

Ocean Fertilization and Depletion of Deep-sea O₂

(A recipe for a catastrophic anoxia in deep sea water strata)

Typical deep-sea water masses have been isolated from the surface for long periods of time and have limited supplies of dissolved oxygen that are replenished at extremely slow rates.

Multiple strata separate these deep waters from the surface waters and from the atmosphere, so that O₂ equilibria in these deep water layers are (a) slow to replenish, and (b) likely to be highly-sensitive to disruption.

Given what we already know about nutrient-induced eutrophication in aquatic systems and the catastrophic effects of the anoxia that results (classic textbook subject-matter), we should be quite skeptical of schemes that imagine wide-scale fertilization the ocean's surface layers. First, of course, on a century-to-century time scale, deep-sea organisms are adapted to one of the most stable, unchanging environments on earth.

Secondly, while fertilization of the sea's surface waters (with a dusting of iron, for example, or systems of ocean pumps) may enhance phytoplankton growth, the increased biomass will not be confined to surface waters, but will result in export of tons of additional organics to the deep-water layers.

Heterotrophic microbes in the deep-sea can be expected to respond to an increased import of such organics with a burst of exuberant growth – quickly depleting already limited supplies of dissolved oxygen, and producing a cataclysmic deep-sea anoxia, expanding examples of which have already developed.

Since the ocean covers approximately 70% of earth's surface and produces the greater portion of the oxygen that we breathe, advocates of wide-scale fertilization, if successful in their campaign, may unwittingly trigger ecosystem disruptions and marine extinction events on an unimagined scale.

Even our brightest, most well-meaning, and most ingenious suggestions need to be measured against the human propensity to error, blunder, and trigger unintended consequences. Although we are an inventive species, we are also brash and display a reckless lack of humility. Current projects that envision re-engineering the operation of 70% of earth's biosphere constitute a clear example.

Footnote

Humanity's central problems today are: (a) the impending arrival of a 7th, 8th, and 9th billion by mid-century, along with (b) the extreme levels of overpopulation / environmental impacts that we already exhibit. With additional billions on track to join us by mid-century and many other millions rapidly industrializing, the combined effects of today's planet-wide demographic tidal wave constitute the single greatest risk that our species has ever undertaken.

For instance, can biosystem functioning even survive a continuation of the impacts that we are already exerting today, even without the avalanche of new arrivals who are arriving at a rate of 800,000 additional persons every four days?

As a result, discussions involving
geoengineering have the effect of

- (a) Distracting us from the true nature of our problem which is overpopulation
- (b) Encourages journalists and non-scientists to imagine that scientists can devise some sort of technological fix that will allow us to escape (and ignore) the demographic corner into which we have painted ourselves, and
- (c) Encourages policymakers and economic interests to imagine that business as usual can be pursued for at least a little while longer.