

ASSISTANCE

Adapted situation awareneSS tools and tallored training curricula for increaSing capabiliTie and enhANcing the proteCtion of first respondErs



European Commission

Project co-funded by the European Union within the Horizon 2020 Programme



Project Ref. N°	ASSISTANCE H2020 - 832576
Start Date / Duration	May 1, 2019 (36 months)
Dissemination Level ¹	PU (Public)
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Deliverable D8.2

Progress report on Gender Dimension
Strategy GDS

31/01/2020

¹ PU: Public; PP: Restricted to other programme participants (including the EC services); RE: Restricted to a group specified by the Consortium (including the EC services); CO: Confidential, only for members of the Consortium (including the EC services).

ASSISTANCE

Nowadays different first responder (FR) organizations cooperate together to face large and complex disasters that in some cases can be amplified due to new threats such as climate change in case of natural disasters (e.g. larger and more frequent floods and wild fires, etc) or the increase of radicalization in case of man-made disasters (e.g. arsonists that burn European forests, terrorist attacks coordinated across multiple European cities).

The impact of large disasters like these could have disastrous consequences for the European Member States and affect social well-being on a global level. Each type of FR organization (e.g. medical emergency services, fire and rescue services, law enforcement teams, civil protection professionals, etc.) that mitigate these kinds of events are exposed to unexpected dangers and new threats that can severely affect their personal safety.

ASSISTANCE proposes a holistic solution that will adapt a well-tested situation awareness (SA) application as the core of a wider SA platform. The new ASSISTANCE platform is capable of offering different configuration modes for providing the tailored information needed by each FR organization while they work together to mitigate the disaster (e.g. real time video and resources location for firefighters, evacuation route status for emergency health services and so on).

With this solution ASSISTANCE will enhance the SA of the responding organisations during their mitigation activities through the integration of new paradigms, tools and technologies (e.g. drones/robots equipped with a range of sensors, robust communications capabilities, etc.) with the main objective of increasing both their protection and their efficiency.

ASSISTANCE will also improve the skills and capabilities of the FRs through the establishment of a European advanced training network that will provide tailored training based on new learning approaches (e.g. virtual, mixed and/or augmented reality) adapted to each type of FR organizational need and the possibility of sharing virtual training environments, exchanging experiences and actuation procedures.

ASSISTANCE is funded by the Horizon 2020 Programme of the European Commission, in the topic of Critical Infrastructure Protection, grant agreement 832576.

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Executive Summary

This progress report presents an overall methodology, based on a detailed review of the state of the art, to integrate gender dimension and guide gendered research within the ASSISTANCE project. It has been prepared by the University of Cantabria (UC).

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Change control datasheet

Version	Changes	Chapters	Pages	Date
0.1	First draft	All	41	23/12/19
0.2	Internal version updated & distributed to consortium	All	52	09/01/20
0.3	Reviewed by RISE	All	52	15/01/20
0.4	Reviewed by UPV and ETRA (internal reviewers)	All	52	17/01/20
1	Final draft version for submittal	All	52	22/01/20

Content

Executive Summary	3
List of Authors	4
Change control datasheet	5
Content	6
List of Figures	8
List of Tables	9
Acronyms	10
1. Introduction	11
1.1. Purpose of the document	11
1.2. Scope of the document.....	11
1.3. Structure of the document.....	11
2. Literature review	11
2.1. Gender: key concepts and definitions.....	11
2.2. Gender in research	13
2.2.1. Gender Analysis (GA).....	13
2.2.2. Gender dimension (GD).....	17
2.2.3. Sex & gender analysis methods.....	17
2.3. Gender in First Responders.....	21
2.3.1. Female FRs in numbers.....	21
2.3.2. Initiatives to reduce the gender gap in FRS.....	21
2.3.3. Sex/Gender Diversity in FRs.....	22
2.3.4. Protecting female FRs.....	23
2.3.5. Technologies and female FRs	28
3. Gender analysis in ASSISTANCE	30
3.1. Overview.....	30
3.2. Setting objectives	31
3.3. Identifying target groups/participants.....	32
3.3.1. FR personnel	32
3.3.2. Citizens	33
3.3.3. Technology providers	33
3.3.4. Participation	34
3.4. Setting methods and techniques	34
3.5. Data collection, analysis and reporting.....	37
3.6. Case studies for GDS.....	39
4. Conclusions	42

- 5. Annexes43
 - 5.1. ANNEX A 43
 - 5.2. ANNEX B 50

List of Figures

Figure 1: Flow chart of gender dimension in research. (Based on ³⁶).	20
Figure 2: Injury/symptom type reported by female firefighters from different geographical regions. (Data taken from ⁷²).	24
Figure 3: Comparison of ill-fitting Personal Protective Equipment (PPE) reported in 1993 and 2019. (Data taken from ^{72,93}).	27
Figure 4: Comparison of ill-fitting Personal Protective Equipment (PPE) in different geographical locations. Data taken from ⁷²	27
Figure 5: Overall process for the approach to sex/gender analysis in ASSISTANCE project.	30
Figure 6: Gender Dimension Strategy in the ASSISTANCE timeline.	31
Figure 7: Summary of results from a pre-testing questionnaire on disasters perception.	41

List of Tables

Table 1 Summary of Gender Analysis (GA) approaches.	16
Table 2 Check list on sex/gender dimension in research. Table adapted from ¹²	18
Table 3 Specific objectives of GDS.	31
Table 4 Internal target group of FRs. Information taken from the DoA.	32
Table 5 Method 1.- Research planning.	35
Table 6 Method 2.- Participatory research.	36
Table 7 Method 3.- Engineering innovation.....	36
Table 8 Method 4.- Other factors.	37
Table 9 Method 5.- Gender monitoring.	37

Acronyms

ASSISTANCE	Adapted situation awareneSS tools and tallored training curricula for increaSing capabiliTie and enhANcing the proteCtion of first respondErs
AR	Augmented Reality
CVA	Capacities and Vulnerabilities Analysis
D#.#	Deliverable number #.# (D1.1 deliverable 1 of work package 1)
DoA	Description of Action of the project
EC	European Commission
EMS	Emergency Medical Service
EMT	Emergency Medical Technician
EU	European Union
FRs	First Responders
GA	Gender Analysis
GAM	Gender Analysis Matrix
GD	Gender Dimension
GDS	Gender Dimension Strategy
H2020	Horizon 2020 Programme for Research and Innovation
IASC	Inter-Agency Standing Committee
IFC	Informed Consent Form
KPI	Key Performance Indicator
LEA	Law Enforcement Agency
LERU	League of European Research Universities
M#	#th month of the project (M1=May 2017)
NFPA	National Fire Protection Association
NGO	Non-Governmental Organization
PPE	Personal Protective Equipment
PPT	Personal Protection Technologies
POP	People-Oriented Planning Framework
SA	Situation Awareness
SRA	Social Relations Approach Framework
SO#	Specific Objective
UNHCR	United Nations High Commissioner for Refugees
UNRWA	United Nations Relief and Works Agency
VR	Virtual Reality
WEF	Women’s Empowerment Framework
WP	Work Package

1. Introduction

1.1. Purpose of the document

The purpose of this document is to develop the general methodology that will be used to integrate gender into research and innovation activities of the ASSISTANCE project. This involves gender research on both citizen's attitudes towards disasters and First Responder's involvement in relation to technologies for intervention (e.g. Situation Awareness platform and wearables and sensors) and training developments (e.g. Virtual Reality and Augmented Reality).

1.2. Scope of the document

This deliverable D8.2 – *Progress report on Gender Dimension Strategy GDS* covers the outputs of Task 8.5 Gender Dimension produced during the first 9 months of the project. It includes a literature review focused on gender research and gender issues in First Responder organizations and operations and proposes a research plan (objectives, methods and techniques) for assessing gender issues. This deliverable also presents a case study to illustrate the way different research actions are planned to be included in the final GDS guideline.

The approach presented here is a first step but also a reference point for further actions during the project such as participatory research, engineering innovation process and gender monitoring.

1.3. Structure of the document

The deliverable is divided into two main parts, apart from this introduction. Section 2 presents concepts and definitions, gender research methods and a literature review on gender issues in First Responder organizations and operations, Section 3 describes the proposed methodology for including the gender dimension in the ASSISTANCE project. Finally, Section 4 presents conclusions. Additional information is provided in Annexes.

2. Literature review

2.1. Gender: key concepts and definitions

The Cambridge dictionary defines gender as *the physical and/or social condition of being male or female*. The Oxford dictionary differentiates between biological and socio-cultural factors defining gender as *the fact of being male or female, especially when considered with reference to social and cultural differences, not differences in biology*.

The concept of gender was introduced by physiologist and sexologist John Money in 1955² to reject biological determinism that links biology with rigid sex roles and expectations.

² Ehrhardt, A.A. John Money, Ph.D, The Journal of Sex Research, 44:3, 223-224. 2004. DOI:10.1080/00224490701580741.

Feminism theory adopted this term in the 1970s. Since then, the distinction between sex and gender has been used in several contexts, social research and documents provided by the World Health Organization (WHO). The WHO defines gender as *the socially constructed characteristics of women and men – such as norms, roles and relationships of and between groups of women and men*. This perspective focuses on behaviour, actions and roles and describes gender as a learned behaviour (people learn to be girls and boys who grow into women or men) that determines gender identity and gender roles³. Similarly, the European Institute of Gender Equality defines gender as *the social attributes and opportunities associated with being male and female...These attributes, opportunities and relationships are socially constructed and are learned...* Therefore, gender is socially and culturally determined.

According to these approaches, gender does not necessarily match sex. Gender includes cultural and attitudinal connotations (opposed to exclusively physical characteristics) distinctive to the sexes. Hence, 'sex' and 'gender' are different terms: sex refers to biological characteristics and gender refers to cultural attitudes and behaviours. It is necessary to accurately use these terms. It should be also noted that sex is used in some biological contexts where gender is never used as a synonym of sex⁴. Therefore, the distinction between 'sex' and 'gender' is not absolute. Both concepts shape humans and are of interest in research. The differences between men and women rarely involve only sex, and gender rarely operates outside the context of sex⁵.

One of the most interesting approaches to gender definition in relation to research and engineering is provided by the Stanford University⁵ defining gender as *sociocultural attitudes and behaviours that shape behaviours, products, technologies, environments, and knowledges*. This definition is adopted in the present document because it provides an added value to gender as a factor to integrate into the research process and the development and use of technology and/or products. The gender perspective improves the quality of research and innovation.

There are several terms and concepts derived from gender⁶. Some terms of interest are defined here. The first concept is gender norms which covers standards, ideas and expectations socially produced by institutions (e.g. school, and workplaces) about how women and men should be and act. Secondly gender identities refer to how individuals and groups perceive and present themselves and how they are perceived by others⁷. Note that rather than being binary, gender identity is multidimensional⁸. The third concept is gender relations regarding the relations between women and men as social groups including how power is distributed⁹ (e.g. male domination and gender segregation in labour).

³ World Health Organization (WHO). <http://www.euro.who.int/en/health-topics/health-determinants/gender/gender-definitions>

⁴ Haig, D. Of sex and gender. *Nat Genet* 25, 373. 2000. doi:10.1038/78033

⁵ Gendered Innovations. <http://genderinnovations.stanford.edu/terms/gender.html>

⁶ Gender Equality. Glossary of Terms and Concepts. UNICEF Regional Office for South Asia, November 2017.

⁷ Schiebinger, L. *Has Feminism Changed Science?* Cambridge: Harvard University Press. 1999.

https://iref.ugam.ca/upload/files/prog_3cycle/textes/Schiebinger_Feminism_changed_sciences.pdf

⁸ Hyde, J. S., Bigler, R. S., Joel, D., Tate, C. C., & van Anders, S. M. The future of sex and gender in psychology: Five challenges to the gender binary. *American Psychologist*. Vol. 74, No. 2, 171-193. 2018.

⁹ European Institute for Gender Equality (EIGE). <https://eige.europa.eu/thesaurus/terms/1207>

The fourth concept is gender equality that determines the absence of sex discrimination in opportunities, access to resources or services and benefits². The fifth concept of interest is gender equity defined as the treatment for men and women according to their specific needs (e.g. equal treatment or different treatment considered as equivalent in terms of rights obligations and opportunities).

2.2. Gender in research

Gender has been the aim or part of research and innovation in several dimensions, perspectives and research methodologies. Some gender studies use interdisciplinary research devoted to gender identity and gendered representation as central categories of the analysis (woman's studies, feminist studies, etc.). Other approaches focus on gender diversity supporting the presence of women across different domains (research teams, disciplines, organizations, society and methods) to improve and enrich research¹⁰. More specifically, gender in research can be seen as both an empirical category and a theoretical conceptualization¹¹ that facilitates plurality of ideas and new methodologies, thus improving the quality of results. Gender in research can be presented in many ways.

The integration of gender involves two main layers of analysis: 1) the project participation (e.g. curricula, gender diversity in project teams and promotion and encouraging women participation) and 2) the project itself (e.g. content and description, objectives, tasks, methods and expected results).

Similarly, gender can be integrated at different levels, from gender-dedicated projects (the topic is directly gender), gender-related projects (those projects that address some gender aspects or some topics indirectly related to gender), projects which include desegregated data (by sex and/or gender) while addressing other gender relevant factors, to simply projects which are not expected to address gender but may well include gender-sensitive aspects (e.g. inclusive language and/or visual representation).

This section outlines current approaches to gender that can be useful to define a Gender Dimension Strategy (GDS). The first part presents an overview of the gender analysis framework, mainly used in gender-dedicated and gender-related projects. The second part discusses gender dimension as a suggested approach to address gender perspective in projects not directly related to gender. The third part presents and suggests the methods considered as a starting point for defining and assessing gender in the ASSISTANCE project.

2.2.1. Gender Analysis (GA)

Gender analysis (GA) is a type of socio-economic analysis that provides data and information to integrate a gender perspective into policies, programmes and projects¹².

¹⁰ Nielsen, M. W., Bloch, C. W. and Schiebinger, L. making gender diversity work for scientific discovery and innovation. *Nature Human Behaviour* 2, 726-734, 2018. doi:10.1038/s41562-018-0433-1

¹¹ Woodward, K., Woodward, S. Gender studies and interdisciplinarity. *Palgrave Commun* 1, 15018. 2015. doi:10.1057/palcomms.2015.18

¹² Gender Analysis. The European Institute for Gender Equality (EIGE), 2018. ISBN 978-92-9470-623-2.

According to the European Commission GA is *the study of differences in the conditions, needs, participation rates, access to resources and development, control of assets, decision-making powers, etc., between women and men in their assigned gender roles*¹³.

The main purpose of GA is to identify and address gender inequalities. Conducting a GA helps to better understand the underlying causes of inequities and to achieve positive changes for women. It is commonly used for diagnosing the existing gender situation in communities and/or for assessing the impact of a given intervention on men and women. GA is usually conducted by development agencies, foundations, NGOs and country government systems. Depending on the context GA can vary in scope and methods¹⁴. GA often includes the following main steps¹⁵: 1) collect data (desegregated data), 2) identify gender issues, 3) understand the context and 4) identify priorities and needs. The key elements of GA are¹³:

- The distinction between sex (biological) and gender (socially constructed).
- The expected roles and responsibilities in each context.
- The identification of different work: productive (activities to generate incomes), reproductive (household and domestic activities) and community (political and religious activities).
- The different access to and control of resources and benefits.

GA frameworks have been introduced from the 80's-90's. These tools were designed to collect information related to gender differences, identify needs for equity and propose solutions to meet such needs¹⁶. Whereas these frameworks differ in scope and emphasis, most use similar concepts and some result from the combination of existing and new approaches and notions. The following commonly referenced GA frameworks are briefly described in Table 2.

- The Harvard Analytical Framework^{17,18,19}.
- The Moser Framework^{20,21}.
- The Caren Levy framework²².
- The Gender Analysis Matrix (GAM)²³.

¹³ European Commission, Communication from the Commission to the Council and the European Parliament — Programme of action for the mainstreaming of gender equality in Community development co-operation, COM(2001) 295 final, 2001.

¹⁴ SIDA (Swedish International Development Cooperation Agency), Gender analysis — principles & elements, March 2015. Available at: <https://www.sida.se/English/publications/159386/gender-analysis—principles—elements/> The Swedish Gender Equality Agency. <http://www.includegender.org>

¹⁵ Hunt, J. Introduction to gender analysis concepts and steps, Development Bulletin, no. 64, pp. 100-106. 2004.

¹⁶ UNRWA Gender Analysis Manual. United Nations Relief and Works Agency for Palestine refugees in the area near east. 2011.

¹⁷ Wiebe, A. Applying the Harvard Gender Analytical Framework: A case study from a Guatemalan Maya-Man community. University of Calgary Press on behalf of Canadian Association of Latin American and Caribbean Studies, Vol. 22, No. 44, pp. 147-175. 1997.

¹⁸ Gender roles in development projects. Edited by C. Overholt, M. B. Anderson, K. Cloud and J. E. Austin Kumarian Press, Connecticut, 326 pp. 1986. Public Administration and Development, 6(1), 107–108. doi:10.1002/pad.4230060111

¹⁹ Conducting a gender analysis for programme design. Gender in Food and Nutrition Security Programming. FAO. 2014. http://www.fao.org/elearning/Course/FG/en/pdf/1348_text_only_1348.pdf

²⁰ Moser's Gender Planning Framework. International Labour Organization. South-East Asia and the Pacific Multidisciplinary Advisory Team. <https://www.ilo.org/public/english/region/asro/mdtmanila/training/unit1/moserfw.htm>.

²¹ Moser, Caroline O.N. Gender Planning and Development: Theory, Practice, and Training. London: Routledge. DPU60 Working Paper Series: Reflections. NO. 165/60 2014. ISSN 1474-3280.

²² Levy, C. The Process of Institutionalising Gender in Policy and Planning: the web of institutionalisation. DPU Working Paper No 74, Development Planning Unit, University College London. 1996.

<http://www.ucl.ac.uk/dpu/publications/working%20papers%20pdf/wp74.pdf>

²³ Parker, R. Another Point of View: A Manual on Gender Analysis Training for Grassroots Workers. New York: UNIFEM. 1993.

D8.2 Progress report on Gender Dimension Strategy GDS

- The Women's Empowerment Framework (WEF) ^{24,25}.
- The Social Relations Approach Framework (SRA) ^{26,27}.
- The People-Oriented Planning Framework (POP) ²⁸.
- The Inter-Agency Standing Committee (IASC) Gender Marker ^{29,30}.
- The Capacities and Vulnerabilities Analysis Framework (CVA) ^{31,32}.

Rather than rigid structures these tools are practical instruments i.e. the researcher/analyst could use one of these models, a combination of models, or may create his/her own version. Furthermore, GA frameworks may well constitute a good reference for those interested in addressing gender issues in a range of fields and activities. For instance, when focused on organizations and institutions such as FRs (firefighters, law enforcement, civil protection, emergency medical services, etc.), GA frameworks can help to determine how the activities might affect women and men, whether institutions are 'gendered' (e.g. recruitment, division of labour and/or women access to top ranks and decision-making) and what strategies or interventions are needed.

To sum up, there are different approaches to GA. Most were designed for assessing gender inequality for development and humanitarian projects. Although these tools focus on socio-economic perspectives, they provide concepts, processes and methods flexible enough to be extrapolated to other contexts and projects. These approaches allow the analysts to organize research and conduct data collection and analysis to think about possible interventions. Likewise, GA frameworks introduce useful notions and processes to be considered in gender dimension methodologies such as:

- Formulating key questions about gender.
- Analysing roles and activities of women and men.
- Including participatory processes.
- Collecting and analysing sex disaggregated data.
- Considering gender relations (people-people and people-institutions).
- Identifying vulnerabilities and gender needs.
- Defining intervention actions.

²⁴ Longwe, S. H. Education for women's empowerment or schooling for women's subordination?, *Gender & Development*, 6:2, 19-26, 1998. DOI:10.1080/741922726

²⁵ Longwe, S. H. Towards realistic strategies for women's political empowerment in Africa. *Gender and Development* Vol. 8, No. 3, 24-30, 2000.

²⁶ Kabeer, N. and Subrahmanian, R. Institutions, Relations and Outcomes: Framework and Tools for Gender-Aware Planning, IDS Discussion Paper 357, Brighton. Another version available from Gender and Learning Team, Oxfam, 274 Banbury Road, Oxford OX2 7DZ. 1996.

²⁷ Kabeer, N. Resources, agency, achievements: Reflections on the measurement of women's empowerment. *Development and Change* 30(3): 435-464. 1999.

²⁸ Anderson, M. B. People-Oriented Planning at Work: Using POP to Improve UNHCR Programming. A Practical Planning Tool for Refugee Workers. Collaborative for Development Action, Inc. Cambridge, MA 02138 USA Geneva December 1994. <https://www.unhcr.org/3bfa3daa4.pdf>

²⁹ The Gender Handbook for Humanitarian Action. 2nd edition. Inter-Agency Standing Committee (IASC). 2017. https://reliefweb.int/sites/reliefweb.int/files/resources/iasc_gender_handbook_2017.pdf

³⁰ 2012 IASC Gender Marker. Analysis of results and lessons learned. February 2012.

³¹ Anderson, M. B. and Woodrow, P. J. A framework for Analyzing Capacities and Vulnerabilities. Harvard University. International Relief/Development Project.

³² Birks, L. Powell, C. and Hatfield. Adapting the capacities and vulnerabilities approach: a gender analysis tool. *Health Promotion International*; 32:930-941, 2016. doi: 10.1093/heapro/daw032

GA	Focus	Method
Harvard	Gender roles and control of and access to resources.	Framework of activities and access and control to resources to identify influencing factors that affect the division of labour and resources .
Moser	Same as above but more emphasis on gender relations.	Framework of six tools : 1) gender triple roles, 2) women's needs, 3) disaggregated information, 4) Impact of new policies on triple roles, 5) addressing needs, 6) involve people on the process.
Levy	Gender mainstreaming in institutions.	Framework of 13 elements/questions within four spheres: 1) beneficiaries, 2) policy, 3) organizational and 4) delivery. It can be used for participatory gender mainstreaming.
GAM	Gender issues, gender assumptions and searching for solutions.	Participatory approach. 4x4 matrix with levels of society (women, men, household and community) vs impacts (labour, time, resources and socio-cultural factors).
WEF	Gender inequality as product of oppression and exploitation.	Framework of two tools: 1) levels of empowerment/equality (welfare, access, conscientization, participation and control) and 2) recognition of equality (negative, neutral and positive)
SRA	Gender rights and institutional analysis.	Based on 5 concepts : 1) increasing of well-being, 2) rights determined by social relationships, 3) inequality from institutions, 4) Institutions follow gender policies and 5) analysis of causes of inequality.
POP	Same as Harvard but focused on refugees or people who have suffered displacement due to a disaster.	Same as Harvard.
IASC	Make funding more effective and gender sensitive.	Gender marker (4-scale codes) of projects contribution to gender equality : Code 0 (no contribution), Code 1 (limited), Code 2a (potential significant contribution), Code 2b (advance in gender equality).
CVA	Explore the capabilities and vulnerabilities in humanitarian context.	Matrix of vulnerabilities and capabilities into three categories: material, social and attitudinal. Includes disaggregated gender analysis.

Table 1 Summary of Gender Analysis (GA) approaches.

As mentioned, no single framework/tool provides a way to address all gender questions. In addition, there are other GA approaches for collecting and analysing gender-relevant information, and ways to analyse gender aspects. The next section presents sex/gender aspects related to research and innovation- namely Gender Dimension.

2.2.2. Gender dimension (GD)

Over the last few years, Gender Dimension (GD) has received increased attention in research. Several funding agencies around the world have promoted the integration of the GD in technology and research actions (Canadian Institutes of Health Research³³, US National Institutes of Health³⁴, among others). The European Commission (EC) encourage researchers to integrate gender dimension in their projects, when relevant³⁵. It is well-known that the introduction of GD reduces bias, enables social equality in scientific outcomes and foster opportunities for discovery and innovation³⁶. This section addresses Gender Dimension (GD) in research content, which is different from gender balance and equality in research^{37,38}.

The term Gender Dimension (GD) was developed by the EC^{39,40}. Generally speaking, the GD means that gender should be a part of the research design and process⁴¹. The integration of GD in research involves questioning stereotypes and investigating gender needs, attitudes and behaviours to enhance excellence of the knowledge, technologies and innovations produced^{10,11}. Therefore, GD allows exploring whether and how gender is relevant to a given research and innovation project. It may help to formulate new research questions (i.e. create new knowledge) and to find new solutions and products. It is important to note that gender is not only a matter of equality, it is also an improvement in research.

2.2.3. Sex & gender analysis methods

Scientists and engineers tend to be accustomed to think in relatively narrow terms. For example, sex and gender specific reporting is limited. The common practice is pooling the response of females and males that potentially leads to a misunderstanding of gender differences and therefore the study itself. Pooling data potentially yields inexact results. Including GD in a research project is not an easy task because there are no standardized methods. That is why GD often relies on the criteria, knowledge and creativity of researchers.

³³ Canadian Institutes of Health Research. <http://www.cihr-irsc.gc.ca/e/8682.html>

³⁴ NIH Policy on Sex as a Biological Variable. <https://orwh.od.nih.gov/sex-gender/nih-policy-sex-biological-variable>

³⁵ https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/gender_en.htm

³⁶ Tannenbaum, C., Ellis, R.P., Eyssele, F. et al. Sex and gender analysis improves science and engineering. *Nature* 575, 137–146, 2019 doi:10.1038/s41586-019-1657-6.

³⁷ <http://www.geecco-project.eu/links/>

³⁸ <https://eige.europa.eu/gender-mainstreaming/toolkits/gear>

³⁹ European Commission. Structural Change in Research Institutions: Enhancing Excellence, Gender Equality, and Efficiency in Research and Innovation. Luxembourg: Office for Official Publications of the European Communities, 2011.

⁴⁰ European Commission. Regulation of the European Parliament and of the Council: Establishing Horizon 2020, The Framework Programme for Research and Innovation, 2014-2020, Article 15. Brussels: European Commission, 2011.

⁴¹ Korsvik, T. R. and Rustad, L. M. What is the gender dimension in research?. Case studies in interdisciplinary research. Kilden genderresearch.no. Research Council of Norway.

References from the literature formulate general rules/questions of this subject matter while providing some examples or case studies in a variety of scientific disciplines (engineering, science, health and environment)^{42,43,9}. The Kilden report¹² proposes a list of questions that may help to illustrate the GD approach (Table 2).

Research ideas
<ul style="list-style-type: none">• Does sex/gender assessment affect the investigation?• Is sex/gender important to understand the phenomenon? Are there other dimensions that can be considered in relation to sex/gender (age, ethnicity, educational level, income, occupation, technical competence, etc.)?• Have you reviewed literature relating to sex/gender in the research field?
Proposal phase
<ul style="list-style-type: none">• Does the project take sex/gender research topics and methods into account? Does the proposal explain how this will be handled?• Are researchers trained in gender studies in the research group?• Are expected results likely to have impact on women and men? Can the research contribute to advances in gender equality?
Research phase
<ul style="list-style-type: none">• Are research methods designed to consider possible sex/gender differences and similarities? Will sex/gender-differentiated data be collected? Are samples, test groups or other actors involved in the project diverse in terms of sex/gender?• Will sex/gender be a variable in the analysis? Will other variables be included in relation to sex/gender in the analysis?• Are unconscious (stereotypical) assumptions about sex/gender implicit in the interpretation of data? Are there dimensions other than sex/gender that are important to consider?
Dissemination phase
<ul style="list-style-type: none">• Is the sex/gender dimension included in the presentation of findings?• If the sex/gender dimension is included, is it done in a way that does not reproduce stereotypical notions, but also looks at variations within the gender categories?• Have you considered that dissemination of the research findings can be directed towards networks, institutions, journals and conferences that address gender issues?

Table 2 Check list on sex/gender dimension in research. Table adapted from¹²

Another interesting reference is the League of European Research Universities (LERU) that outlines research areas with a clear need for GD and summarizes examples of research projects⁴⁴. This information can be useful to start thinking about sex/gender related issues on research and projects at hand.

⁴² <http://igar-tool.gender-net.eu/en/examples>

⁴³ Why gendered science matters. How to include gender dimension into research projects. Eurosfair Manual. http://www.eurosfair.pr.fr/7pc/doc/1257501518_manual_main_body_final.pdf

⁴⁴ Gendered research and innovation: Integrating sex and gender analysis into research process. League of European Research Universities (LERU). No. 18- September, 2015. <https://www.leru.org/files/Gendered-Research-and-Innovation-Full-paper.pdf>

A very recent publication discusses the potentials of sex and gender to foster scientific activities and calls the interested parties to provide robust methods³⁶. This paper proposes a roadmap for sex and gender analysis across scientific disciplines and suggests decision trees that represent cognitive processes when analysing gender. Future challenges in relation to how researchers respond to gender are discussed as well. This study encourages researchers to address gender bias and implement solutions. Figure 1 shows an adapted version of a proposed decision tree for gender analysis and reporting in science and engineering. The flowchart is divided into two main processes. The first process involves research on gender to find differences/similarities. One of the most interesting aspects from this process is that reporting no gender differences can be also a reasonable finding. The second process explores the sources of gender differences when found. While the first process involves pure research activities (e.g. data collection, data processing, and analysis) the second process is interpretative in nature (explaining underlying mechanisms) and seeks practical solutions to mitigate gender issues.

The most outstanding reference is the Gendered Innovations Website by the Stanford University⁵. It proposes systematic procedures for each step of research and development (e.g. define research priorities, formulate concepts, determine standards or models, design studies, or analyse and report data) illustrated by case studies. These methods are listed here:

- Rethink research priorities.- Analyse the significance of sex and gender when thinking about a project.
- Rethink concepts and theories.-Ensure that assumptions are robust and do not blind researchers to gender.
- Formulate research questions.-Delimit questions (asked and non-asked) from research priorities, theories and concepts about sex/gender and frame research design and choice of methods.
- Analysing sex.- Include sex as a variable related to biological distinction between female and male.
- Analysing gender.- Include gender attitudes and behaviours.
- Engineering innovation process.- Framework to incorporate sex and gender into engineering innovation process.
- Analysing how sex and gender interact.- Recognize how gender and sex interact each other and with other factors
- Participatory research and design.-Analyse sex and gender specific experience
- Analysing factors intersecting with sex and gender.- Examine how other factors/variables intersect with sex and gender.
- Rethinking language and visual representations.- Remove assumptions that may limit innovation and reinforce gender inequalities.
- Rethinking standards and reference models.- Standards and reference models are both shaped and shaped by gender norms.

Some methods described above are related to research planning and design and some directly provide procedures to address gender during a project. Some methods may be discarded depending on the project priorities and objectives and some may be improved depending on the skills and creativity of the research team.

The integration of GD into research content is an important issue likely to have a positive impact on science and technology, and therefore the society. Current references include general concepts and approaches illustrated with case studies. However, GD relies on the researchers due to the variety of subject matters, projects and contexts.

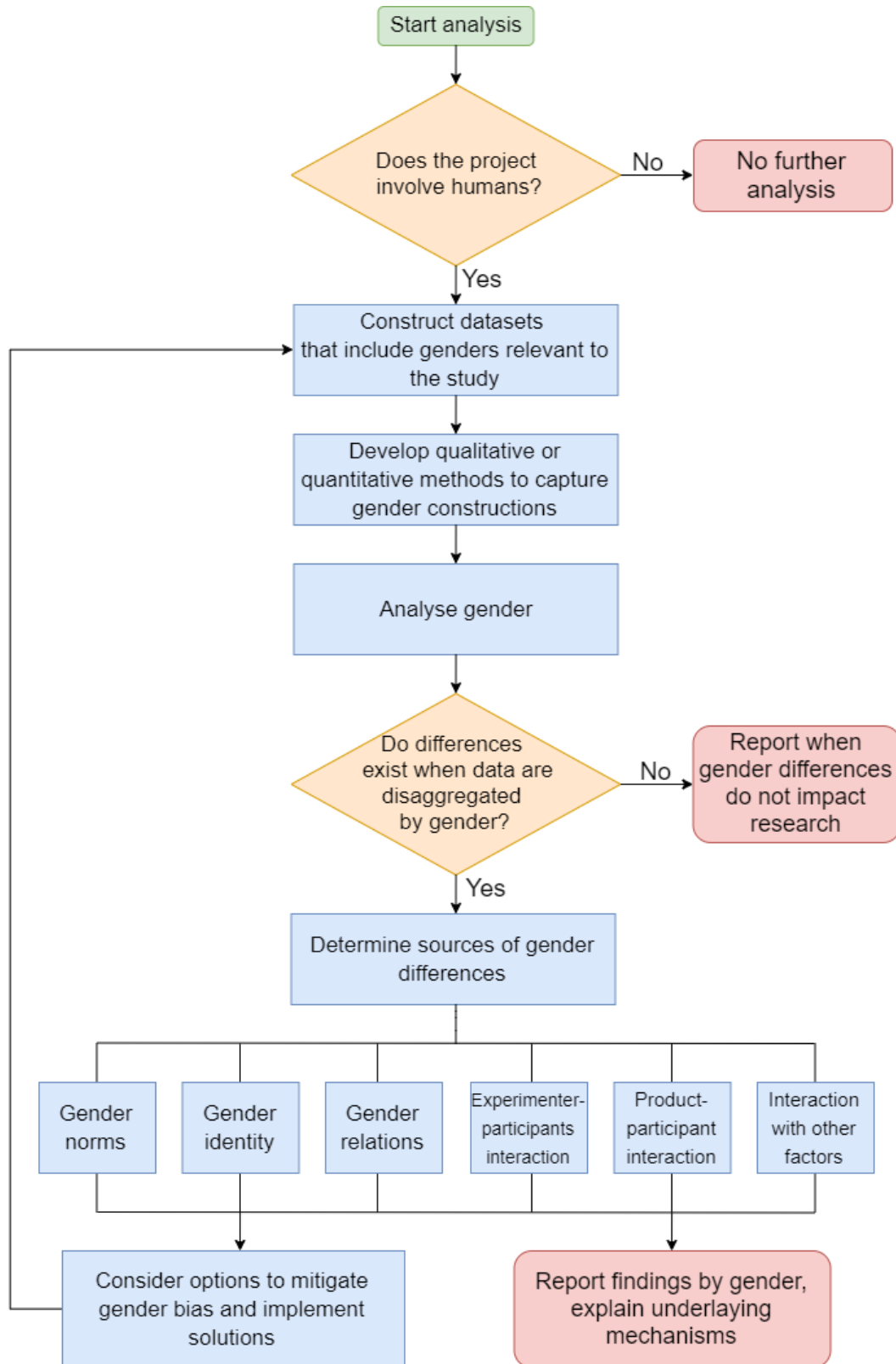


Figure 1: Flow chart of gender dimension in research. (Based on³⁶).

2.3. Gender in First Responders

2.3.1. Female FRs in numbers

Women cover a small percentage of active employees in fire and law enforcement but are more active in emergency medical services. Internationally, it is estimated that women firefighters represent on average 5.4%⁴⁵. The proportion of women in Law Enforcement Agencies (LEAs) is a bit higher, around 12.5% in USA⁴⁶ (data from 2015) and 19.48% on average in Europe (data from 2012)⁴⁷. In Emergency Medical Services (EMSs) the presence of women is around 33.7% in USA⁴⁸, 40.1% in UK (data from 2012 in ambulances services)⁴⁹.

The female workforce in EMS varies according to occupation. For instance, in the Spanish 112/EMS 40.4 % of female workers are physicians, 65.1 % emergency nurses, 17.4 % Emergency Medical Technicians (EMT)/drivers and 79.2 % call operators⁵⁰. This is a good example of gender division of labour with higher percentages of women performing tasks related to listening and caring for others, which are generally considered “feminine” traits (nurse and call operator) and lower percentages of women in specialization tasks (physician) and technical tasks (driver).

2.3.2. Initiatives to reduce the gender gap in FRS

The numbers of women as FRs are increasing worldwide. There are different associations created to reduce gender gaps in FRs. Examples in law enforcement include the International Association of Women Police⁵¹, the National Association of Women Law Enforcement Executives in USA and the European Network of Policewomen⁵²; in the field of firefighting and rescue they include the International Association of Women in Fire & Emergency Services, Wafa⁵³ Australia, IWomen⁵⁴ USA, and CTIF Commission for Women in Fire & Rescue Services⁵⁵ Europe. The philosophy behind these initiatives/associations is to promote gender equality and actively combat gender biases through a variety of means (e.g. improving working and safety conditions, encouraging women inclusion and promotion, showing the benefits of gender diversity, etc.).

⁴⁵ World Fire Statistics. Center of Fire Statistics (CTIF). International Association of Fire and Rescue Services. Repor N° 22. 2017.

⁴⁶ Schafer, K., Sutter, R. and Gibbons, S. Characteristics of individuals and employment among first responders. U.S. Department of Labor Chief Evaluation Officer. August 2015.

⁴⁷ Women in police services in the EU. Institut for Public Security of Catalonia. February 2013.
http://ispc.gencat.cat/web/.content/home/ms_-_institut_de_seguretat_publica_de_catalunya/recerca/Estudis-ispc/women_in_police_services/women_in_police_services_eu_2012.pdf

⁴⁸ Emergency Medical Technicians & Paramedics. <https://datausa.io/profile/soc/emergency-medical-technicians-paramedics#demographics>

⁴⁹ Equality Data Analysis Report. The NHS Equality Delivery System. West Midlands Ambulance Service NHS Trust. January 2012.
<https://officialwmas.files.wordpress.com/2017/01/equality-data-analysis-report-2011-2012.pdf>

⁵⁰ Servicios de urgencias y emergencias 112/061. Recursos y actividad. Sistema de Información de Asistencia Primaria (SIAP).
https://www.msrebs.gob.es/estadEstudios/estadisticas/estadisticas/estMinisterio/docs/Inf_est_Serv_urg_emerg_112_061.2012.pdf

⁵¹ <http://www.iawp.org/>

⁵² <http://www.enp.eu/>

⁵³ <https://wafa.asn.au/>

⁵⁴ <https://www.womeninfire.org/>

⁵⁵ <https://www.ctif.org/index.php/commissions-and-groups/women-fire-and-rescue-services>

2.3.3. Sex/Gender Diversity in FRs

Several studies have analysed and discussed sex and gender in FRs. A primary concern is the assumption that physical strength is dominant in these professions. This is presumably an advantage to male bodies⁵⁶. It is commonly known that sexual size dimorphism in humans has a clear evolutionary basis and is caused by genetic and hormonal factors⁵⁷. Women and men generally differ in size, weight, height and body muscle. There are differences between female and male in absolute strength in the muscles of both upper and lower limbs. A study showed that larger fibres enable men to derive more strength from their muscles than women⁵⁸. However, as mentioned by the authors, it is difficult to attribute this to true biological differences as lifestyle and fitness can be also important factors. Similarly, cardiovascular response to constant-load submaximal exercise of females is lower than males but more efficient due to the use of compensatory mechanisms (e.g. improvements in mechanical efficiency)⁵⁹.

Undoubtedly, many tasks performed by FRs require bodily power (e.g. lifting a heavy patient, arresting a strong suspect, kicking down a door). However, this can be compensated with tools currently used by FRs (e.g. stretchers, OC sprays, Halligan). Therefore, the key role of physical strength for saving lives is a simplification. Not only is fitness a matter of power but mobility, movement efficiency and aerobic capacity are also important components to improve performance efficiency and reduce injuries. There are many women with better fitness than the average male, particularly those women who spend the time and effort required to train⁵⁶.

Most FRs organizations require physical tests that applicants must pass before demonstrating other skills also valuable to do a good first response job. The implications of unique/double test standards or lowering physical requirements to hire women are not discussed here. But the main idea is that physical capability is only one trait responders must have. For instance, intelligence is deemed to be a crucial factor when leading operational activities and investigations in LEAs⁶⁰.

Women and men are likely to bring distinct and unique biological and physiological qualities to their role as first responders. Cognitive functions such as emotion, memory and perception depend on sex/gender⁶¹. Many comparative studies have reported female advantages on retention and social cognition^{62,63} and male advantages on

⁵⁶ Gender in First Response: How Biology and Physiology Shape Male and Female Responders. ENVISAGE technologies. White paper. 2018. <https://www.envisagenow.com/gender-differences/>

⁵⁷ Kirchengast, S. Human sexual dimorphism-a sex and gender perspective. *Anthropol. Anz.* 71/1–2, pp. 123–133. 2014.

⁵⁸ Miller, A. E. et. al. Gender differences in strength and muscle fiber characteristics. SpringerLink, 20 November 1992. <https://link.springer.com/article/10.1007/BF00235103>.

⁵⁹ Wheatley, C. M., Snuder, E. M, Johnson and Olson, T. P. Sex differences in cardiovascular function during submaximal exercise in humans. *Wheatley et al. SpringerPlus* 2014, 3:445 <http://www.springerplus.com/content/3/1/445>

⁶⁰ The Female Factor. Gender Balance in Law enforcement. EUROPOL. <https://www.europol.europa.eu/publications-documents/female-factor-gender-balance-in-law-enforcement>

⁶¹ Epting L.K., Overman W.H. Sex-sensitive tasks in men and women: A search for performance fluctuations across the menstrual cycle. *Behav. Neurosci.* 112:1304–1317.1998. doi: 10.1037/0735-7044.112.6.1304.

⁶² Andreano J.M., Cahill L. Sex influences on the neurobiology of learning and memory. *Learn. Mem.* 16:248–66. 2009. doi: 10.1101/lm.918309.

⁶³ Cahill, L. Why sex matters for neuroscience. *Nat. Rev. Neurosci.* 7, 477–484.2006. doi: 10.1038/nrn1909

mental rotation⁶⁴ and navigation tasks⁶⁵. These functional differences may be associated with the gender-specific structure of the brain⁶⁶. A study showed that women have a better communication between analytical (left of the brain) and intuitive processing (right of the brain) modes⁶⁷. This provides women more intuitive thinking, better memory and stronger “emotional intelligence” than men. For instance, policewomen are less likely to use excessive force than policemen⁶⁸. These traits are highly desirable for those who perform first responding assignments (e.g. use of new technologies and/or interacting with people). Similarly, mental rotation and spatial navigation are highly desirable skills in first responding activities. For instance, male FRs are likely to have an accurate and fast capability to visually encode spatially distributed information (e.g. learning the environment, distance judgments, wayfinding in degraded conditions).

Job duties during a disaster are inherently dangerous. Gender can be also relevant in risk perception⁶⁹. Risk is considered as part of the firefighting culture (e.g. firefighters are believed to be motivated to take risks). Interestingly, a study focused on gender safety behaviours in firefighters, paramedics and EMTs showed that women perceived risk differently than their male colleagues⁷⁰. The qualitative study suggests that, rather than the hypermasculine culture, females’ views may improve safety behaviours (i.e. weighing risk and benefits of dangerous situations, focusing on biomechanics and technique, asking for help, reporting injuries, being heard by colleagues and illuminating a hostile work environment). However, as stated by the authors, women’s experiences depend on other factors (e.g. years of experience, leadership roles and crewmates). It should be noted that risk-taking also depends on personal risk/gain analysis regardless the gender.

Gender diversity has benefits for a variety of knowledge and action tasks in FRs. Given this, the most robust approach to improve first response capabilities is to use the natural strengths of both women and men in a complementary way.

2.3.4. Protecting female FRs

Emergency response is a “high risk” occupation. Protecting FRs is the major concern of the ASSISTANCE project. The physical demands are the main causes of injuries in emergency responder groups with higher injury rates in police officers and firefighters.

⁶⁴ Peters M. Sex differences and the factor of time in solving Vandenberg and Kuse mental rotation problems. *Brain Cogn.*57:176–184. 2005. doi: 10.1016/j.bandc.2004.08.052.

⁶⁵ Sharps MJ, Welton AL, Price JL. Gender and Task in the Determination of Spatial Cognitive Performance. *Psychol. Women Q.* 17:71–83. 1993. doi: 10.1111/j.1471-6402.1993.tb00677.x.

⁶⁶ Cosgrove, K. P., Mazure, C. M., and Staley, J. K. Evolving knowledge of sex differences in brain structure, function, and chemistry. *Biol. Psychiatry* 62, 847–855. 2007. doi: 10.1016/j.biopsych.2007.03.001

⁶⁷ Ingahalikar, M., Smith, A., Parker, D., Satterthwaite, T. D., Elliott, M. A., Ruparel, K., ... Verma, R. Sex differences in the structural connectome of the human brain. *Proceedings of the National Academy of Sciences*, 111(2), 823–828. 2013. doi:10.1073/pnas.1316909110

⁶⁸ Women in policing: breaking barriers and blazing a path. U.S. Department of Justice. Institute of Justice Special Report. July, 2019. <https://www.ncjrs.gov/pdffiles1/nij/252963.pdf>

⁶⁹ Byrnes, J. P., Miller, D. C., & Schafer, W. D. Gender differences in risk taking: A meta-analysis. *Psychological Bulletin*, 125(3), 367–383. 1999. doi:10.1037/0033-2909.125.3.367

⁷⁰ Yasin A. Khan, Andrea L. Davis & Jennifer A. Taylor. Ladders and lifting: How gender affects safety behaviors in the fire service, *Journal of Workplace Behavioral Health*. 2017. DOI: 10.1080/15555240.2017.1358642

Injury rates in female FRs are proportional to their presence: 32% of EMS personnel; 5% of firefighters; and 13% of LEAs⁷¹.

In a study, female firefighters reported 33% more injuries than male firefighters⁷². However, as noted by the authors, the differences may be due to cultural norms in male participants for not reporting minor injuries (e.g. it is a sign of weakness). A recent study reveals that women firefighters from North America are more likely to report suffering from injuries/symptoms than those from other geographical locations (Australasia, Europe and UK-Ireland)⁷³ (Figure 2).

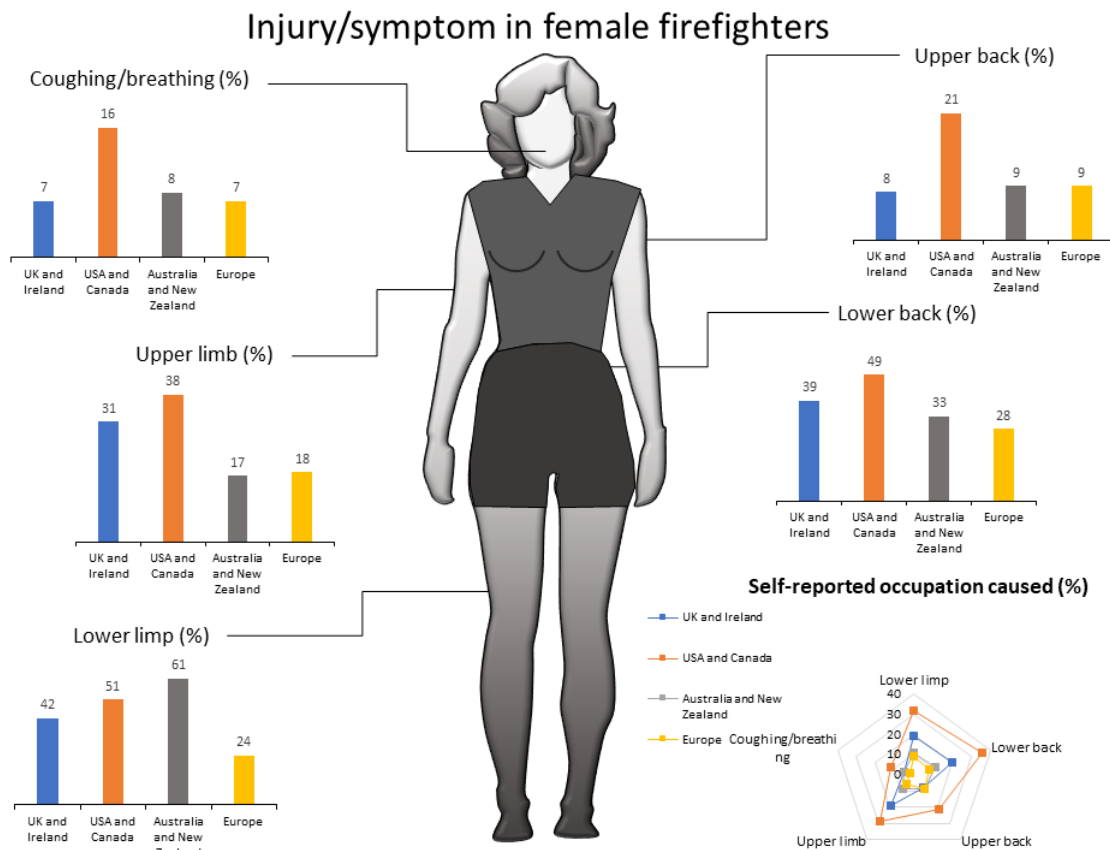


Figure 2: Injury/symptom type reported by female firefighters from different geographical regions. (Data taken from⁷²).

It is apparent that injury rates, rather than being gender-related, are determined by working tasks. In fact, among emergency medical services (EMS), firefighting, and police occupations, sprains and strains are the leading causes of injuries treated in US hospital emergency departments⁷⁴. An NFPA report shows that injuries in female firefighters and male firefighters on the fireground follow the same pattern/causes: overexertion or strain (female 25 %; male 26 %), exposure to hazard (female 18%; male 21%), contact

⁷¹ Reichard, A. A and Jackson, L. L. Occupational Injuries Among Emergency Responders. American Journal of Industrial Medicine 53:1-11., 2010. DOI: 10.1002/ajim.20772.

⁷² Liao, H. et al. Correlates of Work Injury Frequency and Duration Among Firefighters. Journal of Occupational Health Psychology, Vol. 6, No. 3, 229-242. 2001. DOI: 10.1037//1076-8998.6.3.229.

⁷³ Watkins, E. R. et al. Women Firefighters' Health and Well-Being: An International Survey. Women's Health Issues 29-5, 424-431. 2019.

⁷⁴ Reichard A.A. & Jackson L.L. Occupational injuries among emergency responders. American Journal of Industrial Medicine, 53, 1-11. 2010. doi:10.1002/ajim.20772.

with object (female 10%; male 13%), slip or trip (female 16%; male 13%), fall (female 11%; male 11%) and struck/assaulted (female 7%; male 7%)⁷⁵.

However, there are gender differences on health-related aspects in FRs. For instance, the prevalence of musculoskeletal injuries appears to be higher in male⁷⁶. Alcohol consumption has been documented for male⁷⁷ and female⁷⁸ firefighters with differences in binge drinking (male 56% and female 39.5%). But tobacco use rates are generally higher among females than males in fire service⁷⁹.

Moreover, empirical evidence shows that women are likely to have higher rates of anxiety, Posttraumatic Stress Disorder (PTSD)⁸⁰ and suicide⁸¹. Policewomen reported symptoms of depression, anxiety, or emotional problems post-9/11 significantly more often than policemen⁸². Gynaecological health such as menstrual cycle changes and impact on job efficiency⁷² and pregnancy complications (miscarriage and preterm births)⁸³ are other factors to consider when assessing health and safety of female FRs.

Personal occupational experiences are important sources of information regarding FRs well-being and safety. A study on EMS workers found gender-based differences in stress, burnout and coping behaviours (humour and substance abuse)⁸⁴. Also, experiences of female and male under critical incidents are found to be different (i.e. females were concise and males more intense in describing their experiences)⁸⁵.

A qualitative study reports seven key aspects on work health and job satisfaction of female firefighters⁸⁶: 1) physical demands/difficulties, 2) gender related physiological differences, 3) compensatory strategies, 4) equipment mal-adaptation, 5) earning respect, 6) negative attitudes of male counterparts (impact on social inclusion and health behaviours) and 7) recognition of injury risk.

Similarly, another study proposes the following six themes, listed in order of importance⁸⁷: 1) impact of working in a male dominated field, 2) harassment, 3) similar

⁷⁵ Campbell, R. Patterns of female Firefighter Injuries on the Fireground. National Fire Protection Association. 2017.

⁷⁶ Jahnke, S. A. et al. Obesity and incident Injury Among Career Firefighters in the Central United States. *Obesity* 21, 1505-1508.2013. doi:10.1002/oby.20436.

⁷⁷ Haddock, C. K. et al. Alcohol use among firefighters in the Central United States. *Occupational Medicine*; 62:661–664.2012. doi:10.1093/occmed/kqs162.

⁷⁸ Haddock, C. K. et al. Alcohol use and problem drinking among women firefighters. *Women's Health Issues* 27-6, 632–638. 2017. <http://dx.doi.org/10.1016/j.whi.2017.07.003>.

⁷⁹ Jahnke, S. A. The health of women in the US fire service. *Women's Health*, 12:39. 2012. <http://www.biomedcentral.com/1472-6874/12/39>

⁸⁰ Berger, W., Coutinho, E. S. F., Figueira, I., Marques-Portella, C., Luz, M. P., Neylan, T. C., . Mendlowicz, M. V. Rescuers at risk: A systematic review and meta-regression analysis of the worldwide current prevalence and correlates of PTSD in rescue workers. *Social Psychiatry and Psychiatric Epidemiology*, 47(6), 1001–1011.2012.

⁸¹ Stanley, I. H. et al. Examining anxiety sensitivity as a mediator of the association between PTSD symptoms and suicide risk among women firefighters. *Journal of Anxiety Disorders* 50, 94-102. 2017. <https://doi.org/10.1016/j.janxdis.2017.06.003>.

⁸² Bowler, R. M. et al. Gender Differences in Probable Posttraumatic Stress Disorder Among Police Responders to the 2001 World Trade Center Terrorist Attack. *American Journal of Industrial Medicine* 53: 1186-1196. 2010.

⁸³ Jahanke, S. A. et al. Maternal and Child Health Among Female Firefighters in the U.S. *Maternal and Child Health Journal* 22:922–931. 2018. <https://doi.org/10.1007/s10995-018-2468-3>.

⁸⁴ Sporer, C. R. sex Differences in Stress, Burnout and Coping in Emergency Medical Service Providers. CUNY Academic works. 2016. https://academicworks.cuny.edu/gc_etds/1427.

⁸⁵ Jacobsson, A. et al. Experiences of critical incidents among female and male firefighters. *International Emergency Nursing* 23: 100–104. 2015. <http://dx.doi.org/10.1016/j.ienj.2014.06.002>.

⁸⁶ Sinden, K, et al. A qualitative study on the experiences of female firefighters. *Work* 45: 97–105 97. 2013. DOI 10.3233/WOR-121549.

⁸⁷ Hollerbach, B. S. et al. Current Female Firefighters' Perceptions, Attitudes, and Experiences with injury. *Int Fire Serv J Leadersh Manag* 11: 41–47. 2017.

rates/types of injury, 4) inadequate training, 5) ill-fitting gear, and 6) functional techniques/endurance.

A National Report Card on Women in Firefighting⁸⁸ defines key factors that may affect women at the fire service: 1) discrimination and harassment, 2) unfair recruiting methods, 3) inadequate uniforms/equipment, 4) inadequate firehouse living accommodations, 5) sexual harassment and 6) unfair promotion processes.

Based on these studies it is possible to identify three main gender issues in FRs: 1) discrimination/harassment, 2) ill-fitting equipment and 3) physical barriers.

1) Discrimination/harassment.- Undoubtedly, discrimination⁸⁹ and sexual harassment⁹⁰ are factors to consider because they produce unhealthy occupational environments (e.g. employee feels under-valued) causing negative performances, both physically and psychologically (i.e. lower productivity, absenteeism, turnover, employee burnout, and health issues). Stereotypes play an important role because men can be more overconfident than women about their ability, especially for domains in which the gender gap is larger⁹¹. To avoid this, education regarding diversity and inclusion in the workplace is imperative⁹⁰.

2) Ill-fitting equipment.- This gender issue may be associated with the prevalence of injury and the reduction of female FRs working efficiency. In this sense, physical and physiological sex/gender differences might require specific measures. RAND conducted a study on hazards and personal protection for Fire Service, EMS and LEA personnel⁹². The main issues identified were 1) physical stress and comfort, 2) communications, 3) disease protection (for EMS and LEA personnel), 4) Practical respiratory and chemical protection equipment for FRs, 5) Personal Protection Technologies (PPT) and 6) training and best safety practices. Obviously, these topics comprise the overall FRs community (male and female). Protective clothing design was reported as a specific issue i.e. women are being sized as if they were small men. This is a key factor already mentioned here (e.g. equipment mal-adaptation, ill-fitting gear and inadequate uniforms/equipment) because male-specific Personal Protective Equipment (PPE) may contribute to injuries in women⁹³.

Ill-fitting of protective clothing was first introduced by the Handbook on Women in Firefighting⁹⁴ in 1993. The handbook includes a survey on PPE. Recently, a study conducted a similar survey⁷⁵. Figure 3 compares ill-fitting of different PPE components reported in both studies (1993 and 2019). Results suggest a slight improvement in 26

⁸⁸ Hulett, D. M. et al. A national Report Card on Women in Firefighting. Association of Women in Fire & Emergency Services. 2008. <https://www.womeninfire.org/wp-content/uploads/2014/07/35827WSP.pdf>.

⁸⁹ Eriksen, C. Gendered dynamics of wildland firefighting in Australia. Society & Natural Resources <http://dx.doi.org/10.1080/08941920.2016.1171938>.

⁹⁰ Lonsway, K. A., Paynich, R. and Hall, J. N. Sexual Harassment in Law Enforcement: Incident, Impact, and Perception. Police Quarterly, 16(2), 177-210. 2013. <https://doi.org/10.1177/1098611113475630>.

⁹¹ Bordalo, P., Cofman, K., Gennaioli, N. and Shleifer, A. Beliefs about Gender. American Economic Review, 109(3): 739–773. 2019. <https://doi.org/10.1257/aer.20170007>

⁹² LaTourrette, T. et al. Protecting Emergency Responders. Vol. 2. RAND. Science and Technology Policy Institute. 2003. https://www.rand.org/pubs/monograph_reports/MR1646.html

⁹³ Andersen, K. A., Grimshaw, P. N., Kelso, R. M., & Bentley, D. J. Musculoskeletal lower limb injury risk in army populations. Sports Medicine – Open, 2, 22.2016.

⁹⁴ Armstrong, D. S. et al. A Handbook on Women in Firefighting. The Changing Face on the Fire Service. Federal Emergency Management Agency. United States Fire Administration. 1993.

years. Furthermore, the provision of specific PPE varies from one country to another (Figure 4).

Interestingly, 86% of female firefighters reported no specific PPE and 33% reported ill-fitting SCBA facepiece in Europe. Gender approaches to improve weight, size, comfort and enhancing the functionality of PPE components are required.

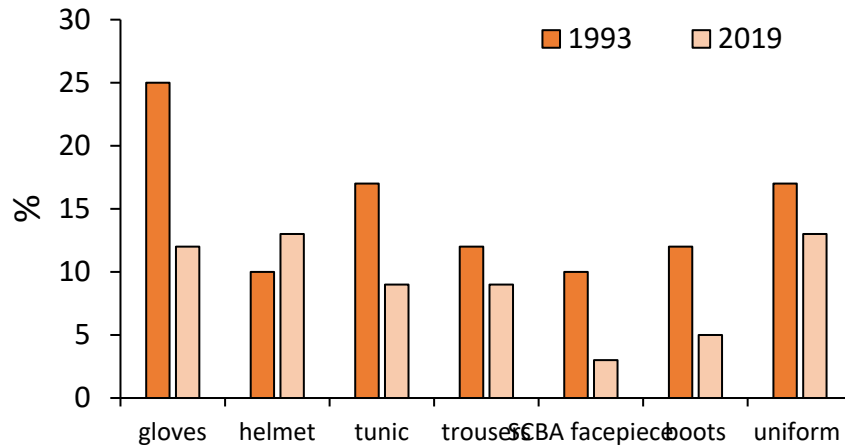


Figure 3: Comparison of ill-fitting Personal Protective Equipment (PPE) reported in 1993 and 2019. (Data taken from^{72,93}).

Personal Protective Equipment (PPE) for female firefighters

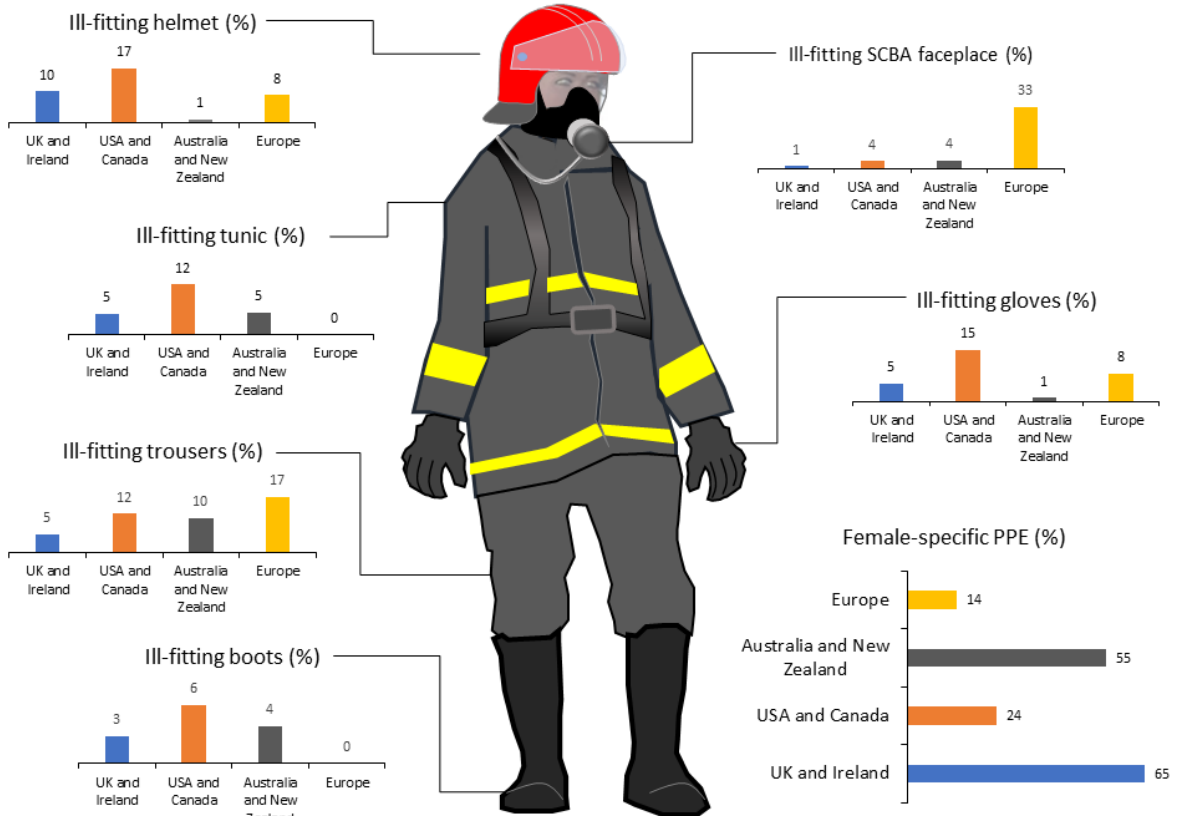


Figure 4: Comparison of ill-fitting Personal Protective Equipment (PPE) in different geographical locations. Data taken from⁷².

3) Physical barriers.- This gender issue has been largely discussed before. Here we focus on its implications in training since ASSISTANCE will address new training methods. FRs are the first to arrive at a disaster scene and need knowledge, equipment and skills to mitigate the situation. There is a gender gap in traditional physical training. The inflexibility of training and protocols can be considered a barrier to the full acceptance of the benefits of gender diversity in FRs⁹⁵. Inadequate training is a threat to safety and increased risk for injury in female FRs. The need for new training methods and techniques tailored to emerging gender and diversity issues has been suggested in several studies^{90,91,92,96}. The objective is to allow female FRs to accomplish the same tasks while using their strengths and reducing their limitations (e.g. to accommodate the “changing bodies”, especially between 30 and 45 years old). However, specific training for women may be ignored by leadership and training officers⁹². Furthermore, pieces of evidence show that women: 1) are more effective in learning, 2) utilize their mentors more effectively than men, 3) leaders are more likely to receive learning from others, 4) learn more from reflection and self-assessment, 5) are more aware of their identity in the workplace and more likely to utilize help from relationships⁹⁷. Police training instructors indicated that female officers have an advantage over their male peers in several areas, including empathy toward others and interacting in a way that is not designed to “prove” something⁹⁸. Hence, focusing only on physical training is likely to diminish women's productivity. The implementation of sensitive policies and new training methods can facilitate the integration and best performance of women as FRs.

2.3.5. Technologies and female FRs

The use of new technologies can help to protect and enhance the emergency response capabilities for both women and men and also reduce the gender gap in FRs. A study defines priorities to address first response capability gaps with new technologies⁹⁹:

- Readily accessible, highly-friendly simulation tools to support training and exercises in incident response management.
- The ability to know the location of responders and risk and hazards in real time.
- The ability to communicate with responders in any environmental conditions.
- The ability to remotely monitor the tactical actions and progress of all responders involved in the incident in real time.
- Communications systems that are hands-free, ergonomically-optimized, and can be integrated into personal protective equipment.
- Protective clothing/equipment for all first responders against multiple hazards.

⁹⁵ Health & safety issues of the female emergency responder. Federal Emergency Management Agency / United States Fire Administration. 1996. <https://www.usfa.fema.gov/downloads/pdf/publications/fa-162.pdf>.

⁹⁶ Russo, B. R. Women firefighters' strategies for advancement in the fire service: breaking down barriers in gender-based occupation. Submitted to the Faculty of the Graduate College of the Oklahoma State University in partial fulfillment of the requirements for the Degree of Doctor of Philosophy. December, 2013

⁹⁷ Kossek, E. E. and Lobel, S. A. *Managing Diversity: Human Resource Strategies for Transforming the Workplace*. Blackwell Business. 1996.

⁹⁸ Pike, D. L. Women in Police Academy Training: Some aspects of organizational response, in *The Changing Roles of Women in the Criminal Justice System: Offenders, Victims, and Professionals*, ed. Imogene L. Moyer (Prospect Heights, IL: Waveland Press, 1985), 250-270.

⁹⁹ Project Responder 3: Toward the First responder of the Future. Homeland Security. Science and Technology. 2012. https://www.nisconsortium.org/portal/resources/bin/Project_Responder_3:_1423591018.pdf

D8.2 Progress report on Gender Dimension Strategy GDS

- The ability to detect, monitor, and analyse passive and active threats and hazards at incident scenes in real time.
- The ability to identify what resources are available to support a response (including resources not traditionally involved in response), what their capabilities are, and where they are, in real time.
- The ability to identify trends, patterns, and important content from large volumes of information from multiple sources to support incident decision making.
- The ability to rapidly identify hazardous agents and contaminants.
- The ability to monitor the status of resources and their functionality in current conditions, in real time.
- The ability to remotely scan an incident scene for signs of life and decomposition to identify and locate casualties and fatalities.

The ASSISTANCE project aims to address some of these gaps through Situation Awareness (SA) tools, drones and robots with different sensors, wearables for FRs (e.g. sensors and cameras), robust communication and new training tools.

Designing technologies and the programs that run them must take into account a) gender differences in use and their evolution, and b) their effects on the lives and use of time of people of both sexes¹⁰⁰. However, there are gender challenges when designing and implementing ASSISTANCE technologies for FRs.

First, biophysical variables (e.g. sex differences in height and weight) may be determinant. For instance, wearables, Virtual Reality (VR) and Augmented Reality (AR) equipment (e.g. headsets, accessory and control devices, etc.) are usually one size fit (a size that fits most men)¹⁰¹. Second, individual characteristics can greatly influence potential users' interaction with new technologies and thus adoption. Hence the impact of gender perspective in technology experience needs to be addressed^{102,103,104}. Participatory research and experiments that seek to balance interests, benefits and responsibilities seem to be plausible approaches. Third, the impact of technologies on subjective well-being, working conditions, risk perception, health status, service coverage, communication, equal opportunities, etc. is another challenge deemed to be evaluated under a gendered perspective. Fourth, including women and gender expertise on technology design can broaden views¹⁰⁵. However, it should be noted that only one woman in an innovation team does not ensure representation for all women. It is therefore necessary to promote gender participation and gender balance in research and innovation teams.

¹⁰⁰ For a better integration of the gender dimension in the Horizon 2020 Work Programme 2018-2020. Position paper. Advisory Group for Gender. December 2016.

<https://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetailDoc&id=28824&no=1>

¹⁰¹ <https://brainxchange.com/wearable-and-immersive-tech-and-the-female-workforce/>

¹⁰² Faulkner, W., & Lie, M. Gender in the Information Society: Strategies of Inclusion. *Gender, Technology, and Development*, 11 (2), 157-177. 2007.

¹⁰³ Oudshoorn, N., Rommes, E., & Stienstra, M. Configuring the User as Everybody: Gender and Design Cultures in Information and Communication Technologies. *Science, Technology and Human Values*, 29 (1), 30-63. 2004.

¹⁰⁴ Goswami, A. and Dutta, S. Gender differences in technology usage-a literature review. *Open Journal of Business and Management*, 2016, 4, 51-59.

¹⁰⁵ Danilda, I., & Thorslund, J. (Eds.). *Innovation & Gender*. Stockholm: VINNOVA Information. 2011.

3. Gender analysis in ASSISTANCE

3.1. Overview

The general approach for sex/gender analysis within the ASSISTANCE project involves five iterative steps (Figure 5) defined for research interventions during the project (from M0 to M36).

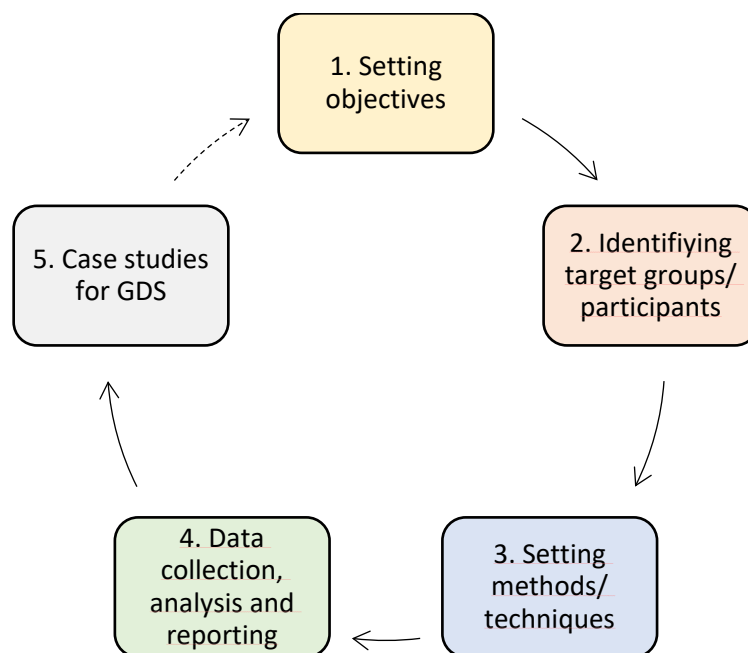


Figure 5: Overall process for the approach to sex/gender analysis in ASSISTANCE project.

1. Setting the objectives.- This step mainly consists of the preliminary definition of the objectives. A rethinking about priorities while considering gender aspects will be continuously conducted i.e. how to address the potential implications of strategic choices and implementation activities in terms of sex or gender.

2. Identifying target groups/participants.- A participatory research and design is planned to be used. This involves the identification of the target groups and participants (female and male) likely to be involved, engage FRs and evaluate through cooperation in different phases of the project, when required.

3. Setting methods and techniques.- Gendered Innovations methods⁵ are considered as reference. Several gendered methods that include qualitative and quantitative techniques are defined in this step (planning, research, engineering approaches and gender monitoring).

4. Data collection, analysis and reporting.- This step involves the application activities of methods and techniques described in step 3 involving data collection, data processing (e.g. statistical hypothesis testing) and reporting (including null results that may represent important findings). The number and scope of such actions will depend on the specific conditions and opportunities during the project (target groups involvement, women availability, etc.).

5. Examples for Gender Dimension Strategy (GDS).- Outcomes of previous steps (including case studies) will be reported in two main outcomes: the GDS guideline (D.8.4) and Human Factor impact assessment document (D8.7) (Figure 6).

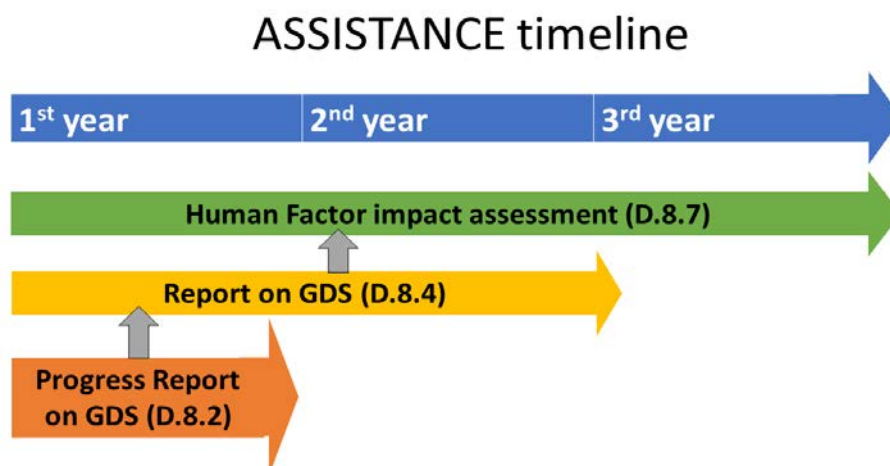


Figure 6: Gender Dimension Strategy in the ASSISTANCE timeline.

3.2. Setting objectives

Ensuring the protection of FRs which work together during the mitigation of disasters is the guiding principle of ASSISTANCE. This involves the development and use of technologies based on the needs and preferences of end-users. Thus, the innovation of the project can be seen from a bottom-up perspective with the participation of responders and citizens as direct beneficiaries. Within this perspective, sex and gender are important non-technological factors to consider. The literature review has shown the need to integrate sex and gender in several aspects such as personal protection, training and the design, testing and validation of technology to promote equality-equity and also to improve emergency response and mitigation.

The objective is to develop a Gender Dimension Strategy (GDS) defined as a guideline with examples of best practices, solutions, strategies and lessons learned to analyse gender and improve scientific excellence and innovation in the field of safety and security of FRs. The ASSISTANCE project will be used as a testbed to achieve this main objective. The project involves designing, testing and validation of technologies through piloting actions and the application of new training approaches along with other activities to address gender aspects (i.e. differences/similarities in behaviours and learning, gender bias, etc.). A rethinking process about priorities has been conducted and the specific objectives have been defined (Table 3).

Specific Objective	Description
SO1	To incorporate gender dimension in the constraints and opportunities for rapid response to disasters.
SO2	To include gender aspects in design, testing and validation of ASSISTANCE technologies.
SO3	To explore gender through new methods.
SO4	To promote gendered perspective in research.

Table 3 Specific objectives of GDS.

3.3. Identifying target groups/participants

Considering the core topic of ASSISTANCE and gender aspects in FRs, a wide approach to determine the potential participants (female and male) is considered:

- FR personnel referring to FR organizations (LEAs, Firefighters and EMSs) that will assess the research outcomes of the project.
- Citizens that can provide 1) their perception on safety and FRs activities and 2) their awareness and preparedness in case of a disaster.
- Technology providers referring to members of the research/engineering team involved in design and testing of ASSISTANCE developments and tools.

3.3.1. FR personnel

This target group comprises two subgroups 1) internal and 2) external FRs. Internal FRs are members of the consortium that are expected to participate in pilots (training and testing technologies) and additional research actions (Table 4). There are five FRs dedicated to fire service (GB, SBFF, OSPOM, CNOP-PIB and IFV), one EMS (AAHD), one LEA (MIR-PN) and one 112-emergency coordination (AVSRE). The number of female personnel differs among FRs with a higher proportion of women in EMS and 112-emergency.

Name	Short name	Country	Main activity
AGENCIA VALENCIANA DE SEGURIDAD Y RESPUESTA A LAS EMERGENCIAS	AVSRE	Spain	112/ emergency coordination
OPENBAAR LICHAAM GEZAMENLIJKE BRANDWEER	GB	Netherlands	Fire service/ industrial accidents
AMBULANCE AND EMERGENCY PHYSICIANS ASSOCIATION	AAHD	Turkey	EMS/training
MINISTERIO DEL INTERIOR	MIR-PN	Spain	Law Enforcement
SODERTORNS BRANFORSVARFORBUND	SBFF	Sweden	Fire and rescue services
OCHOTNICZA STRAZ POZARNA W OZAROWIE MAZOWIECKIM	OSPOM	Poland	Fire service/ volunteers
CENTRUM NAUKOWO-BADAWCZE OCHRONY PRZECIWPOZAROWEJ IM. JOZEFA TULISZKOWSKIEGO - PANSTWOWY INSTYTUT BADAWCZY	CNOP-PIB	Poland	Fire service/ civil protection/ research
INSTITUUT FYSIEKE VEILIGHEID/IFV	IFV	Netherlands	Fire service/ training

Table 4 Internal target group of FRs. Information taken from the DoA.

Internal FRs were asked for the number of male and female personnel they may provide to help conducting gender analysis in the project. SBFF has 310 employees, 35 of them are women. CNOP-PIB has 10 career professionals, 2 of them are women and 30 volunteers (around 10% women). AAHD is willing to provide 66 men and 48 women. AVSRE will provide 10 FRs (3 women and 7 men), but they are open to provide additional participants from LEAs. GB can provide 2 women and 10 men participants.

External FRs organizations might also take part in specific gender analysis actions. A dedicated task (Task 1.3 End User Group Coordination) is included within ASSISTANCE to involve as many FRs as possible. Another way to incorporate additional participants is directly contacting with external FRs organizations.

3.3.2. Citizens

How citizens perceive, understand, internalise, accept and respond to threatening situations and how they accept new technologies proposed in ASSISTANCE are key factors to consider. Current approaches to this are limited. The special Eurobarometer 464b: European's attitudes toward security¹⁰⁶ provides valuable data about citizens perceptions but lacks gender analysis. Face to face interviews, administered to 2500 citizens, were conducted in a study to analyse gender differences in preparedness and response behaviours towards flood risk. Results suggest that men are more confident in their abilities, perceiving greater individual and household preparedness. By contrast, women had a better understanding of these events and more household-caring attitudes and behaviour¹⁰⁷.

The involvement of citizens in GDS of ASSISTANCE is inspired by these two approaches. One of the Key Performance Indicators (KPIs) in the DoA consists of conducting questionnaires to measure security perception of citizens (>250) from different European countries. This questionnaire will be conducted preferably to women and men in equal numbers. The key point here is the opportunity to analyse desegregated data to determine gender differences or similarities regarding vulnerabilities, perception of threats and risks, the selection of coping strategies and the acceptance of ASSISTANCE outcomes. Additionally, intersecting factors with gender will be collected (age, socioeconomic status, educational background, ethnicity, etc.).

3.3.3. Technology providers

Technology providers play an important role in the design and innovation of ASSISTANCE outcomes. As mentioned, only one woman in an innovation team does not ensure adequate representation of women. 21 % of ASSISTANCE research team are female (data based on the DoA). This context provides a good opportunity not only to address gender policies (i.e. gender balance) but to analyse the impact of a gendered perspective in the design, development and testing of technologies and tools for FRs.

¹⁰⁶ https://data.europa.eu/euodp/data/dataset/S1569_87_4_464B_ENG

¹⁰⁷ Cvetkovic, V. M. et al. The Role of Gender in Preparedness and Response Behaviors towards Flood Risk in Serbia. International Journal of Environmental research and Public Health. Vol. 15 Issues 12, December 2018.

3.3.4. Participation

Research subjects will take part in representative case studies to be included in the GDS. The main aim when selecting/recruiting participants is to have significant and representative samples of both sexes/genders. That is why the collaboration of FRs is crucial.

In some cases, each FR organization will oversee recruiting and informing their own workers (males and females). Also, FRs involved in training sessions and pilots will be likely to take part in specific gender analysis actions.

The degrees of participation for FRs will vary. While some participants will be required to fill in simple questionnaires or be interviewed individually or in focus groups (discussion, decision-making) others will be observed performing actions (task completion, decision-making time). This will depend on the number of people and the available/required time.

In relation to citizens, a survey company is expected to be hired by the University of Cantabria to conduct the questionnaire. Therefore, this company will contact the target respondents from Europe (split evenly by gender).

One issue is that questionnaires and other documents (i.e. information sheets) may need to be written in each country's primary language e.g. when planning on launching a questionnaire to people from various countries. To address this, partners collaboration is also crucial.

Ethical requirements will be used in any case taking as reference the following deliverables produced in WP10: D10.1 arrangements, procedures and criteria to recruit participants, D10.2 Informed Consent procedures: templates of Informed Consent Forms (IFC) and Information Sheets, D10.5 processing of special categories of personal data, D10.6 data protection, D10.7 rights and freedoms of participants, D10.8 ICF procedures, D10.9 profiling of personal data, D10.10 previously collected personal data, D10.11 evaluation of ethical risks related to data processing.

3.4. Setting methods and techniques

ASSISTANCE is not a fully gender-dedicated project but a gender-related project (i.e. gender aspects are deemed to be addressed). Some methods proposed by Gendered Innovation have been adapted to address gender in FRs.

Method 1.- Research planning (Table 5). This method is related to strategic decisions about what work to undertake. The application of this method started during the proposal phase and it is being revised as the project evolves. The present document (D8.2) summarizes the main outcomes of this method to date. After a literature review, the main conclusions are that: 1) not considering gender potentially affects the investigation (missed opportunities for innovation) and 2) a gender approach can help to better understand FRs protection. The reformulation of research questions and specific objectives accordingly and the definition of the present methods are the main outcomes.

Method 2.- Participatory research (Table 6). There are numerous participatory research strategies. However, participatory approaches do not differ fundamentally from other empirical research procedures¹⁰⁸. This method comprises a range of approaches involving inquiring and action by research participants. The aim of this method is to include FR communities in different tasks, not only when gathering data but when processing data and interpreting the results as well.

<i>Method 1.- Research planning</i>	Specific Objective(s): SO1-4
<ol style="list-style-type: none"> 1. Gender requirements by EC. <ol style="list-style-type: none"> 1.1. New needs and opportunities. 1.2. Missed opportunities. 2. Analysing gender. <ol style="list-style-type: none"> 2.1. Concepts and theories on gender. <ol style="list-style-type: none"> 2.1.1. Gender Analysis frameworks. 2.1.2. Gendered dimension-sex and gender research methods. 2.1.3. Gendered Innovation methods. 2.2. Current and new evidence to integrate sex and gender into ASSISTANCE. <ol style="list-style-type: none"> 2.2.1. State-of-the-art on gender in FRs. 2.2.2. Potential conflicts between assumptions and new evidence. 2.2.3. FRs needs, assumptions and behaviours. 2.2.4. Issues related to sex and gender in FRs not being addressed. 3. Rethink research priorities (objectives) and potential outcomes. <ol style="list-style-type: none"> 3.1. Whether gender may impact on constraints and opportunities for a rapid response (FRs and citizens). 3.2. Whether training methods and technologies need to be tailored to women and/or can be improved by gender diversity in FRs (also in terms of biological sex). 3.3. Whether new methods and techniques can be applied for gender analysis. 3.4. Whether gendered perspectives in the research team improve the outcomes. 	

Table 5 Method 1.- Research planning.

Method 3.- Engineering innovation process (Table 7). Gender differences in responses, language and spatial abilities and systematic thinking and sex differences could generate new insights for innovation. Essentially this method will allow addressing this during design, test and evaluation of ASSISTANCE tools and technologies.

Method 4.- Other factors (Table 8). This method will be used to explore sex and gender interactions and intersecting factors likely to have impact on sex/gender analyses. Examining how other factors intersect with sex and gender is also necessary (age, nationality and geographic location, socioeconomic status, rank and experience, etc.) because these factors may reveal sub-group differences among women and among men likely to be obscured by using only gender or sex as a variable.

¹⁰⁸ Bergold, J. and Thomas, S. Participatory Research Methods: A Methodological Approach in Motion. Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, 13 (1). Art. 30. 2012. <http://nbn-resolving.de/urn:nbn:de:0114-fqs1201302>.

Method 2.- Participatory research	Specific Objective(s): SO1, SO3
<ol style="list-style-type: none"> 1. Identify the area of work (i.e. EMS, Fire Service, Law Enforcement and Research). <ol style="list-style-type: none"> 1.1. Analyse gender structures. 1.2. Specific knowledge from women and men to contribute. 2. Identify potential target groups (FRs, citizens and technology providers). <ol style="list-style-type: none"> 2.1. Define the characteristics of the target users. 2.2. Collect information of perspectives, interests, etc. 3. Observe FRs or users. <ol style="list-style-type: none"> 3.1. Access to “tacit” knowledge by workers or users. 3.2. Influence of sex and gender on how the work is done. 3.3. Probe understanding in interaction with users. 4. Seek user or community input. <ol style="list-style-type: none"> 4.1. Engage users in defined problems, requirements, solutions, alternatives, etc. (e.g. GAM approach). 4.2. Define influence of gender roles in the data collected. 5. Evaluate and redesign. <ol style="list-style-type: none"> 5.1. Cooperate in all steps of project evaluation. 	

Table 6 Method 2.- Participatory research.

Method 3.- Engineering innovation	Specific Objective(s): SO2, SO3, SO4
<ol style="list-style-type: none"> 1. Evaluate past innovation practices. <ol style="list-style-type: none"> 1.1. Detect male default. 1.2. Detect stereotyping. 1.3. Identify missed opportunities. 2. Determining relevance of sex/gender. <ol style="list-style-type: none"> 2.1. Anatomical and physiological differences between female and male FRs. Need of tailored technology? 2.2. Potential applications and different patterns of use of the technology. 2.3. End users’ expectations (women and men). 2.4. Configurations that reinforce gender stereotypes and gender bias. 3. Design team. <ol style="list-style-type: none"> 3.1. Include women. 3.2. Include gender expertise. 4. Analyse users and markets. <ol style="list-style-type: none"> 4.1. Analyse the different effects on women and men. 4.2. Identify relevant sex and biophysical variables. 4.3. Analyse also similarities between female FRs and male FRs. 4.4. Examine other factors intersecting with sex and gender. 5. User input. <ol style="list-style-type: none"> 5.1. Participatory research (Method 2). 5.2. Surveys, interviews, focus groups (attitudes, perceptions and self-reporting). 5.3. Experiments and new measures (decision-making and performance). 6. Evaluating and planning. <ol style="list-style-type: none"> 6.1. Consider both benefits and problems. 6.2. Consider gender expertise for further actions. 	

Table 7 Method 3.- Engineering innovation.

<i>Method 4.- Other factors</i>	Specific Objective(s): SO1-4
<ol style="list-style-type: none"> 1. Analysing how sex and gender interact. <ol style="list-style-type: none"> 1.1. Sex-gender interaction (e.g. sex-related physical needs and gender-related work needs to develop technologies). 1.2. Sex and gender interaction with other factors (e.g. age, socioeconomic status, geographical location, job experience, rank, etc.) 2. Factors intersecting with sex and gender. <ol style="list-style-type: none"> 2.1. Identify relevant factors. 2.2. Identify intersections. 	

Table 8 Method 4.- Other factors.

Method 5.- Gender monitoring (Table 9). This method is being used since the beginning of the project to supervise gender sensitive aspects during all activities and potential outcomes. Additionally, gender aspects will be addressed in the consortium (ASSISTANCE team and internal management) during the project to 1) seek gender balance in the composition of research teams and 2) ensure women participation in decision making.

<i>Method 5.- Gender monitoring</i>	Specific Objective(s): SO1-4
<ol style="list-style-type: none"> 1. Gender considerations for partners (checking list) 2. Language and visual representations <ol style="list-style-type: none"> 2.1. Check unintended hypothesis-creating metaphors 2.2. Promote use of inclusive language. 2.3. Check that visual display data do not embed gender assumptions. 3. Standards and reference models. <ol style="list-style-type: none"> 3.1. Check models for both female and male (and not a male reference model). 3.2. Whether existing model differentiates between women and men. 3.3. Check if standard(s) may be invalidated by trends. 3.4. Identify the importance of sex in reference model(s). 3.5. Whether model(s) addresses sex-specific factors. 3.6. Whether model(s) considers between women's and men's attitudes, needs, and interests. 	

Table 9 Method 5.- Gender monitoring.

3.5. Data collection, analysis and reporting

Data collection is planned to be conducted at three levels:

- Level 1.- Analysis that covers all phases: design, preparation, execution and evaluation.
- Level 2.- Data collection and data processing in activities conducted by other partners for other purposes during the project e.g. societal impact assessment, training and piloting actions.
- Level 3.- Processing disaggregated data previously collected by other partners.

Data collection will be as flexible as possible according to the evolution of the project (e.g. current and new constraints and opportunities, availability of participants and resources, etc.). This process will be subject to mutual consortium decisions according to objectives, the limitations of those participating, equipment availability and resources. The suitability of data collection vs participants will be analysed to determine whether a given action can be designed and conducted to overall FRs or specific FR groups (i.e. EMS, Firefighting, LEA). Moreover, data will be derived from an array of different sources:

Questionnaires.- The advantages of questionnaires in research are well-known. Questionnaires will be preferably designed for statistical analysis (i.e. comparing female and male responses) using standardized answers for a simple compilation of data. Responses can include quantitative data (e.g. the number of female FRs, years of experience) or qualitative data (e.g. interpretative, perceptions and subjective opinions). There is always the possibility, however, that the written question will be interpreted differently by readers. Therefore, pre-testing questionnaires will be conducted beforehand. A survey company is expected to be hired by the University of Cantabria to conduct an online questionnaire about citizens' attitudes towards safety and security and FRs actions (see a preliminary version of the questionnaire in ANNEX A). This questionnaire explores two aspects: 1) perception of safety and security (e.g. citizen awareness-preparedness) and 2) perception of FRs resources and actions to deal with emergencies.

Another pre-test questionnaire (ANNEX B) has been created for internal and also external FRs to analyse gender structures by collecting information of: 1) the proportion of woman in different FRs (firefighters, emergency services, polices, civil protection, etc.), 2) the roles/ranks woman play within FRs and 3) the presence of gender/diversity policies within FRs organizations/institutions. This questionnaire has been circulated and reviewed by consortium partners. Other questionnaires are expected to be designed and conducted during different phases of the project. Particularly, questionnaires will be administered after training sessions to explore trainees' impressions and after pilots for testing ASSISTANCE technologies.

Interviews/Focus groups.- These actions are planned to increase data and in case of not having a significant number of FRs participants (women and men) for questionnaires (small sample size). Interviews and focus groups are useful to explore views and experiences of female and male FRs regarding training methods, technologies, working conditions, risk perception among other aspects of their work. Structured interviews will follow the same procedure as questionnaires but allowing the possibility for follow-up questions for clarification and gathering further information. Semi-structured interviews will also have a pre-defined set of key questions but more flexible allowing further discussions (e.g. to find new information important to participants but not previously considered by the research team).

Interviews can be also conducted for small groups (6-10 participants) interviewed together to gather collective views from FRs. Focus groups allow scrutiny of complex problems as participants interact with each other (e.g. opinions from some participants may trigger others to elaborate new responses and ideas they did not think about before).

Dominant personality and reluctance to discuss feelings or opinions openly in front of peers or superiors are issues to be addressed in the design process. According to the DoA, a focus group will be involved but more focus groups are expected to be used (i.e. women group, men group and mixed group) for comparative analysis. Interviews and focus group sessions will be recorded for further analysis of transcripts.

Experimental research.- Laboratory and/or field experiments can provide important insights about gender similarities/differences in FRs performance and behaviour. This will allow the possibility to include rigorous observations and new measurement methods for assessing gender in FRs. That is why in addition to traditional experiments, the possibility of creating and running software-based experiments is also considered here (i.e. to implement experiments on a computer)¹⁰⁹.

The software/web application will support stimulus presentation and response registration with high temporal resolution and will enable participants to interact with video and sound and will have input interfaces (e.g., keyboard, mouse, and joystick).

The basic components and functionality of the software will be previously tested. Subjects will be studied completing tasks and making simple decisions in the proposed scenarios/situations. The decision model for the experiment is not decided yet. There are three alternatives:

- Research subjects have access to all the information they need, that they can process all the information available, and that they have plenty of time.
- Decision making is inherently risky, and that human beings do not have the cognitive ability or the time to make fully informed decisions in most cases. They are limited by having too many options and the pressure to make a "good enough" decision given time constraints and incomplete information.
- Research subjects use information, but it may not be consciously accessed and listed as in the classical model. Memory and intuition come into play.

The main dependent variables can be time (decision and performance), decisions taken, tasks completion (the order/sequence and the number of tasks), among others.

Quantitative and qualitative methods will be used to process and analyse desegregated data. Basic descriptive analysis of data will involve the calculation of simple measures and the distributions of variables by sex/gender to facilitate comparisons. For continuous variables parametric and non-parametric statistical methods will be defined for hypothesis testing. Different approaches will be considered for qualitative data analysis depending on the research focus (e.g. human action and interaction, experiences and meaning of phenomena) and Coding (categorization, constant comparison, interpreting, etc.) will be used as the analysis strategy.

3.6. Case studies for GDS

This section presents a short example of a preliminary case study conducted by the University of Cantabria during this first period to illustrate the way different case studies are planned to be reported in the GDS.

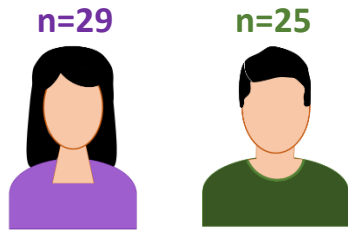
¹⁰⁹ Stahl, C. Software for creating Psychological Experiments. *Experimental Psychology*; Vol. 53(3):218–232. 2016. DOI 10.1027/1618-3169.53.3.218.

The challenge: Whereas a substantial body of research indicates that women and men differ in their perceptions of risk, others are not conclusive. Understanding differences and similarities between female and male attitudes and perceptions towards safety and security in case of disasters can help to improve FRs policies and actions.

Method: Research on the relationship between gender and safety and security in Western countries is limited. Here we compare women's and men's attitudes towards disasters at local, national and European levels. A pre-test questionnaire (ANNEX A) was administered to 54 participants (female 29; male 25) between 18 and 65 years old. It included questions divided into two blocks: A. Perception of safety and security (seven questions) and B. Perception of FRs roles/actions (three questions). Responses were divided by gender and contingency tables were analysed using Fisher's Exact test ($\alpha=0.05$).

Results: Figure 7 summarizes the main findings from the first block of questions (block A). p -values are reported ($p>0.05$ no significant gender differences; $p<0.05$ significant gender differences). We found that women have more perception of the likelihood of disasters in Europe caused by extreme weather conditions ($p=.0014$) and industrial accidents ($p=.0271$) than men. But there are no significant differences in the likelihood of fire disasters and terrorist attacks perceived by female and male respondents ($p>0.9999$; $p=.3620$). We also found no gender differences in self-perception of preparedness against different disasters: Extreme weather, $p=.2783$; Fire, $p=.9231$; Industrial accidents, $p=.8662$; Terrorist attacks, $p=.3379$. Interestingly, most respondents think they are not well prepared to face industrial accidents (female 76 %, male 80 %) and terrorist attacks (female 72 %, male 60 %). Results show that risk perception in women and men differs in most cases. Women are more likely to perceive higher risk (high/critical risk) if a disaster occurs in their vicinity: Extreme weather ($p=.0014$), Fire ($p=.0015$) and Terrorist attack ($p=.0306$). The risk level perceived by both women and men in case of an industrial accident does not differ significantly ($p=.4246$). It should be noted that respondents live close to a SEVESO company.

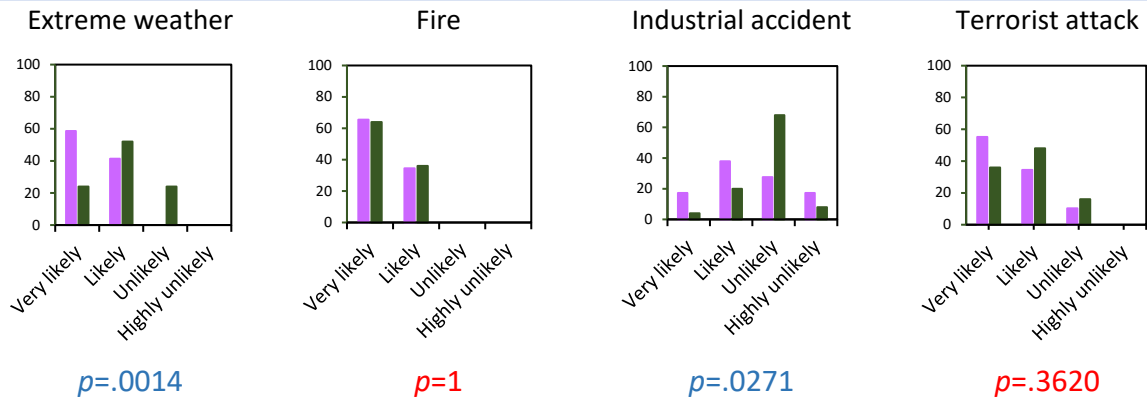
Discussion: Primary questions concerning life safety and security include how individuals perceive large disasters and whether gender is a relevant factor or not. Using a simple pre-testing questionnaire, the current study explores similarities/differences between women and men in relation to potential disasters (extreme weather, fire, industrial accident and terrorist attack). Overall our findings show that there are differences but also similarities between women and men. The awareness of women about extreme weather disasters and industrial accidents in Europe is higher than men. However, women and men do not differ in self-perception of preparedness to face disasters. Women may experience higher risk perception in relation to extreme weather, fire disasters and terrorist attacks. This needs to be confirmed with a bigger population sample. The questionnaire is planned to be conducted online involving more (>250) respondents from different European countries. Then it will be necessary to determine sources of gender differences and the underlying mechanisms (e.g. gender norms, gender identity, gender relations, interaction with other factors, etc.) and consider alternatives and/or options to implement solutions. However, this exploratory study provides an exciting opportunity to promote the importance and study of gender to improve our understanding about constraints/opportunities for rapid response to disasters.



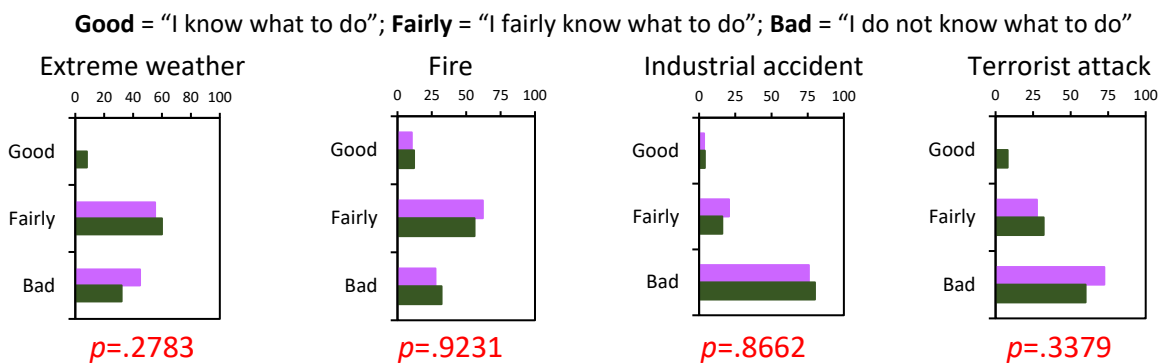
Gendered attitudes towards disasters

How citizens perceive, understand and internalise threatening situations can improve our understanding about constraints/opportunities for rapid response. This study explores gender dimension in awareness and perception of potential disasters.

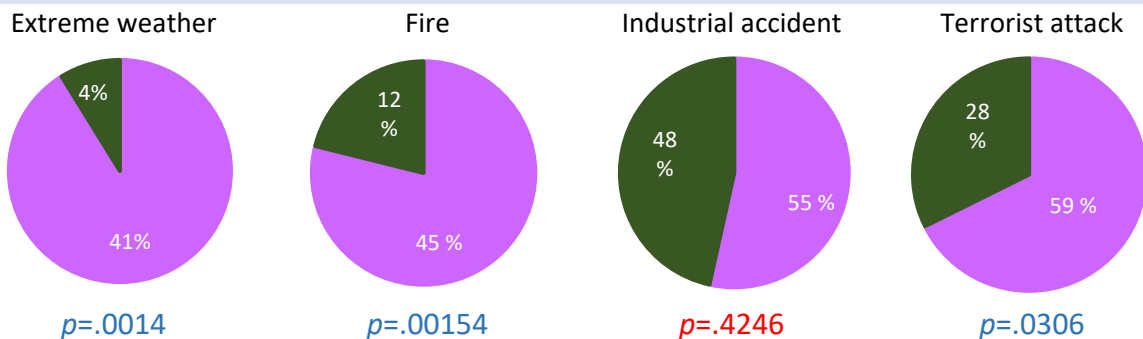
Likelihood of disasters in Europe (%)



Self-perception of preparedness (%)



Higher risk perceived (%)



Fisher Exact test ($\alpha=0.05$) H0: no significant gender differences; H1: significant gender differences

Figure 7: Summary of results from a pre-testing questionnaire on disasters perception.

4. Conclusions

Women and men are likely to bring unique qualities to their role as first responders. Therefore, sex/gender differences require specific measures. The flexibility of new training protocols and the use of new technologies can support full acceptance of the benefits of gender diversity in FRs. Furthermore, the integration of Gender Dimension is not only a matter of equality, it also means an improvement in research and innovation.

This deliverable D8.2- Progress report on Gender Dimension Strategy (GDS) has described the methodology to conduct gender analysis in the ASSISTANCE project. It consists of five main iterative steps:

- 1) Setting the objectives.
- 2) Identifying target groups/participants.
- 3) Setting methods and techniques.
- 4) Data collection, analysis and reporting.
- 5) Case studies for the GDS.

1) The main objective is to develop a GDS guideline with best practices, methods/techniques illustrated by case studies for FRs. A set of specific objectives (SO) have been defined:

- SO1.- Incorporate gender dimension in response to disasters.
- SO2.- Include gendered approaches for design, testing and use of technologies and training methods.
- SO3.- Promote gendered perspectives in research and innovation processes.
- SO4.- Use new measures to analyse gender in FRs.

2) Target groups/participants (female and male) have been identified: FRs who are directly impacted by the technologies and training methods, citizens who may be involved in disasters and technology providers who play a key role in research and innovation actions within the project.

3) Five gendered methods have been defined. These methods are based on Gendered Innovation but redefined and tailored to the ASSISTANCE project.

- Method 1.- Research planning.
- Method 2.- Participatory research.
- Method 3.- Engineering innovation process.
- Method 4.- Other factors.
- Method 5.- Gender monitoring.


4) ASSISTANCE will be the testbed for the data collection. Data collection, analysis and reporting have been described (i.e. questionnaires, interviews and computer-based experiments) while considering constraints and opportunities that may arise during the project.

5) A case study has been presented to illustrate the way this information will be included in further deliverables.


This document is a clear guide to integrate gender and conduct further research actions in the ASSISTANCE project.

5. Annexes

5.1. ANNEX A



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Citizens Survey on SAFETY & SECURITY Perception

About the project

The following questionnaire is being conducted as part of the ASSISTANCE project, funded by the European Commission (GA 832576). The research aims to increase both the protection and the efficiency of First Responders when facing complex emergencies and disasters through the use of novel technologies.

About the survey

This survey aims to explore the public perception with respect to different kind of emergencies/disasters considering the citizens' perspective. The following aspects will be explored:

- Perception of safety and security;
- Perception of First Responders actions to deal with emergencies;

About your participation

The researchers involved in the project will pre-process the data in an anonymous and confidential manner:

1. All the information collected will be de-identified and treated as confidential by the researchers. Your demographic information will be used only to contextualize the statistical analysis of the aggregate results and not be published or used in any form, rather than the above mention statistical analysis;
2. All the data will be securely stored and used only for the purpose of the present research, in accordance to ethical requirements;
3. You can withdraw from the questionnaire at any time, without any obligation to explain the reasons for doing so, until you submit the survey. After you submit the survey, we cannot remove your responses because we will not know which responses came from you.

The overall results generated from this exercise may be published in journal articles, conference presentations and via any other mode of scientific exchange and dissemination that will be seen as appropriate by the researchers. However, participants' anonymity will always be protected, and all data will be de-identified.

It is likely that you will not receive any personal benefit for your participation in this survey. Your participation may help us to learn more about the perception of safety and security and we hope this knowledge will benefit others in the future. No risk is foreseen.

Who to contact

For further information about ASSISTANCE project please visit our website at: <https://assistance.eu/>. If you have any questions or concerns at this point or in the future, please feel free to contact:

<p>Researcher contact data</p> <p>Arturo Cuesta Jiménez Universidad de Cantabria arturo.cuesta@unican.es Ph: +34 942201826</p>	<p>Project coordinator contact data</p> <p>Federico Carvajal Rodrigo Universidad Politécnica de Valencia fecarro@upvnet.upv.es Ph: +34 963879194</p>
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A. PERCEPTION OF SAFETY AND SECURITY

QA1 How likely do you consider that the following events will occur in Europe?

	Very likely	Likely	Unlikely	Highly unlikely
Extreme weather conditions (flood, storm, landslide)				
Fire				
Earthquake				
Hazardous Materials Accidents (Chemical and Nuclear)				
Terrorist attack				

QA2 How likely do you consider that the following events will occur in your country?

	Very likely	Likely	Unlikely	Highly unlikely
Extreme weather conditions (flood, storm, landslide)				
Fire				
Earthquake				
Hazardous Materials Accidents (Chemical and Nuclear)				
Terrorist attack				

QA3 How likely do you consider that the following events will occur in your village/city/town?

	Very likely	Likely	Unlikely	Highly unlikely
Extreme weather conditions (flood, storm, landslide)				
Fire				
Earthquake				
Hazardous Materials Accidents (Chemical and Nuclear)				
Terrorist attack				



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QA4 To what extent do you agree or disagree with each of the following statements about PUBLIC SAFETY & SECURITY? (ONE ANSWER PER LINE)

		Totally agree	Tend to agree	Tend to disagree	Totally disagree	Don't know
1	First Responders (Firefighters, Emergency Medical Teams, Civil Protection and Police) in my VILLAGE/CITY/TOWN are well trained and have enough resources to deal with emergencies/disasters					
2	First Responders (Firefighters, Emergency Medical Teams, Civil Protection and Police) in my COUNTRY are well trained and have enough resources to deal with emergencies/disasters					
3	First Responders (Firefighters, Emergency Medical Teams, Civil Protection and Police) in EUROPE are well trained and have enough resources to deal with emergencies/disasters					

QA5 For each of the following sentences, please tell me to what extent you agree or disagree that it could improve the first responder's efficiency in case of an emergency/disaster. (ONE ANSWER PER LINE)

		Totally agree	Tend to agree	Tend to disagree	Totally disagree	Don't know
1	More personnel					
2	Visible leadership and decision-making					
3	Multi-agency coordination (e.g. firefighters, medical teams, civil protection, security forces, etc.)					
4	Updated emergency plans					
5	Citizens awareness/collaboration					
6	Good training for First Responders					
7	Use of technology (sensors, software, drones, robots, etc.)					
8	Other (specify _____)					



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QA6 Which statement best represents your preparedness for an emergency/disaster? (ONE ANSWER PER LINE)

	I know what to do	I fairly know what to do	I don't know what to do
Extreme weather conditions (flood, storm, landslide)			
Fire			
Earthquake			
Hazardous Materials Accidents (Chemical and Nuclear)			
Terrorist attack			

QA7 If the following emergencies/disasters occur in your vicinity, what in your view is the level of risk for you and your family? (ONE ANSWER PER LINE)

	Critical risk	High risk	Moderate risk	Low risk
Extreme weather conditions (flood, storm, landslide)				
Fire				
Earthquake				
Hazardous Materials Accidents (Chemical and Nuclear)				
Terrorist attack				



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B. PERCEPTION OF FIRST RESPONDERS ACTIONS

QB1 In your opinion, what role should each of the following play for AN EARTHQUAKE RESILIENCE? (ONE ANSWER PER LINE)

		A very important role	A fairly important role	A limited role	No role at all	Don't know
1	Public authorities (e.g. municipality; Governor of the Province, etc.)					
2	Law enforcement agencies (e.g. police)					
3	Firefighters					
4	Emergency Medical Teams					
5	Civil Protection					
6	Citizens-residents					
7	Experts (e.g. geologists)					
8	Media (e.g. radio, TV, internet)					
9	Others (specify _____)					

QB2 In your opinion, what role should each of the following play IN CASE OF A TERRORIST ATTACK? (ONE ANSWER PER LINE)

		A very important role	A fairly important role	A limited role	No role at all	Don't know
1	Public authorities (e.g. municipality; Governor of the Province, etc.)					
2	Law enforcement agencies (e.g. police)					
3	Firefighters					
4	Emergency Medical Teams					
5	Civil Protection					
6	Citizens-residents					
7	Security experts (e.g. intelligence, explosives)					
8	Media (e.g. radio, TV, internet)					
9	Others (specify _____)					



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QB3 In your opinion, what role should each of the following play IN CASE OF AN HAZAROUS MATERIAL ACCIDENT (Chemical, Biological, Radiological and/or Nuclear)? (ONE ANSWER PER LINE)

		A very important role	A fairly important role	A limited role	No role at all	Don't know
1	Public authorities (e.g. municipality; Governor of the Province, etc.)					
2	Law enforcement agencies (e.g. police)					
3	Firefighters					
4	Emergency Medical Teams					
5	Civil Protection					
6	Citizens-residents					
7	Experts (e.g. specialist on hazardous substances)					
8	Media (e.g. radio, TV, internet)					
9	Others (specify _____)					



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C. GENERAL INFORMATION

QC1 Country: _____ **Village/Town/City:** _____

QC2 Gender

Male	Female	Other

QC3 Age

18 to 24	25 to 39	40 to 54	55+

QC4 Level of Education (ONE ANSWER)

Primary school	Secondary school	Bachelor's degree	Postgraduate degree	Other (please specify)

QC5 Which of the following best describes your current socio-professional category? (ONE ANSWER)

Self-employed	
Employee	
Retired	
Unemployed	
Student	
Other (please specify _____)	

5.2. ANNEX B



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Questionnaire: Female first responders in the EU

About the project

The following enquires being conducted as part of the ASSISTANCE project, funded by the European Commission (GA 832576). The research aims to increase both the protection and the efficiency of First Responders when facing complex emergencies and disasters through the use of novel technologies.

About the survey

This survey aims to explore gender dimension in First Responders (FRs) in the European Union. The following aspects will be explored:

- The proportion of women in different FRs (firefighters, emergency services, polices, civil protection, etc.).
- The roles/ranks women play within FRs;
- The presence of gender/diversity policies within FRs organizations/institutions.

About your participation

1. All the information collected will be only used for the statistical analysis and will not be published or used in any other form, rather than the above-mentioned statistical analysis;
2. All the data will be securely stored and used only for the purpose of the present research, in accordance to ethical requirements;

The overall results generated from this research may be published in journal articles, conference presentations and via any other mode of scientific exchange and dissemination that will be considered as appropriate by the researchers. However, participants' anonymity will always be protected, and all data will be de-identified.

It is likely that you will not receive any personal benefit for your participation in this survey. Your participation may help us to learn more about the gender dimension in safety and security and we hope this knowledge will benefit others in the future. No risks are foreseen.

Who to contact

For further information about ASSISTANCE project please visit our website at: <https://assistance-project.eu/>. If you have any questions or concerns at this point or in the future, please feel free to contact:

Researcher contact data

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The questionnaire

1) Please state the total number of staff in your organization/institution:		
Total staff		
Staff in the field		
2) Please give the total number of female staff in your organization/institution:		
Female staff		
Female staff in the field		
3) Please give the total number of male and female members by rank/grade using a 5-category scale: Top, Superior, Medium, Lower ranks or 1st grade in the profession		
Please state the ranks/grades you include in each category		
Rank/grade by category	Male Numbers	Female Numbers
Top ranks: ...		
Superior ranks: ...		
Medium ranks: ...		
Lower ranks: ...		
1 st grade in the profession: ...		
4) Please give the date when women were first employed as staff member.		
dd/mm/yyyy		
5) Does your institution have a gender policy/network/organization?		
6) What initiatives are currently in place within your organization/institution in relation to recruitment, retention and progression of women?		
7) Does your organization/institution have a flexible working policy or opportunities for all staff members to work part time, job share, etc.?		



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General information

Your organization/institution type is:

Fire fighting	Medical/ Emergency	Police/ Law Enforcement	Civil protection	Other (specify)

Your organization/institution name: _____

Country: _____, Region: _____, City/Town: _____

Web site: _____

Your organization/institution operates at:

National level	Regional level	Local level

The information you have provided covers:

National level	Regional level	Local level	Only from my organization/institution

Many thanks for completing this short questionnaire!!