

less money, and even the available funds have not flowed smoothly to countries in need. The process of distributing funds should be streamlined. But there must be safeguards to ensure that adaptation money is used effectively.

With such major issues still unresolved, pessimistic observers see no chance of success in Copenhagen. But there is still time left for leaders to reach significant agreements if they make it a personal priority and recognize the urgency of the problem. Some leaders, such as British Prime Minister Gordon Brown, have indicated that they would be willing to attend the conference to seal a deal, but more should step forward and they should commit to going. This would lend stature to the negotiations and would raise the chances of achieving a substantial agreement.

## Russia's grand plan

The creation of a second pillar of excellence will give the country a chance to regain its scientific stature.

When former Russian President Vladimir Putin identified nanotechnology as the spearhead for Russia's economic and technological renewal, critics scoffed, saying that the move was ill-prepared and bound to fail. The multi-billion-dollar initiative would drown in corruption and nepotism, they said. Jokes made the rounds about 'banano' business.

The nanotechnology initiative includes nanoscale techniques with applications in a broad variety of fields, from materials research to mechanical engineering, and from electronics to medicine and biotechnology. Two years on, criticisms of the grandiose project persist. But there is no doubting the political commitment to gingering up Russia's capacities in science, in an attempt to lessen the former superpower's precarious dependence on natural resources.

The creation of the Russian Corporation of Nanotechnologies (Rusnano), a state-owned venture-capital organization that is to shoulder the task of turning Russia into a powerhouse for nanotechnology, is arguably the best thing that has happened to Russian science since the collapse of the Soviet Union. Its procedures for selecting ideas and projects worth investing in are, in terms of thoroughness and transparency, streets ahead of anything else in Russia's dated science-funding system. And in Anatoly Chubais, the 'super-manager' who was responsible for the privatization of Russia's oil and gas industry during the Boris Yeltsin era, Rusnano has a formidable figurehead with the backbone required to negotiate between Russian politics and big business.

No one could complain of a lack of funds: by 2015, Russia will have allocated 318 billion roubles (US\$11 billion) to the initiative (see page 1036). Yet Russia's aspirations could prove over-ambitious because of other critical weaknesses.

In particular, the nation's business and legal environment needs to be more receptive to foreign capital, personnel and know-how. Just as important will be the creation of a research community that can generate ideas and skills: Russia's move into nanotechnology creates a demand for at least 100,000 scientists, requiring in turn a boost in the delivery of Russian undergraduates in relevant disciplines.

It will not be possible to resolve many of the important issues in the remaining time this year. But leaders could make strong progress by building on the momentum at the national level. Many of the commitments made by nations this year are conditional — they depend on other parties taking specific actions as well. These could provide a model for approaching strong targets through a stepwise process.

In the end, successful international negotiations share some important characteristics with scientific research. Both are iterative processes, in which results from one step help to determine the path forward. They require time and perseverance. And they rarely travel in a straight line. Countries should endeavour to build on the positive actions of the past year, both before and after the Copenhagen summit. ■

The Kurchatov Institute in Moscow, founded during the Second World War to develop nuclear weapons, has been chosen to lead this effort. Diversifying in recent years, it has basic-research competence in most 'nano'-related disciplines. Its director, Mikhail Kovalchuk, has been instrumental in getting the nanotechnology initiative off the ground. But although recently refitted with 6 billion roubles' worth of state-of-the-art equipment for nano-engineering, the Kurchatov Institute cannot master the task alone.

To put basic research in nanotechnologies on a more solid footing, the Russian government is now set to create a national research centre for nuclear physics and nanotechnology. Coordinated by the Kurchatov Institute, the centre will comprise a number of other existing research institutes, such as the Russian Academy of Sciences' Petersburg Institute of Nuclear Physics near St Petersburg.

In addition, the government plans to set up a small number of national research universities. The move, announced earlier this month, is an attempt to overcome the counter-productive separation — a relic of the Soviet science system — of teaching at universities and basic research done mostly at academy institutes.

This move deserves every support.

It has the potential to breathe new life into a research system that has in the past 20 years been plagued by brain drains and frustration, and delivered few internationally recognized achievements. Such a second pillar of basic science, financially and structurally independent from the Russian Academy of Sciences, would be a strong signal of hope, not least to Russia's large scientific diaspora.

But in establishing the centre, the modus operandi of which is still under discussion, the science ministry must avoid the autocracy and subordinating merit to celebrity that hamper many Russian institutions. An international advisory committee should oversee all aspects of the centre's science, recruitment and procurement. Leading positions must be filled with top scientists and administrators, and recruitment decisions should be transparent. Collaboration with leading research institutes abroad, and with Russian university research departments, should be a high priority from the start. Only through such integrity and openness will Russia's drive to science-based prosperity have a hope of succeeding. ■

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