



Analysis of the integration of Socio-economic Sciences and Humanities in Horizon 2020

(First preliminary report)

Authors:

Christina Bitterberg	(DLR)
Keji Adunmo	(APRE)
Amélie Antoine Audo	(Sciences Po)
Denise Bartolo	(MCST)
Nathalie Collain	(CNRS)
Rossitsa Chobanova	(AED)
Seda Göksu	(TUBITAK)
Smadar Hirsh	(ISERD)
Tatiana Leonova	(CSRS)
Constantina Makri	(RPF)
Stephanie Rammel	(FFG)
Maria Samara	(EKT)
Regina Schneider	(Euresearch)
Larissa Titarenko	(BSU)

© 5 July, 2013 Net4Society
www.net4society.eu

All rights reserved

Reproduction only with written consent by the coordinator

Net4Society is an FP7 project funded by the EUROPEAN COMMISSION
THEME 8: Socio-economic Sciences and Humanities
Coordination and Support Action
FP7-SSH-2012-2
SSH.2012.8.8-2

This publication reflects only the author's views
– the EU Commission is not liable for any use that may be made of the information contained therein.

Table of Contents

1.	Introduction	4
2.	SSH in Horizon 2020 Part III <i>Societal Challenges</i>	5
2.1	Challenge 1 “Health, Demographic Change and Wellbeing”	5
2.2	Challenge 2 “Food Security, Sustainable Agriculture, Marine and Maritime Research and the Bioeconomy”	8
2.3	Challenge 3 “Secure, Clean and Efficient energy”	11
2.4	Challenge 4 “Smart, Green and Integrated Transport”	13
2.5	Challenge 5 “Climate Action, Environment, Resource Efficiency and Raw Materials”	15
2.6	Challenge 6 “Europe in a Changing World: Inclusive, Innovative and Reflective Societies”	18
2.7	Challenge 7 “Secure Societies”	18
3.	SSH in Horizon 2020 Part II <i>Industrial Leadership – Leadership in enabling and industrial technologies</i>	20
3.1	Information and Communication Technologies (ICT)	21
3.2	Nanotechnologies	22
3.3	Advanced materials	23
3.4	Biotechnology	24
3.5	Advanced Manufacturing and Processing	25
3.6	Space	26
4.	SSH in Horizon 2020 Part I <i>Excellent Science</i>	27
4.1	European Research Council	27
4.2	Future and Emerging Technologies (FET)	28
4.3	Marie Skłodowska-Curie Actions	29
4.4	Research Infrastructures (including e-infrastructures)	31
5.	Conclusions	32

Tables

Table 1: List of Abbreviations.....	3
-------------------------------------	---

Table 1: List of Abbreviations

Abbreviation	Explanation
Council	European Council
EC	European Commission
EP	European Parliament
ERA	The European Research Area is composed of all research and development activities, programmes and policies in Europe which involve a transnational perspective. Together, they enable researchers, research institutions and businesses to increasingly circulate, compete and co-operate across borders. The aim is to give them access to a Europe-wide open space for knowledge and technologies in which transnational synergies and complementarities are fully exploited.
ERC	European Research Council: the European Union funding body that implements the specific FP7 Ideas Programme and will implement the follow-up programme under Horizon 2020.
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
FET	Future emerging technologies
FP7	7 th European Framework Programme for Research and Technological Development.
Horizon 2020	The next EU Framework Programme for Research and Innovation (2014-2020)
ICT	Information and Communication Technologies
JRC	Joint Research Centre
KET	Key enabling technologies (Part II “Industrial Leadership” – Leadership in enabling and industrial technologies”)
MS	EU Member State
NCP	National Contact Point: National official representative to the Framework Programme in Member States, Associated Countries and Third Countries.
NET4SOCIETY	NET4SOCIETY ³ International Network of the National Contact Points for Socio-economic Sciences and Humanities
PGA	Partial general approach – agreement of the European Council (on texts such as Horizon 2020 Framework Regulation, or Horizon 2020 Specific Programme)
RI	Research Infrastructures
SSH	Socio-economic Sciences and the Humanities

1. Introduction

Horizon 2020, the upcoming EU's framework programme for research and innovation for the time period of 2014-2020, aims at strengthening Europe's scientific and technological base, fostering benefits for society and better exploiting the industrial potential of policies for innovation, research and technological development. It shall play a central role in the accomplishment of the Europe 2020 strategy for smart, sustainable and inclusive growth. Horizon 2020 will provide a Common Strategic Framework for the Union's research and innovation funding activities, and thus is intended to support the creation of new job opportunities, long-term sustainable growth and competitiveness as well as the tackling of societal challenges across the Union.

Socio-economic sciences and humanities (SSH) will be an integral part of Horizon 2020 and a cross-cutting issue through the whole programme. SSH are supposed to be embedded in all pillars of Horizon 2020 as an essential element of the activities needed to tackle each of the societal challenges to enhance their impact. Specific support to SSH will be provided by the societal challenge "Europe in a changing world: Inclusive, innovative and reflective societies".

In order to monitor the integration of SSH in Horizon 2020, to identify those parts of Horizon 2020 that explicitly include SSH research dimensions and to guide National Contact Points (NCPs), researchers and other stakeholders towards funding opportunities for SSH in Horizon 2020, NET4SOCIETY has compiled this preliminary report on SSH integration in Horizon 2020. The report therefore provides an overview on which SSH topics are likely to be taken up in the different programme parts of Horizon 2020 in the coming seven years.

This preliminary report is based on a qualitative textual analysis of the "Partial General Approach"¹ (PGA) of the Horizon 2020 Specific Programme. The PGA is an agreement of the Member States, dating from December 2012, based on the original proposal of the European Commission. To include more recent developments and results from the negotiation process on Horizon 2020, the analysis was also updated with the outcomes of the negotiations during the Irish Council Presidency and therefore reflects the state-of-play during late June 2013. The analysis was carried out by a task group of SSH NCPs with academic backgrounds in socio-economic sciences and humanities.

The structure of the document is determined by the degree of SSH integration in the different Horizon 2020 programme parts. Instead of following the order of the different parts in Horizon 2020 (*I. Excellent science, II. Industrial leadership, III. Societal challenges, IV. Non-nuclear direct actions of the Joint Research Centre*), this report starts with the parts that include the highest amount of SSH research dimensions, the *societal challenges*. It continues with the "Key enabling technologies" of the *Industrial leadership* part. *Excellent science* with the major programmes "ERC" and "Marie Skłodowska-Curie actions" comes last, as this programme part includes bottom-up funding possibilities where research topics are not defined within the calls. Therefore SSH integration cannot be analysed in the same way as in top-down programmes such as *II. Industrial leadership* or *III. Societal challenges*.

This analysis omits some parts of Horizon 2020. The programme parts "Access to risk finance" and "Innovation in SMEs" (both part of *Industrial leadership*) are not covered, as they neither define top-down research areas that could be analysed with regard to SSH aspects nor do they present programmes of particular attractiveness for SSH researchers, such as the ERC or the Marie Skłodowska-Curie Actions. Part IV *Non-Nuclear Actions of the Joint Research Centre (JRC)* is not included, as the activities in this part do not present funding opportunities for SSH researchers in general but rather describe how the JRC will contribute to the other parts of Horizon 2020.

¹ Proposal for a Council decision establishing the Specific Programme implementing Horizon 2020 - The Framework Programme for Research and Innovation (2014-2020) - Partial general approach

Challenge 6 “Europe in a Changing World: Inclusive, Innovative and Reflective Societies” is the one mainly SSH-driven challenge in Horizon 2020, therefore SSH research dimensions are included in all parts of Challenge 6 and are not listed in this report in detail or per activity line.

In the future, NET4SOCIETY will further monitor SSH integration in Horizon 2020 and will follow-up this preliminary report by analysing the first round of Horizon 2020 work programmes to be published by the end of 2013. A NET4SOCIETY document that lists all topics and funding opportunities for SSH within the first Horizon 2020 calls will be published shortly after the publication of calls. This is a continuation of activities that were carried out by the NET4SOCIETY network during FP7 and were highly appreciated by the research community.

In addition, and based on this preliminary report as well as on the future analysis of work programmes, a comprehensive NET4SOCIETY report on the integration of SSH in Horizon 2020 will be published in 2014.

Disclaimer:

The Horizon 2020 research dimensions presented in this document reflect the state-of-play at a certain point in time and can still be subject to changes since negotiations on the framework programme are not closed. Even though NET4SOCIETY undertook this exercise with care and applied a comprehensive approach, no guarantee is given that all SSH relevant research aspects are listed in this report.

2. SSH in Horizon 2020 Part III *Societal Challenges*

Part III “Societal Challenges” responds directly to the policy priorities identified in the Europe 2020 strategy. It aims to stimulate the critical mass of research and innovation efforts needed to achieve the Union's policy goals. All the envisaged activities shall take a challenge-based approach, bringing together a critical mass of resources and knowledge across different fields, technologies and scientific disciplines. The activities shall cover the full cycle from research to market. There is a new focus on innovation-related activities, such as piloting, demonstration activities, test-beds, support for public procurement, design, end-user driven innovation, social innovation and market take-up of innovations.

2.1 Challenge 1 “Health, Demographic Change and Wellbeing”

General description

The broad objectives of the challenge include effective health promotion, supported by a robust evidence base, prevention of diseases, contribution to wellbeing and to containing costs. Improved understanding of health and disease will demand close linkage between fundamental, clinical, epidemiological and socio-economic research. Effective sharing of data and the linkage of these data with real-world large scale cohort studies is also essential, as is the translation of research findings into the clinic, in particular through the conduct of clinical trials. It is a societal challenge to adjust to the further demands on health and care sectors due to the ageing population. If effective health and care is to be maintained for all ages, efforts are required to improve and speed-up decision making in prevention and treatment provision, to identify and support the dissemination of best practice in the healthcare sector, to raise awareness and to support integrated care.

Major activity lines of the challenge are:

- 1.1. Understanding health, wellbeing and disease
- 1.2. Preventing disease
- 1.3. Treating and managing disease
- 1.4. Active ageing and self-management of health
- 1.5. Methods and data
- 1.6. Health care provision and integrated care
- 1.7. Specific implementation aspects

SSH aspects in Challenge 1

Challenge 1 contains Social Sciences and Humanities aspects in all of its activity lines – a large share of the research aspects listed necessitate the integration of SSH. There is no specific activity line solely dedicated to SSH but there is a frequent reference to the SSH aspects to be integrated in specific sub-areas of the programmes. Three activity lines (1.1.1, 1.4.1 and 1.4.2) put a specific focus on SSH and explicitly state that SSH will be needed to contribute to the research topics listed. However, SSH contributions are easily detectable in other activity lines as well - although not clearly stated.

To summarise, SSH relevant aspects in Challenge 1 focus mainly on issues of developing health and wellbeing indicators, promoting health and disease prevention, support to policy-making, attention to patients, improving healthcare systems, involving all health providers in the research cycle, prevention of health inequalities, demographic change.

The following passages from the various activity lines of Challenge 1 contain SSH aspects:

Activity line 1.1. Understanding health, wellbeing and disease

1.1.1. Understanding the determinants of health, improving health promotion and disease prevention

- Development of comprehensive health and wellbeing indicators in the Union based on existing data sources and indicator systems. Environmental, behavioural (including life-style), psychological, organisational, cultural, socio-economic, biological and genetic factors, in their broadest senses will be studied.
- Innovative approaches to exposure assessment are needed using new-generation biomarkers based on 'omics' and epigenetics, human biomonitoring, personal exposure assessments and modelling to understand combined, cumulative and emerging exposures, integrating socio-economic, cultural, occupational, psychological and behavioural factors. Improved links with environmental data using advanced information systems will be supported
- Existing and planned policies and programmes can be assessed and policy support provided
- Improved behavioural interventions, prevention and education programmes can be developed

1.1.3. Improving surveillance and preparedness

- New or improved methods for surveillance, diagnosis, early warning networks, health service organisation and preparedness campaigns are needed for the modelling of epidemics, for effective pandemic response as are efforts to maintain and enhance capabilities to combat drug resistant infectious disease

Activity line 1.2. Preventing disease

1.2.1. Developing effective prevention and screening programmes and improving the assessment of disease susceptibility

- Testing and validation of screening methods and programmes.
- Identifying individuals and populations at a clinically relevant increased risk of disease
- Personalised, stratified and collective strategies for efficacious and cost effective disease prevention

Activity line 1.3. Treating and managing disease

1.3.2. Transferring knowledge to clinical practice and scalable innovation actions

- Clinical trials for transferring biomedical knowledge to application in patients and support for these will be provided, as well as for the improvement of their practice
- Enhancing the use of databases and electronic health records as data sources for trials and knowledge transfer

Activity line 1.4. Active ageing and self-management of health

1.4.1. Active ageing, independent and assisted living

- Multidisciplinary advanced and applied research and innovation with socioeconomic, behavioural, gerontological, digital and other sciences is needed for cost effective user-friendly solutions for active, independent and assisted daily living (in the home, the workplace, public spaces, etc.) for the ageing population and people with disabilities taking into account gender differences.
- Development of technologies and systems and services enhancing quality of life and human functionality including mobility, smart personalised assistive technologies, service and social robotics, and ambient assistive environments.
- Research and innovation pilots to assess implementation and wide uptake of solutions will be supported.
- Involvement of end-users, user communities and formal/informal carers will be emphasised.

1.4.2. Individual awareness and empowerment for self-management of health

- Research into socio-economic factors and cultural values, behavioural and social models, attitudes and aspirations in relation to personalised health technologies, mobile and/or portable tools, new diagnostics, sensors and devices for monitoring and personalised services
- Solutions will be developed and tested with the use of open innovation platforms such as large scale demonstrators for social and service innovation

Activity line 1.5. Methods and data

1.5.1. Improving health information and better use of health data

- Development of data processing, knowledge management, modelling, visualisation, ICT-security and privacy related issues

1.5.2. Improving scientific tools and methods to support policy making and regulatory needs

- Support research and development, integration and use of scientific tools, methods and statistics for rapid, accurate and predictive assessment of the safety, efficacy and quality of health interventions and technologies including new drugs, biologics, advanced therapies and medical devices
- Support for improved risk assessment methodologies, compliance frameworks, testing approaches and strategies relating to environment and health
- Need to support the development of relevant methods for assisting the assessment of ethical aspects

Activity line 1.6. Health care provision and integrated care

1.6.1. Promoting integrated care

- Improved cooperation between the providers of health and social or informal care to support the management of chronic disease, including patients with disabilities, outside institutions
- In the context of demographic change, research and innovation to improve the organisation of long-term care delivery as well as policy and management innovation will also be supported.
- Implementing new and integrated care solutions

1.6.2. Optimising the efficiency and effectiveness of healthcare provision and reducing inequalities by evidence based decision making and dissemination of best practice, and innovative technologies and approaches

- Comparative analyses of the reform of public health systems in Europe and in third countries and assessments of their mid to long-term economic and social impacts will be supported.
- Analyses of future health workforce needs both in terms of numbers and required skills in relation to new patterns of care will be supported.
- Research on the evolution of health inequalities, of their interplay with other economic and social inequalities and on the effectiveness of policies aiming to reduce them in Europe and beyond will be supported.
- Assessment of patient safety solutions and quality assurance systems, including the role of patients on safety and quality of care.

2.2 Challenge 2 “Food Security, Sustainable Agriculture, Marine and Maritime Research and the Bioeconomy”

General description

The specific objective of the challenge is to secure sufficient supplies of safe and high quality food and other bio-based products, by developing productive and resource-efficient primary production systems, fostering related ecosystem services, alongside competitive and low carbon supply chains. This will accelerate the transition to a sustainable European bio-economy.

The need to provide a sustainable, safe and secure food supply for the European and an increasing global population is the challenge that Europe will be facing. Furthermore, Europe will need to ensure sufficient supplies of raw materials, energy and industrial products, under conditions of decreasing fossil carbon resources, while maintaining its competitiveness. Bio-waste represents a huge problem and cost, despite its high potential added value.

Major activity lines of the challenge are:

- 2.1. Sustainable agriculture and forestry
- 2.2. Sustainable and competitive agri-food sector for a safe and healthy diet
- 2.3. Unlocking the potential of aquatic living resources
- 2.4. Sustainable and competitive bio-based industries and supporting the development of a European bio-economy
- 2.5. Cross-cutting and maritime research

SSH aspects in Challenge 2

All in all, SSH aspects are present in the majority of Challenge 2 activity lines. They include the following issues:

- Fostering ecosystem services by integrating agronomic, environmental and social goals into sustainable production and consumption
- Socio-economic research and forward looking activities in relation to the bio-economy strategy, including development of indicators, data bases, models, foresight and forecast, impact assessment of initiatives on the economy, society and the environment
- Social, economic and environmental benefits and the modernisation of the bio-economy associated sectors and markets supported through multi-disciplinary research, driving innovation
- Broad approach to innovation ranging from technological, non-technological, organisational, economic and social innovation

The following passages from the various activity lines of Challenge 2 contain SSH aspects:

Activity line 2.1. Sustainable agriculture and forestry

Support for more productive, environmentally-friendly resource-efficient and resilient agriculture and forestry systems is achieved by appropriate knowledge, tools, services and innovations. These systems should supply sufficient food, feed, biomass and other raw-materials and deliver ecosystems services while at the same time supporting the development of thriving rural livelihoods.

2.1.2. Providing ecosystem services and public goods:

- Research activities will contribute to a better understanding of the complex interactions between primary production systems and ecosystems services and will support the provisions of public goods (including cultural and recreational value) and services, through the delivery of management solutions, decision-support tools and the assessment of their market and non-market value.

2.1.3. Empowerment of rural areas, support to policies and rural innovation:

- New concepts and institutional innovations are needed to ensure cohesion of rural areas and prevent economic and social marginalisation, foster diversification of economic activities
- Ensure appropriate relations between rural and urban areas, as well as facilitate knowledge exchange, demonstration, innovation and dissemination and foster participatory resource management

- Explore ways in which public goods in rural areas can be converted into local/regional socio-economic benefit
- Socio-economic and comparative assessment of farming/forestry systems and their sustainability performance will be addressed.

2.1.4. Sustainable forestry:

- Produce bio-based products, ecosystems, services and sufficient biomass, with due consideration to economical, ecological and social aspects of forestry as well as to regional differences.
- Activities will focus on the further development of sustainable forestry systems which can address societal challenges and demands.

Activity line 2.2. Sustainable and competitive agri-food sector for a safe and healthy diet

Addressing consumer needs for safe, healthy, high quality and affordable food, while considering the impacts of food consumption behaviour and food and feed production on human health, the environment and the global ecosystem.

2.2.1. Informed consumer choices:

- Consumer preferences, attitudes, needs, behaviour, lifestyle, education and the cultural component of food quality will be addressed
- Communication between consumers and the food chain research community and its stakeholders will be enhanced.
- Social innovation will respond to societal challenges, and innovative predictive models and methodologies in consumer science will deliver comparable data and lay the ground for responses to Union policy needs.

2.2.2. Healthy and safe foods and diets for all:

- Nutritional needs, a balanced diet and the impact of food on physiological functions, physical and mental performance will be addressed
- Food safety innovations, improved tools for risk and risk-benefit assessment and for risk communication and improved food safety standards

2.2.3. A sustainable and competitive agri-food industry

- The needs for the food and feed industry to cope with social, environmental, climate and economic change from local to global will be addressed
- Innovative and sustainable resource efficient technologies and processes that will strengthen the innovation potential of the European food supply chain, enhance its competitiveness, create economic growth and employment and allow the European food industry to adapt to changes
- Traceability, logistics and services, socio-economic and cultural factors, animal welfare and other ethical issues will be addressed too

Activity line 2.3. Unlocking the potential of aquatic living resources

The overall objective is to manage aquatic living resources to maximise social and economic benefits/returns from Europe's oceans, seas and inland waters.

2.3.1. *Developing sustainable and environmentally-friendly fisheries*

- The socio-economic effects of management options will be measured.
- The shared use of maritime space with other activities, particularly in the coastal zone, and its socio-economic impact will also be addressed.

2.3.2. *Developing competitive and environmentally-friendly European aquaculture*

- Emphasis will also be given to understanding the social and economic dimensions of the aquaculture sector to underpin cost and energy efficient production matching with the market and consumer demands, while ensuring competitiveness and attractive prospects for investors and producers.

Activity line 3.5. Cross-cutting marine and maritime research

2.5.2. *Develop the potential of marine resources through an integrated approach*

- Advances in the field of eco-innovation, such as new products, processes and the application of management concepts, tools and measure to assess and mitigate the impact of human pressures on marine environment.

2.3 Challenge 3 “Secure, Clean and Efficient energy”

General description

The specific objective of the challenge is to make the transition to a reliable, affordable, publicly accepted, sustainable and competitive energy system, aiming at reducing fossil fuel dependency in the face of increasingly scarce resources, increasing energy needs and climate change.

Major activity lines of the challenge are:

- 3.1. Reducing energy consumption and carbon footprint by smart and sustainable use
- 3.2. Low cost, low carbon electricity supply
- 3.3. Alternative fuels and mobile energy resources
- 3.4. A single, smart European electricity grid
- 3.5. New knowledge and technologies
- 5.6. Robust decision making and public engagement
- 3.7. Market uptake of energy innovation
- 3.8. Specific implementation aspects

SSH aspects in Challenge 3

Challenge 3 contains Social Sciences and Humanities aspects in several of its activity lines. There is no specific activity line solely dedicated to SSH. SSH aspects are especially represented in the content of activity 3.6. There are three activity lines (3.2, 3.3, 3.5) where SSH are not featured. However, SSH (mainly economic sciences) are very important to provide arguments to define which energy conversion is more efficient, which are the more cost-competitive and sustainable technologies, etc.

To summarise, SSH relevant aspects in Challenge 3 focus mainly on issues of understanding interactions between social, economic and environmental systems, providing knowledge and tools for effective decision making and public engagement. SSH activities shall focus on the development of tools, methods, and models and forward-looking and perspective scenarios for a robust and transparent policy support, including activities on public acceptance and engagement, user involvement, environmental impact, and sustainability assessment improving the understanding of energy related socio-economic trends and prospects.

The following passages from the various activity lines of Challenge 3 contain SSH aspects:

Activity line 3.1. Reducing energy consumption and carbon footprint by smart and sustainable use

- Development of new advisory, financing and demand management services and input from the behavioural and social sciences while at the same time taking into account questions of public acceptance.

This SSH-relevant activity includes:

3.1.1. Bring to mass market technologies and services for a smart and efficient energy use

3.1.2. Unlock the potential of efficient and renewable heating-cooling systems

3.1.3. Foster European Smart cities and Communities

Activity line 3.4 A single, smart European electricity grid

- Managing the interactions between suppliers and customers as well as trade energy flow.
- Deployment of future infrastructure indicators and cost benefit analysis
- New planning, market and regulatory designs for smart energy grid technologies, products and services.
- To test and validate solutions and assess the benefits for the system and for individual stakeholders, before deploying them across Europe.
- Research to understand how consumers and businesses react to economic incentives, behavioural changes, information services and other innovative opportunities provided by smart grids.

Activity line 3.6. Robust decision making and public engagement

- Development robust and transparent theories, tools, methods and models to assess the main economic and social issues related to energy;
- Building of databases and scenarios for an enlarged Union and the assessment of the impact of energy and energy-related policies on security of supply, consumption, the environment, natural resources, and climate change, society and competitiveness of the energy industry;
- Socio-economic research for creating favourable market conditions at the regulatory, administrative and financing level for low-carbon, renewable and energy efficiencies technologies and solutions.
- Measures facilitating the energy policy implementation, preparing the ground for rollout of the investments, supporting the capacity building and acting on public acceptance.
- Innovation for the smart and sustainable use of existing technologies.

- Innovative organisational structures, the dissemination and exchange of good practices and specific training and capacity building actions will be encouraged.
- Consumer behaviour including that of vulnerable consumers like persons with disabilities and behavioural changes will be studied in open innovation platforms such as the Living Labs and large scale demonstrators for service innovation as well as through panel surveys, while ensuring privacy.

Activity line 3.7. Market uptake of energy innovation

- Innovative market uptake and replication solutions to rollout new energy technologies in time and through a cost effective implementation.
- Actions with clear Union added value aiming to develop, apply, share and replicate non-technological innovations with a high leverage factor in Union's sustainable energy markets across disciplines and levels of governance:

2.4 Challenge 4 “Smart, Green and Integrated Transport”

General description

The specific objective of Challenge 4 is to achieve a European transport system that is resource-efficient, climate- and environmentally-friendly, safe and seamless for the benefit of citizens, the economy and society.

Activities are aimed at contributing to achieving a 60% reduction of CO₂ by 2050, halving the use of ‘conventionally-fuelled’ cars in cities and achieving virtually CO₂-free city logistics in major urban centres by 2030. Low-carbon fuels in aviation should reach 40% by 2050, and CO₂ emissions from maritime bunker fuels should be reduced by 40% by 2050. They are also aimed at drastically reducing congestion and accident costs, and virtually eradicating road deaths by 2050.

Major activity lines of the challenge are:

- 4.1. Resource efficient transport that respects the environment
- 4.2. Better mobility, less congestion, more safety and security
- 4.3. Global leadership for the European transport industry
- 4.4. Socio-economic research and forward looking activities for policy making
- 4.5. Specific implementation aspects

SSH aspects in Challenge 4

The objective of achieving sustainable mobility requires the development of the knowledge on consumer’s behaviour and of the understanding of transports organization. In this perspective, challenge 4 offers many aspects of research on transport where SSH can contribute, even if the opportunities of involvement are not very well defined, particularly for Humanities. Still, we find SSH research planned within a comparatively small special activity line focussing on social sciences, highlighting socio-economic aspects, foresight and spatial and urban planning (4.4). This activity line 4.4 has no sub-items and by far the least text. At the present time it is not clear how SSH-aspects will be integrated in the other activity lines and how activity 4.4 will be connected with the other activity lines. Currently one can have the impression that SSH-research will be placed only in a separate activity line, which

does not reflect the potential contributions SSH research could make to most of the activity lines in Challenge 4.

The following passages from the various activity lines of Challenge 4 contain SSH aspects:

Activity line 4.1. Resource efficient transport that respects the environment

4.1.2. Developing smart equipment, infrastructures and services

- Development of new policies, business models, concepts, technologies and IT solutions to increase capacity
- Analysis of accessibility, user friendliness and social inclusiveness

4.1.3. Improving transport and mobility in urban areas

- Development of public and non-motorised transport as well as other resource-efficient transport options for passengers and freight as a real alternative to the use of private motor vehicles, supported by greater use of intelligent transport systems as well as by innovative supply and demand management.
- Assessment of interaction between the transport system and other urban systems.

Activity line 4.2. Better mobility, less congestion, more safety and security

4.2.1. A substantial reduction of traffic congestion

- Innovative solutions will also facilitate accessibility and passenger choices, including for the ageing population and vulnerable users and provide opportunities to reduce congestion by improving incident management and the development of traffic optimisation schemes.

4.2.2. Substantial improvements in the mobility of people and freight

- Ensure flexibility and rapid responses to crisis events and extreme weather conditions by reconfiguring travel and haulage across modes.

4.2.4. Reducing accident rates, fatalities and casualties and improving security

- Integration of security aspects in the planning and management of passenger and freight flows, on the conception of aircraft, vehicles and vessels, on traffic and system management and on the design of transport infrastructures and of freight and passenger terminals.
- Improve the safety of all road users especially those at greatest risk, particularly in urban areas.
- Provide useful tools for enhanced security thanks to intelligent transport and connectivity applications.

Activity line 4.3. Global leadership for the European transport industry

4.3.2. On board, smart control systems

- Delivering traffic management and user information direct to in-vehicle devices, supported by reliable real-time traffic data on road conditions and congestion from the same devices.

4.3.4. Exploring entirely new transport concepts

- Strategic multidisciplinary research and proof of concept activities shall address innovative transport systems solutions. This will include also new services.

Activity line 4.4. Socio-economic and behavioural research and forward looking activities for policy making

- Actions to support policy analysis and development including gathering evidence to understand behaviour on spatial, socio-economic and wider societal aspects of transport
- Understanding local and regional specificities, user behaviour and perceptions, social acceptance, impact of policy measures, mobility, changing needs and patterns, evolution of future demand, business models and their implications, including scenario development and technology foresight. Better understanding of the links between territorial development, social cohesion and the European transport system.
- Reduction of social and territorial inequalities in access to mobility, addressing economic issues, focusing on ways to internalise the externalities from transport across modes, assess future requirements for skills and jobs, research and innovation development

2.5 Challenge 5 “Climate Action, Environment, Resource Efficiency and Raw Materials”

General description

The specific objective of the challenge is to achieve a resource-efficient and climate change-resilient economy and society, to protect the environment and ensure a sustainable supply of raw materials. Activities are aimed at contributing to increasing European competitiveness, raw materials security and improving well-being, whilst assuring environmental sustainability. The challenge supports the aim of keeping average global warming below 2 degree Celsius and enabling ecosystems and society to adapt to climate change and other environmental changes.

Major activity lines of the challenge are:

- 5.1. Fighting and adapting to climate change
- 5.2. Protection of the environment, sustainable management of natural resources, water, biodiversity and ecosystems
- 5.3. Ensuring the sustainable supply of non-energy and non-agricultural raw materials
- 5.4. Enabling the transition towards a green economy and society through eco-innovation
- 5.5. Developing comprehensive and sustained global environmental observation information systems
- 5.6. Cultural heritage

SSH aspects in Challenge 5

Challenge 5 contains Social Sciences and Humanities aspects in almost all of its activity lines – a large share of the research aspects listed necessitate the integration of SSH. There is no specific activity line solely dedicated to SSH. Two activity lines (5.4.2 and 5.4.3) put

their main focus on SSH and explicitly state that SSH will contribute to the research topics listed. However, SSH is very present in other activity lines as well.

To summarise, SSH relevant aspects in Challenge 5 focus mainly on issues of understanding interactions between social, economic and environmental systems, vulnerabilities and resilience of societies, providing knowledge and tools for effective decision making and public engagement, fostering eco-innovation (including social innovation), and enabling the transition to a green economy and society (such as fostering sustainable consumption).

The following passages from the various activity lines of Challenge 5 contain SSH aspects:

Activity line 5.1. Fighting and adapting to climate change

5.1.2 Assess impacts, vulnerabilities and develop innovative cost-effective adaptation and risk prevention and management measures:

- Analysis of vulnerabilities, second order effects such as migration and conflicts, costs and opportunities with regard to climate change.
- Impacts of climate change on economic assets.
- Evaluation of innovative, equitably distributed and cost-effective adaptation responses to climate change.
- Evaluation of potential costs of geo-engineering options.
- Investigation of inter-linkages, conflicts and synergies of adaptation and risk-prevention policy choices with other climate and sectoral policies.
- Investigation of impacts on employment and the living standards of vulnerable groups.

5.1.3 Support mitigation policies, including studies that focus on impact from other sectoral policies

- Assessment of socio-economic risk, opportunities and impacts of climate change mitigation options
- Assessment from impact from other sectoral policies
- Development and validation of new climate-energy-economy models, taking into account economic instruments and relevant externalities, with the aim of testing mitigation policy options and low carbon technology pathways
- Facilitation of (socio-economic) innovation by improving links between research and application and between entrepreneurs, end users, researchers, policy makers, knowledge institutions

Activity line 5.2. Protection of the environment, sustainable management of natural resources, water, biodiversity and ecosystems

5.2.1 Further our understanding of biodiversity and the functioning of ecosystems, their interactions with social systems and their role in sustaining the economy and human well-being.

- Monitoring/forecasting impact of human activities (including land use change) on the environment and of environmental changes on human well-being / economies.
- Improvement of understanding of complex interactions between natural resources and social, economic and ecological systems, and of the resilience/fragility of human systems.

5.2.2 Developing integrated approaches to address water-related challenges and the transition to sustainable management and use of water resources and services

- Provision of strategies, tools, technologies and innovative solutions to improve water quality, cope with imbalances between water demand and availability of supply, promote sustainable end-user behaviour
- Development of appropriate water management strategies

5.2.3 Provide knowledge and tools for effective decision making and public engagement

- Research to underpin policy decisions needed to manage natural resource, and to promote institutional, economic, behavioural and technological change
- Research to underpin development of systems to value biodiversity and ecosystem services
- Assessment of vulnerabilities and impacts
- Development of innovative ways to increase policy coherence, resolve trade-offs and manage conflicting interest
- Development of innovative ways to improve public awareness of research results and the participation of citizens in decision-making

Activity line 5.3. Ensuring the sustainable supply of non-energy and non-agricultural raw materials

5.3.1 Improve the knowledge base on the availability of raw materials

- Improve knowledge to develop governance (global rules, practices and standards) of resource exploration, extraction and processing, including economic viability and social acceptance

5.3.2 Promote the sustainable supply and use of raw materials, including mineral resources, from land and sea, covering exploration, extraction, processing, re-use, recycling and recovery

- Investigation of economic viability of recycling and materials recovery technologies

5.3.4 Improve societal awareness and skills on raw materials

- Support development of innovative green skills
- Improve public awareness of raw materials; facilitate cultural, behavioural, socio-economic, systemic and institutional changes

Activity line 5.4 Enabling the transition towards a green economy and society through eco-innovation

5.4.1 Strengthen eco-innovative technologies, processes, services and products including exploring ways to reduce the quantities of raw materials in production and consumption, and overcoming barriers in this context and boost their market uptake.

- Support of organisational, societal, behavioural, business and policy innovation
- Strengthen participation of civil society
- Taking account of rebound effects
- Addressing the potential to move to more sustainable patterns of consumption

5.4.2 *Support innovative policies and societal changes*

- Research on the main barriers to market and societal change
- Contributions from the Social Sciences and Humanities
- Development of tools, methods and models to assess and enable the main economic, societal, cultural and institutional changes needed to achieve a paradigm shift towards a green economy and society
- Research will explore how to promote sustainable lifestyles and consumption patterns, encompassing socio-economic research, behavioural science, user engagement, and public acceptance of innovation, as well as activities to improve communication and public awareness.

5.4.3. *Measure and assess progress towards a green economy*

- Improvement of measurement methods and systems relevant to resource efficiency and eco-innovation
- Socio-economic research will provide a better understanding of the root causes of producer and consumer behaviour

Activity line 5.6 Cultural heritage

5.6.1 *Identifying resilience levels via observations, monitoring and modelling*

- Analysis of the perception of value of cultural heritage

2.6 Challenge 6 “Europe in a Changing World: Inclusive, Innovative and Reflective Societies”

The specific objective is to foster a greater understanding of Europe, provide solutions and support inclusive, innovative and reflective European societies in a context of unprecedented transformations and growing global interdependencies.

Major activity lines of the challenge are:

- 6.1. Inclusive Societies
- 6.2. Innovative societies
- 6.3. Reflective societies

SSH aspect in Challenge 6:

Challenge 6 is the one SSH-driven challenge in Horizon 2020, therefore SSH research dimensions are included in all parts of challenge 6 and will not be listed here in detail or per activity line.

2.7 Challenge 7 “Secure Societies”

General description

The specific objective of this challenge is to protect freedom and foster security in Europe in a context of global interdependencies and sophistication of threats while strengthening the European culture of freedom and justice and its compliance.

Major activity lines of the challenge are:

- 7.1. Fight crime, illegal trafficking and terrorism, including understanding and tackling terrorist ideas and beliefs
- 7.2. Protect and improve the resilience of critical infrastructures, supply chains and transport modes
- 7.3. Strengthen security through border management
- 7.4. Improve cyber security (formerly ICT)
- 7.5. Increase Europe's resilience to crises and disasters
- 7.6. Ensure privacy and freedom, including in the Internet and enhancing the societal legal and ethical understanding of all areas of security, risk and management
- 7.7. Enhance standardisation and interoperability of systems, including for emergency purposes
- 7.7a Support the Union's external security policies including through conflict prevention and peace-building

SSH aspects in Challenge 7

Up to now, the financial and intellectual share of the societal aspects in the Security programme was rather limited on the whole, but their importance has steadily grown during FP7. Accordingly, there is wide-spread agreement (i.e. EP & Council) that "enhancing the societal dimension of security research will be an important aspect of this challenge." The SSH share is thus expected to be substantial. The exact percentage will largely depend on the extent to which (some of) the following changes in the programme suggested by the EP only are adopted in the end:

"In order to anticipate, prevent and manage these threats, it is necessary to understand and address the root causes of insecurity and to [...] prevent and combat the abuse of privacy and breaches of human rights in the Internet, and elsewhere, while ensuring European citizens individual rights and freedom. [...] Finally, as security policies should interact with different social policies, enhancing the societal dimension of security research will be an important aspect of this challenge. Respecting fundamental values is a building block of each effective security research and policy. Seeking and implementing security solutions implies to respect values such as freedom, democracy, equality and the rule of law. This must be at the base of any activity to provide security to European citizens."

SSH issues that are relevant in this context would be globalisation, global interdependencies, political stability, regional instability, conflicts, foreign & security policy, policy development, legal & illegal activities, justice, human/fundamental rights, the rule of law, democracy, legitimacy, international cooperation, communication, prevention, preparation, anticipation, foresight, risk analysis, risk management, organisation of society, community resilience, values, freedom, equality, privacy, trust, care, cultural & religious identity, immigration, insecurity and its root causes, violence, threats, victims, social impact, social & economic disorders, economy, economic impact, economic/financial loss, economic challenge, commercialisation, business opportunities, market, competitiveness, services, businesses, smart and inclusive growth.

However, in the text of the PGA, many of these aspects are not present yet. The current phrasing of the different activities includes only a limited number of SSH aspects, as listed below:

Activity line 7.1. Fight crime, illegal trafficking and terrorism, including understanding and tackling terrorist ideas and beliefs

- Understanding causes and impacts of radicalisation and violent extremism and tackling terrorist ideas and beliefs

Activity line 7.5 Increase Europe's resilience to crises and disasters

- Research will cover the whole crisis management chain and societal resilience

Activity line 7.6 Ensure privacy and freedom, including in the Internet and enhancing the societal legal and ethical understanding of all areas of security, risk and management:

- Better understanding of the socioeconomic, cultural, and anthropological dimensions of security, causes of insecurity, role of media and communication and the citizen's perceptions
- Ethical and legal issues and protection of human values and fundamental rights
- Risk and management issues

Activity line 7.7a Support the Union's external security policies including through conflict prevention and peace-building

- Development of organisational, legal, ethical aspects, trade issues, protection of confidentiality and integrity of information
- New capabilities and solutions to support the EU's external security policies in civilian tasks
- Research on conflict resolution and restoration of peace and justice, early identification of factors leading to conflict
- Research on impact of restorative justice processes

3. SSH in Horizon 2020 Part II *Industrial Leadership – Leadership in enabling and industrial technologies*

The Horizon 2020 Part “Industrial Leadership – Leadership in enabling and industrial technologies” (KET – Key enabling technologies) aims at strengthening the competitiveness of Europe's businesses and will provide dedicated support for research, development and demonstration on ICT, nanotechnology, advanced materials, biotechnology, advanced manufacturing and processing and space. Interactions and convergence across and between the different technologies will be emphasised. This part will follow a technology-driven approach to develop enabling technologies that can be used in multiple areas, industries and services. Applications of these technologies to meet societal challenges shall be supported together with the societal challenges.

In the Council's “Partial General Approach” for the Specific Programme it is stated: “Where appropriate, social sciences and humanities will contribute to taking into account user needs preferences and acceptance as well as ensuring societal engagement and informed consumer choice.” Obvious applications of SSH in KETs might also be associated with ethical concerns with regard to technology advances.

3.1 Information and Communication Technologies (ICT)

General description

The specific objective of this area is to maintain and reinforce European leadership in technologies related to advanced, embedded and energy and resource efficient and robust components and systems, leverage European assets in processor and system architecture, and data localisation technologies, to reinforce the competitiveness of European industry in developing, mastering and shaping the next generation Internet, to strengthen Europe's position as provider of products and services based on individual and business creativity and to reinforce European scientific and industrial leadership in industrial and service robotics, cognitive and communicative systems and to take advantage of the excellence of Europe in these key enabling technologies and support and further enhance the competitiveness and market leadership of its industry.

Major activity lines under ICT pillar of KET in Horizon 2020 Programme are identified as follows:

- 1.1.1. A new generation of components and systems: Engineering of advanced embedded and energy and resource efficient components and systems
- 1.1.2. Next generation computing: Advanced and secure computing systems and technologies, including cloud computing
- 1.1.3. Future Internet: Infrastructures, technologies and services
- 1.1.4. Content technologies and information management: ICT for digital content, cultural and creative industries
- 1.1.5. Advanced interfaces and robots: Robotics and smart spaces
- 1.1.6. Micro- and nanoelectronics and photonics: Key enabling technologies related to micro-and nanoelectronics and to photonics, covering also quantum technologies.

SSH aspects in ICT

There is no specific activity line solely dedicated to SSH. All in all, not many SSH aspects are mentioned in this section. Below are some activity lines listed that contain SSH aspects.

Cross-cutting dimension:

- the interaction between humans and technology

1.1.3 Future Internet: Infrastructures, technologies and services

- To develop the next generation internet, Research and Innovation will be needed on issues such as services, cyber security, privacy, reliability and trust.

1.1.4 Content technologies and information management: ICT for digital content, cultural and creative industries

- New tools to create, access, exploit, preserve and re-use all forms of digital content in any language and to model, analyse, and visualise vast amounts of data (big data), including linked data (intelligent and adaptive information management systems). This includes new technologies for arts, language, learning, interaction, web design, media.

3.2 Nanotechnologies

General description

The specific aim for the section “Nanotechnologies” is to raise the awareness of benefits and risks. Safety assessment and the management of overall risks in the deployment of these technologies will be systematically addressed. Where appropriate, social sciences and humanities will contribute to taking into account user needs preferences and acceptance as well as ensuring societal engagement and informed consumers’ choices.

Major activity lines of “Nanotechnologies” are:

- 1.2.1. Developing next generation nanomaterials, nanodevices and nanosystems
- 1.2.2. Ensuring the safe and sustainable development and application of nanotechnologies
- 1.2.3. Developing the societal dimension of nanotechnology
- 1.2.4. Efficient and sustainable synthesis and manufacturing of nanomaterials, components and systems
- 1.2.5. Developing and standardisation of capacity-enhancing techniques, measuring methods and equipment

SSH aspects in Nanotechnologies

There is no specific activity line solely dedicated to SSH. The SSH aspects are more present in the content of activities 1.2.2. and 1.2.3. The activity line 1.2.1. does not feature SSH. To summarise: Social sciences and humanities will contribute to defining proactive, science-based governance of nanotechnologies as well as to providing validated scientific tools, methods and platforms for hazard, exposure and risk assessment and management along the entire life cycle of nanomaterials and nanosystems, identifying the human and physical needs of nanotechnology deployment.

The explicit share of SSH is very limited in comparison to other research aspects. Behind the defined actions it is clear that a lot of preliminary and accompanied SSH work is expected to be done. For example, the 1.2.3. activity “Addressing the human and physical needs of nanotechnology deployment” suggests identification of such needs, and the activity “Focussing on governance of nanotechnology for societal and environmental benefit, including communication strategies to ensure social engagement” suggests the identification, characterisation and evaluation of such benefit (or loss).

The following list provides an overview on SSH-relevant activity lines and the SSH aspects mentioned within them:

Activity line 1.2.2. Ensuring the safe and sustainable development and application of nanotechnologies

- Defining proactive, science-based governance of nanotechnologies
- Providing validated scientific tools, methods and platforms for hazard, exposure and risk assessment and management along the entire life cycle of nanomaterials and nanosystems, including standardisation issues.

Activity line 1.2.3. Developing the societal dimension of nanotechnology

- Addressing the human and physical needs of nanotechnology deployment
- Focussing on governance of nanotechnology for societal and environmental benefit, including communication strategies to ensure social engagement.

Activity line 1.2.4. Efficient and sustainable synthesis and manufacturing of nanomaterials, components and systems

- Identification of new characteristics of management concerning new flexible, scalable and repeatable unit operations, smart integration of new and existing processes, including technology convergence such as nanobiotechnology, as well as upscaling to enable sustainable high precision large scale production of products and multi-purpose plants that ensures the efficient transfer of knowledge into industrial innovation.

Activity line 1.2.5. Developing and standardisation of capacity-enhancing techniques, measuring methods and equipment

- Characterisation of specifics of market introduction of safe complex nanomaterials and nanosystems, including nanometrology.

3.3 Advanced materials

General description

The specific objective is boosting Europe's industrial leadership through research, technological development, demonstration and innovation in advanced materials.

Major activity lines of “Advances materials” are:

- 1.3.1. Cross-cutting and enabling materials technologies
- 1.3.2. Materials development and transformation
- 1.3.3. Management of materials components
- 1.3.4. Materials for a sustainable, resource-efficient and low-emission industry
- 1.3.5. Materials for creative industries, including heritage
- 1.3.6. Metrology, characterisation, standardisation and quality control
- 1.3.7. Optimisation of the use of materials

SSH aspects in “Advanced materials”

There is no specific activity line solely dedicated to SSH. The SSH aspect is more present in the content of activities 1.3.4. and 1.3.5. The activity line 1.3.1. does not feature SSH.

Social sciences and humanities are expected to contribute to developing new approach based and ‘no-waste’ management; to developing new business models and responsible consumer behaviour; to creating new business opportunities, and including the preservation of Europe's materials with historical or cultural value.

The explicit share of SSH is very limited in comparison to other research aspects. Behind the defined actions it is clear that a lot of preliminary and accompanied SSH work is expected to be done.

The following list provides an overview on SSH-relevant activity lines and the SSH aspects mentioned within them:

Activity line 1.3.2. Materials development and transformation

- Research to define efficient, safe and sustainable development and scale up to enable industrial manufacturing of future design based products towards a "no-waste" management of materials in Europe e.g. in the metal, chemical or biotechnological industries.

Activity line 1.3.3. Management of materials components

- Research and development for new and innovative management of life cycle costs and environmental impacts through novel use of advanced materials technology.

Activity line 1.3.4. Materials for a sustainable, resource-efficient and low-emission industry

- Developing new business models and responsible consumer behaviour that increase the use of the renewable resources for sustainable applications, reduce energy demand in the product's entire life cycle and facilitate low emission production, as well as process intensification, recycling, depollution, materials for energy storage and materials with potential for high-added value from waste and remanufacture.

Activity line 1.3.5. Materials for creative industries, including heritage

- Applying design and the development of converging technologies to create new business opportunities, including the preservation and restoration of Europe's heritage and materials with historical or cultural value, as well as novel materials.

Activity line 1.3.6. Metrology, characterisation, standardisation and quality control

- Promoting technologies such as characterisation, non-destructive evaluation and predictive modelling of performance for progress and impact in materials science and engineering.

Activity line 1.3.7. Optimisation of the use of materials

- Research and development to investigate innovative business model approaches

3.4 Biotechnology

General description

The specific objective of the Biotechnology theme is to lay the foundations for the European industry to stay at the front line of innovation, also in the medium and long term, enabling the European industry to develop new products and processes meeting industrial and societal demands using preferably environmentally-friendly and sustainable production methods; and competitive and enhanced biotechnology-based alternatives to replace established ones; on the other hand, harnessing the potential of biotechnology for detecting, monitoring, preventing and removing pollution. In addition to that, developing platform technologies (e.g. genomics, meta-genomics, proteomics, metabolomics, molecular tools, expression systems, phenol typing platforms) and triggering leadership and competitive advantage on a wide number of economic sectors are indicated as other important aims related to this area.

Major activity lines under the Biotechnology pillar of KET in the Horizon 2020 Programme are identified as follows:

1.4.1. Boosting cutting-edge biotechnologies as a future innovation drivers

1.4.2. Biotechnology-based industrial processes

1.4.3. Innovative and competitive platform technologies

SSH aspects in “Biotechnology”

There is no specific activity line solely dedicated to SSH. Major SSH aspects are determined as below:

1.4.2 Biotechnology-based industrial processes

- Assessment of the techno-economic feasibility as well as the sustainability of the developed products and processes.

Cross-cutting

- user needs preferences and acceptance as well as ensuring societal engagement and informed consumers' choice on products
- safety assessment and the management of overall risks in the deployment of biotechnologies
- raising awareness of benefits and risks for bio-technology on general public
- developing appropriate technical standards and technical activities in support of standardisation and regulation on bio-technology

3.5 Advanced Manufacturing and Processing

General description

The objective is to boost Europe's industrial leadership through research, technological development, demonstration and innovation in advanced manufacturing and processing.

Major activity lines of this section are:

1.5.1. Technologies for Factories of the Future

1.5.2. Technologies enabling Energy-efficient buildings and systems

1.5.3. Sustainable, resource-efficient and low-carbon technologies in energy-intensive process industries

1.5.4. New sustainable business models

SSH aspects in “Advanced Manufacturing and Processing”:

There is one specific activity line solely dedicated to SSH: *1.5.4. New Sustainable Business Models*. The activity lines 1.5.2. and 1.5.3. do not feature SSH.

Social sciences and humanities will contribute to this part through promoting sustainable, industrial growth by facilitating a strategic shift in Europe from cost-based manufacturing to an approach based on the creation of high added value products and ICT-enabled intelligent and high performance manufacturing in an integrated system and through the development of new business models.

The explicit share of SSH is very limited in comparison to other research aspects. Behind the defined actions it is clear that a lot of preliminary and accompanied SSH work is expected to be done.

The following list provides an overview on SSH-relevant activity lines and the SSH aspects mentioned within them:

Activity line 1.5.1. Technologies for Factories of the Future

- Promoting sustainable, industrial growth by facilitating a strategic shift in Europe from cost-based manufacturing to an approach based on the creation of high added value products and ICT-enabled intelligent and high performance manufacturing in an integrated system.

Activity line 1.5.4. New sustainable business models

- Development of business models in customised approaches that can adapt to the requirements of globalised value chains and networks, changing markets, and emerging and future industries. This includes addressing sustainable business models by covering the whole lifecycle of the product and process.

3.6 Space

General description

The specific aims of the “Space” part of the key enabling technologies are: to carry out research activities in line with the space research activities of the Member States and European Space Agency (ESA) aiming at building up complementarities among different actors, to maintain a globally leading role in space by safeguarding and further developing a cost-effective and competitive and innovative space industry (including SMEs) and research community, by fostering space-based innovation, to enhance the research-base by providing continuity in space research and innovation programmes, to make standardisation in order to optimise the investments in space sector and to exploit the space infrastructure by promoting the development of innovative products and services, to develop advanced and enabling space technologies and operational concepts from idea to demonstration in space, to ensure more extensive utilisation of space data from existing, archived and future European missions in the scientific, public and commercial domain and to support the European research and innovation contribution to long term international space partnerships.

Major activity lines under the Space pillar of KET in Horizon 2020 Programme are the following:

- 1.6.1. Enabling European competitiveness, non-dependence and innovation of the European space sector
 - 1.6.1.1. Safeguard and further develop a competitive and entrepreneurial space industry and research community and strengthen European non-dependence in space systems
 - 1.6.1.2. Boost innovation between space and non-space sectors
- 1.6.2. Enabling advances in space technologies
- 1.6.3. Enabling exploitation of space data
- 1.6.4. Enabling European research in support of international space partnerships
- 1.6.5. Specific implementation aspects

SSH aspects in “Space”:

The activity lines listed under “Space” do neither explicitly include SSH aspects, nor do they mention themes that include obvious but implicit SSH research dimensions.

4. SSH in Horizon 2020 Part I *Excellent Science*

The Horizon 2020 Part on “Excellent Science” aims at reinforcing and extending the excellence and competitiveness of the EU’s science base. It shall contribute to the consolidation of the European Research Area. It will support individual researchers through the ERC and the Marie Skłodowska-Curie actions. The programme part “Future and emerging technologies (FET)” will extend Europe’s capacity for advanced and paradigm-changing innovation. It will foster scientific collaboration across disciplines on radically new, high-risk ideas and accelerate development of the most promising emerging areas of science and technology. Research infrastructures will be further developed. These activities are inherently forward-looking and are intended to build skills and capacities in the long term. In this part of Horizon 2020, the activities are mostly of a “bottom-up”, science-driven nature.

4.1 European Research Council

General description

The European Research Council (ERC), a flagship component of the Ideas Programme of the FP7, consists of no predetermined subjects or themes making it a bottom up approach concept. It funds cutting-edge frontier research. ERC, which over the period of FP7 became an important resource for SSH in Europe, had dedicated approximately 15% of the total budget to proposals in the SSH field of research.²

For Horizon 2020 (2014-2020), the ERC has received a substantial increase in its budget (now €13,268).

SSH aspects in the ERC

SSH research is facing a double challenge. On the one hand, European policy makers and societies at large demand new knowledge related to social, economic and cultural development. On the other hand, the research community requires data, methodologies and the necessary framework for developing the SSH themselves.

The programme aims to increase the cooperation between researchers and the generation of knowledge across Europe and to translate this knowledge into social and economic growth. For this reason, SSH researchers can participate and make use of the grants available under ERC as it is specifically designed for projects across science, engineering, humanities and social sciences. The following are the four calls in which SSH researchers can participate in:

² At the end of FP7, ERC had committed 17% of its total budget of €7,510 million to the Social Sciences and Humanities.

- **ERC Starter Grant:** this scheme targets promising researchers who have the proven potential of becoming independent research leaders. These calls, which are published once a year, are for researchers of any nationality with 2-7 years of experience since completion of PhD.
- **ERC Advanced Grants:** these grants move a step higher, as the researchers that fall under the remit of this scheme need to be already independently established researchers who are aiming to pursue ground breaking and high risk projects in their respective field of research.
- **ERC Synergy Grant:** under this grant, a small group of principle investigators are funded for the purpose of bringing together complementary skills, knowledge and resources in new ways to jointly address research problems in any field of science and engineering.
- **ERC Proof of Concept:** those that would have already been awarded an ERC grant have a second opportunity to re-apply for additional funding under this scheme. This scheme was devised with a vision of establishing the innovation potential of ideas arising from their ERC –funded frontier research projects.

4.2 Future and Emerging Technologies (FET)

General description

The specific objective of the FET programme is to open up new and promising fields of research and innovation, to foster radically new technologies by exploring novel and high-risk ideas building on scientific foundations and contribute to the European next generation industries.

To achieve this goal, FET shall promote research and technology beyond what is known, accepted or widely adopted, and shall foster novel and visionary thinking to open promising paths towards powerful new technologies, some of which could develop into leading technological and intellectual paradigms for the decades ahead.

FET activities will be structured around three strands following different logics of action:

- 2.1. FET Open dedicated to the ‘fostering of novel ideas’
- 2.2. FET Proactive dedicated to ‘nurturing emerging themes and communities’
- 2.3. FET Flagships dedicated to the ‘pursuing of grand interdisciplinary science and technology challenges’.

SSH aspects in FET

FET activities will consist primarily of bottom-up collaborative research in all fields. Thus, there is no specific activity line dedicated to SSH. Nonetheless, while the FET programme aims to be visionary, transformative and unconventional, the new logics for action and new opportunities of research for SSH must be considered:

- (a) The support for goal-oriented and interdisciplinary collaborative research might aim to further collaboration with SSH researchers.
The FET programme appeals to radical breakthroughs with a transformative impact increasingly rely on intense collaboration across disciplines in science and technology (for instance, information and communication, biology, bioengineering and robotics, chemistry, physics, mathematics, medicine modeling, earth system sciences, material

sciences, neuro- and cognitive sciences, social sciences or economics) and with the arts, behavioral sciences and humanities.

- (b) The support for new emerging research themes, with benefits for society.

The activities shall give firmer shape to different logics for action, on the appropriate scale, identifying and seizing opportunities of long-term benefit for citizens, the economy and society.

In particular, both of the following activities report SSH aspects:

- (a) *'FET Proactive'* shall, in close association with the societal challenges and industrial leadership themes, address a number of promising exploratory research themes with the potential to generate a critical mass of inter-related projects that, together, make up a broad and multi-faceted exploration of the themes and build a European pool of knowledge.
- (b) *'FET Flagships'* shall, taking into full account the outcome of FET preparatory projects, support ambitious large-scale, science and technology driven research aiming to achieve a scientific and technological breakthrough in areas identified as relevant in an open and transparent manner involving the Member States and relevant stakeholders...The scientific advance should provide a strong and broad basis for future technological innovation and economic application, plus novel benefits for society.

The activities within the FET programme should be complementary to the activities of the other parts of Horizon 2020, but they could also potentially overlap.

4.3 Marie Skłodowska-Curie Actions

General description

The Marie Skłodowska-Curie Action's will receive funding worth an estimated €5.7billion under Horizon 2020 and will sit under the Excellent Science pillar of the research framework programme.

Tuition and mobility of professionals in the fields of science and technology is essential for the development of the ERA. In FP7, the Marie Skłodowska-Curie actions (Specific Programme people) received a budget of €4.75 billion (2007 to 2013). This has been an important instrument to make Europe attractive to the best researchers. A budgetary increase to €6.1 billion was awarded for the period of 2014 to 2020.

It is noteworthy that the Marie Skłodowska-Curie actions that are about exchanging knowledge and gaining new experiences from network cooperation, as well as mobility, through a bottom-up approach with no pre-defined themes, have promoted excellence and contributed to internationalisation efforts in Europe. In strategic terms, the Marie Skłodowska-Curie actions are the most international initiatives in FP7. In Horizon 2020, the identified main objectives for Marie Skłodowska-Curie are to ensure optimum development and dynamic use of Europe's intellectual capital in order to generate new skills and innovation.

The following six objectives have also been identified:

1. Fostering new skills through excellent initial training of researchers;
2. Nurturing excellence through cross-border and cross-sector mobility;
3. Stimulating innovation through cross-fertilisation of knowledge;
4. Increasing structural impact by co funding the activities;
5. Specific support and policy action;
6. Stimulate young people to embark on research careers.

In Horizon 2020, the following four actions are proposed:

1. Fostering new skills for excellent initial training for researchers (structured doctoral training);
2. Nurturing excellence by cross-border and cross sector mobility (Marie Curie Fellowships);
3. Stimulating innovation by means of cross-fertilisation of knowledge (Staff exchange);
4. Increasing structural impact by co-funding activities.

SSH aspects in Marie Skłodowska-Curie actions

As Social Science and Humanities research remains a relatively new domain in European funding schemes, with a proportionally small share of funds, Marie Skłodowska-Curie Actions have been often seen as an alternative funding source to SSH.

For this reason, it is extremely important that Marie Skłodowska-Curie actions remain available for the Social Sciences and Humanities. Therefore, involvement of “research institutions, businesses, SMEs and other socio economic actors” in Marie Skłodowska-Curie actions should be used in the widest possible sense, including all fields of future workplaces and public engagement. Apart from that, Marie Skłodowska-Curie actions will be bottom-up and there is no pre-defined share reserved for SSH research.

It is felt that there is an imbalance in the structure of the current panels for the Marie Skłodowska-Curie actions; there are six dealing with physical and life sciences and engineering, but only two for social sciences and humanities. It has been suggested that the panels are best to be restructured along the same lines as currently used by the ERC to ensure that evaluation has a better balance under the Marie Skłodowska-Curie actions in Horizon 2020.

The following schemes are available for SSH researchers in Horizon 2020:

1. *Fostering new skills for excellent initial training for researchers (structured doctoral training)*

This action focuses on structuring the initial training of excellent researchers and doctoral students, providing them with enhanced career perspectives in both public and private sectors. In international, interdisciplinary and inter-sectoral training networks early stage researchers are equipped with a diversity of skills matching the demands of the labour market.

2. *Nurturing excellence by cross-border and cross sector mobility (Marie Skłodowska-Curie Fellowships);*

The fellowship programme will fund researchers who want to conduct a research project at an institution in another European or non-European country, thus, creating an attractive career opportunity for experienced researchers. The aim is to enlarge the researchers' competences

at universities, research institutions and businesses and to improve their career development in the public and private sectors.

3. Stimulating innovation by means of cross-fertilisation of knowledge (Staff exchange);

The increase of knowledge transfer and innovative ideas to the market is made possible under this action. This means will be achieved by exchanging highly qualified research staff between participants in different countries, disciplines and sectors within Europe and worldwide.

4. Increasing structural impact by co-funding activities.

The promotion of regional, national, and international funding schemes for young researchers is the main aim of this action. This further includes the setting up of new programmes as well as enlarging existing ones in order to harmonise them with European standards for working conditions.

4.4 Research Infrastructures (including e-infrastructures)

General description

The activities will aim at developing excellent European research infrastructures for 2020 and beyond, fostering their innovation potential and human resources and reinforcing European policy. Coordination with the cohesion funding sources will be pursued to ensure synergies and a coherent approach for the development of the research infrastructures. Synergies with Marie Skłodowska-Curie actions will be encouraged.

In Horizon 2020, Research Infrastructures (RI) will include the following activities:

- Developing the European research infrastructures for 2020 and beyond

EU funding will support the preparation phase of future research infrastructures, the implementation phase, the development of Regional Partner facilities, the operation phase and design studies for new RIs. It will support the networks and clusters that bring together and integrate, on European scale, key national research infrastructures.

Finally, support will be provided to global research and education networks, infrastructures providing virtually unlimited computational and data processing capacity and interoperable, open and trusted scientific data infrastructure.

- Fostering the innovation potential of RIs and their human capital

This activity will support R&D partnerships with industry, pre-commercial procurement by research infrastructure actors, stimulate the use of research infrastructures by industry, encourage the integration of research infrastructures into local, regional and global innovation Ecosystems.

Furthermore the training of staff managing and operating research infrastructures of pan-European interest, the exchange of staff and best practices between facilities will be supported.

- Reinforcing European policy and international cooperation

This activity will exploit synergies between national and Union initiatives and will facilitate the development of global research infrastructures.

SSH aspects in Research Infrastructures

The roadmap with ESFRI infrastructures³ includes five in the area of SSH:

SHARE, European Social Survey, CESSDA, CLARIN and DARIAH

Those that are officially under implementation are SHARE, European Social Survey and CESSDA.

The use of infrastructures in SSH research will lead to new, innovative and often interdisciplinary ways of research. For example making available our cultural heritage in digital form combined with sensitive interlinking of such resources will open a new frontier for Humanities research.

5. Conclusions

This report demonstrates that within the Council's PGA of the Specific Programme, a number of SSH aspects are present in the different programme parts of Horizon 2020.

This is particularly true for Part III. *Societal Challenges*. All Societal Challenges include SSH aspects in their texts, to varying degrees. Apart from the SSH-driven Challenge 6 "Europe in a changing world: Inclusive, innovative, and reflective societies", Challenge 1 "Health, Demographic Change and Well-being" and Challenge 5 "Climate Action, environment, Resource Efficiency and Raw Materials" include the largest share of SSH research dimensions. Challenge 2 "Food Security, Sustainable Agriculture, Marine and Maritime Research and the Bioeconomy" and Challenge 4 "Smart, Green and Integrated Transport" include many SSH aspects as well. Challenge 3 "Secure, Clean and Efficient Energy" contains SSH aspects to a lesser extent. While the topics in Challenge 7 "Secure Societies" potentially include a large number of SSH research dimensions, this is currently not reflected adequately in the analysed text, where only few aspects are mentioned explicitly. However, as outcome of negotiations between EP, EC and Council, a further activity line with a strong SSH focus is likely to be established.

While some activity lines in the different challenges concentrate on SSH-aspects (such as activity line 5.4 "Enabling the transition towards a green economy and society through eco-innovation" in Challenge 5), there is only one explicitly SSH-dedicated activity line, in Challenge 4 "Transport": "4.4 Socio-economic research and forward looking activities for policy making."

The SSH aspects that are mentioned most often throughout the challenges regard issues of behaviour, consumption and lifestyles, management and governance, public perceptions/awareness and public engagement and acceptance, policy development and decision support, policy impact assessment, social/economic innovation, market assessment & business development, economic systems and instruments. It is noteworthy that the inclusion of humanities is rather limited.

Some topics with SSH research dimensions are present in more than one challenge and a number of thematic overlaps can be identified, e.g. between Challenge 1 and Challenge 6 on

³ http://ec.europa.eu/research/infrastructures/pdf/esfri-strategy_report_and_roadmap.pdf

social models and demographic change, or between Challenge 2, 3, 4 and 5 on environmental issues and sustainability.

Within the “key enabling technologies” of Part II. *Industrial leadership*, the integration of SSH is more limited. There are no dedicated activity lines to socio-economic research, or activity lines that are mainly SSH-driven. In “Nanotechnologies” and “Advanced materials” SSH research aspects seem to be more present than in other parts. In “Space”, no SSH aspects are mentioned. All in all, the SSH research dimensions within “key enabling technologies” focus on consumer behaviour, user preferences and acceptance, governance and management issues, risk assessment and management, and the creation of business models.

Within the programmes of Part I, Excellent Science, there are no pre-defined research topics. Therefore an analysis of SSH research dimensions cannot be undertaken for these programmes. However, it can be stated, that a number of funding opportunities remains for SSH researchers within the ERC and the Marie Skłodowska-Curie Actions. In the case of the ERC, proposals crossing disciplinary boundaries are particularly encouraged. This can be a chance for SSH researchers to engage in interdisciplinary research and therefore can build capacities to foster the embedding of SSH. Within the “Future and emerging technologies (FET)” Programme a similar interdisciplinary approach is applied.

To summarise it can be stated that SSH research dimensions are present in all of the Horizon 2020 societal challenges and to a lesser extent in most of the key enabling technologies. However, they are not always obvious and clearly identified and it remains an open question how their embedding will be actually translated into work programmes and research projects.