

FRAUNHOFER-GESELLSCHAFT ZUR FÖRDERUNG DER ANGEWANDTEN FORSCHUNG E.V.

SIX MISSIONS FOR EUROPE

CREATING ADDED VALUE FOR THE EUROPEAN CITIZEN

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Contact

Fraunhofer Department for the European Research Area
EU Office Brussels
brussels@zv.fraunhofer.de
+32 2 506 42 40

Introduction

Following Fraunhofer's [support](#) of the European Commission's call for a mission-oriented approach in a substantial part of the next framework program and subsequently elaborating from a RTO's point of view on how [to best design and implement such an approach](#), we would like to extend the discussion by providing a few tangible and illustrative examples for potential European missions. Out of many possibilities and important subjects that have the potential to improve the welfare of European citizens Fraunhofer singled out six mission proposals to exemplify how a more targeted and result-driven allocation of European funding can create hugely positive impact for all European citizens and foster European competitiveness in an ever more complex world.

Fraunhofer selected six areas of great importance to Europe citizens and formulated each mission with special focus on the benefit to all European citizens. We restricted ourselves to those areas where no Member State has the power and capability to bring about the desired structural change alone. Furthermore, all missions involve not only a substantial technological challenge but also a political challenge. We believe that a mission-oriented approach with tangible goals and deliverables has the ability to spur member states to action and to facilitate a unified vision that finally leads to joining forces in missions:

- The **data** mission that will enable each European citizen to control his/her personal data: DATA SOVEREIGNTY FOR THE EUROPEAN CITIZEN
- The **personalized medicine** mission that will give every European citizen access to the most advanced cell-based therapies: THE EUROPEAN HAPLOBANK - ENABLING CELL-BASED THERAPY FOR EVERY EUROPEAN CITIZEN
- The **circular economy** mission that will create highly competitive products that are in full accordance with the principles of the circular economy: CIRCULAR PRODUCTS MADE IN EUROPE: CERTIFIED!
- The **mobility** mission that will integrate the different approaches to autonomous driving throughout Europe and lead to a single European transport area: FULLY AUTONOMOUS AND ZERO-EMISSION DRIVING BETWEEN MAIN EUROPEAN CITIES BY 2030
- The **health** mission that will save hundreds of thousands of lives: REDUCE THE BURDEN OF ANTI-MICROBIAL RESISTANCE
- The **food** mission that will empower European citizens to re-design the food production chain in a co-creation approach: CITIZEN SCIENCE FOR SAFE AND HEALTHY FOOD

All these areas and topics have been in the focus of European research and innovation for a while and there is a vast amount of knowledge that we can build upon. Fraunhofer believes that only through a mission-oriented approach in these topics the full potential of decades of European research efforts can be translated into substantial results for European citizens.

1

Data Sovereignty for the European Citizen

The future will be digital. Digitization changes the way we work, learn, consume – in brief: life. Our private and professional lives become digital as more and more transactions are carried out via the internet and more and more digital services are consumed. Every digital transaction leaves a trace and these traces add up to a digital identity of a person. This digital identity is then again the reference for subsequent transactions and becomes more and more comprehensive. The more aspects of life become digital, the more personal data will be shared at multiple places and the more significance the digital identity of a person gains.

People like the simplification of their lives that digitization brings about, but they are increasingly worried about the uncontrolled use of their personal data. The call for more control and transparency with regard to personal data becomes more and more urgent as digitization advances. What is required is nothing less than “squaring the circle” of leveraging the opportunities and benefits of digitization on the one hand and of protecting privacy and securing personal data on the other hand.

We strongly recommend setting up a mission to enable European citizens to attain full sovereignty of their personal data shared in the digital world across borders, systems, and organizations. It requires Europe's united political will and substantial economic resources to set new standards for digitization and to enforce their privacy rights granted to them by the [General Data Protection Regulation \(GDPR\)](#).

A standardized, decentralized and federated personal data space will support all European governments and companies to provide data processing services that respect the rights of the individual and that are in conformity with the law. The European citizens gain more control about their personal data. Companies and governments shall only be allowed to access and use personal data if they follow the usage restrictions controlled by the citizen (self-determination). The citizen shall be able to track all data usages (data transparency) and to revoke usage permissions at any time (consent withdrawal). An essential prerequisite for compatibility and acceptance is a European standardization of data exchange, data usage reports, and data usage control policies.

Other regions in the world pursue different paths, e.g. the “Social Credit System” in the People’s Republic of China. In this context, we propose a different way anchored in the values of the European Union. Achieving this challenging mission will provide the European citizen with true digital sovereignty of their personal data and will put them in a sustainable position to live a self-determined life in the digital world.

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The European Haplobank – enabling cell-based therapy for every European Citizen

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Various ground-breaking discoveries in the last decades have given rise to the notion of personalized medicine. This means the possibility to develop customized therapies for every human individual according to his/her genetic code and predisposition. Additionally, induced pluripotent stem cells (iPSCs), which have been found 2006 by Yamanaka and Gurdon and which have been awarded with the Nobel Prize in 2012 are one of the most promising candidates for being a cell source for future and upcoming cell therapies. These cells can be generated without any serious intervention from nearly any human cell or body liquid by genetic reprogramming and have the potential to differentiate into most cell types of the human body. Perfectly characterized stem cell lines will give every European citizen access to the most advanced cell-based therapies and will provide a unique pipeline and development platform for future therapies. Unfortunately, the development of a stem cell line for therapeutic use costs more than 100,000 Euro per individual and is a long-lasting process, so production on demand is in most urgent cases not possible. These immense costs hinder national health systems and pharma industry from advancing research in personalized medicine.

However, personalized medicine does not require a stem cell line for each person. An immunological matched stem cell line is sufficient – analogous to an organ transplant. So it is a question of critical mass of stem cell lines and comprehensive data sets that allow the matching of an individual to a stem cell line. A number of several thousand stem cell lines will cover the whole European community. This is what Europe can provide in a joint effort: A true European mission for the benefit of the individual citizen in every European country that at the same time lays the fundament for future investment in personalized medicine from industry and cannot be done by any member state on its own.

The European Haplobank will give every European citizen access to the most advanced cell-based therapies and will provide a unique pipeline and development platform for future therapies. Newly developed cell-based therapies will be directly available for the patients without long-lasting or burdensome preparation. These new stem cell approaches will have the capability to provide each European citizen with appropriate replacement after cell destroying diseases or accidents, for example after myocardial infarction or burning injuries. Even complete organ constructs kept in reserve would be conceivable in future. It will bring European patients together with European biotech and pharma industry in the first line of next generation medicine. The economic benefits (reduced costs for European healthcare and growth of European healthcare industry) are in the multi-billion Euro range. It will show the benefit of a European Union to every European citizen as it is biologically and economically necessary to act together in this endeavor.

3

Circular Products made in Europe: Certified!

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Producing and globally exporting competitive goods and services is crucial for the members of the European Single Market to exploit its full socio-economic benefits. However, if Europe wants to fulfil the ambitious goals of the Paris Climate Agreement, the negative impacts of production on the environment and the climate cannot be neglected anymore. Dependencies on raw materials and scarce resources are also an important aspect to be considered. Hence, the ultimate goal is to transform Europe into a true circular economy, where waste is eliminated by design and negative impacts are minimized to the greatest possible extent. Products in a circular economy approach are less resource-intensive and more sustainable. To achieve this a completely new vision for cross-industry collaboration and circular production processes in value chains all over Europe is needed.

The different steps to finally arrive at a product are diverse, ranging from the sourcing of the raw materials, the transport to/from the production side, the product design, to the production process itself. In today's global value chains, each of these dimensions implicates important negative environmental impacts, with regard to the energy and materials consumption, the waste and waste water and other emissions. Even though diverse individual approaches to a circular production already exist at the member states' and regional level, an overarching cross-country approach is still missing. A new trans-European approach to industrial value creation will establish a fully sustainable production. Unlike conventional supply chains, this approach will focus on the overarching optimum of the complete value chain, ranging from mining to recycling industry, rather than the optimum of each individual partner. It will make sure that the value creation from used parts and products will not be consumed by higher efforts for remanufacturing, recycling and logistics. Up to now, this is still not the case and a circular approach is not profitable; a strong political support on the European level is therefore decisive.

The introduction of a European sustainability standard will significantly contribute to change overall production patterns and force industrial cooperation. Such a standard considers all dimensions of the value chain (e.g. logistics, packaging, recyclability, reparability). A sustainable production made in Europe targets a local production based on recycling instead of global supply chains. This creates jobs and growth in the EU and reduces transport. Moreover, the EU becomes more resource independent from possibly unstable regions.

4

Fully autonomous and zero-emission driving between main European cities by 2030

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In the year 2030 at least one city of each EU Member State shall be ready to enable autonomous driving in the city and be linked to at least one other city in Europe. Autonomous cars will cross borders and master city traffic as well as motorways between all 27 member states. They will interact with each other, with other traffic participants and with the relevant infrastructure. In 2030 the European car industry will be the leading producer of autonomous cars. Special attention should be given to interactions with other autonomous systems. This should provide extremely valuable use cases towards a Machine Economy in which machines seamlessly interact and trade with not only humans but also other machines (e.g. a car autonomously negotiating road toll).

Despite supporting various projects, roadmaps and advisory groups towards automated road transport on EU level, funding and coordination in Europe is not sufficient to ensure a leading position of the domestic automotive industry. Even though first systems with low level automation are in operation and first testing of autonomous driving are taking place there is still an enormous need for research, innovation and technology development towards fully autonomous cars. Further the sector will have to shift to a technology development that depends more than ever on standards and supply chain integration. The European road infrastructure is highly integrated and vehicle standards are set in the single market. Autonomous driving can only be successfully mastered at European level. With this mission Europe will have a network of 27 cities that are linked together and serve as a nucleus for a Pan-European infrastructure for autonomous vehicles.

The adoption of fully autonomous self-driving automobiles after 2030 will cause a revolutionary change in the ownership, usage and design of vehicles. This will redefine the automotive industry and offer enormous economic potential. Today Europe's cars are world leaders in many fields and the automotive industry and its suppliers are major employers in many regions. It will be therefore of highest importance that Europe's industry remains competitive throughout 2030 and beyond.

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Reduce the burden of anti-microbial resistance

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Today, anti-microbial resistance (AMR) causes some 25 000 deaths annually and over €1.5 billion in healthcare expenses and productivity losses per annum in Europe alone. AMR has been rising constantly over the last years. Inaction is projected to cause yearly millions of deaths globally and by 2050 AMR has the potential to become a more common cause of death than cancer. The goal of this mission is to turn this trend around by 2040 and drastically reduce the burden of AMR.

It is an important global economic and societal challenge that cannot be tackled by a single country or public administration alone. That means that a holistic, multi-sectorial approach involving many different sectors and actors is needed. Since bacteria develop resistance naturally it is not enough to only develop new antibiotics. Instead, the mission should mainly focus on innovations that help reducing the incidence rates of bacterial infectious disease, support a rational use of antibiotics and cut transmission of resistant bacteria. More research needs to be carried out to better understand how resistance develops and spreads in the environment, develop diagnostic tools and better surveillance methods as well as validate smarter strategies to use antibiotics in health care and agriculture. Digital health innovations – such as online drug monitoring, big data analyses of the resistances – are needed to improve and optimize the way antibiotics are deployed in health systems. The mission should therefore systematically build on interdisciplinary approaches that include digital innovations along the entire cycle from prevention, diagnostic, therapy to care.

A strong international collaboration component of the mission is inevitable in order to achieve its ambitious goal. The mission needs to engage with international stakeholders such as the WHO and countries beyond the EU.

Food is one of the most important matters for every human being. It goes far beyond survival and securing a sufficient amount of carbohydrates, proteins and nutrients. It influences our health, contributes to our well-being and also holds significant cultural value. Various food scandals in Europe over the past several years, along with well-documented debates on the labelling of genetically modified food or on the use of glyphosate-based herbicides, have led European citizens to take a closer look at what they are eating and how it is produced. Conventional agriculture and large-scale animal farming are being increasingly questioned by the public: from over-fertilizing to huge fattening farms, nitrate-contaminated drinking water and the ghastly images emerging from large animal farms, people are increasingly trying to change their habits. Consumers, small initiatives, local farmers and small companies caused increased demand for organic and/or regional products. But they are facing multi-national corporations that control the market at all stages of the food production chain. The interests of those multi-nationals directly conflict with the paradigm shift in food production sought for by the consumer, i.e. the mass of European citizens.

Food is one of the few topics that are in the very own public interest and therefore the public's opinion and competence should be taken into account in re-organizing the food production chain. Our aim is to involve citizens in our activities on the widest possible basis. In this context, food is an ideal topic as the hurdles for participation are low. The issue is not so complicated as to deter citizens without specific expertise or effectively exclude them from taking part. Together with European citizens, we want to make the switch towards sustainable, environmentally-friendly and resource-saving food production in Europe by 2030. All European citizens should have access to safe and healthy food. At the same time, consumers need to know what ends up on their plates: the origin and sourcing of foodstuffs should be easy and unambiguously traceable for everyone. In order to ensure that projects in this context fully align with the interests of citizens, research and committed citizens (Citizen Scientists) need to work together as equal partners on research, development, and innovation.

Citizen Science is a sustainable way of aligning European research more closely with the real world of citizens and the related challenges. The understanding of Citizen Science up to now generally considers the citizen merely as a kind of "supplier" who collects data and makes it available to research - whether in analogue (e. g. bird counts) or in digital form (e. g. apps for environmental monitoring). Within the framework of this mission, Citizen Science goes far beyond this concept: Citizens should be development partners on an equal footing and play an active role in shaping innovation. Particularly new models of cooperation between strong, innovative European research organizations and committed European citizens have the potential to provide innovative, perhaps even disruptive new solutions to help create "bottom up" initiatives in society. The development of pan-European standards for citizen science offers an opportunity to strengthen civil society in Europe. From past experience, we have learned that in times of economic and social transformation, economic success follows close behind improvements in social structures. With this mission, Europe has the opportunity to become a driving force and pioneer for innovative, sustainable solutions in the food sector.

European Missions at the core of FP9

We believe that all six missions would increase the welfare of European citizens to the greatest degree and additionally lay the foundation for future growth of European industry in the respective sectors. Nevertheless, we would like to draw attention to the fact that digitization will take over no matter if we provide a general, standardized framework for the storage and use of data (data mission). But if we did, we would enable a citizen-centered digitization in all sectors. A targeted use of (big) data is essential in all our missions and will be in most innovations that we see coming in future years.

Fraunhofer would strongly recommend that any mission will be endowed with the means to really transform Europe and the existing landscape in that specific field. All member states and European institutions have to jointly set the priorities which will be further elaborated by the European Commission with the help of its stakeholders. A mission is multidisciplinary and trans-sectoral, setting the direction for the upcoming years; all of the relevant policy areas have to be actively involved, just as different policy levels (European, national and regional) – leading to an efficient decision making process, a bundling of resources and the avoiding of doubling.

To prepare for and to execute a transformation a mission shall be designed in two-phases. Phase 1, "Breed", with duration of 5 years and a budget of one billion Euros brings together all stakeholders and ingredients and leverages everything to a point where the market is willing to co-invest due to the high likelihood of future benefits of transformation. Phase 2, "Reap", maintains the ecosystem with all stakeholders and provides funding for further marketing and promotion of transformation (dissemination) but requires substantial industry / Member State investment in transformation process driven by high expectations regarding future return on investment.

An important prerequisite for the success of any mission would be the continued fostering and development of Key Enabling Technologies (KETs). They should in the best possible sense of the word "enable" successful missions and innovation. The collaborative, pre-competitive development of technologies and competencies in key sectors will provide an ever-present stock of know-how and research infrastructure which mission consortia and European industry can readily deploy and implement and from which Europe as a whole will benefit through faster innovation cycles.