

Indonesia's science super-agency must earn people's trust

The drastic shake-up of the country's science system is intended to boost innovation, but there are concerns about political interference in the new centralized agency.

For decades, Indonesia's leaders have watched as the nation's southeast Asian neighbours have become powerhouses for technology and innovation. Indonesia lacks the tech multinationals on the scale of Singapore, Thailand or Malaysia. Its businesses contribute just 8% of expenditure on research and development (R&D), and technology exports comprise less than 10% of all exports. By contrast, Malaysia and Singapore's businesses account for around half of all R&D spending, and technology makes up half of exports.

Successive Indonesian governments have debated how the country can emulate its peers, and in 2017 the research ministry, Kemenristek, proposed that researchers and businesses should work more closely. But for reasons that are still not entirely clear, the government of President Joko Widodo decided it was time to shake up the entire science system. The cabinet-level research ministry has been merged with the education ministry, and a new 'science super-agency', BRIN, was inaugurated on 28 April.

BRIN is led by Laksana Tri Handoko, previously the head of the Indonesian Institute of Sciences, which was one of the country's oldest national research organizations, employing some 2,000 researchers in mostly applied fields. Funding data have not yet been released, but BRIN's budget is likely to be many multiples of the universities budget.

The move has proved unpopular with Indonesia's science community. Opposition to BRIN has united organizations spanning the generations, including both the Indonesian Academy of Sciences and the Indonesian Young Academy of Science.

Last week, BRIN absorbed the institute of sciences, along with other previously stand-alone research organizations, including the National Nuclear Energy Agency and the space and aeronautics agency. BRIN will eventually assume responsibility for R&D conducted in many – if not all – government departments. The agency will be overseen by a steering committee headed by Megawati Soekarnoputri, a former president of Indonesia and the chair of the governing Indonesian Democratic Party of Struggle.

Handoko told *Nature* that the changes are needed to bring coherence to a fragmented research system. He says grants will be awarded on the basis of independent peer review. Moreover, combining many different research and

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funding sources into one giant fund (including monies derived from a levy on businesses) will allow Indonesia to invest the sizeable sums needed to build research and technology infrastructure.

But researchers fear such a structure is a recipe for political interference in science funding. Furthermore, it isn't yet clear how BRIN will boost innovation. Satryo Brodjonegoro, head of the Indonesian Academy of Sciences, told *Nature* that BRIN's creation is a setback for Indonesian science.

Researchers are right to be concerned. Although Indonesia's government spends little of its national income on R&D (in 2018, spending accounted for just 0.23% of gross domestic product), in the past decade scientists in the country have recorded southeast Asia's highest rate of growth in scientific publications. This is partly because, since 2017, the nation's researchers have been evaluated according to their output in international journals.

Publications grew from 6,080 in 2013 to 37,513 in 2019, according to data compiled by the United Nations science agency UNESCO (go.nature.com/3n4ky30). Of these, 24% are in physics and astronomy, and 27% are in strategic areas such as artificial intelligence, energy, materials science and nanotechnology. Indonesia has also recorded significant gains in publishing related to the UN Sustainable Development Goals, and the proportion of researchers in the population has been rising.

In the past, President Widodo has complained that researchers are not doing enough to boost innovation, but scientists fear that the country's top leadership does not understand or respect their achievements.

It is rare to see a country bring previously autonomous R&D agencies under the control of a single body. The United Kingdom's 2018 merger of nine funding agencies into UK Research and Innovation (UKRI) is an exception. Most countries in which R&D is organized more centrally – such as China – created this type of arrangement at the start. Meanwhile, some countries with relatively centralized systems, such as India and France, are on a path to decentralization by strengthening research and innovation in universities.

Other nations with a strong research tradition, such as Germany and the United States, spread responsibility for science funding, governance and accountability across multiple organizations. Accountability is particularly important, because it helps to ensure that the autonomy of staff and grant recipients is protected. And that is where Indonesia's plans carry perhaps the greatest risk. This urgently needs to be mitigated.

BRIN's leadership should consult Indonesia's science and innovation policy-research community, in which these questions have long been studied. At the very least, BRIN should consider giving Indonesia's parliament some kind of oversight role. Parliamentarians could, for example, approve its budget and check that promises of non-interference are being kept. The United Kingdom chose not to have UKRI report to Parliament; compared with the previous arrangements, this move potentially increases government influence over science funding.

A science agency chaired by one of Indonesia's most powerful political figures, reporting directly to the president,

does have its advantages – science will clearly be represented at the highest level of government. But there might come a time – as a result of a change in government, for example – when BRIN's leadership and Indonesia's president come from different political parties. The agency will need to function just as well in such a scenario. This is why safeguards against interference and potential conflicts of interest need to be put in place, and why parliament needs to have a stronger role.

The creation of BRIN is, without doubt, an ambitious reorganization, but it's not clear how the agency will help Indonesia with its technology ambitions. More clarity and better communication are needed, and governance architecture must be designed in such a way that it outlasts its founders. Only then will Indonesian science and innovation truly thrive.

License CRISPR for free to share gene editing globally

Universities hold the majority of CRISPR patents. They can ensure that the technology is widely available for education and research.

This week, Wageningen University and Research in the Netherlands announced that it will allow non-profit organizations to use its CRISPR-Cas9 gene-editing technology for free, for non-commercial applications in food and agriculture. It's an important development, and another step towards making a technology with untapped potential more accessible – especially for researchers in low- and middle-income countries (see page 178).

Wageningen is one of a clutch of research institutions globally that hold patents on CRISPR, a technique that enables precise changes to be made to genomes, at specific locations. Other institutions – including the Broad Institute in Cambridge, Massachusetts, and the University of California, Berkeley, which have some of the largest portfolios of patents on the subject – also provide CRISPR tools and some intellectual property (IP) for free for non-profit use. But universities could do better to facilitate access to CRISPR technologies for research.

The field is snowballing. The US Patent and Trademark Office alone has around 6,000 CRISPR patents or patent applications, with 200 being added every month, mostly from China and the United States.

But unusually, universities and publicly funded research organizations dominate the CRISPR patenting landscape. As of 2017, only one-third of CRISPR patents came from the private sector, according to an analysis by Agnès Ricroch,

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a plant geneticist at the institute AgroParisTech, and her colleagues (J. Martin-Laffon *et al. Nature Biotechnol.* **37**, 613–620; 2019). That means universities are in a strong position to influence change. And change begins with the licensing agreement – which is needed even when an organization is using IP for research.

Licensing agreements should be transparent, so that institutions offering access can be held accountable for the promises they make. But few publish these agreements, out of concern that it would give their competitors an advantage. However, if universities all agreed not to charge for IP used in research, they would no longer be in competition, and could collaborate to create model agreements.

Licensing agreements should also limit 'reach-through clauses'. These allow patent holders to claim rights on commercialization of discoveries and inventions based on their IP, many years into the future. It's a method of prolonging income, but has been likened to authors paying royalties to Google or Microsoft if they write a book on the companies' word-processing software.

For centuries, patents have helped to protect inventors' IP from competitors who would otherwise be able to copy and profit from someone else's idea. Patents also incentivize the investment needed to develop or commercialize an idea, because they reassure investors that a technology cannot easily be copied.

But companies have been known to use patents to hinder competition. Moreover, when inappropriately applied, patents can be harmful. During a pandemic, for example, patents on vaccines could slow or reduce vaccine availability. That is why more than 100 countries, and many organizations (including *Nature*) are calling on members of the World Trade Organization to temporarily waive IP protection on COVID-19 vaccines.

Equitable access is crucial. Nearly two decades ago, international donors created the African Agricultural Technology Foundation in Nairobi as a platform to share know-how, tools and technology. Ecologist Gordon Conway, then president of the Rockefeller Foundation in New York City, promised it would “unjam the logjam” of IP in agricultural technology. In practice, concerns over genetic modification put the brakes on such technologies in low- and middle-income countries. But CRISPR is changing that, and universities that benefit from patents could help to establish an organization to facilitate access.

Two years ago, the Netherlands Federation of University Medical Centres proposed ten principles for “socially responsible licensing”. High on the list is that academic institutions should ensure that their research benefits societies, including allowing findings to be used freely for research or education.

It is fitting that a Dutch university is among those applying these principles for a technology that has world-changing potential. The time has come for all universities that hold CRISPR patents, along with public funders and international institutions such as the World Intellectual Property Organization, to consider how they might join forces so that IP on CRISPR can be more easily accessed free of charge for research, under clear and transparent rules.