

emissions under the United Nations Framework Convention on Climate Change. The chances of meeting the UN's Millennium Development Goals to halve poverty by 2015 look equally unpromising.

It does not help that the UN has been lacklustre in its preparations for the Rio summit. A panel of senior politicians and business heads has been put to work to draw up a plan (again) for global sustainable growth that will set the agenda for much of the discussion. But the panel was announced only last August, and it is not clear that such an important task can be completed in so little time.

Still, many scientists and environmental economists remain hopeful. Last month, *Nature* joined a group of 17 Nobel laureates in Stockholm as they drew up their own vision of the key challenges to sustainable development. Given the size of the task, the mood was surprisingly upbeat. Central to the proposals that the group came up with was the need (again) to change the mindset of world leaders. Rather than keeping to the traditional view that economic development and environmental conservation sit in opposition, the laureates stressed that continued damage to factors such as biodiversity, soil quality and indigenous people's land rights will increasingly affect economic growth.

There are encouraging signs that, in some places, the necessary change in attitudes is under way. For example, late last month at the Global Energy Partnership in Rome, 23 governments agreed on holistic indicators to assess the sustainable production and use of bioenergy. These include the price and supply of food and the net creation of jobs, as well as water quality and greenhouse-gas emissions. The current biofuel fiasco, in which policies on the use of such fuels have been introduced ahead of the proper checks and balances, could have been avoided had these wider factors been given proper consideration.

## Misspent energy

*The crisis at Fukushima Daiichi should spark a rethink of nuclear-research programmes.*

Three months after a triple meltdown at the Fukushima Daiichi nuclear power station in Japan, the world is taking a hard look at nuclear power. Last week, Germany said that it would close all of its 17 nuclear plants. Switzerland has also announced its withdrawal from the nuclear arena. Other nations remain committed for now but, in the West, hopes for a nuclear renaissance seem moribund.

Nevertheless, global energy needs continue to rise. By 2020, the world's electricity demand will have increased by 35–40%, according to the International Energy Agency (IEA) in Paris. Without nuclear power, many nations will struggle to meet that demand, especially if they cut back on fossil fuels to reduce the effects of climate change.

Germany hopes to make up its shortfall through an increase in renewable energy sources and a 10% reduction in energy consumption. New technologies could help to meet these targets. Yet in 2009, the latest date for which IEA figures are available, Germany spent US\$246 million on nuclear research — roughly what it did on research into renewables and energy efficiency combined. In Japan, which continues to be plagued by energy shortages from Fukushima's shutdown, the US\$2.7-billion nuclear-research budget was six times the energy-efficiency budget.

Many of these research programmes began in the 1950s and 60s, when fission reactors seemed to be the first step on the road to a nuclear future. Technical challenges, the enormous expense of fission power and the risks associated with meltdowns have made that road seem much longer today than it did 50 years ago.

Some nuclear investments seem more questionable following the Fukushima crisis and potential gaps in energy provision. Should Japan

Similarly, the Organisation for Economic Co-operation and Development in Paris has launched the Your Better Life Index, a tool to evaluate livelihoods using indicators that go beyond gross domestic product. They include housing, environment, safety and work-life balance. As the Nobel laureates noted, such welfare indicators are needed to account properly for natural capital and the social aspects of progress in economic decisions.

**“Continued damage to factors such as biodiversity will increasingly affect economic growth.”**

Governance remains a major issue with the implementation of environmental goals. Part of the reason that the 1992 Earth Summit failed to have the hoped-for impact was that no international body was given responsibility to monitor and enforce its decisions. This remains the case, but suggestions on how to change the situation are maturing. Brice Lalonde, coordinator of the Rio summit, told a meeting in Brussels on 25 May that he wants to see the World Trade Organization's environmental remit strengthened, so that it can police any new global agreement. Others would prefer to see a beefed-up UN Environment Programme collaborate more with other relevant UN and international bodies. There could even be a role for the UN Security Council.

Political realities, or what are still viewed as political realities, remain a huge obstacle to sustainable development. But for those willing to listen, the global community now has at least a wider and more thorough understanding of the scale of the environmental problems it faces. This may yet spur political will to ensure that the Rio summit, and wider discussion on the vital decisions that it represents, are not a waste of time (again). ■

spend hundreds of millions of dollars on advanced breeder reactors when its plans for conventional ones are on hold? Should Germany continue its sizeable national programme in nuclear fusion, a distant and difficult technology, when its fission reactors are being shut down?

Meanwhile, the threat from climate change grows ever larger, and there is a pressing need for research to help reduce it. More efficient building design could drastically reduce energy consumption, and materials research is needed to drive down the cost of solar panels. New technologies must be developed and integrated into a more robust electricity grid if renewable power is to be efficiently distributed.

However, in many nations, the research is under-supported. A 2010 IEA analysis found shortfalls in all energy research except fission. Even a small shift from nuclear to other areas could make a big difference.

None of this means that nations should abandon fission. Existing nuclear plants continue to provide cheap, carbon-free energy, and some nations, notably China, have decided that, despite safety concerns, nuclear fission is key to expanding their economies while reducing carbon emissions.

Nor does it mean that all nuclear research should be abandoned. Indeed, some of it seems prescient, given the recent disaster: research into nuclear waste disposal will undoubtedly inform the ongoing clean-up at Fukushima (see page 135). And research into conventional light-water reactors could lead to safety improvements. Other endeavours, such as reactors that can produce medical isotopes, stand on their own merits.

But conventional fission is a mature technology. Today's reactor designs are safer and more efficient than those from the Fukushima Daiichi era. They are the ones that countries will build. More advanced reactor designs may be necessary one day, but for now they seem a very expensive dream. Cheaper areas of research could have a bigger impact in the short term. In a world with finite resources, and serious energy and environmental crises on the way, it is time to rethink research priorities. ■

➔ **NATURE.COM**  
To comment online,  
click on Editorials at:  
[go.nature.com/xhunqv](http://go.nature.com/xhunqv)