

THIS WEEK

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Turbines and turbulence

Some legitimate questions have been raised over the green credentials of wind turbines. Politics must not block research where it is needed.

Will wind turbines wreck the environment? Last month, the *South China Morning Post* published a news story that contained a thinly veiled attack on China's wind industry. The article cited herdsmen in a village in Inner Mongolia who say rain stopped falling after the establishment of a nearby wind farm, and meteorologists who backed up the observation with a few years' data that show low precipitation. The article also quoted an engineer in the government's renewable-energy department who hastily dismissed concern over the effect of wind farms, refused to acknowledge the need for research, and asserted the overarching necessity for China to develop wind energy. The article concludes that "wind power is not completely green". There have been similar attacks on wind energy in Texas and elsewhere.

It is good to see that the newspaper, Hong Kong's most prominent English-language daily, retains a critical stance towards the Chinese government under the 'one country, two systems' policy, and is willing to put Chinese officials on the spot. But in this case, the dismissive official quoted probably has a point. There is no solid scientific evidence that wind turbines can trigger major changes in rainfall. And given *Nature's* conversations with atmospheric modellers outside China, people are not likely to find any. One expert said the idea that a wind farm could have such a dramatic and demonstrable effect was "silly".

Wind farms, however, may affect regional or global environmental systems — although to suggest this can draw rapid scorn from wind-power proponents. In 2004, the environmental engineer and atmospheric modeller Somnath Baidya Roy, then at Princeton University in New Jersey, published work showing turbulence created by turbines would, among other effects, lead to vertical mixing of energy and heat in atmospheric layers that would affect local temperatures, and possibly change evaporation patterns (S. B. Roy *et al. J. Geophys. Res.* **109**, D19101; 2004). Some took his study as an attack on the wind industry, and he was besieged with nasty e-mails. They questioned his sanity, threatened to get him fired from his post at Princeton, and accused him of being a pawn of the coal or oil industries. (He has never had nor sought any industrial ties.) The president of one US-based wind-farm firm told Roy to consider "how much heat is your head turning out, while you consider such thoughts?" and to ponder many other factors "while checking your navel for lint". (We know this because Roy considered the comments humorous enough to post on his webpage.)

At around the same time, other scientists used models to suggest that wind turbines could have effects on climate change and suggested that estimates of these effects should be balanced against their green benefits. Although these researchers are seen by some in the industry as overly critical, they concluded with no stronger recommendation than a call for more research.

In October, Roy, now at the University of Illinois at Urbana-Champaign, published data to back up his theoretical work (S. B. Roy and J. J. Traiteur *Proc. Natl Acad. Sci. USA* **107**, 17899–17904; 2010).

A 25-year data set showed a significant effect of wind farms on near-surface temperatures. Roy suggested in the paper that those constructing wind farms should consider low-turbulence turbines or use the results to help find the most suitable sites. It hardly constituted an attack on wind energy. In fact, he says, the main impact — a raising of

"Data showed a significant effect of wind farms on near-surface temperatures."

surface temperatures at night and lowering during the day — could benefit agriculture by decreasing frost damage and extending the growing season. Many farmers already do this with air circulators.

Roy's study was on wind farms with some 20 turbines. Local effects will be more marked in much larger farms. Roy hopes to start a field campaign that can monitor energy fluxes, evaporation, humidity and temperature on a variety of farms as they scale up.

China, developing huge wind farms and planning more, should take a prominent role in such studies. As its facilities expand, it can make solid scientific assessments, which could contribute to a more rational and beneficial use of wind. Although the Chinese official may have been right to dismiss the suggested effect on rainfall, his government should not ignore the need for wider research on the impact of its wind revolution. ■

Assessment time

Italy's proposed university reform must be linked to performance.

As Rome burned last week during anti-government riots, many of those present were focusing on the plight of Italy's underfunded and underperforming universities, which face major reform. There is no doubt that reform is needed. The question is whether the government will deliver it correctly.

Islands of excellence exist in Italian universities, particularly in the north of the country. And they survive despite such low levels of government investment that little cash remains for infrastructure or research once salaries have been paid. But malaise is widespread, and money is not the only question. University workforces are riddled with dead wood, a legacy of too little competition for academic posts or research grants. And universities are not penalized if they choose to hire staff on the basis of personal contacts instead of talent.

A controversial new law, expected to be approved this week, attempts to fix these issues. It is imperfect, but if implemented properly, it will give Italy's universities a brighter future. Critical to its implementation,