

# MISSIONS FOR EU INNOVATION POLICY

## WHY THE RIGHT SET-UP MATTERS

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### Executive summary

The proposed introduction of research & innovation (R&I) missions in Horizon Europe, the next EU research programme, seems to be the most significant and ambitious change on previous programmes, especially given its implications for the governance of research projects.

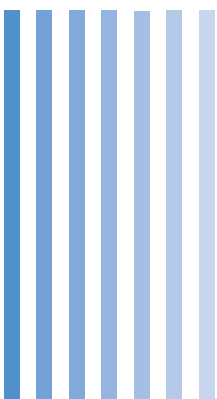
R&I missions are an innovation policy instrument where the government sets the objective of solving a certain technological or societal problem within a pre-defined time-frame that cannot yet be reached technologically. Governments may employ various policy instruments ranging from financial support for R&I activities to regulation to achieve this objective.

**The mission concept has been very useful in demonstrating the value of public sector activity** within the innovation system and its role in technological breakthroughs of the 20th century such as the internet, new drugs or renewable energy. Yet, a wide range of different innovation policies have been labelled mission-oriented and at the same time we know too little about unsuccessful missions, which presents challenges in utilizing the concept for policy advice. Despite the large differences among policies subsumed under the mission concept, one can distil several defining features that are very valuable in informing how future missions should be governed and how the responsible organizations should be set up.

**This paper proposes five core features** in order to assess whether a policy qualifies as an R&I mission: (1) a mission should have a **verifiable target** as an objective; (2) a mission should **elevate technologies** from early stages close to market-readiness; (3) missions should be implemented by **active and assertive public agents**; (4) implementing agencies should be able to rely on strong **technical in-house capacities** and (5) missions require visible and stable **political backing**.

Setting up missions that comply with these criteria would be a demanding exercise for European research policy. **The following three recommendations should be useful:**

**Governance is a key factor for ensuring success:** Today, EU research programmes are conducted via a strict rules-based structure. Missions would require a more flexible and agile governance that grants implementing organizations a high degree of autonomy in managing and steering research projects. To fulfil their new role, these agencies would also need stronger technical capabilities.



**Harness the full potential of EU policy tools:** The EU's budgetary resources are limited but regulation can serve as a powerful policy lever. Despite the more cumbersome political process involved, regulation should be an integral part of missions. Furthermore, not all missions need to be strictly based on grand societal challenges; following an industrial policy agenda is also a legitimate objective.

**Involve member states:** The EU's power to coordinate member state policies in the field of research is relatively limited. A buy-in of member states could be a game-changer, as this would significantly widen the scope of available policy instruments, including public procurement and taxation. Furthermore, the backing of national governments would create public visibility and political accountability, increasing the sense of urgency to deliver on the mission objectives.

The EU needs to be more active in promoting technology and innovation. **The proposed R&I missions are the right tool, as long as they get sufficient political support and the underlying governance is right.**



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## INTRODUCTION

The European Commission will shortly publish its proposal for “Horizon Europe,” the next research and innovation framework programme, and with it will kick-start the debate around the budget and new priorities for European R&I policy. And it seems the current research Commissioner Carlos Moedas has the ambition to leave a significant footprint by proposing new flagship programmes that could shape European R&I policy for years to come.

The likely introduction of **R&I missions in the next framework programme is probably the most significant and ambitious change** in terms of governance and funding of future research projects. With missions the Commission seeks to give its R&I activities a clear direction and a verifiable goal such as, for example, making 100 cities carbon neutral by 2030 or reducing plastic litter entering the oceans by 90% by 2025 as proposed by Mariana Mazzucato as potential R&I missions for the EU.<sup>1</sup>

R&I missions are an innovation policy instrument where the government sets the objective of solving a certain technological or societal problem within a defined time-frame that is currently out of reach and requires significant technological advances if it is to be achieved. Historical examples include the Apollo mission to put a man on the moon launched by the United States government or the German energy transition, with the goal of ending nuclear power production. Governments back up these objectives with financial support for R&I activities and other policy instruments that speed up innovation.

In tracing the concept of mission-oriented R&I policy, one realises that **throughout the 20th century governments have relied on research missions for a range of different policy objectives**, such as technological supremacy in defence, as an industrial policy tool or for fighting climate change. The mission concept has been very useful for demonstrating the value of public sector activity within the innovation system and its role in the discovery of breakthrough technological advances. Yet, a wide range of different innovation policies have been labelled mission-oriented and at the same time we know too little about unsuccessful missions, which presents challenges in utilizing the concept for policy advice.

This paper argues that, despite the large differences among policies subsumed under the mission concept, **one can distil several defining features that are very valuable in informing how future missions should be governed** and how the responsible organizations should be set up. If the EU were to set up a mission, it would need to grant those public agencies involved in implementation greater autonomy and stronger competences as well as invest in their capabilities. In essence, it would have to transform mainly administrative bodies that operate on clear rules-based lines into proper innovation agencies that actively manage and steer research projects.

Beyond governance, two other aspects will be critical for the success of EU missions: First, missions should harness the full potential of policy instruments available to the EU, including regulation. Second, securing political commitment by member states will be vital if EU missions are to gain sufficient visibility and win extra resources.

In sum, **missions are a demanding policy instrument especially for an EU that lacks a strong political centre**. Yet, the EU needs to be more active in promoting technology and innovation. The proposed R&I missions are the right tool, as long as they get sufficient political support and the underlying governance is right.

1. Mazzucato, M. (2018). *Mission-Oriented Research & Innovation in the European Union: A problem-solving approach to fuel innovation-led growth*. Luxembourg: Publications Office of the European Union.



MISSIONS ARE A  
DEMANDING POLICY  
INSTRUMENT.

The paper proceeds by providing a brief overview of the EU's current framework for R&I policy, better known as Horizon 2020. The second section proposes a definition for R&I missions so it can become a tool for policy advice. It then discusses some of the conceptual problems and illustrates what the introduction of missions would mean for EU R&I policy. The third section provides policy recommendations for the EU context (1) on the governance of missions, (2) what kind of missions could be chosen given the policy tools available and (3) why the involvement of member states will be critical for success.

## 1. CURRENT STATUS OF EU'S RESEARCH AND INNOVATION POLICY

The EU's Framework Programmes (FPs) – the umbrella for R&I policies – were introduced in the 1980s and since then have seen a steady increase in their budget from €3.8 billion in FP1 to €77 billion in FP8 –known as Horizon 2020 that started in 2014 and runs through 2020. Over time the FPs have also tripled their weighting in the long-term EU budget to currently 7.3% and more than doubled their share of total public R&D spending in the EU to 11.2%.<sup>2</sup> In line with a growing budget the objectives have also become more complex: while the programme originally had a strong industrial policy focus, it nowadays relies on a diverse set of programmes and instruments to support all stages and actors of the R&I ecosystem.<sup>3</sup>

Despite its increasing significance and important network and scale effects of collaborative research, it is important to be aware that EU R&I policy is one element of a multi-level system in which member states still account for almost 90% of research funding. By 2020 annual spending in Horizon 2020 will increase to about €13 billion, roughly the amount that the German government spent annually between 2014 and 2016 on research and development (R&D), excluding the higher education system.<sup>4</sup> So, while EU and US public R&D spending were roughly on a par during this period (government sector and higher education), the EU lacks the power of a single political centre in allocating these resources.

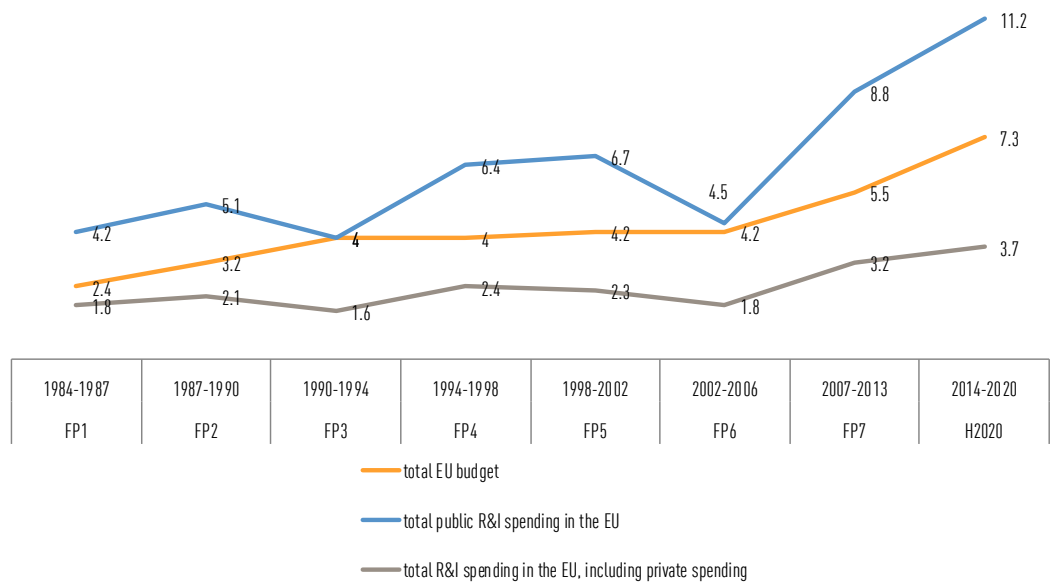
2. Weber, M. et al. (2018). *Erkenntnis- und Wissenstransfer im Kontext europäischer F&I Politik*. Studien zum deutschen Innovationssystem Nr. 12-2018. Austrian Institute for Technology and Zentrum für Europäische Wirtschaftsforschung.

3. See for example Reillon, V. (2017). *EU framework programmes for research and innovation: Evolution and key data from FP1 to Horizon 2020 in view of FP9*. European Parliamentary Research Service, In-Depth Analysis, September 2017; Flink, T. (2016). EU-Forschungspolitik – von der Industrieförderung zu einer pan-europäischen Wissenschaftspolitik. In Simon, D. et al. (Ed), *Handbuch Wissenschaftspolitik* (2nd ed.). Wiesbaden: Springer VS.

4. The paper makes no distinction between R&D and R&I spending.

FIGURE 1 – EU R&I spending increased over time as a share of the EU budget and total R&I spending

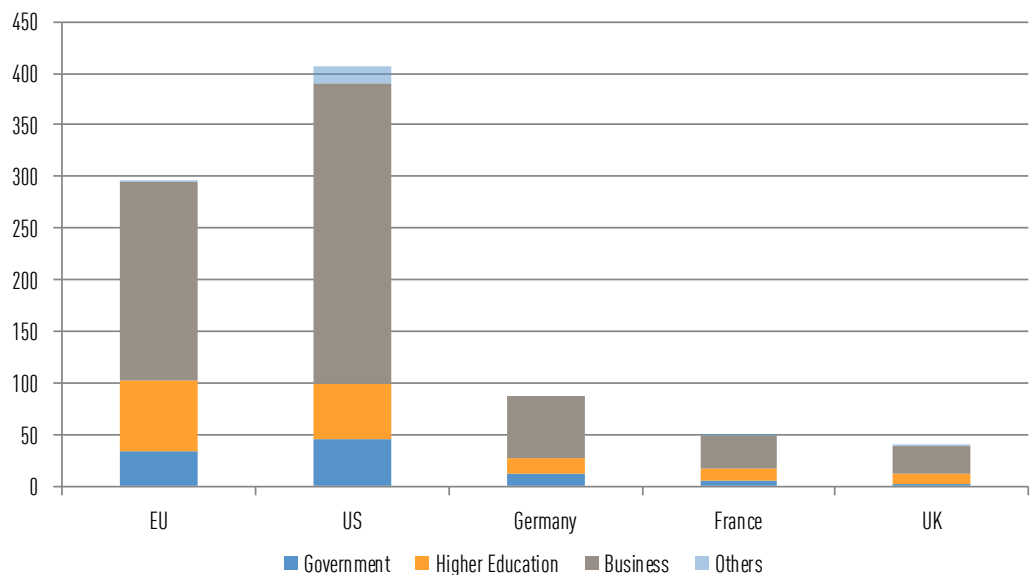
Budget of EU R&I spending as % of ...



Source: Weber, M. et al. (2018). *Erkenntnis- und Wissenstransfer im Kontext europäischer F&I Politik. Studien zum deutschen Innovationssystem Nr. 12-2018. Austrian Institute for Technology and Zentrum für Europäische Wirtschaftsforschung.*

FIGURE 2 – Member State R&D spending makes up the bulk of public R&D support in the EU

R&D expenditure (GERD) by sectors, in billion euros, average 2014-2016



Source: Eurostat.

The current Horizon 2020 programme is structured along three pillars representing the three objectives of EU R&I policy: promoting (1) excellent science, i.e. curiosity-driven basic research, (2) research to strengthen industrial competitiveness and (3) research with societal impacts. The first pillar (€24.4 billion) focuses on universities and research infrastructures. The second

pillar (€17.0 billion) promotes enabling technologies in industrial sectors and innovation in SMEs (here in non-industrial sectors as well). The third and largest pillar (€29.7 billion) is structured along seven “societal challenges” such as climate change or ageing societies and seeks to mobilize a critical mass of research activity in these areas.

The idea of missions is essentially about providing a direction to R&I activities. When analyzing the individual sub-programmes of Horizon 2020, it is evident that the EU already deploys a number of “mission-like” policies that seek to give such direction:

- In the first pillar €2.7 billion is dedicated to the **Future and Emerging Technologies (FET) Flagship** programmes that seek to achieve scientific breakthrough in areas such as understanding the human brain or graphene, a material with the potential to be used for printable electronics.
- In its Industrial leadership pillar about 80% of funding goes to **Leadership in Enabling and Industrial Technologies (LEIT)**. The programme funds applied research with high relevance for European industry, such as ICT or biotech. Such thematic activities were the original focus of FPs in the 1980s and remain significant. LEIT and its predecessors helped to strengthen transnational research networks between universities and industries.

The third and largest pillar is all about giving research a direction and purpose. Structured in seven **Societal Challenges**, it seeks to “stimulate the critical mass of research and innovation efforts needed to achieve the Union’s policy goals”.<sup>5</sup> To achieve this, it is equipped with almost 40% of the Horizon 2020 budget. Individual Societal Challenges have a budget between €1.3 billion and €7.5 billion on hand.

**TABLE 1 – Structure of Horizon 2020 (Framework Programme 8, 2014-2020)**

PILLARS	BUDGET IN BILLION EURO	INCREASE COMPARED TO PREVIOUS FP	MISSION-LIKE PROGRAMMES WITHIN THE PILLARS THAT PROVIDE A DIRECTION FOR R&I ACTIVITY
<b>I. Excellent science</b>	24.4	74%	Future and Emerging Technologies (FET) Flagships – €2.7bn
<b>II. Industrial leadership</b>	17.0	11%	Leadership in enabling and industrial technologies (LEIT) – €13.6bn
<b>III. Societal challenges</b>	29.7	103%	7 Societal Challenges
<b>TOTAL</b>	77.0	38%	

Source: Weber, M. et al. (2018). *Erkenntnis- und Wissenstransfer im Kontext europäischer F&I Politik, Studien zum deutschen Innovationssystem Nr. 12-2018, Austrian Institute for Technology and Zentrum für Europäische Wirtschaftsforschung.*

The European Commission estimates that €47 billion is assigned to programmes with pre-defined topics (top-down), while only €25 billion is allocated to programmes where beneficiaries may freely propose projects (bottom-up).<sup>6</sup> Furthermore, current programmes within Horizon 2020 are designed to lead to breakthrough research and innovation through long-term projects such as the FET flagships, to promote industrial competitiveness and to address important societal challenges. So, at first sight, it seems the EU’s R&I policy framework has significant potential for mission-oriented policy.

<sup>5</sup> Regulation of the European Parliament and the Council of 11 December 2013 establishing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020) and repealing Decision No 1982/2006/EC (2013). Official Journal of the European Union, L347, 104-173.

<sup>6</sup> European Commission (2017). *Issues papers for the High Level Group on maximizing the impact of EU research and innovation programmes*, p. 58.

### BOX 1 ■ Implementation of Horizon 2020 in practice

The FP is a programme of funding programmes. Each pillar consists of different programmes employing diverse instruments, ranging from the European Research Council, which supports individual researchers with grants, to the FET Flagships that set up mega-projects with a 10-year duration and a budget of €1 billion.

Most, including the Societal Challenges pillar and the LEIT programme mentioned above, are in essence classic research grants. While the Commission is solely responsible for the FP budget, it only defines the work programmes for about half of its activities and only implements about 25% of the budget directly.<sup>7</sup>

In a typical programme the Commission would decide on the main strategic directions by defining two- or three-year work programmes, which include a large number of project calls structured along priorities such as “robotics” or the “future internet”. Individual calls can get quite specific in terms of the kind of technological capabilities sought. These work programmes are then typically implemented by executive agencies on behalf of the Commission.<sup>8</sup> The implementing body (i.e. EAs) organizes the evaluation of proposals, which is performed by external experts in a peer review process, then concludes grant procedures and performs project monitoring.

The implementation procedures in FPs are rather static and rules-based and strategic decision-making is usually distant from day-to-day project management.

## 2. WHAT ARE RESEARCH AND INNOVATION MISSIONS?

### 2.1 Mission-oriented innovation policy: a working definition

Many of the world’s most pressing challenges such as climate change, ageing societies, health problems, population growth not only represent political challenges that require responses by way of regulation, taxation or social safety nets, but involve technological problems, too. More and more scholars of innovation policy therefore explore whether state-led attempts to deploy “big science to meet big problems” could speed up technological progress in tackling societal challenges.<sup>9</sup> There are numerous historical examples of R&I missions, such as the iconic Apollo mission to put a man on the moon, where governments forged breakthrough technology advances by defining a visible and verifiable target, creating the necessary urgency and bundling the required resources.<sup>10</sup>

**But how exactly can an innovation mission be recognized?** Examples in the literature vary widely from space missions to industrial policy strategies or comprehensive transition plans such as the German *Energiewende* (energy transition). This paper proposes the following **working definition in order to assess whether a policy qualifies as an R&I mission:**

- *Objective:* A mission has a relevant and **verifiable target** (ideally quantifiable and time-bound).
- *Effect on R&I activity:* A mission creates strong incentives in the innovation community to **raise technologies from basic research to pre-commercial application** in an ambitious time-frame.

<sup>7</sup> For a detailed analysis of the Horizon 2020 implementation structures see Reillon, V. (2015). *Horizon 2020 budget and implementation: A guide to the structure of the programme*. European Parliamentary Research Service, In-Depth Analysis, November 2015.

<sup>8</sup> Exceptions are Public-Private Partnerships (PPPs) which formulate their own work programmes within certain sectoral or technology areas.

<sup>9</sup> Ergas, H. (1986). “Does technology policy matter?” In BR Guile, H. Brooks (Eds.), *Technology and Global Industry: Companies and Nations in the World Economy*, National Academy Press, Washington, DC.

<sup>10</sup> See for example Mazzucato, M. (2017). *Mission-Oriented Innovation Policy: Challenges and Opportunities*. UCL Institute for Innovation and Public Purpose Working Paper, (2017-1).



- *Implementation*: A mission is implemented by an **active and assertive public agent** (often a government agency or ministry). The governance structure allows for failure and experimentation.
- *Public sector capacity*: Implementing agencies rely on **strong in-house expertise at a technical level**, far-sightedness and a risk-taking culture to fulfil its role.
- *Political commitment*: Missions **are visible and have stable backing** from the government. Political buy-in ensures the availability of the required resources for an extended period of time and creates urgency to make progress.

The working definition above seeks to boil down the concept to a few central features inherent to an archetypical R&I mission. This definition applies particularly to missions that seek to address grand societal challenges because this is the field where the European Commission intends to utilize the concept. Interestingly, there are fewer examples for such missions than for policies with other purposes such as achieving technological superiority in defence or promoting entrepreneurship as part of industrial policy that have been labelled mission-oriented.<sup>11</sup>

The German *Energiewende* is often cited as an example of a mission that responds to a grand challenge. It fulfils several but not all of the above-mentioned criteria. It has a verifiable and time-bound target – to end nuclear energy production by 2022. It sets strong incentives for innovation activities and technology transformation through regulation, subsidies and research support. Moreover, the mission enjoys strong support in most political parties as well as in civil society. However, it deviates from the definition when it comes to implementation and public sector capacity, two criteria that focus on the features of mission-oriented organizations such as the US defence advance research programme agency (DARPA) or other government agencies with specialized staff to steer the R&I activities of their grantees.<sup>12</sup> The German energy transition by contrast does not rely on comparable agencies to steer research activities. So, when thinking about an archetypical R&I mission, one could imagine an all-encompassing, transformative project similar to the *Energiewende* combined with strongly mission-oriented government agencies that manage research activities.<sup>13</sup>

## 2.2 The challenge to turn missions into a tool for policy advice

The concept of mission-oriented innovation policy has been developed as an *ex post* rationalization for innovation policy where the public sector provided a clear direction for R&I activities. The main message of this literature is that **state intervention was critical for technological breakthroughs** and the emergence of new product markets.<sup>14</sup> With these cases scholars challenge the notion that disruptive innovation is mainly driven by visionary entrepreneurs and venture capitalists while state intervention does more harm than good.<sup>15</sup>

11. See for example Mowery, D. C. (2010). "Military R&D and Innovation". in B. N. Hall and N. Rosenberg (eds), *Handbook of the Economics of Innovation*, vol. 2, Elsevier, 1219–56; and Mazzucato, M. (2013). *The Entrepreneurial State: Debunking Public vs Private Sector Myth*. London: Anthem Press.

12. For a more detailed analysis of mission-oriented organizations see Dittrich, P. & Ständer, P. (2017). *How would a European disruptive innovation agency look like*. Jacques Delors Institut – Berlin, Blog Post, 11 December 2017.

13. Kuittinen, H. & Velte, D. (2018). *Case Study Report: Energiewende – Mission-oriented R&I policies: In-depth case study*. Luxembourg: Publications Office of the European Union.

14. See for example Foray, D., Mowery, D.C., Nelson, R.R. (2012). 'Public R&D and social challenges: What lessons from mission R&D programs?' *Research Policy* 41 (2012) 1697–1702; Keller, M. R., and Block, F. L. (2012), 'Explaining the Transformation in the US Innovation System: The Impact of a Small Government Program', *Socio-Economic Review*, 30 September, 1–28; and Mazzucato, M. (2013). *The Entrepreneurial State: Debunking Public vs Private Sector Myth*. London: Anthem Press.

15. See for example Lerner, J. (2009) *Boulevard of Broken Dreams: Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed - and What to Do About It*. Princeton: Princeton University Press.

By demonstrating the central role of government agencies in the development of new technologies such as the microprocessor, the internet or recent advances in biotech, the concept captured the interest of policy makers. More and more governments ask scholars of innovation policy for advice in designing R&I missions.<sup>16</sup> In their new role as policy advisors, proponents of mission-oriented policy have to tackle a number of conceptual challenges:

- So far, we **lack a systematic and quantitative evaluation of both successful and unsuccessful mission-oriented policies**. The literature has mostly analysed cases where governments successfully responded to a challenge. We know, however, very little about mission-oriented policies that failed, rendering it difficult to understand pitfalls when designing a policy.
- **The concept of mission-oriented policy is relatively broad and flexible**. The diversity of missions in terms of policy instruments used, actors engaged or challenges addressed is so large that it is challenging to translate this into tailored policy advice.
- **Missions are context-specific and cannot be easily translated into best-practice guidance**. An effective mission-oriented policy might only function in the specific system for which it was designed. This makes it hard to copy a successful mission from another country, societal challenge or period.

Thus, when applying the mission concept, policy makers should be aware of these problems and carefully assess how they can implement a mission in their specific context. Nevertheless, missions are still a valuable concept when thinking about boosting public sector capacity in innovation policy.

## 2.3 Integrating missions in the EU Framework Programme

The European Commission intends to integrate missions in its next R&I Framework Programme. It appears, however, the EU is not a complete beginner in designing an innovation policy that provides researchers with a direction: programmes such as LEIT and Societal Challenges already seek to foster technology leadership and research with a positive impact on industries or society at large. Despite the experience with programmes that define objectives top-down, **the systematic introduction of missions would require significant changes to the implementation of EU R&I policy**.

First, missions organize R&I activities undertaken by a wide range of different actors around a single and observable objective. This gives the public agent that is in charge of organizing and interlink the different R&I activities a key role. **Supporting missions through the FP structures would mean funding fewer projects more actively and more flexibly**. This would require stronger technical capacities for implementing organizations. In particular the executive agencies of which three are involved in the implementation of FET Flagships, LEIT and Societal Challenges, would need an upgrade of their functions.<sup>17</sup>

Moreover, the current top-down structure – where the strategic and project levels are relatively far apart – would need to be prised open for more feedback loops, so that the strategic level can adjust quickly to developments at the implementation level and reallocate resources if necessary.

Second, **bringing basic and applied research together within one project has been challenging so far**. In the FET Flagships, for example, the engagement of the private sector has been limited because the commercial utility of the projects remains uncertain. While EU research

<sup>16</sup> Recent examples are Brazil and the United Kingdom as well as the European Commission.

<sup>17</sup> The respective EAs are the Research Executive Agency (REA), the Executive Agency for Small and Medium-sized Enterprises (EASME) and the Innovation & Networks Executive Agency (INEA).



SUPPORT FROM THE HIGHEST LEVEL OF GOVERNMENT WOULD BE IMPORTANT.

programmes utilize different instruments ranging from research grants for laboratories to advice for entrepreneurs, missions would need to go one step further and make all the different beneficiaries interact and cooperate with each other.

Finally, missions also require lasting political support. In the past specific R&I policies have rarely received the explicit endorsement from the President of the European Commission or the European Council. **Support from the highest level of government would be an important signal.**

## 3. RECOMMENDATIONS FOR EUROPEAN R&I MISSIONS

Over the last year, the Commission Directorate-General for research and innovation (DG RTD) made a great effort to explore the case for missions and commissioned a number of reports by scholars and high-level advisory groups as input for its legislative proposal for Horizon Europe, the ninth framework programme, expected by mid-2018.<sup>18</sup>

Missions will partially serve as a political communication tool. R&I activity needs to be inspiring for a wider public if the upper reaches of government are to put its weight behind it. However, to establish missions as a corner-stone of EU R&I policy, missions require a sophisticated governance model. To pave the way for missions some current FP structures need to change, a worthwhile but also delicate endeavour since these structures have developed over several years.

Beyond governance, two other aspects will be critical for the success of EU missions: First, unlike national governments, the EU has a much more significant regulatory role than it has budgetary fire power. This means that the success of missions should not only be rooted in R&I funding, but also in market regulation and standard setting. Second, securing political commitment by member states will be important to equip EU missions with sufficient visibility and additional resources. This will not be an easy task as the EU as such has only limited powers to coordinate member state policies in this area.

*Thus, the three main recommendations are: (1) Governance is a key factor for success; (2) Choose missions that harness the potential of available policy instruments in the EU; (3) Involve member states without losing the agility of mission governance.*

### 3.1 Governance is a key factor for success

**Introducing missions without changing the underlying method of programme implementation will not work.** It would reduce missions to a communication tool without creating the necessary structures and capacities to make it succeed. Adopting missions in the EU framework programme could face three difficulties: designing a new implementation mode that allows for risk-taking and experimentation, enhancing progress monitoring and upgrading public sector capacities to take on the new responsibilities.

When searching for new technologies some paths will unavoidably turn out as dead ends. In order to **allow for experimentation and risk-taking**, missions sometimes organize research pro-

<sup>18</sup> Report of the independent High Level Group on maximising the impact of EU Research & Innovation Programmes (2017). *LAB – FAB – APP – Investing in the European future we want report*. Luxembourg: Publications Office of the European Union; Mazzucato, M. (2018). *Mission-Oriented Research & Innovation in the European Union: A problem-solving approach to fuel innovation-led growth*. Luxembourg: Publications Office of the European Union; European Commission (2018). *Mission-Oriented Research & Innovation Policy: A RISE perspective*. EU publications, 2018-03-08.

jects in portfolios where several teams attempt to solve the same problem. In the EU context, **introducing a portfolio approach would mean easing the strictly rules-based management of research projects** now in place. It would give more discretion to implementing agencies and allow them to reallocate resources within or even across portfolios. To equip implementing organizations with such a high degree of autonomy and discretion, as well as with the mandate to make risky investments with uncertain outcomes, would, however, constitute a break with the current implementation model. To date proposals are evaluated by external expert panels, which in many programmes effectively exempt implementing organizations from any role in allocating funding to beneficiaries.

A stronger involvement of portfolio managers would also play a key role in **progress monitoring**. Today, many Horizon programmes struggle to measure their impact and track progress beyond rather generic output indicators.<sup>19</sup> In theory, missions have the advantage of a verifiable objective, which should allow setting milestones along the way. Portfolio managers could be tasked to determine these milestones based on discussions with the project team. A staged funding process would be a second, more formalized instrument for progress monitoring. One could imagine, for example, a seven-year funding period over three stages (1+3+3 years), reducing the number of projects in the portfolio at each stage. This would also allow for shifting the projects from a concept phase to research and prototype development in the second and commercialization in the third phase. Alternatively, the portfolio could be regularly adjusted by taking in new projects and terminating unsuccessful ones.

Intensified project management would also require staff members overseeing fewer projects but they would be more strongly involved in setting the research agenda and taking strategic decisions. In line with these more demanding responsibilities, **implementing organizations such as executive agencies would need to change**. Today, they are mainly administrative bodies that operate on a very narrow mandate set by the Commission. Their role developed out of the need to save administrative costs, which takes inadequate account of the value of the public sector in the FP.

In order to equip the EU's public sector with more technical expertise, **executive agencies could hire practitioners from science or industry** as portfolio managers for limited periods. They would bring in the necessary experience and foresight to formulate and monitor milestones and discuss performance with the individual project teams. Individuals who join the public sector only for a limited stint might also be inclined to take more risks and try to make a real difference during their stay. However, creating positions for practitioners will be costly and will require a certain prestige if it is to become an attractive career step.

### 3.2 Choose missions that harness the potential of available instruments

Much thought already went into the question which missions should be pursued at European level and how the selection process for settling on missions could be organized in an inclusive and democratic way. Before moving forward to formulating missions, policy makers should **take a step back and ask what kind of missions it would make sense to pursue at EU level**.

**Be aware of limited financial resources:** One should bear in mind that the current FP makes up around 11% of public R&I spending in the EU and has a budget of around €10 billion per year. Even if this sum went up in future, the budget for missions would only account for a fraction of it. In comparison to other missions, the EU will only have a small budget. The budget for the *Energiewende* is estimated at around €5.8 billion in 2016, the Apollo mission in the 1960s had an average annual budget of about \$13.6 billion (in 2008 prices).<sup>20</sup>

<sup>19</sup> European Court of Auditors (2016). *EU audit in brief: Introducing the 2015 annual reports of the European Court of Auditors*. Luxembourg: Publications Office of the European Union.

<sup>20</sup> See case study report on [US Apollo Project](#) and [German Energiewende](#).



FOR R&I ACTIVITIES, RULES SET IN THE SINGLE MARKET ARE PIVOTAL.

**Make regulation an integral part of missions:** With 1% of gross domestic product (GDP) the EU budget is a rather weak policy tool compared to member state budgets that account on average for 49% of GDP. However, the EU has a powerful role in setting the regulatory framework for companies and consumers in the Single Market. For R&I activities, rules resulting from competition policy, consumer protection and sectoral policies such as environmental or energy policy are pivotal. Regulation for example on data protection or on air pollution can serve as a strong incentive for companies to change their behaviour and innovate.

While the Commission acts as policy entrepreneur in both FP and regulatory matters, its discretion is much wider in the former. Once the FP budget and programmes are fixed in the respective legislation, the Commission is responsible for the implementation of the budget (with the exception of PPPs) and in many cases also for the definition of the work programme.<sup>21</sup> Regulation, however, depends also on other stakeholders, namely the European Parliament and the European Council.

Thus, in order to maximize the impact of missions and make regulation an integral component, the Commission will be dependent on lasting political backing from the co-legislators. Although this poses an obvious risk because missions might ground to halt as result of political conflict, this is also **a chance to make the objectives of innovation policy a subject for parliamentary debate** and democratic decision-making.

**When you want to do industrial policy, be open about it:** The idea of basing missions on Sustainable Development Goals (SDGs) sounds attractive, because their relevance and desirability are undisputed. Yet, big hopes are placed in missions to serve also as industrial policy. This expectation is rooted in the analysis of past missions for example in the United States that helped companies to be first to exploit the potential of technologies such as the microprocessor, the internet or biotechnology.<sup>22</sup>



USE MISSIONS TO DEFEND EUROPE'S POSITION AS INDUSTRIAL POWERHOUSE

It is important to be aware that missions with specific objectives will yield results mainly in the field for which they were designed. Surprise innovation as a by-product of bottom-up experimentation might happen but it should not be taken for granted. Thus, one should not expect missions that primarily target global challenges to produce breakthrough technology in a sector with high commercial potential as a side product. **Policy makers, therefore, should not limit themselves to SDGs and should also target areas where global industrial competition is fierce.** Europe is already losing ground in technologies such as artificial intelligence, quantum computing or e-mobility, while China very openly aims for market leadership in critical high-tech sectors with its Made in China 2025 strategy backed by enormous resources.<sup>23</sup> For Europe, missions are a chance to bundle and target resources, not only to address global challenges but also to defend its position as an industrial powerhouse.

### 3.3 Involve member states

The EU's R&I programmes make up only a fraction of total government expenditure on R&I in the EU. Therefore, mobilizing member states to contribute to EU innovation missions is of great importance to exploit their full potential. There are three important aspects to consider.

**Widen scope of policy tools:** Besides commanding 90% of public R&I expenditure, member states have many other valuable policy tools at hand. Through public procurement they can generate the necessary demand for new innovative products and create entirely new markets.

21. Reillon, V. (2015). *Horizon 2020 budget and implementation: A guide to the structure of the programme*. European Parliamentary Research Service, In-Depth Analysis, November 2015.

22. Mazzucato, M. (2013). *The Entrepreneurial State: Debunking Public vs Private Sector Myth*. London: Anthem Press.

23. Wübbeke, J. et al (2016). *Made in China 2025: The making of a high-tech superpower and consequences for industrial countries*. MERICS papers on China No 2, December 2016.

New technologies could be procured for public administrations, the health system, public utilities or the transport system. Through taxation, costs for negative externalities can be imposed on the producer. And finally, many regulatory decisions still rest with national governments and could meaningfully complement EU rules.

**Visibility creates accountability:** National governments are also much more visible and influential in the public debate, which is necessary to create a sense of common purpose and urgency. It was the US president who put himself behind the Apollo mission and the German chancellor who made the commitment to end nuclear power production. Making missions a priority for the entire government creates political accountability and will help to push through the necessary legislation or make resources available. Thus, **if heads of states and governments would put their collective political weight behind missions and advocate them as a joint European enterprise, missions would stand a much better chance of achieving ambitious goals** than if they remain a project of the European Commission or, even worse, a priority for only a few Commission DGs such as DG Research & Innovation and DG Connect.

**Create co-ownership:** It is, however, easier said than done to effectively coordinate European and national R&I policies and even more difficult to create co-ownership for a complex undertaking like missions. The traditional reluctance to delegate functions of research policy to “Brussels” or to allow the EU to grasp the role of strategic coordinator will likely persist. Nevertheless, the Commission needs to come up with ideas on how to involve member states in EU missions. Existing structures in the FP that allow collaboration between the European and national levels in Horizon 2020 appear too static and rules-based and would undermine the agility of a mission governance model. An alternative would be to **structure missions as work packages, which member states could take up individually**. Nevertheless, there does seem to be an unavoidable trade-off between strong co-ownership and a lean and agile governance model.

FIGURE 3 ■ Key recommendations for implementing missions in EU R&I policy

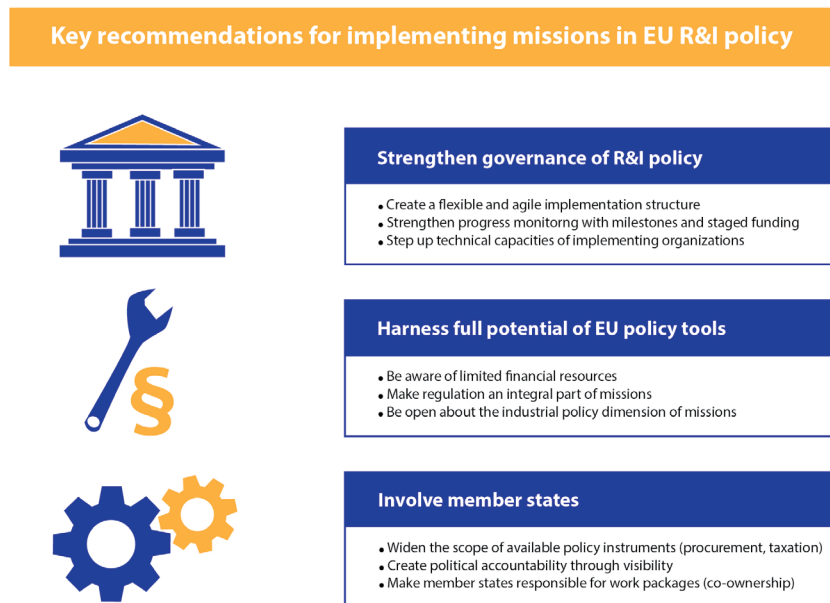


Illustration: Cinthya Nataly Haas-Arana

## CONCLUSION

With the proposal to integrate missions in the next FP, the Commission is by and large entering uncharted territory for two reasons:



MISSIONS WOULD  
REQUIRE A BREAK WITH  
PAST GOVERNANCE  
STRUCTURES.

**First, R&I missions would require a break with the past governance structure of FPs.** We recommend to introduce a more flexible structure that grants implementing organisations more competences and greater autonomy. It also means an upgrade of the technical capacities of these organisations, in particular of executive agencies, so they can actively manage research projects.

**Second, missions need to step out of the Framework Programme silo and become part of an integrated and multi-level innovation policy.** To harness their full potential, it is vital to take advantage of the most powerful policy tool that the EU has at hand – regulation – and to involve member states. National governments will help missions be visible and will make additional resources available. But both tasks are challenging. Pushing for regulation that has a transformative impact on European industries will meet resistance from some governments and lobby groups. And winning national governments to put themselves fully behind EU missions would be a break with the past reluctance of member states to accept a coordinating role for the EU in research policy.

Although it will require determination to make missions a success, it is a worthwhile endeavour. In light of global societal challenges and competition for technology leadership missions are the right tool, as long as they get sufficient political support and the underlying governance is right.

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