



## MISSIONS

# Mission-Oriented Research & Innovation in the European Union

A problem-solving approach to fuel innovation-led growth

*by Mariana MAZZUCATO*



Research and  
Innovation

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### Mission-Oriented Research & Innovation in the European Union

*A problem-solving approach to fuel innovation-led growth*

European Commission

Directorate-General for Research and Innovation

Directorate A – Policy Development and Coordination

Unit A.6 – Open Data Policy and Science Cloud

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## PREFACE BY PROFESSOR MARIANA MAZZUCATO

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The European Commissioner for Research, Science and Innovation, Carlos Moedas, invited me to draft strategic recommendations on mission-oriented research and innovation in the EU, to guide the future European Union Framework Programme for Research and Innovation.

To find a way to bring together the triple objectives of smart innovation-led growth, inclusion and sustainability, we must first answer the critical question of how to direct innovation to solve the pressing global challenges of our time.

Europe has been thinking about and tackling such challenges for a long time, including through Horizon 2020. In this report I examine and explain how research and innovation can not only stimulate growth and economic activity but how it can also actively direct it towards meeting global challenges by transforming them

into concrete, measurable, and, most importantly, achievable missions.

I look at what we can learn from the missions of the past — like the Apollo Program — and how to apply those lessons to the more complex challenges of today. A key lesson is that missions must be bold, activating innovation across sectors, across actors and across disciplines. They must also enable bottom-up solutions and experimentation. I provide examples of what possible future missions at EU level could look like. I stress that these examples do not presume to pre-empt what must be a participatory selection process. Rather, they are intended to trigger the imagination and ambition of participants in that process.

I developed this report taking into consideration the Interim Evaluation of Horizon 2020<sup>1</sup>, the ESIR Memorandum<sup>2</sup>, the

<sup>1</sup> European Commission (2018) Horizon 2020 Evaluation.

Available at: <https://ec.europa.eu/research/evaluations/index.cfm?pg=h2020evaluation> (Accessed: 12 February 2018)

<sup>2</sup> European Commission (2018) AN ESIR MEMORANDUM - Towards a mission-oriented research and innovation policy in the European Union.

Available at: <http://europa.eu/!hB37Cx>, Executive Summary available at: <http://europa.eu/!Fp36hh>

RISE Perspective on Mission-oriented R&I Policy<sup>3</sup> and dedicated case study reports<sup>4</sup>.

In the last months, I have held a series of targeted discussions with relevant stakeholder groups<sup>5</sup>. I also had the opportunity to give a keynote speech, followed by a discussion, to the Competitiveness Council on the topic of mission-oriented policy across Europe on December 1, 2017 based on my working paper Mission-oriented Innovation Policy: Challenges and Opportunities<sup>6</sup>.

All of these inputs have been invaluable to me in developing a vision of what a European mission-oriented research and innovation policy could look like and I have tried to include in this report some of the insights and feedback received.

Missions provide a massive opportunity to increase the impact of European research and innovation, grasp the public imagination and make real progress on complex challenges. I hope this report will assist policy makers in designing and implementing the European missions of the future, as well as nurture a new belief amongst EU citizens about what real collaboration across Europe can achieve. I thank everyone who has contributed for their engagement and dedication, which has given me a palpable sense of how powerful missions can be at bringing people together around ambitious common goals.

*Professor Mariana Mazzucato*

<sup>3</sup> European Commission (2018) Mission-oriented R&I Policy – A RISE Perspective. Available at: <http://europa.eu/luR68yR>

<sup>4</sup> European Commission (2018) Research, Innovation and Science Policy Experts (RISE). Available at: <https://ec.europa.eu/research/openvision/index.cfm?pg=home#mission> (Accessed 16 February 2018)

<sup>5</sup> See annex for details

<sup>6</sup> Mazzucato, M. (2017) 'Mission-oriented Innovation Policy: Challenges and Opportunities', UCL Institute for Innovation and Public Purpose (IIPP) Working Paper Series, (IIPP 2017-01). Available at: <https://www.ucl.ac.uk/bartlett/public-purpose/sites/public-purpose/files/moip-challenges-and-opportunities-working-paper-2017-1.pdf> (Accessed: 12 February 2018)

# INTRODUCTION

## WHY EUROPE NEEDS MISSIONS

The ability of innovation to spur economic growth has long been recognised. Less recognised is the fact that innovation has not only a rate but also a *direction*. By harnessing the directionality of innovation, we also harness the power of research and innovation to achieve wider social and policy aims as well as economic goals. Therefore, we can have innovation-led growth that is also more sustainable and equitable.

Finding ways to steer economic growth, and the European policy agenda, is difficult but necessary. Missions are a powerful tool to do this. They can provide the means to focus our research, innovation and investments on solving critical problems, while also spurring growth, jobs and resulting in positive spillovers across many sectors. Critically, by spearheading public research and innovation investments in new strategic areas that have the possibility to bring together different actors (public, private and third sector) and spurring collaboration across different sectors (e.g. from transport to digital to nutrition) it is possible to awaken private sector investment that continues to lag. Indeed, what drives private investment is the

perception of future growth opportunities. Missions help define those opportunities in ambitious ways.

Mission-oriented policies can be defined as systemic public policies that draw on frontier knowledge to attain specific goals or “big science deployed to meet big problems”<sup>7</sup>. Missions provide a solution, an opportunity, and an approach to address the numerous challenges that people face in their daily lives. Whether that be to have clean air to breathe in congested cities, to live a healthy and independent life at all ages, to have access to digital technologies that improve public services, or to have better and cheaper treatment of diseases like cancer or obesity that continue to affect billions of people across the globe. To engage research and innovation in meeting such challenges, a clear direction must be given, while also enabling bottom-up solutions. The debate about directionality should involve a wide array of stakeholders, each contributing to the key questions: What are the key challenges facing society; How can concrete missions help solve those challenges; How can the missions be best designed to enable participation across different actors, bottom-up experimentation and system-wide innovation?

<sup>7</sup> Ergas, H. (1987) ‘Does technology policy matter?’, in Guile, B.R. and Brooks H. (eds.) *Technology and global industry: Companies and nations in the world economy*, Washington DC: National Academies Press, pp. 191-245.

## EUROPE'S MISSION POTENTIAL

Societal challenges are complex. More complex than going to the moon, which was mainly a technical feat. To solve them requires attention to the ways in which socio-economic issues interact with politics and technology, to the need for smart regulation, and to the critical feedback processes that take place across the entire innovation chain. It also requires stronger civic engagement. Importantly, such challenges cannot be solved by any single European country, no matter how large it may be. Only at the level of the European Union, with its long experience of operating within a multilevel governance system, can we achieve the scale and diversity of talent and ideas to make real progress.

The sheer complexity and specialisation of science today means that attitudes of openness and collaboration are not a nice complement, but rather a critical factor for success. European Member States are at different levels of economic development, with some having invested much less than others in the key pillars of innovation: education and research. Nevertheless, in every single country there are areas of excellence and expertise that could prove to be the critical factor to solve the challenges of today. Missions are primarily a way to orchestrate the rich diversity of talent and

expertise that today lies mostly fragmented or untapped across Europe. They are also a way to harness the recognition that such expertise is itself an outcome of investment and innovation.

A mission-driven approach can be critical for European competitiveness. Other major players in the global economy, like China or the United States, have innovation systems that are more centralised or focused on a reduced number of key clusters. Europe, on the other hand, is both more fragmented – which can be a negative in terms of gaining scale – and more diverse – which creates a messier but also potentially more creative environment. To capitalise on this asset, Europe needs to take the next step and take advantage of its unique nature as a common market of diverse economies. In addition to strengthening regional research and innovation capacities, Europe also needs European Union wide efforts to connect policies and grand challenges. What the mission approach can add to the next European Framework Programme for Research and Innovation is a new lens to help steer investment towards tackling challenges but in a more focussed, problem-solving manner. Europe's unique multilevel governance system is highly suitable for mission-oriented policies: member states and regions can experiment within larger EU-wide missions.

## THE MAN ON THE MOON MISSION

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The Apollo 'Man on the Moon' mission expressed by President John F. Kennedy in 1961<sup>(a)</sup> was a geo-political and technological mission. It set a clear and ambitious objective: put a man on the moon and bring him back safely. There was also a concrete timeline – get there before the end of the decade (1960s).

The Apollo mission required investments and innovation not just in aerospace but also across multiple sectors (food, medicine, computation, materials, biology, microbiology, geology, electronics, and communications). Without new materials, for example, the mission would not have worked. It inspired children to dream about becoming astronauts; reinvigorating STEM subjects in schools; required researchers from various disciplines and sectors to cooperate to solve problems in a bottom-up manner; stimulated new types of risk-taking in many different sub-projects, of which many, of course, failed.

Apollo resulted in success – when Neil Armstrong was the first man to set his foot on the moon on 20 July 1969 – but it also led to many unexpected spinoffs that would not have emerged without this massive engagement with a science and innovation led objective. Indeed many of these spinoffs — such as the integrated circuit — would have arisen even if Armstrong had never set foot on the moon. The process of systemic cross-disciplinary, cross-sectoral, and cross-actor innovation that Apollo stimulated was every bit as important as the mission itself.

Apollo was inspirational, and much can be learned about the importance of setting clear goals, while allowing bottom-up experimentation to contribute to the overall success, but when we think of selecting EU missions today it is necessary to frame missions with a clearer societal relevance. While a purely technological mission may be appropriate for an innovation agency (e.g. in the case of space this would include NASA or ESA), at the EU level, we must be more ambitious in making the link to societal impact. For example, it would be useful to consider how innovation in space, particularly in new satellites and surveillance technology, could be used to curtail the number of deaths of immigrants crossing the Mediterranean. This would require collaboration between sectors as different as space, security services, marine technology, shipping, and immigration services.

<sup>(a)</sup> European Commission (2018) Mission-oriented R&I policies: Case Study Report Apollo Project (US). Available at: <http://europa.eu/!Fj47uu>.



This is not about a box ticking exercise to solve one problem after another. This is a way to steer economic growth in ways that are more meaningful. It is also about designing and implementing policies in a way that more strongly links them to delivery and results. Indeed, in a historical period in which business investment is lagging and belief in liberal democracy seems to be floundering, missions also provide more excitement about where economic growth opportunities might lie and how to reinvigorate democratic processes around economic policies. By setting missions that require different sectors to work together, it is possible to create instruments that reward those businesses that are willing and able to co-invest alongside European and Member State public investments. It is not about static subsidies but about dynamic co-investment along the entire innovation chain. It is about thinking how to concretely share not only the risks of innovation but also how to best share the rewards in ways that benefit society the most.

## CHANGE BEGINS AT HOME

Because “change begins at home”, missions first and foremost have to tap into the rich stock and flow of high quality science and innovation that is already being funded under different European programmes. Horizon 2020 is one of the largest global funds for science and innovation. It is certainly the largest fund under a single political authority, with the added strength of being fully open to the world. Unlike most other public funds, it combines science and innovation under the same umbrella, spanning from curiosity-driven

frontier science to support for start-ups and partnerships with industry. This means that missions can provide policy makers for the first time a privileged view over the different elements of this vast and complex programme.

European research and innovation missions will thus have as a core strength and differentiating factor privileged direct access to the pipeline of one of the most comprehensive science and innovation programmes in the world. Under a given mission, it will be possible both to identify some of the most advanced, relevant scientific projects funded by the European Research Council and mobilise them to contribute to a mission; and at the same time to use the future European Innovation Council to look into what the most advanced start-ups are doing and how they can support a given mission. Thus, missions will be a way to combine different and diverse inputs into a more creative, ambitious and effective result. Bold missions can provide new syntheses that are today impossible and thus will hopefully achieve the breakthroughs that are urgently needed to solve some of the most pressing issues facing our citizens.

# MISSIONS FOR EU RESEARCH AND INNOVATION

## SOCIETAL RELEVANCE

Research and innovation missions at the European level should be prioritised in those areas where the added value to the EU is greatest. A mission should have societal relevance, for example in the ability to improve health, nutrition, or the living environment for a large section of European citizens across a range of Member States. Research and innovation missions should aim to improve society's welfare. This will require dedicated framing. For example,

a mission on quantum computing could have strong societal impact if it is framed in terms of the potential to enhance cyber security, improve industrial processes, or support the development of new types of health care services. At the same time, the innovative spillovers that might result along the way may not be known beforehand and can have unforeseen applications. Indeed, most of the technologies in our smart products today — from the Internet to GPS — emerged as spillovers from missions of the past<sup>8</sup>.

<sup>8</sup> Mazzucato, M. (2013) *The Entrepreneurial State: debunking public vs. private sector myths*, London: Anthem Press, UK

## ENERGIEWENDE

There are lessons to be learned from how missions have been set at Member State level. The Energiewende in Germany addresses the important societal challenge of reducing carbon emissions, which are a key cause of climate change. The mission is framed with clear targets including that of exiting from nuclear power production in Germany by 2022.

While Energiewende contains a strong political steer, it is framed in such a way as to stimulate bottom-up research and innovation processes across multiple sectors, including, for example, sectors like steel that have otherwise remained relatively inertial. It was the Energiewende that stimulated steel to trial the conversion of smelting gas from steel production into base chemicals using renewable energy. Energiewende packages a complex mixture of policy, investment and legislation into one simple idea that makes it clear to German citizens that their government, scientists and businesses are working to make their society free of dependence on nuclear power. Energiewende is also interesting in that it

Nelson's work on *The Moon and the Ghetto*<sup>9</sup> asked the demanding question of why innovation has resulted in such difficult feats as landing a man on the moon, and yet continues to be so terribly disorganised and technologically unsavvy in dealing with the more earthly problems of poverty, illiteracy, and the emergence of ghettos and slums. He argued that while politics was partly the culprit, the real problem was that a purely scientific and technological solution could not solve such problems. There is a

greater need to combine understandings of sociology, politics, economics and technology to solve these problems, as well as to make the conscious decision to point innovation towards them. This is exactly what a well-designed mission can achieve.

## NO 'ONE SIZE FITS ALL'

Missions come in different shapes and sizes. There is no 'one size fits all' definition

<sup>9</sup> Nelson, R.R. (2011) 'The Moon and the Ghetto Revisited', *Science and Public Policy*, 38(9), pp. 681–690. Available at: <https://doi.org/10.1093/scipol/38.9.681> (Accessed: 12 February 2018)

addresses a concern that has arisen from decades of a citizen-driven green movement. This movement resulted in the societal legitimacy to set such a clear goal (the ambitions of the *Energiewende* are supported by 90% of the German population).<sup>(b)</sup> Ultimately, *Energiewende* is based on a longstanding and growing sentiment of exiting nuclear power production but only became a mission after a political decision to engage based on the Fukushima nuclear disaster in Japan in March 2011 (we see a similar dynamic in how the Apollo mission responded to Sputnik). The lesson for European research and innovation missions is that they should be based on a selection process that starts with a political steer on topics of societal relevance, while simultaneously mobilising active public involvement in the decision-making on the choice for missions.

<sup>(b)</sup> European Commission (2018) *Mission-oriented R&I policies: Case Study Report Energiewende (DE)*. Available at: <http://europa.eu/md89DM>

of what a mission should be and how it should be structured. To allow research and innovation missions to create impact with societal relevance, flexibility is needed in how the mission is defined. In some areas, a mission should trigger action to speed up progress in the development of technologies to increase their societal impact. In other areas, the mission should drive a systemic change. Most likely, ambitious missions that have the potential to have wide societal impact will need a combination of both, but their characteristics may differ<sup>10</sup>.

When developing a new mission, the art lies in learning from past missions, be it missions more focussed on diffusion or missions focussed on new frontier technologies, and adapting that knowledge and expertise to fit today's challenges and so defining and structuring a new mission. Putting 'old wine in new bottles' won't work<sup>11</sup>. We must allow missions to genuinely interact with the new types of complex problems societies face, as well as incorporating the new knowledge we have on how innovation comes about to their design: it is serendipitous, non-linear and very high risk.

## GRANULARITY: BETWEEN A PROJECT AND A CHALLENGE

Global challenges have been expressed as 17 Sustainable Development Goals (SDGs).<sup>12</sup>

One hundred and ninety three countries have signed up to these inspirational goals; hence, they provide an excellent opportunity to move forwards with mission-oriented thinking. They must be taken seriously as both an obligation to future generations and for global prosperity, but also as opportunities to steer investment-led growth. Addressing these challenges, around health and the environment, must not be seen as a trade-off with a focus on economic growth. Rather they present a means to focus on opportunities for investment-led growth — crowding in activity across actors. In addition, targets must be set so that progression to achieving such challenges is as serious as the goal setting itself.

Within the European research and innovation context, Horizon 2020 introduced seven Societal Challenges to structure its programming. This process was complemented by Focus Areas, defining areas of activity that cut across several of the Societal Challenges, such as the circular economy, or digitisation. Even though this has led to a step-change in coherence and coordination, moving away from sectoral research and innovation programming, it has stopped short of delivering broad societal impact as impact is still assessed at the level of individual projects.

The SDGs, Societal Challenges or Focus Areas are useful to ensure focus, but for the most part remain too broad to

<sup>10</sup> Foray, D., Mowery, D.C., and Nelson, R. R. (2012) 'Public R&D and social challenges: What lessons from mission R&D programs?', *Research Policy*, 41(10), pp. 1697–1902.

<sup>11</sup> Mowery, D.C., Nelson, R. R. and Martin, B. (2010) 'Technology policy and global warming: Why new policy models are needed (or why putting new wine in old bottles won't work)', *Research Policy*, 39(8), pp. 1011– 1023.

<sup>12</sup> European Commission (2018) *The Sustainable Development Goals*.

Available at: [https://ec.europa.eu/europeaid/policies/sustainable-development-goals\\_en](https://ec.europa.eu/europeaid/policies/sustainable-development-goals_en) (Accessed 16 February 2018)

be actionable. On the other end of the spectrum, research and innovation projects have clear objectives and are actionable, but will remain isolated in their impacts if not clearly linked to their ability to address global challenges and to achieve societal impact.

The 'granularity' of European research and innovation missions thus sits between broad challenges and concrete projects. Missions set clear and ambitious objectives that can only be achieved by a portfolio of research and innovation projects and supportive measures, such as policy interventions,

deployment actions and involvement of end-users.

Missions should be broad enough to engage the public and attract cross-sectoral investment; and remain focussed enough to involve industry and achieve measurable success. By setting the direction for a solution, missions do not specify how to achieve success. Rather, they stimulate the development of a range of different solutions to achieve the objective. As such, a mission can make a significant and concrete contribution to meeting an SDG or Societal Challenge.

Figure 1 below illustrates the movement from broad challenges to specific missions.

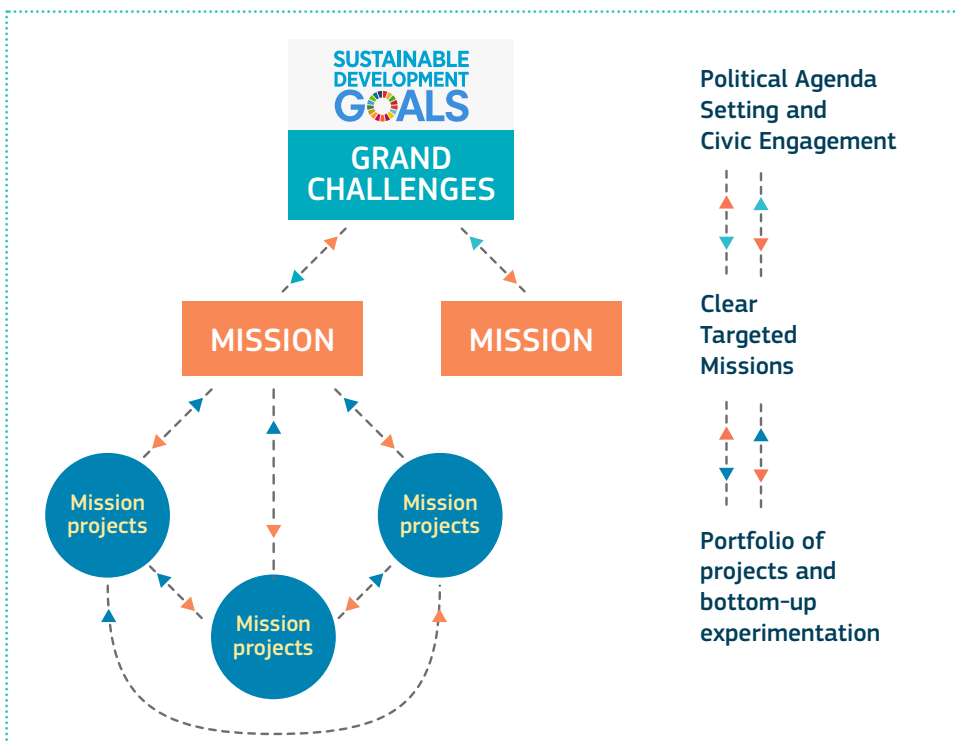


Figure 1. From Challenges to Missions Image: RTD - A.1 based on Mazzucato (2017)

For example, SDG 14 'Conserve and sustainably use the oceans, seas and marine resources for sustainable development' could be broken down into various missions, for example 'A plastic-free ocean'. This could stimulate research and innovation in means to clear plastic waste from oceans, or in reducing use of plastics, innovation in new materials, research on health impacts from micro-plastics, behavioural research and innovation to improve recycling or drive public engagement in cleaning up beaches. Each of these areas can be broken down into particular 'projects'. This is further analysed in the example section of this report, as well as other illustrative examples.

## FOSTERING EXPERIMENTATION

Missions must be chosen. Yet their success will depend on the bottom-up processes that nurture innovation while 'getting there'. A culture of experimentation and risk-taking is a crucial element in the philosophy of missions. There must be incentives to 'think outside the box' to come up with new solutions to address the mission objective. This requires a portfolio approach, based on different solutions, and a broad range of different interactions. The objective should be addressed by multiple actors, stimulating cross-discipline academic work, with a strong focus on the intersection between natural sciences, formal sciences, social sciences and humanities; collaborations across different industries; and new forms of partnerships between the public sector, the private sector and civil society organisations. Innovation itself is often characterised by feedback effects, trial and

error, and serendipity (the search for one thing leads to the discovery of another) - picking missions that have different possibilities for solutions will enhance the innovation dynamic itself.

## NEW CONVERSATIONS BETWEEN FUNDAMENTAL AND APPLIED RESEARCH

Missions are not about prioritising applied research and innovation over basic fundamental research, which will continue to be funded by instruments like the European Research Council. Rather they are a new way to frame the conversations between the two, galvanising new forms of collaboration. Missions are also a new way to think about the dynamic interactions between enabling horizontal policies (framework policies around e.g. education, skills, training, research and innovation) and more directed vertical policies (e.g. health, environment, energy). Instead of using vertical policies to 'pick' sectors or technologies, the vertical aspect of missions picks the problem. The solution is then reached by stimulating multiple sectors and multiple forms of cross-actor collaborations to work to address those problems using the entire research and innovation value chain, from fundamental research to applied research and cutting-edge innovation.

## FET Flagships

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The EU has launched 'Future and Emerging Technology (FET) Flagships', initially on Graphene and the Human Brain, and more recently on Quantum. FET Flagships demonstrate a high level of ambition and commitment (€1 billion from a range of sources over a number of years) with a strong technology-driven approach based on multi-disciplinary research activities.

Their high ambition and significant public EU research investment have crowded-in industry partners and mobilised private investment. Based on these characteristics, FET Flagships show a high degree of alignment with EU research and innovation missions as described in this report.

However, the FET Flagships have not so far put the same emphasis on public engagement or on defining goals and milestones in terms of societal relevance, even though they do aim to turn scientific and technological developments into innovations that can be brought to market, and aim to support societal challenges. The experience from the current FET flagships should prove valuable for designing and implementing future missions, and applying the selection criteria, implementation requirements and public engagement criterion proposed here could increase the impact and visibility of FET flagships as future missions.

# FIVE KEY CRITERIA FOR SELECTING MISSIONS

Selecting missions that matter to society and stimulate innovation across multiple sectors is a highly complex task. Missions come in different shapes and sizes, but the European research and innovation missions should fulfil the following key criteria.

## 1. BOLD, INSPIRATIONAL WITH WIDE SOCIETAL RELEVANCE

Missions should engage the public. They should make clear that through ambitious, bold action at the European level, solutions will be developed that will have an impact on people's daily lives. To do this, missions must outline exciting opportunities for bold innovation — while being connected to debates in society about what the key challenges are, like sustainability, inequality, health, climate change, and increasing the quality of the welfare state. Therefore, a mission cannot only have relevance for the population of one Member State, or a small sub-set of the European population. It should touch the lives of, or inspire, a significant part of the European population. However, it is important to note that relevance does not necessarily equate with popularity.

## 2. A CLEAR DIRECTION: TARGETED, MEASURABLE AND TIME-BOUND

Missions need to be very clearly framed. While enabling long-term investments, they need a specific target that can either

be formulated in binary ways (as clearly as whether man has reached the moon and returned back safely) or quantified (as clearly as whether a certain percentage reduction in carbon emissions against a baseline has been reached across manufacturing). In addition, they will need a clear timeframe within which actions should take place. This needs to be long enough to allow the process to grow, for actors to build relationships and interact, while at the same time being time-limited. Without specific targets and timing, it will not be possible to determine success (or failure), or measure progress towards success.

## 3. AMBITIOUS BUT REALISTIC RESEARCH & INNOVATION ACTIONS

Mission objectives should be set in an ambitious manner (taking risks), centred on research and innovation activities across the entire innovation chain, including the feedback effects between basic and applied research. Ambitious objectives will ensure that researchers and innovators are challenged to deliver what would otherwise not be attempted (“additionality” in research). Yet, the objective should be framed to be on the one hand high-risk but also realistically feasible, at least in theory, within the given time period.

Setting the technical objectives unrealistically high will result in a lack of buy-in, while setting the objective too low



will not incentivise extra efforts – or provide inspiration. Furthermore, the required technological development should attract research and innovation activities that otherwise would likely not be undertaken by private actors, providing the justification and legitimacy for public intervention. This does not have to be done within a narrow market failure framework, but a more active market ‘co-creation’ framework<sup>15</sup>.

#### 4. CROSS-DISCIPLINARY, CROSS-SECTORAL AND CROSS-ACTOR INNOVATION

Missions should be framed in such a way as to spark activity across, and among, multiple scientific disciplines (including social sciences and humanities), across different industrial sectors (e.g. transport, nutrition, health, services), and different types of actors (public, private, third sector, civil society organisations). Missions need to be chosen to address clear challenges that stimulate the private sector to invest where it would not have otherwise invested (“additionality” in business). By taking a problem focussed lens and not a sectoral lens, problems related to sustainability will not just involve, for example, renewable energy, but could also involve transport, strategic design, new digital solutions, amongst others. Similarly, problems related

to health will not only involve innovation in pharmaceuticals but also in such areas as nutrition, artificial intelligence, mobility and new forms of digitally enhanced public service provision.

Missions connect all relevant actors through new forms of partnerships for co-design and co-creation by focussing on targets that require multiple sectors and actors to solve. Thus, mission-oriented innovation has the possibility of leading to system-wide transformation.

#### 5. MULTIPLE, BOTTOM-UP SOLUTIONS

Missions should not be achievable by a single development path, or by a single technology. They must be open to being addressed by different types of solutions. A mission-based approach is clear on the expected outcome. However, the trajectory to reach the outcome must be based on a bottom-up approach of multiple solutions – of which some will fail or have to be adjusted along the way.

<sup>15</sup> Mazzucato, M. (2016) «From Market Fixing to Market-Creating: A new framework for innovation policy», Special Issue of Industry and Innovation: “Innovation Policy – can it make a difference?”, 23 (2)

# IMPLEMENTATION

The mission concept and proposed criteria provide a basis for identifying EU level research and innovation missions. However, the future missions will also require new approaches to implementation. They should not be managed in the same way as other parts of the Framework Programme, like the European Research Council or future European Innovation Council (which are bottom up), or the current approach to the Societal Challenges. While lessons must be learned from the latter due to the importance of challenges in setting the direction for change, missions are more concrete than challenges and thus for their implementation we must also learn from successful mission-orientated organisations around the world — of course adapted to the EU context.

The main lessons can be grouped under the following aspects

## Engagement of diverse national and regional stakeholders

Mission objectives should provide legitimacy, such as relevance to the SDGs, EU priorities and/or Member State priorities; the mission should not exist in a vacuum. While EU investments in research and innovation are a basic condition, a broader political commitment to align policy objectives at

both the EU and Member State level will be critical to implement a successful mission.

Missions should engage as much as possible with Member State strategies, including industrial strategies - which in many countries have made a comeback. Indeed a mission-based approach is a useful lens for an industrial strategy to be based around, so that it is not about picking sectors or technologies but about picking problems to guide innovation across multiple actors in multiple sectors<sup>14</sup>. This will lead to more complementary public investments from European, national or regional programmes, and also additional private investments, creating a catalysing effect on the chances for success. Hence, missions can serve as a way to initiate new EU-wide and national dialogue around the role of public sector support for research and innovation – not only fixing market failures but also more actively co-creating and co-shaping new markets.

Selection of a mission that will incite broad public engagement, as well as a wide interest from industry and civil society stakeholders, can spur further political commitment. Crucial to the implementation of EU missions will be the need to reinvigorate capacity building in public organisations and institutions as well as competencies and expertise at European,

<sup>14</sup> For example, the UK Government's recent Industrial Strategy White Paper states that the strategy will be focussed on addressing 4 key societal challenges: Clean Growth, Future of Mobility, AI and the Data Economy, and the Ageing Society. Helping to translate these challenges into multiple missions is the task of the new UCL Commission for Mission Oriented Innovation and Industrial Strategy (MOIIS).

Member State, regional and local level. This is essential to effectively coordinate and provide direction to participants when formulating and implementing missions

### Measurement and impact by goals and milestones

It is essential for missions to define a concrete target and objectives. That is to say, it must be possible to say definitively whether the mission has been achieved or not. Appropriate indicators and monitoring frameworks will need to be established to measure progress. They must be dynamic, recognising that static cost-benefit analysis and net present value calculations would most likely stop any bold mission from the outset.

While missions must allow for long-term investments, the use of intermediate milestones is critical. Intermediate milestones will provide the means to keep track of progress towards the mission objective and allow for informed and flexible adaptive decisions to intervene. Real-time data, publicly available, on progress on the milestones will also keep a sense of urgency, achievement and motivation among involved actors. The use of AI and big data for creating dynamic metrics will be very important.

Intermediate milestones will also be important for flexibility and adaptation so

that the mission can be changed over time if the milestones provide new information or show that the mission, for whatever reason, has been framed problematically and needs adjusting. While missions are long-term and should have a stable goal, the intermediate signposts should be used to decide whether changes in direction are required, and, in some cases, whether the mission itself needs redefining.

In addition to the milestones, broader measures of the cross-sectoral and cross-science impact are needed. So even if a milestone or the overall mission objective is not reached, the mission might still be considered to be successful (at least to an extent) if the process produced positive, economy-wide spillovers (e.g. the Internet was not discovered because of an ex-ante objective, but rather as a solution to a problem that scientists had in the late 1960s around allowing multiple computers to communicate on a single network.). Indeed, creating cross-sectoral spillovers can be an objective itself, best achieved when the process of innovation remains open and cross-disciplinary.

### A portfolio of instruments to foster bottom up solutions

A mission is not a single project, but a portfolio of actions that can encourage multiple solutions. A diverse set of different funding instruments will help achieve this,

from grants, to prizes, to new forms of procurement, and financial instruments. This will guarantee that public funding is allocated to a diverse set of activities with a focus on complementarities, and avoiding duplication. The process should explicitly be one that admits the tension between the top-down direction setting and the bottom-up explorative approaches. Rather than prescriptive specifications of projects, participants should be given flexibility to propose a variety of solutions for achieving the mission goals and intermediate milestones. This will nurture bottom-up experimentation, but in each case the lessons (and data) from the experiments should be collected, analysed and understood.

This would mark an important change from programme management and evaluation under Horizon 2020. Rather than managing projects in isolation and according to project specific objectives, a portfolio of projects would be managed to stimulate interaction, experimentation and cross-learning. Rather than evaluating at the level of the overall programme following the completion of actions, evaluation would be an integral part of the mission and feed into the ongoing implementation and management of projects and funding. This would also avoid funding projects that simply support existing networks without necessarily adding new value.

### Flexibility, pro-active management and building in-house capabilities

Missions are a concerted effort to reach a pre-defined objective through a multitude

of actions. As the focus is on reaching an outcome, a high degree of flexibility and adaptability is required to allow the possibility to change course if there is a risk that the objective will not be achieved.

In budgetary terms, there should be a possibility to increase the budget for a mission if there are indications that extra investment (within boundaries) could make the difference between reaching a mission objective or not. Similarly, if indicators consistently point towards a situation where a mission objective is out of reach, the possibility to terminate a mission should also be conceivable.

Such decisions should be based on metrics that can orchestrate the (tricky) balance between the need for some form of ex-ante dynamic risk assessment and the danger of writing off potentially viable missions at an early stage because ex-ante impact assessments cannot predict the kind of unexpected spillovers the mission approach can cause.

This has implications for how European public research and innovation funding is allocated and assessed. Evaluation of project proposals should pay as much attention to the portfolio of projects, as to the excellence of individual proposals. If individual projects, after a period of time and based on clear indicators, seem not to be contributing to the mission objective, it should be possible to redirect funding to other activities. In a similar vein, to ensure the maximum contribution of activities to the mission objective, funding should be distributed on a 'stage-gate' principle, where successive tranches of funding

are only allocated based on reaching an intermediate milestone.

This proactive approach to the management of a portfolio of projects requires significant in-house capacities and expertise. Lessons should be learned from mission-oriented organisations like DARPA and ARPA-E in the US, Yozma in Israel, SITRA in Finland and Vinnova in Sweden. The point is not to copy these organisations but to learn from key sources of their success. For example, these organisations have explicitly welcomed risk-taking at the organisational level; they have used secondment practices to bring high-level scientists into the civil service for limited time periods; they have often aligned goals with national procurement practices; and have been extremely good at drawing on expertise of wider networks<sup>15</sup>. Such organisations develop what has been called ‘mission mystique’<sup>16</sup> or institutional charisma: It is an honour to work in a mission-oriented organisation where ambitions for the use of innovation to solve problems are as important as building in-house capacity and expertise.

Unfortunately, the trend is for much of the in-house knowledge to be outsourced to third parties, whether consulting companies, think tanks or the private sector. This is particularly noticeable in policy and programme evaluations where

increasing number of public organisations rely on external evaluators. While some outsourcing is fine (scientific peer-review is a case of outsourcing), it is also crucial to build dynamic capabilities inside public institutions that are responsible for engaging with technological and scientific priorities. While public organisations may require more long-term stability than private ones, they still must nurture risk-taking and experimentation– and hence such capabilities have to be consciously nurtured in the public sector.

This means we have to be willing to rethink the curricula for public administration (including the relevant executive education programmes) as well as key quality and performance management tools and metrics widely employed in public organisations. Public institutions in charge of mission-oriented policies need to be willing to experiment with both bringing in new expertise (e.g. establishing novel forms of collaboration with third-sector organisations to pool and share expert knowledge<sup>17</sup>) and changing everyday routines and processes to build dynamic organisational capabilities (including dynamic performance management, procurement, and human resources).

<sup>15</sup> The Institute for Innovation and Public Purpose (IIPP) at University College London has launched a Mission Oriented Innovation Network (MOIN) that creates a platform where lessons are learned between global mission-oriented agencies, with particular emphasis on the way in which ambitious organisational goals are created, internal capabilities nurtured, and dynamic metrics used to capture the market shaping effect of mission oriented policies.

Available at: <https://www.ucl.ac.uk/bartlett/public-purpose/partnerships> (Accessed 16 February 2018)

<sup>16</sup> Goodsell, Ch. T. (2011) ‘Mission Mystique: Strength at the Institutional Center’, *The American Review of Public Administration*, 41(5), pp. 475–494.

<sup>17</sup> An excellent example of how to bring expertise into public organisations is Public Practice in the UK, which seeks to bring back the expertise of high level planners and architects into the innovation-led strategies of city level governments. See: <http://www.publicpractice.org.uk> (Accessed 1 February 2018)

# PUBLIC ENGAGEMENT

The issue of public engagement and missions is crucial because of the symbiotic nature of the relationship between the two. Missions provide a straightforward explanation to the public of how diverse, and sometimes difficult to understand, developments in research and innovation contribute to a better society. In addition, the potential impact of missions is much higher when they inspire and engage widespread support.

Missions must be framed within challenges that are broadly agreed to be of high societal importance. This will ensure their longevity and survival across political cycles as well as contributing to their success. It will ensure that citizens can clearly see the benefits that European research and innovation in particular, and EU intervention in general, bring to their lives and communities. In order to capture this, meaningful public participation in the selection process of missions is a pre-requisite.

Therefore, even though the nature of missions requires that they be selected at the political level, the selection process must have a strong element of public involvement. This is both because innovation benefits from multiple and diverse influences, and also because without civic engagement, the risk of alienation from the broader public and a purely technocratic approach is too high. A mission will not inspire people unless they are part of it. A rigorous process of evaluation is needed to ensure continuing

relevance and commitment and to prevent selection being captured by either passing fashion or vested interests.

Public participation in the selection process must be followed by public inclusion in the implementation. Keeping society informed of progress and achievement of intermediate milestones, for example using social media or community based workshops, could play a role in maintaining broad interest and thus incentivising continuation of the mission. The opportunities for such engagement will of course differ depending on the nature of the mission, but some form of genuine participation of civil society organisations in concrete projects within a mission will be crucial to facilitate open dialogues on expected outcomes and practical applicability of solutions. Furthermore, as missions are cross-actor and cross-discipline, social innovation will be a key element of implementation. Citizens can possibly be mobilised to become active participants in missions, for example by cleaning plastics from beaches or by providing real-time monitoring data as enabling technologies develop and become more universally present in society.

Furthermore, innovation often finds its true purpose in the hands of consumers who work out what a technological innovation is really capable of or what it can be used for. Innovation is still born until people find a way to fit it into their lives. So while it is important that missions pervade the supply side of innovation (driving communities

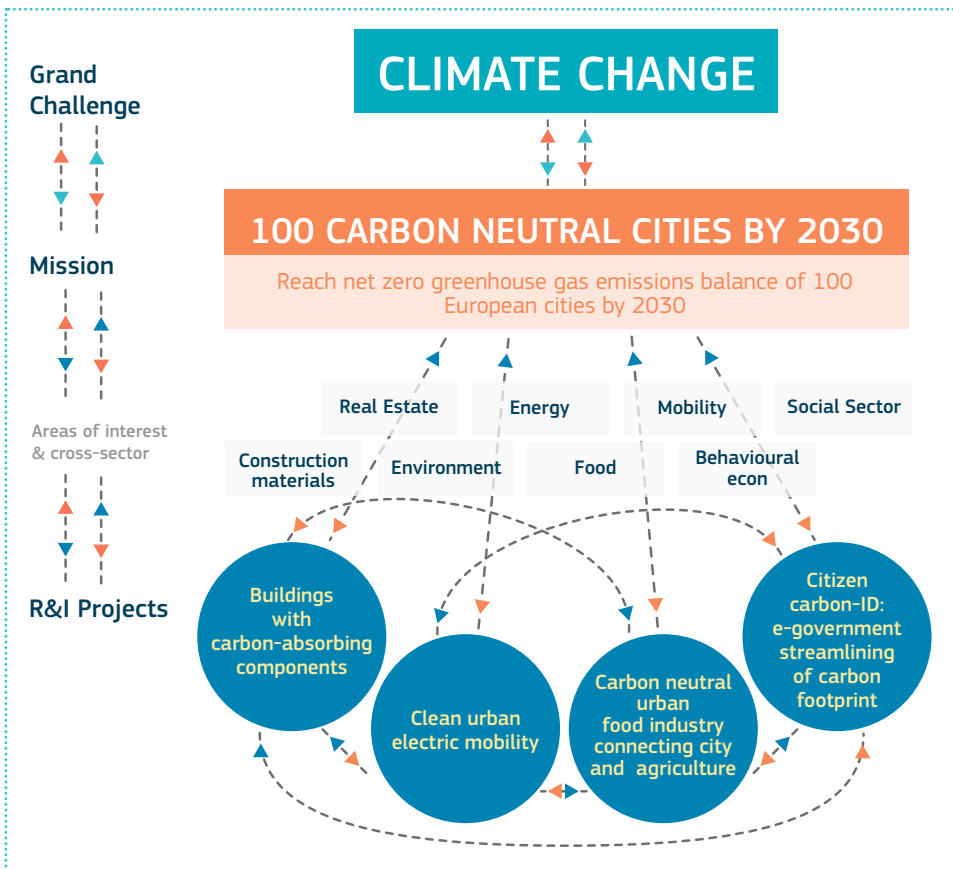
of knowledge to bring about important changes), innovation can also come from the demand side (people discovering what a technology is for in the process of using it, or solving important problems they face). Indeed, there is lots of evidence from within innovation processes that this interaction between supply side and demand side is vital to the success of missions<sup>18</sup>.

All available and proven channels of communication with citizens should be explored so citizens can feel enthusiasm and trust in the process of change. The precise constellations of civil society, public and private actors that should be involved will only be fully developed when particular missions are selected.

<sup>18</sup> For ideas on how the web can be used to increase demand side participation, see Leadbeater, C. (2009), *We-Think*, UK: Profile Books

# EXAMPLE MISSIONS OF THE FUTURE

This report is not designed to decide what the future European research and innovation missions should be, but rather to offer guidance in their selection and implementation. It is useful, nonetheless, to provide some examples of how to define missions, based on the criteria described in this report. The three examples below are solely for pedagogical use. They are not, and nor are they intended to be, scientifically, technically, or otherwise complete. For each of the three examples, the five criteria for mission-setting, as described above, are exemplified and illustrated.





## 100 CARBON NEUTRAL CITIES BY 2030

### 1. BOLD, INSPIRATIONAL WITH WIDE SOCIETAL RELEVANCE

By 2030, 80% of European citizens will live in cities. European values, culture and productivity are closely related to cities. Cities are important drivers of innovation; they have close interactions with citizens and have the ability to test solutions at scale. By turning 100 cities across Europe into fully carbon-neutral places to live and work, about 40% of European urban citizens could benefit from cleaner air and Europe would take a major step forward in achieving the objectives of the Paris Climate Agreement.

### 2. A CLEAR DIRECTION: TARGETED, MEASURABLE AND TIME-BOUND

One hundred cities reaching a net zero greenhouse-gas-emission balance by 2030 is a concrete target that can be definitively measured. Different timelines and intermediate milestones can be used for cities of different size or economic basis.

### 3. AMBITIOUS BUT REALISTIC RESEARCH & INNOVATION ACTIONS

Research and innovation activities across the entire innovation chain are essential to reach a carbon-neutral balance for cities. Collaboration and feedback loops between basic research (such as the carbon-absorption capacity of construction materials), applied research (such as sustainable urban mobility and freight options), and social, entrepreneurial innovation (such as incorporating citizen

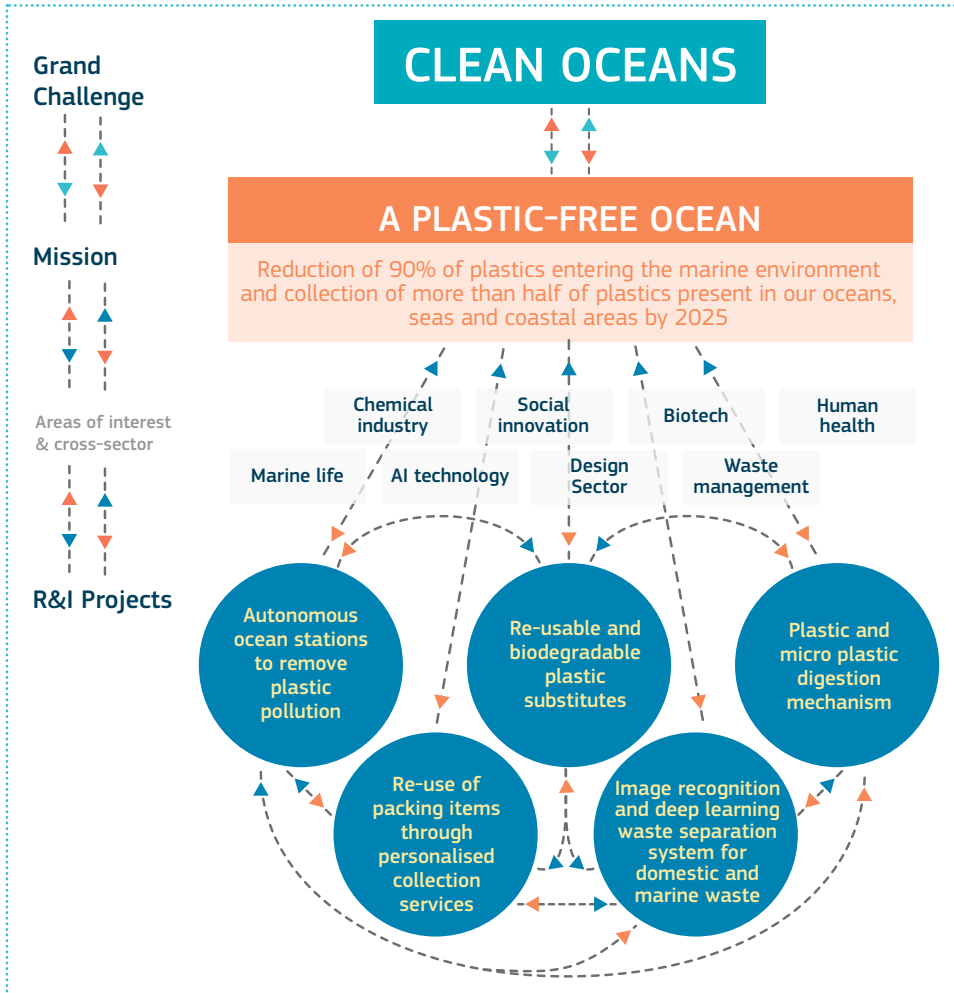
carbon-ID in the real estate market and daily purchases), will be essential. Such knowledge-based research and innovation could work in conjunction with regulatory and governance actions to see that the mission target is reached.

### 4. CROSS-DISCIPLINARY, CROSS-SECTOR AND CROSS-ACTOR INNOVATION

Cities play an important yet different role in the life of all actors of society and therefore need the involvement of engineers, social workers, planners, environmental scientists, data analysts, economists, citizens, policy makers and other actors. To achieve carbon neutrality in cities, these actors need to collaborate across sectors, such as urban planning, construction, energy efficiency in buildings, mobility, behavioural aspects, food, environmental capacity etc. while incorporating cross-disciplinary research such as urban planning, energy efficiency in buildings, mobility, consumer behaviour and innovative business.

### 5. MULTIPLE, BOTTOM-UP SOLUTIONS

Carbon neutrality in cities can only be reached through a systemic approach including all the different activities and functions of urban areas. This requires a multitude of research and innovation projects, combined with policy, governance and civil engagement, that may have specific objectives (such as facilitating domestic use of renewable energy, incentivising electro-mobility or developing materials for energy efficient building, etc.), but that need to be aligned and interact with one another to multiply the overall impact.



## A PLASTIC-FREE OCEAN

### 1. BOLD, INSPIRATIONAL WITH WIDE SOCIETAL RELEVANCE

Every year, Europeans generate 25 million tonnes of plastic waste, of which less than 30% is recycled. Plastic makes up 85% of beach litter. There are two strands to tackling plastic ocean pollution. First

existing plastic pollution must be removed from the ocean and second, new ways must be found to curtail the entry of new plastic waste to the oceans. Drastically reducing the amount of plastic that enters and floats in the oceans will have a substantial impact on the health of European citizens, marine life and the environment. This mission would be closely aligned with the objectives

of the recently adopted Plastics Strategy<sup>19</sup> creating an important interaction between research and innovation activities and policy development.

### 2. A CLEAR DIRECTION: TARGETED, MEASUREBLE AND TIME-BOUND

This mission could have a clear target to reduce the amount of plastic entering the marine environment by 90%; and of collecting more than half of the plastic currently present in our oceans, seas and coastal areas. This would mean stopping at least 7.2 million tonnes of plastic entering the marine environment and collecting at least 2 million tonnes of plastic per annum from oceans, seas and coastal areas. A very ambitious, yet achievable timeline to reach this target would be circa 5-10 years.

### 3. AMBITIOUS BUT REALISTIC RESEARCH & INNOVATION ACTIONS

Research and innovation activities across the entire innovation chain would be essential to reach a plastic-free ocean. Research actions would also need to target the reduction of impact of marine litter on human and animal health. Collaboration and feedback loops between basic research (such as chemical research on characteristics of plastic), applied research (such as biotech applications in packaging design) and entrepreneurial innovation (such as on-sea plastic collection stations) will be essential. Such knowledge-based research and innovation could work in conjunction with regulatory and governance actions to see that the mission target is reached.

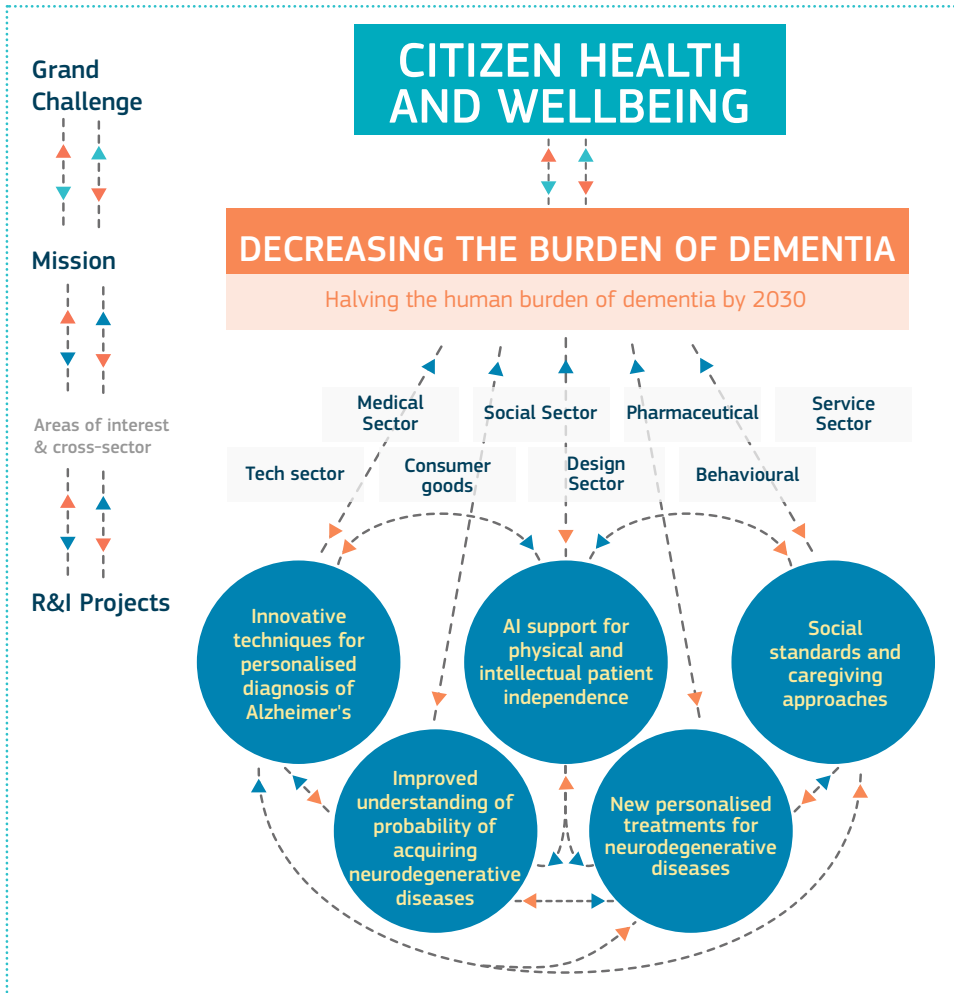
### 4. CROSS-DISCIPLINARY, CROSS-SECTORAL AND CROSS-ACTOR INNOVATION

Oceans are a source of life for society. Many different actors of society will need to be involved (such as chemical engineers, marine biologists, marketing experts, environmental scientists, earth observation specialists, fishermen, citizens at large, etc.). These different actors will need to collaborate across sectors such as chemical, biotech, marine life, consumer goods, Artificial Intelligence, health, design, waste — while incorporating cross-disciplinary research such as product design, in particular design for the food processing chain (packaging of food), cosmetics, tyres and textiles.

### 5. MULTIPLE, BOTTOM-UP SOLUTIONS

Removing plastics from the ocean is such a large and complex exercise, that it could not be achieved by a single technological (or policy) solution. It will require a combination of various solutions, focusing on different facets of the problem, which will need to be coordinated in order to reinforce each other. Interaction between projects, and experimentation and risk-taking, can increase additionality. For example, an autonomous ocean plastics management station might take time to implement, but the knowledge base for this station could be used to inform a hybrid, plastics-digestion mechanism, which could be implemented first, possibly in the form of distributed nets. This might kick-start an innovative and more efficient way of overall ocean plastics removal.

<sup>19</sup> European Commission (2018) European Strategy for Plastics. Available at: [http://ec.europa.eu/environment/waste/plastic\\_waste.htm](http://ec.europa.eu/environment/waste/plastic_waste.htm) (Accessed 16 February 2018)



## DECREASING THE BURDEN OF DEMENTIA

### 1. BOLD, INSPIRATIONAL WITH WIDE SOCIETAL RELEVANCE

European values are closely connected to a high quality of life, optimising care and wellbeing and balancing family life and work. Dementia is a syndrome that

currently afflicts 10.5 million Europeans (expected to rise to 18.7 million people by 2050). Halving the human burden of dementia would both mean a tremendous impact in terms of improvement of quality of life for patients and families of patients with dementia. On top of the human cost dementia is estimated to currently cost around €530 per citizen per year.

## 2. A CLEAR DIRECTION: TARGETED, MEASURABLE AND TIME-BOUND

The target is to halve the human burden, by reducing by 50% the progression of the disease in affected patients. A very ambitious yet feasible timeline for this target is 10 years. This would represent a saving of €92 billion in anticipated healthcare over that 10-year period (or around €9 billion per year). To track whether the target has been reached, intermediate milestones like the number of patients presenting an earlier clinical status of dementia and the average age at which dementia is diagnosed could be defined.

## 3. AMBITIOUS BUT REALISTIC RESEARCH & INNOVATION ACTIONS

To reduce the progression of dementia in patients research and innovation activities across the entire innovation chain would be essential. Collaboration and feedback loops between basic research (such as brain-science on neurodegenerative diseases), applied research (such as personalised treatments of dementia) and entrepreneurial innovation (such as artificial intelligence for patient independence), will be essential. Such knowledge-based research and innovation could work in conjunction with regulatory and governance actions to see that the mission target is reached.

## 4. CROSS-DISCIPLINARY, CROSS-SECTOR AND CROSS-ACTOR INNOVATION

Dementia is a syndrome that affects many parts of society. It can only be addressed by bringing together a wide range of actors, such as patients, doctors, social workers,

families, designers, teachers, programmers, laboratory workers. These actors will need to collaborate across sectors, (such as medical, tech, social, consumer goods, pharmaceutical, design, service sector, behavioural economics, etc.), while incorporating cross-disciplinary research (such as integrated digital technologies (e.g. big data, e-health records, sensors, mobile devices, and telemedicine) for better monitoring and independent living interactions between artificial intelligence, behavioural sciences and molecular biology for early detection of dementia).

## 5. PROMOTE MULTIPLE, BOTTOM-UP SOLUTIONS

The pervasiveness of dementia in society means that addressing this challenge can only be achieved by tackling a wide variety of elements that can each contribute to the mission. There is not a single avenue to solve the problem. For example, innovative early-diagnosis tools and techniques might take more time to develop and need more inputs from basic research before implementation in applied research. Nevertheless, linking the knowledge of one project with other parallel projects on e.g. awareness and training, could help to develop knowledge and ability to implement behavioural changes in social standards and caregiving.

## CONCLUSION

Europe has major strengths, not least among them our research and innovation system, built on many successive years of investment by Member States and the Union alike. But Europe is at a crossroads and faces many major challenges — from inequality to rising air pollution to antiquated health systems. Rather than let the challenges overwhelm us and feed rising populism we have an opportunity, as we stand on the cusp of the 9<sup>th</sup> European Framework Programme for Research and Innovation, to turn these challenges into opportunities for change, for new forms of interactions, and for revived innovation-led growth.

The key insight of this report is that missions are both a means of setting economic growth in the direction of where we want to be as a society and a vehicle we can use to get there.

I have outlined the key criteria to help European policy makers choose missions that will be ambitious, engaging and achievable. I have outlined the main broad issues around implementation to guide the policy makers as they put a formal shape on missions in the coming years and I have outlined examples of what European level missions could look like. It will take a lot of work by many people and organisations but, if Europe can get mission-oriented policy right, the potential benefits are staggering.

This is not about low-tech and high-tech but about getting the entire economy, across EU Member States working towards achieving goals that were implied but not actioned enough in Horizon 2020.

On the occasion of a conference I organised in 2014 on Mission-Oriented Finance for Innovation<sup>20</sup>, I asked Cheryl Martin, the Director of the US innovation agency in the Department of Energy, ARPA-E what she considered the driving factors in the success of her agency which has been responsible for some of the most advanced innovations on battery storage. She said that the key was to measure success firstly by how much risk they were willing to take and secondly by how much impact the successes had across society. There is much to learn from the balance and portfolio thinking implied by this approach: take risks but make sure successes really matter!

I hope this report will serve as a stimulus for Europe to gain courage to take the risks needed to launch a new vision of a problem-solving approach to innovation-led growth — that matters. A vision that will involve multitudes of EU stakeholders and be bold enough to awaken passion in science, technology and the humanities by reframing challenges and solutions in such a way that the process is just as exciting as the outcome.

<sup>20</sup> Mazzucato, M. and Penna, C. (eds.) (2015) *Mission-Oriented Finance for Innovation: New Ideas for Investment-Led Growth*, Rowman & Littlefield. Available at: <http://www.policy-network.net/publications/4860/Mission-Oriented-Finance-for-Innovation> (Accessed: 12 February 2018)



## ABOUT THE AUTHOR

**Professor Mariana Mazzucato** (PhD) holds the Chair in the Economics of Innovation and Public Value at University College London where she is the Founder and Director of the new Institute for Innovation and Public Purpose (IIPP). In 2018, she was appointed as Special Advisor on Mission-driven Science and Innovation to the European Commissioner for Research, Science and Innovation, Carlos Moedas.

She previously held the RM Phillips Chair at the Science Policy Research Unit of the University of Sussex and has also held academic positions at the University of Denver, Bocconi University and the Open University.

Her highly-acclaimed book *The Entrepreneurial State: debunking public vs. private sector myths* focuses on the role that the public sector played in the history of radical innovations. It uses those lessons to consider a new policy framework for innovation-led growth - and how to enable rewards from innovation to be just as 'social' as the risks taken.

Her research looks at the relationship between financial markets, innovation and the role of public policy. She advises policy makers around the world on innovation-led growth and is currently a member of the Scottish Government's Council of Economic Advisors; the UN Sustainable Development Solutions Network Leadership Council and SITRA's Advisory Panel in Finland. She is also a member of the EC high level expert group on the Economic and Societal Impact of Research and innovation (ESIR).

Mazzucato is winner of the 2014 New Statesman SPERI Prize in Political Economy, the 2015 Hans-Matthöfer-Preis and the 2018 Leontief Prize for Advancing the Frontiers of Economic Thought. In 2013, she was named as one of the '3 most important thinkers about innovation' in the New Republic.

Her new book, *The Value of Everything* will be published by Penguin (Allen Lane) in 2018.



# ANNEX

## CONSULTATION PROCESS

As part of the consultation process for this report, Professor Mazzucato discussed mission-oriented research and innovation policy with leaders and experts from diverse scientific and professional backgrounds.

These discussions were part of a series of explorative meetings organised by the European Commission from December 2017 to February 2018. The purpose of these meetings was to investigate the opportunities for mission-oriented research and innovation policy in Europe. The outcome of this exploration has contributed to the development of this report.

**The dates and the compositions of the different meetings were as following:**

### 1 December 2017, Brussels

Meeting with the Competitiveness Council. Professor Mazzucato gave a keynote speech, followed by a discussion, on the topic of mission-oriented policy across Europe based on her working paper Mission Oriented Innovation: Challenges and Opportunities<sup>21</sup>.

### 21 December 2017, Brussels

Meeting at CEPS – European think tanks and professional research organisations represented: CEPS, European Climate Foundation, EPC Industrial Innovation for

Competitiveness platform - Institute for European Studies, VUB, Delors Institute – Berlin, Breughel, CNRS, Helmholtz, Vinnova, TNO, EARTO, National Research Council of Italy, PolSCA.

### 23 January 2018, Brussels

High-Level Expert Groups within the EC represented: RISE group, Lamy Group; EIC Group; HL Panel Decarbonisation Pathways Initiative; KET's HLG on Industrial Technologies; Scientific Panel for Health; Horizon2020 Advisory Group for Societal Challenge 1: Health, Demographic Change and Wellbeing.

### 24 January 2018, Brussels

European Commission DG represented: SG, EPSC, SANTE, ENV, CLIMA, JRC, EAC, CNECT, MOVE, ENER, REGIO, MARE, HOME, ECFIN, AGRI, TRADE, GROW, BUDG, EMPL, RTD.

### 22 February 2018, Brussels

Strategic Programme Committee meeting with representatives of the Member States.

**In these meetings Professor Mazzucato led the discussions based on the following topics:**

1. Designing Missions at EU level; Key characteristics for success (Inter-disciplinarity, timeframe, targets, level of granularity, etc.);

<sup>21</sup> Mazzucato, M. (2017) 'Mission-oriented Innovation Policy: Challenges and Opportunities', UCL Institute for Innovation and Public Purpose (IIPP) Working Paper Series, (IIPP 2017-01). Available at: <https://www.ucl.ac.uk/bartlett/public-purpose/sites/public-purpose/files/moip-challenges-and-opportunities-working-paper-2017-1.pdf> (Accessed: 12 February 2018)

2. Public engagement in identification and implementation of missions;

3. Ensuring impact of Missions:

- Links with policy frameworks, innovation and national programs
- Key implementation requirements (monitoring and evaluation, involvement of end users, etc.)

4. Discussion on defining hypothetical examples of missions – for pedagogical use.

Professor Mazzucato also participated in a meeting organised and led by STOA on 24 January 2018 at the European Parliament in Brussels. The meeting was hosted by the STOA commission with following panel:

- Christian EHLER -, MEP & STOA; Jerzy BUZEK, MEP & ITRE; Kurt VANDENBERGHE - DG RTD; Luc SOETE - ESIR, Daria TATAJ - RISE; Patrizia TOIA - MEP & ITRE; Luke GEORGHIOU - Manchester University (UK); Martin KERN - EIT; Sylvia SCHWAAG SERGER, Lund University, (SE).

About 200 people participated in this meeting, organised and led by STOA.

### **Future activities**

#### **Spring 2018**

Call for feedback on the basis of this report asking the public for their input on missions at EU Level.

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The EU Open Data Portal (<http://data.europa.eu/euodp/en/data>) provides access to datasets from the EU. Data can be downloaded and reused for free, both for commercial and non-commercial purposes.

The European Commission, through Carlos Moedas, Commissioner for Research, Science and Innovation, invited Professor Mazzucato to draw up strategic recommendations to maximise the impact of the future EU Framework Programme for Research and Innovation through mission-oriented policy.

This report is the result of Professor Mazzucato's reflections based on her research, with inputs through a consultation process with internal and external stakeholders of the European Commission.

*Studies and reports*

