

For a better integration of the gender dimension in the Horizon 2020 Work Programme 2018-2020

Position paper
Advisory Group for Gender
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PART I

Framing and objective of this paper

The mandate of the Advisory Group for Gender is to provide advice pertaining to all activities under Horizon 2020 where gender equality and in particular the integration of a gender dimension in research and innovation content is relevant.

This position paper from the Horizon 2020 Advisory Group for Gender aims to contribute to the preparation of the 2018-2020 Work Programme, extending and updating the suggestions proposed in its previous position paper of 2015. It takes into account the new priorities of the different Horizon 2020 Advisory Groups and proposes new ways to further integrate the gender dimension into research and innovation (R&I) content, throughout all parts of Horizon 2020.

NB: The *gender dimension in research and innovation content* is not the same as *gender balance in research teams*. Both aspects are important Horizon 2020 objectives of gender equality. This paper addresses the gender dimension in R&I content.

The *gender dimension* is a dynamic concept that ensures that researchers question gender norms and stereotypes and address the evolving needs and social roles of women and men. Addressing the gender dimension in research and innovation entails taking into account sex and gender in the whole research process, when developing concepts and theories, formulating research questions, collecting and analysing data and using the analytical tools that are specific to each scientific area.

The quality and accountability of research is affected negatively when sex and gender is not taken into account. Therefore, the gender dimension is an essential aspect of **research excellence**. It increases **the societal relevance of the knowledge produced, as well as technologies and innovations**. It also contributes to the production of **goods and services better suited to potential markets**. It is therefore essential to devote resources to these aspects of research. Depending on the field of research, this entails an analysis of gender, sex or both.

Gender is a key analytical and explanatory variable in research. Gender, as a socio-cultural process, refers to cultural values and social attitudes that together shape and sanction "feminine" and "masculine" behaviours. It also has an impact on the design of products, technologies, environments, and knowledge. Gender assumptions often go unquestioned and can unconsciously influence scientific priorities, research questions, and choice of methods. Awareness of gender aspects is therefore a key component of research excellence.

Sex refers to biological characteristics of women and men, boys and girls, in terms of genes, chromosomes, anatomy and physiology. Sex is globally understood as the classification of living beings as male and female, or intersexed. Sex differences and similarities relevant to research and innovation should be thoroughly investigated.

How to include the gender dimension in the Work Programme and topics: general recommendations

- **Explain why sex and/or gender matter in your area:** think about and present the ways in which taking into account the gender dimension will provide added value in terms of creativity, excellence and return on investment, both from private and public perspectives. Addressing sex and/or gender aspects is an emerging and important dimension of research in many scientific and technological fields, representing a valuable source of innovation.
- **Make it explicit:** indicate in the topic how exploring sex or gender aspects is relevant and must be taken into account. If it is not specifically mentioned in a topic, there is a risk that the gender dimension will not be considered at all in the proposals. If sex and gender aspects are referred to in vague terms in a topic, proposers often ignore them. Therefore, the way they need to be mobilised should be mentioned *very explicitly* in topics. Evaluators will then assess the gender dimension alongside other relevant aspects of the proposals.
- **Foster the production of new knowledge on gender:** consider what is already known in your area in terms of the gender dimension and identify what is missing. In many areas, gender knowledge still needs to be generated. You should signal it and indicate **which gender aspects should be explored**. Calls specifically focusing on increasing and updating gender knowledge should be considered.
- **Addressing sex and gender aspects is often part of a multidisciplinary approach.** Multidisciplinary approaches are encouraged in Horizon 2020. Reflecting on gender considerations in relation to health, transport, energy, security, etc. is a great opportunity to foster the cooperation between scientists with gender expertise and others. It helps concepts to cross the borders of scientific fields and encourages research methods to evolve.
- **Include gender in the impact statement:** the statement on expected impacts is an important part of the topic description, which evaluators will assess under the impact criterion. Sex and gender related outcomes may be among the key aspects of the expected impacts. It can be expected that the funded action will have an impact for instance on boys or girls, women or men, gender relations, socio-economic positions and the status of men and women. It can also be expected that funded actions and funded research should contribute to advance gender equality.
- **Remember that specific studies on gender, as well as training on the gender dimension** can be included by applicants in their proposals as **eligible costs**. This is a novelty of Horizon 2020. The aim is to help researchers develop and share gender expertise in relation to the funded projects.

Further information and resources on gender

- **The Gendered Innovations project**

- 1) Developed practical methods of sex and gender analysis for scientists and engineers;
- 2) Provided case studies as concrete illustrations of how sex and gender analysis leads to innovation. The fields covered were: basic science, engineering and technological development, environment, food & nutrition, health & medicine, transport, communicating science

"How Gendered Innovations Analysis Contributes to Research" http://ec.europa.eu/research/science-society/document_library/pdf_06/gendered_innovations.pdf

More info on http://ec.europa.eu/research/swafs/gendered-innovations/index_en.cfm?pg=home

- **Gender Toolkit - How is the gender dimension integrated into a project?**

Developed for FP7, the practical toolkit comprises an overall introduction to gender and research and shows how gender is interwoven with all aspects of research. It then examines in pragmatic terms how the gender dimension of research content contributes to excellence in research. It also analyses case studies based on concrete examples drawn from nine specific research fields: health; food, agriculture and biotechnology; nanosciences, materials and new production technologies; energy; environment; transport; socio-economic sciences and humanities; science in society and specific activities of international cooperation.

[Link to the Gender Toolkit](#)

- **GenPORT portal**

GenPORT is a developing online community of practitioners, served by an internet portal and made up of organisations and individuals working across the globe for gender equality and excellence in science, technology or innovation. GenPORT covers all sciences - natural and social sciences, as well as humanities. GenPORT offers an arena for organisations and individuals to showcase and access the world's best research resources, practical materials, policy briefings, experiences, and much more. Constantly evolving online information and services will be shaped by the activities and contributions of community members.

Sharing resources on a global internet platform makes them prominent and visible to a huge user base. Allowing users to shape the portal and its contents allows users to tailor these resources to their own needs, and to make them more easily accessible and searchable. The creation of the online community offers a fast track to experience sharing, and supports continuing policy and practical learning in pursuit of good practices in gender equality.

More info on www.genderportal.eu

- **Gender-Net ERA-NET**

The Gender-Net ERA-NET has just produced manuals on the integration of sex and gender analysis into research content: http://www.gender-net.eu/IMG/pdf/GENDER-NET_D3-11_Manuals_with_guidelines_on_the_integration_of_sex_and_gender_analysis_into_research_web.pdf

- **The COST Action GenderSTE**

The GenderSTE project encourages networking across researchers, practitioners and policy-makers on gender equality in R&I. It disseminates methods for sex and gender analysis in research, in the fields of transport, energy, climate, cities and innovation. More info on www.genderste.eu

- **She Figures 2015**

The She Figures reports are a mine of statistics on gender and science issues in European countries. The 2015 issue has begun to approach gender in research content, providing the proportion of a country's scientific publications integrating a gender dimension in their research content. Download She Figures 2015 here:

https://ec.europa.eu/research/swafs/pdf/pub_gender_equality/she_figures_2015-final.pdf

PART II: Concrete suggestions for each Horizon 2020 Work Programme Part

Societal Challenges

Health, demographic change and wellbeing – Societal Challenge 1

Research about health, demographic change and wellbeing requires attention to sex differences and to gender aspects as they jointly determine any eventual health outcomes for individuals. To promote more targeted citizen-centered and personalised treatment and healthcare, data and results from European Commission funded projects should be disaggregated and analysed by age, sex and gender, as well as within and between both sexes. This is essential to examine and understand the causal mechanisms behind development of health conditions and reduced well-being across the lifespan.

The Advisory Group for SC1 Health has proposed **seven vertical research themes** for the Work Programme for “Health, Demographic change and Wellbeing” 2018-20:

1. Personalised medicine
2. Rare diseases
3. Infectious diseases
4. Non-communicable diseases
5. Pediatrics
6. Public health and prevention including migration
7. Active and healthy ageing

There is a potential gender dimension on all of these seven research themes and it is important that topics for 2018, 2019 and 2020 explicitly encourage applicants to explore gender and/or sex aspects in their proposals.

In addition to these seven main themes, the AG SC1 has proposed horizontal themes, among which Sex and Gender in Medicine.

Personalised medicine, Rare diseases, Infectious diseases, and Non-Communicable Diseases:

Over the years, scientific knowledge has increasingly demonstrated that some treatments affect men and women differently. However, the proportion of treatments to which men and women respond differently is yet unknown. Many physiological, pathological and psychological functions are influenced by sex-based differences in biology. Recent research on cardiovascular disease, osteoporosis, depression, anxiety, eating disorders has identified significant differences among women and men with respect to the distribution of these diseases. **Women and men have different sex- and gender-related risks for developing certain conditions and respond differently to treatment.** For example, biological differences between males and females can affect how a medicine works in the body. Additionally, patterns of gene expression differ between males and females.

Clinical trials, experimental and non-experimental research should reflect the sex distribution of the population groups to be included. In the past, women have often not been included in clinical trials in statistically relevant numbers to allow for systematic analysis of sex differences. In the cardiovascular disease field, **women have largely been under-represented in clinical trials.** This has resulted in safety and efficacy of several drugs being evaluated predominantly in male populations. It has also been demonstrated that some therapeutic options are not equally effective and safe in men and women, girls and boys. This is also the case in other disease areas such as depression, arthritis, autoimmune diseases, etc.

As medical research moves towards personalised medicine, sex differences at the basic cellular and molecular level will become even more important. As the benefits of precision medicine are yet to come, the **best available strategy at this moment in time is to include a sex and gender analysis**, incorporating

sex specific epigenetic modifications through lifestyle and environmental effects, that themselves may be gender related. Sex and gender determine cellular pathophysiology and the crosstalk of the organism with the environment as well as stress responses of isolated cells, of male and female organisms and, finally, coping strategies of individuals. Men and women (or girls and boys) should be included as subjects in the research unless there is a good explanation as to why not.

Reducing the burden of chronic diseases like diabetes, cardiovascular disease, cancer and mental disorders is a priority of EU Member States and at EU Policy level, since they affect 8 out of 10 people aged over 65 in Europe. Collection and use of 'big data' for understanding disease pathways and for identifying risk factors leading to disease should be conducted in a sex and gender sensitive manner. For instance, in Genome Wide Association Studies, inclusion of women is currently low and sex chromosomes are frequently excluded from the analysis.

Pediatrics, Public health and prevention including migration, and Active and healthy ageing:

A focus on the life course and healthy ageing calls for attention to how nature and nurture interact and how this may result in sex and gender specific outcomes. Sex and gender analyses have to start in pregnancy and longitudinal, prospective studies should follow individual development through the various age phases of the lifespan of both men and women.

Research needs to explore how girls and boys, women and men experience well-being, health, service and care across the lifespan and in different social contexts. Particular attention should be devoted to different social groups, such as migrants and asylum seekers or intersex, lesbian, gay, bisexual, transgender (LBGT) people. We know very little about girls' and boys', women's and men's different perception of the aims and content when it comes to population based and targeted prevention. Taking into account the evidence from sex and gender research will lead to more targeted, effective opportunities for prevention, treatment and care.

Research into **risk factors for chronic diseases (NCDs)** constitutes an area of high public health relevance in European countries. It can be improved by integrating sex and gender, thus contributing to the evidence base for the prevention of chronic diseases and the promotion of active and healthy ageing. It is important to acknowledge that **wellbeing and lifestyle factors are influenced by gender norms** determining, for example, differences in diet, nutrition and exercise patterns between women and men, girls and boys.

Modern child developmental theories have proposed various views about potential gender differences in adjustment, mental disorders, coping strategies and resilience. Sex and gender analyses are therefore needed to understand the different ways in which **girls and boys regulate emotions, suicidal ideation, attention and aggressive impulses**. Similarly, we need comparative studies among **boys and girls about social competence, stability of friendship, well-being and coping with adverse events** through adolescence and young adulthood. In general, there is a need for analysing mechanisms behind change and stability in gender specific behaviour from cradle to grave. This can be done by **conducting developmental studies of behaviour genetics, psychophysiology, developmental psychopathology or personality**.

Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and bioeconomy – Societal Challenge 2

The report of the AG for Societal Challenge 2 is structured around four focus areas: Sustainable food security; Rural Renaissance; Blue Growth and Bioeconomy. The AG SC2 members identified several research gaps to be addressed between 2018 and 2020. Gender relevant themes are included in all four focus areas but are especially prevalent in the first two. It is essential to reflect more in depth on the gender differences which affect the social and economic foundations of these sectors and to explore

recent evolutions, in particular in the light of the **changing roles of women and men in rural development and the sustainable food security**.

In the “**Sustainable food security**” focus area most of the collected research gaps would require a gender dimension, especially in the “Informed consumer choices” and the “Healthy and safe foods and diets for all” subsection. Consumer choices have the most obvious gender dimension as diet choices and the selection of foods frequently present strong variations among boys and girls, men and women, as do their roles within a household. In case of healthy food innovation, the gender dimension is also quite clear as physiological sex differences in taste and food uptake should also be better understood. In case of food safety, the gender link is less apparent but equally important if we take into account the fact that households are the weakest points in the food system and are responsible for most of the food safety incidents.

In the “**Rural Renaissance**” focus area it was evident that at least some of the identified research gaps would benefit from taking into account the gender dimension. In the area of “Rural development and innovation” identified research gaps are all related to different dimensions of demographic changes affecting men and women differently (e.g. migration, depopulation, youth, repeasantisation and food policies). Another strongly gender related area is “Knowledge and Innovation Systems” where the identified research gaps are all related to knowledge uptake which has strong gender differences (e.g. ICT literacy, entrepreneurship, learning cycles and regional differences within the EU).

In general, agriculture, forestry, marine and maritime and bioeconomy are characterised by strong gender differences in their governance, work cultures and professional roles, where masculinity is often put to the fore. Men's needs and concerns have been traditionally predominant in their economic governance and technological development. Thus, **the gender dimension provides an important and interesting research area, to explore identified social, governance and technology related research gaps** (e.g. precision farming, animal welfare, climate smart agriculture, waste and resource management, public goods and ecosystem services).

Moreover, the AG SC2 has identified a number of **links to and synergies with research gaps in other societal challenges**. The gender relevant thematic link proved to be the most obvious in the cases of SC1 through the topics of healthy diets and rural demographic change (in particular ageing), SC6 through the topics of rural demographic change (migration – both refugees and migrant workers often in seasonal labour) and rural entrepreneurship (farm diversification and new rural enterprises).

Secure, clean and efficient energy - Societal Challenge 3

The transition towards a new energy system, secure, clean and still affordable, requires a new thinking. Integrating a gender dimension into the work programme will provide added value in terms of creativity, excellence and return on investment. This includes energy research involving an equal share of women and men in research teams, but it also demands a gender dimension in research.

Customers, or prosumers, have a crucial role in the future energy system. Consumer behaviour is an important issue not just for physical operations but also for planning of energy systems. Studies on energy consumer behaviour have shown differences between men and women. Additionally, differences in energy consumption behaviour can be expected in culturally diverse societies, notably in European cities. Different cultural backgrounds bring different expectations for energy supply as well as different behaviours in energy use. Thus, **all research regarding active consumers or consumer involvement has to explore the gender dimension as well as the cultural dimension**. Especially when exploring the future role of prosumers, gender may have an impact on acceptance and user expectation.

Energy efficiency in buildings: energy saving in buildings is a still untapped potential. The gender dimension of the smart home so far is mainly only seen in regard to the ageing society and to telemedicine. But even in these areas, in regard to energy issues, the gender dimension has not been fully explored and may be one of the major reasons that the smart home concept has not reached the

market growth that has been anticipated for years. If energy efficiency in buildings is to be deployed in the market more strongly than at present, **women and men have to be taken on board**:

- For re-thinking energy efficient potentials and smart home applications
- For designing simple and reliable systems with useful assistance and information for the inhabitants
- For market deployment initiatives linked to gender differences and expectations in regard to energy

As a cross-cutting issue **for energy research in the smart home environment, gender experts and researchers covering all key enabling technologies should work together** for new integrated solutions, which can cover energy as well as health, environmental and security issues in homes. New solutions building on photonics, nano-electronics, microsystems, new materials and advanced manufacturing can bring major transformations to homes to make them safer, healthier, cleaner, more environmentally friendly. Creativity labs can be used to **introduce gender dimensions into this forward-looking research**, engaging both women and men to share their experiences and plans for their homes.

Smart cities: Gender is a key factor for smart cities, since cities and districts are largely influenced by the people who live in them and who experience them in different ways. Their behaviour impacts energy demand for housing, transport, lighting, etc. Women are often on the alert for secure and environmentally friendly solutions. Smart cities are not just an issue of energy, but of transport, health, security and many other areas of life. **Women and men may use different routes in cities and have different behavioural patterns in transport.** For instance, studies have shown that this is the case for cycling and walking where women prefer routes with infrastructures that they perceive to be safe. Security and practicability issues arise especially when travelling with children. Research has to be re-focused on the needs of parents or caretakers and of children and on caring roles in general, including those related to the older population, if smart cities are to be successful, fitted to and accepted by the society at large. Women are more likely to put more focus on actual benefits with regard to security and sustainability than the technology. It has to be kept in mind, however, that meeting needs which appear to be gender specific may contribute to reinforcing existing “gender roles”. For instance, owning a car can mean that women/mothers are enabled to better perform their already existing role. Research should focus on innovative solutions that also advance gender equality.

The focus is on **intelligent, user-driven and demand oriented city infrastructures and services.** It is a cross-cutting theme and should not only include energy and transport driven by ICT, but all key enabling technologies, as well as healthy living and ageing, as cities cover all aspects of our lives. The gender dimension is crucial and should be mandatory in terms of

- ensuring an equal share of women and men participating in research as well as user integration, and
- ensuring gender related research questions and analyses in all stages of the innovation chain with regard to impact on different societal groups, particularly men and women.

Research on actual experiences and tests of **the energy transition and its actual management** shows that there are also gender differences in the way citizens react to innovation in terms of energy regulations about its use and production. Conflicts and resistances usually occur, in different forms and with different intensity depending on local circumstances and type of intervention, with women generally playing a more active and positive role, mediating and negotiating and helping managing conflicts. Therefore, gender differences in attitudes, responses and agency should be considered.

In the area of technological research in energy, the **impact of the technology on all societal groups**, men, women, the elderly or children, has to be explored. For instance, since the elderly, children and some women are at home more often than men, environmental impacts of technology may affect them differently.

Training on gendered innovation methodology should be mandatory for all project partners in energy technology since gendered innovation is still untapped for the energy sector. So far only few data are available in regard to energy related behaviour. Specific gender knowledge about energy technology,

energy use, energy related use of technology etc. has to be generated, so that impact and final exploitation and market deployment can be more effective.

Smart, green and integrated transport – Societal Challenge 4

Gendering European Transport and Innovation

There is ample evidence of gender as a vital cross-cutting category that relates to structures, identities and cultures in European transport and mobility. At the same time, there is a need for more complex and fresh approaches, to explore the influence of gender practices in transport demand and supply, and the links to the shaping of transport policies as well as research and innovation activities. A deeper and sounder understanding of **how gender relates to the new technological agendas and future prospects of European transport and mobility and innovation** is needed. Among the questions that should be raised:

- What are the gender-related implications of policies, regulations and new standards and forms of transport governance?
- Are there gender patterns of acceptance and resistance to emerging or missing services, technologies, including dimensions of age, class, ethnicity etc., and what is their background?
- How can gendered innovations optimise market opportunities?
- How can gender equality in transport and mobility be increased e.g. in good practices, public mobilizations and contributions to accountable transport and mobility solutions?
- How can variations within both genders be investigated?

Transport safety and security

In legal and consumer evaluation of transport safety, the average male represents the whole population. European industry in the transport safety area could be world-leading if that norm was broadened to also include the average female. **Substantial societal saving would be achieved by addressing safety of men and women equally well**, in particular with situations that risk harm in transport that depend – among other things – on gender specific mode use differences. Additionally, safety as well as security issues should be taken into account with respect to infrastructures that provide access to transport modes (e.g. pedestrian tunnels for access to train platforms evoking feelings of threat in particular for women or the elderly).

Urban planning/ mobility challenges in urban areas

One important trend in women's activities is their massively increased engagement in professional work which goes hand in hand with a "division of labour" within the family and the household. As a result, transport needs and needs while travelling change. Transport no longer has to fulfil only the direct immediate transport needs of women and men, but also the transport needs of those they are caring for – be it children and other persons, in particular the elderly. This means that a perspective is needed that embraces the needs of a household, not only individuals.

Generally speaking, we need to design, organise and manage transport and mobility in a way that is more responsive to women's and men's needs. Requirements change with respect to networks and routes that are covered by public transport or cycling infrastructures. **Research is needed that addresses the particular needs of women and men with respect to all transport modes** taking into account the fact that resolving accessibility issues - to education and training facilities or job opportunities, for instance - can largely contribute to closing gender gaps.

Automated transport

Automation will bring about a fundamental change of the transport system. The implementation of automation into the transport system should make reference to **specific needs and interests of women**

and men of all ages, not least because it can be assumed that the individual acceptance of an automated transport system will largely depend on its perceived usefulness. Specific needs and interests do not only result from gender differences, but also from intersecting factors such as age, income level, cultural aspects and regional characteristics. The gender dimension also needs to be applied to better understand human-machine interactions and male and female users' behaviour

Smart and sustainable transport for all, gendering new biking in Europe.

Many cities and residents in Europe are eager to revitalise visions of the bicycle as a daily mode of transport. This is motivated by ever-worsening road congestion, the inefficiency of conventional urban public transport, and a wish to improve health conditions. The return of the bike is closely connected to new forms of technology, production and consumption. New types of biking come in the shape of mountain and sports biking and public bikes. Currently there is a division between the European countries with Denmark, Holland and Germany serving as models for biking friendly regimes with a high level of overall biking and with a higher level of equality among bikers regarding gender and age. In what ways can **new types of biking be made smarter and more inclusive in terms of technical innovations and proximity to users according to gender, age, ethnicity etc.?** And how can the new bike systems be linked to city wide and integrated transportation and access for all?

Safe, assessable and fair transport for seniors

Europe is facing a new demographic trend and in 2016: 55+ European citizens will represent approximately 30% of the population. This poses new challenges and opportunities for future developments of safe, accessible and fair transport for seniors. It is useful to advance knowledge about how gender specific needs and demands could influence technologies, products and services that will enable seniors to pursue an active, healthy and independent life. The focus should be on a variety of trends and innovations that cross cut public and private, rural and urban, as well as motorised and semi-motorised modes of transport. Also, **gender differences should be taken into account in terms of technology practices, driving abilities and interests.** Research and Innovation in this field have a huge export potential. For example, China is facing similar demographic trends in the near future and has an interest in keeping seniors mobile.

Data and statistics

Transport statistics and other indicators, which are the lifeblood of transport policy, are in need of innovation and sophistication in order to comply with EU policy agendas of sustainability and equality for all. Present day transport statistics tend to focus on status quo and operate with abstractions of individuals as neutral users or citizens. Besides, **most data and statistics in transport** apply very simplistic categories, e.g. in terms of gender that is translated into binary male/female variables, but which **lacks context and specificity such as age, class, ethnicity, disability, sexuality** etc. In order to advance efficient inclusive and sustainable solutions to current transport problems which serve the wellbeing of all, there is a need to develop fresh indicators together with new survey technologies, big data etc. **Methodologies and indicators should aim at including vital questions of social, cultural and gender dimensions along with indicators of broader mobility patterns and potential change.**

Climate action, environment, resource efficiency and raw materials - Societal Challenge 5

The SC "Climate action, environment, resource efficiency and raw materials" has a major societal dimension and raises numerous gender issues. Public engagement and governance issues are common to all these areas and attention to socially responsible solutions (participant, cooperative, grassroots initiatives) is particularly necessary in this field. Gender-related social roles, communication practices and

power issues need to be taken into account in this context. Here are some examples of issues related to gender for the AGs five new priorities:

Climate Action after COP21

A major social transformation needs to take place to reach the 1.5° global temperature increase target and much effort must be put into understanding what this implies. Policy needs to be improved in this field and linked to other policy areas to ensure overall coherence. Citizens need to be included in the making of future choices. **Gender analyses need to avoid simplifying (i.e. seeing women only as victims in the global south) and to carry out gender analyses of policies.** Gender dimensions need to be taken on board in such topics as:

- Understanding social representations/perceptions of climate change, of adaptation/mitigation, of possible pathways, etc.;
- Comparisons with other societies in time (history) and space (sociology, anthropology) should be made to inspire new solutions;
- In the Arctic, which will undergo massive transformations due to climate change, the populations concerned need to be studied, to evaluate impacts and to engage them in future choices;
- On more technical issues like biomass and forestry or intensified agriculture, it is necessary to work with populations to explore bottom-up solutions and question their scale – all this with a gender perspective. Work forces and work practices in these fields need to be studied, including issues of masculinity/femininity;
- A user's point of view, including gender perspectives, is required on Climate Services and Climate data to establish what type of data is needed, how should it be presented, etc.;
- Specific research on gender and climate change should be proposed.

The circular economy

A circular economy is resource intensive, recycles, uses waste as a resource, looks for new synergies, etc. Among issues where a clear gender dimension is needed:

- The study of work cultures in sectors that were independent but that will now have to collaborate. Questions of masculinity/femininity often arise;
- A focus on the building sector (particularly renovation) and how it evolves (or not) is needed. Gender – particularly masculinities – will be an important dimension;
- Perceptions of recycling, of waste need to be understood. These often refer to ideas of cleanliness/dirtiness that are probably affected by gender;
- Study of frugal “traditional” practices need to be carried out;
- In demonstrator projects, attention needs to be given to gender issues related to participation in the projects as well as to their content;
- Gender & entrepreneurship questions should be researched specifically.

Innovative and resilient cities and rural areas

This topic focuses on a territorial dimension, and is strongly linked to food, transport, energy, health, etc. that all have clear gender dimensions (see the recommendations given for these SC's in this paper). The gender dimension of the occupation and use of space needs to be studied. Issues of resilience, of social inclusion are central and are strongly gender-related (see for instance the high poverty rates among single parents who are more frequently mothers). Participatory approaches are essential in designing the future organisation of cities and rural areas and demonstrator projects would be appropriate. Attention needs to be paid to gender balanced participation in devising these exercises, but also to putting gender-specific issues to the fore.

The water-food-energy nexus

This is an issue that links SC5 (in charge of water) with the SCs for Food and Energy (see above). Here again, the gender issues related to production roles, consumer preferences, to workplace practices, etc. need to be taken on board transversally.

Managing transformation

An **understanding of “social innovation” / social change is needed**: understanding present practices and reasons for changing - or not. Gender is an essential dimension of this analysis and research specifically focussed on gender and processes of change would be appropriate. **Governance** is a major element in enabling transformation, and gender-related power issues will inevitably be raised. A major challenge is to include poorer, less favoured populations – here again gender is a major issue.

Europe in a changing world: Inclusive, innovative and reflective societies - Societal Challenge 6

The full title of Societal Challenge 6 is deliberately included above since **“inclusion” re-emphasises the importance of “reflection” into the nature and origins of inequalities**, in order to devise “innovative” solutions that will deliver strategies for change. In its report, Advisory Group for SC6 advocates research that will have genuine impact in reducing discrimination, both explicit and implicit; improving societal cohesion; and creating opportunities for all European citizens. Whilst all Horizon 2020 research needs to embody considerations of gender equality within the formulation of research questions and programs of work, within SC6 we would expect to see elements of the calls that, within the major themes proposed, specifically **address fundamental research into consideration of the concept of gender itself and how it can be related to the development of successful policy interventions to reduce discrimination**, not only on the basis of gender but also on the basis of other differences. Gender is clearly a priority since it affects by far the largest proportion of all human societies, but a reflective society is one that examines the experiences of all its citizens and, since a civilised society is one that projects its values to the rest of the world, their relation with other societies. The AG SC6 would hope that this approach will also be introduced systematically elsewhere in Horizon 2020.

The report of the AG SC6 elaborates three major themes (“Migration”; “The human and social dynamics of the Fourth Industrial Revolution”; and “Governance for the future”) alongside five cross-cutting issues (“Gender”; “Ethics and values”; “Digital”; “Sustainable development”; and “Europe in the world and international collaboration”). The cross-cutting issues are used to inform the major themes and the group felt that it was important to integrate these into research on the major themes - treating them separately is likely to miss important opportunities for coherent and high quality research and innovation.

It is worth highlighting that across the board in these areas **reference to gender is also integral to awareness of wider issues of diversity and questions of inclusion and empowerment** linked directly to them. These are fundamental to understandings of power imbalances and challenges to societal cohesion and often have complex contemporary and historical underpinnings that require investigation. Gender can be a key analytical starting point for interrogating such circumstances and building research agendas fit to explore them.

Migration: Understanding human mobility

The SC6 work programme should recognise the holistic structure, essence and dynamic mechanisms of migration. The term migration covers many diverse types and actors, such as refugees, asylum seekers, family re-unification, economic migration, intra-European migration, external migration to and from

Europe, etc. These need to be distinguished, but the interplay between them is also important within the overall concept of 'human mobility'.

The specification of actors involved in the current European migration and refugee challenge is needed to **understand the societal dynamics** of these phenomena. This will help in the examination of the multiple and interlocking issues related to migration and refugee movements upon diverse sectors of society. These include all aspects of inclusive, innovative and reflective societies, such as ways of life, integration, assimilation, culture, history, diversity and multi-culturism, refugee movements, diaspora, post-colonial relationships, demography, labour, education and other issues. In turn, these issues involve and impact different actors in diverse ways, for example, families, both separated and re-united, unaccompanied minors, intellectuals, artists and creative professionals, skilled labour. Gender should be taken into account in each case.

There needs to be a specific **cross-cutting focus on gender**, not only as a stand-alone issue. In many situations, women and girls are the most vulnerable individuals among refugees, both as treated by the group and in the way European policy responds. Women are also more likely to be left behind or to be trafficked, whilst young single male refugees often travel alone and are more likely to become alienated and drawn into criminal activity. **The transformation of migrant and refugee communities in Europe is a specifically gender-related topic which needs to be researched separately.** The complexities of tendencies such as the radicalisation and populism of individuals in different communities cannot be understood without a gender dimension.

A gender perspective should not only focus on women. There are many young single male refugees who need to be included into society in a productive manner, so that their abilities can be used and enhanced, their welfare secured, and the stability of European societies can be maintained. However, it is clear that in some cultures and ethnicities, women are the family carers and this has been widely used as a positive strategy, so that for example financial resources are entrusted to them. This implies that **research and innovation needs to include a wide range of different approaches to tackle the 'integration' topic.**

The human and social dynamics of the Fourth Industrial Revolution

Gender related issues cut across all societal implications of the Fourth Industrial Revolution, including in relation to work, education and social relations. For example:

- What are the consequences of the fact that care work remains largely unpaid and done by women?
- Why does the so-called 'glass ceiling' still often block the rise of women to positions of high power in the workplace?
- Why are they more likely than men to be unemployed and in precarious work?

The normal academic discourse warning of a 'race to the bottom' and the formation of both a European and global 'precarariat' in terms of the types of work and working conditions tends either not to take into account gender or to be focused on the loss of traditional male manufacturing and blue-collar work over the last twenty years. However, recent research shows that both historically and at the present time, such precarious work is much more prevalent in female employment. This historical precariousness of paid women's work contrasts quite sharply with the contemporary relatively stable framework of male employment in both blue-collar and white-collar occupations. This, coupled with much women's work traditionally being unpaid, for example in the home, casts a new light on gender differences in employment which requires more research, especially in the context of the Fourth Industrial Revolution.

More positively, there may be potential benefits for traditionally female oriented jobs arising from the increasing importance of emotional Intelligence in the Fourth Industrial Revolution (i.e. it is not possible to automate compassion). At the same time, it might be fruitful **to explore potential ways to channel this importance into higher paying employment for women.** This presupposes, in fact, that men in general do possess lower emotional intelligence than women, which is by no means established even though it may reflect current perceptions. These points indicate the **need for wide-ranging research on**

gender dimensions of key areas of skills such as emotional intelligence, but also creativity, critical reflection etc.

Governance for the future

Governance policies, decision-making, legal and regulatory frameworks, etc., largely determine many of the system characteristics within which European society operates and is structured, both formally and informally. Much of this is historical legacy from periods when gender differences were often strongly reinforced and when women were subject to significant exclusion in most walks of life, including in the public sphere. Although many formal structures reinforcing these mind-sets have since been dismantled in Europe, much still needs to be done. Many vested traditional attitudes remain which still erect significant barriers making it difficult for women to lead full, equal and active lives. Gender issues are thus central to the governance debate, not least because in almost all European countries, female politicians are in a small minority and are thus in practice largely on the edge of political power and influence, despite making up half of the population. The few exceptions include Norway where all main parties have a mandatory 40% minimum of women members of the national parliament. These issues **require focused research and innovation in order to assist in changing the balance of power in governance** in European societies.

Secure societies - Societal Challenge 7

Gender is fundamental to research and innovation aimed at protecting the freedom and security of Europe and its citizens. This operates at all levels of society and the market and applies to implementation of EU policy initiatives on security matters, resilience at societal and individual levels as well as the competitiveness of the security industry. **Gender aspects can be explored as part of the societal dimension of security**, where new research domains have emerged such as the links across culture, risk perception and disaster management, and human factors in security areas. **Gender dimensions of secure and resilient societies need to be considered across all areas of threat and risk as well as when evolving strategies** to address them. Diversity in vulnerabilities and understanding of constraints on and opportunities for rapid response in different public spaces are part of this picture. Awareness of different end users and communities that benefit from processes and products also includes gender considerations. Gender aspects of security and privacy risks feature as part of innovation processes in which diversity of end users is part of market segmentation. **Newly developed tools and methodologies need to be designed and tested for diverse user groups such as:** police and other emergency services, citizens, different communities and gender groups, and cooperating organisations. Unintended negative consequences of the application of these tools and methodologies for one or several of these groups should be an integral part of the testing. Gender considerations can also be important for detailed assessment of the effectiveness, or forms of resistance to, diverse policy strategies and goals across different sections of society.

In the area of **Borders and External Security**, gender impacts on the nature of flows of people, immigration and border control. Gender affects the experience of disaster or displacement related to these flows and the ways in which people are made secure or insecure. Gender impacts aspects such as innovations in identifying risks or threats through visual or technological processes as well as the development of protocols relating to the diverse forms of movement across borders in different locations (airports, large or small ports, etc.). Considerations of gender contribute to greater specificity in understanding differences across time and place as well as situations.

In the area of **Fighting Crime and Counter Terrorism**, gender considerations come into play in widespread ways including in relation to perpetrators and victims of crime and strategies for, and instruments and processes of, counter terrorism. This includes detection across online and offline environments and networks, and issues of cybersecurity where systems may need to take account of gender characteristics of particular groups of users and contrasting risk factors affecting them. A specific

focus might be devoted to the **international gender and diasporic dimensions of radicalization and counter-radicalization including women's and men's roles in preventing and countering violent extremism**. Trafficking of goods and people in different forms features gender characteristics in those controlling it as well as those who are the victims of it.

Secure and Resilient Societies, with increased resilience linked to better design and governance of dynamic socio-technical systems, need to take account of gender, including through detailed understanding of contrasting ways of engaging different groups in society as well as assessing varied forms of impact upon them. Growing emphasis on live and adaptive responses to crises – whether due to crime, terrorism or natural disaster – need to consider gender in terms of social roles and locations and risk factors and constraints, as well as differentiated paths towards empowerment and agency in such circumstances. In this context **examining gender issues related to active citizenship towards resilient societies offers possibilities for new approaches and strategies in areas such as community awareness and leadership and crisis readiness and management**. The values-based social contract between public and private institutions and people in these developments needs to navigate gender issues around trust, to contribute to the success of such structures in terms of their configuration, acceptance and operation. Gender is in play when considering how different groups of practitioners operate in crisis situations as well as how they develop systems of best practice for co-operation with each other and improve the effectiveness of their engagement with citizens. Technologically driven solutions offer possibilities for building gender sensitivities into social networks in innovative and effective ways to deepen engagement with sections of society, or reach them more effectively. **New interdisciplinary research aimed at motivating and empowering different populations to contribute to security and resilience, as well as social cohesion, can usefully take account of gender**. Different social and community public and private roles and identities are all in play in this context.

Cybersecurity and Privacy Technologies involve gender considerations in the move to more user-friendly and accessible security systems and strategies for making individual users in different work, consumer and service environments, more active participants in safeguarding the resilience of the digital economy. Specialised systems in sensitive areas such as health and finance are major spheres of innovation aiding public confidence in, and growth of, diverse market sectors. Gender aspects of security and privacy risks feature as part of innovation processes recognising diversity of end users as part of market segmentation. Gender considerations are part of wider awareness of diversity in usage patterns, personal data risk factors, and security needs. In such ways gender considerations can inform strategies for keeping security and privacy central to digital innovations on user-centred bases. In the Internet of Things and Big Data economy the complexity of connections across people, places and things grows exponentially. **Gender is one of the key lenses through which innovation can be viewed and new systems, products and services developed**. It is also an important lens for **understanding surveillance and assessing risks to privacy and security**. Gender factors come into play when considering innovations linked to data usage control. Gender contributes to shaping market uses of direct and derived data and related understanding of how the digital economy is evolving. This includes highly diverse and ever increasing strategies for harnessing profit from data and patterns of usage. Gender considerations feature in the trade-off between user or customer benefits and provision of personal information.

Growing a Competitive European Security Industry presents a number of challenges on the gender front linked to wider debates about the importance of bringing more women into science and technology and the need to increase the finance options available to them in starting and growing their own businesses in the sector. The security sector is notably male-dominated and it may be that specific funding instruments related to gender and culture change in relation to innovation pathways would be beneficial. The fundamental importance of the European security industry to a safe and secure operating environment for EU governments, businesses and the public, signals the **importance of diversity in innovation to harness the best of ideas and inputs addressing social needs in inclusive ways**. The current gender gap emphasises the need for new security and innovation research, industry and financial networks for women across Europe and policy and industry support for engaging more women in innovation in the security sector as well as policy debates and processes linked to growth and

competitiveness within it. Diversity in products and services is part of this picture where awareness of **needs related to gender or gender-related roles can contribute to new innovation perspectives and paths**. Gender considerations are also relevant to processes related to standardization and improved safety standards.

Leadership in Enabling and Industrial Technologies (LEIT)

Information and Communication Technologies (LEIT-ICT)

Internet of Things

With the Internet of Things, any physical and virtual object can become connected to other objects and to the Internet, creating a fabric of connectivity between things and between humans and things. These “things” are devices (e.g. cars, cleaning devices, body enhancing prostheses) connected to the communication grid and to applications - which therefore are enabled to sense, to react and to act partially in autonomous manner. The idea is that routine tasks or such like switching off light and saving energy will be performed without involving users, be they women or men. **Designing these devices and the programs that run them must therefore take into full account a) gender differences in use and their evolution, and b) their effects on the lives and use of time of people of both sexes**. As an example: within a project on “Active ageing”, the devices aimed to help elderly people by providing mobile emergency assistance were designed with adherence to the body in mind. This was influenced by the male model of carrying things in a pocket and ignored other approaches, such as the female practice of using bags rather than pockets as carrying devices.

In this new context, integrating women and gender in ICT and overcoming the gender gap in ICT education is much more than just a way to boost the functioning of Metcalf’s law, that the more people are connected, the higher is the value produced by a network. The “things” and “objects” connected among themselves and to the net should be designed and programmed to take into account the gender related physical, psychological and social characteristics of the user. It also becomes an imperative to be able to forecast the effects of the Internet of Things on gender relations, as both the possibilities of dominance and control and of empowerment and liberation will increase with the new technologies.

The relational self

A new development in ICT is the focus on a new concept, which is known as the relational self. The idea is that, in the hyper-connected era, the individual self is not only autonomous, but increasingly derives from and aspires to relationships and interactions with other selves, technological artefacts, and the rest of nature (see <https://ec.europa.eu/digital-agenda/en/onlife-manifesto>). This concept incorporates a critique of the notion of human beings as rational autonomous agents. This notion was modelled after a stereotypically masculine idea of the human being, and its critique is an important contribution of feminism and gender theory. But the present declination of the relational self is presented, again, as sexless and genderless, a disembodied mind. The proponents of the theory of the relational self are aware that the role of communities of various kinds become increasingly important. They look with positive expectations to the fact that platforms that are able to manifest this power of the community, or power of the crowd, can provide buying power, production power, financing power, democratic power. But in this enthusiasm reminiscent of the cultural climate existing in the fifties of last century (when humankind was conquering space) the specific role of gender and the asymmetry in power that gender relations entail in our societies tend to be forgotten. It is therefore **important that, at the level of European research, all the initiatives** that have ICT and relational self – for example, special entities devoted to research in the ICT areas- **be closely monitored from the gender viewpoint, least the novelty of the approach be used as a mask for old gender blindness**.

Robotics

Women and men differ in their needs for and experience with technology. Women may have less technical experience and less positive attitudes toward technology. They may also be more apprehensive about using assistive technologies, such as robots, in domestic environments. Thus, it is important to include both women and men in technology design. Analysing sex and gender as well as including both women and men users in technology development is a positive action that can lead to better designs and improve marketability of products. Researchers are developing new assistive technologies to support independent living for the elderly and to lighten the burdens of caregivers. Through **participatory research and design with both the elderly and their caregivers**, designers are gaining key insights for developing assistive products that are useful to a broad user base. Involving users and stakeholders in the design process enhances outcomes. Building machines based on gender analysis will be important for the development of the next generation of assistive technology.

Nanotechnologies, advanced Materials, Biotechnology and advanced manufacturing and Processing (LEIT-NMPB)

Leadership in Enabling and Industrial Technologies (LEIT) focuses on the industrial competencies underpinning the global competitiveness of European industry. The NMBP part looks at new breakthrough technologies in the Key Enabling Technologies (KETs) that are fundamental to many of the intermediates, products and services sold. Since materials, products or services will be sold to or used by people, then the gender dimension needs to be analysed. When, as may often be the case in the NMBP fields, the research does not directly involve humans even as the end users, then it may be that the different relations to the topic may differ between men and women, for example the field might be traditionally seen as 'for men' or 'for women'. There may be differences in perception of or behaviour towards biotechnology or nanotechnology which can be considered from the outset so the eventual results can be fully utilised and the eventual market uptake reaches its full potential. **As the programme moves towards greater societal engagement there are more opportunities to consider the human and therefore gender dimension.**

Where the research is for humans, for example, biotechnologies related to health (new methods or devices for diagnostics...), bioactive molecules, advanced materials or nanotechnologies for health care and energy applications, **there is a need to understand of the risks associated and the effects on men and women.** For example, the biochemistry or the exposure levels during a lifetime may be different between men and women.

Actions in the focus area of the **circular economy** will include research and innovation tackling the gap between potential solutions and their societal and industrial take-up and deployment; this could take into account the **different roles of male and female individuals as consumers and producers.**

The industrial eco-system to **deliver nanotechnologies and material technologies to the customer and citizen** also requires new strategies taking these technologies from the idea to the product. Topics implemented as cross-cutting Key Enabling Technology (KET) pilot activities will build on previous research and this is a key point at which gender can be taken into account through taking the KETs forward.

Actions with a substantial technical focus, such as pilots and pilot lines or advanced materials for energy applications, may also require sex or gender to be considered, for example, in terms of access or training and intended use of pilots and the whole value chain including users and consumers of energy applications.

The **participation of men and women in all aspects of the NMBP programme** remains an important issue, and, even if it is already being addressed, it needs to be further encouraged. The participation of women in the private sector in the key enabling technologies (KETs) is often lower than in other fields

and the NMBP programme recognises that this can be reflected in the participation of women in the programme. For proposals, this can include making sure there is a gender balanced team at all levels, and measures to monitor the participation throughout the project, including steps to change imbalances. Specific call topics to support the networking of women in the KETs fields towards greater participation in the LEIT-NMBP programme could be considered.

Space (LEIT Space)

The potential of space to contribute to the Horizon 2020 objectives (generating excellent science, creating industrial leadership and tackling societal challenges) is outstanding. Space activities expand scientific and technological knowledge, allow applied research by means of a multidisciplinary approach, generate products and services for the benefit of the citizens and strengthen the competitiveness of the private sector. Space plays an increasingly pivotal role in the efficient functioning of modern societies and their further development and is a contributing lever for economic growth, social wellbeing and sustainable development. Space also serves to cement the EU's position as a major player on the international stage and contributes to the Union's economic and political independence. In all these fields, space has a major impact, and that **impact can be even bigger by paying adequate attention to sex and gender aspects.**

Workforce and Careers

Space is an area which is largely dominated by men, women are severely underrepresented in the aerospace sector. However, it is of utmost importance to reach out to all talent available in the workforce, both male and female, as research has shown that diversity in the workforce contributes to more creative and innovative solutions. It is essential to have both male and female perspectives on space and their contrasting elements present in research.

It is not easy for young female engineers to enter the male-dominated space industry. It is likewise difficult for women higher up the career ladder to obtain leadership positions in this field. To counterbalance the male-dominated space industry, it is important to create networking, mentoring and training facilities for women, and also to make sure they receive awards, are invited on conference panels (often, such panels at space conferences are composed of only men), etc. It is also important to raise men's awareness on gender bias in the space industry. The enduring nature of gender inequality and the sector's significance in technological terms may signal the need for specific funding instruments focused on gender and culture change.

Female astronauts

Astronauts have always had a big impact on society, they are truly 'envoys of mankind'. Of the around 500 astronauts who have been to space since the beginning of the space age in the late 1950s, only about 50 have been female. In Europe, there are only three female European astronauts.¹

Russia and especially the USA have recently made efforts to increase the percentage of women among their astronauts. The recently selected group of eight new NASA astronauts is 50% female, and the Russians have recently done an experiment for a moon mission with an all female. The European Space Agency's last round of astronaut selection in 2009 attracted more than 8000 applicants, about 13% of whom were female; in the end one out of the six selected applicants was a woman. **The selection method and criteria for astronauts may need to be revisited in order to take into account gender**

¹ Helen Sharman who was the first British female astronaut in 1991, Claudie Haigneré first female French astronaut in 1991 and later first female ESA astronaut in 2001, and Samantha Cristoforetti who spent 199 days on the International Space Station ISS in 2014 (and holds the record for longest single spaceflight by a woman).

aspects. Moreover, it is important to increase the number of women applying to be an astronaut and to reconsider the ways of current advertising/recruiting of astronauts.

As in most areas of gender stereotypes, the media plays a pivotal role in the representation of astronauts. When space journalists, who are often male, interview female astronauts, questions tend to be about hair and makeup, which are not the questions that male astronauts are asked. Advertisements using space to sell a product often depict the stereotype of a male astronaut. Hence, **how space is portrayed in the media also requires a gender perspective.**

Human spaceflight must include females

In addition to the workforce argument, there are also other arguments to improve gender balance in the space field. Long-term presence in space has effects on the human body that are not necessarily the same for men and women; effects on bone mass for instance may be different. NASA has conducted studies in this field (www.nasa.gov/content/men-women-spaceflight-adaptation). **Europe should also conduct studies on the different impact of long-term presence in space in men and women.** There is also an economic component to explore further: There are also studies that have calculated that sending women to outer space instead of men can have a significant impact on cost, as women use less calories and are generally lighter in weight.

Specific space research fields with gender aspects

Several interest areas in which space plays a major role have gender aspects that should be taken into account. For instance, health, climate change, international cooperation, or migration. Current plans for Europe to populate the moon or Mars will also have gender aspects: the diversity of future inhabitants, what they need and want should be considered when constructing and arranging such a settlement. Mixed crew composition will be essential and this will require more female astronauts and investigations of psychosocial, health and life support aspects of long-term presence in space.

Access to risk finance

Gender is a crucial aspect to be taken into account when designing policies and programmes that should be “gender-informed and sensitised”. In order to stimulate better knowledge transfer, there is a **need to understand the differences between men and women when looking at their readiness and willingness to take risks and go into business and/or create their own business².**

Importance of the gender dimension for Access to Risk Finance (and for Innovation in SMEs)

Investing in women’s entrepreneurship is good for business, and essential for economic growth. Women-owned small and medium enterprises (SMEs) make significant contributions to the economies in which they operate (economic growth and job creation). However, female entrepreneurs face a range of financial and nonfinancial challenges in realizing their growth potential, and are more likely than their male counterparts to cite access to finance as a major or severe constraint on their business operations. In addition, financial institutions have not yet realised the business opportunities of meeting the specific financing needs of women entrepreneurs as a distinct customer group³.

A wide range of surveys show access to credit is the biggest constraint on growth for all SMEs and women-owned businesses face an even larger credit gap than their male counterparts. Globally, when it comes to financial access women lag behind men.

² A very practical example from the US, May 2014, “Gender Effects in Venture Capital”
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2445497

³ A Market And Credit Gap Assessment and IFC’s Portfolio Gender Baseline International Finance Corporation 2014
<https://yali.state.gov/wp-content/uploads/sites/4/2016/03/WomenOwnedSMes+Report-Final.pdf>

Financing Instruments and equal opportunity

Only one third of the EU's start-ups are created by women. One of the major problems is that women entrepreneurs do not get equivalent financial support to male counterparts. This applies for "private" funding. Women entrepreneurs should be aware of the opportunities of the financing instruments of the European Commission that do not discriminate against women giving equal opportunities to men and women to get support for their entrepreneurial initiatives.

The SME instrument is an important opportunity that can be leveraged to expand the access of women to finance as it gives equal opportunities to proposals from men and women proposals addressing the persistent gap in financial access for women.

The AG Access to Risk Finance has formulated recommendations to the EC with the objective of having more women entrepreneurs better prepared to submit their proposal and negotiate with potential investors. To do so they need information and advice on the financial options, on the instruments available, on the advantages of raising finance and how to become "investment ready". It is imperative to engage financial Institutions in order to increase women's access to capital, to promote access and the use of high-quality financial services, particularly among innovative women entrepreneurs.

On the supply-side, women business angels and women managing venture capital funds should be widely supported and promoted. Today they are very unbalanced with currently only around 10% of angel investors being women. There are already many initiatives and partnerships regarding women business angels in the European Commission and some other groups are tackling this topic. The AG Access to Risk Finance addresses specifically the difficulties the entrepreneurs in the proof of concept stage, the newly-setup project and SMEs meet when searching, selecting and obtaining information regarding financing instruments which they could apply to.

Training

The Commission should **develop a capacity-building strategy** and consequent implementation plan that makes use of techniques (tailored for both women and men) such as **awareness raising campaigns, coaching, mentoring, workshops, courses, training materials** (in particular through social media) as well as knowledge **transfer of best practices**.

The training should be addressed to

- less experienced early-stage investors (both women and men), providing not only training, but also coaching and networking activities;
- to alternative finance operators, like potential women business angels (perhaps more flexible in financing women's initiatives) to develop their expertise and professionalism — in particular, regarding their mentoring and advisory role;

Research and other activities

The research and activities suggested below could be funded in various parts of Horizon 2020 and not only under "Access to risk finance".

- Support capacity building, awareness and visibility of gender for both the supply (financiers) and demand (scientists, entrepreneurs, etc., especially the young ones) sides.
- Improve linkages with other EC initiatives in support of gender and entrepreneurship: SME Week, A2F week, Female Entrepreneurship Ambassadors, in more than just the usual way of websites or policy statements or picture-taking events.
- Include a call to promote women entrepreneurship, including a cross-country benchmarking at EU level (comparison maybe also with the USA) and a study of the reasons that stimulate or hinder women when opening a business; development and testing of models.

Innovation in SMEs

'Innovation in SMEs' aims at creating a bridge between the core of the framework programme - support to research, development and innovation projects - and the creation of a favourable ecosystem for SME innovation and growth. The objective of 'Innovation in SMEs' is to optimise the Research, Development & Innovation environment for SMEs, including through the establishment and facilitation of a range of support services, with the aim of strengthening the innovation capacity of SMEs and creating value on the market and/or into society, thus underpinning the Europe2020 strategy for smart, inclusive and sustainable growth.

A range of actions contributes to building innovation management capacity for SMEs. Innovation management capacity is the internal ability of companies to manage innovation processes from the generation of the idea to its profitability on the market and/or into society. There are **three main ways that a gender dimension should be considered:**

- Gaining access to funds,
- Promoting workplace equity (gender balance),
- Considering social innovation as an important line in the innovation field.

On social innovation, it is important to remark that short and long term social demands are growing and imaginative responses are needed in time of budget constraints. As social challenges are also opportunities this could be an engine for Europe 2020 strategy for a smart, green and inclusive growth. In this framework, **social innovation projects, with a strong gender dimension, must be specifically mentioned in the SMEs innovation lines and a fund reserve could be defined for these kinds of projects.**

In the general information about the Innovation in SMEs section of Horizon 2020, most of the definitions are focused on market and high returns of investment. The SME instrument addresses the financing needs of internationally oriented SMEs, in implementing high-risk and high-potential innovation ideas. It aims at supporting projects with a European dimension that lead to radical changes in how business (product, processes, services, marketing, etc.) is done. It launches companies into new markets, promote growth, and create high returns of investment. The SME instrument addresses all types of innovative SMEs so as to be able to promote growth champions in all sectors. However, at the moment, **none of these elements include a gender dimension**, that should appear in access to funding opportunities, in market issues and in the social impact of innovation. Therefore, it is highly important to explore **how gender influences all these essential dimensions of SME activity.**

Excellent Science

The Excellent Science pillar of Horizon 2020 mainly includes "bottom-up" calls, where the applicants propose their own research topics. This pillar has met serious problems concerning differences in success rates of male and female applicants, and with regard to gender balance within research teams. MCSA has made a lot of progress on this issue and the ERC is now seriously trying to tackle it. But the question of how to best stimulate the integration of gender in research content remains. **Integrating gender into research** when relevant (and it is often more relevant than applicants may think) is a **major factor in reaching true scientific excellence. This needs to be very clearly spelled out both to applicants and to evaluators of such bottom-up calls.**

The next few pages outline specific thematic issues for each programme part of the Excellent Science pillar.

Future Emerging Technologies

FET focuses on research beyond what is known, accepted or widely adopted and supports novel and visionary thinking to open promising paths towards powerful new technologies. FET seeks for genuine cross-fertilisation and deep synergies between the broadest range of advanced sciences and cutting-edge engineering disciplines. FET has the potential to become the leading research and technology visionary funding scheme in the innovation process within and beyond Horizon 2020.

FET encourages new cutting-edge ideas that may foster innovation in Europe. **Gender is a key dimension of innovation** in the following ways:

- Most of the present and future societal challenges deal with the social transformation of the gender roles in the European society, from a new conception of the family roles to a transition towards a more “liquid”, less bivalent dimension of gender as only a female/male distinction. The **societal transformations that the new gender roles have generated** need innovative tools to deal with everyday life, education of children, housing, urban plans and distribution of working time. New innovative technologies will be crucial to deal with this transition to a post-patriarchal society and innovative ideas may emerge in FET by taking into consideration this dimension.
- Gender studies have opened new dimensions of **research on transhumanism and post-humanism**, that is, the overcoming of the male/female distinction fostered by new technologies such as robotics and Artificial Intelligence (AI). New ways of conceiving humanity can foster cutting edge research in areas such as ICT, robotics, cognitive science and AI. This research is likely to lead to highly innovative new approaches to societal patterns and behaviours and services and products reflecting them.
- Gender’s “essential” difference is a controversial dimension whose exploration faced many objections from the feminist movement. Nevertheless, some studies in cognitive science show that there has not been enough **investigation of any essential cognitive differences between male and female behaviour**. The investigation of this dimension, including differences in emphatic responses, language abilities, spatial abilities and systematic thinking could generate new fundamental insights for the development of innovative technologies.
- Gender innovation in health & medicine, engineering and environment is already a rich field of research. New **experimental paradigms that test the gender effects in these domains and encourage the development of distinct protocols**, products and policies are strongly needed to foster innovation.

Marie Skłodowska-Curie Actions

The MSC Actions play an important role in researchers’ careers, opening their minds for other perspectives, integrating them in the international scientific community and supporting them in building professional networks that will be important for their future life as researchers. It is important that **equal opportunities are ensured, independent of gender and sex**. Special attention has to be paid to these aspects supported by appropriate specific measures such as:

- The strategy regarding gender equality should be examined in the evaluation, based on information provided in the briefing of evaluators including information on unconscious of implicit gender bias and showing some key numbers of the topic and applying a quick test;
- Introduce positive measures or incentives (such as extra funding or evaluation points) for gender analysis in the scientific areas proposed by the applicants;
- Have candidates explain why gender is not relevant in their research, if such is the case.

- Introduce the objective of “gender balance” in research teams involved in the projects. The ERA priority addressing gender balance should be reinforced in order to maximise the potential of human resources;
- Take on board the dual career issue with specific MSCA calls;
- International mobility: Consider preparatory schemes introducing outgoing researchers with regard to culture and language as well as specific features of the research and innovation systems of third countries. As an example, the S&T Fellowship Programme China was very successful combining half a year of language training with 18 months of research stay in China. In such schemes also, specific attention should be paid on gender related aspects and barriers of mobility;
- The Commission should undertake regular surveys of MSCA fellows’ experiences as well as reviews of host institutions regarding the implementation of the “Human Resource Strategies for Research (HRS4R)” and the “HR Excellence in Research Award” with special attention on Gender Equality Plans and respective measures.

Research Infrastructures

Alongside the objectives of all AGs, specifically, the AG RI has been asked: “*While staying within the limit of the RI Specific programme, how can the new policy initiatives such as the 3O's, the Digital Single Market (DSM) with the European Cloud Initiative, as well as the ESFRI Roadmap and the Long Term Sustainability of Research Infrastructures be fully taken into account in the Work programme 2018-2020?*”. The Expert Advisory Group on European RIs, including e-infrastructures, has **engaged directly with gender issues in a number of ways including human capital, research content and impact.**⁴

Building human capital

All projects on RIs should be scrutinised with respect to the adherence to Horizon 2020 aims with respect to gender in decision-making, teams and content. Applications on RIs should bear in the mind the importance of ensuring that there is gender balance in research teams (including research managers) as well as gender expertise, thus widening and building human capital. It has been noted that the growth in data driven science will lead to a huge shortage of data professionals in the near future unless there is a very significant increase in the training of data scientists. Meeting this need can be helped by actions targeted at **establishing gender balance in this domain including the training of teams in understanding why gender and sex analysis is important.** A further increase of the qualifications levels of RI managers is needed. There is a need to build the RI human resources capacity including an improved representation of women involved in the integrating and training aspects, increase of exchanges, involvement of user communities, including industry.

Research on Human Capital in RIs

Furthermore, it was suggested to **examine hidden gender aspects of the running of and the access to RIs**, as well as to investigate **why some research communities are not gender-balanced or why for some topics gender is seen as irrelevant.** Another suggestion was to **launch a study providing a gender analysis of researcher flows** supported by MSCA and gender related aspects influencing the choice of target countries and host institutions in researcher mobility. In addition, it is important to increase awareness amongst applicants of the possibility to include in their RI proposals, as eligible costs, *specific studies on gender*, as well as *training on gender*.

⁴ It should be noted that the European Charter for Access to Research Infrastructures does not refer to gender: https://ec.europa.eu/research/infrastructures/pdf/2016_charterforaccessto-ris.pdf.

Research Content

The gender dimension is neglected and not well understood in different types of RIs yet the **gender dimension in RI research has the capacity to add value in terms of creativity, excellence and return on investment**, both from private and public perspectives. Gender is an emerging and important subject of research in many scientific and technological fields. It constitutes, as such, a valuable source of innovation, therefore it is important that gender is mentioned in a topic so that the evaluators will evaluate the gender dimension alongside the other relevant aspects of the proposals. It is crucial to harness the creative power of sex and gender analysis in RIs to discover new things.

The gender-related implications of social science and the relationship between RIs and e-RIs through data strategy, collection and analysis will provide new insights into the gender impact of a dynamic society on broad social science themes, for example: employment; future of professions; climate change; migration; security and secrecy; well-being; personal and career development; collective organisation. Thus **research is needed to understand the comparative and collaborative nature of e-infrastructures, the impact of these RIs and e-RIs on men and women as users (both formal and informal) and the effect on innovation, exclusion and impact.**

Moreover, horizontal integration of the social dimension is rarely done under current RI operation and could be promoted to **foster excellent socio-economic research, provide greater insight into future gaps in RI programmes and enhance socio-economic and gender understanding.** The integration will draw attention to the gender societal challenges and innovative solutions to which access to RIs, integrated across national borders, will lead.

The increasing internationalisation of RIs should also be focused on socio-economic and gender factors relating to changes (including technological and migration) in the labour market, the nature of professional work and impetus from open RIs for the setting up of SMEs. The gender nature of migration is not fully understood but RI collaboration could provide important insight into the changing European population, its challenges and opportunities. Moreover, by linking new data to be gained under Horizon 2020 research in social sciences to existing international data repositories on societal processes (established by international programmes for research based on sample surveys), will expand considerably gender data on these processes. Many social science RIs are national but provide important data that is not replicated in other European countries. Such replication is important in a number of ways so that data can be rigorously compared and analysed to provide new and excellent research.

Programmes should be setup to foster RI collaborations between institutions at European level to **enhance our understanding of the contemporary, dynamic, gender-related socio-economic context across Europe** and provide insight into the **differential and intersectional experiences** and social, cultural and economic resources of men and women including migration.

User Groups

The gender-related access conditions to RIs needs to be widened and some consideration should be given to targeted access opportunities to **tackle under-utilisation by women and facilitate access for researchers from less developed countries.** Thus, awareness of the gender dimension would aim to improve the representation and engagement of women as users and developers of RIs. Moreover, **the gender engagement in projects should be evaluated with the aim of improving infrastructure usage.** Research on RIs should also recognise that the complexity of user groups not just by sex, but by other intersectional characteristics, such as age, diversity and migration, to enable a richer understanding of use, relevance and impact of particular RIs than if such characteristics were not included.

Impact statement

Gender is one of the key aspects of the expected impacts and should be included in impact statements on RIs. It can be expected that the funded action on RIs and e-RIs will have an impact for instance on

boys or girls, women or men, gender relations, socio-economic positions and the status of men and women. It can also be expected that the funded actions should contribute to gender equality.

In conclusion with respect to RIs: there is a need for gender balance to be incorporated into decision-making and research teams, the gender dimension into research and innovation content and to the impact statement. Finally, gender expertise needs be built into the evaluation and more broadly mobilised.

Spreading excellence and widening participation

The Horizon 2020 area “Spreading excellence and widening participation” aims at reducing internal disparities in terms of research and innovation performance by supporting less performing Member States and Regions in optimising their individual strengths. This would enable the European Research Area to function in a more streamlined and homogenous way. Specific measures for spreading excellence and widening participation include Programmes like TEAMING, TWINNING, ERA Chairs, the Transnational Network of National Contact Points (NCP) as well as the support to COST programme, although the 2018-2020 Work Programme is expected to include calls only for ERA Chairs and Twinning Programmes.

ERA Chairs aim at bringing outstanding researchers to universities and other research organisations that have high potential for research excellence. The universities then mobilise support to invest in facilities and infrastructure. **Twinning** projects aim at networking for excellence through knowledge transfer and exchange of best practices between research institutions and leading partners. Both programmes cover all scientific sectors. No specific reference to gender is included in the current work programme. Given the type of projects, the integration of gender in the next working programme could be similar to the way it was done in MSCA WP 2016-2017, referring primarily to women’s participation in applications and research teams.

Recommendations on how to improve gender balance of participation:

1. **Support a gender balance** in Spreading Excellence projects by implementing a 40% minimum participation of women or men in all research teams to be formed during the project (in line with the objectives for Horizon 2020 Research Committees and Advisory Groups).
2. **Introduce incentives** (such as additional funding, evaluation points or eligibility of costs, etc.) for the promotion of gender analysis in the scientific areas of research generating during the implementation of the projects. Integrating gender analysis in research and innovation content improves the scientific quality and societal relevance of knowledge, technology and innovation. The European Commission has highlighted relevant examples⁵ in a number of fields –basic science, communication science, engineering and technological development, environment, food and nutrition, health and medicine, and transport – and the Horizon 2020 working programme could enhance this trend in the Spreading Excellence action.
3. **Introduce a discipline-based funding quota** in order to ensure a more balanced distribution of funding allocation among scientific fields in which women or men predominate. Research evidence shows that gender stereotypes in research and technology lead women and men to different disciplines and research fields.
4. **Encourage restructuring of research institutions and maximisation of human potential** with the help of gender equality policies based on the results of the Horizon 2020 funded projects (e.g. EGERA). The development of relevant methodology for restructuring an organization could accelerate the research institution’s pathway towards scientific excellence.
5. **Introduce an adjusted mode of calculation of the “Composite indicators of research excellence”** for researchers who have taken parental, pregnancy or care leaves. As family and

⁵ See "Gendered Innovations": http://ec.europa.eu/research/swafs/gendered-innovations/index_en.cfm?pg=home

care responsibilities burden unequally on women and men, due to social stereotypes. Family related leaves that interrupt professional life for upbringing children may reduce women's performance in academic and research tasks (publications, mobility, career building, etc.).

Science with and for Society

The specific objective of the SWAFS programme of Horizon 2020 is to build effective cooperation between science and society, to recruit new talent for science and to pair scientific excellence with social awareness and responsibility. It allows all societal actors to work together (researchers, citizens, policy makers, business, third sector organisations etc.) during the whole research and innovation process, e.g. through citizen science approaches, in order to better align both the process and the outcomes of novelties with the values, needs and expectations of European societies. The approach of an open co-creation engaging diverse groups of actors is called Responsible Research and Innovation, including gender (RRI). RRI implies anticipating and assessing potential implications and societal expectations with regard to research and innovation.

To that end, the programme 'Science with and for Society' focuses on eight specific spheres of action (this order does not represent prioritisation), which integrate all aspects of RRI within the last phase of Horizon 2020 (2018-2020). Gender equality appears as one of them, but all the others in fact include a gender dimension:

1. Make scientific and technological careers attractive to young students, boys and girls, and foster sustainable interaction between schools, research institutions, industry and civil society organisations;
2. **Promote gender equality**, in particular by supporting structural changes in research institutions and in the content and design of research activities;
3. Integrate society in science and innovation issues, policies and activities by incorporating the needs and values of all citizens, thereby increasing the quality, relevance, social acceptability and sustainability of research and innovation outcomes in various fields of activity, from social innovation to areas such as biotechnology and nanotechnology, etc.
4. Encourage citizens, including children and youth, to engage in science through formal and informal science education, and promote the diffusion of science-based activities, namely in science centres and through other appropriate channels;
5. Develop the accessibility and the (re-)use of the results of publicly-funded research;
6. Develop the governance for the advancement of responsible research and innovation by all stakeholders (researchers, public authorities, industry and civil society organisations), which is sensitive to the needs and demands of society, and promote an ethics framework for research and innovation;
7. Take due and proportional precautions in research and innovation activities by anticipating and assessing potential environmental, health and safety impacts;
8. Improve knowledge on science communication in order to enhance the quality and effectiveness of interactions between scientists, general media and the public.

The SWAFS programme has funded several expert groups, e.g. to develop case studies on how to integrate sex and gender analysis in research and innovation along the subject areas of Horizon 2020: Gendered Innovations;⁶ Structural change in research institutions;⁷ and a study on Gender Equality Policies⁸ in public research in ERA.

⁶ The case study portal is available at http://ec.europa.eu/research/swafs/gendered-innovations/index_en.cfm?pg=home; a comprehensive report on methods of the gendered innovations project is available at http://ec.europa.eu/research/swafs/gendered-innovations/index_en.cfm?pg=home (checked last on 1-Apr-16)

Since the second work programme phase of SWAFS (2016-2017), further efforts have also been made to ensure that cross-cutting issues (e.g. social sciences and humanities, gender, international cooperation) are integrated in each of the different parts of the work programme, ensuring an integrated approach. In the last phase of Horizon 2020 (2018-2020) SWAFS action lines will accelerate and catalyse institutional change processes, including gender; contribute to building a regional dimension of SWAFS partnerships, explore and support citizen science approaches and continue building and clustering the knowledge base for SWAFS themes.

Stepping up the support to Gender Equality in Research & Innovation policy

Gender Equality Plans are the main policy instruments promoted through the European Research Area to advance gender equality in research organisations and universities. Based on progress so far, actions will be adapted to catalyse the changes in response to the three objectives: **gender equality in scientific careers, gender balance in decision-making, and the integration of the gender dimension in research content.**

Additionally, considering the evolution of the research systems in Europe, **gender aspects of scientific careers and decision-making processes need to be investigated to gather updated evidence for future policy action.** Finally, a major and recent challenge is to better integrate the **gender dimension in research and innovation** programmes and projects. Following the uptake of the gender dimension in Horizon 2020 and in some national research agencies, it is time to take stock of what has been done so far, and design the next steps in terms of process and knowledge. This will enhance the societal relevance of the produced knowledge, technologies and innovations and contribute to the production of goods and services better suited to potential markets.

⁷ https://ec.europa.eu/research/science-society/document_library/pdf_06/structural-changes-final-report_en.pdf (checked last on 1-Apr-16)

⁸ http://ec.europa.eu/research/pdf/199627_2014%202971_rtd_report.pdf (checked last on 1-Apr-16)