Rathenau Instituut

European research and innovation in a new geopolitical arena

Report

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Foreword

This publication brings together information of relevance to the European Union's research policy. In particular, the Rathenau Instituut aims to describe what research cooperation in the EU (the European Research Area) means for academic research in the Netherlands. In the coming months, the European Commission will be presenting the successor to the Horizon 2020 Framework Programme for Research and Innovation, called 'Horizon Europe'.

The EU has become more important than ever as a source of research funding since the launch of Horizon 2020. Horizon 2020 had a budget of 78.6 billion euros for the 2014-2020 period. Dutch researchers have been relatively successful at obtaining funding from the programme, making the EU an important source of funding for research in the Netherlands.

But the EU has become more than simply an additional source of funding for researchers. It also influences the agenda setting, programming, organisation, utilisation, and infrastructures of scientific research. For example, the Horizon 2020 programme identified societal challenges as guideposts for research. The European Research Council encourages research 'excellence' by organising funding across the EU on a competitive basis. Cooperation within the European Strategy Forum on Research Infrastructures is also meant to lead to an EU-wide research infrastructure.

The new European Commission has set its sights even higher. What does this mean in financial terms, and – above all – how is this impacting Dutch research? And how can the Dutch and other national parliaments assert control? Are ordinary citizens being engaged, and is that happening at the right time? These are all important questions, in the opinion of the Rathenau Instituut. We will be tracking relevant trends and developments over the next several months. At the time of publication, the COVID-19 pandemic is sweeping the world. The crisis will have a far-reaching impact on public health, the economy and society in the EU. EU research and innovation policies may also be affected, although the implications are difficult to gauge at present. For the sake of completeness, we should note that we have not included these events in our analysis.

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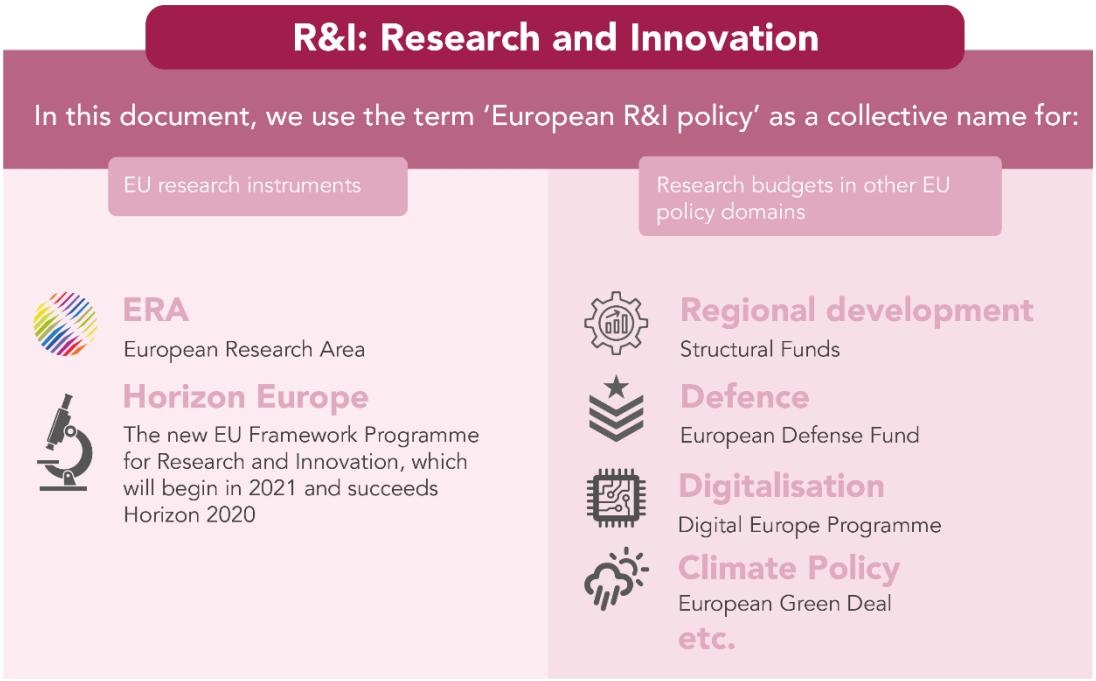
Summary

This study explores recent changes in the European Union's research and innovation (R&I) policies associated with geopolitical, technological and economic trends and developments. The European Commission's new R&I policy speaks of a growing ambition to mobilise researchers, industry and other parties to attain geopolitical and societal goals, made evident in its new Horizon Europe Framework Programme for Research and Innovation (2021-2027), its proposed European Green Deal, and the new European Defence Fund (EDF). The Commission is asking the EU Member States to make a major investment in its plans.

Negotiations concerning the Horizon Europe framework programme were fraught with difficulties. To increase Member States' support for Horizon Europe, the Commission must be able to demonstrate that the EU's R&I policy will have positive long-term effects for all Member States. In particular, it must demonstrate the added value of closer integration between Member States' R&I efforts. The European Commission is therefore taking a new direction in the European Research Area (ERA).

The Rathenau Instituut believes that the present policy review period affords a good opportunity to explore the added value of joint investment in European research and innovation. A key question in the policy review is to what extent Horizon Europe should contribute to a more balanced distribution of research capacity across Member States, and in what way. The logic of 'global excellence' suggests that it will be necessary to concentrate research capacity in centres of excellence (in Western European countries) to compete globally for talent, knowledge and investment. On the other hand, a balanced distribution of research capacity can make European research and innovation more resilient in the long term and help foster cohesion in the European Union.



Source: Rathenau Instituut

Figure 1 Research and innovation policy in the European Union

Content

1 New directions in the EU's R&I policy

1.1 Far-reaching changes

The European Union (EU) has become an important factor in Dutch research and innovation in recent decades. Researchers in the Netherlands often collaborate with partners from other EU Member States. In an earlier analysis, the Rathenau Instituut (2016) showed that the EU's framework programmes for research and innovation are an indispensable source of funding for Dutch science. Current data collected by the Rathenau Instituut (2020) show that the eighth framework programme, Horizon 2020, accounts for 12% of total public research funding in the Netherlands. In addition to generating an additional source of funding, the EU also provides guideposts for research in its policy. For example, in recent years Dutch researchers have increasingly focused on the societal challenges that were central to the EU framework programme. European rules and guidelines concerning socially relevant research, gender equality and open access publications influence the standards set by Dutch knowledge institutions. In addition, the European Structural Funds have a major impact on regional research and innovation programmes.

The EU is in a period of major transition at this time. Far-reaching advances in technology, shifting international relations and the growing impact of climate change have led the European Commission to redefine its policy on research and innovation (R&I). This exploratory study is the first part of a project in which the Rathenau Instituut will be examining changes in European R&I policy in relation to geopolitical, technological and economic trends and developments. We carried out desk research for this purpose and interviewed some twenty experts (see the Appendix).

Based on our analysis, we have identified five major trends that will influence the EU's new R&I policy.

1. Rapid advances in digital technologies

Digital technologies are rapidly advancing. Applications making use of artificial intelligence (AI) can collect and analyse ever-growing quantities of data. For example, AI is considered a game changer in security and defence (Rathenau Instituut, 2019), and it is part of the digital arms race. On the one hand, there are now military versions of digital technologies, including augmented reality, which

give soldiers better information during operations and more autonomous weapon systems (Rathenau Instituut, 2019). On the other hand, the cyberworld is also a new military battlefield, with cyberespionage and cyberweapons posing a threat to the electricity grid and other critical infrastructure (Rathenau Instituut, 2017).

AI is also hugely significant for business competitiveness. Fast-growing companies of the past decade were technology companies that also invested heavily in AI. What is worrying for the EU is that virtually all of the dominant companies – Google, Apple, Facebook, Huawei, Alibaba and Amazon – originated not in Europe but in the USA and China. AI is regarded as a winner-takes-all technology, i.e. the first parties to break into the market successfully can achieve unrivalled dominance (Taskforce AI position paper 2019). China and the USA have launched major multi-year programmes to gain and maintain global dominance in AI. Several EU Member States have also embarked on national AI programmes, including France in March 2018.[1] On 19 February 2020, the European Commission presented its digital strategy, which includes a data strategy and a White Paper on AI. The three key objectives of that strategy are 'technology that works for people', 'a fair and competitive economy', and 'an open, democratic and sustainable society'.[2]

2. Geopolitical uncertainty

Geopolitical uncertainty is the second global trend that will influence the EU's new R&I policy. Analysts refer to the end of multilateralism.[3] The international geopolitical order is undergoing a major reshuffle. The USA's supremacy is slipping, and China is establishing itself as a new economic superpower alongside the USA and the EU. Russia continues to pose a security threat. All these factors combined are resulting in an unpredictable geopolitical arena (Wetenschappelijke Raad voor het Regeringsbeleid, 2017). Faith in neo-liberal globalisation appears to have been lost. International alliances are under pressure, in particular NATO, the World Trade Organisation (WTO) and the Intermediate-Range Nuclear Forces (INF) Treaty (Clingendael Institute, 2019). The new team of European Commissioners, led by Ursula von der Leyen, is specifically presenting itself as a 'geopolitical Commission'.

3. Changing position of science in society

The third relevant trend is the changing position of science in society. A survey conducted by the Rathenau Instituut shows that although the public places great trust in science (Rathenau Instituut, 2018), it is less inclined to regard researchers as sources of relevant and reliable knowledge. Increasingly the public, business

1 https://www.aiforhumanity.fr/en/
2 'Shaping Europe's digital future: Commission presents strategies for data and Artificial Intelligence'. European Commisson website, 19 February 2020. https://ec.europa.eu/commission/presscorner/detail/en/ip_20_273
3 'De jaren 10. Hoe de geopolitiek oprukte in de wereld'. In: *NRC Handelsblad* 30 December 2019. https://www.nrc.nl/nieuws/2019/12/30/de-jaren-10-hoe-de-geopolitiek-oprukte-in-de-wereld-a3985293

owners, policymakers, interest groups and politicians have easy access to knowledge from a variety of sources online which may or may not be evidence-based. Broad access to knowledge obviously supports informed policymaking, but it can also lead to uncertainty if the available sources contradict one another (Rathenau Instituut, 2014). Researchers must therefore be able to explain how their methods result in knowledge that is more robust than knowledge produced by non-scientific methods. An additional factor is that academia's emphasis on excellence causes researchers to publish mainly in academic journals that are almost inaccessible to the general public. In addition, public-private academic research partnerships are increasing, giving industry more leverage over research agendas. This leaves researchers less leeway to consider other stakeholders in society.

All these trends have widened the gap between the public and science.
The new European Commission wants to raise awareness of the meaning and significance of science to society.

4. Brexit

Fourth, there is Brexit. The departure of the United Kingdom is forcing the remaining Member States to recalibrate their relationships within the European Union and consequently to review existing priorities. European cooperation and integration will decelerate in some policy areas while accelerating in others. At the same time, Brexit is putting pressure on the EU's overall budget and thus on the funding available for the Horizon Europe framework programme. Finally, Brexit has also curtailed opportunities to maintain partnerships with non-EU countries ('third countries') (see section 4.1).

5. Climate crisis

The fifth and final major development on our list is the climate crisis. We have known about global climate change for decades, but only now is it becoming a matter of real political urgency. To meet the targets of the Paris Agreement, the EU's economies will have to undergo profound changes, including changes in consumer behaviour.

1.2 Four strategic targets

The EU is attempting to formulate an appropriate response to these major trends and developments. In the European Commission's current policy documents, we

have identified four key strategic targets for the EU's R&I policy that are intended to bolster the bloc's position in a changing world.[4]

1. Boost the EU's competitiveness vis-à-vis the USA and China

This challenge has fuelled joint investment in R&I since the first EU framework programme back in the 1980s. At that point, Japan and the USA were the competitors that the EU most feared. Now China has surpassed Japan as a dreaded rival in R&I.

2. Develop technological sovereignty in the face of emerging technologies such as AI and the changing geopolitical context

Technological sovereignty benefits not only the EU's economic competitiveness but also, and in particular, its security (EPSC, 2019). Now that the 'faith' in neoliberal globalisation appears to be ebbing away and multilateralism is under strain, the EU wants to gain autonomy from China and the USA and avoid having to rely on these countries for key enabling technologies such as AI. Instead, the EU wants to lead from the front in shaping AI and develop AI applications that are in line with European values. The EU approach to AI focuses on people, and not on the technology firm and its shareholders (as in the USA) or the nation state (as in China). The European focus is on the public benefits that AI can bring, such as better healthcare and cleaner transport. The basic premise is that AI must be in line with the values as expressed in the Treaty on European Union.[5]

3. Promote science and knowledge as European core values

The Commission wants to make it clearer to the public what the EU stands for. That is why it is positioning research integrity and reliable science as core values that underpin the 'European way of life'. The Commission wants to make the impact of science on the daily lives of European citizens more visible, not only to boost support for public investment in R&I but also to enhance the legitimacy and credibility of European researchers in policy discussions.

4. Tackle climate change

The Commission has announced an ambitious 'European Green Deal' that has the support of most of the heads of government in the Union. The EU aims to be a global leader in this regard. The Commission is prepared to amend all necessary laws and regulations, thus transforming energy supply and consumer behaviour in

4 For example, European Commission (2019). *Orientations towards the first Strategic Plan: implementing the research and innovation framework programme Horizon Europe*; European Commission (2020). *White paper on Artificial Intelligence - A European approach to excellence and trust*; ERAC Ad-hoc Working Group on the Future of the ERA (2019). *Draft ERAC opinion on the future of the ERA*; Leyen, U. von der (2019). *A Union that strives for more: My agenda for Europe*.

5 European Commission (2018). *Artificial Intelligence for Europe*. https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=51625

such a way that Europe becomes the first climate-neutral continent by 2050. This target requires a major investment in research and innovation.

2 Key changes in European research instruments

2.1 Horizon Europe framework programme

In this report, we discuss how the four strategic targets are reflected in a number of key changes to the EU's research and innovation policy. Prior to our analysis, we briefly describe the 9th Framework Programme for Research and Innovation, Horizon Europe,[6] to give readers a context in which to understand the changes.

Figure 2 Structure of the Horizon Europe framework programme

Source: European Commission (2019). *Horizon Europe factsheet.* https://ec.europa.eu/info/sites/info/files/research_and_innovation/knowledge_publications_tools_and_data/documents/ec_rtd_factsheet-horizon-europe_2019.pdf

Horizon Europe has three pillars. The first pillar is Excellent Science, with a proposed budget of 25.8 billion euros. Horizon Europe's predecessor had budgeted 21.7 billion euros for academic research of this kind (see Figure 3). The intention is to continue allocating funding on a competitive basis. The second pillar is Global Challenges and European Industrial Competitiveness. It combines elements from the second and third pillars of Horizon 2020. The proposed budget for this pillar is 52.7 billion euros, compared to 45.2 billion euros in Horizon 2020. The second pillar is organised into a number of clusters and includes the Joint Research Centre, i.e.

6 See European Commission (2018). *Proposal for a DECISION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on establishing the specific programme implementing Horizon Europe – the Framework Programme for Research and Innovation*, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018PC0436; Presentatie 'Horizon Europe': https://ec.europa.eu/info/files/horizon-europe-investing-shape-our-future_en

the European institute for policy research. The third pillar, Innovative Europe, focuses on entrepreneurship and market-creating innovation. The proposed budget of 13.5 billion euros is significantly higher than the 2.7 billion euros under Horizon 2020. In addition, 2.1 billion euros has been proposed for measures meant to improve participation in the framework programme across Europe ('Widening Participation & Spreading Excellence') and to strengthen the European Research Area.[7] Finally, 2.4 billion euros has been budgeted for the Euratom nuclear research programme. This brings the total proposed budget to 100 billion euros. This includes 3.5 billion euros allocated to InvestEU, a programme that brings together under one roof all of the many EU financial instruments and that builds on and extends the European Fund for Strategic Investments (EFSI, part of the Juncker Plan[8]).

Horizon Europe differs from the previous framework programme in five ways:

1. it puts more emphasis on strategic EU policy priorities;
2. it takes a mission-oriented approach;
3. it has a larger budget for 'widening' measures;
4. it establishes a European Innovation Council;
5. it deploys European partnerships more strategically.

We explain these five changes below.

7 This amount will be higher because it was later agreed to earmark 3.3% of the total budget for this purpose.

8 The Juncker Plan is the 'Investment Plan for Europe', launched by the European Commission in 2015 to improve investment conditions in the EU after the economic and financial crisis. The plan has three objectives: remove obstacles for investors, highlight and provide technical support for investment projects, and make smarter use of financial resources.

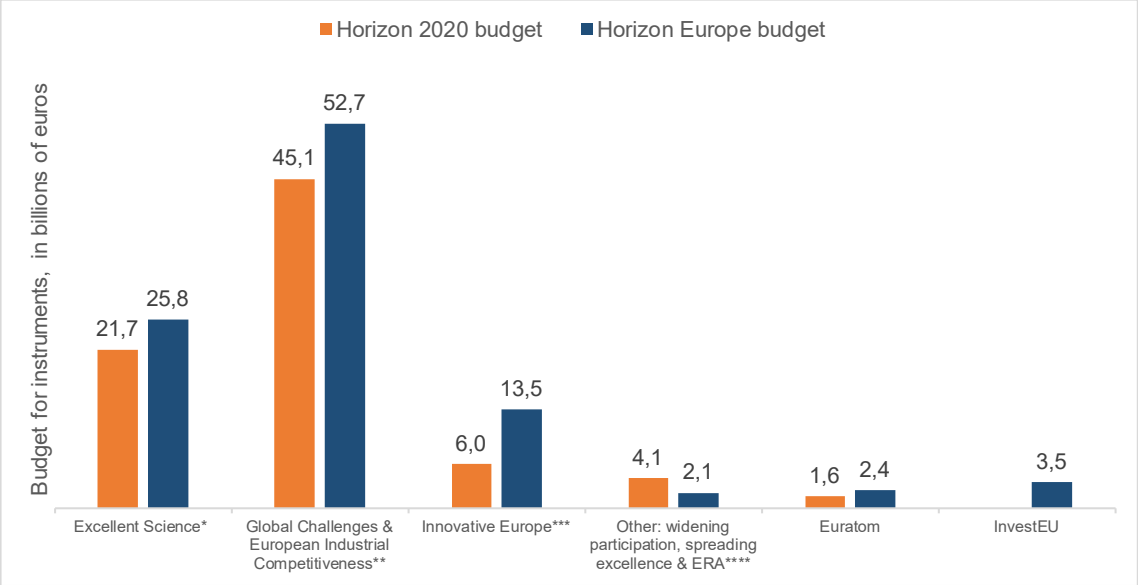


Figure 3 Comparing the Horizon 2020 and Horizon Europe budgets

Sources: Rathenau Instituut, calculations based on: European Commission (2013). Factsheet: Horizon 2020 budget; European Commission (2019). Horizon Europe. The next EU Research & Innovation investment programme (2021 – 2027)
Note: Insofar as possible, this figure compares the Horizon 2020 budget (at 2013 price levels) with the proposed Horizon Europe budget (at 2018 price levels). However, the H2020 pillars do not align with those of Horizon Europe and the new framework programme also has some new instruments.
Our categorisation is based on the instruments in the Horizon Europe pillars.
*H2020 equivalent: Excellent Science without FET
**H2020 equivalent: Societal challenges + Industrial leadership + JRC, without access to risk finance, without Innovation in SMEs
***H2020 equivalent: EIT
****H2020 equivalent: Access to risk finance + SWAFS + SEWP

2.2 More emphasis on strategic EU policy priorities

In terms of priorities, it is notable that the Commission intends to place more emphasis in the Horizon Europe framework programme on the Union's current strategic policy priorities. The Commission has identified six priorities to which the framework programme is meant to contribute:

1. A European Green Deal: making Europe the world's first climate-neutral continent
2. An economy that works for people: giving Europe a strong and resilient social market economy
3. A Europe fit for the digital age: making Europe a global leader in the digital and industrial transformation

4. Promoting our European way of life: protecting European citizens and European values
5. A stronger Europe in the world: reconfirming Europe's international position in a changing world
6. A new push for European democracy: strengthening democracy in Europe.

The Commission intends to make spending under the Horizon Europe budget largely contingent on these policy priorities and the United Nations' Sustainable Development Goals. It has stated in so many words that the Horizon Europe programme is part of its vision for a sustainable, fair and prosperous future for people and planet based on European values. For example, the Commission has agreed with the Member States to devote 35% of Horizon Europe's budget to climate targets.[9]
Horizon Europe's focus on EU policy priorities is also expressed in its seeking synergies with other EU programmes, such as the European Agricultural Fund for Rural Development, the European Maritime and Fisheries Fund, the European Regional Development Fund, the Digital Europe Programme, the LIFE Programme for the Environment and Climate Change, the European Space Programme, and the European Defence Fund. The Commission wants to coordinate the various programmes to achieve a greater combined impact. This means, for example, that the Commission ensures that the design and objectives of these EU programmes are consistent and that the financing and implementation rules for the various EU programmes are aligned. When allocating funds from Horizon Europe's budget to research and innovation, the Commission will specifically consider the science and innovation requirements of other EU programmes. The Commission also encourages other EU programmes to take advantage of Horizon Europe's research results and innovative solutions.

2.3 Mission-oriented approach

The second change is the strategy of creating more societal impact by working to solve urgent problems in society. The EU has defined five mission areas:[10]

1. Cancer
2. Adaptation to climate change, including societal transformation

9 European Commission (2019). *Orientations towards the first Strategic Plan for Horizon Europe*. https://ec.europa.eu/info/sites/info/files/research_and_innovation/strategy_on_research_and_innovation/documents/ec_rtd_orientations-he-strategic-plan_122019.pdf

10 The Netherlands is also pursuing a mission-oriented top sector and innovation policy: Ministry of Economic Affairs and Climate Policy (2019). *Missies voor het topsectoren- en innovatiebeleid*. https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/publicaties/2019/04/26/missies/Missies+voor+het+Topsectoren-+en+Innovatiebeleid+26-04-2019.pdf

3. Healthy oceans, seas, coastal and inland waters
4. Climate-neutral and smart cities
5. Soil health and food.

These mission areas replace the seven ‘grand challenges’ of the Horizon 2020 programme and will support specific missions aimed at solving these pressing challenges in society. Each mission must achieve an inspirational and measurable goal for European citizens within a set timeframe of ten years.

The Commission has established a mission board in each mission area.[11] Their task is to advise on the content of the work programmes and their revision as needed during implementation. According to reports on the first meetings, the Commission has tasked the mission boards with broadening the application of existing knowledge and encouraging the scaling up of local and regional initiatives. The mission boards are tackling this task by setting up projects that cut across disciplines, as part of a portfolio approach. The portfolios of four ‘green deal mission areas’ will be part of the European Green Deal. Typically, the Commission sees the missions as a learning device for innovation. At first, missions will be relatively small in scale, with a maximum of 10% of the annual budget of Pillar II being earmarked for missions during the first three years of the programme. The missions will develop their portfolio approach step by step. The Commission has mandated the mission boards to engage the public in programming and in carrying out mission-oriented research. For example, the Commission has asked all mission boards to visit each of the Member States.[12] Citizen engagement appears to serve a twofold purpose: to make practical use of available knowledge and to reinforce the legitimacy of investing in science.

2.4 Larger budget for ‘widening’ measures

The third change concerns the way funds will be distributed across the EU Member States. One of the novelties of Horizon Europe is that the budget reserved for the ‘widening’ measures has been increased from 1.8% to 3.3% at the urging of the European Parliament. The budget increase addresses a sensitive issue in previous framework programmes, i.e. the uneven distribution of allocated research budgets across the Member States, in part because ‘research excellence’ served as a selection criterion (see Figure 4 and 5). It was above all the EU13 countries (especially in Central and Eastern Europe) that called for a more balanced

11 https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme/missions-horizon-europe_en; For the tasks of the mission boards, see footnote 6, article 5.1.

12 ‘Missies in 2020, de stand van zaken’. Neth-ER website, 14 January 2020. https://www.neth-er.eu/nl/nieuws/Missies-2020-de-stand-van-zaken

distribution key by seeking to change the selection criteria for project funding. The Commission did not accommodate their request, however, arguing that research excellence was necessary to drive European competitiveness. The Commission considers that the EU13 countries should make better use of the EU's Structural Funds, i.e. the European Regional Development Fund and the Cohesion Fund, to improve their R&I capacity.

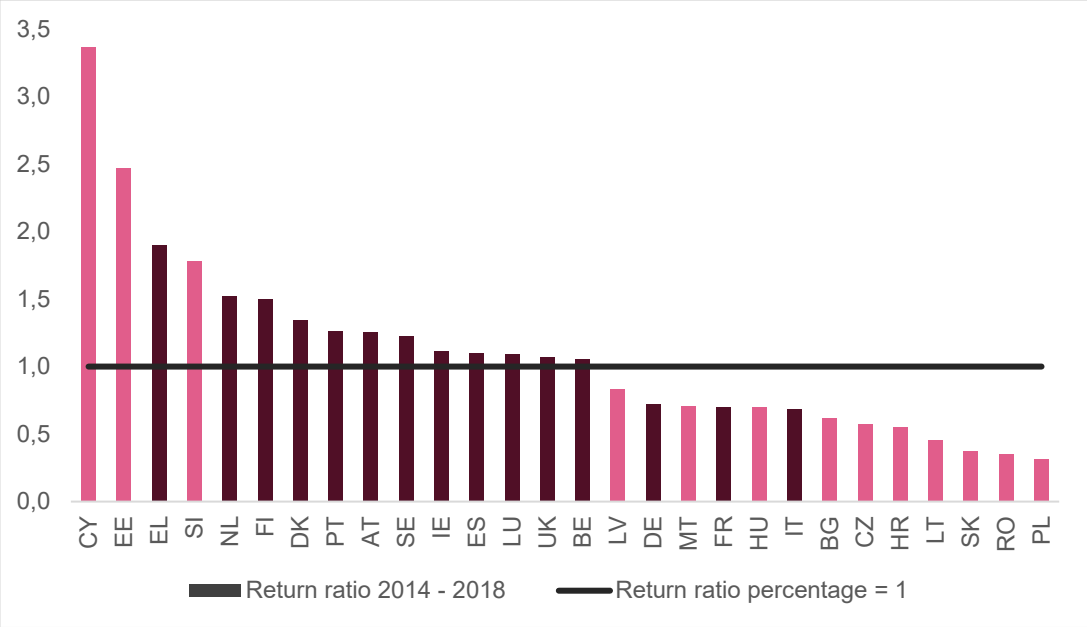


Figure 4 Relative share of EU Member States in Horizon 2020 funding allocation versus relative contribution to total EU budget

Sources: Rathenau Instituut, calculations based on data from Horizon 2020 Dashboard, reference date 11 February 2020; European Commission Budget, available at https://ec.europa.eu/budget/graphs/revenue_expediture.html.
Note: The figure shows the return ratio for all EU Member States. The return ratio is the share of the H2020 budget that a country received divided by the share that that country contributed to the EU's Multiannual Financial Framework (MFF) over the years 2014-2018. The dark red columns are EU15 countries. The pink columns are EU13 countries (Member States since 2004 or thereafter).
Note 1: As we have no information available on each country's actual contribution to the Horizon 2020 budget, we have assumed that it is comparable to the share that each one contributes to the EU budget (MFF).
Note 2: A value greater than 1 means that, over the 2014-2018 period, a country received a higher percentage of the H2020 budgets on average than the percentage it contributed to the MFF as a whole.
Note 3: The Horizon 2020 Dashboard does not track support received from the EIT.

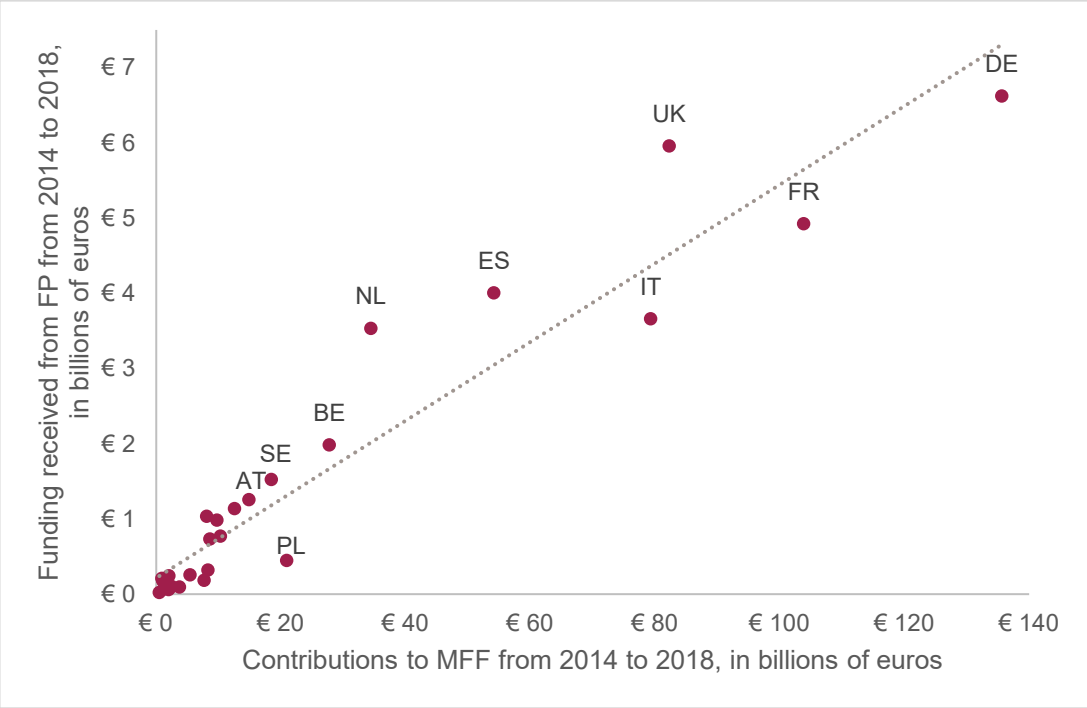


Figure 5 Funding received from Horizon 2020 programme and contribution to European budget (MFF) by country, in billions of euros

Sources: Rathenau Instituut, calculations based on data from Horizon 2020 Dashboard, reference date 11 February 2020; European Commission Budget, available at https://ec.europa.eu/budget/graphs/revenue_expediture.html.
Note: The figure shows the correlation between the amount each country receives from the H2020 framework programme (per call year) and each country's contribution to the EU's Multiannual Financial Framework (MFF). Both values represent the total for 2014-2018.
Note 1: As we have no information available on each country's actual contribution to the Horizon 2020 budget, we have assumed that it is comparable to the share that each one contributes to the EU budget (MFF). Countries' contributions to the MFF are total own resources, part of total revenue in the European Commission's budget for 2014-2018.
Note 2: A position above the linear regression line means that a country has received more from the H2020 budget than to be expected based on the average ratio of FP received to MFF contributions.

2.5 European Innovation Council

Another novelty is the establishment of the European Innovation Council (EIC), meant to boost European competitiveness and technological sovereignty. The EIC builds and expands on several Horizon 2020 instruments. Its aim is to better align the framework programme for research and innovation with the EU's industrial policy. The EIC awards grants and venture capital to promising SMEs to enable ground-breaking innovations. By launching the EIC, the Commission is creating EU-wide funding opportunities aimed at scaling up innovative start-ups, SMEs and

entrepreneurs. The idea is to expand the number of ‘unicorns’ in Europe, i.e. technology firms worth more than USD 1 billion. The EIC offers funding combined with networking opportunities, mentoring, coaching and strategic advice. It works through two instruments: ‘Pathfinder’ funding for researchers and technologists who want to take novel breakthrough technologies to the pre-commercial phase, and ‘Accelerator’ funding for start-ups, SMEs and entrepreneurs wanting to take innovations to market. Seventy per cent of the EIC’s budget is earmarked for SMEs, the remainder for non-profit research institutions.[13]

2.6 Strategic European partnerships

Finally, Horizon Europe puts more emphasis on strategic European partnerships in a bid to boost the impact of public investment in research and innovation. Under these partnerships, the EU works with private and/or public partners to develop and implement a research and innovation programme. Partnerships of this kind allow the Commission to create synergies between Horizon Europe and national and regional programmes, to encourage Member States to apply research outcomes, and to scale up innovative solutions.

The Commission wants to be consistent when entering into partnerships, and it also wants to be able to dissolve them more easily when they are no longer fit for purpose. The Commission is scaling down the total number of partnerships, retaining only the most strategic ones. Of the almost 100 remaining partnerships from previous framework programmes, 49 candidate partnerships now remain for the new programme.[14] Instead of the eclectic mix of the past, the Commission now wishes to concentrate on only three forms of partnership, i.e. Co-programmed European Partnerships, Co-funded European Partnerships and Institutionalised European Partnerships. The third form is based on Articles 185 and 187 of the Treaty on the Functioning of the European Union (TFEU). Article 185 allows the Commission to participate in a research programme undertaken by several Member States. One example is the Active and Assisted Living programme, which funds R&D into technologies and services for the elderly. Article 187 allows the Commission to enter into a Joint Undertaking (a public-private partnership), such as the Electronic Components and Systems for European Leadership (ECSEL), designed to fund R&D in these key enabling technologies in Europe.

13 Funding for scale-ups is also one of the goals of Invest-NL, launched in January 2020. It is a private enterprise financed by public funds (1.7 billion euros). Invest-NL is an impact investor focused primarily on energy transition and scale-ups in the Netherlands. The European Commission (with guidance from the European Investment Fund) will itself invest on behalf of the EIC. The InvestEU Fund mobilises public and private investment through an EU budget guarantee.

14 See footnote 9.

3 Other changes in the EU's R&I policy

In addition to the Horizon Europe Framework Programme for Research and Innovation, the EU is introducing four other changes in its research and innovation policy:

1. the European Defence Fund, EDF
2. a more assertive industrial policy
3. the European Commission's newly reorganised Directorate-General for Research and Innovation (DG RTD)
4. a new impetus for the European Research Area (ERA).

3.1 European Defence Fund

The EU established the European Defence Fund (EDF) in 2017 to strengthen European military capabilities.[15] Much of this fund is earmarked for research and innovation. The purpose of the EDF is to encourage Member States to develop innovative joint defence technologies that contribute to Europe's strategic autonomy.

The EDF is meant to concentrate and consolidate the fragmented, mainly nationally organised research and industrial development activities in this field. This is the first time that the EU is funding defence research and technology. The initiative met with opposition from a number of MEPs who see it as an undesirable move towards the militarisation of the EU. There is also resistance from European scientists who prefer to see funding channelled into research on non-violent conflict resolution.

By establishing the EDF, the EU has created a second major research and innovation programme alongside Horizon Europe. The Commission proposes giving the EDF a total budget of 13 billion euros over the 2021-2027 period. The EDF makes funding available to joint projects that have participants from at least three Member States. The Commission's proposal for the next budget round is to invest some 600 million euros annually in research (4.1 billion euros total) and almost 1300 million euros as co-financing for development (8.9 billion euros total). The Commission has considered making the EDF part of Horizon Europe, but has

15 European Commission (2019). *European Defence Fund – factsheet*. https://ec.europa.eu/docsroom/documents/34509

chosen to keep civil and military research separate, both formally and financially. Nevertheless, the research component of the EDF will parallel the Horizon Europe system as far as possible, with the phrasing of calls and the project selection process being similar in the two programmes. The intention is for EDF and Horizon Europe programming to be closely related in content, something that is certain to spark much debate. The EDF is politically sensitive because it appears to suggest that the EU intends building its own military force. There was therefore serious opposition to the initiative in the European Parliament. As the boundaries between civil and military research become blurred, the EDF will have ample opportunity to benefit from civil research on AI and other digital technologies within Horizon Europe. However, some European researchers and academic organisations wish to distance themselves from any potential cross-overs between civil and military research (Rathenau Instituut 2019).

3.2 More assertive industrial policy

As well as building a stronger defence industry, the EU also plans to undertake a more assertive industrial policy in pursuit of the four strategic goals set out in section 1.2 above.[16] The EU wishes to boost its position in 'key strategic value chains'. i.e. interlinked and integrated activities in key industries, also referred to as industrial value chains. To do this, it will allow a new type of European alliance for Important Projects of Common European Interest (IPCEI).[17] IPCEIs are meant to focus on specific technologies, including clean and autonomous vehicles, an industrial Internet of Things, low-carbon-emission industry, and cybersecurity.[18]

IPCEI alliances are typically established at the initiative of several Member States and enterprises, with these Member States being permitted to grant these private parties State aid. IPCEIs are therefore not European partnerships like those under the Horizon Europe framework programme, but they do require the Commission's approval. In December 2019, the EU approved the second IPCEI, involving the development of innovative technologies for lithium-ion batteries supporting clean and low-emission mobility. The seven participating Member States will provide 3.2 billion euros in State aid (the Netherlands is not one of the participants).[19] The EU's

16 'Europe is rediscovering its penchant for statist intervention'. In: *The Economist* 16 January 2020.
17 Important Projects of Common European Interest (IPCEI) include innovative research projects which often involve significant risks and require joint, well-coordinated efforts and transnational investment by public authorities and industries in different Member States.
18 Strategic Forum for Important Projects of Common European Interest (2019). *Strengthening Strategic Value Chains for a future-ready EU Industry*. https://ec.europa.eu/docsroom/documents/37824
19 This partnership is part of the European Battery Alliance, which the Commission launched in 2017 with interested Member States and industrial actors. See: 'State aid: Commission approves €3.2 billion public support by seven Member States for a pan-European research and innovation project in all segments of the

aim in approving this IPCEI is to prevent the European automotive industry from becoming entirely dependent on a non-EU manufacturer because it lacks the necessary know-how and production capacity. This is one example of how the EU is pursuing a more integrated approach to policymaking. That approach should lead to more strategic autonomy while promoting its climate and sustainability agenda.

The Commission intends to launch a new industrial strategy in March 2020. The strategy is expected to include the aforementioned IPCEI and an overhaul of intellectual property and competition rules facilitating the emergence of European industrial superpowers.

3.3 Newly reorganised Directorate-General for Research and Innovation (DG RTD)

The Commission is also applying the integrated policy approach in its internal organisation. The Directorate-General for Research and Innovation (DG RTD) will administer and monitor the Horizon Europe framework programme and its budget in conjunction with representatives of other DGs.

Previously, DG RTD bore primary responsibility for the bulk of the Horizon 2020 framework programme budget, and consulted with representatives of relevant DGs on priorities. Other DGs had primary responsibility for the remaining budget components. Now, a committee made up of representatives from the DGs concerned will administer the programme and the budget for each cluster (e.g. health). The Commission hopes to link the work programmes and the various policy objectives of the DGs in this manner. There has also been a shake-up of RTD's internal organisation. In addition to five directorates handling general DG matters, RTD has four thematic directorates (Healthy planet, Clean planet, People, and Prosperity), the idea being to overcome bureaucratic 'silos' in these areas.

3.4 European Research Area

Last but not least, the Commission has given the European Research Area (ERA) a new impetus. The ERA was established in 2000 to promote the free movement of knowledge and researchers between national research systems in Europe. Operating alongside the Horizon Europe framework programme, the ERA is an

battery value chain'. European Commission website, 9 December 2019. https://ec.europa.eu/growth/industry/policy/european-battery-alliance_en, https://ec.europa.eu/commission/presscorner/detail/en/ip_19_6705

important policy instrument for European research and innovation. The Commission, the Member States and the EU's knowledge institutions are responsible for implementing the ERA policy framework. Primary responsibility lies with the Member States, as each one is in charge of its own national research system.

The Commission has appointed a European Research Area and Innovation Committee (ERAC) made up of representatives of the Member States. ERAC coordinates the implementation of ERA policy and drives matters forward where necessary. This is because a 2014 study found that ERA implementation varied considerably from country to country.[20] Member States wanted to preclude EU legislation on the ERA and therefore opted to assume more responsibility for its implementation. As a result, there are marked differences between Member States in the progress they are making towards ERA priorities, e.g. effective national research systems, transnational cooperation, an open labour market for researchers, and gender equality.[21]

The new European Commissioner for Innovation and Research, Culture, Education and Youth, Mariya Gabriel, has chosen the ERA as one of her priorities. She will be publishing a new Communication on the future of ERA before the summer. An ad hoc ERAC working group has issued an opinion on the future of the ERA as input for her Communication. ERAC has since adopted this opinion.[22]

The opinion proposes four new ERA priorities:

1. Framework conditions for the production, circulation and use of knowledge, including research career issues
2. R&I-driven joint action with other policy areas in a global context
3. Relevance and visibility of R&I for society
4. Broad inclusiveness.

Priority 4 is meant to make the ERA more responsive to the needs of the diverse socio-economic situations across the EU, for example encompassing the geographical dimension but also gender-related issues.

One important change proposed in the opinion is that the ERA must do more to address societal challenges and interact more closely with other policy areas, aspects that have been ignored in the current ERA priorities. In addition, the

20 European Parliamentary Research Service (2016). *European Research Area. Cost of Non-Europe Report*. https://www.europarl.europa.eu/RegData/etudes/STUD/2016/581382/EPRS_STU(2016)581382_EN.pdf

21 European Commission (2019). *ERA progress report 2018*. https://ec.europa.eu/info/publications/era-progress-report-2018_en

22 ERAC (2020). *ERAC opinion on the future of the ERA*. https://data.consilium.europa.eu/doc/document/ST-1201-2020-INIT/en/pdf

working group recommends making EU citizens much more aware of the benefits of European research and innovation (and the ERA in particular) in their daily lives so as to mobilise support for the necessary investment. The Commission aims to promote science, research and knowledge as core values of Europe in this manner, in response to geopolitical developments that require a more powerful European identity. Our interviewees expect the new Communication on the future of the ERA to follow the broad outlines of this opinion. The Member States will then draw up European Council conclusions under the German Presidency in the second half of 2020.

4 Outstanding issues and ongoing discussions

4.1 Outstanding issues in Horizon Europe

The following three issues have yet to be clarified within the Horizon Europe framework programme:

1. relationship with other EU programmes
2. international cooperation
3. the budget.

The European Council and the European Parliament have yet to negotiate the relationship between Horizon Europe and associated EU programmes.

Brexit has led to a postponement of any decision on the terms and conditions for international cooperation. Collaboration on research and innovation with non-EU countries has priority in addressing global societal challenges. In addition, if the EU is to compete with major forces such as the USA and China, then the Member States must form a bloc in certain strategic research areas such as AI. That makes it interesting for the EU to cooperate with Canada and Japan, or with Israel, where a hub of the European Institute of Innovation and Technology (EIT) opened in late 2019. Important criteria for cooperating with non-EU countries include such matters as funding and open access.

There has also been no decision regarding the Horizon Europe budget. The Commission must have the support and approval of the Member States for its plans. Based on our interviews, recent policy documents and news reports, we have identified two main issues in that respect.

4.2 EU and Horizon Europe budgets

The main areas of debate concern the total budget for the EU and for Horizon Europe. At the moment, the Member States, the European Commission and the European Parliament are negotiating the budget of the European Union, the Multiannual Financial Framework (MFF), for the next seven years. The Horizon Europe budget is a pawn in the battle over the MFF.

Budget negotiation involves a complex trade-off between competing interests. Roughly speaking, there are two opposing camps: the old EU Member States (until Brexit, known as the EU15) versus the newer Member States, known as the EU13. The EU15 (now EU14) camp consists of relatively prosperous Member States, including the Netherlands, which make a substantial financial contribution to the EU budget. Although their interests will be served by a solid budget for Horizon Europe, they are apprehensive about paying more to compensate for the departure of the British. By contrast, the second camp, the EU13, does not want to put a cap on the overall budget because this would rapidly lead to cuts in the Cohesion Fund. They will therefore only agree to a cap on the MFF if other budget items are scaled back, including research and innovation. Dutch academic organisations are therefore calling on the Dutch Government to defend Horizon Europe in their negotiations, citing its major societal impact and positive contribution to Dutch research capacity.[23]

4.3 Excellence versus widening of participation

One of the points of disagreement between Member States concerning Horizon Europe's budget is the focus on excellence on the one hand and a more equitable distribution of resources on the other. For years now, the newer Member States (EU13) have derived relatively little benefit from the EU framework programmes for research and innovation. That is because knowledge-intensive industry is on a smaller scale in these countries and because they have fewer truly excellent academic organisations, less experience working on international projects, and only modest links to European networks (STOA, 2018). Receiving a larger share of the Horizon Europe budget would help the EU13 Member States retain talented researchers. Past framework programmes already included a number of instruments aimed at a more balanced distribution of available funds across the Member States and at supporting the EU13 countries in scientific and technological capacity-building. They have now demanded a significant increase in these instruments under Horizon Europe. Ultimately, the Member States agreed to earmark 3.3% of the framework programme budget for 'Widening Participation and Spreading Excellence' measures, i.e. projects or programmes that promote an even distribution of the budget across Europe. Conversely, 'excellence' and 'impact' will continue to be the main award criteria for all proposals, in line with the EU14's preference.

23 VSNU (2020). *Europese financiering van onderzoek en innovatie van belang voor Nederland*. https://vsnu.nl/files/documenten/Domeinen/Internationaal/VSNU%20inbreng%20-%20Horizon%20Europe%20en%20MFK%20onderhandelingen%20tbv%20AO%20Eurogroep-Ecofinraad.pdf. For an English text on the VSNU position on Horizon Europe, see https://www.vsnu.nl/en_GB/fp-9

5 Final considerations: added value of European cooperation

This study shows that the EU is mobilising its R&I policy towards achieving partly new strategic targets, and also in response to geopolitical developments. The European Commission wishes to use Horizon Europe to:

1. boost the EU's competitiveness
2. attain technological sovereignty
3. promote research and science as European core values
4. combat climate change.

The Commission is also drawing on associated policy instruments, such as the European Defence Fund and the European Research Area, for the same purposes.

While there is sufficient support within the EU for Horizon Europe's new strategic agenda and for investment in R&I in general, the Commission is having trouble persuading Member States to make the major, targeted investment this requires because they tend to focus on their national interests. Negotiations within the European Council remain difficult. With the Member States stressing their national interests, appreciation of the added value of European integration in R&I appears to be fading into the background. Two camps are battling over the excellence criterion versus widening of participation. In the meantime, Member States appear to be intent on securing enough cash for their own researchers and enterprises.

Achieving strategic targets with the aid of research and innovation requires not only a major investment but also support for a shared vision of the added value of European cooperation. For example, why should we tackle this together and not separately? Is the EU primarily a competitive arena or a concentration of forces? What's the added value of devoting EU resources to capacity-building in the new Member States? And how will this impact the EU's citizens?

As a common strategic investment plan, Horizon Europe must be underpinned by a vision of European cooperation. While the European Research Area is being redefined, Member States have an opportunity to reaffirm the added value of European integration and joint investment in R&I. A common research area makes it possible to coordinate the efforts of different Member States. For example, given the EU's strategic targets, countries could specialise in different, complementary areas. One sensitive issue in this discussion is the extent to which the EU should seek a better geographical distribution of research capacity. Does improving R&I

capacity in less developed countries mainly benefit those countries, or will more developed countries ultimately also profit? Unrestricted researcher mobility across Europe fosters knowledge-sharing throughout the continent. One of the aims of the ERA is to promote ‘brain circulation’ within the EU and avoid asymmetric mobility flows resulting in a brain drain from the less developed to the most developed Member States. Can closer integration of Europe’s research systems help to mobilise more research capacity for the EU’s strategic targets?

The recent opinion on the future of the ERA echoes a vision of inclusiveness: achieving the EU’s strategic targets involves mobilising the potential of the whole continent, including countries that currently participate only marginally in the framework programmes for research and innovation.[24] The opinion also proposes making public awareness of research and innovation successes a new ERA priority. Having tangible examples of such successes (referred to as ‘ERA lighthouses’) will help EU citizens to better understand the significance of science for the economy and society.

The Rathenau Instituut is tracking these developments closely. As a follow-up to this study, we will delve deeper into two areas of science, climate change and AI, and, in particular, explore the value of EU policies for society. What do Horizon Europe and the ERA do for the EU’s citizens? What roles do the EU, national governments and parliaments play in this respect? And how can the European Parliament monitor whether and how promises are being kept?

24 ERAC (2020). *ERAC opinion on the future of the ERA*. https://data.consilium.europa.eu/doc/document/ST-1201-2020-INIT/en/pdf

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Appendix: List of interviewees

Sebastiaan den Bak	Netherlands Organisation for Scientific Research (NWO)
Nynke Cornelissen	Dutch Ministry of Education, Culture and Science
Willemijn Dicke	Association of Universities in the Netherlands (VSNU)
Thomas Grosfeld	Confederation of Netherlands Industry and Employers (VNO-NCW)
Radhika van Hameren	Permanent Representation of the Kingdom of the Netherlands to the European Union
Pieter Hanson	FME
Just van den Hoek	Neth-ER
Marc Holtkamp	European Commission
Ineke Hoving	Dutch Ministry of Economic Affairs and Climate Policy
Kim Huijpen	Association of Universities in the Netherlands (VSNU)
Johannes Klumpers	European Commission
Odilia Knap	Dutch Ministry of Economic Affairs and Climate Policy
Joyce Kuipers	Netherlands Organisation for Scientific Research (NWO)
Erik van de Linde	Royal Netherlands Academy of Arts and Sciences (KNAW)
Eduardo Maldonado	Agência Nacional de Inovação (Portugal)
Koen de Pater	Dutch Ministry of Economic Affairs and Climate Policy
Jurgen Rienks	Neth-ER
Joep Roet	Neth-ER
Wim van Saarloos	Royal Netherlands Academy of Arts and Sciences (KNAW)
Jan Reint Smit	Netherlands Enterprise Agency (RVO).
Robert-Jan Smits	Eindhoven University of Technology
Talita Soares	European Parliament
Auke Venema	Dutch Ministry of Defence
Arie van der Zwan	European Commission

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