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Combatting Climate Change: Attend to *The Art of War*

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Humanity is its own enemy in the war against the warming of our planet. To our peril, we have ignored a deep insight attributed to Sun Tzu: “Strategy without tactics is the slowest route to victory. Tactics without strategy is the noise before defeat” (*The Art of War*, 5th century BC Chinese military treatise).

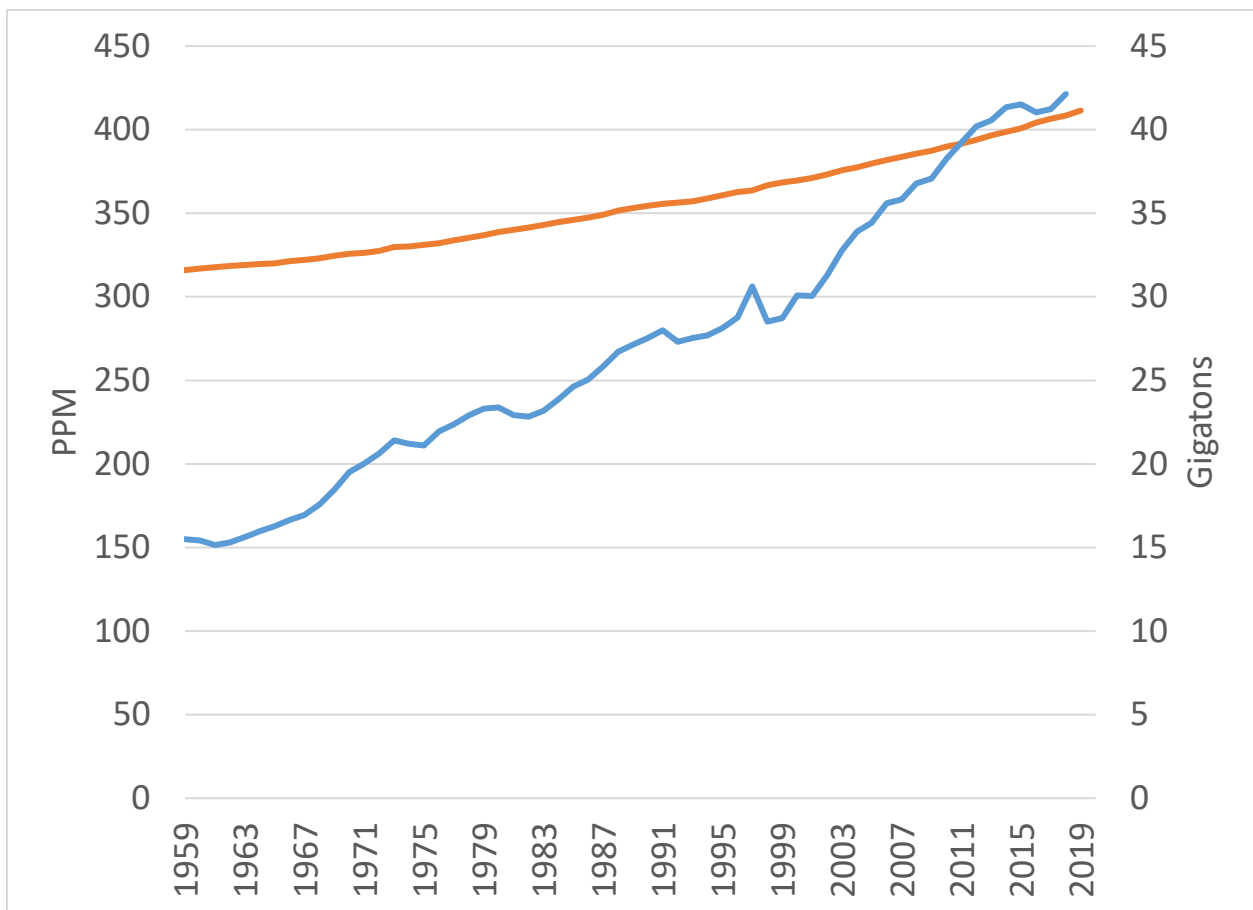
Environmental advocates, major international environmental agreements, and domestic policy programs have traditionally focused on a flawed one-prong tactic to fighting climate change. That prong is *mitigation*, the curbing of emissions. A well-crafted strategy to address the risks posed by climate change would engage three prongs: it would add *adaptation* and *amelioration* to the armamentarium. Were Sun Tzu writing on climate change today, he might invoke the metaphor of fighting a modern war relying solely on ground forces, and ignoring what air and naval forces could contribute. He would support investments in adaptation and resilience, to offset some of the damages associated with warmer temperatures. He would advocate research into solar radiation management, notably injecting aerosols into the upper atmosphere to reflect back incoming solar energy. This would lower the temperature for a given accumulation of atmospheric greenhouse gases.

He might also observe that even within the mitigation efforts, our tactics are haphazard. Some measures pay vast amounts to curb emissions, while more economical measures lay fallow. For example, consider the German power sector in 2010. Electricity generators faced an allowance price of about [14€/tCO₂ under the EU ETS](#), but the [German subsidies for wind and solar power had implicit carbon prices of 77 and 562€/tCO₂](#), respectively. Allowance prices in the Regional Greenhouse Gas Initiative in the northeast and mid-Atlantic states have been less than [\\$6/tCO₂](#), while allowance prices in the California cap-and-trade program recently have exceeded [\\$15/tCO₂](#), a fairly modest gap. But the implicit cost of reducing U.S. CO₂ emissions through fuel economy standards exceeds [\\$200/tCO₂](#). The inconsistencies across nations, even for the same instrument, are enormous: the Indian carbon tax, the coal cess, is the equivalent of about [\\$4/tCO₂](#), while the Swedish carbon tax is greater than [\\$120/tCO₂](#).

Many developing countries have made clear that they do not nor bear the responsibility for climate change nor have the resources to address it. In principle, carbon taxes could generate revenues that would allow developed countries to offer [side payments to developing countries](#), or a global cap-and-trade scheme could allocate emission allowances in a manner such that trading in the pursuit of cost-minimization would transfer resources to developing countries. In practice, countries have generally pursued carbon pricing well below levels necessary to avoid a climate emergency, and they have shied away from making significant transfers to developing countries. As [Bill Nordhaus](#) recently noted, to limit warming to no more than 2°C, global carbon prices would have to increase to more than \$100/tCO₂. The current amount, when averaged across all sources and policies, amounts to about \$3/tCO₂.

A sensible strategy would also adjust course if it were faring poorly. Thus, the nations of the world should [act, learn, and then act](#) again. Ever since the 1992 [UN Framework Convention on Climate Change \(UNFCCC\)](#), the nations taking action have sought to control climate change solely by limiting greenhouse emissions. That approach is not working. Figure 1 shows the disheartening history of carbon dioxide emissions and atmospheric concentrations since 1959.

Figure 1. Global [CO₂ Emissions](#) from Fossil Fuel Combustion and Land Use Change and [CO₂ Concentrations](#), 1959-2019



No surprise, global temperatures increased throughout this period, on the average of about [0.1°C of warming per decade](#); warming has accelerated in the 2000s. Even if emissions were miraculously cut by 50% by the end of this decade, the Earth would be on track for additional temperature increases given that oceans – which absorb tremendous amounts of solar heat – have already warmed.

Lacking a spare planet, surrender is not an option in the war against climate change. This essay argues for a strategy with a reasonable chance of success: add expensive adaptation and untested amelioration to emission mitigation. Public policy should exploit all activities that can reduce the public's risk exposure cost-effectively.

Why the near-singular focus on emission mitigation in the actions to combat climate change to date? It reflects the environmental community's concern that promoting adaptation or geoengineering, such as solar radiation management, would reduce public support for mitigation. In short, this moral hazard concern would slow emission mitigation efforts given hopes about adaptation and solar radiation management. That concern should be weighed against the demonstrated strong free- (or at least cheap-) riding incentive discouraging the mitigation of emissions. It is due to the externality that stretches across the globe and forward in generations. Persisting with the one-prong tactic implicitly accepts massive losses from climate change.

A three-prong strategy embracing adaptation and solar radiation management at least offers hope. It would pursue each prong – mitigating emissions, investing in adaptation, and implementing solar radiation management – to equate its marginal cost to the marginal benefit

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of the risk reduction. Aggressively advancing adaptation and solar radiation management, with whatever progress on emission mitigation can be achieved, will confront the severe to catastrophic impacts of climate change.

Effectively pursuing this more comprehensive approach to climate change will take time. It will take meaningful planning; research and development; and institutional design – not to mention massive resources. Building a coastal [barrier to protect New York City](#) will take years, if not decades, as the recent experience in [Venice](#) suggests. Developing the delivery vehicles for solar radiation management – and the research to assess (and hopefully tame) unintended consequences – is surely [a decade's project](#). Mitigation technologies that could change the game – large-scale battery storage, nuclear fusion, etc. – will be realized no sooner.

Having neglected Nature, catastrophic climate change will be our destiny if we simply stay the course. Now is the time to add adaptation and amelioration to our strategy for survival.