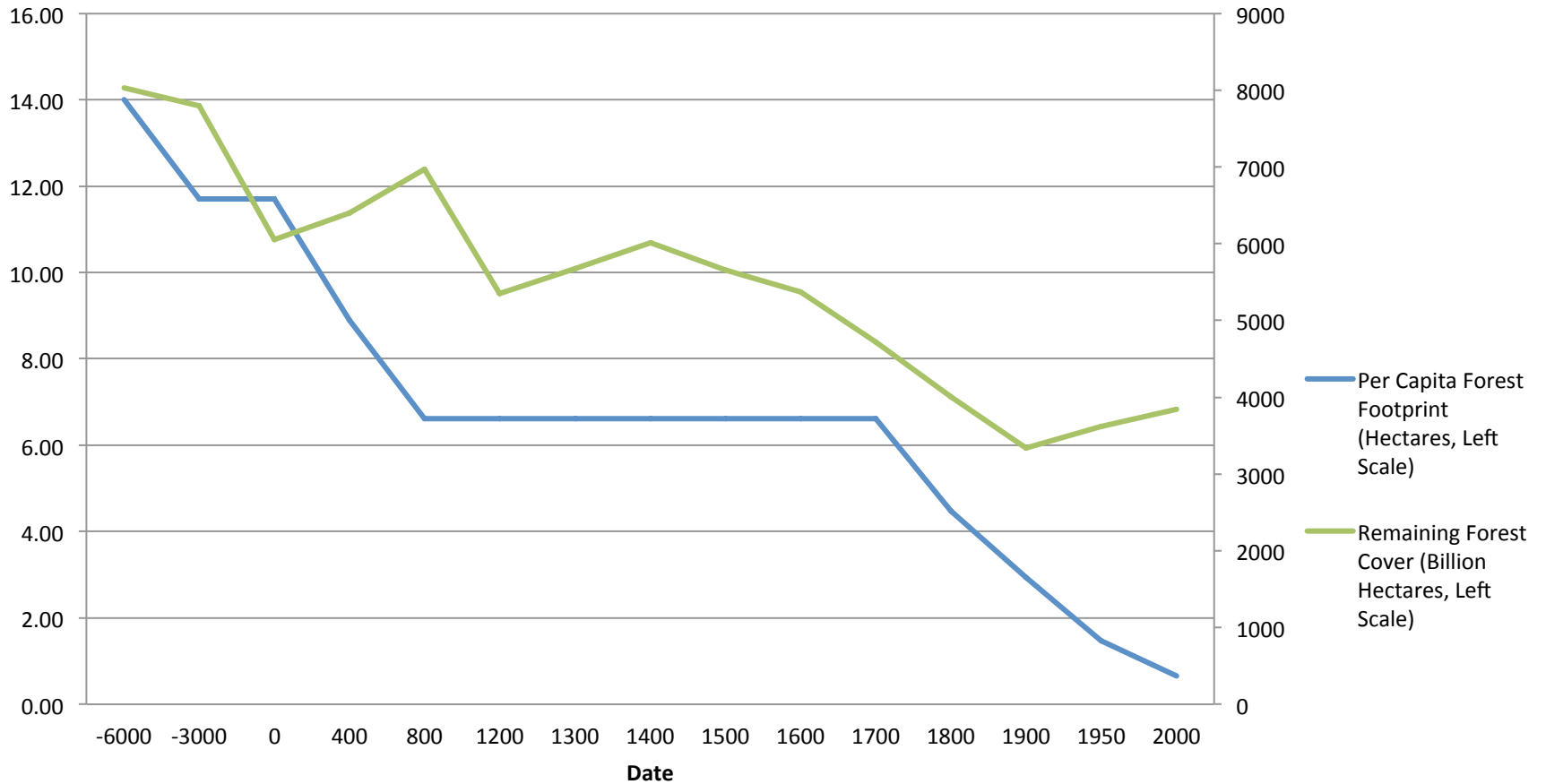
# *Evolution of the Carbon Cycle*



THE EVOLUTION OF EARTH'S PRINCIPAL CARBON FLUXES

# *Human History:*

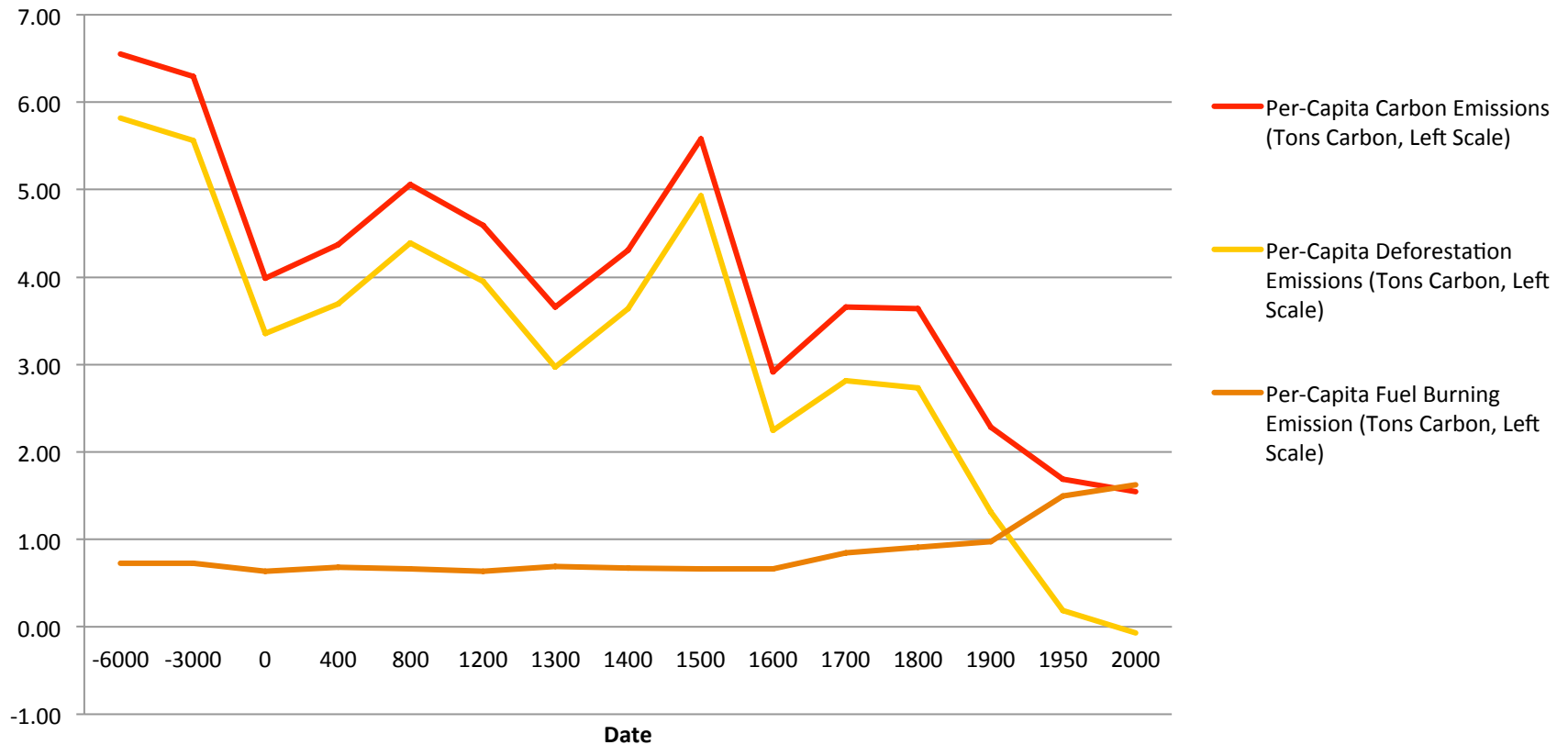
## *Per-Capita "forest footprint" declined*





# *Human History:*

*The bulk of carbon emissions were caused by forest clearing*



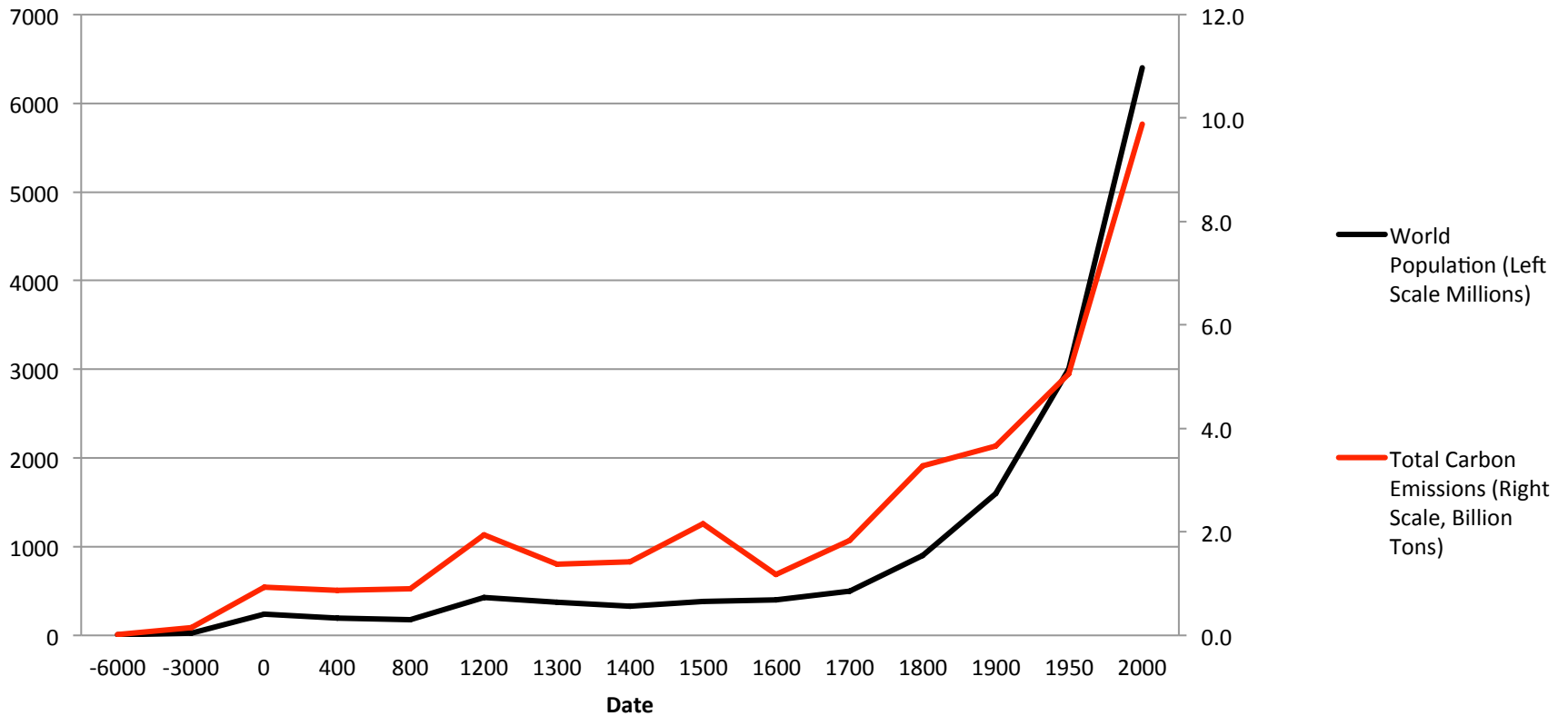
# Human History:

*Forest clearing declined because of rising crop yields...  
average cereal harvests went up from 2000 to 10,000 kg/He*



# *Human History:*

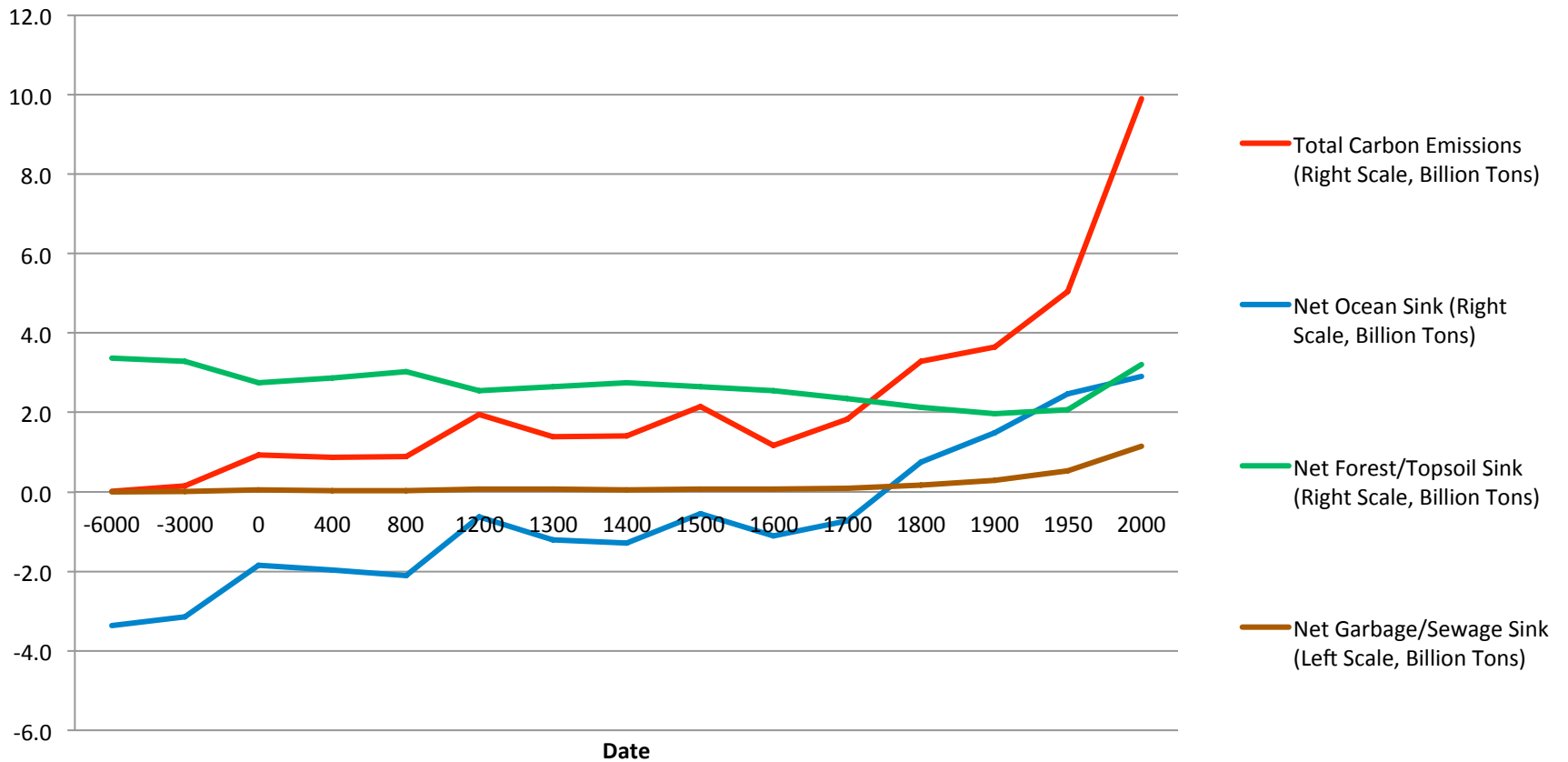
*But population ( and total emissions rose)*





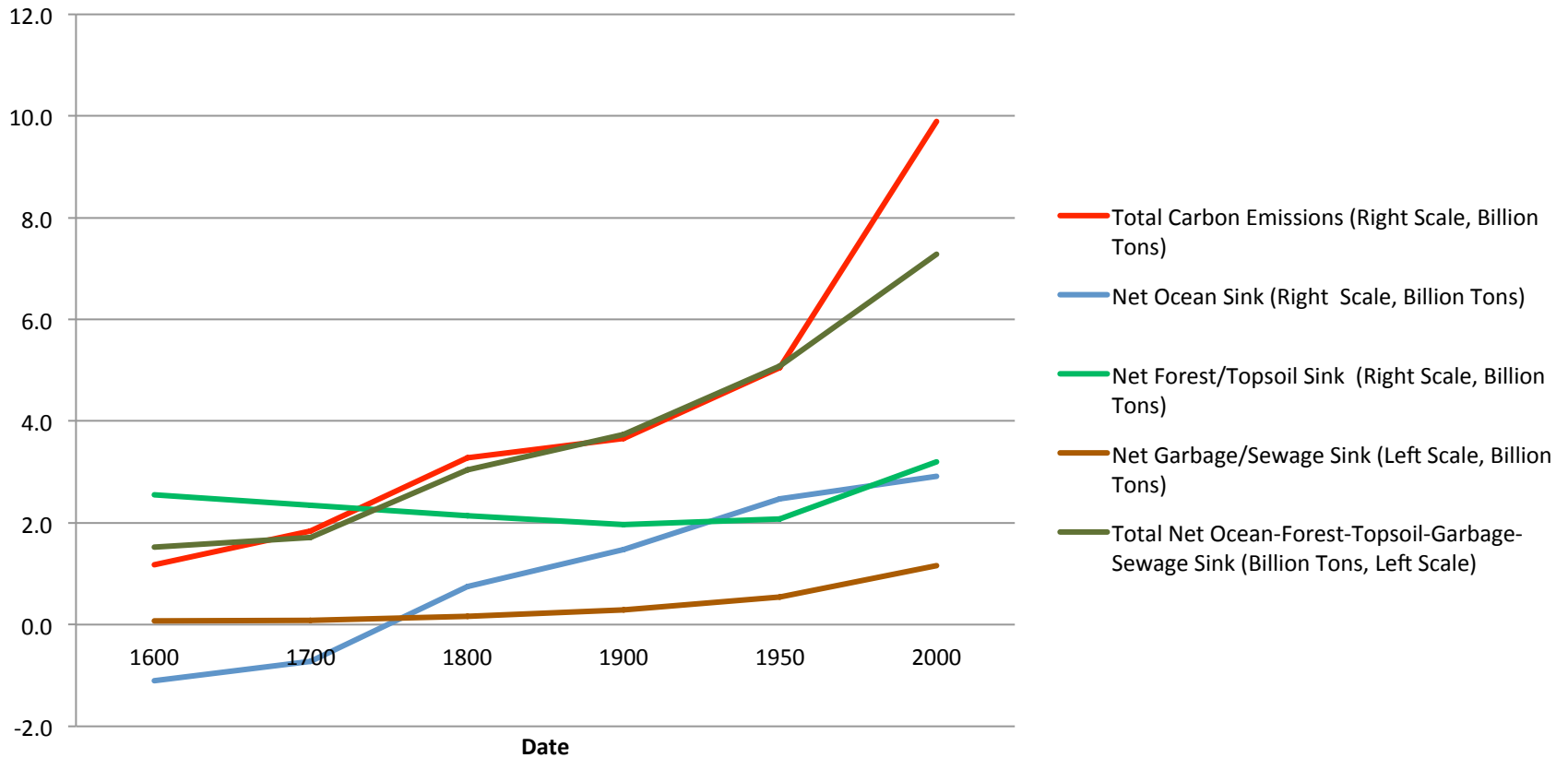
# *Human History:*

## *Oceans, Forests, and Landfills absorbed carbon emissions*



# Human History:

The ocean sink tracked carbon emissions ... up until 1950



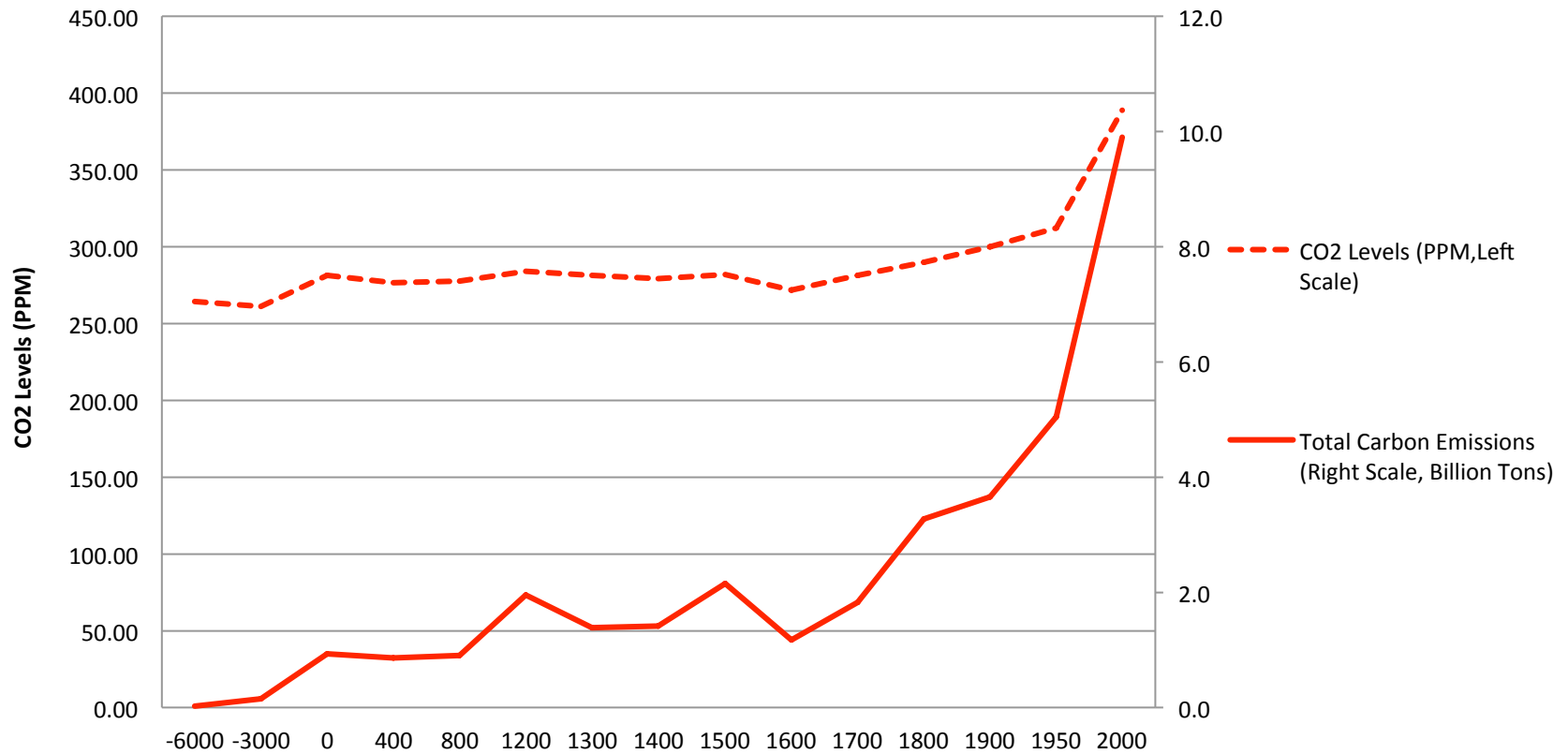
# *Balanced CO2:*

*Until about 1950 emissions were balanced by sinks ...*



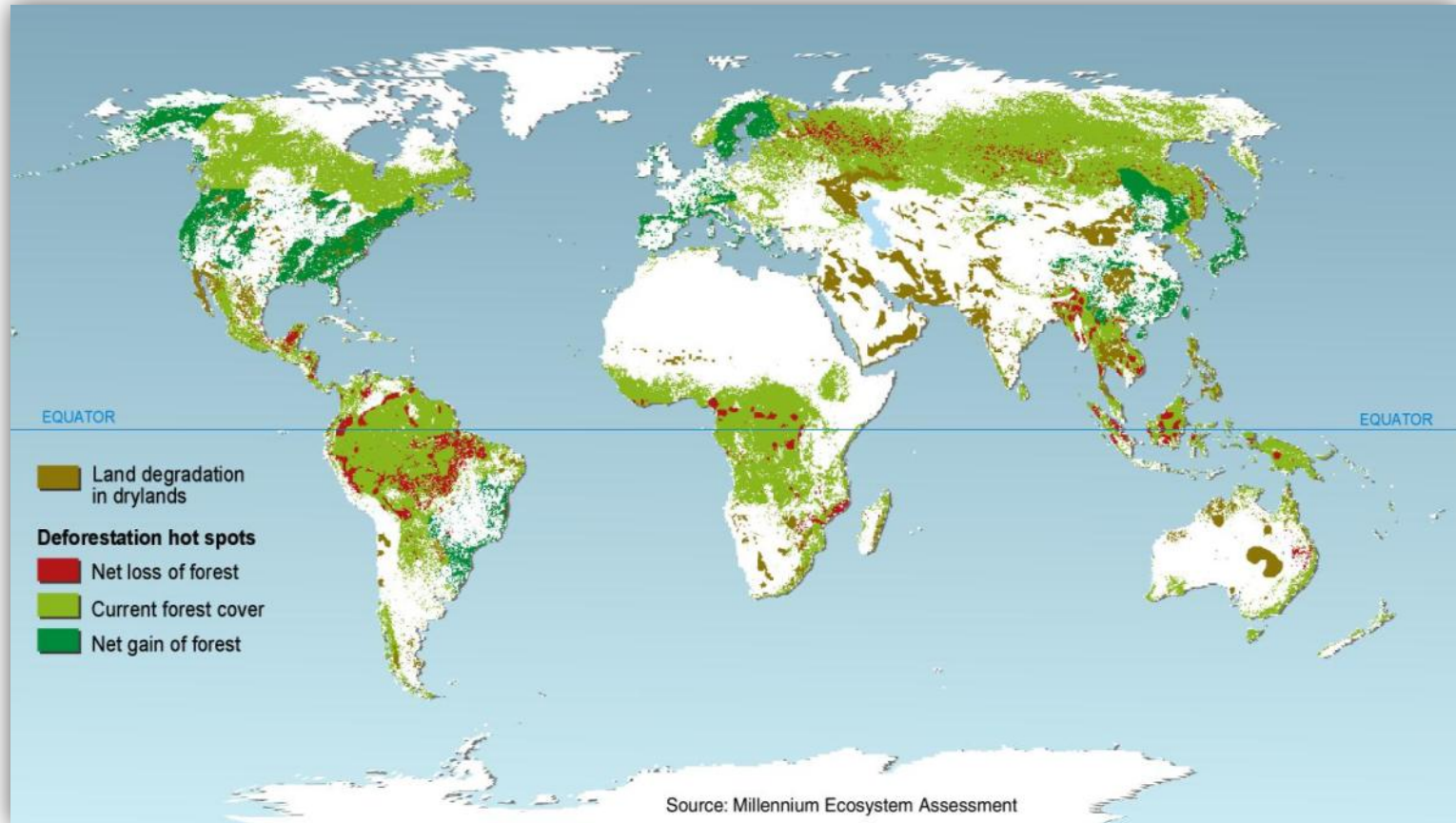
# Balanced CO2:

*Therefore, until 1950, "CO2 sensitivity" was low...*



# *Since 1950 forests have been expanding into abandoned grasslands*

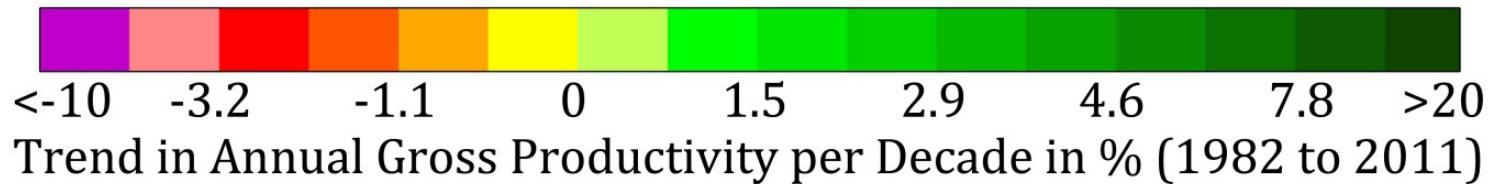
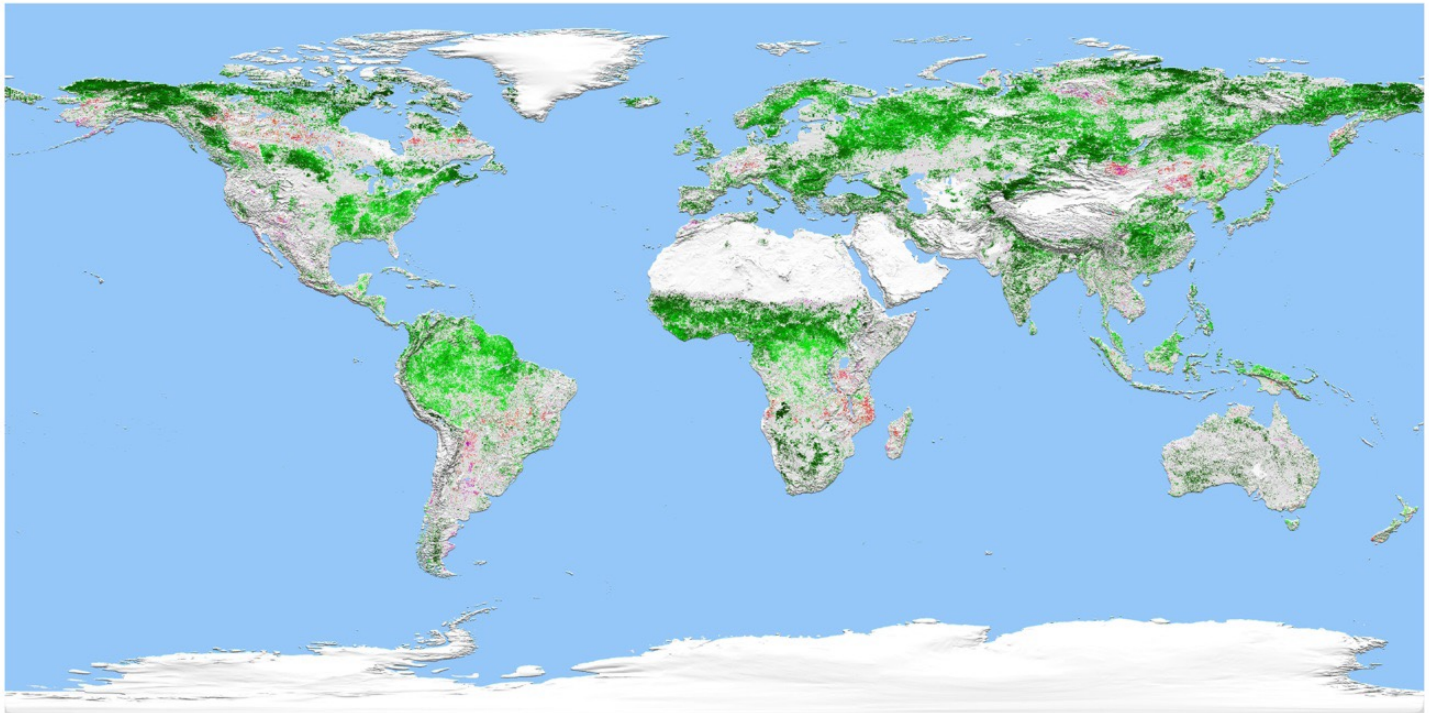
*4.2 billion hectares of forest are expanding into grasslands*



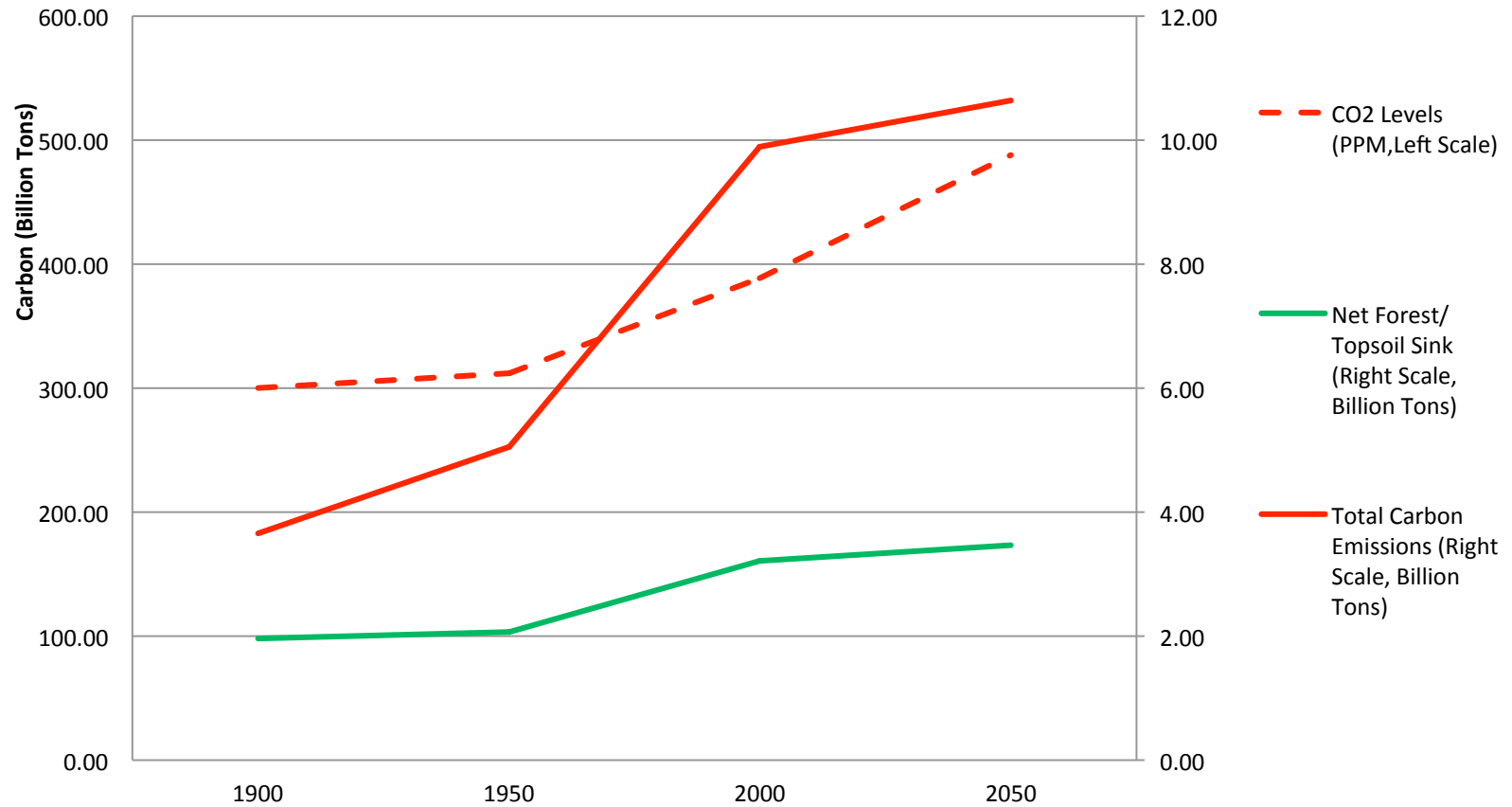


# *And forests are growing faster:*

*Annual forest CO<sub>2</sub> uptake rose from about 1 billion tons-per-year in 1950 to  
2.4 billion tons-per-year in 2015*

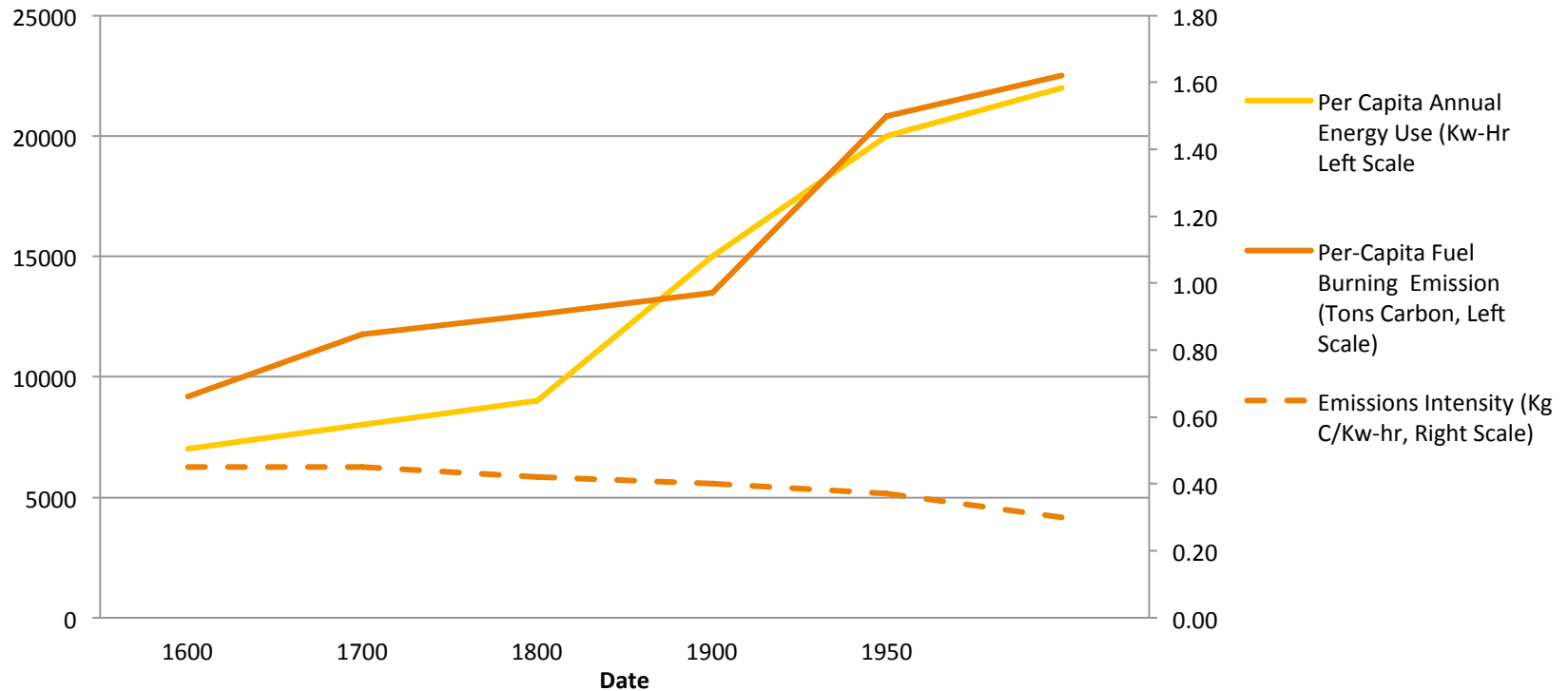


*Higher CO2 fertilizes higher growth rates and gives trees an advantage of grasslands*



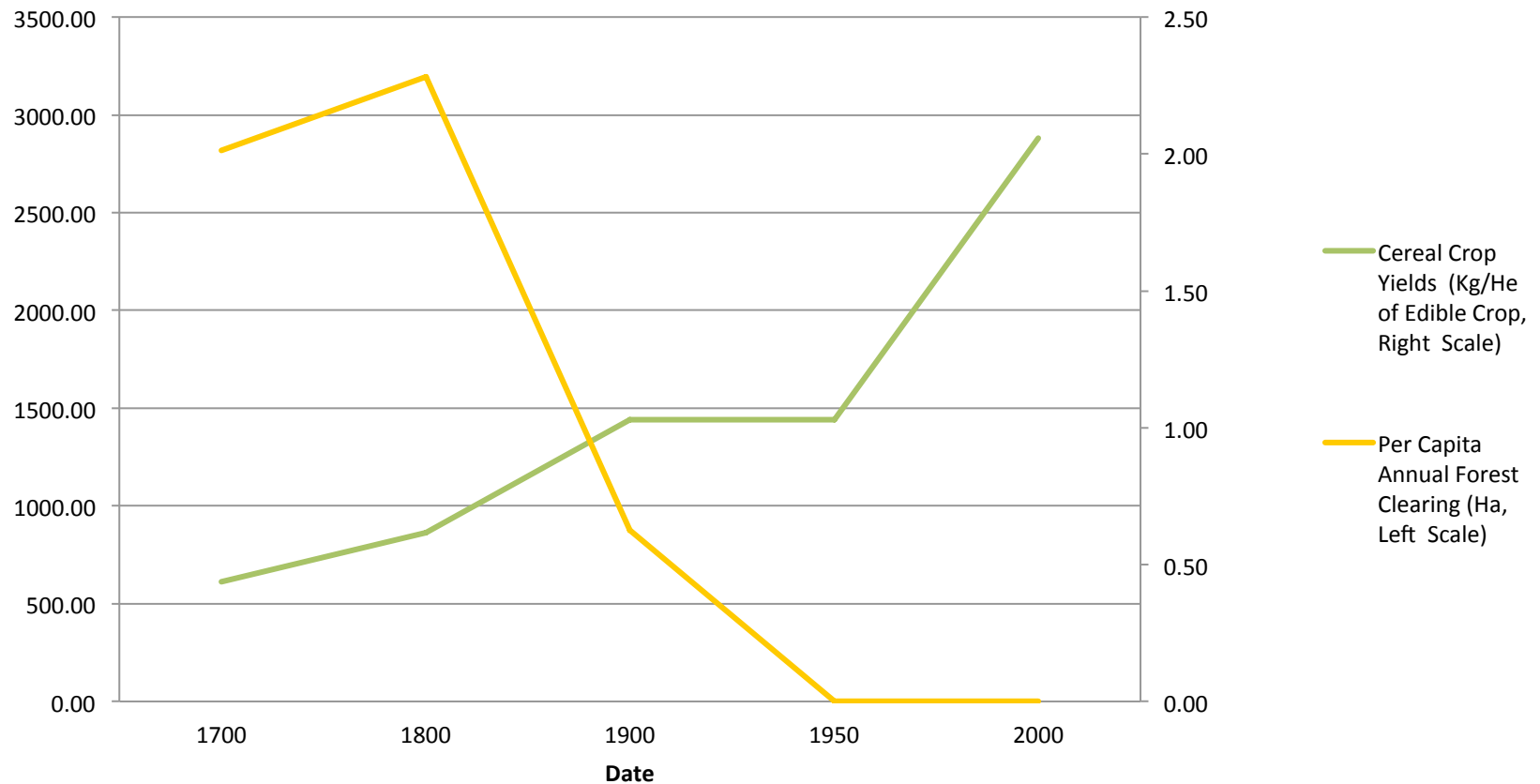
# *Modern Energy efficiency helps*

*Since 1750 per-capita energy consumption rose 4 times (from 6000 to 22000 kw-hr/year) , but fuel burning carbon emissions only doubled, because oil and gas burn "cleaner" than wood and coal*



# *And farms need less land*

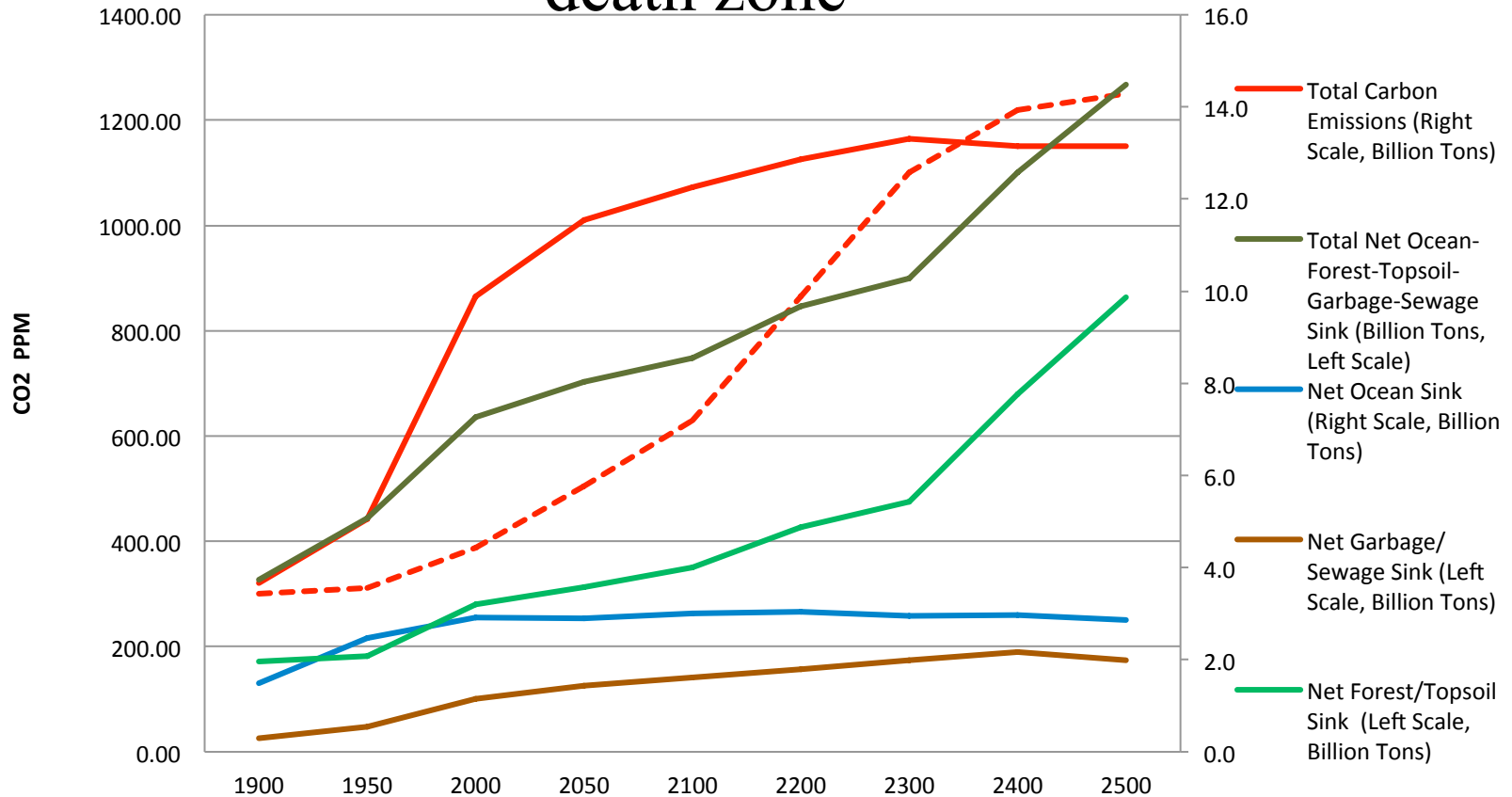
*Since 1750 crop yields rose ( thanks to Turnips, Guano, Synthetic Nitrogen, Seed Drills, Hybrid Crops and GMO Crops), and tractors replaced horses and oxen*



*But with “business as usual”*



With 10 Billion people, CO2 peaks at  
around 1250 PPM in 2400,... well into the  
“death zone”



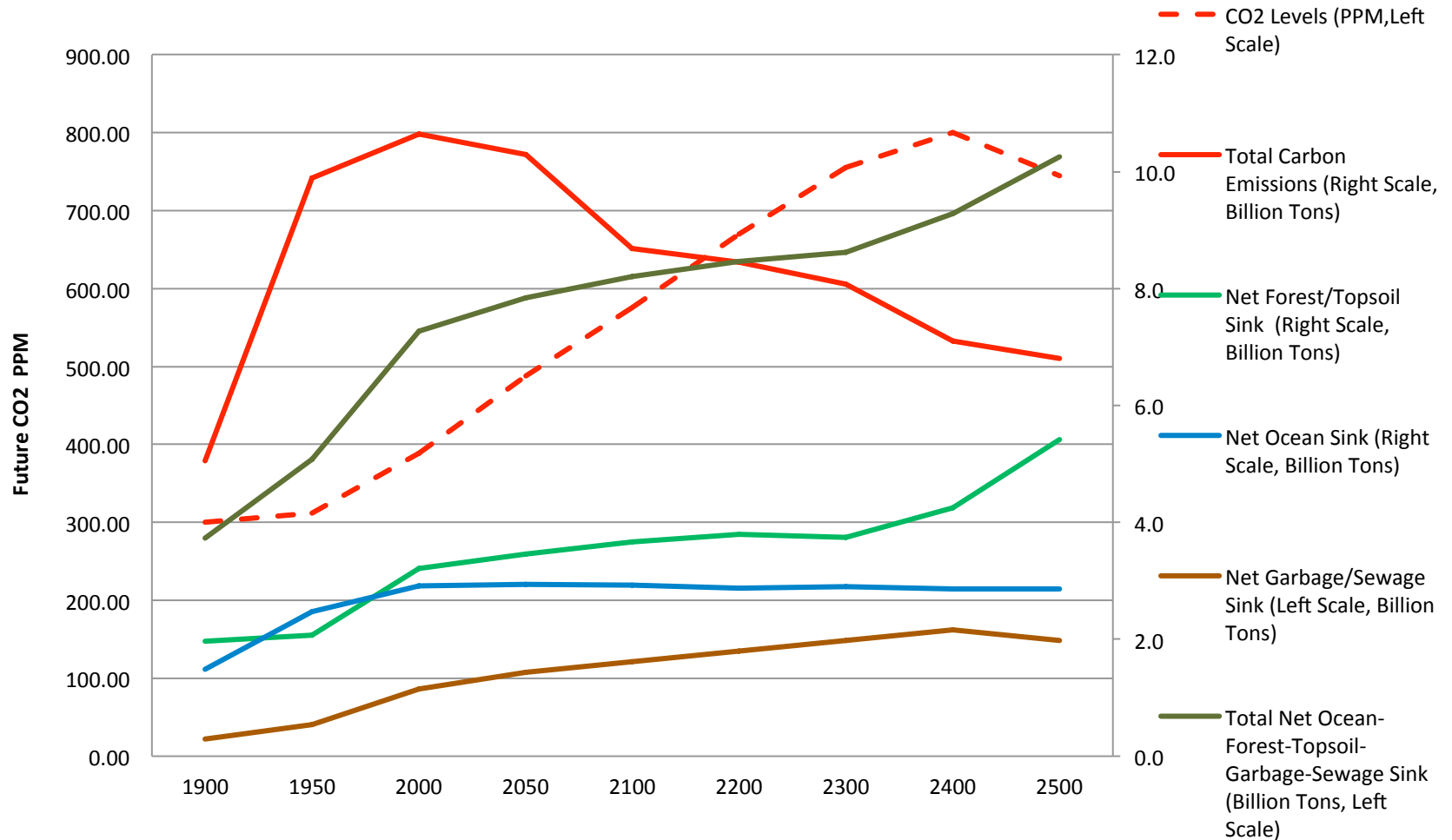


*So ...50% of total energy use can be switched to “non carbon”  
by converting cars, buildings, computers, servers and appliances  
to solar-wind electricity*





# With 10 Billion people, CO2 tops out at 800 PPM in 2400 (a ...4-6 degree temperature rise)

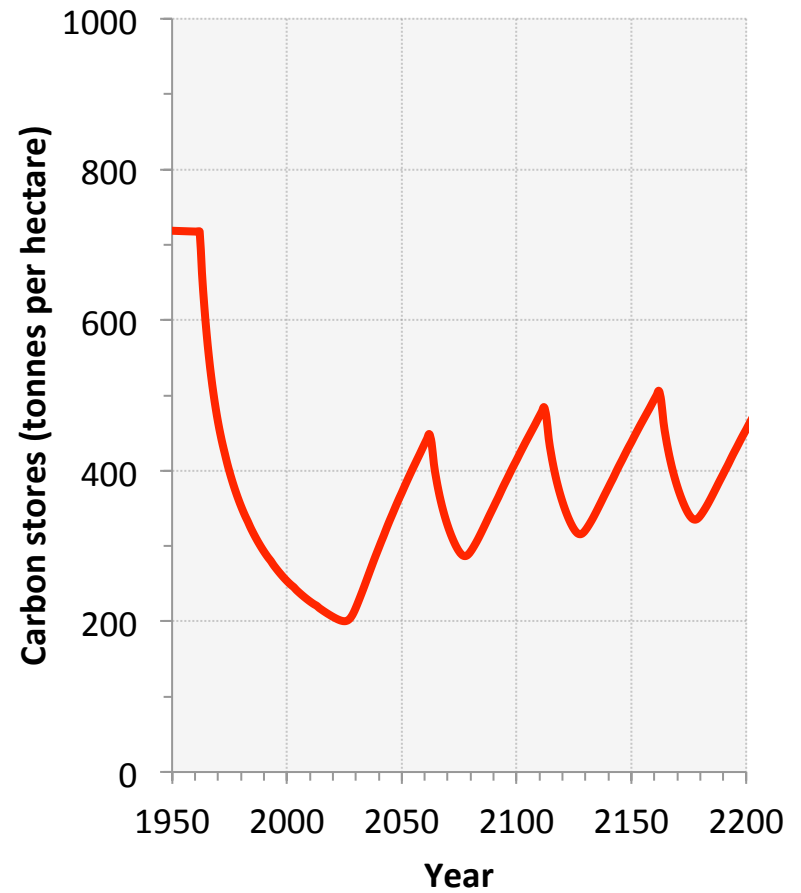




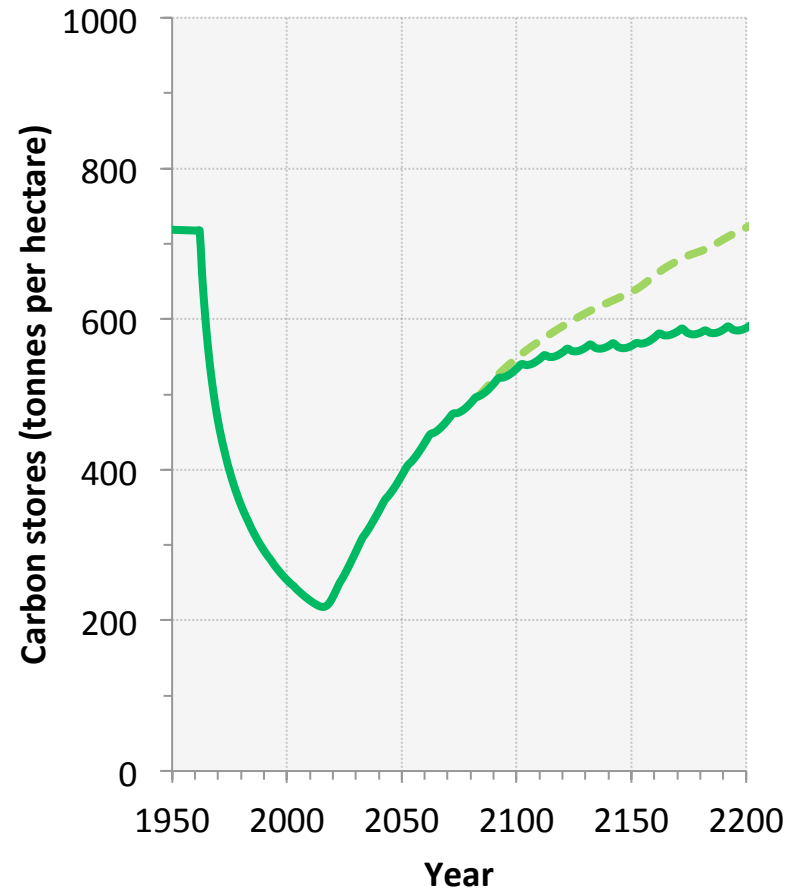
*To survive, we have to consider “rewilding” by  
expanding earth’s natural ecosystems*



# *Start by banning clearcuts*



*Switch to selective logging ... which maintains soil carbon and biodiversity*

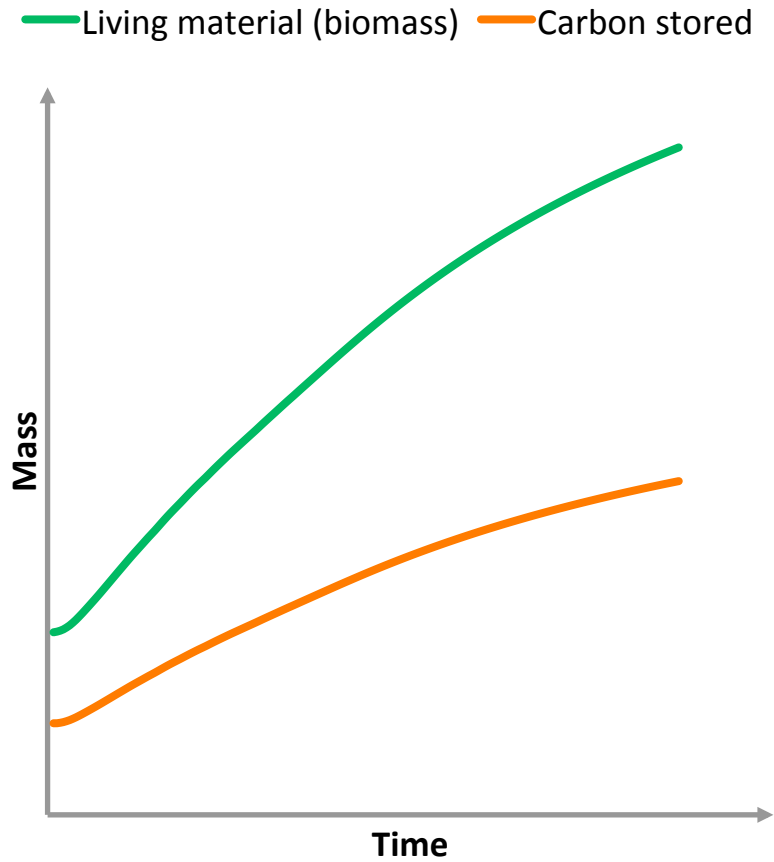




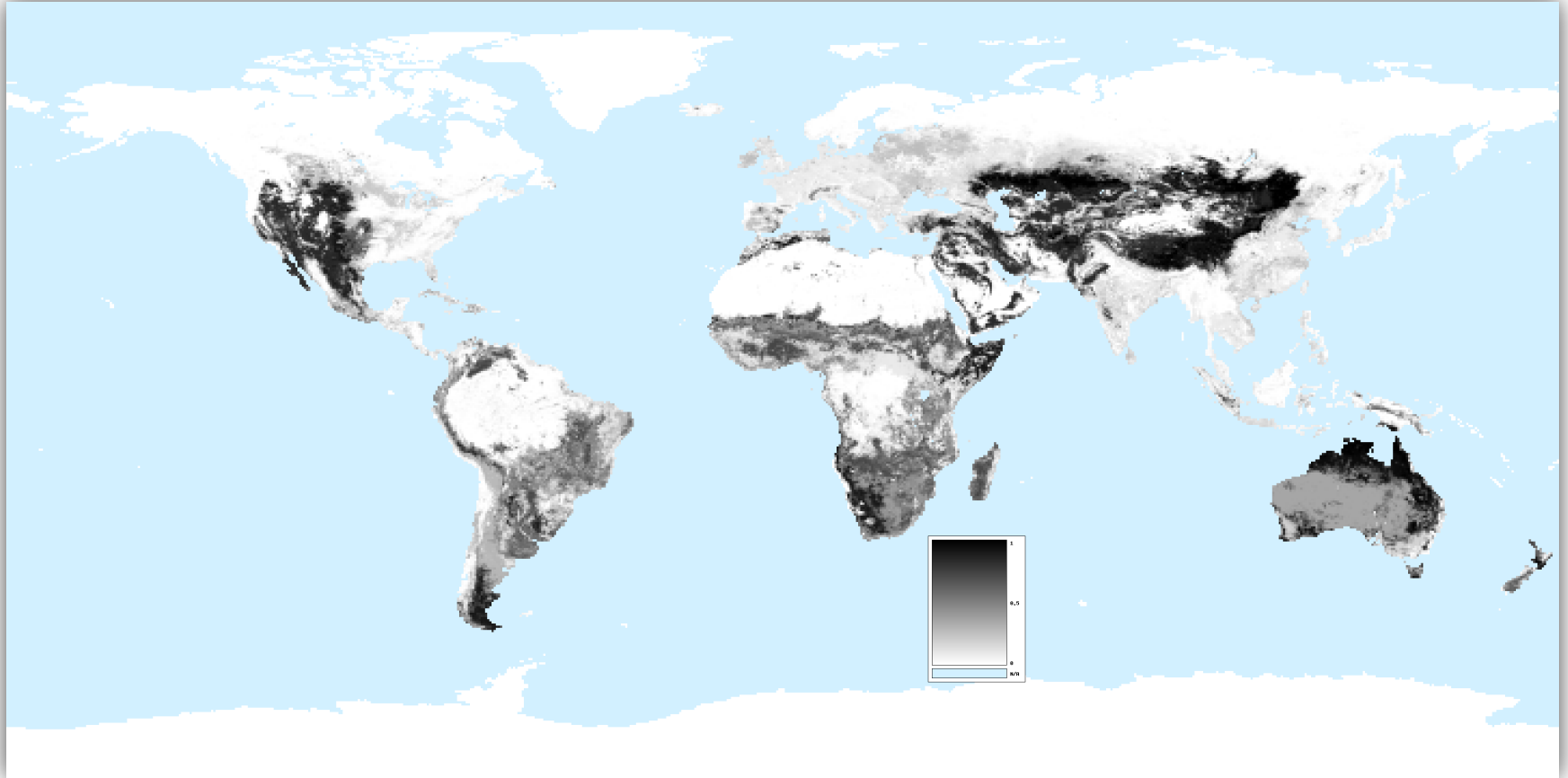
*Continue by rewilding boulevards,  
backyards, pastures, grasslands*

	TonsC/Hectare-Yr.
– Wetlands	0.3
– Grasslands	0.4
– Tidal Kelp, Eelgrass, Mangrove	0.5
– Forest	0.7
– Rainforest	0.9
– Tropical Rainforest	1.2
– Mulched Low Till Cereal Crops	1.3
– Biochar Mulched Gardens	2.4

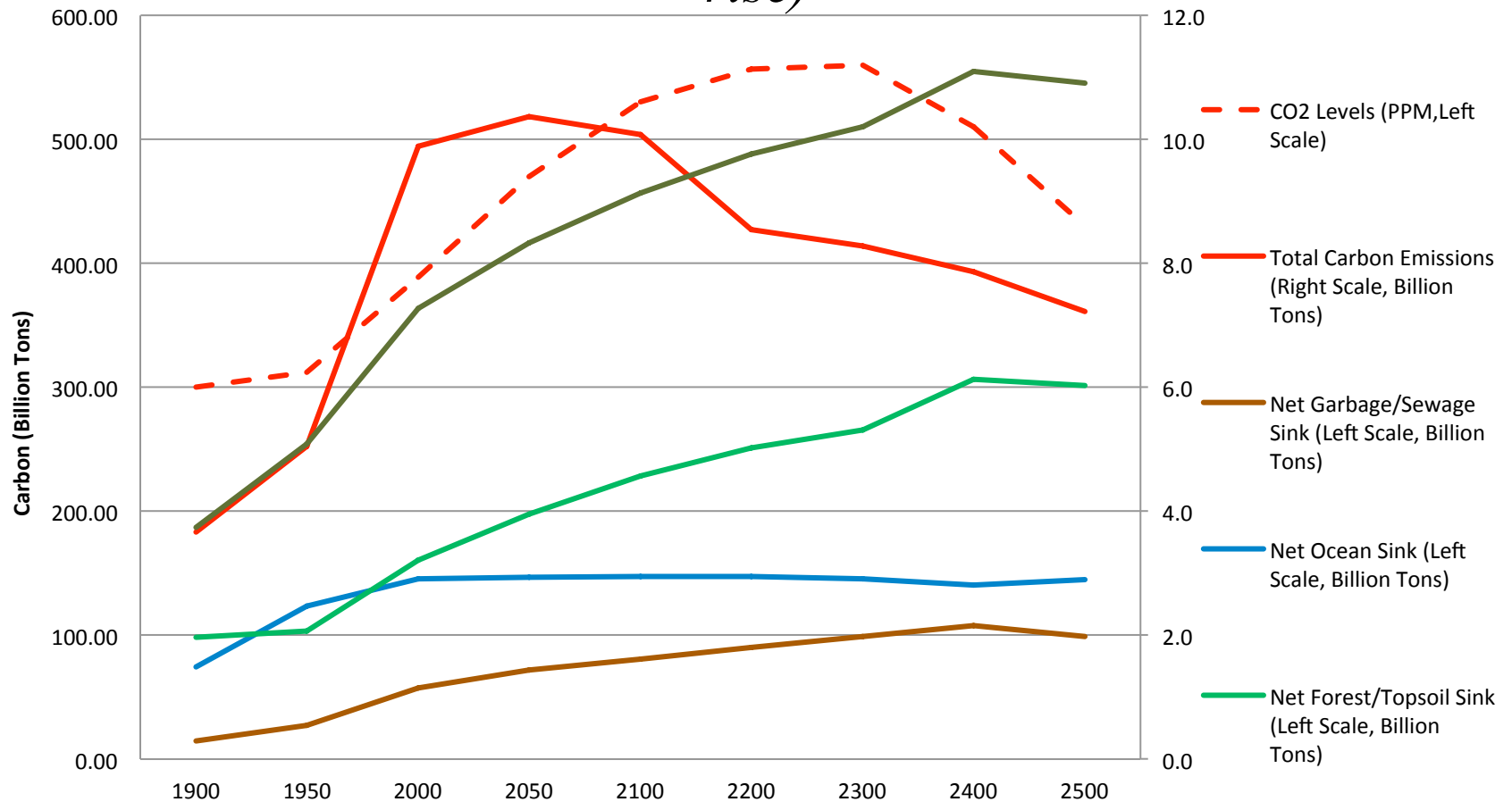
# *Reforestation absorbs carbon rapidly*



*Earth has 2.4 billion hectares of pastureland.  
Only a tenth is needed for modern cattle farming*



*With reforestation of 4 Million Hectares of grassland each year CO2 keeps rising, but only reaches 560 PPM by 2300 (1.6 degree temperature rise)*



*1 million hectares of today's melting tundra can be reforested each year. This will absorb CO<sub>2</sub>, and reduce runaway methane emissions*





*1 million hectares of plowed fields can be switched to mulch-cover “low-til” planting each year, cutting soil carbon oxidation and instead sequestering soil carbon*

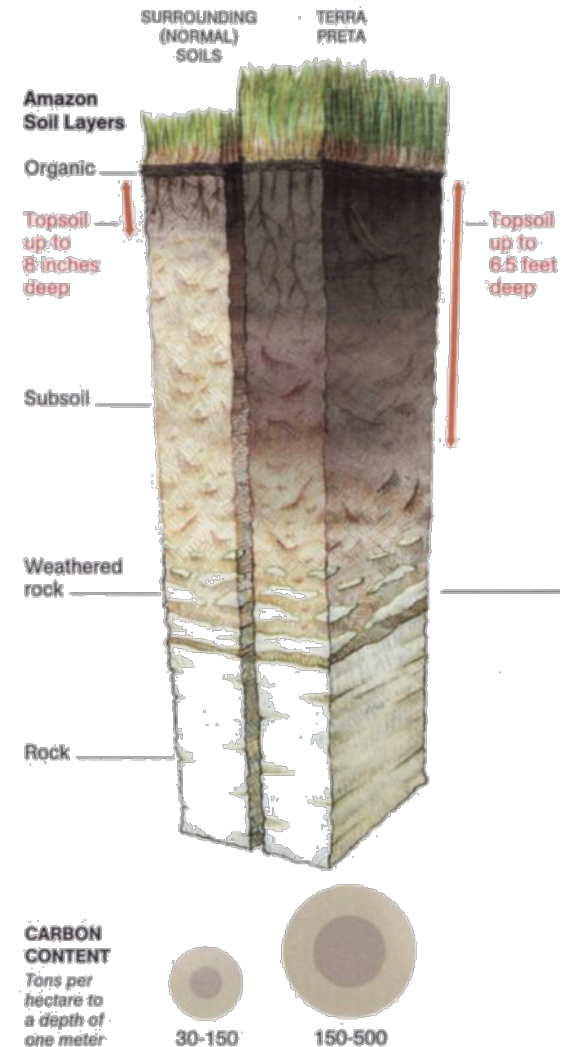




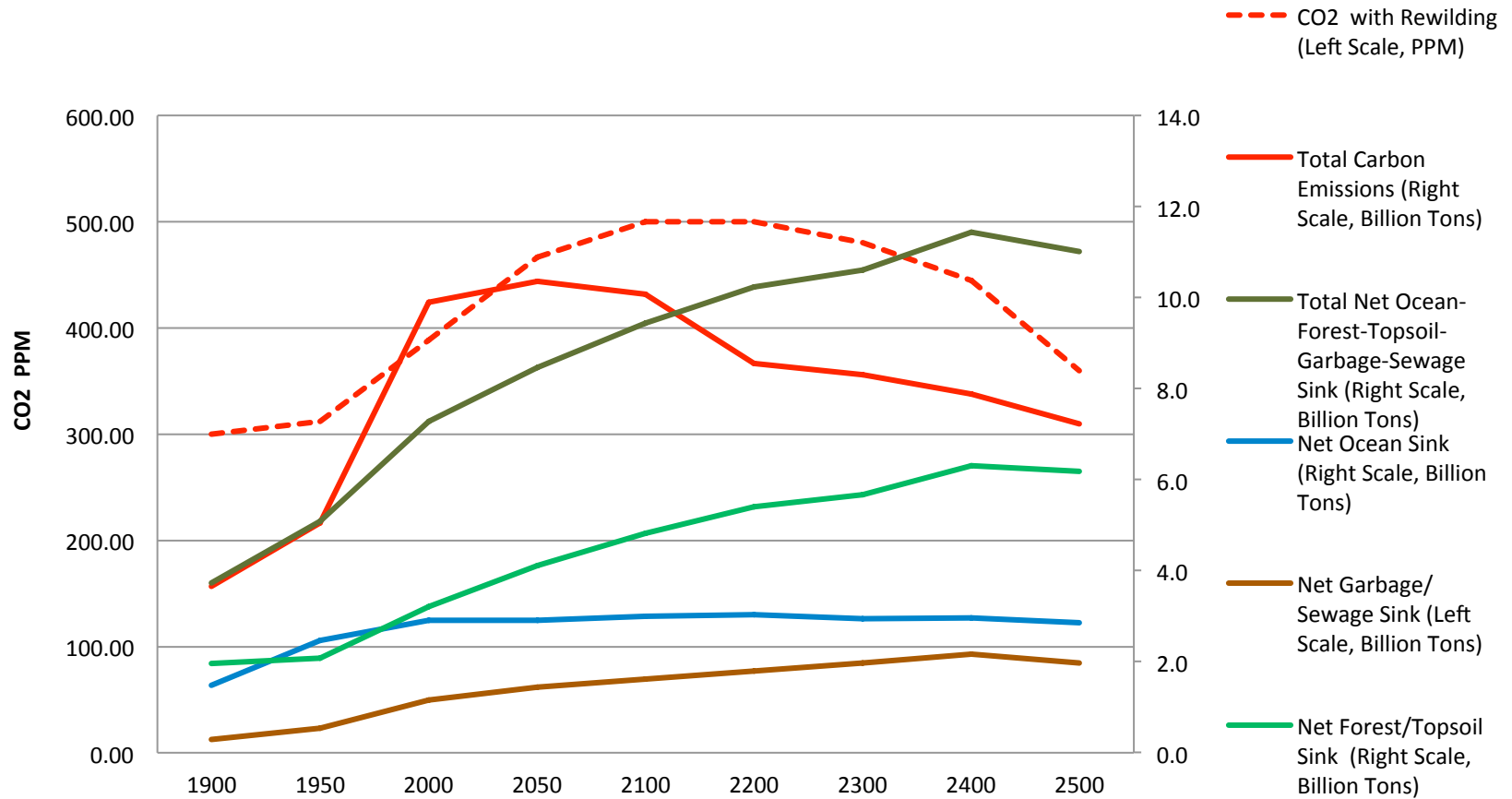
*250 thousand hectares of vegetable cropland and orchard can be mulched with biochar each year*



*Biochar can be added to garden and orchard mulch to boost topsoil carbon retention from 7% to 30%*

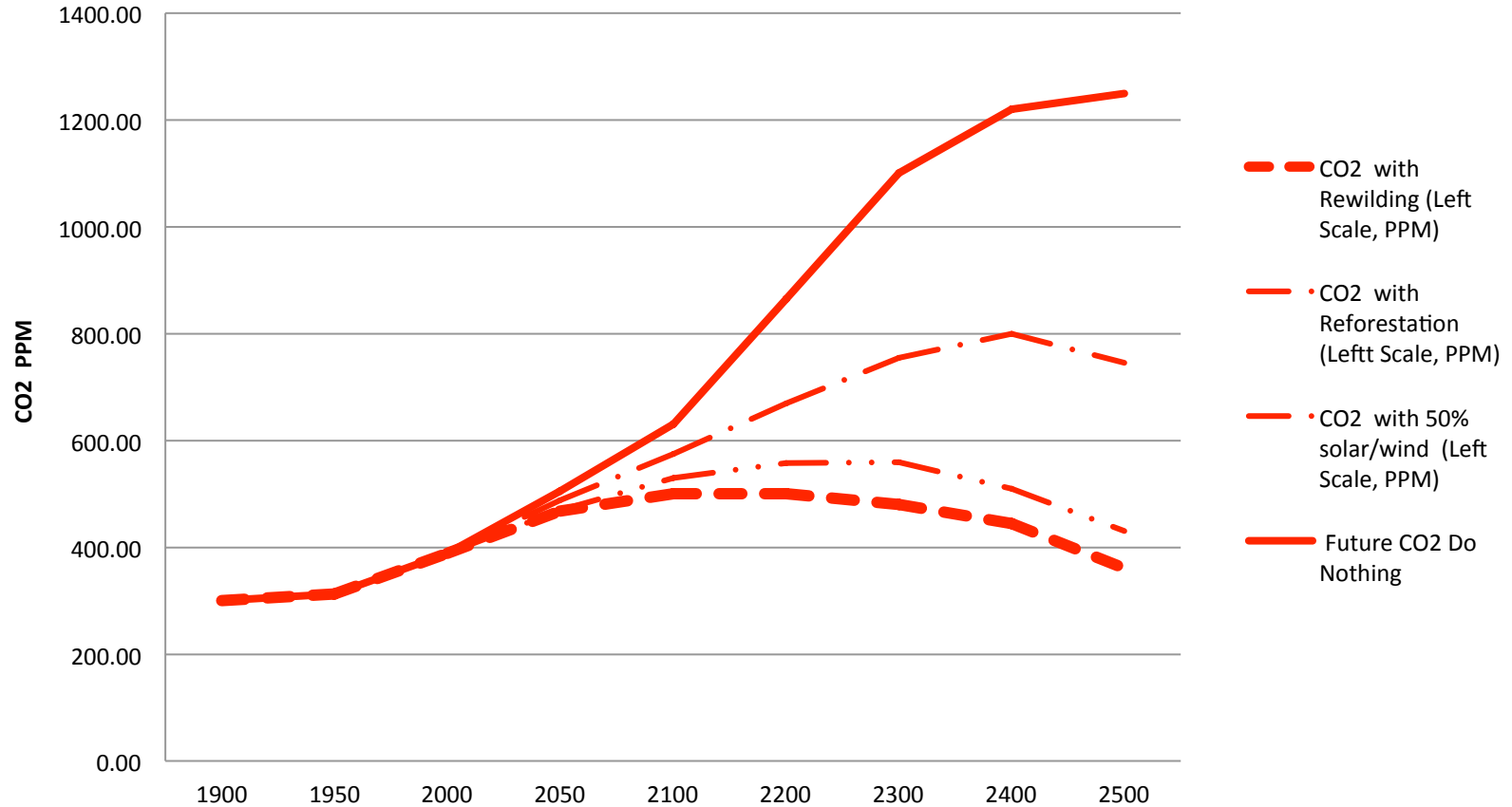


*CO2 tops out at 500 PPM in 2200 – a 1 degree temperature rise.*



# Future CO2 Comparison:

1) Do nothing 2) Develop Solar 3) Reforest Pasture 4) Reforest Tundra and switch to mulch and biochar for farming

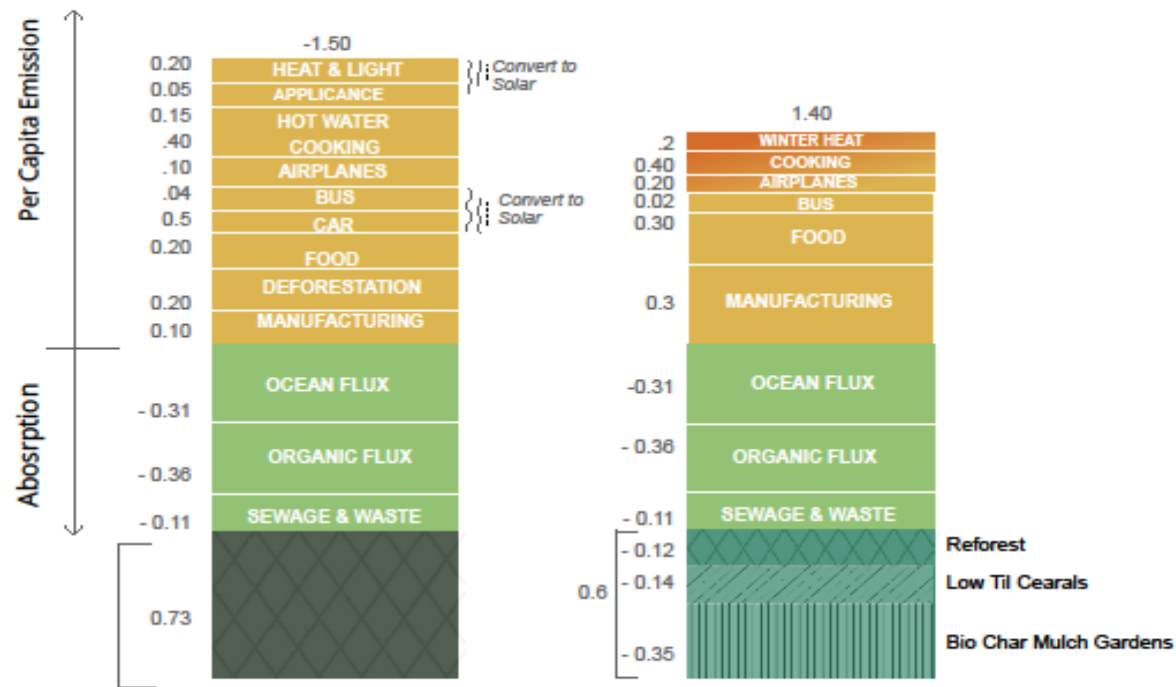




# *Converting my life to “Net Zero”*



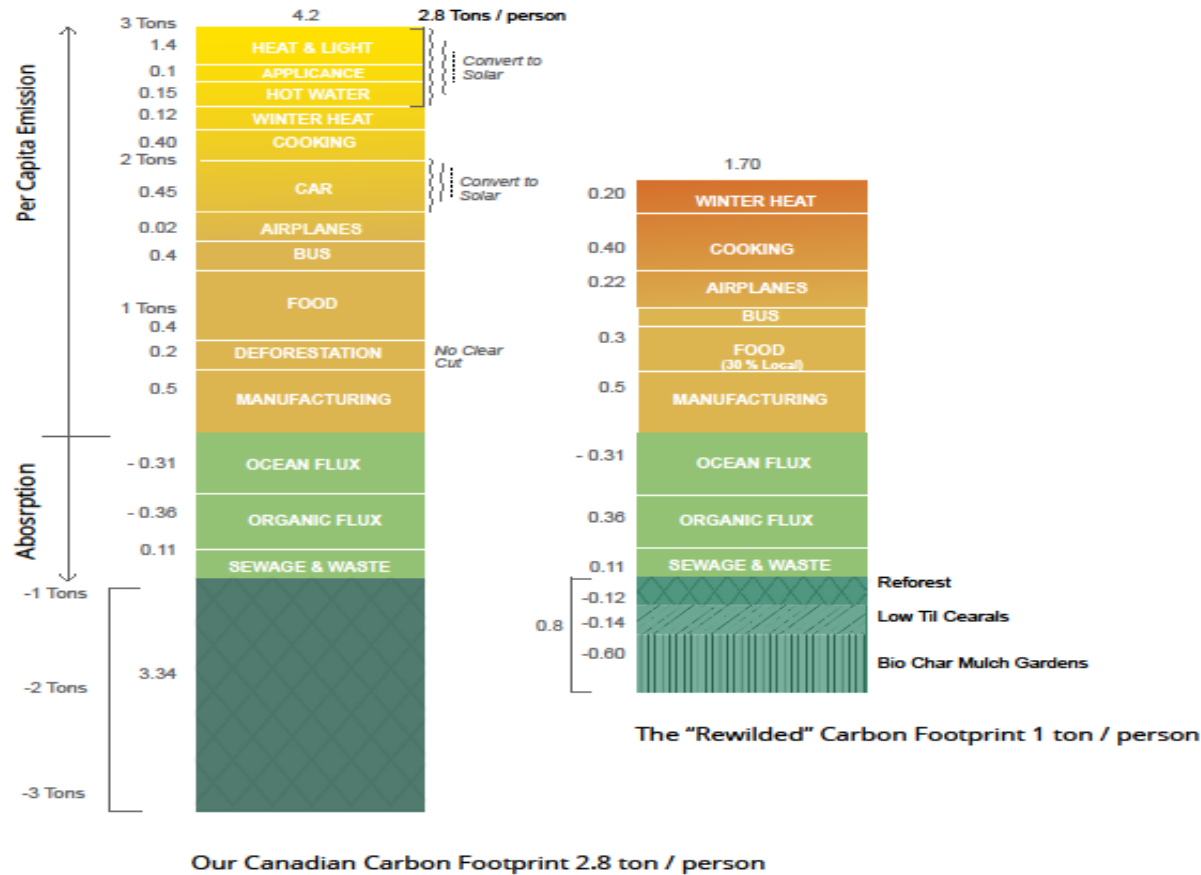
# *The Global average carbon footprint*



Average World Carbon Footprint

World "Rewilded Footprint Balanced"

# *The average Canadian carbon footprint*





## *Converting our house and orchard to net zero*

- 1 Convert from grassland to orchard*
- 2 Add a biochar kiln to preserve an extra 20% of each years 15 tons of orchard mulch*
- 3 Buy an electric car*









## *Charity Begins at Home: Converting my house and orchard to net zero*

- 4 Switch to LED lighting and a smaller fridge*
- 5 Use biogas propane for the stove*
- 6 Use a heat pump for heat and hot water*
- 7 Install 30 – 280 watt solar panels and a grid-tie inverter*

*Heat pump and LED lights save 25% of normal  
electrical load*





*Sewage digester provides stove gas*





*30 Solar panels provide house and car electricity*



