Restructuring research institutions in view of emerging trends in agricultural research and the bioeconomy: from knowledge to social innovation

Chapter 7

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1. Introduction

Restructuring of public research institutions is an integral part of the co-innovation process. Research capabilities must align with societal needs as a basis for innovation with added societal value. Research institutions should not only adapt to rapidly evolving and new ground-breaking technologies and novel trends in collecting, using and publishing scientific data such as data mining and open access, but they also need to be able to quickly respond to societal changes, new business models and global challenges such as energy, climate, water and food security. Such complex and pressing challenges require a new way of performing research with an integrated, cross-cutting and multi-actor approach based on trans- and multidisciplinary science and co-creation.

During the fourth SCAR conference (Brussels, 2015) the following recommendations were put forward for new knowledge and innovation systems (KIS) in Europe to cope with new bioeconomy developments and support the implementation of the Bioeconomy Strategy: (i) the KIS should be challenge-oriented rather than driven by scientific curiosity and strike the right balance between basic and applied research; (ii) the KIS should be transdisciplinary with multiple theoretical challenges and practical methodologies; (iii) knowledge should be diverse and socially distributed in the KIS with particular attention on social innovation and the inclusion of socially disadvantaged actors and regions; (iv) since co-creation is the main driver for new knowledge, the KIS should be reflexive and in dialogue with all stakeholders; (v) new rewarding and assessment systems should be installed to ensure high quality control; and finally, (vi) taking into account the previous recommendations, there is a need for a set of new skills and competences not only for researchers but also for all actors and stakeholders involved in the KIS.

At the 30th EURAGRI conference (Tartu, 25–27 September 2016) on Bioeconomy challenges and implementation: the European research organisations' perspective – co-hosted by the Estonian Ministry for Rural Affairs and the Estonian University of Life Sciences, the consequences of the above recommendations for public research institutions were thoroughly discussed, in particular in relation to challenge-oriented, transdisciplinary research and social distribution of knowledge based on state-of-the art technologies. This paper is based on the discussions at the 30th EURAGRI conference, reflecting emerging trends in agricultural research and the bioeconomy.

Capacity development, innovation and the role of public researchers

According to the Capacity Development Results Framework (World Bank, 2005) capacity development is situated at several levels: individuals, organisations and an enabling environment.

Whilst the enabling environment is generally considered as the main dimension in the framework for capacity development and thus the innovation process, the individuals and organisations are central to it as core contributors. Because science and new knowledge are the basis of innovation, public research institutions have an important role to fulfil vis-à-vis society at large as knowledge

producers and know-how and technology developers.

"Innovation is the implementation of a new and significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations."

OECD and Eurostat 2005

Recent recommendations from the independent High Level Group on maximising the impact of EU Research & Innovation Programmes point to the adoption of a mission-oriented, impact-focused approach to address global challenges and mobilise researchers, innovators and other stakeholders to carry out those research and innovation missions.[1] The group also recognises the importance of mobilising and involving citizens and recommends co-design and co-creation in that respect.

Two different types of research can be identified: science-driven research and innovation-driven research.[2] Whilst the first refers to emerging science that can contribute to solving a societal issue or scientific question in a linear diffusion model, the second originates from an issue or a problem in society that can be solved by new research, or a new idea to solve an existing issue in a system or network approach.

The second type of research is becoming increasingly important in view of innovation for capacity development to cope with recent challenges at several levels.

"Capacity is the ability of individuals, organisations or society as a whole to set and implement development objectives as well as to identify and meet development challenges in a sustainable manner.

Capacity development is the process whereby individuals, organisations and society as a whole unleash, strengthen, create, adapt and maintain capacity over time."

OECD, GAT 2006

Challenge-oriented research

There is growing concern on the impact and economic value of research at public institutions. In general these organisations – and specifically universities – are not flexible enough to be able to respond quickly to societal needs. Academics, and especially professors in tenure track positions, can determine their own direction of research without a responsibility or immediate obligation of return to society. Since universities are often public institutions, supported by taxpayers' money, they should in principle align with societal needs. In that respect, government investments at the national and regional levels are urgently needed to identify new structures and methodologies to effectively and efficiently employ and transfer newly gained knowledge and fully exploit its potential to bring added economic or social value in terms of innovation linked to different sectors.

There are local, regional and interregional initiatives in which several stakeholders actively participate operating in several countries. In general, these are private-public partnerships funded by the government and co-financed by private partners. Examples are clusters, demand-driven innovation projects, feasibility studies and public-private investment projects. Despite the fact that these structures exist and are successful, most researchers at academic and research institutions still

[1] LAB – FAB – APP: Investing in the European future we want (2017). Report of the independent High Level Group on maximising the impact of EU Research & Innovation Programmes. European Commission, Directorate General for Research and Innovation

[2] Agricultural Knowledge and Innovation Systems towards the Future. A Foresight Paper. Standing Committee on Agricultural Research (SCAR). Strategic Working Group AKIS-3 Report

do not sufficiently capture the needs of industry and other stakeholders, or society at large. Demand-driven projects funded by local, national and regional governments where emphasis is put on a multi-actor approach and projects cover the whole value chain may significantly contribute to applied and practice-oriented research. Multi-actor projects such as those in Horizon 2020 Societal Challenge 2 are good examples, and their outcomes demonstrate the added value of such an approach.

The agricultural research sector should be connected with other bioeconomy research sectors, such as the medical, food processing, biorefinery or chemistry sectors, to engage in new business models and innovative value chains. Moreover, in the current policy setting, the bioeconomy is overlapping with the circular economy, and will increasingly have to take into account reuse and recycling strategies and local production. This should be reflected in how research institutions and departments are structured. They should be organised so as to cover entire value chains with the involvement of different actors rather than maintaining a silo mentality where the focus is on individual sectors and specific themes and/or technologies and dialogue with fellow scientists from other fields and with other actors is not encouraged.

Some recent developments in the agrifood research sector are focused on innovation platforms with the involvement of different types of stakeholders, including public research institutions.

Innovation platforms are an example on how agricultural research can be integrated into the innovation process and add to regional and local development. According to Hommann-Kee Tui *et al*. (2013)[3] an innovation platform is a space for learning, action and change. It is a group of individuals (who often represent organisations) with different backgrounds, expertise and interests: farmers, traders, food processors, researchers, government officials, etc. The members come together to diagnose problems, identify opportunities and find ways to achieve their goals. They may design and implement activities as a platform or coordinate activities by individual members.

Recently guidelines for the efficient of use of innovation platforms have been developed for the AR4D approach[4], particularly in developing countries. The guidelines aim to support these actors in: (i) reflecting on when and under what conditions innovation platforms are an appropriate mechanism to foster collective action and innovation for resolving agricultural development problems and capitalising on opportunities; (ii) designing innovation platforms, including the definition of realistic goals, facilitation mechanisms, timelines and responsibilities and how to measure outcomes and impact; and (iii) allocating necessary resources, creating the enabling conditions required for the effective implementation of innovation platforms, and developing metrics to assess their impact. Similar innovation platforms can be an interesting structure for public research institutions to participate in the bioeconomy innovation concept to enhance the transfer of knowledge and create impact with the involvement of other actors and stakeholders.

In the frame of the European 2020 flagship Innovation Union, European Innovation Partnerships (EIPs) have been set up as a new approach to research and innovation. EIPs are challenge-driven,

[3] Homann-Kee Tui, S., Adekunle, A., Lundy, M., Tucker, J., Birachi, E., Schut, M., Klerkx, L., Ballantyne, P. G., Duncan, A. J., Cadilhon, J. and Mundy, P. (2013). What are innovation platforms? Innovation Platforms Practice Brief 1. Nairobi, Kenya: ILRI.

[4] Schut, M., Andersson, J.A., Dror, I., Kamanda, J., Sartas, M., Mur, R., Kassam, S., Brouwer, H., Stoian, D., Devaux, A., Velasco, C., Gramzow, A., Dubois, T., Flor, R.J., Gummert, M., Buizer, D., McDougall, C., Davis, K., Homann-Kee Tui, S., Lundy, M. (2017). Guidelines for Innovation Platforms in Agricultural Research for Development: decision support for research, development and funding agencies on how to design, budget and implement impactful innovation platforms. International Institute of Tropical Agriculture (IITA) and Wageningen University (WUR) under the CGIAR Research Program on Roots Tubers and Bananas (RTB). pp 88. June 2017.

focusing on societal benefits and taking into account the rapid modernisation of the associated sectors and markets.[5] EIPs act across the whole value chain, bringing together all actors at EU, national and regional level in order to (i) step up research and development efforts; (ii) coordinate investments in demonstration and pilots; (iii) anticipate and fast-track any necessary regulation and standards; and (iv) mobilise 'demand' in particular through better coordinated public procurement to ensure that breakthroughs are quickly brought to market. Rather than taking the above steps independently, as is currently the case, the aim of the EIPs is to design and implement them in parallel to cut lead times.

Five EIPS have been implemented, including one on agricultural productivity, sustainability, and primary production; one on water; and one on raw materials. All of these programmes are related to the bioeconomy. Although EIPs are very efficient in the multi-actor approach and based on the interactive innovation model, there is a need for cross-linking between the different EIPS and respective operational groups to tackle cross-sectoral themes such as the bioeconomy.

Another example is provided by the thematic platforms of the Research and Innovation Strategies for Smart Specialisation (RIS3) that are integrated, place-based and part of the economic transformation agendas, according to the quadruple helix. This concept involves the demand-driven aspect with inclusion of civil society representing the innovation users who own and drive the innovation process, as a fourth group next to business, research and public administration. The Smart Specialisation Strategy consists of a bottom-up and top-down approach with a clear roadmap, action plan, pilot projects and monitoring and evaluation and is a way for universities to engage with other actors and stakeholders as vital partners in the process of regional specialisation. Universities can contribute to building the capacities needed to implement the smart specialisation strategy by being generative (research related to regional priorities, multi- and cross-disciplinary approaches, connectivity, and objective regional assessment), absorptive (help build capacity to absorb knowledge, provide demand through teaching and learning, nurture social ties), collaborative (national regional brokers, reach out and reach in) and based on leadership (support regional vision and partnership, propose joint activities and place marketing). An RIS3 thematic platform in agrifood on the bioeconomy has been initiated by the Lombardy (IT) and Randstad Regions (NL) with a focus on food and feed from agrofood waste and on food and feed ingredients from algae.[6]

Transdisciplinary research

The existing regional and local public/private hubs do not always necessarily represent the whole value chain. For example, at the inception phase of the bioeconomy concept, much emphasis has been put on the biorefinery and bioindustrial (non-food) processing side. Public and private actors from sectors such as the biomass production sector, logistical transport sector and food processing industry have been less involved. Local and regional bioeconomy clusters reflect the policy or bioeconomy strategy of the regional and national authorities whose focus is often on the processing of biochemical products and bioenergy rather than on biomass production and waste recovery. Current revisions of bioeconomy strategies at national and European levels may stimulate the involvement of other sectors and proactively engage different research fields to cover not only entire value chains but also new business models. Connection of the bioeconomy with the circular economy will also require restructuring efforts at the institutional level. The European Commission

[5] http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=eip
[6] http://s3platform.jrc.ec.europa.eu/bio-economy2

recently launched the Bioeconomy Knowledge Centre[7] to lend its support to the review of the 2012 Bioeconomy Strategy, taking into account current policy frameworks and international policy developments, such as the COP21 Paris agreement, the United Nations Sustainable Development Goals and the Circular Economy Package.

In view of recent developments and emerging trends in the bioeconomy, there is an urgent need at the public research level to strengthen multi- and transdisciplinary research performance with a balanced and problem-solving attitude. Not only should different scientific disciplines be covered but several aspects such as communication, education and training, IPR management, business models, entrepreneurship also need to be addressed. To develop this new mindset and acquire these new competences scientific curricula should be renewed at the BSc and MSc levels as well as at the trainer and educator levels and for all actors involved. Youngsters and high school students should learn early on how to think smart in a holistic and multidisciplinary way to transmit this approach to future generations to meet pressing challenges. Showcasing of successful examples may help in motivation and training schemes, and demonstrate how different disciplines and expertise can complement each other. In the peer review system for publication the 'chicken and egg' problem prevails as there is no transdisciplinary research to be published without transdisciplinary review and vice versa. The same is true for multi-actor funded projects for which evaluators are needed with similar expertise. The EC has started to list experts with multi-actor experience in its H2020 expert database. Furthermore, a new approach in requirements for transdisciplinary approach in the coming H2020 calls or the next Framework Programme may contribute efficiently to paving the way forward.

Social distribution of knowledge

The social distribution and societal inclusion of scientific knowledge is the basis for participatory decision-making as part of the democratic process based on knowledge distribution between the scientific community, society at large and policymakers. However, the granting of social access through open data management is not sufficient to actively disperse the knowledge obtained through scientific research. Additional vectors such as massive open online courses (MOOCs) offered by universities and university colleges can be used as instruments to maintain and share newly acquired knowledge. Knowledge flow can also be stimulated between all actors in the process of co-creative innovation, but so far resources for animating active distribution and dissemination have been missing in many cases. The so-called 'valley of death' or innovation gap in the innovation sequence between fundamental science and commercial products is also reflected in the distance between traditional knowledge stuck at academic institutions and new knowledge that can be linked to innovation. In the pipeline from knowledge to innovation, a concerted and shared effort is needed by various groups of stakeholders to be efficient. Cultural differences may influence the way knowledge is gathered, used and distributed. This means that regionally adapted solutions that take into account socioeconomic context, including cultural aspects, oriented to regional and local innovation may be more effective. Agricultural practices especially may be subject to regional cultural preferences, which must be a key consideration in the socioeconomic context of regional innovation.

[7] https://biobs.jrc.ec.europa.eu/?q=page/european-commission-launches-knowledge-centre-provide-scientific-evidence-bioeconomy

Restructuring research institutions: the case of the Natural Resources Institute Finland (Luke)

Finland is a strong investor in research and technological development (RTD) and innovation. The country's investment in RTD has been one of the highest among developed countries: between 3.5% and 4% of GDP, versus the EU average of 1.5% to 2% in the 21st century.

In a small country of only 5.5 million inhabitants, the Finnish innovation system is rather multifaceted and diffuse. The Ministry of Education and Culture is responsible for education and scientific research; it oversees a total of 14 universities and 25 polytechnics (universities of applied sciences). These entities have recently been privatised as non-profit councils, but they are heavily dependent on budget funding. The Ministry of Education and Culture also runs the Academy of Science of Finland, the country's most significant funding body (Research Council) for competitive academic research.

Another important source of competitive research funding is Tekes, which reports to the Ministry of Employment and Economy. Tekes mainly supports strategic applied research for industrial development and provides state aid for direct development of product and innovation in businesses.

In addition, there are 12 governmental research institutes, reporting to different sectoral ministries.

The former **MTT Agrifood Research Finland** reports to the Ministry of Agriculture and Forestry (MMM). The project to establish the **Natural Resources Institute Finland (Luke)** was launched by the Ministry of Agriculture and Forestry on 17 January 2013 with the aim of merging the following organisations under MMM:

- MTT Agrifood Research Finland
- Finnish Forest Research Institute Metla
- Finnish Game and Fisheries Research Institute RKTL
- Information Centre of the Ministry of Agriculture and Forestry Tike
- These institutions formed the Natural Resources Institute Finland (Luke) as of 1 January 2015. Luke is the second largest research institute in the country, with:
- Combined resources of
    - 2012: €95 M from budget; €45 M from competitive sources
    - 2016: €70 M from budget; €50 M from competitive sources
- Person-years: 1,700 in 2012, 1,300 in 2016
- Locations: 38
- Headquarters in Helsinki

Merging four different, well-established organisations with longstanding institutional cultures and each with their own operational and funding structures cannot happen overnight. What remains of old structures tends to virtually 'haunt' the new organisational structures. In the merger, Luke became a bioeconomy research institute, instead of performing rigidly sectoral agricultural, forestry and game and fisheries research. In the new organisation, staffs from the former institutions were mixed, resulting in the new structure being divided into four new research units:

1. Management and production of renewable resources: agricultural production and management of forests, game and fisheries stocks, including the relevant ecological and

environmental issues.
2. Green technology: animal production, genomics and breeding technologies, ICT and automation.
3. New business models: bioeconomy-related business models, including industrial symbioses, circular economy and bioeconomy services.
4. Economy and society: economic, political and societal aspects of the bioeconomy.

In the abovementioned divisions, the scientists from the previous institutes were placed into different teams and horizontal domains common to the former institutes, such as ecology, environment, technology economics and societal issues were amplified, which facilitated the transition towards the new Luke.

Various lessons were learnt from that experience which could be useful to consider for future mergers:

- Updating former operational culture and structures to meet future needs takes time and effort but is well worth both.
- The public sector merger was planned and executed by existing/former directors of the prior institutes. It might be wise to select an external merger director or even appoint the new management team in advance.
- The merger period should not be too long, as it generates uncertainty and rumours.
- The new organisational structure should be kept simple to make sure that individuals in management positions are immediately aware of their responsibilities.
- Merging the different ICT systems should be done in advance so that they are operational from day one.
- Different salary systems are a source of discontent as long as they exist. In Finland, lowering – and raising – salaries in the public sector is nearly impossible. It would be beneficial to have a common salary system from the start.
- Luke lost almost 25% of its state budget during the merger. It is not ideal to link heavy budget cuts with a merger.
- It is very important to keep customers and stakeholders on board during the merger – there is a risk that the organisation may turn inwards.

Now, after Luke has been operational for two years, many of the restructuring obstacles have been overcome, and the new organisation is beginning to show its strength. Luke has adjusted to the lower state budget by reducing staff by 12% and decreasing the number of locations and space expenditure. Luke has been able to convince the public funding bodies and private customers that it can provide excellent scientific results and expertise for society. Luke is now smaller, more agile and more cost efficient than all the former institutions combined, and it is clear that there is no going back. However, before the next merger, it would be good to have a couple of years of stability.

International restructuring of research and higher education: the case of Montpellier, France

In France, since 2010, the government has embarked on an ambitious programme to restructure the research and higher education system with two major objectives:

- Increase the size and reinforce the research potential of universities through mergers and by establishing structural links between universities and research organisations.
- Reinforce the innovation potential of the research and higher education system by incentivising partnership with the private sector.

This reform programme relies on the mobilisation of additional financial resources through the Investments for the Future Programme (PIA[8]) and its various calls, and on the establishment of new structures at local and regional levels[9] to forge links between higher education bodies and research organisations.

In the fields of agriculture and the biosciences such a policy resulted in the establishment of new partnerships between actors of the knowledge and innovation system, incentivised by grants from the PIA as illustrated by the case of Montpellier, in southern France.

The area in and around Montpellier is considered as a major concentration of research and higher education forces in France and Europe, in the fields of agriculture and the biosciences, compared in size and research quality with places like Wageningen or Heidelberg. However such research and higher education forces are scattered among three universities and about 20 other institutions such as research centres[10], engineering schools[11], and health higher education centres.[12]

After the merger of two of the three universities in Montpellier, which requested about four years of negotiations, 19 organisations involved in research and higher education in the fields of agriculture and the biosciences decided to come together in one consortium to bid in a call launched under the framework of the PIA, to form an 'I-Site'.[13]

The consortium won the call in March 2017 (after two unsuccessful attempts), which entails the provision of additional funding, amounting to EUR 17 m per year for ten years.

The successful consortium, called MUSE[14], comprises the university resulting from the merger, 11 research centres, four *grandes écoles*, and three CHU, with a total of 10,000 staff (6,000 scientific) and 47,000 students active in the fields of agriculture, the environment and health. The consortium's roadmap, successfully evaluated through the call, sets out a ten-year vision according to which its 19 members will form a single, united university as a new legal entity allowing them to each maintain their original legal status. This calls for a legal experiment to come up with such an unheard of entity.

In the meantime the members of MUSE have agreed to:

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[8] The PIA is itself financed through the interests produced by public capital set aside by the French Treasury (part of it having been previously borrowed from international financial markets).

[9] The so-called "communities of universities and establishments" (COMUE), which embody this new national policy known as the "site policy" (*politique de site*).

[10] In France the majority of research forces are concentrated in national research organisations, such as CNRS or INRA in the field of agriculture, INSERM in the field of medicine, etc. These national organisations have regional centres established all over France.

[11] *Grandes écoles* for engineers are specific to France. The *grandes écoles* are higher education institutions that train elite students admitted to this system through an extremely competitive selection process. The *grandes école* system faces growing criticism for its elitism, for competing with universities in terms of attracting the best students and for diverting public resources from the underfunded mainstream higher education system. In the fields of agriculture and veterinary sciences there are about a dozen such *grandes écoles* in France under the supervision of the Ministry of Agriculture, one of the most famous being established in Montpellier.

[12] Teaching hospitals, known as *Centres Hospitaliers Universitaires* (CHU) in France

[13] For Initiative Sciences, Innovation, Territory, Economy.

[14] For Montpellier UniverSity of Excellence.

- Sign all scientific papers under the brand name Université de Montpellier while retaining their own name in the signature
- Include the MUSE Logo in all their communication papers
- Coordinate their international policies
- Coordinate the recruitment of new scientific staff
- Engage in a new collective governance structure to initially manage the PIA funds, with more oversight responsibilities added in due time.

The MUSE consortium has established an overarching governance body in the form of a foundation including five leading local enterprises of the sector in a bid to open all its activities to the private sector, boost the emergence of start-ups and speed up technology transfers from public laboratories to economic actors.

With the money from the PIA, new research calls are being launched to enhance partnerships among laboratories belonging to the MUSE consortium members to foster transdisciplinary research and integrated approaches in agriculture, health and the environment. The innovation potential of submitted projects is a major selection factor.

In addition, resources are devoted to the progressive establishment of graduate schools at consortium level introducing new curricula including significant student participation in research conducted in consortium member laboratories.

An external review is scheduled in two years to assess progress in the implementation of the MUSE consortium roadmap. Failure to achieve the planned milestones could result in the withdrawal of the 'I-Site' label and the termination of funding by the PIA.

By accepting to participate in the MUSE consortium, the 19 research and higher education entities in Montpellier have agreed to renounce part of their sovereignty and autonomy in a bid to overcome excessive fragmentation and promote more integrated, applicative, research and education activities which are conducive to innovation and sustainable development. The consortium's motto is "Feed, Protect and Heal". The jury is still out on whether this progressive approach, which has also been implemented in other French regions and requires substantial additional funding[15], will actually deliver the expected outcomes. It will take about ten years to have a definitive answer.

Conclusions and recommendations

Innovation is based on several key dimensions and KIS is needed to guide and stimulate the transition to an innovative and modern bioeconomy.

KIS implies strong involvement from all actors throughout the innovation process from knowledge to commercial or added value products to face current and future complex challenges. A balanced problem-solving approach requires knowledge flow between all actors of science, society and policymakers as well as amongst the scientific community. Transdisciplinary research is a prerequisite in building capacities to address current global challenges such as energy, climate and food security and to be able to rapidly come up with efficient and innovative sustainable solutions and cope with new business models.

These societal challenges and rapid developments in bioeconomy research driven by ICT

[15] The additional character of the PIA funding is questioned in some circles in view of the decrease of public funding through traditional budgetary channels.

applications, open data and new methodologies require an in-depth restructuring and reorganisation of public research institutions to maximise their social and economic impact.

To achieve that vision, proactive changes are needed at the public research institution level as well as in creating an enabling environment. The discussion group at the 30th EURAGRI Conference recommended the following actions:

- Internal reorganisation (merging and restructuring of institutions and/or departments): Institutions should revise and reform their structure based on a bottom-up approach, looking to societal challenges as a basis for co-creating social innovation to quickly respond to emerging societal needs. Different scientific disciplines from the natural and social sciences should be combined.
- Support systems: New support instruments are needed to link basic and applied research and create strong dialogue between all actors and stakeholders involved to ensure knowledge flow and a co-creation and co-innovation approach to maximise the impact and economic value (exploitation of knowledge). Such support systems should be created and funded by government institutions as part of the policies to create an enabling environment for innovation. Existing support systems need to be better coordinated and their interfaces aligned to improve their effectiveness.
- Educational systems: New approaches and new curricula and/or changes in existing curricula at several levels will train and retrain academic staff and public researchers to have a mix of skills and new knowledge allowing them to actively take part in the innovation process based on the quadruple helix concept (a high focus on demand).
- Evaluation criteria: Objective (standardised) quantitative and qualitative evaluation criteria are needed to measure and monitor the social and economic ('innovation') impact of knowledge created at public research institutions and universities as continuous drivers of a flexible and self-correcting restructuring and reorganisation process. Such criteria can be developed and targeted at several levels (e.g., institutional, department, research group, and on an individual basis). Midterm impact reviews should be carried out to adjust research and action plans accordingly (participatory research) and stimulate a continuously evolving research system.
- Outreach activities: A pro-active strategic communication road map including outreach activities to engage and enter into dialogue with civil society, different stakeholders, and key actors in research and innovation should be at the heart of the public research institution and form the basis of research plans to quickly understand and address societal needs and work towards a dynamic problem-solving and application-driven approach.