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 Human Factor in ASSISTANCE impact assessment

30/06/2020

[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.

Disclaimer

Executive Summary

This progress report presents the research strategy and the first results of Societal Impact Assessment applied to the ASSISTANCE project. The strategy focuses on three perspectives: 1) the project itself, 2) the First Responders and 3) the citizens. The document 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	57	04/06/20
0.2	Internal version updated & distributed to consortium	All	63	12/06/20
0.3	Reviewed by IFV (internal reviewer)	All	63	22/06/20
0.4	Reviewed by AVRSE (internal reviewer)	All	63	23/06/20
1	Final version for submittal	All	63	24/06/20

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Acronyms

AR	Augmented Reality
ASSISTANCE	Adapted situation awareneSS tools and taIlored training curricula for increaSing capabiliTie and enhANcing the proteCtion of first respondErs
AT	Analysis tool
CTA	Constructive Technology Assessment
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
EU	European Union
FRs	First Responders
H2020	Horizon 2020 Programme for Research and Innovation
IAIA	International Association for Impact Assessment
ICGP	Interorganizational Committee on Principles and Guidelines
IQR	Interquartile range
IFC	Informed Consent Form
GELS	Gender, Ethical, Legal and Societal
KPI	Key Performance Indicator
LEA	Law Enforcement Agency
M#	#th month of the project (M1=May 2019)
MT	Monitoring tool
PD	Pilot Demonstration
PIA	Privacy Impact Assessment
R&D	Research and Development
RQF	Research Quality Framework
SA	Situation Awareness
SIA	Societal Impact Assessment
SO#	Specific Objective
TA	Technology Assessment
TW	Training Workshop
UC	Use Case
VR	Virtual Reality
WP	Work Package
SAT	Self-Assessment tool
SIA	Societal Impact Assessment
S&S	Safety and Security

1. Introduction

1.1. Purpose of the document

The aims of this document are: 1) to define the Societal Impact Assessment strategy for the ASSISTANCE project and 2) to present preliminary results that will guide further research. The approaches and results presented in this progress report are the reference point to conduct further actions towards the development of the Best Practices Handbook (D8.4) and the Human Factor impact assessment (D8.7).

1.2. Scope of the document

This deliverable D8.3 – *Progress report on Human Factor in ASSISTANCE impact assessment* covers the outputs of Task 8.4 Societal Aspects produced during the first 14 months of the project. It addresses a literature review focused on societal impact, especially on Safety and Security research, and presents the strategy based on Societal Impact Assessment principles and methods applied to three topics: 1) the project, 2) the First Responders and 3) the citizens. In relation to these three topics the deliverable includes:

1. Results of a Delphi method to identify categories and indicators for measuring societal impacts of the project.
2. The design of a toolkit for assessing societal issues during the practical demonstrations and training workshops.
3. Results of a pilot questionnaire on citizens attitudes towards disasters and First Responders capabilities.

1.3. Structure of the document

The deliverable is divided into two main parts, apart from this introduction. Section 2 presents concepts and definitions and a literature review on societal impact approaches. Section 3 describes and presents first results of the proposed strategy for analysing and measuring societal impacts divided into three subsections: 1) the overall project, 2) the First Responders when facing technologies and training methods and 3) the attitudes of citizens towards disasters. Finally, Section 4 presents conclusions. Additional information is provided in Annexes.

2. Literature review

This section deals with the main concepts and definitions as well as a review of the different approaches and issues in relation to societal impact, especially in Safety & Security (S&S) research.

2.1. Main concepts and definitions

Broadly speaking the societal impact is the net effect that a given activity has upon individuals and/or communities[2]. In other words, societal impacts are everything that affect people[3].

[2] Schoor, L., About Social Impact, Centre for Social Impact, http://www.csi.edu.au/about-social/
[3] Vanclay, F., International Principles For Social Impact Assessment, Impact Assessment and Project Appraisal, vol. 21, pp. 5-12, 2003 https://doi.org/10.3152/147154603781766491

The societal impact is a significant topic since it comprises issues that directly or indirectly affect people. It can be seen as changes in one or more of the following aspects: 1) people's way of life, 2) their culture, 3) their community, 4) their political systems 5) their environment, 6) their health and wellbeing, 7) their personal and property rights and/or 8) their fears and aspirations[4]. All research projects have a societal impact of one form or another as they are carried out in society and their results are introduced into society[5].

2.2. Societal impact approaches

A pertinent question is how to assess the societal impact of a research and innovation project. There is not an easy answer to this question. However, one can distinguish two main approaches from literature related to the assessment at hand: The Societal Impact Assessment (SIA)[6,7,8] and the Constructive Technology Assessment (CTA)[9,10,11]. The SIA is a research instrument that can be applied to the project itself and its potential outcomes. This may include participatory techniques involving stakeholders and researchers in a constant dialogue about the implications of the project and its developments[12]. The CTA is a more specific approach that can be designed in a reflexive way getting information during the stages of technology development from a societal impact perspective[8].

2.2.1. Societal Impact Assessment (SIA)

Definitions of Societal Impact Assessment (SIA) vary across fields and applications. According to the International Association for Impact Assessment (IAIA)[13] the SIA is *the processes of analysing, monitoring and managing the intended and unintended consequences, both positive and negative, of planned interventions* (e.g. projects) *and any social change processes caused by those interventions*. In general terms, SIA can be defined as evaluating the social consequences of a project[3]. More specifically SIA refers to a set of guidelines and principles to identify the societal effects of new technologies, programmes and projects[8].

[4] Vanclay, F., Esteves, A. M., Aucamp, I. and Franks, D., (2015). Social Impact Assessment: Guidance for assessing and managing the social impacts of projects. Fargo ND: International Association for Impact Assessment.
[5] Burgess, J. P., (2012) The Societal Impact of Security Research, PRIO Policy Brief, 9. Oslo: PRIO.
[6] Bornman, L. (2013) What Is Societal Impact of Research and How Can It Be Assessed? A Literature Survey. Journal of the American Society for Information Science and Technology, 64(2):217–233.
[7] Takyi, S. A. (2014) Review of Social Impact Assessment (SIA): Approach, Importance, Challenges and Policy Implications. International Journal of Arts & Sciences, 07(05):217–234.
[8] Kreissi, R., Fritz, F. and Ostermeier, L. (2015) Societal Impact Assessment. International Encyclopedia of the Social & Behavioral Sciences, 2nd edition, Volume 22. http://dx.doi.org/10.1016/B978-0-08-097086-8.10561-6.
[9] Rip, A. and Kulve, H. (2008) Constructive Technology Assessment and Socio-Technical Scenarios. Chapter 4 in E. Fisher et al. (eds.), The Yearbook of Nanotechnology in Society, Vol. 1.
[10] Rip A., Robinson D.K.R. (2013) Constructive Technology Assessment and the Methodology of Insertion. In: Doorn N., Schuurbiers D., van de Poel I., Gorman M. (eds) Early engagement and new technologies: Opening up the laboratory. Philosophy of Engineering and Technology, vol 16. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-7844-3_3
[11] Douma, K.F.L. et al., (2007) Methodology of constructive technology assessment in health care. International Journal of Technology Assessment in Health Care 23(2):162-168. DOI: 10.1017/S0266462307070262
[12] Harvey, B., 2011. Foreword: SIA from a resource developer's perspective. In: Vanclay, F., Esteves, A.M. (Eds.), New Directions in Social Impact Assessment: Conceptual and Methodological Assumptions. Edward Elgar, Cheltenham,pp. xxvii–xxxiii.
[13] International Association for Impact Assessment (IAIA). https://www.iaia.org/

The main purpose of SIA is to predict and mitigate negative impacts and identify opportunities to enhance benefits[14]. However, society can benefit from projects only if the results are marketable and consumable products or services[15].

A short story of the SIA can be found in[16] and a more extended review of this subject-matter is presented in[17]. The field of SIA emerged during the 1970s as a response to new environmental legislation[18,19]. Starting in the domain of environmental issues, SIA has extended to other areas where technologies and research started to shape the everyday life of people.

Early contributions to SIA consisted of guidelines and handbooks with general aspects and best practices[20,21,22,23]. The International Association for Impact Assessment (IAIA) was established in 1981 to support SIA implementations. The Guidelines and Principles for SIA published in 1994 by the Interorganizational Committee on Principles and Guidelines for Social Impact Assessment (ICGP) is perhaps the most well-known reference of this early contributions[24]. Since then, researchers and policy makers have examined the "impacts" or consequences of several developments. However, nowadays (several years later) there is not a common conceptual view or methodology of SIA. One reason is that SIA focuses on several issues (e.g. human rights, social inequality, well-being, health and safety, public participation, etc.) likely to be addressed in different ways. An attempt to create a paradigm in the SIA is proposed in International Principles for Social Impact Assessment[4]. This guidance introduces good practices in accordance with the IAIA and proposes four phases: 1) understand the issues, 2) predict, analyse and assess the likely impact pathways, 3) develop and implement strategies and 4) design and implement monitoring programs. Kemp proposed a list of actors to be considered when assessing societal impact[25] and Becker[26] defined two main steps for this process: 1) preparatory phase focused on an analysis of the project and 2) scenario build technique to recognise future effects of the project.

[14] Wilson, E. (2017) What is Social Impact Assessment? Indigenous peoples and resource extraction in the arctic: Evaluating ethical guidelines. https://arran.no/sites/a/arran.no/files/what_is_sia_paper3_web.pdf
[15] Lamm, G. M. (2006). Innovation Works: A Case Study of an Integrated Pan-European Technology Transfer Model. *BIF Futura* 21(2), 86–90.
[16] Jacquet, J. B. (2014). A Short History of Social Impact Assessment, Technical Report, 2014, DOI: 10.13140/RG.2.1.1470.5686
[17] Esteves, A. M., Franks, D. and Vanclay, F. (2012) Social impact assessment: the state of the art, Impact Assessment and Project Appraisal, 30(1), 34-42, DOI: 10.1080/14615517.2012.660356
[18] Freudenburg, W. R. (1986). Social Impact Assessment. *Annual Review of Sociology* 12, 451-487. https://doi.org/10.1146/annurev.so.12.080186.002315
[19] National Environmental Policy Act, United States, 1969, https://www.britannica.com/topic/National-Environmental-Policy-Act
[20] Finsterbusch, K. (1980). Understanding Social Impacts: Assessing the Effects of Public Projects. Beverly Hills, Calif., Sage Publications, 311 pp. ISBN: 0803910150
[21] Finsterbusch, K. and Wolf, C. P. (1977). Methodology of Social Impact Assessment. Stroudsburg, PA: Dowden, Hutchinson, and Ross, Inc.
[22] Finsterbusch, K., Llewellyn, L. G. and Wolf, C.P. (1983). Social Impact Assessment Methods. Beverly Hills, Calif., Sage Publications.
[23] Leistritz, F. L. and Murdock, S. H. (1981). The Socioeconomic Impact of Resource Development: Methods for Assessment. United States.
[24] Guidelines and principles for social impact assessment, 1994, https://doi.org/10.1080/07349165.1994.9725857
[25] Kemp, D. (2011). Understanding the organizational context. New directions in social impact assessment: conceptual and methodological advances, 20-37.
[26] Becker, H. (2001). Social impact assessment. *European Journal of Operational Research*, 128(2), 311-321.

SIA in research and application has been widely discussed in a paper[6] that presents practices in the assessment of societal impact including approaches of national evaluation systems. Firstly, the Netherlands system considers three parts: 1) societal quality (efforts to interact with stakeholders), 2) societal impact (how research affects stakeholders or procedures) and 3) valorisation (actions to make results available and suitable for application). An important process mentioned by the ERiC project is conducting productive interactions between researchers and stakeholders during and/or after the research[27]. Secondly, the UK Excellence Framework (REF)[28] proposes expert panels to review the narrative evidence of case studies supported by indicators and measuring the impact in a quantifiable way. Similarly, the Australian Research Quality Framework (RQF)[29] suggests a quantitative and contextual approach where information is seen as context statements, impact statements, case studies and relevant qualitative and quantitative indicators. Finally, methods and indicators are also developed by Finnish research organizations[30] proposing five dimensions of impact: 1) impact on economy, technology and commercialization, 2) impact on knowledge, expertise, human capital and management, 3) impact on networking and social capital, 4) impact on decision making and 5) impact on social and physical environment.

Although there is not a common SIA methodology, significant guidelines and handbooks have general principles such as public participation, scientific and valid methods and development of mitigation strategies[16]. A key point of SIA is the use of participatory and anticipatory strategies to gain a clearer understanding of the impact produced by a given activity or development. However, both strategies have social and cognitive problems[8]. In relation to social problems, the development of an inclusive approach considering the perspective of different stakeholders could be challenging because this process usually focuses on specific topics rather than core aspects. Regarding cognitive problems, the main limitation is tracking the future of technologies and their likely impacts. The SIA is a discipline in constant evolution that aims at covering projects, developments and technologies and new guidelines and improvements are being proposed.

2.2.2. Constructive Technology Assessment (CTA)

The Technology Assessment (TA) is the study and evaluation of technologies assuming the importance of ethics (i.e. avoiding potential negative impacts to people). The TA initially included public perceptions and opinions for assessing new technologies[31,32]. Within this context the Constructive Technology Assessment (CTA) focuses on short-term design and construction stages rather than possible impacts of the technology.

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[27] Evaluating Research in Context (ERiC). (2010). Evaluating the societal relevance of academic research: A guide. Delft, The Netherlands: Delft University of Technology.

[28] Erno-Kjolhede, E., & Hansson, F. (2011). Measuring research performance during a changing relationship between science and society. Research Evaluation, 20(2), 131–143. doi:10.3152/095820211x12941371876544

[29] Donovan, C. (2008). The Australian Research Quality Framework: A live experiment in capturing the social, economic, environmental, and cultural returns of publicly funded research. New Directions for Evaluation, 2008(118), 47–60. doi:10.1002/ev.260

[30] Lähteenmäki-Smith, K., Hyytinen, K., Kutinlahti, P., & Konttinen, J. (2006). Research with an impact evaluation practises in public research organisations, Kemistintie, Finland: VTT Technical Research Centre of Finland.

[31] John, G. and Van de Graaf, H., (1996). "Technology Assessment as Learning." Science, Technology, and Human Values, vol. 21, pp. 72-99, https://doi.org/10.1177/016224399602100104

[32] Vig, Norman J., and Herbert Paschen, eds. (2000). Parliaments and Technology: The Development of Technology Assessment in Europe. ISBN: 1438422938, 9781438422930

The idea is that problems of developed technologies need to be addressed through the dialogue and interaction between developers, users and/or stakeholders. CTA is a specific approach that tests the technology in "society" rather than in a "laboratory"[33,34] "*we must avoid a situation in which researchers/engineer sits alone in dark rooms and develop solutions without knowing what the needs of society are*" [35].

CTA activities can be conducted in the form of pilot demonstrations, workshops, scenario workshops, public debates, or reports. A key point is to identify the opportunities of intervention and how such interventions can be as productive as possible[8]. There are three CTA strategies: 1) technology forcing, 2) strategic niche management and 3) alignment[36]. Technology forcing means technology development from the demand side (i.e. end user requirements). Strategic niche means the creation of controlled and safe experimental environments. Alignment also analyses interaction between people and technology but focusing on the dialogue and mutual understanding to balance perspectives. Similarly, CTA process has three elements: 1) anticipation, 2) reflexivity and 3) social learning[34,37]. Anticipation involves users and stakeholders taking part in the design processes. Reflexivity considers that technological effects are dependent not only on designers' minds but on the interactions between designers and users in each context. Social learning process can be divided into two forms: the first-order learning leading to specify and define one's own design and the second-order learning showing that one is creating new combinations and demands. References of best practices in CTA can be found in[38].

2.3. Societal impact and Safety & Security research

The main aim of any Safety & Security (S&S) project is a safer and better society. However, S&S research has two kind of potential outcomes: beneficial and detrimental ones[39]. This may involve some controversies. First, some segments of the society can benefit more than others. Second, the overall benefit of individual results of S&S research and investment is complex and unequal. Third, improved societal S&S for some segments of a society does not necessarily imply an overall improvement in the S&S for the society as a whole[40]. Despite these identified issues, it is widely accepted that S&S research also depends on attitudes and behaviour of individuals and groups in addition to the availability of technology[38].

[33] Smits, R. and J. Leyton, (1991), Technology Assessment: Waakhond of speurhond? Op weg naar een integraal technologiebeleid. Zeist: Kerckebosch. Pp. 307-318

[34] Genus, A. and Coles, A. (2006). On Constructive Technology Assessment and Limitations on Public Participation in Technology Assessment, Technology Analysis and Strategic Management, vol.17, pp. 433-443, https://doi.org/10.1080/09537320500357251

[35] "What we know about societal security", Research programme on societal security and risk – SAMRISK, The Research Council of Norway, 2011.

[36] Rip, A. and Schot, J. (1996), The past and future of constructive technology assessment, Technological Forecasting and Social Change, vol. 54, pp. 251-268.

[37] Constructive Technology Assessment, Encyclopedia of Science, Technology, and Ethics. 15 Jun. 2018 https://www.encyclopedia.com/science/encyclopedias-almanacs-transcripts-and-maps/constructive-technology-assessment

[38] Rip, A. and van Lente, H., Bridging the Gap Between Innovation and ELSA: The TA Program in the Dutch Nano-R&D Program NanoNed, Nanoethics, vol. 7, pp. 7-16, 2013, https://doi.org/10.1007/s11569-013-0171-9

[39] Burgees, J. P., (2014). The Future of Security Research in the Social Sciences and Humanities. Discussion Paper, Standing Committee for the Humanities (SCH), European Science Foundation.

[40] Barnard-Wills, D., Wadhwa, K. and Wright, D. (2014) Toolkit for Societal Impact Assessment in Security Research. Report on Deliverable 3.2, ASSERT Project.

The overall objective of SIA for S&S technologies is to enhance the accountability of decision-making [41]. Therefore, the SIA perspective should be included in S&S research by creating a space for discussion to find consensus at all stages of the Research & Development (R&D) process.

One of the main contributions in the application of SIA to security research is the ASSERT project[42]. The Report on methodologies relevant to the assessment of societal impacts of security research discusses the transferability of Social Impact Assessment (SIA), Constructive Technology Assessment (CTA), and Privacy Impact Assessments (PIA) to the field of security research[43]. The authors suggested a systematic planning on SIA procedures in the different phases of the R&D security technology process. In relation to CTA, the authors identified two main challenges. The first challenge is geographical as privacy and policy perceptions may change among the EU countries. The second change is domain-specific because CTA usually focuses on totally new technologies whereas some innovations are based on current technologies. The transferability of PIA to security area was also discussed. Two limiting factors were identified. The first factor is that PIAs and surveillance impact assessments may be not comprehensive enough to cover all relevant issues. The second limiting factor is that the definition of information, actions, or characteristics to be kept private can be different between countries, regions, and institutions. The authors concluded that a dialogue between different individuals and groups potentially affected by a planned project, is a benefit in itself.

An example of the proposed solutions in the ASSERT project for assessing the societal impact is applied to two case studies[44]: 1) A worked example of the stakeholders and questions involved in public transport security and 2) awareness raising and competence building of public transport staff in countering terrorism and serious crime. In the first case study the authors conducted a three-assessment approach. Assessment round 1 explores whether research meets the needs of society. Assessment round 2 investigates and ensures that research do not have negative impacts on society. Finally, Assessment round 3 confirms that research benefits society. A set of key questions were used for each round based on indicators while providing examples (positive and/or negative). For round 1 these indicators are effectiveness of measures, initiator, legal implications, privacy issues and data protection and ethical issues. For round 2 indicators are freedom of association, socio-economic aspects, ethical and cultural aspects, non-citizens, religious aspects, disabled, age related aspects, gender aspects, mitigating measures, implications for relevant stakeholders, information and engagement of stakeholders and interested parties. For round 3 the indicators are customer satisfaction and subjective security, staff moral/satisfaction and subjective security, image and reputation, media-perception, politics, reaching of strategic/operational goals and

[41] Hempel, L., Ostermeier, L., Schaaf, T. and Vedder, D. (2013). Towards a social impact assessment of security technologies: A bottom-up approach, Science and Public Policy, Volume 40, Issue 6, 1 December 2013, Pages 740–754, https://doi.org/10.1093/scipol/sct086

[42] ASSERT: assessing security research: tools and methodologies to measure societal impact. The project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 313062. http://assert-project.eu/download/

[43] Prainsack, B. and Ostermeier, L. (2013). Report on methodologies relevant to the assessment of societal impacts of security research, Deliverable 1.2, ASSERT Project.

[44] Kreissl, R. and Mueth, M. (2014). A Case Study in applying Societal Impact Assessment in Public Transport Security. ASSERT Project. http://assert-project.eu/wp-content/uploads/2013/04/ASSERT_D_Test-Case-Public-Transport_HC_14-04-09.pdf

adhering to compliance, reduction of health threats, full lifecycle assessment and data availability, monitoring and operational aspects. As the authors stated this set of questions is neither comprehensive, nor does it constitute a blueprint for SIA. Nevertheless, it is a starting point for exploring the relevant dimensions of societal impacts regarding security measures and research.

The second case study showed how the SIA approach could contribute to improve security projects (i.e. identifying the negative effects but also finding new solutions and promoting the application of research). The V-SICMA project was used as example[45]. The SIA contributed to find new solutions and adjust and focus research targets. Lessons learned and examples provided demonstrate the benefits of integrating societal dimensions. The SIA was considered from the early stages of the project and empirical and ethnographic perspectives were used to analyse the ground-level personnel (bottom-up approach). This allowed the researchers to find key aspects in detection and appropriate reaction to serious terrorist attacks in transportation systems. Lessons learned from the application of the SIA showed that a close observation and analysis of daily routine work provided important information. The authors also discovered that security is a problem of responsibility from the management perspective but an interference of the routines from the perspective of the ground level staff. In this sense, the treatment of potential high impact events versus frequent minor events is a key aspect for risk perception of individuals. In this case, the SIA perspective showed the importance of organizational cultures and routines in security.

3. Societal Impact Assessment in ASSISTANCE

ASSISTANCE offers technologies and novel training solutions aimed at protecting First Responders (FRs) and enhancing their capacities when face to severe disasters. But this project is also a planned intervention which potentially has net effects upon FRs as end-users and citizens as indirect beneficiaries, and therefore the society. Consequently, there is the need to assess non-technical aspects and potential impacts of the project and its activities. The main purpose here consists of analysing and measuring societal impacts of ASSISTANCE using Societal Impact Assessment (SIA) principles and methods.

3.1. Overall approach

ASSISTANCE entails societal issues likely to be addressed in several ways. Nevertheless, cause-effects relationships are not always clear. Societal impacts can be diffuse, complex and contingent and can happen at different levels. To minimize these problems, the proposed strategy focuses on three independent topics: 1) **the project itself** (intended and unintended potential and real outcomes), 2) the perspectives of **FRs** (when adopting technologies and novel solutions) and 3) **citizens** perceptions and attitudes (towards safety & security in relation to disasters). Figure 1 shows the proposed research strategy.

[45] V-SICMA Project: https://www.sifo.de/de/v-sicma-sensibilisierungs-bewertungs-und-handlungstraining-fuer-sicherheitsmassnahmen-in-1832.html

1) The SIA applied to the project involves an anticipatory strategy to identify needs covered by the project, potential negative impacts, and benefits to society. The main purpose is to gain a clearer understanding of the societal impacts produced by ASSISTANCE in short, medium, and large terms. SIA can be seen here as the process of assessing and estimating in advance the consequences likely to follow from project developments[46].

2) The next approach uses SIA principles and methods to explore the attitudes and behaviour that FRs may have when adopting technologies and training solutions proposed by ASSISTANCE. The idea behind this is that a techno-centric approach is deemed to be insufficient being necessary a participatory strategy through the inclusion of end users in design, testing and implementation processes. Special attention is paid to productive interactions [47] (between research team and end-users) during the pilot demonstrations and the training workshops that will be conducted during the project (M17-36). SIA can be seen here as a process of discussion and negotiation on short-term design and construction stages of technologies and solutions rather than future impacts.

3) Although ASSISTANCE is mainly focused on FRs needs, the third approach will use the SIA perspective to explore citizens awareness, risk perception and preparedness in relation to disasters and to gain knowledge of social acceptance of technologies. SIA can be seen here as survey research involving citizens from different EU countries to measure subjective social indicators (e.g. individual perceptions, self-reports, and opinions) as well as to determine their perception of ASSISTANCE developments.

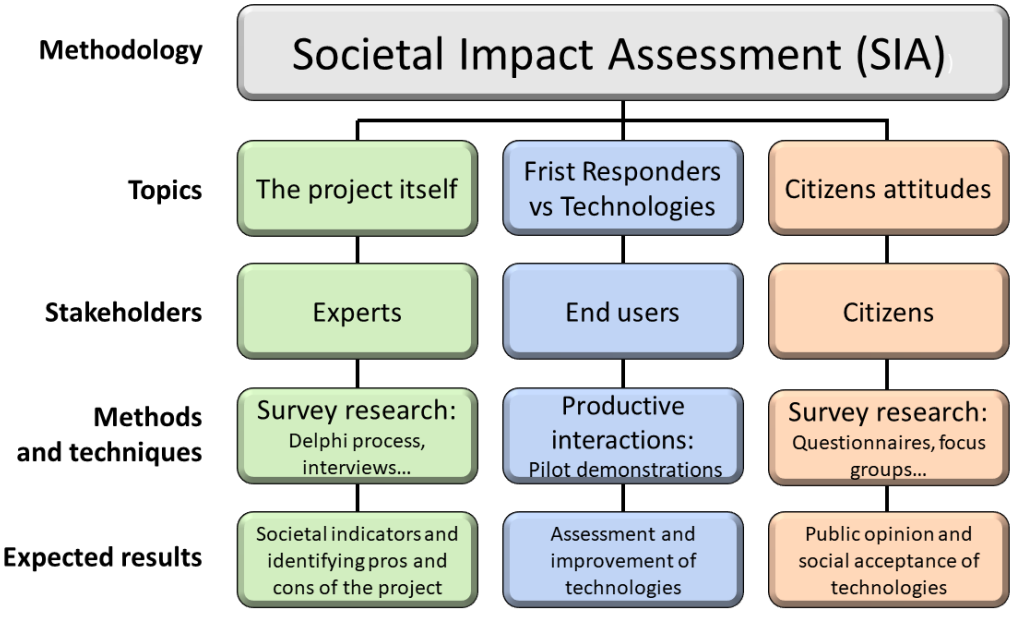

Figure 1: Overall research strategy applying Societal Impact Assessment to ASSISTANCE.

[46] Burdge, R. J. & Vanclay, F. (1996) SOCIAL IMPACT ASSESSMENT: A CONTRIBUTION TO THE STATE OF THE ART SERIES, Impact Assessment, 14:1, 59-86. https://doi.org/10.1080/07349165.1996.9725886

[47] Spaapen, J. and van Drooge, L. (2011). Introducing 'productive interactions' in social impact assessment. Research Evaluation, 20(3),211-218http://www.siampi.eu/Content/Introducing_Productive_Interactions.pdf

3.2. The project

Background: The research strategy aims at ensuring that ASSISTANCE meets the needs of society, benefits society and does not have negative impacts. The first step of this approach involved a top-down constructive process (from societal domains to impact categories) to identify and prioritize operational units (from impact categories to indicators) to analyse and measure societal impacts of the project.
Methods: A Delphi method of consensus development was used, comprising two survey stages and a teleconference workshop involving project partners. In stage 1, participants (n=26) were asked to score the likely impact of the ASSISTANCE project on 56 societal categories classified into eight domains. In stage 2, participants (n=22) were asked to score the 29 societal categories that had survived the first round. Descriptive statistics and (dis) agreement were calculated for each survey item.
Results: Remarkable results were considered important for the following domains: Health and Safety (2), FRs organization (3), Training (2), Research and Innovation (3), Culture (1) whereas impact categories of Society, Policy and Economic domains were not considered essential perhaps denoting the influence of practical and technocratic perspectives of most participants.
Conclusion: The consensus definition of impact categories generated through this Delphi exercise provides guidance to prioritize and suggest indicators that will be used to measure societal impacts of the project.

3.2.1. Introduction

The assessment of societal impacts of new technologies, programs and projects has become a crucial process to predict and mitigate negative impacts and identify opportunities to enhance benefits. However, current attempts to assess societal impact are relatively immature. References are focused on general aspects for research evaluation or technology innovations while discussing main concepts and proposing general frameworks. Yet, there is no specific methodology for assessing societal impact of projects focused on technologies for disasters response.

The ASSISTANCE project proposes a holistic solution for First Responders (FRs) including technologies for intervention (e.g. Situation Awareness platform, robots, drones, wearables and sensors) and advanced training methods (e.g. Virtual Reality and Augmented Reality).

The societal perspective of such developments is the focus of a dedicated task (T8.4) which must face two main challenges. The first challenge is the variety of societal aspects and their abstract nature. Note that the term “societal” includes anything that affects humans (e.g. culture, economy, social, health, working conditions, quality of life, environment, etc.)[8]. This issue makes categorization a difficult activity because societal aspects are usually interrelated (e.g. working conditions may involve societal aspects related to health, safety, security, privacy, rights, economy, etc.). The second challenge is the uncertainty when attempting to track future effects of the project because innovation does not always occur in a linear and predictable way but in a complex process that may also involve unplanned or unintended outcomes.

To address these challenges, a tailored methodology has been designed to increase the awareness of potential consequences and benefits of ASSISTANCE by exploring the likely impacts on stakeholders and society. This study is the first step to achieve this goal. A Delphi consensus procedure has conducted with a heterogeneous panel of experts comprising FRs (end-users) and technical partners (technology providers and researchers) of the project. Essentially, this strategy is based on the idea that aggregated group responses are more reliable than individual ones. The aims of this study were:

1. To encourage project partners to think about and discuss non-technical aspects.
2. To establish a consensus on the identification and prioritization of impact categories for evaluating societal impacts of the project.

3.2.2. Method

The Delphi Method: The Delphi method has proven to be an accurate instrument to generate forecast in research[48]. The Research and Development RAND Corporation carried out an early application of the Delphi method (1964) to assess the direction of long-range trends focused on science and technology, and their possible impacts on society[49]. Nowadays, this research procedure is still used in several fields[50,51,52,53,54]. The Delphi technique basically comprises a set of questionnaires sent to a group of experts in several rounds (normally two and rarely more than 3 rounds) allowing participants to refine their responses as the process progresses. The questionnaire(s) for the subsequent rounds normally include results of the previous round(s) (i.e. in the form of frequency distribution, central tendency, and dispersion). The objective is to achieve a consensus and agreement in subject-matters where the knowledge is uncertain and/or imperfect. The advantages of this instrument are: 1) anonymity (avoiding the potential influence of others on individual responses), 2) controlled feedback (structured process through questionnaires and rounds to reach a consensus) and 3) statistical processing of results.

Study design: The flowchart in Figure 2 shows the phases and processes of the study. The Delphi technique involved three stages. In Round 1, participants were asked to independently rank the likely impact of the project on 56 statements across eight societal domains. Data on participants were also collected including gender, range of age and profile/profession.

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[51] akhani, B.K., Giannouladis, K., Leighton, P. et al. (2020). Seeking a practical definition of stable glaucoma: a Delphi consensus survey of UK glaucoma consultants. Eye 34, 335–343. https://doi.org/10.1038/s41433-019-0540-x
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[54] Piecyk, M., & McKinnon, A. (2013). Application of the Delphi method to the forecasting of long-term trends in road freight, logistics and related CO_2 emissions. International Journal of Transport Economics / Rivista Internazionale Di Economia Dei Trasporti, 40(2), 241-266. Retrieved June 5, 2020, from www.jstor.org/stable/42748311

Results from Round 1 were presented to participants in a teleconference workshop (Plenary meeting of the project last 24th March 2020) by showing the consensus of likely impact in categories as "high", "moderate", and "low". Afterwards, in Round 2, participants were asked again to rank the 29 statements that survived the previous round. This time the statements included the median scores from the Round 1. A third survey round was not required because consensus was achieved in prioritizing 11 final impact categories.

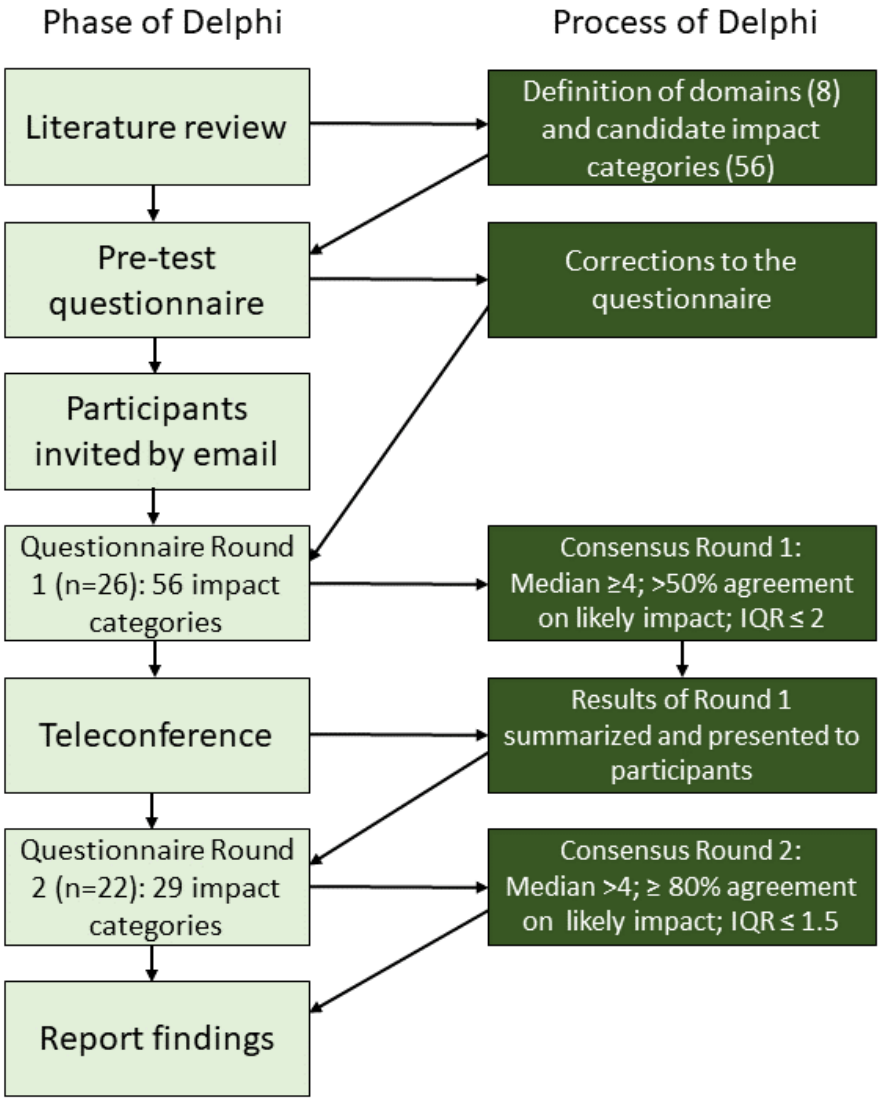

Figure 2: Flowchart of Delphi consensus and prioritization procedure on impact categories.

Survey development: the scoping literature review previously conducted was used to define the domains and the candidate impact categories (Table 1). The questionnaires were divided into eight sections (domains): Health and Safety, FRs Organization, Training for FRs, Culture, Society, Research and Innovation, Economy and Policy. The key question included in every section was: "To what extent do you think the ASSISTANCE project would change aspects related to…" followed by statements describing the proposed categories (See ANNEX A).

Domain	Impact category	Domain	Impact category
Health and Safety (HS)	HS1) Injury HS2) Mental/physical demands on duty HS3) Healthcare HS4) Comfort/mobility HS5) Assistance of injured FRs HS6) Physical protection HS7) Citizens response/evacuation	FRs Organization (O)	O1) Decision-making O2) Management O3) Planning and procedures O4) Intervention strategies O5) Workforce organization O6) Division of labour O7) Recruitment
Training for FRs (T)	T1) Curricula T2) Qualifications T3) Promotion T4) Fitness T5) Pedagogical tools T6) Use of technologies T7) Specialization	Culture (C)	C1) Tradition and values C2) FRs reputation C3) Risk perception C4) Self-protective behaviour C5) Tactical/strategic knowledge C6) Citizens' awareness C7) Acceptance of technology
Society (S)	S1) Working-life balance S2) Gender equality/equity S3) Interaction between coworkers S4) Interaction between FRs and citizens S5) Voluntary service S6) Vulnerable population S7) Community involvement	Research and Innovation (RI)	RI1) Multidisciplinary RI2) Collaboration on science and education RI3) Targeting of future research RI4) Dissemination RI5) Research skills/ overall research capacity RI6) Staff development RI7) Gendered perspective
Economy (E)	E1) Financing E2) Investments E3) Commercialization E4) Productivity E5) Job creation E6) Wage/salary E7) Cost of product/service	Policy (P)	P1) Political and executive decisions P2) Standards and references P3) Privacy and data protection P4) Rights and freedoms P5) Right to information P6) Ethical compliance P7) Retirement

Table 1 Societal domains and impact categories considered for the Delphi process.

Each item (statement) had 6 potential responses: “definitely not”, “probably not”, “possibly”, “probably”, “very probably”, “definitively”. A pre-test was conducted with researchers at the University of Cantabria to check the first questionnaire for proper wording (e.g., ambiguities, vagueness). The final survey process was managed using the online survey tool Google Forms with each questionnaire designed to take around 15 min to complete. Participants were sent a link to the questionnaires with an explanation of the Delphi process.

Analysis: Each item on the questionnaires was scored on a 6-point Likert scale, ranging from 1-6 (1=Definitely not; 2=Probably no; 3=Possibly; 4=Probably; 5= Very probably; 6=Definitively). The scores provided by participants were summarized with the following measures: median (degree of likely impact for a given item), percentage of the responses fall into 4-6 scores (weight of likely impact) [55] and interquartile range (IQR, degree of consensus among the participants)[56]. To explore whether different profiles/profession influence in response patterns, responses from FRs and technical partners were compared using Mann-Whitney U Test[57] to verify the null hypothesis that two samples come from the same population (i.e. they have the same probability distribution) with the alternative hypothesis that randomly selected values from one sample will be less than or greater than randomly selected values from the second sample. Alpha level of 0.05 was used for all statistical tests. The software package PSPP was used for statistical analysis. To be confident that agreement had been reached, the consensus was defined if each category meet the criteria presented in Table 2. Then, outcome categories were rated as 1) “High” likely impact (fulfil all criteria), 2) “Moderate” likely impact (fulfil two criteria) and 3) “Low” likely impact (fulfil one or none of the criteria). Responses to questions/statements (56) in Round 1 were summarized and presented to participants in a 45 min teleconference. The Round 2 questionnaire included 29 categories labelled as “High” and “Moderate” likely impact from the first round. The median scores of each statement from the previous questionnaire were included in this second round.

Criteria for Round 1	Criteria for Round 2
Median ≥4[55]	Median >4[55]
Scores 4-6 >50% of participants[53]	Scores 4-6 ≥ 80% of participants[55]
IQR ≤ 2[58]	IQR ≤ 1.5[58]

Table 2 Criteria to filter impact categories each round. Scores 4-6 correspond to “Probably”, “Very probably” and “Definitely” responses.

Participants: Sampling was purposive to ensure as many participants as possible (≥ 15). The invited participants were either First Responders or technical partners

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[58] Basu S, La Distia Nora R, Rao NA, Jiang X, Fuady A. (2020). International Ocular TB Study Group. Prognostic factors for TB-associated uveitis in the Asia-Pacific Region: results of a modified Delphi survey [published online ahead of print, Jan 2]. Eye (Lond). 2020;10.1038/s41433-019-0743-1. doi:10.1038/s41433-019-0743-1

(researchers/technology providers) involved in the ASSISTANCE project. Table 3 shows the demographic characteristics of contributors. In total 26 respondents (FRs n=10; technical partners n=16) completed the Round 1 and 22 respondents (FRs n=8; technical partners n=14) completed the two rounds (dropout of 16 %).

Age	Male	Female	Total
18-24	0.0 %	0.0 %	0.0 %
25-39	30.8 %	11.5 %	42.3 %
40-54	38.5 %	7.7 %	46.2 %
55+	7.7 %	3.8 %	11.5 %
Total	**76.9 %**	**23.1 %**	**100 %**

Table 3 Demographics of participants in the Delphi process.

Ethics: All participants were informed and agreed to take part at the beginning of the online anonymous questionnaires. All data were handled in accordance with procedures defined in WP10 deliverables.

3.2.3.Results and discussion

Round 1: FRs and technical partners may have different perspectives and therefore both groups may differ in their responses. Mann-Whitney U test was used to compare the distributions of sum scores given by FRs (n=10) and technical partners (n=16) to the eight domains of the first questionnaire. The differences between distributions were not significant (Health and Safety U= 51.52, p=.131; FRs Organization U=62, p=.342; Training for FRs U=69, p=.561; Society U=62.5, p=.381; Culture U=71.5, p= .653; Policy U=61, p=.314; Research and Innovation U=70, p=.597; Economy U=72.5, p= .691) suggesting that the profile/profession of participants did not affect the response pattern. Figures 3-10 show the median scores, the percentage of positive responses (scores 4-6), the interquartile range (IQR) and the consensus on the likely impact for each category of the eight domains. The inclusion criteria for categories in this round consisted of Median ≥4, >50% of participants given 4-6 scores ("Probably", "Very probably" and "Definitely") and IQR < 2 (meaning that 50% or more responses are within 1 score of the median). There was consensus regarding likely impact of the ASSISTANCE project on 29 categories (24 "High" and 5 "Moderate").

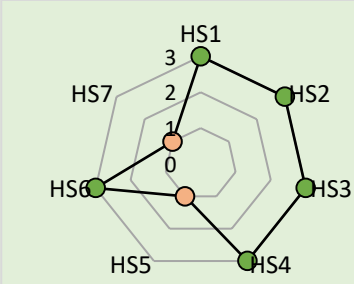
Health and Safety	Mdn	% [4-6]	IQR	Consensus on likely impact
HS1.- Injury	5	69.2	2	
HS2.- Mental and Physical demands	4	73.1	2	
HS3.- Healthcare	4	61.5	2	
HS4.- Comfort mobility	4	53.8	2	
HS5.- Assistance of injured FRs	3.5	50.0	2	
HS6.- Physical protection	4	53.8	2	
HS7.- Citizens response/evacuation	3	23.1	1.25	High / Moderate / Low

Figure 3: Results of Round 1 for Health and Safety domain.

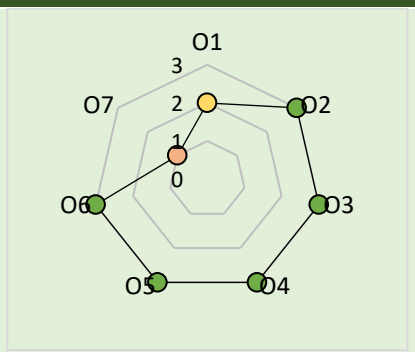
FRs Organization	Mdn	% [4-6]	IQR	Consensus on likely impact
O1.- Decision-making	5	73.1	3	
O2.- Management	5	84.6	2	
O3.- Planning and procedures	4	76.9	1.25	
O4.- Intervention strategies	4	80.8	1	
O5.- Workforce organization	4	57.7	2	
O6.- Division of labour	4	57.7	2	
O7.- Recruitment	3.5	50.0	2	High / Moderate / Low

Figure 4: Results of Round 1 for FRs Organization domain.

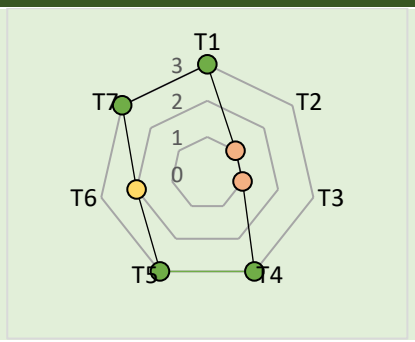
Training for FRs	Mdn	% [4-6]	IQR	Consensus on likely impact
T1.-Curricula	4	61.5	1.3	
T2.-Qualifications	3	46.2	1	
T3.-Promotion	3	34.6	2	
T4.-Fitness	4	65.4	2	
T5.-Pedagogical tools	5	73.1	2	
T6.-Use of technologies	5	76.9	2.3	
T7.-Specialization	5	69.2	2	High / Moderate / Low

Figure 5: Results of Round 1 for Training for FRs domain.

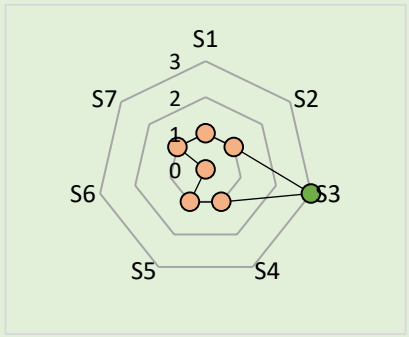
Society	Mdn	% [4-6]	IQR	Consensus on likely impact
S1.-Working-life balance	2	18.2	1	
S2.-Gender equality/equity	2	18.2	1	
S3.-Interaction between co-workers	4	81.8	2	
S4.-Interaction FRs-citizens	3	50.0	2	
S5.-Volunary service	3	27.3	1.25	
S6.-Vulnerable population	3	40.9	3	
S7.-community involvement	3	31.8	2	High / Moderate / Low

Figure 6: Results of Round 1 for Society domain.

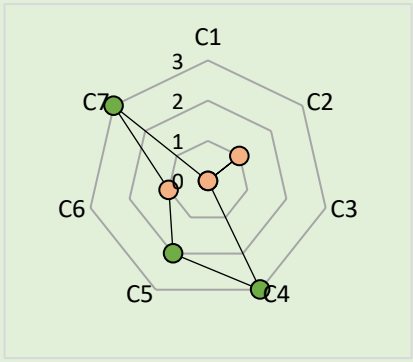
Culture	Mdn	% [4-6]	IQR	Consensus on likely impact
C1.-Tradition and values	3	34.6	2.25	
C2.-FRs reputation	2	19.2	1	
C3.-Risk perception	3.5	50.0	3	
C4.-Self-protective behaviour	4.5	65.4	2	
C5.-Tactical strategic knowledge	5	69.2	3	
C6.-Disasters awareness	3	26.9	2	
C7.-Acceptance of technology	5	80.8	1.25	High / Moderate / Low

Figure 7: Results of Round 1 for Culture domain.

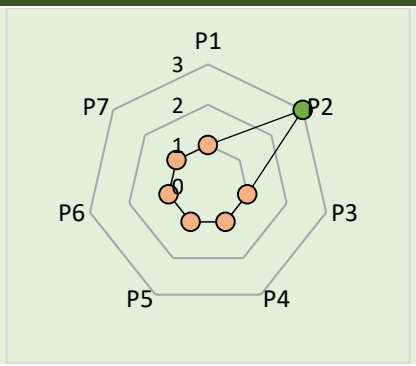
Policy	Mdn	% [4-6]	IQR	Consensus on likely impact
P1.-Eexecutive decisions	3	38.5	2	
P2.-Standards and references	4.5	84.6	1	
P3.-Privacy	3	26.9	2	
P4.-Rights/ freedoms	2.5	26.9	2	
P5.-Right to information	3	42.3	2	
P6.-Ethics	2	15.4	1	
P7.-Retirement	3	30.8	2	High / Moderate / Low

Figure 8: Results of Round 1 for Policy domain.

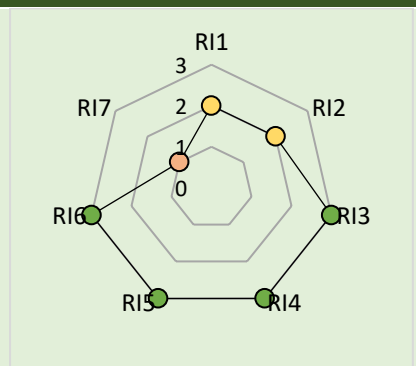
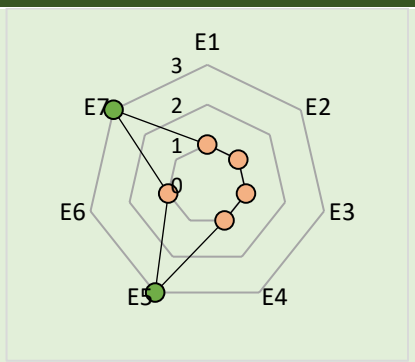
Research and Innovation	Mdn	% [4-6]	IQR	Consensus on likely impact
RI1.-Multidisciplinary	5	73.1	3	
RI2.-Collaboration on science and education	5	69.2	2.25	
RI3.-Targeting of future research	5	80.8	2	
RI4.-Dissemination	5	69.2	2	
RI5.-Research skills/ research capacity	5	88.5	2	
RI6.-Staff development	5	88.5	1.25	
RI7.-Gendered perspective	3.5	50.0	2	High / Moderate / Low

Figure 9: Results of Round 1 for Research and Innovation domain.

Economy	Mdn	% [4-6]	IQR	Consensus on likely impact
E1.-Financing	3	42.3	1	
E2.-Investments	3	42.3	1.25	
E3.-Commercialization	3	34.6	1	
E4.-Productivity	3.5	50.0	1.25	
E5.-Job creation	4	57.7	2	
E6.-Wage/salary	3	11.5	1	
E7.-Cost of product/service	4	65.4	2	



High | Moderate | Low

Figure 10: Results of Round 1 for Economy domain.

Contrary to expectations, some categories related to the project activities showed "Low" likely impact. HS7.- Citizens response/evacuation, for example had a median of 3 and an IQR of 1.25 denoting consensus on the neutral likely impact of the project on this category. Participants also agreed that the project will not impact on S2.-Gender equality/equity (Mdn=2; IQR=1). As expected, participants agreed that the project will not affect P3.-Privacy and data protection (Mdn=3;IQR=2), P4.- Rights and freedoms (Mdn=2.5; IQR=2) and P6.-Ethics (Mdn=2; IQR=1) categories. It is argued here that changes on these categories were considered undesirable impacts by participants (e.g. breaking the law, Infringement upon Fundamental Rights and Ethics, etc.). Descriptive statistics and the accepted/rejected categories from Round 1 were presented to the project partners during a teleconference and they were request for free contributions. All agreed with results and provided qualitative feedback, but no formal changes were needed for the subsequent round.

Round 2: Median scores from the first round were added to each item of the second questionnaire for re-scoring. The inclusion criteria for this round were more rigorous: median>4, >80% of participants given 4-6 scores and IQR<1.5. Results from the two rounds were used to develop the final list of likely impact categories (Table 4).

The respondents agreed to categories HS1, HS6, O1, O2, O4, T5, T7, C5, RI1, RI3 and RI4 (High likely impact) and partially agreed to categories HS2, HS4, O3, O5, T4, T6, C4, C7, RI5 and RI6 (Moderate likely impact) while categories HS3, O6, T1, S3, P2, RI2, E5 and E7 were rejected (Low likely impact). Comparing the results of the first and second round, the dispersion for 20 categories decreased (Table 4). The highest reduction (decrease of IQR) and, therefore, consensus can be found in O1, C5 and RI1. For categories O3, T1, C7, P2 and RI6 the IQR increased indicating a high level of uncertainty among the respondents.

Category	Round 1 (n=26)			Round 2 (n=22)			Difference			Likely impact
	Mdn	%	IQR	Mdn	%	IQR	Mdn	%	IQR	
HS1.-Injury	5	69.2	2	5	100.0	1	0	30.8	-1	High
HS2.-Mental and physical demands	4	73.1	2	4	81.0	1	0	7.9	-1	Moderate
HS3.-Healthcare	4	61.5	2	4	66.7	1.5	0	5.1	-0.5	Low
HS4.-Comfort/mobility	4	53.8	2	4	85.7	1	0	31.9	-1	Moderate
HS6.-Physical protection	4	53.8	2	5	90.5	1.5	1	36.6	-0.5	High
O1.-Decision-making	5	73.1	3	5	95.2	0	0	22.2	-3	High
O2.-Management	5	84.6	2	5	90.5	1	0	5.9	-1	High
O3.-Planning and procedures	4	76.9	1.25	5	95.2	2	1	18.3	0.75	Moderate
O4.-Intervention strategies	4	80.8	1	5	95.2	1	1	14.5	0	High
O5.-Workforce organization	4	57.7	2	5	76.2	1.5	1	18.5	-0.5	Moderate
O6.-Division of labour	4	57.7	2	5	71.4	2	1	13.7	0	Low
T1.-Curricula	4	61.5	1.25	4	76.2	1.5	0	14.7	0.25	Low
T4.-Fitness	4	65.4	2	4	95.2	1	0	29.9	-1	Moderate
T5.-Pedagogical tools	5	73.1	2	5	90.5	1	0	17.4	-1	High
T6.-Use of technologies	5	76.9	2.25	5	90.5	1	0	13.6	-1.25	Moderate
T7.-Specialization	5	69.2	2	5	85.7	1.5	0	16.5	-0.5	High
S3.-Interaction between co-workers	4	81.8	2	4	76.2	1.5	0	-5.6	-0.5	Low
C4.-Self-protective behaviour	4.5	65.4	2	4	81.0	1	-0.5	15.6	-1	Moderate
C5.-Tactical/strategic knowledge	5	69.2	3	5	81.0	1	0	11.7	-2	High
C7.-Acceptance of technology	5	80.8	1.25	5	95.2	2	0	14.5	0.75	Moderate
P2.-Standards and references	4.5	84.6	1	4	76.19	1.5	-0.5	-8.4	0.5	Low
RI1.-Multidisciplinary	5	73.1	3	5	90.5	1	0	17.4	-2	High
RI2.-Collaboration on science and education	5	69.2	2.25	5	81.0	2	0	11.7	-0.25	Low
RI3.-Targeting of future research	5	80.8	2	5	95.2	1.5	0	14.5	-0.5	High
RI4.-Dissemination	5	69.2	2	5	90.5	1	0	21.2	-1	High
RI5.-Research skills/capacity	5	88.5	2	5	90.5	2	0	2.0	0	Moderate
RI6.-Staff development	5	88.5	1.25	5	81.0	2	0	-7.5	0.75	Moderate
E5.-Job creation	4	57.7	2	4	66.6	1	0	9.0	-1	Low
E7.-Cost of product/service	4	65.4	2	4	71.43	2	0	6.0	0	Low

Table 4 Comparison of Round 1 and Round 2 and likely impact consensus for categories.

Main findings: In total 27 categories were rejected during the first round. Some of these categories are related in one way or another to the project activities. For instance, HS7.-Citizens response/evacuation is related to Task 5.2 (Sub-task 5.2.3 Damaged Assets Location) where technologies for supporting evacuation are planned. Similarly, S2.-Gender equality/equity is related to Task 8.5 Gender Dimension. It is argued here that participants were biased by the global idea of the project and its main outcomes rather than specific technologies and research activities.

Out of the 11 categories in which a final consensus was reached 2 are related to Health and Safety (HS1.- Injury and HS6.- Physical protection), 3 are related to FRs Organization (O1.-Decision-making, O2.-Management and O4.-Intervention strategies), 2 are related to FRs training (T5.-Pedagogical tools and T7.-Specialization), 1 is related to Culture (C5.-Tactical/strategic knowledge) and 3 are related to Research and Innovation (RI1.-Multidisciplinary, RI3.-Targeting of future research and RI4.-Dissemination). These categories are highly associated with the main expected outcomes of the project (the protection of FRs, improving management of disaster events, use of advanced training methods, improving knowledge and research excellence). Categories included in Economy, Policy and Society domains did not reach consensus to be included in the top list. One reason may be that was not easy for participants to identify societal impacts at a glance. Some societal impacts are not so evident (e.g. macro-societal level) with complex relations between technologies and their potential effects thus requiring social expert judgements or further analysis. Results also showed other 10 categories that were close to reach a definitive consensus (Moderate likely impact). It is suggested here that, there is no use in dismissing these categories because some may be relevant for further analysis (e.g. they may be included in future analyses) as the project evolves.

Conclusion: Whereas it was necessary to consider as many societal aspects as possible, the defined dimensions were broken down from the high level of abstraction into more operational elements. Therefore, a set of categories was proposed from societal dimensions. The Delphi approach allowed us to identify an agreed a list of top impact categories that will feed into further practical analyses. Conclusions can be summarized as follows:

1. The Delphi process is a suitable participatory and transparent approach for assessing societal impact since the consensus among a group of experts has more power than individual judgements. One of the main advantages is the involvement of project partners to think about further societal consequences of the project developments.
2. Results presented here can be extended to societal impact assessment of similar projects on the use of technologies and advanced training for disasters response.
3. The response patterns of FRs and technical partners did not differ significantly.
4. Technocentric and practical perspectives dominated the consensus process.
5. Final consensus was reached on one fifth of the proposed categories. A list of indicators will be defined based on these categories for assessing societal impacts of the project (e.g. identifying benefits and negative impacts).
6. Further actions involve the definition of societal indicators related to the selected categories to identify intended impacts and/or unintended side effects of the project.

3.3. The First Responders

Background: Attitudes and behaviour of FRs when adopting ASSISTANCE technologies and training solutions is part of societal impact assessment.
Method: A toolkit is designed to integrate, monitor and evaluate non-technical aspects (gender, ethical, legal and societal) for the pilot activities. A primary design of the specific tools for assessing societal aspects is presented: 1) Self-assessment tool (planning), 2) Monitoring tool (Execution) and 3) Analysis tool (Evaluation).
Conclusion: Although the tools for assessing societal impacts for the pilot activities are under construction, the main concepts and reference methods to guide further research are presented.

3.3.1.Introduction

The ASSISTANCE project involves Pilot Demonstrations (PDs) and Training Workshops (TWs). Three pilot scenarios considered relevant to the wider application of technologies and training solutions have been chosen: 1) Earthquake (Turkey), 2) Chemical plant explosion (Netherlands) and 3) Terrorist attack (Spain). For each pilot, reference scenarios and several Use Cases (UCs) have been defined to test and validate the functionalities and requirements of the proposed technologies (see D2.3 for more details). A validation plan (to manage risk and ensure that the required functionality is achieved) will be defined in WP7 Task 7.1 (M23-28). A training curriculum has been also defined comprising 8 subjects: 1) background knowledge, 2) VR platforms, 3) VR platforms usage, 4) VR scenarios, 5) Simple VR reality scenario, 6) 1st Pilot VR scenario, 7) 2nd Pilot VR scenario and 8) 3rd Pilot VR scenario. The curriculum schedule and the evaluation methods for each subject have been defined to measure if the educational goals have been achieved (See D 6.2 for more details).

Whereas functionality of technologies and training evaluations are covered, there is also a need to address non-technical implications of such developments. The GELS toolkit is being designed to integrate, monitor and evaluate Gender, Ethical, Legal and Societal aspects for the pilot demonstrations and advance training. It is an original idea of CEL designed in collaboration with UC. Pilot leaders, host organizers as well as the rest of partners are expected to work together according to this toolkit. Table 1 is a matrix/framework that provides an overview of the GELS Toolkit. This matrix highlights the issues of the piloting activities (i.e. elements to address), the stages during which the process passes and the corresponding tools. The issues are characterized in terms of: Gender [Gen], Ethical [Eth], Legal [Leg] and Societal [Soc]. The specific tools are categorized as (Figure 3):

1. ***Self-assessment tool (SAT):*** A sort of *Vademecum* for pilot leaders, host organizations and other partners to consider non-technical aspects when planning PDs and TWs.
2. ***Monitoring tool (MT):*** An approach for researchers to watch and analyse carefully human factors during PDs and TWs.
3. ***Analysis tool (AT):*** A tool for researchers to assess non-technical aspects after PDs and TWs.

Stage	Tool	Key Issues			
		Gender [Gen]	**Ethics [Eth]**	**Legal [Leg]**	**Societal [Soc]**
		Gender integration and gender perspective	*Protection of participants*	*Privacy and data protection*	*FRs attitudes towards technology/training methods*
1. Design	Self-assessment tool [SAT]	Does the pilot integrate gender aspects? How many women and men are expected to participate? What are their roles? [SAT-Ge]	Does the pilot require recruitment? Is ICF required? Are there any risks for participants? [SAT-Eth]	What administrative legal actions might the pilot require? [SAT-Leg]	What people (target groups and main actors) are planned to participate? What productive interactions are planned (dissemination/participatory)? What are the research and evaluation plans? [SAT-Soc]
2. Execution	Monitoring tool [MT]	Observe women and men performance Acquire data (e.g. participants self-reporting, opinion) Monitor changes (compare actual vs planned conditions) [MT-Gen]	Check compliance with ethical principles Monitor changes (compare actual vs planned conditions) [MT-Eth]	Check compliance with data protection and privacy (GPR) Monitor changes (compare actual vs planned conditions) [MT-Leg]	Observe participants performance and behaviour Acquire data (e.g. participants self-reporting, opinion) Monitor changes (compare actual vs planned conditions) [MT-Soc]
3. Evaluation	Analysis tool [AT]	Analyse and process data. Report main findings and deviations. [AT-Gen]	Analyse whether the ethical requirements and protective conditions of the pilot were as expected. Report main findings and deviations. [AT-Eth]	Analyse whether the legal requirements of the pilot complied with expectations. Report main findings and deviations. [AT-Leg]	Analyse and process data. Report main findings and deviations. [AT-Soc]

Table 5 Matrix of the GELS toolkit for monitoring, managing, and evaluating non-technical aspects of the Pilot Demonstrations and the Training Workshops.

The intersections between categories (issues and tools) in Table 1 determine the specific guidance provided. The nature of this framework changes according to the stage of the timeline moving from questions to prompt the users during the early stages (SAT), observation and supervision of the pilot and training activities (MT) to the analysis and evaluation of non-technological factors (AT). The relevance of the information may differ according to the nature of the PD being conducted. In fact, the users of the toolkit may not need to address all the elements to the same degree of detail during each of the stages. Indeed, some parts of the guidance may not be relevant in some pilots (i.e. if the pilot demonstration does not need external participants/volunteers to be recruited and used). However, it is important that partners will be aware of every element and stage. Furthermore, this guideline is also intended for those who may deal with other similar actions to ensure the integration, monitoring and evaluation of gender, ethical, legal, and societal aspects in similar projects.

The corresponding tools are under construction and will be ready to use during the Pilot Demonstrations (PDs) and Training Workshops (TWs). Moreover, the final version of the GELS Toolkit will be included in the Best practices Handbook (D8.6).

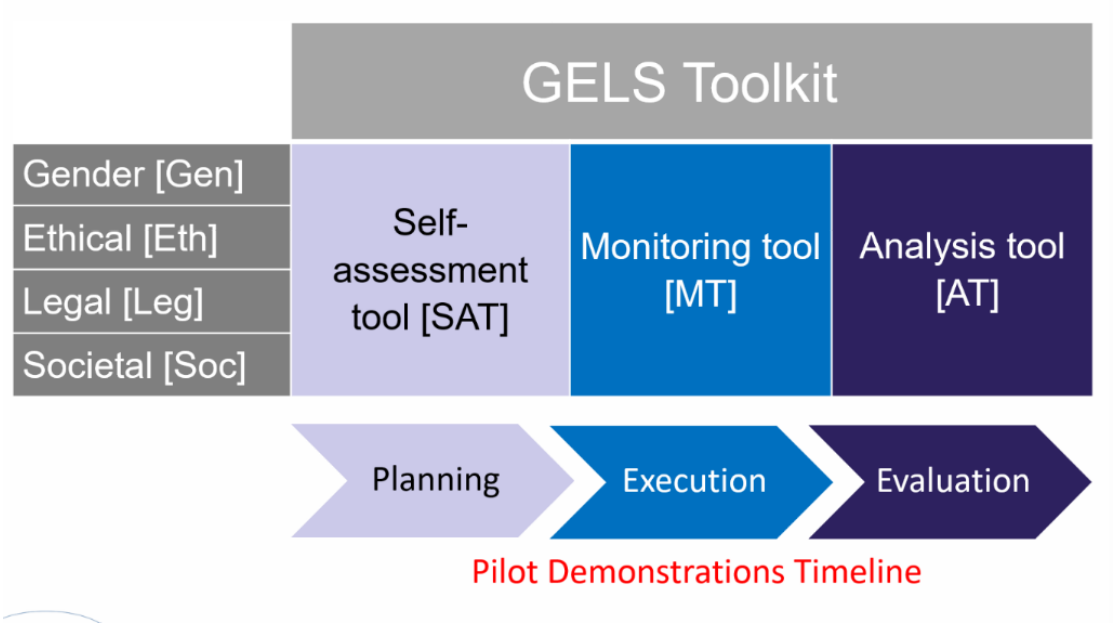


Figure 11: The GELS toolkit.

The following three sections describe the first approach for Societal [Soc] analysis based on the GELS Toolkit comprising the Self-assessment tool (SAT-Soc], the Monitoring tool [MT-Soc] and the Analysis tool [AT-Soc].

3.3.2.Self-assessment tool [SAT-Soc]

The Self-assessment tool for societal issue (SAT-Soc) is defined in the form of a lists of questions/statements that users should consider when planning the piloting activities. The tool is conceived to cover as many aspects as possible. However, as mentioned, the user may not require addressing all the elements to the same degree of detail and/or some parts may not be relevant. The tool addresses the following key aspects: 1) Information of the activity (Table 6), 2) Participation (stakeholders' involvement) (Table 7) and 3) Evaluation (Table 8).

A key concept introduced here is "productive interactions" (Table 7) defined as *exchanges between researchers and stakeholders in which knowledge is produced and valued that is both scientifically robust and socially relevant*[59]. Productive interactions are *conditio sine qua non* for societal impact assessment i.e. to produce impact you need to have contact with stakeholders and society. Exchanges can be conducted in many ways and at different levels: 1) dissemination (stakeholders receive information) and 2) participatory (stakeholders are involved).

[59] SIAMPI. Social Impact Assessment Methods for research and funding instruments through the study of Productive Interactions between science and society. Final Report. http://www.siampi.eu/

Information of the activity
PI1.- What is the scenario of interest? • The type of disaster (e.g. Earthquake, Industrial accident, Terrorist attack) • Storyboard (timeline of the simulated event) • Location and venue details (layout, maps, graphic information) • The host organization (primary activities, sensitivities, experience in managing similar actions, etc.) PI2.- What ASSISTANCE developments will be tested? • Technology (e.g. SA platform (Situation Awareness, ALR tool, user terminals, sensors, wearables, drones, robots, etc.) • Training methods (e.g. VR platform, MR platform, Training Moodle server) PI3.- What action(s) will take place directly involving stakeholder's and why? • Use Cases- technologies-expected outcomes • Training learning-expected outcomes • Parties that would be interested PI4.-What are the potential benefits of the activity for stakeholders? • Benefits can be related to knowledge improvements, provision of additional information, experience, cooperation, staff training, publicity and reputation, etc.

Table 6 Self-assessment tool: Information of the activity.

Participation (stakeholders' involvement)
P1.- Who will participate? • FRs (e.g. type of FR-Firefighter, LEA, EMS- organization, number of participants, rank, age, gender, etc.) • Technical partners (e.g. organization, number of participants, age, gender, etc.) • Volunteers/citizens (number, socio-economic status, education, age, gender, etc.) P2.- What are their roles? • In relation to the activity itself (host, manager, data collector, active staff, observer, advisor) • In relation to technologies (e.g. developer, operator, observer, user, evaluator) • In relation to training methods (e.g. developer, user, learner, instructor, evaluator) • In relation to the simulated scenario (e.g. victim, first responder in the field, disaster manager decision maker), P3.- What productive interactions are planed? • Dissemination (e.g. manuals, briefings, presentations, exhibitions, social media/web, video explanations, webinars) • Participatory (e.g. meetings, workshops, tutorials, training sessions, end-user trials, guided exercises, quizzes, etc.) P4.- What information will be collected? • Performance (e.g. situation awareness, tactical and strategical knowledge, decision-making time, tasks completion, accuracy, etc.) • Attitudes towards (e.g. risk, protection, access to information, communication, comfortability/affordability, usability, usefulness, confidence, learning, flexibility, etc.) P5.- How information is expected to be collected and analysed? • Data collection methods and techniques (e.g. interviews, focus groups, questionnaires, direct observations, others?) • Data analysis: 1) qualitative (e.g. content analysis, hermeneutic analysis), 2) quantitative (e.g. descriptive and inferential statistics)

Table 7 Self-assessment tool: Participation.

Productive interactions for pilots have two main aims: 1) identifying improvements for technologies and training approaches and 2) assessing current and potential changes in knowledge, behaviour and procedures of stakeholders derived from these productive interactions (Table 8). The first is related to Constructive Technology Assessment (CTA) process. The second is related to Societal Impact Assessment (SIA).

Evaluation
E2.- What indicators will be used to measure the societal impact of the activity? • For dissemination productive interactions (number of press releases, leaflets and documents, presentations by invitation, etc.) • For participatory productive interactions (e.g. number of participants, joint road maps, practical use or adoption of technologies and training methods, etc.) E1.- How the feedback from stakeholders will be used to improve the technologies and methods? • Follow up through additional productive interactions • Include suggested changes/improvements for the next demonstration activities • Other? E2.- How the feedback from stakeholders can be used for assessing societal impact of piloted technologies and training methods? • Assessing current changes in stakeholder's behaviour and procedures from data collected (e.g. performance evaluation, System Usability Scale[60]) • Drawing potential impacts from data collected

Table 8 Self-assessment tool: Evaluation.

3.3.3. Monitoring tool [MT-Soc]

The Monitoring tool is defined as an instrument to watch and check pilot activities carefully, especially productive interactions, to explore and discover societal impacts (e.g. changes in performance and behaviours) of such activities on participants. The aim of this tool is providing support to gather valuable information of facts, performances, preferences, thoughts, and behaviours of participants in a systematic way. The monitoring mechanisms will depend on the nature of the pilot activities and what is being monitored. Several methods are likely to be used to gain feedback or responses from different perspectives (Table 9).

The described monitoring techniques are designed to acquire data (quantitative and qualitative) and should fit the purpose, be timely and applicable. Note that monitoring activities will be subject to mutual consortium decisions according to different goals, the limitations of those participating, equipment availability, time availability and resources. This process is currently in the design stage and the use of this tool will be as flexible as possible according to the progress of each pilot activity (e.g. current and new constraints and opportunities, availability of participants and resources, etc.). The suitability of data collection vs participants will be analysed to determine whether a given productive interaction can be conducted also involving different stakeholders (i.e. Emergency Medical Services, Firefighters, Police officers, technical partners, etc.).

[60] Bangor, A., Kortum, P. T., & Miller, J. T. (2008). An empirical evaluation of the System Usability Scale. International Journal of Human-Computer Interaction, 24(6), 574--594

Monitoring technique	Description	Collected information	
		Qualitative	Quantitative
Observation	Watching the procedures and participants. There are two main methods: 1) human observation, 2) automated observation (e.g. video cameras, recorders).	✓	✓
Benchmarking	Measuring performance actions/decisions by comparing them with accepted standards/references.	✓	✓
Usage	Gathering information of the way in which technologies are used, or how much they have been used.	✓	✓
Baseline	Stablishing a minimum threshold/level (e.g. acceptance, quality, safety, etc.) considered to be necessary.		✓
Survey	Gathering opinions and attitudes from stakeholders and/or organizers trough questionnaires.		✓
Talking with people	Getting feedback from participants through interviews/focus groups (face-to-face, online, phone, etc.).	✓	

Table 9 Potential monitoring techniques for pilot demonstrations and training workshops.

The following illustrates how the Monitoring tool for societal aspects can be defined when assessing attitudes of FRs in relation to technology. Generally speaking, the example describes a monitoring process that aims to collect feedback from FRs involved in the pilot activity in relation to:

- Usefulness.- Degree to which the technology is able to meet FRs needs.
- Usability.- Degree to which the technology is reasonably easy to use and can be adopted by FRs.
- Impact.- Degree to which the technology is likely to modify current practices and behaviour of FRs when dealing with disasters.

To collect data a combination of a questionnaire and interviews can be defined as follows. The questionnaire may well be divided into three sections as shown in Table 10. The questionnaire and especially the well-known System Usability Scale provides quantitative data (from Likert scale to scores). But it may be difficult to understand why respondents assign a specific low or high score to the scales included without additional information[61]. That is why a debriefing session (group session) should be conducted once the respondent has filled in the questionnaire to discuss, at general level, the answers provided. The researcher will be in charge of guiding the discussion going through the questionnaire and facilitating the debate among the different points of view. The interview can be recorded or transcribed by note takers to produce a qualitative report.

[61] SUStisfied? Little-known System Usability Scale facts. Sauro, J. s.l. : User Experience: The Magazine of the User Experience Professionals Association, 2011, Vol. 10(3).

A. Usefulness	Data coding
A1.- This technology will cover our needs as first responder	5-point Likert scale: strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1)
A2.- This technology will improve our first response capabilities	
A3.- This technology will improve our protection as first responders	
A4.- This technology is applicable in my organization	
B. Usability	**Data coding**
B1.- I think that I would like to use this technology	5-point Likert scale: strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1). System Usability Scale (SUS)[62]
B2.- I found this technology unnecessarily complex	
B3.- I think this technology is easy to use	
B4.- I think that I would need the support of a technical person to be able to use this technology	
B5.- I find the various functions in this technology are well integrated	
B6.- I think there is too much inconsistency in this technology	
B7.- I would imagine that most people would learn to use this technology very quickly	
B8.- I find this technology awkward to use	
B9.- I would feel very confident using this technology	
B10.- I needed to learn a lot of things before I could get going with this technology	
C. Impact	**Data coding**
C1.- This technology is compatible with our current practices	5-point Likert scale: strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1)
C2.- This technology will help us to learn new ways for dealing with disasters	
C3.- This technology will make easier our job	
C4.- This technology is likely to expand our tactics	
C5.- This technology is likely to alter our routines (usual ways of doing the job)	
C6.- This technology will require new skills and specialization	
C7.- This technology is likely to increase our feeling of security	
C8.- This technology is likely to reduce risk taking behaviours	
C9.- This technology will facilitate interaction between co-workers	
C10.- This technology will be trusted by FRs personnel	

Table 10 Example questionnaire on societal impact during pilot demonstrations.

3.3.4.Analysis tool (AT-Soc)

Once data is collected, the next step is to get insights from it. The Analysis tool is defined as a framework divided into quantitative (Table 11) and qualitative analysis (Table 12). The quantitative analysis involves statistical means for explaining (descriptive statistics) or predicting (inferential statistics) the behaviours and performances of stakeholders/participants[63]. The qualitative data is essentially non-numeric information from different sources (e.g. interview transcripts, notes, video and audio recordings)[64] so it is "sense making" or understanding stakeholders/participants in context-attitudes, rather than predicting or explaining.

[62] *The Factor Structure of the System Usability Scale. In: Kurosu M. (eds) Human Centered Design. HCD 2009. Lecture Notes in Computer Science* . Lewis J.R., Sauro J. Berlin : Springer, 2009, Vol. vol 5619.

[63] Smith, M. J. (2018). Statistical Analysis Handbook: A Comprehensive Handbook of Statistical Concepts, Techniques and Software Tools. 2018 Edition. Issues version: 2018-1. ISBN 978-1-912556-06-9. https://www.statsref.com/StatsRefSample.pdf

[64] Leavy, P. (2014). The Oxford Handbook of Qualitative Research. DOI: 10.1093/oxfordhb/9780199811755.001.0001. https://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199811755.001.0001/oxfordhb-9780199811755

A. Quantitative analysis
A1.- Preparing data
A1.1.- Coding: convert data into a numeric format, if necessary
A1.2.- Data entry: enter the data into a spreadsheet or database
A1.3.- Missing values: check and detect blanc entries
A1.4.- Transformation: create scale measures and/or collapse values into fewer categories
A2.- Descriptive statistics
A2.2.- Univariate analysis
A2.2.1- Frequency: calculate percentages/frequency of individual values or ranges (display in tables or graphs for better understanding)
A2.2.2.- Central tendency: calculate statistics Mean, Median and/or Mode
A2.2.3.- Dispersion: calculate range and /or IQR (Interquartile range) and/or standard deviation
A2.3.- Bivariate analysis
A2.3.1.- Correlation: calculate coefficients to determine that variables are related to each other (display scatterplots, regression lines and/or crosstabs for better understanding). Also use statistical testing to analyse whether the correlation is significant (calculate *p*-value).
A3.- Inferential statistics*
A3.1.- General Linear Model (GLM)
A3.1.1.- ANOVA (Analysis of variance): when comparing the effects of a dummy predictor variable on an outcome variable
A3.1.2.- Multivariate regression: when multiple outcomes variables are modelled as being predicted by the same set of predictor variables
A3.1.3.- Logit model: when the outcome variable is binary (0-1), and it is presumed to follow a logistic distribution
A3.1.4.- Probit model when the outcome variable is binary (0-1), and it is presumed to follow a normal distribution
A3.2.-Compare on group to a hypothetical value
A32.1.- One sample t-test (Gaussian population)
A3.2.2.- Wilcoxon test (non-Gaussian population)
A3.2.3.- Chi-square or binomial test (two possible outcomes)
A3.3.- Compare two unpaired groups
A3.3.1.- Unpaired *t*-test (Gaussian population)
A3.3.2.- Mann-Witney U test (non-Gaussian population)
A3.3.2.- Chi-square or binomial test (two possible outcomes)
A3.4.- Compare two paired groups
A3.4.1.- Paired t- test (Gaussian population)
A3.4.2- Wilcoxon test (non-Gaussian population)
A3.4.3.- McNemar's test (two possible outcomes)
A3.5.- Compare three or more unmatched groups
A3.5.1.- One-way ANOVA (Gaussian population)
A3.5.2.- Kruskal-Wallis test (non-Gaussian population)
A3.5.3.- Chi-square test (two possible outcomes)
A3.6.- Compare three or more matched groups
A3.6.1- Repeated-measures ANOVA (Gaussian population)
A3.6.2.- Friedman test (non-Gaussian population)
A3.6.3.- Cochrane Q (two possible outcomes)
• Note: The included statistical tests are suggested, and others are likely to be applied.

Table 11 Quantitative analysis.

B. Qualitative analysis
B1.- Categories
B1.1.- Content analysis: categorizing verbal or behavioural data to classify, summarize and tabulate the data
B1.2.- Narrative analysis: reformulation of stories by respondents considering individual context and experiences (i.e. a revision of primary qualitative data)
B1.3.- Discourse analysis: exploring naturally occurring talk and types of written text
B1.4.- Framework analysis: advanced way for familiarization, identifying thematic frameworks, coding, mapping, and interpretation
B1.5.- Grounded theory: it starts with an analysis of a single case to formulate a theory. Then, additional cases are examined to see if they contribute to the theory
B1.- Steps
B1.1.- Coding (categorization of data)
B1.1.1.- Open coding: organize raw data to try to make sense of it
B1.1.2.- Axial coding: interconnect and link the categories of codes.
B1.1.3.- Selective coding: formulate the story through connecting the categories
B1.2.- Identifying patterns and relationships
B1.2.1.- Repetitions: scan primary data for words and phrases most used
B1.2.2.- Data comparison: compare and discussing findings with literature
B1.2.3.- Missing information: search for expected aspects but not mentioned by respondents
B1.2.4.- Metaphors and analogues: compare primary research findings to phenomena and discuss similarities and differences
B1.3.- Summarizing data

Table 12 Qualitative analysis.

3.4. Citizens

Background: Survey research methods will be used to investigate citizens perception as part of SIA in the ASSISTANCE project. Before embarking on the main study, the proposed methods should be piloted to test its suitability. This study presents results of the pilot questionnaire on citizens perceptions and attitudes towards emergencies/disasters and first responding capabilities.

Methods: A questionnaire was piloted with 54 Spanish participants (female n=29; male n=25). It was divided into two five sections: 1) Disaster awareness, 2) Opinion on FRs capabilities, 3) Opinion on improvements for FRs, 4) Self-preparedness and 5) Risk perception. Likert-scales were used to score responses. Results include descriptive statistics, inferential statistics, and the assessment of Internal reliability.

Results: The overall internal reliability of the questionnaire was 0.88 (Cronbach's alfa). Results suggest that: 1) disaster awareness may depend on geographical area, 2) respondents had a favourable opinion of first responding capabilities in Europe, 3) priority improvements for FRs are Multi-agency collaboration, Good training and Use of technologies , 4) the level of preparedness differs across potential disasters but 5) risk perception do not.

Conclusion: Primary questions concerning life safety involve how individuals perceive hazards and related protection measures. This pilot questionnaire is the first step for further research on citizens perception on safety and security included in the ASSISTANCE project.

3.4.1.Introduction

Research into response to disasters have shown that panic (e.g. non-adaptive, antisocial, or irrational behaviour) is rare and most citizens act in a fairly rational way[65]. In fact, the role of the average citizen to protect themselves or others is crucial before, during and after a disaster. Being subjective, individuals are likely to prepare and therefore response to those events they perceive to be significant. Therefore, exploring public perception of risks is the first necessary step[66].

Survey research is a fundamental method to acquire information on public knowledge and perception of manmade and natural hazards[67]. It includes the use of standardized questionnaires or interviews to collect data on people perception and attitudes in a systematic way. Representative examples are the Special Eurobarometer 464b (2017)[68] and the UNESCO survey on citizens awareness on disaster preparedness around the world[69]. Examples from scientific literature include the use of questionnaire surveys for different natural hazards: Volcanic eruptions[70,71], Tsunamis [72,73], Earthquakes[74,75], Floods[76], Landslides[77], Cyclones[78].

Survey research instruments are being designed to investigate citizens perception as part of Societal Impact Assessment in the ASSISTANCE project (i.e. the DoA includes conducting questionnaires to measure security perception of citizens). Here a questionnaire was designed and piloted with 54 participants. The aims of this study were:

1. To report on the methods for the development and implementation of the questionnaire.
2. To briefly summarise the key findings.
3. To review the items of the questionnaire to improve subsequent research on the broader population.

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3.4.2.Method

Study design: Pilot questionnaires are often overlooked but important part of survey research[79]. Conducting a pilot survey has advantages such as the possibility to detect incompatible issues and the appropriateness of questions. A pilot questionnaire helps to know whether a designed survey fulfils the purpose of the study before the actual large-scale survey.

This pilot included key questions to understand the cognitive and interpretive processes of people regarding disasters and FRs capabilities. The questions were designed to cover as many aspects as possible for further planning of survey research. Purposive sampling was considered involving Spanish respondents from the same geographical region (Cantabria, Spain). Participants were administrated the questionnaire (face-to-face) and asked to independently score items. Demographic data and level of education were gathered in the last section of each questionnaire. Responses were transcribed into an Excel spreadsheet for data processing.

Questionnaire development: The first version of the questionnaire (in English) was reviewed by technical partners (RISE) and FRs (AAHD) and then translated and adapted to Spanish. The questionnaire was divided into the following sections (Annex B):

QA1 (Disaster awareness by geographical area).- *How likely do you consider that the following events (Extreme weather conditions/Fire/Earthquake/Hazardous Materials Accidents/Terrorist attack) will occur in (Europe/your country/your village-town-city)?*. This main question involved 15 items (5 type of disasters x 3 geographical areas) each with 4-point Likert scale responses: “Very likely”, “Likely”, “Unlikely” or “Highly unlikely”.

QA2 (Opinion on FRs capabilities by geographical area).- *To what extent do you agree or disagree with each of the following statement: First Responders in (Europe/your country/your village-town-city) are well trained and have enough resources to deal with disasters.* This main question involved three items (each for the geographical area) and 4-point Likert scale responses to each: “Totally disagree”, “Tend to disagree”, “Tend to agree”, “Totally agree” and “Don’t know”.

QA3 (Opinion on improvements for FRs).- *To what extent do you agree or disagree with the following solutions to improve first responder’s efficiency in case of a disaster (more personnel/visible leadership and decision-making/Multi-agency coordination/Updated emergency plans/citizens collaboration/Training for FRs/Use of new technologies/other)*. This main question involved seven statements with 4-point Likert scale responses: “Totally disagree”, “Tend to disagree”, “Tend to agree”, “Totally agree” and “Don’t know”.

[79] Bhattacherjee, A. (2012). Social Science Research: Principles, Methods and Practices. University of Florida. Texbooks Collection 3. http://scholarcommons.usf.edu/oa_textbooks/3

QA4 (Self-preparedness).- *Which statement best represents your preparedness for (Extreme weather conditions/Fire/Earthquake/Hazardous Materials Accidents/Terrorist attack).* This main question involved five items each with 3-point Likert scale responses: "I know what to do", "I fairly know what to do" and "I don't know what to do".

QA5 (Risk perception by disaster in close vicinity).- *If the following emergencies/disasters occur in your vicinity (Extreme weather conditions/Fire/Earthquake/Hazardous Materials Accidents/Terrorist attack) what in your view is the risk for you and your family.* This main question involved five items with 4-point Likert scale responses: "Low risk", "Moderate risk", "High risk" and "Critical risk".

Check-box answers were provided to reduce the time to answer each item. We had also included the option for free text (in the form of "Other, please specify" answer). The 4-point Likert responses did not have a safe 'neutral' option for respondents (i.e. they were required to form an opinion) and the 3-point Likert responses offered polar points along with a neutral option. Country and place of residence (village/town/city), demographic data (age and gender), level of education (primary/ secondary/ university/ other) and socio-professional category (self-employed/ employee/ retires/ unemployed/ student/ other) were gathered in the last section of each questionnaire. Due to the nature of the pilot questioning, face-to-face delivery was considered most appropriate (e.g. questions could be clarified and direct feedback from the respondents). Overall, the questionnaire took approximately 20 min to complete which was acceptable to the participants. The survey took place at different times: July 2019 (26 respondents), December 2019 (7 respondents), February 2020 (21 respondents).

Participants: A dedicated effort was made to use a representative population sample (i.e. gender-balance, different ages, several educations and socio-professional profiles). Table 13 displays the characteristics of the surveyed participants.

Characteristics	n = 54	Characteristics	n = 54
Gender		**Level of education**	
Male	25 (46.3%)	Primary	5 (9.25%)
Female	29 (53.7%)	Secondary	27 (50%)
Other	0 (0%)	University	21 (38.9%)
		Other	1 (1.85%)
Age (years)		**Socio-professional category**	
18-24	16 (29.6%)	Student	19 (35.15%)
25-39	8 (14.8%)	Self-employed	5 (9.3%)
40-54	28 (51.9%)	Employed	25 (46.3%)
55+	2 (3.7%)	Unemployed	4 (7.4%)
		Retired	1 (1.85%)

Table 13 Demographics, level of education and socio-professional category of respondents.

Analysis: Each item on the questionnaire was scored: 4-point Likert scale (responses ranging from 1 to 4) and 3-point Likert scale (responses ranging from 1 to 3). "Don't know" responses were removed from the final analysis. Frequency of responses, mean and standard deviation were computed for descriptive statistics. Each item scores are considered as an independent sample for statistical analysis in this study.

Non-parametric methods were used in statistical inference Mann-Whitney U test to compare two samples (assessing whether the two samples come from the same distribution) and Kruskal–Wallis test[80] to measure the differences between three or more samples (using scores with their rank numbers and tests whether these are equal over samples). Internal reliability of each section and the overall questionnaire was assessed by Cronbach's alpha. Statistical software, PSPP was used for statistical analysis with an alpha level of 0.05 for all statistical tests.

Ethics: Before conducting the anonymous questionnaire, participants were required to read an information sheet (based on WP 10 documents) which explained the questionnaire's purpose and content, that they could withdraw from the survey at any time without consequence and that no participant would be identifiable through publication of the results.

3.4.3.Results and discussion

Main findings: Due to the nature of this pilot study a summary of key findings is presented here. It is unclear whether these results represent the broader population. However, they provide baseline data against which future research can be assessed.

QA1 (Disaster awareness by geographical area): The aim of this question was to explore if the perception of disasters likelihood changes across different geographical areas (Europe/Country/ Village-Town). Table 14 displays the descriptive statistics (frequency, mean and standard deviation).

The differences were statistically significant for all potential events (Kruskal-Wallis test): Extreme weather ($H(2)= 15.45$, $p <0.001$), Fire ($H(2) = 34.96$, $p <0.001$), Earthquake ($H(2)= 7.66$, $p <0.001$), Industrial accident ($H(2) = 16.4$, $p <0.001$) and Terrorist attack ($H(2)= 56.18$, $p <0.001$). These results may be interpreted as: "the closer to one (my village/town) the less likely the disaster is to occur". To confirm this, we compared sample responses from Europe and Country (Spain) and the differences were not significant (Mann-Whitney U test) for Extreme weather ($U=1434$, $p= 0.871$), Earthquake ($U=1188$, p= 0.072) and Industrial accident ($U=1169.50$, $p= 0.058$) whereas the perception for Fire ($U=1144.50$, $p= 0.013$) and Terrorist attack ($U=1145.50$, $p= 0.038$) differed suggesting that respondents believe that fire events are more likely to happen in their country and that terrorist attacks are more likely to happen in Europe than in their own country.

[80] Kruskal, W.H., Wallis, W.A. (1952). Use of ranks in one-criterion variance analysis. J. Am. Stat. Assoc. 47, 583–621 and errata, ibid. 48, 907–911.

Extreme Weather

	Very likely	Likely	Unlikely	Very unlikely	Mean	SD
Europe	42.59%	46.30%	11.11%	0.00%	3.31	0.67
Country	44.44%	44.44%	11.11%	0.00%	3.33	0.67
Village/Town	18.52%	48.15%	31.48%	1.85%	2.83	0.75

Fire

	Very likely	Likely	Unlikely	Very unlikely	Mean	SD
Europe	64.81%	35.19%	0.00%	0.00%	3.61	0.49
Country	83.33%	14.81%	1.85%	0.00%	3.81	0.44
Village/Town	35.19%	25.93%	35.19%	3.70%	2.93	0.93

Earthquake

	Very likely	Likely	Unlikely	Very unlikely	Mean	SD
Europe	5.56%	31.48%	51.85%	11.11%	2.30	0.74
Country	5.56%	20.37%	46.30%	27.78%	2.04	0.85
Village/Town	0.00%	0.00%	38.89%	59.26%	1.41	0.50

Industrial accident

	Very likely	Likely	Unlikely	Very unlikely	Mean	SD
Europe	11.11%	29.63%	46.30%	12.96%	2.39	0.86
Country	5.56%	22.22%	46.30%	25.93%	2.07	0.84
Village/Town	0.00%	12.96%	46.30%	40.74%	1.72	0.68

Terrorist attack

	Very likely	Likely	Unlikely	Very unlikely	Mean	SD
Europe	46.30	40.74	12.96	0.00	3.33	0.70
Country	29.63	46.30	16.67	7.41	2.98	0.88
Village/Town	3.70	20.37	40.74	35.19	1.93	0.84

Table 14 Perception of disasters likelihood across geographical areas. Mean and Standard Deviation (SD) from 1 to 4 scores: where 1 is “Very unlikely” and 4 is “Very likely”.

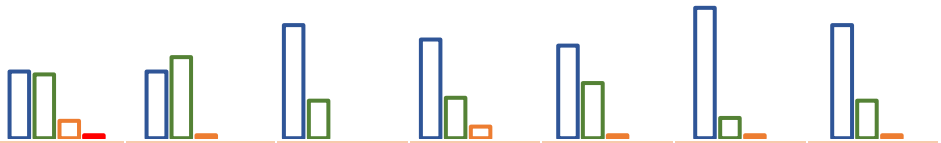
QA2 (Opinion on FRs capabilities by geographical area): The aim of this question was to verify if the perception of FRs capabilities (well training and enough resources to deal with disasters) changes across different geographical areas. Descriptive statistics are shown in Table 15. Significant differences were found (Mann-Whitney U test) between Village/Town vs Europe (U=921.5, p= 0.003) and Country Vs Europe (U=1089.5, p= 0.027). This was not the case for Village/Town vs Country (U=1261.5, p= 0.38). Overall, these results suggest that respondents had a favourable opinion of first responding capabilities in Europe.

	Totally agree	Tend to agree	Tend to disagree	Totally disagree	Mean	SD
Europe	20.37%	59.26%	9.26%	0.00%	3.14	0.57
Country	11.11%	66.67%	20.37%	1.85%	2.87	0.62
Village/Town	7.41%	59.26%	27.78%	0.00%	2.78	0.58

Table 15 Perception of First Responders capabilities across geographical areas. Mean and Standard Deviation (SD) from 1 to 4 scores: where 1 is "Totally disagree" and 4 is "Totally agree".

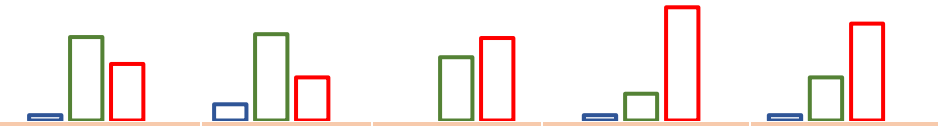
QA3 (Opinion on improvements for FRs): The aim of this question was to capture respondents' opinions about potential enhancements for disasters response. Although respondents were not experts, they were assumed to provide valuable information to the proposed items, especially those items directly related to the ASSISTANCE outcomes (i.e. the use of technologies and the importance of good training for FRs). Table 16 displays the results. As expected, the response pattern was similar in all potential improvements with a majority of "totally agree" and "tend to agree" responses. However, significant differences were found between samples (H(6)=33.64, p<0.001, Kruskal-Wallis test). Improvements "Multi-agency collaboration", "Good training" and "Use of technologies" were rated as the most important by participants (72.2%, 83.3% and 72.2% of "totally agree" respectively). Interestingly, these are the core improvements addressed by the ASSISTANCE project.

QA4 (Self-preparedness): The aim of this question was to obtain information of the perceived level of self-preparedness by citizens to handle different disasters. Table 17 shows the descriptive statistics of the responses. For simplicity, responses were transformed to Good ("I Know what to do"), Fairly ("I fairly know what to do") and Poor ("I do not know what to do"). There were significative differences (Kruskal-Wallis H(4)=33.32, p<0.001) showing that the level of preparedness differs across potential disasters. The lower levels of preparedness were found in Earthquake (56.6%), Industrial accident (77.78%) and terrorist attack (66.67%). Interestingly, these are the selected disaster scenarios for the three pilot demonstrations of the ASSISTANCE project.



	More personnel	Leadership and Decision-making	Multi-agency coordination	Updated Emergency plans	Citizens' collaboration	Good training	Use of Technolog
Totally agree	42.6%	42.6%	72.2%	63.0%	59.3%	83.3%	72.2%
Tend to agree	40.7%	51.9%	24.1%	25.9%	35.2%	13.0%	24.1%
Tend to disagree	11.1%	1.9%	0.0%	7.4%	1.9%	1.9%	1.9%
Totally disagree	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Mean	3.29	3.42	3.75	3.58	3.60	3.83	3.72
SD	0.75	0.54	0.44	0.64	0.53	0.43	0.50

Table 16 Opinion on improvements for FRs. Mean and Standard Deviation (SD) from 1 to 4 scores: or where 1 is "Totally disagree" and 4 is "Totally agree".



	Extreme weather	Fire	Earthquake	Industrial accident	Terrorist attack
Good	3.70%	11.11%	0.00%	3.70%	3.70%
Fair	57.41%	59.26%	43.40%	18.52%	29.63%
Poor	38.89%	29.63%	56.60%	77.78%	66.67%
Mean	1.65	1.81	1.44	1.26	1.37
SD	0.55	0.62	0.50	0.52	0.56

Table 17 Subjective preparedness against disasters. Mean and Standard Deviation (SD) from 1 to 3 scores: or where 1 is "Poor" and 3 is "Good".

QA5 (Risk perception by disaster in close vicinity): This question aimed at increasing our understanding of citizens risk perception with respect to the occurrence of different disasters in their close vicinity. By looking at the results in Table 18 it is possible to see that around half of respondents perceived moderate risk for Extreme weather and Fire and around half of respondents perceived critical and high risk for Earthquake, Industrial Accident and Terrorist attack. Perhaps surprisingly, we obtain null findings here i.e. there was no statistically significant difference in risk perception across different disasters (Kruskal-Wallis $H(4)=6.44$, $p= 0.168$). Therefore, based on the presented results it is possible to argue that the type of disaster may not affect the level of risk perceived. Hence the question remains open and further research is needed to confirm/reject this.

	Extreme weather	Fire	Earthquake	Industrial accident	Terrorist attack
Critical risk	0.00%	7.41%	11.11%	25.93%	16.67%
High risk	24.07%	22.22%	35.19%	25.93%	27.78%
Moderate risk	59.26%	46.30%	31.48%	22.22%	29.63%
Low risk	16.67%	24.07%	22.22%	25.93%	25.93%
Mean	2.07	2.13	2.35	2.52	2.35
SD	0.64	0.87	0.95	1.14	1.05

Table 18 Risk perception in relation to different disasters. Mean and Standard Deviation (SD) from 1 to 4 scores: or where 1 is "Low risk" and 4 is "Critical risk".

Internal reliability: The extent to which participants respond to the items in a similar manner reflects internal consistency of the questionnaire. The Internal reliability measures the degree of correlation between different items of the same construct/section within the questionnaire. Cronbach's alpha -a widely used reliability coefficient- was calculated for the questionnaire overall and for each section. The entire questionnaire had an overall alpha value of 0.88, larger than the threshold of 0.7 generally considered in social sciences. Sections (QA1, QA3-5) had larger Cronbach's alpha values than the threshold but Section 2 (QA2) had an individual alpha lower than the threshold (Table 19). This lower internal reliability for Section 2 with heterogeneous responses may be due to question was too general and may not convey respondents' perceptions. Another explanation may be that responders did not have the information needed to achieve the required accuracy in their opinions. This section will be reviewed to develop the final large-scale survey.

Section	N items	Cronbach's alpha
QA1.- Disaster awareness by geographical area	15	**0.87**
QA2.- Opinion on FRs capabilities by geographical area	3	0.40
QA3.- Opinion on improvements for FRs	7	**0.88**
QA4.- Self-preparedness	5	**0.89**
QA5.- Risk perception by disaster in close vicinity	5	**0.74**
Entire questionnaire	35	**0.88**

Table 19 Internal reliability for the pilot questionnaire.

Conclusion: We developed and piloted a questionnaire that measures different aspects about citizens perception and attitudes toward disasters: awareness, self-preparedness, risk perception and opinions regarding first responding capabilities. In total 54 participants were invited to fill in the questionnaire. Responses were explored and new research questions were highlighted. This pilot questionnaire and the preliminary results provide baseline data against which future research will be assessed.

4. Conclusions

Societal aspects (i.e. perception of security and possible effects of technological solutions on society) need to be tackled in a comprehensive manner in the ASSISTANCE project. This entails several aspects likely to be analysed in different ways. In addition, societal effects of the project can be complex and can happen at various levels. To address this, deliverable D8.3- *Progress on Human Factor in ASSISTANCE impact assessment* has proposed a research strategy focuses on three perspectives:

1) The project itself i.e. intended and unintended potential and real outcomes.
2) The perception of FRs when assessing technologies and novel solutions.
3) Citizens perceptions and attitudes towards safety & security in relation to disasters.

1) A first analysis was conducted to identify the societal impact categories of the project. Next actions involve the definition of the indicators associated to these categories that will be used in further survey processes to measure and determine the potential benefits and unintended negative impacts of the project.

2) The GELS toolkit defined for the pilot activities is under construction. Early design for assessing societal aspects within this toolkit have been presented. Further actions involve consolidating the final version of the tools involved (Self-assessment tool, Monitoring tool and Analysis tool).

3) The pilot questionnaire on citizens attitudes towards disasters has revealed new research questions and insights to design and conduct the large-scale survey (online questionnaire > 250 participants).

To sum up, the approaches and results presented in this progress report are the reference point to design and conduct further actions towards the development of the Best Practices Handbook (D8.4) and the Human Factor impact assessment (D8.7).

5. Annexes

5.1. Annex A

Prioritizing Societal Impacts in ASSISTANCE

This anonymous questionnaire is part of the Delphi consensus process designed to identify and prioritize the main societal impacts of the ASSISTANCE Project.

Once we have received responses from all participants, we will collate and summarize the findings and formulate a brief second questionnaire.

The overall results generated from this exercise may be published in journals, proceedings or any other mode of scientific exchange and dissemination that will be seen as appropriate by the researchers. However, your participation in the survey and your individual responses will be strictly confidential to the research team and will not be divulged to any outside party, including other survey participants.

If you agree to participate in the study, please click on "continue".

If you have any questions, please contact Arturo Cuesta cuestaar@unican.es

Thank you for your participation!
*Required

Participant information

1. *

Mark only one oval per row.

	Female	Male	Prefer not to say
Gender	◯	◯	◯

2. *

Mark only one oval per row.

	18 to 24	25 to 39	40 to 54	55+
Age	◯	◯	◯	◯

3. *

Mark only one oval per row.

	First Responder	Other (technology provider, researcher)
Professional profile	◯	◯

Health and Safety

4. To what extent do you think the overall ASSISTANCE project would change the following aspects related to HEALTH-SAFETY? *

Mark only one oval per row.

	Definitely not	Probably not	Possibly	Probably	Very probably	Definitely
The amount of injuries of first responders on duty	◯	◯	◯	◯	◯	◯
The physical and mental demands for first responders on duty	◯	◯	◯	◯	◯	◯
The provision of healthcare to victims	◯	◯	◯	◯	◯	◯
The comfort and mobility of first responders	◯	◯	◯	◯	◯	◯
The assistance of injured first responders on duty	◯	◯	◯	◯	◯	◯
The provision of physical protection to first responders	◯	◯	◯	◯	◯	◯
The citizens' preparedness and response	◯	◯	◯	◯	◯	◯

First Responders Organization

5. To what extent do you think the overall ASSISTANCE project would change the following aspects related to First Responders ORGANIZATION? *

Mark only one oval per row.

	Definitely not	Probably not	Possibly	Probably	Very probably	Definitely
The way first responders make critical decisions	◯	◯	◯	◯	◯	◯
The way first responders manage disasters	◯	◯	◯	◯	◯	◯
The emergency plans and procedures	◯	◯	◯	◯	◯	◯
The strategies adopted by first responders	◯	◯	◯	◯	◯	◯
The human resources management in first responders	◯	◯	◯	◯	◯	◯
The differentiation and specialization of first responding tasks	◯	◯	◯	◯	◯	◯
The recruitment procedures and selection criteria for first responder applicants	◯	◯	◯	◯	◯	◯

Training of First Responders

6. To what extent do you think the overall ASSISTANCE project would change the following aspects related to TRAINING for First Responders? *

Mark only one oval per row.

	Definitely not	Probably not	Possibly	Probably	Very probably	Definitely
The topics comprising training curricula for first responders						
The qualification and experience required for first response job/activities						
The chances for employees to raise a more important position or rank						
The first responder's capacity of being suitable to fulfil a role or task						
The adoption and use of new methods of theory and teaching for first responders						
The adoption and use of new technologies for training						
The chances for first responders to develop specific skills and expertise to perform certain activities						

Society

7. To what extent do you think the overall ASSISTANCE project would change the following aspects related to SOCIETY? *

Mark only one oval per row.

	Definitely not	Probably not	Possibly	Probably	Very probably	Definitely
The working-life balance of first responders						
The commitment to gender equality-equity						
The way different first responders interact with each other						
The way first responders interact with victims						
The number of volunteers as first responders						
The way vulnerable people are assisted during disasters						
The involvement of communities/social organizations in disaster response						

Culture

8. To what extent do you think the overall ASSISTANCE project would change the following CULTURAL aspects? *

Mark only one oval per row.

	Definitely not	Probably not	Possibly	Probably	Very probably	Definitely
The shared beliefs, traditions and customs of first responders						
The opinion that people in general have about first responders						
The subjective judgement about the characteristics and severity of risks						
The way first responders take precautions and self-protective measures						
The strategic/tactical knowledge of first responders						
The citizens awareness of potential disasters						
The acceptance of new technologies for disaster response						

Political

9. To what extent do you think the overall ASSISTANCE project would change the following POLITICAL aspects? *

Mark only one oval per row.

	Definitely not	Probably not	Possibly	Probably	Very probably	Definitely
The policical and executive decisions affecting rerearch and first responders						
The current methodologies and best practices						
The way of keeping personal data secret						
The compliance with fundamental rights and freedoms						
The provision of transparent information						
The way people are treated with respect according to moral principles						
The time first responders stop working due to age or ill health						

Research and Innovation

10. To what extent do you think the overall ASSISTANCE project would change the following aspects related to RESEARCH AND INNOVATION? *

Mark only one oval per row.

	Definitely not	Probably not	Possibly	Probably	Very probably	Definitely
The combination of several disciplines in research and innovation						
The contribution to academy and education						
The development of new ideas for further research and innovation						
The spreading of information to academy and society.						
The skills and overall capacities of the project partners						
Professional development of staff members in research team						
The integration of gender perspective into research and innovation						

Economy

11. To what extent do you think the overall ASSISTANCE project would change the following ECONOMIC aspects? *

Mark only one oval per row.

	Definitely not	Probably not	Possibly	Probably	Very probably	Definitely
The ways of getting money for project partners						
Effort and time of the research team to make profit or get an advantage						
The project partners capacity to make profits						
The project partners productivity						
The provision of new employment opportunities						
The amount of money paid to employees						
The cost of using new technologies in disasters response						

5.2. Annex B

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

Citizens Survey on SAFETY & SECURITY Perception

About the project

The following anonymous 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 disasters.
- Perception of First Responders capabilities.

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:

Researcher contact data	**Project coordinator contact data**
Arturo Cuesta Jiménez Universidad de Cantabria arturo.cuesta@unican.es Ph: +34 942201826	Federico Carvajal Rodrigo Universidad Politécnica de Valencia fecarrod@upvnet.upv.es Ph: +34 963879194

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QA1. DISASTER AWARENESS BY GEOGRAPHICAL AREA

QA1.1 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				

QA1.2 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				

QA1.3 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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QA2. OPINION ON FRS CAPABILITIES BY GEOGRAPHICAL AREA

QA2.1 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					

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QA3. OPINION ON IMPROVEMENTS OF FIRST RESPONDERS

QA3.1 To what extent do you agree or disagree with the following solutions to improve first responder's efficiency in case of a 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_____ _____)					

QA4.SELF-PREPAREDNESS

QA4.1 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			

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QA5. RISK PERCEPTION BY DISASTER IN CLOSE VICINITY

QA5.1 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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QB GENERAL INFORMATION

QB1 Country: _____ Village/Town/City: _____

QB2 Gender

Male	Female	Other

QB3 Age

18 to 24	25 to 39	40 to 54	55+

QB4 Level of Education (ONE ANSWER)

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

QB5 Which of the following best describes your current socio-professional category? (ONE ANSWER)

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