ERA Strategy Map

Deliverable 5.2

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1. Introduction

The VERA project aimed to provide relevant strategic intelligence for the future governance and priority-setting of the research, technology, development and innovation system in Europe and for better adapting science, technology and innovation policy to the shifting global environment and upcoming socio-economic challenges. Towards this end, VERA has developed four scenarios on the evolution of the European Research Area, analysed critical issues for the ERA's future capabilities emerging from these scenarios, explored subsequent strategic options and generated a set of policy recommendations.

In this context, the University of Manchester has conducted, through VERA WP5, 'Strategic Debates' with key stakeholders so as to:

• Undertake a comprehensive assessment and renewal of the European Research Area (ERA) priorities.

• Promote stakeholders' discussions on key policy issues of relevance to the current/future European R&I landscape.

The VERA Strategic Debates involved the organisation of seven Focus Groups and a Symposium, engaging 123 participants from 28 countries representing the following ERA stakeholders: Society actors, University and research actors, Industry actors, Research funders, Coordinators of ERA actions and networks, Policymakers and International actors.

The insights elicited from both debates have contributed to a) get a better understanding of stakeholder's potential reactions to plausible future evolutions of the European R&I landscape, and b) formulate sound and well balanced policy recommendations that are rooted in a solid knowledge of these individual actors' strategies and shared visions across actor groups.[1]

The first contribution, which is deployed in the present ERA Strategy map, can be divided into three specific objectives aiming to:

1. provide R&I stakeholders with informative and reflective material that improves their awareness on potential opportunities and threats by 2030, and the possible strategies to respectively exploit or avoid them.
2. enlighten R&I actors on decisions that other stakeholders may take in future scenarios, thus making easier for them the design and adoption of more effective cooperation and interaction strategies.
3. enable a more efficient policy action by providing policy makers with information on R&I actors' principal concerns by 2030 and their consequent strategies.

The first section of this ERA Strategy map introduces the VERA project and the VERA WP5 objectives and outcomes. The second section describes the methodology utilised by the University of Manchester to mobilise R&I stakeholders, elicit discussants' insights, analyse key ideas and present the results. The third section and fourth sections constitutes the core analysis. The third one deploys three sub-sections consisting of a) a description of each VERA scenario alongside with its actor-specific opportunities, threats, strategies, implications and dilemmas, b) an analysis of the reactions that VERA scenarios have brought about on each ERA dimension (see ERA Open Advice report), and c) an overall analysis of the previous reactions. The fourth one makes a thorough description of stakeholder's answers to the ERA dimensions on each scenario. Finally, the fifth section presents last reflections on each VERA scenario dynamics and, taking a step back to comment upon the implications of R&I stakeholders' strategies for the future of ERA, offers a final conclusion on the relations between future ERA pathways and the strategic responses that the VERA project has identified.

On the whole, the ERA Strategy map shows that foresight processes can be designed to capture and give larger sense to multiple stakeholders' reflections on the future of complex systems. More specifically, it illustrates how the VERA scenario-based methodology has been able to anticipate potential R&I actors' behaviours in relation with ERA plausible evolutions, thus serving as the basis for a more effective R&I policy action.

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[1] Popper, R., Velasco, G., Edler, J., Amanatidou, E. and Miles, I. (2015), *ERA Open Advice*, Report of the Forward Visions on the European Research Area (VERA) project, The University of Manchester, Manchester.

2.   Methodology

The ERA Strategic Debate was carried out by the University of Manchester in the context of the VERA Work Package 'ERA Strategies' (see www.eravisions.eu/strategies). It consisted of two Strategic Debates and a two-stages analytical phase.

The **Strategic Debate 1** involved the organisation of 7 Focus Groups and a Symposium engaging 123 participants from 28 MS. The identification of participants targeted 3 types of actors, drawing on the stakeholders' salience model:

- Dominant actors with the power and legitimacy to set change or veto ERA agendas; represented by policy-makers, research funders, coordinators of ERA actions, as well as influential academia and industry actors.
- Affected actors with legitimacy and limited power to modify ERA priorities; represented mainly by selected society and academia actors.
- Dormant actors with potential future legitimacy in the shaping of ERA agendas; represented by some Society and International actors.

Four VERA scenarios[2] (annexe 8) were used to stimulate structured discussions about the European R&I system by 2030.

- S1: Private Knowledge – Global Markets
- S2: Societal Challenges – Joint Action
- S3: Solutions apart – Local is beautiful
- S4: Times of Crises – Experts at the Wheel

The ERA stakeholders' strategies were elicited through interactive focus-group discussions. It involved a rating of scenarios desirability, followed by structured brainstorming on opportunities and threats inspired by these VERA scenarios. This allowed the identification of 417 opportunities and threats, i.e. 243 at R&I system level and 174 actor-specific. The issues were prioritised by the FG participants in terms of their importance and uncertainty.

From the pool of opportunities and threats for the actor/system (indistinctively) generated in the first part, each participant assigned 3 votes to the 3 most certain (few doubts around the issue) as well as important issues. These rating helped identify issues that may be object of immediate policy action.

Furthermore, the strategies were mapped against a list ERA objectives, which were an expanded version of current ERA priorities. This mapping was also used to assess the strategies in terms of their positive or negative 'impact' on the ERA objectives.

Finally, a clustering and labelling process allowed the identification of recurrent strategies throughout scenarios and stakeholders (cross cutting analysis of scenarios and actors).

The **Strategic Debate 2** used the previous cross cutting analysis as input/background material of a stakeholders' symposium. The event involved Society, Academia, Industry, R&I funders, Coordinators of ERA actions, R&I Policymakers and R&I International actors. A total of 44 participants were mobilised. The symposium took into account stakeholders' strategies, as well as a pool of stakeholders' policy recommendations to generate a fleshed out advice (see ERA Open Advice report) and this ERA Strategy map.

The **analytical phase** consisted of two cross cutting steps. On the first stage, the most critical opportunities/threats and strategic implications identified by the VERA stakeholders were examined within each VERA scenario (see section 3.2). This scenario-based analysis was also undertaken (see sections 3.3 and 3.4) in relation with the nine ERA dimensions defined in the ERA Advice report (ibid.). On the second stage, a visual representation has supported the analysis of each R&I actor's strategies, thus trying to distinguish and compare how every stakeholder would react to the four future ERA contexts.

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[2] See www.eravisions.eu/scenarios

The Road to the ERA Strategy Map

Milestone	Location	Target stakeholders	Date
Pilot	Paris	VERA team	November 2013
Focus Group 1	Vienna	Society actors	January 2014
Focus Group 2	Manchester	Academia actors	April 2014
Focus Group 3	Helsinki	Industry actors	April 2014
Focus Group 4	Berlin	Research funding actors	April 2014
Focus Group 5	Barcelona	Coordinators of ERA instruments	May 2014
Focus Group 6	Barcelona	Policymaking actors	May 2014
Focus Group 7	Brussels	International actors	June 2014
Symposium	Manchester	All R&I actors	October 2014
Conference	Brussels	All R&I actors	January 2015

3. Scenario-based Strategy Map

3.1. VERA actors' preliminary reactions to future scenarios

The methodology of VERA discussions included an initial task whereby the VERA discussants rated the four future scenarios according to the level of desirability. In order to avoid that the notion of desirability could differ across participants, the discussants were asked to rate it from the perspective of their respective organizations. The structured selection of discussants undertaken by the University of Manchester warranted, in principle, that the VERA participants were familiar with their own institutions' objectives and visions, thus their capacity to make this sort of assessment to some extent was taken for granted. A short description of VERA scenarios can be found in annexe 8, and more detailed characterization is presented per each scenario throughout the section 3.2. The table below shows the results for the four scenarios and the seven stakeholder groups.

Desirability of scenarios for different stakeholder groups

Actors	Scenario 1 Private Knowledge	Scenario 2 Societal challenges	Scenario 3 Local solutions	Scenario 4 Experts at the wheel
Society	undesired	somewhat undesired	Desired	Desired
Academia	undesired	Desired	undesired	somewhat desired
Industry	somewhat undesired	somewhat desired	somewhat undesired	Desired
Funders	undesired	Desired	Desired	somewhat desired
ERA instruments	undesired	Desired	Desired	Desired
Policymakers	undesired	Desired	somewhat desired	somewhat undesired
International	undesired	Desired	somewhat desired	somewhat desired

Coding	undesired	somewhat undesired	somewhat desired	Desired

We may note that there is not one clearly preferred scenario across all the focus groups. For each scenario we actually have stakeholder groups that do not find it desirable. Overall, the societal challenge scenario and the scenario with "experts at the wheel" to focus on sustainability are most often seen as desirable. Interesting deviation of that pattern can be seen, as representatives of the academic world (and to some extent by industry) see major disadvantages in a focus on "local solutions" and a shift in knowledge production towards a less science driven paradigm, as well as by societal actors who opposed the top-down definition of societal challenges. However, we clearly see that a VERA scenario dominated by private industry R&I is least desired across all stakeholder groups, even the majority of industry representatives did not find this scenario attractive.

Some complementary conclusions can be drawn when the answer to VERA scenarios is analysed per each R&I stakeholder. We may conclude, for example, that Society has rejected those scenarios where research priorities are not clearly driven by citizens, e.g. neither scenario 1 (dominated by firms) nor scenario 2 provide adequate levels of citizens' engagement. In the case of Academia, there is a neat commitment with societal challenges. This context is seen as an opportunity, since it opens the door to new and promising academic specialisation around real society problems. It seems that they perceive these challenges basically at the global level, hence the low rate presented in the 'local solutions' scenario. The answer of Industry is probably the least defined, as they present only one preference in scenario 4 and they do not reject any scenario. Research funders and ERA instruments present almost identical preferences, e.g. a clear rejection of private markets dominance in scenario 1. In principle, these actors can take a right distance that permits systemic analysis and more balanced perspectives than other R&I actors.

3.2. Multi-stakeholder analysis of VERA Scenarios

3.2.1. Scenario 1: Private knowledge – Global markets

Scenario description

In this scenario, the main driver for political and private action is to overcome the negative consequences of the 2008 financial crisis, to stabilise a new period of growth and to create jobs. The value of research is mainly to serve the economy. While public policy is therefore mainly concerned with boosting competitiveness, public budgets are still constraint and public funding for research is limited and concentrated on basic research and future emerging technologies(FET). As a consequence, expenditure in research and innovation by companies and other private actors, in particular philanthropic organizations, amply outweighs public spending. Private actors are thus, de facto, able to define research priorities. The research landscape in Europe is mainly influenced by knowledge-intensive sectors that are concentrated in the stronger, globally interconnected regions with a specialized, globally distributed activity. Excellent science, which in principle remains protected, is located in science clusters with few large organizations, mainly universities, providing a cutting-edge science base. The shape and importance of European-level policies have changed considerably. The focus is on a European regulatory framework supporting the innovation ecology with common structures for IP, standardization and public procurement, accompanied by coordinated approaches and collaborations involving national and regional public bodies and also NGOs. Those cooperation schemes have become more elitist, as not all countries participate. Consequently, EU bodies have little to no power in setting research priorities or coordinate research funding. Similarly, international and global agreements pursued by EU organisations centre around framework conditions, e.g. for IP or standardization, and strongly driven by what is perceived to be advantageous to the interests of European corporations. The industry driven re-sectoralization of European policies hampers coordinated approaches towards dealing with societal challenges. However, societal challenges, while not in the centre of policy attention any more, can still be addressed in this scenario thanks to funding from philanthropic

organizations, and public-private partnerships, or as the result of collective experiments bringing together concerned groups and local actors. Major challenges addressed are energy transition and health issues.

Opportunities, threats and actions

Society

An industry- and competition- dominated research system in Europe is clearly the least desirable scenario for societal actors. The main reasons for this have to do with the threat of severely reduced long-term, basic research budgets and a lack of orientation of research towards dealing with pressing societal challenges. EU institutions would have no leverage to steer research towards pressing societal problems, and even if there could be more public-private partnerships those would be short-term and market-driven. Further, social science and humanities would struggle for funds and would have to orientate their research towards research deemed more relevant for the economy. Depending on the scale of industry dominance, societal actors feared a growth in regional disparities that could undermine the democratic model of the EU.

Ideas for strategic responses from societal groups centred, first, around *resisting the market driven research model*. Strategic ideas of this type included establishing (new) societal actors or even encourage consumers' boycotts to react to market-oriented research choices to constantly challenge the system by maintaining a constructive critique of the established priorities.

A second strategic line is to offer *alternatives to and niches within the market driven system*. This involves (a)*mobilising the social economy* to promote a research model more oriented towards societal needs, e.g. with the creation of new types of (social) enterprises, which could be niches for research, (b) developing new communities and alliance structures where researchers can work together with society to re-build trust on science and research, (c) broadening crowd-funding of research to enable research driven by society's interests that may be neglected by industrial motives and (d) mobilising

philanthropic sources to fund research, thus enabling intellectual freedom and 'escaping' careers based on research paths driven by industry interests.

Academia

Representatives from Academia did not find this scenario desirable, although this was not the most disliked one. Not a single representative from the academic sector favoured a scenario dominated by private knowledge production in global markets. Only one fourth of the representatives however, explicitly rejected this scenario, with many still favouring a corporate world of science over a world of local solutions and strong involvement of society to solve those solutions (Scenario 3. Solutions apart – Local is beautiful).

The threats perceived in this scenario by the actors from Academia was based on the belief that corporate funding of research would dominate, thus leaving blue sky research largely to the public sector with increasingly shrinking budgets. However, more importantly, industry would still interfere with basic research initiatives and with public research strategies more generally. Furthermore, the corporate sector would impose application oriented research agendas and thus marginalise social science research. Inequality in research opportunities would further grow across Europe, which in the long run would be detrimental for research capacities in Europe. The opportunities in this scenario as seen by Academia stakeholders include: more benefits from the cooperation between the research community and industry, improved research management skills, and a broadened and improved labour market for researchers in industry making also available more opportunities for women in science.

There are *two groups of strategic responses* from Academia in relation to the identified threats and opportunities. One signals a willingness to *buy into this corporate world, to cooperate and establish links* in order to generate benefit for and from publicly funded research. This involves *increased collaboration* between Academia actors on the one hand and firms on the other. The main mechanisms for that would be to (1) follow industrial international R&D capacity abroad, i.e. by establishing labs abroad, (2) try to increase firms' interest to invest locally, e.g. by

promoting joint facilities investment, (3) increase the participation in policy initiatives promoting cooperation with industry and (4) encourage the establishment of labs in companies. Further, Academia actors would increase their efforts as regards the '*third mission'* and thus enhance their engagement not only with companies, but also with foundations and other societal organisations. Finally, university *training and education* would need to shift focus towards promoting and creating incentives for scientists' entrepreneurship.

The second group of strategies seeks to maintain and sustain a counter-weight to the corporate research world and thus a *space for non-profit driven research*. The leadership in Academia would need to provide *space for scientists* to do research in areas that are not of primary interest to firms. Given the intensified competition from industry for top research talents, Academia actors would have to engage in strategies to *recruit world-class individuals* for blue-sky research. More generally, academic actors would seek to protect and foster *social responsibility* activities amidst the strong pull towards profit driven research.

Industry

Industry actors expressed a very ambiguous and diverse assessment of the scenarios. A small minority of participating industry actors voted scenario 1 as most desirable, whereas a relatively larger minority voted it as the least desirable scenario. Obviously, the option that industry becomes the dominant actor in funding and performing research in the future attracts diverse views even within the business community.

Notwithstanding, industry sees a number of opportunities in this scenario. There is an expectation for a better alignment of publicly funded research with private interests and activities and consequently more opportunities for outsourcing research to the public sector. Given the dominance of industry-funded research in this scenario, regulation and framework conditions would need to be improved to attract private investments. As a consequence, Europe would become more attractive as a location and cooperation partner for international firms. The main threat perceived by industry representatives in this scenario appears to be the fear of a structural underfunding of curiosity-

driven research across Europe leading in the long term to reduced generation of radical innovation and thus of competitiveness of EU industry.

There are three strategic responses of firms evolving from the discussion about this scenario with industry representatives. First, firms would seek to keep a strong *involvement with public capacities in research* chiefly through public private partnerships. Second, firms would implement strategies to *ensure exploitation of research*, i.e. they would seek to improve the mechanisms that support and enable commercialisation of research results, thus strengthening the vertical integration of R&I activities. Finally, as the reduction of university funding would eventually lead to less cooperation potential within Europe and to a lower number of start-up companies from universities, European businesses would seek to exploit their stronger research position and increased global competition to make the most of *international R&I*, i.e.to increase global R&I cooperation, as well as to increase their presence in regions outside Europe, outsource their research activities to lower-cost/more highly-specialised countries and to extend opportunities for company acquisition abroad.

Funders

Not surprisingly, the market driven, company dominated scenario was unambiguously the least desirable scenario for representatives from research funding organisations, as their role in providing the bulk of project based funding for public researchers would erode. Moreover, even within the remaining room for manoeuvre, funding agencies see the threat of having to adapt their funding strategies and even their funding criteria to industrial priorities and industry-relevant impacts. This adjustment as well as attempts for joint funding of research would lead to a lasting tension between the societal mission of public funding organisations on the one hand, and their need to accommodate industrial research interests and co-funding on the other. Furthermore, the resulting increase in discrepancies as to research capacities across Europe would endanger not only cohesion, but also the very foundation of the ERA concept as an integrated, coherent internal market for knowledge. Compared against these perceptions of threats, the potential

benefits in this scenario appear small, as they only refer to increased competitiveness and capacity in the areas dominated and funded by industry.

The strategic responses of research funders to this undesirable scenario lie across two directions. First, research funders would *join forces with companies and engage in joint strategy formulation.* One way of doing this would be to develop partnerships with universities and enterprises to jointly make strategic roadmaps so as to identify common interests and promote synergies. Second, they would *modify the focus and criteria of funding.* This would also need efforts to *safeguard investment in fundamental research* and a re-direction, similar to the strategic response of Academia (see above), in career development including, for example, employability of PhDs in industry as a key criterion for project funding or the promotion and support of setting up start-ups based on publicly funded research.

ERA Instruments

Representatives of ERA instruments (e.g. ERA-NETs, JPIs) were unanimously opposed to this scenario; all participants in the focus group having rated it as the least desirable. Similar to representatives of funding agencies and policymakers, the main threat in this scenario was seen in the overall reduction of basic research funding and the orientation of research towards areas of high interest for the European industry, thus possibly neglecting, however, other areas of importance. This, together with the weakening of EU institutions implied in this scenario, could make the EU more vulnerable as it would be dependent on knowledge produced elsewhere in areas that are not of immediate concern to industry. On the up side, by aligning up with industry's interest in research, the EU could strengthen considerably its technological capabilities and also increase the job opportunities for researchers in industry.

Again, two main strategies, similar to those of funders and policymakers, were identified: to *influence industry strategies*, i.e. by focusing on joint instruments that can convince industry to go beyond short-term investment and by shifting emphasis from thematic networks to value chain and solution-oriented partnerships at all levels (from regional to international). A second

strategic response would again be to *fill gaps*, i.e. to focus in research areas and instruments that are not part of industries' priorities and to design programmes that improve flexibility and coordination of research activities to be more re-active, tackling issues that are seen as societally relevant and urgent.

Policymakers

A market driven scenario is highly undesirable in the view of representatives of policymaking bodies. This has mainly to do with the inability implied by the specific scenario to have political and thus societal influence on research priorities. The orientation on challenges, the adaptation to regional and local contexts, the inclusion of social responsibility and social science aspects in research, would all come under pressure and thus not lead the research system into a socially desirable direction. Further, the potential benefit out of the combined investments of a range of private actors, foundation, charities and other non-profit organisations would be hampered by a lack of coordination and steering. Against those threats, the opportunities in this scenario seem to weigh less. Policymakers would find it potentially easier to formulate policies as one sector – industry – would dominate the landscape and the research system as such may gain in dynamism due to the mobilisation of many private actors, supporting in turn policy goals as well as increasing the attractiveness of research for the younger generation.

Four types of strategies of public policymakers would develop in this scenario. A first strategy would be to *react to and overcome the negative consequences implied by this scenario. Such strategies would include* focusing support on SMEs specialisation without compromising the regional bases of knowledge or further worsening regional cohesion in Europe. Second, policy actors would try to create *funding niches and to close gaps*, i.e by focusing on areas that are not already addressed by industry (e.g. risk-intensive and curiosity-driven research), and by proposing co-financing tools in these areas. Thirdly, policy actors would join forces with industry and try to create *win-win situations*. This could involve promoting and participating in private-led large research initiatives as well as creating local incentives within broader regional policies to keep and attract industries of strategic

importance. Even further, policy actors would encourage the alignment of the Higher Education and the industry sectors e.g. by re-defining curricula to meet the needs of industry, or by jointly funding professorships or PhD placements in industry. A last strategic reaction identified by policy actors would be to strengthen corporate social responsibility activities, i.e. by encouraging firms to invest some of their profits in social projects, or by setting up advisory/support bodies for identifying and funding long-term research issues of common interest, blind spots, and high risk challenges.

International

International actors unanimously rejected scenario 1. The effects implied by the scenario leading to declining investments in basic research in the EU and decreasing importance of EU political institutions would make Europe weaker as a research location and as partner for policy and cooperation in public research. Nevertheless, countries with a very open economy, with an active entrepreneurship policy and with capacities to link national public research with private, globalised research capacities could benefit from this scenario.

Attitudes towards the opportunities offered by this scenario differed strongly between the representatives. For instance, discussants from countries with a market liberal orientation in their economy had different views from those coming from countries with a more state centred orientation. People from countries that were considered attractive to global firms for investments had different views from those coming from countries that struggled to attract foresight private investments. In general, the strategic choices identified implied that countries would try to play an active part as *location for and partner of global firms*, e.g. by participating more intensively in joint technological initiatives, establishing a proactive program of scientific collaboration attractive to industry, including a broadening of university-industry collaboration, or making reforms in policy and public administration to better respond to industrial demands. Identified strategic choices also included *improving conditions for the next generation in the countries concerned*, by promoting entrepreneurial education and reinforcing innovation aspects in teaching

programmes, thus implying a change in both the role of universities, and also their function. In terms of their international policies, non-European countries have an interest in strong EU institutions and partnerships and would thus encourage the EU to promote public-private partnerships and joint technological initiatives as well as to reinforce the role of the EU in terms of R&I strategies in emerging countries.

Implications and dilemmas

A market driven, firm dominated globalised research system is opposed by the majority of representatives of all stakeholder groups. Even firm representatives see the downsides of this scenario outweighing the benefits. The main threats shared by most of the VERA focus groups' participants are seen to be (1) the focus on short term and on selected priorities reflecting the commercial interests of industry which may neglect research areas that are of societal concern but too risky or long term for industrial investment, (2) the decreased support to basic research, (3) the reduced role of the state in steering research priorities more generally and (4) the danger of an increased concentration of capacities in regional hot spots. The potential benefits relate to increased competitiveness of the European industry and attractiveness of Europe as a location of firms for conducting research (as framework conditions and policy programmes would become more favourable in this respect), as well as increased job opportunities of researchers in industry at least in the short- and mid-term.

The strategic responses across the stakeholders show a clear pattern, and signs of a self enforcing spiral. Despite the opposition to this scenario, there is very limited strategic intent, or expectation, to roll back the dominance of industry. Some initiatives suggested by societal actors try to reduce the influence of the private sector, but overall there are three dominant strategic lines to be seen. First, funding agencies (including ERA instruments), Academia and policymakers would try to *establish spaces and opportunities for fundamental and societally driven research areas*, further supported by a much greater role of funding by philanthropists (as suggested by societal actors). Thus, a new division of labour would develop, with public funders and researchers occupying and

defending a (much smaller) niche for societally driven and basic research. However, this only needs to be problematic if one assumes that the activities of firms are not aligned with societal challenges. The main policy challenge thus would be to align industrial strategies to what is societally desirable and economically beneficial for firms. Considering corporate strategies in many fields (energy, environment, health, etc.) the public-private divide does not have to lead to a reduction in societally beneficial research and technology activities; in fact, intelligent regulation, standardisation, demand-based policies and co-operation schemes could support such an alignment.

Second, despite an opposition to the scenario, actors would *develop opportunistic strategies*, to align their own activities with the dominant strategies of firms to benefit more broadly from industrial activities. This would include an adjustment of funding programmes to immediate needs of companies and an improved weight of industry-relevant impact and engagement of Academia, which would however lead to higher competition between public research performers for industrial sponsoring.

Third, the *research and education* system would slowly move towards providing what is seen to be in the interest of industry. For instance, training programmes would adjust to make researchers more entrepreneurial, funding would be geared towards securing employability of publicly funded young researchers, research programmes in academia would align strongly with perceived industry interests, and more university chairs would be jointly funded by industry and universities.

There is a long term tension in those developments of opportunistic behaviour and re-adjusting of the system (especially the Higher Education system) towards industry needs. Such strategic actions would reinforce the scenario which is actually opposed by the very same actors, and it would potentially lead to a tipping point at which public research and careers in public research become an addendum to industrial needs, and a provider of knowledge for immediate use by industry, rather than a provider of long term, fundamental knowledge and capabilities that will be needed for a sustainable research system.

3.2.2. Scenario 2: Societal Challenges – Joint Action

Scenario description

This scenario is driven by a sense of urgency as regards major societal challenges, such as energy shortage, military conflict on the borders of the EU, and alarming developments as regards climate change or disease pandemics. Further, Europe is still recovering from the aftermath of the financial crisis.

To address these challenges and maintain the European way of life, European States have become increasingly open to collective action and have achieved a high degree of tax harmonization to battle against tax evasion, particularly by large multinational firms. Joint European action has crystallized in thematic cooperation to tackle societal challenges. Decisions about such collaborations were first made at the intergovernmental level (the Council), where societal challenges were linked with ways to boost industrial leadership. The resulting diverse thematic joint actions brought together not only national governments but also "hot-spot" regions and knowledge hubs. However, following claims of NGOs and political parties, the locus of decision making on thematic priorities and on joint action has shifted. The new framework now rests upon legitimation processes under the aegis of the European Parliament and the European institutions have become key players, as the major part of decisions about policy priorities and programming takes place between the Commission, the Council, and the Parliament. As a result, joint actions emerge as large programmes with large public investments in research and development addressing societal challenges, with NGOs and other civil society organizations contributing as well. Even the publicly funded pursuit of frontier research becomes embedded into this paradigm and is aligned with the thematic challenges defined. Programmes addressing Societal Challenges embrace health issues (e.g. pandemics, prevention), security and sustainability of energy provision, and climate change. European-level networks and programmes are working towards linking up with, or building new, international alliances where the challenges need to be addressed at global level.

Opportunities, threats and actions

Society

Despite the focus on grand societal challenges, the representatives of societal actors did not particularly favour this scenario. The opportunities that societal actors saw in this scenario have to do with the priority of society and policy over industrial interests. This also includes an improved education and a better societal discourse feeding into priority making. The EU could become the orchestrator of international research around global challenges, e.g. climate change and security. However, there are doubts as to the ability of the EU both in acting at the global scale, and in accommodating less challenge-driven demands and interests or those coming from peripheral European regions. Thus, a reinforcement of the EU identity will be needed since the focus on global challenges may reduce the system resilience and put the EU integration process in risk. In this regard, a related opportunity might open up for a more democratic and inclusive definition of research priorities. However, and outcome and solution orientation in the research approach and funding might potentially lead to increased 'projectification' and reduced accountability in cases of urgent need to make decisions about research choices.

The main direction of strategic action for the group of societal actors is to *influence and shape the discourse on challenges.* Societal actors will seek to be instrumental in recovering societal relevance of research. In this regard they may encourage political activism to exercise continuous critique on the status quo. They would also intensify the debate on the importance of social science and diversity and equity in research. In this regard, societal actors would actively work towards *integrating social science* in other scientific disciplines, supporting new alliances of actors that reduce scientific boundaries.

Academia

This scenario is clearly the most desirable for the representatives from academia. This is largely due to the enhanced role of academia in tackling societal challenges. Academia see an opportunity to shape the research agenda around societal

challenges both at national and regional level and accordingly align their research agendas (and accompanying management structures) and career pathways. This would result in more socially accepted programmes. This strategy, however, entails the risk of a potential mismatch between internal capabilities and the competences needed to tackle the challenges addressed. This would in turn imply a strong need to cooperate with other organisations and to communicate intensively with society about the content of research and training. At the same time such a strategy might put excessive pressure on Academia to deliver solutions. Moreover, funding agencies might lose some of their independence while funding of areas identified as important based on a 'bottom up' approach might dry out. Finally, a challenge orientation in research policies may not necessarily lead to a unified policy response across all European regions, as these challenges are subject to different meanings and interpretations across different regions.

The strategies of Academia in this scenario concern first *a re-adjustment of research and education activities towards societal challenges,* involving internal instruments such as the creation of small-scale, exploratory grants to support young researchers' careers and to establish life-long professional collaborations. More generally, education would have to ensure a multi-disciplinary approach in training and research activities while students can relate their academic knowledge to societal challenges. Academia would also need to engage more in international platforms on grand challenges' themes. Second, Academia would need to be *pro-active in shaping the "challenges' agenda"* and seek to utilise EU instruments for formulating their related strategies. Third, Academia, similar to scenario 1, *would create space to allow research that may fall outside the top-down defined research themes* and to promote professional disciplinary associations, so as to maintain the "health of disciplinary activities" even if the demands for inter-disciplinary and multi-disciplinary research will be on the rise.

Industry

The representatives of industry did not vote this scenario as the most undesirable one, but at the same time only one representative assessed it as least desirable. Industry would be able to work along such a scenario and combine the contribution to challenge-driven research with its own business interests. The biggest opportunity in this scenario for industry appears to be the need for an opportunity for larger scale cooperation, especially between industry and science, oriented towards tackling challenges. The corresponding threat is the fact that the framework conditions for coordination, including IPR, would need to be improved. The challenges approach in research would also risk widening regional disparities in research capacity. However, this can be turned into an opportunity by working towards the specific needs and capabilities of regions.

Firms would endorse this scenario mainly by *aligning their strategic planning with societal challenges*. This means they would use roadmaps and long-term vision building instruments more systematically. This would be part of endeavours to adopt a *holistic perspective in the company strategy* that involves the participation and engagement of various stakeholders. Firms would work towards a synergetic relationship between their own mission and activities on the one hand, and the research eco-system around grand challenges, on the other. Finally, firms would also increasingly *change their own knowledge production*, *promoting more interdisciplinary research within firms* and integrating diverse specialities, including social scientists.

Funders

For the representatives of research funding organisations this scenario is the most desirable, followed narrowly by the Scenario 3 "Solutions apart – Local is beautiful". The dominant positive characteristics associated with this scenario are considered to be the normative value of dealing with societal challenges and the positive consequences of deeper and broader cooperation across Europe in order to achieve this. Further, the scenario is seen to invite smart specialisation activities, which will facilitate a more focused orientation of funding organisations. On the downside, a problem oriented approach may weaken the European research capacity due to the strict focus on solving specific challenges and increase inequality in research across Europe. Moreover, the very definition of grand challenges is seen as a

constant challenge faced with changing circumstances and that needs to reflect societal concerns and needs that are subject to local/regional/national specificities.

An important strategic reaction of funders would be *to secure a space for curiosity driven research.* Thus, they would possibly move towards more open calls for proposals with fewer deadlines and quite generically defined thematic scope. They would also encourage suggestions about research areas to support coming from the researchers base, thus facilitating *more bottom-up research support.* Funders would also need to *promote interdisciplinary evaluations and research approaches* and as organisations they would have to engage much more in international collaborations in order to allow new combinations and large scale bundling of resources around challenges needing a long-term approach. Funders would also encourage the combination and use of big data in challenge-oriented research, whereby data may be used to identify validity of challenges and regularly monitor and assess progress made. In the same vain, funding organisations would engage more systematically and broadly with societal stakeholders, as challenge-oriented themes are more driven by societal issues, rather than technology.

ERA Instruments

Most representatives of ERA Instruments rated this scenario as desirable. However, it was closely followed by scenario 3 (Solutions apart – Local is beautiful) and 4 (Times of crisis – experts at the wheel). The attraction of a challenge-driven and policy-led scenario would be the potential of enhanced and more effective cooperation across Europe, as funding programmes, research practices and regulation would have to be further aligned. This would bring more consensus around the usefulness of research and its link with and innovation.

However, the need for closer cooperation could limit the autonomy of many research actors, while large scale cooperation between Member States could marginalise smaller states or weaker regions in research capacity terms. Combined with smart specialisation approaches, this could further increase inequality across European countries and/or regions.

Representatives of ERA instruments mainly saw three strategic lines in this scenario. First, to support *investment in education and the mobility of young researchers* not only geographically, but also between the different actors of the innovation system, thus contributing to establishing the much needed interdisciplinary approach in challenge-driven research. Secondly, to *increase transparency and visibility* of both research results and achievements, but also in identifying of specific topics and research activities to support, as this would facilitate linking research to societal needs. Finally, pan-European cooperation for public procurement of innovation would need to be fostered, as public demand can be a trigger for businesses to engage in innovation activities, thus also strengthening European competitiveness while dealing with societal challenges.

Policymakers

A research system in Europe that is organised around societal challenges is most desirable for the majority of policymakers that participated in the VERA focus groups. The challenge-driven approach in research is seen as the most efficient one in terms of bringing together the scattered capabilities across Europe, converging towards solving certain challenges and engaging societal actors much more strongly in the definition and assessment of research priorities. The diversity of capabilities across European countries and regions could be dealt with through appropriate international cooperation strategies, whereby regions could become specific hubs for certain research areas based on their specialisation.

Two lines of strategic direction can be distinguished. First, policymakers will try to *link challenge-driven research areas to national and regional competitiveness.* They would, for example, a) invest in areas where countries are competitive in order to build national strengths, orienting policies to performance-based funding, b) stimulate regional knowledge specialisation through regional innovation and thematic programmes, and integrate them into national and EU policies and c) support industry-driven clustering initiatives that involve different states (macro regions) in order to form regional hubs around grand challenges areas of common interest and form the critical mass of competence and resources to compete with other regions. In

line with this, policy would further *mobilise industry* by creating financial instruments to stimulate R&I initiatives within firms that are in line with grand challenges, and include industry representatives in national and regional R&I agenda setting. At the same time, policymakers would try to ensure *relevance of the challenge approach in research to the needs and concerns of society*, by for instance maintaining a continuous validation of identified challenges through an intensified and iterative dialogue with societal stakeholders and an increased citizens' engagement in science.

International

This scenario was seen as most desirable by half of the international participants. The main appeal of this scenario for non-European actors lies in the increased opportunities for collaboration with European actors based on common interests on solving certain challenges. The caveat, however, is the challenge to find appropriate mechanisms to align the challenge orientation in research and cooperation with the economic and research capabilities of partner countries. Strategic approaches of non-European actors would centre on global approaches to smart specialisation and cooperation, with a view to co-define 'grand challenges' with the EU and mirror the challenge approach in their countries.

Within this approach, non-European actors' strategies would focus on the comparative advantages of each country in order to identify smart specialisation areas and to promote certain regions and cities as research hot-spots. This would also include alliances of industry with research organisations and universities to foster industry-academia collaboration programmes, including mobility schemes with European counterparts. Strategies would also involve encouraging the EU to continue the efforts towards gender mainstreaming in research, and gender diversity as a cross-cutting aspect of grand challenges' research. However, this turn towards international cooperation and challenge orientation in research would also lead to reduced funding of basic research in order to be able to concentrate enough resources in the respective specialisation areas in each country to compete with other regions. Associated to this the bottom-up definition of research areas to support would also be reduced.

Implications and dilemmas

The majority of stakeholders from funders, academia and industry would endorse this scenario by developing strategies to align their research and their capability building with research themes relevant to the so-called 'grand challenges'. Further, in this scenario actors would have to endorse cooperation, as the interdisciplinary bundling of research capacities can only deliver on challenge-driven research. This is also a catalyst for more global cooperation that is engineered politically. Similar to the business-driven scenario (Private Knowledge – Global Markets) this would most likely lead to a reduction of focus and support on curiosity-driven research.

A range of challenges have been identified in this scenario. To start with, the very definition of what the so-called 'grand challenges' are, what is the appropriate level of granularity in this definition and how challenges should be prioritised and selected are challenges in their own right. Further, stakeholders see a potential mismatch between the type and scale of capacities needed to solve certain challenges and what capacities are available at European/national/regional levels. In this regard, there is a fear of an increase in regional disparities across all stakeholder groups as research capacities are unevenly distributed across Europe, and the definition of challenges at EU level does not take into account local or regional specificities and concerns, especially those of the weaker regions.

Strategic responses fall under four categories. First, there are *strategies to increase the quality and scale of collaboration* internationally and between industry and public research. Second, this goes hand in hand with the *improvement of the capabilities* especially of the younger generation, through adjusted training programmes and increased international and inter-sectoral mobility. Third, all research performing or funding actor groups seek to *align their strategic activities to the challenge orientation in research.* Fourth, there are organisational and policy strategies to ensure that there is *some space and budget left for curiosity-driven* and for single-disciplinary research, although not as emphasised as in scenario 1 (Private Knowledge – Global Markets).

3.2.3.   Scenario 3: Solutions apart – Local is beautiful

Scenario description

Major political scandals and the inability of policy to cope with the lasting financial crises have spawned a rapid growth of mistrust in higher level policy making. This has been speeded up by social movements supported by widespread internet use. The inability to collaborate leads to a local handling of societal challenges.

The major policy concern is to address challenges (even when perceived to be global) in a manner which benefits the municipality and its citizens. The societal paradigm which influences the attitudes towards science and technology is about progress in lifestyle and self-optimisation rather than problem-oriented solutions. With diverging societal rationales between Europe and the rest of the world, Europe becomes a desired place to settle. Scientific knowledge is broadly seen as just one among many sources of knowledge, including practitioners', lay and indigenous knowledge, that can contribute to the development of local solutions. The open, heterogeneous research and innovation landscape provides opportunities for close links between scientists and society around micro/regional level activities. Citizens invest in such activities and take the initiative to become involved at the micro-level. Issues addressed by these activities (not necessarily debated as societal challenges) are smart cities, local energy production, public health and prevention, or local food production and distribution systems. The role of European-level policies is substantially re-defined to providing infrastructures as well as platforms for exchange of good practice and learning. The EU sees its role in the world in a Switzerland-type manner: having its own agenda but reluctant to intervene in any matter that is not of direct concern, and only developing ad-hoc relations with countries when judged useful.

Opportunities, threats and actions

Society

Scenario 3, as scenario 4 (Times of Crises – Experts at the Wheel) were the most desirable ones for society actors. Society actors appreciated the possibilities offered by the scenario for improved R&I governance with the inclusion of societal actors and the creation of new agencies specialised in social innovation and human wellbeing, and the definition of new lines of socially-oriented research. However, they stressed the importance for societal actors to convey key problems with clarity, and transparency and proposing their own solutions. They noted high degree of subjectivity in concepts like happiness, progress, or solidarity and admitted that jobs, growth, competition and other economic objectives could actually remain important individuals' rationales. The difficulty of engaging society especially in cases of financial crises or institutional inertia was also stressed.

The strategic options identified by the societal actors were underlined by the desire for a *more active role and engagement.* Thus, the organisation of *bottom-up initiatives* that promote social change was put forward, introducing new solidarity forms of economy, sometimes recovering traditional practices promoting activities aiming to engage a higher number of citizens in science, while *contributing to a well-educated and knowledgeable society* as a whole. The involvement of society presupposes the acknowledgment of *non-academic types of knowledge as important*. This should be strengthened by fostering cultural exchange and cultural learning. The focus on societal problems also implied *research specialisation* and *inter-disciplinary* approaches in research.

Academia

Scenario 3 was considered the most undesirable for academia actors. This was mainly due to a perceived risk of losing scientific freedom and a possible neglect of curiosity-driven research, the vulnerability of citizens' support for science, and the data quality and confidentiality issues associated with citizens' science. However, academia actors also identified certain opportunities that mainly lie in developing new interdisciplinary careers based on science-society interaction, acknowledgement of the value of science by society and particularly children and students and thus increased legitimacy of science, as well as a shift in university missions to also accommodate business opportunities from solving community and local problems.

The key strategies identified by academia actors reflect the need to consider *relevance to societal*

needs apart from scientific excellence in assessing impacts of research as well as in researchers' careers. Thus, the definition of new measurements of impacts in research evaluation was suggested combining peer-review with citizen-review approaches, alongside the modification of the criteria for the evolution of researchers' careers. Furthermore, the academic community recognised the importance of a *multidisciplinary approach* and suggested training for enabling and improving collaboration of researchers with other disciplines' communities. An overall *research orientation to target societal problems* with a human wellbeing orientation underpinned the discussion on strategies. However, the need to achieve a *balanced approach in research funding* across curiosity-driven and problem-oriented types of research was also made evident.

Industry

Industry actors rated this scenario as the most undesirable scenario.[3] The main threats that industry actors identified was the excessive focus on wellbeing issues and possible negative impacts on jobs and growth, the neglect of certain industrial areas not directly addressing human wellbeing, and the associated loss in European competitiveness. Such an approach might also increase economic differences between countries and thus jeopardise European integration. At the same time, however, industry actors identified opportunities with the engagement of citizens in research which may create dynamic contexts, enabling open innovation, where innovative ideas and creative business can blossom. Consumers would be co-creators and industry solutions would be more aligned to market needs.

The industry actors identified certain strategic options based on *diversification, more customisation and more openness*. In this regard they noted the need to balance and combine their wellbeing portfolios with other technology developments, especially those derived from societal challenges, and to substitute mass

manufacturing by product customisation and on-demand production, inviting the users as co-creators in the process and shortening the invention-to-innovation cycle. They also recognised the importance to be more open to other actors in relation to their research developments and strategies, and more transparent when sharing solutions. They too echoed the need to *develop new impact indicators, incorporate the human wellbeing perspective*, and *explore ways to combine crowd-funding and private sponsorship*.

Funders

Research funders were not too pessimistic about this scenario. In fact it was the second most desirable scenario for research funders overtaken by scenario 2 (Societal Challenges – Joint Action). Research funders appreciated the participation of citizens in the identification and prioritisation of research focus that this scenario accommodated. They further noted that the consequent fostering of collaboration between science and society would generate new funding sources. However, they were concerned about the broadness and diversity in the concept of wellbeing across different countries and regions and the inherent risk of a proliferation of heterogeneous and divergent research objectives. They also noted the complexity that should be expected in the governance of research bodies having to deal with a multitude of actors within a context of decreasing public funds.

Accordingly the strategic options identified mainly addressed the need to *clarify the role of the actors* involved and the criteria for adopting funding decisions, including the use of ex-ante evaluation to *foster transparency of funding decisions.* Reflecting the concerns about the diversity in the concept of wellbeing and shrinking budgets, research funders considered it important to contribute to the *definition of the wellbeing* concept and to *explore new funding instruments* that link society with researchers, thus permitting a better attention to citizens' needs.

ERA Instruments

Scenario 3 was second in desirability for coordinators of ERA Instruments together with scenario 4 (Times of Crises – Experts at the Wheel). These actors saw European diversity as a

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[3] Some industry actors also rated scenario 1 (Private Knowledge – Global Markets) as most undesirable even though that scenario gave industry the dominant role in research governance and decision-making.

valuable asset offering opportunities for entrepreneurship and cooperation in research areas related to wellbeing, and circulation of knowledge across different regions with a proliferation of virtual R&I networks. However, they too noted the diversity in interpreting the concept of wellbeing across different cultures and the consequent fragmentation this may entail. At the same time, they recognised that societal organisations would gain influence, crowd-funding would be promoted and universities would become social entrepreneurs supporting social learning processes and individuals' needs.

The involvement of societal actors in governance might bring challenges due to lack of, or limited, knowledge about certain research areas that may lead to controversies. In addition, the orientation of research towards societal needs might disperse researchers' interest, which might lead to neglect of certain research fields (like curiosity-driven research). The openness of research implied in this scenario may risk privacy of personal data. Overall, it was emphasised that a balance needs to be found between the regional and supranational levels. An overemphasised focus on regional issues may disregard the necessary R&I reforms at higher level and ignore some system transformations that may be needed, while, an intense bottom-up approach (either local or national) may limit the economic and social benefits of a supranational policy articulation.

Coordinators of ERA instruments identified strategic options that related to the *research focus on human wellbeing*, the rising *importance of regions*, and the importance to *engage with society*. In this regard, attention would need to be paid to re-emerging issues like regional identity, symbols and traditions and to focus more on *societally relevant research* and *region-oriented approaches.* Stronger social networks would enhance involvement of society along with more *emphasis in the dissemination* of scientific results in society. EU research *governance* instruments should also become *more open and less bureaucratic* to include society actors.

Policymakers

Similar to the research funders, research policy actors rated scenario 3 as their second best choice in desirability (overtaken by scenario 2 -

Societal Challenges – Joint Action). Policy actors recognised that decisions taken regarding science priorities would enjoy more legitimacy in this scenario. This scenario would also enable improved communication between policy and society capturing socio-cultural differences in the participation process. It would strengthen the role of social networks in enabling citizens' interaction, disseminating knowledge, and facilitating a better understanding of common concerns and trends as well as science and research rationales. Contrary to what researchers believed, policy actors argued that researchers' work will be appreciated and their autonomy will be respected in this scenario, rather than jeopardised. They also saw the opportunity for defining new models of funding research.

However, they also feared that the strong influence of citizens on research policies might lead to a loss of political independence and relevance. Such a bottom-up approach in research organisation might increase fragmentation in the European knowledgebase while the exclusive attention to wellbeing might result in economic slowdown, and a gradual fragility in the research and innovation system, which would not be able to react effectively to quick or unexpected context changes.

In response to the threats identified, policy actors identified strategic options spanning a wide range of areas. First of all the need for *more openness and transparency in governance* was recognised. This translated to more effective communication and collaboration with all relevant stakeholders, and utilisation of monitoring and evaluation of policies. Considering issues that slow down the EU research integration it was suggested to *devolve R&I funds to regions* 'lagging behind' while also *building absorptive capacities* so as to avoid eroding their knowledge base. To *avoid research – innovation fragmentation* it was considered important to promote the creation of bottom-up virtual communities and networks based on local priorities as well as to support the *formulation of demand-side policies in R&I*. At the same time, exploitation of *crowd-funding* of research sounded valid alongside a *balanced allocation of resources across research types*. Policy actors also agreed with the importance of engaging society. In this regard they suggested to define a conceptual *approach on public participation* that

places citizens' contributions clearly on the R&I agenda and to diversify R&I topics by promoting the participation of targeted groups, e.g. women, the elderly, disabled. The researchers' career was another area of policy attention. They noted the importance of attracting *non-EU researchers* and overcoming barriers to researchers' *mobility*.

International

Scenario 3 was not the most desirable scenario for international actors; their preference was split between 2 (Societal Challenges – Joint Action) and 4 (Times of Crises – Experts at the Wheel). International actors considered this scenario to be enhancing the participation of developing countries in transnational and multidisciplinary research networks. They also saw science to be increasingly recognised as a common global 'good', and efforts to be gradually oriented to responsible research and innovation. International networks would be enriched with new tradition-oriented solutions and wellbeing insights. The threats identified in this scenario mainly related to a deviation from science rationales, moving towards excessive local and shorter-term perspectives. In addition the bottom-up approach in research organisation and governance may reduce the significance of supranational R&I policies and international agenda setting.

Accordingly the strategic options identified aimed at *reconciling the local with the international* level, *public with private and societal actors* and focusing on research supporting *human wellbeing* especially in developing countries. International actors noted the need to comply with shared agendas and international agreements, avoiding unilateral redefinitions and to establish *connections between regions* to create synergies without losing individual specialisations. Regarding the research focus, the need was noted for *active knowledge transfer and scientific collaboration* for human wellbeing and provision of incentives for *multi-disciplinarity and transnational research networks* to achieve wellbeing in less developed countries. The suggestion was also made to improve *education for sustainable development* by also applying a strong focus in research and innovation. International actors also agreed with *more open governance* approaches, establishing a platform for public engagement, and boosting the interaction between science, industry and society. Links should be established between public and private sectors at the international level, in order to align research policies and priorities. International actors echoed the importance to *consider relevance to societal needs* in both research evaluation and researchers' careers.

Implications and dilemmas

By cross-analysing the different stakeholders' perspectives, the value of this scenario is revealed. All the actors appreciated the inclusion and active engagement of society in decision-making and science itself under a research focus in issues associated with wellbeing. The increased interaction between science and society was positively noted alongside acknowledgement and recovery of local knowledge and traditions benefiting from European diversity. Interdisciplinary research needed by a societal problem-driven approach was valued together with the emergence of new lines of research and the creativity expected in diverse research settings engaging also users.

However, these benefits do not come without risks or concerns that take various forms across the different actors. Fears about loss of independence surface among academia actors while a possible neglect of certain types like curiosity-driven research was common across several focus groups. A risk of slowing down economic growth due to the strong focus on research relevant to wellbeing was noted by industry actors. The rising of the regional and local levels was seen by coordinators of ERA instruments and international actors at the expense of the international level, thus jeopardising ability to react to challenges calling for joint efforts at global level. Research funders and policy actors noted the complexity inherent in multi-stakeholders' governance, while all actors acknowledged the challenges brought by the diverse interpretations of the concept of wellbeing across different cultures.

The strategic options identified in turn to strengthen opportunities and avoid or deal with threats also reveal some interesting points. *Relevance to society and its needs and interests is a pervasive concept* across all areas, from research orientation, to governance and funding, to research evaluation and researchers' career.

R&I governance may need to become more complicated but at the same time needs to be more transparent to increase legitimacy through direct response to societal needs. The *international and regional levels* seem to be the most addressed in this scenario so the question arises: will the national level be downsized? Despite the pronounced focus on issues of wellbeing, discussants did not forget to note the *importance of various research areas/types*: sustainability research, societally relevant research, challenge/problem-oriented research as well as curiosity-driven research. This makes us wonder: is such a focus possible? Last but not least, *crowd-funding* was mentioned by several actors as worth exploiting for research funding. While this is a valid suggestion in itself caution needs to be paid so that the value of this concept is not over-estimated.

3.2.4. Scenario 4: Times of Crises – Experts at the Wheel

Scenario description

The driving force of this scenario is the onset of dramatic climate catastrophes with important effects on the environment and eventually our health and way of life. These disruptive forces are levers of deep societal transformation. As a consequence, the growth paradigm is completely replaced by a new sense of "deep sustainability" on which all economic, political and societal activities are based. This is also strengthened by the target to fully recover from the economic and financial crises of the early years of the century. Experts working in understanding environmental phenomena and anticipating its dynamics gain substantial power and responsibility in policy processes, as policies rely strongly on scientifically produced evidence. At the same time, the research and innovation landscape has become more diverse, opening up to cross-disciplinary collaborations and unconventional initiatives to collaborate with societal actors. Large research programmes are in place to boost mitigation and adaptation from different angles – ranging from breakthrough-driven research to speeding up the innovation process.

Under the overarching goal of mitigation and adaptation to the effects of the climate crisis, several other challenges are addressed, including urban management, energy provision, new forms of housing and mobility, food production and circulation and many more. Facing the climate crisis, a political choice was made to delegate the strategy and programming efforts to the European level, where the involvement of experts in the policy processes is managed through the Comitology system within the European Commission. The sustainability rationale is adopted around the globe, but at different speeds and in a variety of ways. Numerous collaborations are in place for joint action, and Europe operates a large aid programme for those regions lagging behind.

Opportunities, threats and actions

Society

Agreeing with the industry actors, society actors found this scenario the most desirable along with the previous scenario. In a future dominated by

sustainability issues citizens would actually become more informed and influential stakeholders driving informed policy and funding decisions in research and innovation. New and emerging eco-cultures would thrive and become dominant. Regions would benefit from sustainability approaches, as a range of micro-localised sustainability solutions would have the opportunity to be redefined and expanded. Sustainability objectives would have to be properly narrowed as different perspectives coexist in different geographical areas. However, the overemphasis on problem-oriented research might downsize certain types of research such as curiosity-driven research or lead to the dominance of technological solutions over for example research in social sciences. The practice of citizens´ science might also imply a reduction in research quality standards.

Society actors defined strategic options in order to promote sustainable practices, increase awareness and spur more sustainability-friendly behaviours in society. In this regard it was suggested to *promote intelligent and responsible use of resources* - research should support, enhance and *disseminate sustainable practices* - facilitate *behavioural change* and *sustainability awareness* through social *education and training activities*, and explore *new research areas* that are sustainability-relevant, e.g. social sustainability, social economy, sustainability of rural areas, etc.

Academia

As with the previous scenario, this scenario was not the most desirable for academia. The representatives from academia agreed that the concept of sustainability is differently perceived throughout European regions. Ideally, the European (sustainability) agenda should be flexible enough to reflect this diversity. As in this scenario policies need to be informed by relevant and qualified actors, academia actors can play an important role in the formulation of sustainability issues and tentative solutions. Academia actors recognised the importance of including a broader composition of advisors in governing boards, including societal and regional representatives. Opening research and education governance to a broader range of actors would open the possibility of challenging the real significance of

sustainability and the related policy objectives at the European level. However, including citizens might potentially imply dealing with non-scientific agendas, which could be counter-productive especially when it comes to sensitive matters or controversial issues.

The strategic options identified by academia reflected the opportunity to exploit the focus in sustainability and the prominent role given to experts in this scenario. In this regard it is meaningful to *promote and reinforce education and training in the field of sustainable development*, so as to address the increasing need of experts and to prioritize *education and research areas related to sustainable development* (e.g. alternative energy, recycling, new materials) in order to create job opportunities and increase impact globally. Achieving impact at European and global levels also requires increased *coordination and collaboration and networking* as well as *unhampered researchers' mobility*. Academia actors also noted the need to develop *new models for research assessment and impact analysis* in terms of sustainability, introducing new indicators and monitoring approaches.

Industry

Interestingly, this scenario was the most desirable for industry actors together with the previous scenario (Solutions apart – local is beautiful). Industry actors saw that business opportunities would lie in sustainability consultancy, energy efficiency, waste management, and food industry. In addition, there would be options to network different sectors, e.g. new product applications like food for cosmetics. Local sustainability and smart specialisation would offer opportunities for SMEs to grow, which would help re-launch economic growth. However, they also noted that a full alignment of economic growth with environmental concerns constitutes a risky approach, and may eventually imply a loss in European competitiveness. Research would be driven by sustainability values, which would facilitate a more rational and focused approach in industrial innovation. A shared idea on sustainable society could facilitate the European research integration and might lead to improved coordination within and across public actors.

However, industry actors saw several challenges in this scenario as well. These relate to the risk of inability to compete for certain industry players without the necessary skills, resources and long-term commitments, or the lack of support for some other industries that are not directly related to sustainability. Sustainability also runs the risk to become a broad mainstream area of support (nearly an ideology), thus hindering any focus or coordination. For sustainability to become a shared goal for society, people would need to be accordingly informed and educated. Only then society could play an active role. Global and local concerns are different in terms of sustainability. Coordinating actions would have to be designed at international, national and regional levels and then be made compatible across these levels.

More *flexible and innovative approaches/frameworks* will be necessary to efficiently support such varied/multidisciplinary research and to avoid the risk of environmental legislation proliferation. Firms would need to *redefine their performance benchmark criteria*, and would need to adopt more sustainable working methods and production systems, e.g. prioritising on-site and local manufacturing instead of decentralized and transport-based production. To some extent, firms would have to *think globally and act locally* by also recovering traditional practices, e.g. in the food sector. They would need to adapt products/services and procedures to *comply with consumers' concerns and demands* and redesign strategies to promote societal engagement, thus consolidating *'sustainability compliance' as a behavioural standard* that can be rewarded with sustainability *certifications and endorsements*, e.g. eco labels.

Funders

This was among the less desirable scenarios for research funders. Although Europe may gain international leadership and recognition in areas like climate change or resource efficiency, an excessive attention to sustainability issues may have negative consequences like a gradually thinner support to certain areas, or research saturation in others. However, they recognised that the global character of sustainability challenges would facilitate the alignment of research interests and the convergence of national innovation systems. To take advantage

of this integration opportunity, it would be important to ensure that national agendas and funding criteria are compatible and coherent. The designation of sustainability experts could guide this compatibility process. The prevalence of global perspectives will permit research funders to establish collaborations with other countries' agencies and promote synergies among different research disciplines.

In relation to strategies, research funders noted that this scenario offers opportunities for *cooperation with other funding bodies at the global level*. This should be seen as a priority option but requires *harmonised rules and procedures*. In parallel, *public-private international partnerships* may catalyse sustainable innovation and may become a powerful strategy to put research outcomes in practice. Strengthening the relevance of the EU research and innovation system in the world is also considered a strategic action for the EU. In this regard, it is suggested that Research Councils combine *national-oriented perspectives* with more open-minded and proactive initiatives that aim to establish *multilateral agreements*, e.g. the activities of the Global Research Council. *Venture capital* initiatives would be useful options to complement research public funding, thus covering those *less addressed areas* in this scenario.

ERA Instruments

This scenario was second in desirability for ERA Instruments' actors. ERA Instruments' actors noted that a new market for sustainability services and goods would place Europe in a global leading position largely due to better connection and mobilisation of businesses, NGOs and regional governments around common research concerns. Knowledge would circulate more efficiently through coordination instruments like ERA-NETs, or Joint Programming Initiatives. The integration of value-driven research, responsible innovation, and consumer-behaviour education would have a positive impact on climate, as well as citizens in the long-term, e.g. less pollution, fewer environment-related accidents and disasters. However, an exclusive focus on sustainable solutions might put in risk curiosity-driven research, resulting in negative consequences to the research and innovation system in the long term.

Citizens' engagement would also bring new valuable (ethically and socially) perspectives, on research topics and procedures. In this regard, new instruments for citizen-science participation would need to be developed. Digital collaborative platforms would be intensively used in this context, thus stimulating knowledge exchange. There is a risk, however, that an excessive use of digital tools might lead to a progressive global disconnection, as more people will call prefer face-to-face interactions. New instruments would also bring the opportunity of eliminating bureaucracy and intermediaries. Less focus would be put on research appropriation and IPR issues as technology transfer processes would be more agile and fluent, and sustainability advances would be basically driven by peer-to-peer sharing network approaches.

ERA instruments' actors noted that in this scenario any top-down EU research and innovation approach would be challenged since more emphasis would be put on bottom-up initiatives. Towards this end, successful EU *instruments should increase cooperation with individual citizens and foundations* as real agents of change. *Peer-to-Peer (P2P) research* and *Joint Public Procurement initiatives* are examples of two interesting approaches to promote. Although challenge-driven research and innovation would be dominant, basic research would also need to become a priority in this context. To gain independence from the EU funding, these initiatives would need to devise *multi-source funding strategies*. Europe will have to complement the scientific approach to sustainability with the *harmonization of national regulations* and countries' incentives. These measures would need to be accompanied by *IPR regulations* that ensure that sustainability solutions (conceived by either private or public action) are *accessible for all actors* involved. Such important reforms would require the intervention of an increasing number of *'sustainability' experts*. Their *designation needs to be transparent*, avoiding the influence of political mechanisms in their selection.

Policymakers

Scenario 4 was not as desirable for policy actors as for societal actors. However, they appreciated the increased possibility implied by this scenario to engage with citizens via focusing on shared

concerns. They also noted the increased potential for international cooperation in research and innovation given that sustainability would be a pan-European, if not global, goal. It would be important though to monitor the difficulties experienced by small countries to keep pace with sustainability-oriented EU research development. Policy actors also saw many opportunities to develop new public services and products and for research and innovation systems to benefit from intense public efforts to foster innovation and economic growth.

The strategic options identified by research policy actors reflected recognition of the importance of taking action in dealing with sustainability at international level and assisting developing countries to follow the new growth paradigm. In this regard, they proposed to define strategies that *align global challenges' programmes with those of third countries*, e.g. within Joint Programming Initiatives and to develop programmes that *integrate research with international aid*. Involving citizens was also appreciated. Strategies should be defined and funds allocated to *speed up citizens' engagement*. *Associations of institutions or individuals* should also be created that share the same type of sustainability concerns and necessities. *Crowd-funding mechanisms* should be exploited for research funding. Policy actors also noted that the *right balance of resources* should be found *across EU priorities* to counterbalance the emphasis on environmental challenges. At the same time *growth policies* should try to mitigate environmental impacts with actions preserving *natural resources*.

International

Together with scenario 2 (Societal Challenges – Joint Action), scenario 4 was the most desirable for international actors. The international actors noted that the 'sustainability' agenda would offer the opportunity to certain developing countries to become international leaders in certain 'sustainability' areas, like environmental studies or natural resources policies. Other areas, i.e. those related with sustainable solutions for a 'green economy' would highlight relevant policies applied in industrialised regions, e.g. renewable and efficient energy systems, or smart cities development. However, there would also be intense competition for achieving the best

sustainability solutions which might lead to unfair commercial or legislative barriers between nations. The different conception (often politically influenced) that regions have on environmental challenges (due to demography, weather or geographical specificities) might actually contribute to converting the 'sustainability' landscape into a very difficult system to govern. A very intense competition could even lead to the fragmentation of the European research and innovation system.

International actors identified certain strategic options highlighting the opportunities offered for global cooperation as well as the rising importance of the regional perspective and avoiding a strong dependence on natural resources. In this regard, they suggested to implement *multi-governance models* that take into account the *regional perspective* and to build broad '*sustainability identities'* in countries and regions, rather than attaching only the environmental aspect to the concept. It was also considered important to participate actively in *European networks and sustainability international-agreements* and to *strengthen collaboration in mobility and knowledge exchange programmes* with the '*Next Eleven'* countries (Egypt, Bangladesh, Indonesia, Iran, Mexico, Nigeria, Pakistan, the Philippines, Turkey, South Korea and Vietnam). At the same time, efforts should be made to prevent that the emphasis in climate change and environmental research takes place at the expense of other major social problems.

Implications and dilemmas

Surprising to some extent, industry actors, apart from the societal actors, were more positive than academics towards the stronger engagement with society and the research focus on sustainability implied in this scenario. They all agreed, however, that to play a stronger role society needs to be educated and equipped with the necessary skills.

Policy actors (national, international and ERA Instruments) recognised the opportunities that a sustainability agenda offered for a leading role for Europe and the strong potential for international collaboration. This called for efforts to align national and regional environmental rules and regulations.

At the same time, policy actors shared an interest in the regional perspectives of sustainability, which would not necessarily be the same at the regional or across the national and international levels. This calls for flexibility in the definition of the concept as well as consideration of the different meanings of sustainability across the different levels in policy formulation. This diversity was seen by some to convert the 'sustainability' landscape into a very diverse and difficult system to govern which might lead to the fragmentation of the European research and innovation system.

Policy actors agreed that the inclusion of society and the connection with and mobilisation of businesses, NGOs and regional governments around common research concerns would be an asset.

A common concern across most of the stakeholders was the risk of neglect of support for certain research types or industries not directly relevant with sustainability issues. An over-emphasis in sustainability solutions might put in risk curiosity-driven research, resulting in negative consequences to the R&I system in the long term. As research funders noted, attention to sustainability issues might have negative consequences such as the abandonment of certain research areas or research saturation in others and a gradually thinner support for international collaboration and synergies with other disciplines.

The strategic options identified by R&I actors highlighted international collaboration, societal engagement, adjustment of research content and education to sustainability issues along with wide researchers' mobility, partnerships between the public and private sectors allowing multiple funding sources, firms' strategy development in compliance with the sustainability agenda as well as harmonisation of national legislation and consideration of the regional dimension.

More specifically, academia actors reflected the opportunity to exploit the focus in sustainability and the prominent role given to experts in this scenario by promoting *education and training in the field of sustainable development*, developing *new models for research assessment and impact analysis* and focus on increased *coordination and collaboration and networking* as well as *unhampered researchers' mobility*. A strategy for *cooperation with other bodies at the global level* was echoed by funders alongside *public-private international partnerships*. Firms would need to *redefine their performance benchmark criteria*, adapt products/services and procedures to *comply with consumers' concerns and demands* and redesign strategies to promote societal engagement. Society actors defined strategic options in order to *promote sustainable practices, increase awareness and spur more sustainability-friendly behaviours* in society.

The strategic options identified by research policy actors include taking action in dealing with sustainability at *international level* and assisting developing countries to follow the new growth paradigm (also emphasised by international actors). At the same time, strategies should be defined to *speed up citizens' engagement and encourage crowd-funding mechanisms* while not neglecting support to other EU priorities. The international actors also stressed the rising importance of the *regional perspective* and avoiding a strong dependence on natural resources. ERA instruments' actors stressed strategies aimed at *increasing cooperation with individual citizens and foundations* through for example Peer-to-Peer (P2P) research and Joint Public Procurement initiatives and the need to complement the scientific approach to sustainability with the *harmonization of national regulations* and countries' incentives.

3.3. Dimensional analysis of VERA Scenarios

During the seven VERA focus groups, R&I stakeholders were asked to vote on the importance of existing ERA priorities divided into 15 aspects (see Annexe 9) and brainstorm on new priorities or aspects. A total of 114 ERA aspects or aspirations were generated and prioritised by the stakeholders based on their ERA relevance. This was followed by an internal clustering and content analysis activity, which resulted in 38 ERA key aspects. The final set of key aspects was debated internally by the VERA team and grouped into 9 ERA dimensions, which are fully documented in the *ERA Open Advice* report. In this section we present short summaries of the 9 ERA Dimensions (ibid.) followed by a briefly discussion of VERA Scenarios' significance for each dimension. It needs to be noted that the bar charts have captured the R&I actors' aggregated insights per scenario. Therefore, it can be assumed these visualizations represent the strategic reactions that European R&I system actors as a whole have envisaged in relation with the four VERA future contexts. Notwithstanding the variety of actors' strategies, this aggregation provides an overarching vision for policy shapers to decide what ERA dimensions would need policy attention depending on the different policy contexts as illustrated by the scenarios.

3.3.1. VERA Scenarios & ERA Dimension 1: Boosting research and innovation synergies

A major new dimension to be integrated into ERA strategies relates to the importance of boosting *research and innovation synergies* by promoting a more intense participation and interaction of stakeholders throughout the innovation process, particularly in terms of industry-academy cooperation.

Boosting research and innovation synergies implies (1) broadening ERA into a European Research and Innovation Area; (2) implementing more effective innovation funding instruments; (3) shortening the transition from invention to innovation; (4) using IP supporting strategies for innovation; (5) boosting industry-academy R&I cooperation; (6) embracing open innovation strategies; and (7) stimulating entrepreneurship.

VERA Scenarios & ERA Dimension 1: Boosting research and innovation synergies
A future driven by private firms has dominated the innovation discussions. Although open innovation assumes a wider actors' participation, private markets seems to conserve the innovation driving-role. The sustainability context generated a big number of strategies, which endorses the benefits of promoting R&I linkages to tackle problems like climate change or raw materials scarcity. In scenario 3, human beings' needs seem to have been already fulfilled by local/traditional solutions, hence the little interest shown on innovation aspects. From other angle, the moderate proportion of actions proposed in scenario 2 seems to recognise that the EC is already incorporating adequate innovation strategies in this scenario.

Bar chart: Scenario 1: 45%, Scenario 2: 13%, Scenario 3: 6%, Scenario 4: 35%
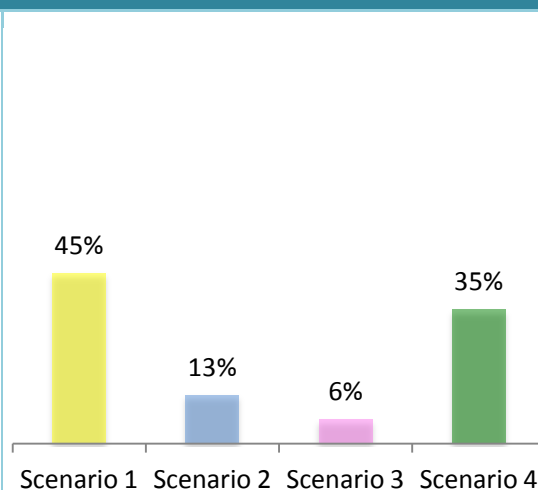
3.3.2. VERA Scenarios & ERA Dimension 2: Strengthening the global influence of ERA

The second most debated dimension was strengthening the *global influence of ERA*, which includes the development of a global variable geometry, a more systematic position of Europe vis-à-vis countries and regions outside Europe, and the growing role of global infrastructures.

Strengthening the global influence of ERA implies (1) enhancing ERA coordination for global cooperation; (2) intensifying dialogues with emerging and developing economies; and (3) optimising funding of, and access to, research infrastructures.

VERA Scenarios & Dimension 2: Strengthening the global influence of ERA

Most of R&I actors' internationalisation strategies were incited by scenario 1 and 4. Whereas the first scenario somehow constitutes a defensive reaction to a complex context that is dominated by private companies, the answer to the scenario 4 is more constructive, and it is based on the global nature of sustainability problems. As expected, globalization has not been a preference in Scenario 3, which in principle keeps coherence with its local/regional orientation. The societal challenges scenario has not either given rise to numerous strategic actions, which may indicate, given the similarity of this scenario with the present context, that institutions de-facto assume that their R&I activities have yet to acquire a more global dimension.

32% Scenario 1 14% Scenario 2 18% Scenario 3 36% Scenario 4
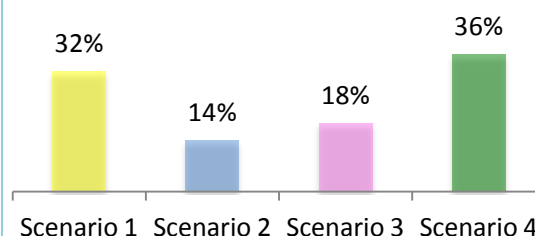
3.3.3. VERA Scenarios & ERA Dimension 3: Promoting smart R&I evaluation

Interestingly, the promotion of *smart R&I evaluation* attracted the attention of many stakeholders to the point that it became a dimension by itself, with stakeholders being very concerned about assuring transparent funding decisions and using evidence and reliable data to support European policies.

Promoting smart R&I evaluation implies (1) reinforcing the role of evidence and transparency in R&I policies; (2) assessing R&I impacts more flexibly and comprehensively; (3) promoting peer review in evaluation of excellence and relevance; and (4) evaluating and monitoring citizen-science initiatives more sensitively.

VERA Scenarios & Dimension 3: Promoting smart R&I evaluation

This dimension was found predominately oriented to public research. This is one of the reasons that explain why the topic has not been discussed in scenario 1. As for scenario 2 and 3, we can deduce that their high percentages on evaluation strategies, in contrast with scenario 4, are due to the high relevance that both scenarios give to citizens' participation in research. Although this participation was broadly recommended throughout most of focus groups, a number of doubts and concerns on the real impact of this participation came up during the discussions. In this respect, most R&I actors assumed that they had to reinforce their evaluation procedures to incorporate the voice of society while preserving research outcomes quality.

0% Scenario 1 40% Scenario 2 50% Scenario 3 10% Scenario 4
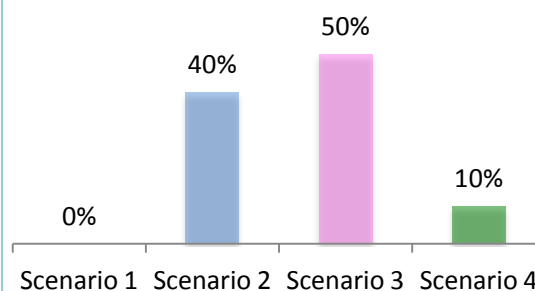
3.3.4. VERA Scenarios & ERA Dimension 4: Improving the governance of the EU R&I system

As regards the dimension on improving the *governance of the EU R&I system*, the discussion focused on R&I system coherence at EU level rather than on national R&I effectiveness, including the encouragement of more intense R&I actors' dialogue across Europe.

Improving the governance of the EU R&I system implies (1) exploring synergies between R&I and other policies and funding programmes at EU level; (2) improving the coordination of national R&I strategies; (3)

raising European competitiveness through R&I; (4) supporting R&I stakeholder dialogues; (5) reducing and simplifying EU R&I bureaucracy; (6) sustaining R&I funding; and (7) setting EU R&I agendas collaboratively.

VERA Scenarios & Dimension 4: Improving the governance of the EU R&I system

Governance aspects have been mostly identified in scenario 1. On reflection, it may be due to the necessity of more solid public support that counteracts the 'tyranny' of the private markets. Policy actors, for example, would ensure research sustainability and, similarly, R&I funders would try to identify new capital sources. From an opposite perspective, we can relate the low proportion of strategies in scenario 3 with decentralised governance structures. We may also observe that scenario 2 presents a moderately high percentage of governance strategies, which can be explained to some extent by the familiarity that R&I discussants had on existing instruments for tackling societal challenges.

42% Scenario 1
27% Scenario 2
13% Scenario 3
18% Scenario 4
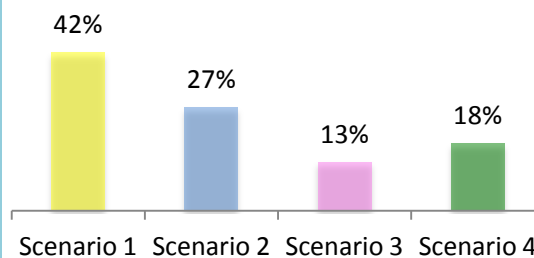
3.3.5. VERA Scenarios & ERA Dimension 5: Fostering relevant science-society engagement

A much systematic and relevant *science-society engagement* has been strongly advocated as another new ERA dimension. This debate is very close to the EU initiatives on participation in the context of responsible research and innovation and includes a call for more science- and research-oriented education programmes at all levels.

Fostering relevant science-society engagement implies (1) encouraging 'sustainable' responsible research and innovation (RRI); (2) engaging society in science and R&I policy decisions; and (3) elaborating R&I oriented education and social awareness strategies.

VERA Scenarios & Dimension 5: Fostering relevant science-society engagement

The analysis of these charts permits to come to the conclusion that science-society engagement needs to receive much attention in the formulation of EU R&I policies. The suitability of this dimension nowadays (in terms of RRI, participation on policy decisions, or society education related aspects) can be inferred by the similar percentages observed across scenarios and by the evidence that VERA scenarios deliberately capture a great deal of horizon possibilities. In fact, as the present R&I landscape is, to a large extent, a spectrum formed by very different future possibilities, the systematic and balanced presence of science-society engagement strategies alongside scenarios makes this dimension very robust in comparison with other ERA dimensions.

32% Scenario 1
18% Scenario 2
21% Scenario 3
29% Scenario 4
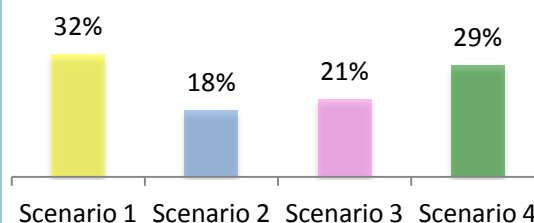
3.3.6. VERA Scenarios & ERA Dimension 6: Developing attractive and impactful research careers

In terms of developing *attractive and impactful research careers*, as one of the existing priorities, the debate basically maintained the importance of 'an open labour market for researchers', how-ever recognising the existing substantial differences remaining across Member States (MS) and highlighting the

importance of cross-European and cross-sectoral mobility, whereby especially support for cross-sectoral mobility has been a recurrent feature in a number of dimensions.

Developing attractive and impactful research careers implies (1) facilitating cross-border mobility of researchers; (2) enabling impactful exchange of researchers between academia and industry; (3) achieving an open and cohesive labour market; and (4) harmonising careers and training programmes.

VERA Scenarios & Dimension 6: Developing attractive and impactful research careers

Most of strategies on 'Developing attractive and impactful research careers' have been conceived in the least transformed scenarios. Given the influence of employability and training issues on European researchers' work-life balance, these issues seem to have been preferably discussed on the most pragmatic and realistic future contexts. The interest showed in scenario 2 may be also explained by the opportunities that societal challenges bring for increasing knowledge exchange across countries and sectors. In this sense, it is surprising, however, that R&I stakeholders suggested the lowest proportion of strategies on scenario 4, whose nature should demand an intensification of worldwide mobility initiatives.

Chart:
- Scenario 1: 40%
- Scenario 2: 36%
- Scenario 3: 16%
- Scenario 4: 8%
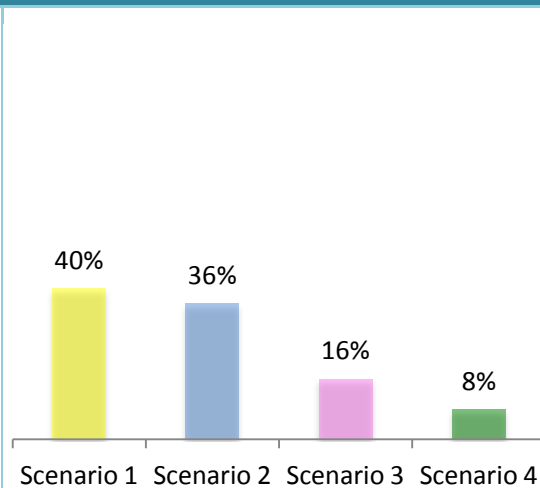
3.3.7. VERA Scenarios & ERA Dimension 7: Supporting knowledge co-creation and sharing

The seventh dimension, though deeply connected to the first, is underpinning *knowledge co-creation and sharing*, which builds on the ERA priority on 'optimal circulation, access to and transfer of scientific knowledge'; however, a broader perspective was taken by including transdisciplinarity as a must-have component of the EU knowledge generation machinery (especially in the context of grand challenges).

Supporting knowledge co-creation and sharing implies (1) developing a knowledge co-creation ecosystem; (2) fostering knowledge sharing and transfer; (3) adopting broader open access practices and policies; and (4) standardising and utilising digital research platforms.

VERA Scenarios & Dimension 7: Supporting knowledge co-creation and sharing

The ERA dimension on 'Knowledge co-creation and sharing' shows similar answers across scenarios 1, 2 and 4. It can be noted that, while scenarios 2 and 4 imply the existence of underpinning knowledge-transfer networks, the competitive environment of scenario 1 forces firms and R&I institutions to deal with (often critical) interaction issues to survive. Although they are supported by very different reasons, it is reasonable the attention paid to this topic by R&I stakeholders on these three scenarios. We may also conclude that the high proportion of strategies that has been generated in scenario 3 is consistent with the fact that local R&I actors and individuals will try to look for new forms of interaction and communication.

Chart:
- Scenario 1: 22%
- Scenario 2: 19%
- Scenario 3: 38%
- Scenario 4: 22%
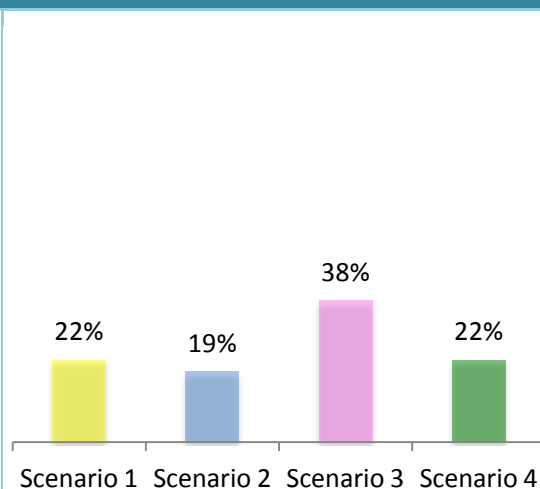
3.3.8. VERA Scenarios & ERA Dimension 8: Achieving gender equality and social inclusion

The dimension on gender issues was expanded and rebranded into achieving *gender equality and social inclusion in R&I*. In an increasingly socio-economically complex Europe, stakeholders saw the need to include empathy to vulnerability and multiculturalism as key elements of a much needed agenda on diversity.

Achieving gender equality and social inclusion in R&I implies (1) putting in place and implementing appropriate gender equality measures; (2) involving disable and vulnerable groups in R&I; and (3) including multicultural perspectives in R&I programmes.

VERA Scenarios & Dimension 8: Achieving gender equality and social inclusion

In scenario 2 gender concerns are principally related to women careers promotion. The high rate of scenario 2 is also explained by the consideration of the gender aspect as a horizontal theme to better address societal challenges. The unbalanced presence of gender and inclusion strategies across VERA scenarios actually reflected how stakeholders' reflections on these issues can differ along different R&I landscapes and how in some contexts gender aspects and social inclusion are found well addressed, or at least on the right track, e.g. scenario 2. Scenario 1 has not inspired distinct gender equality strategies, which somehow reflects the different grade of preoccupation/attention paid by business and academic communities on this topic.

3.3.9. VERA Scenarios & ERA Dimension 9: Reinforcing ERA regional and local outreach

Finally, a ninth and new dimension focused on reinforcing *ERA regional and local out-reach* – with specific emphasis on regional cohesion, integration of region-specific and trans-regional challenges into the ERA agenda and greater permeability of EU funding instruments into less research-intensive regions.

Reinforcing ERA regional and local outreach implies (1) accelerating regional cohesion through R&I; (2) strengthening the role of regions in ERA; and (3) increasing interregional R&I cooperation.

VERA Scenarios & Dimension 9: Reinforcing ERA regional and local outreach

The chart on 'Reinforcing ERA regional and local outreach' shows that scenarios 2 and 3 have stimulated a significant rate of regional strategies. This is a very reasonable answer in scenario 3, as that context is assumed to be driven by the 'local' paradigm. In this regard, R&I actors would try to exploit the opportunities that regional reinforcement-oriented policies would facilitate. Scenario 2 presents a high proportion of regional actions due to the interest that ongoing smart specialisation strategies actually bring about. Other significant R&I plans that underlay scenario 2 discussions are those related with R&I actors' intentions for achieving a better position within regions so as to influence more strongly the societal challenges R&I agenda.

3.4.   Multi-dimensional analysis of VERA Scenarios

This section will provide a brief analysis on the flexibility and capacity of VERA scenarios to stimulate collective-thinking and discussions on the future of ERA. The use of scenarios in fore-sight may target different objectives, e.g. checking the robustness of tentative policies before implementation, or supporting actors' strategies definition processes, among others. VERA scenarios have been used by WP5 for repositioning stakeholders' mindsets into transformed contexts as a step forward in providing policy advice and feeding present-day policy discourse.

In scenario 1, VERA actor's strategies were mainly focusing questions of governance. Most of actions referred to the necessity of boosting European competitiveness. The second most attractive dimension in this scenario was innovation. Many strategies actually stressed the important role of business-oriented research in contexts strongly dominated by growth rationales.

A smart use of governance instruments, especially those promoting ERA cooperation, is needed to tackle big challenges more effectively in scenario 2. In the graph we may also observe that, despite the global nature of 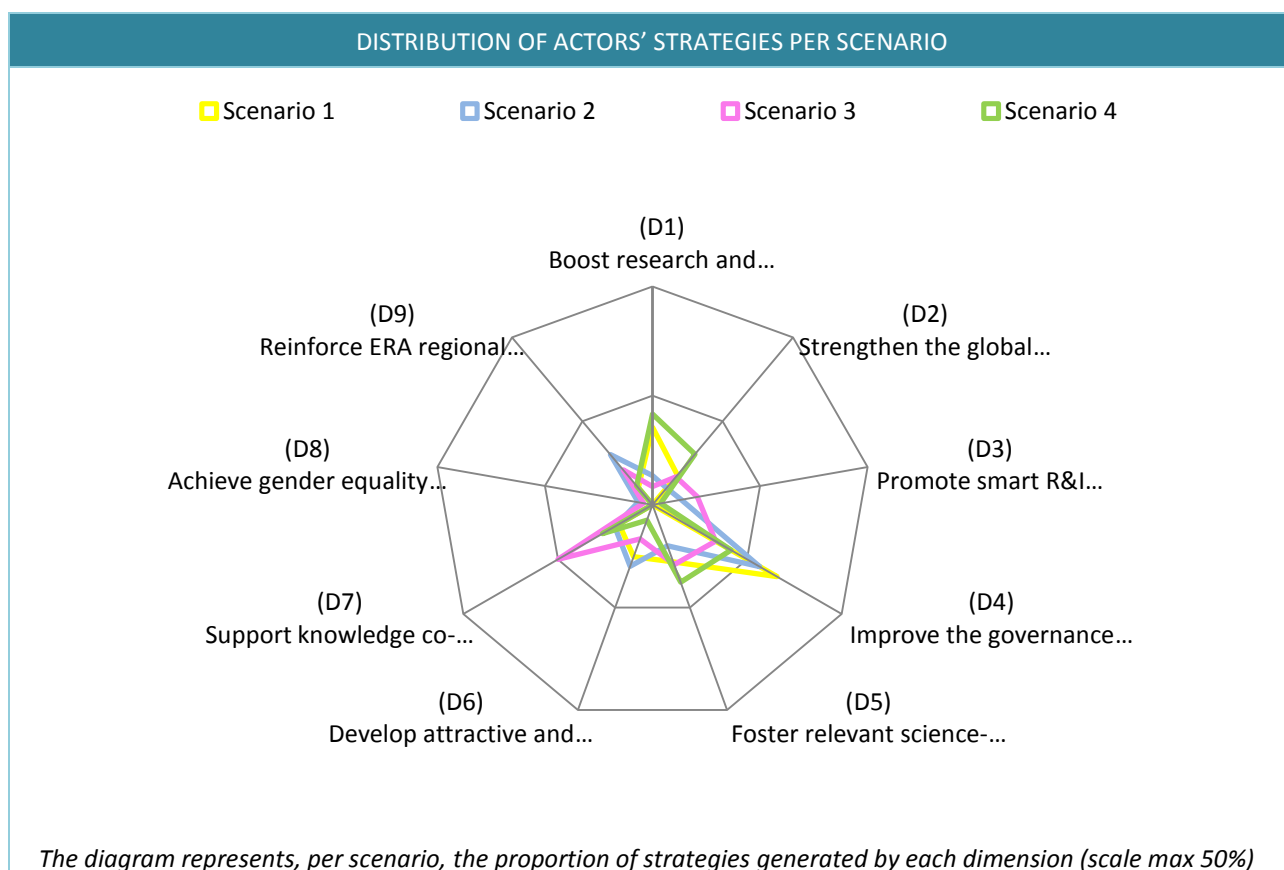societal challenges, regional strategies have been more frequently suggested than global actions. This reveals the importance that is given by R&I actors to achieving synergies between their strategies and the development of complementary smart specialisation initiatives.

Scenario 3 reflects the importance of knowledge co-creation dimension, which reinforces stakeholders' networking and communication strategies. The moderate attention given to citizen's involvement in science may be due to the fact that this aspect is found conveniently addressed in this scenario.

Scenario 4 has principally stimulated innovation strategies at the global level. The polygon also shows that in this scenario the VERA stakeholders would have to adjust their strategic actions to new and improved forms of R&I governance. The attention paid to science-society engagement refers to R&I stakeholders' interest in developing strategies more close to citizen science and societal participation processes.

The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

4.   Stakeholders-based Strategy Map

4.1.1.   *Strategies of society actors*

Two different types of strategies can be identified by societal actors that participated in the VERA focus groups. The first one can be called 'resistance' strategies aiming at opposing research focus and research model that does not consider societal needs and concerns. This is more relevant in the context of a scenario driven by industrial interests (scenario 1) or challenge-oriented research (scenario 2). In the former case, the creation of (new) societal actors was suggested or even consumers' boycotts to react to market-oriented research choices. In the latter case, political activism was encouraged to exercise continuous critique to research priorities in order to recovering societal relevance of research.

The second type of strategies can be called 'alternative to mainstream' strategies. Interestingly, such strategies were suggested to complement 'resistance' strategies so as to prove that a totally different approach to research would be possible even in the very competitive scenario 1 or the very focused scenario 2. In particular scenario 1 triggered suggestions to promote a research model more oriented towards societal needs by mobilising social economy initiatives (e.g. social enterprises, new communities and alliance structures between society and researchers, crowd-funding and philanthropic sources to fund research areas of high societal relevance but uninteresting for industry). Scenario 2 triggered suggestions for initiatives to intensify the debate on the importance of social science and diversity and equity in research working towards integrating social science in other scientific disciplines, and supporting new alliances of actors that reduce scientific boundaries.

These alternative types of strategies seem to become mainstream in the contexts of scenarios 3 and 4 where society enjoys a more strengthened role in research governance and organisation. A third type of strategies emerges in these contexts however. It becomes evident that in scenarios where society acquires a more strengthened role, citizens need to be well-informed and knowledgeable. Thus raising awareness and education strategies become relevant addressing also social and cultural learning as well as non-scientific knowledge. Such education and training strategies are more intense under scenario 4 since they are oriented towards more sustainability-friendly behavioural change in society.

The need to strengthen the role of society in research governance and organisation has already become evident to the people representing societal organisations in the VERA focus group. The immediate strategies that societal representatives suggested as important already today included increased participation of citizens in trans-European professional associations, building new communities and alliance between society and academia to re-build trust of society in science, and organising society in NGOs to demand funds for research. In addition the integration of social and hard sciences was already acknowledged as important to consider societal perspectives in scientific matters.

However, much more needs to be done for society to organise and acquire the necessary skills and knowledge to participate actively in research decision-making. The VERA scenarios could be effective triggers in this respect.

The strategy map shows that society actors asked for higher citizens' involvement in scenario 1. It is probably because of a sense of being under threat in that context. In this respect, they also debated on 'helping' actions in terms of governance in this scenario. The opposite reason applies in the case of scenario 3, where society actors are more comfortable, thus strongly focusing on knowledge co-creation, i.e. adopting a constructive posture instead of a defensive reaction. Surprisingly, innovation aspects are very poorly emphasized, similarly as the global dimension. Instead, they preferred to discuss regional and local issues in the sustainability scenario. Furthermore, R&I evaluation captured low attention. Contrary to other actors, society did not see major worries on the evaluation of citizens' contribution to R&I.

The ERA Strategy Map of **Society Actors**
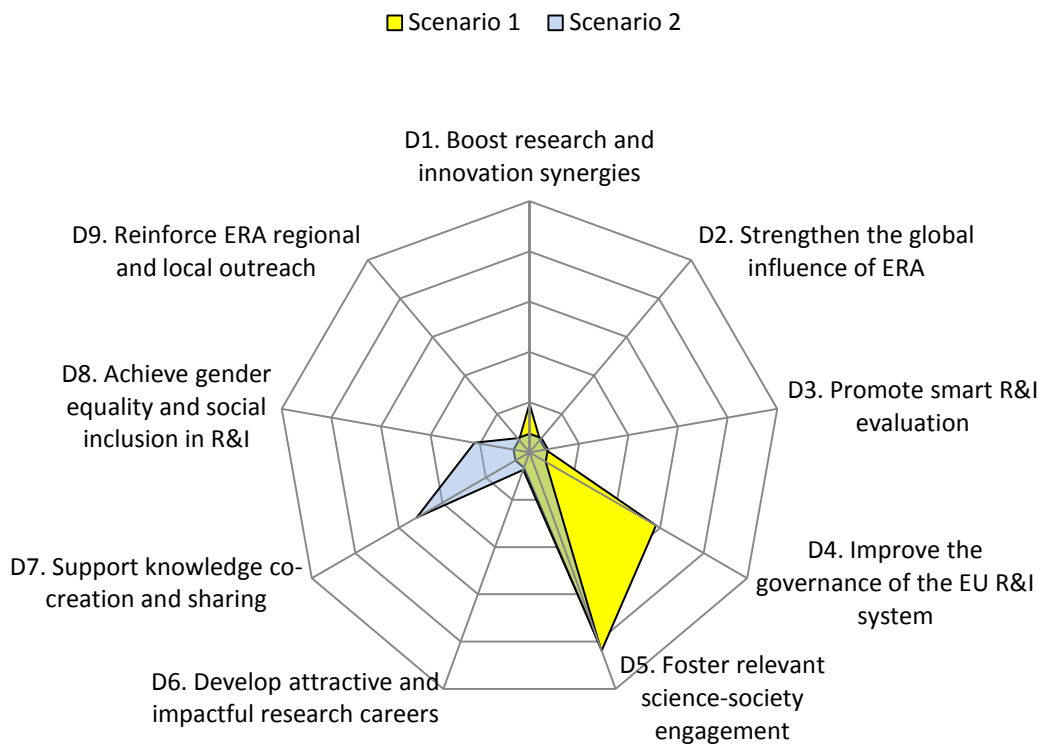
☐ Scenario 1 ☐ Scenario 2

The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

☐ Scenario 3 ☐ Scenario 4
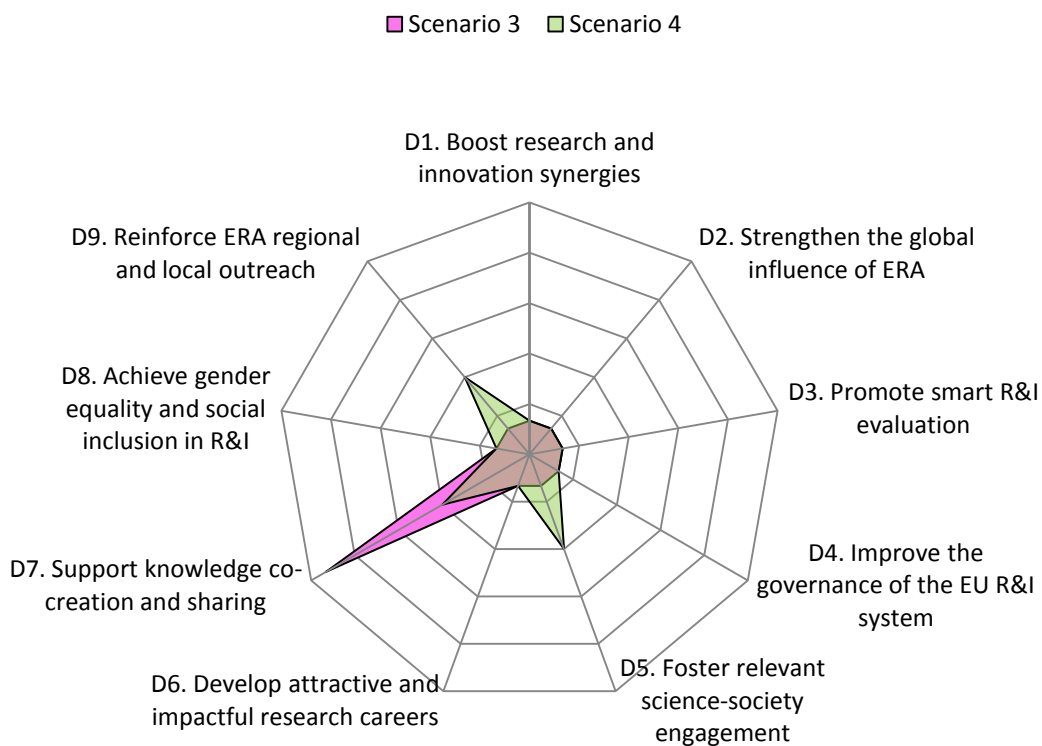
The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

4.1.2. *Strategies of academia actors*

Two main rationales underpin the strategic options identified by representatives of academia in all the scenarios. The one is about adjusting programmes and capacity to changing circumstances and priorities. This translates to putting emphasis on the so-called "third mission" of universities to engage with business and society at the local level and promote scientists' entrepreneurship in training and education (Scenario 1), adjusting research and education activities towards societal challenges (scenario 2), or societal needs and sustainability as exemplified in scenarios 3 and 4 respectively.

'Adjustment' strategies also entail modifying or creating new measurement approaches for research evaluation and impact analysis, as well as in career development to reflect relevance to the specific research focus. This became more prominent in scenarios 3 (research relevant to societal needs) and 4 (focus on sustainability research).

The second common rationale refers to balancing any extreme emphasis. The most common fear expressed in all scenarios in this regard refer to a possible neglect of certain types of research like curiosity-driven research or research areas not closely relevant to the research focus of each scenario. Thus, academia actors call for space for scientists to do research in areas that are not of primary interest to firms under scenario 1, or to allow research that may fall outside the top-down defined challenge-driven themes (scenario 2), or for a balanced approach in research funding across curiosity-driven and problem-oriented types of research (relevant for both scenarios 3 and 4).
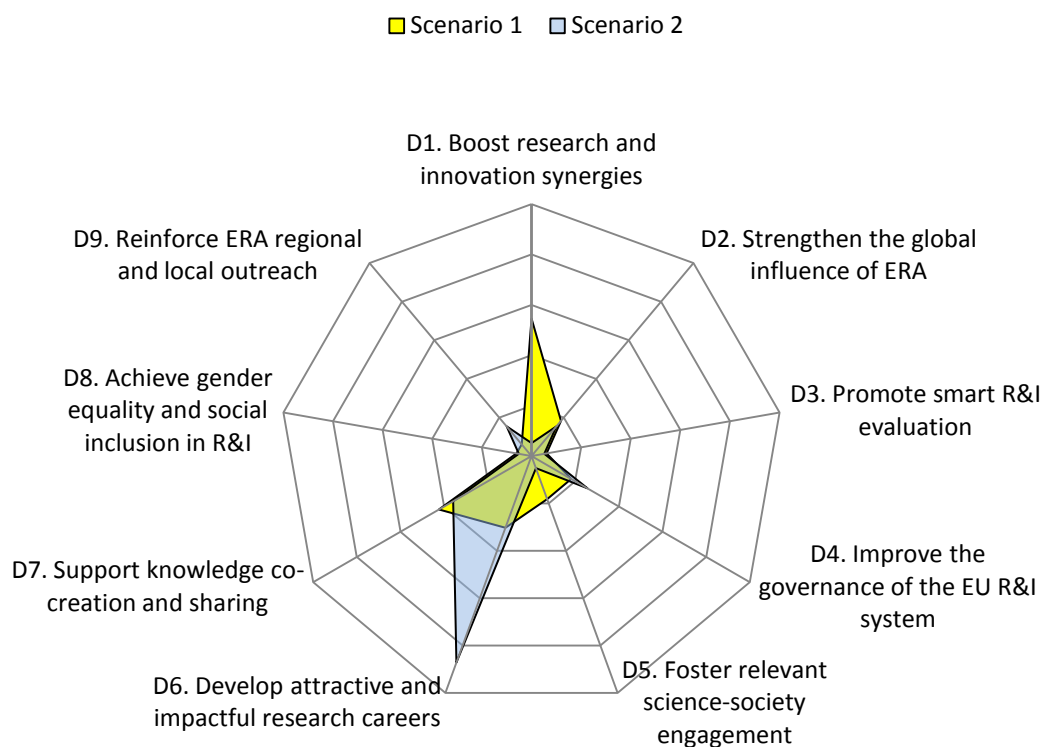
Collaboration and internationalisation of academia actors was also a strategy line suggested especially in the very competitive environment implied in scenario 1 but also in scenarios 2 and 4. In the first case internationalisation would be linked to close collaboration with industry, e.g. by establishing labs aboard following international industrial research activities. In the other cases collaboration and internationalisation reflected the need to join forces to deal with grand challenges and lead to a global impact.

Comparing the above strategic options across the various scenarios with the strategies that representatives of Universities and PROs stressed as important already today some interesting conclusions can be drown. Several measures were deemed necessary today to increase attractiveness to, or improve the conditions of, the researchers' profession as well as to improve the recruitment processes to attract talents and further facilitate mobility. Such measures can also relate to the strategy to become more competitive which was stressed especially in the context of scenario 1. Academia people seem to understand that their institutions need to become more competitive already today by also developing their own strategic funding by increasing services provided to third parties, participating in collaboration initiatives, etc. In this regard, one would also expect to see strategies for internationalisation and cooperation with both public and private actors already in the agenda of academia actors. However, this was not emphasised in the today's strategies noted by academia stakeholders.

At the same time, academia actors seem to face immediate issues today that are less addressed in the strategic options that were triggered by the different scenario contexts. These relate to open access policies, gender equality and reinforcing regional links. In particular academic actors noted the immediate need to develop, implement and assess a university-level policy for open access to research data, to develop strategies to eliminate unconscious gender bias in decision making committees (recruitment, promotion, funding), as well as to link with regional actors and push effectively regional development.

In the strategy map we observe that academic actors showed interests in knowledge and innovation actions in scenario 1 (e.g. close collaboration with industry) which may reflect a partnership proactive strategy. Large attention was paid to research careers, which corroborates that nowadays the debate is intense in this sense (scenario 2 is actually the least transformed one in this theme). Evaluation was deemed important in scenario 3 due to the doubts that society involvement impact assessment implies. It is remarkable that citizens' involvement was not so firmly advocated by academics as society actors.

The ERA Strategy Map of **Academia Actors**

☐ Scenario 1   ☐ Scenario 2

D1. Boost research and innovation synergies
D2. Strengthen the global influence of ERA
D3. Promote smart R&I evaluation
D4. Improve the governance of the EU R&I system
D5. Foster relevant science-society engagement
D6. Develop attractive and impactful research careers
D7. Support knowledge co-creation and sharing
D8. Achieve gender equality and social inclusion in R&I
D9. Reinforce ERA regional and local outreach

The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

☐ Scenario 3   ☐ Scenario 4

D1. Boost research and innovation synergies
D2. Strengthen the global influence of ERA
D3. Promote smart R&I evaluation
D4. Improve the governance of the EU R&I system
D5. Foster relevant science-society engagement
D6. Develop attractive and impactful research careers
D7. Support knowledge co-creation and sharing
D8. Achieve gender equality and social inclusion in R&I
D9. Reinforce ERA regional and local outreach

The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

4.1.3. Strategies of industry actors

The strategic options identified by industry actors that participated in the VERA focus groups seem to be more diversified across the scenarios than those of the research actors examined above. Reflecting the extremely competitive environment of scenario 1, industry actors noted the need for strategies that would ensure access to public research capacities also (i.e. through public-private partnerships), and that would further boost commercialisation of research results and innovation generation. At the same time, they would try to lower costs of knowledge production by global research collaborations and outsourcing of research activities.

The collaboration element is also echoed in scenario 2 but this time with the whole research eco-system around grand challenges and with a more alignment / adjustment purpose in mind rather than access to extra resources to increase competitiveness.

Adjustment purposes also character most of the scenarios triggered by the rest of the scenarios. For instance, in response to scenario 2, industry people suggested to better align their strategies both in terms of context and process to the special features of societal challenges, by using roadmaps and long-term vision building instruments engaging various stakeholders. Adjustment strategies also referred to knowledge production, promoting more interdisciplinary research *within* firms and integrating diverse specialities, including social scientists.

Scenario 3 also dictated adjustment strategies in various areas and means. These included diversification of research portfolios (despite the focus on well-being issues), more customisation in products and services engaging users as co-producers and more openness and transparency in research developments and strategies. Scenario 3 also triggered strategies to explore ways to combine crowd-funding and private sponsorship.

Adjustment in scenario 4 addressed both research and business activities. It included more flexible and innovative approaches/frameworks to allow multidisciplinary research, adopting more sustainable working methods and production systems, and similarly to scenario 3, more societal engagement both for adapting

products/services and procedures to consumers' concerns and demands as well as in designing corporate strategies.

Interestingly, today's strategies identified by industry representatives hardly reflected the above orientations apart from collaborating more closely with academia and facilitating the generation of innovation. For instance, industry people suggested applying action research in their research approaches as a way to generate innovation or to increase participation in industry-academia collaborations and partnerships.

Although relevant only to the hypothetical scenarios 2 and 4, it might also be wise for industry to consider alignment to the grand challenges and sustainability agendas of European policies already today. This is already encouraged by EU policies such as Innovation Union and Europe 2020 highlighting the business opportunities inherent in the 'grand challenges' agenda. At the same time co-creation and engagement of users already gains ground in the corporate world.

The analysis of industry actors' strategy maps reveals a clear and logical attention to innovation oriented strategies. This is a very robust observation as long as it happens in all VERA scenarios. Another very robust observation may conclude that industry representatives paid low attention to initiatives for improving researchers' careers. Public research aspects do not seem to be a critical issue of corporative strategies. It needs to be noted, as well, that ERA globalization does not constitute an industry's main priority, notwithstanding the fact they should exist a clear internationalisation plan in their respective corporations. As for citizens' involvement, industry actors have found it essential only in relation with scenario 4, which somehow casts doubts on the real industry's commitment with open innovation in the rest of scenarios. However, they see strategic options in knowledge co-creation in scenario 3, which may reflect an adaptive answer to a context where individual researchers and other local actors' would predominantly occupy the market development driving-seats. Finally, the industry actors' debate showed that gender equality and diversity aspects were not among their future priorities.

The ERA Strategy Map of **Industry Actors**
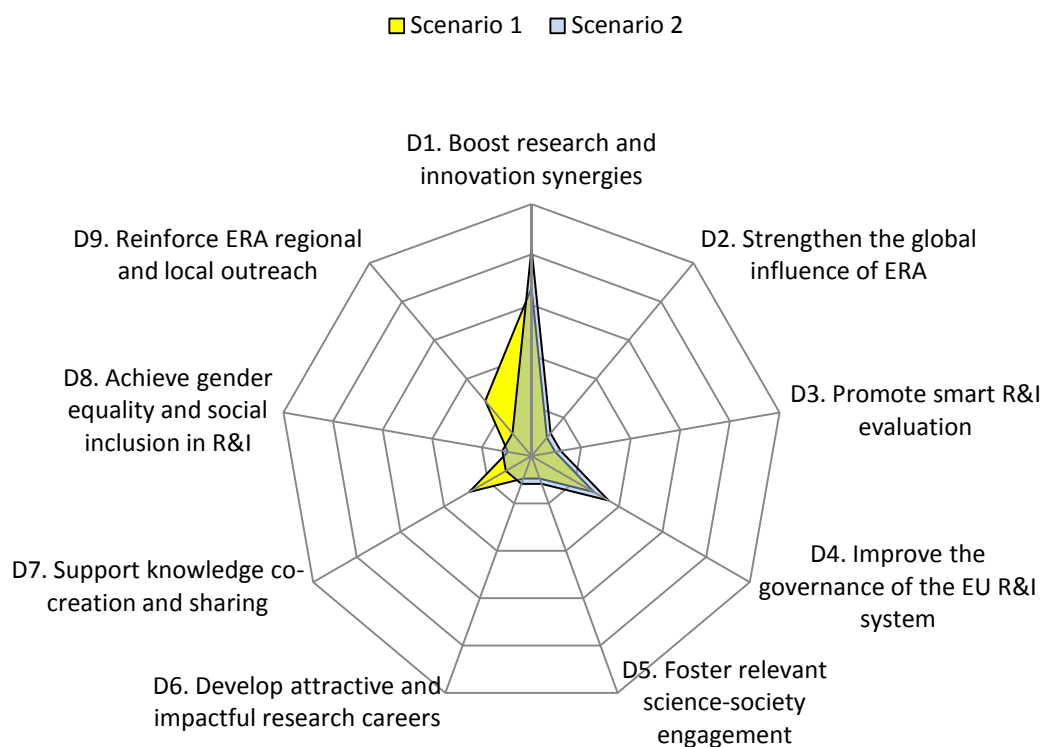
☐ Scenario 1 ☐ Scenario 2

The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

☐ Scenario 3 ☐ Scenario 4
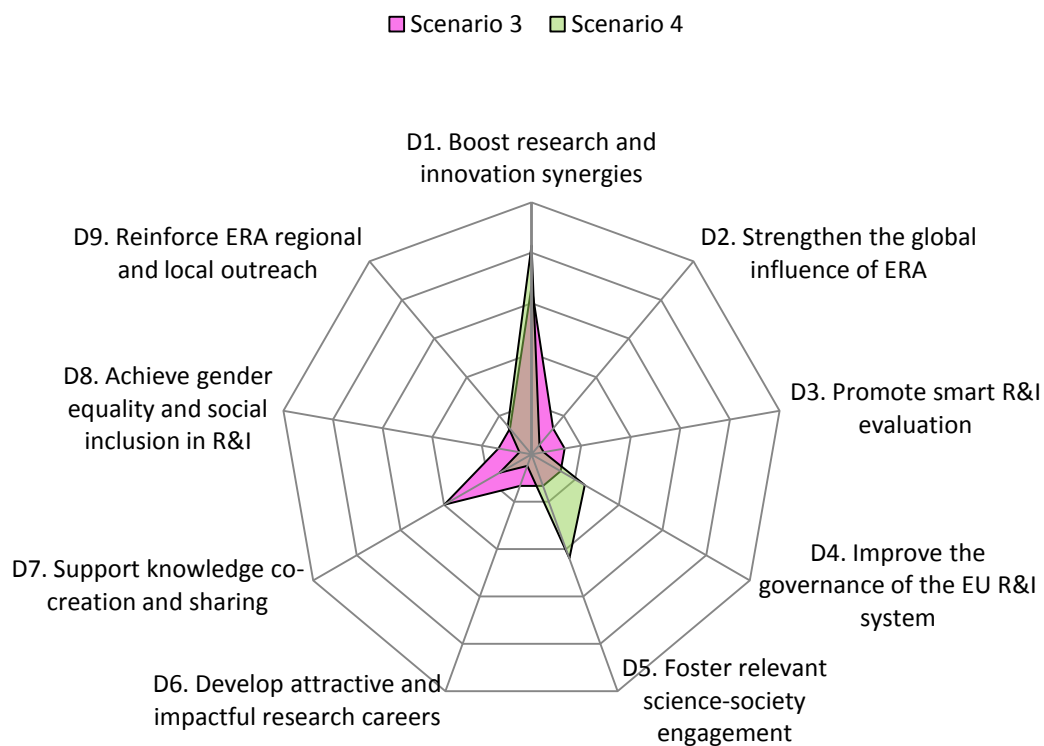
The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

4.1.4. Strategies of research funding actors

Collaboration and joining of forces underline the common strategic options identified by research funders across the various scenarios. This takes the form of collaborating with industry to jointly formulate strategies under scenario 1, or international collaboration in new combinations to allow large scale bundling of resources around challenges under scenario 2, or similarly collaboration with other funding organisations at global level for forming alliances (similar to a Global Research Council) addressing sustainability issues under scenario 4.

Adjustment strategies as well as strategies to balance extreme research focus in particular areas area also repeated by research funders. In particular, the need to safeguard investment in fundamental research and allow both top-down and bottom-up approaches in research focus definition in a coordinated manner is echoed across all the different scenarios. The search for new funding sources becomes relevant especially in scenario 3 (exploiting crowd-funding for instance) or 4 (using venture capital initiatives to complement public research funding and cover for areas less addressed in the scenario).

Similar to universities and PROs, adjustment strategies of research funders refer to modifying the research focus and criteria of funding so as to be more in line with industrial interests (in scenario 1), promoting interdisciplinary evaluations and research approaches in scenario 2, or contributing to the definition of the well-being concept (the focus in scenario 3). Adjustment in scenario 3 also takes another form (clarifying criteria for funding, using ex-ante evaluation) reflecting the need to foster transparency of funding decisions.

The strategic options identified as already important to follow today reflected some of the strategies that emerged under the scenario contexts. In particular research funders stressed the need to establish collaboration models with other funding agencies that allow the rule of "money follows researcher" and thus contribute to mobility in research. Further, they suggested including peer review in agreements between funding institutions, thus fostering transparency in decisions and better relevance of research focus to the interests of the research base.

However, collaboration beyond national borders or with private actors to join forces or to find new funding sources does not seem to occupy funders' strategies today. This may need particular attention given the current European policies' focus on grand challenges that by default need joining of forces and resources.

Research funders' discussions, along with policy actors', presented a very strong focus on governance aspects. This focus can be observed in many scenarios, somehow reflecting their proximity and similitude to the research and innovation policy makers' perspective. As expected, and compared with other actors, research funders paid more attention to R&I evaluation aspects. The interest of research funders in promoting a smarter conception of evaluation somehow contributed to position R&I evaluation as a new evolving ERA dimension. It may also be noted that researchers' careers aspects captured the attention of research funders almost exclusively in scenario 1. This is probably due to the threats that they would actually experience in this scenario, which may imply a potential decrease of public funding. On the other hand, scenario 1 proved to be useful to stimulate their discussions on innovation and governance aspects. The scenario 3 brought again a range of doubts about the participation citizens in science and their real contribution to research. These doubts explains why R&I evaluation was so much debated in this scenario. Research funding representatives were also very interested in highlighting the global dimension of ERA in a scenario of sustainability. They put particular emphasis on the value that international cooperation means for scenario 4. Surprisingly, regional issues were only slightly tackled, and were almost entirely restricted to the discussions of scenario 2.

The ERA Strategy Map of **Research Funding Actors**
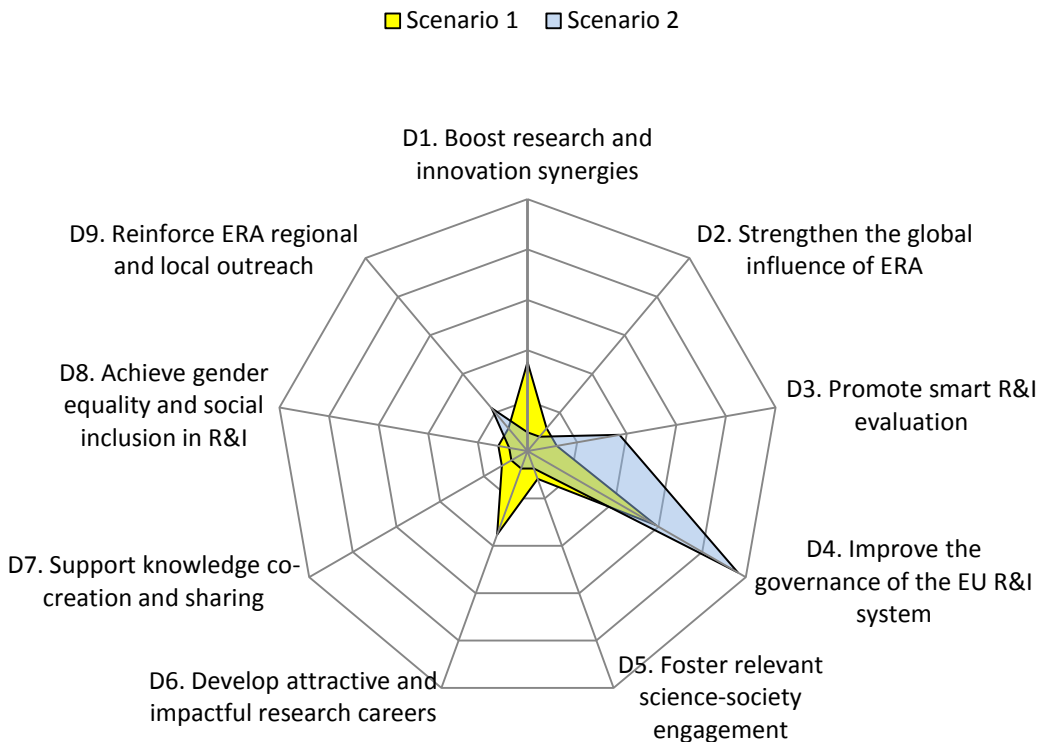
☐ Scenario 1   ☐ Scenario 2

The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

☐ Scenario 3   ☐ Scenario 4
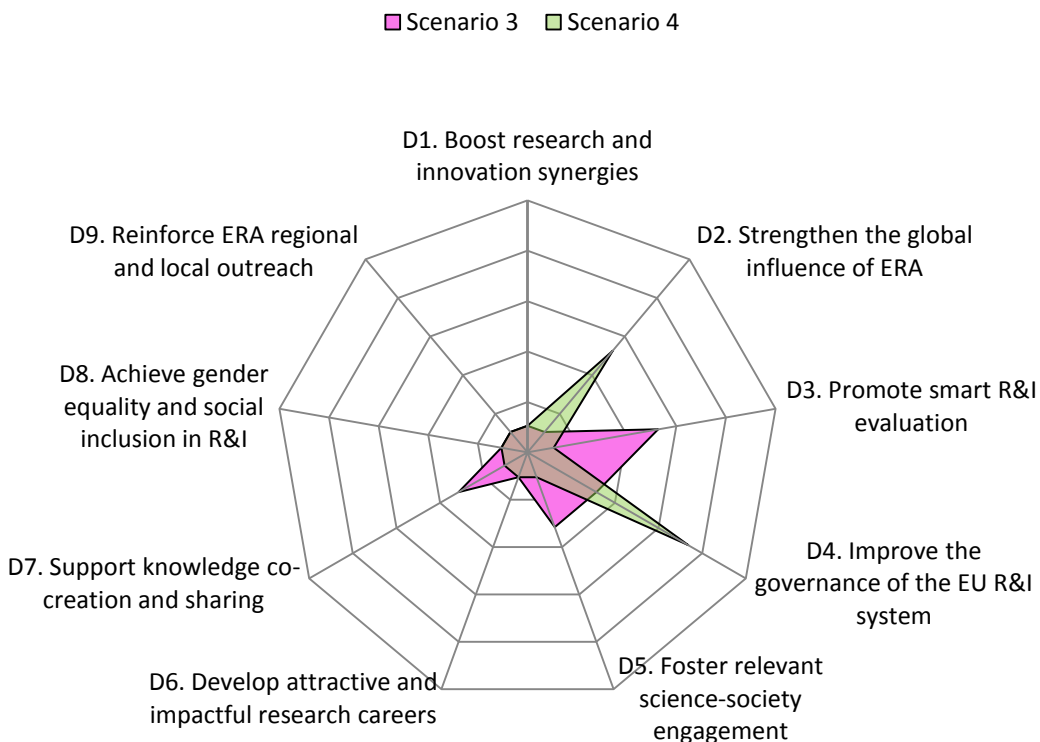
The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

4.1.5. *Strategies of coordinators of ERA instruments*

The strategies triggered by the different scenarios for the ERA Instruments' representatives that took part in the VERA focus groups can also be grouped under 'win-win', 'balancing', and 'adjusting' strategies. Their themes are also quite similar to those identified by international and policy actors. In more detail, 'win-win' strategies range from focusing on joint instruments that can convince industry to go beyond short-term investment and by shifting emphasis from thematic networks to value chain and solution-oriented partnerships at all levels (scenario 1), and fostering a pan European cooperation for public procurement of innovation under scenario 2, to encouraging Peer-to-Peer (P2P) research and Joint Public Procurement initiatives and multi-source funding strategies under scenario 4. Strategies to engage society can also be considered as win-win conditions as these can allow social acceptance of research decisions and directions. These included for instance strategies to increase transparency and visibility in identifying specific topics and research activities to support (scenario 2) or to focus more on societally relevant research and region-oriented approaches, create social networks to engage more with society, put more emphasis in the dissemination of scientific results and make EU research governance mechanisms more open and less bureaucratic to include society actors (scenario 3).

'Balancing' strategies included again strategies to mitigate a possible neglect of research areas and instruments that are not part of industries' priorities (scenario 1) or of basic research in scenario 4. 'Adjusting' strategies ranged from investment in education and the mobility of young researchers to promote an interdisciplinary approach in challenge-driven research or increase transparency and visibility of both research results and achievements (scenario 2). They also included harmonization of national regulations and countries' incentives in relation to sustainability and transparency in the selection and appointment of 'sustainability' experts which were relevant in scenario 4.

Today's strategies identified by ERA Instruments actors reflect some of the longer-term strategies mentioned above but more linked to current issues. For instance they stress the importance of strategies for cross-sectoral collaboration through mobility schemes and public-private partnerships while also giving emphasis on transparent research results dissemination and putting the regional dimension back to the agenda as this is also reflected in the 'reflexive societies' topic in H2020.

ERA instruments representatives showed very similar strategic map profile in scenario 1 and 2 to the map elicited from research funders in scenario 3 and 4. To some extent, this reflects the heterogeneity of perspectives that were included in this particular focus group. ERA instruments group was actually the one that included a larger and rich variety of participants' preferences and points of views. In general, they were very keen on discussing R&I governance new initiatives, especially in scenario 1, where they would find themselves on threat due to an ERA potential disintegration and a reduction of publicly funded R&I projects. Interestingly, they showed a high interest in R&I evaluation in scenario 2, which somehow can be explained by the fact that existing ERA instruments, and their respective ongoing projects, deserve more improvements in terms of project-evaluation transparency. The transparency of EC research funding decisions would also benefit from these improvements in the rest of scenarios. Regional and local strategies were outlined in relation with scenario 3, which also brought about many strategic discussions on knowledge co-creation. It is also interesting to realize that scenario 4 had a strong innovation approach. Similarly to the industry actors' discussions, there are some interesting conclusions on the implications of this scenario to boost practical solutions to environmental challenges. In this respect, it is particular important that this predisposition to innovation had been reflected by the ERA instruments actors discussions, as far as they are supposed to be practically involved in a variety of R&I projects and developments.

The ERA Strategy Map of **Coordinators of ERA Instruments**
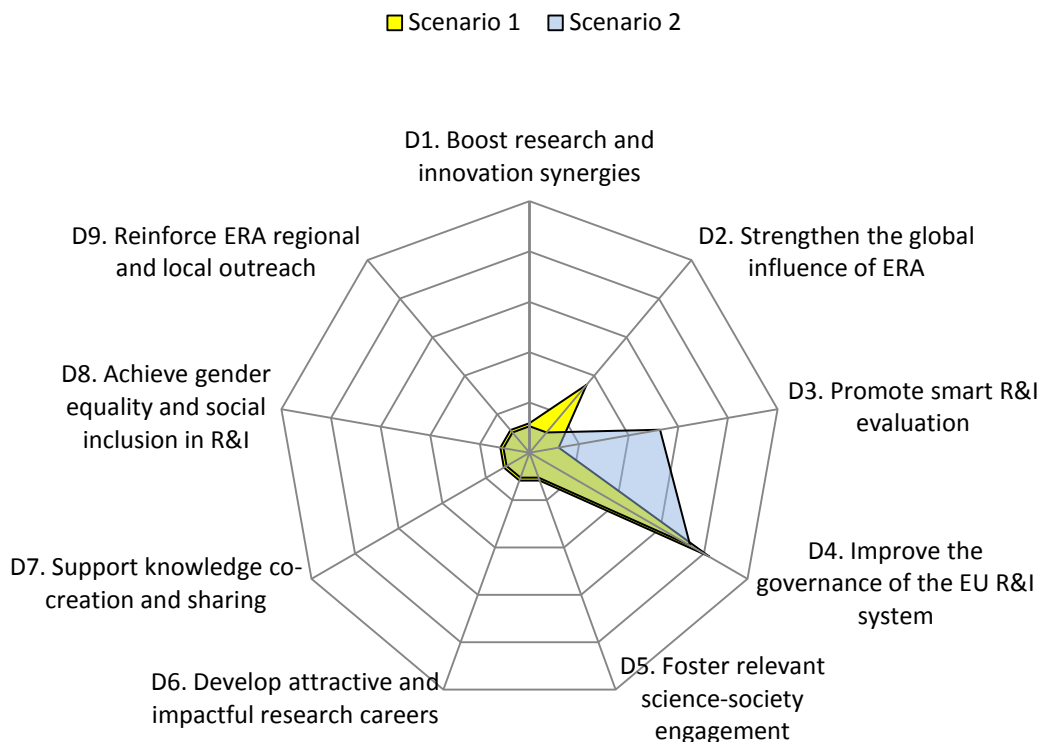
□ Scenario 1   □ Scenario 2

The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

□ Scenario 3   □ Scenario 4
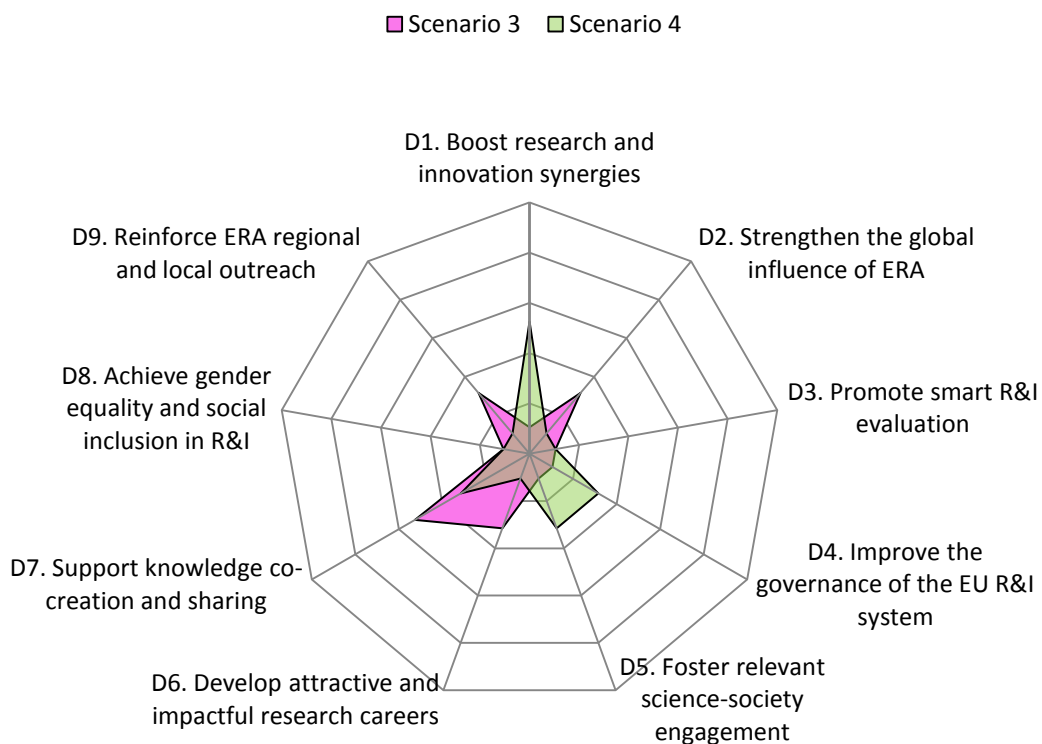
The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

4.1.6.   Strategies of policy actors

Policymakers' strategies can be grouped in four types. First, there are the 'adjustment' strategies. These range from adjusting education and training programmes to industrial needs in scenario 1, to facilitating participation of industry stakeholders to research decision-making in scenario 2 and of societal stakeholders in scenario 3 and 4, or to strengthening monitoring and evaluation activities in order to ensure transparency required in scenario 3.

Next, there are the 'win-win' strategies which are basically aimed at boosting the positive features in each scenario. These include participating in private-led large research initiatives or attract industries of strategic importance to certain regions under scenario 1, or in scenario 2, strengthening and stimulating national and regional specialisation, forming regional hubs by supporting industry-driven clustering initiatives that involve different states, and creating financial instruments to stimulate R&D and innovation initiatives within firms. Similar to scenario 2, win-win strategies in scenario 3 take the form of R&I funds targeting 'lagging behind' regions while also building absorptive capacities so as to avoid eroding their knowledge base and support the formulation of demand-side policies in research and innovation to reinforce synergies between research and innovation. The win-win situation in scenario 4 was more perceived to be linked with the EU acquiring a strong role at the international level and becoming the role model for developing countries. This included for instance aligning global challenges' programmes with those of third countries, e.g. within Joint Programming Initiatives.

The third type can be named 'balancing' strategies, i.e. aiming at balancing extreme dominance of certain actors or research areas. This in scenario 1 takes the form of setting up advisory/support bodies for identifying and funding long-term research that may fall outside the interests of industry, or maintaining a continuous validation of identified challenges to ensure relevance to societal concerns and needs through an intensified and iterative dialogue with societal stakeholders in scenario 2, to ensuring balanced allocation of resources across research types in scenario 3 and across different EU priorities in scenario 4.

The last type is the 'remedying' strategies trying to overcome negative consequences implied by the different scenarios. For instance, support to SMEs, and lagging behind regions is suggested to overcome focus on industry's dominance and creation of European research hot-spots, alongside encouragement of corporate social responsibility activities supporting social projects to remedy a possible neglect of societal needs. Ensuring that the challenges approach considers societal needs and interests was also relevant in scenario 2. Remedying strategies took a different form in scenario 4 due to the focus on sustainability. In this case the need was stressed for growth policies to try and mitigate environmental impacts with actions preserving natural resources.

The immediate strategies gave emphasis to strengthening innovation support; improve research and innovation investment efficiency, and further boosting collaboration between academia and industry.

Some very immediate strategies were also identified to improve conditions in the researcher's profession by shifting from grant-based approaches to salary-based approaches for early career researchers and harmonising post-doctoral mobility rights across different countries to further encourage mobility. Closer engagement with society was not addressed in the strategies deemed important already today even though triggered by both scenarios 3 and 4. This may be interpreted in two ways: first the EC has been promoting this and supporting relevant programmes for a number of years. The question remains though if a real change has been caused by these activities and what is the degree to which such activities have been integrated in national and regional policy-making procedures.

In relation with the strategy map, it was expected that policy makers' holistic views had not presented so 'irregular' polygons. However, it may be noticed that their strategies are more robust alongside scenarios than other actors. The maps are actually quite similar independently of future contexts, which somehow reflect policy maker pragmatic postures. While it is remarkable their interest in reinforcing the regional dimension, R&I governance was the most debated dimension in all scenarios as expected.

The ERA Strategy Map of **Policy Actors**
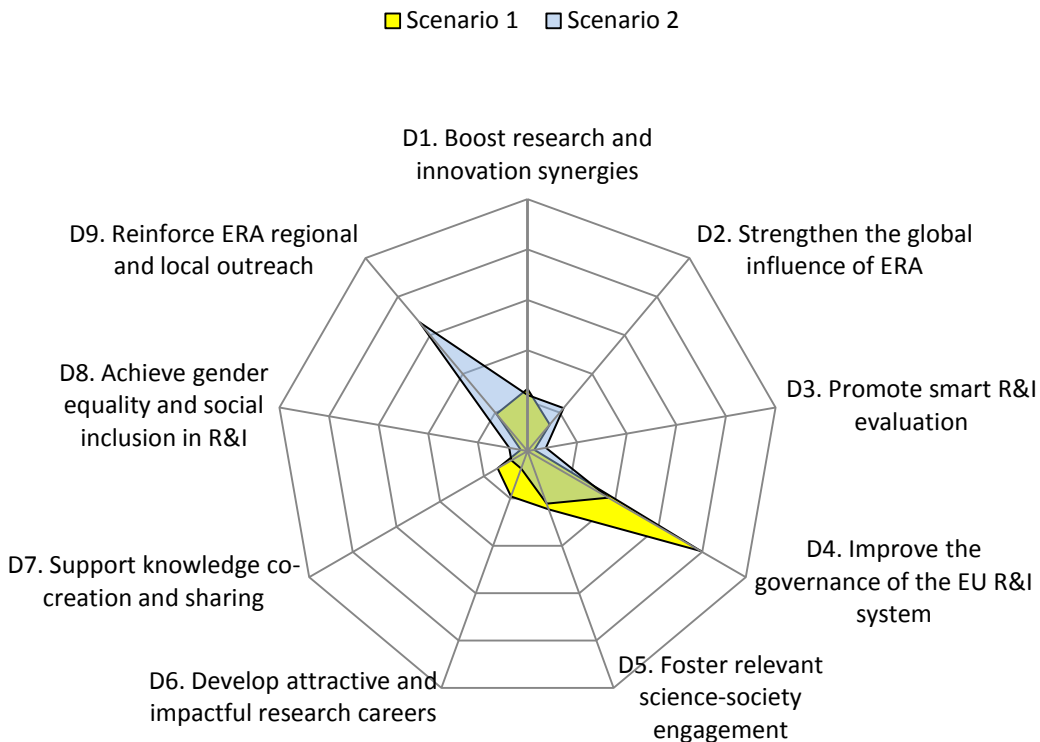
☐ Scenario 1   ☐ Scenario 2

The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

☐ Scenario 3   ☐ Scenario 4
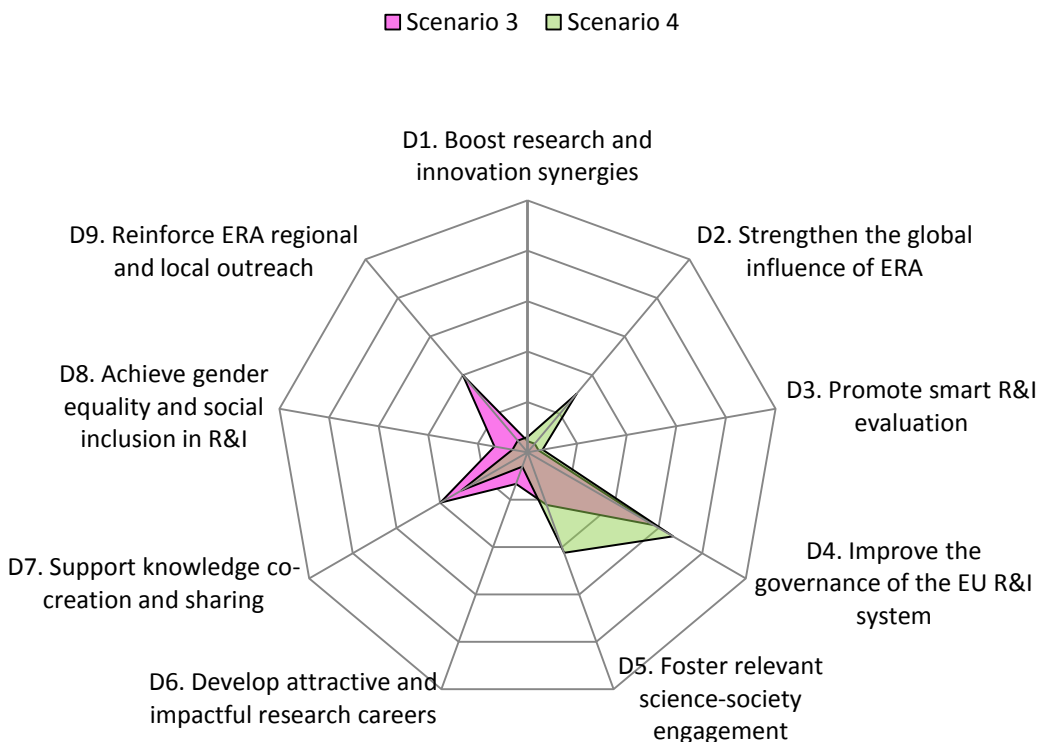
The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

4.1.7. *Strategies of international actors*

International actors seem to be promoting similar strategic agendas across the different scenarios. International collaboration takes two forms in scenario 1; between EU and non- EU countries as well as cross-sectoral between national organisations and industry. In scenario 2 it is primarily between the EU and non-EU countries, while in scenario 3 it mainly reflects the EU as a role model for developing countries and in scenario 4 it focuses on the 'next eleven countries'. The regional dimension is also emerging across all scenarios. It takes the form of macro-regional hot-spots with certain research capacities that would be attractive to industries in scenario 1, while in scenario 2 preserving and cultivating national and regional strengths and specialisations is crucial so that the 'challenges' agenda can be translated and transferred to the national and regional level. The regional dimension turns to the local level in scenario 3 where interestingly it has to be aligned with the international level both in terms of research organisation and research focus. Scenario 4 emphasises the rising importance of the regional perspectives that build broad 'sustainability identities' in countries and regions. Scenario 4 has also triggered strategies to apply multi-level and multi-stakeholder governance models, which is also relevant for the rest of the scenarios although maybe less so for scenario 1.

Strengthening university-industry collaboration is also a recurring strategy suggested by international actors in all scenarios, although more in relation to scenarios 1 and 2. In these cases it is suggested to establish a proactive scientific collaboration programme attractive to industry, or to set up alliances of industry with research organisations and Universities also promoting entrepreneurial education in universities. These strategies can all be named as 'win-win' strategies aimed at exploiting the positive features of each scenario.

Furthermore, 'balancing' strategies were also identified by international actors repeating the need to find resources and support for research areas and practices that maybe neglected by the special research focus in each scenario. This mainly referred to curiosity-driven research and bottom-up approaches in themes' selection.

The strategies that the international actors identified as important already today reflect most of those noted above. Thus the claim that the international actors might be pushing a certain agenda is further supported. Strengthening international collaboration with emerging economies was already deemed necessary and the need was spotted in this regard for these economies to be proactive to connect to the EU, searching for interactions with European research and innovation initiatives. Touching on more immediate needs, harmonization of rules, indicators and means of evaluation for transnational RTDI cooperation was also noted.

The importance of the regional dimension was echoed in today's strategy to organize priority setting exercises to identify key knowledge components in each region, and to elaborate a 'smart specialisation' strategy, thus fostering collaboration-networks in some areas and adapting SMEs necessities to market. A similar strategy referred to the national level and the alignment of national priorities to the 'grand challenges' agenda responding to the increased policy attention given at the EU level. Reflecting the current attention to academia - industry collaboration, the development of innovation roadmaps was suggested but also promotion of mobility (both cross-sectoral and cross-country) by identify and disseminating 'good practices' regarding recruitment processes and mobility. International actors also stressed the importance of bringing science closer to society by linking RTDI strategies with future studies, promoting the access of society to these works and promoting creativity beyond traditional knowledge borders. Today's strategies of international actors also included measures to deal with open access such as creating incentives for libraries to provide access to scientific knowledge as well as standardizing and digitalizing access to scientific data.

The maps show how strongly a global ERA is considered important in the definition of international actors' strategies. This is especially relevant as for the necessity of promoting researchers' mobility in scenario 1. We can also observe that regional actions would be principally planned in scenario 2, thus somehow replicating EC smart specialisation strategies.

The ERA Strategy Map of **International Actors**
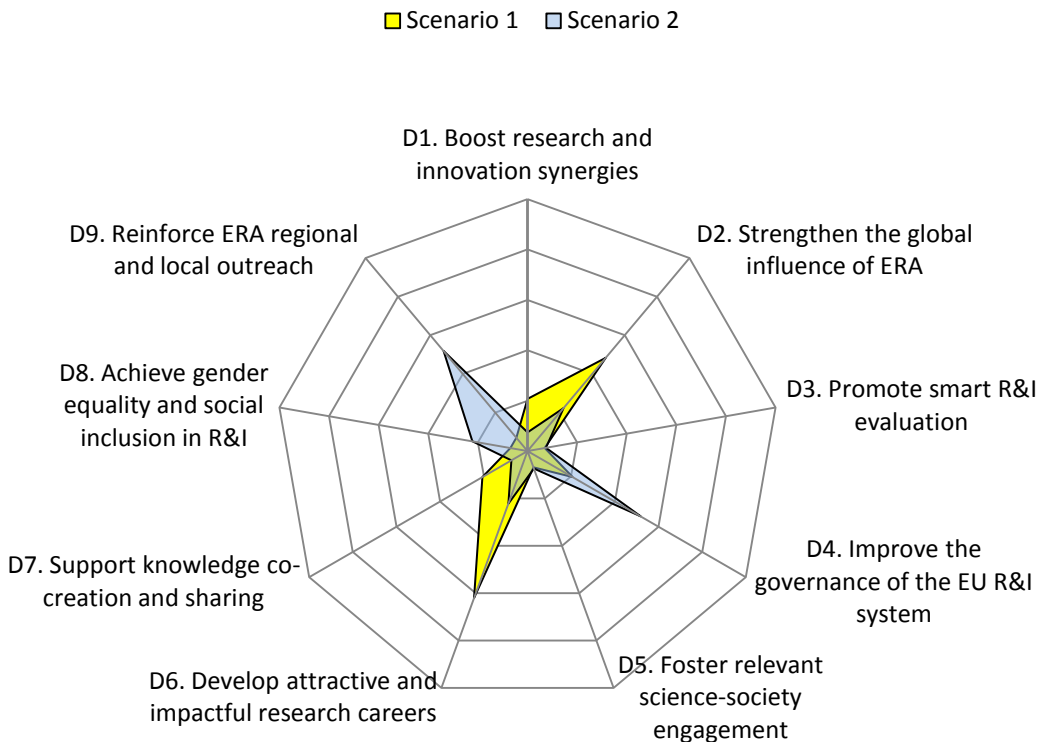
☐ Scenario 1   ☐ Scenario 2

The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

☐ Scenario 3   ☐ Scenario 4
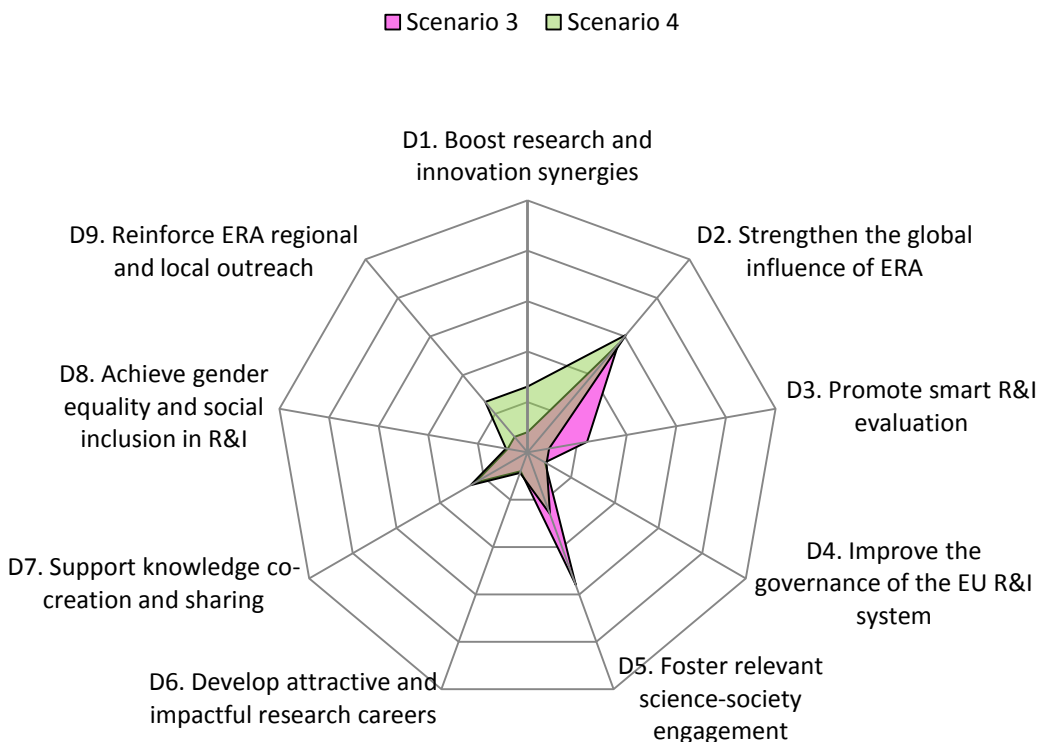
The diagram represents, per scenario, the proportion of strategies generated by each dimension (scale max 50%)

5.   Final remarks

5.1.   Reflections on ERA dynamics

5.1.1.   Reflections on a firm dominated R&D landscape, public de-investment

The main expectation behind this scenario is one in which research and innovation serve to boost competitiveness in Europe and thus contribute directly to an attractive area for investment and growth. As seen above, this scenario is not preferred by any of the stakeholders. The *main* strategic reactions of stakeholders, when confronted with this undesired scenario, are threefold. First, there is niche creation, funding agencies and to a lesser extent research organisation would try to preserve space and opportunities for funding and conducting fundamental research and research that is primarily driven by societal needs and the quest to find solutions, rather than the market considerations of large companies. For that to happen, there would be an attempt to mobilise societal actors (philanthropy) to fill a gap that is left by a pull out of public funds for research. Second, some actors, especially Universities, would react opportunistically, that is they would further focus on the Third Mission and on cooperation with industry, leading to a fierce competition for industrial funds or research, and an adjustment of research topics and fields towards the needs of industry. Related to this, a third strategy would be to adjust teaching in Universities to prepare graduates, especially high level scientists, even more towards solution and market orientation and employability in industry, as academic careers would be seen as less attractive and research opportunities would more and more shift to industry. All in all the likely strategic reactions of stakeholders should ERA develop towards dominated by global industrial interests, could lead to a re-enforcing dynamic towards more industry orientation in academia – and policy - that then would create a re-enforcing cycle in a direction that is actually not desired by anyone. While Europe presently is not characterised by too much industrial R&D, rather the contrary, it is nevertheless important to realise what kinds of dynamics would unfold should the public sector divest considerably in years to come and rely too heavily on industrial R&D to pick up.

5.1.2.   Reflections on policy and funding focused on challenges

In this scenario, which is seen by many stakeholders as a positive one in principle, the overriding trend would be towards linking and joining up capabilities. Stakeholders realise the need for joining forces as the definition of research programme would start with the need to find solutions for concrete problems related to the societal challenges in order to tackle large scale problems. Thus, firms, policy makers and funders would involve societal actors much more in their policies and activities: Universities and industry would create larger, longer term platforms around challenges, supported by policy makers who would support the development of challenge oriented clusters. In line with this, funding and research would become more multi-disciplinary, whereby the need to involve citizens in research ("transdisciplinary research") is recognised, but stakeholder would struggle to find proper means to actually implement this citizen-oriented paradigm. The main concern for most stakeholders in this scenario is how and by whom the challenges are actually defined. If challenges determine the structure and process of research across Europe, great care would have to be taken to define processes that are seen as legitimate and effective in defining challenges. Despite its general desirability, stakeholders also see two worrying consequences in this scenario. One is the very high coordination costs because of the overall strategic turn towards more clustering and cooperation and because of the need to organise the definition of challenges at and between different levels. The second challenge, which is cross cutting all scenarios but especially relevant here, is the stress on basic research and education in basic research, as research activities are mainly funded for and assessed against their contribution to problem solving.

5.1.3.   Reflections on a possible focus on local solutions and human wellbeing

The main rationale for those stakeholders who see this scenario as attractive is the expectations that European research would not only serve the needs of individuals much more directly, but that the involvement of citizens would reinvigorate Europe with a new dynamisms, a new energy in research and innovation. The major strategic response would be to try to better connect societal actors with funders,

with policy makers and ultimately with researchers, as most activity would revolve around the involvement of and consequences for citizens. This would lead to the development of citizen science and transdisciplinary funding approaches, whereby funding would be linked with the condition to include citizens in the actual definition and implementation of the research programme and citizens would become a major role in the ex ante and ex post review of research proposals. The dilemma in this development, however, would be that the more the involvement of citizens is local, dispersed and ad hoc, the less transparent the research and research definition process might become, with pressures on accountability and legitimacy, as strong, well organised societal actors may capture agendas. The scenario with the most immediate involvement of citizens would then, ironically, need new forms of governance that preserves accountability and legitimacy while allowing localised, direct science-society interaction in a large scale.

5.1.4. Reflections on sustainability as a leading challenge driven by experts

In a scenario I which the defining problem is sustainability and the agenda is driven by experts mainly, the main strategic reactions for industry, policy makers, funders and research organisations, is the focus on and alignment around those core disciplines and sectors that are seen to contribute most t the sustainability agenda. At the same time, as the agendas are driven largely by experts, strategic action would also include attempts to influence the expert debate as a means to secure research funding and broader influence in the system. This is very similar to the challenge orientation in scenario 2, however, it is much more limited to a set of experts, rather than a broader definition of challenges with various stakeholder groups. Therefore, the main common threat perception in this scenario is the importance of how the sustainability problem is defined and how the process of this definition, which is expert driven, can ultimately be controlled democratically (access, transparency, accountability). The dilemma in this scenario area again is similar to the challenge scenario, but intensified. A strong focus on sustainability would marginalise a number of disciplines, technologies and sectors. And given the need for the Higher Education Sector to follow suit, we would see a similar development as in scenario 1, whereby the academic education would be focusing not on industrial needs, but a selected societal problem, sustainability. In the long run, this could severely limit the readiness of the research system to tackle other challenges and proceed on research lines in unrelated areas.

5.2. Implications of R&I stakeholders' strategies for the future of ERA

By way of concluding our ERA Strategy map, we take a step back and reflect upon the overall big picture of stakeholder reactions to the scenarios – and what they mean for the steering of the future of ERA.

This allows us to understand two things. First, it gives us an idea about how desirable scenarios are for the different stakeholder groups. Second, and more important, by looking at the strategic reactions towards each of the scenarios across all stakeholder groups we can identify how stakeholders would respond and take advantage of the four scenarios. This results in a number of interesting findings. We have seen different types of reactions:

(1) actors intensify or adopt their existing strategic orientation in those *scenarios* that they *endorse* and that play to their existing strengths and preferences,

(2) actors develop *coping mechanisms* in *scenarios* they do *not prefer,* by a) adapting the definition of their interests and subsequent action (changing partly their roles and identities in the system), b) creating and occupying specific niches or by c) developing counter-strategies to mitigate against what they see as negative consequences of a specific scenario.

The interesting observation out of this big picture exercise is that these strategic reactions for each scenario result in a number of tensions and dilemmas, often leading to what – from a stakeholder perspective – is a vicious circle of re-enforcing dynamics towards undesired scenarios once such a scenario is emerging and strategic actions are taken. These insights into the dynamic relations between different strategic responses and scenario pathways offer some important lessons in terms of understanding the emergence of path dependencies of ERA which might create re-enforcing dynamics that can easily spiral out of control – regardless of how desirable they are for different stakeholder groups.

The combination of strategy with desirability has also taught us a number of lessons when we think of and co-construct a future ERA. First, we have seen basic dynamics and possible trajectories as a consequence of directions we discuss today. The big picture view that we have taken has also demonstrated what it could mean to move toward a specific future. Furthermore, we have seen that strategic reactions of stakeholders would reinforce each other in ways that may result in all sorts of unintended and unexpected consequences. The industry dominated scenario, to take the most obvious example first, is not desired, but once Europe would go down the road of severe reduction of public investment in research, all sorts of adjustment strategies may then lead to a world that would not be able to sustain the necessary fundamental and blue sky research and the societal challenge orientation. Equally, a very strong focus on challenge orientation, or even the focus on once challenge (sustainability) would create various governance challenges and would, through the combination of adjustment strategies, potentially hollow out the variety of research systems in Europe. A drive towards a much more radical involvement of citizens at the local level would, ironically, lead to enormous challenges for the democratic control of research activities.

All this is not to downplay the positive effects of re-adjustments of pathways for the future of ERA. But it shows that all discourse on desired futures for ERA need to take into account the strategic reactions of stakeholders and what they mean for systems over time. This is maybe the main lesson of a scenario approach of VERA, to confront ourselves not only with the desirability of different futures, but to contemplate what it actually would mean if the system with all its stakeholders would adjust their strategies in order to benefit from those futures. As a consequence, any ERA discourse also needs to reflect on the downsides that result from the adjustment strategies of all actors involved in the long run.

Annexes

Annexe 01: List of stakeholders engaged in the VERA Strategic Debates

Surname	Name	Country	Representative	Strategic Debate 1	Strategic Debate 2
Agrafioti	Ino	France	Academia	Focus Group	
Ahlqvist	Toni	Finland	WP5 team	Focus Group	
Alexandrova	Maria	Bulgaria	Industry	Focus Group	
Amanatidou	Effie	UK	WP5 team	Focus Group	Symposium
Azevedo	Catarina	Portugal	Industry	Focus Group	Symposium
Bade-Strøm	Tobias	Norway	Policymakers	Focus Group	
Badík	Roman	Czech rep.	ERA instruments	Focus Group	
Bärenreuter	Christoph	Austria	Research funders	Focus Group	Symposium
Bellavista	Joan	Spain	Policymakers	Focus Group	
Beltrami	Georgio	Italy	Policymakers	Focus Group	Symposium
Bin	Adriana	Brazil	International	Focus Group	
Bjornshauge	Lars	Denmark	Industry		Symposium
Bustos	Pablo	Chile	International	Focus Group	
Butkus	Eugenijus	Latvia	Research funders	Focus Group	
Candemir	Basak	UK	Policymakers	Focus Group	
Carl	Daniela	UK	Society	Focus Group	
Casingena Harper	Jennifer	Malta	Academia		Symposium
Chernyavskaya	Tatiana	UNIDO	International	Focus Group	
Cox	Debbie	UK	WP5 team	Focus Group	Symposium
Daimer	Stephanie	Germany	WP5 team	Focus Group	Symposium
deChevingé	Suzanne	France	Society	Focus Group	
Dębkowska	Katarzyna	Poland	Academia		Symposium
Dettenhofer	Markus	Czech rep.	ERA instruments	Focus Group	
Doussineau	Mathieu	Spain	WP5 team	Focus Group	
Edler	Jakob	UK	WP5 team	Focus Group	Symposium
Ejdys	Joanna	Poland	Academia	Focus Group	
Ermida	Valdir	Brazil	International		Symposium
Fairclough	Isabela	UK	Academia	Focus Group	
Feldhoff	Silke	Germany	WP5 team	Focus Group	
Fernandez Zubieta	Ana	Spain	ERA instruments	Focus Group	
Ferrer	Jose Maria	Spain	Industry	Focus Group	
Franke	Jan	Germany	Policymakers	Focus Group	
Gamlen	Phil	UK	Academia	Focus Group	
Gheorgiu	Radu	Romania	WP5 team	Focus Group (Pilot)	
Giesecke	Susanne	Austria	WP5 team	Focus Group	Symposium
Gomez Valenzuela	Victor	Dominican Rep.	International		Symposium
Gøtke	Niels	Denmark	Research funders	Focus Group	
Griessler	Erich	Austria	Society	Focus Group	
Grimm	Andrea	Germany	Policymakers	Focus Group	
Guimaraes	Rui	Portugal	Academia	Focus Group	

ERA Strategy Map

Surname	Name	Country	Representative	Strategic Debate 1	Strategic Debate 2
Haegeman	Karel	Spain	WP5 team	Focus Group	Symposium
Hassinen	Saara	Finland	Industry	Focus Group	
Havas	Attila	Hungary	Academia		Symposium
Helgenberger	Sebastian	Austria	Society	Focus Group	
Hesping	Sandra	Germany	ERA instruments	Focus Group	Symposium
Iapadre	Lelio	Italy	ERA instruments	Focus Group	Symposium
Jorge	Miguel	Portugal	Academia		Symposium
Keet	Peter	Netherlands	Policymakers	Focus Group	
Kergroach	Sandrine	France	International		Symposium
Klotz	Elisabeth	Germany	WP5 team	Focus Group	
Kocińska	Ewa	Poland	Industry	Focus Group	
Köhler	Mechthild	Germany	Research funders	Focus Group	
Koivula	Minna	Finland	Industry	Focus Group	
Konttinen	Jari	Finland	Industry	Focus Group	
Kozłowski	Jan	Poland	Policymakers	Focus Group	
Kuhlman	Stephan	Netherlands	WP5 team	Focus Group (Pilot)	
Kurochkin	Gleb	Russia	International	Focus Group	
Kuster	Stephan	Germany	Research funders	Focus Group	
Labra	Romilio	Chile	International	Focus Group	
Laredo	Philippe	France	WP5 team	Focus Group (Pilot)	
Leijten	Jos	Netherlands	Industry		Symposium
Leinonen	Anna	Finland	WP5 team	Focus Group	
Leon	Gonzalo	Spain	Research funders	Focus Group	Symposium
Loikkanen	Torsti	Finland	WP5 team	Focus Group	Symposium
LulewiczSas	Agata	Poland	Academia		Symposium
Maes	Katrien	Belgium	Academia	Focus Group	
Mango	Carlo	Italy	Academia	Focus Group	
Marinelli	Elisabetta	Spain	WP5 team	Focus Group	
Martinez	Inazio	Spain	ERA instruments	Focus Group	
McCormick	Ian	UK	ERA instruments	Focus Group	
Merida Martin	Fernando	Spain	Policymakers	Focus Group	
Meyer	Susanne	Austria	ERA instruments	Focus Group	
Midtgaard	Thomas	Denmark	ERA instruments		Symposium
Mienert	Marion	Germany	Research funders	Focus Group	
Migueis	Ricardo	Portugal	ERA instruments	Focus Group	
Miles	Ian	UK	Academia		Symposium
Misiewicz	Malgorzata	Poland	Policymakers	Focus Group	Symposium
Molas	Jordi	Spain	WP5 team	Focus Group (Pilot)	Symposium
Moretti	Pier Francesco	Italy	ERA instruments	Focus Group	
Morgen	Henrik	Denmark	ERA instruments	Focus Group	
Mussi	Philippe	France	ERA instruments	Focus Group	
Mustonen	Riita	Finland	Academia	Focus Group	Symposium
Ormala	Erkki	Finland	Industry	Focus Group	

ERA Strategy Map

Surname	Name	Country	Representative	Strategic Debate 1	Strategic Debate 2
Ordonez Matamoros	Gonzalo	Netherlands	WP5 team	Focus Group (Pilot)	
Papaioannou	Skevos	Greece	Society	Focus Group	
Parys	Julia	Austria	WP5 team	Focus Group	
Pelkonen	Antti	Finland	WP5 team	Focus Group	
Petit	Maxime	Belgium	Academia		Symposium
Pinto	Vicente	Portugal	Policymakers	Focus Group	Symposium
PlaterZyberk	Anna	Poland	Research funders	Focus Group	
Plouin	Jacques	France	International	Focus Group	
Pollitzer	Elizabeth	UK	Society		Symposium
Popper	Monika	Poland	Industry		Symposium
Popper	Rafael	UK	WP5 team	Focus Group	Symposium
Radicev	Slobodan	Serbia	Academia	Focus Group	
Razzanelli	Matteo	Italy	ERA instruments		Symposium
Remøe	Svend Otto	Norway	Research funders	Focus Group	Symposium
Robison	Douglas	France	WP5 team	Focus Group (Pilot)	
Salles	Sergio	Brazil	International	Focus Group	
Sancho Reinoso	Alexis	Austria	Society	Focus Group	
Scapolo	Fabiana	Belgium	ERA instruments	Focus Group	
Schaich	Christian	Germany	Research funders	Focus Group	
Schelvis	Patrick	Netherlands	Policymakers	Focus Group	
Schoen	Antoine	France	WP5 team	Focus Group (Pilot)	
Simmons	Brooke	UK	Society	Focus Group	Symposium
Smith	John	Belgium	Academia	Focus Group	Symposium
Steenstra	Daniel	UK	Industry	Focus Group	
Stegmaier	Peter	Netherlands	WP5 team		Symposium
Taeyoung	Shin	Taiwan	WP5 team		Symposium
Tebar	Juan Antonio	Spain	ERA instruments	Focus Group	
Tenberg	Natalie	Germany	WP5 team	Focus Group	
Teufel	Benjamin	Germany	WP5 team	Focus Group (Pilot)	
Theis	Dietmar	Germany	Industry	Focus Group	Symposium
Toivonen	Leena	Finland	Academia	Focus Group	
Tzanakou	Charikleia	UK	Academia	Focus Group	
vanRij	Victor	Netherlands	Academia		Symposium
Velasco	Guillermo	UK	WP5 team	Focus Group	Symposium
Warnke	Philine	Germany	WP5 team	Focus Group	
Wenink	Jolien	Netherlands	ERA instruments	Focus Group	
Wilkens	Andre	Germany	Research funders	Focus Group	
Wolfmayr	Franz	Austria	Society	Focus Group	
Woodward	Alison	Belgium	Society	Focus Group	Symposium
Wu	Hsuan-Yi	Taiwan	International		Symposium

Annexe 02: List of stakeholders' organisations involved in SD1 and SD2

Organisations
Aalto University Business School
AINIA, Spain
Astroparticle Physics European Consortium (APPEC)
Austrian Institute of Technology (AIT)
Austrian Science Fund (FWF)
Bavaria's regional innovation and research agency BayFOR
Bicocca University of Milan
BOKU Centre for Global Change and Sustainability
British Consulate-General Istanbul
Center for Gender Studies and Diversity Research
Central European Institute of Technology (CEITEC)- Czech Republic
Centre for Industrial Technological Development (CDTI)
Centre for Technology Innovation of the Technical University of Madrid
Centre National de la Recherche Scientifique
Confederation of Finnish Industries
European Association of Service Providers for Persons with Disabilities
European Commission Directorate General Joint Research Centre (JRC)
European Forest Institute Regional Office for the Mediterranean (EFIMED)
European Industrial Research Management Association
European Universities Association
Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI), Romania
Falmouth University
Fondazione Cariplo, Italy
Foundation for Science and Technology (FCT)
Fraunhofer Institute for Systems and Innovation Research
Futures Diamond Ltd
German Aerospace Center
German Federal Ministry of Education and Research
German Research Foundation (DFG)
Hungarian Academy of Sciences
INGENIO
Innovations Factory Ltd
INOVA Group
INRIA
Institute for Advanced Studies, Austria
Institute for European Studies, Vrije Universiteit Brussel
Institute for Prospective Technological Studies (JRC-IPTS)
Institute of Agricultural Research of Chile (INIA)
Institute of Political Science of Louvain-Europe
Institute on Research, Innovation and Society (IFRIS)
InterAlign Organisation Ltd
Joint Research Centre-IPTS
KemiraOy
League of European Research Universities
Malta Council for Science and Technology
Manchester Business School
Manchester Institute of Innovation Research (MIoIR)
Marie Curie Fellows Association

Mercator Centre Berlin

Ministry of Economic Affairs - Netherlands

Mission of Chile to the EU

Municipality of Espinho

National Science Centre- Poland

National Taiwan University

Netherlands house for Education and Research

NordForsk

Organisation for Economic Co-operation and Development (OECD)

Organisation for Health Research and Development, Netherlands- ZonMw

Permanent Representation of Italy to the EU

Permanent Representation of Poland to the EU

Poznan Science and Technology Park,

Regional Studies Association, UK

Research at the Austrian Ministry of Transport, Innovation and Technology (BMVIT)

Research Council of Norway

Royal Academy of Engineering, UK

Science and Technology Policy Institute of Taiwan (STEPI)

Science Europe

Siemens Research

Spanish Ministry for economy and Competitiveness (MINECO)

Spanish National Research Council (IESA-CSIC)

SPARC Europe

Strategic Centre for Science, Technology and Innovation in Health and Well-being (SalWe)

Tampere University

Technical Research Centre of Finland (VTT)

Technical University Munich

Technical University of Bialystok

United Nations Educational, Scientific and Cultural Organization (UNESCO)

United Nations Industrial Development Organization (UNIDO)

Universite de Marne la Vallee, IFRIS

University of Campinas

University of Central Lancashire

University of Crete

University of L'Aquila

University of Manchester

University of Natural Resources and Life Sciences, Austria

University of Novi Sad, Serbia

University of Oxford

University of Strathclyde

University of Technology, Poland

University of Twente

University of Warwick

Vilnius University

Zentrumfuer Soziale Innovation (ZSI)

Annexe 03: Agenda of the VERA Strategic Debate 1 (VERA Focus Groups)

The VERA Focus Groups

Strategies for European Research & Innovation Futures

Paris (Pilot) – Vienna – Manchester – Helsinki – Berlin – Barcelona (x2) – Brussels

Five tasks of the 7 Focus Groups Agenda and Pilot Workshop

T1	**Task 1: Scenario-specific opportunities and risks ('Impact/Bias analysis')** • *Opportunities and threats for their organisation* • *Opportunities and threats for their national RTDI system*

Short break + Refreshments

T2	**Task 2: Stakeholders strategies in the context of each scenario <u>by 2030</u>** • *New/emerging strategies of the actor* • *Re-emerging strategies of the actor* • *Discontinuing strategies of the actor* • *Continuing strategies of the actor*

Networking Lunch

T3	**Task 3: Stakeholders' assessment of ERA Objectives+ (for each ERA Priority Area)** • **Effectiveness in national research systems** • Transnational co-operation and competition • Open labour market for researchers • Knowledge circulation • Gender • + Additional objectives from Actors involved in ERA Instruments
T4	**Task 4a: Mapping stakeholders' strategies against ERA Objectives+**
T5	**Task 5: Tweet-café on <u>Today's recommendations</u> vis-à-vis ERA Objectives+**

Q&A + Conclusions

Annexe 04: Agenda of the Strategic Debate 2 (VERA Symposium)

The VERA Symposium

Strategies for European Research & Innovation Futures

Manchester, UK

Five building blocks of Day 1 Agenda: Back <u>from</u> the Future

B1	**Welcoming remarks** (Jakob Edler)
	Introduction to the VERA Symposium: Day 1 Agenda (Rafael Popper)
	VERA: Positioning the project and the scenario approach (Stephanie Daimer)
B2	**The VERA Scenario Worlds** (Animated Video)
	Key features of European STI futures: A VERA Team Backcast (Jordi Molas)
	Key features of European STI futures: A Stakeholders Feedback (Rafael Popper)
	Synthesis of Key features of ERA futures (Stephanie Daimer)

Relaxing Cup of *'Café con Leche'*

B3	**Stakeholders' strategies and Strategic Debate on VERA Scenarios** • **Private Knowledge – Global Markets** (Jakob Edler) • **Societal Challenges – Joint Action** (Rafael Popper) • **Solutions apart – Local is beautiful** (Effie Amanatidou) • **Times of Crises – Experts at the Wheel** (Guillermo Velasco)

Networking Lunch

B4	**Evolving Dimensions of the European R&I Landscape** (Rafael Popper)		
	Stakeholders Feedback on ERA Dimensions + BackcasTEA Time dynamics *		
B5	BackcasTEA Time* <u>Earl Grey</u> • **Governance** • **Researchers** • **Smart evaluation**	BackcasTEA Time* <u>Lemon & Ginger</u> • **Global & EU** • **Research & innovation** • **Regional & local**	BackcasTEA Time* <u>Mint</u> • **Knowledge** • **Science-Society** • **Gender & equality**
	Open Debate on 'Back from the Future' Policy Issues + Overview of Day 2 dynamics *		

Three building blocks of Day 2 Agenda: Back <u>to</u> the Future

B1	**Introduction to the VERA Symposium: Day 2 Agenda** (Jakob Edler)		
	BackcasTEA Time results + PrioriTEA Time dynamics (Rafael Popper)		
B2	PrioriTEA Time* <u>English B'fast</u> • **Governance** • **Researchers** • **Smart evaluation**	PrioriTEA Time* <u>Fruit Punch</u> • **Global & EU** • **Research & innovation** • **Regional & local**	PrioriTEA Time* <u>CO2 Decaf</u> • **Knowledge** • **Science-Society** • **Gender & equality**
	Open Debate on Stakeholders' Policy Priorities		
B3	**'Back to the Future': Open debate on medium-to-long-term priorities & transformations**		
	Closing Remarks (Stephanie Daimer)		

Annexe 05: Selected memories from the ERA Focus groups

VERA FG Society (Vienna, January 2014)

VERA FG Academia (Manchester, February 2014)

VERA FG Industry (Helsinki, April 2014)

VERA FG Research funders (Berlin, April 2014)

VERA FG ERA Instruments (Barcelona, May 2014)

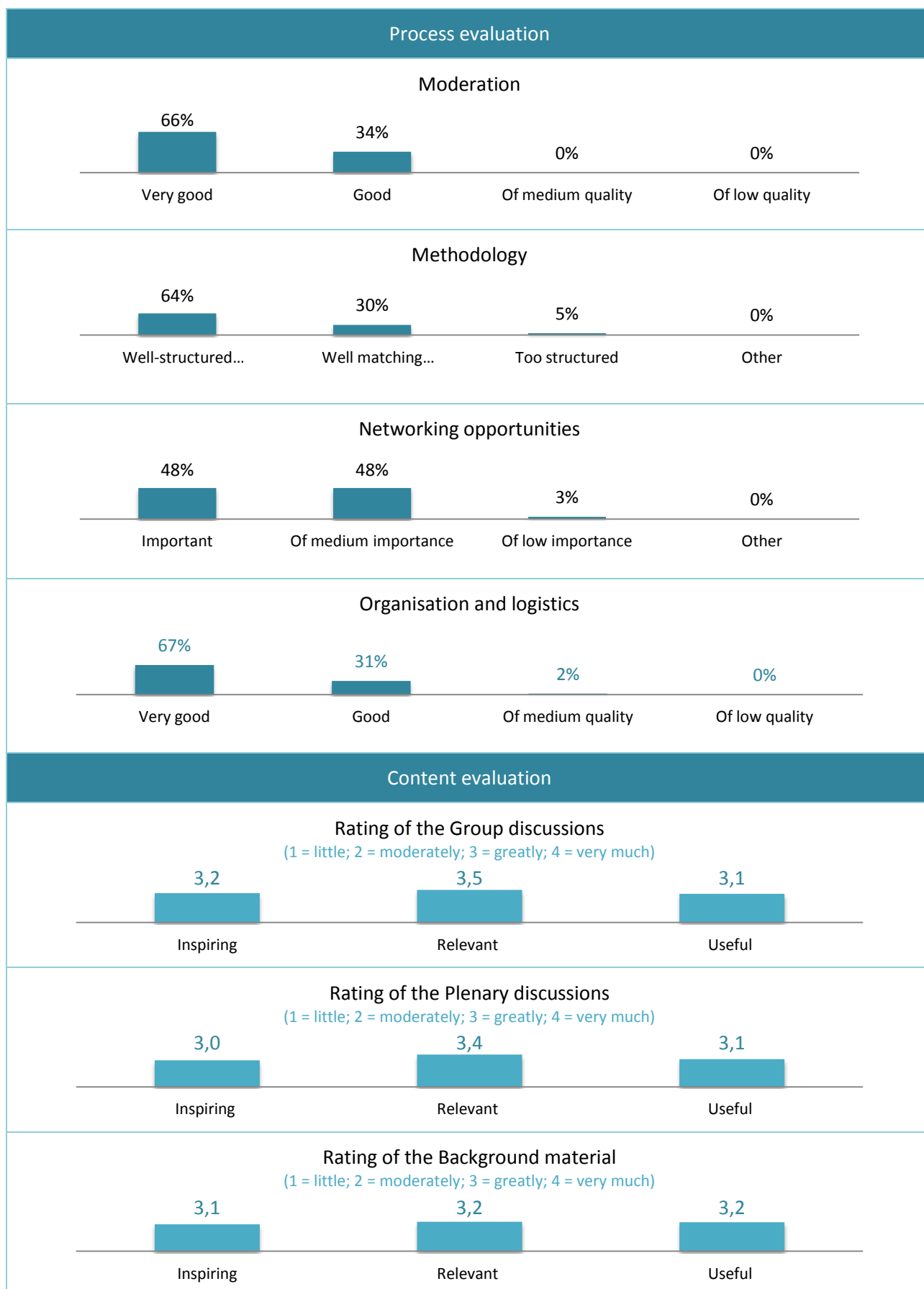VERA FG Policymakers (Barcelona, May 2014)

VERA FG International (Brussels, June 2014)

VERA Symposium (Manchester, October 2014)

Annexe 06: Stakeholders' evaluation of the seven Focus Groups

Process evaluation

Moderation

66%	34%	0%	0%
Very good	Good	Of medium quality	Of low quality

Methodology

64%	30%	5%	0%
Well-structured…	Well matching…	Too structured	Other

Networking opportunities

48%	48%	3%	0%
Important	Of medium importance	Of low importance	Other

Organisation and logistics

67%	31%	2%	0%
Very good	Good	Of medium quality	Of low quality

Content evaluation

Rating of the Group discussions
(1 = little; 2 = moderately; 3 = greatly; 4 = very much)

3,2	3,5	3,1
Inspiring	Relevant	Useful

Rating of the Plenary discussions
(1 = little; 2 = moderately; 3 = greatly; 4 = very much)

3,0	3,4	3,1
Inspiring	Relevant	Useful

Rating of the Background material
(1 = little; 2 = moderately; 3 = greatly; 4 = very much)

3,1	3,2	3,2
Inspiring	Relevant	Useful

Annexe 07: Stakeholders' feedback on SD1 and SD2 outcomes

"Thanks for the opportunity! Please find some comments below. Comments are personal, not necessarily a national position"

"Research and Innovation should be related indeed. So Innovation should be included in ERA as far as it is related to research. We need innovation elements to be included in research funding and in research agenda building, i.e. innovation driven research"

"We should not include general innovation funding, which would only dilute funding. It should be clear why and where Innovation funding has a European added value, because innovation is mainly developed locally"

"Boosting industry-academy cooperation is a very good recommendation. I would say the JTI's are in the lead here with substantial EU contribution"

"Although the ERA global perspective is important, the risk is that attention is diverted from the core mission of ERA, which is European cooperation (integration) of MS policies and funding"

"A cornerstone of the ERA agenda is to increase the effectiveness of national research systems in Europe, which includes improvement in policy making and implementation, growth in research investment and increased competition"

"The core is to consider the Research System at European level and to see how we can improve the functioning of the system as a whole by a better orchestration of the national systems, programmes, instruments and activities"

Peter Keet

Ministry of Economic Affairs - Department of Innovation and Knowledge

The Hague, Netherlands

"First of all, congratulations for the work, the VERA recommendations are very interesting"

I have chosen two recommendations to comment, that contribute to the ERA concept consolidation"

Comments on 'Broadening ERA into a European Research and Innovation Area'

"I firmly believe that this is a crucial element for ensuring long-term European competitiveness. It is true that today the emphasis on innovation constitutes a general policy trend in all European countries and, in fact, H2020 has addressed it (even if the term of ERA still refers to research). But H2020 is not enough. Nevertheless, both in terms of funding and instruments used, innovation is poorly covered in H2020 because many other factors influencing innovation success are not addressed: markets are still very far"

"The goal of 'broadening ERA' implies from my point of view the need to break the isolation between policy areas and citizen involvement"

"A broader ERA should affect the way that the exploitation of H2020 results are dealt with"

Comments on 'Developing a knowledge co-creation ecosystem'

"From my point of view, the consequences of this recommendation are in the core of the desirable transformation of the European innovation system structure"

"Unfortunately, the actors' fragmentation and weak stable and long-term links existing today in the EU are not well solved by current instruments"

"New approaches like EIT's 'knowledge and innovation communities' were created for this goal but their impact is still very low. We need to move from project-based actions to strategic partnerships where all actors could contribute (not only industry-led initiatives) by aligning their agendas"

"Clear stimuli at the institutional level are also needed to change priorities in public institutions to participate in these ecosystems."

"Furthermore, other actors outside the EU are also needed if we like to see an impact"

Prof. Gonzalo León

Vice President for Strategic Programmes

Director of the Centre for Technology Innovation- Technical University of Madrid

"First, let me say I really appreciated the efforts, approach and passion in this project I was involved in, thanks"

Comments on the EU R&I system governance

"Governance is the most structuring aspect of ERA but the most difficult to change. Top-down approach fails without any incentive (money). R&I system governance is inappropriate due to the average effect of the 'compromise' at national levels, so washing out regional needs/capacities and widening gaps between territories through concentration on national/EU commonalities"

"Coordination is usually approached between states, also in terms of funding instruments. Governance is therefore linked to funding instruments, regional dimension, Science in society. New modes of governance requires: fragmentation of the spatial scales (down to the individuals, total bottom-up approach) and coordination of these scales through enhanced connectivity"

Comments on Knowledge co-creation

"World is evolving towards user-manufacturers, high value of brain intensity jobs, decentralization of production, fast circulation of information. Knowledge co-creation is therefore linked to collaborative advantage in a world where open access to knowledge will be achieved maintaining neutrality of the infrastructures and truthfulness of information"

"Nevertheless, instead of 'alignment' I prefer indeed a 'strategic anarchy', where the system self-organizes towards the ultimate goal of tackling societal challenges with a 'shared value' approach and the public role is to create a friendly and free environment for knowledge creation and access"

Dr. Pier Francesco Moretti

Research policy officer

Permanent Representation to the European Union to support the Italian Presidency

"It was a pleasure to be involved in the very open and constructive discussions on the many issues of VERA" I scanned through the 38 recommendations (at level 2), which were pooled in 9 sections. It is not surprising that I feel that quite a number out of these 38 recommendations are relevant and important"

"I think that European research is challenged to provide an adequate balance between fundamental, blue-sky research and applied, market driven research. This is a formidable task – on one hand we need to stay competitive on global markets today and tomorrow, which justifies investment in the application oriented research. On the other hand we must also preserve fundamental research in all disciplines to protect and make progress in our human heritage and to create future innovations out of new grounds.

"Relevant and timely stimuli along the process from idea generation and selection to manufacturing, marketing, sales and after-sales are required to accelerate innovations. Basically, our global competitors in Asia and the United States don't have a better research or marketing, but they are faster in the implementation of their ideas. Shortening the time for commercialization of ideas is the most efficient source for future innovations and hence for future prosperity"

Prof. Dr. Dietmar Theis

Honorary Professor Technical University Munich

R&D Policy advisor of Siemens Board

"Combining recommendations about inclusion/diversity/gender (dimension 8) and the need to engage research in addressing societal issues in section (dimension 5) seems for stakeholders coming from feminist civil society and academia as an excellent way to address the shortcomings in the present framing of the European Research Area. Without the mobilization of the talent and ideas of the diverse intelligence in Europe in an atmosphere that encourages giving weight to issues of a sustainable and human future, the current resources present in the European Union will be squandered. It can only be hoped that the fine tuning proposed by the VERA will be followed with commitment".

Prof. Alison E. Woodward

Institute for European Studies

Department of Political Science, Vrije Universiteit Brussel

"Thanks for the invitation to comment on your comprehensive work. It was a pleasure to take part in the VERA workshop.

Comments on 'Strengthen the global influence of ERA'

"The competitiveness of ERA is measured on the global scale. The benefits of European integration are not self-contained they should be used for more strategic cooperation with third countries. Building on the work of the Strategic Forum for International Cooperation (SFIC) Member states and the Commission should work together closely to identify common interests and form an effective partnership vis-à-vis other nations".

Comments on 'Support knowledge co-creation and sharing'

"Knowledge co-creation is a dynamic driver for many aspects of ERA, especially regarding innovation. New electronic media and services fuel community-building, transparency, availability and synergies, and today's and tomorrow's digital natives in science and society will put them to the test. There will be more flexibility in funding, agenda-setting, data sourcing and peer review. Research systems should welcome this stimulus".

Andrea Grimm

EU-Bureau of the Federal Ministry for Education and Research

German Aerospace Center, Project Management Agency

European and International Cooperation

Selected comments from stakeholders after the VERA Focus Groups

"Simple and objective"

"Extremely enjoyable!"

"Next meeting in Tenerife!"

"Very fascinating discussions!"

"There were good networking opportunities"

"More attention to national priorities needed"

"Thank you. It was really enjoyable and useful!"

*"You should try to use more visuals and cartoons"**

"The composition of groups stimulated discussions"

*"It would be great to see the intermediate and final report"**

"Definitely entertaining! Please keep the momentum going!"

"The workshop was well-structured and interactive, dynamic"

"Overall, very engaging and interesting workshop. Thank you!"

"There are many challenges in bringing industry and research issues"

"Networking dinner was very relevant and useful in achieving its networking aims"

"I hope your efforts will continue and I, on behalf of my organisation, will be available to collaborate and support"

(*) The authors tried to address these comments in the preparation of this report by (a) including visualisations of the VERA Strategic Debates process and main results throughout the report, (b) using cartoons for the ERA key aspects and the policy bundles, and (c) sharing a draft of the chapter on *Participatory recommendations* (Section 3) with a selected group of VERA stakeholders to comment.

Annexe 08: Short description of the four VERA Scenarios

NOTE: The VERA team has produced four scenarios as part of the Work Package 3 activities led by the Fraunhofer Institute for Systems and Innovation Research in Germany. The VERA scenarios were used as 'food for thought' in the VERA Strategic Debates to stimulate stakeholder's thinking about policy options in several possible futures for ERA. For this reason, this annexe reproduces a short description of the VERA scenarios, which is also available together with a short video at http://www.eravisions.eu/scenarios

On scenarios and ERA's future

Scenarios are simplified constructs that highlight different images of what the 'thing we care for' could look like in the future. The idea is not to produce 'pragmatic' scenarios, but to offer the users of such scenarios contrasted visions of the future that will enrich the way they think about how to act 'today'. The thing we consider is 'research and innovation activities'. Furthermore we have a dual focus: *geographically*, we focus on European level R&I activities; *politically* we are interested in the governance of these activities. The four VERA scenarios play with transition processes and future worlds of today's European Research Area (ERA), considering drivers and events which ultimately might lead to "less" or "more" coordination and integration of research and innovation activities at European level. As these future worlds are in their character quite different from today's ERA, the notion of "ERA" does not appear in the scenario texts.

Key assumptions guiding all VERA scenarios

VERA scenarios are nested; that is, they are positioned within a global vision of Europe and of the world. In all exercises that deal with 'specific things', we have to take into account that the 'thing' that interests us is inserted in a wider context. The general trend in foresight analyses is to start from this global context, nesting the 'thing' within that context before presenting the different options we consider for it. A number of studies have, however, shown that specific 'things' can behave in similar ways, while being inserted in very different global scenarios of the future. We qualify our 'thing' – future Research and Innovation activities and governance in Europe – to be to a reasonable extent robust against global developments. Therefore we have made the choice to focus on the European R&I landscape per se, defining four very contrasted scenarios. Thus, we aimed at ensuring the internal coherence of each scenario. These scenarios take for granted three macro trends that are critical to explaining the landscape and the relative margins of manoeuvre of actors. We consider these trends to be present in all scenarios. In addition, we note that two drivers play a key role in the move towards one scenario or the other.

Three shared macro trends

1. Most foresight exercises insist about the existence of a multipolar world, where Europe is one pole and Asia or BRICS become a new rising pole. We fully assume this trend, and its assumption that we will witness the rise of new key countries in the global scene: the so-called 'dragons' (with Korea at the forefront), China and probably some of the other BRICS (Brazil, India, or even Indonesia). We still think that in this rebalancing Europe as an economic zone (or a market) will remain a major player. This means that we locate VERA scenarios in a persisting state of affairs where peace prevails at the global level.

2. We also endorse the view that the deepening of economic globalisation (goods, finance, IP and services) will continue into the future.

3. Whatever scenario prevails, climate change and global warming will become increasingly prevalent. The differences among scenarios lie in they way this challenge is addressed: how it handle in policy programming and used to justify resource allocations. Scenario 4 does indeed take it as the major driving force shaping the R&I landscape.

Two main drivers shaping the scenario logics

1. *The role of the public finance crisis* in scenario shaping. Our scenarios take account of one major issue: whether Europe is over the public finance crisis in 2020. We have built two scenarios that assume Europe has the financial ability to address proactively the 'societal challenges' it has identified: scenario 2 makes a balanced effort between different societal challenges, while scenario 4 concentrates on the ecological transition. The two other scenarios take place in a constrained environment for public expenditure: scenario 1 recognises it and gives economic actors a wide responsibility in shaping directions, while scenario 3 corresponds to a fragmented search for solutions and the rise of local and regional answers.

2. *The rationale for societal progress*. Scenarios 1 and 2 reflect none or incremental changes in the way societies define themselves. The paradigm of growth and creating jobs prevails. In scenario 2 this has some qualifications as the addressing of societal challenges becomes prominent. VERA scenarios 3 and 4 correspond to two types of transitions: towards new definitions of progress ("human well-being" and "sustainability") and correspondent RTDI governance. They represent transformative structural changes.

Scenario 1: Private Knowledge – Global Markets

The Driving Force: In this scenario, the **after-effects of the global financial crisis** of 2008 are still deeply felt. As a consequence, the variety of approaches to recovery has led to locked-in growing inequalities between countries and regions within the European Union. So, the recovery from the crisis, a new period of growth and the creation of jobs are **the thrust** driving political and private action. The value of research is mainly to serve the economy.

Policy concerns: Public policy is therefore mainly concerned with boosting competitiveness. The consolidation of public budgets remains a major constraint. Public funding for research is limited and concentrated on basic research and future emerging technologies (FET).

The Research and Innovation Landscape: The expenditure in research and innovation by companies and other private actors, in particular philanthropic organizations, amply outweighs public spending. Private actors are thus, de facto, able to define research priorities. The research landscape in Europe is mainly influenced by knowledge-intensive sectors that are concentrated in the stronger, globally interconnected regions. Here, research is being carried out as a specialized, globally distributed activity. Also, excellent science is located in science clusters with fewer and larger organizations, mainly universities, providing a cutting-edge science base. In fact, this scenario appears to be the only one where the excellence paradigm remains untouched.

European-level policies look quite different compared to 20 years ago. European Union bodies have established a regulatory framework supporting the innovation ecology with common structures for IP, standardization and public procurement. There are also coordinated approaches and collaborations among funding agencies, similar to the types of collaboration seen in the ERA-Nets, but more heterogeneous, involving national and regional public bodies and also NGOs. The number of states actually collaborating in such initiatives is rather small. Consequently, EU bodies have little to no power in setting research priorities or coordinate research funding.

Addressing Societal Challenges: The re-sectoralization of European policies hampers coordinated approaches to societal challenges. However, societal challenges can still be addressed in this scenario, thanks to the funding of philanthropic organizations, and public-private partnerships, or as the result of collective experiments bringing together concerned groups and local actors. Major concerns addressed are energy transition and health issues.

Europe in the world: International and global agreements about framework conditions, e.g. for IP or standardization, are pursued by the European institutions whenever perceived to be advantageous to the interests of European corporations.

Scenario 2: Societal Challenges – Joint Action

The sense of urgency has been **the driving force** of this scenario. Various causes are behind this sense of urgency, among them a shortage of energy provision, military conflict right on the borders of the European Union, and alarming developments as regards climate change or disease pandemics.

The thrust: To maintain the way of life in Europe, European States have become increasingly open to collective action. This is accompanied by **recovery from the 2008 financial crisis**. As Europe struggled over the years to emerge from that crisis, it has achieved a high degree of tax harmonization to battle against tax avoidance and tax optimization, particularly by large multinational firms.
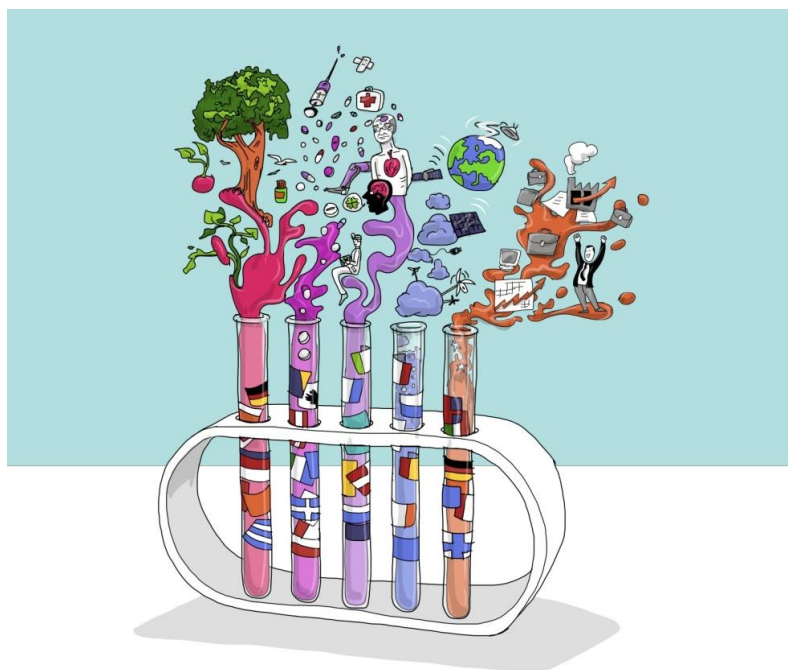
The political will for **Joint Action at European level** grew over the years and has crystallized in thematic cooperation to tackle societal challenges. Decisions about these collaborations were first made at the intergovernmental level (the Council), where the debate around societal challenges focused on economic considerations, mainly on how to boost industrial leadership. This resulted in a variety of thematic joint actions bringing together, not only national governments, but also "hot-spot" regions and knowledge hubs. However, as claims from political parties and NGOs became more insistent, a new institutional framework was installed for the identification and selection of societal challenges, which were to be addressed by joint European action. This framework rests upon legitimation processes under the aegis of the European Parliament. So, overall the European institutions have become key players: The major part of decisions about policy priorities and programming takes place between the Commission, the Council, and the Parliament.

The Research and Innovation Landscape: The Joint Actions emerge as large programmes with large public investments in research and development addressing societal challenges. NGOs and other civil society organizations contribute to the funding and performance of these programmes. The RTDI system in Europe offers various promising career prospects for researchers, including better opportunities for women. With the main **policy concern** focusing on **addressing societal challenges**, the publicly funded pursuit of frontier research becomes embedded into this paradigm. Programmes addressing Societal Challenges embrace Health issues (e.g. pandemics, prevention), the security and sustainability of energy provision, and climate change.

Europe in the world: European-level networks and programmes are working towards linking up with or building new international alliances where the challenges need to be addressed at global level.

Scenario 3: Solutions apart – Local is beautiful

The driving force: Major political scandals, in particular data scandals, and the inability of policy to cope with the **lasting financial crises** have spawned a rapid growth of mistrust in higher level policy making. This has been speeded up by social movements supported by widespread internet use.

The thrust: The inability to collaborate leads to a local handling of societal challenges. The major **policy concern** is to address challenges (even when perceived to be global) in a manner which benefits the municipality and its citizens.

The societal paradigm which influences the attitudes towards science and technology is about progress in lifestyle and self-optimisation rather than problem-oriented solutions. The attributes of the European lifestyle are valued elsewhere in the world with non-European firms and organizations settling in Europe in order to both learn and benefit from the local quality-of-life attributes. Socio-economic value creation indicators are extended to include a quality of life index (e.g. including gender equality, personal-data privacy and a contentment-quotient). With the diverging societal rationales between Europe and the rest of the world, Europe also becomes a desired place to settle.

Research and innovation activities have a profoundly different function compared to 20 years earlier: Scientific knowledge is broadly seen as just one among many sources of knowledge, including practitioner, lay and indigenous, that can contribute to the development of local solutions. The open, heterogeneous research and innovation landscape provides opportunities for close links between scientists and society around micro/regional level activities. Citizens invest in such activities and take the initiative to become involved at the micro-level. Issues addressed by these activities (as they are in fact not being debated as **societal challenges**) are smart cities, local energy production, public health and prevention, or local food production and distribution systems.

The role of **European-level policies** is substantially re-defined to providing infrastructures as well as platforms for exchange of good practice and for learning.

Europe sees its **role in the world** in a Switzerland-type manner: having its own agenda and reluctant to intervene in any matter that is not of direct concern, and only developing ad-hoc relations when judged useful.

Scenario 4: Times of Crises – Experts at the Wheel

The driving force of this scenario is the onset of dramatic climate catastrophes with important effects on the environment and eventually our health and way of life. These disruptive forces are levers of deep societal transformation.

The thrust: As a consequence, the growth paradigm is completely replaced by a new sense of "deep sustainability" on which all economic, political and societal activities are based. The full **recovery from the economic and financial crises** of the early years of the Century supports these developments. Mitigation and adaptation to the effects of the crises are the main **policy concerns**. Experts working in understanding environmental phenomena and anticipating its dynamics gain substantial power and responsibility in policy processes, as policies rely strongly on scientifically produced evidence.

At the same time, the **research and innovation landscape** has become more diverse, opening up to cross-disciplinary collaborations and unconventional initiatives to collaborate with societal actors. Large research programmes are in place to boost mitigation and adaptation from different angles – ranging from breakthrough-driven research to speeding up the innovation process. As sustainability research evolves into a mainstream activity, comparable to the widespread acquisition of management skills decades before, the researcher base in sustainability-related fields expands significantly, integrating larger numbers of women, retired persons, and those living in remote areas.

Addressing Societal Challenges: Under the overarching goal of mitigation and adaptation to the effects of the climate crisis, several other challenges are addressed, including urban management, energy provision, new forms of housing and mobility, food production and circulation and many more.

European-level policies: Facing the climate crisis, a political choice was made to delegate the strategy and programming of mitigation and adaptation efforts to the European level, where the involvement of experts in the policy processes is managed by re-vitalizing the Comitology system within the European Commission.

Europe in the world: The sustainability rationale is adopted around the globe, but at different speeds and in a variety of ways. Numerous collaborations are in place for joint action, and Europe operates a large aid programme for those regions lagging behind.

Annexe 09: List of ERA priorities and aspects supporting VERA Focus Groups

ERA 2013 priorities	ERA aspects	Highlighted issues
1 Increasing the effectiveness of national research systems	ERA 01.1 Ensure coherent and stable public research funding	• Budget cuts are mostly affecting research performing organisations with short-term consequences, as the reductions in researchers' salary or temporary interruptions of R&D support measures. However, budget cuts and interruptions may have long-term implications in some countries.
	ERA 02.1 Promote project and performance based research funding	• At least 21 Member States have provisions to link part of, or all their institutional funding with competitive calls for projects and research performance in order to increase the efficiency and effectiveness in public spending.
	ERA 03.1 Define national research and innovation strategies	• In 21 Member States a strategy for R&D as well as innovation has been adopted. In some cases they are including measures which address the objectives of the ERA priorities.
	ERA 04.1 Use peer review criteria /ex-ante evaluation	• The majority of Member States increasingly apply the core principles of international peer review, i.e. work evaluated by professionals of analogous competence to the author. Some Member States also use foreign peer reviewers to seek greater independence in evaluations, or to raise domestic standards.
	ERA 05.1 Develop Smart Specialisation strategies	• Smart specialisation is aimed to boost regional innovation, in order to achieve economic growth and prosperity, by enabling regions to focus on their own strengths. • In dealing with Grand Challenges going beyond national borders, trans-national coordination and policies are needed. Smart Specialisation is a mean to ensure an entry point in this process while also safeguarding local interests.
2 Optimising transnational co-operation and competition	ERA 06.2 Foster transnational cooperation	• Transnational cooperation is increasingly supported by the EU R&D Framework Programmes. Dealing with Grand Challenges requires coordination at multiple levels, joining of efforts and effective use of resources.
	ERA 07.2 Implement compatible rules for transnational cooperation	• Compatible national funding rules to make transnational cooperation more effective are implemented by at least nine Member States. It would make more efficient the use of EC funding instruments.
	ERA 08.2 Harmonise access to Research infrastructures	• The conditions for cross-border access to research infrastructures are not always harmonised amongst Member States. This makes trans-national collaboration ineffective while also causing fragmentation and duplications of research efforts.
3 Promoting an open labour market for researchers	ERA 09.3 Improve recruitment processes	• European universities and Research Technology Organizations have reviewed their recruitment processes through programmes which aim to turn the rigid and bureaucratic procedures of the past into more transparent, open and flexible procedures based on meritocracy and excellence.
	ERA 10.3 Improve attractiveness of researchers' careers	• Member States continue to support the implementation of the Code and Charter, i.e. the researchers' roles, responsibilities, rights, recruitment and merit recognition processes, to improve researchers' working conditions. As of June 2013, more than 480 organisations from 35 countries in EU and beyond have endorsed the principles.
	ERA 11.3 Increase researchers mobility	• Around 31% of EU post-PhD researchers have worked abroad (EU or worldwide) as researchers for more than three months at least once during the last ten years. • 80% of mobile researchers believe mobility had strongly increased the advancement of their research skills and 62% the quality of their publications.
4 Improving circulation, transfer and access to scientific knowledge	ERA 12.4 Achieve open access to publications and data	• Almost all Member States have set up the legal and administrative context in support to provide on-line access to scientific information that is free of charge to the end-user. • The EC launched actions to support MS networking on Open Access and to train researchers.
	ERA 13.4 Promote knowledge transfer	• Throughout the EU a strong emphasis is put on the development of capacities and skills in research performing organisations, whereas the development of knowledge transfer strategies has not yet received the same support. • National measures are still fragmented, which hampers overall open innovation and knowledge transfer efficiency. The EC is developing a comprehensive policy on Open Innovation and KT, and will consult stakeholders in 2014.
	ERA 14.4 Reinforce digital ERA	• A digital ERA will facilitate seamless online access to digital research services for collaboration, computing and accessing scientific information (e-Science) and to e-infrastructures. • Seven countries support a wide range of actions and at least fourteen other Member States are partly promoting some necessary measures. At least eleven Member States have some provisions for the implementation of electronic ID for researchers.
5 Fostering gender equality and gender mainstreaming in research	ERA 15.5 Encourage gender equality	• In Horizon2020, the EC is committed to promote effectively gender equality and the gender dimension in research content, including them in its programmes. • The EU provides support to universities and research organisations to set up and implement gender equality plans. Up to December 2013, eleven projects were funded involving around seventy research organisations and universities.

Annexe 10: About the authors

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Annexe 11: About the Manchester Institute of Innovation Research (MIoIR)

The Manchester Institute of Innovation Research is a centre of excellence in the field of innovation studies, building on a 50-year tradition of innovation and science studies in Manchester.

The Institute comprises of a group of internationally renowned scholars and experts, and supports a broad expertise across a range of academic disciplines. With more than 50 full members, approximately 50 PhD researchers, and a range of associated academics, we are Europe's largest - and one of the world's leading - research centres in our field.

We are at the heart of innovation-related research and also form one of the largest components of the University of Manchester Research Institute (UMRI).

We are also a recognised international centre of excellence for the study of Science, Technology and Innovation policy and management, and the Institute informs science and innovation policy by engaging with key policymakers, in the UK, Europe and further afield. Reflecting the ethos of rigour and relevance, engagement with key stakeholders is at the core of our work.

The Institute also has a very strong visitor programme for academics and management and policy practitioners, and provides a range of popular and high level short courses on evaluation, foresight and S&T Policy.

Our research topics group around a set of dedicated themes, while the Institute hosts the key journal Foresight. The Institute is fully integrated into several global academic networks. It is a founding member of the European Network of institutes active in innovation and science policy studies - EU-SPRI - and is a member of European policy analysis networks such as ETEPS (the European Techno-Economic Policy Support Network).

Visit us at: http://www.research.mbs.ac.uk/innovation/

Forward Visions on the European Research Area

The VERA project aims to provide relevant strategic intelligence for the future governance and priority-setting of the research, technology, development and innovation (RTDI) system in Europe and for better adapting science, technology and innovation policy to the shifting global environment and upcoming socio-economic challenges. For this purpose VERA carries out an in-depth stocktaking of RTDI related forward looking activities in Europe and internationally and a thorough review of trends and drivers of long-term change of European RTDI governance. On the base of these insights VERA develops scenarios on the evolution of the European Research Area, assesses the critical issues for the ERA's future capabilities emerging from these scenarios, explores subsequent strategic options and ultimately generates a set of policy recommendations for responsive and future oriented multi-level, multi-domain RTDI policy strategies.

VERA is conceptualised as a continuously progressing two-way communication process among ERA actor groups from society, industry, academia and policy across domains, levels and regions. It is setting up a strategic conversation between these stakeholders that evolves through several carefully tailored stages in order to jointly discover shared visions and strategic options around the ERA's future perspectives towards 2020 and far beyond. VERA is exploring gradual evolution following from current patterns of change but is also explicitly embracing transformative and disruptive developments with a long term perspective.

The VERA project has been proposed by a consortium of ten internationally renowned institutes from nine EU countries involving a team of more than 20 researchers with outstanding expertise both in terms of relevant knowledge and forward looking methodology and excellent contacts with RTDI stakeholders in Europe and the world.

VERA is based on a well-defined work programme with clearly defined steps and measurable outcomes that are targeted to specific user groups and purposes. The backbone of the process is a communication strategy that is coordinating the stakeholder engagement in a systematic manner. Substantial efforts are dedicated to go beyond unspecific propositions and to co-create relevant strategic intelligence together with the key target groups.

For further information, please visit the VERA project website at http://www.eravisions.eu