

research and spread the benefits of new medicines more widely. Done poorly, they could drive a wedge between governments and the industry, one of the most important parts of Europe's research base.

Whether an individual believes that drugs are overpriced is often determined by their politics, their health and whether they have ever worked in the pharmaceutical sector. What is not in doubt is that uncontrolled drug pricing is not a sustainable policy and that governments are taking action to drive prices down. Price cuts forced on the industry by politicians can be divisive. More innovative approaches, already under discussion in a number of countries, seem a better bet. Science can and should inform this reform.

Earlier this month, Germany pushed a law through its lower house to restructure its pharmaceutical market. These rules will allow companies to set prices for a year, after which they will have to prove that new medicines deserve to be priced higher than the going market rate for similar products. This is a sensible strategy. A healthy market needs significantly better drugs, not more of the same.

Britain, too, is seeking to pay for drugs only what it thinks they are worth. At the moment, the National Institute for Health and Clinical Excellence (NICE) helps in the task by producing solid research on the cost-effectiveness of new drugs. At present, the deliberations of NICE are merely used to accept or reject a drug for widespread use as priced by its manufacturers. Recently, it rejected Roche's Avastin (bevacizumab) treatment for patients with colorectal cancer, which costs £20,800 (US\$33,000) per patient but was judged to bring only modest benefit.

Next month the UK government will consult on plans to shift from this approach to a value-based pricing model, under which drug

companies and health officials would effectively haggle over price. Such a move is fraught with difficulty and must be very carefully managed. NICE may be the enemy of patient groups desperate for expensive treatments, but it is internationally respected for its robust use of scientific evidence. Under the coming changes, some experts fear that decisions on whether to introduce high-priced drugs will be fobbed off onto regions or even individual physicians — a move that could bring widespread variation in the availability of new drugs.

**Poorly cast drug pricing mechanisms could drive a wedge between government and big pharma.**

There are also legitimate concerns about the impact of such variable pricing systems on the pharmaceutical sector. With the approximate cost of bringing a drug to market now \$1 billion, and an expensive new wave of medicines such as the protein-derived biologics on the horizon, governments must be prepared to pay a high price for innovative drugs, or risk seeing science stall.

If industry is to cooperate with the changes, which it should, politicians must proceed on the basis that a new regime must be designed to value and distribute drugs in a better way, not simply to reduce national deficits by shrinking their health-care bills.

Some dire warnings are unlikely to be realized — such as those from industry groups that a system that hits profits could see their members abandon an ungrateful Europe. But governments must remember that big pharma is a crucial component of the continent's research ecology. It should not be exploited for short-term political and economic gain. ■

## Citizen scientists

*Scientists should speak out on the environmental effects of ventures such as tar-sands mining.*

Canada's international reputation as a green and gentle nation has long been a matter of national pride. But is that reputation deserved? Canada's actions on environmental issues — from ignoring Kyoto Protocol targets to obstructing progress at United Nations climate-change talks — are increasingly raising eyebrows, both at home and abroad. Perhaps nothing is more emblematic of this reality gap than Canada's determination to mine its tar sands at a frantic rate. The sands are a dirty source of oil. They require more energy for oil extraction than do conventional reserves, producing extra greenhouse-gas emissions. The industry has torn up vast swathes of landscape, created toxic ponds of waste and released pollutants into waterways. Where such issues justify pressure for action, it is crucial that scientists such as David Schindler (see page 499) highlight them.

It would be unrealistic to expect that we could harvest fossil fuels or minerals without an effect on the environment. No form of mining is clean. But the fast development of the tar sands, combined with weak regulation and a lack of effective watchdogs, have made them an environmentalist's nightmare. Both independent scientists and mining companies are already taking steps to mitigate the sands' environmental impact. The industry reduced extraction emissions per barrel by an average of about 30% in the 1990s. And, at the University of Alberta in Edmonton, work is under way to find a way to extract oil from tar sands without using vast quantities of water, effectively replacing the current method with a chemical 'dry cleaning' process. Such a technique, if feasible, would reduce pressure on the local rivers as a water supply and would dampen the continual expansion of toxic tailings ponds.

Companies are unlikely to invest in expensive remedial solutions

unless they are forced to do so by environmental regulations, some of which are already in place. The provincial Albertan government is seemingly more progressive than the federal Canadian government in its climate-change plan. Large companies have had to meet a one-time 12% reduction in their emissions per barrel from 2007 onwards, with those that have been unable to comply paying Can\$15 (US\$14.7) per tonne on their extra emissions, making the province one of only a few places in the world with a mandated price on carbon. There are rules insisting that companies have plans to reclaim lands used and to deal with tailings ponds. And there are fines for non-compliance. The oil company Syncrude was last month fined Can\$3.2 million for the deaths of 1,600 birds that landed in its tailings ponds — the biggest environmental fine in Alberta's history. From this, Can\$1.3 million will go to the University of Alberta for research into better bird deterrents, which the company will be obliged to enact.

But many of these rules are weaker than they seem. A boom in production will still see overall emissions go through the roof. Only a single 1 km<sup>2</sup> plot has been certified as reclaimed so far in more than 600 km<sup>2</sup> of mining area. A long-promised Alberta land-use framework, which would set limits on development, has yet to be completed. And of five mining operations that have had their plans for dealing with tailings ponds evaluated, just two met directives. The other three were granted grace periods extending to 2018 to sort out their mess.

Canada's tar sands, like the Deepwater Horizon oil spill, are a warning sign of things to come. Future sources of fossil fuels will only get dirtier and riskier. Many have predicted that the next big boom will be in shale gas, which suffers from methane gas leaks that could make it as 'dirty' a resource as coal. It is more important than ever for scientists to monitor environmental impacts and to speak up to raise legitimate concerns. The University of Maryland's Margaret Palmer helped to bring international attention to the environmental problems associated with mountain-top

mining, for example, leading to more stringent enforcement of regulations in the United States. Scientists can make a difference, not, as some critics allege, by playing politics, but by applying their expertise as concerned citizens. ■

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