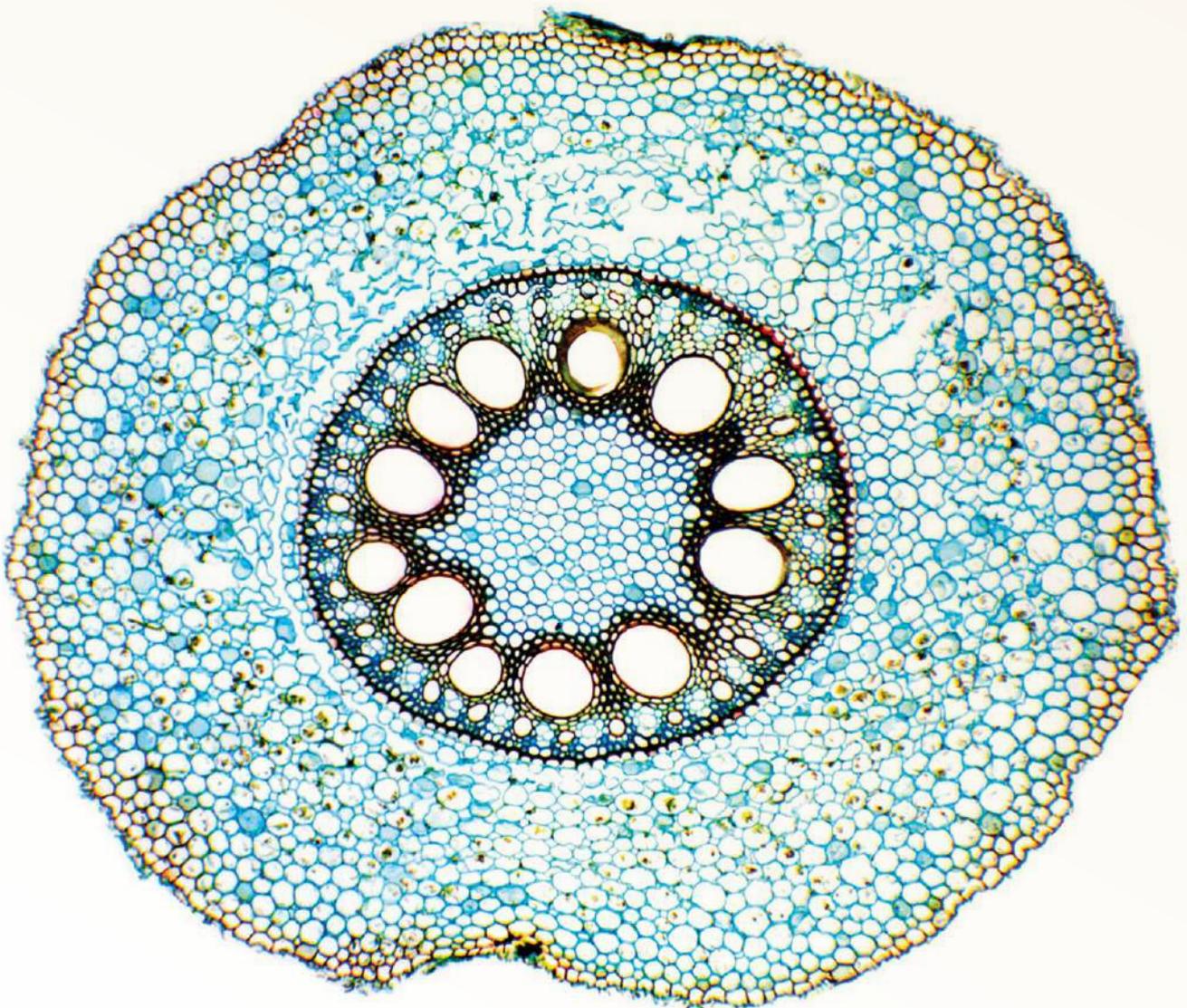


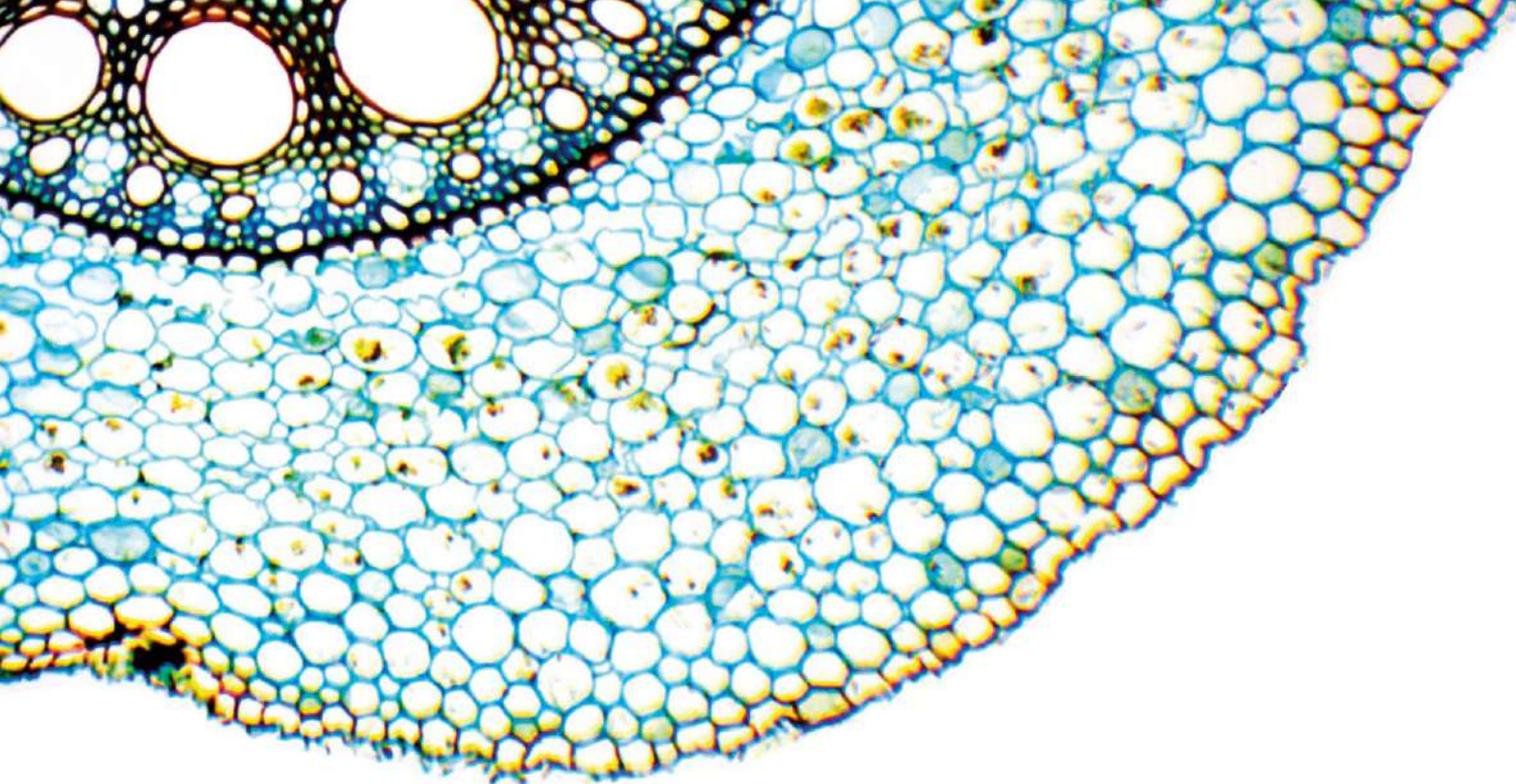
**International
Science Council**

The global voice for science

SCIENCE AND SOCIETY IN TRANSITION

ISC ACTION PLAN: 2022–2024





Cover photo:

Dr Keith Wheeler / Science Photo Library

*Maize root. Light micrograph of a section through the root of a maize plant (*Zea mays*) showing a vascular cylinder (centre). The cylinder is comprised of a central cluster of parenchyma cells (blue), surrounded by fused vascular bundles (black/green/blue) and the endodermis (black/red ring). The largest vessels seen here (white) are metaxylem, part of the xylem tissue in the vascular bundles. Xylem transports water and mineral nutrients from the roots throughout the plant, while phloem (light blue), the other component of the bundles, transports carbohydrates and plant hormones. Magnification: x44 when printed 10 centimetres wide.*

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Work with the ISC to advance science as a global public good.

Connect with us at:

www.council.science
secretariat@council.science

International Science Council
5 rue Auguste Vacquerie
75116 Paris, France

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SCIENCE AND SOCIETY IN TRANSITION

ISC ACTION PLAN: 2022–2024

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SCIENCE AND SOCIETY IN TRANSITION

ISC ACTION PLAN: 2022–2024

The International Science Council (ISC) is a global, membership-based organization, bringing together international scientific unions and associations, national academies and other representative bodies of national and international science. The purpose of the Council is to articulate a global voice for science on matters that concern the global public good, and that enhance the capacity of science to serve it¹. The active engagement of ISC members in the Council's work is central to securing a powerful global voice for science. Because of its members, and together with key international partner organizations, the ISC is in a position to convene the required expertise and influence across scientific fields, disciplines, regions and stakeholder communities to advance effective international science-for-policy and policy-for-science.

Box 1. The ISC's vision, mission and strategic objectives

The ISC's vision is of science as a global public good. Its mission is to be the global voice for science.

The Council's strategic objectives are to:

- Promote international, integrated research on key global challenges;
- Increase evidence-informed understanding and decision-making at all levels of public policy, discourse and action;
- Support the continued and equal development of science systems in all parts of the world;
- Protect scientific freedom and advocate principles for the responsible practice of science.

The ISC's three-yearly Action Plans serve to operationalize the ISC's vision, mission and strategic objectives as set out in the Council's high-level strategy, which was adopted by the ISC General Assembly in 2018. The Plans provide the Council's members, funders and stakeholders with regular outlooks on ISC priorities and activity planning, monitoring and reporting. This document presents the Council's prospective scientific and organizational priorities and related activities for the 2022–2024 period. It has been prepared in consultation with ISC members and adopted by the Council's 2021 General Assembly.

¹ Throughout the document, the word 'science' is used to refer to the systematic organization of knowledge that can be rationally explained and reliably applied. It is inclusive of the natural (including physical, mathematical and life) sciences, the social (including behavioural and economic) sciences, as well as the humanities, medical, health, computer and engineering sciences.

LETTER FROM THE PRESIDENT

The ISC's second Action Plan is published at an important inflection point for the Council and for science and its relationship to wider society. The inaugural Governing Board under the leadership of Daya Reddy left the ISC in a very good position to accelerate its impact and profile. Board members, the CEO and the ISC Secretariat must be enthusiastically acknowledged for what they have achieved in the first three years since the Council's establishment.

As I write in late 2021, the new Board is rapidly settling in, and establishing modes of working to energize this Action Plan and to elevate the position of the ISC in the global sphere.

We know that the continuing COVID-19 pandemic, inadequate progress on the 2030 Sustainability Agenda and climate change, growing societal concerns about inequality and social cohesion, and the opportunities and challenges presented by rapidly evolving technologies make the need for science to be engaged more acute than ever.

The ISC as the global voice for science must continue to work to elevate its profile and impact, particularly in the multilateral space and in the global science community. The establishment of the High-Level Commission on Science Missions for Sustainability chaired by Helen Clark and Irina Bokova, launched at the end of 2021, has had an extraordinary level of support from global citizens in science, politics, diplomacy, philanthropy, and business.

In early 2022 the Council will release the first phase of the COVID-19 Scenarios Report, which focuses on the possible scenarios for medium- and long-term outcomes of the pandemic. This will be followed by a companion report on the policy implications and lessons learned.

The ISC's recent position paper on *Science as a Global Public Good, Freedom and Responsibility in the 21st Century: A contemporary perspective on the free and responsible practice of science*, and the *report from the Steering Group* advising the ISC on its strategy in the intergovernmental system are timely, and I urge you to read them as companion pieces to this document.

The Action Plan supports the creation of a fellowship of the ISC to expand its effective profile and reach, and to recognize individuals who have promoted science for the global public good. One of the Board's early actions will be to develop this concept. Similarly, we must further develop our regional strategy. We will be working with the ISC's Members to increase the visibility and knowledge of the ISC among the global scientific community, and to assist Members to increase their own impact.

Positioning the ISC as the recognized global voice for science ultimately means additional resources, and the new Board is making fundraising a priority. We must increase our resources, while decreasing the reliance on membership dues, so we can expand our capacity and speak to our vision as the global voice for science.

COVID-19 and its consequences has not lessened the energy and commitment of the ISC's Members and wider network. Rather, it has served to illustrate the importance of international science collaboration for the global public good, and for enhancing the stewardship of the peoples, biota, and environment in which we live.

I, and the new Governing Board, thank you for your commitment to ensuring robust science across all its disciplines and promoting the use of science for the public good. Together, we look forward to implementing this Action Plan.

Peter Gluckman
ISC President
December 2021

GOVERNING BOARD

The ISC Governing Board is mandated by the General Assembly (GA) to implement the decisions of the GA, with the help of the ISC Secretariat.

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ISC Chief
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INTRODUCTION

The ISC published its first three-year Action Plan in September 2019. It included an ambitious set of science and policy projects on topics of global relevance to contemporary science and society.

It also set out a series of priority actions aimed at increasing the Council's core competencies, capacities and resources. The Plan was intended to provide a practical and flexible framework for the ISC's work until the next General Assembly and the election of a new Governing Board in late 2021.

Five months into the implementation of the 2019–2021 Action Plan, the World Health Organization declared COVID-19 a Public Health Emergency of International Concern (i.e. a pandemic). The ISC adapted quickly and effectively to the new, disruptive realities of this ongoing crisis. It initiated work that contributes to the international scientific response to the pandemic². Headquarters and Regional Office staff adjusted to remote working conditions and, together with the Governing Board, invested the resources needed to fully exploit virtual modes of convening meetings, and of communicating and conducting day-to-day business. Although the pandemic has disrupted face-to-face engagement with ISC members and partners, considerable efforts have been made to enhance dialogue with them, engage them in ongoing work and seek their views on developing activities. Notwithstanding many difficulties, including inevitable delays in implementing some work plans, the Council was able, at the end of 2020, to reflect on an impressively productive 15 months of activity following the publication of the first Action Plan, as evident from the ‘ISC Activity and Achievement Report: July 2018 to June 2021’.

The Council’s second Action Plan will guide the Council’s work until the end of 2024. It builds on ISC activities and achievements to date, reflects the lessons that have been learned in implementing the first Action Plan, and responds to the evolving global context within which science operates.

The 2019–2021 Action Plan proved its value as a means of signalling the Council’s priorities to members and external audiences in ways that led to important partnerships and collaborations. Through the Action Plan, the importance of programmatic flexibility and organizational agility was recognized, enabling unforeseen but valuable opportunities to be taken up. Other lessons that have been learned and that are embedded in the 2022–2024 Plan include the following:

- The importance of criteria that permit the Council to judge which unanticipated requests, partnership invitations and suggestions for urgent action should be taken up to create a focused, persuasive and manageable agenda.
- The importance of robust processes to control operational overstretch, by ongoing prioritization, improved management, work sharing with members and partners, and increased capacities.
- The need to continue exploring with members how to best utilize their strengths, expertise and breadth in delivery of its work, as well as the extent to which substantive contributions can be expected from members of the Governing Board and its Standing Committees and accessed via external experts.
- The need for the Council to improve on how it defines, monitors and measures the impact of its work by setting realistic impact ambitions for its projects and programmes.
- The need for a balanced portfolio, and for supportive teamwork that can accommodate a wide range of actions, from deep-dive inquiries to campaigns for change, rapid responses on fast-moving issues, and approaches for support by members and partner organizations.

Based on these insights, as well as the contextual analysis which follows in Section 3, below, the ISC’s 2022–2024 Action Plan is an evolution of the 2019–2021 Plan, rather than a radical departure.

² The ISC created an information portal for COVID-19 science (<https://council.science/covid19/>), developed a joint project with the International Institute for Applied Systems Analysis (IIASA), which produced an influential report entitled ‘Transformations Within Reach’ (<https://stories.council.science/iiasa-isc/>), and launched a project on long-term scenarios for the COVID-19 pandemic, convening a group of international leaders in a project oversight panel (see: Skegg, D., Gluckman, P., Boulton, G., Hackmann, H., Abdool Karim, S., Piot, P., and Woopen, C. 2021. Future scenarios for the COVID-19 pandemic. *The Lancet*, Vol. 397, pp. 777–78).



GUIDING PRINCIPLES AND CRITERIA FOR THE ISC'S WORK

The Council's vision of science as a global public good implies a focus not only on those issues that are deemed essential to the public good at any one time, but also on the quality, efficiency and effectiveness of the procedures of science that enhance its capacity to serve the global public good.

In identifying priorities for action, the ISC looks on the one hand, to its globally distributed and disciplinarily diverse membership for their aggregate sense of scientific concern and opportunity and, on the other hand, to UN agencies and major international bodies such as the Organisation for Economic Co-operation and Development and World Bank, for their sense of consensual geopolitical priorities.

As a global voice for science, the ISC provides leadership in catalysing, incubating and coordinating international action on issues of priority to both science and society. In this role the Council works to represent science in global fora, set global science agendas, convene global debate, articulate scientific understanding, promote agreed perspectives and principles, provide advice and function as an effective agent of change. The unique added value that the ISC brings to this work stems from its growing power to convene and connect relevant expertise and influence across diverse scientific and stakeholder communities and its growing access to the global policy community.

The principles that should apply to the ISC's work and how it positions itself in the global arena are as follows:

- ISC activities should concern issues of global significance, whether they relate to science-for-policy or policy-for-science, and should support effective international scientific collaboration.
- The Council should define its priorities in terms of issues rather than disciplines, noting that almost all global challenges are inherently complex, commonly demanding multi- and interdisciplinary efforts.
- All work led or catalysed by the ISC should aim to inform policy and/or practice, especially at the global level, and assist the public understanding of science.
- All ISC work should seek to redress global knowledge divides.
- An ethos of inclusivity and of embracing diversity with regard to geography, gender, age, language and culture should permeate the Council's work.
- The ISC should respect and be sensitive to epistemological diversities that reflect differing regional histories and values and that lead to differing scientific priorities, perspectives and approaches.
- The principles of open science, as defined by the Council³, should be adopted in all its work. This includes a commitment to effective engagement with societal stakeholders and the promotion of transdisciplinary research.
- The ISC should seek collaboration and leverage with other organizations where this offers working efficiencies or enhances the potential for impact.
- The Council should develop the capacity for agile and efficient responses to emerging issues and opportunities.
- The ISC should take responsibility for its impact on the environment and integrate sustainability principles into its ways of working⁴.

These principles set out the ISC's approach to fulfilling its role as the global voice for science. They operationalize the ISC's core values and inform the essential criteria for choice of specific activities, which include the following:

- The issue is timely and relevant to the Council's mission and strategic objectives.
- The issue offers a clear and, ideally, unique role for the Council.
- There is a well-defined target audience and pathway to influence, and a strong probability of positive impact.

³ See: <https://council.science/publications/open-science-for-the-21st-century/>

⁴ See: <https://council.science/about-us/sustainability-principles/>



THE EVOLVING GLOBAL CONTEXT FOR SCIENCE

Understanding the global context, which both conditions and is conditioned by the work of scientists and the trajectory of scientific progress, is crucial in determining the Council's priorities and its portfolio of activities.

This coupling between science and society is exemplified by the COVID-19 pandemic, which has produced a major shift in global scientific priorities. Much of its aftermath will be determined by scientific efforts, not only in suppressing the pandemic but also in understanding and addressing its long-term consequences.

The 2019–2021 Action Plan was prefaced by a contextual analysis, which identified particularly important contemporary issues for the international scientific community as summarized in Box 2. The ISC used this contextual analysis to identify major domains of action that are consistent with its role as the global voice for science.

Box 2. Context for the 2019–2021 Action Plan

The role of science in responding to major challenges faced by humanity

Major challenges to science lie in:

- identifying manageable pathways through the complex web of planetary, social and economic processes that would enable transformations needed to deliver the UN 2030 Agenda and the Sustainable Development Goals;
- understanding and addressing the challenges that the ongoing digital revolution presents to privacy, ethical standards and legal systems and its inherent potential for monopoly control; and
- negotiating ongoing globalization with resurgent nationalism.

The societal implications of major scientific advances

Two areas of particular importance are, first, the unprecedented capacities of artificial intelligence (AI) technologies in using modern data resources to characterize complexity and find optimal solutions for complex problems; and, second, the advances in the life and biomedical sciences that offer new pathways to the solution of major problems and to new applications, from the molecular to the population level. These advances have enormous potential for social benefit in providing efficient solutions for human healthcare, in enhancing societal interactions, in creating business opportunities and in enhancing governmental efficiency.

Adapting the practices of science

The rigorous methods of science have proven to be optimal means of creating reliable knowledge. Changing priorities, technologies and evolving social norms call for the organization of national and international science systems and the working habits of scientists to be adapted. There are pressures for more effective mobilization of international funding to address urgent global challenges; for strengthening cross-disciplinary collaboration; for enhancing collaboration across scientific communities of varying capacity; for promoting data sharing and open science; for the reform of scientific publishing and related incentives; for more effective bridges between science, policy and wider publics; for responses to ‘fake news’; for promotion of global equity; and for establishment, review and revision of the responsibilities and norms of scientific inquiry, whether conducted in public or in private settings.

The context for the 2022–24 Action Plan has been fundamentally altered by the COVID-19 pandemic, which has created a watershed in perceptions of risk, priority and opportunity. Even prior to the outbreak there was increasingly pressing awareness of growing global economic inequalities, of escalating climatic hazards, of collapsing biosphere functions and of accelerating disruption of planetary functions. These are all essential concerns of the Sustainable Development Goals; however, the global collaboration necessary to address them seemed to be fracturing under the pressure of divergent nationalisms. The pandemic should be a wake-up call for both science and society in highlighting the reality and urgency of the risks faced by humanity. What have been its lessons?

It has revealed:

- Generally weak interactions at the science–policy interface in the pre-COVID-19 years, when the threat of pandemic disease was high on many countries’ risk registers; yet with few exceptions, there was little serious preparedness.
- The weakness of geopolitical collaboration in addressing global problems even though solutions to such problems, and national self-interests, depend fundamentally on such collaboration.
- The enormous potential and capacity of modern science to address major issues where there is a political will to do so. In the case of the pandemic, this has been not only in genomics and vaccine development, but also in behavioural science, aerosol dynamics and much beyond.
- Open science in action. A wide variety of scientists creatively deployed and applied their knowledge, produced databases and websites, and shared data, ideas and findings in ways that set aside conventional constraints and across the public–private interface.
- The damage to public health, well-being and social cohesion that can arise from misinformation and conspiracy theories. The power of these voices has been amplified by digitally democratized communication and social media that permit extreme views to be broadcast with minimal restraint.

These lessons and concerns have important consequences for the Council’s priorities and, together with the rapid pace of change in many areas of science and in the world at large, make it appropriate to revisit the ISC’s 2019 analysis and demonstrate that it must remain adaptive and responsive. The three headings used in 2019 continue to provide a useful frame in summarizing the current context for science.

3.1 THE ROLE OF SCIENCE IN RESPONDING TO MAJOR CHALLENGES FACED BY HUMANITY

The short-term horizon has, inevitably, been dominated by the COVID-19 pandemic, the response to it, and efforts to conceive and plan for a more resilient, equitable and sustainable ‘new normal’. The pandemic has thrown issues of poverty, insecurity and inequality into high relief. It has highlighted the perennial threat of zoonotic diseases where viruses jump the species barrier, with the potential to import high toxicity into human populations, thereby raising the risk of further pandemics. It has exposed critical gaps in public health systems and, more broadly, in societies’ risk preparedness. It has exposed the inadequacy of international political collaboration, where ‘the human family seems to care so little for itself that we were unable to pool our experience, our understanding, and our knowledge to forge a common and coordinated response’⁵. It has underlined the need for a more effective interface between scientific solutions and geopolitical action on global problems, even in the context of contemporary trends towards scientific nationalism, concerns about ‘research security’ and increased restriction of the vital freedom of scientists to exercise their responsibility to speak truthfully, freely and openly about their findings.

⁵ Horton, R. 2021. Offline: the case for No-COVID. *The Lancet*, Vol. 397 (January 30), p. 359. <https://www.thelancet.com/action/showPdf?pii=S0140-6736%2821%2900186-0>

It is crucial that science absorbs lessons about preparedness and international collaboration from the pandemic. At the same time, the science community must ensure that the focus on urgent, but longer-term issues is not displaced by the pandemic's shadow, but benefits from the pandemic experience. For example, putting the response to the climate emergency or the delivery of the Sustainable Development Goals (SDGs) on hold for a period would have deeply damaging long-term consequences. Indeed, the pandemic has thrown a spotlight on many areas where science and policy have failed to address longer-term issues of global sustainability, and on the extent to which the most serious harms have fallen on populations whose lives and livelihoods are inherently vulnerable and who have developed traditions of resilience out of necessity. It is therefore crucial to quicken the tempo with which the SDGs are being addressed by political and scientific communities and the private sector, to quicken the pace with which science is being mobilized to support the necessary transformations and the enhancement of resilience, and to increase efforts to engage with citizens about the implications of global sustainability for their lives.

Global temperatures have continued to rise at an accelerated rate and global CO₂ concentrations are at record levels even as emissions have temporarily fallen as consequence of the COVID-driven economic slowdown. Just as COVID-19 has brought home the reality of pandemic threat, the extreme climate events during 2021 may have increased popular awareness that damaging climate change is here now, and is not merely a hypothetical concern for the future. It seems likely that we will breach the target to limit the global temperature rise to no more than 1.5° above pre-industrial levels, agreed at the 2015 UN Framework Convention on Climate Change Conference of the Parties (COP21) in Paris. As demonstrations on the sidelines of COP26 and elsewhere have shown, there is increasingly vocal popular support for effective inter-governmental action. Although global targets have been agreed at a political level, effective coordination designed to achieve them has been limited. There has hitherto been little concerted international effort to plot a practicable roadmap for achieving these targets. Such a roadmap is vital in sending the signals that private and public sector bodies and research communities need if they are to apply themselves urgently and efficiently to the massive technological, economic and social transformations that are required if the world is to achieve net-zero carbon emissions by 2050.

The continuously increasing demand for energy, food, fibre, water and land has come at a significant cost to the biosphere. The sheer scale of production and consumption, combined with systemic inefficiencies, misallocation of resources, and waste, is causing rapid and widespread biodiversity loss. Biodiversity underpins human life. It is responsible for a myriad of ecosystem services upon which society depends for basic life-support functions, such as the provision of food, fuel and clean water, nutrient cycling, pollination services and climate regulation. The implications for human health and well-being, societal resilience and sustainable development are potentially catastrophic. Halting biodiversity loss and restoring degraded ecosystems is essential for sustainable development.

The spotlight thrown by the pandemic on the poor and vulnerable and the emerging impacts of climate change on these same populations call into question the indices used to monitor human well-being and development. The first Human Development Report was published in 1990. Since then, our world has changed considerably, with current and impending crises in environmental, ecological, health, political and economic systems. Fundamental shifts are taking place in how the human–nature relationship is understood, how value creation/extraction is conceptualized, and how progress should be measured. It is time to rearticulate human development for the 21st century in addressing questions such as: What are the major emerging challenges to human-centred development? How can human development be advanced while reducing adverse planetary impacts? How can the human development approach inform public debates and decision-making about current and future challenges? What would be a meaningful and useful definition of human development for our changing world?

At a time when international political collaboration should be a priority in addressing global challenges, an exclusive nationalism, sometimes associated with increased scientific nationalism, appears to be on the rise in an increasingly divided world. Its latest expression has been in inequitable global access to vaccines.

3.2 THE SOCIETAL IMPLICATIONS OF MAJOR SCIENTIFIC ADVANCES

The pace of adoption and penetration of AI technologies has quickened and they are becoming increasingly ubiquitous, driven by advances in machine learning and deep learning as processes for discerning complex patterns in big data. This has major consequences for industry, economies and societies. AI technologies disrupt pre-existing norms, unlocking value wherever they permeate, and unleashing an unprecedented era of innovation. However, these technologies can also exacerbate existing inequalities, deepen exclusion and discrimination, undermine privacy, and eliminate agency and empowerment on a vast scale, potentially undermining the benefits they offer. There is a risk of potential displacement of humans from roles hitherto regarded as uniquely human, the creation of artificial videos, biases in algorithms that can negatively impact marginalized groups, cyber-warfare, new forms of criminality and the obfuscation of reality that undermines social cohesion. The impact of AI technologies requires knowledgeable consideration at all levels of governance. It is crucial that governance and transparency mechanisms are adopted that protect the public interest. It will be important, in ensuring transparency and gaining public confidence, that the public sector discloses the details of machine-learning algorithms in decisions that significantly affect individuals. The ethics of AI use, data use and ownership, of legal constraints and regulation issues are important priorities for society.

There have been particularly significant advances in the biomedical sciences in recent years. The potential of the basic science of gene editing as a therapy to address human disease has been apparent for several years. CRISPR-Cas9 is revolutionizing genomic engineering as a simple and affordable way to manipulate and edit DNA. Its applications are numerous. There have already been major advances in agriculture and food security, and considerable potential in areas such as cancer, blindness and Alzheimer's disease. Research on messenger (m)RNA uses its function in sending instructions for DNA in creating proteins that help fight disease; mRNA-based vaccines now play a key role in creating immunity to the COVID-19 virus, and the technology has great potential for agriculture in increasing disease- and stress-resistance in plants.

Bio-tech is one of four groups of science-based technologies that have interacted and often converged in recent years, the others being information-tech, nano-tech and cognitive-tech, increasingly driven by AI, and enabled by automated decision-making, large data sets and high-speed computing. These technologies are often problematic because the rate of their diversification in novel, high-impact use in different settings has frequently outpaced environmental, ethical, regulatory and legal considerations. At the same time, they have great promise because of their reach, scale and optimized delivery, with a transformative potential in sectors that contribute directly to human capital such as agriculture, water, sanitation, energy, transport, education, health, nutrition and social protection, and through greater effectiveness (targeting and localization, customization, personalization) and efficiency. They have the potential to transform scientific advances in areas such as drought-resistant crops and in solution of hitherto intractable medical problems (e.g. protein folding). It is essential that the enabling infrastructures and capacities required for these technologies to be adopted and embedded are globally accessible, as yet another economically punishing knowledge gap is even now developing between Global North and Global South.

Public and political attitudes towards digital social media and the companies that control them have shifted in recent years. There is a dawning realization that technology giants and the platforms they have created do not always serve the public interest. Although they are used in practice as a public infrastructure, ultimately, they serve the economic agenda of the companies, which have accumulated massive databases of personal information, excessive power to determine what is acceptable, and editorial policies that are almost law because of the companies' overwhelming size. They have contributed to rising disinformation, polarization in unconnected 'echo chambers', and extremism, with a massive role in conditioning public discourse in ways that are detrimental to scientific understanding. At the same time, social media have also proven to be important bridges for science in reaching wider publics.

Further technologies are emerging that have the potential to improve or undermine the human and planetary condition depending on the way that they are managed and regulated. The ISC has an important role in assisting in the dialogue between the technology, societal and policy communities on the complex issues that emerge.

3.3 ADAPTING THE PRACTICES OF SCIENCE

The COVID-19 pandemic has been a stress test for science and its capacity to confront a global emergency. It has exposed strengths, weaknesses and opportunities. Two fundamental strengths have been exposed. One, too often ignored, has been the willingness of the international scientific community, whether in public or private sectors, to respond efficiently, unconditionally and tirelessly to a global emergency. The other has been the depth and profound utility of scientific understanding in tackling crises, and the public trust that such demonstrations elicit. The pandemic has revealed weaknesses in the way in which the record of science can be accessed in emergencies, the need for rapid access to and peer review of results that would normally be published at a more leisurely pace, and the need for routine access to the record of publicly funded science, too much of which is hidden behind publishers' pay-walls. While commercial scientific publishers have temporarily opened access to the pandemic-relevant record of science that they hold, no such access to the patented part of the relevant scientific record has been allowed. At a meeting of the World Trade Organization on 10 March 2021, a proposal supported by over 80 low-income countries to waive patent rights to boost production of COVID-19 vaccines for poor nations was rejected by richer members on the grounds that 'protecting intellectual property rights encouraged research and innovation and that suspending those rights would not result in a sudden surge of vaccine supply'⁶.

The spontaneous response of the global scientific community to the pandemic has exemplified the potential of an open science that stimulates collaboration between its disciplines and with broader publics (i.e. both multi- and transdisciplinary), with unprecedented sharing of ideas and data within and beyond the scientific community and across the public-private interface. This agility has been essential in enabling progress from initial sequencing to effective vaccines in less than a year. In the words of the Director of the US National Institutes of Health: 'we have never seen anything like this'; 'the phenomenal effort will change science – and scientists – for ever'⁷. Could such openness be the 'new normal' in addressing the many major global challenges that confront science and society and that can only be effectively addressed by international collaboration?

⁶ Reuters. 2021. Rich, developing nations wrangle over COVID vaccine patents. 10 March. <https://www.reuters.com/article/us-health-coronavirus-wto-idUSKBN2B21V9>

⁷ Sample, I. 2020. The great project: how Covid changed science forever. The Guardian, 15 December. <https://www.theguardian.com/world/2020/dec/15/the-great-project-how-covid-changed-science-for-ever>

There are positive and negative trends in the development of open science. On the positive side, UNESCO's 193 Member States unanimously passed the recommendation for open science at its general conference in November 2021. A potentially countervailing trend is occurring as major commercial publishers of science increasingly brand themselves as technology companies, with moves towards the creation of multi-sided data-science-knowledge platforms. Such platforms have the potential to monopolize the provision of wide-ranging services for science and its institutions, and thereby to dominate the trajectory and effective governance of large parts of the scientific enterprise. These trends also bear down strongly upon the way that science is evaluated and thereby incentivized, on the capacity for those in low- and middle-income countries to access the record of science, either as authors or readers, and on the potential for an agile and responsive open science.

The internet and the Web were pioneered by their founders as open, free and with universal infrastructure and standards, but are becoming fragmented by a Balkanized set of computer protocols that increasingly differ by company and by country, with profound implications for the functioning of the international scientific community. It is another area of tension between global collaboration and national withdrawal.

A strongly developing dimension of open science has been a worldwide increase in the number of citizens engaged in the process of knowledge co-creation. Such citizen scientists are not passive, but increasingly help set the research agenda, engage in crowdsourcing via Web platforms, collect and analyse scientific data, and help in the dissemination of results and their impact. This is a welcome development, but its destination is uncertain. Will it lead to major new forms of knowledge generation, transfer and use, improve the standing of marginalized groups, provide legitimacy to and strengthen trust in scientific practices or change the outlooks of citizens? Will it bring new perspectives to science, invent innovative ways to tackle societal challenges, gain legal or political influence on specific policy issues or help create a better-informed population? Will it encourage a greater understanding of how science works?

In recent years, awareness of the structural prejudices that permeate our societies and actions to combat them have increased in prominence. The grassroots #MeToo movement has generated widespread awareness about violence and discrimination against women. The COVID-19 pandemic fuelled anti-Asian sentiment and xenophobia worldwide. The death of George Floyd in police custody highlighted endemic racism in institutions, legal systems and policies. Notwithstanding greater legal freedoms, discrimination against those who identify as lesbian, gay, bisexual, transgender or queer continues in many countries. The scientific community is not immune to discrimination, subjugation and silencing of minority voices.

A further compelling rationale for inclusivity and diversity lies in the processes of creative scientific inquiry, where culturally mixed groups are more likely to offer a wider range of perspectives, questions and pathways to discovery than arise from traditional, more homogeneous scientific settings or from bastions of scientific exclusion and privilege. Exclusionary perspectives, unaware of scientific advances other than those made in the Global North, often assume that Northern priorities are necessarily global priorities, leading to the exclusion of or contempt for knowledge and priorities in other regions. A global science community will not have come of age until it replaces a unipolar perspective with an inclusive universalism, open to a wider ecology of knowledge and capable of building an authentic global knowledge commons.

Many of the complex issues that science and policy confront need transdisciplinary approaches. Transdisciplinarity requires problems to be simultaneously framed through multiple lenses and with stakeholder engagement from the outset. This implies co-design, co-production and extended peer review. Transdisciplinary research is increasingly recognized as being essential, yet current mechanisms for funding and assessing such activities are limited. Those undertaking such research may find recognition of their effort limited, as the primary impacts are not generally reflected in the usual assessments of scientific work that utilize bibliometric indices. The academic system needs to evolve to accommodate such research.



ISC SCIENTIFIC PRIORITIES: 2022–2024

Our analysis of the contemporary global context for science substantiates the continued relevance of the ISC’s four domains of action that were used as the frame for the 2019–21 Action Plan, and of the major strands of work that have subsequently been undertaken within those domains.

However, our assessment of the profound impacts of the COVID-19 pandemic on the context for science and other important shifts in the opportunities and challenges facing both global society and global science since 2019 suggest new priorities, and the need to re-evaluate the urgency of others while ensuring the need to remain within the envelope of available resources.

Based on the above, this section presents an action-oriented overview of the ISC's scientific portfolio of work for the 2022–2024 period. The framework of four domains of action used in the 2019–2021 Plan has been slightly amended. For example, digital processes, which comprised domain 2 in the first Action Plan, are now pervasive through all areas of scientific concern, such that a broader frame for fast-moving, interrelated science and technology in the digital era now seems more appropriate. In addition, a fifth domain subsumes the growing set of activities overseen by the ISC's Committee for Freedom and Responsibility in Science (CFRS). The resulting framework expresses the overall thrust of the Council's priorities to members and the wider community. It inevitably contains some overlaps.

The ISC's 2022–2024 domains of action are:

Domain 1: Global Sustainability

Domain 2: Converging Science and Technology in a Digital Era

Domain 3: Science in Policy and Public Discourse

Domain 4: Changing Practices in Science and Science Systems

Domain 5: Freedom and Responsibility in Science

For each domain, the ISC has identified a set of priority themes on which the Council will seek to concentrate its efforts and resources in the coming planning period. Each domain and its themes are described below. Potential and possible new priority themes, as well as options for new activities within existing themes that arise from the Council's updated assessment of the contemporary global context for science are highlighted under each domain. For the purposes of designing specific actions that address these and any emerging or unanticipated opportunities that may arise during the planning period, the ISC will continue to engage with its membership (see also Section 5.1.2a, below).

Boxes 3 to 7 provide a comprehensive overview of the Council's existing portfolio of activities under each domain's priority themes. In addition to ongoing strategic work and activities that the ISC inherited from its predecessor organizations, the portfolio includes active projects and programmes from the 2019–2021 Action Plan (marked in green) that will continue during the next period; projects identified in that Plan that were not fully mobilized but remain relevant; and new projects that the ISC has developed or become involved in since the publication of the 2019–2021 Plan. The boxes provide website links to fuller information on each activity, and identify, per activity, the ISC's role and the partners with which the Council works to influence action and realize impact. In addition, the main impacts that the Council seeks to achieve in activities related to each priority theme are summarized. In line with the ISC's project management approach, the work of identifying effective routes to impact is undertaken at the level of individual project design and development.

In keeping with experiences of the last three years and lessons learned about the importance of maintaining programmatic flexibility, the portfolio presented in Boxes 3 to 7 is expected to evolve over the 2022–2024 period.

Table 1 summarizes the ISC's new framework of domains of action and priority themes. It flags proposed new themes and activities and provides an indication of the evolution of the Council's portfolio of activities to date by showing when activities related to specific themes were initiated.

Priority themes	Evolution of activity development				New activities for development 2022–2024
	Activities initiated				
	before 2019	2019	since 2019		
Domain 1: Global Sustainability					
1.1: Transformations to sustainability	X	X			
1.2: Human health and development			X		Health New
1.3: Systemic risk and global emergencies	X	X	X		Climate New
Domain 2: Converging Science and Technology in a Digital Era					
2.1: Digital transformations of science and education		X	X		
2.2: Digital technologies for sustainability			X		
2.3: Convergent technologies: impacts, ethics and governance New					
Domain 3: Science in Policy and Public Discourse					
3.1: The public value of science		X	X		
3.2: Science–policy interfaces at the global level	X	X			
3.3: The new normal for science New					
Domain 4: Changing Practices in Science and Science Systems					
4.1: Open science	X	X	X		
4.2: Engaged science		X			Transdisciplinarity New
4.3: The evaluation of science		X			
Domain 5: Freedom and Responsibility in Science					
5.1: Diversity, inclusivity and freedom in science	X		X		
5.2: Responsible science	X	X			

Table 1. ISC domains of action, priority themes and activities: 2022–2024



1

GLOBAL SUSTAINABILITY



Domain one: The greatest and most urgent contemporary challenge for science is articulated by the 2030 UN Agenda for Sustainable Development and its framework of 17 Sustainable Development Goals (SDGs). With a planet on ‘red alert’ and societies far off-track in their progress towards achieving the SDGs, recovery from the COVID-19 pandemic must involve a redoubling of global efforts to reset humanity’s relationships with the planet in ways that recover a self-sustaining environment while ensuring human equity, health and well-being. This will require urgent engagement from the whole spectrum of the sciences.

In the next planning period, ISC's work in this domain will focus on the following three themes.

Theme 1.1: Transformations to sustainability

There is an urgent need for an international scientific effort that stimulates and supports rapidly accelerated processes of transformation. The clock is ticking. There are fewer than ten years left to achieve the SDGs, and yet societies are not close to addressing the interlinked crises of climate change, biodiversity loss, pollution, social dislocation, inequality and economic fragility.

Theme 1.2: Human health and development

Multilateral policy and action are fundamental to ensuring human-centred development, informed by a rearticulation of the human development paradigm that considers new socio-political realities, new technologies and deepening environmental crises. The coupling between human health, well-being and environment is linked not only to poverty and inequality, but also, as the COVID-19 pandemic has shown, to human intervention in the environment in ways that increase the vulnerability of human populations to environmental shocks. The pandemic has brought issues of public health and the burden of disease, including mental health, to the fore, with the realization that these are intrinsic to human development and should be a part of this theme, and that integrated, truly global awareness and response are imperatives.

In addition to existing activity relevant to this theme, the ISC will seek to develop a new activity on issues of health, including access to healthcare, the burden of disease and mental health and well-being.

Theme 1.3: Systemic risk and global emergencies

Preparedness is crucial in the face of cascading, systemic risks, involving new, complex, interacting threats that disrupt the fabric of social life and undermine attempts to achieve both global sustainability and human-centred development. These risks and potential crises demand more effective anticipatory responses from both science and society.

In relation to this priority theme the ISC plans to develop new, globally coordinated action on the climate emergency, drawing on lessons learned from COVID-19 and involving ISC members and ISC co-sponsored programmes. The fundamental issue for the ISC is to identify precisely where, as a body that represents a wide spectrum of the global science community, it could best place its efforts. It will work with other scientific bodies that are deeply engaged with the climate emergency in identifying such a role. An initiative could be built on coordinated/joint preparations for the COP27 meeting (2022).

Box 3. Domain 1 existing activities for the 2022–2024 period

Priority theme 1.1: Transformations to sustainability			
Activities	ISC role and partnerships	Status	Time-frame
Multistakeholder platform on ‘Transformations within Reach: Roadmaps to a sustainable and equitable world’ (Phase II of the 2020 ‘Bouncing forward sustainably’ initiative)	ISC role: Co-Lead Partner: IIASA (Co-Lead)	In development; subject to successful fundraising	2021–2023
Transformations to Sustainability Funding Programme	ISC role: Partner Partners: Belmont Forum and NORFACE (Co-Leads)	Ongoing	To end 2022
Global Forum of Funders’ initiative	ISC role: Lead Partners: IDRC, Sida, UKRI, NRF of South Africa, IIASA, Future Earth, and the Belmont Forum	Ongoing	Ongoing

Anticipated impacts:

- Actionable social science research and knowledge on processes of social transformations are promoted and effectively integrated into solutions-oriented sustainability science and its influence on policy.
- Science-based scenarios and tractable implementation pathways to agreed critical system transformations are available and used in policy and practice at all levels of governance.
- Accelerated investment in mission-oriented international science for global sustainability through new multilateral action by science funders (including national and international, public and private funding agencies and through a Commission being launched by the ISC’s Global Forum of Funders).

Priority theme 1.2: Human health and development			
Activities	ISC role and partnerships	Status	Time-frame
Project on ‘Rethinking Human Development’ (Phase II)	ISC role: Lead Partner: UNDP	In development	2021–2024

Anticipated impact:

- A new global discourse on and indicators of human development underpin global sustainability research, policy and practice.

Priority theme 1.3: Systemic risk and global emergencies

Activities	ISC role and partnerships	Status	Time-frame
<u>Project on ‘Hazards Definition and Classification’ (Phase II)</u>	ISC role: Partner Partner: UNDRR (Lead)	Ongoing	2021–2023
<u>Development and implementation of a global risk research agenda for 2030</u>	ISC role: Partner Partners: IRDR (Lead), UNDRR, The Risk Knowledge Action Network, CAST, and others to be determined	Ongoing	Ongoing
<u>Project on ‘COVID-19 Outcome Scenarios’ (Phase II)</u>	ISC role: Lead Partners: WHO, UNDRR (as observers)	Ongoing	2021–2022/23

Anticipated impacts:

- Increased inter- and transdisciplinary scientific collaboration on the interacting drivers and impacts of global systemic risks to inform societal decision-making on prevention, preparedness and management of future global emergencies.
- Long-term global outcome scenarios of the COVID-19 pandemic inform governments’ decisions on pandemic responses and recovery pathways in ways that secure optimal global outcomes.

Ongoing strategic action

In addition to the specific activities presented above, it is important to highlight the ISC’s ongoing and active support for a series of international research programmes, scientific committees and other initiatives that work to convene, coordinate and promote international science that addresses many of today’s major global environmental change and sustainability challenges. Several of these initiatives are co-sponsored by the ISC together with UN bodies and other international organizations. They include international programmes like Future Earth, the World Climate Research Programme, the Integrated Research on Disaster Risk programme, the Urban Health and Wellbeing Programme and the Global Research Programme on Inequality. For further information on these and other relevant ISC-supported initiatives, see <https://council.science/what-we-do/affiliated-bodies/>.

An important priority for the ISC is to facilitate and foster strategic exchange, synergistic alignment and collaborative action between these initiatives and to ensure that the knowledge and expertise they convene is mobilized in support of the Council’s priority themes and related activities, particularly those relevant to global sustainability priorities.

The ISC also supports international sustainability science by means of endorsing and promoting International Years or Decades of Science, which are typically established by resolutions of the UN General Assembly. Of particular relevance to the 2022–2024 period is the ISC’s active participation in the UN Decade of Ocean Science for Sustainable Development (2021–2030), led by IOC-UNESCO (<https://www.oceandecade.org>), and in preparations for an International Year of Basic Sciences for Sustainable Development (2022), led by an ISC member, the International Union of Pure and Applied Physics (<https://www.iybssd2022.org/en/home/>).



2

**CONVERGING
SCIENCE AND
TECHNOLOGY IN
A DIGITAL ERA**



Domain two: The discoveries and applications of science and technology enabled by massive data resources and AI systems are providing innovative solutions to old problems in private and public sectors, notably in areas of convergence between information, bio, nano and cognitive technologies. However, they can also deepen inequalities and discrimination, entrench large-scale disempowerment, and maintain a trajectory of growth that continues to deplete planetary resources. Drawing on upstream domains of creative research, the ISC's interests primarily concern areas of application of these technologies, exploiting interdisciplinary potentials, assessing environmental impacts, regard for issues of ethics, regulation and governance, and potential social impacts. Given the vital role of data in most areas of science, issues of data ownership and accessibility are increasingly coming to the fore, with questions about the achievability of a 'global data commons'.

In the next planning period, ISC's work in this domain will focus on the following three themes.

Theme 2.1: Digital transformations of science and education

The tools of the digital revolution have provided science with an opportunity to understand and characterize the complexities inherent in many global challenges through cross-domain research. This potential is constrained by limitations in the ability to access and combine heterogeneous data within and across domains. The fundamental enabler of interdisciplinary, data-driven science is an ecosystem of resources that enable data to be FAIR (Findable, Accessible, Interoperable and Re-usable) for humans and machines, with maximally automated stewardship of data, effective terminologies and metadata specifications. An associated priority is the worldwide educational challenge to face-to-face learning caused by the COVID-19 pandemic and the need for education systems and their users to adapt to a fast-changing and increasingly digital world applying appropriate technologies.

Theme 2.2: Digital technologies for sustainability

Digital technologies have enormous potential to steer processes directed towards achievement of sustainability goals, but their successful application will require closure of the global digital divide, changing market incentives and committed and responsible governance at all levels. With the UN Secretary-General's digital roadmap as framing, there is an urgent need to exploit the potentials of digitalization in charting pathways to sustainability through inter-sectoral collaboration, in which the science community must play an important role.

Theme 2.3: Convergent technologies: impacts, ethics and governance

Recent years have seen major breakthroughs in the life sciences, material sciences and neurosciences, often enabled by AI, automated decision-making, large data sets and high-speed computing. They frequently converge in applications that promise major dividends because of their reach and scale, and their ability to personalize services and optimize service delivery. Their applications can be transformative in sectors that contribute to human well-being, such as in health, agriculture, water, sanitation, energy and transport. Yet these technologies can also exacerbate existing inequalities, deepen exclusion and discrimination, and eliminate agency and empowerment on a vast scale.

In the 2022–2024 planning period the Council will seek to create a scoping group from among interested members to explore the potential for globally focused work by the ISC on the impacts, ethics and governance of convergent technologies.

Box 4. Domain 2 existing activities for the 2022–2024 period

Priority theme 2.1: Digital transformations of science and education			
Activities	ISC role and partnerships	Status	Time-frame
Programme on ‘Making data work for cross-domain grand challenges’	ISC role: Sponsor/ Partner Partner: CODATA (Lead)	Ongoing	2020–2030
COVID Education Alliance’	ISC role: Partner Partners: P4TT, FOGGS (Co-Leads)	Ongoing	2020–2022
<p>Anticipated impacts:</p> <ul style="list-style-type: none"> • Digital technologies are effectively leveraged to make data available and useable across all areas of research, particularly for data sourced from multiple disciplines to explore the structure and function of complex systems. • International scientific collaboration supports education systems to effectively adapt to the digital era and be able to cope with constraints imposed by disruptive global crises such as the COVID-19 pandemic. 			
Priority theme 2.2: Digital technologies for sustainability			
Activities	ISC role and partnerships	Status	Time-frame
Coalition for Environmental Sustainability in support of the UN’s Roadmap for Digital Cooperation’	ISC role: Co-Lead Partners: UNDP, UNEP, UBA, Future Earth (Co-Leads)	Ongoing	2021 onwards
Project on ‘Sustainability in the Digital Age’	ISC role: Partner Partners: Future Earth (Lead), German Environment Agency, Québec Artificial Intelligence Institute	Ongoing	2020–2024
Global Platform on ‘International Digital Health & AI Research Collaborative’	ISC role: Partner Partners: Wellcome Trust, Fondation Botnar	Ongoing	2021–2023
<p>Anticipated impacts:</p> <ul style="list-style-type: none"> • Stakeholders from the public and private sectors as well as civil society who work on the environment and digital transformation nexus collaborate effectively to coordinate efforts and share lessons learned as well as mobilize resources and political commitments for action. • An agreed Acceleration Plan for Digitalizing Environmental Sustainability (as part of the UN Roadmap for Digital Cooperation) and a series of political, technical and financial commitments. 			
<p>Ongoing strategic action In addition to the specific activities presented above, the ISC provides ongoing support to the work of two international data bodies that function under the auspices of the Council: the Committee on Data for Science and Technology (CODATA) and the World Data System (WDS).</p>			



3

SCIENCE IN POLICY
AND PUBLIC
DISCOURSE



Domain three: The call for evidence-informed policy has heightened during the pandemic as governments have repeatedly claimed to be ‘following the science’, whether, in fact, doing so or not. Scientific understanding, robust or not, has played a central role in public discourse, and scientists have been regarded as the most trustworthy contributors to that discourse. A critical issue for the Council is to understand how the enhanced standing achieved by science during the pandemic can be maintained as a ‘new normal’ in addressing other major challenges, such as the global climate risk, rather than its effect being ephemeral.

In the next planning period, the ISC's work in this domain will focus on the following three themes.

Theme 3.1: The public value of science

Levels of public trust in science remain relatively high and appear to have been significantly enhanced during the COVID-19 pandemic, although the political and media discourse is increasingly fragmented and polarized, and trust in business, media and politics is declining. This trend is exacerbated by pervasive digital technologies and social media, which enable the widespread dissemination of misleading and biased information and the growth of fake science.

Theme 3.2: Science–policy interfaces at the global level

At the global level, and particularly within the UN system, more impactful science–policy engagement requires effective coordination between a growing range of interface mechanisms, which operate within and between different agencies and with different mandates, modes of engagement and cultures of decision-making. It is also essential to connect efforts to advance evidence-informed policy-making at the national level to those undertaken internationally. The visibility of science in addressing global issues must be continually reinforced through coordination between these levels. The experience of the COVID-19 pandemic has exposed strengths and weaknesses at the science–policy interface, and provided much evidence about processes that build or undermine the public's trust in policy, which has proved to be an essential determinant for the mitigation of risk.

Theme 3.3: A new normal for science

The outbreak of the COVID-19 pandemic stimulated an impressive and spontaneous response from a wide variety of scientists and their organizations. They creatively deployed and applied their knowledge, produced databases and websites, short-circuited the cumbersome processes of conventional publication through the use of preprints, and shared data and ideas with unprecedented openness in ways that set aside conventional constraints and across the public–private interface. Many individuals offered cogent and impressively clear analyses on public media, playing a large role in stimulating public confidence and trust and thereby helping to stimulate the responsible civic behaviour that has been crucial in inhibiting the spread of infection. But the pandemic also ruthlessly exposed some of the processes that inhibit the effectiveness of science in contributing to the global public good. Prior to the pandemic, the benefits of open science were a matter of conjecture. The global scientific response was an example of it in action. Should the scientific response be a pointer to a new normal? Or should science be allowed to revert to its old ways and to the restrictive norms of much conventional scientific inquiry?

In the 2022–2024 planning period the ISC will explore a strand of work, with an interim title of 'The new normal for science'. In the 2022–2024 planning period the ISC will explore a strand of work, with an interim title of 'The new normal for science'. The Council will seek to work with interested members to scope the issues, identify possible priorities for action and potential collaborators.

Box 5. Domain 3 existing activities for the 2022–2024 period

Priority theme 3.1: The public value of science			
Activities	ISC role and partnerships	Status	Time-frame
<u>'Global Science TV'</u>	ISC role: Co-Lead Partner: Australian Academy of Science (Co-Lead)	Ongoing	2020 onwards
<u>BBC-ISC StoryWorks'</u>	ISC role: Co-Lead Partner: BBC (Co-Lead)	Ongoing	2021–2022/23

Anticipated impacts:

- Effective use of compelling digital content and storytelling to assist public understanding of and engagement in scientific research and practice and fortify levels of public trust in science.
- State-of-the-art conceptual tools are used by scientific communities to increase awareness among policy-makers and wider publics of the value of evidence-based decision-making.

Priority theme 3.2: Science–policy interfaces at the global level			
Activities	ISC role and partnerships	Status	Time-frame
<u>Project on 'Science in and for the intergovernmental system'</u>	ISC role: Lead	Ongoing	2021 onwards
<u>Global Knowledge Dialogue Series (First event to be held in Oman, 30 January – 3 February 2023)</u>	ISC role: Lead	Ongoing	2023 onwards

Anticipated impacts:

- A strengthened relationship with key global decision-makers.
- A strengthened mandate for science and increased robustness of science–policy interfaces in global policy processes.
- Recognition of the ISC as a global go-to for independent, integrated scientific expertise, input and advice, in part through the triennial Global Knowledge Dialogue, jointly sponsored by ISC and the Omani Government, commencing in January 2023.

Ongoing strategic action

The ISC maintains an active role at the intersection of science and policy. Much of this work focuses on policy processes related to the UN's broader post-2015 development agenda, including the 2030 Agenda for Sustainable Development, the Sendai Framework for Disaster Risk Reduction, the Paris Agreement on Climate Change and the New Urban Agenda. In addition to collaborating with UN bodies (including UNEP, UNDP, UNDRR and WHO) in joint activities, the Council's roles within the UN system range from representing science and enabling scientific participation in UN events and processes to preparing independent scientific input and advice. Its formal responsibilities within the UN system include the coordination, together with the World Federation of Engineering Organizations (WFEO), of the international Scientific and Technological Community Major Group within the UN (<https://council.science/science-technology-major-group/>). In the coming years, the Council's work at the global science–policy interface will be informed by the recommendations of the Steering Group that is leading the project on 'Science in and for the intergovernmental system'. It will also be strengthened by closer alignment and active collaboration with the International Network for Government Science Advice (INGSA), which operates under the auspices of the ISC.



CHANGING PRACTICES IN SCIENCE AND SCIENCE SYSTEMS



Domain four: Effective and efficient processes within national science systems are essential to the role of science as a public good. They must adapt to new technologies, to new priorities that emerge both from the dynamic of scientific discovery and from societal needs. They must respond to the need for global collaboration in addressing the many challenges that confront humanity, recognizing that global solutions need global involvement and that the international science community's contribution needs to be built on principles of inclusivity. Open science concepts and actions are on the increase, while the interface between public and private science needs attention, as both are essential contributions to many of the global challenges that science must confront.

In the next planning period, ISC's work in this domain will focus on the following three themes.

Theme 4.1: Open science

A new era of open science is being built on the capacity of digital infrastructures. Publishing is fundamental to the scientific enterprise and to open science. It must be globally inclusive, with a voice for all, sensitive to diverse perspectives, and with ideas, evidence and data circulating freely, quickly and efficiently. An important ISC report identifies major current deficits in these respects, which is being followed up by a programme of action to achieve the necessary reforms. A further barrier to global implementation of open science is a persistent digital divide in low- and middle-income countries that inhibits access to a developing global open science community. The ISC addresses this issue through its support for open science platforms and activities in low- and middle-income countries in particular (in Africa, Asia and Latin America) and through its related work to exploit the potentials of the digital revolution for the Sustainable Development Goals (priority theme 2.2).

Theme 4.2: Engaged science

The ISC definition of open science includes the phrases that it is 'open to scrutiny and challenge, and to the knowledge needs and interests of wider publics' and 'open to engagement with other societal actors in the common pursuit of new knowledge, and to support humanity in achieving sustainable and equitable life on planet Earth'. In order to stress and to develop this crucial aspect of open science, the ISC identifies this complementary activity of engaged science, which involves the co-design and co-production of knowledge related to contemporary global challenges. This transdisciplinary approach pervades all the work of the ISC. It includes working in and with the private sector, how the roles of public and private sector are related, the role of citizen science and the contribution of Indigenous knowledge.

A group will be set up to scope the dimensions of this project, agreeing and promoting common understandings of transdisciplinarity, its implications and benefits, including the role of citizen science.

Theme 4.3: The evaluation of science

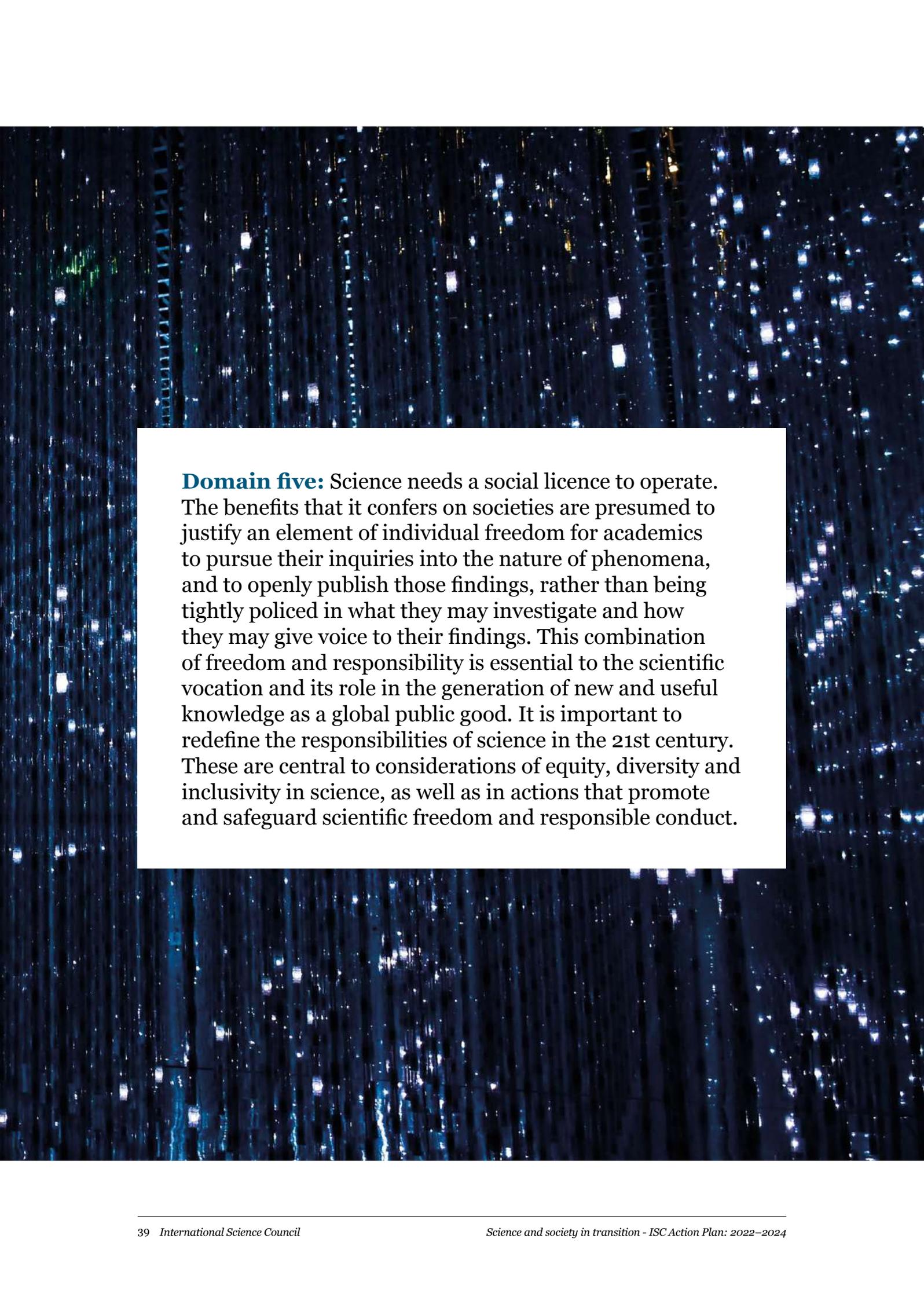
The ways that science and scientists are evaluated, particularly for purposes of promotion, play fundamental roles in creating incentives that determine scientists' behaviour and the operation of science systems. The precise mode of evaluation plays a pivotal role in current business models for scientific publishing, in the phenomenon of predatory publishing, and in undermining the provision of vital technical support staff in science, and can be a serious barrier to the development of open science. It has also led to a situation where much of the data about science, crucial to the strategic management of science systems, lies in the hands of private investors rather than the institutions of science.

Box 6. Domain 4 existing activities for the 2022–2024 period

Priority theme 4.1: Open science			
Activities	ISC role and partnerships	Status	Time-frame
Project on ‘ <u>The future of scientific publishing (Phase II)</u> ’	ISC role: Lead	Ongoing	2021–2024
Project on ‘ <u>Open Science in the “Global South”, including the development of Regional Open Science Platforms</u> ’	ISC role: Sponsor Partners: NRF, DSI in Africa; IAI in Latin America; ASM, Malaysia	Ongoing	2019 onwards
<p>Anticipated impacts:</p> <ul style="list-style-type: none"> • A common global understanding of the principles, needs, challenges and actions for the realization of open science, and support for a recommendation on open science by UNESCO member states that represents the interests, needs and values of the international scientific community. • Implementation of an agreed set of principles for scientific publishing and actions in collaboration with key stakeholders to advocate and realize reform. • Scientists and science systems in the low- and middle-income countries are positioned at the forefront of data-intensive, open science. 			
Priority theme 4.2: Engaged science			
Activities	ISC role and partnerships	Status	Time-frame
Project on ‘ <u>Private sector science</u> ’	ISC role: Lead	In development	2022–2024
<p>Anticipated impacts:</p> <ul style="list-style-type: none"> • Improved mechanisms of collaboration and agreed behavioural norms at the public/private interface, particularly at times of crisis. • Increased capacities for effective transdisciplinary engagement in processes of scientific knowledge co-design and co-production. 			
Priority theme 4.3: The evaluation of science			
Activities	ISC role and partnerships	Status	Time-frame
Project on ‘ <u>Evaluating science as a global public good</u> ’	ISC role: Co-Lead Partners: IAP, GYA	In development	2021–2024
<p>Anticipated impacts:</p> <ul style="list-style-type: none"> • Comparative understanding of the functioning and effects of research evaluation systems and approaches around the world. • Agreement on a context-sensitive system of metrics, and rules for its use, that enhances the value of research in serving the public good and that can be adopted at national level. 			



FREEDOM AND RESPONSIBILITY IN SCIENCE



Domain five: Science needs a social licence to operate. The benefits that it confers on societies are presumed to justify an element of individual freedom for academics to pursue their inquiries into the nature of phenomena, and to openly publish those findings, rather than being tightly policed in what they may investigate and how they may give voice to their findings. This combination of freedom and responsibility is essential to the scientific vocation and its role in the generation of new and useful knowledge as a global public good. It is important to redefine the responsibilities of science in the 21st century. These are central to considerations of equity, diversity and inclusivity in science, as well as in actions that promote and safeguard scientific freedom and responsible conduct.

In the next planning period, the ISC's work in this domain will focus on the following two themes.

Theme 5.1: Diversity, inclusivity and freedom in science

An ongoing social revolution in many societies is concerned with combating racism and gender stereotypes, recognizing the value of all and ensuring inclusivity. These issues are as important in science as they are in wider society. At the same time, political destabilization and the climate emergency have led to a new era of displacement of peoples seeking refuge in other countries. These pressures have also tended to inhibit freedom in the practice of science, while endemic inequalities have undermined the capacity of many states to support the science systems they need.

Theme 5.2: Responsible science

What are the responsibilities of scientists in the 21st century? Have they evolved because of the digital era in which science works, or because of changed political, social and economic expectations? Do settings of emergency influence the responsibilities of scientists? What responsibilities should scientists have for dual use of their discoveries? It is urgent that these questions be addressed systematically, with a view to arriving at a clearer understanding and recognition of scientific responsibility in the contemporary context.

Box 7. Domain 5 existing activities for the 2022–2024 period

Priority theme 5.1: Diversity, inclusivity and freedom in science			
Activities	ISC role and partnerships	Status	Time-frame
<u>Project on ‘Combating systemic discrimination in science’</u>	ISC role: Lead Partners: IAP, TWAS, WFEO, GYA, CIPSH, AAAS, IAU, Scholars at Risk, IHRN	Ongoing	2020–2024
<u>Project on ‘Gender equality in science’ (Phase II)</u>	ISC role: Co-Lead Partners: IAP, WFEO, GRC, Committee for Gender Equality in Science	Ongoing	2022–2024
<u>Project on ‘Science in Exile’</u>	ISC role: Partner Partners: TWAS (Lead), IAP	Ongoing	2020–2022
<u>Project on ‘Foresight for new collaborative platforms to support LMIC science systems’</u>	ISC role: Partner Partners: IDS (Lead)	Ongoing	2020–2022

Anticipated impacts:

- Increased awareness and concerted action that enables institutional change within the global science community to combat racism and other forms of systemic discrimination in science.
- Increased gender equality and inclusivity in science systems throughout the world.
- An active international network that coordinates action to protect and support refugee and displaced scientists, enabling them to continue their scientific work in safety and to contribute to the preservation and further development of science in their home countries.
- Agreed mechanisms for mobilizing collective action from science funders and science policy-makers to address persistent global inequalities in scientific capacity and in access to science.

Priority theme 5.2: Responsible science

Activities	ISC role and partnerships	Status	Time-frame
Project on ‘21st Century Guidelines for freedom and responsibility in science’ (Phase II)	ISC role: Lead	Ongoing	2021–2023
Project on ‘The conduct of scientists working in emergency situations’	ISC role: Co-Lead Partner: INGSA (Co-Lead)	In development	2022–2023
Project on ‘Global Guidance Framework to Harness the Responsible Use of Life Sciences’	ISC role: Partner Partners: WHO (Lead)	Ongoing	2021–2022

Anticipated impacts:

- Guidelines for action that are based on a globally agreed understanding of scientific freedom and responsibility in 21st-century science are adopted by scientific institutions at national to global levels.
- Action based on best practice guidelines for scientific research and science communication during emergency situations.
- Global dialogue on ‘dual use research of concern’ with the aim of harnessing the global health benefits of the life sciences, and the adoption by the UN of a global guidance framework for the ethical and responsible use of the life sciences.

Ongoing strategic action

In addition to the activities outlined in this domain of action, the Council’s Committee for Freedom and Responsibility in Science oversees ongoing work related to the monitoring and, where necessary, defence of the freedom of scientists to engage in scientific enquiry, exchange ideas, communicate knowledge and to associate freely in such activities. This work is essential to the ISC’s vision and mission and, together with actions that advocate the responsible practice of science, is embedded in the Council’s statutes.



ENABLING SUCCESS: ORGANIZATIONAL PRIORITIES FOR THE 2022–2024 PERIOD

Although science priorities are at the core of the Action Plan, the impact of its priorities in serving the mission of the ISC depends on efficient and effective working practices and delivery processes.

Drawing on experience in the 2019–2021 period, this section presents a set of organizational development goals aimed at improving these practices and processes.

5.1 ENGAGING MORE EFFECTIVELY WITH MEMBERS

The ISC's membership provides the essential foundation for the organization's work. Mutual advantage for the Council and its members will be pursued by:

5.1.1 Developing a comprehensive ISC membership engagement policy that institutionalizes effective engagement principles, processes and practices in the Council's operations.

The policy will be developed in consultation with members and under the leadership of the ISC's Committee for Outreach and Engagement (COE). It will build on the lessons learned to date, and on valuable insights gained from the one-on-one member conversations that have been conducted by the ISC secretariat during 2020 and 2021.

5.1.2 Establishing effective pathways for members to be more directly and actively involved in the Council's scientific activities.

As reflected in the 'ISC Activity and Achievement Report: July 2018 to June 2021', members currently contribute in important ways to the Council's ongoing activities via consultative processes, calls for input, representation on project Steering Groups and participation in project events. The intention for the forthcoming period is for the ISC to create opportunities for members to collaborate with each other, under the auspices of the Council, in leading the design and delivery of activities that address critical interdisciplinary needs in the international scientific agenda. In this regard, the Governing Board will:

- a. Reach out to members to invite their leadership and/or participation in processes aimed at scoping and developing concrete work plans for new ISC priority themes and activities identified in Section 4 above. These processes, which may include knowledge synthesis work, will be supported by the ISC through the allocation of designated seed funding.
- b. Solicit members' ideas on an annual basis for new international activities that are consistent with the Council's criteria for choice (as set out in Section 2) and domains of action (as per Section 4) and that should be developed and implemented by members or groups of members. Submissions will be reviewed by the Committee for Science Planning and its recommendations will be presented to the Board for final approval. In the 2022–2024 period the Board will allocate up to €100,000 per annum to support selected activities. Where necessary, and to ensure equitable access to such collaborative opportunities by members from low- and middle-income countries, the Board will support members in pursuing additional external fundraising opportunities.

5.1.3 Ensuring inclusive engagement.

The Council's mission places on it the responsibility, in pursuing its activities, to ensure its membership is as inclusive as possible. This requires that it take steps to ensure equitable access to collaborative opportunities, particularly by members from low- and middle-income countries. In addition to the steps in 5.1.2, above, further initiatives would include directed approaches to members to participate in relevant projects and working with members to develop new collaborative platforms to support low- and middle-income countries' science systems. Similarly, the Council will, in collaborative activities, work to promote inclusivity in relation to gender, and be responsive to issues of linguistic and cultural diversity.

5.2 EXPANDING THE MEMBERSHIP BASE

Two important priorities in relation to membership are implicit in the ISC's mission: that it should be able to address important issues requiring expertise across a broad disciplinary range, and that it should be globally representative.

5.2.1 Representing the broader spectrum of scientific fields and disciplines.

It is already the case that the ISC's work has required it to call upon expertise from fields of science such as medicine and public health, the humanities, and engineering and technological sciences that are not well represented, if at all, within the Council's membership. The Council has worked with individuals and representatives in these fields to bridge such gaps. In some cases, mutual support and interaction has taken place in the framework of formal agreements, such as that with the InterAcademy Partnership (IAP). A similar framework is in the process of being established with the World Federation of Engineering Organizations (WFEO).

For the Council to give substance to its mission in acting as the global voice for science, it is vital that its membership reflects the spectrum of sciences as broadly as possible. Efforts to add to its membership in areas not currently represented should be pursued with transparency towards existing members and relevant partner organizations. An example is provided by the agreement between the ISC and IAP, in which the organizations have made a commitment to promote each other's mission and membership.

5.2.2 Ensuring worldwide representation.

As the ISC is committed to represent and safeguard the interests of global science, its membership should, as far as possible, be globally representative. It will be an important priority for the 2022–24 period to extend the membership into those countries where it does not currently have a national member, with particular stress on extending membership in central, west and north Africa. The ISC remains committed to developing a regional strategy that works for all, ensuring the ISC can have both regional resonance and global impact. The ISC Governing Board and Headquarters team will continue to engage with members in all regions while continuing, in line with the ISC's first Action Plan, ongoing work to strengthen its effective presence in Africa, Latin America and the Caribbean, and Asia and the Pacific. The Governing Board will also consider pursuing engagements with regions or groupings beyond these, such as with the Small Island Developing States Liaison Committee established in 2020.

5.2.3 Building and implementing a common vision for the Council's longer-term sustainability.

In view of the evolution of the ISC's role since its launch in July 2018 it is timely to reconsider, in consultation with its current members, whether it would pursue its mission more comprehensively by extending its membership to new membership categories. These could include, for example, individuals, universities or university associations, and a wider diversity of non-governmental organizations or science-based businesses. The rationale for extending the membership in these ways must be clearly related to the role of the ISC in the international arena and not to an extension of membership for its own sake. Agreeing on an appropriate and sensible approach to extending the membership will also require a review, and possible revision, of the ISC's current dues structure and corresponding voting arrangements. Dealing with these matters in an integrated way will be essential to the success of the ISC's business model and its longer-term sustainability.

5.3 INCREASING THE ISC'S VISIBILITY AND INFLUENCE

The timeliness, quality and relevance of the ISC's work are the bedrock of its reputation. They are essential but not always sufficient in securing the influence needed to create desired impacts. In the 2022–24 planning period the ISC will increase its spheres of influence within and beyond scientific communities around the world by:

5.3.1 Adding to the group of ISC Patrons, who have worked effectively on the ISC's behalf, particularly in engaging communities beyond science.

5.3.2 Expanding partnerships with influential international bodies, as exemplified in Section 4, boxes one to seven. Working with highly regarded partners is essential to the evolving reputation, influence and potential of the ISC.

5.3.3 Exploring options for creating a network of ISC Fellows, with the intention of conferring this title on individuals who play a significant role in delivering the Council's programmes of work, in acting as ambassadors in promoting that work among key communities, or in engaging with international bodies to promote take-up of relevant ISC recommendations. The ISC Governing Board will give priority to designing appropriate Terms of Reference and associated processes for managing such a network.

5.3.4 Further building the Council's communications and outreach capability, ensuring that it is able to provide an increasingly interactive portal for members, as well as an effective source of public-facing information based on their work and the Council's own portfolio of activities.

5.4 ACCELERATING RESOURCE MOBILIZATION

The activities set out in Section 4 represent an ambitious range and scope of actions with a strategic intent consistent with the Council's vision and mission. The funding base and mix of member and external contributions are, however, not consistent with these levels of rapid growth in activity in the medium to long term. New sources of income will therefore urgently be required to fund the ISC's continued growth. In the coming period, and in addition to an increased emphasis on project-level fundraising, the ISC will give priority to the following:

5.4.1 Enabling philanthropic giving by developing relevant principles that guide the initiation and sustained development of relationships with philanthropic organizations and individual donors.

5.4.2 Engaging in a targeted fundraising campaign, with budgetary provision for new income streams arising from this campaign.

5.4.3 Pursuing the idea of establishing a charitable trust fund to provide a framework for long-term financial planning and increased security for core ISC functions and activities. This will require the development and implementation of a targeted ISC fundraising campaign, with budgetary provision for securing new core income streams. The Governing Board will also investigate the possibility of leverage by using funds from current reserves to secure matching funding from donors, referring by way of example to activities associated with the pandemic as a 'moment for science'.

5.5 ENHANCING ACCOUNTABILITY

It is important that a membership organization such as the ISC is, from time to time, subject to review by its members. Now that the trajectory of development of the ISC is becoming established, it is particularly important that its direction of progress, its priorities and its processes be scrutinized to gauge the extent to which they serve the purposes for which the Council was created by its membership, and the extent to which they do so in efficient and effective ways.

It is the view of the Governing Board that the optimal time for a review would be during the second year of the Council's second planning period, that is, five years after its launch and a year before its third action plan is due to be published. It is proposed therefore that a process of review be agreed with the ISC membership during 2022 and implemented during 2023.



CONCLUSION

Three years after its establishment as ‘the global voice for science’, the International Science Council has begun to find that voice and to learn how best to use it.

This second three-year Action Plan is designed to build on the robust foundations developed through the Council’s first planning period by tighter control and focus of its efforts, better utilization of the resources represented by its community and members, extension of its influence among significant international partners and stakeholders in the processes and applications of science, and through the energetic pursuit of its projects and programmes.

It does so in awareness of the need for science to enhance its global contribution to a complex world – one in transition for both science and society.

ABBREVIATIONS

AAAS	American Association for the Advancement of Science
AI	Artificial intelligence
ASM	Academy of Sciences, Malaysia
CAST	China Association for Science and Technology
CFRS	Committee for Freedom and Responsibility in Science
CIPSH	International Council for Philosophy and Human Sciences
CODATA	Committee on Data of the International Science Council
CODES	Coalition for Digital Environmental Sustainability
COE	Committee for Outreach and Engagement
COP26	26th Conference of the Parties to the UN Framework Convention on Climate Change
COVIDEA	Covid Education Alliance
DSI	Department of Science and Innovation, South Africa
FOGGS	Foundation for Global Governance and Sustainability
GFF	Global Forum of Funders
GRC	Global Research Council
GYA	Global Young Academy
IAI	Inter-American Institute for Global Change Research
IAP	InterAcademy Partnership
IAU	International Association of Universities
IDRC	International Development Research Centre
IDS	Institute of Development Studies
IHRN	International Human Rights Network of Academies and Scholarly Societies
IIASA	International Institute for Applied Systems Analysis
INGSA	International Network for Government Science Advice
IOC-UNESCO	Intergovernmental Oceanographic Commission of UNESCO
IRDR	Integrated Research on Disaster Risk
ISC	International Science Council
NORFACE	New Opportunities for Research Funding Agency Cooperation in Europe Network
NRF	National Research Foundation, South Africa
P4TT	Platform for Transformative Technologies
SDG	Sustainable Development Goal
Sida	Swedish International Development Cooperation Agency
T2S	Transformations to Sustainability programme
TWAS	The World Academy of Sciences
UBA	German Environment Agency
UKRI	UK Research and Innovation
UN	United Nations
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WDS	World Data System
WFEO	World Federation of Engineering Organizations
WHO	World Health Organization



International Science Council

The global voice for science

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Connect with us at:

www.council.science
secretariat@council.science

International Science Council
5 rue Auguste Vacquerie
75116 Paris, France

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