nature

www.nature.com/nature

Vol 450 | Issue no. 7167 | 8 November 2007

A drop in the ocean

Wave power and other renewable-energy resources deserve carefully targeted government support.

If the world is to wean itself off fossil fuels, a wide range of alternative energy sources will have to be brought into play. The geographically dispersed nature of renewable resources, including power from solar, wind, wave, tidal and geothermal sources, underscores the need for different nations to develop viable alternatives that utilize the resources they are best placed to exploit.

But some technologies are struggling to make their mark. The harnessing of wave power, for example, has so far had mixed results. This renewable resource held considerable currency in some territories during earlier energy crises, but it has yet to make any real contribution to the global energy mix (see page 156). After the energy crises of 1974 and 1979, nations in the stormy northern Atlantic Ocean, including Britain and Norway, set up relatively modest programmes to explore wave power. But faced with assessments suggesting that the costs of wave power were unlikely to fall quickly enough to render it competitive, government backing for wave energy was all but abandoned.

"Wave power has been relegated to a 'second tier' of renewable-energy resources."

Now the energy crisis is back with a bang, and numerous privately run companies around the world are testing wave-power devices, many of them developed in collaboration with university researchers. All of the designs face common obstacles. They will need to survive in a physically hostile and corrosive environment, which will sometimes subject them to forces ten or twenty times as great as those they need for normal operation. And although economies of scale will reduce the costs of wave-power plants, such reductions are likely to follow the unspectacular trajectories enjoyed by, say, builders of marine engines, rather than the spectacular leaps achieved by manufacturers of silicon chips.

These are the considerations that have, in effect, relegated wave power to a 'second tier' of renewable-energy resources that do not attract substantial public- or private-sector backing. Yet there is a strong argument, given the grim outlook for the world's energy supply, that such support should be forthcoming so that the commercial viability of the more promising wave technologies can be examined more fully.

The London-based Carbon Trust, a company set up by the UK government to promote a low-carbon economy, has identified wave energy as one of Britain's most promising renewable resources, with the potential to provide up to 20 gigawatts of power by 2050. But the trust estimates that it could cost £2.2 billion (US$4.6 billion) in development to reduce the cost of wave-generated electricity from current estimates of between 12p and 44p to a competitive 6p per kilowatt-hour.

That sum may seem daunting to the British government acting on its own; but in global terms, it isn't much. The Carbon Trust estimates, for example, that Denmark has so far spent £1.3 billion on the development of wind power. The Japanese government has invested at least £1 billion in solar power. And don't mention it to the nuclear lobby, but the amount of public money invested to make atomic power fit-for-purpose was orders of magnitude higher.

Both governments and private investors, of course, need assurance that any wave-power technologies they decide to support will have some worth. To gauge the potential of different designs, it can be valuable for backers of rival technologies to benchmark prototype equipment and compare it objectively with the competition.

A promising model in this regard is the European Marine Energy Centre in the Orkney Islands in Scotland, a testing site set up in 2003 that receives support from Edinburgh, London and Brussels. The centre helps private companies to test their wave-power designs. One firm, Edinburgh-based Pelamis, has already tested and improved its design at the centre, and four more are expected to do so in the next two years.

Such benchmarking can, of course, get wave energy only so far. At some stage, it will have to take its chances on the open market. But in the meantime, governments whose coastlines may be suitable for wave energy should support promising technologies to an extent that will at least allow for a firmer measure of their viability. ■

The great divide

The gap between theory and practice remains surprisingly wide in conservation biology.

Men and women do not decide to become conservation biologists because they yearn for riches and fame, for swimming pools or caviar. They decide to become conservation biologists because they want to stop species from becoming extinct.

So it can sometimes come as a surprise for outsiders to learn how far removed the conservation biologist often is from actual efforts to save species. Most of the time, conservation biologists describe problems, float solutions, prioritize areas and actions, and run computer models of natural ecosystems. They are cartographers of crises, producing demoralizing maps of threat and extinction. They are adept at coming up with ever-better methods of doing more with less — at least in theory (see page 152).

It generally falls to a separate and amorphous group, known as 'practitioners', to buy land, put up fences, set fires, put out fires, lobby politicians, negotiate with farmers, spray invasive weeds, poison rats and guard against poachers. These people are generally not conservation biologists: they are civil servants, environmental consultants, park managers or environmental lobbyists.

The distance between these two groups creates a sometimes-yawning 'implementation gap' between theory and practice. Conservation

biologists write and publish papers, which the practitioners seldom read. The practitioners, in turn, rarely document their actions or collate their data in forms useful to conservation biologists. Typically, practitioners make decisions based on personal experience and intuition. Their knowledge stays untapped by others — and can be impervious to fresh scientific findings.

The existence of this gap has been acknowledged, and numerous efforts are already directed at bridging it. Some publications try to bring scientific news to practitioners. William Sutherland, a conservation biologist at the University of Cambridge, UK, runs a site called ConservationEvidence.com where practitioners are encouraged to deposit reports on the outcomes of their interventions — successful or otherwise. Data from these reports can then be fed into systematic reviews of the kind being done by Andrew Pullin at Bangor University in Wales, whose Centre for Evidence-Based Conservation attempts to answer questions such as 'are Japanese knotweed control and eradication interventions effective?'.

There have been many calls for more mid-career training of practitioners. Conservation biologists could run workshops, and squeeze in some much-needed interaction with their peers on the application side of the discipline. The need for this may sound obvious — but in a field so cash-strapped that many conservation projects can't even afford to assess their own effectiveness afterwards, it sometimes seems like a luxury.

Local and national governments with a stake in conservation should be encouraged to support such training as a cost-effective means of raising the efficiency of the conservation projects on their turf — an objective that constituents at both ends of the political spectrum are liable to support.

"What is needed is a concerted effort by both academic scientists and practitioners to get out of their respective ruts."

But the gap can also be bridged if conservation biologists remember to look at all of their professional activities in light of their interest — be it practical, moral, aesthetic or even humanitarian — in saving species from extinction. In essence, the more time that they can spend working with local practitioners on real conservation issues the better.

What is needed is a concerted effort by both academic scientists and practitioners to get out of their respective ruts, open up paths of communication, share information and seek ever more efficient means to a common end. ■

Deadly consequences

Health authorities have yet to respond effectively to the combination of HIV and tuberculosis.

Tuberculosis (TB) is not only completely treatable, it is curable and controllable, and has been so for decades. So it is appalling that the disease is currently flaring up around the world in an epidemic of co-infection with HIV, which is also associated with a frightening increase in strains of TB that are resistant to existing drugs.

This week, the 38th Union World Conference on Lung Health convenes in Cape Town, South Africa. The main themes of the meeting will be the challenges of HIV–TB co-infection and multiple-drug resistance in TB.

The importance of co-infection has been emerging steadily, especially in Africa, since the early days of the AIDS pandemic. TB is now the most common opportunistic infection in HIV-positive patients starting antiretroviral therapy. Such co-infection presents particularly troubling complications for treatment: there are overlapping drug toxicities and the risk of a life-threatening inflammatory syndrome if infection status is unknown and treatment administered incorrectly.

"Researchers, doctors and health-care workers need to do far more to respond to the scale of the problem that TB and co-infection with HIV presents."

The South African city of Tugela Ferry presents a startling example of how an HIV–TB epidemic could play out. The incidence of TB there is very high, and of some 400 multidrug-resistant cases identified since 2006, more than half were classified as extensively drug resistant, meaning that they are resistant to second-line as well as first-line drug treatments. Most of the resistant infections occur in individuals co-infected with HIV. Efforts to manage both diseases in patients may itself encourage the emergence of drug-resistant strains.

Activists and health-care workers have often sought to blame the South African government for its lax response to this crisis. But it has also been aggravated by an unfortunate historical divide in the worlds of research and health care between those addressing TB and those tackling AIDS (see *Nature* **446,** 109–110; 2007). Researchers, doctors, health-care workers and the entities that support them need to do far more to respond to the scale of the problem that TB presents, and its interconnectedness with HIV. Priorities outlined in 2004 by the World Health Organization for HIV/TB research have not been implemented adequately, according to a report released by the Forum for Collaborative HIV Research last week.

Large parts of sub-Saharan Africa are becoming subsumed by co-infection. And although the rate of infection has dropped elsewhere, many European and Asian nations still face large numbers of patients with active TB infections. A report from the US Centers for Disease Control and Prevention last month showed that the phenomenon may present a threat in the United States as well (*Morbid. Mortal. Wkly Rep.* **56,** 1103–1106; 2007). One-third of TB patients there didn't know their HIV status, despite official policy that routine testing be performed on everyone with TB. And 9% of those with TB were also HIV positive, according to the report.

The global co-infection epidemic is all the more troubling because it was potentially avoidable with better use of existing drugs. The rising incidence of drug-resistant TB is now forcing agencies in Africa and around the world to react to the scale of the problem. The list of needs is a familiar one: better delivery of existing care approaches, development of more useful diagnostics, and community-based care. But a bigger mental shift is needed in recognizing the size of the problem and its interconnectedness with the AIDS pandemic. ■