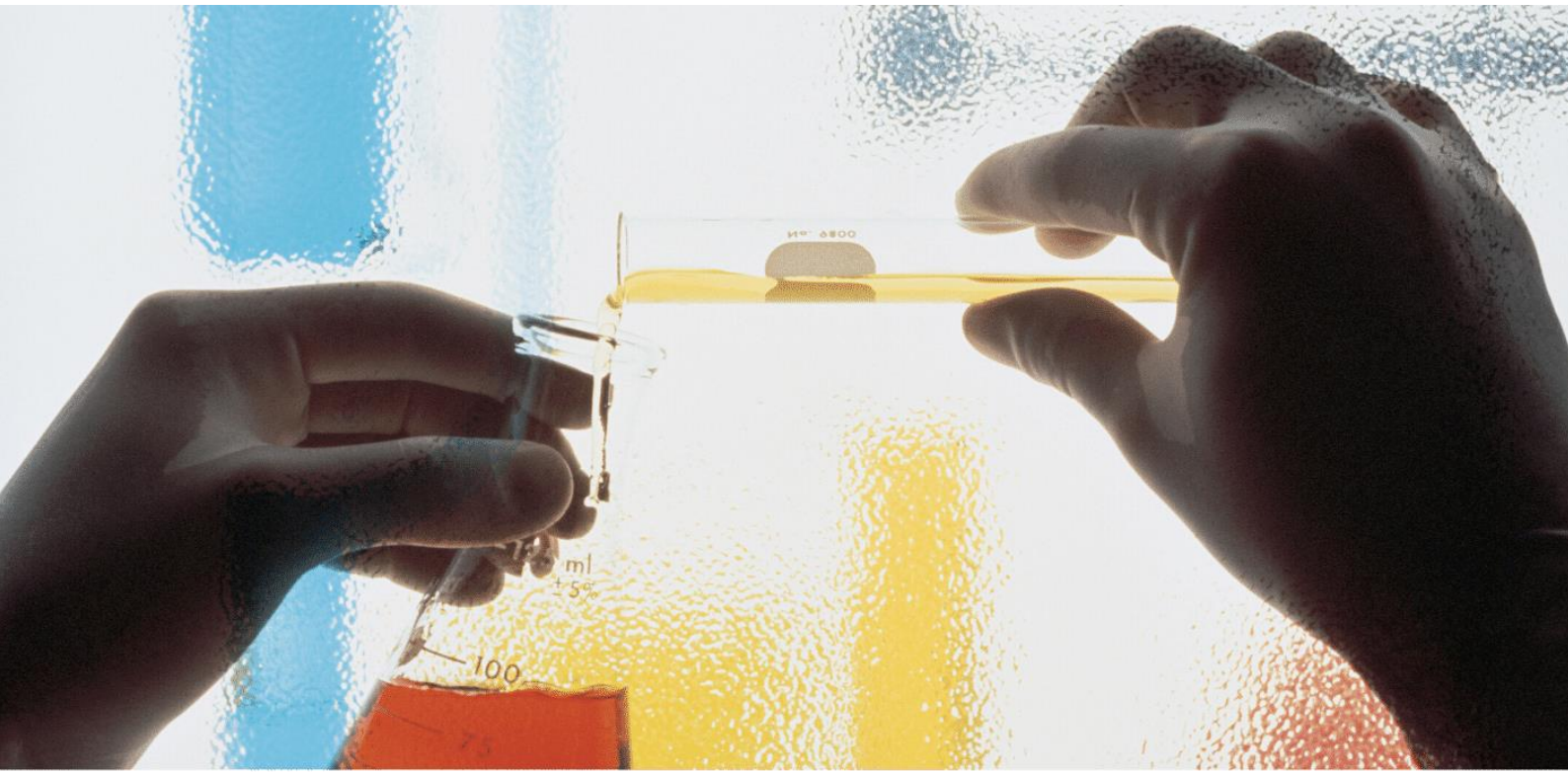
Supporting UNESCO Member States in Evidencing 10 Key Priority Areas:

Documenting Implementation Measures and Indicators for South Africa's 2017-2020 Monitoring Submission to UNESCO for the Recommendation on Science & Scientific Researchers



Survey Data Inputs for Part 2 of the UNESCO Reporting Form for South Africa

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Part II

Instructions: The national government is in the process of collecting information for its four-yearly report assessing the system of research and innovation according to international standards found in the Recommendation on Science and Scientific Researchers (2017). The topics below relate to all aspects of science and many aspects of society for the years 2017-2020, and require consultations with other parts of government and the science community.

Before replying, please gather the necessary background information. When a link is selected, a separate page will open where questions appear.

1 STI and national and international objectives

Science is part of Member States' efforts to develop more humane, just and inclusive societies and serves to further the United Nations ideals of peace and welfare of humankind.

The below topics refer to science in society grouped by the Key Priority Area 1

(a) have measures been taken to implement the norms and standards of the Recommendation?

(b) have any obstacles to compliance with the norms and standards been encountered?

1. STI and national and international objectives

	(a)	(b)
1.1 Helps achieve Sustainable Development Goals	Yes/No	Yes/No
1.2 Helps achieve Gender Equality	Yes/No	Yes/No

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Measures that have been taken to implement the norms and standards of the Recommendation

Evidence for Measures taken at the Member State Level

1.1 Helps achieve Sustainable Development Goals

The following national policies were identified by a drafting group composed by twelve scholars and researchers from different universities and commissions.

Acting on climate change
Implementation of the United Nations Framework Convention on Climate Change and its Paris Agreement is of paramount importance in South Africa. South Africa continues to invest in and to harness Science, Technology, and Innovation (STI) for SDGs, and this in cognisance of the impact of 4IR
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South Africa's National Development Plan 2030
https://www.gov.za/sites/default/files/gcis_document/201409/ndp-2030-our-future-make-it-workr.pdf

The plan outlines for instance the importance for socio-economic Development (page 26) ; health (page 26); "A wider system of innovation that links universities, science councils and other research and development role players with priority areas of the economy" (page 41); "Increase the number of students eligible to study towards maths and science based degrees to 450 000 by 2030" (page 62); "Expand science, technology and innovation outputs by increasing research and development spending by government and through encouraging industry to do so" (page 63); "Expand science, technology and innovation outputs by increasing research and development spending by government and through encouraging industry to do so".

In terms of the implementation, South Africa is making progress in terms of using science for healthcare decisions and there has been an increase in funding for science related career paths. However, there is a need for national coordinated approach towards evaluating the impact of the funding and other interventions geared towards promoting science as an enabler of socio-economic development.

See:
Chapter 4. Economy infrastructure. The foundation of social and economic development.
Chapter 5. Environmental sustainability. An equitable transition to a low-carbon economy.

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Chapter 9. Improving education, training and innovation.
Chapter 10. Promoting Health.
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Agenda 2063: The Africa We Want. https://au.int/en/agenda2063/overview
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RISDP 2020-2030 Blueprints
Chapter 2.1: An Industrialised Regional Economy that Sustainably Exploits its Natural Resources, Leveraging on Science, Technology and Innovation, p. 19.
https://imanidevelopment.com/wp-content/uploads/2020/03/4th-Draft_RISDP-2020-30-Blue-Prints2.pdf
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Constitution of the Republic of South Africa, Act 108 of 1996
--
National Development Plan 2030 (NDP)
--
2019 White Paper on Science, Technology and Innovation
--
Biodiversity Frameworks
--
United Nations Framework Convention on Climate Change (UNFCCC)
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Human Science Research Council (HSRC) Annual Report

1.2 Helps achieve Gender Equality

No evidence available from existing sources.

Evidence for Measures taken at the Level of Research Staff at Research Performing Organisations

1.1 Helps achieve Sustainable Development Goals

No evidence available from existing sources.

1.2 Helps achieve Gender Equality

No evidence available from existing sources.

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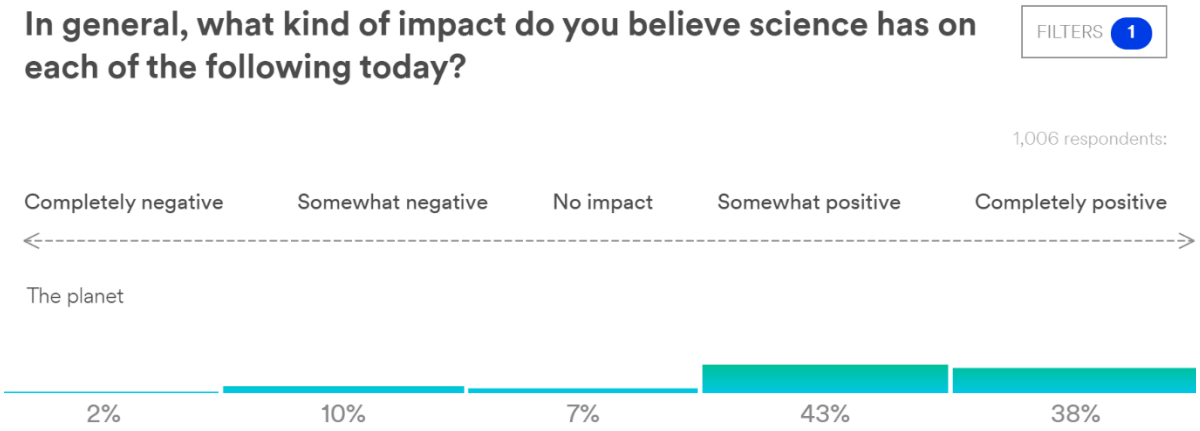
Evidence for Measures taken at the Level of Public Perspectives on Science and Scientific Researchers

1.1 Helps achieve Sustainable Development Goals

The following questions and their answers, extracted from the surveys mentioned in the Data Sources section, assess whether the general public recognise the value of science in taking care of the planet and the environment.

Question #13 from the 3M State of Science survey 2018 evaluates the perceived impact of science on different social scenarios and/or groups throughout time. The answers range from a 'completely negative" perception to a 'completely positive" perception. Regarding the impact of science on the planet, **43% of the people described it as somewhat positive, 38% as completely positive, 10% as somewhat negative and 2% as completely negative. 7% of the interviewees expressed that science has had no impact whatsoever on the planet.**

Figure 1: Question #13 from the 3M State of Science survey 2018



As a follow up to the previous question, question #15 from the 3M State of Science survey 2018 evaluates the perceived future impact of science on different social scenarios and/or groups. The answers range from a 'completely negative" perception to a 'completely positive" perception. Regarding the future impact of science on the planet, **42% of the people described it as completely positive, 37% as somewhat positive, 7% as somewhat negative and 4% as completely negative. 8% of the interviewees expressed that science will have no impact whatsoever on the planet.**

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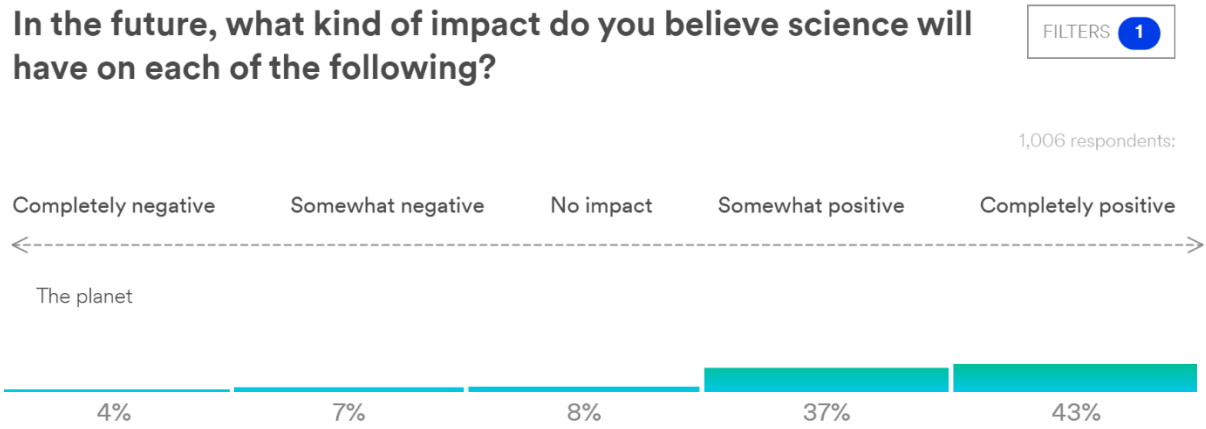
Figure 2: Question #15 from the 3M State of Science survey 2018



Another question of the 3M State of Science surveys evaluates the public perception of science and its impact on the world's problems. The interviewees were asked to select their level of agreement to the following statement: We need science to solve the world's problems. In 2019, **41% of the people somewhat agreed, 41% completely agreed, 14% somewhat disagreed and 4% completely disagreed.** In 2020, **44% completely agreed, 39% somewhat agreed, 13% somewhat disagreed and 4% completely agreed.**

Table 1 Question from the 3M State of Science survey 2019 (Q28) and 2020 (Q11)

We need science to solve the world's problems		
	2019	**2020**
Completely disagree	4%	4%
Somewhat disagree	14%	13%
Somewhat agree	41%	39%
Completely agree	41%	44%

1.2 Helps achieve Gender Equality

No evidence available from existing sources.

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2 STI and society

Member States' governments and the general public alike recognize the value and use of science and technology for tackling global challenges. Society is engaged in science and research through the identification of knowledge needs, the conduct of scientific research, and the use of results.

The below topics refer to science in society grouped by the Key Priority Area 2

(a) have measures been taken to implement the norms and standards of the Recommendation?

(b) have any obstacles to compliance with the norms and standards been encountered?

2. STI and Society

	(a)	(b)
2.1 Knowledge Society	Yes/No	Yes/No
2.2 Peaceful Applications of S&T	Yes/No	Yes/No
2.3 Scientific Culture	Yes/No	Yes/No

Measures that have been taken to implement the norms and standards of the Recommendation

Evidence for Measures taken at the Member State Level

2.1 Knowledge Society

The following national policies were identified by a drafting group composed by twelve scholars and researchers from different universities and commissions.

South Africa's National Policy Framework for Women's Empowerment and Gender Equality

https://static.pmg.org.za/bills/010710genderes.htm

The relevant section is found on page 6:

"Access to science and technology: As described in the Beijing+5 Report2, science and technology, as fundamental components of development, are transforming patterns of production, contributing to the creation of jobs and new ways of working, and promoting the establishment of a knowledge-based society. Given the large number of women in the workforce, South Africa must devise mechanisms for engaging women with science and technology in order to enhance their productivity and thus increase the quality of national production. Women should be actively involved in the definition, design, development, implementation and gender-impact evaluation of policies related to the economic and social changes referred to above."

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Gender Monitoring in STI in support of SADC Protocols on Science Technology and Innovation and Gender Development

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Focused implementation: the 10 key areas of the UNESCO Recommendation on Science and Scientific Researchers (2017)

This document addresses Key Area 2 - The need for science to meaningfully interact with society and vice versa. It provides an overview of the evolution of research, practice and policy around public engagement with science in South Africa, the latter of which has been articulated most recently in the Department of Science and Technology's (DST) 2019 White Paper on Science, Technology and Innovation.

The notion of meaningful interaction in the South African context is frequently referred to in terms of "Mode 2" (Gibbons) knowledge production. Mode 2 first entered into education

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policy discourse in the wake of Apartheid, when a small group of South African scholars[1] "came to exercise a very powerful influence in making higher education policy (Jansen 2002). Accordingly, the National Commission on Higher Education (NCHE) and the subsequent White Paper on Higher Education (Education White Paper 3) and the White Paper on Science bear and Technology bear Gibbons' hallmark. Unfortunately, however, and as Jansen's study describes via a case study in the Faculty of Engineering at the University of Durban Westville, attempts to apply Mode 2 principles, yielded disappointing results, owing to "entrenched institutional rules and behaviours" that undermined "any attempt to rethink the research and practice of engineering education even when such restructuring appear[ed] to work in the best interest of students".

In the years that followed, little policy progress was made toward aims of expanding public engagement in science. In 2009 the Human Sciences Research Council (HSRC) published a report entitled: Sciences and the Publics: A Review of Public Understanding of Science Studies. This report, although largely oriented around a now-discredited deficit model of public engagement, indicated an absence of mechanisms in South Africa for a systematic, comprehensive and nuanced assessment of the public's relationship with science, a lack of policy, and a failure of existing policy commitment to translated into programs and projects.

In the years that followed publications emerged from HSRC conferences related to transdisciplinary research, although these were still to an extent shaped by the same deficit model thinking prevalent in Europe's "Science in Society" paradigm, aimed at promoting science communication, rather than promoting genuine two-way public engagement[2]. These contrast with the subsequent publication of a book by Du Plessis et at (2014) that took a less instrumental approach to TDR[3], exploring possibilities of such practices for decolonising African universities, and address complex sustainability problems related to energy and social justice. Pockets of research innovation have also begun to appear, notably with a partnership between the Global Change Institute at the University of Witwatersrand and the City of Johannesburg's Environment and Infrastructure Service Department (EISD), who are co-designing an adaptation framework consisting of short- and long-term plans for coping with climate variability[4]. Interest also seems to be growing in applying transdisciplinary approaches to dealing with the devastating effects of the Co-Vid 19 virus, via for example an upcoming call for the Africa Young Graduates and Scholars (AYGS) 2021 Conference, which will explore the Future of Work in a Post COVID-19 Africa: Engaging Knowledge Production and Knowledge.

Despite increasing acknowledgement of the value of TDR, which points to its potential for "grasp[ing] the scale of the complexity humanity faces, [and] provid[ing] us with the means to

[1] Jansen (2002) specifically names Ahmed Bawa, Nico Cloete, Joe Muller, Mala Singh, Andre Kraak, and George Subotsky. See for example Kraak, A., 2000. Changing modes: A brief overview of the mode 2 knowledge debate and its impact on South African policy formulation. *Human science research. Pretoria*, pp.9-19.

[2] See for example the papers by Du Plessis "Communicating social sciences: following a transdisciplinary research approach in the public understanding of science (PUS)", and "Science communication and transdisciplinarity within an African context".

[3] Du Plessis, H., Sehume, J. and Martin, L., 2014. *Concept and application of transdisciplinarity in intellectual discourse and research*. Real African Publishers.

[4] https://www.wits.ac.za/gci/media/transdisciplinary-research-for-complex-wicked-challenges-/

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think, act and create innovatively"[5] (Mistra 2020:2), current policies remain inadequate for supporting the development of genuine forms of public engagement through all stages of scientific investigation. Moreover, plans outlined in the Department of Science and Technology's (DST) 2019 White Paper on Science, Technology and Innovation, *at least in their current form,* are unlikely to have a substantial impact. That this is the case is apparent from the definition of transdisciplinarity adopted by the report, as "research efforts conducted by investigators from different disciplines working jointly to create new conceptual, theoretical, methodological and translational innovations that integrate and move beyond discipline-specific approaches in order to address a common problem. A critical defining characteristic of transdisciplinary research is the inclusion of stakeholders in defining needs and hence research objectives and strategies"(2019) is instrumentally, and narrowly conceived relative to accepted scholarly definitions. Lang et al (2012, p. 27) for example, define TDR as "a reflexive, integrative, method driven scientific principle aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge".

The DST White Paper rightfully acknowledges that the world is changing fundamentally, driven by multiple, complex drivers that are socio-economic, geopolitical, scientific and technological, and environmental in nature, making transdisciplinary knowledge production increasingly important (DTI 2019: xi), yet the policy shifts foreseen in the White Paper seem instrumentally framed toward harnessing technological innovation as a means of stimulating economic growth, as are so many other government approaches to TDR. Accordingly, planned policy reforms are not likely to produce significant changes toward broader goals outlined by UNESCO Key areas 2 in pursuit of increased engagement of society throughout the entire research cycle, from the identification of knowledge needs, the conduct of scientific research, and the use of results. Of particular relevance interventions aimed at creating "An enabling innovation environment in South Africa" (see Chapter 4, pp. 30:42).

The White Paper states an intent to move "beyond R&D to a broader conceptualisation of innovation…supporting a whole-of-society approach to innovation…to ensure that all policies related to innovation (e.g., trade, competition, education and procurement policies) work together to support innovation in South Africa" (2019: xi). To this end the report indicates the introduction of mechanisms including those to strengthen support to business and SMEs, plans to develop an enabling legislative framework, notably by providing intellectual property rights (IPRs) for publicly funded R&D, and for increasing the uptake of locally developed technologies through government procurement. In addition, as a means of bolstering "innovation for inclusive development", the DST intends to introduce "a significant policy shift in including civil society in STI planning at all levels, and devoting resources to supporting grassroots and other neglected innovators. (DST xii)" These measures, while welcome, do not address broader aims embodied in UNESCO Key Area 2 of enabling upstream engagement in order to identify knowledge needs.

[5] https://mistra.org.za/wp-content/uploads/2020/05/Working-Paper-Linking-Transdisciplinarity-Practice-to-South-African-Science-Technology-and-Innovation-Policy-Final-Final-280420.pdf

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In addition, although the White Paper acknowledges that science, technology and innovation (STI) need to develop through "partnerships between business, government, academia and civil society" (2019: 2), and that thus far, processes for agenda setting have been " Inadequate", "non-inclusive", and have failed to involve civil society (2019: 9), little detail is provided in the document on how these failings will be systematically rectified. For example, in a section entitled "Policy intents and actions", under a sub-section "Improve inclusion and build more linkages across the NSI", the document states on page 24 an intention to "more explicitly bring civil society into the NSI fold". Yet the specific measures listed "to address the equality and empowerment of women, and to increase cooperation between relevant stakeholders" are entirely oriented to gender-related issue, with no reference at all to what broader civil society constituents might be included, or crucially, how. The following section, "3.3.2 Ensuring that STI enjoys support at the highest levels of government and business" DST 2019: 25) mentions an annual STI Plenary to be convened by the Presidency, including business, government, academia and civil society, but this again, no clear detail is provided in terms how meaningful engagement with civils society will be achieved, merely that STI plans and investment strategies will be reported on and discussed. A similar lack of detail is found in section on the same page "3.3.3 Ensuring that STI agenda setting and planning are based on ongoing stakeholder consultation and expert analysis", which mentions a strengthened National Advisory Council on Innovation in support of the Ministerial STI Structure in carrying out its mandate, to be achieved " for example, by following up on matters discussed at the STI Plenary", and by seeking advice "from relevant NSI institutions and think-tanks, for instance the Academy of Science of South Africa (ASSAf), the HSRC and the Centres of Excellence" Here the emphasis on engaging stakeholders seems mainly focused on drawing on academia, rather than a wider stakeholder community, which again, falls short of broad public engagement.

Furthermore, where the White Paper does refer to civil society directly, it asserts a somewhat unclear intent to assist this contingency "as a source of innovation, information, mentorship and networks" making efforts to "strategically link this sector to NSI actors such as technology stations and science councils", strengthening its function as an innovation *intermediary* [italics added] between government and grassroots innovators. The report implies intermediary roles in other ways, notably through the promotion of partnerships with publicly funded R&D institutions and science councils to *pilot and distribute* [italics added] technology for public benefit. These roles of testing and dissemination scientific and technological innovation again falls significantly short of UNESCO objectives of promoting *societal engagement for the identification of knowledge needs, and in the conduct of scientific research.* And while the White paper does assert that "Civil society will also be empowered to play a stronger role in planning and implementing projects that lend themselves to experimentation." (2019:41), the paper lacks detail on which types of civil society actors will be involved, how, in which sort of projects, and on whose terms.

To conclude, at the national level, no coherent policy seems to have been articulated that could be said to effectively address Key Area 2 on the meaningful interaction of science with society. While a sort of policy "blueprint" exists in the form of the DST White Paper, this lacks detail with regard to actual processes, and moreover seems to have been designed in the interests of harnessing a mainly technological framing of innovation for the sake of increasing economic

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growth. Accordingly, it seems unlikely that this draft policy will contribute significantly to UNESCO goals of making science "more open, accessible, efficient, democratic,and transparent"[6].

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2019 White Paper on Science, Technology, and Innovation

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Human Sciences Research Act 23 of 1968: Human Science Research Council (HSRC)

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DSI Local Economic Development (LED) work

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Grassroots Innovation Strategy

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Water Research Act and the Master Plan - DWS

The following answers were collected from a survey conducted by the RRING team with research policy experts in South Africa contributing information about policies relevant to different aspects of the key priority areas. The interviewees were asked if they have any national policies supporting the use of science and technology to tackle global challenges. The responses of each respondent are shown and presented as segments, where only the most relevant information for this indicator was retrieved.

Policy measures

1: National Research and Development Policy 2002: Science is global in reach and scope. It is critical, if we wish to retain top-class scientists in South Africa, that they are well connected to global research. It is also imperative that we tap into international human and financial resources to address South African research. It is also necessary to invest in the development of continental research networks to ensure that African scientists develop effective collaborations across the continent. www.dst.gov.za[7]

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1: The White Paper on Science and Technology 2019:building on South Africa's strong record in developing international STI partnerships, the White Paper introduces a systematic approach to expanding the internationalisation of STI and science diplomacy – with a strong focus on the African continent to support a pan-African agenda. the white paper stresses Strengthening international cooperation and science diplomacyLinkages between science and

[6] See Towards a UNESCO Recommendation on Open Science, p.2
[7] Required to be implemented. Attachment - Link.

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society, including public engagement, science diplomacy and internationalisation, are central to these ambitions. www.dst.gov.za[8]

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1: The National Development Plan Vision 2020 The unintended consequences of globalisation increase the pressure on government leaders to adjust global institutions to new realities, and to promote a more equitable global order. It is far from clear, however, that the structural tension between the accountability of all governments to their electorates will easily be reconciled with the need to address the challenges of the global commons in a responsible way. Pg 99[9]

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1: The National Development Plan Vision 2020[11]

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No segments provided[12]

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No segments provided[13]

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No segments provided[14]

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1: National Space Strategy[15]

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1: Science Engagement Strategy[16]

[8] Required to be implemented. Attachment. Page 99
[9] Required to be implemented. Attachment. Page 99
[10] Required to be implemented. Attachment
[11] Required to be implemented. Attachment.
[12] Required to be implemented.
[13] Required to be implemented.
[14] Required to be considered.
[15] Required to be implemented. Attachment.
[16] Required to be implemented. Attachment.

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1: Responsible Research and Innovation: Responsible Research and Innovation (RRI) is concerned with producing ethically acceptable, sustainable and socially desirable research and innovation outcomes. RRI is underpinned by the principle that research and innovation need to be responsive to a wide range of stakeholders and societal grand challenges, and be sensitive to the values, needs and expectations of South Africans

2: Responsible Research and Innovation: Responsible Research and Innovation (RRI) is concerned with producing ethically acceptable, sustainable and socially desirable research and innovation outcomes. RRI is underpinned by the principle that research and innovation need to be responsive to a wide range of stakeholders and societal grand challenges, and be sensitive to the values, needs and expectations of South Africans

3: 1.1.3 The evolution of the global STI policy environment South Africa must take cognisance of the changing global STI environment. Policy trends across OECD countries have various implications for South African STI policy. Foremost among these is that OECD countries are shifting the composition of their STI funding by increasing public financial support to firms (at the expense of public research), amid a projected stabilisation of public R&D budgets. The OECD group is focusing on immediate economic priorities and policy efficiency gains (such as public research capacity, business innovation and entrepreneurship, governance, and improving framework conditions for innovation) rather than long-term issues (such as structural adjustment, sustainability and green growth). The OECD group is further setting up an agenda to advance Responsible Research and Innovation (RRI). A South African focus on RRI would help local researchers to collaborate and compete with their foreign counterparts in a world where ethical concerns (such as fair trade) and environmental concerns (such as emission standards) are increasingly influencing competitiveness. Access to R&D funding has become increasingly competitive and countries are developing their research systems accordingly. South Africa will have to follow suit. Any strategy to attract foreign R&D funding would have to take the shifting patterns of global funding into account, particularly the increasing role of large firms in the national R&D effort (meaning that international collaborative efforts will have to shift to firms). South Africa needs to concentrate on increasing the research capacity of domestic firms and strengthening their competitiveness in global value chains

4: 2.2.9 Instilling a Responsible Research and Innovation approach to support environmental sustainability and ethical STI STI can help build a basis for a knowledge-based society and a healthy economy, but it can also cause harm. South Africans should develop a shared normative understanding of what is appropriate for our reality. A South African RRI approach would rest on the following pillars, based on the European Union's RRI framework: (i) engagement of all societal actors throughout the process of framing societal challenges and developing joint solutions; (ii) addressing racial and gender transformation to unlock the full potential of South African society; (iii) improving the educational and skills profile of South Africans; (iv) increasing open access to STI; (v) maintaining a high level of ethics in terms of

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the relevance and acceptability of STI to society and environmental sustainability; and (vi) developing the required governance framework to drive the RRI agenda across the NSI.[17]

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1: Health Disease burdens South Africa's health system. The way in which South Africa chooses to address global challenges such as communicable diseases plays an important role in determining the country's research agenda. South Africa needs to develop the ability to manufacture drugs, vaccines and other biologics locally, to improve the health sector's bio-economy and to help the country achieve its public health goals.

2: Sustainable industries There is increasing demand and preference for sustainable renewable biological resources and bioprocesses as mechanisms for new and revitalised industries. There is opportunity to decouple industrial growth from environmental degradation through more sustainable production methods using industrial-scale biotechnology. South Africa currently imports all its enzyme requirements. Developing local manufacturing in this area will decrease reliance on imports. Enzymes are a strategic area of interest as they help heavy industries become more environmentally sustainable by reducing water usage, energy consumption, greenhouse gas emissions and other toxic wastes. The need to respond to global challenges such as climate change, energy and food security in the context of limited water supplies and productive land and the need to reduce carbon emissions should be seen as an opportunity. Economies of scale in the biofuels industry can drive scarce skills development (particularly in engineering and production), and research and development in fermentation technology and crop improvement.[18]

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1: 2.1 Vision for an ICT Landscape for South Africa The vision of the ICT R&D and Innovation Strategy is that by 2015: South Africa is an inclusive information society where ICT-based innovation flourishes. Entrepreneurs from historically disadvantaged population groups, rural communities and the knowledge-intensive industry benefit and contribute to the well-being and quality of life of our citizens. South Africa has a strong national ICT brand that captures the vibrancy of an industry and research community striving for excellence, characterised by innovative approaches to local and global challenges, and recognised for its contribution to the economic growth and well-being of our people and the region. The vision for an ICT future for the country within the next 10 years encompasses a South African ICT landscape that has made a material socio-economic impact.[19]

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No segments provided[20]

[17] Required to be considered. Link. Pages: viii, viii, 6, 19.
[18] Required to be considered. Link. Pages: 4, 32.
[19] Required to be considered. Link. Pages: 21.
[20] Required to be implemented.

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1: This requirement is mentioned in several places as part of the "2019 White Paper on Science, Technology and Innovation".[21]

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1: With these broad goals in mind, section 3 presents the grand challenges facing the science and technology system over the next decade. The grand challenges outlined in this plan address an array of social, economic, political, scientific, and technological benefits. They are designed to stimulate multidisciplinary thinking and to challenge our country's researchers to tackle existing questions, create new disciplines and develop new technologies. This bold innovation strategy will require policy leadership by the DST and strengthened cooperation across government. The grand challenge areas are: • The Farmer to Pharma value chain to strengthen the bio-economy • Space science and technology • Energy security • Global-change science with a focus on climate change • Human and social dynamics Progress in all these areas will be based on the three foundations: technology development and innovation, human capital and knowledge infrastructure (including the research institutions mandated to promote sector research). Figure 3 illustrates the interconnections between these foundations and the grand challenge programmes. While the latter are structured within a national context, international collaboration and partnerships will be essential to success.

2: South Africa is clustered with countries such as Poland, Russia and Brazil. The implication is clear: for South Africa to join the ranks of wealthier countries, it needs to increase its knowledge output substantially. This will require an increase in R&D expenditure. For example, while average R&D spend by the OECD countries in 2004 was 2.3 percent of GDP, and China's was 1.35 percent that year, South Africa invests a mere 0.91 percent of GDP on R&D.9 This plan is based on the premise that the government's growth targets require a significant investment in innovation, balanced and targeted in accordance with the full range of national priorities. Ultimately, such investment will contribute to more rapid economic and social transformation. By committing to growing the base of scientists and engineers, both in general and in areas offering the most economic potential over the long term, South Africa is investing in human capital that will serve its needs well into the future. By targeting development and new global industries, the country can reduce its dependence on imported technology, and become more self-sufficient in such basic commodities as energy and food. The Ten-Year Innovation Plan presents a framework of indicators drawn up by DST in collaboration with other partners.[22]

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1: Develop a common understanding within government in particular the Department of Higher Education and Training, Department of Science and Technology, Department of Trade and Industry, Public Enterprises, Treasury, Economic Development on how to promote the

[21] Required to be considered. Attachment.
[22] Suggested. Attachment - Link. Pages: 18 and 19.

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role of science and technology and higher education in shaping society, the future of the nation and the growth path.[23]

2.2 Peaceful Applications of S&T

The following answers were collected from a survey conducted by the RRING team with research policy experts in South Africa contributing information about policies relevant to different aspects of the key priority areas. The interviewees were asked if their country has specific policies for ensuring that members of the general public are engaged through the process of conducting research (e.g., through well-designed citizen science initiatives). The responses of each respondent are shown and presented as segments, where only the most relevant information for this indicator was retrieved.

Policy measures

1: Academy of Science of South Africa Act, 2001The Act establishes the Academy of Science of South Africa to promote common ground in scientific thinking across all disciplines, including the physical, mathematical and life sciences, as well as human, social and economic sciences; to encourage and promote innovative and independent scientific thinking; to promote the optimum intellectual development of all people; to advise and facilitate appropriate action in relation to the country's needs, opportunities and challenges; and to link South Africa with high-level scientific communities within the Southern African Development.[24]

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1: National Advisory Council on Innovation Act, 1997 The Act establishes the National Advisory Council on Innovation to advise the Minister responsible for science and technology and, through the Minister, the Cabinet, on the role and contribution of science, mathematics, innovation and technology in promoting and achieving national objectives.[25]

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1: NATIONAL POLICY DEVELOPMENT FRAMEWORK 2020 The Nation Policy Development Framework will guide all government departments in drafting their respective public policies. The framework seeks to standardise the policy formulation processes across all spheres of government. In doing so, it will set out the basis for policy development (codifying practices and processes), coordination, policy making cycle, expected standards and institutional arrangements to be put in place for effective policy development and implementation.[26]

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[23] Suggested. Attachment - Link. Pages: 275.
[24] Attachment.
[25] Attachment.
[26] Attachment.

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1: The mandate of SAASTA is to interact with the public on issues of science, engineering, and technology; to communicate the advances in these fields to the public, and to steer young minds to careers in science, engineering, and technology (SET).[27]

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1: Science Engagement South Africa's innovation revolution must assist in solving our society's deep and pressing socio-economic challenges. Global competitiveness, shrinking resource availability, and the requirements of a skilled labour force mean that, increasingly, an awareness and understanding of why science and research are critical to our lives is essential for developing an innovation culture. To fully realise the social, economic, and environmental benefits of the significant investment in science, research, and innovation, we as a country must communicate and engage the wider community more fully in science and in an understanding of the knowledge economy to which we aspire. 1.1 A cross–cutting mandate The NRF acknowledges the role of science engagement in the achievement of the NRF strategic goals. An important aspect is to ensure that the knowledge that is produced through NRF funding is widely disseminated, shared, understood, and used widely for the common good. For this reason, a new corporate division was created in the 2011/12 financial year. The NRF's Science Engagement programme has a crosscutting mandate that aims to strategically align all science engagement activities across the organisation. The South African Agency for Science and Technology Advancement (SAASTA) is a business unit of the NRF tasked with facilitating the communication and advancement of science. The programme also accounts for the decentralised science engagement activities at the National Research Facilities, SKA SA and a developing focus through the new RISA renewal process. RISA is optimally positioned to contribute towards coordinated, consistent, and effective science communication and engagement policy and implementation that will make a meaningful contribution to bridging the gap between science and society. 1.1.1 South African Agency for Science and Technology Advancement (SAASTA) The mandate of SAASTA is to interact with the public on issues of science, engineering, and technology; to communicate the advances in these fields to the public, and to steer young minds to careers in science, engineering, and technology (SET). These goals are pursued through a large number of science engagement programmes that fall under three key strategic areas: Science education, which aims to build the supply of tomorrow's scientists and innovators; Science communication, through which SAASTA shares science and technology achievements with the public, building up their appreciation of and engagement with the benefits and risks of science; and Science awareness platforms, which engage the public with the phenomena of science, engineering and technology. 1.1.2 Science Engagement at National Research Facilities The National Research Facilities perform a critical role in the science engagement agenda through providing science awareness platforms that are used to: Improve the scientific and technological (S&T) literacy and awareness of South Africans ; Encourage the inclusion of S&T content in educational programmes and curricular activities; Host regular science-related activities and national events that engage the broader public; Host educator workshops for improving the understanding and delivery of science concepts; and Conduct summer and

[27] Link.

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winter schools for prospective postgraduate students. SAASTA and the National Research Facilities interact closely with a network of science centres, higher education institutions, science councils, professional science associations and a host of other science-based entities at national and international levels to engage the public in science, engineering and technology. They have adopted a matrix, ensuring that the SAASTA cross-cutting science engagement strategy is implemented without encroaching on the operational activities of the National Research Facilities. 1.1.3 RISA Science Engagement The RISA Renewal process in 2012/13 has seen an emphasis placed on the communication of research and broader engagement with public audiences. This has required a more integrated approach to science communication and engagement across NRF. Both SAASTA and Corporate Relations personnel are included in all RISA instruments to advance the focus on science engagement through individual research projects. This portfolio is developing as the projects roll out into full project mode. Some activities to be supported in the 14/15 business cycle include: Three Regional SA PhD conferences; Annual Postdoc Research Forum; Public lectures, especially by visiting scientists; Media profiling of SARCHI and COE's(print and radio); Science communication training for postgraduates and postdoctoral fellows; Public engagement support through the African Focus interventions; and Publications for public audiences.[28]

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1: The NRF, therefore, has the responsibility to maintain the National Research Facilities in "state-of-the-art" condition so that they are in a position to fulfil a number of critical functions in the science system. These include: • Making qualified contributions to national research priorities and platforms (e.g. astronomy); • Contributing to national human resources development and training initiatives (e.g. scarce skills development); • Fostering strategic regional, continental and international linkages (e.g. by means of National Research Facilities' Flagship programmes); and • Promoting and advancing science education and awareness, through SAASTA, by means of public outreach and strategic community engagement programmes (e.g. Winter and Summer Schools for high school learners and undergraduate students). To fulfil these goals, the NRF has a national responsibility to ensure the sustainability of these programmes and initiatives through: • Appropriate resourcing of the research platforms at the National Research Facilities; • Ensuring the effective utilisation of the installed infrastructure; • Maximising the many, targeted international linkages and networks; and • Undertaking strategic community engagement programmes in cooperation with SAASTA. By enhancing the infrastructure, management and operations of these facilities, the NRF will – in consultation with the Board and the Ministry for Science and Technology – at regular intervals provide strategic advice regarding the appropriate placement of the National Research Facilities within the NSI, as well as provide advice on the creation of new national research facilities (for example, within the Humanities and Social Sciences disciplines). One proposal which will be implemented during the tenure of this plan will be to encourage the joint appointment of appropriately qualified National Research Facilities researchers at relevant HEIs to foster mentoring and training of postgraduate candidates, as well as provide access to the infrastructure available at the National Research Facilities. Joint

[28] Link.

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development and implementation of postgraduate programmes, such as the NASSP, will be encouraged. Another unit of the NRF, SAASTA, may upon superficial analysis be questioned by some in terms of fit within the NRF family of units. A more meticulous analysis will reveal that SAASTA's mandate fits very well with the NRF mandate, and is even complementary to it. The SAASTA mandate reads as follows: The South African Agency for Science and Technology Advancement (SAASTA) aims to advance public awareness, appreciation and engagement of science, engineering and technology in South Africa. This is achieved through education, science communication and direct engagement interventions for youth and the society at large.

2: Core Competencies of the NRF Core competencies are those areas in which an organisation has distinctive advantages, or activities that the organisation performs better than any other institution within the NSI landscape. As part of mapping the way forward for the organisation and considering its strategic position, we have also attempted to redefine the core competencies of the NRF. These core competencies are embedded in providing: • Leading-edge grant management systems; • World-class research benchmarking; • State-of-the-art research platforms; • Strategic science information; • Facilitation of international science cooperation, networks and partnerships; • Science advancement through community engagement; • Catalyst for system-wide research collaboration; and • Science and technology management. The NRF recognises that these core competencies are largely based on the tacit knowledge the organisation possesses, which is valuable, and difficult to imitate. They should be continually strengthened and nurtured by reflecting on the values and culture of the organisation, thereby ensuring that they are not lost in the process of strategy implementation. NRF Values Statement In the context of the new Strategic Plan, the NRF Vision 2015, it was deemed opportune that the values of the organisation be revisited to ensure alignment with the overall direction and strategy. Within this context, the NRF management embarked upon a series of Value Sharing Workshops conducted throughout the NRF business units. The objective of the workshops was to foster, in a bottom-up process, a single set of values to define a common organisational culture for the NRF. The values are intended to fulfil several objectives, including to: • define accepted organisational norms and behaviours; • provide a benchmark for staff to use for selfevaluation of professional behaviour and responsibility; • communicate to both internal and external stakeholders that the NRF takes its ethical commitments seriously; • promote high standards of business practices; and • enhance the NRF's reputation to all its stakeholders. The shared values synthesised from this process are: • Passion for Excellence • World-class Service • Respect • People-centred • Ethics and Integrity • Accountability These values are to be integrated into the NRF Code of Conduct and Practice and as a guide for ethical reasoning and decision-making that will ensure that all in the NRF meet the highest standards of conduct in all our dealings as staff of the NRF. Strategic Goals of the NRF Taking into account the NRF's vision and mission statements, as well as our core competencies, we have formulated a five-point plan for the organisation by means of which we have identified five major high-level strategic goals for the next six to seven years. These strategic goals are depicted in Figure 5. As shown, these strategic and performance goals serve as the drivers for achieving a system-wide

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impact in the form of a prosperous and sustainable African landscape and in determining a knowledge society for the benefit of all.[29]

2.3 Scientific Culture

The following national policies were identified by a drafting group composed by twelve scholars and researchers from different universities and commissions.

Science Engagement Strategy – SAASTA

https://www.pub.ac.za/wp-content/uploads/2018/10/2015-Science-Engagement-Strategy.pdf

The Science Engagement Strategy (SES) was approved by the Minister of Science and Technology in January 2015. The SES formalises and provides strategic direction to the science engagement programme led by the Department of Science and Technology (DST), which dates back to 1998.

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The College of Science, Engineering and Technology (CSET) at The University of South Africa has *a policy document regarding the science community engagement in the College*, within the policies of community engagement of the institution.

The following answers were collected from a survey conducted with research policy experts in South Africa contributing information about policies relevant to different aspects of the key priority areas (with the support of the ICoRSA Policy Research Unit under the auspices of the RRING project). The interviewees were asked if their country has a national strategy for public engagement with science. The responses of each respondent are shown and presented as segments, where only the most relevant information for this indicator was retrieved by the responding research policy experts. Where the research policy experts only provided a link, this has been provided below.

Policy measures

No segments provided[30]

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No segments provided[31]

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No segments provided[32]

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[29] Link.
[30] Link - Attachment.
[31] Link.
[32] Attachment.

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No segments provided[33]

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No segments provided[34]

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No segments provided[35]

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No segments provided[36]

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No segments provided[37]

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No segments provided[38]

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No segments provided[39]

When asked if they have a general requirement for public/societal engagement with science in their constitution, domestic legislation, policy or regulatory frameworks, the research policy experts expressed the following:

Policy measures

1: NATIONAL POLICY DEVELOPMENT FRAMEWORK 2020 The Nation Policy Development Framework will guide all government departments in drafting their respective public policies. The framework seeks to standardise the policy formulation processes across all spheres of government. In doing so, it will set out the basis for policy development (codifying practices and processes), coordination, policy making cycle, expected standards and institutional arrangements to be put in place for effective policy development and implementation.[40]

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1: The HSRC Code of Ethics The HSRC is committed to using the public funds allocated to it to undertake and promote research that will benefit all the people of South Africa. As HSRC research, therefore, is aimed at supporting societal goals, this research belongs to the public domain and as such should be able to withstand public scrutiny at all times. HSRC research

[33] Link.
[34] Link.
[35] Link.
[36] Attachment.
[37] Link - Attachment.
[38] Link - Attachment.
[39] Link - Attachment.
[40] Attachment.

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focuses on people, and the bulk of the information and data gathered is accordingly likely to be of a personal nature to the participants in the research. www.hsrc.ac.za

2: Academy of Science of South Africa Act, 2001The Act establishes the Academy of Science of South Africa to promote common ground in scientific thinking across all disciplines, including the physical, mathematical and life sciences, as well as human, social and economic sciences; to encourage and promote innovative and independent scientific thinking; to promote the optimum intellectual development of all people; to advise and facilitate appropriate action in relation to the country's needs, opportunities and challenges; and to link South Africa with high-level scientific communities within the Southern African Development.[41]

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[41] Attachment - Link.
[42] Attachment.
[43] Attachment.

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research, therefore, is aimed at supporting societal goals, this research belongs to the public domain and as such should be able to withstand public scrutiny at all times. HSRC research focuses on people, and the bulk of the information and data gathered is accordingly likely to be of a personal nature to the participants in the research.

2: NATIONAL POLICY DEVELOPMENT FRAMEWORK 2020 The Nation Policy Development Framework will guide all government departments in drafting their respective public policies. The framework seeks to standardise the policy formulation processes across all spheres of government. In doing so, it will set out the basis for policy development (codifying practices and processes), coordination, policy making cycle, expected standards and institutional arrangements to be put in place for effective policy development and implementation.

3: National Research Foundation Act, 1998 This Act stablished the National Research Foundation to promote basic and applied research as well as the extension and transfer of knowledge in the various fields of science and technology. Over and above individual research and research infrastructure grants awarded to support the conduct of research that engages public, the NRF has established strategic programmes that focuses on various areas of strategic importance, i.e., Centres of Excellence, and the South African Research Chairs Initiative, some of which conduct research that directly involves public. To provide for the support, promotion and advancement of research, both basic.

4: Human Sciences Research Council Act, 2008 This Act promotes research that generates critical and independent knowledge relative to all aspects of human and social development.[44]

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1: Public Awareness of S&T Access to information is empowering, enabling people to monitor policy, lobby, learn, collaborate, campaign and react to proposed legislation. It is also one of the most powerful mechanisms through which social and economic progress can be achieved. The democratisation of society and elimination of poverty can only occur if people have equal access to the services and resources, they need to perform their productive tasks. Democracy implies being aware of choices and making decisions. The extent to which this is possible depends largely on how much information is available to the people and how accessible it is. For the national system of innovation to become effective and successful all South Africans should participate. This requires a society which understands and values science, engineering and technology and their critical role in ensuring national prosperity and a sustainable environment. This, in turn, requires that S&T information be disseminated as widely as possible in ways that are understood and appreciated by the general public. Recent history has demonstrated the potential of technology to improve the quality of people's lives. Yet disadvantaged populations in general and women in particular, especially those in rural areas, have little access to information about these technologies. To date, a combination of factors have prevented them from gaining equitable access to the information they need and have thus limited their ability to participate more fully in the transformation process in South Africa. A campaign to promote awareness and understanding of S&T and of its importance

[44] Attachment.

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will have two key elements, namely promoting S&T literacy on the one hand, and promoting the power of S&T on the other. These programmes would include • increasing familiarity with the natural world • promoting understanding of some of the key concepts and principles of S&T • demonstrating that science, engineering and technology are social tools and • fostering the ability to use S&T knowledge in ways that enhance personal, social, economic and community development. The deficiencies of the current system are multifaceted. The solution of this problem requires an innovative approach in itself. All available SET institutions in South Africa should be actively involved in such an initiative. Government will institute via DACST the delivery of S&T public awareness programmes in collaboration with consortia of institutions, including societies for the advancement of science, professional associations, academies of science, science museums and libraries, media (printed and electronic), educational institutions and private business.[45]

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1: under the guidance of the DST, such a policy framework will be developed to describe the purpose, functions and governance of Public Research Institutions relevant to national development as guided by the NDP, taking into account the roles of all stakeholders. This will involve clarifying the general purpose of such institutions and the strategic mandates of the DST and other line departments in this respect, and taking into consideration the current capacities of these institutions. Interventions to enhance coordination across different Public Research Institutions and funding agencies will also be developed. The work of the STIIL Review Panel will inform the implementation of the policy framework by way of the decadal plan. As the mandates of Public Research Institutions are refined according to this policy framework, an appropriate evaluation framework will be put in place to enable objective assessment of their efficiency levels. This will be a prelude to interventions to improve productivity across the focus areas of Public Research Institutions. The evaluation criteria will include requirements for expanding collaboration with civil society, industry and international partners (e.g., to establish international research institutes). In particular, the requirement to maintain and expand the science base will be incorporated. The ambitions underpinning this White Paper – excellence, inclusion, partnerships and pan-African collaboration – will be built into the evaluation framework

2: Innovation policy should enable all sectors of society to equitably access knowledge infrastructure and participate in creating and actualising innovation opportunities, and ensure that all individuals share in the benefits of innovation. There is growing interest in broadening the concept of innovation to include innovation for inclusive development, i.e., innovation for societal benefit and the public good. Globally, there is greater activity and benefit in bottom-up, grassroots, distributed and local innovation. The public sector needs to become an enabler of innovation for inclusive development. This can be done, for example, by strengthening ICT applications for e-government, e-learning and e-health, and can include co-creation and user-led initiatives using socially innovative methods such as living labs. 38 DEPARTMENT OF SCIENCE AND TECHNOLOGY 2019 | White Paper on Science, Technology and Innovation "Actions in support of broad-based and grassroots innovation and

[45] Link. Pages: 76-77.

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entrepreneurship can strongly sustain a process of inclusive growth." The Organisation for Economic Cooperation and Development (OECD), 2018 4.10 Policy intent: Support innovation for social and grassroots innovation The approach will involve widening the range of stakeholders and deepening their engagement in deliberative planning. Over the past decade, grassroots innovation, as a particular priority within the broader innovation for inclusive development agenda, has gained prominence in STI initiatives, both globally and in South Africa. Support for grassroots innovation will be a planning priority in all relevant initiatives. It will be funded accordingly, and monitored in all relevant M&E frameworks. Developers of local economic development plans, as well as provincial growth and development strategies, will be encouraged to include support for grassroots innovation, and innovation scouting in plans. A multi-tiered package will provide support appropriate to the level of development of grassroots innovators. Mentorship will be incentivised through a government-funded voucher system and awards, and complemented by corporate social responsibility programmes. Grassroots innovators will be capacitated and supported by, for example, supplier development programmes. Government will further leverage the potential of publicly funded IP to support grassroots innovation. South Africa will develop a country-specific, second-tier patent system, offering a cheap, no-examination protection regime for technical inventions that would not usually fulfil the strict patentability criteria. With the introduction of a substantive patent search and examination system at the Companies and Intellectual Property Commission (CIPC), a preferential accelerated patent examination system will be introduced for SMEs, broad-based black economic empowerment firms, previously disadvantaged individuals, and young innovators, depending on criteria such as the involvement of start-up firms. Civil society will also be assisted in its many roles, including as a source of innovation, information, mentorship and networks. Efforts will be made to strategically link this sector to NSI actors such as technology stations and science councils. Its function as innovation intermediary between government and grassroots innovators will be strengthened. Training packages will be developed, using social media and digital technologies, to equip civil society with innovation development skills. Collaboration within the civil society sector will be strengthened and incentivised, including partnerships with publicly funded R&D institutions and science councils in piloting and distributing technology for public benefit. Finally, as part of its drive to increase funding to the NSI, and to target investments to help address national priorities, government will work with NSI partners to develop an appropriate funding instrument for grassroots innovation. The objective will be to target both neglected and marginalised groups of innovators, including the youth, as well as to support innovations with high social returns that are unlikely to gain traction because of market and other failures.

3: The South African research system is diverse, with pockets of excellence, for instance in the biomedical field. This chapter outlines how outputs can be reoriented and increased by expanding and transforming the research system in response to a rapidly changing and increasingly technologically advanced world. The application of research to help address health challenges and to grow understanding of how social groups interact with each other are but two examples of how knowledge from different fields (in this case in the natural and social sciences) interacts to increase understanding of and help address South Africa's long-

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standing and grave challenges. However, research and the creation of knowledge have far more than just instrumental value. Research also contributes to the development of an empowered and thinking citizenry that functions effectively, creatively and ethically as part of a democratic society. To achieve these aims will require attention to the supply of high-level skills, the openness of the system, the diffusion of knowledge, and access to scientific infrastructure. Linkages between science and society, including public engagement, science diplomacy and internationalisation, are central to these ambitions.

4: 5.6.1 Open Science and Open Innovation The OECD estimates that 30 per cent of innovation in Europe is open in the sense of being shared. For example, the Philips Research Campus in Eindhoven invites industry participation with a view to facilitating collaboration between publicly funded and privately funded research. The Bill & Melinda Gates Foundation's malaria project is also using data from a number of resources, because open innovation means that the disease can be addressed more quickly. It must be remembered, however, that open innovation does not mean “free”. Patents and IPR still apply, but only at the end of the innovation process. The DST is actively examining the transition to open science and open innovation. This will call for appropriate regulatory frameworks and data skills development, as discussed below. Incentives for open science will be fostered through education programmes and career development programmes for researchers. A focus on citizen science will also be introduced. Barriers to open science will be evaluated and where necessary removed, ensuring that legislation and practice support, rather than thwart, the principles of open and collaborative science. Government will therefore review these, taking into account certain aspects of IPR from publicly funded research and accepting that open science, open innovation and IP, and the associated rights, are not mutually exclusive. Government will also review the policies and institutions governing access to research data and research publications. The DST, in consultation with DTPS and DHET, will produce a national open science (and data) framework consisting of principles and guidelines for the adoption of open science in South Africa. The framework will be used as a vehicle for awareness raising and training on good practice. As a general principle, publicly funded research and research data may, after a careful analysis, be made available (with some exceptions including data that can compromise sovereign security and which is of a confidential nature). Government will encourage researchers to deposit data arising from research in publicly accessible repositories, and to support open journal publishing and data sharing, providing access to data and other research outputs arising from publicly funded research. In this manner, research will be made more transparent, rigorous and efficient in stimulating innovation and promoting public engagement.[46]

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1: The two documents already uploaded (2019 White Paper and 2015 Science Engagement Strategy refer here). There are too many relevant segments for me to upload here.[47]

[46] Link. Pages: 27, 38, 44, 52.
[47] Link.

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The interviewees were also asked if their country has a national strategy to ensure that societal knowledge needs are identified. The responses of each respondent are shown and presented as segments, where only the most relevant information for this indicator was retrieved.

Policy measures

1: The National Research Foundation Act 23 of 1998 To provide for the support, promotion and advancement of research, both basic and applied, and human capacity development in the various fields of science and technology, including humanities, social science and indigenous knowledge; and for this purpose to provide for the establishment of a National Research Foundation; to support and promote science engagement; to develop, support, advance and maintain national research facilities; to promote the development and maintenance of the national science system and support of Government priorities; and to provide for incidental matters.[48]

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1: National Advisory Council on Innovation Act, 1997 The Act establishes the National Advisory Council on Innovation to advise the Minister responsible for science and technology and, through the Minister, the Cabinet, on the role and contribution of science, mathematics, innovation and technology in promoting and achieving national objectives.[49]

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1: The Education White Paper 3: A Programme for the Transformation of Higher Education (July 1997) and the Higher Education Act (Act 101 of 1997) provide the policy and legislative framework for transforming the higher education system and its institutions to be more responsive to societal interests and needs. Implementation of this framework began in 1998. The White Paper emphasises that successful policy must restructure the higher education system and its institutions to meet the needs of an increasingly technologically orientated economy. It must also deliver the requisite research, the highly trained people and the knowledge to equip a developing society with the capacity to address national needs and to participate in a rapidly changing and competitive global context. The White Paper recommends a focus on science, engineering and technology programmes to correct imbalances, particularly the shortage of trained personnel in these fields. All higher education institutions are currently undergoing transformation to redress past imbalances.[50]

When asked if South Africa has specific policies for ensuring that accurately identified societal knowledge needs from society are used to orient research investment in their country, the research policy experts expressed the following:

Policy measures

[48] Attachment.
[49] Attachment.
[50] Link.

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No segments provided[51]

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1: Public investment in R&D needs to be redistributed away from the support of activities within the government's own facilities and towards more comprehensive support of R&D executed in the private sector. Nevertheless, this long-term need must be seen in the light of the government's current responsibilities, namely to take a lead • in pre-competitive research, until a culture develops in the private sector where such research is seen as a business imperative • where entry barriers related to equipment and human resources are high • in areas where the activity is considered to be a service which the government has a duty to provide, and • in areas of public good in which, to achieve the greatest benefit, the research results and technology transfer need to be placed in the public domain.

2: Enhancing Quality of Life The means to ensure that the governmental research portfolio gives due attention to those areas of R&D with the capacity to affect quality of life must be established, and specifically in domains where market failure is high such as the following : • environmental sustainability • health care provision • meeting basic needs at the community level • reducing the total cost of infrastructure provision • providing safety and security to all who live and work in South Africa. The government has a duty to ensure that an appropriate portion of the money it spends on science is utilised in these areas. Urban and rural communities need to be assisted and encouraged to adopt social and technological innovations to assist them in decisionmaking and to enhance their ability to make informed choices.

3: The principal blueprint for action adopted by government is the Growth and Development Strategy, adopted by Cabinet in late 1995. The six pillars of that strategy are: • Investing in people as the productive and creative core of the economy • Creating employment on a large scale while building a powerful, internationally competitive South African and southern African economy • Using enhanced investment in household and economic infrastructure both to facilitate growth and improve the quality of life of the poor • A national crime prevention and security strategy to protect the livelihood of our people, secure the wealth of the country and promote investment • Transforming government into an efficient and responsive instrument of delivery and empowerment, able to serve all South Africans while directing government resources primarily to meet the needs of the poor majority • Using a system of welfare "safety nets" to draw the poorest and most vulnerable groups progressively into the mainstream of the economy and society. The policy proposed in this White Paper is specifically designed to reinforce the pillars of the Growth and Development Strategy.

4: Increased co-ordination of innovation policies and strategies in response to the complex challenges generated by global social and economic changes. A national system of innovation that addresses the needs and aspirations of its citizens, while maintaining a competitive edge, must have a high measure of strategic and creative interaction among its constituent elements. The promotion of a national system of innovation as a framework for social and

[51] Link.

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economic policy maximises the possibilities for all parts of the system to interact with each other to the benefit of individual stakeholders or groupings of stakeholders and the advancement of national goals. For example, the close co-operation between government, industry and research institutions is a prerequisite for projects designed to produce growth and development in accordance with national goals. Increasingly, the co-ordination of innovation strategies and initiatives within a national system of innovation will extend beyond the boundaries of national states as regional imperatives grow stronger. The development of a national system of innovation in South Africa will have to take into account social and economic developments in neighbouring countries with a view to eventually developing a regional system of innovation as a crucial long-term guarantee of regional stability and upliftment.[52]

The interviewees were also asked if South Africa has a national strategy for the communication of research results. The responses of each respondent are shown and presented as segments, where only the most relevant information for this indicator was retrieved.

Policy measures

1: The HSRC Code of Ethics The HSRC is committed to using the public funds allocated to it to undertake and promote research that will benefit all the people of South Africa. As HSRC research, therefore, is aimed at supporting societal goals, this research belongs to the public domain and as such should be able to withstand public scrutiny at all times. HSRC research focuses on people, and the bulk of the information and data gathered is accordingly likely to be of a personal nature to the participants in the research.[53]

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1: National Research Foundation Act, 1998 This Act stablished the National Research Foundation to promote basic and applied research as well as the extension and transfer of knowledge in the various fields of science and technology. Over and above individual research and research infrastructure grants awarded to support the conduct of research that engages public, the NRF has established strategic programmes that focuses on various areas of strategic importance, i.e., Centres of Excellence, and the South African Research Chairs Initiative, some of which conduct research that directly involves public.[54]

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No segments provided[55]

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[52] Link.
[53] Attachment - Link.
[54] Attachment.
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1: se previous page of survey[58]

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1: This is the same strategy document uploaded before - SCIENCE ENGAGEMENT FRAMEWORK developed by the Department of Science and Technology in 2014/15, now known as the Department of Science and Innovation.[59]

Finally, when asked if South Africa has a national strategy for ensuring that research results are used to benefit society, the research policy experts expressed the following:

Policy measures

1: National Research Foundation Act, 1998 This Act stablished the National Research Foundation to promote basic and applied research as well as the extension and transfer of knowledge in the various fields of science and technology. Over and above individual research and research infrastructure grants awarded to support the conduct of research that engages public, the NRF has established strategic programmes that focuses on various areas of strategic importance, i.e., Centres of Excellence, and the South African Research Chairs Initiative, some of which conduct research that directly involves public.[60]

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1: I would say that the 1996, and 2019 White Papers do this, but also see the DSTs SCIENCE ENGAGEMENT STRATEGY IMPLEMENTATION PLAN (2017) : Background The DST seeks to develop a society that is literate/knowledgeable about science and engages critically with science issues. Endeavours to do so date back to 1998 and have continued over the years without adequate strategic coherence. In order to formalise and guide a national programme towards the envisioned society, the DST adopted the SES in January 2015. In terms of the strategy, the envisioned society will be realised by pursuing four objectives that will shape all future DST-led science engagement initiatives and provide a basis for realigning existing initiatives. These objectives are the following: (a) To popularise science, engineering, technology and innovation as attractive, relevant and accessible in order to enhance scientific literacy and awaken interest in relevant careers. (b) To develop a critical public that actively engages and participates in the national science and technology discourse to the benefit of society. (c) To promote science communication that will enhance science engagement in South Africa. (d) To profile South African science and technology achievements domestically

[57] Link.
[58] Link.
[59] Attachment.
[60] Attachment.

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and internationally, demonstrating their contribution to national development and global science, thereby enhancing their public standing.[61]

Evidence for Measures taken at the Level of Research Staff at Research Performing Organisations

2.1 Knowledge Society

The following questions and their answers, extracted from the surveys mentioned in the Data Sources section, assesses the researchers´ perspective on whether science and technology are being recognised as valuable to tackle global challenges, as well as their level of commitment to engage with society. This is an indicator of whether the researchers´ feel committed or are being encouraged to work with the community in order to solve societal problems.

Question #11.1 from the RRING survey assesses whether scientific researchers´ think it is important to make the results of their research and innovations work accessible to as wide a public as possible. The responses range from Strongly Disagree to Strongly Agree. **65% of the researchers strongly agree with the statement, 26% agree and 1% strongly disagree.**

Table 2: Question #11.1 from the RRING survey on socially responsible research/innovation

Please specify your agreement with the following statement:

- It is important to make the results of my research and innovations work accessible to as wide a public as possible

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	N/A
1%	0%	0%	0%	6%	26%	65%	1%

Following the same line, question #11.2 and #11.3 from the RRING survey goes deeper and asks what steps have the researchers´ taken to make the results of their research accessible to the public. **72% of the researchers expressed having taken steps in the last 12 months. 8% said no and 4% were unsure.**

Table 3: Question #11.2 from the RRING survey on socially responsible research/innovation

In the last 12 months, have you taken steps to make the results of your research and innovation work accessible to as wide a public as possible?

Yes	No	Unsure	N/A
72%	8%	4%	15%

[61] Link.

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Regarding the steps taken to make the results of their research accessible to the public by the researchers who said yes in the last question, **30% of them said making their research and innovation (R&I) results publicly accessible. 24% specified sharing their work within a professional R&I stakeholder environment, and 12% said engaging with non-academic/public stakeholders through outreach activities after research is completed.**

Table 4: Question #11.3 from the RRING survey on socially responsible research/innovation

If yes: What steps, if any, have you taken to make the results of your research and innovation work accessible to as wide a public as possible?

Step	Percentage
Non-specific, vague, platitude or virtue signalling response	4%
Public accessibility of R&I results	30%
Institutional- or project-based/supported publishing of research findings (outside of scholarly publishing)	3%
Publishing/disseminating R&I outputs using institutional open access repositories or external open access databases	4%
Personally publishing/disseminating R&I outputs to the public outside of scholarly publishing	7%
Engaging with non-academic/public stakeholders through outreach activities after research is completed	12%
Promoting R&I results in the media	5%
Open access scholarly publishing	7%
Upstream engagement and participatory approaches with non-academic/public stakeholders shaping direction of the research	1%
Another step taken to make R&I results available to the public	1%
Sharing R&I work within professional R&I stakeholder environments	24%
Unclear / Uncertain	1%

2.2 Peaceful Applications of S&T

No evidence available from existing sources.

2.3 Scientific Culture

The following questions and their answers, extracted from the surveys mentioned in the Data Sources section, addresses socially inclusive identification of knowledge needs. This is an indicator of whether scientific researchers are conducting upstream public engagement.

Question #5.1 from the RRING survey assesses whether scientific researchers´ think it is important to involve individuals and/organizations with a diverse range of perspectives and expertise when planning their research and innovation work. The responses range from Strongly Disagree to Strongly Agree. **47% of the researchers strongly agree with the statement, 31% agree, 11% somewhat agree, 1% strongly disagree and 8% expressed feeling neutral about it.**

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Table 5: Question #5.1 from the RRING survey on socially responsible research/innovation

Please specify your level of agreement with the following statement:

- It is important to involve individuals/organizations with a diverse range of perspectives and expertise when planning my research and innovation work

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	N/A
1%	0%	0%	8%	11%	31%	47%	1%

Going deeper into the topic, question #13.1 from the RRING survey assesses whether scientific researchers´ think it is important to involve individuals and/organizations with a diverse range of perspectives and expertise when planning their research and innovation work. The responses range from Strongly Disagree to Strongly Agree. **61% of the researchers strongly agree with the statement, 24% agree, 8% somewhat agree, 3% strongly disagree and 3% expressed feeling neutral about it.**

Table 6: Question #13.1 from the RRING survey on socially responsible research/innovation

Please specify your level of agreement with the following statement:

- Research and innovation should address societal needs

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	N/A
3%	0%	0%	3%	8%	24%	61%	1%

Question #13.2 and #13.3 from the RRING survey continues with the same issue and asks what steps have the researchers´ taken to ensure their research and innovation work addresses societal needs. **69% of the researchers expressed having taken steps in the last 12 months. 5% said no and 8% were unsure.**

Table 7: Question #13.2 from the RRING survey on socially responsible research/innovation

In the last 12 months, have you taken steps to ensure your research and innovation work addresses societal needs?

Yes	No	Unsure	N/A
69%	5%	8%	17%

Regarding the steps taken to make the results of their research accessible to the public by the researchers who said yes in the last question, **46% of them said addressing societal needs in their R&I work, and 25% specified selecting the research topic by their own perception of societal needs.**

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Table 8: Question #13.3 from the RRING survey on socially responsible research/innovation

If yes: What steps, if any, have you taken to ensure your research and innovation work addresses societal needs?

Step	Percentage
Non-specific, vague, platitude or virtue signalling response	6%
Addressing societal needs in R&I work	46%
Participatory process: research topic/problem defined by societal needs	1%
Selection of research topic/problem defined by researchers´ perceptions of societal needs	25%
Societal issues as a substantive dimension in R&I content/focus	8%
Reflecting on/evaluating R&I impact on societal needs	1%
Communicating R&I work/activities to public/non-academic stakeholders	2%
Other step taken to address societal needs in R&I work	8%
Unclear / Uncertain	1%

Evidence for Measures taken at the Level of Public Perspectives on Science and Scientific Researchers

2.1 Knowledge Society

The following questions and their answers, extracted from the surveys mentioned in the Data Sources section, assess whether the general public "recognise value and use" in what science and technology are offering to society.

Question #19 from the 3M State of Science survey 2018 assesses whether the general public think that science can find solutions for several global challenges. **Among the top global challenges that people think that science will find solutions for are energy supply (84%), clean water supply and sanitation (81%), disease treatment (80%), access to affordable renewable energy sources (80%) and internet access (77%).**

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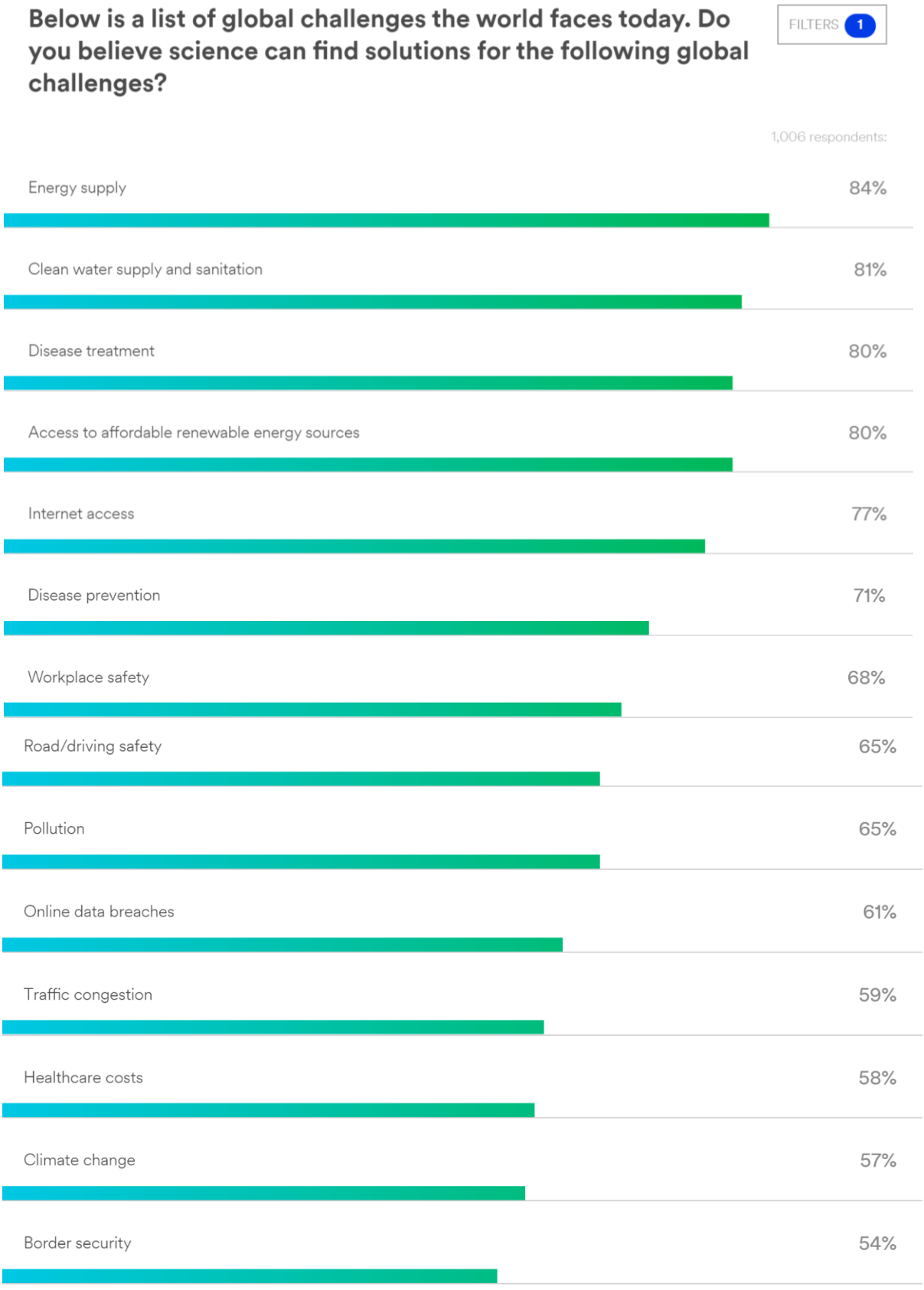
Figure 3: Question #19 from the 3M State of Science survey 2018



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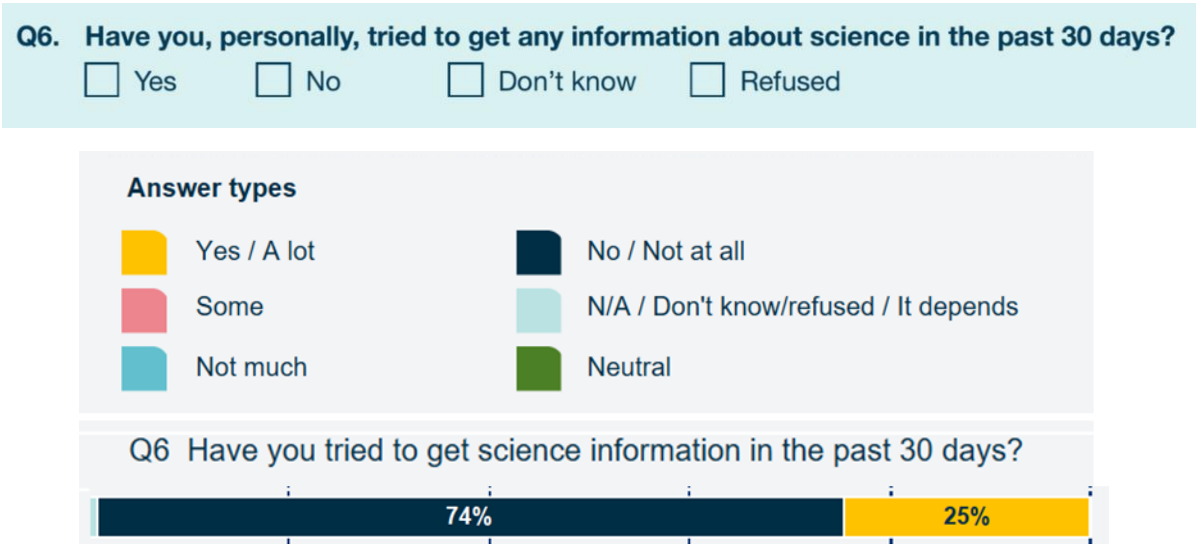
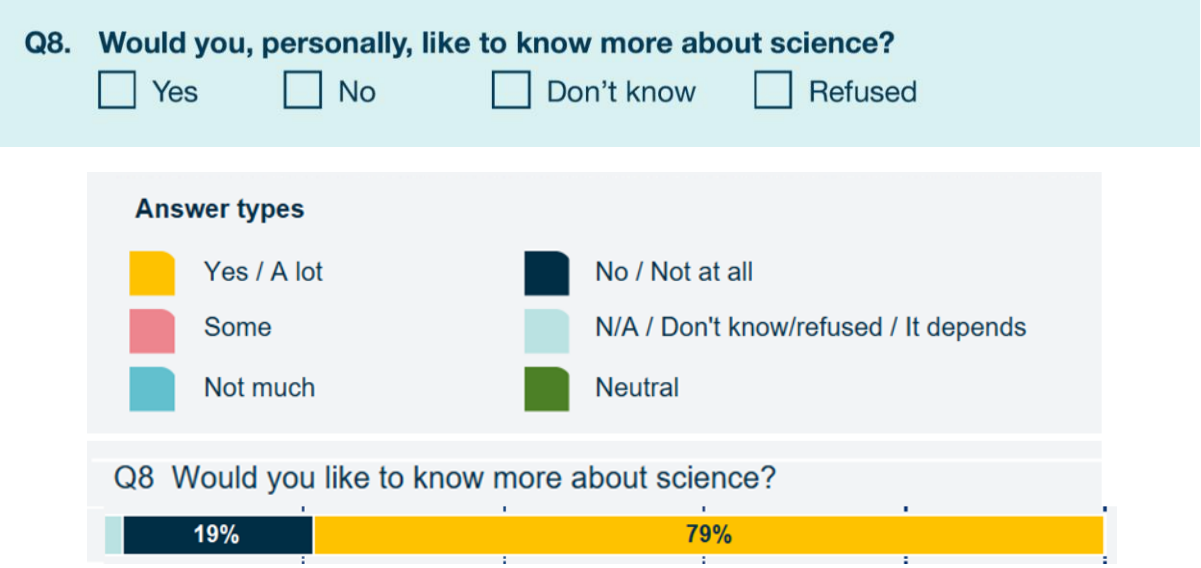
Question #6 from the WGM survey 2018 evaluates the interest of the public in obtaining information about science in the past 30 days. Results from the data generated by this particular survey question indicate whether the general public see value in investing their time obtaining this type of information. **74% of people indicated they didn't try to get any information about science in the past 30 days, while 25% specified that they did.**

Figure 4: Question #6 from the Wellcome Global Monitor Survey 2018



Question #8 from the WGM survey 2018 assesses the public's interest in knowing more about science. The question implicitly measures whether members of the public see value or utility in expanding their understanding of science. **79% of people indicated they would like to know more about science, while 19% specified that they wouldn't.**

Figure 5: Question #8 from the Wellcome Global Monitor Survey 2018



One question of the 3M State of Science surveys evaluates the level of support for science activities and discoveries. The results show the activities and/or habits that the general public does in their daily lives in order to support science. In 2019, **24% of the people indicated sharing science advancements with their social circle, 25% specified staying up-to-date**

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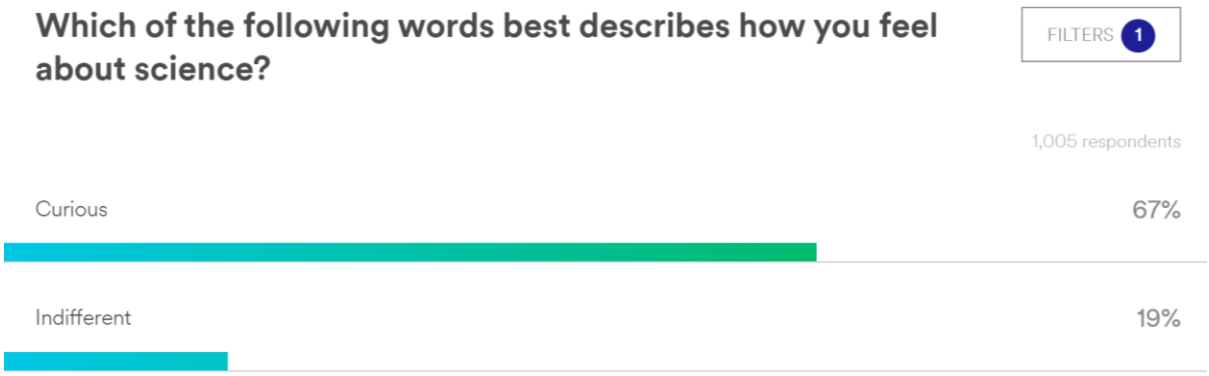
in the latest scientific discoveries, 19% confirmed standing up for science when debating with others, 17% expressed sharing science advancements on their social media accounts and 10% said being a vocal supporter of science on social media. In 2020, **28% of the people indicated sharing science advancements with their social circle, 27% specified staying up-to-date in the latest scientific discoveries, 20% confirmed standing up for science when debating with others, 19% expressed sharing science advancements on their social media accounts and 12% said being a vocal supporter of science on social media.**

Table 9: Question from the 3M State of Science survey 2019 (Q21) and 2020 (Q43)

Which, if any, of the following do you do to support science activities and advancing scientific discoveries?		
	2019	2020
I share science advancements with friends, family, and colleagues	24%	28%
I stay up-to-date on the latest scientific discoveries	25%	27%
I stand up for science when debating its merits with others	19%	20%
I share science advancements on social media	17%	19%
I am a vocal supporter of science on social media	10%	12%

Question #3 from the 3M State of Science survey 2019 assesses how the general public feels about science. These answers could shed some light on the reasons behind their decision of whether or not they would like to know more about science. **67% of the people indicated feeling curious and 19% feeling indifferent.**

Figure 6: Question #3 from the 3M State of Science survey 2019



Going deeper into this topic of emotions, one of the questions of the 3M State of Science surveys evaluates the perception of the role of science over the next 20 years. In 2019, **81% of the people indicated feeling optimistic and 19% feeling pessimistic.** In 2020, **80% specified feeling optimistic while 20% expressed feeling pessimistic.** Regarding the trust in science, in 2019 **57% of the people indicated trusting and 43% feeling suspicious.** One year later, **64% specified trusting in science while 36% expressed feeling suspicious.**

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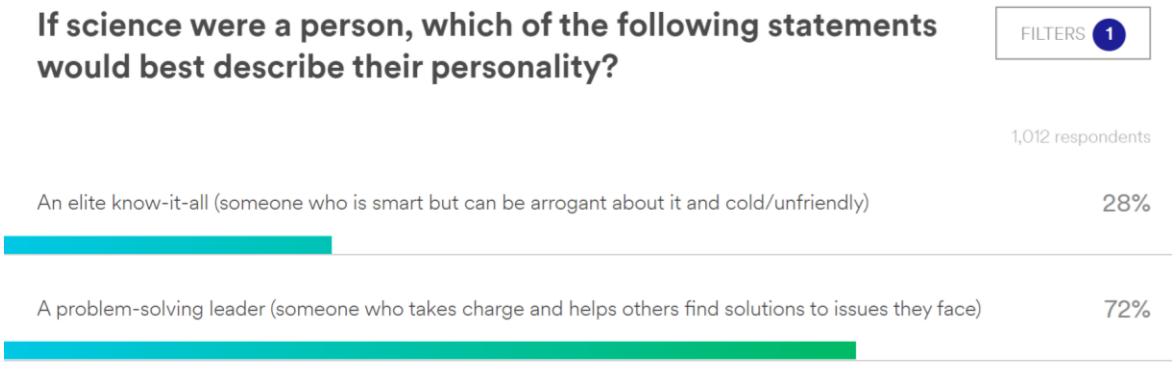
Table 10: Question from the 3M State of Science survey 2019 (Q5) and 2020 (Q1)

When you think about the role of science over the next 20 years does it make you feel more…		
	2019	2020
Optimistic	81%	80%
Pessimistic	19%	20%
Trusting	57%	64%
Suspicious	43%	36%

Question #13 from the 3M State of Science survey 2020 assesses the public perception of science by providing the interviewees two different options to describe the 'personality' of science: one them being an elite know-it-all and the other being a problem-solving leader. **72% of the people indicated that if science were a person, it would be best described as a problem-solving leader. 28% expressed that science would be an elite know-it-all.**

Figure 7: Question #13 from the 3M State of Science survey 2020



Another question of the 3M State of Science surveys evaluates the level of interest of the public in knowing more about science. In this question, the interviewees had to select their level of agreement to the following statement: I wish I knew more about science. In 2018, **47% of the people completely agreed, 41% somewhat agreed, 9% somewhat disagreed and 3% completely disagreed.** In 2019, **47% of the people completely agreed, 38% somewhat agreed, 10% somewhat disagreed and 5% completely disagreed.** In 2020, **51% of the people completely agreed, 36% somewhat agreed, 9% somewhat disagreed and 4% completely disagreed.**

Table 11: Question from the 3M State of Science survey 2018 (Q6)

I wish I knew more about science in general			
	2018	2019	2020
Completely disagree	3%	5%	4%
Somewhat disagree	9%	10%	9%
Somewhat agree	41%	38%	36%
Completely agree	47%	47%	51%

Question #24 from the 3M State of Science survey 2018 evaluates the perceived barriers to scientific advancement, being the lack of interest and trust in science one of them. This is an

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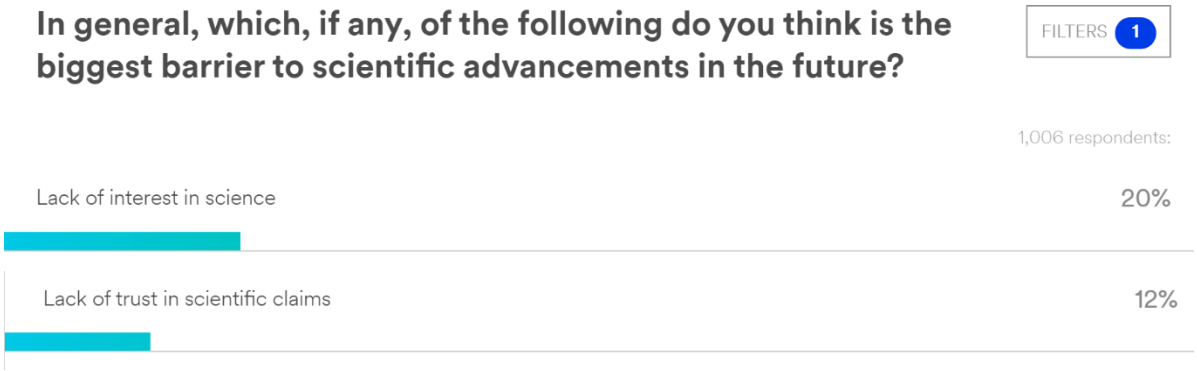
indicator of the public role of science and its impact. **20% of the people think that the lack of interest in science is one of the biggest barriers to scientific advancement in the future. 12% considers that the lack of trust in scientific claims is also a big obstacle.**

Figure 8: Question #24 from the 3M State of Science survey 2018



One question of the 3M State of Science surveys evaluates the frequency in which the interviewees think about the impact that science has in their everyday lives. In 2018, **45% of the interviewees said that they think about it a lot, 43% a little and 12% never.** In 2019, **47% of the interviewees said that they think about it a little, 39% a lot and 14% never.** In 2020, **46% of the interviewees said that they think about it a little, 39% a lot and 15% never.**

Table 12: Question from the 3M State of Science survey 2018 (Q11), 2019 (Q17) and 2020 (Q7)

How much do you think about the impact of science in your everyday life?			
	2018	2019	2020
Never	12%	14%	15%
A little	43%	47%	46%
A lot	45%	39%	39%

In this sense, and going deeper into this topic, question #10 from the 3M State of Science survey 2019 evaluates the perceived importance of science in the lives of the interviewees. When asked if they think their lives would not be all that different without science, **29% of the people indicated they completely disagreed, 24% somewhat disagreed, 26% somewhat agreed and 21% completely agreed.**

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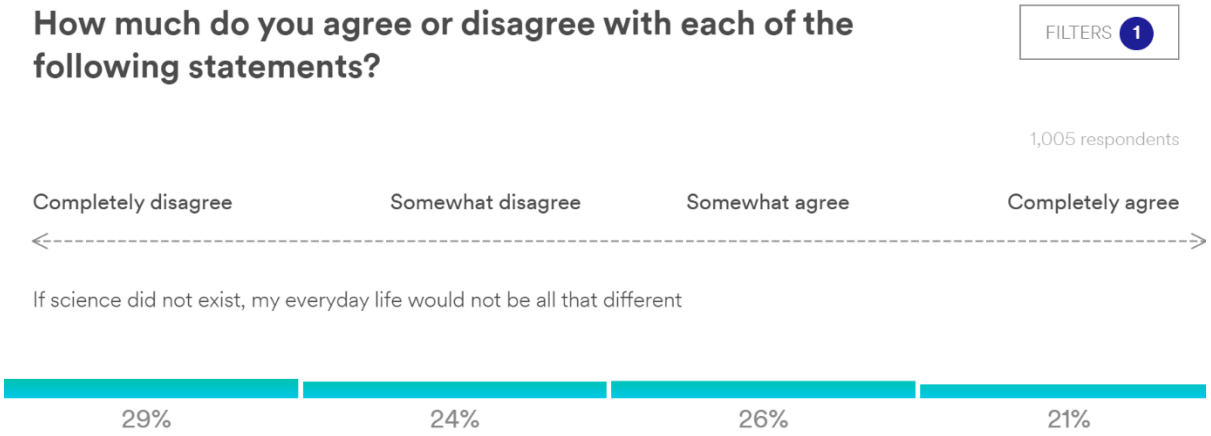
Figure 9: Question #10 from the 3M State of Science survey 2019



Question #8 from the 3M State of Science survey 2018 assesses whether the perceived level of importance of science in different social scenarios and/or groups. When asked how important do they feel science is to their everyday life, in 2018, **56% of the people indicated thinking it is very important, 32% said that it is somewhat important and only 5% expressed that it is not important at all.** In 2019**, 51% of the people indicated thinking it is very important, 32% said that it is somewhat important and only 9% expressed that it is not important at all.** In 2020, **57% of the people indicated thinking it is very important, 34% said that it is somewhat important and only 4% expressed that it is not important at all.**

Table 13: Question from the 3M State of Science survey 2018 (Q8), 2019 (Q9) and 2020 (Q3)

Thinking about the present-day, how important do you feel science is to you in your everyday life?			
	2018	2019[62]	2020[63]
Not important at all	5%	9%	4%
Somewhat important	32%	32%	34%
Very important	56%	51%	57%

When asked how important science is to their families in their everyday lives, in 2018, **52% of the people indicated thinking it is very important, 33% said that it is somewhat important and only 7% expressed that it is not important at all.** In 2019, **46% of the people indicated thinking it is very important, 35% said that it is somewhat important and only 11% expressed that it is not important at all.** In 2020, **54% of the people indicated thinking it is very important, 37% said that it is somewhat important and only 5% expressed that it is not important at all.**

[62] 8% of the people expressed having no opinion.
[63] 4% of the people expressed having no opinion.

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Table 14: Question from the 3M State of Science survey 2018 (Q8), 2019 (Q9) and 2020 (Q3)

Thinking about the present-day, how important do you feel science is to your family in their everyday lives?			
	2018	2019[64]	2020[65]
Not important at all	7%	11%	5%
Somewhat important	33%	35%	37%
Very important	52%	46%	54%

When asked how important do they feel science is to their local community/town, in 2018, **57% of the people indicated thinking it is very important, 32% said that it is somewhat important and only 5% expressed that it is not important at all.** In 2019, **50% of the people indicated thinking it is very important, 32% said that it is somewhat important and only 9% expressed that it is not important at all.** In 2020, **58% of the people indicated thinking it is very important, 34% said that it is somewhat important and only 4% expressed that it is not important at all.**

Table 15: Question from the 3M State of Science survey 2018 (Q8), 2019 (Q9) and 2020 (Q3)

Thinking about the present-day, how important do you feel science is to your local community/town?			
	2018	2019[66]	2020[67]
Not important at all	5%	9%	4%
Somewhat important	32%	32%	34%
Very important	57%	50%	58%

When asked how important science is to society in general, in 2018, **62% of the people indicated thinking it is very important, 26% said that it is somewhat important and only 4% expressed that it is not important at all.** In 2019, **56% of the people indicated thinking it is very important, 29% said that it is somewhat important and only 7% expressed that it is not important at all.** In 2020, **72% of the people indicated thinking it is very important, 23% said that it is somewhat important and only 2% expressed that it is not important at all.**

Table 16: Question from the 3M State of Science survey 2018 (Q8), 2019 (Q9) and 2020 (Q3)

Thinking about the present-day, how important do you feel science is to society in general?			
	2018	2019[68]	2020[69]
Not important at all	4%	7%	2%
Somewhat important	26%	29%	23%
Very important	62%	56%	72%

[64] 8% of the people expressed having no opinion.
[65] 4% of the people expressed having no opinion.
[66] 9% of the people expressed having no opinion.
[67] 4% of the people expressed having no opinion.
[68] 8% of the people expressed having no opinion.
[69] 3% of the people expressed having no opinion.

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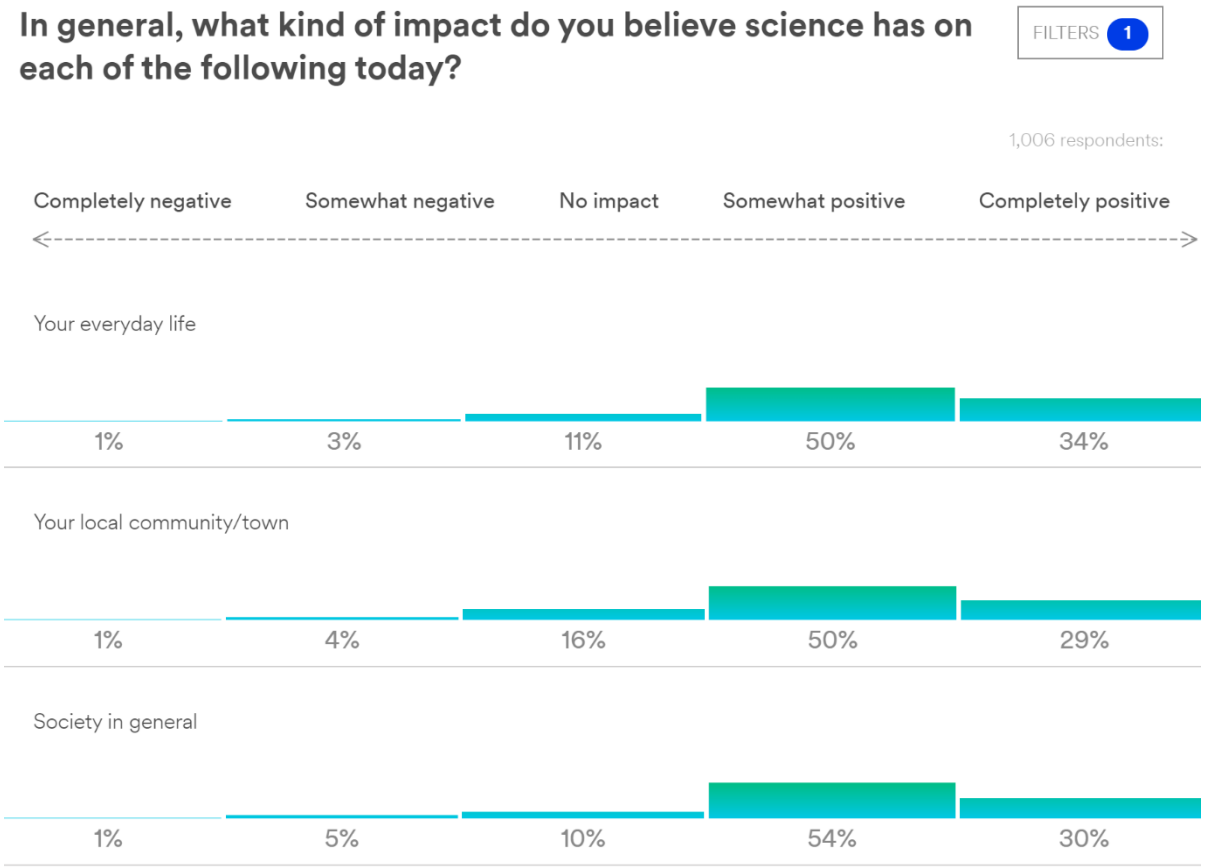
Question #13 from the 3M State of Science survey 2018 goes a little bit further and evaluates the perceived impact of science on different social scenarios and/or groups throughout time. The answers range from a 'completely negative" perception to a 'completely positive" perception. Regarding the impact of science on their everyday life, **50% of the people described it as somewhat positive, 34% as completely positive, 3% as somewhat negative and 1% as completely negative. 11% of the interviewees expressed that science has had no impact whatsoever on their everyday life.**

Regarding the impact of science on their local community/town, **50% of the people described it as somewhat positive, 29% as completely positive, 4% as somewhat negative and 1% as completely negative. 16% of the interviewees expressed that science has had no impact whatsoever on their local community/town.**

Regarding the impact of science on society in general, **54% of the people described it as somewhat positive, 30% as completely positive, 5% as somewhat negative and 1% as completely negative. 10% of the interviewees expressed that science has had no impact whatsoever on society in general.**

Figure 10: Question #13 from the 3M State of Science survey 2018



As a follow up to question #13, question #15 from the 3M State of Science survey 2018 evaluates the perceived future impact of science on different social scenarios and/or groups. The answers range from a 'completely negative" perception to a 'completely positive" perception. Regarding the future impact of science on their everyday life, **42% of the people described it as somewhat positive, 40% as completely positive, 5% as somewhat**

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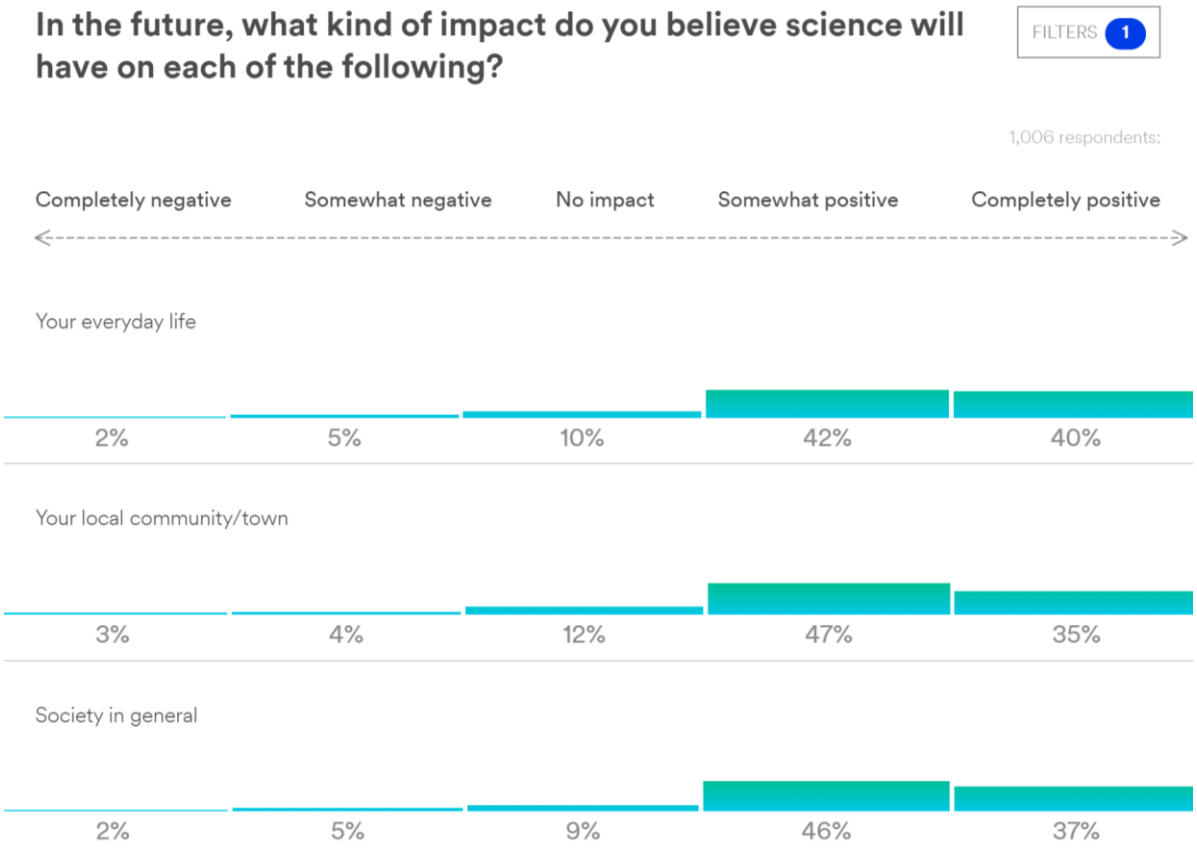
negative and 2% as completely negative. 10% of the interviewees expressed that science will have no impact whatsoever on their everyday life.

Regarding the future impact of science on their local community/town, **47% of the people described it as somewhat positive, 35% as completely positive, 4% as somewhat negative and 3% as completely negative. 12% of the interviewees expressed that science will have no impact whatsoever on their local community/town.**

Regarding the future impact of science on society in general, **46% of the people described it as somewhat positive, 37% as completely positive, 5% as somewhat negative and 2% as completely negative. 9% of the interviewees expressed that science will have no impact whatsoever on society in general.**

Figure 11: Question #15 from the 3M State of Science survey 2018



Question #25 from the 3M State of Science survey 2018 also evaluates the perceived future impact of science but focused on the industry or field of work of the interviewees. **46% of the people think that science will have a significant impact in the future of their industry/field, 41% think it will be a small impact, and 13% considers that it will have no impact at all.**

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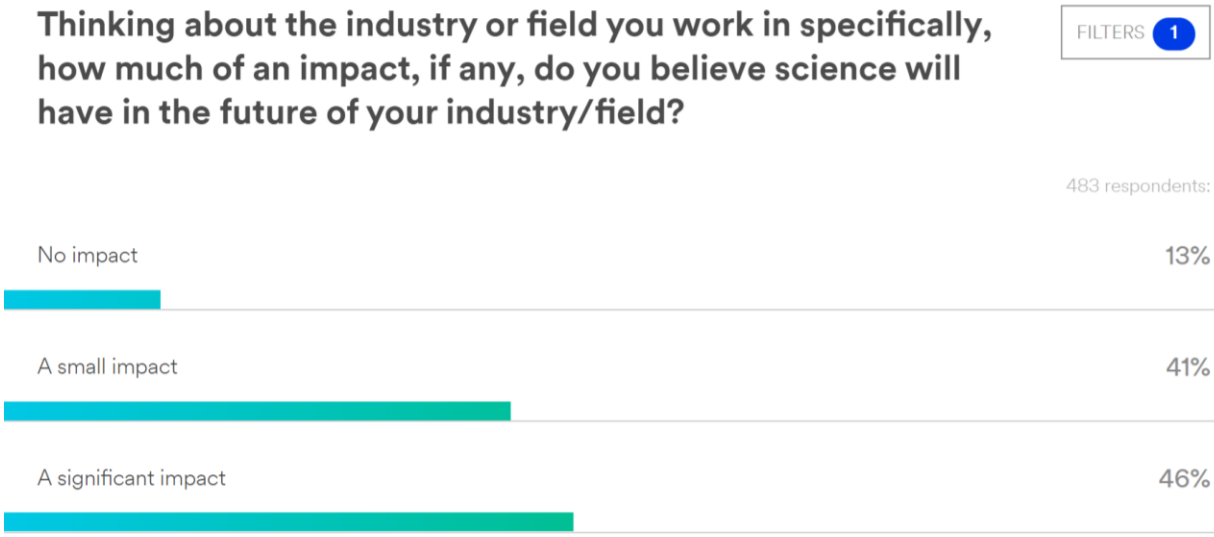
Figure 12: Question #25 from the 3M State of Science survey 2018



Question #9 from the 3M State of Science survey 2020 evaluates the perceived impact of science on the world in positive/negative terms. The interviewees were asked if they think science has a mostly positive or mostly negative impact on the world. **82% of the people think that the impact is mostly positive, 13% that is mostly negative and 5% think that science has no impact whatsoever on the world.**

Figure 13: Question #9 from the 3M State of Science survey 2020

Being more specific, question #10 from the 3M State of Science survey 2020 asks about the perceived impact of science on the interviewees' lives. They were asked if they think science will make their lives better, worse or if it will not have any impact at all. **82% of the people think that their lives will be better, 10% said that science won't impact their lives and only 8% considers that science will make their lives worse.**

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Figure 14: Question #10 from the 3M State of Science survey 2020

Following the same line, another question of the 3M State of Science surveys assesses whether the public recognises the role of science in advancing and improving our daily lives. The interviewees had to specify their level of agreement to the following statement: If science didn't exist, my everyday life wouldn't be all that different. In 2018, **30% of the people somewhat disagreed, 27% somewhat agreed, 24% completely disagreed and 20% completely agreed.** In 2020, **28% completely disagreed, 26% somewhat agreed, 24% somewhat disagreed and 22% completely agreed.**

Table 17: Question from the 3M State of Science survey 2018 (Q12) and 2020 (Q4)

If science didn't exist, my everyday life wouldn't be all that different		
	2018	2020
Completely disagree	24%	28%
Somewhat disagree	30%	24%
Somewhat agree	27%	26%
Completely agree	20%	22%

Going deeper into this topic, question #12 from the 3M State of Science survey 2018 asked the public to specify their level of agreement to the following statement: If science didn't exist, society wouldn't be all that different. **32% of the people somewhat agreed, 25% completely disagreed, 22% somewhat disagreed and 21% completely agreed.**

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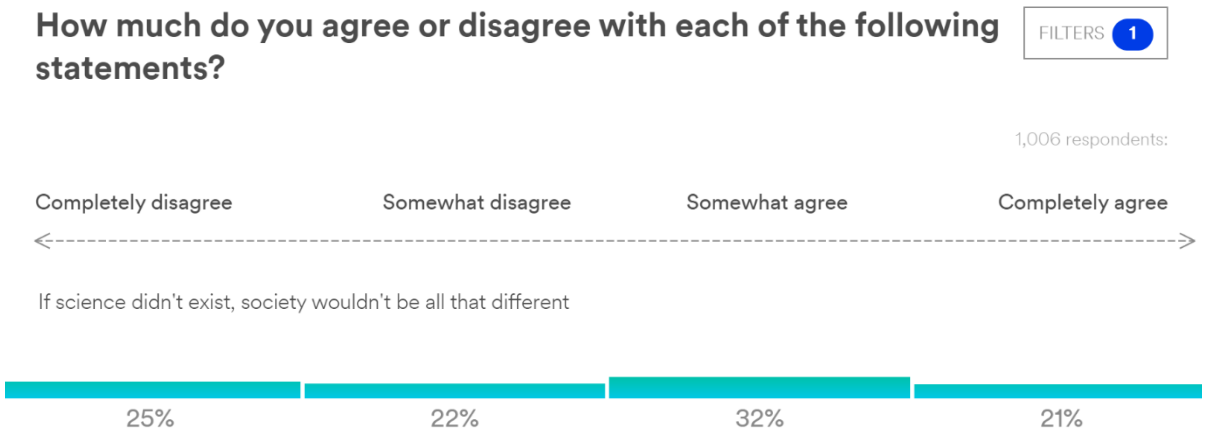
Figure 15: Question #12 from the 3M State of Science survey 2018



In one question of the 3M State of Science surveys, the public had to select their level of agreement to the following statement: As an adult, I don't see the point of now needing to understand science; which reinforces the results of the previous question. This refers to the perceived importance of science in all stages of human life, not just childhood or formative years. In 2018, **42% of the people completely disagreed, 29% somewhat disagreed, 17% somewhat agreed and 12% completely agreed.** In 2019, **46% of the people completely disagreed, 29% somewhat disagreed, 18% somewhat agreed and 8% completely agreed.** In 2020, **47% of the people completely disagreed, 28% somewhat disagreed, 15% somewhat agreed and 10% completely agreed.**

Table 18: Question from the 3M State of Science survey 2018 (Q6), 2019 (Q7) and 2020 (Q2)

As an adult, I don't see the point of now needing to understand science			
	2018	2019	2020
Completely disagree	42%	46%	47%
Somewhat disagree	29%	29%	28%
Somewhat agree	17%	18%	15%
Completely agree	12%	8%	10%

In the same question, and as a follow up of the previous results, the interviewees had to select their level of agreement to the following statement: I want my kids to know more about science. The results could shed some light on the perceived importance of science in our everyday lives and its impact on the new generations. **65% of the people completely agreed, 28% somewhat agreed, 6% somewhat disagreed and 1% completely disagreed.**

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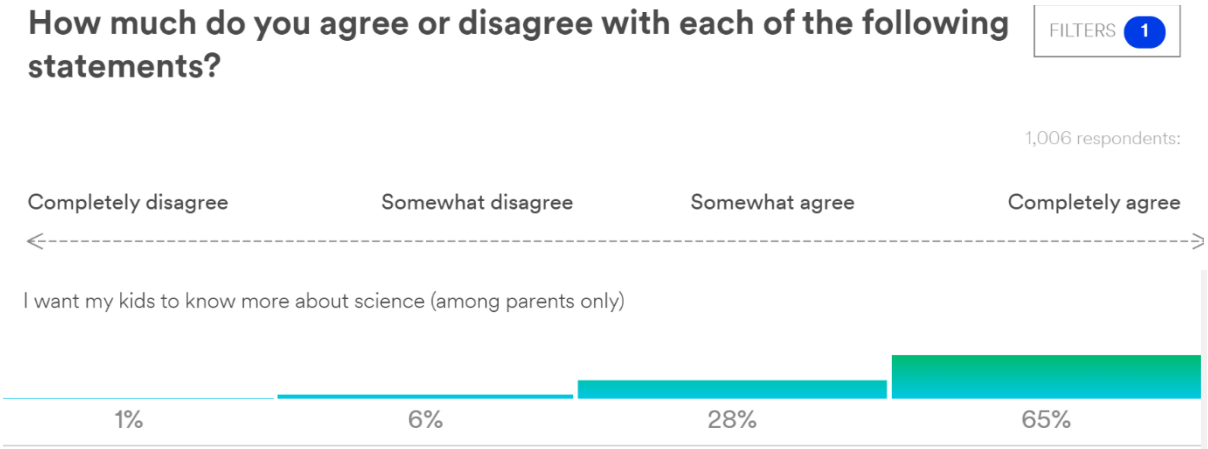
Figure 16: Question #6 from the 3M State of Science survey 2018



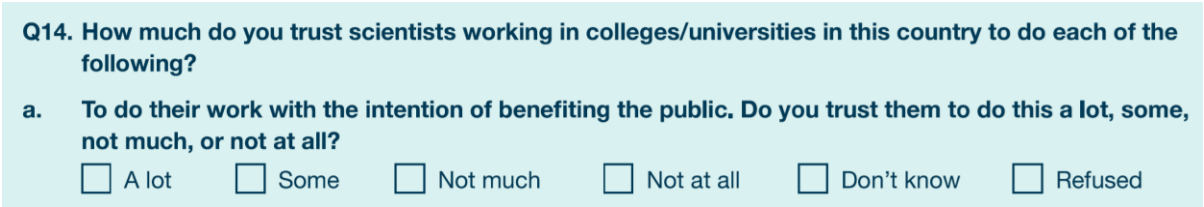
One of the 3M State of Science surveys questions assesses how much does the public know about science overall. In 2018, **65% of the people indicated knowing a little, 19% specified knowing a lot and 16% expressed knowing nothing at all.** In 2019, **67% of the people indicated knowing a little, 18% specified knowing a lot and 15% expressed knowing nothing at all.** In 2020, **66% of the people indicated knowing a little, 18% expressed knowing nothing at all and 16% specified knowing a lot.**

Table 19: Question from the 3M State of Science survey 2018 (Q5), 2019 (Q6) and 2020 (Q14)

How much would you say you know about science overall?			
	2018	2019	2020
Nothing	16%	15%	18%
A little	65%	67%	66%
A lot	19%	18%	16%

Question #14 from the WGM survey 2018 evaluates the level of public trust in the scientists working in colleges/universities in their country of residence. It specifically addresses public views about the nature of university scientists' work and whether it benefits the public. **26% of the people indicated trusting in scientists working in colleges/universities "a lot", 25% expressed trusting in them to "some extent", 17% specified not trusting in them too much, and 13% indicated not trusting in them at all.**[70]

Figure 17: Question #14 from the Wellcome Global Monitor Survey 2018



[70] 19% of the interviewees didn't answer or specified that their level of trust would depend on other factors.

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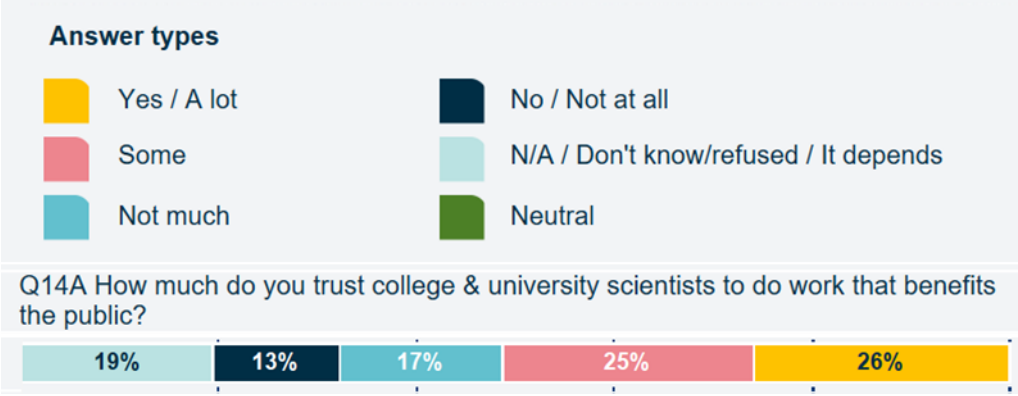
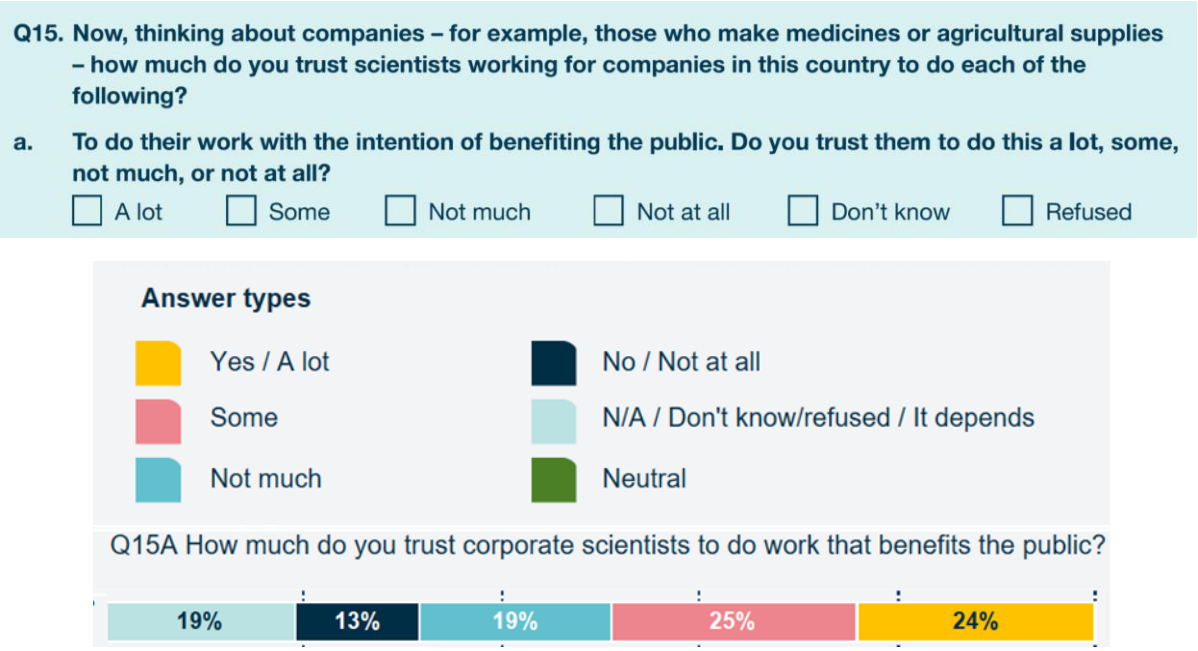


Question #15 from the WGM survey 2018 assesses the level of public trust in the scientists working in companies (e.g., pharmaceutical or agricultural industries) in their country of residence. It specifically addresses public views about the nature of company scientists' work and whether it benefits the public. **48% of the people indicated trusting in scientists working in colleges/universities to "some extent", 18% expressed trusting in them "a lot", 10% specified not trusting in them too much, and 5% indicated not trusting in them at all.**[71]

Figure 18: Question #15 from the Wellcome Global Monitor Survey 2018



Similar to the previous two questions, this question from the 3M State of Science surveys evaluates the level of trust of public trust in scientists, science and their impact on the planet. The interviewees were asked to specify their level of agreement to the following statement: Science causes just as many problems as solutions. In 2018, **36% of the people somewhat agreed with the statement, 33% somewhat disagreed, 16% completely agreed and 15% completely disagreed.** In 2019, **35% of the people somewhat agreed, 32% somewhat disagreed, 19% completely disagreed and 14% completely agreed.**

[71] 20% of the interviewees didn't answer or specified that their level of trust would depend on other factors.

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Table 20: Question from the 3M State of Science survey 2018 (Q9) and 2019 (Q28)

Science causes just as many problems as solutions		
	2018	2019
Completely disagree	15%	19%
Somewhat disagree	33%	32%
Somewhat agree	36%	35%
Completely agree	16%	14%

In question #9 from the 3M State of Science survey 2018, the interviewees had to specify their level of agreement to the following statements: I trust scientists and I trust science. Regarding the trust in scientists, in 2018, **52% of the people somewhat agreed with the statement, 24% completely agreed, 21% somewhat disagreed and 4% completely disagreed.** In 2019, **50% of the people somewhat agreed with the statement, 21% completely agreed, 21% somewhat disagreed and 8% completely disagreed.** In 2020, **50% of the people somewhat agreed with the statement, 23% completely agreed, 22% somewhat disagreed and 5% completely disagreed.**

Table 21: Question from the 3M State of Science survey 2018 (Q9), 2019 (Q14) and 2020 (Q5)

I trust scientists			
	2018	2019	2020
Completely disagree	4%	8%	5%
Somewhat disagree	21%	21%	22%
Somewhat agree	52%	50%	50%
Completely agree	24%	21%	23%

Regarding the trust in science, in 2018, **52% of the people somewhat agreed with the statement, 31% completely agreed, 14% somewhat disagreed and 3% completely disagreed.** In 2019, **51% of the people somewhat agreed with the statement, 30% completely agreed, 16% somewhat disagreed and 4% completely disagreed.** In 2020, **51% of the people somewhat agreed with the statement, 30% completely agreed, 16% somewhat disagreed and 4% completely disagreed.**

Table 22: Question from the 3M State of Science survey 2018 (Q9), 2019 (Q14) and 2020 (Q5)

I trust science			
	2018	2019	2020
Completely disagree	3%	7%	4%
Somewhat disagree	14%	16%	16%
Somewhat agree	52%	48%	51%
Completely agree	31%	30%	30%

In the same question, and as a follow-up of the previous statements, the interviewees had to specify their level of agreement to this new one: I am skeptical of science. In 2018, **36% of the people somewhat disagreed, 33% somewhat agreed, 18% completely disagreed and 12% completely agreed.** In 2019, **36% of the people somewhat disagreed, 36% somewhat agreed, 19% completely disagreed and 9% completely agreed.** In 2020, **36%**

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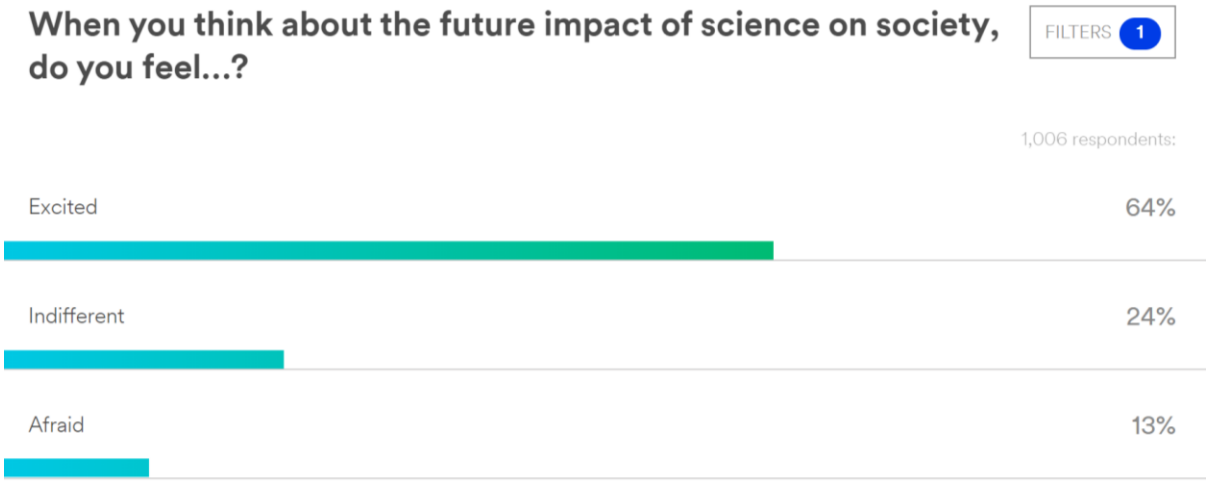
of the people somewhat agreed, 35% somewhat disagreed, 20% completely disagreed and 9% completely agreed.

Table 23: Question from the 3M State of Science survey 2018 (Q9), 2019 (Q14) and 2020 (Q5)

I am skeptical of science			
	2018	2019	2020
Completely disagree	18%	19%	20%
Somewhat disagree	36%	36%	35%
Somewhat agree	33%	36%	36%
Completely agree	12%	9%	9%

Question #4 from the 3M State of Science survey 2018 evaluates the perception of the public about the future impact of science on society in terms of emotions. **64% of the people indicated feeling excited, 24% expressed feeling indifferent and 13% specified feeling afraid.**

Figure 19: Question #4 from the 3M State of Science survey 2018



2.2 Peaceful Applications of S&T

No evidence available from existing sources.

2.3 Scientific Culture

The following questions and their answers, extracted from the surveys mentioned in the Data Sources section, assess whether the results of scientific research are available to the general public and whether the level of the society engagement with science is sufficient for them to consume this information.

Question #6 from the WGM survey 2018 evaluates the interest of the public in obtaining information about science in the past 30 days. This particular question not only indicates whether the general public see value in investing their time obtaining this type of information, but also the level engagement they feel towards science research and its results.

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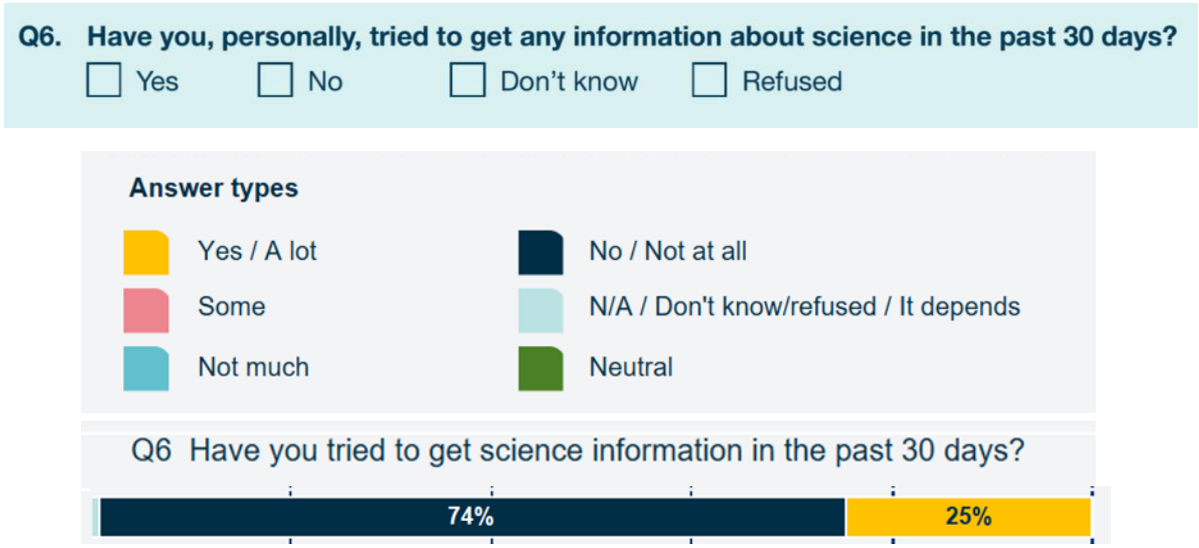
74% of people indicated they didn't try to get any information about science in the past 30 days, while 25% specified that they did.

Figure 20: Question #6 from the Wellcome Global Monitor Survey 2018



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3 Research informing Policy

Member States should use scientific knowledge in an inclusive and accountable manner to inform national policy and decision-making, and to advance international cooperation and development.

The below topics refer to science in society grouped by the Key Priority Area 3

(a) have measures been taken to implement the norms and standards of the Recommendation?

(b) have any obstacles to compliance with the norms and standards been encountered?

3. Research informing Policy

	(a)	(b)
3.1 Uses S&T Knowledge for Decision-Making and Policy	Yes/No	Yes/No
3.2 Scientists Advise Government	Yes/No	Yes/No

Measures that have been taken to implement the norms and standards of the Recommendation

Evidence for Measures taken at the Member State Level

3.1 Science Diplomacy

The following answers were collected from a survey conducted by the RRING team with research policy experts in South Africa contributing information about policies relevant to different aspects of the key priority areas. The interviewees were asked if there are any programs that help national scientists to get in touch with scientists in other countries. The responses of each respondent are shown and presented as segments, where only the most relevant information for this indicator was retrieved.

Policy measures
1: Multilateral Cooperation and Africa
2: Oversees Bilateral
3: International Relations[72]
- - - - - - - - - - - - - - - - - - -
No segments provided[73]
- - - - - - - - - - - - - - - - - - -
No segments provided[74]
- - - - - - - - - - - - - - - - - - -
1: Check National Research foundation policy guidelines. I could not find it online[75]

When asked whether South Africa invests in international development (focused on other countries), the experts responded the following:

Policy measures
No segments provided[76]

[72] No attachments/links provided
[73] Attachment.
[74] Attachment.
[75] Link.
[76] Required to be implemented. Attachment.

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3.2 Uses S&T Knowledge for Decision-Making and Policy

The following national policies were identified by a drafting group composed by twelve scholars and researchers from different universities and commissions.

Enhanced application of science, technology and innovation to support the priorities of regional Integration, p. 9 in *Summary of the SADC Revised Regional Indicative Strategic Development Plan SADC-RISDP, 2015-2020*

https://www.sadc.int/files/5415/2109/8240/SADC_Revised_RISDP_2015-2020.pdf

--

2019 White Paper on Science, Technology and Innovation

--

National Water Research, Development and Innovation Roadmap – DSI

--

Water Research Act and the Master Plan – DWS

--

South Africa's foreign policy

--

National Development Plan 2030 (NDP)

--

The Medium-Term Strategic Framework (MTSF)

--

Engagement Strategies

The following answers were collected from a survey conducted with research policy experts in South Africa contributing information about policies relevant to different aspects of the key priority areas (with the support of the ICoRSA Policy Research Unit under the auspices of the RRING project). The interviewees were asked if there are any Member State policies requiring that public policy development be informed by scientific knowledge. The responses of each respondent are shown and presented as segments, where only the most relevant information for this indicator was retrieved by the responding research policy experts. Where the research policy experts only provided a link, this has been provided below.

Policy measures

No segments provided[77]

[77] Required to be implemented. Attachment.

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- - - - - - - - - - - - - - - - - - -

No segments provided[78]

- - - - - - - - - - - - - - - - - - -

No segments provided[79]

3.3 Scientists Advise Government

No evidence available from existing sources.

Evidence for Measures taken at the Level of Research Staff at Research Performing Organisations

3.1 Science Diplomacy

No evidence available from existing sources.

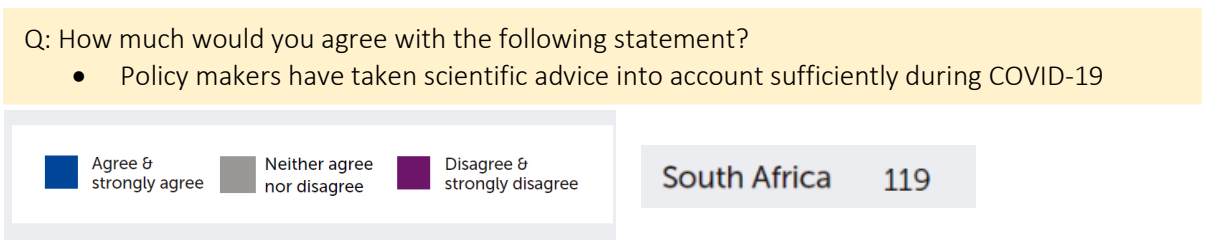
3.2 Uses S&T Knowledge for Decision-Making and Policy

No evidence available from existing sources.

3.3 Scientists Advise Government

The following question and its answers, extracted from the surveys mentioned in the Data Sources section, assess whether policy makers have taken scientific advice into account sufficiently, focusing on the period of the present pandemic. This particular question from the Frontier's Academic response to COVID-19 survey evaluates the perception of the researchers on this topic. **52% of the researchers agree that policy makers haven taken scientific advice intro account sufficiently during COVID-19, while 30% strongly disagree.**

Figure 21: Question from the Frontiers' Academic response to COVID-19 survey



[78] Required to be implemented. Attachment.
[79] Required to be implemented. Attachment.

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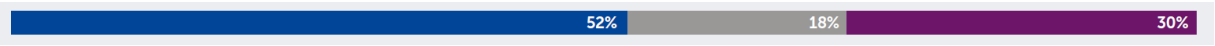

Evidence for Measures taken at the Level of Public Perspectives on Science and Scientific Researchers

3.1 Science Diplomacy

No evidence available from existing sources.

3.2 Uses S&T Knowledge for Decision-Making and Policy

No evidence available from existing sources.

3.3 Scientists Advise Government

No evidence available from existing sources.

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4 Science is a common good

Member States are urged to treat public funding of research and development as a form of public investment, the returns on which are long term and serve public interest. Open science, including the sharing of data, methods, results and the knowledge derived from science, intensifies the public role of science and should be facilitated and encouraged.

The below topics refer to science in society grouped by the Key Priority Area 4

(a) have measures been taken to implement the norms and standards of the Recommendation?

(b) have any obstacles to compliance with the norms and standards been encountered?

4. Science is a Common Good		
	(a)	(b)
4.1 Openness	Yes/No	Yes/No

Measures that have been taken to implement the norms and standards of the Recommendation

Evidence for Measures taken at the Member State Level

4.1 Openness

The following national policies were identified by a drafting group composed by twelve scholars and researchers from different universities and commissions.

NIPMO Act

--

Water Wheel – scientific magazine to share science knowledge with the public (online and accessible to all registered)

--

WRC knowledge portal – sharing all WRC funded project reports

--

Water SA – a scientific journal to promote publication of water RDI products

--

South Africa is leading the African Open Science Platform (AOSP) initiative

--

Intellectual Property Rights Act of 2008 (IPR ACT 51 of 2008)

--

National Research Funding for research

Evidence for Measures taken at the Level of Research Staff at Research Performing Organisations

4.1 Openness

The following questions and their answers, extracted from the surveys mentioned in the Data Sources section, assess whether researchers feel encouraged to share their scientific data to the public, thus reinforcing the public role of science.

Question #12.1 from the RRING survey assesses whether scientific researchers´ think it is important to make data from their research and innovation activities freely available to the public. The responses range from Strongly Disagree to Strongly Agree. **46% of the researchers strongly agree with the statement, 29% agree, 10% somewhat agree, 6%**

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disagree, 4% strongly disagree, 1% somewhat disagree and 3% expressed feeling neutral about it.

Table 24: Question #12.1 from the RRING survey on socially responsible research/innovation

Please specify your level of agreement with the following statement:

- It is important to make data from my research and innovation activities freely available to the public

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	N/A
4%	6%	1%	3%	10%	29%	46%	1%

Question #12.2 and #12.3 from the RRING survey continues with the same issue and asks what steps have the researchers´ taken to make data from their research and innovation activities freely available. **48% of the researchers expressed having taken steps to make their data freely available. 27% said no and 4% were unsure.**

Table 25: Question #12.2 from the RRING survey on socially responsible research/innovation

In the last 12 months, have you taken steps to make data from your research and innovation activities freely available?

Yes	No	Unsure	N/A	Prefer not to say
48%	27%	4%	20%	1%

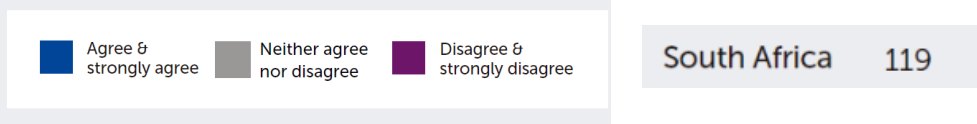
The following question from the Frontier's Academic response to COVID-19 survey evaluates the impact that the pandemic has had in the way researchers will publish and share their work in the near future. The pandemic has made visible the need for clear and accurate scientific information to be available to the public, so it is interesting to see how a phenomenon of this magnitude will affect the way results are shared by the research community.

Regarding the statement: I am more likely to publish my work in open access journals, **48% agree with it while 15% disagree.** Regarding the statement: I am more likely to publish my data, **47% agree with it while 10% disagree.** And finally, regarding the statement: I am more likely to deposit my work on a preprint server, **22% agree with it while 25% disagree.**

Figure 22: Question from the Frontiers' Academic response to COVID-19 survey

Q: How has the COVID-19 pandemic changed the way you will publish and share your work in the future?

- I am more likely to publish my work in open access journals
- I am more likely to share my data
- I am more likely to deposit my work on a preprint server



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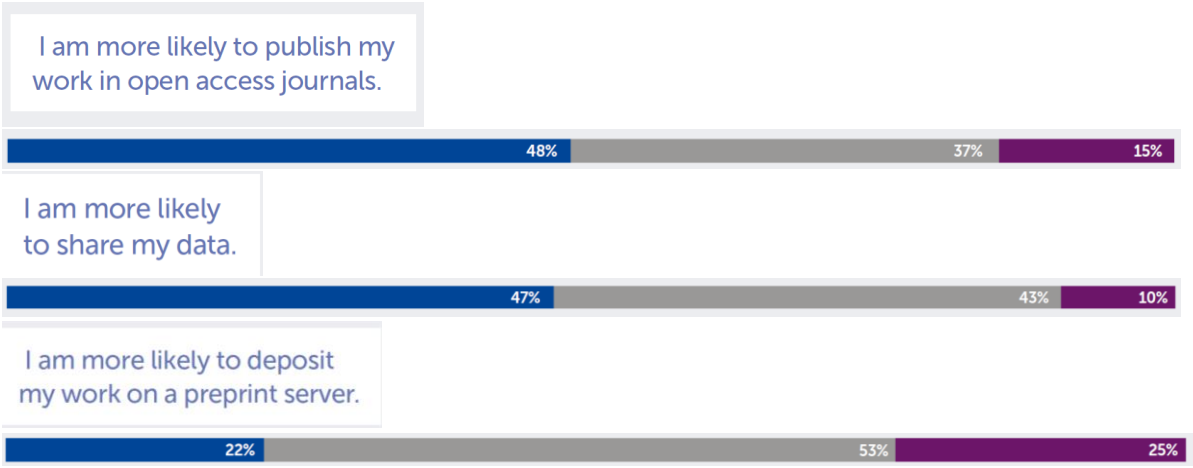

Question #11 from the OECD International Survey of Scientific Authors evaluates whether the researchers have made the data and code of their finished work available to their peers. This is an indicator of the level of openness within the scientific community and thus the on the public role of science. **62% of the researchers expressed not making the data nor the code available to fellow researchers, while 30% confirmed sharing their data. 8% of the interviewees specified making data and code available to their peers.**

Table 26: Question #11 from the OECD International Survey of Scientific Authors

Q11

Have you or your co-authors made them directly available to fellow researchers?

Yes, only data	Yes, only code	Yes, both data and code	Neither data nor code
30%	0%	8%	62%

Question #12 from the OECD International Survey of Scientific Authors assesses the mechanisms of accessibility and the characteristics of the data and code coming out from published research work. **19% of the researchers said that, in the case of data, they comply with standards that facilitate combining with other data sources. 19% specified that it is possible for interested users to search online for information about their outputs. 19% assured that there is a standard mechanism for requesting and securing access to their outputs. 13% said that detailed and comprehensive metadata or explanations was provided and 12% explained that interested users would have to subscribe or pay a fee to access any of the outputs.**

Table 27: Question #12 from the OECD International Survey of Scientific Authors

Q12

Which of the following apply to data and code coming out of your research work for this paper?

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Interested users have to subscribe or pay a fee to access any of these outputs	12%
Outputs have been assigned unique and permanent digital object identifiers	10%
There is a standard mechanism for requesting and securing access to these outputs	19%
It is possible for interested users to search online for information about these outputs	19%
A clear usage licence was applied	6%
Detailed and comprehensive metadata or explanations was provided	13%
In the case of data, they comply with standards that facilitate combining with other data sources	19%

The following questions and their answers assess the researchers´ perspective on the importance of sharing their scientific research methods. This is an indicator of the success of the culture of open access and transparency.

Question #10.1 from the RRING survey evaluates whether scientific researchers´ think it is important to make their research and innovation methods/processes open and transparent. The responses range from Strongly Disagree to Strongly Agree. **55% of the researchers strongly agree with the statement, 28% agree, 5% somewhat agree, 3% somewhat disagree, 3% strongly disagree and 1% expressed feeling neutral about it.**

Table 28: Question #10.1 from the RRING survey on socially responsible research/innovation

Please specify your level of agreement with the following statement:

- It is important to make my research and innovation methods/processes open and transparent

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	N/A
3%	0%	3%	1%	5%	28%	55%	4%

Question #10.2 and #10.3 from the RRING survey continues with the same issue and asks what steps have the researchers´ taken to make their research and innovation methods/processes open and transparent. **60% of the researchers expressed having taken steps to make sure their research methods and processes are open and transparent. 5% said no and 12% were unsure.**

Table 29: Question #10.2 from the RRING survey on socially responsible research/innovation

In the last 12 months, have you taken steps to ensure your research and innovation methods/processes are open and transparent?

Yes	No	Unsure	N/A	Prefer not to say
60%	5%	12%	21%	1%

Regarding the steps taken to ensure their research and innovation methods/processes are open and transparent by the researchers who said yes in the last question, **30% of them said following pathways to open/transparent R&I methods and processes. 19% specified exercising one-way dissemination with no reference to research methods/processes or transparency/openness per se and 14% said documenting/reporting research and decision-making processes.**

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Table 30: Question #10.3 from the RRING survey on socially responsible research/innovation

If yes: What steps, if any, have you taken to ensure your research and innovation methods/processes are open and transparent?

Step	Percentage
Non-specific	10%
Pathways to open/transparent R&I methods and processes	30%
Documenting/reporting research and decision-making processes	14%
Disclosing research data, raw data, codes, and statistics	6%
Seeking upstream academic/researcher feedback on research ideas or plans	1%
Seeking approval for methods/processes in research applications	6%
Participation in or engagement with relevant committees	3%
Other step taken to ensure R&I openness and transparency	3%
One-way dissemination with no reference to research methods/processes or transparency/openness per se	19%
Open access publication	7%

The following questions and their answers assess whether researchers feel encouraged to share their scientific research results and knowledge derived from research to the public. In addition to the afore mentioned dimensions, the possibility of knowing how and what was achieved through scientific research strengthens the public role of science.

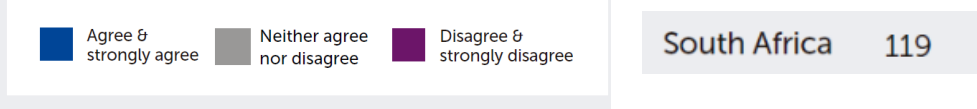
The following question from the Frontier's Academic response to COVID-19 survey evaluates the impact that the pandemic has had in the way researchers will publish and share their work in the near future. The pandemic has made visible the need for clear and accurate scientific information to be available to the public, so it is interesting to see how a phenomenon of this magnitude will affect the way results are shared by the research community.

Regarding the statement: I am more likely to publish my work in open access journals, **48% agree with it while 15% disagree.** Regarding the statement: I am more likely to publish my data, **47% agree with it while 10% disagree.** And finally, regarding the statement: I am more likely to deposit my work on a preprint server, **22% agree with it while 25% disagree.**

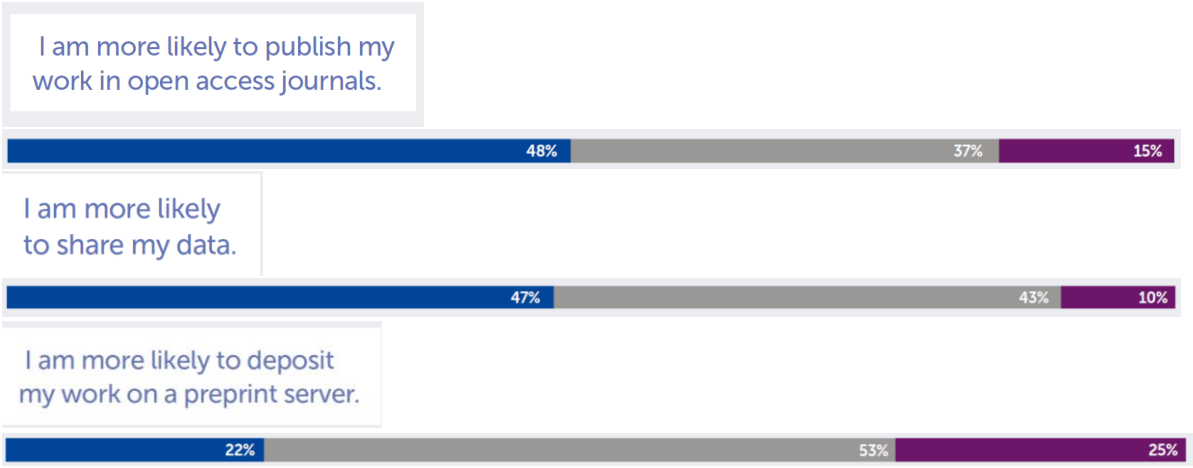
Figure 23: Question from the Frontiers' Academic response to COVID-19 survey

Q: How has the COVID-19 pandemic changed the way you will publish and share your work in the future?

- I am more likely to publish my work in open access journals
- I am more likely to share my data
- I am more likely to deposit my work on a preprint server



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 788503.



Question #6 from the OECD International Survey of Scientific Authors evaluates the level of accessibility to published papers. This is an indicator of the state of open access culture within the scientific world. **31% of the researchers said that any person interested in reading their paper would be able to download it from a journal that does not charge for access to any of its contents. 27% specified that access would be possible only through the publisher and it would require a paid subscription. 17% explained that access could be through the publisher with a paid subscription but that the paper is also available from an open repository.**

Table 31: Question #6 from the OECD International Survey of Scientific Authors

Q6

Please put yourself in the position of someone interested in reading this paper right after it was published. Would this person have been able to download it from the publisher's site at no cost or without subscription?

Yes, from a journal that does not charge for access to any of its contents	31%
Yes, from a journal that charges for access, because you (or your organisation or funder) paid to allow free user access to this paper.	13%
No, access through the publisher required a subscription or paying for access but it was also available from an open repository or webpage unrelated to the publisher	17%
No, access was only possible through the publisher and required a subscription or paying for access	27%
Do not know / do not recall	12%

Question #13 from the OECD International Survey of Scientific Authors assesses the factors that have constrained or enhanced the level of access granted to the research outputs of published papers. Although the majority of the interviewed researchers think that any of these factors does not have significant impact, **36% of the researchers expressed that formal sharing requirements by publishers, funders, policy and /or organisation significantly constrained the level of access granted to the outputs of their papers. 22% think that the main factor constraining the access is the intellectual property protection, while 22% specified that it also has to do with the resources and capabilities for managing disclosure and sharing.**

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Regarding the factors that significantly enhance the level of access granted to the research outputs of their papers, **17% of the researchers expressed that the formal sharing requirements enhance the level of access. 17% said that it is their career objectives, while another 17% think that it has to do with norms within their research field and peer expectations.**

Table 32: Question #13 from the OECD International Survey of Scientific Authors

Q13

Please indicate whether the following factors have significantly constrained or enhanced the level of access granted to the research outputs from this paper (i.e. data, codes and/or publication).

	Significantly constrained level of access granted	No significant impact	Significantly enhanced level of access granted
Formal sharing requirements by publishers/funders/policy/organisation	36%	47%	17%
Intellectual property protection	22%	67%	11%
Career objectives	8%	75%	17%
Norms within your research field and peer expectations	9%	74%	17%
Resources and capabilities for managing disclosure and sharing	22%	63%	15%

Evidence for Measures taken at the Level of Public Perspectives on Science and Scientific Researchers

4.1 Openness

The following questions and their answers, extracted from the surveys mentioned in the Data Sources section, assess whether the general public perceive public funding for research and development as money well spent. These results are an indicator of the perceived value of scientific research for the improvement of the quality of life.

Question #45 from the 3M State of Science survey 2020 assesses whether the public perceives the government as the one responsible for deciding how funding for scientific research and advancements is allocated. **68% of the people think that the government is responsible.**

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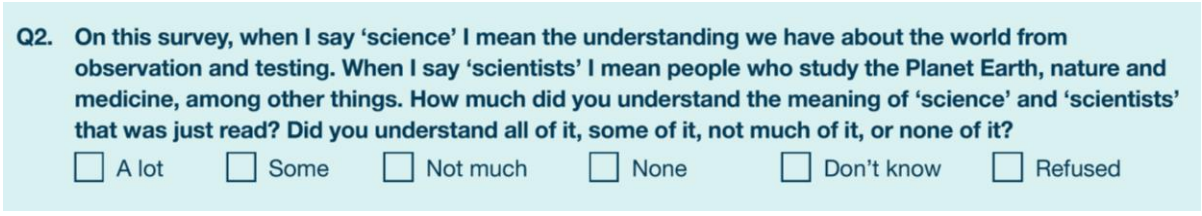
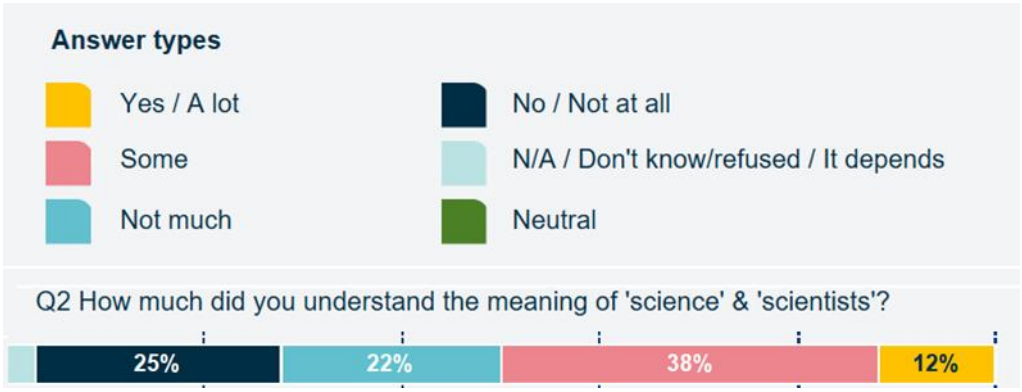
Figure 24: Question #45 from the 3M State of Science survey 2020

The following questions and their answers assess whether the general public understand what science and scientists are, as well as the level of trust placed in them. These results are an indicator of a country's progress in establishing a public role of science.

Question #2 from the WGM survey 2018 is designed to measure the self-reported public understanding of science and scientists. **38% of the people indicated understanding the meaning of "science" and "scientists" to some extent, 25% expressed not understanding it at all, and 22% specified understanding it to a low extent.**[80]

Figure 25: Question #2 from the Wellcome Global Monitor Survey 2018





Question #14 from the WGM survey 2018 evaluates the level of the public trust in scientists working in colleges/universities in their country of residence and whether their work benefits the public. It also asks about the transparency on who is funding their work and whether this information affects or not the level of trust.

26% of the people indicated trusting scientists working in colleges/universities to do their work with the intention of benefiting the public. 25% expressed trusting in them to

[80] 22% didn't know how to respond or indicated that their understanding would depend on other factors.

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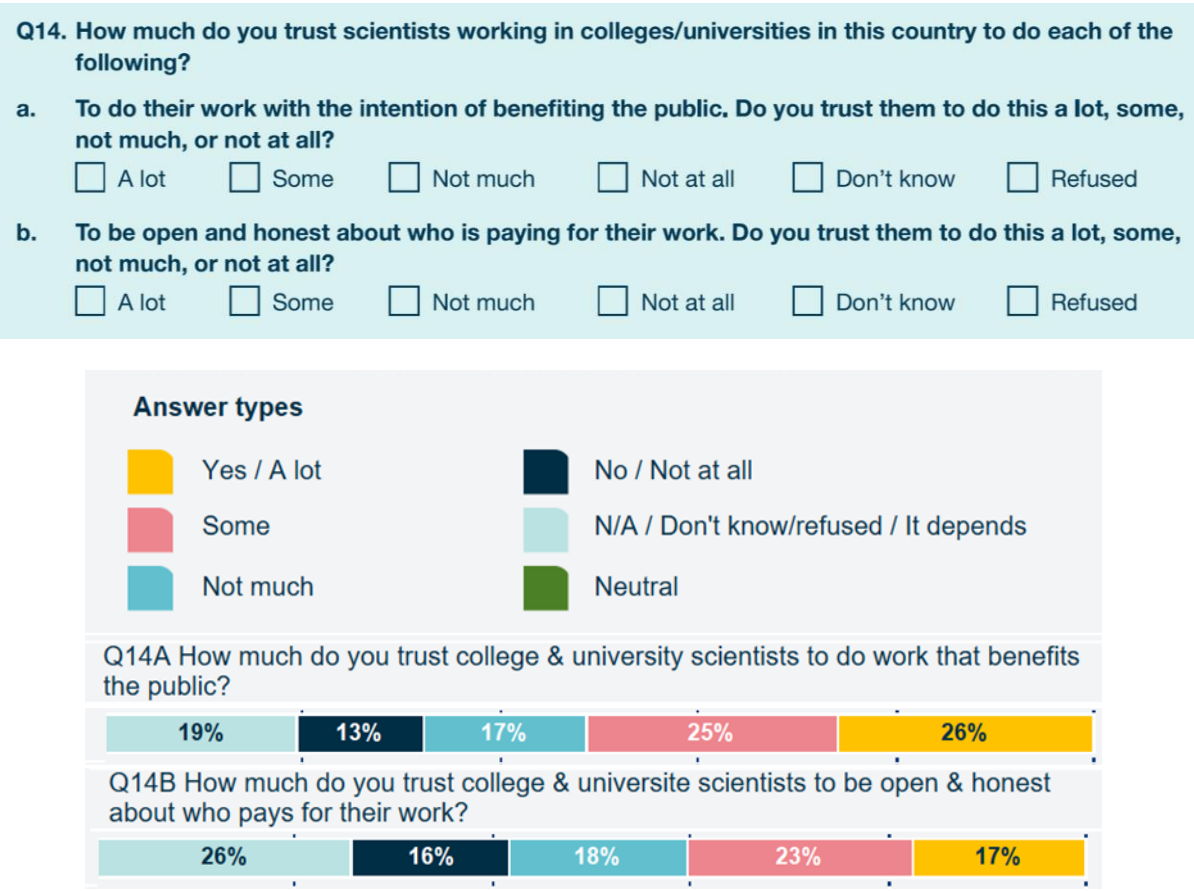
some extent, while 17% specified that their level of trust in them is low. Only 13% of the interviewees indicated not trusting in them at all.[81]

23% expressed trusting scientists working in colleges/universities to be open and honest about who is paying for their work to some extent. 18% specified that their level of trust in them is low. 17% indicated trusting them completely, while 16% expressed not trusting in them at all.[82]

Figure 26: Question #14 from the Wellcome Global Monitor Survey 2018



Question #15 from the WGM survey 2018 assesses the level of public trust in scientists working for companies (e.g., pharmaceutical or agricultural industries) and whether their work benefits the public. It also asks about the transparency on who is funding their work and whether this information affects or not the level of trust.

25% of the people indicated trusting scientists working for companies to do their work with the intention of benefiting the public to some extent. 24% expressed trusting in them completely, while 19% specified that their level of trust in them is low. Only 13% of the interviewees indicated not trusting in them at all.[83]

26% of the people indicated trusting scientists working for companies to be open and honest about who is paying for their work to some extent. 17% expressed trusting in

[81] 19% didn't know or refused to answer or expressed that it would depend on other factors.
[82] 26% of the people didn't know or refused to answer.
[83] 19% didn't know or refused to answer or expressed that it would depend on other factors.

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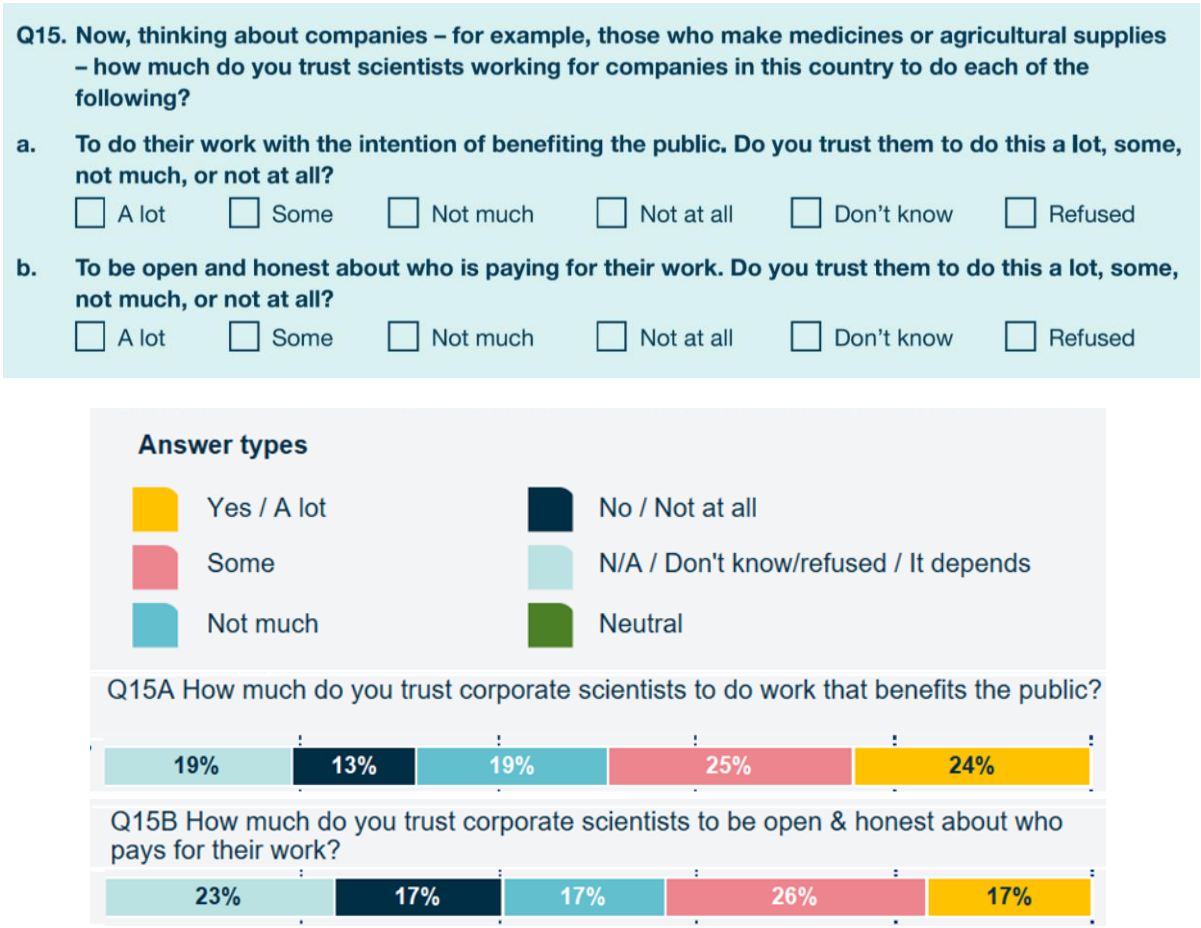
them completely, while 17% specified that their level of trust in them is low. 17% of the interviewees indicated not trusting in them at all.[84]

Figure 27: Question #15 from the Wellcome Global Monitor Survey 2018



The following question assesses the public perception of scientists' efforts in sharing their research results. These results are an indicator of the progress in establishing a public role of science. Question #27 from the 3M State of Science survey 2019 evaluates whether the public perceives that the data available from scientific research is enough. The interviewees were asked to specify their level of agreement to the following statement: Scientists should be sharing their results more often. **42% of the people somewhat agreed, 43% completely agreed, 12%% somewhat disagreed and 3% completely disagreed.**

[84] 23% didn't know or refused to answer or expressed that it would depend on other factors.

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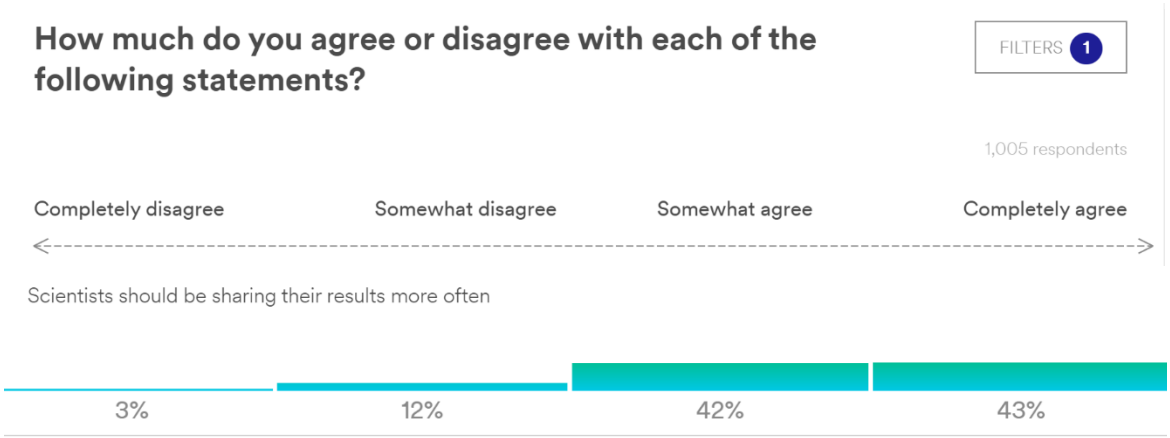
Figure 28: Question #27 from the 3M State of Science survey 2019



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5 Diversity in Science

All citizens enjoy equal opportunities for the initial education and training needed for, and equal access to employment in scientific research. Scientific researchers enjoy equitable conditions of work. The participation of women and other under-represented groups should be actively encouraged in order to remediate inequalities.

The below topics refer to science in society grouped by the Key Priority Area 5

(a) have measures been taken to implement the norms and standards of the Recommendation?

(b) have any obstacles to compliance with the norms and standards been encountered?

5. Diversity in Science

	(a)	(b)
5.1 Non-Discrimination and Diversity	Yes/No	Yes/No

Measures that have been taken to implement the norms and standards of the Recommendation

Evidence for Measures taken at the Member State Level

5.1 Non-Discrimination and Diversity

The following national policies were identified by a drafting group composed by twelve scholars and researchers from different universities and commissions.

2019 White Paper on Science, Technology, and Innovation
--
South African Women in science awards
--
Postgraduate funding- emphasis
--
The 2017 study on emerging researchers and the silent majority
--
Report of the Ministerial Task Team on the recruitment, retention, and progression of Black South African academics
--
Organisation for Women in Science in the Developing World (OWSD)
--
Women in Science, Engineering and Technology Organisation (WISETO) SA Chapter

Evidence for Measures taken at the Level of Research Staff at Research Performing Organisations

5.1 Non-Discrimination and Diversity

No evidence available from existing sources.

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Evidence for Measures at the Level of Public Perspectives on Science and Scientific Researchers

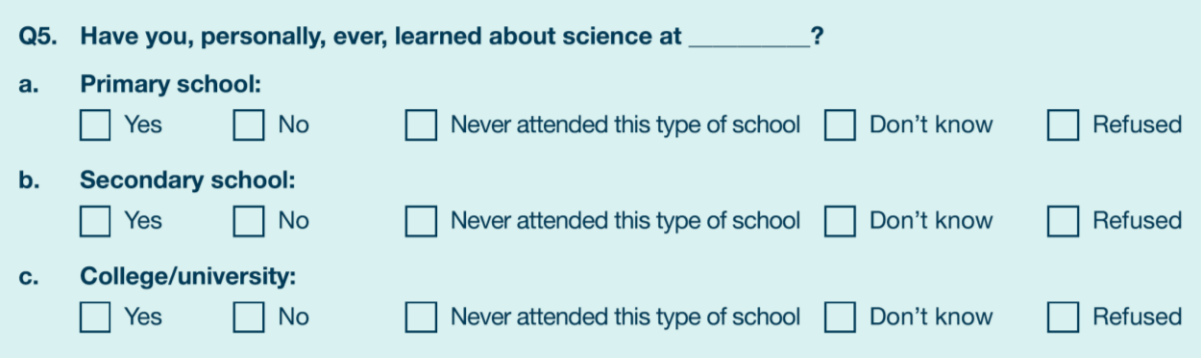
5.1 Non-Discrimination and Diversity

The following questions and their answers, extracted from the surveys mentioned in the Data Sources section, assess whether the general public has had access to scientific knowledge at different types and levels of school. These results are an indicator of progress in assuring equal opportunities for education and training required for scientific research careers.

Question #5 from the WGM survey 2018 evaluates whether the public has learned about science at primary, secondary and/or college/university. This question is of vital importance to understand the potential vulnerabilities of the education system in each country and their relationship to other factors such as the economy and sociocultural contexts.

71% of the people indicated learning about science at primary school, 59% at secondary school and 12% at college/university. 26% of the people indicated not having learned about science at primary school, 37% at secondary school and 64% at college/university.

Figure 29: Question #5 from the Wellcome Global Monitor Survey 2018



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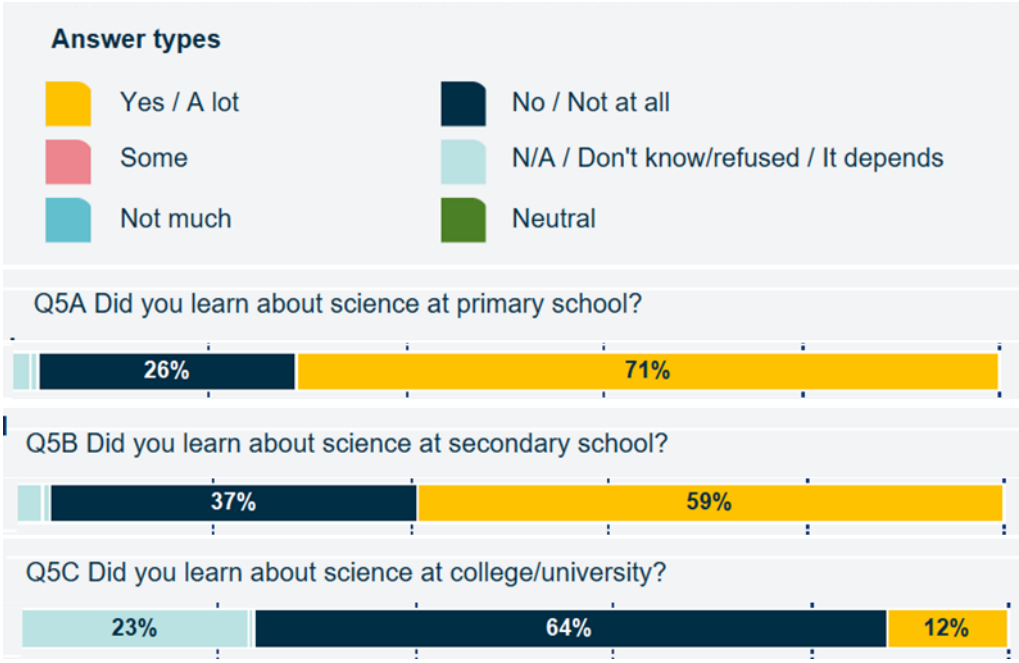
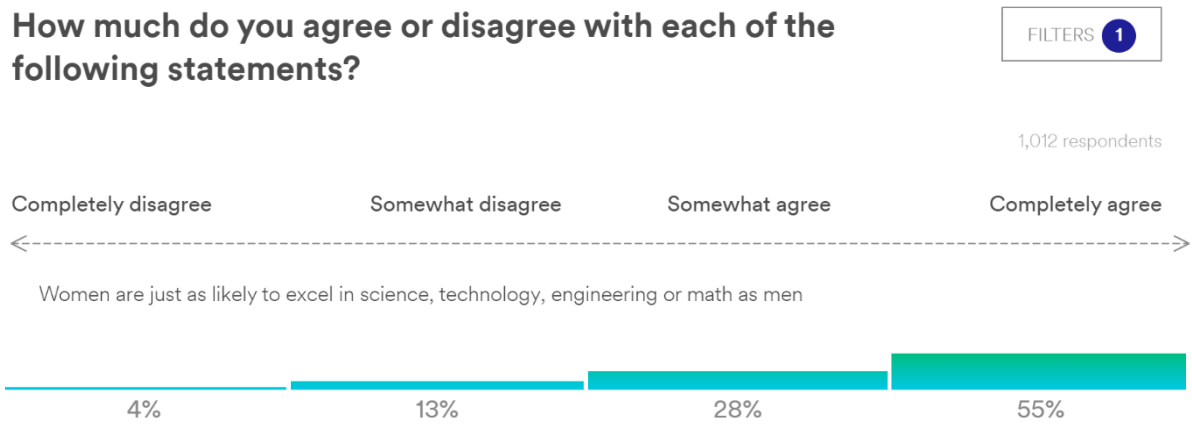


The following questions and their answers assess whether the general public perceives STEM careers as gender inclusive. These results are an indicator of progress in assuring equal opportunities for education and training required for scientific research careers.

Question #26 from the 3M State of Science survey 2020 assesses the perception of women's success as scientists when compared to men. Interviewees were asked to specify their level of agreement to the following statement: Women are just as likely to excel in science, technology, engineering or math as men. **55% of the people completely agreed, 28% somewhat agreed, 13% somewhat disagreed and 4% completely disagreed.**

Figure 30: Question #26 from the 3M State of Science survey 2020



As a follow up question, interviewees were asked to describe why they did not work in a STEM career even though they have a degree in the field in question #27 from the 3M State of Science survey 2020. **Of all the interviewees, none reported that a lack of diversity/inclusion was a barrier for them.**

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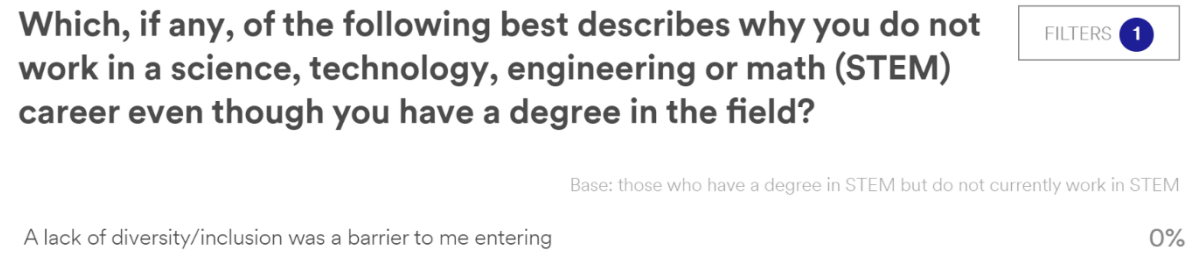
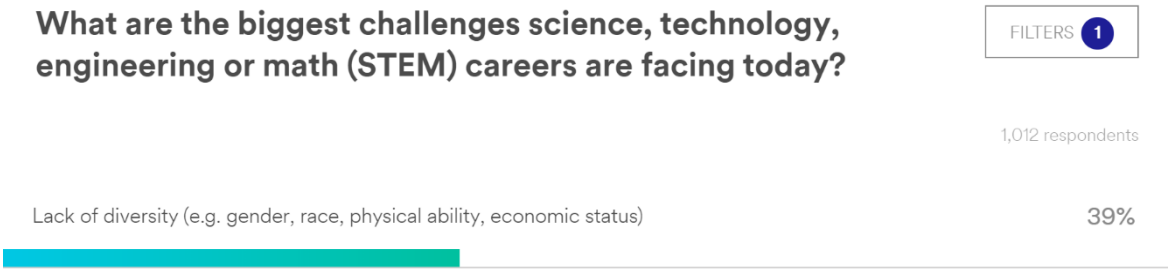
Figure 31: Question #27 from the 3M State of Science survey 2020



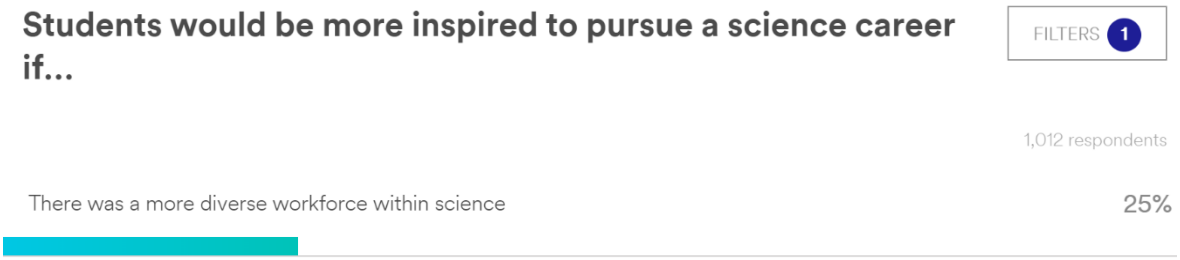
As a follow up question, question #32 from the 3M State of Science survey 2020 assesses the perceived challenges that the general public thinks science careers are facing today. **39% of the people think that the lack of diversity is one of its biggest challenges.**

Figure 32: Question #32 from the 3M State of Science survey 2020



In this sense, question #33 goes deeper and evaluates the potential actions that could inspire more students to pursue a science career. **25% of the people think that more students would pursue this professional path if there was a more diverse workforce within science.**

Figure 33: Question #33 from the 3M State of Science survey 2020



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6 Human Rights Standards

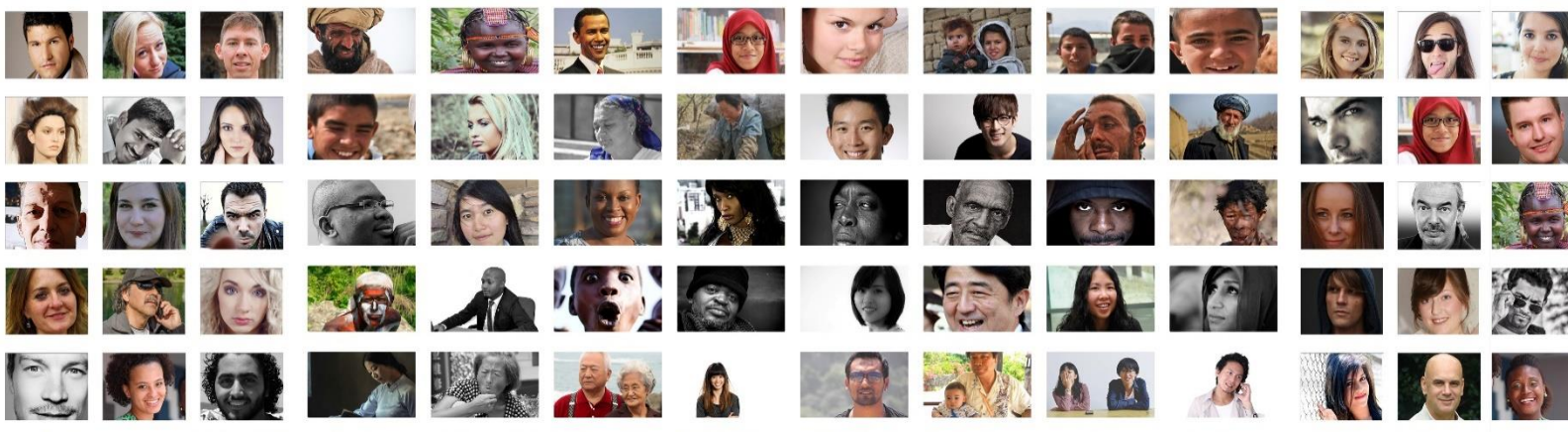
Research should be conducted in a responsible manner that respects the human rights of scientific researchers and human research subjects alike. Open access to research results and the knowledge derived from them promotes the human right to share in scientific advancement and its benefits.

The below topics refer to science in society grouped by the Key Priority Area 6

(a) have measures been taken to implement the norms and standards of the Recommendation?

(b) have any obstacles to compliance with the norms and standards been encountered?

6. Human Rights Standards		
	(a)	(b)
6.1 Human Right to Science	Yes/No	Yes/No
6.2 Human Right to Health	Yes/No	Yes/No
6.3 Other Human Rights	Yes/No	Yes/No



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Measures that have been taken to implement the norms and standards of the Recommendation

Evidence for Measures taken at the Member State Level

6.1 Human Right to Science

The following national policies were identified by a drafting group composed by twelve scholars and researchers from different universities and commissions.

Open Science. South Africa is leading the *African Open Science Platform (AOSP)* initiative.

6.2 Human Right to Health

No evidence available from existing sources.

6.3 Other Human Rights

The following national policies were identified by a drafting group composed by twelve scholars and researchers from different universities and commissions.

Ethics policy (research has to go an ethics committee) look for a national policy.

Evidence for Measures taken at the Level of Research Staff at Research Performing Organisations

6.1 Human Right to Science

The following question and its answers, extracted from the surveys mentioned in the Data Sources section, assess whether researchers promote open access to their scientific research results, thus advancing human right to science.

The following question from the Frontier's Academic response to COVID-19 survey evaluates the impact that the pandemic has had in the way researchers will publish and share their work in the near future. The pandemic has made visible the need for clear and accurate scientific information to be available to the public, so it is interesting to see how a

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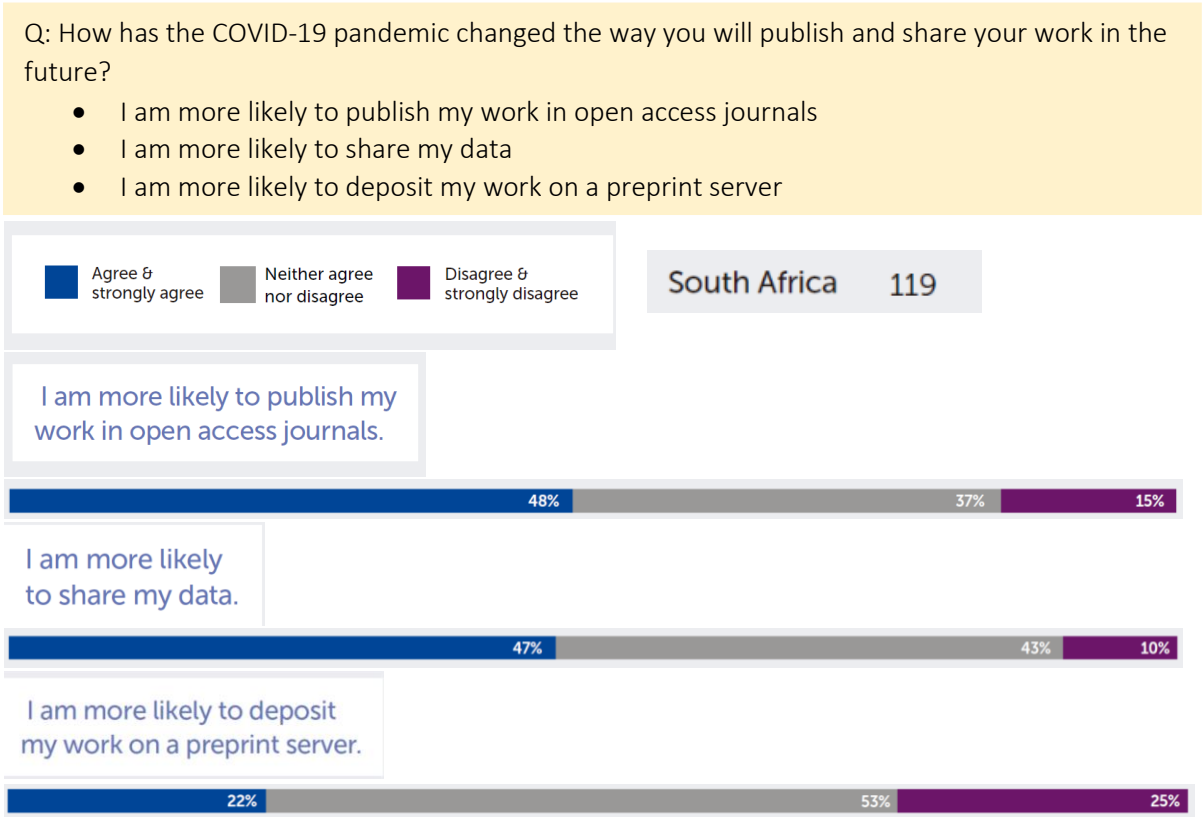
phenomenon of this magnitude will affect the way results are shared by the research community.

Regarding the statement: I am more likely to publish my work in open access journals, **48% agree with it while 15% disagree.** Regarding the statement: I am more likely to publish my data, **47% agree with it while 10% disagree.** And finally, regarding the statement: I am more likely to deposit my work on a preprint server, **22% agree with it while 25% disagree.**

Figure 34: Question from the Frontiers' Academic response to COVID-19 survey



6.2 Human Right to Health

No evidence available from existing sources.

6.3 Other Human Rights

No evidence available from existing sources.

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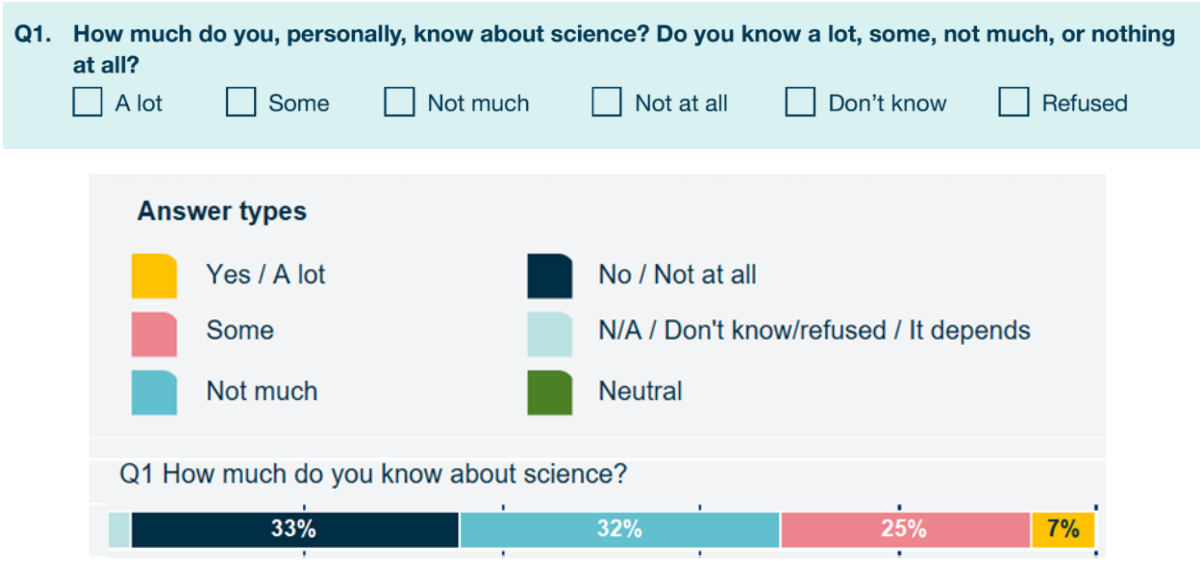
Evidence for Measures taken at the Level of Public Perspectives on Science and Scientific Researchers

6.1 Human Right to Science

The following questions and their answers, extracted from the surveys mentioned in the Data Sources section, assess the level of the public understanding of science and its benefits to society. These results are an indicator of progress in advancing the human right to science.

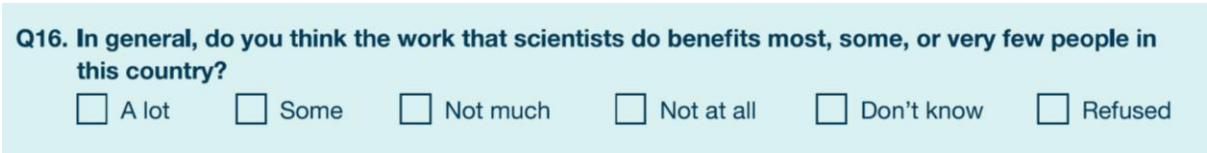
Question #1 from the WGM survey 2018 evaluates how much the public knows about science. This question is related not only to the personal interest of the interviewee, but also to the question of how extensively scientific advancement is being shared in a country. **33% of the people indicated not knowing anything at all about science. 32% expressed not knowing much about science, while 25% specified knowing about it to some extent. 7% indicated knowing "a lot" about science.**[85]

Figure 35: Question #1 from the Wellcome Global Monitor Survey 2018



Question #16 from the WGM survey 2018 assesses public perceptions of the benefits of scientific work. **37% of the people indicated that the work that scientists do doesn't benefit people too much. 28% expressed that it benefits only some people, while 23% specified that it benefits a lot of people.**[86]

Figure 36: Question #16 from the Wellcome Global Monitor Survey 2018



[85] 3% didn't answer, refused to or said that it would depend on other factors.
[86] 12% didn't answer, refused to or said that it would depend on other factors.

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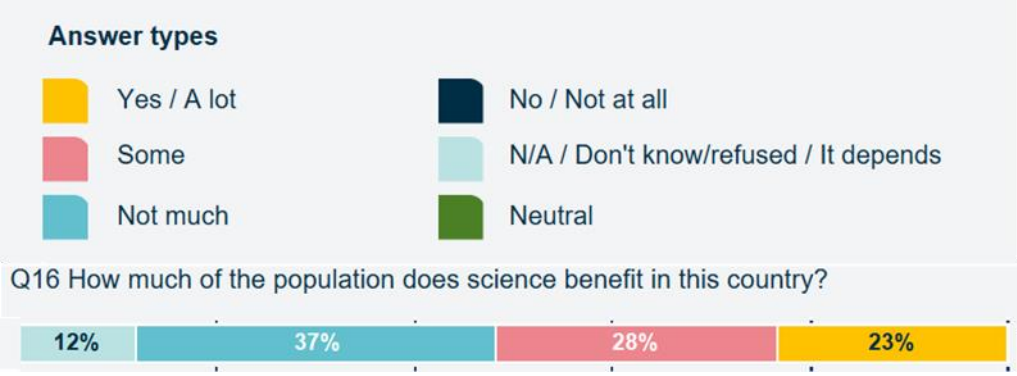
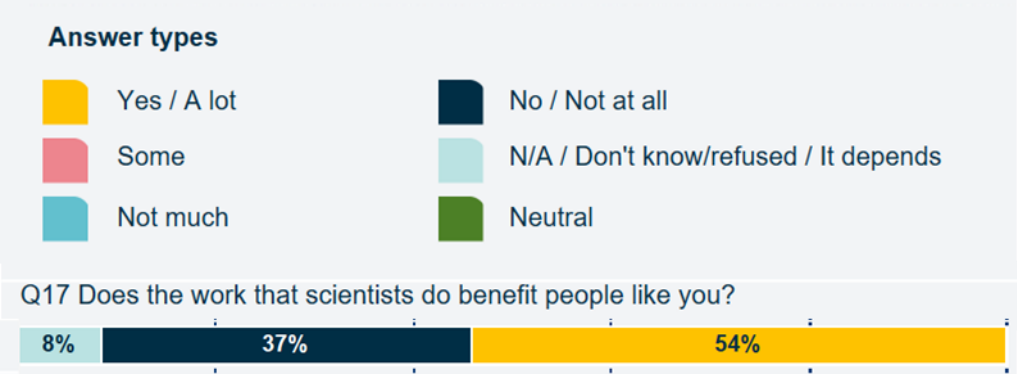


Question #17 from the WGM survey 2018 assesses public perceptions of the benefits of scientific work. This question relates to the question of whether scientific advancement is benefiting society). **54% of the people indicated that the work that scientists do benefits people like them in their country. 37% expressed that they don't think the scientific work benefits people like them at all.**[87]

Figure 37: Question #17 from the Wellcome Global Monitor Survey 2018



Question #21 from the WGM survey 2018 evaluates the public perception of science and technology and its influence on potential improvements to the quality of life of the next generation (as an indicator of scientific advancement benefiting society). **84% of the people agree that science and technology will help improve life for the next generation, while 10% disagree.**[88]

Figure 38: Question #18 from the Wellcome Global Monitor Survey 2018

[87] 8% didn't answer, refused to or said that it would depend on other factors.
[88] 6% didn't answer, refused to or said that it would depend on other factors.

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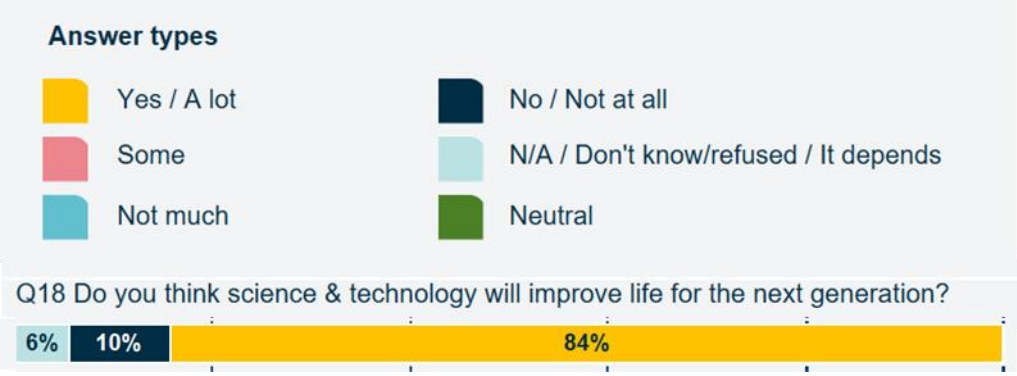
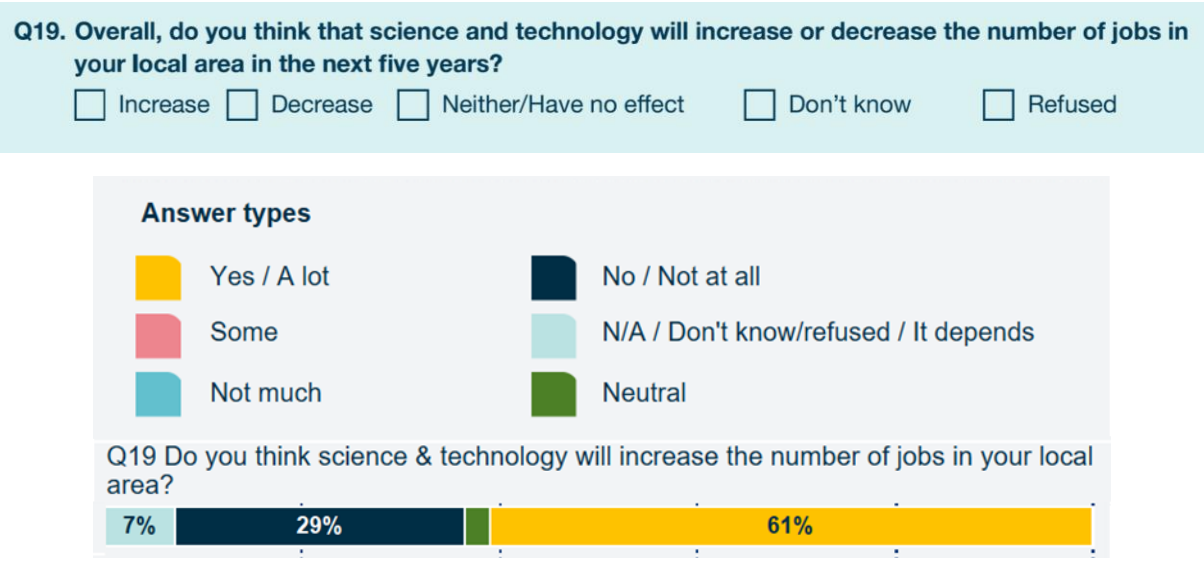


Question #19 from the WGM survey 2018 assesses the perceived impact of science and technology on employment rates in the next five years (as an indicator of scientific advancement benefiting society). **61% of the people think that science and technology will increase the number of jobs in their area in the next five years, while 29% think the employment rate will decrease. 3% expressed feeling neutral about this statement.**[89]

Figure 39: Question #19 from the Wellcome Global Monitor Survey 2018



6.2 Human Right to Health

No evidence available from existing sources.

6.3 Other Human Rights

The following questions and their answers assess the level of trust of the public in science and scientists. These results are an indicator of progress in the perception of a responsible scientific conduct where the trust is a downstream benefit of the responsibility being perceived as "good".

[89] 7% didn't answer, refused to or said that it would depend on other factors, and

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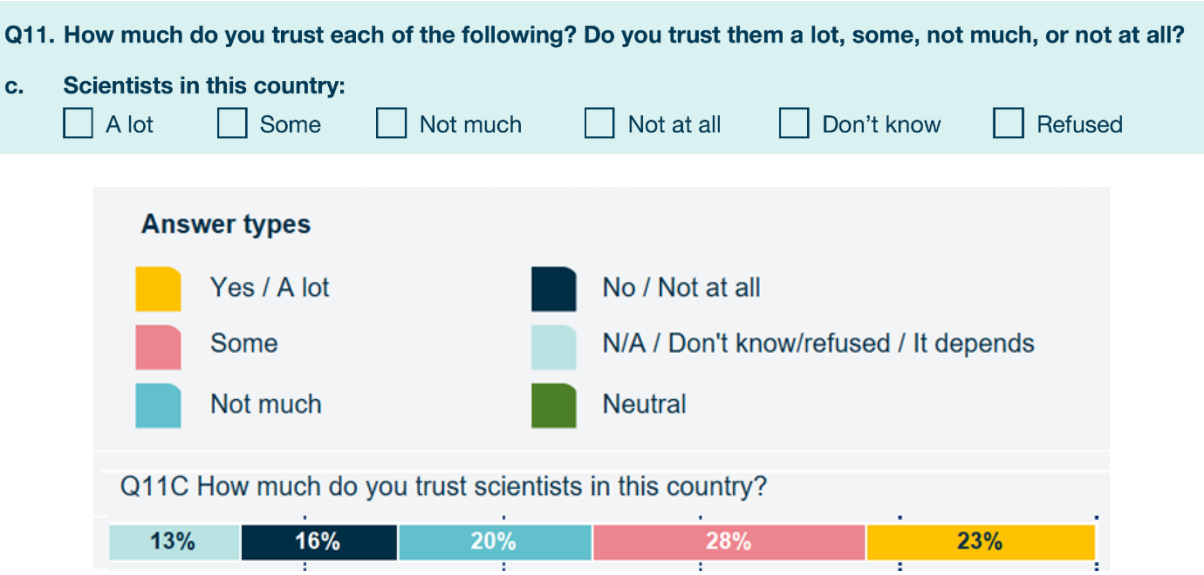
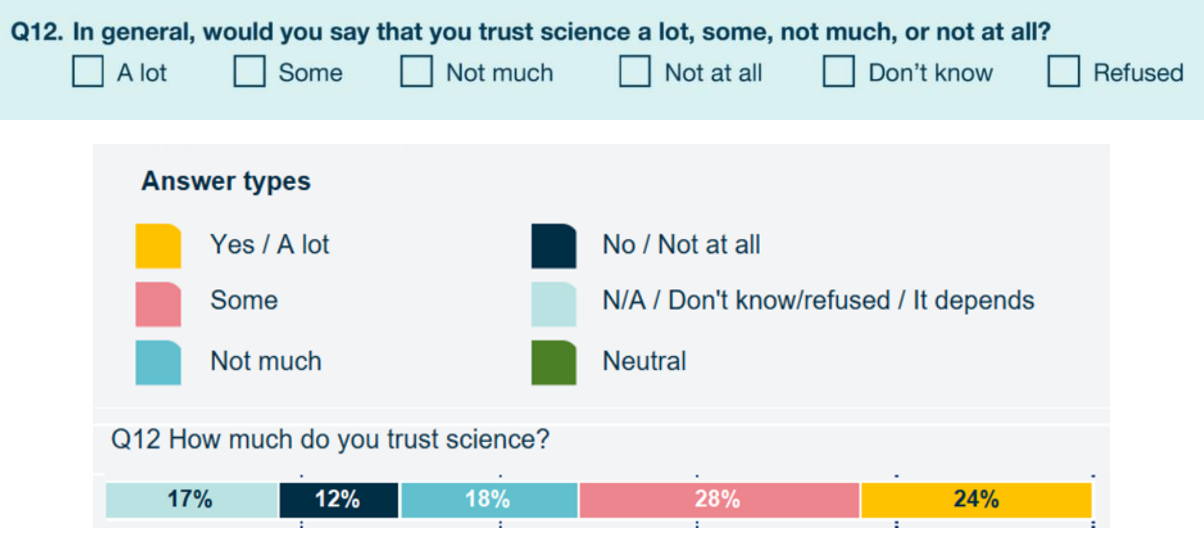
Question #11 from the WGM survey 2018 evaluates whether the public trusts the scientists. **28% of the people indicated trusting in them to some extent. 23% expressed trusting in them completely, while 20% specified that their level of trust in them is low. 16% of the interviewees indicated not trusting in them at all.**[90]

Figure 40: Question #11 from the Wellcome Global Monitor Survey 2018



Question #12 from the WGM survey 2018 evaluates whether the public trusts the science in general. **28% of the people indicated trusting in science to some extent. 24% expressed trusting in science completely, while 18% specified that their level of trust in science is low. Only 12% of the interviewees indicated not trusting in science at all.**[91]

Figure 41: Question #12 from the Wellcome Global Monitor Survey 2018



[90] 13% didn't answer, refused to or said that it would depend on other factors.
[91] 17% didn't answer, refused to or said that it would depend on other factors.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 788503.

7 Scientific Freedom and Scientific Responsibility

Scientific researchers respect public accountability and carry out their work in a humanely, scientifically, socially and ecologically responsible manner, while at the same time they enjoy the degree of autonomy and intellectual and academic freedom appropriate to their task and indispensable to the advancement of science and technology.

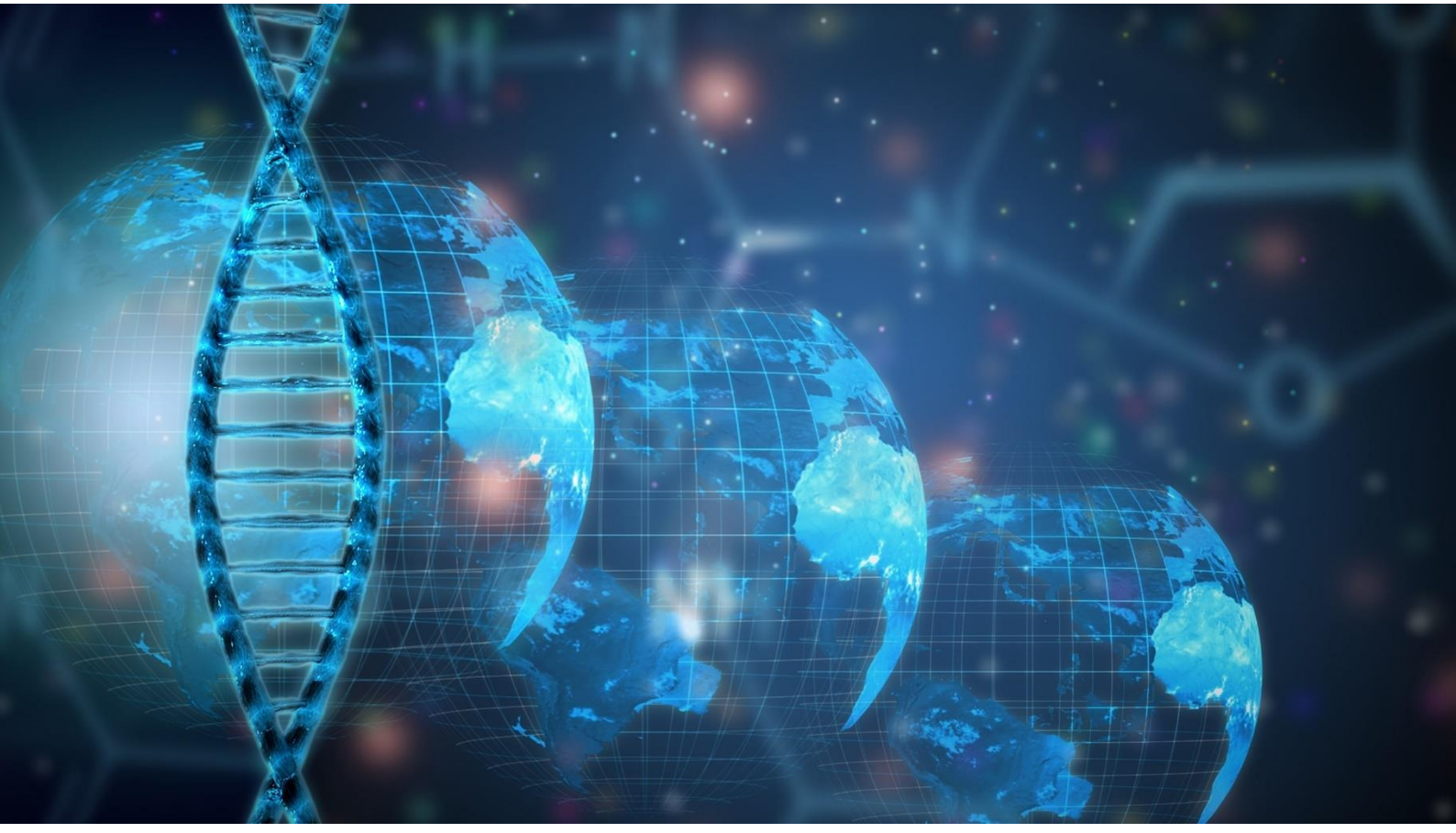
The below topics refer to science in society grouped by the Key Priority Area 7

(a) have measures been taken to implement the norms and standards of the Recommendation?

(b) have any obstacles to compliance with the norms and standards been encountered?

7. Scientific Freedom and Scientific Responsibility

	(a)	(b)
7.1 Scientific Freedom and Scientific Responsibility	Yes/No	Yes/No



Measures that have been taken to implement the norms and standards of the Recommendation

Evidence for Measures taken at the Member State Level

7.1 Scientific Freedom and Scientific Responsibility

No evidence available from existing sources.

Evidence for Measures taken at the Level of Research Staff at Research Performing Organisations

7.1 Scientific Freedom and Scientific Responsibility

No evidence available from existing sources.

Evidence for Measures taken at the Level of Public Perspectives on Science and Scientific Researchers

7.1 Scientific Freedom and Scientific Responsibility

No evidence available from existing sources.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 788503.

8 Research Integrity, Research Ethics, and Ethics of STI

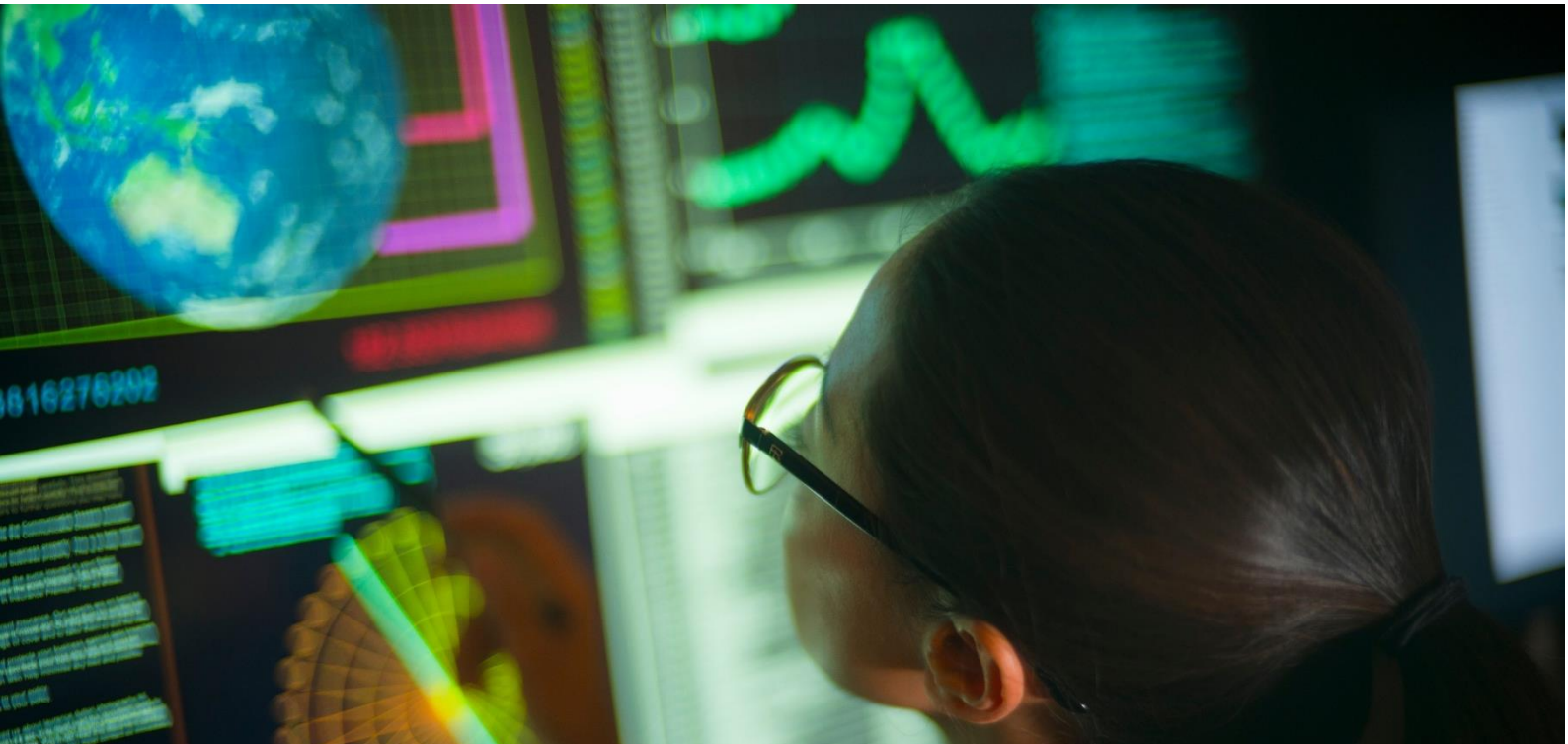
Member States should establish suitable means to address the ethics of science and research integrity, through developing education and training regarding the ethical dimensions of science, establishing and supporting science ethics policies and committees, and stimulating the professional ethics of researchers including their intellectual integrity, sensitivity to conflict of interest and vigilance as to the potential consequences of their research and development activities, including their technical applications.

The below topics refer to science in society grouped by the Key Priority Area 8

(a) have measures been taken to implement the norms and standards of the Recommendation?

(b) have any obstacles to compliance with the norms and standards been encountered?

8. Research Integrity, Research Ethics, and Ethics of STI		
	(a)	(b)
8.1 Regulations Impacting on Research	Yes/No	Yes/No
8.2 Ethics Infrastructure	Yes/No	Yes/No



Measures that have been taken to implement the norms and standards of the Recommendation

Evidence for Measures taken at the Level of Member States

8.1 Regulations Impacting on Research

No evidence available from existing sources.

8.2 Ethics Infrastructure

Each University in South Africa has a research ethics policy that guides how to conduct research in the most ethical manner. However, these documents are outdated and should be updated to reflect the current challenges.

University of Johannesburg: https://www.uj.ac.za/research/Documents/policy/Code%20of%20Academic%20and%20Research%20Ethics.pdf

University of KwaZulu-Natal: http://research.ukzn.ac.za/Files/Research_Ethics_Policy_V_-_Final_rec_from_ACB_31_July_2007_sen_30_may_2007_and_council_29_june_2007_2.sflb.doc

Evidence for Measures taken at the Level of Research Staff at Research Performing Organisations

8.1 Regulations Impacting on Research

No evidence available from existing sources.

8.2 Ethics Infrastructure

No evidence available from existing sources.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 788503.

Evidence for Measures taken at the Level of Public Perspectives on Science and Scientific Researchers

8.1 Regulations Impacting on Research

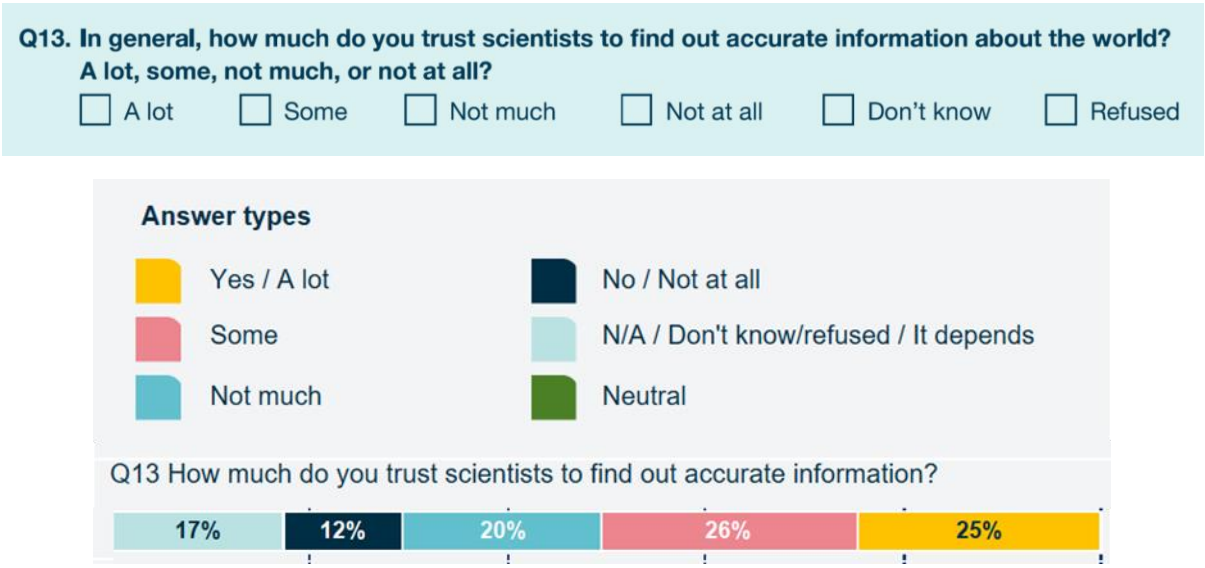
No evidence available from existing sources.

8.2 Ethics Infrastructure

The following question and its answers, extracted from the surveys mentioned in the Data Sources section, assess the public perception of the ethical side of science and scientists. Responses indicate public perceptions of progress in establishing the professional integrity of scientists and their work.

Question #13 from the WGM survey 2018 evaluates how much does the public trust scientists to find out accurate information about the world. This question not only indicates a level of trust on scientists, but also in their methods. **26% of the people indicated trusting scientists to find out accurate information about the world to some extent. 25% expressed trusting in them completely, while 12% indicated not trusting in them at all.**[92]

Figure 42: Question #13 from the Wellcome Global Monitor Survey 2018



One question of the 3M State of Science surveys evaluates whether scientists and their work are perceived as ethical by the general public. The interviewees were asked to specify their level of agreement to the following statement: Most scientists are not as ethical as they should be. In 2019, **43% of the people somewhat agreed, 32% somewhat disagreed, 15% completely agreed and 10% completely disagreed.** In 2020, **48% of the people somewhat agreed, 28% somewhat disagreed, 19% completely agreed and 6% completely disagreed.**

[92] 20% specified that their level of trust in them is low. 17% didn't answer, refused to or said that it would depend on other factors.

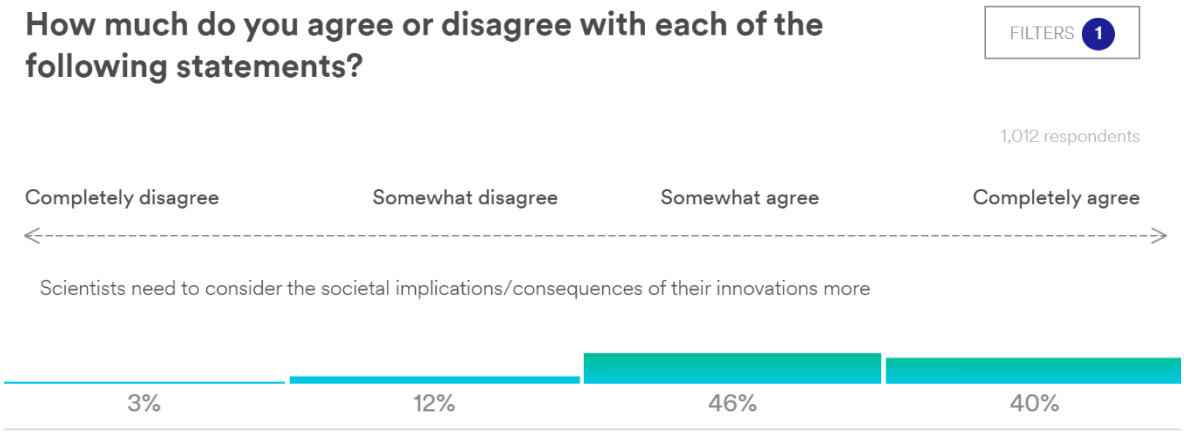
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 788503.

Table 33: Question from the 3M State of Science survey 2019 (Q27) and 2020 (Q29)

Most scientists are not as ethical as they should be		
	2019	2020
Completely disagree	10%	6%
Somewhat disagree	32%	28%
Somewhat agree	43%	48%
Completely agree	15%	19%

Question #29 from the 3M State of Science survey 2020 assesses whether the public thinks that scientists are considering the societal implications of their work. The interviewees were asked to specify their level of agreement to the following statement: Scientists need to consider the societal implications/consequences of their innovations more. **46% of the people somewhat agreed, 40% completely agreed, 12% somewhat agreed and 3% completely disagreed.**

Figure 43: Question #29 from the 3M State of Science survey 2020



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 788503.

9 Human Capital for Research

Human capital is the principal pillar of a sound science system. Member States should develop policies with respect to the training, employment, career prospects, and work conditions of scientific researchers. These policies should address, inter alia, adequate career development prospects; lifelong learning opportunities; the facilitation of mobility and international travel; the protection of health and social security; and inclusive and transparent performance appraisal systems for scientific researchers.

The below topics refer to science in society grouped by the Key Priority Area 9

(a) have measures been taken to implement the norms and standards of the Recommendation?

(b) have any obstacles to compliance with the norms and standards been encountered?

9. Human Capital for Research

	(a)	(b)
9.1 Careers, Mobility	Yes/No	Yes/No
9.2 Learning	Yes/No	Yes/No
9.3 International Travel	Yes/No	Yes/No
9.4 Social Security	Yes/No	Yes/No
9.5 Appraisal	Yes/No	Yes/No

Measures that have been taken to implement the norms and standards of the Recommendation

Evidence for Measures taken at the Member State Level

9.1 Careers, Mobility

The following national policies were identified by a drafting group composed by twelve scholars and researchers from different universities and commissions.

S&T white paper – revised version by DSI

--

National Water Research, Development and Innovation Roadmap - DSI

--

Water Research Act and the Master Plan – DWS

Expand and transform human capabilities – which includes the increase of the science, technology, engineering, and mathematics (STEM) pipeline. The expansion of Centres of Excellence (CoE), South African Research Chairs Initiative (SARChI) and increased support for women and emerging researchers.

The WP outlines the vision of the 2019 STI White Paper to be the science, technology and innovation enabling inclusive, sustainable South African development in a changing world.

9.2 Learning

No policy but there are existing programmes aimed at training young engineers from South Africa where they visit the USA for a master class sand to learn from their counterpart. There is also a series of trainings to equip and facilitate uptake of the knowledge and innovative solutions produced from the WRC funded projects. This contributes to the objective of building a capable water sector.

9.3 International Travel

No evidence available from existing sources.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 788503.

9.4 Social Security

No evidence available from existing sources.

9.5 Appraisal

No evidence available from existing sources.

Evidence for Measures taken at the Level of Research Staff at Research Performing Organisations

9.1 Careers, Mobility

No evidence available from existing sources.

9.2 Learning

No evidence available from existing sources.

9.3 International Travel

No evidence available from existing sources.

9.4 Social Security

No evidence available from existing sources.

9.5 Appraisal

No evidence available from existing sources.

Evidence for Measures taken at the Level of Public Perspectives on Science and Scientific Researchers

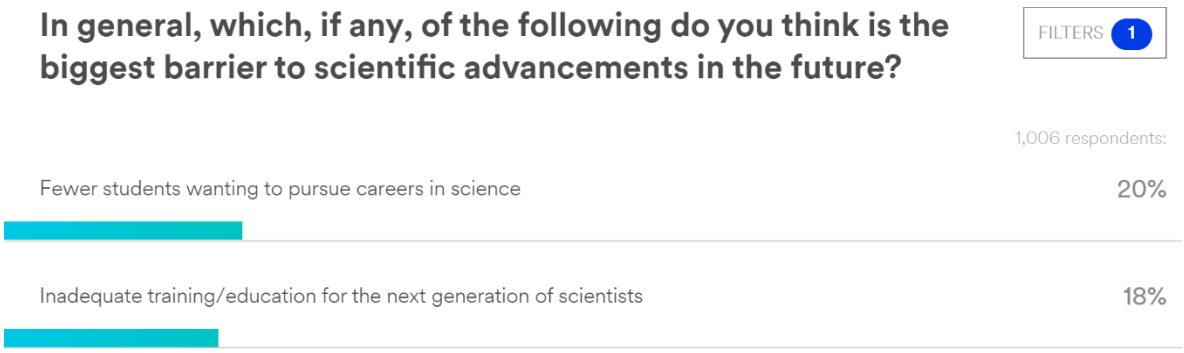
9.1 Careers, Mobility

The following question and its answers, extracted from the surveys mentioned in the Data Sources section, assesses the public perception of the condition of education and/or training in scientific careers, and its impact on the next generation of scientists.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 788503.

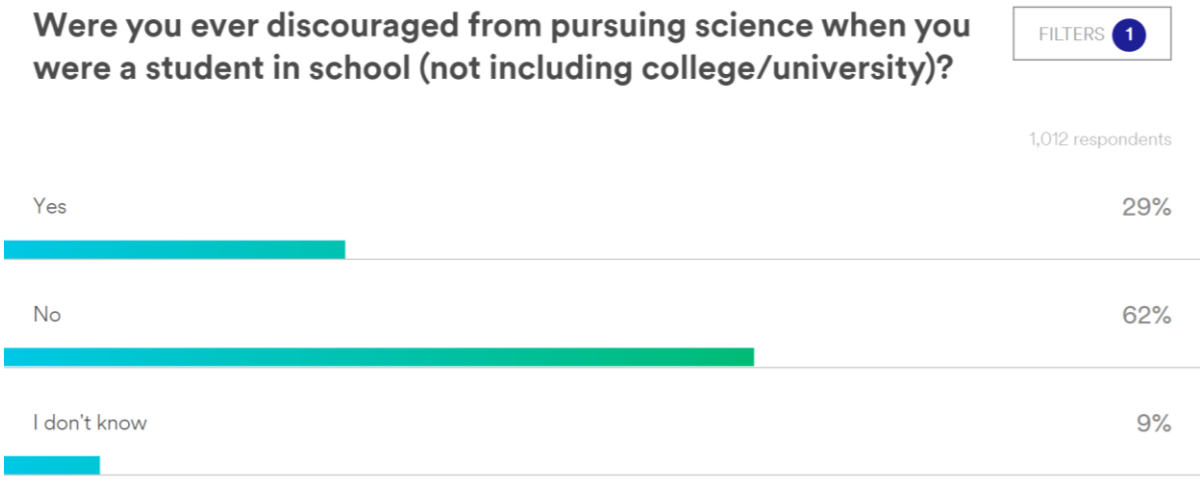
Question #24 from the 3M State of Science survey 2018 provides more information on the perceived barriers to scientific advancements, being the quality of education one of them. **20% of the people think that the fact that fewer students want to pursue a career in science is one of the biggest obstacles to scientific advancements in the future. 18% considers that the inadequate training/education for the next generation of scientists is also a big obstacle.**

Figure 44: Question #24 from the 3M State of Science survey 2018



To complement the previous question, question #23 from the 3M State of Science survey 2020 asks the interviewees if they were ever discouraged from pursuing a career in science when they were students in school. **62% of the people expressed not being discouraged, 29% said that they were discouraged and only 9% indicated not knowing.**

Figure 45: Question #23 from the 3M State of Science survey 2018



Question #25 from the 3M State of Science survey 2019 evaluates the reasons that prevented the interviewees from pursuing a career in science. This particular response assesses the general public's perception regarding the cost of training/education and whether this is a detriment to choosing a scientific career. **29% of the people confirmed that the high cost of education was a reason why they did not pursue a career in STEM.**

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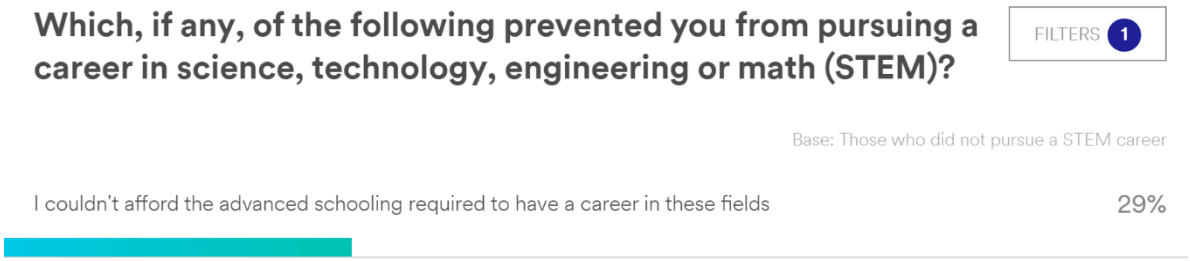
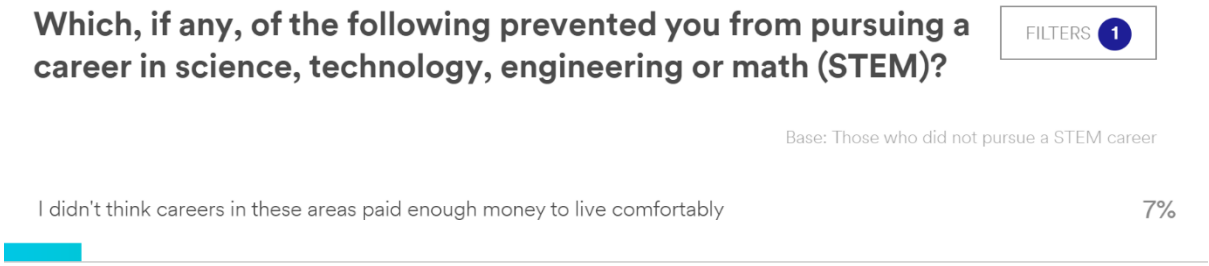
Figure 46: Question #25 from the 3M State of Science survey 2019



In the same question, **7% of the people said that they did not think that careers in these areas paid enough money to live comfortably.** This answer refers to the public perception of the working conditions of scientists and scholars, and the possible need of choosing a professional career that provides better economic conditions.

Figure 47: Question #25 from the 3M State of Science survey 2019



The following questions and their answers assess whether the general public perceives a career in science as an accessible, feasible and desirable professional path for anyone. In one question of the 3M State of Science surveys, the interviewees had to select their level of agreement to the following statement: Only geniuses can have a career in science. In 2018, **32% of the people completely disagreed, 27% somewhat disagreed, 22% somewhat agreed and 19% completely agreed.** In 2019, **33% of the people completely disagreed, 28% somewhat disagreed, 24% somewhat agreed and 15% completely agreed.** In 2020, **32% of the people completely disagreed, 30% somewhat disagreed, 24% somewhat agreed and 14% completely agreed.**

Table 34: Question from the 3M State of Science survey 2018 (Q6), 2019 (Q22) and 2020 (Q26)

Only geniuses can have a career in science			
	2018	2019	2020
Completely disagree	32%	33%	32%
Somewhat disagree	27%	28%	30%
Somewhat agree	22%	24%	24%
Completely agree	19%	15%	14%

In the same question, the interviewees had to select their level of agreement to the following statement: I regret not pursuing a career in science (2018 version), I wish I pursued a career in science (2019 version) and If I could go back in time, I would pursue a science-based career (2020 version). In 2018, **32% of the people somewhat agreed, 26% somewhat**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 788503.

disagreed, 22% completely agreed and 20% completely disagreed. In 2019, **34% somewhat agreed, 26% completely agreed, 21% somewhat disagreed and 18% completely disagreed.** In 2020, **38% completely agreed, 34% somewhat agreed, 18% somewhat disagreed and 10% completely agreed.**

Table 35: Question from the 3M State of Science survey 2018 (Q6), 2019 (Q22) and 2020 (Q26)

I wish I pursued a career in science			
	2018	2019	2020
Completely disagree	20%	18%	10%
Somewhat disagree	26%	21%	18%
Somewhat agree	32%	34%	34%
Completely agree	22%	26%	38%

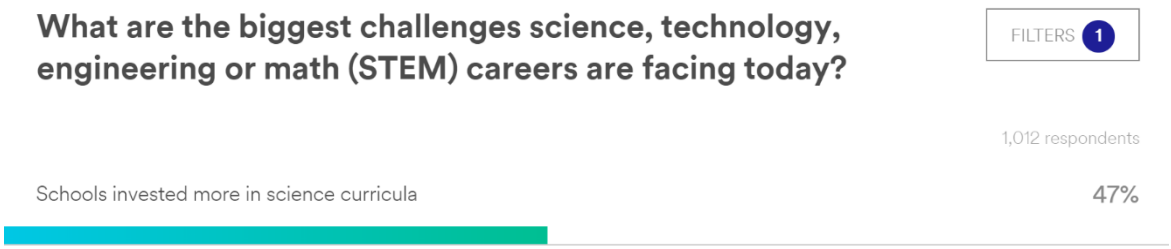
In the same question, the public had to select their level of agreement to the following statement: I would encourage kids to pursue a career in science. In 2018, **56% of the people completely agreed, 33% somewhat agreed, 8% somewhat disagreed and 3% completely disagreed.** In 2019, **49% completely agreed, 35% somewhat agreed, 11% somewhat disagreed and 5% completely disagreed.**

Table 36: Question from the 3M State of Science survey 2018 (Q6) and 2019 (Q22)

I would encourage kids to pursue a career in science		
	2018	2019
Completely disagree	3%	5%
Somewhat disagree	8%	11%
Somewhat agree	33%	35%
Completely agree	56%	49%

Question #32 from the 3M State of Science survey 2020 assesses the perceived challenges that the general public thinks science careers are facing today. This result in particular indicates whether there is a perceived adequate career development strategy. **44% of the people indicated that the limited job openings is one of the biggest challenge.**

Figure 48: Question #32 from the 3M State of Science survey 2020



Question #23 from the 3M State of Science survey 2019 assesses the perceived importance of science for different professional careers, and if parents transmit this belief to their children. When asked whether they (parents) had said that science won't be important in the long run to their kids, **8% of them said yes.**

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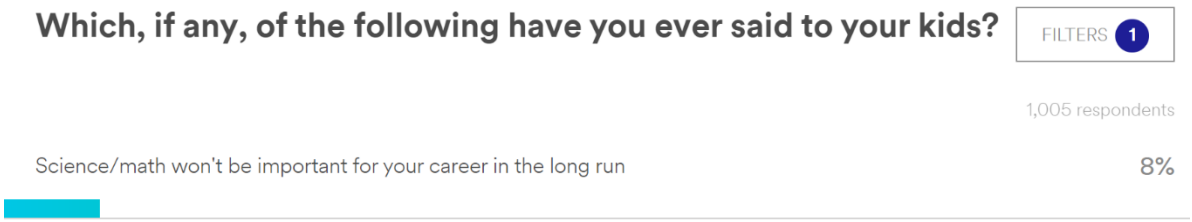
Figure 49: Question #23 from the 3M State of Science survey 2019



One question of the 3M State of Science survey evaluates whether the public think that it is relevant for everyone, regardless their profession, to know about science. The interviewees had to select their level of agreement to the following statement: It is important for everyone to have basic scientific knowledge regardless of their profession. In 2019, **51% of the people completely agreed, 36% somewhat agreed, 9% somewhat disagreed and 4% completely disagreed.** In 2020, **50% of the interviewees completely agreed, 38% somewhat agreed, 9% somewhat disagreed and 3% completely disagreed.**

Table 37: Question from the 3M State of Science survey 2019 (Q7) and 2020 (Q2)

It is important for everyone to have basic scientific knowledge regardless of their profession.		
	2019	2020
Completely disagree	4%	3%
Somewhat disagree	9%	9%
Somewhat agree	36%	38%
Completely agree	51%	50%

9.2 Learning

No evidence available from existing sources.

9.3 International Travel

No evidence available from existing sources.

9.4 Social Security

No evidence available from existing sources.

9.5 Appraisal

No evidence available from existing sources.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 788503.

10 Enabling Environment for Science and Research

Member States – government and non-government stakeholders alike - should create a stimulating environment for a sound science system with adequate human and institutional capacities, by facilitating satisfactory work conditions, moral support, and public recognition of successful performance of scientific researchers; by supporting education in science and technology; by promoting publishing and sharing data and results that meet adequate quality standards; and by monitoring the implementation and impact of such efforts.

The below topics refer to science in society grouped by the Key Priority Area 10

(a) have measures been taken to implement the norms and standards of the Recommendation?

(b) have any obstacles to compliance with the norms and standards been encountered?

10. Enabling Environment for Science and Research

	(a)	(b)
10.1 Infrastructure and S&T services	Yes/No	Yes/No
10.2 Public funding	Yes/No	Yes/No
10.3 Work Conditions	Yes/No	Yes/No
10.4 Publication	Yes/No	Yes/No

Measures that have been taken to implement the norms and standards of the Recommendation

Evidence for Measures taken at the Member State Level

10.1 Infrastructure and S&T services

The following national policies were identified by a drafting group composed by twelve scholars and researchers from different universities and commissions.

S&T white paper – revised version by DSI

--

National Water Research, Development and Innovation Roadmap - DSI

--

Water Research Act and the Master Plan – DWS

--

Water and Sanitation chapter of the NDP

--

NIPMO Act

--

WRC IP support or water and sanitation research products

--

In the WRC we involve communities in area where we implement projects to help them develop skills and help manage the projects – they are out implantation partners.

--

The WRC has light houses for key and strategic and water and sanitation RDI areas where we bring CoPs to jointly craft the national agenda and strategic direction with us.

--

To ensure that we build capacity, we have a requirement that all our funded project must include students and we also recognize projects that have contributes to building capacity in the water and sanitation RDI through the WRC awards and NSTF awards.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 788503.

--

The White Paper outlines the vision of the 2019 STI White Paper to be the science, technology and innovation enabling inclusive, sustainable South African development in a changing world.

--

Better intergovernmental coordination will be required to support policy alignment and implementation in a differentiated system, particularly in relation to collaboration between the DHET and the Department of Science and Technology (DST) in the area of research funding and development. Page 30 in WHITE PAPER FOR POST-SCHOOL EDUCATION AND TRAINING
https://www.dhet.gov.za/SiteAssets/Latest%20News/White%20paper%20for%20post-school%20education%20and%20training.pdf

10.2 Public funding

The following national policies were identified by a drafting group composed by twelve scholars and researchers from different universities and commissions.

Expand and transform research enterprise – these include focusing on researches in national priorities and funding them appropriately and developing a diversity of knowledge fields, e.g. trans-disciplinary research, indigenous knowledge, innovation, and business science. These would-be specific areas of work.

--

Increased STI investments – which includes integrating STI into government planning and budgeting at the highest levels.

--

In the case of science, engineering and technology, the Ministry is particularly keen to increase enrolments in the broad field of information and communications technology, which has been identified by Cabinet as a key focus for skills development. The shift in the balance of enrolments in general and the specific focus on information and communications technology will be achieved through the steering of funded student places and through identifying the institutions that have the capacity and/or potential to respond to the government's HRD strategy p.26 in NATIONAL PLAN FOR HIGHER EDUCATION IN SOUTH AFRICA, MINISTRY OF EDUCATION FEBRUARY 2001
https://www.dhet.gov.za/HED%20Policies/National%20Plan%20on%20Higher%20Education.pdf

10.3 Work Conditions

No evidence available from existing sources.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 788503.

10.4 Publication

No evidence available from existing sources.

Evidence for Measures taken at the Level of Research Staff at Research Performing Organisations

10.1 Infrastructure and S&T services

No evidence available from existing sources.

10.2 Public funding

No evidence available from existing sources.

10.3 Work Conditions

No evidence available from existing sources.

10.4 Publication

No evidence available from existing sources.

Evidence for Measures taken at the Level of Public Perspectives on Science and Scientific Researchers

10.1 Infrastructure and S&T services

The following questions and their answers, extracted from the surveys mentioned in the Data Sources section, assess whether the general public recognises the effort of the Member States in create a stimulating environment for a sound science system with adequate human and institutional capacities.

One question of the 3M State of Science surveys evaluates whether the public think that their country places a higher value in science than others. The interviewees had to indicate their level of agreement to the statement. In 2018, **45% of the people completely agreed, 41% somewhat agreed, 11% somewhat disagreed and 3% completely disagreed.** In 2019, **41% of the people completely agreed, 38% somewhat agreed, 15% somewhat disagreed and 6% completely disagreed.** In 2020, **42% of the people completely agreed, 38% somewhat agreed, 14% somewhat disagreed and 5% completely disagreed.**

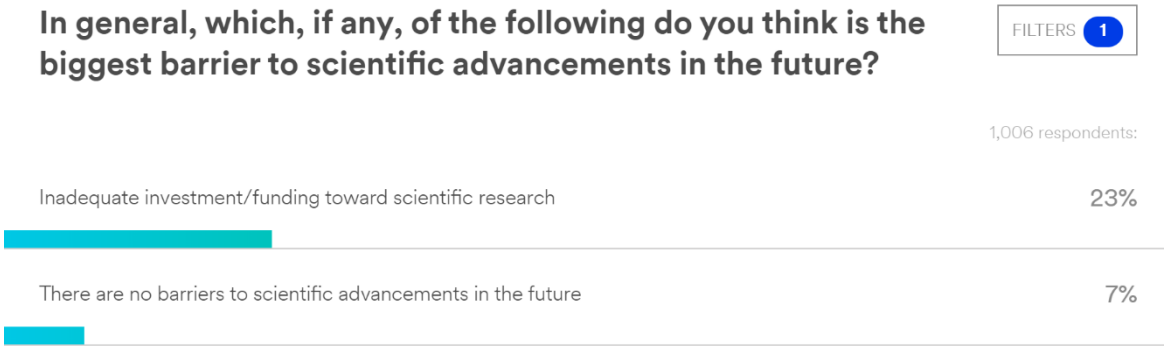
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 788503.

Table 38: Question from the 3M State of Science survey 2018 (Q9), 2019 (Q10) and 2020 (Q4)

How much do you agree or disagree with the following statement: Other countries place a higher value on science than my country			
	2018	2019	2020
Completely disagree	3%	6%	5%
Somewhat disagree	11%	15%	14%
Somewhat agree	41%	38%	38%
Completely agree	45%	41%	42%

Question #24 from the 3M State of Science survey 2018 provides more information on the perceived barriers to scientific advancements, being funding one of them. **23% of the people think that inadequate investment/funding toward scientific research is one of the biggest obstacles to scientific advancements in the future. Only 7% think that there are no barriers at all.**

Figure 50: Question #24 from the 3M State of Science survey 2018



One question of the 3M State of Science surveys goes deeper into this issue and assesses the public perception of their country's scientific advancements in comparison to other countries. In 2018, **61% of the people thought their country was falling behind, 27% thought that their country was equal to other countries, and 13% thought that their country was leading when it came to scientific advancements.** In 2019, **61% of the people thought their country was falling behind, 27% thought that their country was equal to other countries, and 12% thought that their country was leading when it came to scientific advancements.** In 2020, **66% of the people think their country is falling behind, 27% think that their country is equal to other countries, and 13% think that their country is leading when it comes to scientific advancements.**

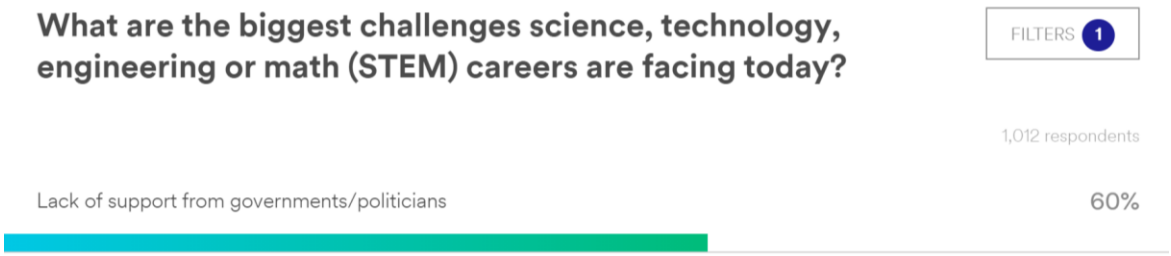
Table 39: Question from the 3M State of Science survey 2018 (Q17), 2019 (Q30) and 2020 (Q12)

Do you think your country is leading or falling behind when it comes to scientific advancements compared to other countries?			
	2018	2019	2020
Leading	13%	12%	12%
Falling behind	61%	61%	66%
Same/equal to other countries	27%	27%	22%

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 788503.

Question #32 from the 3M State of Science survey 2020 assesses the perceived challenges that the general public thinks science careers are facing today. **60% of the people thinks that the lack of support from governments/politicians is one of them.**

Figure 51: Question #32 from the 3M State of Science survey 2020

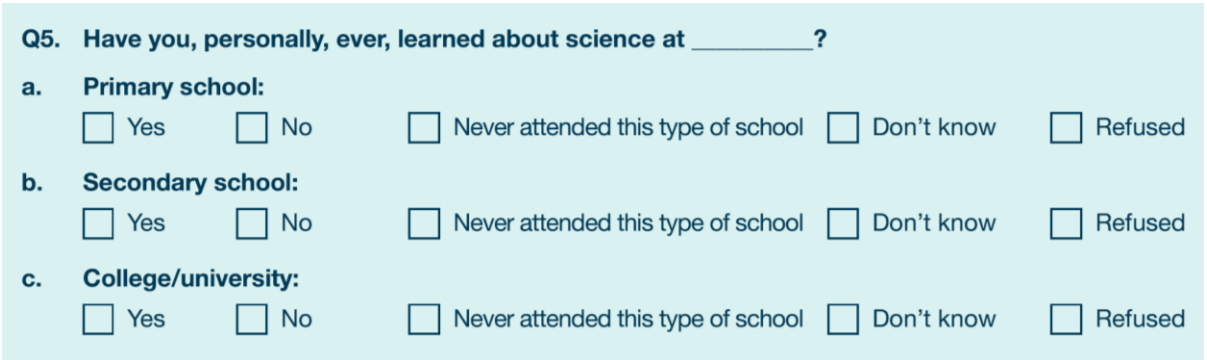


The following questions and their answers assess whether the general public has had access to scientific knowledge at different types and levels of school. The results from these questions are an indicator of progress in member states – government and non-government stakeholders alike- supporting and stimulating an environment in which science and technology can flourish.

Question #5 from the WGM survey 2018 evaluates whether the public has learned about science at primary, secondary and/or college/university. This question is of vital importance to understand potential gaps in science curricula within a country's education system.

71% of the people indicated learning about science at primary school, 59% at secondary school and 12% at college/university. 26% of the people indicated not having learned about science at primary school, 37% at secondary school and 64% at college/university.

Figure 52: Question #5 from the Wellcome Global Monitor Survey 2018



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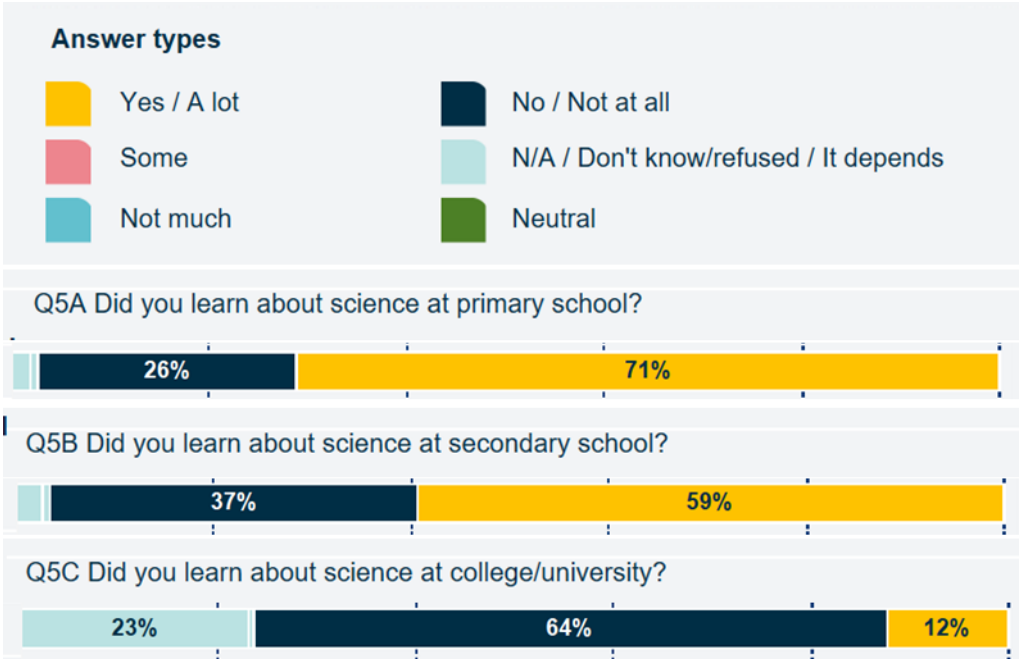
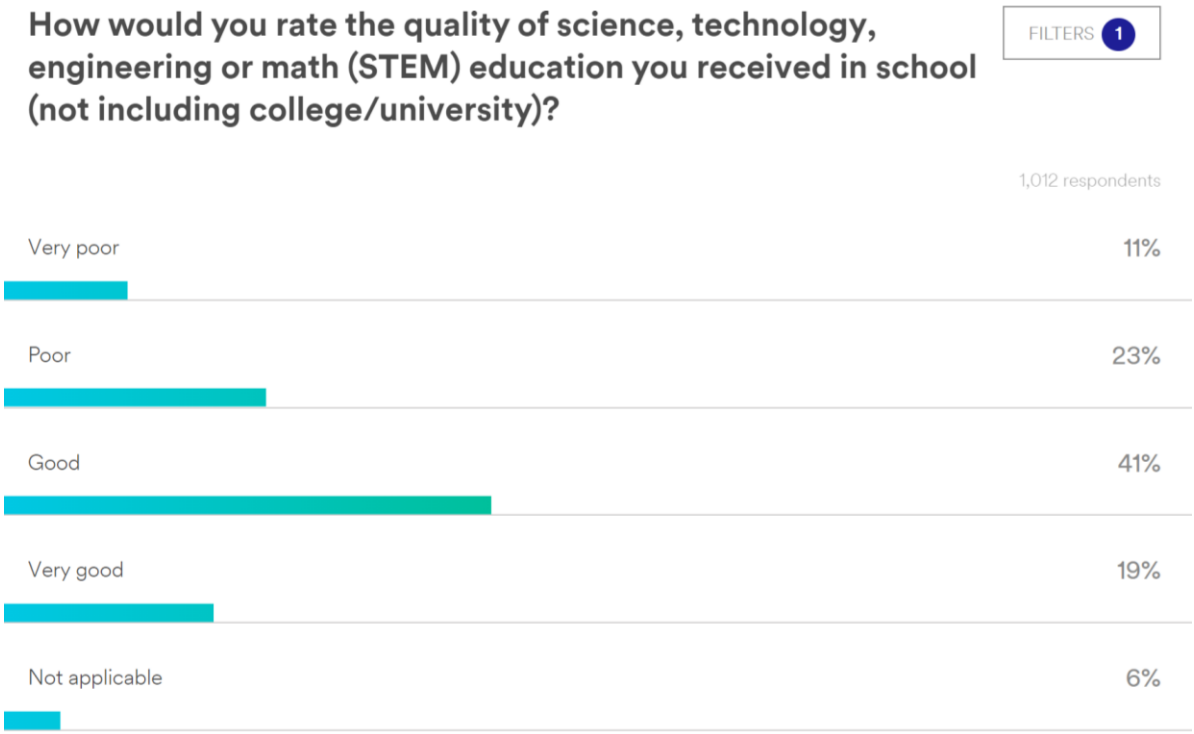


Question #20 from the 3M State of Science survey 2020 assesses the perceived level of quality of STEM education received by the interviewees in school (not including college/university). **41% of the people rated it as good, 23% as poor, 19% as very good and 11% as very poor[93].**

Figure 53: Question #20 from the 3M State of Science survey 2020



[93] 6% of the responses was classified as 'Not applicable'.

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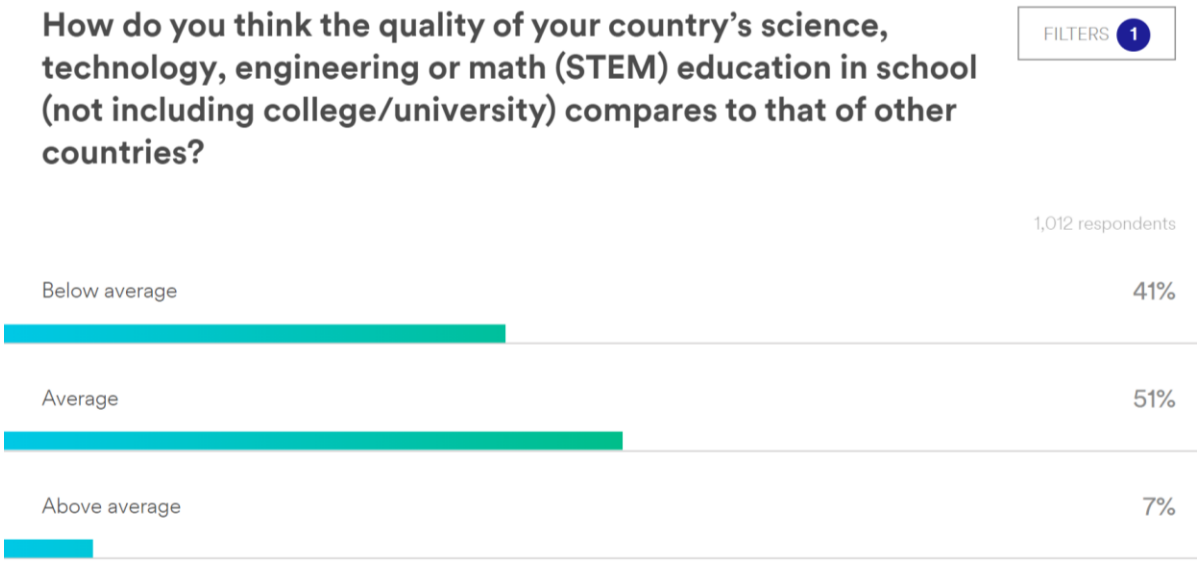
As a follow up to the previous question, question #21 from the 3M State of Science survey 2020 asks about the perceived level of quality of STEM education when compared to that of other countries. **51% of the people think the quality is average, 41% think is below average and only 7% considers it is above average.**

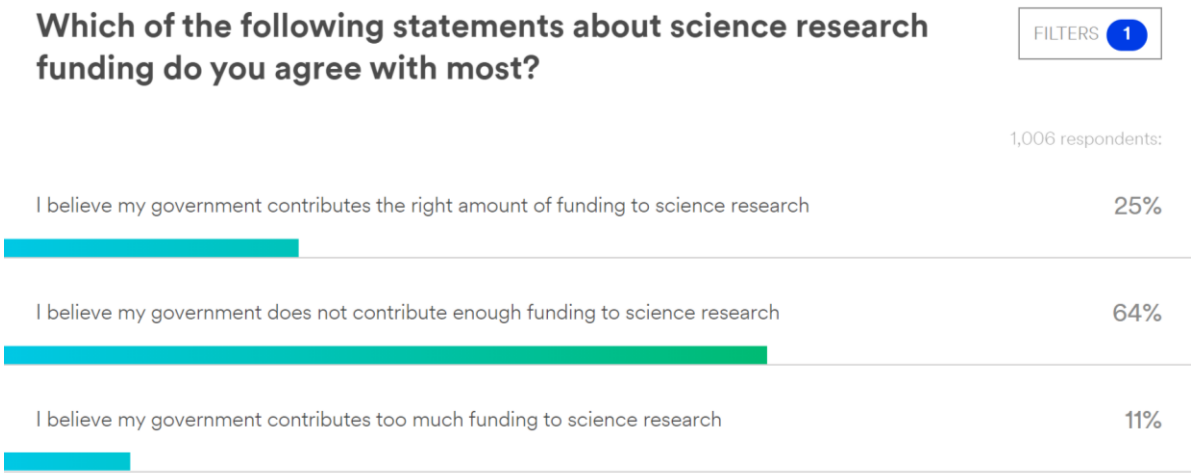
Figure 54: Question #21 from the 3M State of Science survey 2020



10.2 Public funding

Question #14 from the 3M State of Science survey 2018 evaluates the public perception of science research funding. **64% of the people believes that their government does not contribute enough funding to science research, 25% thinks that it contributes the right amount, and 11% that it contributes too much funding.**

Figure 55: Question #14 from the 3M State of Science survey 2018



One question of the 3M State of Science surveys evaluates the level of support for science activities and discoveries. The results show the political actions/activities that the general public does in their daily lives in order to support science. In 2019, **24% of the people**

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indicated supporting government policies that help fund scientific advancements and 14% specified voting for politicians who support funding science. In 2020, **19% confirmed supporting governments policies that help fund scientific advancements and 17% said that they voted for politicians who support funding science.**

Table 40: Question from the 3M State of Science survey 2019 (Q21) and 2020 (Q43)

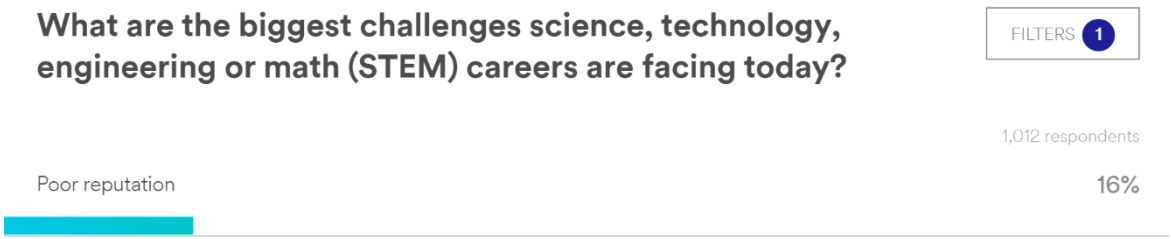
Which, if any, of the following do you do to support science activities and advancing scientific discoveries?		
	2019	2020
I support government policies that help fund scientific advancements	21%	19%
I vote for politicians who support funding science	14%	17%
I don't do anything to advance scientific discoveries	31%	31%

10.3 Work Conditions

The following question assesses whether there is a public recognition of successful performance of scientific researchers. The results from these questions are an indicator of progress in member states – government and non-government stakeholders alike- supporting and stimulating an environment in which science and technology can flourish.

Question #32 from the 3M State of Science survey 2020 assesses the perceived challenges that the general public thinks science careers are facing today. **16% of the people indicated that STEM careers' poor reputation is one of the biggest challenges.**

Figure 56: Question #32 from the 3M State of Science survey 2020



10.4 Publication

No evidence available from existing sources.

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