Advancing the Research Impact Agenda: Transforming the science system
Discussion

This brief discussion note provides three viewpoints that will open up the roundtable conversation on Transforming the science system.

Transforming research – Derk Loorbach

The complex challenges in the world today require types of knowledge and innovation that fundamentally challenge our science systems. Put another way: the way that we 'do' science has shaped society. By developing increasingly detailed insight and accumulating knowledge within disciplines, by developing high quality standards for knowledge production within faculty based and peer-review systems and by optimising academic education to be as cost-efficient as possible, we have lost the joy of discovery and exploration. We have created academic 'regimes' that have helped stimulate growth, technological progress and improvements in every aspect of our lives, but that are also driving systemic injustices, biodiversity collapse and disastrous climate change.

Sustainability transitions research is one of the emerging new fields of research that argues that to address such persistent unsustainability we need a completely new approach to knowledge. Taking societal challenges as starting points, it is inevitable that we take a much more holistic and critical reflexive view upon existing societal cultures, institutions and practices. That we endeavour in processes of co-creation, of experimentation, of learning-by-doing and of envisioning new futures. That we do research in such a way that it becomes part of the societal process of transformation, rather than to stay on the outside. This in itself implies a transformation in the academic regime itself: towards new institutional contexts and incentives, a collaborative culture and transdisciplinarity.

Addressing scientific inequality – Himla Soodyall

The science system is a politically entrenched space where complex power relations interplay.

Inequality in science has multiple facets. In the South African context, it has a very specific meaning (gender, race, etc.). This has been discussed in many contexts and sometimes it seems to trump the advancement of science, technology, and innovation initiatives!

However, it is timeous for us to also focus on the dimension of geography, (specifically North-South) and how inequality in science plays out. While academic scholarship highlights social and economic inequalities, not enough research attention has been paid to inequalities in the world of science. Inequalities in science, can also be seen in these two major domains: *research capacity* and *scientific output*. These inequalities are influenced by many things but most importantly, they influenced by context.

Research capacity: Using the COVID-19 vaccine roll out as a case study – there is a need for investment from the developed countries into research infrastructure into the developing

countries. The fact that Africa has a relatively weak scientific and technology capacity has been underscored decades ago, as illustrated in the UN's Sustainable Development Goals.

Scientific output: The dominant institutions determine what knowledge is, what is legitimate, and what is real, and present this as universal. The International Scientific Index (ISI), that provides indexing of major international journals and proceedings, its indexes and the Impact Factor imposes an idea of mainstream science linked to these articles published in journals included in ISI. Everything else is peripheral science. The differences in the 'local' and the 'international' become sharper in this global academic system.

How climate change changes research – Lauren Rickards

Climate change is now recognised as an enormous challenge requiring action from all sectors, including the research sector. Researchers around the world are increasingly directing their work towards helping society reduce atmospheric greenhouse gas concentrations and manage the emerging and potential impacts of climate change. Encouraging this shift are changes in research and innovation policies and systems, including a stronger focus on the impact of research and efforts to democratise and pluralise research, at least in some applied fields.

While these changes at the level of individual researchers and research systems are welcome, they leave unchecked two significant problems that climate change throws at us. Both of these call for a far more sophisticated understanding of the relationship between research and the rest of the world. The first is the starkly consequentialist evaluation of research that climate change demands. To what extent and in what ways does research worsen or alleviate the over-abundance of greenhouse gases in the atmosphere that is driving climate change? Efforts to reduce the carbon intensity of research institutions such as universities are underway in some quarters. But a far more systematic approach is needed, one that considers the greenhouse implications of research agendas, methods, processes and impact. As a proud input to other sectors, research may soon be evaluated as a source of 'scope 3 emissions' for various industries, businesses and nations. The upshot is that "low carbon" research needs to evolve from a research topic to holistic research criteria.

The second aspect of the relationship between research and its worldly context that demands close examination in light of climate change is its own vulnerability to climate change impacts, including but not limited to the need for it to respond to the emergence of greenhouse gas mitigation norms, expectations and policies. More than just guiding society on adaptation to climate change, research itself needs to adapt. Already sea level rise in the United States and disasters such as the 2019-2020 fires in Australia mean that the far-reaching effects of climate change on research infrastructure, processes and personnel (and thus research timelines, cost and outcomes) are becoming apparent. This is true of research no matter what its discipline or focus. At the same time, as in any sector, vulnerability to climate change impacts is uneven within and across research institutions, shaped as much by existing vulnerabilities as by climatic stressors and their flow-on effects. Climate change adaptation of the research world thus requires us to address not only how particular research groups, processes and assets are exposed and sensitive to climatic and biophysical

threats, but how they are being made vulnerable to the additional pressure of climate change thanks to existing stresses such a lack of resources and difficulty attracting industry partners.

Overall, the implications of climate change for research urgently need to be addressed. We need to not only harness research to society's climate change responses, but look more critically and systematically at how research is inseparable from the generation of climate change and its far-reaching impacts.