on the political agenda. Compromises are sometimes necessary because of local economic demands. Consequently, the political will of city leaders becomes pivotal in influencing climate policy. However, in the context of electoral politics, policy formulation has always been tenure oriented. Thus, continuity in long-term city planning for climate issues is difficult to achieve.

To sum up, cities encounter many of the same problems, and many of these problems originate from multilevel governance, as well as interactions and coordination among stakeholders. In early stages, cities encountered the problem of climate change issues lacking a coordination unit. In response, local governments gradually integrated units related to energy saving and carbon reduction into a task force unit in charge. The cross-border scale is high for climate issues, and many projects overlap between different sectors; thus, such institutions should employ a communication platform and decrease the problem of departmental division by increasing these units' orientation toward climate issues. In the foreseeable future, cities will play a more important role in international climate governance. In the crucial context of global post-Kyoto climate negotiation, the structural and systematic transformation that may be effected by the Taiwanese government's urban climate strategies will require further study.

Reference

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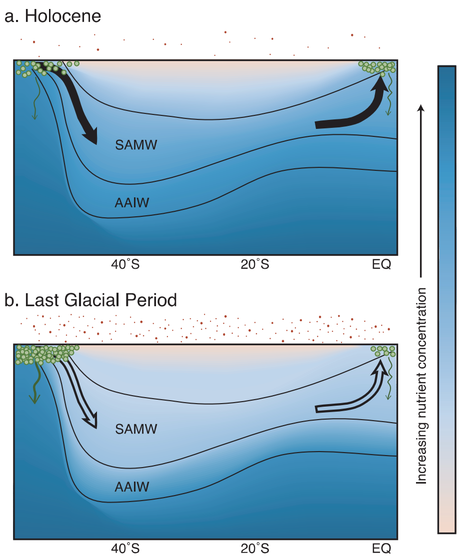
With climate change, fertilizing oceans could be a zero-sum game

Scientists plumbing the depths of the central equatorial Pacific Ocean have found ancient sediments suggesting that one proposed way to mitigate climate warming—fertilizing the oceans with iron to produce more carbon-eating algae—may not necessarily work as envisioned.

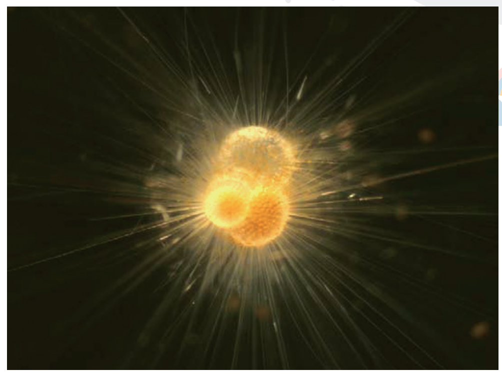
Plants need trace amounts of iron to perform photosynthesis, but certain parts of the oceans lack iron, and algae are therefore scarce in those areas. Recent shipboard experiments have shown that when researchers dump iron particles into such areas, it can boost growth. The algae draw the greenhouse gas carbon dioxide from the air to help build their bodies, so fertilization on a large scale could, theoretically, reduce atmospheric CO_2. Seafloor sediments show that during past ice ages, more iron-rich dust blew from chilly, barren landmasses into the oceans, apparently producing more algae in these areas and presumably also producing a natural cooling effect. Some scientists believe that iron fertilization, along with the corresponding drop in CO_2, is one reason why ice ages become icy and remain so.

The equatorial Pacific Ocean is one such high-nutrient, low-chlorophyll region in the global ocean. In such regions, the consumption of the available macro-nutrients such as nitrate and phosphate is thought to be limited in part by the low abundance of the critical micro-nutri-



Schematic understanding of the nutrient dynamics between the Holocene and the Last Glacial Period. Greater glacial productivity in the Subantarctic left a smaller inventory of nutrients to be subducted into the thermocline during Subantarctic Mode Water formation, thereby lowering the supply of nutrients to equatorial upwelling regions. (Figure from Costa et al., 2016)

Lamont-Doherty Earth Observatory's research vessel Marcus G. Langseth sailed to the central equatorial Pacific in May, 2012.



Planktonic foraminifer. (Figure from http://www.jamstec.go.jp/res/ress/kimopy/foraminifera/G_sacculifer/)

ent iron. Greater deposition of atmospheric dust may have fertilized the equatorial Pacific with iron during the last ice age—the Last Glacial Period (LGP)—but the effect of increased ice-age dust fluxes on primary productivity in the equatorial Pacific remains unclear.

To understand the system, Dr. Ren and her collaborators analyzed fossils found in deep sea sediment with the goal of reconstructing past changes in the nitrogen concentration of surface waters and combining the results with side-by-side measurements of dust-borne iron and productivity. They measured the ratios of nitrogen isotopes, which have the same number of protons but differing numbers of neutrons, that were preserved within the carbonate shells of a group of marine microfossils called foraminifera. These measurements in the equatorial Pacific Ocean reveal that although there was more deposition of atmospheric dust during the last ice age than there is today, the productivity of the equatorial Pacific Ocean did not increase; this may have been because the greater nutrient consumption enabled by the iron, mainly in the Southern Ocean, reduced the nutrients available in the equatorial Pacific Ocean and thus also reduced the productivity there.

This new study argues that increased algae growth in one area can inhibit growth elsewhere. This is because ocean waters are always moving, and algae also need other nutrients, such as nitrates and phosphates. Given heavy doses of iron, algae in one region may absorb all those other nutrients; by the time the water circulates elsewhere, it has little more to offer, and adding iron is ineffective.

The paper, "No iron fertilization in the equatorial Pacific Ocean during the last ice age," appears on January 28, 2016, in the leading journal Nature (http://www.nature.com/nature/journal/v529/n7587/full/nature16453.html)

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