

EFP Deliverable 2.5 – WP 2 – SUPP – Public

## 3rd EFP Mapping Report: *Health Futures*

### Towards a Fully-Fledged Futures Mapping: Results of Mapping 20 FLA on Health

**Date:** December 2012

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#### **European Foresight Platform**

*The European Commission is providing the means to continue the important networking activities of foresight initiatives. Setting out on the previous work of the European Foresight Monitoring Network and For-Learn the new European Foresight Platform resumes its work.*

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## About the 3rd EFP Mapping Report: Health Futures

This report represents deliverable 2.5, of the EFP project. The report discusses the key findings and lessons from the examination of 20 FLA mapped in the area of health research. After exploring the features of the mapped cases across the different mapping variables the report tries to identify similarities and differences and to provide an overall picture of the type of research and outcomes carried out in the area of health.

Date: December 2012

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## About the European Foresight Platform (EFP)

The EC under its Seventh Framework Programme for Research and Technology Development (FP7) is providing the means to continue the important networking activities of foresight initiatives. The Coordination and Support Action “EFP European Foresight Platform – supporting forward looking decision making” aims at consolidating the information and knowledge base on foresight in Europe and internationally. The ultimate purpose of EFP is to better exploit foresight as a resource to support policy-making. The knowledge hub will be used in a series of national and European policy workshops, geared towards major future challenges to Europe. For more information about EFP please visit <http://www.foresight-platform.eu> and to explore more cases in detail please visit <http://www.mappingforesight.eu>

## About the EFP Consortium

The EFP Consortium consists of four partners: Austrian Institute of Technology (AIT), Institute for Prospective Technological Studies (IPTs), Netherlands Organisation for Applied Scientific Research (TNO) and Manchester Institute of Innovation Research (MioIR) of the Manchester Business School (MBS) at The University of Manchester.

## About the EFP Mapping Work Package (WP2)

The EFP Mapping Work Package (WP2) is aimed to monitor, analyse and position (MAP) forward-looking activities (FLA) in Europe and the world. WP2 results can be found in a fully independent Mapping Environment available online at <http://www.mappingforesight.eu>. This is a dynamic web space where visitors can access and share knowledge on forward-looking research and innovation initiatives associated to one or more of the following future-oriented approaches: foresight, horizon scanning, forecasting and impact assessment. EFP WP2 leader and the Mapping Team at The University of Manchester will continue developing the Mapping Environment beyond EFP.



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## Acknowledgements

We wish to thank those experts and colleagues who have supported us in the preparation of this report. In particular our thanks are due to our colleagues from AIT, IPTS and TNO for their invaluable comments on drafts of this report, in particular to Ivan Montenegro Trujillo (Colciencias and 2012 Academic Visitor at Manchester Institute of Innovation Research), Annelieke van der Giessen, Bas van Schoonhoven, Dirk Johann, Elisabetta Marinelli, Joachim Klerx, Matthias Weber and Susanne Giesecke, as well as to the design elements and the royalty-free license our IT subcontractor (Cyber Fox) received from Futures Diamond in order to use its Background Intellectual Property (mapping and content management system) for the purpose of delivering an independent Mapping Environment supporting the EFP Mapping Work Package (WP2). Finally, we wish to thank Guillermo Velasco and Monika Popper for contributing to the European Commission efforts to map forward-looking activities (FLA) around the world.

## Foreword

This **3rd EFP Mapping Report** represents a major step forward in the successful implementation of the *SMART Futures* approach: A fully-fledged futures mapping framework described and piloted in the 1st EFP Mapping Report and applied to selected Security FLA in the 2nd EFP Mapping Report.

On the one hand, the report puts in evidence that the breadth and depth of the EFP mapping activities are substantially bigger in scope than our previous mapping efforts in the European Foresight Monitoring Network (EFMN). Three specific mapping strategies demonstrate this: first, the mapping of a wider range of forward-looking activities (FLA), such as foresight, horizon scanning, forecasting and technology assessment, for example; second, the use of 33 elements in 3 complementary types of mapping including *practices*, *players* and *outcomes*; and third, the use of 20 case studies to cover FLA on **Health**. On the other hand, the report highlights the future potential of larger scale and targeted mapping of FLA *outcomes*. Of course, it is important to continue mapping *practices* – to improve the way we conduct and evaluate FLA; and *players* – to identify key stakeholders, institutions and individuals with whom to establish possible collaborations but also to have a map of players actively shaping our images of the future.

The 3rd EFP Mapping Report on **Health Futures** should be read bearing in mind that it is part of a “bigger picture”. Since 2004 the foresight team of the University Manchester has been improving the methodology to map forward-looking activities. The “SMART Futures Jigsaw” has proven a promising framework to study more than thirty elements characterising FLA. A substantial amount of data has been generated in the 20 cases mapped on *Health* FLA. The previous report has covered *16 cases on Security*. Furthermore, we have developed a bottom-up strategy that allows the FLA community to map additional cases using a web-based crowdsourcing approach. This is why the mapping work uses a fully independent system (available online at [www.mappingforesight.eu](http://www.mappingforesight.eu)), which has been carefully aligned to the needs of the EFP Mapping Environment, and that of other FLA at international and national levels.

Another important consideration of the “bigger picture” of our mapping work is that it is inherently linked to the strategic information needs of a wide range of stakeholders including government, business, research and education actors at local, national and international levels. With this in mind we started to develop some guidance for difference audiences reading our future reports. For this reason, we have included a section on “How to read the 3rd EFP Mapping Report” in order to give some indications about mapping results that may be particularly relevant for: decision-makers and policy-shapers; thematic experts; civil society, NGOs; business people; and FLA practitioners.

Obviously, as our Mapping work will continue evolving beyond the life of the EFP project, we will appreciate your feedback on the 3rd EFP Mapping Report and encourage you to register and proactively contribute to our mapping work.

*Dr Rafael Popper*  
*Manchester Institute of Innovation Research*

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## 1 Introduction

EFP mapping aims at creating a valuable repository of knowledge on forward-looking activities (FLA) to serve as source material informing and supporting national and pan-European policy processes. EFP will use tools to examine the contours of FLA and how they are changing, in evidence-based ways, from a variety of perspectives (Popper and Teichler, 2011).

The present report represents the 3rd EFP Mapping Report.<sup>1</sup> The report aims to discuss key findings and lessons from the mapped FLA in the area of health and to construct an overall picture of the type of forward-looking research carried out in the area.

Overall, the mapping methodology involved both primary and secondary research approaches. The former type included interviews with sponsors, practitioners and users of the cases mapped (including three EC staff: Domenico Rossetti, Fabiana Scapolo and Perla Srouf-Gandon); the latter referred to documentary analysis of academic and grey literature about the selected FLA. The elaboration of the findings from the mapped FLA was based on statistics (that were enabled by the mapping environment) and also on the ‘intelligent reading’ by the authors of the report who are experts in foresight and the domains covered.

The conceptual basis for mapping foresight and forward-looking activities is represented in the SMART Futures Jigsaw (Popper, 2011). It contains 36 elements, which are the dimensions along which we will map FLA. They related to the different phases of a FLA: *scoping*, *mobilising*, *anticipating*, *recommending* and *transforming*. Each of these phases and elements will be explained in greater detail below.

The “**scoping futures**” phase corresponds to the FLA practices, the “**mobilising futures**” corresponds to the FLA players, and the “**anticipating**”, “**recommending**”, and “**transforming futures**” phases are represented by the FLA outcomes.

The structure of the report follows the structure of the EFP mapping environment, i.e. practices (Section 2.1), players (Section 2.2) and outcomes (Section 2.3).

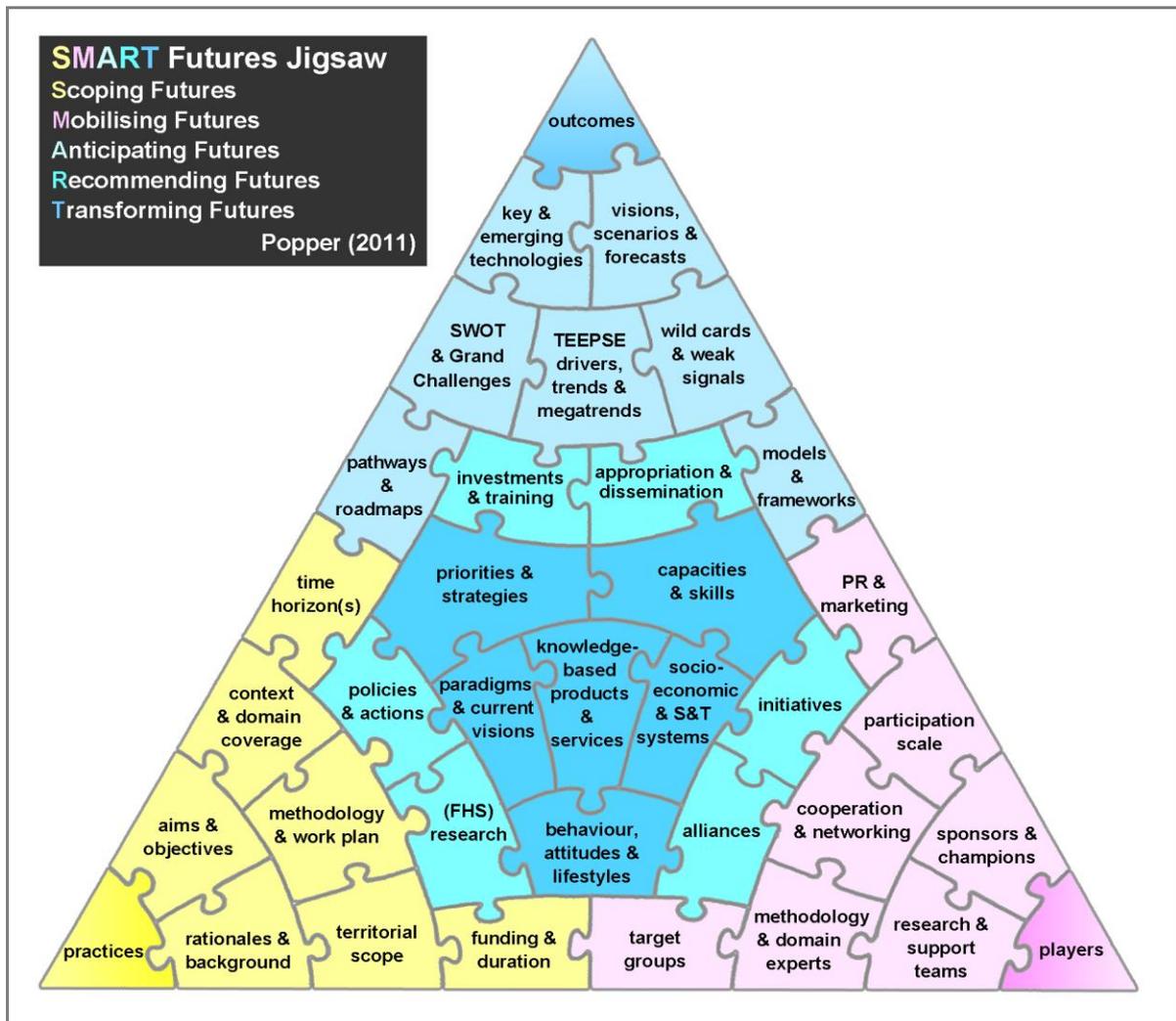
More specifically, the results cover the following indicators under each mapping dimension:

- Practices: aims and objectives, rationales, context and domain coverage, methodology, territorial scope and time horizon;
- Players: sponsors, target groups, public relations (PR) and marketing;
- Outcomes: anticipating futures, recommending futures and transforming futures

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<sup>1</sup> The 2nd EFP Mapping Report is focused on security-related FLA.

**Figure 1: The SMART Futures Jigsaw**



Source: Popper, 2011

## 1.1 How to read the 3rd EFP Mapping Report?

The EFP mapping enables the mapping of FLA across three major dimensions characterising FLA (practices, players and outcomes) each one comprising several indicators. While not all the indicators are addressed in the present report, the analysis presented herewith may prove useful for different audiences in different ways.

In particular, decision-makers and policy-shapers may find particularly useful the presentation of FLA outcomes. In detail it is interesting to see the challenges identified and the resulting scenarios and visions. At the same time, the “trends and drivers” analysis is useful especially when these focus on identified grand challenges followed by possible technological solutions or policy roadmaps. As a result, the sections on FLA outcomes will be particularly interesting for this type of audience.

Thematic experts may be attracted by the “mobilising futures” phase in meeting their efforts to identify other experts around the world to expand their networks and possibly move to collaboration activities. They will probably be interested in identified critical and key technologies that seem promising in providing solutions to current challenges, as well as by wild cards and weak signals with strong potential to change certain scientific and technological fields. The numerous models and frameworks resulting from methodologically oriented FLA may also be of interest to theme experts as well as FLA practitioners.

FLA practitioners may be interested in all the different phases but maybe more in the “scoping” and “mobilising futures” phases as these are more oriented towards the methodological and implementation elements of FLA. Business people may find particularly useful the analysis of key trends and drivers as well as the discussion on the scenarios and forecasts produced. Possible technological solutions are also of particular interest to businesses as inputs to their strategy development.

**Table 1: Mapped cases for the 3rd EFP Mapping Report**

Target audience	Indicative sections of high relevance
Decision-makers and policy-shapers	2.3
Thematic experts	2.2; 2.3.1
Civil society, NGOs	2.3
Business people	2.3.1
FLA practitioners	2.1, 2.2, 2.3.1

## 2 Mapping of FLA cases

In total the mapped cases where the present report is based on are the following.

**Table 2: Mapped cases in the area of health for the 3rd EFP Mapping Report**

Project Title	Acronym	Specific Progr./Theme	Coord. Country	Type of FLA
1. The Detection and Identification of Infectious Diseases	DIID	Health	UK	Foresight
2. The Ageing Society 2030		Health	DK	Foresight
3. The Future of Pensions and Healthcare in a rapidly ageing world		Health	WEF	Foresight
4. Tackling Obesities: Future choices	Obesity	Health	UK	Foresight
5. Mental Capital and Wellbeing	Mental Capital	Health	UK	Foresight
6. Developing the framework for an epidemic forecast infrastructure	EPI WORK	Health	IT	Foresight
7. Harmonizing, Integrating, Vitalizing Research on HIV/AIDS	HIVERA	Health	FR	Foresight
8. Scanning for emerging science & technology Issues		Health	EU	Horizon Scanning
9. Horizon Scanning of Medical Technologies		Health	AUS/NZ	Horizon Scanning
10. Public Health Skills and the Workforce		Health	UK	Horizon Scanning
11. The Future of Healthcare in Africa		Health	EIU report	Forecasting
12. 2009 Ageing Report		Health	EPC/EU report	Forecasting
13. European Economy: Healthcare expenditure projections		Health	EPC/EU report	Forecasting
14. The future of healthcare in Europe		Health	EIU report	Forecasting
15. Stimulation of crisis management activities	SICMA	Health	IT	Forecasting
16. Nurse Forecasting: HR Planning in Nursing	RN4CAST	Health	BE	Forecasting
17. Child well-being in the UK, Spain & Sweden		Health	UK UNICEF	Impact Assessment
18. Human Health: Climate Change 2007		Health	IPCC	Impact Assessment
19. Health in the Green Economy: Transport		Health	WHO	Impact Assessment
20. Health & the environment: a compilation of evidence		Health	AUS	Impact Assessment

According to the 1st EFP Mapping Report the European Foresight Platform (EFP) broadened the scope of its mapping activities in comparison with past activities like EFMN in order to study main practices, players and outcomes of selected *foresight*, *forecasting*, *horizon scanning* and

*impact assessment* (e.g. technology assessment) studies. The 20 (cases listed include all the different types of FLA (Foresight – 7: Horizon Scanning – 3: Forecasting – 6: Impact Assessment-5).

Geographically speaking, the mapped cases mainly derive from high income sovereign areas or global infrastructure entities (e.g. WHO), consultancies and voluntary associations with global reach (e.g. Economist Intelligence Unit EIU and the World Economic Forum). All encompass national, transnational and global scope but the selection leans towards cases and implicit outputs for the EU.

## 2.1 Scoping futures - Results on FLA practices

Drawing upon the SMART jigsaw, FLA practices represent the scoping phase of FLA. As noted above the indicators covered in the present report under the FLA practices are aims and objectives; rationales; domain coverage, territorial scope and relevance for EU.

### 2.1.1 Aims and objectives

The health theme of the EC FP7 aims at improving the health of European citizens and boosting the competitiveness of health-related industries and businesses, and at the same time addressing global health issues. Within this overall aim, priority is given to the following research areas:

- **biotechnology, generic tools and medical technologies for human health** (detection, diagnosis and monitoring, prediction of suitability, safety and efficacy of therapies, innovative therapeutic approaches and interventions);
- **translational research for human health** (integration of biological data and processes, research on the brain and related diseases, human development and ageing, research on infectious diseases, research on major diseases: cancer, cardiovascular disease, diabetes/obesity, rare diseases, other chronic diseases); and
- **optimising the delivery of health care to European citizens** (translation of clinical outcome into clinical practice, including better use of medicines, quality, efficiency and solidarity of health care systems, enhanced health promotion and disease prevention).<sup>2</sup>

Although the research themes follow the EC FP7 definition, the mapped FLA are not, as noted above, limited to EC sponsorship. They also include national, other European and international entities including privately commissioned reports by Janssen Pharma. The theme specific health related FLA, abide by the rule that the most common aims are to ‘transform strategies and priorities’, ‘paradigms and current visions’. This may reflect an historical trend to move away from viewing health systems as sickness systems towards systems for preventing illness and maintaining good health. These latter systems are possible because of game changing health technologies, innovative medicines and new approaches in diagnostics. However as the FLA indicate, discontinuities and gaps in policy visions, financial capacities and commitments may represent significant future hindrances.

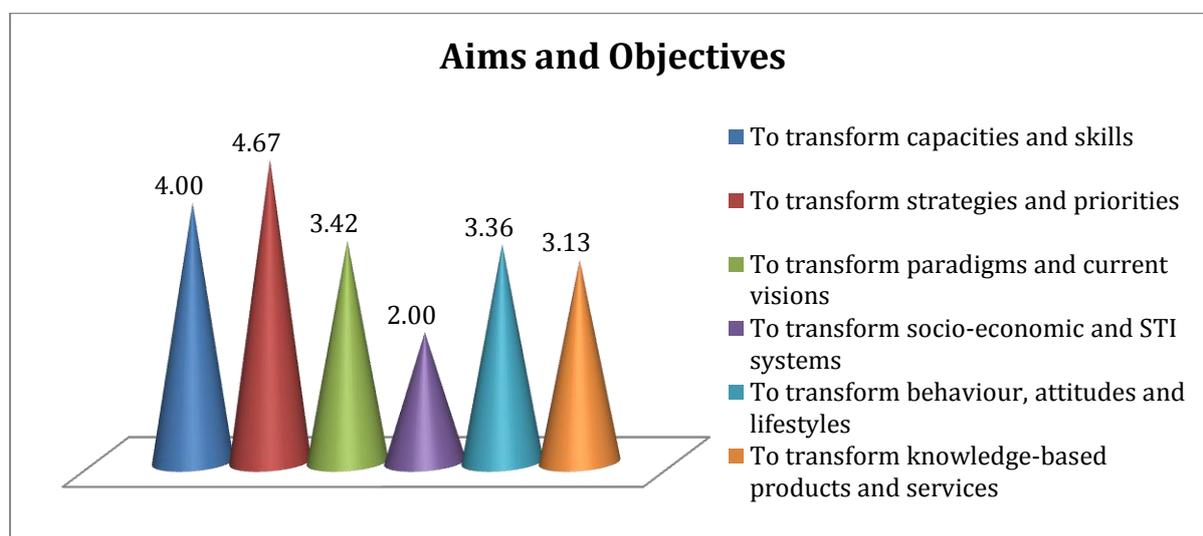
There is a focus on common activities and shared ways of doing things, which reflect the transnational and global reach of human health issues: this is accompanied by some movement towards improving capacities, skills and importantly, end user services provided. The DIID (Detection and Identification of Infectious Diseases project) for example is aimed at producing a vision on managing threats of infectious diseases in humans, animals and plants over the next

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<sup>2</sup> [ftp://ftp.cordis.europa.eu/pub/fp7/docs/health-research\\_leaflet\\_en.pdf](ftp://ftp.cordis.europa.eu/pub/fp7/docs/health-research_leaflet_en.pdf) last accessed 27 Feb. 2012.

10-25 years through special systems for detection, identification and monitoring. EPIWORK aimed at developing an open, data driven, computational modelling platform to be used in epidemic research as well as in policy making for the analysis of global epidemics, integrating and leveraging on transnational data, and to develop, and validate an Internet-based Monitoring System (IMS) producing real time data on disease incidence and epidemic spreading.

**Figure 2: Aims and Objectives - Health**

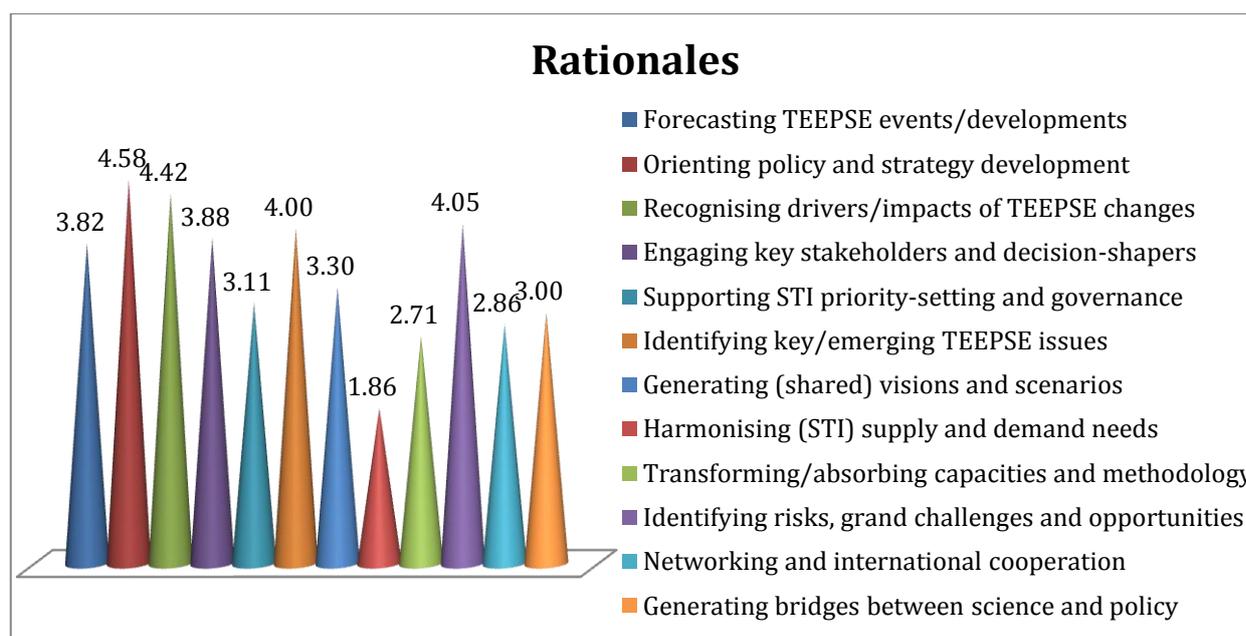


EFP mappers (i.e. EFP partners and The University of Manchester team) had the opportunity to choose from 1 to 5 stars to show relevance of aims to the specific FLA. The number shown on top of each bar is the mean of these scores.

### 2.1.2 Rationales

The mapped health FLA are underpinned by an orientation towards policy and strategy development. There seems to be relatively high importance weighted towards 'forecasting TEEPSE events and developments' and 'recognising drivers/impacts of TEEPSE changes' as well as towards 'identifying TEEPSE issues', and 'risks, grand challenges and opportunities'. This may be explained by the application of quantitative models in several of the cases. All the health FLA have similar rationales apart from EPIWORK. Interestingly however, relative low importance has been attached to harmonising supply and demand needs. This is surprising in view of fiscal shocks and the subsequent relative decline implied for investing in capacity. The identification of issues, risks, and opportunities partly reflects the main orientation of the assessment as well as forecasting studies in the health area.

Another interesting finding is that although health care, disease transmission, remedies and the like are to a very large degree increasingly boundaryless and require transnational and global approaches, 'networking and international cooperation' is not as significant in the health-related FLA as might be expected.

**Figure 3: Rationales of health-related FLA**

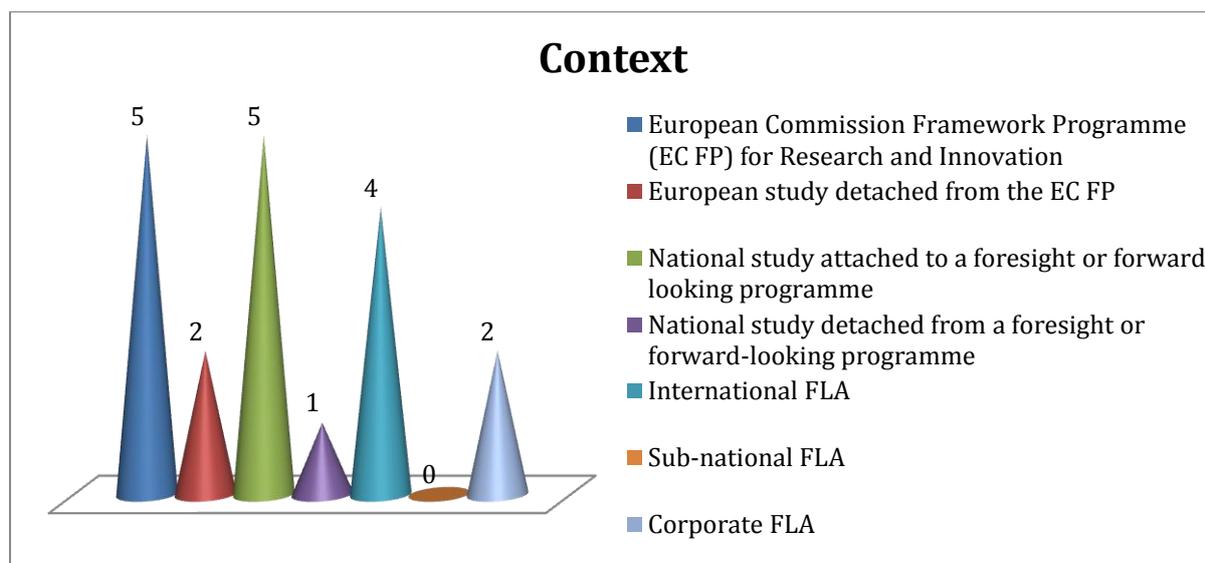
EFP mappers had the opportunity to choose from 1 to 5 stars to show relevance of aims to the specific FLA. The number shown on top of each bar is the mean of these scores.

### 2.1.3 Context and domain coverage

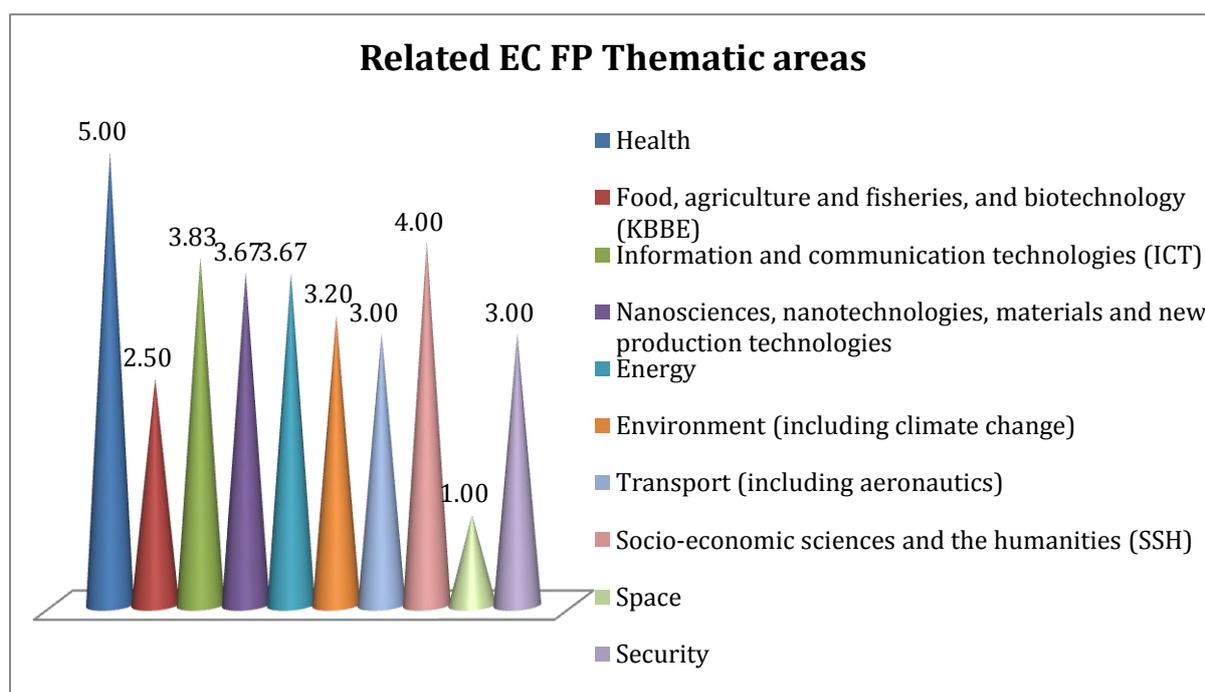
The coverage for the health related FLA is very specific but is highly related to a number of EC FP thematic domain areas (see fig 5). In terms of the FRASCATI areas these FLA point linkage to other categories. EPIWORK, for example, refers to Medical sciences (C), but also Natural Sciences (A) and Social Sciences and Humanities (E). MENTAL CAPITAL refers to both C and E while OBESITY refers to Engineering and technology (B), Agricultural sciences (D) but also C and E. This underscores the multi-disciplinarity and cross domain operational character of the health area and the issues surrounding it as well as the multiple areas that can contribute to solving related challenges.

The health-related FLA mapped have highlighted the importance of recognizing drivers and impacts of changes and forecasting events in the area of health beyond regional and sovereign areas. Whilst, as noted the territorial scope of the health-related FLA mapped at present is mainly Euro-centric the issues themselves are essentially trans-national or global. For example, EPIWORK covering EU 27 countries is of international scope. This also applies for HIVERA, an ERA-NET aimed at joining forces in HIV research in 6 EU Member States and 1 Associated Country. Specific health issues are examined often from a national perspective but it is clear that human health and associated issues aggregated at a European level increasingly indicate responses and solutions at transnational and global levels. This in no way detracts from their relevance to the EU.

**Figure 4: Context of health related FLA**



**Figure 5: Domain coverage of health related FLA**

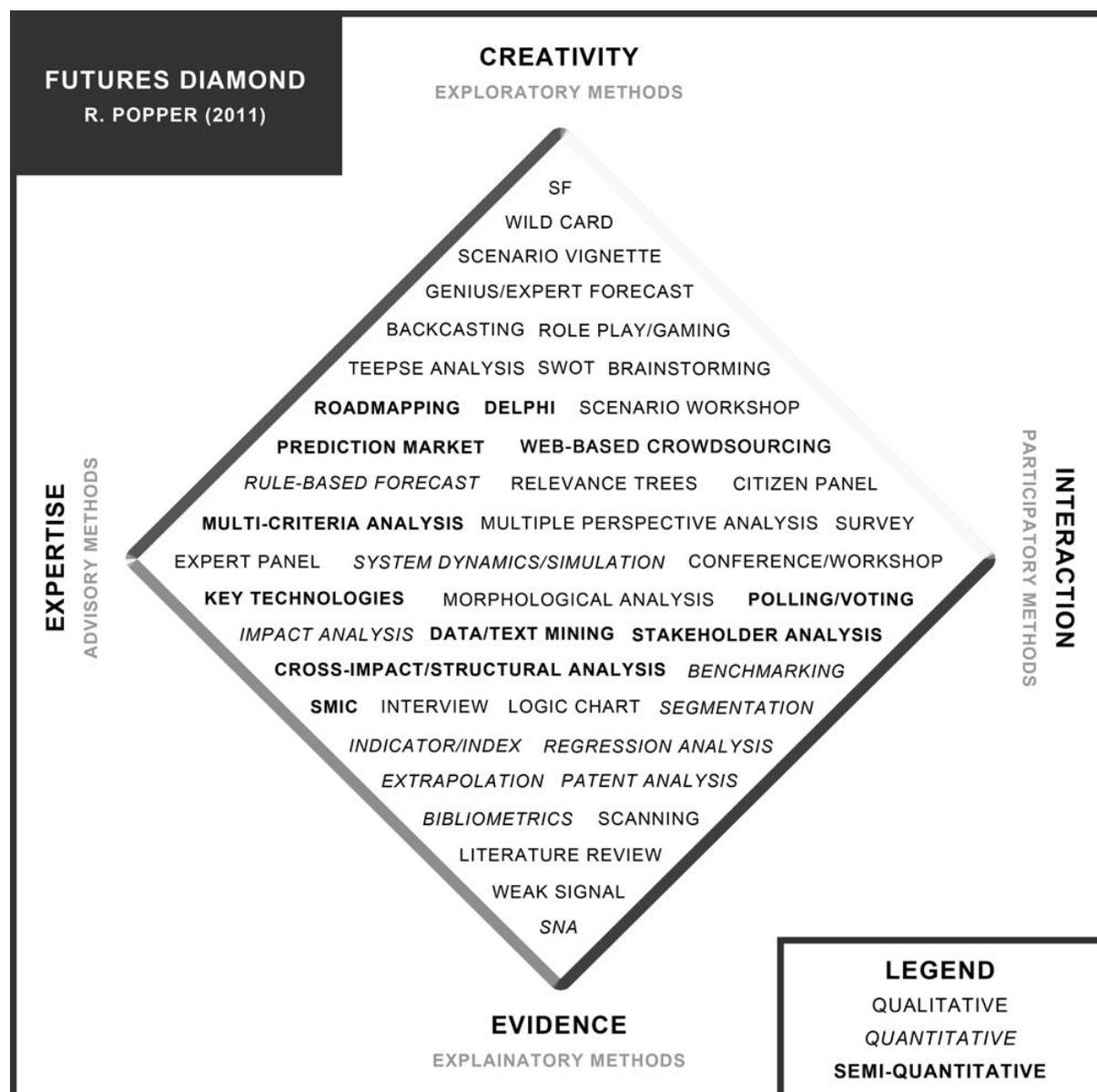


EFP mappers had the opportunity to choose from 1 to 5 stars to show relevance of aims to the specific FLA. The number shown on top of each bar is the mean of these scores.

### 2.1.4 Methods

Methods used include mainly qualitative options including ‘conferences/workshops’, ‘expert panels’, ‘interviews’, documentation analysis through ‘literature reviews’, ‘scenario workshops’ and ‘surveys’. Most of the methods used in the mapped health FLA draw on experience and expertise based on the Futures Diamond illustrated in the following figure (source Popper 2008).

**Figure 6: The Futures Diamond**



Source: Adapted from Popper (2008)

### 2.1.5 Territorial scope and time horizon

The territorial scope of most of the FLA is transnational covering the EU, Oceania and Africa: six are wholly national in scope and none are regional or sub national. Time horizons are predominantly mid term in perspective.

## 2.2 Mobilising Futures - Results on FLA players

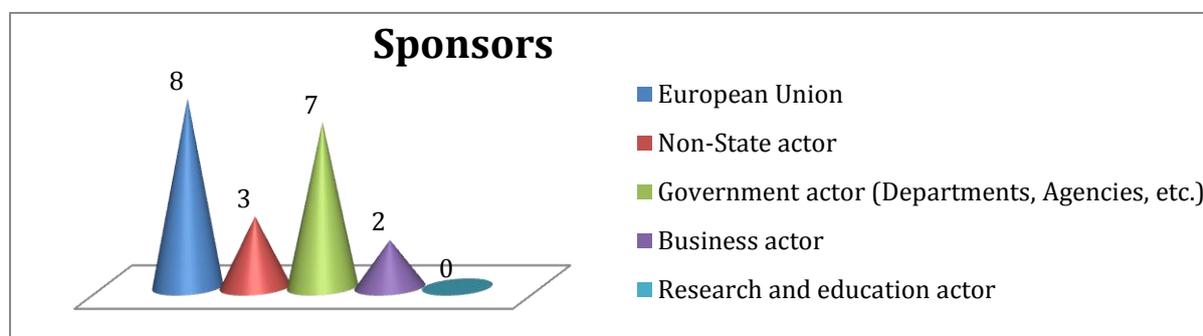
The mobilising phase of the SMART jigsaw refers to the FLA players. The indicators covered in the report in terms of FLA players are sponsors, target groups, PR and marketing.

The 1st Mapping Report noted that the mapping of FLA players would enable networking and cooperation between existing FLA communities, as well as the identification of methodology and domain experts in different countries around the world. Apart from this, the mapping of FLA players can also serve other purposes. It can help draw conclusions regarding the degree to which the target groups are extended from the usual suspects (i.e. academia and research, businesses and policy-makers). By examining the participation scales it can also lead to conclusions in relation to how much the type of engagement is active and extended to several types of stakeholders. Regarding the PR and marketing, conclusions can be drawn in terms of how much 'new' means are used beside more conventional ones (like printed material, websites and conferences).

### 2.2.1 Sponsors

Most of the mapped health related FLA, are sponsored by the EU or governmental entities and agencies: none are from the research and education sector: two of the forecasting FLA were undertaken by the Economist Intelligence Unit as commissions for Janssen Pharmaceuticals<sup>3</sup> (Johnson & Johnson)

**Figure 7: Sponsors**



### 2.2.2 Target Groups

Target groups comprise types of stakeholders or organisations that forward-looking activities aim to inform or influence. Target groups can be reached by either engaging them in the early stages of the FLA process (*scoping, mobilising and anticipating* futures) or by addressing them in the later phases (i.e. *recommending and transforming* futures). In EFP mapping the following target groups are considered (Popper and Teichler, 2011):

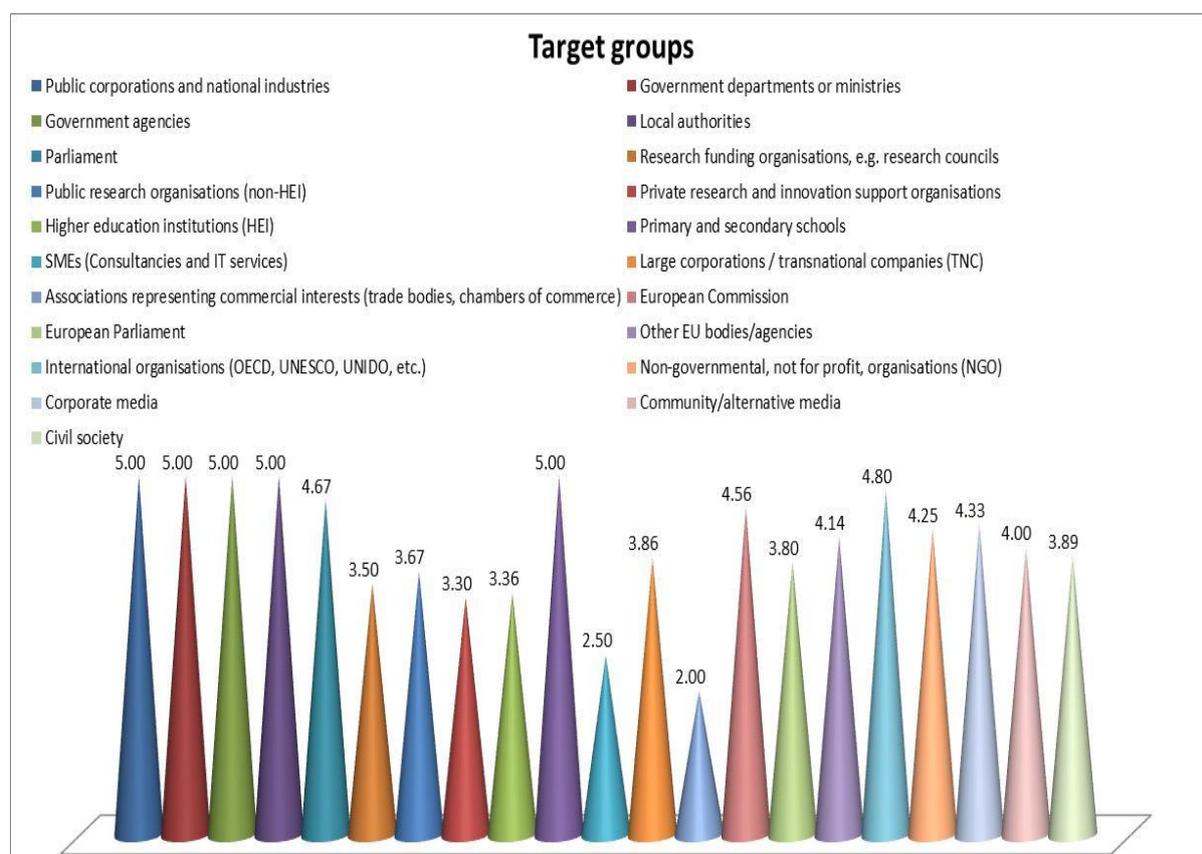
- *Public organisations* – including public corporations and national industries; government departments or ministries; government agencies; and parliaments.
- *Research and education organisations* – including: research funding organisations; public research organisations (non-HEI); private research and innovation support organisations; higher education institutions (HEI); and primary and secondary schools.

<sup>3</sup> <http://www.janssenpharmaceuticalsinc.com>

- *Private organisations* – including SMEs (e.g. consultancies and IT services); large and transnational companies; and associations representing commercial interests.
- *European Union* – including the European Commission; the European Parliament; and other EU bodies/agencies.
- *International agencies* (e.g. OECD, UNESCO, UNIDO, etc).
- *Non-governmental, not for profit, organisations* (NGO).
- *Media* – including the corporate and community/alternative press.
- *Civil society*.

The health related FLA address multiple audiences. Whilst government agencies and in general the policy community are the primary target audience, European bodies and international organisations also play an important role alongside NGOs and civil society. This reflects the nature of health challenges which go beyond national borders and need to actively engage society in finding solutions. Primary and secondary schools are highly targeted as users rather than as key actors in the area. The research community and, surprisingly the business world, are less considered as primary target groups despite the increasing importance given to collaboration between the public and private sectors in dealing with challenges in the health area. Naturally, being the sponsor for many of the health FLA mapped the EC is among the main target audiences too.

**Figure 8: Target groups**

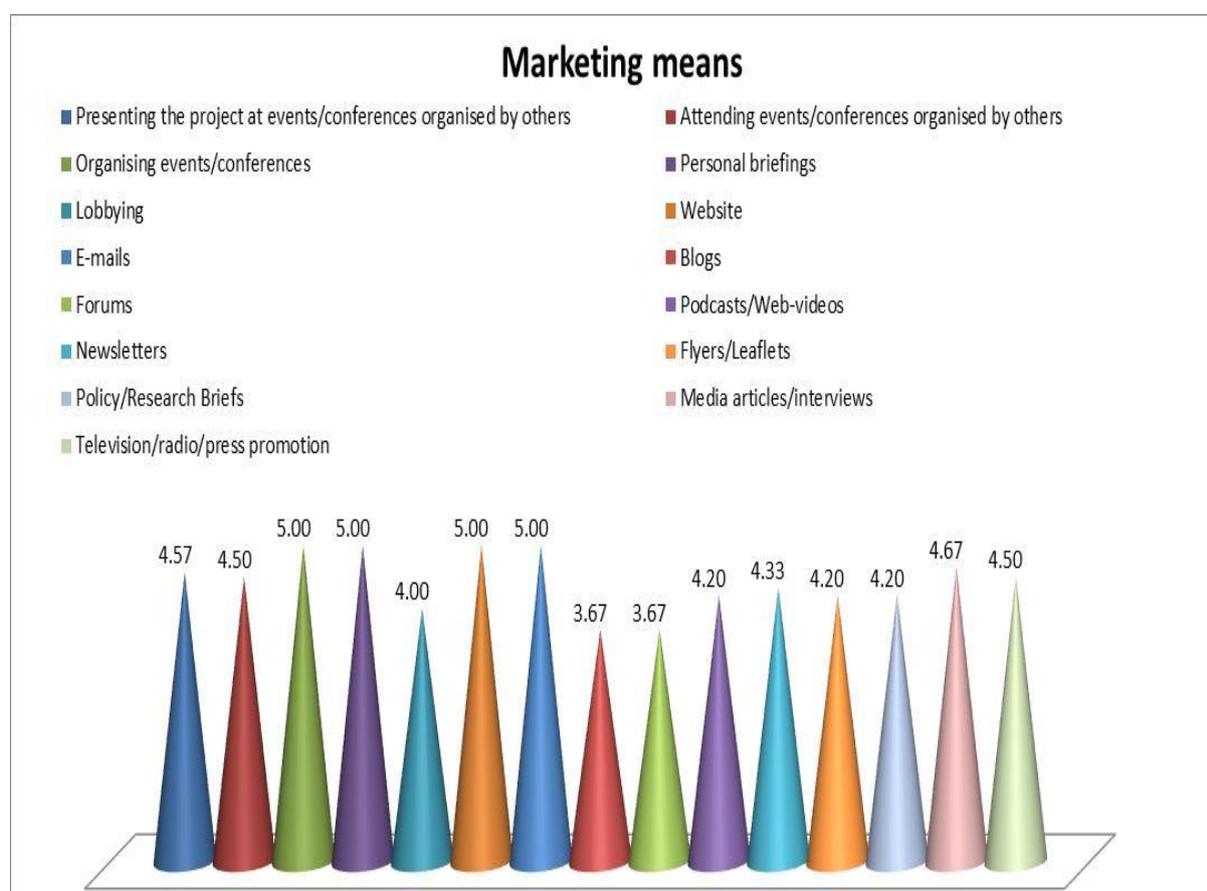


EFP mappers had the opportunity to choose from 1 to 5 stars to show relevance of aims to the specific FLA. The number shown on top of each bar is the mean of these scores.

### 2.2.3 PR and marketing

Health FLA use a wide range of marketing means reflecting the various types of target audiences aimed at. Health issues are highly research-intensive but also politically sensitive. Common PR activities span presentations at events and conferences to personal briefings and lobbying, etc. Commonly used online marketing methods include websites, emails, and blogs, or discussion fora but to a lesser extent: off-line methods used are the more conventional ones of newsletters, flyers/leaflets, policy/research briefs, media articles/interviews. The use of web-videos/podcasts along with television/radio/press promotion is interesting probably as a direct means to reach society at large.

**Figure 9: Marketing means**



EFP mappers had the opportunity to choose from 1 to 5 stars to show relevance of aims to the specific FLA. The number shown on top of each bar is the mean of these scores.

## 2.3 Anticipating, Recommending and Transforming Futures - Results on FLA outcomes

The mapping of FLA outcomes is fundamental in accessing key information that can provide strategic intelligence for different policy areas and levels. However, there are specific challenges in this task. First, there is the issue of terminology. Although there is a more or less shared understanding of the terminology used in FLA, there are cases where the term ‘scenarios’ for example is used to articulate specific ‘visions’ or to document the different development paths of quantitative indicators. ‘Trends’ are sometimes inter-changed with ‘drivers’, while there is little reference to ‘megatrends’ or ‘grand challenges’ as such in the FLA documents.

The outcomes of health FLA are strongly dependent on the aims, rationales and specific focus of each FLA and most outputs, then, are case-specific: generic drivers and trends may be replaced by special trends and drivers that characterise the issues examined, as in the case of obesity, mental health and infectious diseases. Very specific scenarios about specific aspects of the areas are examined. Additionally, given that a specific issue is studied in detail, the outputs cover the whole range of output types leading to a significant level of specificity in recommendations. A way then, to analyse outcomes is by examining their relation to specific rationales and scope of the FLA.

Two other issues have to be noted at this stage as highlighted in the 1st EFP Mapping Report. The first concerns the existence of different levels of sophistication in the mapping of FLA outcomes and results as these depend on whether the mapped FLA are still on-going or completed studies. Secondly, the time gap between the mapping and the completion of the mapped project is another factor influencing the precision of the mapping work: the longer the time that passed, the weaker are the memories of the interviewees and the greater the inability to find the required information in the relevant documents and evidence.

### 2.3.1 Anticipating futures

Anticipating Futures refers to the “formal outputs” of FLA which include: Visions, scenarios and forecasts; Critical and key technologies; TEEPSE drivers, trends and megatrends; SWOT and Grand Challenges; Wild Cards and Weak Signals (WIWE); Pathways and roadmaps; and Models and frameworks. (Popper and Teichler, 2011)

#### 2.3.1.1 Drivers, Trends Megatrends and Grand Challenges

There is no clear differentiation between drivers, trends and megatrends or grand challenges – indeed issues segue into and onto each other but some proximal observations can be made as to significance for the EU.

If we first look at drivers specifically defined within the FLA, **demographic shift (in terms of ageing)** is generally located as a most significant driver and one like **climate change**, perceived as highly resistant to remediation in the short or medium time frames.

Demography issues are well exercised in the health arena because of implications of rising costs for managing **multiple chronic conditions** (a feature of longevity and life style), rising **dependency rates** and the use of costly **medical technology**.

**Life expectancy** is projected to grow over the next few decades: by 2071 the number of adults over 65 could double to nearly 21.3 million, and those over 80 could more than treble to 9.5 million. According to the World Bank public expenditure on healthcare in the EU could jump from 8% of GDP in 2000 to 14% in 2030 as **healthcare costs** are rising faster than levels of available funding. The rising numbers of older people means consequent shrinkage in labour markets, implying declines in productivity and growth and also creating possible inter-generational tensions within societies around issues of rationing expensive healthcare.

Of course, increasing longevity means attitudes towards retirement are shifting both socially and politically and are heavily dependent on economic circumstances. Attitudes towards retirement govern both length of labour participation (people may want and are able to work very much longer than previously) and savings behaviour. Current expectations regarding pensions and healthcare provision may not be met, and this may influence retirement and healthcare burdens on **public and informal care systems** requiring significant changes in how policy is devised and framed.

**Healthcare innovation and regulation** have been placed as important drivers in healthcare evolution. DataMonitor (2007) predicts a number of new products will reach the market in the orthopedic, oncology and cardiology sectors due to significant increases in R&D spending. Biotechnology, nanotechnology and gene therapy offer the potential for significant but costly advances in both life extension and improved quality of life. Telemedicine is viewed as offering capacity for widespread homebased healthcare if appropriate operating infrastructures emerge. The extent and impact of new health technologies over the next 25 years is highly uncertain, as is the regulatory frameworks (including IP) that surround them. Medical innovation partly creates its own demand (e.g. due to health-seeking behaviour) and thereby raises medical expenses. Medical innovation may further increase life expectancy, so increasing the need for old-age social security. New IP regimes would affect pharmaceutical companies, drug regulations and healthcare provision. (Future of Pensions & Healthcare WEF)

Epidemiological evidence indicates changing patterns in **infectious & chronic disease** and these patterns are seen as drivers affecting healthcare. The combinatory effects of these patterns with **climate change** and weather weirding are presented as drivers but the rate and extent of impacts is highly uncertain as is the effectiveness of human responses. The 2003 heat wave in Europe claimed the lives of 35,000 people; the top 10 warmest years over the last century have all occurred since 1990. Less rain and warmer temperatures from climate change could reduce agricultural yields by one-third or more in the US grain belt, and in vast areas of Asia and much of Australia. (Future of Pensions & Healthcare, WEF) New patterns of heat waves and cold snaps, floods and droughts, and local pollution and allergens will affect health directly.

Other drivers are identified such as increasing travel, migration and trade; exotics; drug use leading to drug-resistant organisms; poverty and conflicts in Africa; changing patterns of land use in Africa; shifting agricultural practices towards intensification in Africa; implementation of international systems of disease surveillance and control; lack of new pesticides for crops, and of drugs and vaccines for animals. (DIID) Apart from demographic age-shift MENTAL CAPITAL noted changes in the global economy and the world of work; the changing nature of UK society; the changing nature of public services; and new science and technology. As drivers affecting obesity trends were identified like urbanisation, and continued car use; the personalised services in health and education; the regulation in the UK and EU; the threat of litigation; ICT

and teleworking, Genotyping; GM acceptability; the important role of food and pharma companies; nanotechnology; discrimination; sedentary lifestyles; more eating out; rising costs of healthcare; large retailers dominating food supply chain; growth of functional foods and food/pharmaceutical profit pushing consumption. (OBESITY)

**Ageing, longevity** and the rise of **chronic multiple illness** are also evidentially located as trends as well as being drivers. Eurostat figures show that life expectancy for male babies born in 2030 is more than a decade higher than that for those born in 1980 in the EU-15 (generally the wealthier member states). While higher life expectancy is good news, there is a downside: older people are more likely to be prey to chronic disease. In 2010, over one-third of Europe's population is estimated to have developed at least one chronic disease. The increasing likelihood of developing chronic disease later in life translates into higher healthcare costs. If poorly managed, chronic diseases can currently account for as much as 70% of health expenditure, partly because of the significant costs involved in hiring a workforce to care for sick older people. Exacerbating the problem is the fact that the burden of paying for care will fall on a shrinking labour market cohort of younger people. For the EU as a whole, life expectancy at birth for men would increase by 8.5 years over the projection period, from 76 years in 2008 to 84.5 in 2060. For women, life expectancy at birth would increase by 6.9 years, from 82.1 in 2008 to 89 in 2060, implying a narrowing gap in life expectancy between men and women. The largest increases in life expectancy at birth would take place in the most recent EU Member States, according to the assumptions. It is assumed that some catching-up will take place, with increases in life expectancy of more than 10 years over the projection period – a bigger increase than in the rest of the EU. Overall however, life expectancy at birth is projected to remain below the EU average in all new Member States – except in Cyprus – throughout the projection period, especially for men. For life expectancy at birth for men, it would narrow from 13.1 years in 2008 to 5 years in 2060. For women, the reduction in the differential is smaller, from 7.7 years in 2008 (84.3 in France to 76.6 in Romania) to 4.1 years in 2060 (90.1 in France to 86.5 in Bulgaria). Life expectancy at the age of 65 would increase by 5.4 years for men and by 5.2 years for women over the projection period, for the EU as a whole. In 2060, life expectancy at age 65 would reach 21.8 years for men and 25.1 for women. Most children today would live into their 80s and 90s. (2009 Ageing Report)

**Disease prevention** and **life-style changes** emerge as trends in health behaviour: more effective preventive measures and fundamental lifestyle changes will be promoted to encourage healthy behaviour. The World Health Organisation (WHO) noted in 2005 that at least 80% of all cases of heart disease, stroke and diabetes are preventable. This requires lifestyle changes, which can be influenced through a combination of public education, pricing, taxation and various incentives and disincentives. However expenditure on prevention remains low in many countries compared with the sums spent on curative care. As awareness of the importance of prevention takes hold over the next two decades, however, the proportion of expenditure on public healthcare may rise. (Future of Healthcare in Europe)

Demands for increased transparency of **health intelligence** and effective **data governance** emerge as trends. European governments will need to find ways to improve collection and transparency of health data in order to prioritise investment decisions. There are strong indications that governments have only vague ideas as to whether the investments they make in healthcare are valuable. Sound analysis of return on investment is becoming increasingly important, as demand rises and funds become scarce. Part of the reason why the analysis is

lacking is that clinical data are opaque, owing to requirements to preserve the privacy of personal medical records. Legislation such as the 1995 Data Protection Directive will need to be reviewed with a view to improving the collection and transparency of medical data, to enable more informed healthcare investments. (Future of Healthcare in Europe)

**Low fertility rates** emerge as a continuing trend for the EU, (from 1.52 births per woman in 2008 to 1.57 by 2030 and 1.64 by 2060). In the euro area, a similar low increase is assumed, from 1.55 in 2008 to 1.66 in 2060. In all countries, the fertility rate would remain below the natural replacement rate of 2.1 births per woman that is needed in order for each generation to replace itself. This will result in slow growth and in most cases actual declines in the population of working-age. The fertility rate is projected to increase in all Member States, except in the few where total fertility rates are currently above 1.8, namely France, Ireland, Sweden, Denmark, the UK and Finland, where it is assumed to decrease but remain above 1.85, or remain stable. The largest increases in fertility rates are assumed to take place in Slovakia, Poland and Lithuania, which had the lowest rates in the EU in 2008; here, the increase would occur gradually, approaching the current EU average rates only in 2060. (2009 Ageing Report)

Interestingly the trend identified of inward net **migration** into the EU already low will slow even more. For the next few decades annual net inflows to the EU are assumed to total 59 million people, of which the bulk (46.2 million) would be concentrated in the euro area. The trend is assumed to decelerate over the period, falling from about 0.33% of the EU population to 0.16% in 2060. In many Member States, the size of net migration determines whether the population still grows or has entered a stage of decline. A zero migration population scenario shows how the labour force (aged 15 to 64) would gradually fall behind the level in the baseline scenario in the absence of net migration: by 2030, the labour force would be 10% lower and 20% lower in 2060. Making the best use of the global labour supply through net migration will be increasingly important and requires ensuring that immigrants are effectively integrated into the EU's economy and society. Net migration flows are assumed to be concentrated in a few destination countries: Italy (12 million cumulated to 2060), Spain (11.6 million), Germany (8.2 million), and the UK (7.8 million). According to the assumptions, the change of Spain and Italy from origin to destination countries is confirmed in coming decades. Estonia, Lithuania, Latvia, Poland, Bulgaria and Romania, which are currently experiencing a net outflow, would see it taper off or reverse in the coming decades. However fiscal shocks, economic stagnation and significant political pressures are major factors in determining migrations trends. Slowdowns in migration flows, which have been sourced for cheap health and social care capacity requirements, will impact on service delivery in these areas. (2009 Ageing Report)

The **Grand Challenges** which emerge from the FLA and are facing the EU flow from the drivers and trends. For example how will significant pressure on pay-as-you-go (PAYG) public pensions and healthcare systems be relieved, due to rapid population ageing, cost-increasing medical technologies and higher incidences of chronic diseases. China, for example, and this may affect EU trading capacity here, will be confronted with a significant increase in old-age social security expenditures over the next few decades. World Bank (2005) projections for China, based on existing pension provisions and a no coverage expansion scenario, show China's implicit pension debt (i.e. the present value of projected accrued liabilities) amounts to approximately US\$ 1.6 trillion. (Health Expenditure Projections) As governments continue to struggle with rising pension and healthcare costs, further political reforms and a growing role for the private

sector are likely to emerge as serious challenges requiring resolution. . Pressure on employers to fund and facilitate healthcare for their employees will increase. A better understanding of savings and investment alternatives becomes increasingly important due to the shift towards greater individual responsibility and personal choice in defined-contribution retirement schemes, especially in high income countries.

A major challenge identified at global and sovereign levels is the structural shortage of well-trained medical and healthcare workers. According to the WHO (2006), a global deficit of 2.4 million doctors, nurses and midwives exists. Currently 57 countries, primarily in low income countries, face critical shortages of healthcare workers. (RN4CAST) Old-age care is especially in need of more trained, and adaptable personnel. This latter area points to challenges as to the **future role of the individual** as evidence indicates the **diminishing role of the family in old-age social security**. In many low income countries and some high income countries, families traditionally have played an important role in supporting ageing populations. The tradition is that every individual will support his/her parents in old age, and in turn will be able to rely on the financial support of his/her children. This tradition is codified in law in some countries (e.g. children have the legal obligation to support their parents in China and Singapore). However, this social convention is being challenged as many young people migrate to cities, family sizes shrink and people adopt more individualistic attitudes.

The agglomerated picture that emerges for the EU is a landscape of rising health costs engendered by ageing populations and the related rise in chronic disease, costly technological advances, delivery and financing structures that are inadequate for contemporaneous requirements. Underpinning this landscape are perceived radical changes in attitudes to individual and group community responsibilities that will impact on policy determinations.

### 2.3.1.2 Visions, scenarios and forecasts

The mapped health related FLA show widespread use of visions, scenarios and forecasts with demographic shifts, rising healthcare costs, and emerging technologies predominating. Scenarios are ubiquitous in health FLA as is the use of forecasting. Many combine statistical forecasting with perceived trends to develop future scenarios that could form the basis for discussions for future policy formulations and options (Future of Healthcare in Africa). Many also commence from a vision (s) normatively determined on previous trends and future expectations to foresight and forecast future requirements in research, policy development, resources prioritisation and interactive stakeholder engagement.

The Ageing Society 2030 (Denmark) is a good example of this approach. Here the starting point is a vision of the development of an age-integrated society in which individuals' roles in society are not determined by their chronological age, but rather by their physical and psychological functional ability. The normative basis for the vision is anticipated growth in the number of people over the age of 60-65, resulting from previous trends in the birth rate, the continued relatively low rate of fertility and the anticipated increase in average life expectancy. This will mean that the workforce will become smaller, the increase in average life expectancy will mean that the individual will spend an increasingly greater proportion of his/her adult life outside the labour market but where financial and social structures have not kept up with the increase in life expectancy and the improvement of functional abilities and needs adaptation. The project then recommends (although described as forecasts in the mapping exercise they might better be seen as recommendation) the need for greater focus on the preconditions for creating an age-integrated society concentrating on the determinants for an active and healthy life, functional ability in its broadest sense, the technological opportunities for maintaining functional ability for as long as possible, the organization of the labour market and of companies, and social cohesion in terms of culture, society, gender and ethnicity and across the generations.

Assumed technology advances appear a key determinant in many scenarios – in making telemedicine ubiquitous, for example (The Future of Healthcare in Africa). In this scenario, technology will be the dominant means of extending access to healthcare across the continent, enabling every citizen to access both basic and more specialist healthcare by 2022 even in the most rural parts of Africa. This process will build on the mobile applications rolled out a decade earlier that reminded patients to attend clinic appointments or to take medicine. By 2022 the use of nanotechnology to create diagnostics tools for individuals and health extension workers in the field will be routine. Platforms that use SMS to link with voice messages will provide additional support, and most rural health workers will use SIRI, a speech recognition “personal assistant” that will allow them to schedule appointments, record patient data and information and include low-cost diagnostics applications. Partnerships between the Mobile Health Alliance and UNICEF will help to tie in telemedicine platforms with child protection and other elements of social protection, thereby creating a seamless social service safety net. Local clinics and health workers will have the services of remote general practitioners and specialists accessible 24 hours a day. Video-conferencing will allow doctors to treat patients remotely, and wireless applications for mobile-phone platforms will enable reliable data collection.

DIID (UK) offers a specific vision of step changing infection detection systems in 10–20 years

integrated into wider systems for disease management. A case example is offered of a self-diagnostic device for sexually transmitted diseases by 2015 saving the National Health Service around £135 million per year for the treatment of infections of chlamydia and gonorrhoea alone. The early detection and treatment is forecast to reduce the spread of disease and reduce the risk of complications due to otherwise untreated infections – creating future cost savings. The key choices for policy makers and disease-management professionals include governance issues (different forms and new regulations), how to exploit the existing technology for future systems, how to obtain the best public value from future systems, how to support science areas that are key enablers for future systems, and the need to ensure public engagement with the design of such systems if they are to be effectively deployed.

The WEF report (Future of Pensions and Healthcare) uses 3 global scenarios for 2030 as a basis for challenging current thinking and to facilitate debate between key decision-makers for future action. New forms of collaboration between key stakeholders – individuals, financial institutions, healthcare providers, employers and governments – are determined as critical to finance the on-going well-being of current and future generations in a sustainable manner. These scenarios are based on two critical determinants - the path of economic growth between today and 2030, which could and probably will vary considerably and the second on putative social and political attitudes towards responsibility for the provision and financing of social services.

**Table 2: The Future of Pensions & Healthcare in a rapidly ageing world scenario to 2030**

Scenarios
<p><b>1 The Winners and the Rest:</b> This is a world in which high global growth delays the financial consequences of the growing demographic crisis. Despite growing liabilities from ageing populations, most governments are able to maintain scaled-back versions of existing social security systems, which they do as a matter of political expediency. However amid growing inequality and under- investment in the public sector, such systems are seen as increasingly inadequate by those forced by low incomes to rely on them, creating a conflict-ridden climate of “The Winners and the Rest” on a global scale.</p>
<p><b>2 We Are in This Together:</b> This is a world distinguished by a concerted effort on behalf of leaders and electorates to rein in growing inequality and reassert the idea of collective responsibility and accountability for social services. In this world, growth is moderate, but lower-than- expected returns on capital are compensated for by an emphasis on finding innovative, efficient and inclusive ways to manage the financial implications of the demographic shift, including family and community-based solutions.</p>
<p><b>3 You Are on Your Own:</b> This is a world in which an economic recession is prolonged in the early 2010s, causing fiscal difficulties for most state-funded pension and health systems. Individual responsibility is forced upon many people by the failure of existing social security systems under extreme financial pressure. Struggling to borrow or raise taxes sufficiently, many governments take aggressive measures to push healthcare and pension liabilities onto individuals and the private sector, maintaining only an absolutely minimal role in social security provision for the very needy.</p>

The scenarios are then examined for future effect in the cases of China and Italy considering the demographic shifts, challenges to be met and driving forces specific to those societies.

Forecasting is used extensively in a number of FLA. The IPCC (Human Health: Climate Change – 2007) forecasts that climate change will have effects on human health based on observed trends, statistical modelling and legacy data. These observations include among many the global burden of disease, wider dispersion of a range of infectious diseases, degradation in urban air quality and variabilities in crop yields. Increases in the frequency or intensity of heat waves will increase the risk of mortality and morbidity, principally in older age groups and among the urban poor. The associated health impacts of climate change are substantial, including changes in climate variability that would affect many vector-borne infections. Populations at the margins of the current distribution of diseases might be particularly affected. Climate change represents an additional pressure on the security of the world's food supply system and is expected to increase yields at higher latitudes and decrease yields at lower latitudes. Further assuming that current emission levels continue, air quality in many large urban areas will deteriorate. Increases in exposure to ozone and other air pollutants (e.g., particulates) could increase morbidity and mortality.

The FLA, European Economy: Healthcare Expenditure Projections offers a range of forecasts. Included are labour force assumptions (echoing the Danish study but at an EU level) that labour force participation rates would increase but labour supply will decline because of future population trends. For the EU as a whole, the participation rate (of people aged 15 to 64) is projected to increase by 3.5 percentage points, from 70.6% in 2007 to 74.1% in 2060. The labour force in the EU would increase by 3.7% between 2007 and 2020. This is mainly due to the rise in the labour supply of women. However, the positive trend in female labour supply is projected to reverse after 2020 and, as the male labour supply drops too, the overall labour force is expected to decrease by as much as 13.6%, equivalent to around 33 million people. According to the assumptions, the unemployment rate would be reduced slightly, the employment rate would increase but the number of workers would shrink. Overall, a reduction in the EU unemployment rate of around 1 ½ percentage points is assumed. The employment rate (of people aged 15 to 64) in the EU would increase from 65.5% in 2007 to 66.6% in 2010, 69% in 2020, and almost 70% in 2060. However, the number of people employed would record an annual growth rate of only 0.4% until 2020, before reversing to a negative annual growth rate of a similar magnitude until 2060. Labour input (hours of work) is projected to decline. It would increase by 5.4% until 2020 and fall by 12.9% till 2060. The ratio of elderly non-workers to workers will rise steeply.

Visions, scenarios, forecasts are in all regards preoccupied with issues of demographic trends, rising healthcare costs in order to finance those shifts, the inadequacies of healthcare structures in high and low income countries in delivering services often through lack of skilled personnel combined with the serendipitous effects of climate change, the widening epidemiology of chronic and infectious diseases and perceived changes in social attitudes to caring in communities. In many of the FLA scenario and forecasting approaches are viewed as part of management or policy-making toolkits to improve organisational performance and learning.

### 2.3.1.3 Wild cards and weak signals (WIWE)

Few health related FLA include analysis or explicit reference to wild cards or weak signals. One study mapped (SESTI) however, analysed certain weak signals in the area of health (among others). This study posited that societal developments are often influenced by improbable events with high impact. These events are preceded by “weak signals” which are only partially discussed in policy, if at all, and rarely acted upon. The increasing complexity and uncertainty is reflected in the growing demand for tools for anticipatory intelligence, such as scenario analyses, Delphi, modelling and simulation tools. The study indicated that several countries, Finland, United Kingdom and the Netherlands, have initiated horizon scanning projects to identify disruptive events that are not on the radar of policy yet. The overall goal of the project was to contribute to the development of an effective system for the early identification of weak signals of emerging issues. For that a weak signals pool, integrating several scanning tools in a wiki to collect and disseminate the information, has been set-up. Additional to its European focus, potential links with national actors and platforms are planned, making use of existing networks such as ForSociety, to feed the project outputs into European and national policy processes. Beneath this overriding goal is the desire to initiate momentum at national and European level to pro-actively address emerging issues. Next to its practical goals, this project also aimed at developing and improving new tools and methods for weak signals of emerging issues to improve detection and the operationalization of methods using a case oriented approach. The project builds on existing structures and competencies in foresight and horizon scanning in place at national level and intends to add value by improving existing resources, providing new strategic information and creating synergies exploiting complementarities between initiatives.

Examples of WIWE emerging are included in **Diversification in Medicine** where emerging technologies may lead to new approaches and new health-related service markets. Diminishing trust in conventional medicine, the debate on cultural diversity in medicine and the rising use of complementary and alternative medicine may lead to new requirements with regard to regulation. A growing number of people in Europe (more than 100 million) are turning to complementary and alternative medicine for disorders they feel cannot be treated with conventional therapy. This field encompasses a number of therapies including herbalism, meditation, acupuncture, yoga, hypnosis, biofeedback, and Traditional Chinese Medicine. Growing demand for alternative therapies may have an impact on the public healthcare system in various ways. People may not seek conventional treatments until their condition is severe, if at all, resulting in poor outcomes for individuals and additional cost to the taxpayer (compulsory health care insurances). On the other hand, the growing demand could support a healthy lifestyle that could lead to lower public health costs. Cosmetic and transgender surgery, laser eyesight treatment, abortion and IVF have become common in healthcare provision and have broadened the concept of health and healthcare and raised issues of who pays. This growth of health-related markets creates an increasing ambiguity and raises many questions on health ethics and health care finance. Development of new technologies (like inexpensive DNA testing, home diagnostics, etc.) will challenge these concepts even further. The quality of life of the elderly is often compromised due to frailty, reduced mobility, dependence on medication, financial limitations and loneliness.

**Mental Health in an Ageing Society** appears an imperative as the psychosocial consequences of an aging population and the related problems for all member of such a society are not widely

known. There are a number of innovative social approaches towards addressing the problem such as communities of care, where elderly people live together in communities where they can be cared for as well as providing companionship to one another.

Improving the mental health and wellbeing of the elderly is an important fulcrum in achieving a sustainable aging. Recent discoveries in invasive and non-invasive reading of brain activity (evoking many ethical and legal issues) highlight the issue of **Cognitive enhancement**. This may involve the use of neural implants as a possible means of unconsciously influencing thinking and emotions (also evoking many ethical and legal questions); Further deployment of cognitive performance-enhancing drugs (leading to unfair advantage academic ability and assessment, but also involving health risks) genetic screening of an increasing number of “Cognitive” genes and In Vitro Fertilization (Eugenics and new problem involving use of animals, experiments with cognitive human-zoo hybrid); Possible development of drugs influencing neuro-cognitive development (how impaired should people be to qualify for treatment?); Commercial interest (neuro-marketing - use of neuro-imaging to research subliminal influence ); Cognitive Enhancement of individuals with lower cognitive performance levels (with problems on the insurance border and further widening of social, economic divide) and ICT enhanced learning seems for learning complex cognitive and cognitive motor tasks (augmented reality, virtual reality and gaming).

#### 2.3.1.4 Models and analytical frameworks

Models are a common outcome in the mapped health related FLA. They do not usually address broad developments in a variety of areas but only specific aspects of the issues under examination in the health area.

DIID produced quantitative models for human tuberculosis infection, disease and mortality in sub-Saharan Africa; population at risk of malaria in sub-Saharan Africa; incidence of paediatric HIV/AIDS in sub-Saharan Africa; risk of malaria and human disease vectors in the UK.

The FLA, OBESITY concluded with two models; a quantitative model for modelling future trends in obesity and the impact on health and a qualitative model for designing and evaluating options for policy responses, based on the knowledge of the key variables influencing obesity development and the range of different ways in which UK society might change in the future. The tool has been tested, refined and validated as part of the UK Foresight Tackling Obesity: Future Choices project and is viewed as having the potential to inform future policy making.

The Mental Capital project developed a number of conceptual and analytical frameworks including:

##### **Conceptual:**

Mental Capital through life – the trajectory of mental capital through life through detailing some of the many factors that influence mental capital and how they are connected across the life course

Learning through Life – a visualisation of the issues associated with learning through life

**Analytical:**

Executive function – influence diagram showing the causal factors involved in the development of executive function

Stigma associated with mental ill-health – an influence diagram of the many factors affecting stigmatisation and discrimination of individuals.

The FLA on Health Expenditure Projections contains a model allowing projections of health care spending within a common, coherent framework of macroeconomic variables. The model incorporates the recent developments in demography and epidemiology and draws on new insights from health economics, allowing the comparison of the challenges facing both individual countries' health care systems and European society in its entirety.

**2.3.1.5 Key and emerging technologies**

Critical key technologies as they emerged from the FLA encompassed those associated with the use of ubiquitous and mobile technologies; technologies and tools to support teachers in designing and exchanging learning and biomarker substances used as an indicator of a biological state.

Certain future emerging technologies were also highlighted as being of high significance for healthcare in terms of prevention, diagnosis, treatment and cost effectiveness. The FLA on Horizon Scanning of Medical Technologies (Australia) gave considerable detail on emerging technologies.

These include the **Pumpless extracorporeal lung assist device (Novalung)**: enabling the adoption of a less aggressive lung ventilation strategy, less technically demanding, cheaper and associated with a lower incidence of complications.; although further evidence in the form of randomised controlled trials (RCTs) is required. **Remote controlled catheter navigational systems** consist of an operating console that can be located outside the operating room, reducing radiation exposure to the majority of the attending medical staff. **Transoral gastroplasty (TOGA® System) for obesity**: Extreme forms of obesity are not likely to respond to dietary, behavioural or pharmacological treatment. Bariatric surgery therefore has emerged as the most effective treatment for these patients: transoral gastroplasty is a new minimally invasive procedure. **Extracorporeal shock wave therapy for the treatment of angina**: Prognosis and quality of life for patients who have severe ischaemia/coronary artery disease and who are not indicated for surgery are poor. Often surgical options will have been exhausted, and alternative forms of effective treatment are lacking. Extracorporeal shock wave therapy (SWT) is emerging as a prospect for this application with the aim of relieving chronic pain and improving quality of life for patients with severe ischaemic heart disease. **eFlow® Rapid nebuliser** for the treatment of patients with cystic fibrosis. CF patients require lifelong intensive treatment including physiotherapy, antibiotic treatment, dietary control and digestive enzyme capsules. Patients with CF have a shortened life expectancy, with the predominant cause of death being loss of lung function, which begins in infancy and continues throughout the patient's life. The Pari eFlow Rapid is a small (fits in the palm of your hand), light weight, portable nebuliser, which is capable of efficiently producing aerosols from liquid medications, such as antibiotics, via a vibrating, perforated membrane. The device is electronic and therefore quieter than conventional compressor type nebulisers. It has been suggested that new nebuliser devices such as the eFlow® Rapid increase the deposition of antibiotic therapy into the lungs

with improved patient outcomes which ultimately result in increased patient compliance. The eFlow® device shows potential for improved therapeutic outcomes due to the associated shorter nebulisation times. **Penumbra system for endovascular thrombus removal** for treatment of ischaemic stroke patients. Ischaemic strokes are more common (85%) than haemorrhagic strokes, and both may affect functions including movement of body parts, vision, swallowing, communication, and may result in death. Nearly all patients are disabled immediately following a stroke event. Common disabilities include permanent paralysis of one side of the body, speech or swallowing difficulties, problems with memory, personality changes or a range of other difficulties. Depression, anxiety and cognitive impairment are also common after stroke. By the end of the first year, about half of all survivors of stroke remain dependent on others for activities of daily living. The Penumbra system has been developed for the early management of ischaemic stroke with the aim of preventing death and the burden of long-term morbidity. The system is designed to restore adequate blood flow via debulking and aspiration of occluding thrombus with the aim of salvaging the ischaemic penumbra, the area surrounding a cerebral infarct that suffers less ischaemia. **SpyGlass® Direct Visualisation System** Gallstones are a major cause of morbidity in Western countries. Until recently, direct visualisation of the pancreatobiliary system for the diagnosis and treatment of lesions in the biliary and pancreatic ducts has been limited by the technical challenges associated with developing a scope capable of allowing direct visualisation of these ducts. SpyGlassR offers direct visualisation for diagnostic and therapeutic applications during endoscopic procedures in the pancreatobiliary system, including the hepatic ducts, in patients with biliary and pancreatic diseases.

It should be noted that horizon scanning in medical technologies is long established and is part of on-going processes used to inform jurisdiction, safety, financing decisions and to assist in the managed introduction of new technologies. It should not be confused with generic commentaries as to the usefulness of new and emerging technologies that are contained in passing in many health related FLA.

#### 2.3.1.6 Pathways and roadmaps

Although some future technologies are identified in some cases, technology roadmaps as such are not a common output in the health FLA mapped. DIID, however, defined roadmaps in four areas:

- Novel information technology for the early detection of infectious disease events;
- Early detection and characterisation of new or newly resistant/virulent pathogens using genomics and post genomics requiring laboratory-based facilities;
- Taking technology for identification and characterisation of infectious diseases to individuals; and
- High-throughput screening for infectious diseases of people, animals and plants using surrogate, non-invasive markers.

Roadmapping in healthcare is fraught with the difficulties that arise from problems of extracting and identifying useful information from huge complex systems that include people, technology

and machines. Various sources, including remote monitoring, weather and mobile phone tracking data can be assembled into very large databases containing some relevant and much irrelevant information: all this needs to be filtered and combined with epidemiological models to give timely, accurate response options. The heterogeneous nature of the various database structures and many different representations of data are not easily resolved: data varies in its reliability and its provenance may be uncertain. There is also the issue of public acceptability and privacy issues that may arise. In parallel with, and closely connected with technology developments, is the social problem of obtaining agreement for the widespread international management of information for the public good. This involves a multiplicity of cultural and other concerns. Compellingly, the time taken to address the social issues may exceed that needed for the technology to develop - and the need to address them may therefore be urgent.

### 2.3.2 Recommending Futures

Recommendations from FLA may fall into the following categories: Policies and actions; Initiatives and actors; Appropriation and dissemination; Investments and training; Alliances and synergies and (FHS) research.

The results from the health-related FLA indicate that policy oriented recommendations are the most common type of recommendations and most often refer to specific initiatives and approaches to dissemination or training. Specificity is natural due to the depth in studying one particular issue instead of spreading across various areas, although it might be considered that many of the recommendations are somewhat vague and generic and lack focus in terms of operationalizing policy frameworks. References to these kind of recommendations can be found in many of the mapped FLA. They include

- Improving hospital work environments as a relatively low cost strategy on improved healthcare.
- Provision of high level training for medical and healthcare staff by ensuring that, for example, nurses trained to a high level are given the opportunities to exploit their skills in areas such as e.g. nurse prescribing, community nurse-led initiatives such as those in cardiac and diabetes care and potentially increasing the retirement age for nurses (a policy already being considered in many EU countries and across professions).
- Considering recommending a degree of rationing and consolidation of healthcare facilities, as public resources fall short of demand
- Recommending that European governments should improve collection and transparency of health data in order to prioritise investment decision
- Recommending governments tackle bureaucracy and liberalise rules that restrict the roles of healthcare professionals

The RN4CAST study indicates that hospital quality, safety and staff retention problems are associated with organizational behaviours related to nursing: that elements of hospital organization of nursing care are associated to nurse wellbeing, nurse-perceived quality of care, and patient satisfaction and that as a recommendation hospital organization of nursing care is a **promising area** for international as well as national focus to improve quality of hospital care and the retention of a qualified and committed nurse workforce.

A stronger approach is taken by Mental Capital (UK)) in recommending policy shifts underpinned by:

- Increased treatment and diagnosis instruments for mental health conditions
- Increased provision for depression treatments and other best-practice mental health treatments
- Effective early interventions to address learning difficulties in children including well-designed pre-school parenting programmes for children from disadvantaged backgrounds
- Well designed workplace placement, support and intervention programmes to help those with mental health problems.
- Better use of scientific and other evidence to plan and link interventions that affect mental capital and wellbeing through the life course
- Better decision making, drawing upon better economic analysis of interventions, to take account of wider and longer-term benefits
- Improving the promotion of cross-Government action and central coordination.
- Improving the promotion of cross-Government action and central coordination.

Operationalizing these shifts is viewed holistically in this FLA: measures are needed for increasing investment in capacity and deepening the research base Capacity is linked to the need for fostering dispositions to learning as the global competition for skills intensifies so does the need for individuals to develop their mental capital by training and retraining through their working years in order to compete effectively. Preparing people to meet that challenge will need to start early in life and continue on through the life course. Research is needed to generate better evidence for policy-makers. In particular and among many others, an important objective should be to distinguish between correlative and causative relationships amongst different factors thought to influence mental capital wellbeing.. A longitudinal cohort approach is one way of achieving good quality data to enable the effects of risk factors and interventions to be tracked over the life course. Such data is currently lacking and there could be substantial added value in undertaking long-term cohort studies on an EU basis: comparisons between countries could help in separating out the effect of important socio-economic factors. The development of biomarkers (particularly in the area of depression and dementia associated with ageing) to improve diagnosis of disorders and to promote the development, trial and use of new treatments are viewed as particularly crucial.

Unsurprisingly, as it was conducted by the same agency (Foresight UK) the Obesity FLA, also takes a robust and holistic approach towards the need for significant policy shifts, underpinned by research in tackling obesity. Obesity is viewed as a societal and economic issue and with long-term generational characteristics, the determinants of which are diverse and far reaching in effects and further the phenomenon is not now restricted to high income countries. Economic growth and the impact of new models of food production and consumption require new understandings in food literacy and food skills.

### 2.3.3 Transforming Futures

'Transforming futures' reflects the ability of FLA to shape a range of possible futures through six major types of transformations representing the ultimate outcomes or impacts of FLA:

- Transforming *capacities and skills*
- Transforming *priorities and strategies*
- Transforming *paradigms and current visions*
- Transforming *socio-economic and STI systems*
- Transforming *behaviour, attitudes and lifestyles*
- Transforming *knowledge-based products and services*

These types of impacts need significant time after the end of the FLA to be identifiable and their identification necessitate impact assessment exercises which are beyond the scope of the EFP project. Thus, only indications of transforming impacts can be identified based on the recommendations of the FLA.

The health related FLA may lead to all the different types of transforming impacts. Following the Scenarios to 2030 on the future of pensions and healthcare, the WEF produced a separate report on Transforming Pensions and Healthcare which focused on strategic options. These spanned a wide range of areas such as strategies, behaviours, lifestyles and attitudes, current pension and health systems, as well as capacities and skills:

**Strategic Option 1:** Promote Work for Older Cohorts

**Strategic Option 2:** Shift Delivery of Healthcare to a Patient-centred System

**Strategic Option 3:** Promote Wellness and Enable Healthy Behaviours

**Strategic Option 4:** Provide Financial Education and Planning Advice

**Strategic Option 5:** Encourage Higher Levels of Retirement Savings

**Strategic Option 6:** Facilitate the Conversion of Property into Retirement Income

**Strategic Option 7:** Stimulate Micro-insurance and Micro-pensions for the Poor

**Strategic Option 8:** Enhance Pension Fund Performance

**Strategic Option 9:** Realign Incentives of Healthcare Suppliers

**Strategic Option 10:** Ensure That Cross-border Healthcare Delivery Benefits All Stakeholders

**Strategic Option 11:** Promote Annuities Markets and Instruments to Hedge Longevity Risk

The FLA of the Foresight UK unit also adopts an integrated approach in defining key choices for policy that may contribute to transforming impacts of various types (capacities and skills, strategies and priorities, systems, behaviour and knowledge-based services).

DIID defined key choices for addressing the conditions for future disease management and detection, identification and monitoring systems, regulation, standards and interoperability. At the same time the study explored implications for science, technology and systems, skills and public engagement.

The Tackling Obesity study, of the same unit, defined principles for developing a national strategy to tackle obesity as well as criteria for an effective obesity strategy. Again an integrated, systemic approach is evident:

- 1 Tackling obesity needs a system-wide approach, redefining the nation's health as a societal and economic issue
- 2 Higher priority for the prevention of health problems, with clearer leadership, accountability, strategy and management structures
- 3 Engagement of stakeholders within and outside Government
- 4 Long-term, sustained interventions
- 5 On-going evaluation and a focus on continuous improvement

After pointing out the key issues in developing a strategy to ensure mental capital well-being in the UK, the Mental Capital project goes even further, as we noted above, to define concrete steps for government. At the same time it highlights that a more strategic and visionary approach is needed involving better use of scientific and other evidence to plan and link interventions that affect mental capital and wellbeing, better decision making, drawing upon better economic analysis of interventions, to take account of wider and longer-term benefits, and improving the promotion of cross-governmental action and central coordination. This indicates transformations not only in strategies but also in capacities and skills, knowledge-based services and the whole policy-making system.

Ageing Society 2030 has a more focused orientation as it produced a specific list of strategically informed research themes and topics in contributing to the realisation of a vision of the development of an age-integrated society. This appears to satisfy the view that it directly contributes to transforming priorities and strategies as well as paradigms and current visions.

### Box 1 - Ageing Society 2030: Research priorities

#### Healthy ageing

- The determinants for an active and healthy life,
- Identification of critical phases of life, stressful events and risk factors, which in a whole-life perspective are of significance for the development of chronic illness and early loss of functional ability.
- Health behaviour, lifestyle, social networks and other preventive initiatives as determinants for the age-related onset and severity of diseases, and for cognitive function over the course of life.
- The development of early functional markers for biological and psychological ageing and for surviving without loss of functional ability.
- Biological and clinical research of age-related functions and diseases as a basis for new forms of treatment.
- Individual and institutional causes and ethical implications of “medical ageism” and “biomedicalisation”.
- Inequality and polarisation in health behaviour, health, functional ability and life expectancy determined by social, gender-related and ethnic factors.
- Continuous intervention studies of practice for improving rehabilitation and integrated home and institutional care.
- Maintenance and development of technological competence over the entire course of life.
- Opportunities and consequences of technology-based health measures (pervasive health care), including the commercial opportunities for Danish companies.
- The opportunities and consequences of the extended use of IT and robotics in the health service and everyday life.

#### The age-integrated labour market

- The significance of formal age limits for early retirement from or flexible continuance on the labour market.
- The creation of norms for retirement from and flexible continuance on the labour market, including older persons’ attitude to life-long learning.
- The wage structure’s significance for realising the opportunities for flexible continuance on the labour market.
- Age-specific work skills, including seniors’ skills.
- Making the value of employees to companies visible.
- Initiatives for promoting flexibility and adaptability linked to the ageing society.
- Special “seniors” duties seen in the light of the development potential of mature life.
- The relationship between “running down” and preceding working environment.
- Analyses of late-life career patterns among wage-earners or the self-employed.

#### Cohesion in society

- The concept of social cohesion in an ageing and in an age-integrated society.
- The concept of “social capital” in an ageing and in an age-integrated society.
- The electorate’s ageing and consequences for political processes and potential political outcomes.
- Coordination of the concepts of political and economic sustainability.
- Studies of the population’s preferences concerning prioritisation between “the major cash transfer incomes” and services (health, care, education) as core provisions in the age-integrated society.
- Potential risks for intergenerational tensions.
- The implementation of the unwritten social contract in an age-integrated society.
- The future older persons’ financial situation, including the elderly of other ethnic origins.
- Age functioning simultaneously as an inclusion and an exclusion mechanism.
- Studies of the professionalised elderly groups’ influence on the political processes
- Studies of gender differences and ethnicity in interaction with cohesion in an age-integrated society

The Health in the Green Economy: Transport study identified a number of perceived win-win strategies for transport and health. It is suggested that IPCC considers more systematically health co-benefits (and potential risks) of transport mitigation strategies to highlight policies with the greatest overall gains for society. Furthermore the strategy promotes improved active transport and rapid transit/public transport; more compact land use that integrates urban residential and commercial areas enhancing the climate and health co-benefits of transport strategies; well-tested tools for considering health in transport and land-use policies, including health impact assessment; and investments in active transport and rapid transit/public transport which can assist budget-conscious ministries to achieve development objectives cost effectively.

More specifically focused health related FLA (RN4CAST and EPIWORK) offer contributions to transforming capacities and skills and knowledge-based products and services through the models and frameworks they developed. EPIWORK developed the GIEaM model, a stochastic meta population approach that integrates high-resolution socio-demographic and mobility data to simulate the spread of epidemics at the worldwide scale<sup>4</sup>. Besides the RN4CAST framework for analysing implications of nurse resources, the study proceeds to recommendations in relation to development and maintenance of healthy work environments to both attract and retain high quality staff. These recommendations refer to improving the working environment and labour conditions, providing incentives and further training. Suggestions are also made for the development of competent nurse leaders who promote staff development, empower employees, encourage and support shared decision making and collegial collaboration and ultimately create attractive work environments. Thus, the study contributes to transforming competences and skills, and knowledge-based services in the health sector.

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<sup>4</sup> <http://www.epiwork.eu/publications/dissemination/>

### 3 Conclusions

The most common aims of the mapped health FLA are to transform 'strategies and priorities' and 'paradigms and current visions', 'orienting policy and strategy development', 'engaging key stakeholders and decision-shapers', and 'identifying key/emerging TEEPSE issues'. Health related FLA are predominantly theme-specific FLA highlighting aims and rationales that are case-specific depending on the specificities of the theme addressed.

Health related FLA are targeted towards the policy world and this applies whether they are nationally or internationally focused. The research community and, surprisingly the business world, are less considered as primary target groups despite the increasing importance given to collaboration between the public and private sectors in dealing with challenges in the health area. This is surprising as health care, disease transmission, remedies and the like are to a very large degree increasingly boundaryless and require transnational and global approaches yet 'networking and international cooperation' is not as delineated in the health-related FLA as might be expected. Also of interest, although it is mentioned in some FLA, is the relative low importance (or perhaps emphasis) that has been attached to harmonising supply and demand needs in healthcare. This is also surprising in view of fiscal shocks and the subsequent relative decline implied for investing in capacity.

The health-related FLA mapped have highlighted the importance of recognizing drivers and impacts of changes and forecasting events in the area of health beyond regional and sovereign areas. This reflects an historical trend of moving away from viewing health systems as sickness systems towards systems for preventing illness and maintaining good health. These latter systems are possible because of game changing health technologies, innovative medicines and new approaches in diagnostics. However as the FLA indicate, discontinuities and gaps in policy visions, financial capacities and commitments may represent significant future hindrances.

Demographic shift (in terms of ageing) is generally located as a most significant driver and one like climate change, perceived as highly resistant to remediation in the short or medium time frames. Demography issues are well exercised in the health arena because of the implications of rising costs for managing multiple chronic conditions (a feature of longevity and life style), rising dependency rates and the use of costly medical technology. Following on, visions, scenarios, forecasts in most FLA are preoccupied with issues of demographic trends, rising healthcare costs in order to finance those shifts, the inadequacies of healthcare structures in high and low income countries in delivering services often through lack of skilled personnel combined with the serendipitous effects of climate change, the widening epidemiology of chronic and infectious diseases and perceived changes in social attitudes to caring in communities. Few health related FLA, include analysis or explicit reference to wild cards or weak signals. In many of the FLA scenario and forecasting approaches are viewed as part of management or policy-making toolkits to improve organisational performance and learning.

Recommending and transforming futures in health FLA present themselves as highly complex endeavours because at both the individual and population level they involve a multitude of cross cutting factors only resolvable across many differing time frames and with a range of ethical, governance and cultural dimensions that have to be considered. These latter dimensions of value systems and social/cultural factors drive human behaviour and are not easy to understand nor are they susceptible to rapid change and to the goal transforming futures.

## 4 References and sources

*Note:* The references listed in this report are mainly those related to previous and ongoing mapping activities. In order to map each of the **health**-oriented forward-looking activities (FLA) discussed in this report we have reviewed many more references and sources that are linked to individual cases in the online Mapping Environment.

Amanatidou, E., Popper, R. and Teichler, T., (2012) *2nd EFP Mapping Report: Security Futures*, Manchester: The University of Manchester, European Foresight Platform (EFP).

Popper, R. and Teichler, T., (2011) *1st EFP Mapping Report 2010-11: Practical Guide to Fully-Fledged Mapping of Forward-Looking Activities (FLA)*, Manchester: The University of Manchester, European Foresight Platform (EFP).

Popper, R. (2011) "Wild Cards and Weak Signals Informing and Shaping Research and Innovation Policy", Paper presented at the 'Fourth International Seville Conference on Future-Oriented Technology Analysis (FTA): FTA and Grand Societal Challenges – Shaping and Driving Structural and Systemic Transformations', Seville, 12-13 May 2011.

Popper, R. (2009), *Mapping Foresight: Revealing how Europe and other world regions navigate into the future*, EFMN, Luxembourg: Publications Office of the EU, European Commission, 126pp, [http://ec.europa.eu/research/social-sciences/pdf/efmn-mapping-foresight\\_en.pdf](http://ec.europa.eu/research/social-sciences/pdf/efmn-mapping-foresight_en.pdf)

Popper, R. (2008), 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.

### Links to the 20 **HEALTH** FLA in the Mapping Environment

1. <http://www.mappingforesight.eu/initiative/bis-infectious-diseases/>
2. <http://www.mappingforesight.eu/initiative/bis-tackling-obesities/>
3. <http://www.mappingforesight.eu/initiative/bis-mental-capital-and-wellbeing/>
4. <http://www.mappingforesight.eu/initiative/the-ageing-society-2030/>
5. <http://www.mappingforesight.eu/initiative/the-future-of-pensions-healthcare/>
6. <http://www.mappingforesight.eu/initiative/cfwi-public-health/>
7. <http://www.mappingforesight.eu/initiative/aus-nz-medical-technologies/>
8. <http://www.mappingforesight.eu/initiative/epiwork/>
9. <http://www.mappingforesight.eu/initiative/hivera/>
10. <http://www.mappingforesight.eu/initiative/sesti/>
11. <http://www.mappingforesight.eu/initiative/rn4cast/>
12. <http://www.mappingforesight.eu/initiative/eiu-future-healthcare-in-africa/>
13. <http://www.mappingforesight.eu/initiative/eiu-future-healthcare-in-europe/>
14. <http://www.mappingforesight.eu/initiative/2009-ageing-report/>
15. <http://www.mappingforesight.eu/initiative/healthcare-expenditure-projections/>
16. <http://www.mappingforesight.eu/initiative/sicma/>
17. <http://www.mappingforesight.eu/initiative/unicef-child-well-being/>
18. <http://www.mappingforesight.eu/initiative/ipcc-human-health-climate-change-2007/>
19. <http://www.mappingforesight.eu/initiative/who-health-in-the-green-economy-transport/>
20. <http://www.mappingforesight.eu/initiative/aihw-health-and-the-environment/>

## References to the 20 HEALTH FLA

*Note:* The following information has been gathered using public sources (e.g. interim and final reports, official documents, newsletters and websites) that have been freely available in the Internet on 17.12.12. The readers should be aware that some of the links might not be functional in the future.

### **BIS – Infectious diseases**

[BIS - The Detection & Identification of Infectious Diseases](#)

Key sources

[Action plan](#)

[Future threats](#)

[Executive summary of the final report](#)

### **BIS – Tackling obesities**

[BIS - Tackling Obesities site](#)

Key sources

[Project Final Report](#)

[Summary of Key Messages](#)

[Visualising the Future: Scenarios to 2050](#)

### **BIS – Mental capital and wellbeing**

[BIS - Mental Capital and Wellbeing site](#)

Key sources

[Executive summary](#)

[Mental health: Future challenges](#)

[Learning difficulties: Future challenges](#)

### **Ageing society 2030**

<http://en.fi.dk>

Key sources

[The Ageing Society 2030 report](#)

### **The future of pensions and healthcare**

<http://www.weforum.org>

Key sources

[Report on The Future of Pensions and Healthcare in a Rapidly Ageing World - Scenarios to 2030](#)

### **CfWI Horizon Scanning on public health skills and workforce**

<http://www.horizonscanning.org.uk>

Key sources

[Future Workforce Matters \(Issue 2\)](#)

[CfWI horizon scanning publications](#)

[Key shapers of public health skills and workforce](#)

### **Australian scanning on emerging health technologies**

<http://www.horizonscanning.gov.au>

Key sources

[Emerging technology bulletin](#)

[HealthPACT technology reports](#)

[Reports on horizon scanning activities](#)

### **EPIWORK**

<http://www.epiwork.eu>

Key sources

[Project brief](#)

[Project description](#)

[Epidemic Marketplace](#)

### **HIVERA**

<http://www.hivera.eu>

Key sources

[Project activities](#)

[Methodology for long-term strategies](#)

[Mapping on funding schemes to HIV Research](#)

### **SESTI**

<http://sesti.info>

Key sources

[Health newsletter](#)

[Major trends, challenges and emerging issues in Health](#)

[Health Signals and Emerging Issues for European Policy](#)

### **RN4CAST**

<http://www.rn4cast.eu/en/>

Key sources

[Periodic report](#)

[Periodic report summary](#)

[Patient safety, satisfaction, and quality of hospital care](#)

### **EIU-Janssen: The future of healthcare in Africa**

<http://www.eiu.com>

Key sources

[Key findings](#)

[EIU-Janssen Healthcare Africa Report](#)

[The future of healthcare in Africa - webpage](#)

### **EIU-Janssen: The future of healthcare in Europe**

<http://www.eiu.com>

Key sources

[Key findings](#)

[EIU-Janssen Healthcare Europe Report](#)

[The future of healthcare in Europe - webpage](#)

### **2009 Ageing Report**

[http://ec.europa.eu/economy\\_finance/](http://ec.europa.eu/economy_finance/)

Key sources

[Full report](#)

[Report summary](#)

[Erratum for table 2.5 in the report](#)

### **Projecting future health care expenditure**

[http://ec.europa.eu/economy\\_finance/](http://ec.europa.eu/economy_finance/)

Key sources

[Full report](#)

[Economic papers webpage](#)

[Summary for non-specialists](#)

### **SICMA**

<http://www.sicmaproject.eu/>

Key sources

[Briefing paper](#)

[Project structure](#)

[Project presentation](#)

### **UNICEF – Children’s well-being**

<http://www.unicef.org.uk>

Key sources

[Final report - PDF](#)

[Final report - webpage](#)

[UNICEF’s webpage on child well-being](#)

### **IPCC – Climate change and health**

<http://www.ipcc.ch>

Key sources

[Full report](#)

[Cross-Chapter Case Studies](#)

[Report webpage on Impacts, Adaptation and Vulnerability](#)

### **WHO – Health in the green economy**

<http://www.who.int/>

Key sources

[Full report](#)

[Executive summary](#)

[Health co-benefits of climate change mitigation webpage](#)

### **AIHW – Health and the environment**

<http://www.aihw.gov.au>

Key sources

[Full report](#)

[Report summary](#)

[Report webpage](#)