The 'Mapping Foresight' report is part of a series of publications produced by the European Foresight Monitoring Network (EFMN project, 2004-2008). EFMN is a Europe-wide network inspired and financed by the European Commission within the framework of the Foresight Knowledge Sharing Platform implemented under the Research Framework Programme (FP7). The mapping activity was one of the main activities of the network. Over 2 000 initiatives were mapped between 2004 and 2008 in Europe and other world regions, including Latin America, North America, Asia and Oceania. The report is the result of the first large international effort aimed at understanding the nature of foresight practices. Foresight has become more than just a tool to support policy or strategy development in Science, Technology, and Innovation (STI). Foresight practice is the result of a systematic work to promote effective processes to proactively think about the future. These processes can be applied to a variety of research areas or knowledge domains, such as natural sciences, medical sciences, engineering and technology, agricultural sciences, social sciences, and the humanities.

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Publications Office

ISBN 978-92-79-13110-3

KI-NA-24041-EN-C

Mapping Foresight • Revealing how Europe and other world regions navigate into the future • November 2009

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# Mapping Foresight

## Revealing how Europe and other world regions navigate into the future

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# Mapping Foresight

## Revealing how Europe and other world regions navigate into the future

2009

Directorate-General for Research
Socio-economic Sciences and Humanities

EUR 24041 EN

The Mapping Foresight report was authored by Rafael Popper (PREST Manchester Institute of Innovation Research, Manchester Business School, The University of Manchester, UK).

This publication is part of the series of EFMN publications. They are the result of a fruitful collaborative work done by the EFMN team.

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Cataloguing data can be found at the end of this publication.

Luxembourg: Publications Office of the European Union, 2009

ISBN 978-92-79-13110-3
doi:10.2777/47203
ISSN 1018-5593



*Printed in Belgium*

PRINTED ON WHITE CHLORINE-FREE PAPER

## Acknowledgements

The author would also like to express his gratitude to the European Commission for sponsoring the work carried out by the European Foresight Monitoring Network (EFMN – http://www.efmn.eu) and its sister Euro-Latin Foresight Network (SELF-RULE – http://www.self-rule.org). Special thanks are also due to the Correspondents of these two networks (see Annexes 3 and 4), and EC staff supporting the EFMN Mapping, in particular Pierre Valette, Marie-Christine Brichard and Elie Faroult.

The author would like to acknowledge the contributions of Luke Georghiou (PREST), Michael Keenan (PREST), Ian Miles (PREST), Yanuar Nugroho (PREST), Graciela Sainz (PREST), from PREST Manchester Institute of Innovation Research (Manchester Business School, The University of Manchester, UK) and Maurits Butter from TNO (Delft, The Netherlands), the coordinator of the EFMN project.

Sincere thanks to Ian Miles for his valuable comments, advice and the Foreword, to Yanuar Nugroho for his training on the use of Social Network Analysis (SNA) tools and to Jeff Butler for proofreading the final document.

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# Foreword

The European Foresight Monitoring Network Mapping Report is going from strength to strength and, if this reflects the vitality of the foresight field itself, it is a very good sign. More foresight exercises are being mapped, with around 1 000 mapped in detail. The descriptive data are now being used to support a range of quantitative analyses, which are beginning to go beyond simple counts and bar charts of what topics are being addressed, where, and for whom. The "foresight ark" is a striking visual representation of the application of such analytic methods. Hopefully, we will be developing tools that will let us examine the contours of foresight work, and how they are changing, in evidence-based ways, from a variety of perspectives.

Of course this sort of work is academically interesting, but it should also be of value for foresight practitioners, pointing to what has and has not been attempted in the field: redundancy can be avoided, and fruitful avenues for further exploration suggested; benchmarks and guides to good practice may be established. Such broad-brush data cannot substitute for in-depth accounts of the lessons that can be drawn from designing and implementing foresight exercises: the approaches should yield complementary insights. What is particularly encouraging about the present moment is that we are simultaneously seeing the major steps in foresight mapping that this report embodies – and the move away from self-promoting accounts of how one or other expert conducted foresight, towards better-explicated "warts and all" accounts of actual cases of foresight practice.

The cases mapped in this report show that foresight is very much an international activity, with Africa remaining somewhat underrepresented here. In part this may be because "Foresight" is frequently understood as Technology Foresight, and Africa's roles in technological innovation remain rather limited (and perhaps in some respects invisible). In part, we may see Africa included in some international organisation activities (and even in some national exercises in industrialised countries – there was strong and valuable participation of African teams in the UK Foresight Programme exercise on Detection and Identification of Infectious Diseases, for example). Possibly the technological connotations of "Foresight" mean that work in some particular topics, where there are strong communities of forecasters, modellers, even scenario-builders, is underrepresented – the examples of skill and employment analyses, and of environmental and climate research, come to mind. We are likely to have under represented foresight exercises undertaken by enterprises, too – much of this is likely to remain controversial, or "under the radar". EFMN continues to seek to bridge these gaps, and the foresight community in general needs to be aware of the scope for fostering improved linkages across these varied activities.

This report is being published at a time when the world economy is suffering major turbulence, and new challenges are being thrown at the foresight field. Foresight exercises that were not designed to address economic and financial trends explicitly have been criticised for failing to stress the potential for such developments to be disruptive to their topics – which is a fair enough criticism. However, a more serious charge has to be laid against economic policy-makers and modellers, who failed to apply real foresight and to question "business-as-usual" assumptions. We now know that many commentators were apprehensive about cycles of credit and debt, but these concerns were not built into mainstream analysis. The foresight world could and probably should have done more to challenge such complacency. We can only speculate that participants in exercises were unwilling to burden their reports with warnings that could have led to the whole report being dismissed as clearly the work of people who did not respect the boundaries of their own expertise. The solution is more, rather than less, foresight – foresight that accepts the interrelated nature of socio-economic and socio-technical systems, rather than treating them as somehow compartmentalised.

The other necessary response is for foresight to be employed to help identify and examine alternative and desirable ways of moving beyond the current impasse. Exploring the emerging opportunities that can create new markets and/or help meet critical social and environmental needs, creating visions of plausible solutions to emerging challenges, helping to bridge professional, disciplinary, and cultural boundaries: these are vital roles. Keeping an eye on the longer term is no luxury;

history tells us that crises like the present one can easily spiral downward into international and intercommunal violence when seductive short-term "fixes" are the focus of political debate. Foresight can provide platforms for the creation of aspirations for a better future, and for debating how cooperation, knowledge creation, and broader participation may be brought into play to realise these aspirations. This is liable to mean a whole new generation of foresight exercises – a very ambitious vision. But one bit of good news is that practitioners will be able to draw upon various resources accumulated in recent years, to demonstrate the scope for applying foresight and the tools and practices that have been employed successfully in recent exercises. The mapping work of EFMN will certainly be one of the main resources that will be used.

*Ian Miles*

# Preface

This is the final deliverable of the "Mapping Foresight" work package of the European Foresight Monitoring Network (EFMN) – a Europe-wide network inspired and financed by the European Commission within the framework of the Foresight Knowledge Sharing Platform implemented under the Research Framework Programme (FP7).

This report is the result of the first large international effort aimed at understanding the nature of foresight practices in Europe and other world regions, including Latin America, North America, Asia and Oceania. The large number of foresight exercises mapped between 2004 and 2008 (over 2 000 initiatives) is clear evidence of the rising of the "foresight wave". This is mainly because foresight has become more than just a tool to support policy or strategy development in Science, Technology, and Innovation (STI).

Our results show that the scope of foresight, as practised in the early years of the twenty-first century, involves a wider range of objectives, including: analysis of the future potential of STI, promoting network building, priority setting for STI, supporting methodology and capacity building, and generating shared visions towards, for example, a strong European Research Area. The report shows that "multi-scope foresight" is not a European phenomenon but a global one. It also shows that foresight practice is not a matter of fashion but instead a systematic effort to promote effective processes to proactively think about the future. These processes can be applied to a variety of research areas or *knowledge domains*. The wide range of domains where foresight can usefully be applied extends across the natural sciences (e.g. biological science or chemical science), engineering and technology (e.g. environmental engineering or communications technologies), medical sciences (e.g. public health and health services), agricultural sciences (e.g. crop and pasture production), social sciences (e.g. policy and political science), and the humanities (e.g. language and culture).

One of the most challenging parts of the mapping activity was the implementation of procedures to ensure that mapped exercises comply with the definition of *foresight as a process which combines three fundamental elements: prospective (long-term or forward-looking) approaches, planning (including policy-making and priority-setting) approaches, and participative approaches (engaging stakeholders and knowledge sources)*. We recognise that we have not been able to fully implement such a "filter". This is mainly because, due to the inclusive nature of our international effort, we had to be more flexible; we allowed the EFMN Correspondents to map what they considered were the most relevant foresight exercises in their countries. Nevertheless, most analyses are based on the "fully-mapped" exercises (some 1 000 cases) and these quite often meet our working definition.

The amount of data collected made the writing of this report more difficult than anticipated. There were so many interesting findings to include, but space limitations constrained the discussions. The limited time available also forced us to leave out of the analysis some interesting but more complex findings. Annex 5 of this volume is a good example of such a finding. The image, which resembles a boat, shows a fascinating result of the use of network visualisation tools to interconnect 871 "fully-mapped" exercises. To use a metaphor, the image could well be described as a "foresight ark" revealing how Europe and other world regions navigate into the future. In fact, to be more precise, it shows the "big picture" of the type of futures research captured by the mapping activity. The nodes represent the socio-economic sectors used in the EU's NACE taxonomy, while the links represent the interconnections that the mapped exercises have with these sectors. Although this and other findings are not explained in this report, the selected chapters provide a good account of the most important results.

There were many "favourable winds" helping us to navigate the seas where we could collect foresight exercises. First of all, we should acknowledge the active engagement and commitment of all members of the EFMN Mapping Team as well as the technical support of the TNO (Netherlands), which played a pivotal role in the way the data was captured and hosted. We should also thank EFMN Correspondents and many other colleagues for the mapping of exercises worldwide.

Two specific factors facilitated our work. The first was the possibility to use the results of a previous EU-funded

pilot project, EUROFORE, which was explicitly aimed at mapping foresight competences and experiences in 15 European countries. This pilot built and tested a number of mapping indicators that were later borrowed and further developed by the EFMN. The second factor was the possibility to access the results of another EU-funded project, SELF-RULE, which built a sister database in Spanish to map foresight practices in Latin America. These two projects have played a key role in increasing the volume and geographical reach of the EFMN mapping.

The report has been organised in such a way as to highlight several different perspectives of analysis. After the introductory chapter, the **objectives** perspective is presented in Chapter 2, where the analysis of a number of specific objectives helps us define a broader set of general objectives. Here we analysed qualitative data and the created families of more general objectives. These are based on the analysis of around 200 specific objectives from a sample of 50 exercises. The chapter includes adapted fragments of a paper titled "FTA for Research and Innovation Policy and Strategy" where the authors considered a slight reclassification of our findings.

The **geographical** perspective is included in Chapter 3. This basically updates and reclassifies selected EFMN results presented in a paper titled "Comparing foresight 'style' in six world regions". This chapter required the integration of the abovementioned databases and the mapping of more than 1 000 cases. Most of the cases were from Europe but we also tried to achieve a reasonable number of cases from Latin America, North America, Asia, Oceania and international organisations.

This is followed by Chapter 4 which includes the **country** perspective. This is a completely new analysis (not included in previous reports) presenting key features of foresight practices in ten European countries: nine EU member states (Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Spain and the United Kingdom) and one associate country (Norway). We selected these countries because they have the largest number of cases in the database (ranging from 17 cases in Belgium and Italy to 144 and 181 in the UK and the Netherlands respectively).

We then continue with the **methodological** perspective in Chapter 5. The results here are again based on selected EFMN findings published in a paper titled "How are foresight methods selected?". The discussion here could have been longer but we preferred to leave more space for other chapters. The methodological perspective played a stronger role in previous reports and was the main subject of the aforementioned academic publication.

Next is the knowledge domain or **content** perspective. The analyses here are based upon the characterisation of exercises by the OECD classification for research areas (Frascati Manual) and the EU standard for socio-economic sectors (NACE). Here is where we regret the space and time limitations. The discussions about the so-called "knowledge hubs", "knowledge junction" and "knowledge clusters" in foresight have raised several questions that will have to be addressed in future publications. Nevertheless the chapter still captures the most relevant findings of the content perspective.

Finally, a brief look at the **recommendations** perspective is presented in Chapter 6. This includes minor updates of an analysis prepared for the 2007 Mapping Report. Here 559 recommendations produced by 83 foresight panels and task forces are analysed. The chapter assesses the extent to which panels of foresight exercises conducted at different levels (national, subnational, and supranational) are suggesting particular types of recommendations. To conduct this analysis, we developed a taxonomy of recommendations. The chapter includes a discussion about the challenges of making recommendations at the EU level and presents some practical examples.

The present publication is meant to be used by the foresight community and policy-makers. By revealing how Europe and other world regions navigate into the future, the report fulfils two main objectives: first, to increase the foresight knowledge base and, second, to raise the level of discussions. The second objective is met by promoting a more structured debate around the different perspectives that are adopted in each chapter.

*Rafael Popper*

# About this report

## Who should read this report?

## What does this report deliver?

This report is the result of a major four-year project to assemble useful information about foresight exercises worldwide. It examines the aims and characteristics of more than 1 000 and identifies more than 2 000 exercises.

To describe these aims and characteristics in a meaningful way, the work undertaken by the University of Manchester and the TNO – with information collected from more than 250 Correspondents from the EC-funded EFMN and SELF-RULE networks – has required the development of a new conceptual framework that will both help policy-makers, foresight practitioners and foresight users, and advance foresight mapping methodologies.



The project team has carefully considered and determined how a foresight exercise should be described. The members have also provided a detailed description and typology of the patterns of use and the distribution and frequency of use of foresight methods in different industries, by subjects, challenges and sponsorship.

Much of the information and how it is structured will appeal to bibliometric and scientometric specialists, but it is accessible to managers, consultants and policy advisers including those who have no prior experience of foresight.

But the document is more than a project report and the project has delivered more than was originally anticipated. There is now a reference handbook which shows different types and styles of exercises, propensities to conduct foresight exercises, and a list of subject areas and exercise titles. The last of these makes the content of exercises more easily accessible worldwide. The value of the information in this reference document depends on the professional interests and responsibilities of the reader:

- Policy-makers may appreciate the geographical or spatial analysis, so as to decide if a new style of exercise should be encouraged in a particular region or policy area.
- Organisations planning a new exercise may appreciate the information about different types of exercise, so as to choose more intelligently for a specific topic area and more easily decide which designers and organisers of previous exercises they should contact.
- Sponsors or potential users of foresight results can scan the document to see where previous or related work has been done and learn how that work may be adapted by using different methods.
- Researchers and practitioners interested in the evolution of foresight exercises can now more easily recognise where, how, when and, to some extent, why a particular approach has been used. If desired, they can begin to put this into an economic, cultural or political context.
- R&D, innovation and technology managers can consider how foresight might contribute to the analysis of trends and patterns of investment in their industry or domain.
- Local, regional, national and international and supranational perspectives can be supported.

From all these perspectives new insights can be found and foresight capabilities enhanced. The state of the art in foresight methodology, planning and application is advanced.

Beyond the project report and the reference handbook, this document inspires the further development and implementation of foresight through user-friendly visualisation and participant engagement systems. It provides a picture (via social network analysis) of the role of foresight in a globally connected world of knowledge, experience, information and uncertainty. This is symbolised by the image of an ark on Annex 5.

Learning how to navigate without a compass, map or sextant is not easy; when none of these have been invented even the concept of navigation is fuzzy.

Without a method of communication for emergencies, such as radio, poor quality navigation can be dangerous. But reasons to travel may nevertheless exist. This book not only provides a compass and a map for foresight, neither of which previously existed; it shows how future maps can be produced more easily, including by users. It also shows how the world that is being mapped is already changing. At the same time it suggests how an Internet-based (i.e. wiki rather than radio) network can be established and how it can be tuned to the specific needs of foresight advisers and foresight users.

The range and scope of purposes to which foresight can be applied is impressive and powerful, as is illustrated by this document. Purposeful connectivity across regions and disciplines can now more easily be facilitated and nurtured.

*Jeff Butler*
*Editor of R&D Management*

# Executive summary

An important role for the European Foresight Monitoring Network (EFMN) has been the identification and mapping of foresight-type studies as a continuous activity. Then, on an annual basis, the data gathered from this mapping process has been analysed and presented in a stand-alone report – this Mapping Foresight (MF) report is the final deliverable following three previous reports produced in 2005, 2006 and 2007.

Since its inception in 2004, the EFMN has identified and mapped more than 2000 foresight-type exercises. Identification of suitable exercises relies upon a network of 232 Correspondents (see Annex 3) from around the world. Identified exercises are mapped into a database – known as Dynamo – against a set of variables, including the geographical and domain coverage of the exercise, its sponsor and target audiences, the time horizon adopted, the methods used, and the outputs generated.



The purpose of collecting such data is, essentially, two-fold. First, it enables policy-makers, foresight practitioners and others with an interest in foresight to easily identify exercises according to their particular areas of interest. So, for example, if a policy-maker is interested in identifying foresight-type exercises that have addressed the topic of 'energy', a web-based search interface allows him/her to identify the appropriate exercises, to read about them in more detail, and to download reports produced by the exercises. Such information should, in the medium term, improve understanding of foresight processes and products, and hopefully lead to better foresight practice in the longer term.

The second purpose for collecting such data is to enable the EFMN to monitor developments in the foresight field more generally and to map these on an annual basis. Not all exercises entered into the database are fully characterised, due to the time required for collecting such data. During the life of the project more than 1000 exercises have been sufficiently mapped to be included in the analysis reported here. This has improved the already significant figures of 846 exercises achieved in last year's *Global Foresight Outlook* report and has allowed the EFMN to conduct a more sophisticated analysis. In particular, the larger dataset provides the basis for a great deal of cross-tabulation, which allows the EFMN to begin to investigate the dependencies between different variables. For example, it is now possible to interrogate the data to begin to answer questions such as "To what extent does the geographical perspective influence the time horizon adopted?" and "Do foresight exercises in some countries focus more on some topics than in other countries".

The Mapping Foresight report begins with a general **introduction** of the EFMN and the mapping activity. This is followed by a short description of the evolution of the mapping and the different levels in which exercises have been characterised in the database. These levels required the development of the 'mapping dimensions' (i.e. the above-mentioned set of variables). In Chapter 1 definitions are provided for each of these dimensions. The introductory remarks end with a few comments about data potential and limitation, and a short summary of the mapping process.

The examination of foresight **objectives** required the selection of 50 exercises and the grouping of their specific objectives (around 200 in total) into much broader objectives. The results show that among the most common foresight objectives we can find: fostering cooperation and networking; orienting policy development; recognising barriers and drivers of STI; encouraging futures thinking; supporting STI strategy and priority-setting; identifying research and investment areas; generating shared visions; handling Grand Challenges; and triggering actions and discussions. Chapter 2 expands each of these categories to discuss more specific objectives related to the general ones.

Moving into the **geographical** perspective, this chapter compares foresight practices in Europe (713 cases), Latin America (120 cases), North America (109 cases), Asia (89 cases) and Oceania (15 cases). A sixth category was added to include international exercises (67 cases) sponsored or carried out by international agencies such as OECD, FAO, UNESCO, UNIDO and the World Bank. Nine dimensions were used in the comparisons, including types of sponsorship, types of audience, the time horizon, the scale of participation, territorial scale, methods used, types of outputs, the most common

research areas and the most commonly targeted socio-economic sectors.

Staying with the geographical perspective, the results for the type of *sponsorship* show that the government is the main sponsor of foresight in all regions, although we can see a few differences. For example, the North American figures reflect the high number of industrial-sector studies in our sample, many of which are funded by the business sector. Indeed, the business sector is a far more prominent sponsor in this region than in any other, perhaps reflecting an Anglo-Saxon laissez-faire tradition, as a similar pattern is seen in the sponsorship data for Oceania, as reported elsewhere.

In terms of *target audiences*, there are no great variations, and government agencies and departments are the main target groups, regardless of the region. One remarkable result is the range of research and business targets – far more than there are sponsors.

As for the *time* horizon, most exercises are looking 10 to 20 years ahead. The results also show that Europe, North America, Asia and Oceania have a more strategic attitude towards the far future (e.g. 30, 50, 100 years ahead) than Latin America.

The *participation* dimension shows that between 75-85 % of mapped exercises in Europe, Latin America and North America involved fewer than 200 participants. Among these regions, Latin America shows the highest level of participation – although it also has the lowest number of exercises with more than 500 participants. Asia has the largest proportion of exercises with more than 500 participants. This can be explained by the fact that virtually all foresight exercises mapped in this region are either national or international; exercises at this level usually involve higher numbers of participants.

The analysis of the *territorial scale* shows that for all world regions, the national level is by far the most common. As policy-making is still mostly carried out at this level, this result should come as little surprise. The remaining foresight initiatives are more or less equally distributed over the other territorial scales, although there are some significant differences between regions.

The methodological choices of the regions show that some *methods* are very widely used across the world; such is the case with expert panels, literature review, scenarios and trend extrapolation. But the more interesting findings are those that can tell us more about differences in regional foresight practices. The first of these methods is (futures) workshops, which figure notably in Europe and North America, but are much less important in Asia and Oceania and are out of the top ten in Latin America. The second method of interest is the Delphi technique, which is most often used in Latin America, Asia and Europe, but is absent from the top ten in North America. Finally, it may be useful to look at the average number of methods used by each region: International (4), Europe (5), Latin America (8), North America (4), Asia (4), and Oceania (3).

The *outputs* analysis mainly focuses on those that are normally codified. This means that process-related outputs such as new working practices or new networks were not included. The results, however, still show an interesting picture. For example, the most common outputs are: policy recommendations (evident in all regions); analysis of trends and drivers (frequently in Latin America, followed closely by the pan-European and international studies); scenarios (less frequently present in the North American and Asian studies mapped to date); research and other priorities (found relatively more frequently in Latin America and Oceania, closely followed by North America); forecasts (most popular in Asia); key technologies (the third most important output in Asia); and technology roadmaps (generated most frequently in North America).

The *research areas* dimension shows an interesting result. Foresight exercises in North America and Oceania are often carried out with more defined target research areas than similar exercises in Europe, Latin America and Asia. The main reason for targeting multiple research areas, for example, in international, European, Latin American and Asian foresight studies may be related to the diversity of sponsors in these regions. Finally, results show that the most common *socio-economic sectors* in Europe are: manufacturing; health and social work; electricity, water and gas supply; public administration and defence; and transport, storage and communication.

Turning to the **countries**, this chapter shows key features of foresight practices in ten European countries: nine EU member states (Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Spain and the United Kingdom) and one associate country (Norway). We have selected these countries because they have the largest number of cases in the database. The descriptions of all the dimensions and their detailed results have been compressed into two pages per country.

This section also involved the mapping of the most common sponsors in the selected countries, as well as the mapping of common objectives and their classification using the various groupings discussed in Chapter 2. For example, in Belgium, the government is clearly the main supporter of foresight followed by non-state actors. Sponsors include: the Belgium Federal Office for Scientific, Technical and Cultural Affairs (BELSPO); the Royal Belgian Academy Council of Applied Sciences (BACAS); the Walloon Ministry of Economy; and the Flemish Institute for Science and Technology Assessment (viWTA), among other actors.



Not so different is the typology of sponsors in France where the most common supporters of the mapped foresight exercises are DATAR; the French Ministry of Economy, Finance and Industry; the Ministry of Defence; and CESR-Centre, among others. However, in Germany, we found a wider pool of sponsors, with actors from national and regional government agencies, the research community and the private sector (e.g. the Federal Ministry of Education and Research; the Bavarian State Ministry of Sciences, Research and the Arts; and the government of Rheinland-Pfalz; German Landkreis Löbau-Zittau; MFG Stiftung Baden-Württemberg; and companies like Janssen Cilag GmbH and Siemens AG).

The results on **methods** clearly indicate three groups: First, the widely used methods are literature review, expert panels and scenarios, all of which are qualitative; second, the category of commonly used methods includes extrapolation/megatrends, futures workshops, brainstorming, other methods, interviews, Delphi, questionnaire/survey, key technologies, scanning, essays and SWOT; and finally, the third group includes less frequently used methods, such as road-mapping, modelling and simulation, backcasting, stakeholders mapping, structural analysis, bibliometrics, morphological analysis, citizen panels, relevance trees, multi-criteria and gaming. While the data suggests that this group of methods is rarely used, some figures are lower than might be expected and could possibly be attributed to biases arising from the mapping. For example, methods such as structural analysis and relevance trees have been occasionally applied in Spain and France at the subnational level. But because mapping at this level has been weaker than at the national level, the data does not do justice to the likely higher frequency of their applications.

The content perspective shows that there are very strong linkages between Engineering and Technology, Natural Sciences, and Social Sciences. These three **research areas** can be considered as the main 'knowledge hubs' of foresight work and these results simply confirm the interdisciplinary nature of foresight. An analysis of interconnections between areas shows that, while 58% of the Engineering and Technology studies are interconnected with areas of natural sciences, the proportion of Natural Sciences studies that are interconnected with areas of Engineering and Technology is considerably higher (79 %). The pattern is different when we look at the interconnections between Engineering and Technology areas and Social Sciences, as they both show similar interdependencies (32 % versus 35 %). By contrast, projects on Medical Sciences and Agricultural Sciences show high linkages with Engineering and Technology areas (56 % each), but only 20 % of Engineering and Technology projects are linked to areas in Medical Sciences and Agricultural Sciences.

This interdisciplinary nature of foresight means that foresight exercises often behave as 'knowledge junction' between different research areas and sub-areas. This leads to a number of interesting results. For example, foresight exercises on Biological Science often synthesize data from multiple sources thus creating a very interesting 'triangulation effect'. In particular, we see two well defined triangles: the first suggests that foresight work in this sub-area is the strongest knowledge junction between Engineering and Technology and Natural Sciences; while the second triangle shows that foresight studies on Biological Science provide a less strong but certainly important link between Social Sciences and Natural Sciences.

Another finding is the identification of two equally important sub-areas linking Engineering and Technology with Social Sciences; these are Environmental Engineering and Communications Technologies. Although these linkages may be obvious for some, their recognition as fundamental knowledge junction in the relationship between Engineering and Technology and Social Sciences is a significant result of this report. More findings like the above can be found in Chapter 6.

Looking at the **socio-economic sectors** analysis, we can see that Engineering and Technology, Social Sciences, Manufacturing and Natural Sciences are by far the most popular subject areas to be covered in the initiatives mapped by the EFMN. The second group includes: Electricity, gas and water supply; Health and social work; Transport, storage and communication; Public administration and defence; Agriculture; Education; Fishing; Construction; and Other community, social and personal services activities.

Less popular areas in foresight, but still significant, are: Financial intermediation; and Real estate, renting and business activities. This is an interesting result given that these two sectors have been seriously shaken by the so-called credit crunch (or credit crisis) linked to the sub-prime housing crisis in the United States, which has serious implications for Europe and other world regions. Therefore, we believe that foresight work in these areas will soon experience considerable growth.

As a result, we can conclude that it is equally important to identify those areas where more foresight work may be needed. In other words, we should not only map those 'hot' areas where plenty of strategic thinking and policy options can be found on the table – which was, indeed, our initial question.

A more traditional analysis of socio-economic sectors required us to look at the proportion of foresight work carried out in each 'grand' economic sector (primary, secondary and tertiary). This generated a clear message: 'Foresight on Services' is really dominant!

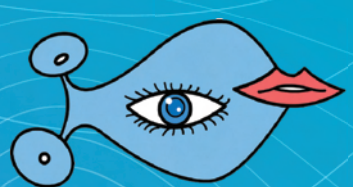
Finally, the analysis of **recommendations** shows the most common recommendations to be those which call for policy shifts and those that call for the creation of new projects, programmes, strategies or discussion fora.

A second group of recommendations includes the incorporation of foresight findings into ongoing debates and strategies; suggested actions for the private sector and non-governmental organisations to pursue; and the need for further research.

A third group includes the development of human resources; improvements in academia-industry links; increases in public spending; and greater cooperation across the innovation system, including international cooperation.

Over the coming years, we expect to see further growth of the 'foresight wave'. This basically means that the European Commission will increasingly need to advance knowledge and tools related to events and trends potentially shaping the future of science, technology and innovation in Europe. In this context, synergies between research projects like iKNOW (aimed to interconnect knowledge and communities to explore emerging issues, wild cards and weak signals) and the new European Foresight Platform (EFP), which integrates the EFMN and ForLearn, will contribute to the Commission's goals of consolidating the information and knowledge base on foresight and as well supporting forward looking decision making. We are sure that the complexity of the issues that will be addressed in these projects, together with the complexity of their interconnections, would benefit from the type of analysis that has been carried out in this report, as well as from the next generation of mapping activities in EFP (2009-2012).

# 1 Introduction to the EFMN mapping process



# Mapping more than 2 000 foresight exercises

## About the EFMN

In 2004 the European Commission (EC) supported the creation of the European Foresight Monitoring Network (EFMN) – an international consortium of research organisations – with one general goal:

*To monitor ongoing and emerging foresight activities and disseminate relevant information to policy-makers and foresight practitioners*

In order to achieve this goal the EFMN had six specific objectives:

- *Network:* To create a Correspondents' network of foresight practitioners and users.
- *Data collection:* To collect foresight exercises and other related activities, as a "library" of information.
- *Mapping:* To analyse key features and characteristics of the collected foresight exercises, and describe relevant issues about foresight practices in Europe and other regions of the world.
- *Briefs production:* To produce "briefs" on specific foresight studies, in order to inform a wider community.
- *Issue analysis:* To analyse the collected foresight exercises in terms of emerging issues, and to organise annual workshops addressing specific issues.
- *Dissemination:* To disseminate the collected information and analyses through the Internet and annual reports.



## About the mapping

The mapping has been lead by the PREST Manchester Institute of Innovation Research of the University of Manchester (UK) and the TNO (Netherlands). In the four years the EFMN has been operational, more than 2 000 exercises have been collected using an electronic database to facilitate systematic structuring of information.

The mapping of foresight exercises has been a major activity of the EFMN, mainly because it has effectively contributed towards the achievement of the network's goal and its more specific objectives. The mapping required the development of a database with indicators capable of capturing the different dimensions of an exercise (e.g. territorial scale, geographical coverage, sponsors, target audiences, time horizon, methods, outputs, research areas, industries, etc.). The use of more or less 'measurable' indicators helped, on the one hand, to unlock information on what is going on in the world of foresight, and, on the other, enabled us to carry out different kinds of analyses to provide foresight practitioners and organisers with more detailed insight into methodological and practical issues.

In this volume we update the most important results presented in our three previous reports (see Popper et al., 2005, 2007; Keenan et al., 2006). While some of the findings are based on recent academic papers published in *Foresight* (see Volume 10, Issue 6), we also include new analyses using 3D visualisation tools.

**Chapter 2** updates our previous results about common rationales and objectives in foresight. **Chapter 3** updates our previous benchmarks of foresight practices in five world regions: Europe, Latin America, North America, Asia, and Oceania (see Keenan and Popper, 2008). **Chapter 4** presents a new analysis of major features characterising foresight practices in ten European countries: Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Spain, and the UK. **Chapter 5** includes a discussion about the attributes and features of the most popular foresight methods. These results are based on findings that one of the authors published in a paper with the title "*How are foresight methods selected?*" (Popper, 2008a). In **Chapter 6** we use 3D visualisation tools to analyse results about the coverage (i.e. research areas and socio-economic sectors) of more than 800 foresight exercises. Finally, **Chapter 7** updates our previous results about recommendations resulting from foresight.

## Evolution of the mapping

The basic structure of the EFMN database (i.e. mapping dimensions and indicators) is a significant elaboration of a previous EC-funded initiative called EUROFORE and aimed at mapping foresight competence in Europe (see Keenan et al., 2003). This pilot

project mapped 100 studies which were later included in the EFMN database.

Having agreed on the final set of mapping indicators, the TNO adapted its online platform (Dynamo) to be used by PREST/MIoIR, other partners and EFMN Correspondents, to capture information about foresight exercises.

The mapping tool was operational in 2005 and, by the end of the year, the database had already more than 800 cases (100 from the EUROFORE initiative plus some additional 700 cases mapped by the EFMN).

Here we should emphasise that, although a limited number of people are involved in the data analysis and the writing of reports, we could not have done this without the help of numerous experts who assisted in gathering initiatives. On average, three to four people per country were actively involved in the mapping activity. The mapping has also benefited from a sister EC initiative carried out in Spanish by the SELF-RULE network. These two mapping activities have built up databases of studies that offer tremendous opportunity to increase our understanding of foresight practices in Europe and the rest of the world.

*Figure 1.1* shows the evolution of the number of cases in the EFMN database; from more than 800 cases in 2005 to more than 2 000 cases in 2008. Of course, as in any database, some cases are better mapped that others, so the number of fully-mapped cases (levels 2 and 3, as explained below) was actually around 1 000.

## Levels of mapping

Given that mapping has been an ongoing activity, the data has been collected gradually using **four levels**:

- Level 0 (cases that are only nominated),
- Level 1 (basic mapping),
- Level 2 (detailed mapping), and
- Level 3 (fully mapped).

**Level 0** is only the nomination of the exercise (i.e. providing the name, a short description, a short comment, and the time horizon).

**Level 1** includes basic information, such as the year in which the exercise was created, the duration, contact person, name of the sponsor, amount of funding, executing organisation, website, number of participants, territorial scale and objectives.

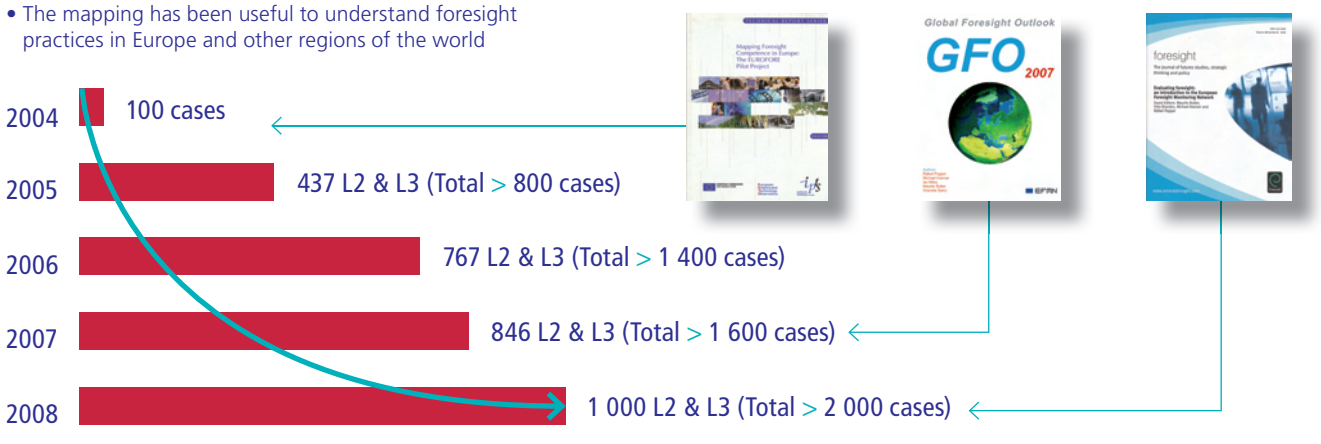
**Level 2** moves into more detailed mapping (e.g. types of audiences, types of sponsors, types of methods, countries and regions involved and types of outputs).

**Level 3** provides mapping against a number of research areas (using the internationally accepted classification system based on the *Frascati Manual*), industries (using the *NACE* Classification of Economic Activities), and the description of policy impacts, other impacts, as well as results and limitations.

*Figure 1.2* shows the data input structure. The database was divided into two screens, one on the left with text fields and single-choice drop-down boxes (mainly

### Figure 1.1: Evolution of the EFMN database

- The EFMN mapping has produced a vast amount of information on foresight unprecedented in the world
- The mapping has been useful to understand foresight practices in Europe and other regions of the world




*Source: Popper*

for mapping at levels 0 and 1), and one on the right with multiple-choice tick boxes (used to map in levels 2 and 3). Thus, the positioning of mapping dimensions on either the left or right hand side has been determined by whether textual information is needed (left side), and whether the dimension can have only one value (left side) or multiple values (right side).

## Data fields (mapping dimensions)

Now let us look at the mapping dimensions:

- **Name of exercise** (in own language and/or in English). However, if a single panel or thematic area was mapped, the full name of the exercise was given first, followed by the name of the panel or thematic area. For example, UK Foresight Programme: Cyber Trust and Crime Prevention.

- **Description** – to briefly describe the exercise, with particular emphasis upon (a) why it was taking place then and (b) how it was being organised, promoted and carried out.

- **Comments** – to add information that does not fit elsewhere. For example, if a project was linked with a wider national programme or a government strategy.

- **Time horizon** – to state the time horizon of the exercise. If it was known that the time horizon was variable, then Correspondents were able to indicate so using a plus/minus option (+/-).

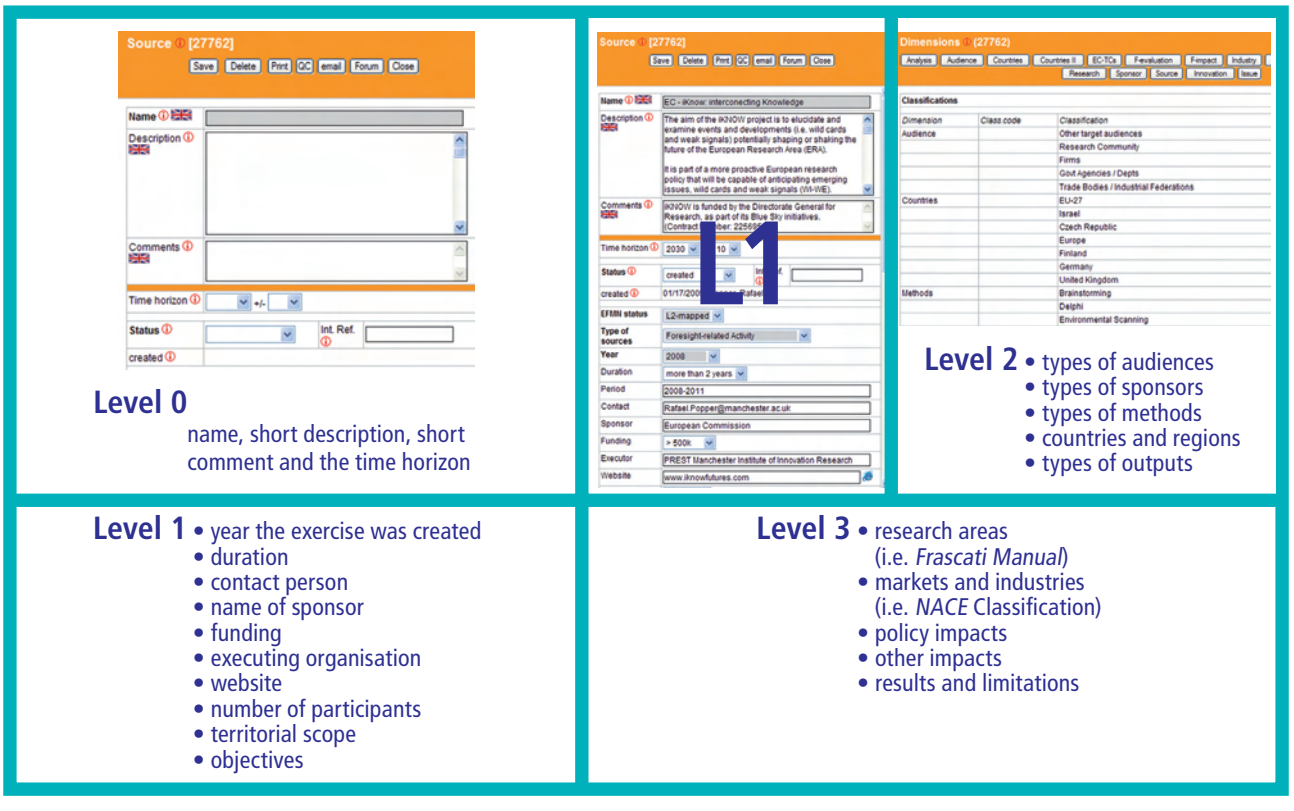
- **Status** – to be used for internal purposes only – indicating if a study was mapped at level 0, 1, 2 or 3.

- **Created** – to keep record of the date and person who mapped the exercise. This was filled in automatically by the system.

- **Year** – to map the year the exercise was carried out. If it spanned more than one year, the year the exercise finished had to be indicated, also if it was still ongoing.



Figure 1.2: Data input structure and mapping dimensions




*Source: Popper*

- **Number of participants** – to map the estimated number of people that were been engaged in the exercise. This number often referred to (a) those individuals who were intimately tied to the conduct of the exercise, e.g. members of steering groups and expert panels, and (b) those individuals who might have been engaged more loosely, for example, as participants in a scenario workshop or as respondents to a Delphi questionnaire.

- **Period** – to map how long did/will the exercise last. This estimate needed to reflect official statements or research contracts linked to the exercise.

- **Contact** – to map the name, affiliation, and e-mail of somebody who was willing and able to provide further information on the exercise, if requested.

- **Executor** – to map the name(s) of the organisation(s) responsible for the day-to-day management and organisation of the exercise.

- **Exercise web address** – to map the website or home page of the exercise.

- **Funding (€)** – to map the estimated cost of the exercise in euro. This figure often reflected the official budget of the exercise. If the activities of a panel or thematic area from within a wider study were mapped, an estimate of the costs of that panel or thematic area was given.

- **Territorial scale** – to map the territorial scale of the exercise. Was it subnational, i.e. covering an organisation that lies below the level of a nation state, e.g. federal region, city region, etc.? Was it national, i.e. bounded by the national borders of a nation state? Was it supranational, i.e. EU-wide or covering at least two nation states?

- **Territory name** – to capture the name of the territory being covered in the exercise.

- **Objectives** – to map the stated overall objectives, based on official statements about the exercise.

- **Policy impacts** – to map the discernible impacts the exercise had had on public policies and strategies. This area was also used to describe the impacts it had had, if any, on the policies and strategies of others, such as firms, universities, NGOs, etc.

- **Other impacts** – to map, besides influencing policies and strategies, what other discernible impacts the exercise had had. Correspondents were asked to also include unexpected impacts here.

- **Benefits and limitations** – to make an overall assessment of the benefits of the exercise. And what were its limitations? In other words, if such an exercise were to be repeated, what would be done differently?

Dimensions on the right-hand side of the database are mainly those where multiple choice was possible. These dimensions have potentially multiple values, which is why tick boxes were provided. Given that some dimensions had several levels of drop-down boxes, Correspondents were encouraged to tick only the boxes at the lowest level at which they wished to map. Here we present short descriptions of these multiple-choice dimensions:

- **Countries** – to map which countries or continents the exercise covered. If an exercise was at EU level, this was also captured by the database.

- **Methods** – to map the methods that had been used in the exercise. Here Correspondents were provided with a comprehensive list of techniques (including qualitative, quantitative and semi-quantitative methods) from which they could make their choices.

- **Sponsor** – to map the type(s) of organisation(s) providing formal financial and/or political support for the exercise.

- **Audience** – to map the primary target audience of the exercise. In other words, which groups did the exercise explicitly set out to inform and influence?

- **Research** – to map what S&T fields, as defined by the *Frascati Manual*, did the study explicitly address. Contributors were advised to map at least to the second level, otherwise the information was too general.

- **Sectors** – to map the socio-economic sectors, as defined in NACE, that the exercise explicitly addressed. Mapping at least at the first level was advised, though Correspondents were free to map at deeper levels if they preferred.

- **Outputs** – to map the sorts of codified outputs produced by the foresight exercise. Contributors could select from the following: policy recommendations; analysis of trends and drivers; scenarios; roadmaps; research and other priorities; lists of key technologies; forecasts; and others.

## Data potential and limitation

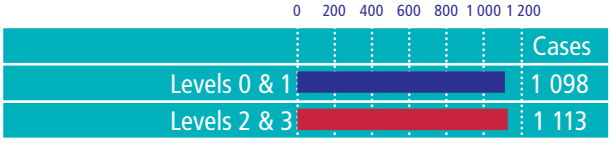
Between 2004 and 2008 we have managed to produce a vast amount of information on foresight, unprecedented in the world.

Talking to experts and foresight practitioners, assisted by Correspondents, looking at existing reports, browsing the Internet, all led to the collection of **2 211** initiatives:

- **890** cases are nominated (level 0),
- **208** cases are mapped at level 1,
- **750** cases are at level 2, and
- **363** cases are at level 3.

The original EC target of 400 cases mapped in detail (levels 2 and 3) was achieved in 2005; the second target of 800 was reached in 2007 and the last target of 1 000 cases has now been exceeded (see *Figure 1.3* below).

**Figure 1.3: The EFMN data in 2008**




As highlighted by Keenan and Popper (2008), the data in the EFMN database is biased by a myriad of measurement effects, some of which are better understood than others. For example, there is an S&T foresight bias in the EFMN database, reflecting the interests of the Directorate-General for Research of the European Commission – although this has lessened in recent times as the scope of monitoring and mapping has substantially expanded.
Of more significance are three biases (*ibid.* p.19).

*First, some countries and regions are much better covered than others. This is apparent when looking across regional data, with more than half the mapped exercises carried out in a number of European countries (i.e. Austria, Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, the Netherlands, Norway, Sweden, Switzerland and the United Kingdom). Latin America is also quite well-mapped on account of the efforts of one of this report's authors in the context of the SELF-RULE project (Popper and Villarroel, 2006).*

*But also, within regions, there is some imbalance in coverage. Taking Europe as an example, the Netherlands – a mid-sized European country – would seem to be very active in foresight, while France and Germany – much larger countries – appear to have far fewer activities. The question here is whether the data collected simply reflects the amount of foresight activity in the region/country and can therefore be considered as representative; or whether monitoring activities have been stronger in some regions/countries than in others, leading to biases in the data. It would seem to be a mix of the two: on the one hand, there is strong evidence that much French and German activity has been insufficiently mapped, while researchers at the Dutch organisation, TNO – a lead partner in the EFMN consortium – have ardently mapped activities in their home country; on the other hand, foresight practice is much more common in some countries, e.g. Finland, than in others, e.g. Italy, and the mapping data simply reflects this.*

*Second, activities at the subnational level have been difficult to detect through monitoring for a variety of reasons (e.g. lack of international visibility, language barriers, etc.), which means they are very likely to be under-represented in the database. This is the case for North America and for certain parts of Europe and Asia.*

*Third, some future-oriented activities have been mapped into the EFMN database as foresight exercises when, in fact, they fall some way short of meeting the necessary criteria for inclusion, particularly around participation levels, for example.*

These factors are likely to account for the observable patterns in this report.

## Summing up the mapping process

To sum up, the EFMN mapping consisted of four major tasks:

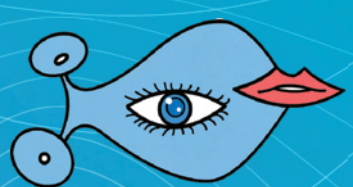
- **First**, foresight initiatives were identified by dedicated network partners who continuously searched the Internet, public reports, etc. In addition, national Correspondents were mobilised and invited to suggest studies on an annual basis.

- **Second**, initiatives were entered into the EFMN database using a set of indicators to capture the different elements of a foresight process (such as methods, country, territorial scale, time horizon and type of sponsorship, among others).

- **Third**, selected data were scanned and (if necessary) considered for quality control. This task involved sending automated emails with a direct link to the database so that national Correspondents could update and improve the quality of mapped cases. This approach had mixed results, meaning that some exercises are much better mapped than others.

- **Finally**, the fourth task required data processing, analysis and experimentation. These analyses have been used to prepare annual mapping reports which have been openly shared with the foresight community.

# 2 Mapping foresight objectives



The EFMN mapping of foresight objectives has been done with open-ended questions. Therefore the analysis of results required the selection of 50 exercises and the grouping of their specific objectives (around 200 in total) into much broader objectives. These can be classified into nine groups (see figure 2.1):

- fostering *cooperation and networking*
- orienting *policy development*
- recognising *barriers and drivers of STI*
- encouraging *futures thinking*
- supporting *STI strategy/priority-setting*
- identifying *research/investment areas*
- generating *shared visions*
- handling *Grand Challenges*
- triggering *actions and discussions.*

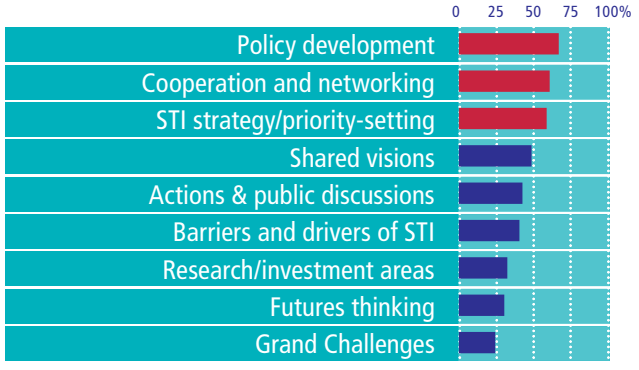
We spell out what each of these categories means below.

Typically, the mapped exercises had three to four specific objectives, spread across two or three of the families above. However, the situation was different when we looked at large national foresight initiatives. For example, the Finnish FinnSight2015 exercise featured ten 'studies' – on (1) materials; (2) global economy; (3) well-being and health; (4) environment and energy; (5) infrastructures and security; (6) bio-expertise and bio-society; (7) learning and learning society; (8) services and service innovations; (9) information and communications; and (10) understanding and human interaction – each having three or four specific objectives. This means that FinnSight2015 as a whole targeted most, if not all, of the nine families of objectives listed above.

The same applies to other large technology foresight programmes (TFP) such as the UK Foresight Programme, the German *Futur* Programme, the Hungarian TEP Programme, the Swedish TFP, the Colombian TFP and the Japanese TFP, among others.



**Figure 2.1: Common foresight objectives**




## Cooperation and networking

One of the most common general objectives of foresight is to foster cooperation and networking in science, technology and innovation (STI). This implies:

- the creation of a common space for open thinking; and
- the engagement of key STI stakeholders at various levels (international, European, national, subnational).

## Policy development

An important objective of foresight is to orient policy development. This often includes the provision of methodological support and advice on policy directions. Such orientation often requires the development of:

- new perspectives into existing agenda-setting and prioritisation mechanisms;
- new consensus-based frameworks to explore policy options; and
- new guidelines to assist government and other actors in policy design and decision-making processes.

## Barriers and drivers of STI

*Barriers* often refer to issues inhibiting the development of a country or a particular sector for example. These barriers could be:

- *social* (e.g. undeveloped collaborative culture, insufficient human capabilities)

- *technological* (e.g. lack of infrastructures)
- *economic* (e.g. limited funding)
- *environmental* (e.g. climate change)
- *political* (e.g. inappropriate regulation, lack of political engagement), or
- *ethical* (e.g. unjust business models).

In contrast, *drivers* are factors enabling the development of a country, organisation, sector, etc. Drivers are also classified into STEEPV categories for example.

## Futures thinking

Foresight is also about futures thinking. This often includes:

- the assessment of existing medium-to-long-term visions;
- the assessment of desired, possible and alternative scenarios;
- the identification of future applications and/or implications of new technologies;
- the exploration of future development trends in sectors (e.g. energy) and sub-sectors (e.g. biofuels);
- the identification of opportunities, threats and challenges for the future;
- the connection of research to business and government goals;
- the identification of new paradigms;
- the assessment of possible impacts of policy recommendations and decisions derived from foresight;
- the creation of a foresight culture through methodology and capacity building.

An important contribution of futures thinking in foresight exercises is the timely identification of issues that should alert and support decision-making, especially when it comes to priority-setting.

## STI strategy/priority-setting

The mapping results show that European foresight exercises tend to mobilise key stakeholders to set and/or strengthen strategic STI areas connected to public and private industries. Such activities normally assess STI developments in specific sectors (e.g. agriculture, environment, health, etc.) as well as the development of framework conditions in industrial production and possibilities for commercialisation of goods and services capable of enhancing competitiveness in key sectors.

In doing so, research and technology milestones are defined with the objective of achieving medium-to-long-term industry goals.

However, the setting of STI priorities is not an easy objective. It requires the combination of many challenging activities, for example:

- analysis of qualitative and quantitative data about STI developments;
- evaluation of existing RTD policies and innovation priorities;
- identification of future technological needs, risks and opportunities;
- identification of desirable and undesirable impacts of modern technologies (e.g. biotechnology);

Here we would like to highlight that one of the most significant challenges of priority-setting in foresight exercises is to ask stakeholders to set their priorities on the basis of experts' assumptions about the future, instead of their existing views on current conditions and realities.



## Research/investment areas

The identification of research and investment areas often involves:

- identification of promising technologies, successful research and business models, and major infrastructure requirements;
- identification of promising markets and business directions;
- translation of key STI barriers and driving forces into opportunities for both public and private industries;
- adaptation of innovative industrial policies and strategies into the national and regional contexts;
- exploration of impacts of potential changes in consumer demand, production capacity or market share, and so on.

## Shared visions

The creation of a shared vision is implicit in most European exercises. It is closely linked to the above-mentioned objective of encouraging strategic thinking: both require the evaluation of existing visions and the assessment of desired, possible and alternative scenarios. However, the most important aspect of this objective is the actual creation of shared visions, enabling the development of new scenarios with their related strategies and recommendations. While many studies develop visions, they are less often successful in 'sharing' them. This is mainly due to, on the one hand, poorly designed participatory processes and, on the other, unsuccessful dissemination strategies.

## Grand Challenges

A shared feature across many foresight exercises is the presence of ambitious objectives or 'Grand Challenges'. Some examples of European Grand Challenges include the Lisbon Objectives, the European Research Area (ERA) and, more abstractly, the European Knowledge Society. Exercises focused on such objectives may have also contributed to the creation and consolidation of the European identity in new EU Member States and Candidate Countries.

At the international level there have been exercises with reference to the United Nations Millennium Goals, and a few exercises focused on global problems such as climate change, natural disasters, terrorism and poverty. As for the national and subnational levels it is possible to find some exercises targeting 'traditional' Grand Challenges, for example: social equity, sustainable development, regional integration, social cohesion and sustained economic growth.

## Actions and discussions

Of course foresight is meant to inform decisions. But ensuring that foresight actually does trigger action can also be an objective built into exercises. For example, a panel in a foresight project might develop demonstrator proposals, and the panel members engage in recruitment of support for such projects during the life of the foresight exercise.

Experience suggests that participants in foresight can often be effective carriers of the message about the results of the activity, and may play roles in implementing (or monitoring the implementation of) the conclusions in their own organisations.

A considerable number of cases recognise that foresight outputs have informed decisions, but they are cautious at the time of measuring the extent to which the process has lead to actions. The general perception is that, on the whole, foresight only triggers the actions that need to be taken, and that further steps, such as formalising and implementing the action (e.g. policy recommendations), are almost entirely dependent on the willingness, room for manoeuvre, and power of the sponsoring organisations.

## Further reflections on objectives

*Figure 2.2* uses Georghiou and Cassingena Harper (2008) to reclassify the above objectives. This rearrangement shows a slight evolution away from the traditional purpose of broad-based technological priority setting to a much more focused and adapted set of applications.

In so doing, the *STI strategy/priority-setting* family was dissolved in order to leave *STI priority-setting* alone and merge *strategy* with *policy development*. In addition, the notion of *methodology and capacity building* has been taking out from the *policy development* category and a new category has been created under that name. Finally, *strategic thinking* has been relabelled as *analysing the future potential of technologies*.

So, the new results show that:

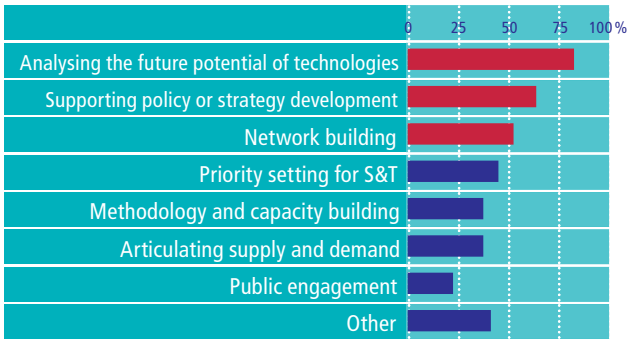
- The most popular category is the one called *analysing the future potential of technologies*. This refers to studies which preselect one or more areas of science or technology and use foresight approaches to assess their potential and the actions needed to take them forward.
- The second group is distinguished by a focus on a particular policy domain, economic or otherwise, and using foresight to develop policy (or business strategy).

- The third group is almost always associated with the verb "to foster" and reflects the aims of many exercises to promote networking between actors in research and innovation. It is noteworthy that the specific remit of prioritisation is present in 46 % of the selected studies. Many exercises have an explicit goal of developing foresight methodologies, or the capacity to use these methodologies, and this forms the next grouping.
- With a similar frequency there is a group of objectives which seek to articulate supply and demand for technology or innovation. These almost always make reference to market opportunities or societal demand.
- The last and distinct category is that of public engagement in foresight. The "Other" category consists of some objectives which are very general, and others which address various aspects of R&D strategy or policy.

From this analysis we may conclude that the objective of foresight has moved on from the typical objective found in the large national foresight programmes during the 1990s.



### Figure 2.2: Rearranging common foresight objectives



# 3 Mapping foresight in world regions

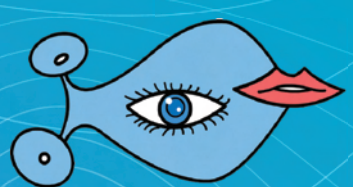
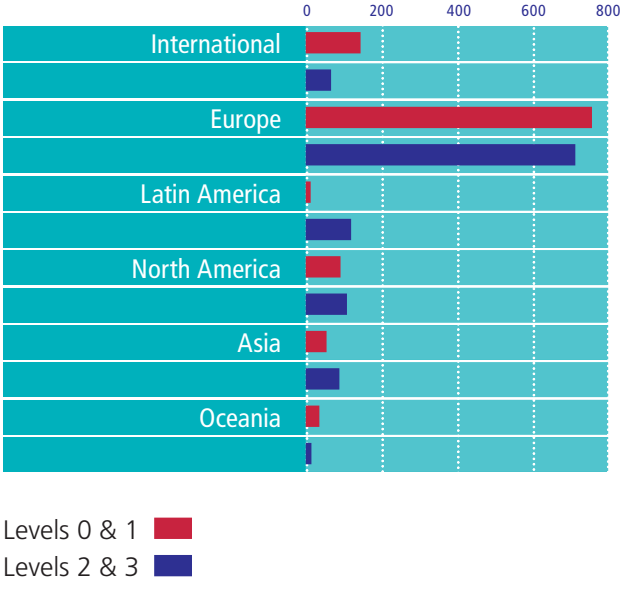


*Figure 3.1* shows the distribution of mapped exercises in six regions:

- **International**: this includes OECD, FAO, UNESCO, UNIDO and World Bank initiatives, for example;
- **Europe**: this includes EU-related studies as well as cross-national, national and subnational studies carried out by European countries, including Iceland, Norway, Switzerland, Turkey, Ukraine and Russia;
- **Latin America**: this includes Argentina, Bolivia, Brazil, Chile, Colombia, Cuba, Ecuador, Mexico, Panama, Paraguay, Peru and Venezuela;
- **North America**: Canada and USA;
- **Asia**: this includes China, India, Japan, Singapore and South Korea;
- **Oceania**: Australia and New Zealand.

### Figure 3.1: Mapped exercises per region




Before discussing the regional distribution of exercises, it is important to make clear that the analyses that will be presented in this report are mostly based on the bar located on the right-hand column of Table 3.1 (representing the **1 113** cases mapped in levels 2 & 3). The left hand column shows **1 098** other cases – in levels 0 and 1 – that are not analysed here.

As originally planned and shown in Table 3.1, the vast majority of L2 and L3 cases are from Europe (**713**). These are followed by cases from Latin America (**120**), North America (**109**), Asia (**89**), international exercises (**67**) and studies from Oceania (**15**).

### Table 3.1: Number of cases per region

| | Levels 0 & 1 | Levels 2 & 3 |
|---|---|---|
| International | 145 | 67 |
| Europe | 757 | 713 |
| Latin America | 13 | 120 |
| North America | 92 | 109 |
| Asia | 55 | 89 |
| Oceania | 36 | 15 |

The uneven distribution of initiatives across regions may reflect the data collection methods rather than the actual prevalence of foresight across regions. Given the early focus on European exercises, as well as the fact that the project team is EU-based, it is perhaps unsurprising to see a 'Eurocentric' view in the project. However, we should not assume that European countries have a monopoly on innovative approaches to foresight.

The number of entries for North America is also significant, possibly reflecting an English language bias in the database (and in the literature and Internet in general). The language barrier was one of the reasons for the creation of a similar mapping platform in Spanish, from which the current report borrowed **114** cases to improve the Latin American data (see http://www.self-rule.org). Language barriers may also account for the lower number of Asian cases captured.

During 2008, the EFMN team employed more resources in an attempt to get better coverage of these and other regions. Future efforts to improve the data should try to increase the numbers in Oceania and Africa. As for the latter, a total of 29 cases were collected but most dimensions remained unmapped. There are several differences in the way foresight is adopted and used. Hence, this section uses EFMN data to describe the current 'status' of foresight in each region:

- **International** – a number of inter-governmental organisations (IGOs), such as the EC, OECD, IPTS, UNIDO, APEC, FAO, for example, have been active promoters of foresight, using a mix of training, methodological support, case studies, and even providing seed funding to set up foresight programmes and cross-national projects. For example, the EC's Seventh Framework Programme for RTD

has built in a unique research line devoted to Foresight Activities. Thus, under its Socio-economic Sciences and Humanities (SSH) research efforts, the EC is interested on: (1) wide socio-economic foresight on key challenges; (2) focused thematic foresight; (3) research systems and research policies in Europe; and (4) the so-called Blue Sky research on emerging issues (see *FarHorizon, SESTI* (www.sesti.info) and the *iKNOW* (www.iknowfutures.com) projects).

- **Europe** – the level of foresight activity in the region has increased significantly over the last decade. This has been influenced by a number of well-positioned traditions, such as technology foresight, sustainability planning and territorial prospective. Some countries, e.g. France, have several decades in the business of futures thinking and that still influences practice today. Others, e.g. the UK and Ireland, have a shorter history where practice has been more influenced by technology foresight programmes and sustainable futures traditions. In Eastern Europe foresight activities mapped by EFMN have been heavily influenced by the European Union's enlargement process and UNIDO efforts to introduce foresight as a support tool for technology transfer and learning.

- **Latin America** – foresight in the region has evolved slowly but gradually. Countries like Argentina, Brazil, Chile, Colombia and Venezuela have launched programmes and projects incorporating concepts and techniques from a wide range of international exercises, mainly from Europe. However, the region has also managed to develop its own way of doing foresight, often due to the creative use of limited resources, thus leading to effective innovations in practices and tools (see Popper and Medina, 2008). International organisations like UNIDO, the Andres Bello Agreement (CAB), ECLAC and more recently the EC have played a key role in supporting national foresight programmes and capacity-building activities.

- **North America** – some of the most popular foresight methods, such as Delphi, were developed in the United States during the 1950s and 1960s. There are many studies at both state and federal levels in the US and Canada, but these are either missing from our database or mapped in levels 0 and 1 only. Note that the data for the US is very much dominated by industry-sector technology roadmapping exercises (see also Porter and Ashton, 2008).

- **Asia** – Japan pioneered the development of national technology foresight, using the Delphi method since 1970 to forecast and shape future technological trajectories. Besides having an influence on Europe, the Japanese experience has also inspired similar exercises in other parts of Asia, particularly Korea and China. Within the context of the Asia Pacific Economic Cooperation (APEC), a Technology Foresight Centre was set up in the late-1990s to conduct region-wide studies and to develop capabilities in member countries. This work has been largely influenced by practices in Australia, North America, Japan and North-West Europe (see Johnston and Sripaipan, 2008).

- **Oceania** – activities in this region have been shaped by the futures community linked to the World Future Society and the World Futures Studies Federation. However, we should point out that the studies currently available in the EFMN database do not do justice to the level of activity in this region. For example, 36 of 51 studies (i.e. 70 %) in the database are only nominated or mapped in level 1 (at the time of writing this report). This is the case for various Australian exercises such as the ones organised by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), and for most exercises from New Zealand, especially those organised by the Ministry of Research, Science and Technology (MoRST) and the Ministry of Housing.

Table 3.2 (below) shows the geographical distribution of cases (note that countries are listed by regional groupings)

| | levels 0 & 1 | levels 2 & 3 |
|---|---|---|
| **International** | 145 | 67 |
| **Europe** | | |
| EU-related | 83 | 79 |
| Austria | 6 | 10 |
| Belgium | 8 | 17 |
| Bulgaria | 1 | 3 |
| Cyprus | 0 | 1 |
| Czech Republic | 0 | 5 |
| Denmark | 21 | 19 |
| Estonia | 1 | 8 |
| Finland | 23 | 52 |
| France | 134 | 64 |
| Germany | 89 | 42 |
| Greece | 1 | 8 |
| Hungary | 1 | 2 |
| Iceland | 7 | 1 |
| Ireland | 6 | 8 |
| Italy | 13 | 9 |
| Latvia | 3 | 2 |
| Lithuania | 0 | 1 |
| Luxembourg | 2 | 4 |
| Malta | 1 | 3 |
| Netherlands | 124 | 148 |
| Norway | 26 | 11 |
| Poland | 9 | 7 |
| Portugal | 4 | 5 |
| Romania | 2 | 4 |
| Russia | 10 | 10 |
| Slovakia | 2 | 2 |
| Slovenia | 1 | 4 |
| Spain | 12 | 39 |
| Sweden | 10 | 11 |
| Switzerland | 10 | 1 |
| Turkey | 1 | 6 |
| Ukraine | 1 | 2 |
| United Kingdom | 145 | 125 |

| | levels 0 & 1 | levels 2 & 3 |
|---|---|---|
| **Latin America** | | |
| Argentina | 0 | 7 |
| Bolivia | 1 | 1 |
| Brazil | 1 | 14 |
| Chile | 0 | 10 |
| Colombia | 0 | 35 |
| Cuba | 0 | 1 |
| Ecuador | 2 | 1 |
| Mexico | 1 | 2 |
| Panama | 0 | 1 |
| Paraguay | 0 | 1 |
| Peru | 0 | 10 |
| Venezuela | 8 | 37 |
| **North America** | | |
| Canada | 16 | 11 |
| United States | 76 | 98 |
| **Asia** | | |
| Asia | 15 | 29 |
| China | 21 | 8 |
| India | 8 | 7 |
| Japan | 7 | 37 |
| Singapore | 2 | 0 |
| South Korea | 2 | 8 |
| **Oceania** | | |
| Australia | 27 | 14 |
| New Zealand | 9 | 1 |
| Total | 1 098 | 1 113 |

## Comparing practices in world regions

The mapping of foresight experiences is not limited to the European region. All over the world, experts and national Correspondents have contributed to the development of the EFMN database. This has allowed us to analyse and compare European exercises against those carried out in other world regions.

The collection of data at the global level enables us to look at geographical differences in foresight practices. Responses to questions like who are the main sponsors and target audiences, what are the typical time horizons, how many people are involved, what are the main differences in territorial scale, what are the main outputs, and what are the top methods used in different world regions provide the reader with valuable information about the diversity of foresight practices.

Six different groups have been distinguished in this report:

- International
- Europe
- Latin America
- North America
- Asia
- Oceania

*Tables 3.1 and 3.2* have shown the number of cases mapped in each of these groups. Here we should say that figures for Europe bring together EU-related cases (including EU27 and previous EU15 studies, New Member States, Candidate Countries and other Europe-wide initiatives) with national and subnational studies carried out in **33 European countries**, namely: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and the United Kingdom.

However, given that the mapping of individual dimensions (e.g. sponsors, audience, time horizon, etc.) was not compulsory, the number of cases per dimension often varies. For example, from a total of **1 113 cases mapped** in levels 2 and 3, some **1 078** cases have been mapped against the *methods* dimension, some **1 077** against the *audiences* dimension, **1 003** against the *sponsors* dimension. Other dimensions like the number of *participants* or *funding* levels, however, proved to be more difficult to map, showing some **528** and **320** cases respectively.



Figure 3.2: World Map

## Sponsors

The sponsors of foresight exercises can be very diverse – involving a wide range of stakeholders, including government, research, business and non-state actors. The specific reasons for sponsoring a foresight study can be different but the overall rationales may be similar (e.g. building visions, setting agendas for research, action or investment, mobilising key actors).

As *Figure 3.3* shows, government agencies and departments (or simply 'government') are the main sponsors of foresight in all regions, although we can see a few differences. For example, government sponsorship is present in nearly all European and Latin American cases mapped, but is to some extent less dominant in North America, Asia and Oceania.

In Asia, the results are somewhat influenced by the inclusion of APEC-funded projects in our database, whereas the North American figures reflect the high number of industrial sector studies in our sample, many of which are funded by the business sector. Indeed, the business sector is a far more prominent sponsor in this region than in any other, perhaps reflecting an Anglo-Saxon *laissez-faire* tradition. A similar pattern is also seen in the sponsorship data for Oceania, as reported elsewhere (see Popper et al., 2007; Keenan and Popper, 2008).

The results show that other 'non-state actors' including NGOs and inter-governmental organisations (IGOs), but excluding business and research organisations, are more likely to be foresight sponsors in Latin America and Asia.

There are two major explanations here. First there is a prominence of IGO sponsorship in Latin America and Asia, contrasting with the situation in North America and Europe. Secondly, more detailed examination of the sample shows that studies in some regions often have more than one sponsor. This is particularly evident in Latin America, where the sponsorship bars add up to around 150 %. By comparison, the sponsorship bars for Oceania add up to around 100 %, pointing to a strong inclination for single sponsorship.

The main reason for multiple sponsors in Latin America is likely to be insufficient funding from government; foresight practitioners often need to assemble a pool of sponsors before an exercise becomes viable. In some countries (e.g. Colombia and Peru) this has some undoubted benefits (e.g. new initiatives emerging in the 'new' sponsoring institutions. But it also has disadvantages, including a potential loss of focus, and the need for compromise to meet the demands of all sponsors.

## Audiences

Sponsorship data tells only part of the story and it is also interesting to look at the target audiences of foresight exercises.

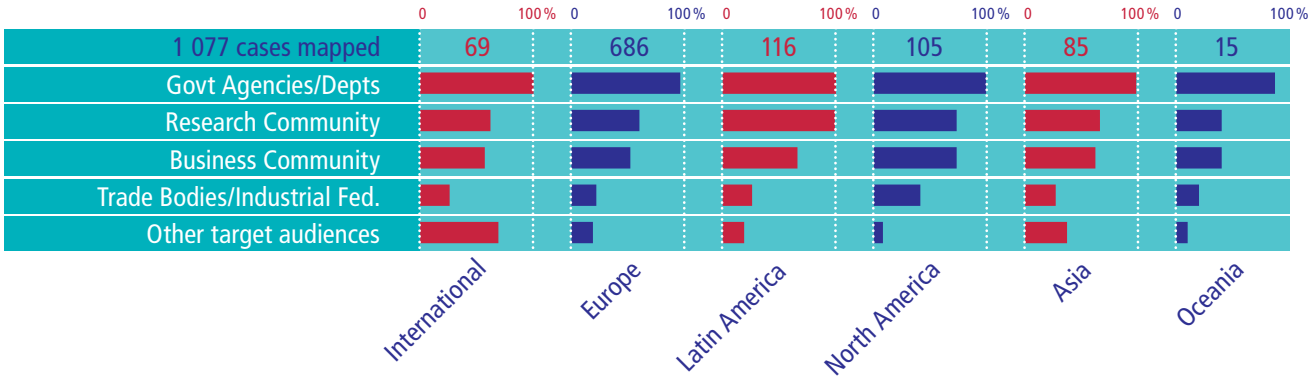
*Figure 3.4* shows the variety of audiences for each region. In general, foresight exercises have a primary set of target groups, whose selection tends to reflect the objectives of the exercise and the interests of the sponsor(s). Broadly speaking, there is no great variation, ***government agencies and departments*** are the main target groups, regardless of the region.

The most remarkable results are the relatively large numbers of ***research*** and ***business community*** targets – far more than there are sponsors. This basically indicates that public administrations often sponsor studies targeted at



**Figure 3.3: Sponsors by region**

Figure 3.4: Target audiences by region




these other groups. But also governments are among target groups more often than they are among sponsors, suggesting that other sponsors could be using foresight exercises to shape public policy agendas (*ibid*, p. 26).

While there may be no great variation between regions, it is possible to observe three interesting features.

- First, in most regions the ***research*** and the ***business*** communities are more or less equally targeted. The exception here is Latin America, where the research community is targeted with the same intensity as governmental bodies. This result may reflect the strong linkages that Latin American TF programmes have established with the academic sector, especially as a tool for research agenda setting.
- Second, North America is clearly the region where foresight activity is more likely to target ***trade unions and industrial federations.***
- Finally, figures for Asia show that this region has the highest number of studies targeting ***other audiences***. According to our data, these audiences are mainly ***(NGOs, trade unions*** and ***intermediary organisations).***

## Time horizon

*Figure 3.5* shows the time horizon of some 1 351 cases, related to their initiation period. Most exercises are looking ***10 to 20 years*** ahead into the future. With the majority of mapped exercises being initiated in the late 1990s or early 2000s, our analyses are focusing on early 21st Century foresight practices. The figure also shows that Europe, North America, Asia and Oceania have a more strategic attitude towards the far future (e.g. 30, 50, 100 years ahead).

## Participation

An important feature of foresight exercises is their potential to become a 'space' for opinion-gathering and reflection among a wide-ranging group of stakeholders. For this reason, the diversity and scale of participation are expected to go beyond what is usually attainable in more standard agenda-setting arenas. Consequently, participation often contributes towards the value-added and shared ownership goals of

Figure 3.5: Time horizon by region

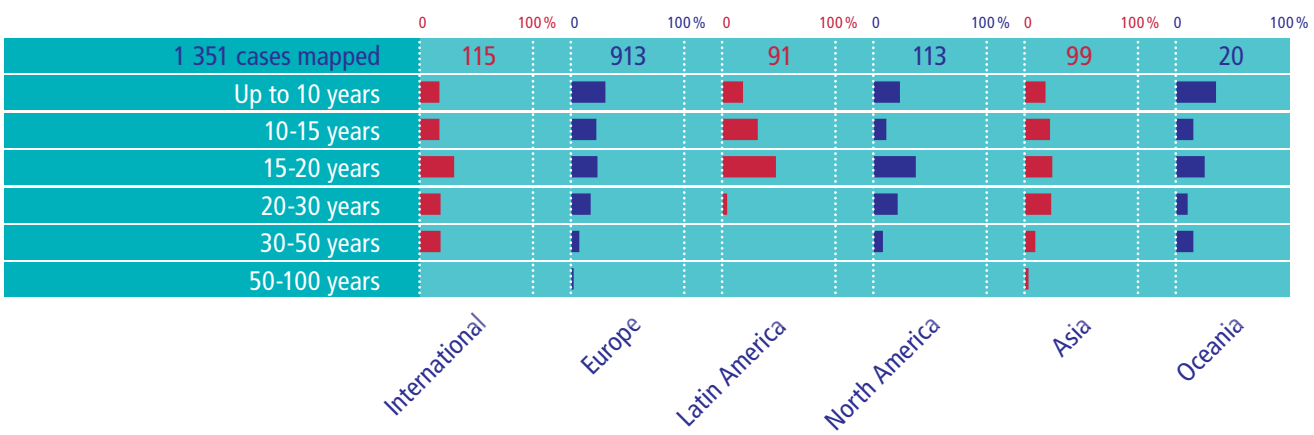
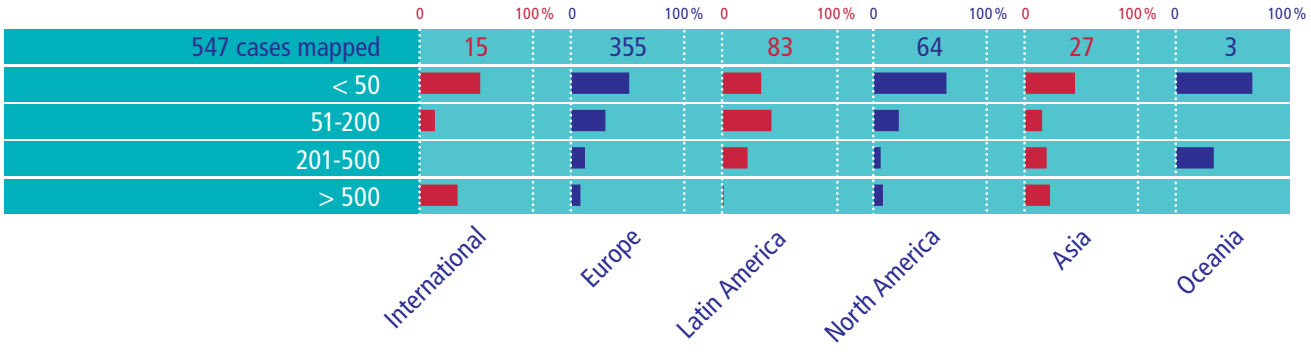


Figure 3.6: Participation by region




foresight. There have been, however, a couple of difficulties with the mapping of this dimension.

First, while the scale of participation can be more or less measured, diversity is more difficult to assess and the EFMN has not attempted to collect this data. This means our analysis is only focused on the scale of participation, which is a less than satisfactory proxy. Second, it has been hard to collect information about the number of people involved in the various activities and the methods used in the exercise (e.g. workshop participants, conference attendants, survey respondents, etc.).

As *Figure 3.6* shows, between 75-85 % of mapped exercises in Europe, Latin America, and North America involved 200 participants or less. Of these regions, Latin America shows the highest level of participation – although it also has the lowest number of exercises with more than 500 participants. Asia has the largest proportion of exercises with more than 500 participants. This can be explained by the fact that virtually all foresight exercises mapped in this region are either national or international, which tends to normally imply higher numbers of participants.

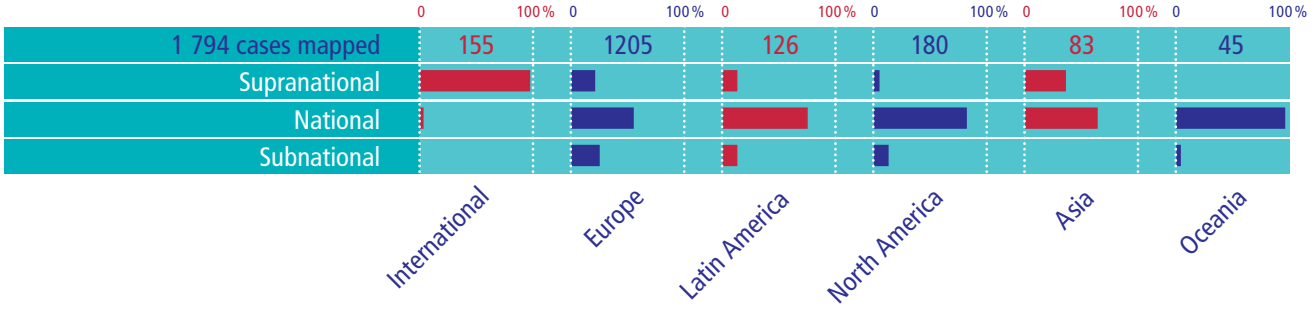
However, the most startling feature of this data is the apparent low levels of participation across all regions, with around half the mapped exercises indicating levels of participation below 50 people. These figures are rather unexpected, given the high participation claims often made on behalf of foresight. But, as Keenan and Popper (2008) suggest, the result may be explained, at least in part, by the inclusion in the EFMN database of future-oriented activities that are outside the usual definitions of foresight as used, for example, by the European Commission; the latter may tend to emphasise high levels of participation.

Another possible factor could be that some of the largest national exercises have been broken down into their constituent parts for the purposes of mapping, creating a measurement effect. Yet another explanation may simply be that large-scale, multi-participant exercises are too challenging, expensive and time-consuming to organise so that, in many situations, the ideal of deep and wide participation remains just that – an ideal.

## Territorial scale

Foresight exercises are carried out at a variety of territorial scales, ranging from subnational exercises to

Figure 3.7: Territorial scale by region



international ones. But given that foresight is often conducted to inform and support policy, we would expect exercises to be carried out at those territorial scales where policy responsibilities reside, particularly at national level.

However, for those regions where there is extensive autonomy at the subnational level (for example, in federal political systems) or where national sovereignty has been pooled (as in the European Union), we might expect to see substantial foresight activity on these scales as well.

*Figure 3.7* shows that for all world regions, the national level is by far the most important. As policy-making is still predominantly carried out at this level, this result should come as little surprise. The remaining foresight initiatives are more or less equally distributed over the other territorial scales, although there are some significant differences between regions.

Subnational exercises are found most frequently in Europe – possibly reflecting long-term trends of regionalisation in many European countries – closely followed by Latin America. In contrast, they seem to be less common in Oceania and are non-existent in Asia. The mapping process might play a part in explaining some of these results. For example, the relatively high figures for Europe and Latin America might be explained by more intensive monitoring efforts in these regions, compared with North America where a larger number of subnational exercises might have been expected, given federal political arrangements.

On the other hand, the low number of exercises for Asia is not surprising, since subnational governance is weakly developed in the countries covered in this region (ibid, p. 22). In terms of supranational studies, Europe shows significant figures (20 %), certainly owing to the activities of the European Commission and its agencies. A large proportion of Asian studies are also supranational. This is mainly due to the activities of the APEC Technology Foresight Centre, which has been supporting region-wide studies. In Latin America and North America there has been limited international activity. In the former, UNIDO and the EC have become important players in recent years.

## Methods

The number and type of methods used in a foresight exercise normally depends on a variety of factors. Some of these factors are linked to the ***intrinsic attributes of methods***, namely their nature (qualitative, quantitative or semi-quantitative) and their capabilities (i.e. the ability to gather or process information based on evidence, expertise, interaction or creativity).

Other factors are more linked to ***fundamental elements and conditions influencing a foresight process***, including available resources (time and funding), the geopolitical context, expected outputs, participation scale and the interconnections between methods – or 'methods mix', among others (see Popper, 2008a).

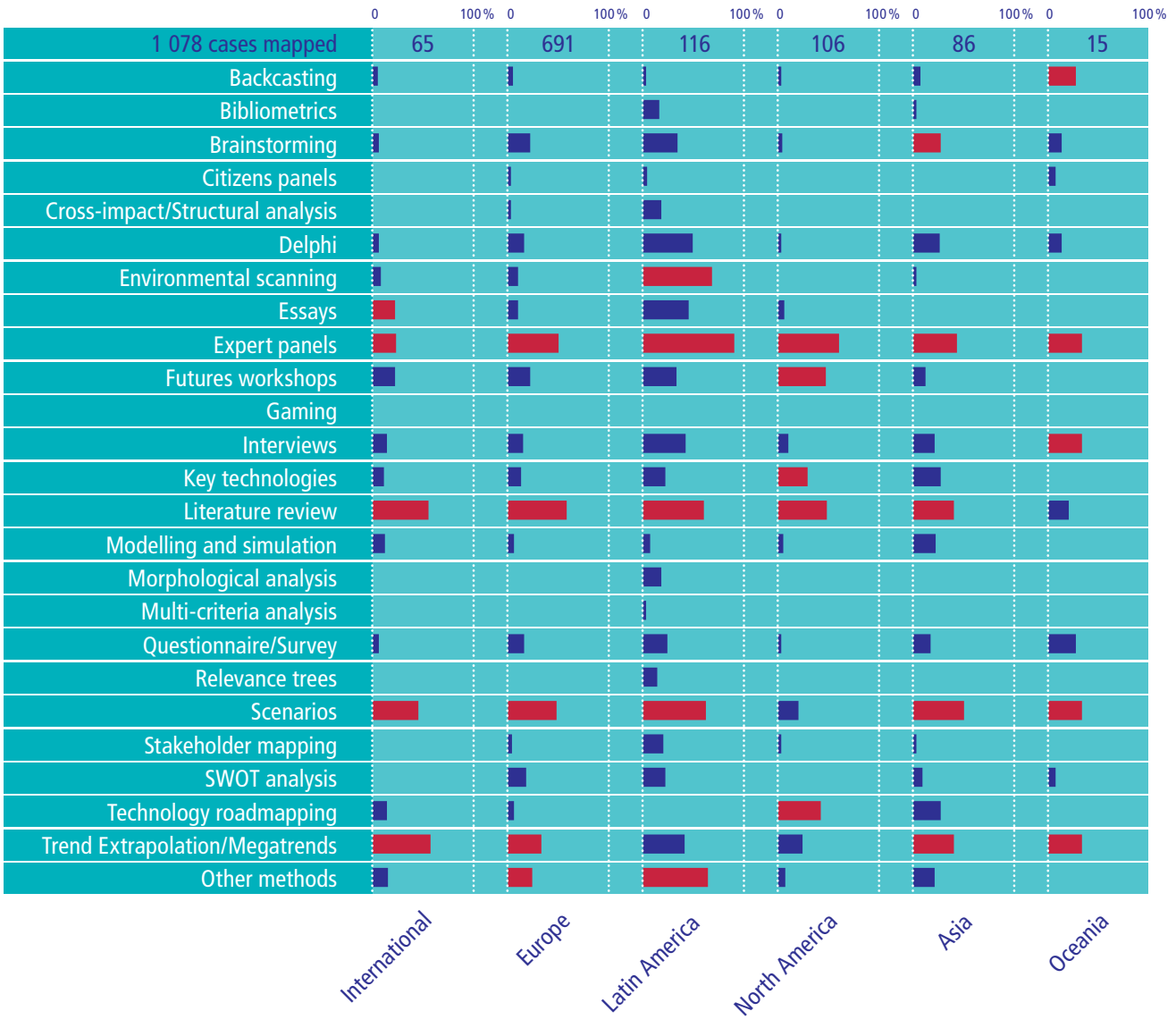
*Figure 3.8* shows the use of some 25 methods (the top ten methods in each world region appear in red). Its results indicate that some methods are very widely used across the world; such is the case for ***expert panels, literature review, scenarios*** and ***trend extrapolation.***

But the more interesting findings are those that tell us more about differences in regional foresight practices. The first of these methods is (futures) ***workshops***, which figure notably in Europe and North America but are used much less in Asia and Oceania and are below the top ten in Latin America. The second method of interest is ***Delphi***, which is most often used in Latin America, Asia and Europe, but is absent from the top ten in North America.

As the author of this report highlighted in the 2008 special issue of *Foresight* Journal (about EFMN):

*In the more established democracies of Europe and North America, actors more at ease with openly discussing contested futures come together in face-to-face forums offered by workshops. By contrast, in newer democracies, or in Japanese society, where there is less tradition of open debate, the more anonymous method of Delphi is preferred. Furthermore, Delphi generates a lot of codified output that is more amenable to analysis and assessment than workshop 'talk' and is therefore preferred by states with a 'strong' tradition of orchestrating socio-economic activity.*

## Figure 3.8: Methods by region




Results also show ***technology roadmapping*** and ***key technologies*** as two of the most popular methods in North America and Asia. This can be explained by the importance of the business sector as a target audience (and as a sponsor in the case of North America) which favours these particular techniques. Other interesting findings include:

- Backcasting, citizen panels and interviews are among the most common methods in Oceania (these figures might change as more cases from that region are examined).

- Trend extrapolation and megatrend analysis, modelling and simulation, and questionnaires/surveys are more popular in international cases than Delphi, SWOT analysis and interviews.

- Despite being created in North America, Delphi appears to be more popular in Latin America, Europe, Asia and Oceania.

- North America seems to be the region with the most emphasis on technology roadmapping and key technologies activities.

- Structural analysis is in the top ten for Latin America – probably reflecting the strong influence that French strategic prospective practices had in the late 1980s and early 1990s.

- Asia uses modelling and simulation in about 25% of the mapped studies.

Finally, it may be useful to look at the average number of methods used by each region: International (4 methods), Europe (5), Latin America (8), North America (4), Asia (4) and Oceania (3).

## Outputs

Are there regional differences in the production of foresight outputs? Our own experience as practitioners tells us that such differences do, indeed, exist. These tend to become more apparent in the relative importance that some regions give to the production of codified outputs versus the generation of process-related intangibles (such as networks and shared visions).

Unfortunately, the EFMN data does not allow us to confirm these views, since mapping efforts have been exclusively concerned with collecting data on the codified outputs of foresight exercises and have not attempted to capture intangible process benefits as well.

The sister SELF-RULE initiative included some of these intangibles in the mapping of Latin American experiences, for example, the emergence of new networks, new actors and new funding schemes, among others. However, these were not used by the EFMN, so cannot be compared with other regions.

Therefore, *Figure 3.9* only shows the popularity of some common codified outputs.

***Policy recommendations*** are the most frequent outputs in all regions, principally in Europe, Latin America and Oceania.

***Analysis of trends and drivers*** has been reported as an output most frequently (relatively speaking) in Latin America, followed closely by the Europe and International studies.

***Scenarios*** are less present in the North American and Asian studies mapped to date.

***Research and other priorities*** are reported as outputs relatively more frequently in Latin America and Oceania; closely followed by North America.

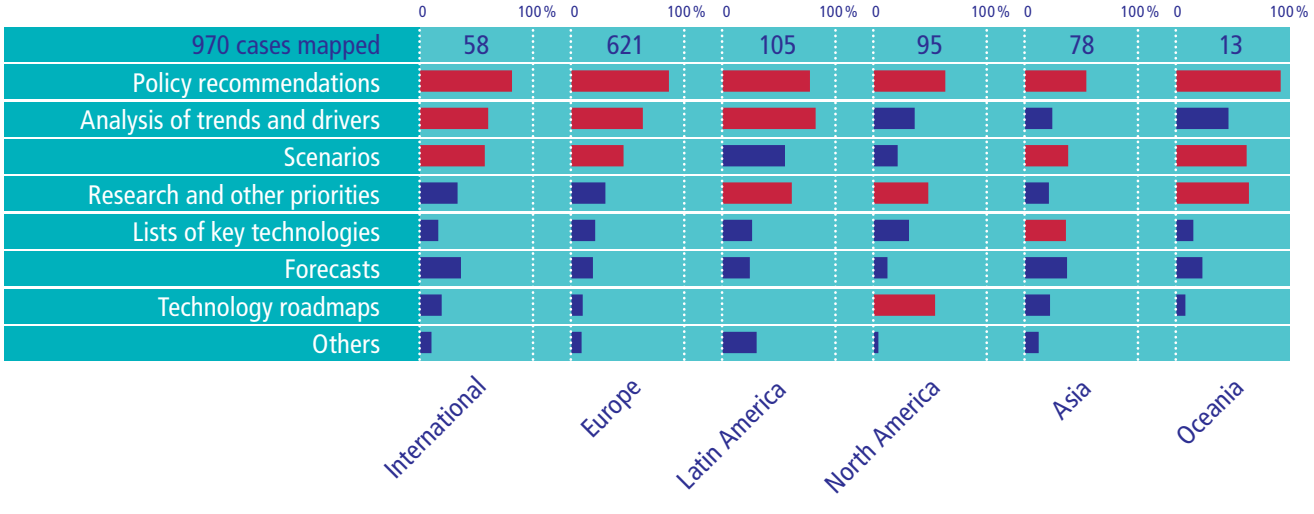
***Key technologies*** are the third most important outputs of Asian cases. They are not very common in other groups.

***Forecasts*** are most popular in Asia. On the whole across all regions, forecasts appear to be one of the least reported outputs.

***Technology roadmaps*** are generated most frequently in North America, while they do not feature at all in Latin American output.



**Figure 3.9: Outputs by region**



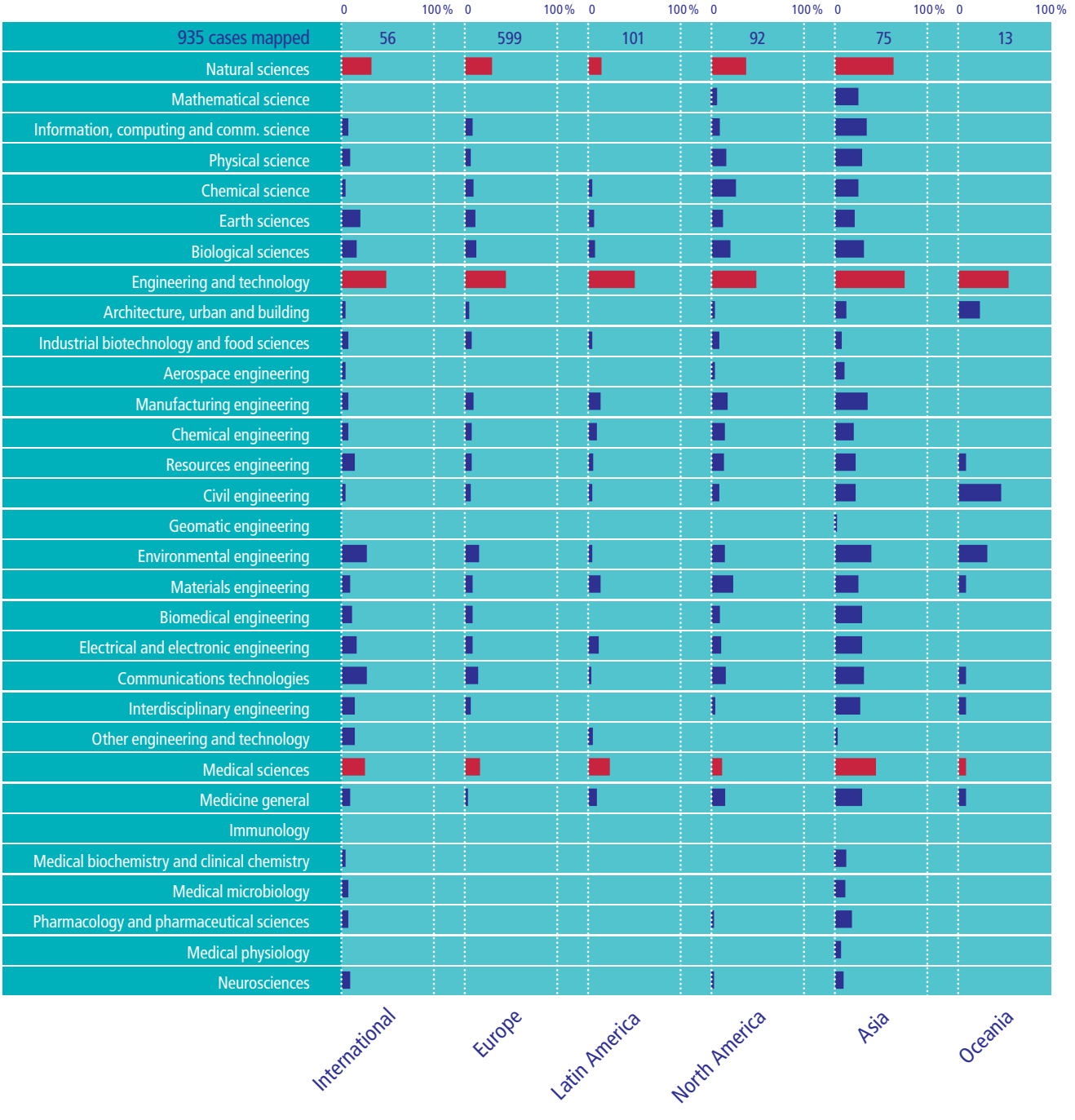
## Research areas

The EFMN database used the research areas indicator to map those science and technology fields, as defined by the *Frascati* Manual, which have been explicitly addressed by foresight. To do so, Correspondents were advised to select categories at least to the second level of research areas; otherwise the information gathered was too general.

*Figure 3.10* shows the regional distribution of results (note that the highest level of FRASCATI categories are shown in red). The first interesting result is that foresight exercises in North America and Oceania are carried out with more defined target research areas than similar exercises in Europe, Latin America and Asia.

This is particularly obvious in Oceania, where the higher level bars of research areas add up to around 100 %.

### Figure 3.10: Research areas by region



By comparison, the research areas bars for North America add up to around 115 %, pointing to a strong inclination for single research area studies.

But how can we read these results? The main reason for targeting multiple research areas, for example, in International, European, Latin American and Asian foresight studies (where red bars add up to 189 %, 150 %, 184 % and over 200 % respectively) may be related to the already mentioned diversity of sponsors in these regions.

Multiple sponsorships often require a much broader conceptual and methodological scope. In other words, if a study is sponsored by a government agency in cooperation with, for example, an international organisation (such as the European Commission, UNIDO or APEC), then the study is often expected to promote

Figure 3.10: Research areas by region (continued)

*basic research* (e.g. by developing theoretical analysis of the factors determining potential changes in a sector, quite often targeting sub-areas of ***social sciences***) and applied research areas (e.g. by exploring the potential of technologies and thus generally, though not always, targeting sub-areas in the ***engineering and technology*** category).

The second interesting result, considering the large proportion of exercises targeting areas of social sciences, is the almost non-existence of foresight exercises on areas of ***humanities*** in our database. One possible explanation here is the fact that our mapping process was originally focused on technology foresight programmes.

Another explanation, based on our own experience as practitioners, is that major foresight sponsors (i.e. governmental bodies, such as offices of science and technology, ministries of economy, departments of trade and industry, and equivalents) tend to have limited capacity to shape the future of those areas included in the Frascati taxonomy under the humanities category. One possible exception could be ***languages and culture***. Studies which have considered cultural issues (such as, for example, the EUFORIA[1] project) are more likely to be mapped as ***studies of human societies*** within the ***social sciences*** category.

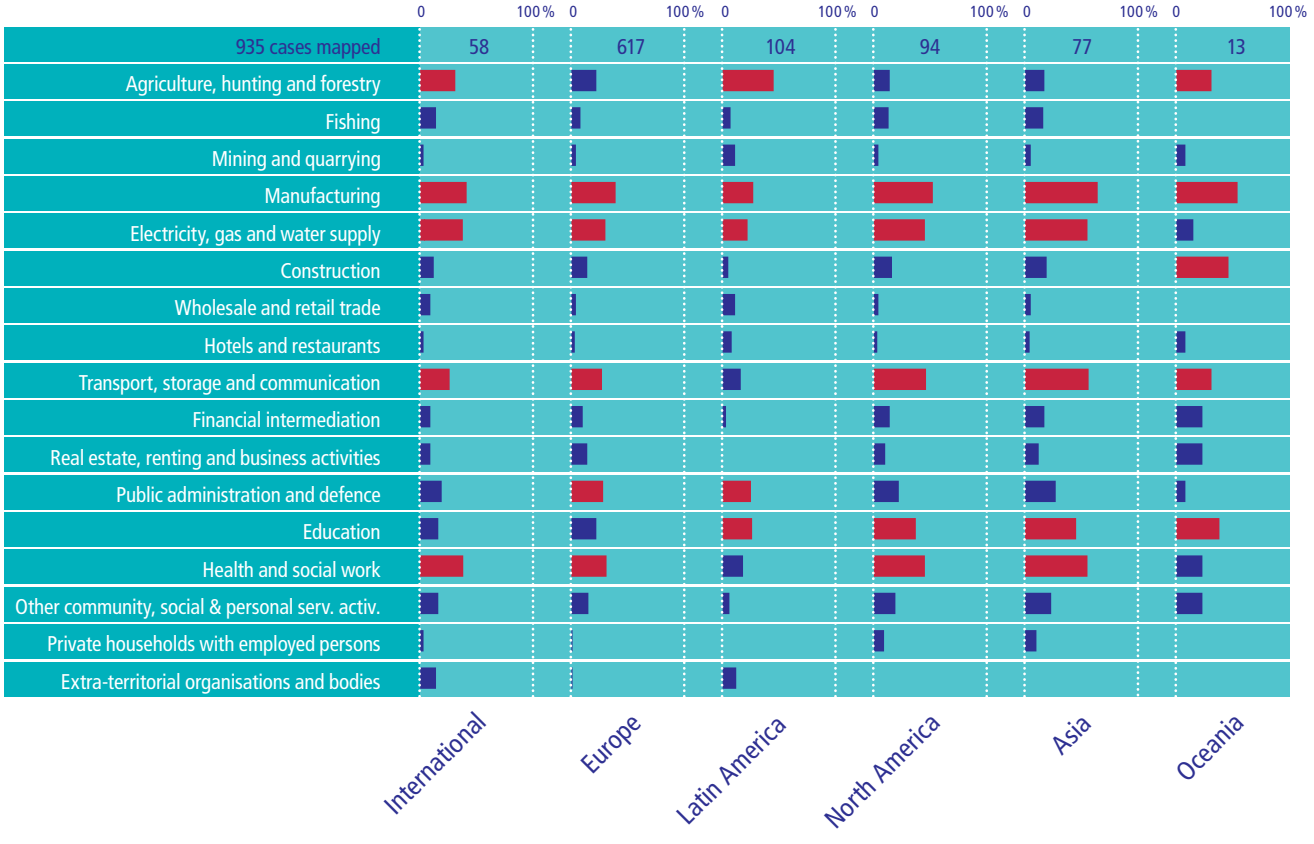
Also striking is the lack of sufficient European foresight on ***agricultural sciences***. This is surprising in the light of the number of *regulatory and socio-economic challenges and opportunities* of the Common Agricultural Policy promoted by the European Union, but also because of *market-related challenges*, such as higher food prices driven by the use of crops to produce biofuel, the growing demand for food products in Asian countries (mainly China and India), and *environmental challenges* such as water scarcity and climate change, among other factors.

## Socio-economic sectors

*Figure 3.11* shows the regional distribution of sectors using the NACE classification system (i.e. Nomenclature générale des Activités économiques dans les Communautés européennes).



### Figure 3.11: Socio-economic sectors by region




*(1) EUFORIA studied the emergence and implications of a "knowledge society".*

The results show that the top five target ***socio-economic sectors in Europe*** are:

- Manufacturing
- Health and social work
- Electricity, water and gas supply
- Public administration and defence
- Transport, storage and communication.

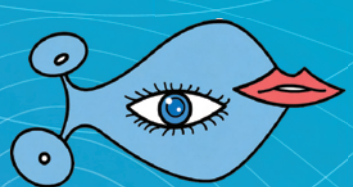
Overall, ***manufacturing*** is one of the top socio-economic sectors in all regions, with Asia, North America, Oceania and Europe focusing on this area and Latin America giving it a little less consideration. While some countries in this region have an important manufacturing base (e.g. Brazil), lower levels of interest in this domain area may reflect the region's continuing strong emphasis on ***agriculture***, which is by far the most common sector covered in its foresight activities.

However, if we think about the recent food crisis, we could conclude that Latin America has been targeting the right sector, while other countries have sometimes neglected this sector and have preferred to study more 'glamorous' topics such as the communications industry (including ICTs).

Two other sectors addressed by a large number of foresight studies concern 'infrastructures' – namely, healthcare (including ***health and social work***), utilities (***electricity, gas and water supply***) and transport. These are among the top five domain areas in Europe, North America and Asia. But Latin America and Oceania show slightly different interests. *Figure 3.11* shows that both Europe and Latin America have a considerable number of studies on ***public administration and defence*** issues.

Finally, it is possible to observe the lack of foresight (especially in Europe but also in other regions) on the sectors hit by the recent economic crisis, namely the ***financial intermediation*** and the ***real estate*** sectors.

# 4 Mapping foresight in ten European countries



The frequency and nature of foresight initiatives varies significantly across Europe. Some countries, especially where foresight has traditionally been used as an instrument to support government and business decisions, show a higher frequency of case studies than others. In this chapter we have mapped practices in nine EU Member States (Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Spain, and the United Kingdom) and one associate country (Norway). We have selected these countries because they have the largest number of cases in the database, ranging from 17 cases in Belgium and Italy to 144 and 181 in the UK and the Netherlands respectively.

For each country we have made summary boxes with the mapping results of eight dimensions: time horizon, sponsors, audiences, territorial scale, methods, research areas, socio-economic sectors and outputs. In addition, we have selected a sample of project objectives in order to provide a 'flavour' of the types of cases mapped in each country. The objectives have then been clustered using the eight categories described in Chapter 2, namely: analysing the future potential of technologies; supporting policy or strategy development; network building; priority setting for science and technology; methodology and capacity building; articulating supply and demand; public engagement; and 'other'.

Due to space limitations we have restricted our descriptions and indicator boxes to one page each. Despite this compression, we hope enough detail is available to illustrate and justify our synthesis about national practices in the ten selected countries.

## Figure 4.1: Mapping foresight practices in 10 European countries

**Belgium**
(17 cases)

**Denmark**
(25 cases)

**Finland**
(50 cases)

**France**
(119 cases)

**Germany**
(57 cases)

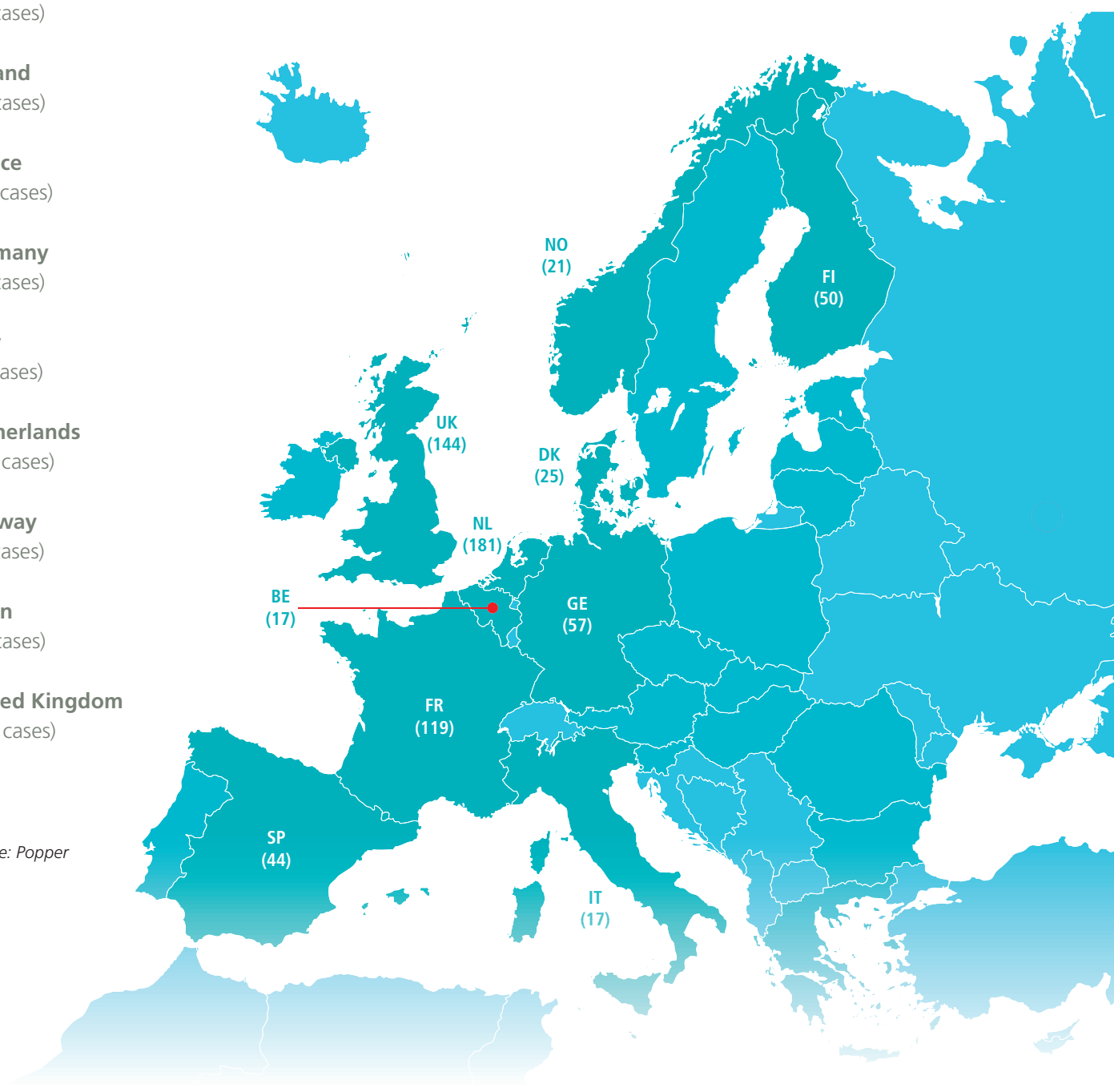
**Italy**
(17 cases)

**Netherlands**
(181 cases)

**Norway**
(21 cases)

**Spain**
(44 cases)

**United Kingdom**
(144 cases)




*Source: Popper*

## Foresight in Belgium

Our database includes 25 exercises linked to Belgium. 17 of these can be considered fully mapped.

*Box 4.1* shows that Belgium has projects targeting a variety of **time horizons** ranging from less than 10 years to more than 30 years into the future. In terms of **sponsors**, the *government* is clearly the main supporter of foresight followed by *non-state actors*. Sponsors include: the Belgium Federal Office for Scientific, Technical and Cultural Affairs (BELSPO); the Royal Belgian Academy Council of Applied Sciences (BACAS); the Walloon Ministry of Economy; and the Flemish Institute for Science and Technology Assessment (viWTA), among others.

As for the **audiences** (users), the figures show that more than 80 % of the studies target *government agencies and departments*, around 50 % target the *research community*, around 40 % target the *business community*, some 25 % of cases target *trade bodies* and *industrial federations*, while *other actors* (e.g. trades unions and intermediary organisations) are targeted in 10 % of the studies.

Figures on **outputs** indicate that *policy recommendations* and *scenarios* are present in half of the studies, followed closely by the *analysis of trends and drivers*.

The **territorial scale** of the studies is mainly *national* (50 %), with the other half equally distributed between *subnational* and *supranational* studies.

The most common **foresight methods** are: *literature review; futures workshops; scenarios*; and *expert panels*. We should also point out that the 'other methods' option was selected in half of the sample, indicating the existence of very diverse methodological frameworks in the country.

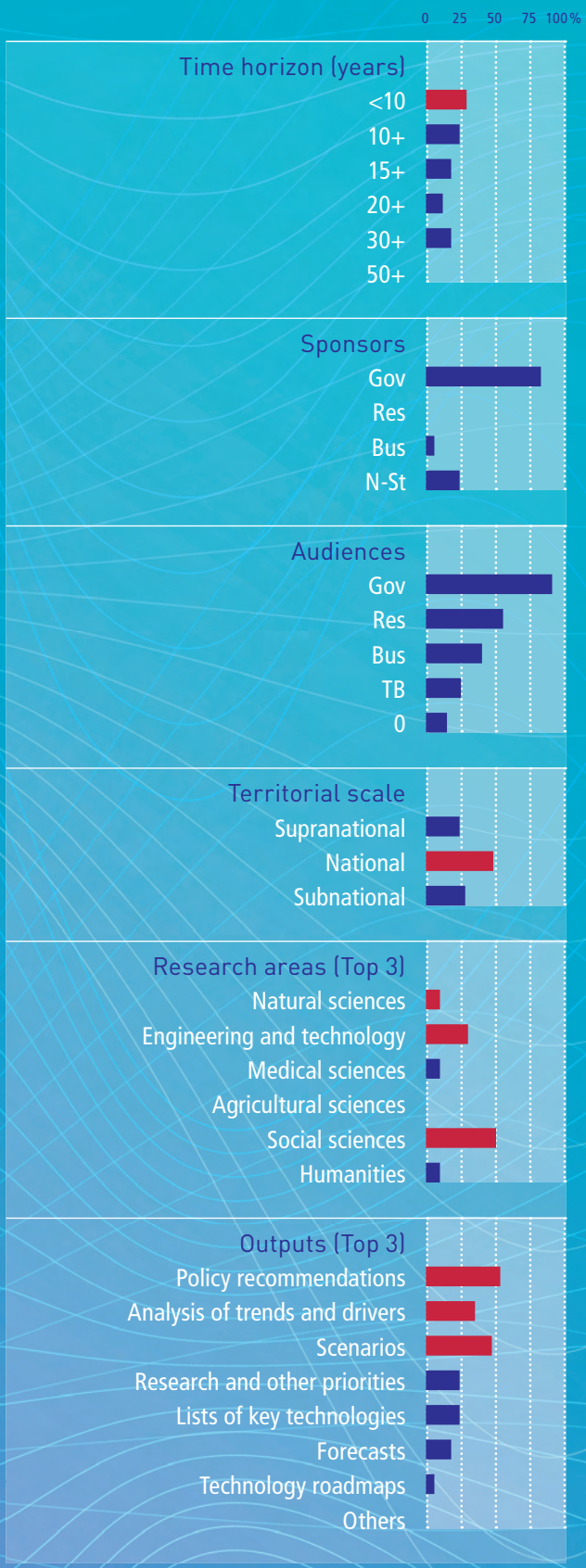
Popular foresight **research areas** focus on *social sciences* (i.e. studies in human society; education; economics and policy and political science) and *engineering and technology* (mainly chemical, resources, environmental and materials engineering).

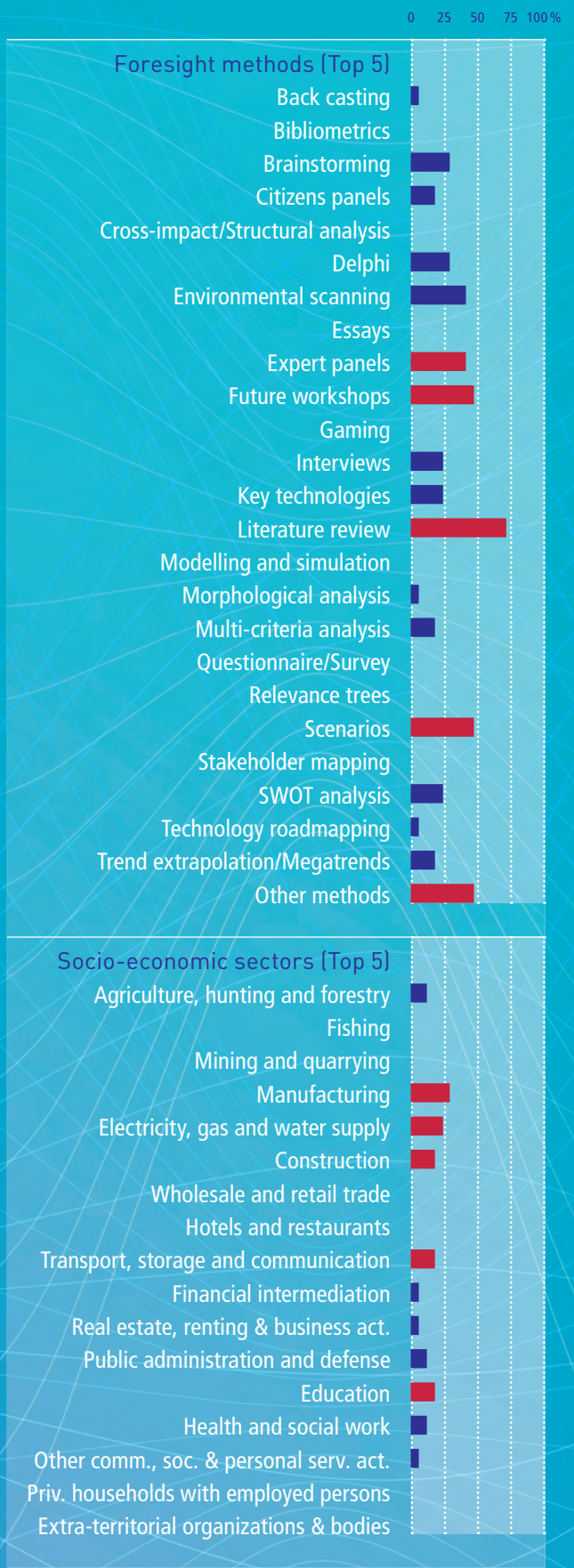
The most often targeted **socio-economic sectors** are *manufacturing; electricity, gas and water supply; construction; transport storage and communication;* and *education*.

Finally, we selected a limited number of **objectives** and clustered them using the categories presented at the end of Chapter 2:

- About *analysing the future potential of technologies*: (1) analysing qualitative data about the socio-economic impact of technologies in the future; (2) elaborating future perspectives in the area of energy; and (3) understanding the meaning of nanotechnology for improving the competitiveness of the country.
- About *supporting policy* or *strategy development*: (1) developing alternative scenarios for the future, which can serve as tools for strategic discussion and planning not only on a European level but also on a national level; (2) elucidating the use and function of the sustainability concept in different contexts, and mapping the diverging views on sustainability; (3) promoting technology and innovation policies; and (4) developing a long-term vision on the opportunities and threats for the Flemish region (broad socio-economic orientation).
- About *network building*: organising a network of competent suppliers fitted to the companies' needs and a framework for innovation.
- About *methodology and capacity building*: (1) comparing different sets of methods and indicators used to put sustainability into practice; and (2) developing methodologies and tools to assess the impact of flood risk reduction measures.
- About *articulating supply and demand*: (1) developing strategies and action plans to be undertaken by different actors, including the private and public sectors as well as civil society (e.g. acquiring a better knowledge of the innovation potential in Wallonia; promoting partnerships and synergies by creating innovation clusters: etc.); (2) offering a basis to businesses to make innovation strategies; (3) providing a larger share of innovative products and services in the total economic output of the region; (4) investigating which energy system the Flanders region would need in 30-50 years and how such a system could be achieved.

## Box 4.1: Mapping foresight in **Belgium** – Source: 17 cases



## Foresight in Denmark

Our database includes 40 exercises linked to Denmark. 25 of these can be considered fully mapped.

*Box 4.2* shows that Denmark has projects targeting a variety of **time horizons** with a considerable number looking at more than 15 years ahead.

In terms of **sponsors**, the *government* is clearly the main supporter of foresight. Sponsors include: the Ministry of Science, Technology and Innovation (VTU); the Ministry of Trade and Industry; the Ministry of Environment; the Environmental Protection Agency; the Risø National Laboratory for Sustainable Energy; and the Nordic Innovation Centre, among others.

As for the **audiences** (users), the figures show that almost 100 % of the studies target *government agencies and departments*, more than 75 % target the *research community*, and more than 50 % target the *business community*.



Figures on **outputs** show that *policy recommendations*, *research and other priorities* and *analysis of trends and drivers* are the key outputs of most studies.

The **territorial scale** of the studies is mainly *national* (75 %), while the other 25 % constitute *supranational* studies.

The most common **foresight methods** include: *expert panels; futures workshops; literature review; scenarios; key technologies* and *technology roadmapping*.

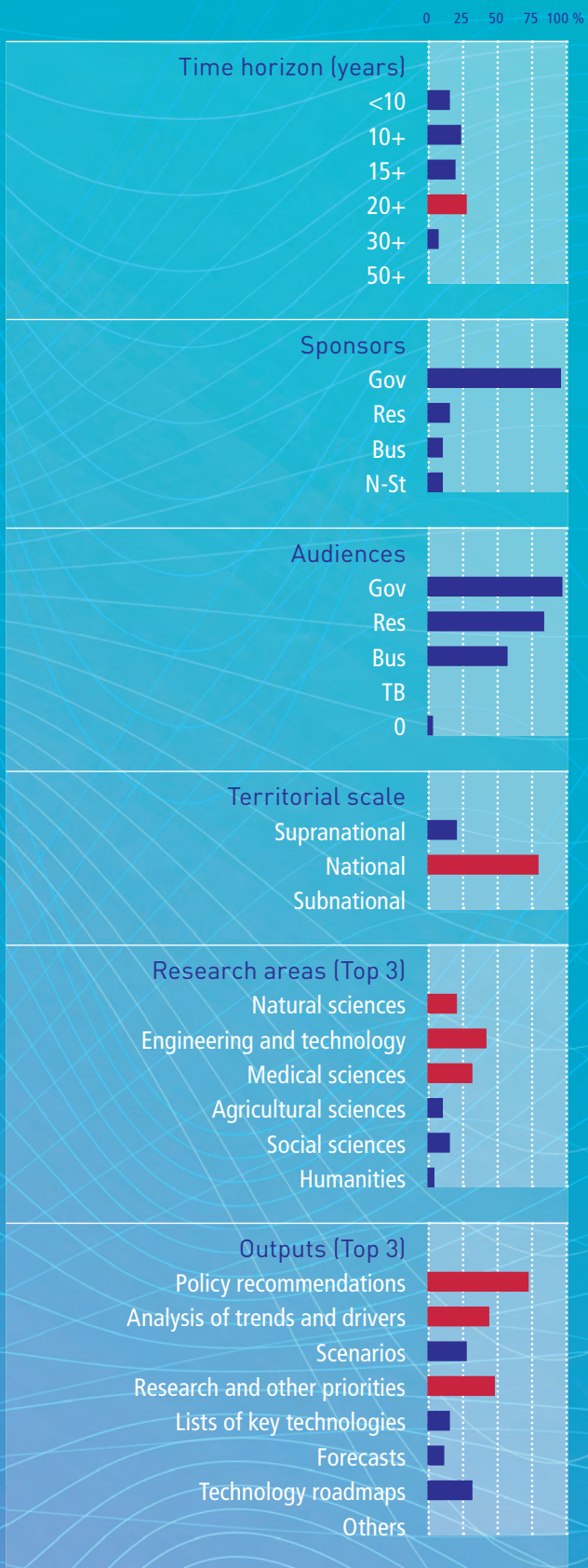
Popular foresight **research areas** focus on *engineering and technology* (especially manufacturing engineering and industrial biotechnology and food sciences) followed by *medical sciences* (mainly public health and health services; and pharmacology and pharmaceutical sciences).

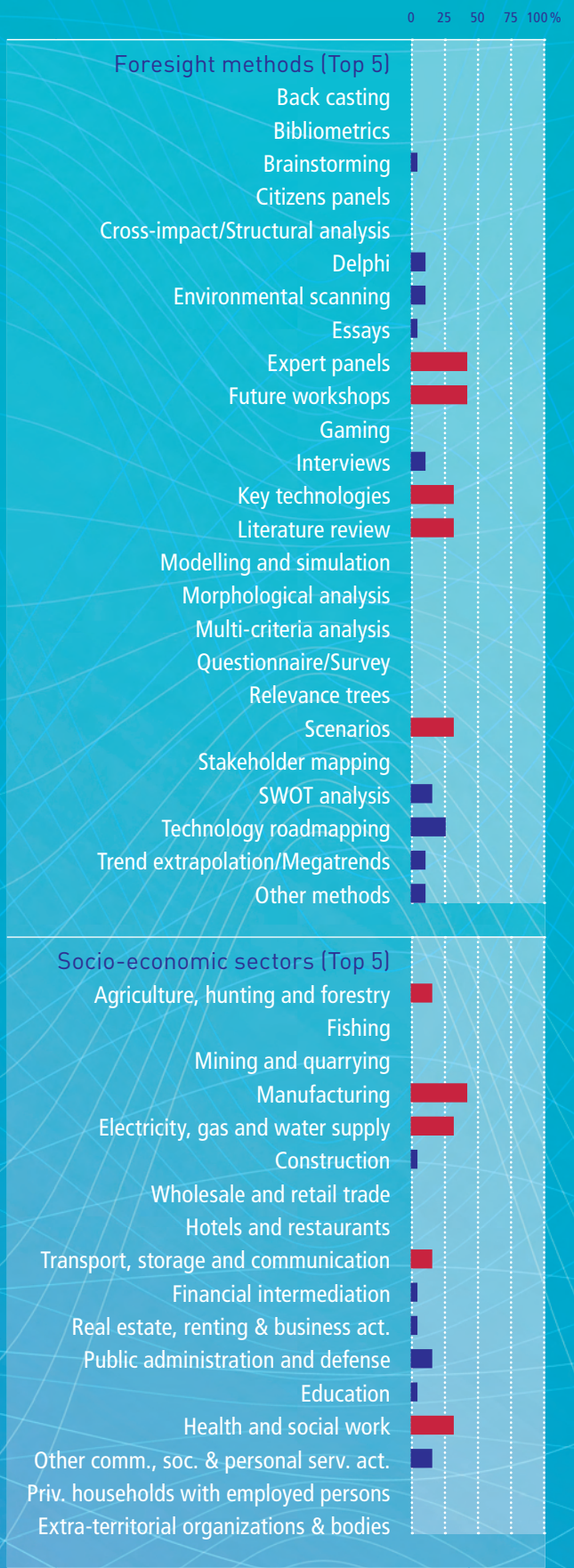
The most often targeted **socio-economic sectors** are *manufacturing, electricity, gas and water supply;* and *health and social work*.

Finally, we selected a limited number of **objectives** and clustered them using the categories presented at the end of Chapter 2:

- About *analysing the future potential of technologies*: (1) analysing the environmental effects of wind turbines during production and decommissioning of wind turbines in a long-term view; (2) enabling a strategic understanding of the possibilities and implications of the use of biomedical sensors for healthcare purposes by establishing likely scenarios for technology, applications and markets; (3) analysing future possibilities for the application of ICT within the whole value chain in the next 5-10 years; (4) analysing environmental potentials and risks related to three generic technologies (nanotechnology, biotechnology and ICT) within the coming 15-20 years; (5) presenting some scenarios of future developments in sensor technology with respect to the technology, its applications and market issues in a timeframe of 2000-2015; (6) generating, selecting and presenting a number of scenarios illustrating the prospects for possible future applications for ICT technologies; and (7) providing a wide knowledge base in regards to possible innovation related to the development of robot technology.
- About *supporting policy or strategy development*: (1) promoting strategies for sustainable development in coastal areas; (2) providing a sound basis for cohesive, long-term Danish policy on research, education and innovation; and (3) providing a well-established knowledge base about an ageing society in 2030 in regards to valuing the needs for new concentrated strategic research efforts.
- About *network building*: creating a framework for an open debate between experts, politicians and stakeholders in the energy sector.
- About *priority setting for S&T*: (1) providing decision support for companies and research institutes in defining R&D priorities and assisting governmental decision-makers in making effective framework policies for the introduction of hydrogen energy; and (2) putting forward a number of long-term energy goals, serving as a guideline for this year's work and for the end of year.

## Box 4.2: Mapping foresight in **Denmark** – Source: 25 cases



## Foresight in Finland

Our database includes 76 exercises linked to Finland. 50 of these can be considered fully mapped.

*Box 4.3* shows that Finland has projects targeting a variety of **time horizons**. Most look at more than 10 years and a few go beyond 50 years.

In terms of **sponsors**, the *government* is clearly the main supporter of foresight. Sponsors include: the National Fund for Research and Development (SITRA); the Ministry of Agriculture and Forestry; the Ministry of Education; the Parliament; and the National Technology Agency of Finland (TEKES), among others.

As for the **audiences** (users), the figures show that more than 80 % of the studies target *government agencies and departments*, around 60 % target the *business community*, around 50 % the *research community*, and some 25 % of cases target *trade bodies and industrial federations*, while *other actors* (e.g. trades unions and intermediary organisations) are targeted in 10 % of the studies.



Figures on **outputs** indicate that *policy recommendations* and the *analysis of trends and drivers* are present in more than half of the studies, followed by *scenarios*.

The **territorial scale** of the studies is mainly *national* (75 %) and the other half is more or less equally distributed between *subnational* and *supranational* studies.

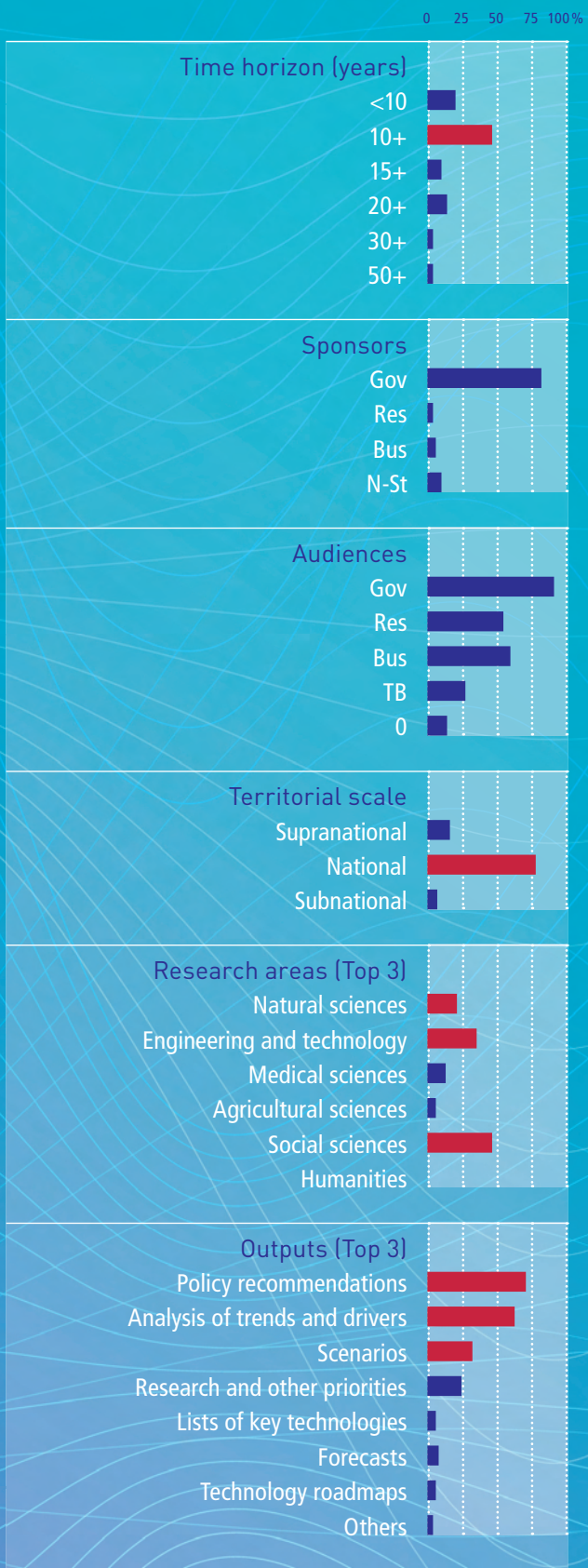
The most common **foresight methods** are: *expert panels; literature review; scenarios; futures workshops; SWOT* and *Delphi*.

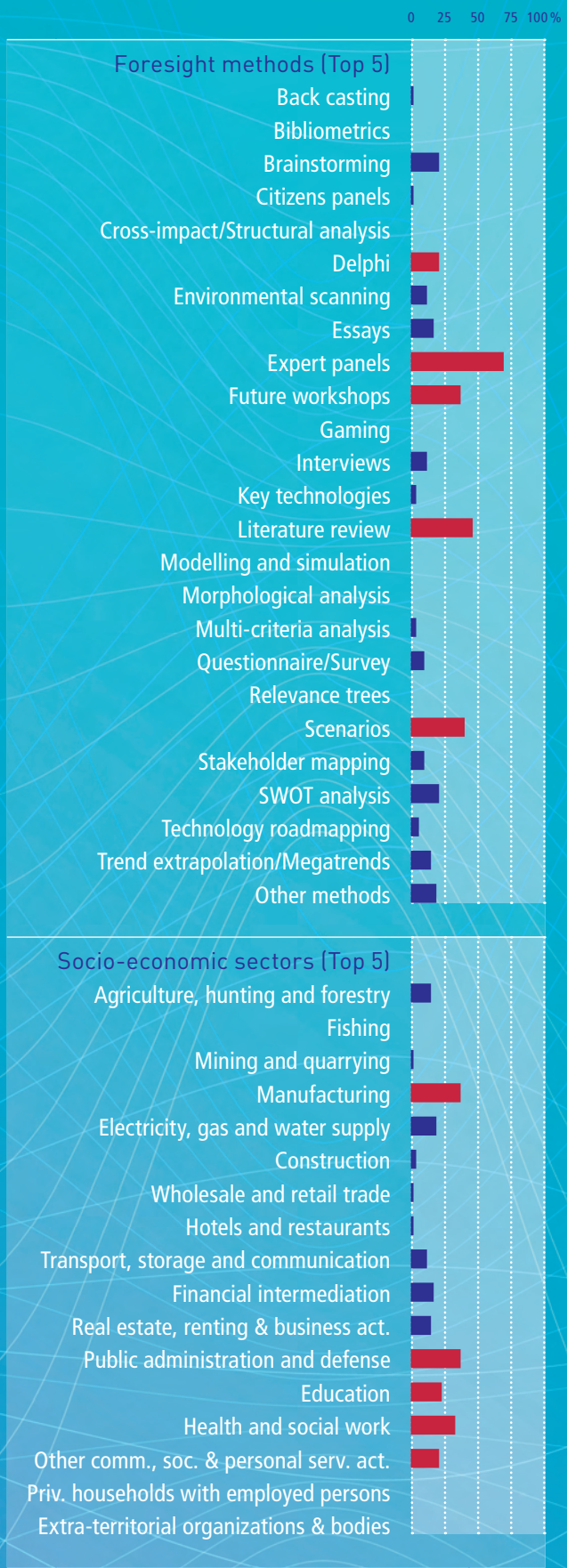
Popular foresight **research areas** focus on *social sciences* (especially policy and political science and the studies in human society) and *engineering and technology* (mainly on communications technologies; environmental engineering; and industrial biotechnology and food sciences). The most often targeted **socio-economic sectors** are *manufacturing; public administration and defence; health and social work*; and *education*.

Finally, we selected a limited number of **objectives** and clustered them using the categories presented at the end of Chapter 2:

- About *analysing the future potential of technologies*: (1) foreseeing the future technology needs of Finnish industry until the year 2015; (2) facilitating a multifaceted discussion about the potential of new technologies in supporting the independent living of elderly people; (3) mapping promising technologies, new business models and qualification requirements; (4) presenting a summary of the production possibilities of renewable energy sources in Finland by 2030; (5) identifying, with a 10 to 15 years perspective, the areas where competitiveness and wellbeing of Finland is best advanced by means of STI.
- About *supporting policy or strategy development*: (1) providing long-term vision for the energy sector; (2) forming three scenarios (business as usual, threats and future in making and opportunities) for food industry, in order to gather one joint scenario and a proposal for a strategy; (3) exploring the future development trends in knowledge intensive business services (KIBS) as a whole and by sub-sectors; and (4) assisting governmental decision-makers in making effective framework policies for the introduction of hydrogen energy.
- About *network building*: generating information on long-term development views for decision-making by regional, sub-regional and local actors, promoting networking among cluster firms.
- About *priority setting for S&T*: (1) helping regional bodies to prioritise innovations about knowledge society developments; and (2) providing decision support for companies and research institutes in defining R&D priorities.
- About *methodology and capacity building*: influencing the educational system by promoting the capabilities for reacting to qualifications needs.
- About *articulating supply and demand*: developing an action model for regional organisations in order to understand future development of the regional labour market and several business areas (e.g. agriculture, software industry, food industry, environmental technology, biotechnology, etc.).

## Box 4.3: Mapping foresight in **Finland** – Source: 50 cases



## Foresight in France

Our database includes 198 exercises linked to France. Of these, 119 can be considered fully mapped.

*Box 4.4* shows that France has projects targeting a wide range of **time horizons**, but most look 10 or 20 years into the future.

In terms of **sponsors**, the *government* is the main supporter of foresight. Sponsors include: Délégation à l'Aménagement du Territoire et à l'Action Régionale (DATAR); the Ministry of Economy, Finance and Industry; the Ministry of Defence; the Conseil Économique et Social Régional (CESR-Centre), among others.

As for the **audiences** (users), the figures show that more than 80 % of the studies target *government agencies and departments*, around 50 % target the *research community*, around 30 % target the *business community*, and some 15 % of cases target *trade bodies and industrial federations*, while *other actors* (e.g. trades unions and intermediary organisations) are targeted in 25 % of studies.



Figures on **outputs** indicate that *policy recommendations* and the *analysis of trends and drivers* lead, followed by *scenarios*.

The **territorial scale** of the studies is mainly *subnational* (59 %), with some *national cases* (37 %) and only 4 % *supranational*.

The most common **foresight methods** are: *scenarios; trend extrapolation/megatrends, literature review*; and *expert panels*. We were expecting to see more use of the French versions of cross-impact (i.e. structural analysis, MACTOR and SMIC) as we were expecting to see more use of Delphi in the United States (see *Figure 3.8*). An interesting question here is whether foresight methods eventually become less popular in the countries where they have been developed.

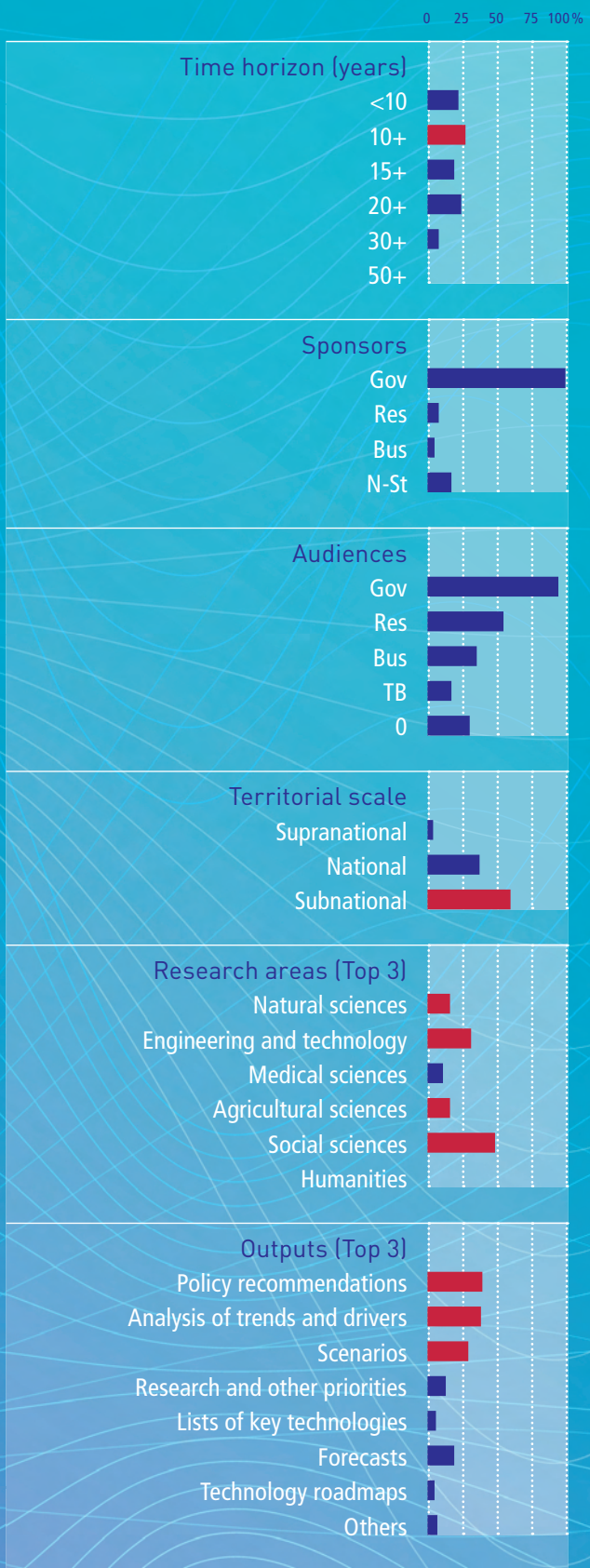
Popular foresight **research areas** focus on *social sciences* (especially policy and political science, studies in human society and economics) and *engineering and technology* (in particular environmental engineering, among others). The most often targeted **socio-economic sectors** are *public administration and defence; health and social work; manufacturing; electricity, gas and water supply;* and *education.*

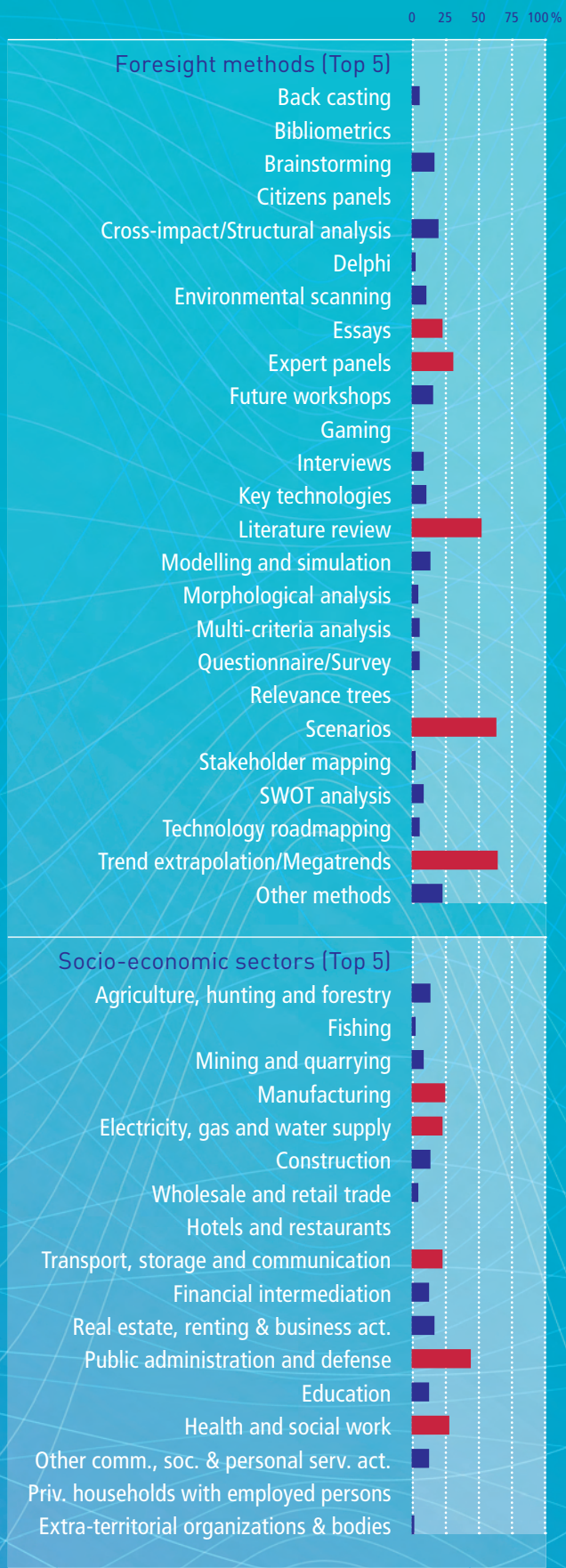
Finally, we selected a limited number of **objectives** and clustered them using the categories presented at the end of Chapter 2:

- About *analysing the future potential of technologies*: (1) detecting weak signals of disruptive events, to forecast next technological breakdowns and to provide a continuous technical watch on key subjects for the micro/nanotechnology community; and (2) identifying key technologies for industry in order to guide government policy to foster appropriate technological solutions and inform companies about the future direction of technological changes.
- About *supporting policy or strategy development*: (1) exploring the possible futures for French agriculture by building scenarios; (2) exploring possible futures of French society and the issues that might arise because of an ageing population; (3) obtaining an analysis based on evidence of the socio-economic challenges and trends that will face Europe in the next 10-15 years; and (4) determining how France can distinguish itself and stay among the most competitive and attractive countries through technology.
- About *priority setting for S&T*: building a clear vision of middle- and long-term issues in the field of transport, housing, town planning, to establish priorities and incentives for research programmes.
- About *methodology and capacity building*: developing, piloting and demonstrating the value of 'light' and flexible regional foresight methods.
- About *articulating supply and demand*: analysing supply and demand of technologies, and identifying key technologies for France in order to help firms to have a better vision of their technological preferences and to anticipate evolutions to come.
- About *public engagement*: (1) helping decision-makers in French regions make choices clarifying the regional situation for inhabitants and for the public at large; and (2) reviewing and launching a national debate on the challenges of the French Research and Innovation System.

For a more detailed account of foresight in France, see also Barré (2008).

## Box 4.4: Mapping foresight in **France** – Source: 119 cases



## Foresight in Germany

Our database includes 132 exercises linked to Germany. Of these, 57 cases can be considered fully mapped.

*Box 4.5* shows that most German projects have **time horizons** below 20 years. Also interesting is the number of projects with less than a 10-year time horizon (40 %). This could be explained by the proportion of subnational exercises in the database (see below).

In terms of **sponsors**, the *government* is the main supporter of foresight (75 %). Sponsors include national and regional bodies such as the Federal Ministry of Education and Research (BMBF); the Bavarian State Ministry of Sciences, Research and the Arts; the government of Rheinland-Pfalz; Landkreis Löbau-Zittau; MFG Stiftung Baden-Württemberg; and companies like Janssen Cilag GmbH and Siemens AG, among others.

As for the **audiences** (users), the figures show that more than 80 % of the studies target *government agencies and departments*, around 50 % target the *business community*, around 40 % the *research community*, and some 15 % of cases target *trade bodies and industrial federations*, while *other actors* (e.g. trades unions and intermediary organisations) are targeted in 30 % of the studies.

Figures on **outputs** indicate that *policy recommendations* lead, followed by the *analysis of trends and drivers* and *scenarios*.

The **territorial scale** of the studies is mainly *subnational* (72 %), with some *national* cases (17 %) and 11 % *supranational*.

The most common **foresight methods** are: *literature review; scenarios; Delphi;* and *other methods* (possibly benchmarking, wild cards and patent analysis among others).

Popular foresight **research areas** focus on *social sciences* (especially policy and political science, studies in human society, education and economics) and *engineering and technology* (in particular environmental and civil engineering; and communications technologies, among others).

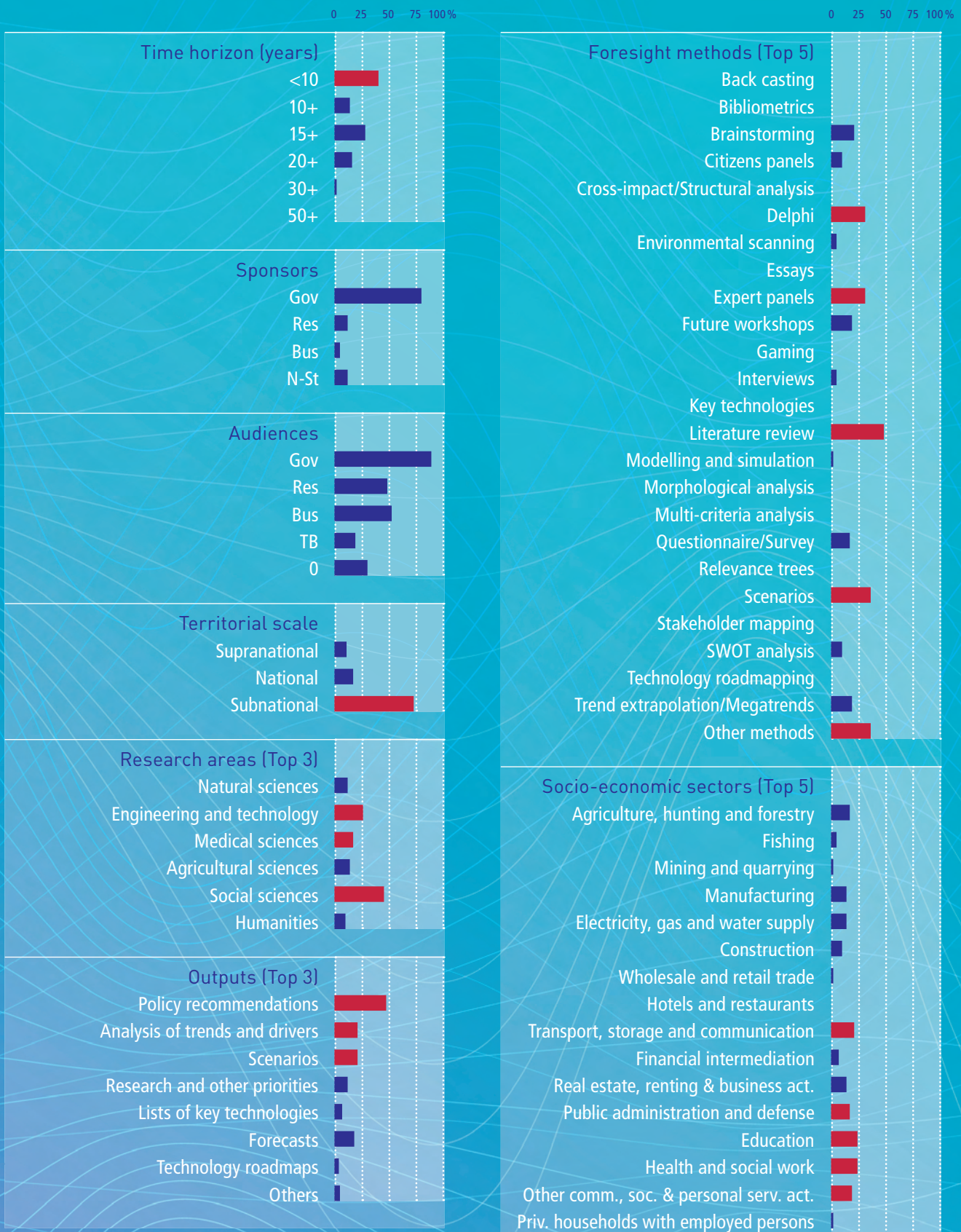
The most targeted **socio-economic sectors** are education; *health and social work*; and *transport, storage and communications*.

Finally, we selected a limited number of **objectives** and clustered them using the categories presented at the end of Chapter 2:

- About *analysing the future potential of technologies*: (1) identifying desirable and undesirable impacts of modern biotechnology in the agricultural and food sector in five EU countries; (2) evaluating the potential of decentralised generation technologies in the liberalised European energy markets; and (3) analysing the relevance of some applications and innovations of nanotechnology in the health sector.
- About *supporting policy or strategy development*: (1) assessing science and technology developments in biotechnology as well as the development of framework conditions in food production; (2) analysing the strategies that regions should implement to become future-oriented; (3) promoting strategies for sustainable development in coastal areas by sharing experiences; (4) enhancing understanding of the forces (colloquially called 'drivers') shaping the evolution of the EU as a Knowledge Society, thus anticipating its potential impact on living conditions.
- About *priority setting for S&T*: introducing new perspectives into the research agenda of the Federal Ministry of Education and Research (BMBF) by adding to the traditional mechanisms for agenda-setting and prioritisation.
- About *methodology and capacity building*: developing methodologies and tools to assess the impact of flood risk reduction measures and scenarios.
- About *public engagement*: (1) promoting a broad public discussion on socio-economic future issues; (2) picking up values and ideals of the population and implementing concrete measures in order to overcome gaps due to different mentalities within the country; and (3) studying the impacts of demographic change (i.e. ageing population on economy and society) and making both population and decision-makers aware of the problems, impacts, challenges and likelihood of demographic change.

For a more detailed account of foresight in Germany, see Cuhls (2008).

## Box 4.5: Mapping foresight in **Germany** – Source: 57 cases



## Foresight in Italy

Our database includes 22 exercises linked to Italy. Of these, 17 cases can be considered fully mapped.

*Box 4.6* shows that all the Italian projects we mapped have **time horizons** below 20 years.

In terms of **sponsors**, the *government* is the main supporter of foresight (80 %). Sponsors include: the Ministry of Defence; the Lombardia Regional Government; the Milan Regional Government; the Regional Government of Trentino; and the Chamber of Commerce, among others.

As for the **audiences** (users), the figures show that more than 80 % of the studies target *government agencies and departments*, around 60 % target the *business community*, around 60 % target the *research community*, and some 30 % of cases target *trade bodies and industrial federations*, while *other actors* (e.g. trades unions and intermediary organisations) are targeted in 30 % of studies.



Figures on **outputs** indicate that *policy recommendations lead*, followed by the *analysis of trends and drivers*.

The **territorial scale** of the studies is mainly *subnational* (68 %), with some *national* cases (9 %) and 23 % *supranational*.

The most common **foresight methods** are: *literature review; key technologies; expert panels; interviews* and *brainstorming*. What is rather interesting here is the proportion of cases using other methods (around 80 %). Unfortunately, the EFMN database cannot provide further information on these methods.

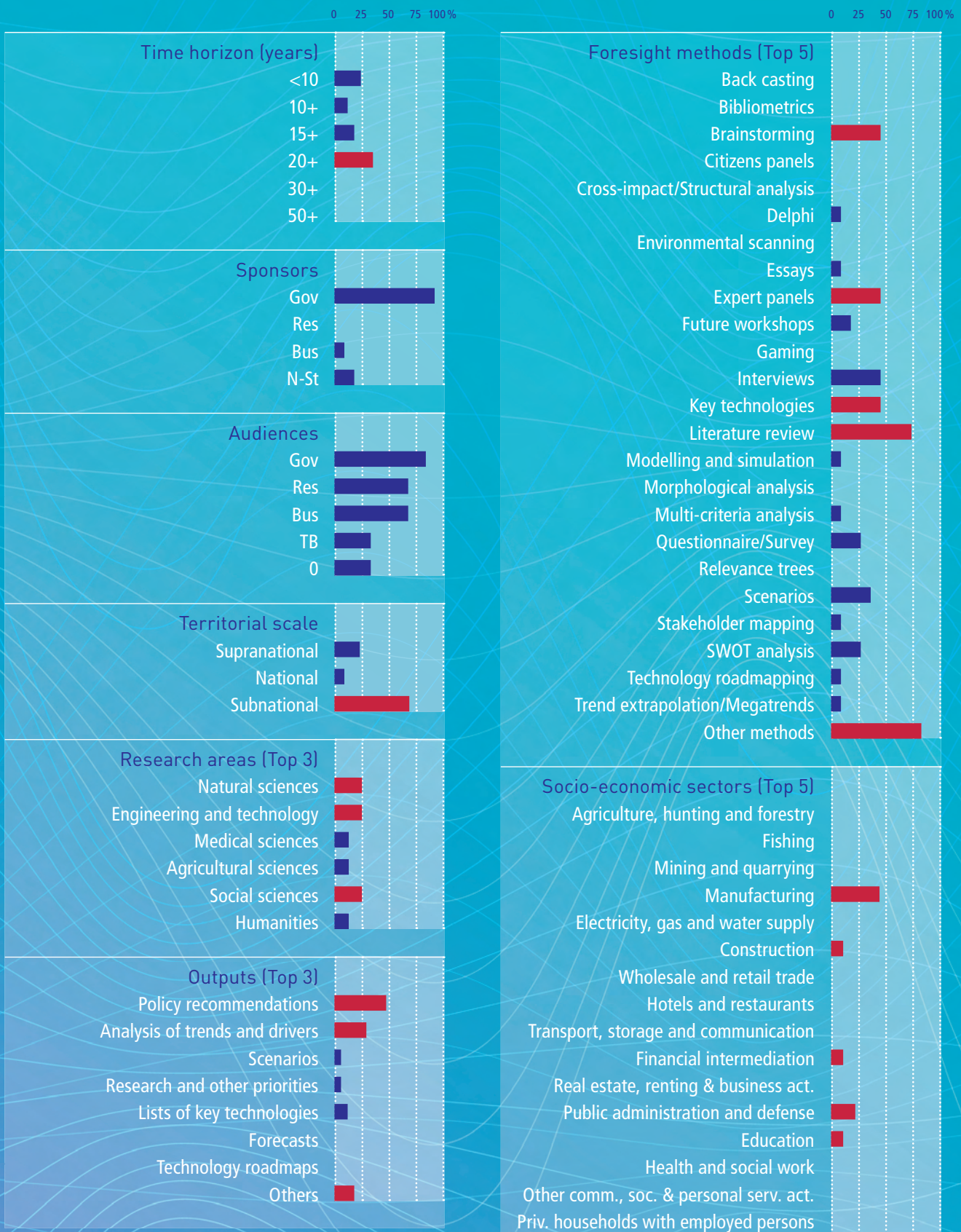
Popular foresight **research areas** focus on *natural sciences* (especially ICT); *social sciences* (especially studies in human society, and economics) and *engineering and technology* (in particular electrical and electronic engineering; and interdisciplinary engineering).

The most often targeted **socio-economic sectors** are *manufacturing; and public administration and defence*.

Finally, we selected a limited number of **objectives** and clustered them using the categories presented at the end of Chapter 2:

- About *analysing the future potential of technologies*: evaluating the national interest and the scientific and industrial feasibility of developing new emerging technologies in selected areas.
- About *supporting policy or strategy development*: (1) developing a broad picture of the state-of-the-art of Sicily in terms of knowledge-based economic and technological development; (2) developing a SWOT analysis of the Trentino region, its potential and future vision; and (3) providing formal and informal visions of regional socio-economic development.
- About *network building*: identifying objectives, needs and the allocation of funds within the national research plan of the Ministry of Education, universities and research institutions.
- About *priority setting for S&T*: helping public decision-makers set priorities in a rational way.
- About *methodology and capacity building*: providing socio-economic perspectives using foresight techniques.
- About *articulating supply and demand*: (1) looking at the upcoming changes for manufacturing industry in various regions in order to prepare SMEs for the future; and (2) identifying a more focused research public policy for large industrial firms, aimed at concentrating funds in the most relevant areas for industrial requirements.

## Box 4.6: Mapping foresight in **Italy** – Source: 17 cases



## Foresight in the Netherlands

Our database includes 273 exercises linked to the Netherlands. Of these, 181 cases can be considered fully mapped.

*Box 4.7* shows that a considerable number of Dutch projects (39 %) have **time horizons** below 10 years.

In terms of **sponsors**, the *government* is the main supporter of foresight (80 %). Sponsors include: the Centraal Plan Bureau (CPB); the Sociaal Cultureel Planbureau (SCP); the Ministry of Social Affairs and Employment; the Ministry of Economic Affairs; the Ministry of Education, Culture and Science; the Ministry of Internal Affairs; the Koninklijke Nederlandse Akademie van Wetenschappen (KNAW); the Provinces of Limburg, North-Brabant and Utrecht; the National Institute for Public Health and the Environment (RIVM); and the Stichting Onderzoek en Ontwikkeling Maatschappelijke (STOOM).

As for the **audiences** (users), the figures show that more than 80 % of the studies target *government agencies and departments*, around 40 % target the *research community*, and around 30 % the *business community*.

Figures on **outputs** indicate that *policy recommendations* lead, followed by the *analysis of trends and drivers* and *scenarios*.

The **territorial scale** of the studies is mainly *national* (87 %), with only a few *subnational* cases (6 %) and 7 % *supranational*.

The most common **foresight methods** are: *literature review; scenarios; expert panels* and *trend extrapolation*.

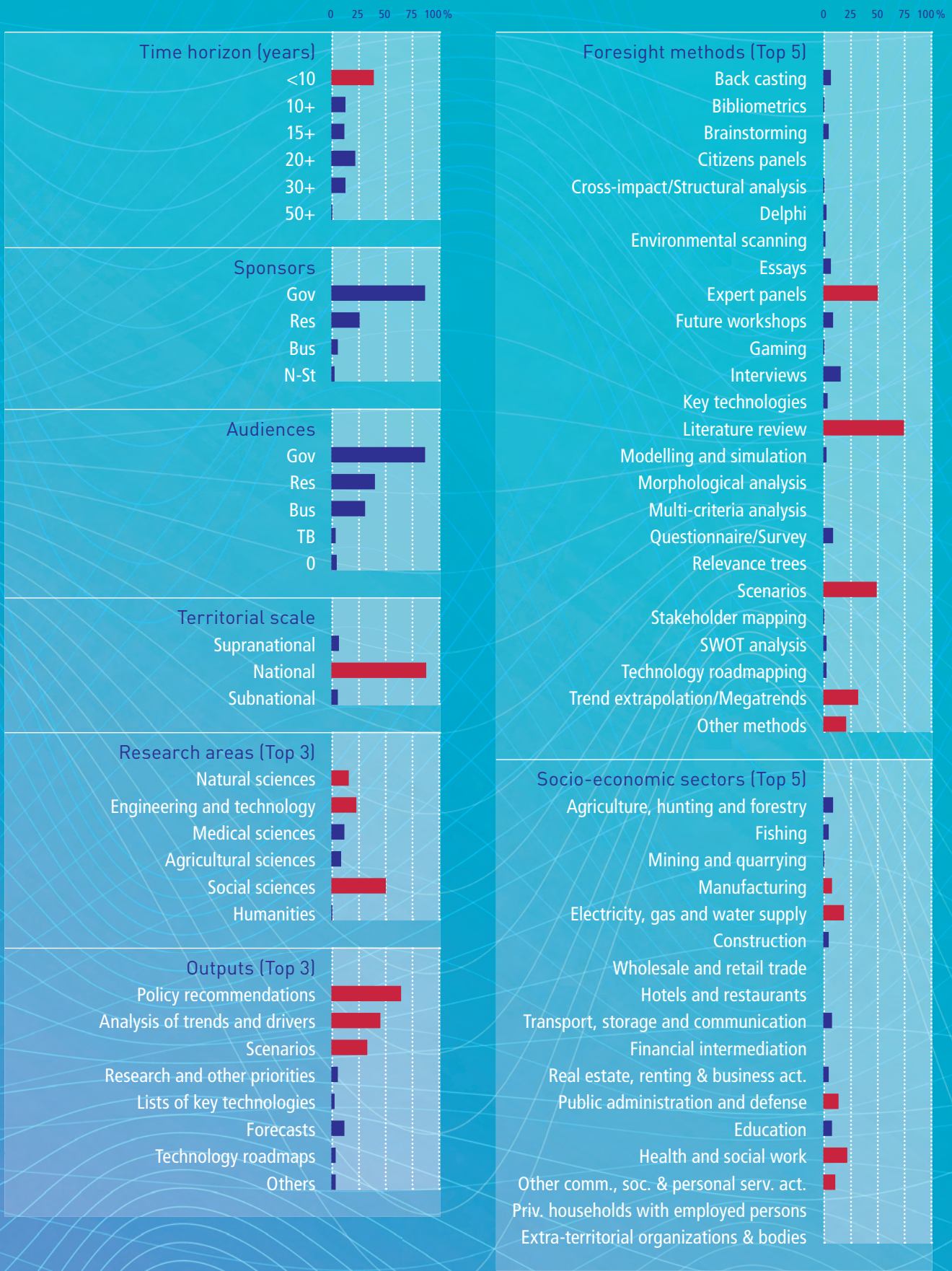
Popular foresight **research areas** focus on *social sciences* (especially policy and political science, studies in human society, education and economics) and *engineering and technology* (i.e. environmental engineering and communications technologies).

The most often targeted **socio-economic sectors** are *health and social work; public administration and defence* and *electricity, gas and water supply*.

Finally, we selected a limited number of **objectives** and clustered them using the categories presented at the end of Chapter 2:

- About *analysing the future potential of technologies*: identifying technology fields that are likely to be of strategic importance to business/industry in the next 10 years.
- About *supporting policy or strategy development*: (1) identifying future trends in agri-business generated by internationalisation; (2) presenting potential development paths in agricultural policy by developing future perspectives, examining four dimensions of the socialisation of the sector; (3) developing transparent and traceable indicators for a future sustainability balance; (4) indicating the international effects of choices made in the Netherlands; (5) acquiring insight into long-term scientific developments in biogeology; determining the country's international position and providing policy recommendations; (6) formulating recommendations for the country; and (7) orienting the Region Limburg in year 2030 by creating four scenarios identifying areas of uncertainty.
- About *priority setting for S&T*: (1) Identifying priorities in national innovation areas for the Dutch economy based on the innovation and research portfolios of SenterNovem and NWO (public funding agencies); (2) prioritising knowledge themes for the next 10 years, in terms of the significance of ICT to the Dutch economy; and (3) identifying priorities within knowledge and innovation themes for integrated water management.
- About *articulating supply* and demand: (1) accommodating a process which mobilises stakeholders in reinforcing a number of strategic S&T areas for agribusiness, rural areas and the fishing industry; (2) articulating major knowledge and innovation challenges in rural areas; (3) describing packages for passenger and freight transport through a scenario for 2030; and (4) developing a vision of the future of catalysis, setting clear goals for catalysis R&D projects, improving cooperation and joint research and development within the Netherlands.
- About *public engagement*: stimulating public discussion on a sustainable future for Brabant.

## Box 4.7: Mapping foresight in the **Netherlands** – Source: 181 cases



## Foresight in Norway

Our database includes 37 exercises linked to Norway. 21 of these can be considered fully mapped.

*Box 4.8* shows that Norway has projects targeting a variety of **time horizons**, especially looking beyond 15 and 20 years into the future.

In terms of **sponsors**, the *government* is the main supporter of foresight (75 %). Sponsors include: the Norwegian Research Council (NRC); the Nordic Innovation Centre; the Ostfold fylkeskommune; the Norwegian Institute for Urban and Regional Research (NIBR) and the Drammen Municipalities, among others. As for the **audiences** (users), the figures show that more than 80 % of the studies target *government agencies and departments*, while the *research* and *business communities* are equally targeted in around 70 % of projects. These are followed by *trade bodies and industrial federations* (25 %), and *other actors* (20 %).

Figures on **outputs** indicate that *policy recommendations* are present in 70 % of the studies while the *analysis of trends and drivers* and the generation of *scenarios* are considered 'outputs' in half of the sample, even if they are used in nearly all the studies.

The **territorial scale** of the studies is mainly *national* (60 %) and the other 40 % is more or less equally distributed between *subnational* and *supranational* studies.

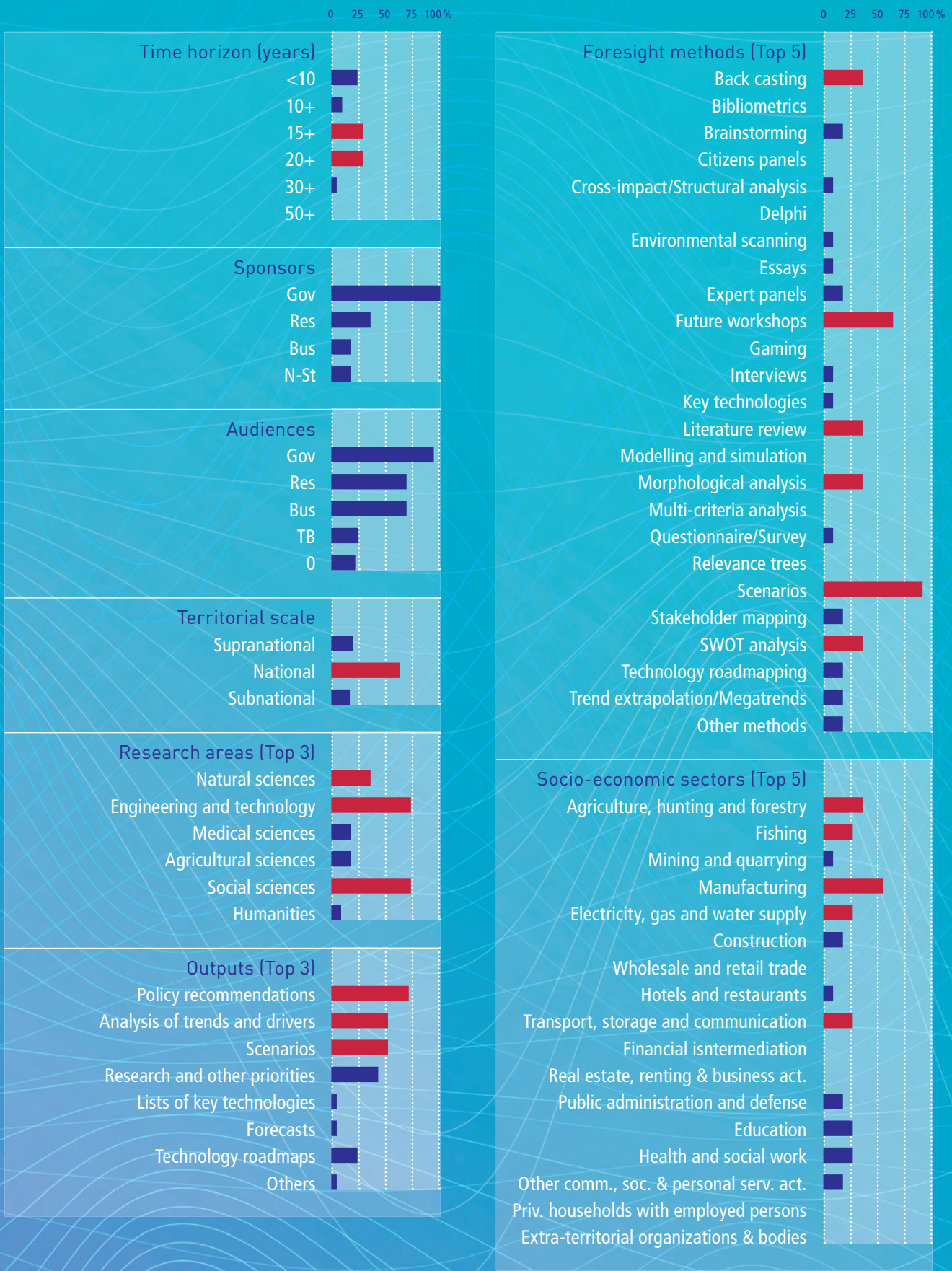
The most common **foresight methods** are: *scenarios; futures workshops; backcasting; SWOT* and *morphological analysis.*

Popular foresight **research areas** focus on *social sciences* (including education; commerce, management, tourism and services; and behavioural and cognitive sciences) and *engineering and technology* (including manufacturing, resources, materials and biomedical engineering). The most often targeted **socio-economic sectors** include: *manufacturing; agriculture, hunting and forestry; fishing; health and social work; transport, storage and communications*; and *education.*

Finally, we selected a limited number of **objectives** and clustered them using the categories presented at the end of Chapter 2:

- About *analysing the future potential of technologies*: developing scenarios concerning the car, the driver, the road and the organisation of the traffic system.
- About *supporting policy or strategy development*: developing a strategic plan for the development of Drammen Kommune over the coming years.
- About *network building*: creating appropriate dialogue between key actors.
- About *priority setting for S&T*: (1) identifying research priorities and policy recommendations related to advanced materials technology; nano-technology; oil and energy; and aquaculture sectors; and (2) providing decision support for companies and research institutes in defining R&D priorities, and assisting governmental decision-makers in making effective framework policies for the introduction of hydrogen energy.
- About *methodology and capacity building*: (1) establishing a module which focuses on developing new theoretical and methodological concepts and tools for planning, scenario building and foresight; (2) developing foresight as a work form and service for Innovation Norway as an organisation; (3) creating and operating a Nordic Foresight Forum for technology foresight practitioners and researchers; (4) identifying 'best practices' in the Nordic countries for technology foresight and similar methodologies for prioritising in science and technology; and (5) exploring the conceptual and theoretical foundations for scenario building and foresight activities, related to traditional forecasting and long-term planning models.
- About *articulating supply and demand*: demonstrating the energy and power that will be consumed within buildings in 2030 (scenario approaches show different averages of energy standards in new and existing residential buildings).
- About *public engagement*: (1) informing the Norwegian Parliament on the attitudes of the public regarding technology and road safety; and (2) developing an arena in which different stake- holders and actors can reflect together on future options for a region.

## Box 4.8: Mapping foresight in **Norway** – Source: 21 cases



## Foresight in Spain

Our database includes 51 exercises linked to Spain. 44 of these can be considered fully mapped.

*Box 4.9* shows that most Spanish projects have **time horizons** between 10 and 15 years into the future.

In terms of **sponsors**, the *government* is the main supporter of foresight (around 90 %). Sponsors include: the Ministry of S&T; the Ministry of Industry; the Ministry of Education; and the Guipuzkoa Government; the Junta de Castilla la Mancha; and the Galicia Regional Government, among others.

As for the **audiences** (users), the figures show that more than 90 % of the studies target *government agencies and departments*, while the *research and business communities* are equally targeted by around 75 % of projects. These are followed by *trade bodies and industrial federations* (50 %), and *other actors* (25 %).

Figures on **outputs** indicate that *policy recommendations* are present in more than 70 % of the studies, while the *analysis of trends and drivers* and the generation of *lists of key technologies* are considered 'outputs' in more than 60 % of these projects.

The **territorial scale** of the studies is mainly *national* (60 %), while the other 40 % is more or less equally distributed between *subnational* and *supranational* studies.

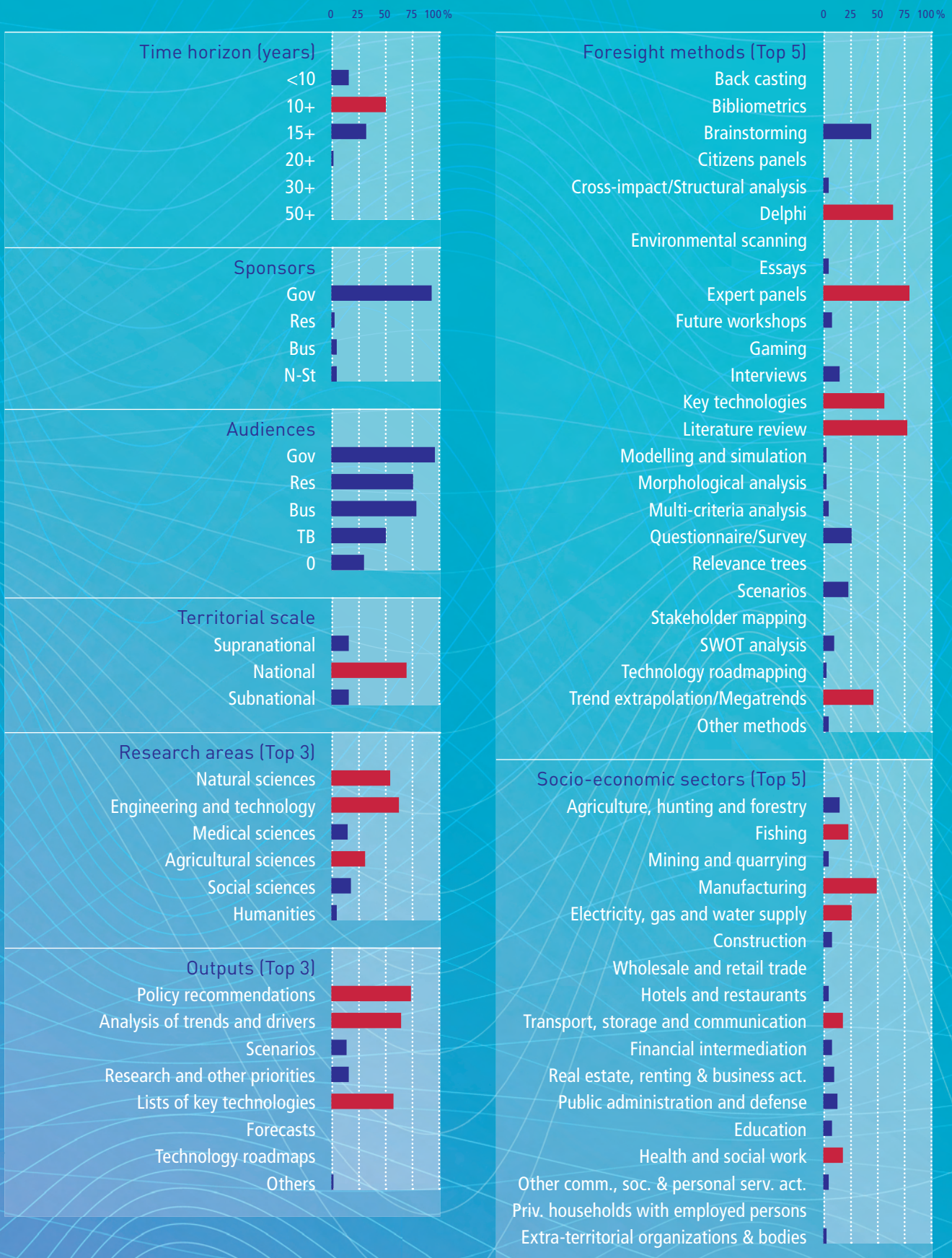
The most common **foresight methods** are: *literature review; expert panels; Delphi; key technologies; trend extrapolation* and *megatrends*; and *brainstorming*.

Popular foresight **research areas** focus on *engineering and technology* (including manufacturing and materials engineering; communications technologies; among others) *social sciences* (including education; commerce, management, tourism and services; policy and political science, and studies in human society) and *agricultural sciences* (mainly fisheries sciences and crop and pasture production areas). In terms of **socio-economic sectors**, Spanish foresight includes: *manufacturing; agriculture, hunting and forestry; fishing; health and social work; transport, storage and communications*; and *electricity, gas and water supply.*

Finally, we selected a limited number of **objectives** and clustered them using the categories presented at the end of Chapter 2:

- About *analysing the future potential of technologies*: (1) setting a strategic vision for the future of Spanish agriculture adopting the potential use of biotechnology; (2) providing a snapshot of the competitive environment and technologies in the agro-food industry in 2015; (3) analysing the most critical aspects related to the future of minimal-invasive surgery; (4) defining key technologies in the materials sector that will influence both energy and transport industries in the next 15 years; and (5) exploring the evolution of ICT within the next 15 years.
- About *supporting policy or strategy development*: (1) offering a consultation tool for public administrations to develop better science and technology policy; (2) analysing the current state of key sectors in Spain (e.g. civil construction, chemical, transport, design, etc.) in order to assess actions in the next 15 years; (3) analysing major technological trends and drivers linked to the evolution of the information society; (4) developing a strategic vision for future technology developments in biomedicine and their impact on the health sector; (5) identifying research technologies in aquaculture and assessing technological developments in the area, in order to anticipate the future of these disciplines and establish measures that ensure their success; and (6) gathering information about emerging micro-technologies, in order to design coherent technology policies in line with their evolution worldwide.
- About *priority setting for S&T*: (1) identifying research areas and technology priorities for the future of biomedicine in Spain; and (2) identifying research priorities in biotechnology in accordance with the guidelines of the Regional Plan for R&D.
- About *articulating supply and demand*: (1) analysing future energy consumption and the factors that influence it; and (2) identifying new demands on tourism at a global level over for the next 10 years.

## Box 4.9: Mapping foresight in **Spain** – Source: 44 cases



## Foresight in the United Kingdom

Our database includes 268 exercises linked to the UK. 144 of these can be considered fully mapped.

*Box 4.10* shows that the UK has projects targeting a variety of **time horizons**, especially beyond 15 years into the future.

In terms of **sponsors**, the *government* is the main supporter (around 75 %). Sponsors include: the British Council; Defra; the Department of Trade and Industry (DTI); the Department of Transport; the Government Office for Science (former OST); and the UK Royal Academy of Engineers; among others. As for the **audiences** (users), the figures show that around 90 % of the studies target *government agencies and departments*, while the *research* and the *business communities* are equally targeted by around 60 % of the projects; followed by *trade bodies* (30 %), and *other actors* (20 %).

Figures on **outputs** indicate that *policy recommendations* are present in more than 70 % of the studies, while the *analysis of trends and drivers* and the generation of *lists of key technologies* are considered 'outputs' in more than 60 % of these projects.

The **territorial scale** of the studies is mainly *national* (80 %), with around 15 % of *subnational* cases and only 5 % *supranational* studies. Here we should note that EC-funded projects in which the UK has been a major partner or coordinator have not been sufficiently targeted in our mapping.

The most common **foresight methods** are: *expert panels; literature review; trend extrapolation; scenarios* and *surveys*.

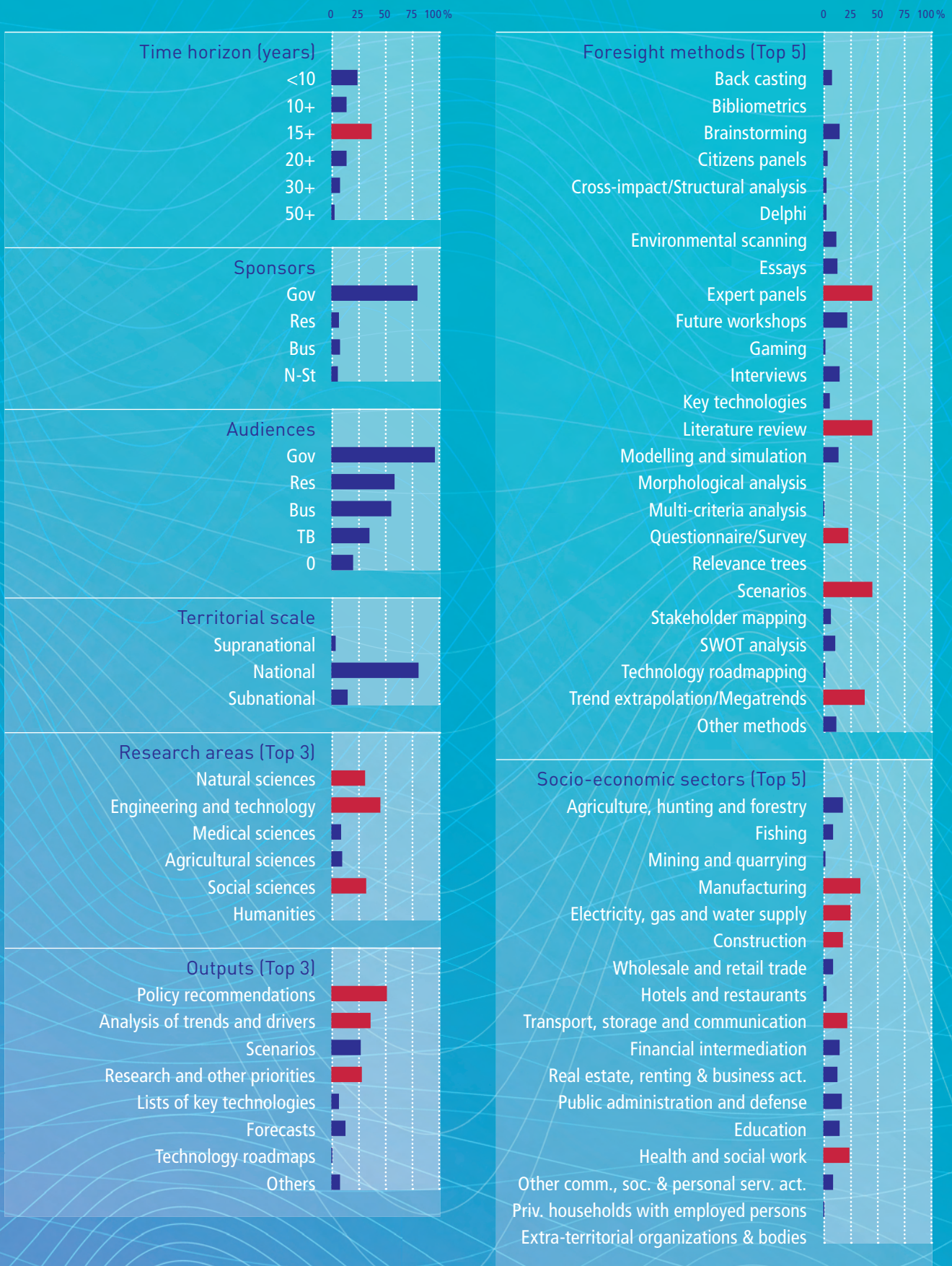
Popular foresight **research areas** focus on *engineering and technology* (including environmental, manufacturing, material and chemical engineering; communications technologies; and industrial biotechnology; among others) *social sciences* (especially policy and political science; education; and studies in human society) and *natural sciences* (mainly biological sciences; earth sciences; chemical sciences; and information and communication sciences). As for the **socio-economic sectors**, our results show that the UK focuses on a wide range of areas, most notably *manufacturing; electricity, gas and water supply*; and *health and social work*.

Finally, we selected a limited number of objectives and clustered them using the categories presented at the end of Chapter 2:

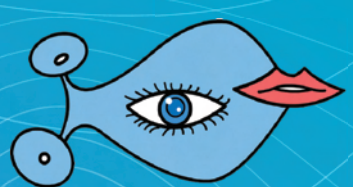
- About *analysing the future potential of technologies*: (1) increasing the competitive standing of regional industry and society through improved appreciation, anticipation and exploitation of future developments in science and technology; (2) providing a vision of how S&T advancement may impact on understanding of addiction and drug use in the next 20 years; (3) exploring the implications of future science and identifying key drivers and trends in current foresight reports; (4) exploring the implications of future information technologies in areas such as identity and authenticity, surveillance, system robustness, security and information assurance; and (5) producing a vision for the development of cognitive systems through recent advances in neuroscience, computer science and related fields, and their interaction.
- About *supporting policy or strategy development*: (1) producing a challenging and long-term (30-100 years) vision for the future of flood and coastal defence; and (2) identifying drivers, issues and technologies associated with key sectors, for example aerospace; packaging; clothing and footwear; transport; building and construction; medical; electronic; etc.
- About *network building*: creating new productive networks between industry, academia and government.
- About *priority setting for S&T*: identifying priorities for public and private R&D spending.
- About *methodology and capacity building*: (1) identifying where foresight could add the greatest value, and helping generate a foresight culture; and (2) improving Defra's capacity to identify and prepare for new risks and opportunities.
- About *articulating supply and demand*: identifying key areas of long-term opportunity, assessing these against UK capabilities, and agreeing a plan of action to exploit these areas.

For a more detailed account of foresight in the UK, see Keenan and Miles (2008) or visit **www.foresight.gov.uk.**

## Box 4.10: Mapping foresight in the **United Kingdom** – Source: 144 cases



# 5 Mapping foresight methods



## Types of methods

This chapter presents the results of the mapping of foresight methods which, for the purpose of this chapter, have been structured around three categories.

The first category comprises qualitative methods. These are often used to provide meaning to developments and observations. Such interpretations tend to be based on particular views, beliefs and knowledge which may be difficult to corroborate since methods provide a lot of room for creative and subjective thinking. In the EFMN mapping, 15 *qualitative* methods have been included in this category: backcasting; brainstorming; citizen panels; environmental scanning; essays; expert panels; futures workshops; simulation gaming; interviews; literature review (LR); morphological analysis; questionnaires and surveys; relevance trees; scenarios; and SWOT analysis.

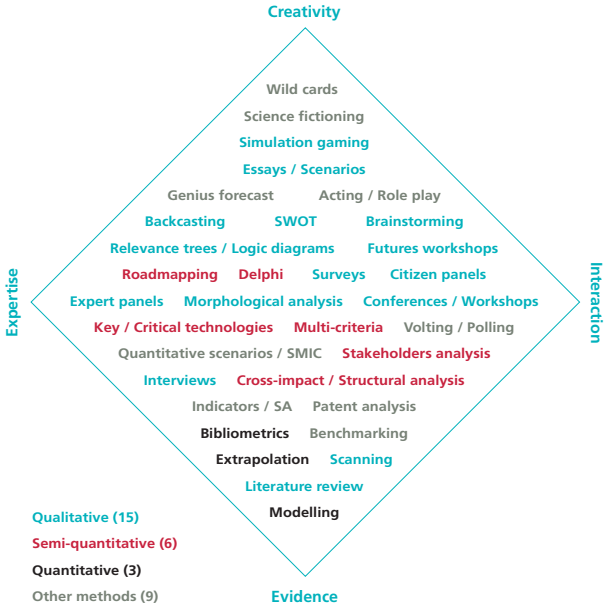
The second category comprises ***semi-quantitative*** methods, applying mathematical principles to quantify the opinions experts for example. The database includes 6 such methods: cross-impact/structural analysis; Delphi surveys; key/critical technologies; multi-criteria analysis; quantitative scenarios/SMIC; stakeholder mapping and (technology) roadmapping.

The third category of methods comprises ***quantitative*** techniques. These are often used to monitor measurable variables and apply statistical techniques to process and analyse the often called "hard data" or indicators. EFMN mapping considered 3 quantitative methods: bibliometrics; modelling and simulation; and trend extrapolation.

Finally, a category labelled 'other methods' was also included in the mapping. This was used when an exercise applied methods like benchmarking and patent analysis, for example (Note grey colour in *Figure 5.1*).



**Figure 5.1: Foresight methods in the Foresight Diamond**




*Source: Popper (2008a)*

## Attributes of methods

Another useful way to classify methods is by considering their ability to gather or process information based on *evidence, expertise, interaction or creativity*. These attributes are the building blocks of the Foresight Diamond (see *Figure 5.1* above).

The reader should note that the attributes are not meant to be exclusive; in fact, they often overlap and combine in different proportions or sequences in each method and so can be regarded as the 'genetic' components of a method. There can be value in 'footprinting' the components of an activity according to the methods deployed. So, for example, an activity carried out using ***brainstorming*** could be estimated to comprise:

- 10 % expertise + 10 % evidence
  ***+ 70 % creativity*** + 10 % interaction

While the same activity carried out using ***trend extrapolation*** could comprise:

- 10 % expertise ***+ 70 % evidence***
  + 10 % creativity + 10 % interaction

### Box 5.1: Key attributes of foresight methods

**Creativity** refers to the mixture of original and imaginative thinking and is often provided by artists or technology 'gurus', for example. These methods rely heavily on the inventiveness and ingenuity of very skilled individuals, such as science fiction writers or the inspiration that emerges from groups of people involved in brainstorming sessions.

**Expertise** refers to the skills and knowledge of individuals in a particular area or subject and is frequently used to support top-down decisions, provide advice and make recommendations. These methods rely on the tacit knowledge of people with privileged access to relevant information or with accumulated knowledge from several years of working experience in a particular domain area.

**Interaction** recognises that expertise often gains considerably from being brought together and challenged to articulate with other expertise (and indeed with the views of non-expert stakeholders). So, given that foresight studies often take place in societies where democratic ideals are widespread, and legitimacy is normally gained through 'bottom-up' and participatory processes, it is important that they are not just reliant on evidence and expertise.

**Evidence** recognises that it is important to attempt to explain and/or forecast a particular phenomenon with the support of reliable documentation and means of analysis of, for example, statistics and various types of measurement indicators. These activities are particularly helpful for understanding the actual state of development of the research issue.



## Most common methods

Having these classifications and attributes in mind will help us present some interesting results based on 886 case studies. *Figure 5.2* shows the number of times each method was used. For example, Scenarios was applied 372 times. The results clearly indicate three groups:

The *widely used* methods are literature review, expert panels and scenarios, all of which are qualitative.

The category of *commonly* used methods includes extrapolation/megatrends, futures workshops, brainstorming, other methods, interviews, Delphi, questionnaire/survey, key technologies, scanning, essays and SWOT.

The third group includes less frequently used methods, such as roadmapping, modelling and simulation, backcasting, stakeholders mapping, structural analysis, bibliometrics, morphological analysis, citizen panels, relevance trees, multi-criteria analysis and gaming.

While the data suggests that this group of methods is rarely used, some figures are lower than might be expected and could possibly be attributed to biases arising from the mapping. For example, methods such as structural analysis and relevance trees have been occasionally applied in Spain and France at the subnational level. But because mapping at this level has been weaker than at the national level, thus the data does not do justice to the likely higher frequency of their applications.

Figure 5.2: Frequency of use of foresight methods

| | Cases | % |
|---|---|---|
| Literature review | 477 | 54 % |
| Expert panels | 440 | 50 % |
| Scenarios | 372 | 42 % |
| Trend extrapolation/Megatrend analysis | 223 | 25 % |
| Futures workshops | 216 | 24 % |
| Brainstorming | 169 | 19 % |
| Other methods | 157 | 18 % |
| Interviews | 154 | 17 % |
| Delphi | 137 | 15 % |
| Questionnaire/Survey | 133 | 15 % |
| Key technologies | 133 | 15 % |
| Environmental scanning | 124 | 14 % |
| Essays | 109 | 12 % |
| SWOT analysis | 101 | 11 % |
| Technology roadmapping | 72 | 8 % |
| Modelling and simulation | 67 | 8 % |
| Backcasting | 47 | 5 % |
| Stakeholder mapping | 46 | 5 % |
| Cross-impact/Structural analysis (e.g. MICMAC) | 36 | 4 % |
| Bibliometical analysis | 22 | 2 % |
| Morphological analysis | 21 | 2 % |
| Citizens panels | 19 | 2 % |
| Relevance trees | 17 | 2 % |
| Multi-criteria analysis | 11 | 1 % |
| Gaming | 6 | 1 % |

| Total number of cases | 886 |
|---|---|

### Box 5.2: Key features of Europe's most common foresight methods

- **Literature review** (LR) represents a key part of scanning processes (see below). Good reviews generally use a discursive writing style and are structured around themes and related theories.
- **Expert panels** are groups of people dedicated to discussion and analysis, combining their knowledge concerning a given area of interest. They can be local, regional, national or international. Panels are typically organised to bring together "legitimate" expertise, but can also attempt to include creative, imaginative and visionary perspectives.
- **Scenarios** refer to a wide range of approaches involving the construction and use of scenarios – more or less systematic and internally consistent visions of plausible future states of affairs. They may be produced by means of deskwork, workshops, or the use of tools such as computer modelling.
- **Futures workshops** are events lasting from a few hours to a few days, in which there is typically a mix of talks, presentations, and discussions and debates on a particular subject. The events may be more or less highly structured and 'scripted': participants may be assigned specific detailed tasks.
- **Brainstorming** is a creative and interactive method used in face-to-face and online working sessions to generate new ideas around a specific area of interest. Aiming at removing inhibitions and breaking out of narrow and routine discussions, it allows people to think more freely and move into new areas of thought, and to propose new solutions to problems.
- **Trend extrapolation** is among the longest-established tools of forecasting. The method provides a rough idea of how past and present developments may look in the future – assuming, to some extent, that the future is a kind of continuation of the past. There may be large changes, but these are extensions of patterns that have been previously observed.
- **Delphi** is a well-established technique that involves repeated polling of the same individuals, feeding back (sometimes) anonymised responses from earlier rounds of polling, with the idea that this will allow for better judgements to be made without undue influence from forceful or high-status advocates. Delphi surveys are usually conducted in two rounds.
- **SWOT analysis** is a method which first identifies factors internal to the organisation in question (e.g. particular capabilities, brands, etc.) and classifies them in terms of Strengths and Weaknesses. It similarly examines external factors (broader socio-economic and environmental changes, for example, or the behaviour of opponents, competitors, markets, etc.) and presents them in terms of Opportunities and Threats.
- **Interviews** are often described as "structured conversations" and are a fundamental tool of social research. In foresight they are often used as formal consultation instruments, intended to gather knowledge that is distributed across the range of interviewees. This may be tacit knowledge that has not been put into words, or more documented knowledge that is more easily located by discussions with experts and stakeholders than by literature review.

#### Other methods

- **Benchmarking** is commonly used for marketing and business strategy planning and has recently become more popular in governmental and inter-governmental strategic decision-making processes. It focuses on what others are doing in comparison to what you are doing by comparing similar units of analysis in terms of common indicators (e.g. research capabilities of key sectors, market sizes of industries, etc.).
- **Patent analysis** often resembles bibliometrics, but uses patents rather than publications as its starting point. It provides strategic intelligence on technologies, and can be used to indicate "revealed competitive advantage" based on leadership in technological development.

*Source: Popper (2008b)*



## Average number of methods

The above results show that qualitative methods are the most popular ones – all the top ten methods in use in Europe are qualitative.

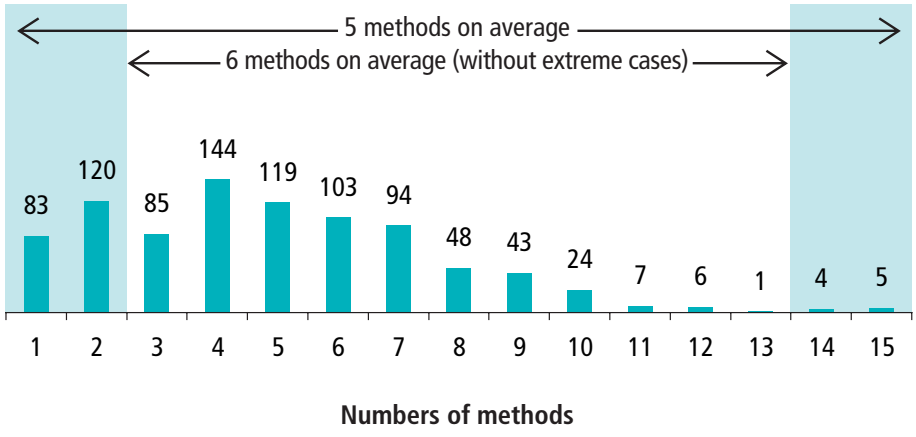
But this observation also leads to another question: how many methods are used in an 'average' foresight study? *Figure 5.3* shows that the average is around five or six methods.

However, the variation is high, so it might be concluded that the diversity of methods used is also high.

But, these numbers should not be taken for granted.

As mentioned above, subnational exercises, for example, tend to use multiple methods in their methodological designs and these have not been well captured in the EFMN database.

## Figure 5.3: Number of methods used in a foresight project




*Source: Popper (2008a)*

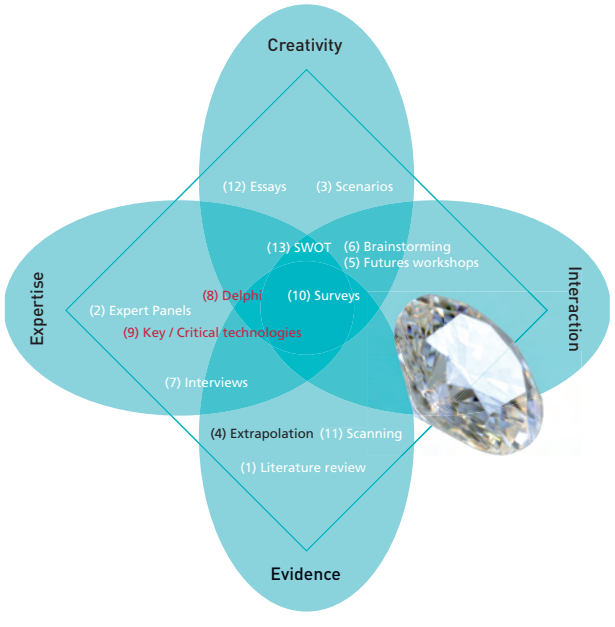
*Figure 5.4* positions the most commonly used methods inside the Foresight Diamond framework.

The shading reflects the ability of methods to gather or process information based on evidence, expertise, interaction or creativity respectively. The interaction dimension is most closely associated with methods like futures workshops and brainstorming; in addition expert panels are designed to promote participation and interaction between groups of stakeholders. The 'popularity' of these methods is fifth and sixth in *Figure 5.2* whereas an 'average' study may use five or six methods. Allowing for data bias, as previously mentioned, we can conclude that the mapped foresight work is aligned with the concepts which are accepted by the community of practitioners. Foresight is seen in this community as a way to encourage more structured debate with wider participation and leading to the shared understanding of long-term issues (Georghiou *et al.*, 2008).
*Figure 5.4* shows that most projects using more than five methods tend to select them, albeit unintentionally, to exploit all four fundamental dimensions or capabilities.

We would also like to highlight that the techniques which most exploit the creativity dimension are not commonly used. Such techniques include gaming, the identification of wild cards and weak signals, and the exploitation of science fiction literature. They may only be used infrequently because they are not well supported by conceptual and methodological frameworks. These results allow us to conclude that the influence of the capabilities of methods is high but not balanced.

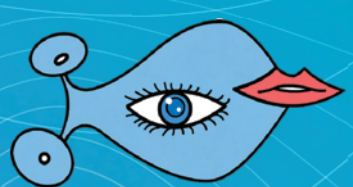
However it would be unrealistic to expect all foresight studies to give an equal weighting to all four vertices of the Diamond.

## Figure 5.4: Positioning common foresight methods in the Foresight Diamond




*Source: Popper (2009)*
*©Rafael Popper*

# 6 Mapping foresight research areas and sectors



The initial question we asked ourselves when we began the mapping of foresight activities was:

- Which research areas and socio-economic sectors can be considered 'hot' or highly targeted in foresight work?

Over the years hundreds of subjects have been targeted. The choice of target tends to depend on and reflect the concerns and interests of sponsors, who – as shown in Chapter 3 – are most likely to be from the government. However, governments differ in size and complexity. Thus, foresight can be sponsored by a wide range of actors and studies can be carried out at any level – local, regional, national or international.

The geographical coverage of areas is presented in Chapter 3 (*Figure 3.10* and *Figure 3.11*). Chapter 4 discusses the most common areas covered by ten European countries. The content characteristics of these preferences are indicated using the six aggregated areas of the Frascati taxonomy and the 17 aggregated areas of the NACE taxonomy. While we have commented on popular sub-levels we recognise that the overall aggregation does not provide sufficient information about the real coverage of exercises. The truth is that it has been really difficult to prepare and discuss results using the 490 fields of these classification systems (224 from Frascati and 266 from NACE).

Having this in mind, we have divided this chapter into three major sections:

- The *general results* section presents major findings about highly aggregated *coverage of foresight studies* (*Table 6.1*).
- The *analysis of research areas* section uses 841 cases to look at the interconnection between 62 research areas. Here we identify **knowledge hubs, knowledge junction** and **key sub-areas**.
- The *analysis* of *socio-economic sectors* section uses a slightly larger sample (871 cases) to map the interconnections between 71 *sectors*. Here we look at **foresight on 'grand' economic sectors** and we recognise **Knowledge Clusters**.

**Table 6.1: Coverage of foresight studies**

| Research areas | Cases 841 | % |
|---|---|---|
| Engineering and technology | 370 | 44 % |
| Social sciences | 335 | 40 % |
| Natural sciences | 270 | 32 % |
| Medical sciences | 140 | 17 % |
| Agricultural sciences | 132 | 16 % |
| Humanities | 26 | 3 % |

| Socio-economic sectors | Cases 871 | % |
|---|---|---|
| Manufacturing | 299 | 34 % |
| Electricity, gas and water supply | 236 | 27 % |
| Health and social work | 235 | 27 % |
| Transport, storage and communication | 195 | 22 % |
| Public administration and defence | 175 | 20 % |
| Agriculture, hunting and forestry | 167 | 19 % |
| Education | 140 | 16 % |
| Construction | 106 | 12 % |
| Fishing | 101 | 12 % |
| Other community, social & personal services activities | 97 | 11 % |
| Real estate, renting and business activities | 79 | 9 % |
| Financial intermediation | 77 | 9 % |
| Mining and quarrying | 45 | 5 % |
| Wholesale and retail trade | 30 | 3 % |
| Extra-territorial organisations and bodies | 23 | 3 % |
| Hotels and restaurants | 22 | 3 % |
| Private households with employed persons | 18 | 2 % |

high coverage
medium coverage
low coverage

## General results

In total, the EFMN mapped 841 cases against the Frascati taxonomy and 871 cases against the NACE classification. *Table 6.1 (above), Figures 6.1 and 6.2 (below)* show basic results about highly aggregated areas (N.B. the sum of percentages is higher than 100 and the total sum of cases is higher than 871 because some projects were linked to more than one area or sector).

Looking at the results, we can see that *Engineering* and *Technology (44 %), Social Sciences (40 %), Manufacturing (34 %)* and *Natural Sciences (32 %)* are by far the most popular categories characterising the initiatives mapped by the EFMN.

The second group includes: *Electricity, gas and water supply; Health and social work; Transport, storage and communication; Public administration and defence*; Medical Sciences, *Agriculture; Education; Fishing; Construction*; and *Other community, social and personal services activities.*

Less popular areas in foresight, but still significant, are: *Real estate, renting and business activities* and *Financial intermediation*. This is an interesting result (a) given that these two sectors have been seriously shaken by the credit crunch (or credit crisis) and more specifically by the sub-prime housing crisis in the United States and (b) given the severity of the effects on Europe and other regions worldwide. We believe that foresight work in these areas will soon experience considerable growth.

Likewise, there are other major challenges related to *extra-territorial organisations* and bodies which might benefit from foresight activities. These include social, economic, political and environmental challenges. One example might be to inform debates about the future role and relevance of existing security and civil defence systems including international agencies such as the United Nations Security Council (UNSC) and North Atlantic Treaty Organization (NATO).

In addition we can expect more foresight studies to generate visions and recommendations about new organisations, international partnerships and international or global problems. Defence, energy, security, food, water, pollution, poverty, infectious diseases and other areas provide key opportunities to exploit foresight more extensively.

**We can conclude that it is as important to identify where more foresight work may be needed** as it is to map the contemporary 'hot' areas for foresight application. There is ample scope to use foresight more widely and effectively in strategic thinking and policy options – and to consider this was in fact an important part of our initial question.

The following two sections will go deeper into the identified 'hot' areas as well as less popular areas. They also identify interesting links and interdependencies.



### Figure 6.1: Mapping interconnections between research areas

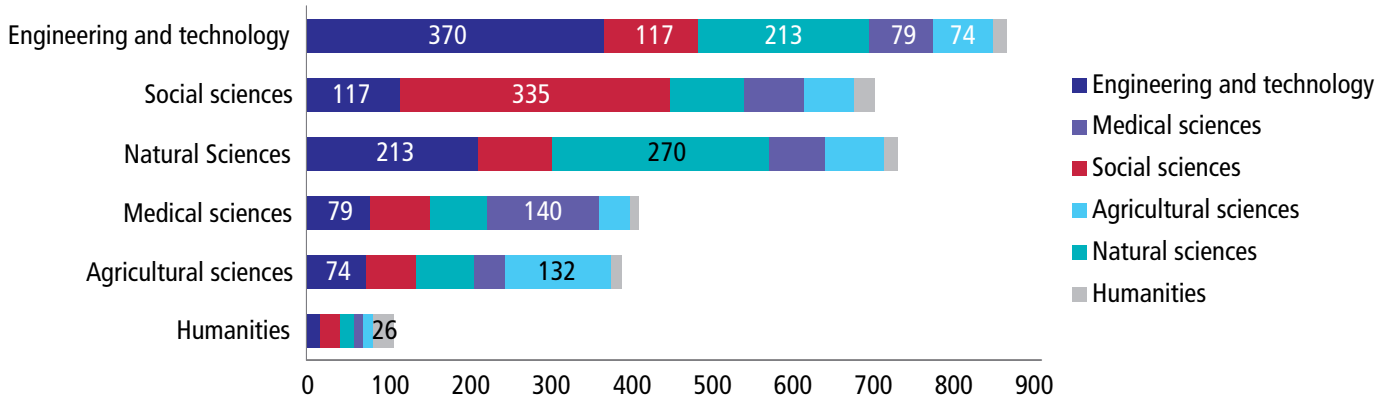


Figure 6.2: Mapping interconnections between socio-economic sectors

| | Private households with employed persons | Hotels and restaurants | Extra-territorial organisations and bodies | Wholesale and retail trade | Mining and quarrying | Financial intermediation | Real estate, renting and business activities | Other community, social & personal serv. activ. | Fishing | Construction | Education | Agriculture, hunting and forestry | Public administration and defence | Transport, storage and communication | Health and social work | Electricity, gas and water supply | Manufacturing |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Manufacturing | 5 | 12 | 6 | 21 | 31 | 38 | 35 | 36 | 32 | 58 | 64 | 89 | 60 | 112 | 94 | 105 | **299** |
| Electricity, gas and water supply | 5 | 10 | 3 | 17 | 25 | 26 | 33 | 23 | 26 | 50 | 42 | 65 | 44 | 98 | 71 | **236** | 105 |
| Health and social work | 14 | 14 | 4 | 20 | 17 | 43 | 39 | 59 | 31 | 39 | 83 | 69 | 83 | 76 | **235** | 71 | 94 |
| Transport, storage and communication | 5 | 15 | 6 | 21 | 22 | 29 | 34 | 34 | 23 | 56 | 52 | 61 | 56 | **195** | 76 | 98 | 112 |
| Public administration and defence | 4 | 9 | 6 | 13 | 11 | 44 | 39 | 43 | 14 | 39 | 67 | 37 | **175** | 56 | 83 | 44 | 60 |
| Agriculture, hunting and forestry | 5 | 14 | 2 | 13 | 24 | 20 | 25 | 26 | 44 | 34 | 41 | **167** | 37 | 61 | 69 | 65 | 89 |
| Education | 9 | 12 | 4 | 13 | 11 | 42 | 31 | 53 | 14 | 31 | **140** | 41 | 67 | 52 | 83 | 42 | 64 |
| Construction | 3 | 11 | 3 | 15 | 14 | 23 | 30 | 23 | 15 | **106** | 31 | 34 | 39 | 56 | 39 | 50 | 58 |
| Fishing | 3 | 10 | 2 | 8 | 16 | 4 | 9 | 12 | **101** | 15 | 14 | 44 | 14 | 23 | 31 | 26 | 32 |
| Other community, social & personal serv. activ. | 8 | 7 | 4 | 10 | 8 | 20 | 19 | **97** | 12 | 23 | 53 | 26 | 43 | 34 | 59 | 23 | 36 |
| Real estate, renting and business activities | 3 | 10 | 2 | 11 | 8 | 35 | **79** | 19 | 9 | 30 | 31 | 25 | 39 | 34 | 39 | 33 | 35 |
| Financial intermediation | 7 | 6 | 4 | 15 | 6 | **77** | 35 | 20 | 4 | 23 | 42 | 20 | 44 | 29 | 43 | 26 | 38 |
| Mining and quarrying | 2 | 5 | 3 | 8 | **45** | 6 | 8 | 8 | 16 | 14 | 11 | 24 | 11 | 22 | 17 | 25 | 31 |
| Wholesale and retail trade | 6 | 6 | 3 | **30** | 8 | 15 | 11 | 10 | 8 | 15 | 13 | 13 | 13 | 21 | 20 | 17 | 21 |
| Extra-territorial organisations and bodies | 2 | 3 | **23** | 3 | 3 | 4 | 2 | 4 | 2 | 3 | 4 | 2 | 6 | 6 | 4 | 3 | 6 |
| Hotels and restaurants | 2 | **22** | 3 | 6 | 5 | 6 | 10 | 7 | 10 | 11 | 12 | 14 | 9 | 15 | 14 | 10 | 12 |
| Private households with employed persons | **18** | 2 | 2 | 6 | 2 | 7 | 3 | 8 | 3 | 3 | 9 | 5 | 4 | 5 | 14 | 5 | 5 |

## Analysis of research areas

In *Figure 6.1* (*above*) and *Table 6.2* (*below*) we can see the interconnections and potential interdependencies between the research areas covered by 841 foresight exercises.

The results show that while 58% of the *Engineering and Technology* studies (213 out of 370) are interconnected with areas of *Natural Sciences*, the proportion of *Natural Sciences* studies that are interconnected with areas of *Engineering and Technology* is considerably higher (79 % or 213 out of 270). The pattern is different when we look at the interconnections between *Engineering and Technology* areas and Social Sciences. They both show interdependencies of similar proportions (32 % versus 35 %). By contrast, projects on *Medical Sciences* and *Agricultural Sciences* show high linkages with *Engineering and Technology* areas (56 % each), but only 20 % of *Engineering* and *Technology* projects are linked to areas in *Medical Sciences* and *Agricultural Sciences*.

A not very surprising finding is the low proportion of *Engineering and Technology* studies interconnected with areas of *Humanities* (5 %). However, it was indeed rather unexpected to find that 65 % of the *Humanities* studies are linked to *Engineering and Technology* areas (17 of 26).

These results reveal the existence of uneven or asymmetric interconnections between research areas at an aggregated level. However, they do not provide enough information about the lower levels.

### Table 6.2: Proportion of interdependence

| Research Areas | | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| A | Natural sciences | | 79 % | 26 % | 27 % | 34 % | 6 % |
| B | Engineering & technology | 58 % | | 21 % | 20 % | **32 %** | 5 % |
| C | Medical sciences | 50 % | 56 % | | 27 % | 54 % | 8 % |
| D | Agricultural sciences | 55 % | 56 % | 29 % | | 47 % | 10 % |
| E | Social sciences | 27 % | 35 % | **22 %** | 19 % | | 7 % |
| F | Humanities | 65 % | 65 % | 42 % | 50 % | 96 % | |

In order to make sense of the linkages at a much deeper level we decided to borrow visualisation tools traditionally used in Social Network Analysis (SNA). In particular, our aim was to visualise research areas in network maps and to explain and understand more clearly the links between them. We expected this to be useful to pinpoint important issues that the EC may want to consider when designing future policies and which might impact upon the dynamics of knowledge production in the European Research Area.

*Figure 6.3* shows the interconnections between **62 research areas** (see codes description in Annex 1). Areas often link one to another with different 'weight'. The 'stronger' the link that connects two areas, represented by a bolder line, the higher the number of reciprocal reference between those two areas. Similarly, the more links a research area gets, the more important it is. For example, in *Figure 6.3*:

> **B** (*Engineering and Technology*) and **E** (*Social Sciences*) share a darker and thicker line than the one shared between **E** (*Social Sciences*) and **C** (*Medical Sciences*).

Here the 'weight' of the lines is consistent with the results presented in *Table 6.2*: **32 %** of *Engineering and technology* studies are linked to Social sciences (**B**–**E**), while only **22 %** of the Social sciences studies are linked to Medical sciences (**E**–**C**).

### Identifying 'knowledge hubs'

*Figure 6.3* shows very strong linkages between *Engineering and Technology, Natural sciences*, and *Social sciences*. These three areas can be considered as the main '**knowledge hubs**' of foresight work and these results simply confirm the **interdisciplinary nature of foresight.**

There are less strong linkages between *Engineering and Technology* studies and the *Medical sciences* and *Agricultural sciences* areas. This result has also been captured in *Table 6.2* which shows that while 56 % of the projects in *Medical sciences and Agricultural sciences* are linked to *Engineering and Technology*, these sectors are only targeted by 21 % and 20 % of projects concerned with *Engineering and Technology* areas.

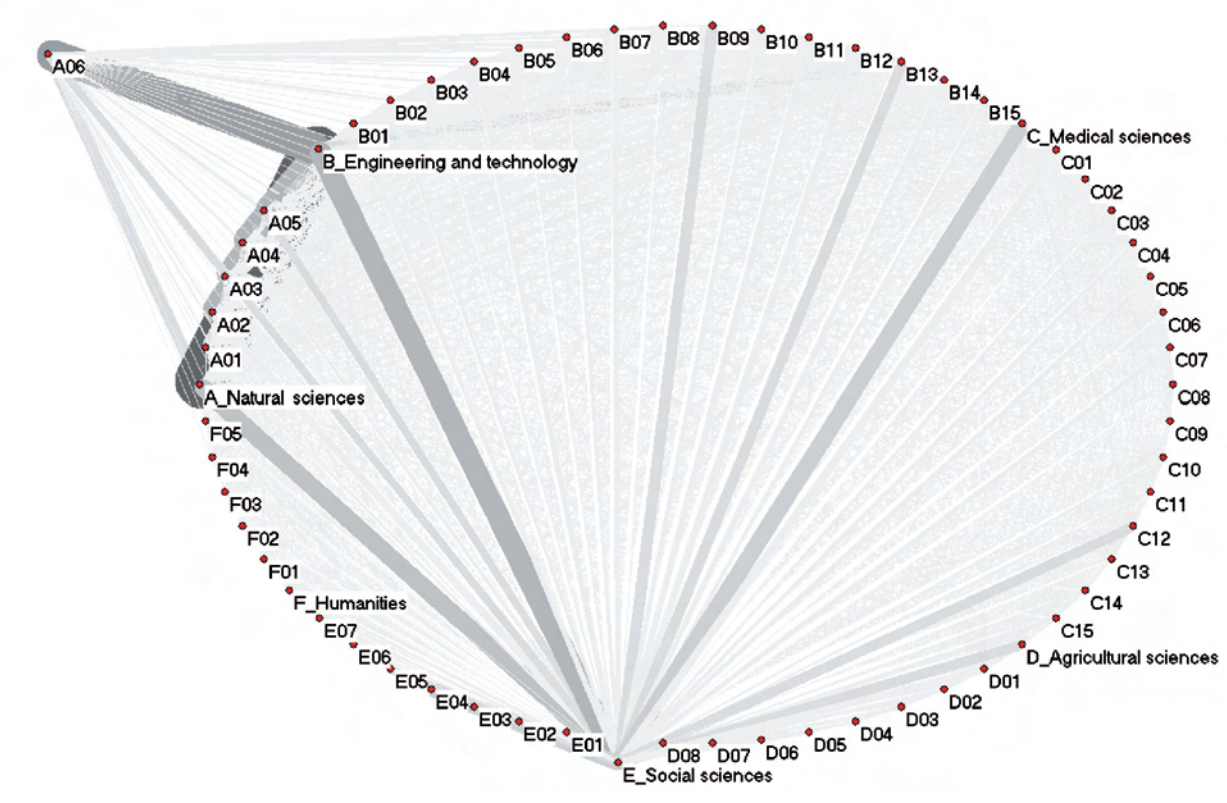
## Identifying 'knowledge junctions'

The interdisciplinary nature of foresight means that foresight projects can be described as 'knowledge junction' between different research areas and sub-areas. With this in mind, we have identified a number of interesting results:

- First, foresight exercises on A06 (Biological science) often synthesise data from multiple sources, thus creating a very interesting 'triangulation effect'. In particular, we can observe two well defined triangles: the first suggests that foresight work in this sub-area is the **strongest knowledge junction** between **Engineering and Technology** and **Natural sciences**; while the second triangle shows that foresight studies on Biological science provide a less strong but certainly **important link** between **Social sciences** and **Natural sciences**.
- Second, there are two equally important sub-areas linking the *Engineering* and *Technology* and *Social Sciences areas*: B09 (Environmental engineering) and B13 (Communications technologies). The importance of these linkages may be obvious for some, but their recognition as **fundamental knowledge junctions** in the relationship between *Engineering* and *Technology* and *Social sciences* is a significant result of this report.
- Third, foresight studies on sub-area C12 (Public health and Health services) provide important linkages between *Medical sciences* and *Social sciences*.
- Fourth, foresight work on the sub-area D01 (Crop and Pasture production) provides important linkages between ***Agricultural sciences*** and sub-areas of ***Social sciences*** on the one hand, and ***Natural sciences*** on the other.
- Last but not least, we would like to highlight the cohesive role of foresight on sub-areas of ***Social sciences***. This is mainly because foresight projects are designed in such a way that, at some time in the process, linkages are established with the policy dimension or (using the Frascati terminology) with sub-area E04 (Policy and Political science).



Figure 6.3: Mapping linkages between research areas in foresight




*Source: Popper (2009)*

## Recognising 'key sub-areas'

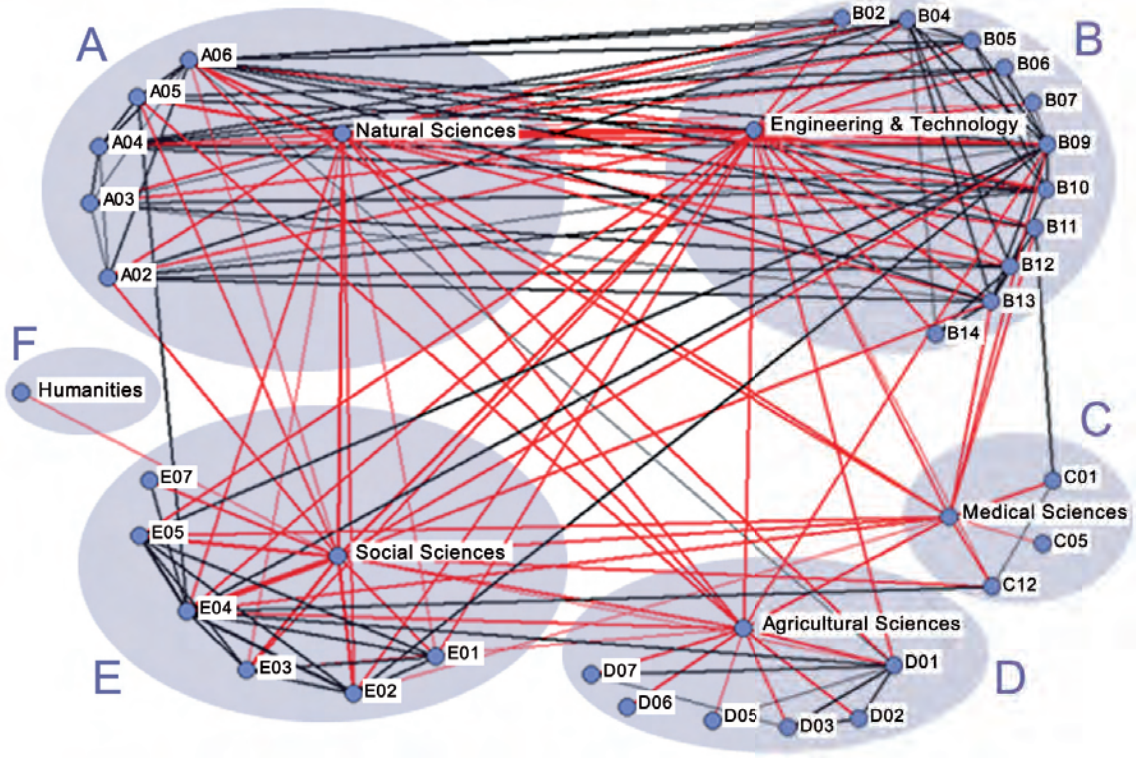
Before entering into the 'key' territory we would like to remind the reader that, in our previous analysis (*Figure 6.3*), research areas were placed in a spatial arrangement showing optimally the relationships between variables. This, which required the definition of correlations among areas and the assignment of scores to each area, facilitated representation of the degree of correlation with lines of different weights. By contrast, in this section we use network tools in a more 'flexible' way. By flexible we mean 'adapted to specific needs'. In other words, instead of creating another fancy (and possibly unreadable!) picture showing the interconnections between 224 variables, we have clustered the six Frascati areas in *Figure 6.4* and manually positioned those sub-areas with the highest number of foresight exercises. The methodological implication of our adaptation is that the 'spatial arrangement' (i.e. distance between areas and sub-areas) does not automatically provide meaningful information. However, this information is not relevant for our analysis of key sub-areas. Therefore, we have used network visualisation tools but only to retain the areas and sub-areas that 'share' more than 25 studies in our dataset.

Moving to *Figure 6.4*, we have used red lines to show interconnections among the six main areas and the linkages between areas and the 'key' sub-areas, while the **black line** only shows the linkages among sub-areas. This analysis leads us to a number of interesting results.

- First, nearly all the sub-areas in ***Natural Sciences*** are well interconnected. These include A02 (Information, computing and communication science); A03 (Physical Science); A04 (Chemical Science); A05 (Earth Sciences); and A06 (Biological Sciences). The 'key' ones are A04 and A06. We did not find much work on *Mathematical Sciences* (A01). Does this show a weakness of European science in this area? Or a lack of foresight about opportunities and threats that innovations here may bring to Europe and the world?
- Second, most sub-areas in ***Engineering and Technology*** are well interconnected. However seven of those can be labelled as 'key': B02 (Industrial Biotechnology and Food Sciences); B04 (Manufacturing Eng.), B09 (Environmental Eng.), B10 (Materials Eng.), B11 (Biomedical Eng.), B12 (Electrical and Electronic Eng.), and B13 (Communication Technologies).

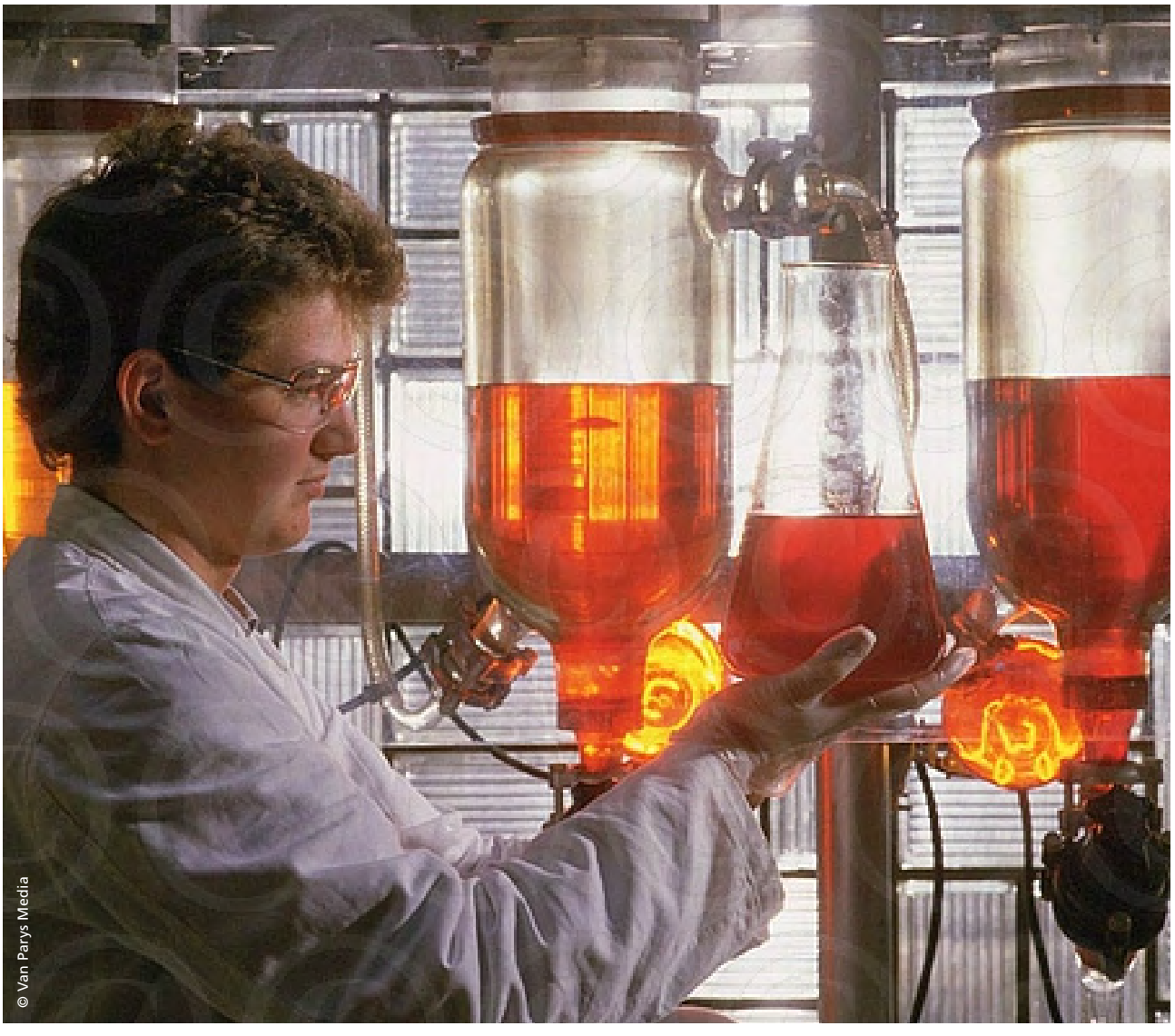


Figure 6.4: Disentangling the linkages between research areas in foresight




*Source: Popper (2009)*

- Third, only three of the fifteen sub-areas in ***Medical Sciences*** are considered 'key'. These are: C01 (Medicine general); C05 (Pharmacology and Pharmaceutical Sciences); and C12 (Public Health and Health Services). There are two other areas which we did not include in the figure, given that our database has less than 25 studies on these sub-areas. These are C03 (Medical Biochemistry and Clinical Chemistry) and C04 (Medical Microbiology). They both have significant links with the Engineering and Technology and Natural Sciences areas.
- Fourth, ***Agricultural Sciences*** as an area seems to have several connections with Social Sciences and Engineering and Technology. Although weakly connected (in various weights), only one of the eight sub-areas (Crop and Pasture Production) has a salient link to other sub-areas, i.e. A06 and E04.
- Fifth, almost all of the ***Social Sciences*** areas seem to be interconnected with most areas. Except for E06 (Behavioural and Cognitive Sciences) and E07 (Law, Justice and Law Enforcement), all topics are highly interconnected. Research topics within Social Sciences also share equally important connections with other research topics within Agricultural Sciences, Medical Sciences, Engineering and Technology, Natural Sciences and Humanities. In a way, research in Social Sciences is the 'binder' of all research topics in the foresight exercises. This is quite the opposite with research within Humanities, which have the least salient links to other research topics in the exercise.



## Analysis of socio-economic sectors

**Could the global financial crisis or the 2008 US housing and credit crisis have been prevented?** Maybe… Maybe not! But we would have certainly been better prepared to deal with such events if 'better' foresight had been the norm in the *Financial intermediation* **(J)** and *Real estate, renting and business activities* **(K)** sectors. Because these two sectors are services, we decided to devote this section to the analysis of foresight activities in the so called 'grand' economic sectors: the primary, secondary and tertiary sectors.

### Mapping 'grand' economic sectors

*Figure 6.5* presents the proportion of foresight work carried out in each 'grand' economic sector. The picture shows a clear message: '**Foresight on Services**' is really dominant!

**Figure 6.5: Foresight on 'grand' sectors**

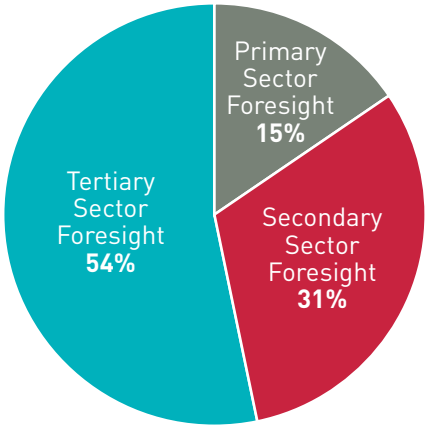



*Table 6.3* shows the overall results for the **Primary Sector**. We can see that slightly more than half of the mapped activities are focused on *Agriculture, hunting and forestry*. But the figures are not surprising. If we look, for example, at the *Eurostat* figures for employment in Agro, we can see that the number of workers is five times higher than in the Fishing and Mining sectors combined, and the gross value added (GVA) almost twice as high. Therefore, we believe that the existing Agro-bias in primary sector foresight is modest and reasonable.

**Table 6.3: Primary Sector Foresight**

| Primary Sector | | Cases | % |
|---|---|---|---|
| A | Agriculture, hunting and forestry | 167 | 53 % |
| B | Fishing | 101 | 32 % |
| C | Mining and quarrying | 45 | 14 % |

*Table 6.4* shows the overall results for the **Secondary Sector**. We can see a similar pattern here. This time nearly half of the studies are focused on *Manufacturing*. Such figures are reasonable given the primary importance of the sector in this group – it accounts for almost 20 % of employment in the EU27, and is also the second largest contributor in terms of GVA.

However, we were not expecting such a low number of studies on the *Construction* sector, mainly for two reasons:

- First, the figures do not reflect the importance of this sector in terms of employment and GVA; and
- Second, this sector has some special characteristics. Trends show an escalation of knowledge-intensive activities in the sector (e.g. integrating ICT systems and digitalisation into parts of the construction process). This may explain why our cluster analysis results (see 'Knowledge Clusters' section below) – and recent studies of Australian scholar Perry Forsythe (2008) – suggest that the *Construction* sector should be considered a service industry. But given that most literature refers to it as a secondary sector, we have left it as such in this section. Nevertheless, in the next section we included *Construction* within the Knowledge-Intensive Private Services cluster.

Similarly, growing concern about the energy market, and in particular Europe's increasing efforts to promote renewable energies and to address the technical and socio-economic challenges of water distribution, may explain why there has been such a large number of foresight initiatives favouring research on the *Electricity, gas and water supply* sector.

*Table 6.5* shows the results for the **Tertiary Sector**. We see that 68 % of the studies target four sectors: Health and social work (22 %); Transport, storage and communication (18 %); Public administration and defence (16 %); and Education (6 %). The remaining 32 % is shared between seven sectors.

Table 6.4: Secondary Sector Foresight

| Secondary Sector | | Cases | % |
|---|---|---|---|
| D | Manufacturing | 299 | 47 % |
| E | Electricity, gas and water supply | 236 | 37 % |
| F | Construction | 106 | 17 % |

Table 6.5: Tertiary Sector Foresight

| Tertiary Sector | | Cases | % |
|---|---|---|---|
| G | Wholesale and retail trade | 30 | 3 % |
| H | Hotels and restaurants | 22 | 2 % |
| I | Transport, storage and communication | 195 | 18 % |
| J | Financial intermediation | 77 | 7 % |
| K | Real estate, renting and business activities | 79 | 7 % |
| L | Public administration and defence | 175 | 16 % |
| M | Education | 140 | 13 % |
| N | Health and social work | 235 | 22 % |
| O | Other community, social & personal services activities | 97 | 9 % |
| P | Private households with employed persons | 18 | 2 % |
| Q | Extra-territorial organisations and bodies | 23 | 2 % |

This uneven 'distribution' of foresight in the services sector becomes apparent when we look at the low proportion of studies in two sectors recently branded in the *2008 Eurostat Regional Yearbook* as "the most important" for the growth of the EU economy: *Real estate, renting and business activities* (**K**) and *Wholesale and retail trade* (**G**). The *Eurostat* report also highlights the fact that **K** contributes more than 20 % of the total GVA created in the EU27 and is responsible for 12 % of total employment, thus showing an extremely high GVA per person employed. By contrast, the same report states that G is the second most important sector in terms of employment, covering 15 % of employment. This sector's share of GVA, at 11 %, is considerably lower than its share in employment, leading to a GVA per person employed of 75 % of the average for all sectors.

Now, looking back at the proportion of studies researching the future of sectors **K** and **G**, we can indeed conclude that (1) the foresight coverage of these sectors does not do justice to their significance for Europe and (2) the complexity of issues characterising these sectors (for example, productivity per capita) may well be good subjects for futures research.

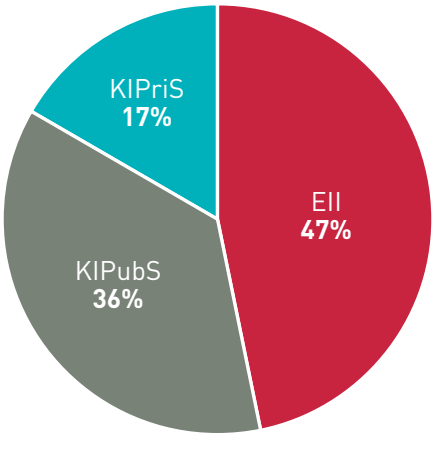
## Recognising 'Knowledge Clusters'

Let us briefly highlight two interesting findings from the use of network visualisation tools (see *Figure 6.7*). The first result is that *Manufacturing* should be considered a '**critical sector**', given that changes here would have an important influence on most socio-economic sectors. This can be observed in the number and the strength of the linkages that this sector shares with others. The second result is the recognition of three distinctive **Knowledge Clusters**:

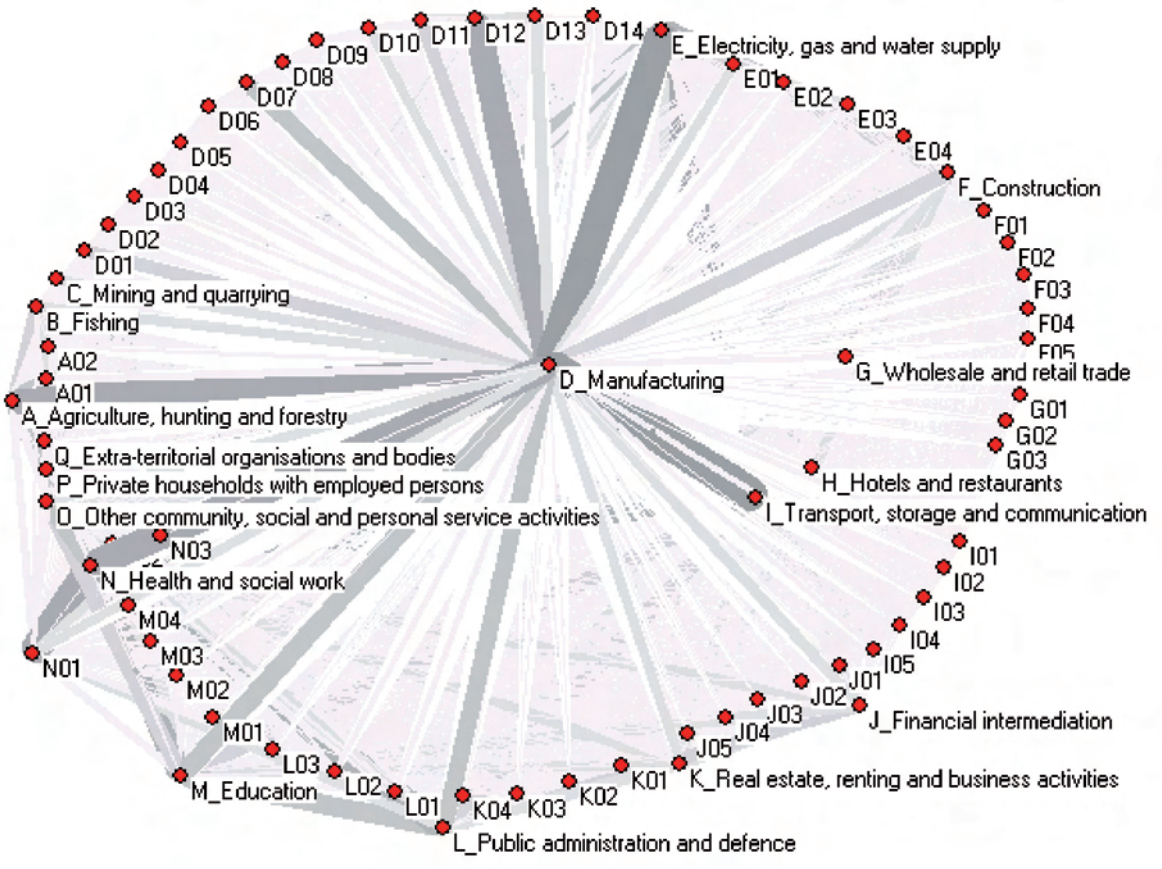
- **Engineering Intensive Industries** (EII), including: *Manufacturing; Transport, storage and communication*; and *Electricity, gas and water supply*.
- **Knowledge-Intensive Public Services** (KIPubS) sectors, such as: *Public administration and defence*; *Education*; and *Health and social work*.
- **Knowledge-Intensive Private Services** (KIPriS) sectors: *Construction; Financial intermediation*; and *Real estate, renting and business activities*.

These **Knowledge Clusters** are virtual environments created by a significant number of research projects associated with complex cognitive processes (including exploration, interpretation and reasoning) and regular exchanges of knowledge about key issues shaping the future of two or more socio-economic sectors.

Figure 6.6: Knowledge Clusters

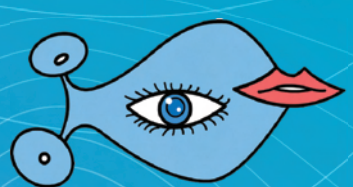


## Figure 6.7: Mapping linkages between socio-economic sectors in foresight




*Source: Popper (2009)*

# 7 Mapping foresight recommendations



This chapter presents an analysis of **559** recommendations resulting from a sample of **83** foresight panels and task forces. The main purpose of this analysis is to measure the extent to which panels of foresight exercises conducted at different territorial levels (national, subnational, and supranational) lead to particular types of recommendations. But given their action- orientation, foresight panels often (though not always) explicitly make recommendations in the light of their analyses and deliberations, most of which are targeted at actors in international, national and regional innovation systems. Even where recommendations are not stated explicitly, often they can be detected implicitly.

For the purposes of the current analysis, it is important to be clear as to what is meant by 'recommendations', otherwise confusion could result. Points to bear in mind include:

- Recommendations are not the same as 'priorities'. The latter refers to topics and areas that have been identified as important. By contrast, recommendations refer to actions that should be taken to address priorities. Care should therefore be taken not to confuse the two.
- Recommendations also tend to be wide-ranging in terms of what they cover and who they target. Policy recommendations are normally directed at the likes of ministries and other funding agencies, but recommendations from foresight panels and task forces often tend to be broader in scope and refer to a wider group of targets, including companies and researchers, for example. So mapping efforts have to be focused upon a broader set of recommendations than those that simply refer to public policies.



## Taxonomy of recommendations

With the aforementioned points in mind, we identified twelve types of recommendations:

**Policy shift**: refers to shifts in public policy recommended by a foresight exercise. This could include a very wide range of topics, essentially covering all areas of public policy. Note that we mean 'policy' rather than 'programmatic' shifts, i.e. the recommendation should refer to a shift at a higher strategic level than simply programme planning, e.g. to include regulation and legislation.

**Creation of a new initiative (e.g. project/programme/strategy/discussion forum)**: the establishment of new initiatives in response to the findings of a foresight exercise. This will certainly include things like new (research) projects and programmes, but might also cover the establishment of new working groups, committees, associations and networks, and other similar hybrid fora.

**Incorporation of findings into ongoing debates and strategies**: recommendations that specify the use of foresight results in defined policy and existing decision-making processes. For example, this category might include recommendations to include foresight results in ongoing policy reviews or to integrate results into strategy documents.

**Private sector and NGO action**: actions that should be taken by the private and NGO sectors in the light of the priorities identified in a foresight exercise. A wide variety of actions are possible, including new investments in technologies, and the development of new services to meet emerging needs.

**Further research**: situations where a foresight exercise makes a general call for further research in a particular area without specifying the need for new projects or centres.

**Human resource development**: initiatives to enhance development of human resources, particularly through education and training.

**Improved academia-industry links**: the improvement of academia-industry links, for example, through greater R&D collaboration, joint training schemes, and so on.

**Increased public spending**: the need for increases in public spending in areas identified in a foresight exercise. Applies in situations where spending increases are proposed without specifying the need for new projects or centres.

**Greater cooperation, including international cooperation**: calls for greater cooperation between actors in the innovation system around the priorities

and issues highlighted by a foresight exercise. Also refers to calls for greater international cooperation.

**Establishment of new centre**: the setting-up of a new group or institute dedicated to addressing priorities identified in a foresight exercise. This can be either a bricks-and-mortar or a virtual centre.

**Further foresight**: the need for further foresight exercises, possibly at different locations or levels, but also in the future.

**Dissemination of findings**: concrete proposals for disseminating the findings of a foresight exercise to various groups and communities.

The data used for this analysis has been collected from **83** panels and task forces, in most cases associated with 'flagship' national programmes in **15** countries (see *Figure 7.1*). Such large-scale programmes are often collections of smaller foresight 'exercises', with 'panels' or task forces focused upon a particular sector or topic. For the purpose of our analysis, these 'panels' are treated as distinct exercises, which they often are (for example, national foresight programmes carried out in Denmark, Germany, Spain and the UK are 'rolling' exercises, in that they constitute a series of exercises focused upon different topics at different times).

Many of the selected panels or exercises have been recently completed, although a small number are more than five years old (e.g. the Hungarian Foresight Programme completed in 2000). Recommendations from Greece, for instance, are based on the results of 12 panels of the national foresight programme: agricultural development and fishery; biotechnology; culture; defence technologies; energy; environment; governance and e-Government; industrial production and manufacturing; information, technology, communications and e-Business; materials; tourism and transport.

The total number of recommendations per country is shown in *Figure 7.2* below. More than 50 recommendations have been collected from four countries: Finland, Spain, Portugal, and Hungary. A second group of countries (Denmark, Germany, France, Austria, UK and Ireland) has between 20 to 50 recommendations mapped. The remainder have less than 20 recommendations mapped.

Figure 7.1: Panels and task forces

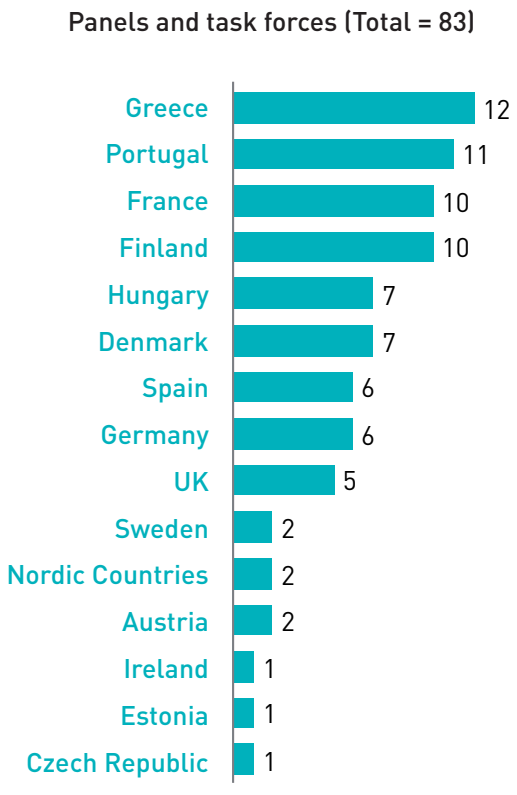
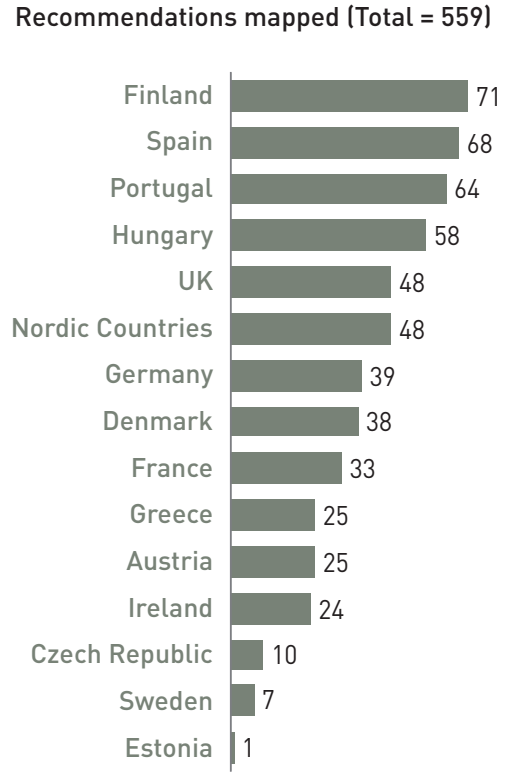





Figure 7.2: Recommendations per country



## General analysis

Following the proposed taxonomy, *Figure 7.3* below shows that recommendations calling for *policy shifts*, together with those that call for the *creation of new projects, programmes, strategies or fora* are the most common.

A second group of recommendations, each with 50-70 proposals includes the *incorporation of foresight findings into ongoing debates and strategies*; suggested *actions for the private sector and non-governmental organisations to follow*, and the need for *further research*.

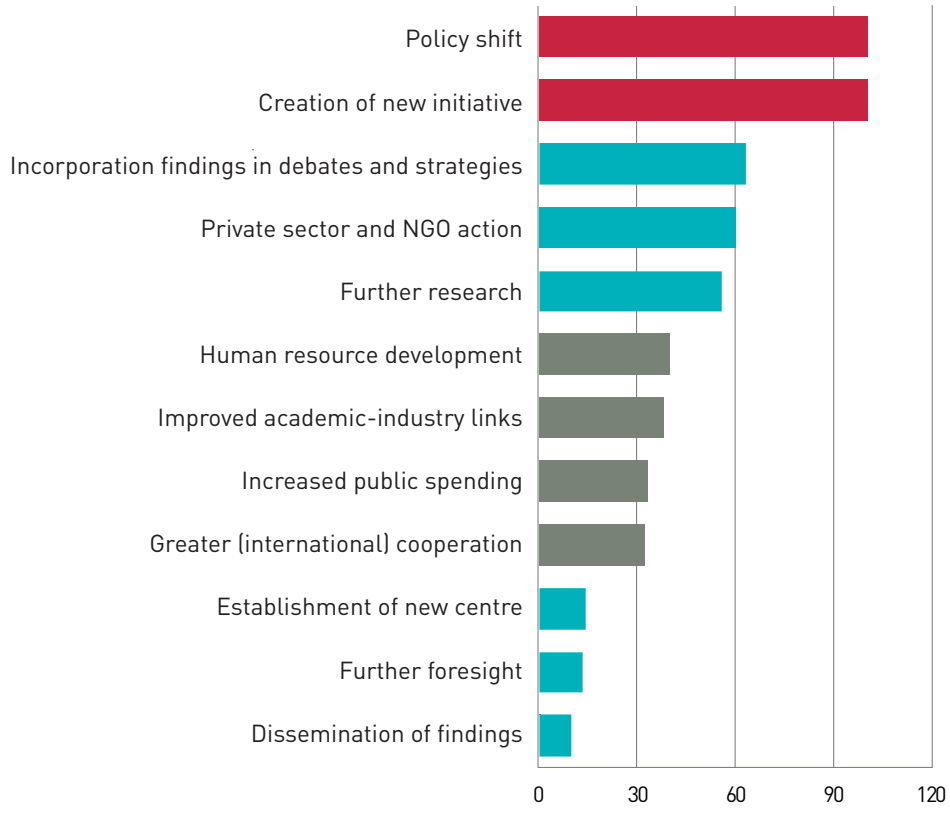
A third group (each with 30-40 suggestions) includes the *development of human resources, improvement in academia-industry links, increases in public spending and greater cooperation* across the innovation system (including international cooperation). A few points are worth highlighting here:

- First, of the recommendations calling for greater cooperation, very few refer to international cooperation but instead point to the need for greater cooperation between different areas of science, different regions in a country, different industrial sectors, and so on.
- Secondly, taken together with the figures for improved academia-industry links, calls for improved cooperation between innovation system actors constitute an important concern for foresight exercises.

A final group of recommendations (i.e. establishment of new centres, further foresight, and the dissemination of foresight findings) represents a very small proportion of the total. Here we should mention that recommendations about the dissemination of findings and calls for further foresight often come from outside the panels and task forces. Thus the low figures may be due to our own mapping procedures.



Figure 7.3: Top 12 recommendations



## Territorial analysis

The consideration of the territorial scope of an exercise is particularly important when drawing conclusions about recommendations. The following analysis supports this argument by comparing the most common types of recommendations at different levels (national, subnational and supranational).

Since most of the recommendations in this study come from national exercises, it is to be expected that this bias will be reflected in the territorial level distribution. This argument is further supported by considering the subnational cases, where the majority of recommendations refer to the subnational level. Given the low number of supranational (including EU) level exercises in our sample, it is hardly surprising to see so few recommendations addressing these two levels.

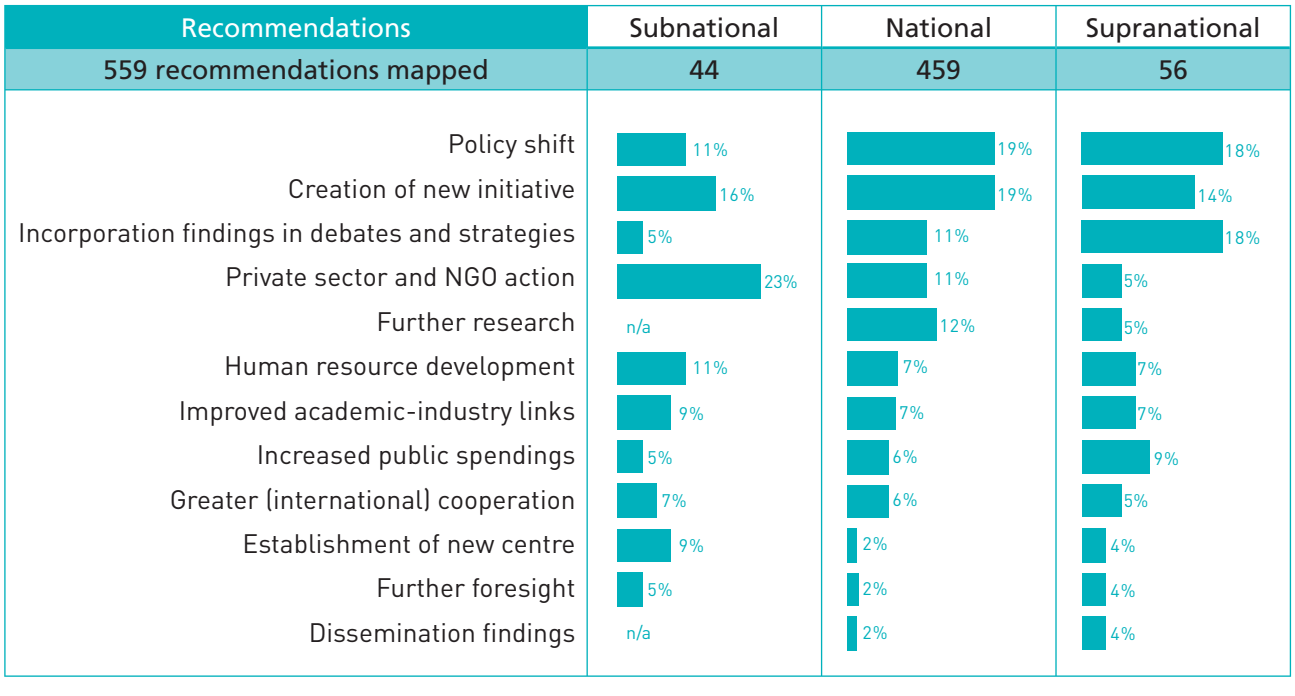
With these points in mind, *Figure 7.4* shows the distribution of recommendations around the twelve typologies. The position of the types of recommendations reflects the overall ranking resulting from the general analysis above. Not surprisingly, we see that the distribution of the **national recommendations** across the twelve typologies indicates a practically identical sequence to the one of general results above (note that they account for 84 % of the sample). Interestingly, the results show that *policy shift* and *new initiatives* are 'equally' important types of recommendations at this level (85 in each grouping). Another significant type is further research, which represents the third most important group.

The **subnational recommendations** show a different distribution pattern with *private sector and NGO action* as the most common type, followed closely by the *creation of new initiates, policy shift* and *human resource development*, while *further research, dissemination of findings* and *increasing public spending* show little or no presence in the selected subnational exercises.

The **supranational recommendations** show the *incorporation of findings in debates and strategies, policy shifts* and the *creation of new initiatives* as the three dominant groups followed by *increased public spending, human resource development* and *improved academia-industry links.*



**Figure 7.4: Outputs by region**



## Table 7.1: Mapping EU level recommendations

| Type | EU level recommendations | Country | Exercise |
|---|---|---|---|
| Policy shift | Improve the Common Agricultural Policy's conditionality system | France | DATAR – Agriculture and Territories. Four scenarios for 2015 |
| | Preferential treatment should be given to research topics that have preventative objectives or deal with major health issues and preferred issues in EU Programmes | Hungary | Hungarian Technology Foresight Programme – Health |
| | Implementation of electricity and gas directives at a European level | Portugal | Engineering and Technology 2000 – Liberalisation of the Energy Sector |
| | Reduction of the present trade barriers including cross-border trading rules | | |
| | Implementation of the European legislation on genetically modified foods | Spain | OPTI – Agro-Food Foresight |
| | Harmonise the existing legislations on nuclear energy and reduce the complexity of the international norm, in order to improve public perception | | OPTI – Spanish Nuclear Energy Futures 2030 |
| Incorporation findings in debates and strategies | Harmonisation of rules and practices between the different European countries (taxes and environmental regulations, rules for financial trade of commodities and commodity derivatives, and rules for unbundling old monopolies) | Portugal | Engineering and Technology 2000 – Liberalisation of the Energy Sector |
| | Implementation of a discrete international campaign to improve the image of Portuguese biotechnology research and industry (especially through the encouragement and facilitation of the production of articles in scientific and bio business publications) | | Engineering and Technology 2000 – Emergence of Biotechnology |
| | Combine ICTs and telematics (e.g. Trans-European Telematic network) in road transport to improve road safety, maximise road transport efficiency, and contribute to environmental problems of congestion, pollution and resource consumption | | Engineering and Technology 2000 – Trends on Transports |
| Greater (international) cooperation | Greater cooperation, including international cooperation | Czech Republic | Foresight as a basis for National Research Programme II (NRPII) |
| | Revitalisation of the rail infrastructure, articulating railway systems of several countries to create transnational networks | Portugal | Engineering and Technology 2000 – Trends on Transports |
| | To manage the threats posed by new technologies, it is essential to create an environment in which government, industry and citizens can trust each other | UK | UK National Foresight: Cyber Trust and Crime Prevention |
| Further research | Fulfil European research policy | France | INRA 2020 |
| | Intensify research activities at a European level, in particular those activities linked to the Framework Programme | Spain | Madrid 2015 |
| Private sector and NGO action | The exploitation of S&T through manufacturing is needed in order to reduce threats coming from outside Europe | Portugal | Engineering and Technology 2000 – Innovation in Traditional Sectors |
| | Intense price competition needs to be combined with product differentiation and marketing, in a situation where continuous price disputes erode profit margins | | |
| Human resource development | Promote stability in society through the acquisition of new skills for the management of diversity | Finland | FinnSight 2015 – Infrastructures and Security |
| | Provision of education and training programmes to raise the human resource capabilities of rural businesses, and of rural populations generally | Ireland | Foresight for Rural Ireland 2025 |
| Creation of new initiative | Initiate European innovation networks and projects based on the exercise's results | France | Key Technologies 2010 |
| Increased public spending | National and European investment in forestation | Ireland | Foresight for Rural Ireland 2025 |
| Establishment of new centre | Development of either a UK or EU rapid prototyping silicon foundry is essential, with clear rules on IP sharing/protection | UK | UK National Foresight: Cyber Trust and Crime Prevention |

## EU level recommendations

Although few in number, it is nevertheless interesting to consider more closely the recommendations that refer to the European level. To begin with *Table 7.1* (above), which shows the countries originating EU-level recommendations, is dominated by Portugal (8 of 21). These recommendations come from various components of the Portuguese technology foresight exercise carried out in 2000-01. Somewhat further behind are the figures for Spain, France, and Ireland.

It would be easy to jump to conclusions here: with its relatively underdeveloped research and innovation system, Portugal has been a major beneficiary of the Framework Programmes and other European funding schemes. Thus, it is perhaps of little surprise to see the European dimension featured so prominently in the recommendations of its national technology foresight programme. In this respect, it will be interesting to analyse the data for Greece – which has been in a similar situation – to see whether this hypothesis holds. However, the data is not as startling as it first seems when we consider the proportion (as opposed to the actual numbers) of recommendations from the different countries that refer to the European dimension. Portugal still comes out on top, with 8 of 64 recommendations at the European level. But it is closely followed by France (3 of 33), Czech Republic (1 of 10), Ireland (2 of 24), Spain (3 of 68) and the UK (2 of 48).

We can also consider the types of recommendations that refer to the European level – though as highlighted above, the small numbers involved should be borne in mind. The table shows the distribution of recommendations across types, with policy shift accounting for almost a third of the total. Half as many recommendations refer to each of two needs: *greater (international) cooperation* and *incorporation of findings into debates and strategies.*

It is often difficult to understand the meaning that lies behind some recommendations when they are taken out of context – for example, what is meant by "fulfil European research policy" could imply radically different things in the context, say, of discussions about overall R&D expenditure or discussions about convergent technologies. But the broad picture is that five recommendations refer to European-level R&D and innovation policies, whilst nine recommendations refer to other aspects of European cooperation and regulation (concerning areas like transport, agriculture, trade, etc.). These numbers are very low, particularly for R&D and innovation, even if we accept the argument above regarding the national framing of foresight exercises. It is almost as if the Framework Programme does not exist. How to explain and address this, if at all?

## Addressing the EU dimension

The first question to ask is whether the figures above really indicate a problem that needs to be addressed? If it is felt that there is indeed a problem, then how to go about solving it? We will deal with each of these questions in turn.

As we have seen, of 559 recommendations, only five clearly refer to R&D and innovation actions to be taken at the EU level – about one per cent of all recommendations. This low number is well below the proportion of public funding made available for R&D through the Framework Programmes. Such figures would seem to suggest that recent efforts to establish a European Research Area (ERA) have had little impact on the mapped foresight exercises.

Foresight exercises should be pointing to areas where future developments – and formulating future visions around which agendas are or should be set – will be important. Should we be surprised or concerned that so few of their recommendations address the European dimension?

At this point, it is perhaps worth considering the significance of foresight exercises in national and regional R&D and innovation landscapes. Whilst more research is undoubtedly needed on their role and impacts, it is known that they can and do have impacts on spending priorities, on agenda-formation, and on the networking of disparate actors into new working communities.

Nevertheless, it is all too easy to overestimate the effects of these exercises, particularly when you consider the rhetoric surrounding some of them. Closer examination shows that their impact on research and

innovation systems is typically rather marginal, and they tend to lead to incremental, evolutionary changes, often at the edges.

This is not to cast doubt on their value. Foresight exercises can and do play an important role in highlighting cross-cutting opportunities that are often missed in the compartmentalised worlds of disciplinary science, socio-economic sectors, and administrative bureaucracy. But to claim that they sit centre-stage in research and innovation systems is, in most instances, wishful thinking.

Furthermore, it could be argued that myopia where the European dimension is concerned is hardly unexpected, given that national and subnational exercises are typically framed in such a way as to address localised settings, while EU exercises are likely to give greater emphasis to the EU level.

Since problems and solutions match the territorial levels in which exercises are being carried out, it would be unrealistic to expect another territorial level to feature prominently, unless deliberate efforts were made to cover it. In practice, EU funding is complementary to national sources of funding, particularly in the big-spending science countries. It is therefore natural for recommendations to focus mostly upon the national level where there are more resources to bid for.



Most recommendations made in national or regional foresight exercises are considered achievable in the short-to-medium term and tend to be within the power of local actors to implement. Actions to be taken at the EU level or in coordination with other countries often fall outside this definition. Thus, recommendations difficult to enact locally are rarely made, unless it is obvious or inevitable that another (often higher) policy level must be the source of action and change.

The bulk of research and innovation system support available at EU level is restricted to research funding, with some further support for networks and mobility. Our data showed that recommendations that call for new research funding account for only 10 per cent of the total mapped.

Therefore, if the scope for action at the EU level is largely limited to research funding, it should hardly be surprising to find so few recommendations referring to this level.

There is simply much more scope for shaping policies, programmes, and even institutions at national and regional levels than at the European level.

Thus, there are some powerful arguments why the European dimension is not very evident in the recommendations of national and regional foresight exercises. While some of these reflect factors that are difficult for the EC to address, some might be tackled.

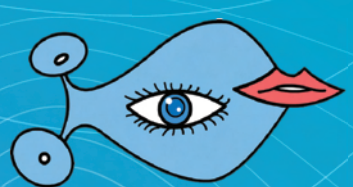
For example, the EC could encourage national governments to incorporate a European dimension into their national exercises – the ForSociety ERA-Net has been attempting to do this, to some extent.

The EC could also provide useful information resources for national or regional foresight exercises to use – for example, databases of megatrends or wildcards – and these could reflect a European flavour (though they would need to retain national relevance!).

Another option would be for the EC to carry out its own foresight exercises that address issues at the European level. If done well, these would not only inform EU policy, but could also provide information inputs for national and regional foresight exercises (such a phenomenon is already apparent in subnational exercises that often make use of the tools and results of national exercises).

These and other ideas would need to be discussed further with the foresight community in Europe. But they would be unlikely to overcome all the structural factors, highlighted above, that underpin myopia about the European dimension.

# 8 Final remarks and lessons for the future



This final mapping report has shown the potential of monitoring the way in which we navigate into the future. The large amount of foresight initiatives collected and mapped, and the quality of the data that has been examined, have allowed us to undertake more interesting comparisons of the main practices and outputs. We have also learned from the difficulties of covering so many world regions; even within Europe the information base should be broadened. The experience shows that more initiatives can be identified by the mapping team, but also that another strategy of developing a 'wiki-mapping' environment could be valuable. With this in mind, we would like to reflect on the purpose and style of future mapping activities.

First, it is important to **develop distinctive mapping protocols to monitor foresight practices, outcome and players**. Our work within the EFMN has been mainly focused on the first (practices). Yes, we have developed an indicator to map codified outputs and we have had an open-ended category where contributors could include policy impacts, results and limitations of the studies. But this was not always captured and, from our own experience as practitioners and evaluators of national foresight programmes, we believe that the mapping of foresight outcomes should also try to capture the process benefits, such as the number of new networks, new working and decision-making procedures, new skills and capabilities in dealing with uncertain and longer-term issues, and other factors. Therefore, any similar initiative should try to explore new and better ways of mapping foresight players and their competences (including major stakeholders, sponsors, project coordinators, work package leaders, panel members, sub-contractors, practitioners, thematic and methodological experts, etc.).

Second, the mapping should be able to **analyse key features and findings of foresight exercises**. We have used a set of generic indicators which have helped us to recognise the depth and density of the waters in which we navigate, but so far we are not able to perform more rigorous meta-analysis of the data, because we need more relevant, powerful and user-friendly IT infrastructures to capture key features and findings.

Third, we need to **put in place an interactive Mapping Environment capable of user-friendly data input, validation and analyses**. As the reader of this report can see, we managed to collect over 2000 exercises and more than half have been fully mapped. This is good for the purposes of this report but it raises questions about if and how to fully characterise all the initiatives and how to cope with an increasing number of future initiatives? Or, another valid question, are these really foresight exercises or just foresight-like projects? Should we bother about these conceptual definitions? If so, how can we better filter and validate the data. Furthermore, the different ways in which this mapping information might be used suggests the need to develop an information system that can be customised.

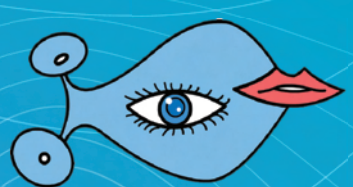
This leads us to our fourth lesson for the future. We need to **provide a common space to share and discuss foresight findings and documents**. This space could be the same mapping infrastructure, in which case it is likely to be best served by a wiki-type platform. Alternatively, the mapping activity should explore the possibility of engaging real foresight players (i.e. sponsors and project leaders) in workshops to discuss the pro's and con's of ongoing foresight processes. Such a face-to-face forum would also play a key role in building and strengthening foresight capacities, as well as expanding the space for mutual learning (something which the EC has been trying to promote via an electronic format within the ForLearn initiative).

Fifth, any future EC-funded foresight mapping initiative should try to **link up with other EC projects and networks, such as the ERAWATCH**. The EFMN has benefited from similar associations with ongoing initiatives and networks such as ForSociety, the biannual FTA conference, the SELF-RULE network, among others. The regular exchange of information and support that the EFMN mapping has received from the more than 200 Correspondents shows that 'voluntary commitment' can be achieved if the contribution is later on rewarded with informative reports such the ones prepared by the EFMN.

Finally, future mapping efforts should try to **generate more appealing and up-to-date information about practices and findings for different readerships**. This could be achieved through the exploitation of the Internet and web 2.0 tools aimed at creating an interactive space for different stakeholders' involvement.

# 9 References – Foresight exercices in Europe and in other world regions





## References


Butter, M., Brandes, F., Keenan, M. and Popper, R. (2008), **Evaluating Foresight: an introduction to the European Foresight Monitoring Network**, Foresight, 10(6), pp. 3-15.

Forsythe, P. (2008), **Modelling customer perceived service quality in housing construction**, *Engineering, Construction and Architectural Management*, 15(5), pp. 485-496.

Georghiou, L. and Cassingena Harper, J. (2008), **FTA for Research and Innovation Policy and Strategy,** Third International Seville Seminar on Future-Oriented Technology Analysis: Impacts and implications for policy and decision-making – Seville 16-17 October 2008.

Keenan, M. and Popper, R. (2007), **Research Infrastructures Foresight: A practical guide for policy-makers and managers of existing (and future) research infrastructures (RIs)**, European Commission, Brussels.

Keenan, M., Butter, M., Sainz, G., and Popper, R. (2006), **Mapping Foresight in Europe and other Regions of the World: The 2006 Annual Mapping Report of the EFMN**, report to the European Commission, Delft: TNO.

Keenan, M. and Popper, R. (2008), **Comparing foresight 'style' in six world regions**, Foresight, 10(6), pp. 16-38.

Popper, R. (2008a), **How are foresight methods selected?**, Foresight, 10(6), pp. 62-89.

Popper, R. (2008b), **Foresight Methodology**, in Georghiou, L., Cassingena H., J., Keenan, M., Miles, I., and Popper, R., *The Handbook of Technology Foresight: Concepts and Practice*, Edward Elgar, Cheltenham, pp. 44-88.

Popper, R. Keenan, M. and Butter, M. (2005), **Mapping Foresight in Europe and other Regions of the World: The EFMN Annual Mapping Report 2004-2005**, report prepared by PREST and TNO for European Commission (DG Research), Manchester, UK, The University of Manchester.

Popper, R., Keenan, M., Miles, I., Butter, M. and Sainz, G. (2007), **Global Foresight Outlook 2007: Mapping Foresight in Europe and the rest of the World**, European Commission, EFMN, pp. 66.




## Further reading


Barré, R. (2008), **Foresight in France**, in Georghiou, L., Cassingena H., J., Keenan, M., Miles, I., and Popper, R., *The Handbook of Technology Foresight: Concepts and Practice*, Edward Elgar, Cheltenham, pp. 112-30.

Crehan, P. and Cassingena Harper (2008), **Foresight in Smaller Countries** (ibid., pp. 216-36).

Cuhls, K. (2008), **Foresight in Germany** (ibid., pp. 131-53).

Eerola, A. and Jørgensen, B.H. (2008), **Foresight in Nordic Countries** (ibid., pp. 184-215).

Havas, A. and Keenan, M. (2008), **Foresight in CEE Countries** (ibid., pp. 287-316).

Johnston, R. and Sripaipan, C. (2008), **Foresight in Industrialising Asia** (ibid., pp. 237-55).

Keenan, M. and Miles, I. (2008), **Foresight in the United Kingdom** (ibid., pp. 91-111).

Kuwahara, T., Cuhls, K. and Georghiou, L. (2008), **Foresight in Japan** (ibid., pp. 170-83).

Popper, R. and Medina, J. (2008), **Foresight in Latin America** (ibid., pp. 256-86).

Porter, A. and Ashton, W.B. (2008), **Foresight in the USA** (ibid., pp. 154-69).

## Foresight programmes and exercises in Europe

**Austria** (AAS-ICE – Visions of a wireless information society; BMVIT – Energiesysteme der Zukunft/BMVIT Future Energy Systems; BMVIT – Innovation and development potential biomedical technologies; BMT Austria 2000; BMVIT – Safety and Security Research 2011; BMVIT Technology Delphi; BMVIT/ARC – The Future of Mobility in Austria. Consequences for Technology Policy; Vienna City Council – Urban development strategy Erdberger Mais; IPTS – Future oriented analysis on the main socio-economic challenges that Europe will face: potential impact of research; Cedefop – Scenarios and Strategies for Vocational Education and Training in Europe; European Decentralized Generation (DECENT) Project: Development of EU policy)

**Belgium** (Flemish Government – Algemene Omgevingsanalyse Vlaanderen 2004/Flemish Government – Socio-Economic Foresight Flanders – Algemene Omgevingsanalyse Vlaanderen; Agoria – Roadmap Mechanica & Mechatronica; BACAS – Industrial biotechnology and sustainable chemistry; CLEO-Ulg Étude prospective en appui de la politique scientifique fédérale; DGTRE: Breakthrough to the Future with the Information Society in the Liège Region; Directorate-General for Technologies, Research and Energy DGTRE – PROMETHEE Wallonia; Flemish Institute for Science and Technology – Energy Foresight Flanders 2050; King Baudouin Foundation – Grey Matters; Perspectives énergétiques pour la Belgique à l'horizon 2030; SCK/CEN – Sustainability and nuclear development; Socioforesight – Belgian Federal Foresight Study; Strategisch Plan Limburg – SPIN OFF Strategic Plan Innovation: New Opportunities for the Future; IPTS – Future oriented analysis on the main socio-economic challenges that Europe will face: potential impact of research; Cedefop – Scenarios and Strategies for Vocational Education and Training in Europe; European INTERREG Rhine-Meuse Activities (IRMA) – Development of flood management strategies for the Rhine and Meuse Basins in the context of integrated river management; European Interregional Cooperation Area – SaarLorLux 2020 Vision for the Future)



**Bulgaria** (ForeTech: Technology and Innovation Foresight; ForeTech: Biotechnology; FP6 SCHOOL Foresight)

**Cyprus** (STRATA Programme – eFORESEE Cyprus)

**Czech Republic** (National Foresight: a basis for National Research Programme II – NRPII; RASES: Government Council for Social and Economic Strategy – Visions for Development 2015; FP6 SCHOOL Foresight; Cedefop – Scenarios and Strategies for Vocational Education and Training in Europe; Ministry of Education – Foresight as a basis for the National Research Program 2004-2008)

**Denmark** (Board of Technology – The future Danish Energy System; Environmental Protection Agency – Green Technology Foresight; Ministry of STI – Technological Foresight on Nanotechnology; Ministry of STI – Teknologisk Fremsyn – ICT from Farm to Table; Ministry of STI – Teknologisk Fremsyn – Pervasive Computing; Ministry of STI – Teknologisk Fremsyn – Ageing Society 2030; Ministry of STI – Teknologisk Fremsyn – Bio – and Healthcare; Ministry of STI – Teknologisk Fremsyn – Hygiene; Ministry of STI Bio/health technology foresight; Ministry of STI Teknologisk Fremsyn – Cognition and Robotics; Nordic Energy Research Programme – Future Wind Turbines; Risø National Laboratory – Sensor Technology Foresight; Society of Engineers (IDA) – Energy Technology Foresight; IPTS – Future oriented analysis on the main socio-economic challenges that Europe will face: potential impact of research; Baltic STRING Region Project; Norden Nordisk Innovations Centre – FOBIS: Nordic Foresight Biomedica Sensors; Nordic Energy Research/Nordic Innovation Centre – H2 Energy Foresight; Nordic Innovation Centre – ICT Foresight)

**Estonia** (FP6 SCHOOL Foresight; STRATA Programme – eFORESEE Estonia; eVikings; Research and Development Council – Competitiveness and future outlooks of the Estonian economy; Cedefop – Scenarios and Strategies for Vocational Education and Training in Europe; Scenarios 2010)

**Finland** (EU Barents 2010 Project; EUFORIA – European Knowledge Society Foresight; IPTS: Future oriented analysis on the main socio-economic challenges that Europe will face: potential impact of research; FFRC – Foresight analysis of the energy cluster in Pirkanmaa region 2010-2020; FFRC: The Future of the Food Industry – ETU 2030; Committee for the Future – Independent Living of Elderly People: Futures Policy and Gerontechnology; Eennakointi – Regional Foresight Information System of the Northern Ostrobothnia; ESF – Education Intelligence Project; ESF – Uusimaa 2035 Scenario Project; Global Challenges of eDevelopment – Future and Security – Scanning the Changing Environment of the Police; Helsinki University of Technology – The Future prospects of knowledge-intensive business services; Knowledge Society Strategy 2002-2005 for Southwest-Finland; Ministry of Agriculture and Forestry – Finland's National Adaptation Strategy; Ministry of Trade and Industry – Foresight Forum; Parliament – Energy 2010; Parliament – Finland 2015: Balanced Development; Parliament – Renewable Energy Sources in Finland by 2030; TEKES – FinnSight 2015: Services and Service Innovations; TEKES – FinnSight 2015: Bio-expertise and Biosociety; TEKES – FinnSight 2015: Environment and Energy; TEKES – FinnSight 2015: Global Economy; TEKES – FinnSight 2015: Information and Communications; TEKES – FinnSight 2015: Infrastructures and Security; TEKES – FinnSight 2015: Learning and Learning Society; TEKES – FinnSight 2015: Materials Utilisation; TEKES – FinnSight 2015: Understanding and Human Interaction; TEKES – FinnSight 2015: Well-Being and Health; TEKES – FinnSight 2015: Food Technology Foresight in Finland; Turku School of Economics – NAVIfuture: Survey on future of personal navigation; VATT – Globalisation: the End of Work? The Economy and Employment in Finland to 2030; VTT – Energy Vision 2030 for Finland; Nordic Energy Research/Nordic Innovation Centre – H2 Energy Foresight; Nordic Innovation Centre – ICT Foresight)

**France** (Europe – Strategic capacities in Europe in 10 years in relation with budgetary perspectives; European Interregional Cooperation Area – SaarLorLux 2020 Vision for the Future; IPTS – Future oriented analysis on the main socio-economic challenges that Europe will face: potential impact of research; Fondazione Rosselli – FoMoFo: Four Motor Foresight – Lombardy; Nancy 2020; INRA 2020; ADEME – Le secteur des transports à l'horizon 2030; AGORA 2020 – Transport, Housing, Urbanism and Risk; Atomic Energy Authorit – Energy 2010-2020 – The paths for a sober growth/Énergie 2010-2020; Atomic Energy Authority OMNT – Observatory of Micro and NanoTechnologies; CGP – L'évolution future des conflits d'usage envisagée à partir des 4 scénarios sur les campagnes françaises à l'horizon 2020; CNAM – L'ANAH à l'horizon 2010/Public Administrations in 2010; CNAM – The Future of Geographical Information in France; CNAM – The future of Pays Basque; CNAM/LIPSOR – La filière agricole et l'environement. Scénarios 2010 par la méthode Delphi – Abaque de Régnier; CNAM L'avenir du mais en France vers l'An 2010/The Future of Corn 2010; Commissariat Général du Plan – CGP – Energy 2010-2020: the challenges of the long term; Conseil économique et social de la région Centre – Region Centre: which scenarios towards 2020?; Conseil économique et social de l'Île-de-France – Living in Île-de-France in 2025; Conseil Régional du Limousin – Limousin 2017; DATAR – Agriculture and Territories. Four scenarios for 2015; DATAR – Aménager la France de 2020; DATAR – Des Chemins vers 2020; DATAR – Quelle France rurale pour 2020?; DATAR – Territoires 2030; DIACT Nord-Pas-de-Calais – Études Prospectives Régionales – Nord-Pas-de-Calais; DREIF – Les Prévisions de Trafics Urbains à l'horizon 2015; Futuribles – An exercise in scenario-building for pensions in France up to 2040; FutuRIS; Institut d'Evaluation des Stratégies sur l'Énergie et l'Environement en Europe – La Demande d'énergie en 2050; Ministère de la Défense – Nanotechnologies: prospective sur la menace et les opportunités au service du combattant; Ministère des Transports, de l'Équipement, du Tourisme et de la Mer – Démarche prospective transports: 2050; Ministre de l'Emploi et de la Solidarité – Personnes handicapées: Analyse comparative et prospective du système de prise en charge; Ministry of Defence – PP30: Prospective Plan of the French Defense Policy in 30 years; Ministry of Economy, Finance and Industry – National and Regional Key technologies; Ministry of Economy, Finances and Industry – Rapport sur les nouvelles technologies de l'énergie; Ministry of Health – Quel système de santé à l'horizon 2020; Ministry of Industry – Key Technologies 2000; Ministry of Industry – Key Technologies 2005; NégaWatt Association – Scénario négaWatt 2006; Observatoire de l'Énergie – Energy Baseline Scenario for France to 2030; Perspectives on future nuclear technologies; Rapport Dépendance: Aging Population Foresight; Key Technologies 2010)

**Germany** (EC DG Research – Future Impacts of Biotechnology on Agriculture, Food Production and Food Processing; Baltic STRING Region Project; BALTIC+ Project; EUFORIA – European Knowledge Society Foresight; IPTS – Future oriented analysis on the main socio-economic challenges that Europe will face: potential impact of research; Cedefop – Scenarios and Strategies for Vocational Education and Training in Europe; European Decentralized Generation – DECENT Project: Development of EU policy; European INTERREG Rhine-Meuse Activities – IRMA – Development of flood management strategies for the Rhine and Meuse Basins in the context of integrated river management; European Interregional Cooperation Area – SaarLorLux 2020 Vision for the Future; Fondazione Rosselli – FoMoFo: Four Motor Foresight – Lombardy; Bundesministerium für Bildung und Forschung – Ein Leben lang gesund und vital durch Prävention/A healthy life due to prevention; Baden-Württemberg – Four Motors Initiative Baden-Württemberg; Bayerischen Staatsministeriums für Wirtschaft, Verkehr und Technologie – Chancen für Bayern 2020/ Opportunities for Bayern 2020; Bayerischen Staatsregierung – Bayern 2020, Unternehmerische Initiative für Wachstum/Bayern 2020: Megatrends and opportunities; Bayerisches Staatsministerium für Wissenschaft, Forschung und Kunst – Wissenschaftsland Bayern 2020/Education and science in Bayern 2020; BMBF – INIT Bauhaus 2010 Innoseg; BMBF – ISI Delphi 98 Survey. Study on the global development of science and technology; BMBF – Nanotechnology pro Health; BMBF – Stadt 2030/BMBF City 2030; BMBF – The German Research Dialogue; CDU Brandenburg – Vision Brandenburg 2010; EFRE/Teilprojekt von InnoSachsen – InnoDreiländereck; Federal Government of Rheinland-Pfalz – ZIRP: Future Initiative Rheinland-Pfalz; Federal Government of Rheinland-Pfalz – ZIRP: Future Radar 2030; FORWERKZEUG; Fraunhofer Institute – Policy Scenarios 2005 and 2020; Fraunhofer Institute – The Future of the German Health System – view of physicists and experts; Hans Bredow-Institut – Digitalisierung des TV Kabels; Landkreis Löbau-Zittau – Zukunftsprogramm für den Landkreis Löbau-Zittau; Landkreis Löbau-Zittau – Zukunftsprogramm Löbau-Zittau/Program for the future of Löbau-Zittau; Landschaft ohne Grenzen; Lantag Mecklenburg-Vorpommerns – Enquetekommission „Zukunftsfähige Gemein- den und Gemeindestrukturen in Mecklenburg-Vorpommern/Survey commission Mecklenburg-Vorpommern; MFG Stiftung Baden-Württemberg – FAZIT; Institut für Agrarpolitik und Landwirtschaftliche Marktlehre/Universität Hohenheim – Prognose der Entwicklung des Agrartechnikmarktes/Foresight on the development of the agricultural market; Rheinland-Pfalz county association (Landtag) – Zukunftsradar 2030: ZIRP Zukunftsinitiative Rheinland-Pfalz; Senator for Economy and Harbour – Innovision 2010 Bremener Innovationsoffensive; SPD-Landesvorstand – Perspectives on Sachsen-Anhalt 2020; Staatsministerium Baden-Württemberg/Abteilung Grundsatz und Planung – Future Commission Society 2000; Siemens Horizons 2020; Forecasting of the development on the market for agricultural machines)



**Greece** (EC DG Research – INTRACK Regional Foresight in Crete; IPTS – Future oriented analysis on the main socio-economic challenges that Europe will face: potential impact of research; EUFORIA – European Knowledge Society Foresight; Cedefop – Scenarios and Strategies for Vocational Education and Training in Europe; General Secretariat for Research and Technology – 2021 Scenarios for Greece; National Technological Foresight; National Technological Foresight Exercise – Biotechnologies; Regional Foresight Exercise in Central Macedonia)

**Hungary** (Cedefop – Scenarios and Strategies for Vocational Education and Training in Europe; Technology Foresight Programme)

**Ireland** (Marine Foresight; Rural Foresight for 2025; University College Dublin – Archaeology in Ireland; BMW Region Foresight Project; IPTS – Future oriented analysis on the main socio-economic challenges that Europe will face: potential impact of research; Environmental Protection Agency – Energy Scenarios Ireland; FORFÁS – National Technology Foresight 1999)

**Italy** (EC DG Research – TRACK Regional Foresight in Sicilia; IPTS – Future oriented analysis on the main socio-economic challenges that Europe will face: potential impact of research; Strategic capacities in Europe in 10 years in relation with budgetary perspectives; Fondazione Rosselli – FoMoFo: Four Motor Foresight – Lombardy; Fondazione Rosselli –

National priorities for industrial research; National priorities for industrial R&D; IRES Piemonte – Scenario Analysis 2010; RISE – Research, Innovation, Economic Development)

**Latvia** (Towards Knowledge Societies of Europe)

**Luxembourg** (Dutch STT – Nanotechnology, towards a molecular construction kit; Cedefop – Scenarios and Strategies for Vocational Education and Training in Europe; Interregional Cooperation Area – SaarLorLux 2020 Vision for the Future; Esch: Esch-sur-Alzette – Workshop Esch 2006 Urban Vision)

**Malta** (STRATA Programme – eFORESEE Malta – Biotech Pilot; STRATA Programme – eFORESEE Malta – ICT & Education Pilot; STRATA Programme – eFORESEE Malta – Marine Sector Pilot)

**Netherlands** (No future without informatics, a look at the future; The economical and physical environment; Time for healthy behaviour; stimulation of healthy behaviour for specific groups; Demand for child care 2003-2007; Development of an integration map; European INTERREG Rhine-Meuse Activities IRMA – Development of flood management strategies for the Rhine and Meuse Basins in the context of integrated river management; IVLOS/ Futureconsult – (On)voorstelbaar (On)voorspelbaar/Incredible unpredictable; Limburg 2030 excellent in Europe; a future study for the regional province Limburg; Ministerie OC&W en EZ – Energy and society in 2050; Study on the political attitude of citizens; National identity of the Netherlands; National security; National strategy for sustainable development; National Foresight Studies to Energy; Financial crime in 2010 – Scenarios and strategic policy questions; NVVP policy options investigated on transport of goods; Opportunities and strengths of the Dutch Defence related industry; Pilot wireless health care; Population trends; Production, labour and sector-structure in four scenario's for 2040; Developments for Dutch farmers; a foresight of policy, the market, technology and actors; Representative and participative; double democracy; Royal Netherlands Meteorological Institute – KNMI Climate Scenarios for Impact studies in the Netherlands; Ruimtelijk Planbureau Den Haag – Four spatial scenario's for the Netherlands; Scenario's for household developments in the Netherlands; Social and cultural developments; Social and cultural rapport 2004; State without a country: a foresight of the consequences of ICT; Summarization of foresights about Delta in the future; SURF: Visions for the future; Foresight study for the occupation/job structure in care and welfare; Foresight of the cable landscape; Scenario's mapped: Future use of space/spatial planning; Forecast in relation to occupation structures in health sector; Foresight study on mediation and law; AER – Energie-infrastuctuur van de toekomst; AWT – With an eye on the future 2010; AWT Flows and floods – knowledge and innovation challenges for a watery Netherlands; Berenschot/Images of management: Berenschot trend analysis; Citizens and the public government in an ICT society; Centre for higher education policy studies Academia in the 21st century, an analysis of trends and perspectives in higher education and research; CPB – Labour productivity on long term in historical and international perspective; CPB – Dutch Central economic planning and a macro economical exploration; CPB – Four long-term scenarios for the Dutch government and health-care sector; CPB – Labour supply scenario's for the Netherlands; COS – The ether without boundaries; CPB – Housing and space in 2020; ECN – Energy technology; ECN – Energy infrastructure of the future; Futureconsult – Four scenarios for the Dutch knowledge economy in 2010; Gemeente Amsterdam – Vision of the city of Amsterdam; Gemeente Amsterdam: future scenario; Gemeente Eindhoven – Vision of the city of Eindhoven 2010; Gemeente Oosterhout – Vision of the city Oosterhout 2000-2015; Gemeente Venlo – Vision Venlo 2030; Gemeente Zwolle – The future of the city of Zwolle; HBA Vakkundig naar 2010/The future vision of the HBA; KNAW Bio-exact – Global trends and national position in biochemistry and biophysics; KNAW – Between earth and life: A strategic foresight of biogeology in the Netherlands; KNMG/DMW-VSNU/VAZ/NVZ/ LCW – The medical doctor of the future; Food supply in the 21st century; Libraries 2040; Limburg 2030; Longing for the endless sea; Marine Parks: sustainability at sea; Milieuverkenning 5 – 2000-2030; Min V&W en Min OC&W – The problems of tomorrow 1/2; Minister van Grote Steden– The future of the policy for big cities; Ministerie EZ – The economy of the 21st century; Ministerie OC&W/Ministerie van EZ – Vision of the future of scientific research; Ministerie van Binnenlandse Zaken en Koninkrijksrelaties – Policy

for big city's 2005-2009; Ministerie van Economische Zaken – Dutch Vision on the role of bio mass in the Dutch energy supply in 2040; Ministerie van Economische – The future of electronic communication; Ministerie van EZ – Innovation in Energy Policy; Ministerie van Justitie en Ministerie van Binnenlandse Zaken en Koninkrijksrelaties – Towards a safer society; Ministry of Economic Affairs – Dynamo 2004; Ministry of Economic Affairs – Visie op biomassa, De rol van biomassa in de Nederlandse energievoorziening 2040/Vision on biomass; Ministry of Economic Affairs ECN – The next 50 years: Four European energy futures; Ministry of Education, Culture and Science – The future of math research in the Netherlands; MInistry of Education, Culture and Science/Dutch Ministry of Economic Affairs – Vision on the future of scientific research; Ministry of VROM – Quality and the future; Ministry of VROM – Housing and living in multicultural cities; Ministry VROM – Trend analysis biotechnology 2004; National Environmental outlook 2000-2030; NIZW – Future scenarios for the health sector; NRLO – Functional Foods – Position and future perspectives; NRLO – Rural Areas put on the map, knowledge and innovation priorities, aspirations for the 21st century; NRLO – Science and Technology, Opportunities for agribusiness, rural areas and the fishing industry; NRLO – Agricultural sciences in Wageningen in 2010; NRLO Agribusiness: knowledge and innovation priorities, aspirations for the 21st century; NRLO Agricultural policy and internationalisation; developments and dilemmas in agricultural policy towards 2015; NRLO Agriculture and Environment, future initiatives for knowledge and innovation; NRLO Agriculture in society: a new perspective, future initiatives for knowledge and innovation; NRLO Bioproduction and ecosystem development in saline conditions; NWO – Technology Roadmap Catalysis; Ocean Farming – Duurzaam zeegebruik; PBOO – The future of the civil society of Limburg at the beginning of the 21st century: an exploration of the future; Province of North-Brabant: Brabant 2050; Quality and the future, foresight to sustainability; Rabobank groep nederland – WBZ: four scenarios for 2012; RIVM – exploration of the future on the health of society 2002; RIVM – Milieukosten energiemaatregelen – Costs and energy interventions 1990-2010; RIVM – The elderly now and in the future; RIVM/NIVEL Health care in big cities; RIVM Macro-economic effects in 2020 of the Kyoto climate policy; RMO – Integration in perspective; RPB – The unknown space explored – Scenarios for household trends in the Netherlands; SCP – Trends in education; SCP – The future of the labour market and social security; SER – Health care in the context of the aging of society; SER – Vision on the future of the debate economy on national and sectoral level; Stichting Weten – exploration of the future on scientific and technical communication; STOOM – Health care; to a organized first line; Strategic foresight on biogeology in the Netherlands; STT – Nanotechnology, towards a molecular construction kit; Dutch STT & RNMO – Beweton Better building and living; a practical foresight; Technology Radar; TNO Automotive – De people mover roadmap; Future perspective of the Netherlands as a guidance country in the year 20XY; TU Delft – ICT at home: trends in ICT in the home environment at 2010; Secondary houses; Universiteit van Nyenrode & Stichting Bevordering Wetenschappelijk Toekomstonderzoek & Stichting Toekomstbeeld der Techniek – The new human being in a future world society; From a logistic turntable to a sustainable service network – the Dutch horticulture cluster in Europe 2020; Vrom en De Rijksgebouwendienst – The future as an inspiration. Scenario's for Public Buildings Affairs; WI – Dutch exploration of energy choices; WI – Choices for sustainability; Wiardi Beckman Stichting – Wiardi Beckman Stichting – Energy in the 21th Century; WRR – Wetenschappelijke Raad voor het Regeringsbeleid – The future of the national state of law; WRR/The state of democracy – Democracy beyond the state; WRR – Challenges for a future media policy; WRR – The Islam in the Netherlands, from a European perspective; WRR – Trends in the media landscape: 4 foresights; IPTS – Future oriented analysis on the main socio-economic challenges that Europe will face: potential impact of research; European Decentralized Generation – DECENT Project: Development of EU policy; Long term scenarios for the Dutch human population; Mobility; NRP – Dutch Climate Options for the Long term – COOL project: Stakeholders' views on 80 percent emission reduction; Population and scenarios: worlds to win?; Potential risks of bio-technology for humanity and the environment; Rabobank Groep Nederland: Build houses with future forecasts in mind; Foresight study about home rights; physical integrity and new methods of investigation; Scenarios for a private medicine market; Shell Scenarios 2025; Vision on the city of Maastricht 2030; Future scenarios for housing and health; US Department of Energy Roadmap for developing accelerator transmutation of waste technology)

**Norway** (EU Barents 2010 Project; Norden Nordisk Innovations Center – FOBIS: Nordic Foresight Biomedica Sensors; Nordic Council of Ministers – Climate 2050; Nordic Energy Research/Nordic Innovation Centre – H2 Energy Foresight; Nordic Foresight Forum; Nordic ICT Foresight – Futures of the ICT environment and applications; Nordic Innovation Centre – Foresight in Biomedical Sensors; Nordic Innovation Centre – ICT Foresight; Nordic Innovation Centre – Nordic Foresight Forum; Nordic Risø – Foresight in the Nordic research and innovation council systems; Norway – Drammen 2011; Norway – Foresight Studies of Business and Industry Development in the Barents; Norway – Scenarier for landbruket i Nordland; Norway – Scenarier for maritime naeringer pa sorlandet 2025; Norway Foresight og scenariebygging; Norway Government – Nordnorsk Utsyn; Norway Government – Norwegian Trondelag 1930-2030; Norway Government Kommunal og regionaldepartementet – Landerlsanalyse for Vestlandet; Norway Innovation Centre – Infuture; Norway Mind the Gap – The NODE Futur Programme (Sorlandet); Norway Ministry of Labour – Norway 2030: The Future of the Public Sector; Norway Ministry of Transport – Nasjonal transportplan 2006-2015, transportscenarier; Norway Ostfold fylkeskommune – Framtid for Ostfold, Nye scenarier 2020; Norway Snohvit – ringvirkninger of muligheter for nordnorsk naeringsliv; Norwegian Association of Maritime Exporters – Scenario 2012; Norwegian Forskningsrådet – Scenariebasert strategiutvikling i Forskningsrådet; Norwegian Government – Sorlandsscenarier; Norwegian Institute for Urban and Regional Research NIBR – Regional Foresight; Norwegian National Forest Research Agenda 2007–2030; Norwegian Research Council RCN – Advanced materials 2020; Norwegian Research Council RCN – Biotech Norway 2020. Our Biotechnological; Norwegian Research Council RCN – Aquaculture 2020; Norwegian Research Council RCN – Energy Norway 2020+; Norwegian Research Council RCN – Rikets Miljøtilstand 2030; Norwegian Research Council RCN – Sustainable Development within the Construction; Norwegian Research Council RCN SURPRISE – Scenario Use and Research for Planning; Norwegian Teknologirådet – Traffic scenarios in 2020)



**Poland** (BALTIC+ Project; Cedefop – Scenarios and Strategies for Vocational Education and Training in Europe; FISTERA – Future Prospects in Poland – Scenarios for the Development of the Knowledge Society in Poland; Ministry of Science and Information Society Technologies – Foresight Project in the field Health and life)

**Portugal** (EC DG Research – TRACK Regional Foresight in Madeira; IPTS – Future oriented analysis on the main socio-economic challenges that Europe will face: potential impact of research; Place's Strategic Foresight: A Look at the Future of the Lisbon Metropolitan Area – LMA; V Technology Foresight for 2000-2020: Engineering and Technology 2000)

**Romania** (ForeTech – Technology and Innovation Foresight for Bulgaria and Romania; FP6 SCHOOL Foresight; FISTERA – Future Prospects in Romania – Scenarios for the Development of the Knowledge Society in Romania; INFORSE – Romania Vision 2050 for Sustainable Energy Development)

**Russia** (Future Skills for the Russian Economy; Finnish Academy of the Future – Russia 2017: Three Scenarios; Millennium Project – Russia's Regions: Goals, Challenges, Achievements; Russia – Long-term Innovation Priorities for Bashkortostan; Russia 2010, a Lloyd's View; Russian Corporation for Nanotechnology – Russian Delphi for Nanoindustry; Russian Corporation for Nanotechnology – Russian Roadmaps for the Nanoindustry; Russian Corporation for Nanotechnology – Skilled Workforce for Nanoindustry; Russian Foresight (thinktank) – Towards common futures: Russia's goals; Russian Ministry of Education and Science – Critical Technologies 2015; Russian Ministry of Education and Science – Critical Technologies for the Sector; Russian Ministry of Education and Science – National S&T Foresight: Delphi; Russian Ministry of Education and Science – National S&T Foresight: Future; Russian Ministry of Education and Science – National S&T Foresight: Macroeconomic; Russian Ministry of Industry and Trade – Timeline for Russian Industries; Russian Ministry of IT and Communication – IT Foresight; Russian Ministry of Natural Resources – Priorities for Natural Resources; Russian National Nanotechnology Foresight Program – Nanotechnology 2020; University of Grenoble – Towards a more coherent oil policy in Russia?; World Economic Forum – Russia and the World: Scenarios to 2025)

**Slovakia** (INFORSE – Vision 2050. Fossil-Free Slovakia; National Technology Foresight 2015)

**Slovenia** (Cedefop – Scenarios and Strategies for Vocational Education and Training in Europe; Ministry of Education, Science and Sport/Chemical Society, Chemical Engineering Section/Chamber of commerce/Ministry of Labour, Family and Social Affairs – Vision and development strategy of chemical & process industries in Slovenia; Ministry of Higher Education, Science and Technology – Technology Foresight in Slovenia; Slovenian National Technological Foresight)

**Spain** (TRACK  Regional Foresight in Canary Islands; IPTS – Future oriented analysis on the main socio-economic challenges that Europe will face: potential impact of research; Europe – Strategic capacities in Europe in 10 years in relation with budgetary perspectives; Fondazione Rosselli – FoMoFo: Four Motor Foresight – Lombardy; French CNAM – The future of Pays Basque; Catalonia 2010: Mediterranean Foresight; Galicia Government/OPTI – Marine Technologies: Observation and Control/The future of Fishing Technologies/Transformation Industry for Sea Products/Aquaculture; Guipuzkoa Government – Scenarios 2020: Four Possible Futures for Gipuzkoa; Regional Government of Madrid – Madrid 2015; Regional Government of Murcia/OPTI (Ministry of Industry) – TICarm: ICT in the region of Murcia; Ministry of Industry – The Spanish Renewable Energy Plan 2005-2010; OPTI (Ministry of Industry): Chemistry Foresight/Agro-Food Foresight/Biotechnology Foresight for the Region of Murcia/The Impact of Biotechnology on Health/The Impact of Biotechnology on Agriculture, Farming and Forestry/Energy Foresight and Technology Trends/Tourism Scenarios/First Technology Foresight Program/Environment Foresight/Civil Construction Technology Foresight/Programme of Industrial Technological Foresight/Foresight on Formulation Chemistry/Second Technology Foresight Program/Spanish Nuclear Energy Futures 2030/Technologies for Design and Production/ICT Foresight/The Impact of New Technologies on Communication Media/Third Technology Foresight Program/Transport Foresight/Biomaterials Foresight/FENIN – Minimal Invasive Surgery Foresight/ASCAMM – Micro technologies and Microsystems/INASMET – Materials for Transport and Energy)



**Sweden** (FP6 SCHOOL Foresight; IPTS – Future oriented analysis on the main socio-economic challenges that Europe will face: potential impact of research; Baltic STRING Region Project; BALTIC+ Project; Norden Nordisk Innovations Centre – FOBIS: Nordic Foresight Biomedica Sensors; Nordic Energy Research/Nordic Innovation Centre – H2 Energy Foresight; Nordic Innovation Centre – ICT Foresight; Academy of Engineering Sciences IVA – Energy Foresight Sweden in Europe; Swedish Technology Foresight)

**Switzerland** (Regional Infrastructure Foresight – RIF – Transition Management for the Sanitation Sector)

**United Kingdom** (Europe – Strategic capacities in Europe in 10 years in relation with budgetary perspectives; Cedefop – Scenarios and Strategies for Vocational Education and Training in Europe; International – Greenpeace Environmental Trust – Future technologies, today's choices; International Ernst and Young – Winners and losers, the future of online betting; IPTS – Future oriented analysis on the main socio-economic challenges that Europe will face: potential impact of research; Manchester City-Region 2020; Nanoscience and nanotechnologies: opportunities and uncertainties; Northern Ireland Foresight eBusiness Report; Riding the rapids: Urban life in an age of complexity; South-West Scenarios 2026; Sustainability literacy – knowledge and skills for the future; Edinburgh 2020; Glasgow 2020; National Foresight: Manufacturing: We can make it better. Final Report Manufacturing 2020 Panel; BBSRC Bioscience for Society: a ten year vision; British Cement Association – A Carbon Strategy for the Cement Industry; Building Futures: Housing Futures 2024/The professionals' choice; the future of the built environment professions/The urban futures game/2020 Vision – Our Future Healthcare Environments/21st century libraries. Changing forms, changing futures/21st century schools; Learning environments of the future; Countryside Agency – The State of the Countryside 2020; UK DEFRA: Climate Change Scenarios for the UK/Community Action 2020/Current and Future Deer Management Options/Consultation on policy for the long term management of solid low level radioactive waste/Energy: Biomass Task Force/Feral wild boar in England: Implications of future management

options/First Report of Sustainable Farming and Food Research Priorities Group/Fresh Start: Changing Times. Farmer's Options for the Future/Future Strategies for the English Farmed Trout Industry/Global Warming – Looking Beyond Kyoto/Horizon Scanning Programme/Industrial Sector Carbon Dioxide/Science Forward look 2004-2013/The Future of the UK Food Chain/The Future of UK Dairy Farming/Climate Change and Demand for Water; Department of Transport: Future Vehicle Emission Standards – 2010 and Beyond/The Future of Air Transport; DTI: Financing the Enterprise Society: Financial Services for Small and Mid-sized Enterprises in 2010/Industrial Biotechnology: Delivering Sustainability and Competitiveness/Information Relationships Report/Our Energy Challenge/Strategy 2010 – Report by the Economic Development Strategy Review Steering Group; Forum for the Future: Financing the Future: The role of the UK financial services in sustainable development/Vision for the sustainable production and use of chemicals; London Connects: Future Strategy 2006; HABIA – Skills Foresight Report 2002; Health and Safety Executive's Horizon Scanning; Health Protection Agency 2004-2009; Henley Centre – Benchmarking UK Strategic Futures Work; Institute of Innovation Research – MIoIR – Contribution of Universities to the knowledge capital: A scenario of success for 2008; Institute of Materials, Minerals and Mining – Foresight document on adhesives; Local Government Association – NHS – Sainsbury Centre for Mental Health – Association of Directors of Social Services: The Future of Mental Health – A Vision for 2015; Local Strategic partnerships – Shaping their future; Making a world of difference – Cultural Relations in 2010; Ministry for Skills and Vocational Education Construction Skills Foresight Report; Nanotechnology in Northern Ireland An Imperative for Action; National Technology Foresight: Ageing Population Panel – The Impact of Demographic Change/@ Your Home. New Markets for Customer Service and Delivery/A Chemicals Renaissance/A survey of spin-out and start-up companies in the materials sector/Aerospace Manufacturing 2020/Agriculture in the UK – its Role and Challenge/Brain Science, Addiction and Drugs/Cognitive Systems/Constructing the Future – Built Environment and Transport Panel Construction Associate Programme/Crime Prevention Panel – Just Around the Corner, A consultation document/Cyber Trust and Crime Prevention/Detection and Identification of Infectious Diseases/Energy for Tomorrow – Powering the 21st Century/Energy Futures Task Force Fuelling the Future A consultation document/Exploiting the Electromagnetic Spectrum/Flood and Coastal Defence/Foresight Futures 2020 Revised Scenarios and Guidance/Functional materials – Future directions/Future of learning – Consultation Document/Health Care 2020/Intelligent Infrastructure Systems/ITEC Group Report – Information, Communications and Media Panel/Let's Get Digital/Mapping out the future for the road ahead – Materials Foresight/Materials: Shaping our Society/New materials that will shape our future/Obesity/Priority Topics for Future Biomaterials Development/Smart materials for the 21st Century/The (R)etail (R)evolution: From a nation of shopkeepers to a world of opportunities/The Age Shift –Priorities for action/The Future of Financial Services/Towards more sustainable decisions; Northern Ireland Ageing Population Panel Report 2001; Northern Ireland Economic Development Forum – Working Together for a Stronger Economy; Northern Ireland response to Technology Foresight progress through partnership – Software Panel; Nuclear Energy – The Future Climate; ODPM/Defra sustainability impact study of additional housing scenarios in England; OST: North East England regional foresight/Research Councils: Large Facilities Roadmap/Intelligent Infrastructure Futures Scenarios Toward 2055; Proudman Oceanographic Laboratory – Coastal Defence Vulnerability 2075; Regional Futures: England's regions in 2030; Forward look at 2020 Housing – Issue Group Report; Royal Academy of Engineering – Transport 2050: The route to sustainable wealth creation; Scotland Science Strategy; Scottish Executive Health Department Cancer Scenarios; Shell Scenarios 2025; Society of British Aerospace Companies: Air Travel – Greener by Design – The Challenge; Strategy for radioactive discharges; Tyndall Centre for Climate Change: Electricity Scenarios for 2050/UK Hydrogen Futures 2050; University of Cambridge – Cambridge Futures; Wellcome Trust – Genetics and Health: Visions for the Future; Wessex Water – The Sustainable Vision; Young Foresight; Manchester Airport Development Strategy to 2015; Northern Ireland Industrial Research and Technology Unit – IRTU – The Foresight eBusiness Report; Scotland's Renewable Energy Potential – Beyond 2010)

## Foresight programmes and exercises in other world regions

**Asia** (IFPRI – The Future of Fish – Issues and Trends to 2020; APEC: DNA Analysis for Human Health in the Post Genomics Era/Nanotechnology: The Technology for the 21st Century/Healthy Futures for APEC/Sustainable Transport for APEC/Technology for learning and culture in 2010/The Future of APEC/Water Supply and Management in the APEC region/Alternative Development Scenarios for Electricity and Transport; Japan Science Council – The Future Society; Japan's Goals in the 21st Century)

**Argentina** (Escenarios Globales. El mundo en 2020: Riesgos y oportunidades para la Argentina; Ejercicio de Escenarios Agroalimentarios; Escenarios del Sector Manufacturero en Argentina; Escenarios de la Industria Química y Petroquímica de Argentina; Ejercicio de Prospectiva en el área de la Educación Superior en Argentina; Ejercicio de Escenarios sobre Recursos Naturales y Medio Ambiente en Argentina; Scenarios for Research and Technology Development Cooperation with Europe (SCOPE))

**Australia** (Australian Business Foundation Alternative Futures – Scenarios for Business in Australia to the year 2015; Review of Wind Energy opportunities in Australia and regional markets; Australia Business Council – Aspire Australia 2025; New Zealand MoRST Blueprint for Change; Australia's National Strategy for Vocational Education and Training; Murray-Darling Basin Ministerial Council (Australia) – Basin Salinity Management Strategy 2001-2015; Australian Wine Foundation – Australia Wine 2025; Australian Department of Immigration and Multicultural and Indigenous Affairs – Future Dilemmas: Options for 2050 for Australia's population, technology, resources and environment; Long-term housing futures for Australia: Using foresight to explore alternative visions and choices; Medium and long-term projections of housing needs in Australia; Sustainability and housing, more than a roof over head; Australian Science and Technology Council (ASTEC) – Matching science and technology to future needs 2010; Smart Internet 2010; Australian Cooperative Research Centre for Construction Innovation – Construction 2020: A Vision for Australia's Property and Construction Industry)



**Bolivia** (Productive Transformation and Higher Education in CAB countries – SECAB)

**Brazil** (MIDIC: Foresight on Productive Chains: Civil construction; MIDIC: Foresight on Productive Chains: Wood and Furniture; MIDIC: Foresight on Productive Chains: Plastics Transformation; MIDIC: Foresight on Productive Chains: Textile and Garment; FINEP-CGEE Foresight on Climate Change; CGEE: Foresight on Energy; CGEE: Foresight on Biotechnology; CGEE: Foresight on Nanotechnology; CGEE: Foresight on Bio-fuel; Brazil 2020; Biodiversidad en el Semiárido Brasileño; NAE: Brazil 3 Tempos; Propuesta para un trabajo de Prospectiva de la Matemática en Brasil; Escenarios para las organizaciones de investigación, desarrollo e innovación en el ámbito del Agronegocio; Bases para la Prospectiva Tecnológica en las regiones Norte y Nordeste de Brasil; Prospectiva Tecnológica en Energía; Perfil del Profesional de la Investigación en 2022; Prospectiva Tecnológica – Recursos Hídricos de Brasil; Prospectiva del Sector de Máquinas y Equipos; Prospectiva del Sector Textil; Prospectiva del Sector Telecomunicaciones; Prospectiva del Sector Petroquímico; Proyecto Qou Vadis: El futuro de la investigación agrícola y la innovación institucional en américa latina y el caribe)

**Canada** (Looking Forward: S&T for the 21st Century; Canadian Government – The Future of Healthcare in Canada; Canadian National Energy Board: Canada's Energy Future; The College of Family Physicians in Canada – Family Medicine in Canada: Vision for the Future; Toward 2025 – Assessing Ontario's Long-Term Outlook; Canada Government – Future needs for medical images in health care in Canada; Canada Image analysis and visualization; Canada Image generation and capture Roadmap; Science and Technology Foresight Pilot Project; Technology Foresight Pilot Project: BioSystemics; The Big Down: from genomes to atoms)

**China** (China's Technology Foresight Report 2003; China's Technology Foresight Report 2005; Ministry of Science and Technology China's Hydrogen Vision; International Food Policy Research Institute IFPRI – The Future of Fish – Issues and Trends to 2020)

**Chile** (Industria de la Acuicultura; Chile Prospectiva 2010: Producción y Exportación de Vinos; Prospectiva Chile 2010 – Actividades Estratégicas para la Competitividad Internacional de Chile en 2010; Industria de la Educación; Industria Chilena del Software; Biotecnología aplicada a la industria hortofrutícola; Biotecnología aplicada a la industria forestall; El mercado mundial de las fuentes de energía en el 2025 y la participación de Chile en él; Identificación de Estudios de Postgrado en Chile que requerirá la Industria de Alimentos Procesados de Origen Agrícola de Primera Transformación y la Industria de Productos Agropecuarios; Estudio Prospectivo para la Región del Maule: Maule 2016; Scenarios for Research and Technology Development Cooperation with Europe (SCOPE))

**Colombia** (World Bank and Colombian Governmental Planning authority for Mines and Energy (UPME) – Energy Scenarios for Colombia; Colombian Milk Sector; Colombian Electricity Sector; Colombian Food Packaging Sector; Tourism Sector in Cartagena City; Health Cluster of the Cauca Region; Horticulture in the Bogota Plains; Vegetable Fibres in Santander Region; National Biotechnology Programme; Colciencias: Productive Transformation of Colombia into a Knowledge Economy; Colciencias/DNP: National STI Plan – Colombia Vision 2019; Colciencias/MCIT: Micro-Small-and-Medium Enterprises Fund (Fomipyme); Colciencias/C. Excellence: Tuberculosis; Colciencias/C. Excellence: New Materials (Hardening Surface); Colciencias/C. Excellence: Essential Oils and Natural Products (Medicinal Plants); Colciencias/C. Excellence: Genetic Resources and Biodiversity (Black Sigatoka in Plantain); Colciencias/C. Excellence: Culture, Development and Peace; Colciencias/EAAB/EPM: Pilot on the Water Recycling Cluster; Colciencias/CIDET: Pilot on the Electricity Cluster; Colciencias Programmes: Biodiesel Production Technologies; Colciencias Programmes: Bioinputs (e.g. biofertilizers); Colciencias Programmes: Electronics Applied to Agriculture; Colciencias Programmes: Nanotechnology Manufacturing Methods; Colciencias Programmes: Malaria Vaccines; Colciencias Programmes: Social Conflicts Resolution; Colciencias: National Capacities in Higher Education, Research and Innovation; Colciencias/MADR: Furniture and Wood Products; Colciencias/MADR: Cacao and Chocolate; Colciencias/MADR: Dairy Products; Colciencias/MADR: Tilapia Fish; Productive Transformation and Higher Education in CAB countries (SECAB); Scenarios for Research and Technology Development Cooperation with Europe (SCOPE); Strategic Euro-Latin Foresight Research and University Learning Exchange (SELF-RULE))



**India** (India Centre for Policy Research – Indian Demographic Scenario 2025; Indian Government – India Vision 2020; Indian Government – Vision for Biotechnology; Deutsche Bank Research: India Rising – A medium-term perspective; Indian TERI/IPCC – Renewable Energy Sources: Future Prospects for Developing Countries)

**Japan** (Microsystems research in Japan; 8th Japanese Foresight; US/NSF – The Future of Data Storage Technologies; US National Science Foundation – International Assessment of Research and Development in Robotics; Japan Climate Change earth simulations; Japan Human Resources and Recruiting 2015; Japan's Energy Future; 7th Japanese Foresight; CEFP – Japan's 21st Century Vision; CEFP – Japan's 21st Century: Toward the Realization of a Dynamic, Stable Society; CEFP – Japan's 21st Century: Competing over the long run. Fostering cultural creativity, transfer of skills and individual abilities; CEFP – Japan's 21st Century: Creating Policies Aimed at Diverse Regional Communities and a Mature National Life; CEFP – Japan's 21st Century: Creating an Influential Nation Without Walls; Japanese Tokyo Institute of Engineering and Innovation – Go Japan 2002; Japan Business Federation – The Keidanren Vision 2007; Japanese Ministry of Economy Trade and Industry – Energy Technology Vision 2100; Japan Atomic Industrial Forum – Atomic energy in 2050: vision and roadmap; Japan after 50 years; Japanese Optoelectronic Industry and Technology Development Association – Optical technology Roadmap; Japanese Ministry of Internal Affairs and Communications – Towards Ubiquitous Networking; Japanese Ministry of Internal Affairs and Communications – U-Japan; Japan Health Science Foundation – Future trends in health and medical care over the next two decades;

Japanese Ministry of Land Infrastructure and Transport – Scenarios on the shape of Japan in 2030; Japan NEDO – Strategic Technology Roadmap; Japan Science Council – The Future Society; Japan's Goals in the 21st Century; Japan Science and Technology Agency; JST – Virtual Science Center)

**New Zealand** (New Zealand Ministry of Housing – Building the Future: Towards a New Zealand Housing Strategy)

**Peru** (Pilot Foresight on Biotechnology; Pilot Foresight on Energy; Pilot Foresight on Hydro-biological Products; Pilot Foresight on Key Areas for 2020; Pilot Foresight on Materials; Pilot Foresight on Textiles; Prospectiva de la exportación de productos; Estudio de Prospectiva de la Alpaca 2015)

**South Korea** (Korean STEPI Technology Foresight 2004; US National Science Foundation – International Assessment of Research and Development in Robotics)

**Turkey** (Turkish Science Policy, 1983-2003; Research Foresight for Life Sciences and Technologies; Turkish National Information Infrastructure Master Plan (TUENA); TUBITAK – Vision 2023 Turkish National Foresight – Construction and Infrastructure Panel; TUBITAK – Vision 2023 – Turkish National Technology Foresight Project; Turkish Gebze High Technology Institute & Kocaeli Chamber of Industry – Technology Foresight for Industry in Kocaeli, Turkey)

**USA** (MIT – The Future of Nuclear Power; Sandia Report – 2020 Vision Project; US Pew Internet & American Life Project – The Future of the Internet; US – International Bridge, Tunnel and Turnpike Association IBTTA – Forum on the Future of Highway Transportation in America; ORNL Bioenergy Feedstock Development Program: Biofuels from Switchgrass; US Naval Studies Board – Autonomous Vehicles in Support of Naval; US – Daily Life in 2050 New York – Vignettes from the Future; US Census Bureau – Population Projections 2025; US City of Bend – 2030: Community Trends Report; US Department of Defense – UAS Roadmap 2005; US Metro Atlanta/Chamber of Commerce – Future for Metro Atlanta; US Government in 2020: Taking the Long View; Microsoft Vision for Lifelong Learning – Year 2020; US Mack Center for Technological Innovation – The Future of Bioscience; US Energy Scenarios for the 21st Century; US Ford Foundation – California Water 2020; US Bureau of Health Professions (BHPr): Changing Demographics – Implications for Physicians Nurses and Other Health Workers; US Prior City Council – 2030 Vision and Strategic Plan; OECD – Energy Scenarios to 2050; World Business Council for Sustainable Development – Biotechnology Scenarios 2000-2050; World Resources Institute WRI – Diverging Paths: What future for export credit agencies in development finance?; New York City 2005-2030 Regional Transportation Plan; US Federal Highway Administration – Destination 2030; US Department of Energy DOE – Vision for Bioenergy & Biobased Products in the United States; Sarasota 2025; US/Microsystems research in Japan; US Ceramics Association Advanced Ceramics Roadmap; US Aluminum Association: Industry Technology Roadmap/Industry Roadmap for the Automotive Market, enabling technologies and challenges for body structures and closures/Industry Vision, sustainable solutions for a dynamic world/Metal Matrix Composites Consortium Technology Roadmap; Institute of the Future – Health Horizons Program: Boomers in transition: The Future of Aging and Health; Institute for the Future – Changing Communication Strategies, new roles for e-mail; Institute of the Future – Diffusion of Innovation in health care; US Office of Energy Efficiency and Renewable Energy – E-Vision 2000, key issues that will shape our energy future; US National Mining Association – Education Roadmap for mining professionals; US Electricity Technology Roadmap; Meeting the Critical Challenges of the 21st Century; Institute for the Future – Engaged Consumers in health and health care; US National Mining Association – Exploration and Mining Technology Roadmap; US Department of Energy and Glass Industry – Glass: a clear vision for a bright future; Institute For The Future – Health and Health Care, the forecast, the challenge; US Aluminum Association – Inert Anode Roadmap; Map of the Decade; Mineral Processing Technology Roadmap; Mining Industry Roadmap for Crosscutting Technologies; Naval Transformation Roadmap 2003, Assured Access & Power Projection… From The Sea; New biocatalysts, essential tools for a sustainable 21st century chemical industry; New Consumer, New Genetics, Seven Scenarios; US Potomac Institute – Out of the box and into the future: a dialogue between war fighters and scientists on far-future warfare; US Concrete

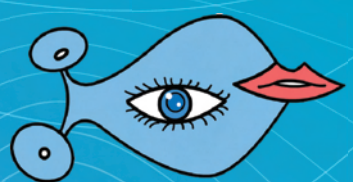
Industry – Roadmap 2030; Roadmap for biomass technologies in the United States; Robotics and intelligent machines: a DOE critical technology roadmap; Solar Electric Power – The US Photovoltaic Industry Roadmap; Steel Industry Technology Roadmap: barriers and pathways for yield improvements; Technology in Daily Life: A spotlight on entertainment; Technology Roadmap for Bauxite Residue Treatment and Utilization; Technology Roadmap for computational Chemistry; Technology Roadmap for Computational Fluid Dynamics; US National Mining Association – The Future begins with mining, a vision of the mining industry of the future; Global Business Network – The Future of Independent Media; US National Intelligence Council – The Global Technology Revolution, bio/nano/materials trends and their synergies with information technology by 2015; US White House OSTP – The Roadmap for the revitalization of High-End Computing; US Department of Energy and US Department of Agriculture – The Technology Roadmap for plant/crop-based renewable resources 2020; US Secretary of Defense – US Air Force Transformation Flight Plan; US Department of Defence – Army Transformation Roadmap; US White House OSTP Policy – Vision 2020: Technology Roadmap for Materials; US Government/Chemical Companies – Vision 2020: New Process Technology Roadmap; US Department for Energy DOE – Vision 2020: Process Measurement and Control: Industry Needs; US Department of Energy DOE – Vision 2020: Reaction Engineering Roadmap; Roadmap for Process Equipment materials Technology – Vision 2020; US Department of Energy DOE – Vision 2020: Separations Roadmap; US Department of Energy DOE – Vision 2020: Technology Roadmap for Materials of Construction, Operation and Maintenance in the Chemical Process Industries; US National Science and Technology Council – Vision for Nanotechnology R&D in the Next Decade; US Fannie Mae Foundation – Fair growth 2020: A tale of four futures, Housing facts and findings; US Department of Energy National Vision of America's Transition to a Hydrogen Economy – To 2030 and Beyond; Propane Vision Technology Roadmap; National Hydrogen Energy Roadmap; National Electric Delivery Technologies Roadmap; US DOE – GRID 2030 A National Vision for Electricity's Second 100 Years; US Department of Energy  Coated Conductor Technology Development Roadmap; National Combined Heat and Power Roadmap; California Energy Commission – Energy Efficiency Roadmap for petroleum refineries in California; Oil heat Industry technology Roadmap; Plant-Crop based renewable resources 2020; US Department of Energy DOE – The Micro CHP (micro-combined heat and power systems) Technologies Roadmap; Technology Roadmap for Productive Nanosystems; US National Renewable Energy Laboratory  – Industrial Material for the Future. R&D Priorities; Institute of the Future – Genetics and Genomics: Transforming Health and Health Care; US Department of Energy DOE – Industrial Wireless Technology for the 21st Century; US National Intelligence Council – The global course of the information revolution: Technological Trends; US/Japan National Science Foundation NSF – The Future of Data Storage Technologies; Pathways for enhanced integrity, reliability and deliverability; US Department of Energy Roadmap for developing accelerator transmutation of waste technology; US National Ocean Service – Coastal Futures 2025; US National Science Foundation – International Assessment of Research and Development in Robotics; US Department of Energy – Chemical Industry R&D Roadmap for Nanomaterials By Design – Chemical Industry Vision 2020; Europeans Future Observatory – America 2025)



**Venezuela** (UNEFM2020; Visión 2015: Programa de Cooperación Regional de Investigación Científica y Tecnológica de la Red de Macro Universiades de América Latina y El Caribe (UCV);  Visiòn Prospectiva de la Agenda Raìces y Tubèrculos Un modelo de Estudio Prospectivo en Agroalimentraciòn. Caso Yuca; Escenarios y estrategias para la presupuestación, determinación y gestión de los costos de producción en el sector de la construcción; Estudio prospectivo sobre la capacidad exportadora de Empresas Venezolanas; Prospección industrial 1970-2000; Prospectiva 1980-1990 de la educación superior y tecnológica de la Región Zuliana; Proyecto de investigación y planificación de la región zuliana; Venezuela: un estudio prospectivo 1975-1990; Estimación prospectiva de la demanda de fertilizantes primarios en el mercado interno de Venezuela 1980-2000; Modelos de prospectiva de largo plazo en Venezuela; Oferta prospectiva de egresados del tercer nivel en Venezuela (1980-1995); Demanda prospectiva en el área de las ciencias sociales y jurídicas en las especialidades de sociología, psicología, comunicación social y derecho; Demanda prospectiva de carreras no cursadas en Venezuela (1980-1995); Proposición al país: proyecto Roraima; Venezuela en el año 2000: el futuro de la economía no petrolera; Presente y Futuro de la Tecnología Petrolera en Venezuela; Presente y futuro de la tecnología del hierro y el acero en Venezuela; La vinculación de la Universidad

con el sector productivo: una propuesta de planificación con carácter prospectivo; Empresarios y Académicos. ¿Un matrimonio imposible?; La opinión de los decisores en base a un estudio de casos; La investigación Latinoamericana en prospective; Prospectiva del sector hábitat en América Latina 1990-2025; Proyecto ATAL (Alta Tecnología para América Latina); La Yuca como insumo industrial. Estudio basado en el método de los escenarios prospectivos; Programa de prospectiva tecnológica del CONICIT (Desarrollo, alcances e implicaciones); Venezuela y el Banco Mundial. Preparándose para el futuro; La crisis que nos falta por recorrer: prospectiva social en Venezuela (1992-2005); Determinación de áreas de formación de Recursos Humanos a nivel Técnico/Básico para la población joven de 15 a 24 años; Proyecto Zulia: Competitividad para el desarrollo; Estudio Carabobo: Competitividad para el Desarrollo. Desarrollo futuro del estado Carabobo; Red estadal de estudios prospectivos, científicos y tecnológicos; Bosquejo de una propuesta: El agua y sus mañanas: conflictos y compromisos (Escenarios hídricos del estado Lara); Venezuela: diagnóstico y prospectiva socio – política; La industria de pulpa y papel en Venezuela: Un análisis de su desempeño reciente desde un punto de vista de prospectiva tecnológica; Venezuela Posible Siglo XXI; Las Agendas de Innovación del CONICIT; Modernización de las gobernaciones en Venezuela. Logros y tendencias; Turismo 2020; Plan Prospectivo Estratégico: Zulia Tercer Milenio 2001-2020; Visión Estratégica de la subregión fronteriza norte del Estado Táchira (Municipios Ayacucho – García de Hevia – Panamericano y Antonio Rómulo Acosta); Análisis de las tendencias de los principales circuitos agropecuarios sujetos de financiamiento en Venezuela. Capítulo XI del Trabajo Especial de Grado titulado "Manual de Crédito Agrícola", presentado como requisito para optar por la especialización en Planificación Agropecuaria, del Instituto Universitario Politécnico de las Fuerzas Armadas (IUPFAN); La topografía del poliédrico mercado cultural y comunicacional en Venezuela; Escenarios DATANÁLISIS; Estudio Comparativo de las Experiencias Internacionales en Prospectiva Tecnológica; Prospectiva Científica y Tecnológica. Primer Ejercicio Piloto; Visión prospectiva del Postgrado de Relaciones Internacionales y Globales al 2020; Scenarios for Research and Technology Development Cooperation with Europe (SCOPE))

# 10 Annexes



# Annex 1: Research areas of the FRASCATI classification

| | |
|---|---|
| **A** | **Natural sciences** |
| A01 | Mathematical science |
| A02 | Information, computing and communication science |
| A03 | Physical science |
| A04 | Chemical science |
| A05 | Earth sciences |
| A06 | Biological sciences |
| **B** | **Engineering and technology** |
| B01 | Architecture, urban and building |
| B02 | Industrial biotechnology and food sciences |
| B03 | Aerospace engineering |
| B04 | Manufacturing engineering |
| B05 | Chemical engineering |
| B06 | Resources engineering |
| B07 | Civil engineering |
| B08 | Geomatic engineering |
| B09 | Environmental engineering |
| B10 | Materials engineering |
| B11 | Biomedical engineering |
| B12 | Electrical and electronic engineering |
| B13 | Communications technologies |
| B14 | Interdisciplinary engineering |
| B15 | Other engineering and technology |
| **C** | **Medical sciences** |
| C01 | Medicine general |
| C02 | Immunology |
| C03 | Medical biochemistry and clinical chemistry |
| C04 | Medical microbiology |
| C05 | Pharmacology and pharmaceutical sciences |
| C06 | Medical physiology |
| C07 | Neurosciences |
| C08 | Dentistry |
| C09 | Optometry |
| C10 | Clinical sciences |
| C11 | Nursing |
| C12 | Public health and health services |
| C13 | Complementary/alternative medicine |
| C14 | Human movement and sports science |
| C15 | Other medical and health sciences |
| **D** | **Agricultural sciences** |
| D01 | Crop and pasture production |
| D02 | Horticulture |
| D03 | Animal production |
| D04 | Veterinary sciences |
| D05 | Forestry sciences |
| D06 | Fisheries sciences |
| D07 | Land, parks and agriculture management |
| D08 | Other agricultural, veterinary and environmental sciences |
| **E** | **Social sciences** |
| E01 | Education |
| E02 | Economics |
| E03 | Commerce, management, tourism and services |
| E04 | Policy and political science |
| E05 | Studies in human society |
| E06 | Behavioural and cognitive sciences |
| E07 | Law, justice and law enforcement |
| **F** | **Humanities** |
| F01 | Journalism and curatorial studies |
| F02 | The arts |
| F03 | Language and culture |
| F04 | History and archaeology |
| F05 | Philosophy and religion |

## Annex 2: Socio-economic sectors of the NACE classification

| | |
|---|---|
| **A** | **Agriculture, hunting and forestry** |
| A01 | General agriculture, hunting and related service activities |
| A02 | Forestry, logging and related service activities |
| **B** | **Fishing** |
| **C** | **Mining and quarrying** |
| C01 | Mining and quarrying of energy producing materials |
| C02 | Mining and quarrying, except of energy producing materials |
| **D** | **Manufacturing** |
| D01 | Manufacture of food products, beverages and tobacco |
| D02 | Manufacture of textiles and textile products |
| D03 | Manufacture of leather and leather products |
| D04 | Manufacture of wood and wood products |
| D05 | Manufacture of pulp, paper and paper products; publishing and printing |
| D06 | Manufacture of coke, refined petroleum products and nuclear fuel |
| D07 | Manufacture of chemicals, chemical products and man-made fibres |
| D08 | Manufacture of rubber and plastic products |
| D09 | Manufacture of other non-metallic mineral products |
| D10 | Manufacture of basic metals and fabricated metal products |
| D11 | Manufacture of machinery and equipment n.e.c. |
| D12 | Manufacture of electrical and optical equipment |
| D13 | Manufacture of transport equipment |
| D14 | Manufacturing n.e.c. |
| **E** | **Electricity, gas and water supply** |
| E01 | Production and distribution of electricity |
| E02 | Manufacture of gas; distribution of gaseous fuels through mains (-) |
| E03 | Steam and hot water supply |
| E04 | Collection, purification and distribution of water |
| **F** | **Construction** |
| F01 | Site preparation |
| F02 | Building of complete constructions or parts thereof; civil engineering |
| F03 | Building installation |
| F04 | Building completion |
| F05 | Renting of construction or demolition equipment with operator |
| **G** | **Wholesale and retail trade** |
| G01 | Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel |
| G02 | Wholesale trade and commission trade, except of motor vehicles and motorcycles |
| G03 | Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods |
| **H** | **Hotels and restaurants** |

## Annex 2: Socio-economic sectors of the NACE classification (continued)

| | |
|---|---|
| **I** | **Transport, storage and communication** |
| I01 | Land transport; transport via pipelines |
| I02 | Water transport |
| I03 | Air transport |
| I04 | Supporting and auxiliary transport activities; activities of travel agencies |
| I05 | Post and telecommunications |
| **J** | **Financial intermediation** |
| J01 | Monetary intermediation |
| J02 | Other financial intermediation |
| J03 | Insurance and pension funding, except compulsory social security |
| J04 | Activities auxiliary to financial intermediation, except insurance and pension funding |
| J05 | Activities auxiliary to insurance and pension funding |
| **K** | **Real estate, renting and business activities** |
| K01 | Real estate activities |
| K02 | Computer and related activities |
| K03 | Research and development |
| K04 | Other business activities |
| **L** | **Public administration and defence** |
| L01 | Administration of the State and the economic and social policy of the community |
| L02 | Provision of services to the community as a whole |
| L03 | Compulsory social security activities |
| **M** | **Education** |
| M01 | Primary education |
| M02 | Secondary education |
| M03 | Higher education |
| M04 | Adult and other education |
| **N** | **Health and social work** |
| N01 | Human health activities |
| N02 | Veterinary activities |
| N03 | Social work activities |
| **O** | **Other community, social and personal service activities** |
| **P** | **Private households with employed persons** |
| **Q** | **Extra-territorial organisations and bodies** |

# Annex 3: List of EFMN Correspondents

| Code | Name | Surname | Organisation |
|---|---|---|---|
| C-001 | Helena | ACHESON | Forfas |
| C-002 | Toni | AHLQVIST | VTT |
| C-003 | Steven M. | ALBRECHT | University of Hamburg |
| C-004 | Effie | AMANATIDOU | ATLANTIS Consulting S.A. |
| C-005 | Philip | ANTON | RAND |
| C-006 | Heidi | ARMBRUSTER | Fraunhofer Institut |
| C-007 | Denis | BALAGUER | Embraer |
| C-008 | Asbjørn | BARTNES | The University of Tromsø |
| C-009 | Patrick | BECKER | Universität Bielefeld |
| C-010 | Clement | BEZOLD | Institute for Alternative Futures |
| C-011 | Lennart | BJÖRN | Teknisk Framsyn |
| C-012 | Knut | BLIND | Berlin University of Technology |
| C-013 | Clemens | BOECKER | Strategy & Marketing Institute GmbH |
| C-014 | Samuel | BOHMAN | Institute for Futures Studies |
| C-015 | Felix | BOPP | Club of Amsterdam |
| C-016 | Kristian | BORCH | RISØ |
| C-017 | Felix | BRANDES | TNO |
| C-018 | Anette | BRAUN | VDI-TZ GmbH |
| C-019 | Cristano | CAGNIN | IPTS – Institute for Prospective and Technological Studies |
| C-020 | Henrik | CARLSEN | FOI |
| C-021 | Jennifer | CASSINGENA-HARPER | MCST |
| C-022 | Mirella | CASTRICHINI | Umbria Region |
| C-023 | Isabelle | CHATRIE | Louis Lengrand & Associés |
| C-024 | Tatiana | CHERNYAVSKAYA | UNIDO |
| C-025 | Michael | CHINWORTH | Vanderbilt Institute for Public Policy Studies |
| C-026 | Carlo | CIPICIANI | Umbria Region |
| C-027 | Christian | CLAUSEN | Technical University of Denmark |
| C-028 | Ramon | COMPANO | IPTS – Institute for Prospective and Technological Studies |
| C-029 | Gabriel | COONEY | University College Dublin |
| C-030 | Patrick | CREHAN | CKA |
| C-031 | Carlos | CRISTO | Ministry of Development Industry and Trade |
| C-032 | Kerstin | CUHLS | Fraunhofer Institute for Systems and Innovation Research |
| C-033 | Karl | CUNION | Office of Science and Technology |
| C-034 | Adrian | CURAJ | UEFISCU |
| C-035 | Olivier | DA COSTA | IPTS – Institute for Prospective and Technological Studies |
| C-036 | Kenneth | DABKOWSKI | The Arlington Institute |
| C-037 | Cornelia | DAHEIM | Z-Punkt GmbH The Foresight Company |
| C-038 | Zoya | DAMIANOVA | ARC FUND |
| C-039 | Tonia | DAMVAKERAKI | Atlantis Research |
| C-040 | Per | DANNEMAND | Risoe National Laboratory |
| C-041 | Armando | DE CRINITO | IRER |
| C-042 | Peter | DE SMEDT | Research Centre of the Flemish Government |

| Code | Name | Surname | Organisation |
|---|---|---|---|
| C-043 | Chris | DECUBBER | Cecimo |
| C-044 | Sergi Mesquida | DELGADO | CIDEM |
| C-045 | Walter | DERZKO | Brain Space |
| C-046 | Steven | DHONDT | TNO |
| C-047 | Jan | DIETZ | The Research Council of Norway |
| C-048 | Julia | DOSE | German Federal Environment Agency |
| C-049 | Liam | DOWNEY | University College Dublin & Dublin City University |
| C-050 | Carsten | DREHER | Fgh-ISI |
| C-051 | Genevieve | DROLET | Ministry of Economic Development, Innovation and Exportation, Quebec |
| C-052 | Annele | EEROLA | VTT Technology Studies, Technical Research Centre of Finland |
| C-053 | Anders | ERIKSSON | FOI |
| C-054 | Albert | FABER | MNP |
| C-055 | Elie | FAROULT | European Commission – DG Research |
| C-056 | Suslu | FATMA | Subito! Research&Futures |
| C-057 | Kurt | FEIGL | ACRI |
| C-058 | Thorvald | FINNBJORNSSON | RANNIS |
| C-059 | Gertjan | FONK | Innonet |
| C-060 | Emilio | FONTELA | Universidad Antonio de Nebrija |
| C-061 | Simon | FORGE | SCF Associates Ltd |
| C-062 | Partners | FORSOCIETY | ForSociety |
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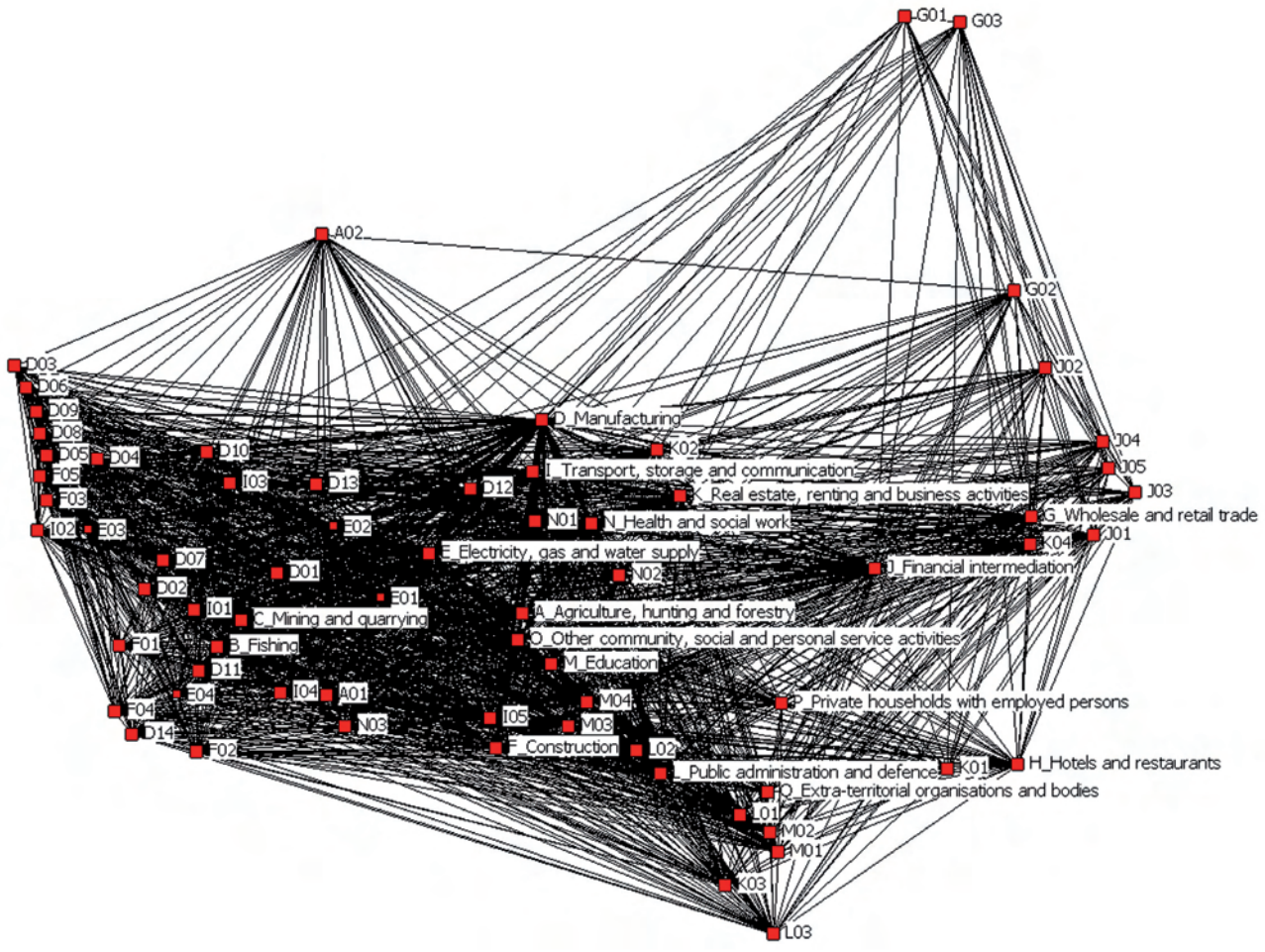
## Annex 5: The foresight ark




*Source: Popper*

The image above, which resembles a boat, shows a fascinating result of the use of network visualisation tools to interconnect 871 'fully-mapped' exercises. To use a metaphor, the image could well be described as a "foresight ark" revealing how Europe and other world regions navigate into the future. In fact, to be more precise, it shows the 'big picture' of the type of futures research captured by the mapping activity.

The nodes represent the socio-economic sectors used in the EU's NACE taxonomy, while the links represent the interconnections that the mapped exercises have with these sectors.

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EUROPEAN COMMISSION

EUR 24041 EN — **Mapping Foresight – Revealing how Europe and other world regions navigate into the future – 2009 – European Foresight Monitoring Network**

Luxembourg: Publications Office of the European Union

2009 — 128 pp. — 21.0 x 29.7 cm

ISBN 978-92-79-13110-3
doi: 10.2777/47203
ISSN 1018-5593