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Executive Summary

This deliverable reports the Multi-cultural Communication Guidelines, which aim at improving security operators and first responders’ situational awareness and intercultural competences in all phases of an emergency.

The IMPACT emergency communication guidelines aim is to help emergency communication teams building their context-specific tool for an effective multicultural crowd management.

Two main strands of activities were conducted to elicit the multi-cultural communication guidelines:

1. The activities carried out on WP1 to define the IMPACT theoretical framework such as: (1) the review of the literature on cross-cultural and crowd behaviours, (2) the data collection activities through observations, passenger surveys, experts’ interviews and focus groups and (3) the definition of relevant scenarios;
2. The preliminary activities carried out on WP4 such as: (1) the identification of the high-level preliminary communication requirements and a set of innovative communication solutions; (2) and the structured simulations run to assess different innovative communication solutions identified, using the Agent Based Models (ABM) developed in WP2.

A list of 39 communication guidelines have been elicited. Guidelines are context-based, in the sense that they are clustered by three categories: “before emergency”, “during emergency” and “after emergency”. For each context, a set of guidelines is proposed.

Far from being exhaustive, together with their generation methodology, the presented guidelines stand as a starting point for further actions: they do not provide just a list of specific messages or actions, but trace a process for building collaborative partnerships and resilient organizational environment in terms of multi-cultural communication competences.
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1 Introduction

IMPACT is an EU funded project whose objective is to explore, analyse and assess the link between cultural features and disaster management in different transport hubs. In this perspective, culture could be seen as a key factor which influences collective behaviours during crisis and emergency management. In order to ensure that transport hubs and operators are prepared to respond and recover from emergencies, one of the main outputs of the project consists of the design and development of a cultural-based security training package.

The main objective of WP4 is the analysis and definition of a proper cultural-based Communication framework for emergency prevention and management in Transport Hubs.

In order to define and develop the multi-cultural communication framework, WP4 is structured around three main tasks:

1. Task 4.1 – Cross-cultural emergency communication framework requirements definition (for further details see D4.1);
2. Task 4.2 – Development of a prototype intelligent software agent for communication in case of emergency (for further details see D4.2);
3. Task 4.3 – Cultural-based emergency communication guidelines.

The present deliverable addresses the third and final task of WP4 “Cultural-based Emergency Communication Guidelines”.

1.1 Purpose of the document

D4.3 summarises the findings from WP1 and previous WP4 Tasks (i.e., T.4.1 and T.4.2) into Communication Guidelines, aiming at improving security operators and first responders’ situational awareness and intercultural competences in all phases of an emergency.

The guidelines will also provide insights on how to train and prepare Transport Hubs operators and staff, properly communicate with multi-cultural crowds to optimise passengers’ reaction time, taking into account the diversity of cultures, background knowledge, experiences and attitudes. Aim of the proposed communication guidelines is to provide information to end users on how to exploit positive crowd behaviours and characteristics whilst lowering panic phenomena and socio-cultural hazardous behaviours that may arise before, during and after emergencies.

The report contains general and high-level guidelines to develop an effective and integrated communication for emergency prevention, management and mitigation that can be applicable to all different transport modes.
Practical methods and templates for proper communication during crises are provided.

### 1.2 Deliverable structure

The present deliverable is structured around 4 main sections as follows:

- **Section 1** presents a general introduction to the project, introduces the main objectives of WP4 and the main purpose of the present document;

- **Section 2** extends the work from WP1 and WP2. It presents an overview of the basics elements of communication as well as a summary of key multicultural aspects and relevant crowd behaviours in transport Hub emergencies;

- **Section 3** introduces the methodology to generate the communication guidelines and reports the IMPACT multi-cultural communication guidelines for the following phases: “before emergency”, “during emergency” and “post emergency”;

- **Section 4** draws some conclusions and opens issues, proposing further research directions.
2 Multicultural communication guidelines generation process

This section provides the theoretical basis for the generation process of the multicultural communication guidelines for emergencies in transport hubs. It includes:

- an overview of the previous project work relevant for communication guidelines generation (section 2.1);
- an exhaustive description of the basic elements of communication, which extends the previous work of T4.1 (section 2.2);
- the identification of the key multicultural aspects (section 2.3) and relevant crowd behaviours in transport hubs emergencies (section 2.4);
- the summary of emergency communication standards, regulations and best practices (section 2.5).

2.1 Summary of previous related work

In this Section, we will summarise the previous work carried out in WP1 and WP4 contributing to define the IMPACT Multi-Cultural Communication Guidelines.
As shown in Figure 1, the first main IMPACT outcomes that will inform the Multi-cultural Communication Guidelines is the IMPACT Theoretical Framework summarised in D1.3 [1] and based on the Literature Review, the data collection through Observations, Passenger Surveys, Experts’ Interviews and Focus Groups and the definition of relevant scenarios as reported in D1.1 [2] and D1.2 [3]. The IMPACT Theoretical Framework comprises all relevant cross-cultural and psycho-social crowd behaviours that may impact emergency prevention and management in the Transport domain.

A second strand of activities contributing to Multi-Cultural Communication Guidelines definition is the work carried out in WP3 about cultural risk mitigation measures [4], and in previous tasks of WP4.

More specifically, in D4.1 [5] emergency communication was extensively reviewed, analysed and assessed through: (1) interviews and focus groups with IMPACT External Stakeholders Group (ESG) members; (2) collection of domain information and procedures from IMPACT transport domain partners and ESG members; (3) review of standards and regulatory constraints; (4) existing R&D projects and best practices from operators in the transport domain/big events organisation; (5) any extra relevant literature on the web; (6) IMPACT team members attendance in specific courses on crowd management and communication; (7) analysis of all requested and gathered information in order to understand to which extent socio-cultural aspects have been taken into account (8) a ‘gap analysis’ process to compare existing communication standards and practices with findings of IMPACT WP1.

Figure 1: IMPACT previous work to define Emergency Multi-Cultural Communication Guidelines.
All this information was used to derive the high-level preliminary requirements for the IMPACT multi-cultural communication framework. A list of 25 requirements have been elicited and a preliminary set of innovative Communication Solutions fulfilling the requirements have been selected.

They have been considered as a first input for the definition of the IMPACT communication Guidelines. D4.1 requirements have been iteratively reviewed and assessed by Computer-based simulation of some innovative Communication Solutions in specific scenarios and then through expert judgement of IMPACT end-users and ESG members.

In the IMPACT D4.2 [6], the Agent-Based Models (ABM) developed in WP2 were extended and customised to assess and compare different innovative Communication Solutions for Multi-cultural crowds among the ones identified in D4.1. In particular, two specific ‘combinations’ of Communication Solutions, for target scenarios, were modelled, analysed and discussed:

1. **emergency lighting**, staff members at exits, and clear public announcements for the evacuation model,
2. **a chatbot** (a software agent that can communicate with passengers through a smartphone) and multicultural staff for the stranded passengers model.

An important finding is that for the evacuation scenario the emergency lighting and staff at exits are beneficial only for very high crowd densities and for crowd groups that are not familiar with the environment. The T4.2 simulations with public announcements in English showed an unexpected emergent phenomenon by actually decreasing evacuation time for a multicultural crowd (diversity in English Proficiency) and increasing the evacuation time while decreasing the total number of falls for mainly English-speaking crowds. This finding requires further work to be better verified and interpreted.

For the stranded passengers’ scenario, the effect of the chatbot support was beneficial to the group emotional level and number of misbehaviours. The multi-cultural staff support unexpectedly did not decrease the misbehaviours, however, because the support seemed to be too late to reduce the passengers’ frustration levels.

These structured simulations, that take into account also multi-cultural aspects in crowd composition, as opposite to previous work such as [7][8], can be beneficial to give advice to Transport Hub operators and First Responders on emergency situation management of crowds, contributing to define the Communication Guidelines in Section 3 by providing validated insights in practical situations.

### 2.2 Basic elements of communication

Before introducing the basic elements of the communication, it is important to define what communication is: communication can be defined as a process in which a sender transmits a message,
in a way that maximises the probability of understanding for the receiver. Three assumptions are implicit in this definition. First of all, any communication process is systemic, because the people involved are part of a system of mutual influence. Secondly, the communication is pragmatic, because what matters is the effect of the communication, i.e. what the receiver understands and the impact on his/her behaviour; thirdly, there is a relevant strategic aspect, because the sender who has clear objectives engages in communication strategies able to achieve them.

In line with these definition, it is evident that communication skills are not innate. Practice and learning by experience are key elements to develop them at individual level. On the other hand, at an organizational level, it is important to highlight that predefined communication strategies and plans have to be developed before any emergency, in order to know in advance how to properly cope with it.

Awareness on the basic communication elements is a key enabler for identifying the most relevant influence factors of interactions and represents the preliminary foundation for generating the communication guidelines. First of all, because it enables the identification of the elements to be taken into consideration when communicating. Secondly, as it highlights possible communication approaches and their expected impact on public. Basic elements of communication are depicted in Figure 2.

As shown, these elements are:

- Context;
- Sender and receiver;
- Message;
- Language/code;
- Channels;
- Filters.
In the following sections, the description of each element is instantiated on the context of emergencies in transport hubs.

### 2.2.1 Context

Any communication exchange takes place in an environment that provides the reference context for a preliminary attribution of the meaning to the messages. For the scope of this document and in line with the stakeholders input, we can have three different reference contexts:

- Before emergency
- During emergency
- After emergency

What follows highlights the features of communication in each context.

**Before Emergency**

Communication in emergency prevention is quite similar to routine communication, as follows:

- **Barriers**: it is assumed that people involved in routine transport operations do not have any difficulty to hear and catch messages. However, the challenge is to create messages able to capture the public attention, namely to overcome the filters of selective attention that everybody automatically activates to discriminate the most relevant information from the continuous overloading flow of data and stimuli.

- **Timeliness**: it is assumed that time resources are adequate when dealing with communication for prevention purposes. This can be exploited by repeating the same message over time (through disseminating pre-defined messages on brochures, displays and so on) or reinforce the impact of messages through face to face communication. The challenge here is not only to disseminate correct information, but also to prevent any inconsistency among the different media.

- **Required response**: this communication aims at generating awareness on a possible risk/problem impacting on the personal safety, and providing knowledge on how to mitigate it, more than a visible action or response.

**During emergency**:

Communication during an emergency differs from routine communication in several ways [9]:

- **Barriers**: it is more difficult for people to hear or catch messages during an emergency: stress, panic, change of routine, tiredness, or any other individual, cultural or environmental barriers can be hurdles to overcome when communicating during emergencies.
• **Timeliness**: if official communications are not available at the right time, rumors and speculations quickly fill the information vacuum. Then, not only correct information must be disseminated, but there is also a relevant need to counter any misinformation being circulated and to use media in a timely fashion, learn local media news cycles and deadlines.

• **Required Response**: emergency warnings’ purpose is to elicit a specific response from the public, rather than merely raise awareness or provide knowledge.

**After emergency:**
Communication after an emergency also differs from routine communication in several ways, as follows:

• **Barriers**: post-traumatic stress symptoms are a normal reaction to upsetting experiences. What makes these events so traumatic is that they undermine the belief that our daily lives are safe and secure. Communication in this context may be obstructed by anxiety, fear, helplessness and any other psychological reaction impacting on attention, in addition to foreseeable uproar.

• **Timeliness**: official communications on what happened and how emergency was managed have to be delivered in a timely fashion, before any rumor and speculation fill the information vacuum. This is relevant to properly finalize evacuation, to alleviate families or friends, to maintain the organization reputation. Plus, time resources must be allocated to manage the post traumatic reactions of people. Not only adequate listening must be provided after the emergency, but it is also recommended to identify the need for psychological support, to be provided over time by a network of professionals.

• **Required Response**: post-emergency messages differ from other kinds of messages because their purpose is to help people to re-establish their normal psychological functioning, in terms of attention, space/time orientation, ability to speak and seek for help, etc.

2.2.2 Senders and receivers
When people communicate usually one is a sender of a message and the other is a receiver. Concerning emergencies in transport hubs, the following **senders** can be identified:

• **First-responders**: internal and external safety and rescue teams.

• **Front-line staff**: Desk and front offices employees, safety and security coordinators and screeners.

• **Management**: Hub management, Authorities, Safety and Security Management, Communication management.

Table 1 shows the matching between contexts as identified in the previous section and the senders involved in communication exchanges.
The receivers are intended here as all the people physically present in and near a transport hub, including people already onboard the vehicles, directly or indirectly affected by an emergency. These include both travellers and non-travellers, especially the most vulnerable groups and individuals who are likely to be poorly informed, due to cultural issues. The relationship between the target people and the transport hub can assume different levels of engagement thus enabling to identify different categories of public, as follows:

- **Frequent passengers:** they are customers of the transport service as such. They are featured by knowledge and regular attendance of the transport hubs and services. They can be considered as a “low-cost-engagement” category towards the travel experience, because their involvement in transport operations does not require any infringement of cultural, social or perceptive barriers. One possible obstacle, assuming a sufficient comprehension of language and/or signs, concerns the level of compliance with the instructions provided by authorities in case of emergencies. For example, lack of compliance can be activated automatically or deliberately: automatically, when the habitual behavioural patterns are activated without conscious control, even before the instructions are perceived; deliberately, when the habitual passenger assumes to have a sufficient knowledge on how to behave in a given situation and voluntarily makes and implements decisions on his/her own, regardless of instructions. Indeed, frequent passengers, if adequately involved and motivated, may reveal themselves as support to the staff during an emergency, and help for the salvation of other people.

- **Occasional passengers:** they are customers of the transport service as such. However, they are featured by an occasional and sporadic relationship with transport hubs. Their attendance, in fact, is determined by “unusual” circumstances, such as particular events (for example sickness or death of a living-abroad relative). They can be considered as a “medium-cost-engagement” category towards the travel experience, because their involvement in transport operations may be obstructed by cultural barriers (for example, differences in the language). Such barriers may impact on the possibility to look for and find information when
needed. On the other hand, they are often likely to comply with the instructions given by the authorities during emergencies.

- **One-time travellers**: they represent a category of very unusual passengers, who are not familiar with the transport hubs and transport in general. They can be considered as a “high-cost-engagement” category of passengers, because cultural barriers (for example, language) may severely impact on the possibility to look for information and comply with it.

- **Visitors**: they are the customers of the transport hubs facilities (shops, public offices etc). They are just potential passengers, in the sense that they may be customers of transport services if needed. Nevertheless, they occasionally or constantly (for example, for job purposes) attend transport facilities, so they also constitute heterogeneous groups that may be involved in case of emergency.

- **Staff of other organisations**: they are employees of other organisation providing different services in the Transport Hubs, e.g., cleaners, baggage handlers, shops and restaurants, banks, etc.

### 2.2.3 Message

Any message has to be interpreted in two ways:

- the meaning given to the message by the sender;
- the meaning given to the message by the receiver.

**Only when these two meanings match, we do have successful communication.**

During emergencies, information is of paramount importance to people. Not only can accurate information make the difference between life and death, but it can also provide reassurance that response and recovery are truly underway. As a consequence, the choice of the adequate content of the message has to take into account the specific information needs of people involved in an emergency situation. Any information need on the receivers’ side is related to a specific objective of the communication, which the sender has to focus on.

The key high-level objective of emergency communication, both during prevention as during emergencies, is to **reach all individuals or groups involved** (target receivers) after identification.

The main communication objectives **before emergencies** are to:

- **educate and inform**, with the aim to guide or change behavior and attitudes. Indeed an educated public is more likely to be ready for emergencies.
- **collect safety-relevant information on passengers**, as for example special needs and spoken languages.
According to [9], **during emergency** key communication objectives are:

- save lives and reduce injury: knowing the proper protective actions to take enables people to reduce their risk.
- facilitate the tactical response by calming fears and managing expectations. People who know what to expect are more likely to follow instructions and allow responders to do their jobs.
- seek cooperation: whether the need is for volunteers to help, to cooperate or to rapidly evacuate, public information is an instrument to make it happen.
- seek for required response: emergency warnings differ from other kinds of messages because their purpose is to elicit a specific response from the public, rather than merely raise awareness or provide knowledge.
- instill confidence: providing timely, accurate, and understandable information builds confidence in emergency management’s competence.
- provide information to help families and groups reunite: information about shelter message boards, hotlines, survivor registries, and other linkages can help reunite people and enable them to move forward with their recovery.
- protect property and the environment: understanding how to indirectly mitigate risk to property and the environment may lessen the damage inflicted by disasters.

**After an emergency** has occurred, key objectives of the communication are to:

- instill confidence
- prevent anger and aggression
- manage the atmosphere, keep everybody in a good-mood as long as possible and maintain a cooperative attitude
- help people seek for help and provide psychological support
- help people involved reunite with familiars and group members

### 2.2.4 Channels

The communication means are the media through which messages are transmitted to their intended audience. Attention and care must be given to what channels are used to communicate, because using an inappropriate channel for an interaction can lead to negative consequences. Complex messages require richer channels of communication that facilitate interaction to ensure clarity. Possible communication channels are:

- Face to face communication
- Signage
- Printed materials
- Public announcements
• Sensors and Internet of Things
• Private Mobile Devices and Apps
• Public space design

A detailed description of each channel is provided in the Appendix (section 6).

2.2.5 Code

Any message can be delivered through several codes, the key difference being between verbal and non-verbal communication. Examples of the former are: words in face to face communication, messages through aural public announcements, textual information displayed on electronic panels. Examples of non-verbal communication are: symbols, images, lights and so on.

One of the main challenges concerning a multicultural public is to provide clear messages by using codes that are accessible to as many people as possible. Two aspects are of particular relevance:

• the readability of texts and symbols, intended as their physical presentation, should they be aural or visual (font, position, pronunciation and so on);
• the accessibility of texts and symbols, intended as their potential of being understandable (language, words, sentences, information organization).

The selection of the most appropriate code through which to communicate always depends on an accurate planning of the objective of the message and the target of the communication.

2.2.6 Filters

Filters are meant as all the factors that can interfere in the transmission of any communication, impacting or preventing the comprehension of the message by the receiver. Filters can be physical or psychological.

Examples of the formers are noise, smoke and any other obstacle in the physical environment that can hinder or obstruct communication. For example, if two people are trying to talk to each other in an emergency, there may be a lot of physical noise which prevents them from hearing each other. The same applies in case of an evacuation emergency scenario, where the possibility to catch written information displayed on electronic panels may be obstructed by other people running around, smoke and so on. Psychological filters regard our personal experience and view of the world. When we communicate, they have a strong influence on the messages that we form in our minds and communicate to others.

Cultural aspects are prominent in this perspective. They will be extensively described in section 2.3.

It is important to highlight that filters are not only a “static” property of an individual. Indeed, filters can be “activated” by the receiver of a message when the sender provides redundant messages or gives
too much information (overload). For example, if the receiver already has the information which the sender is trying to convey, he/she is unlikely to be interested in it. Every message must communicate some new information. However, if the information is totally new, the receiver may not be able to understand the message. The receiver must have some background information which helps him/her to decode the message. Messages should therefore balance old and new information. On the other hand, if too much new information is fed to the receiver, he/she will be unable to take it in. It is necessary for the sender, therefore, not only to mix new information with old, but also to break the information down into small chunks. These aspects are relevant when dealing with prevention communication. On the other side, information overload also describes a situation where so many different messages are received that the receiver is unable to cope with the information, and this is particularly relevant during emergencies. Other filters are associated to the receivers of the messages, when for example they are engaged in the use of pc or mobile phone. In any case, after some information has been communicated, the sender should seek feedback from the receiver, to make sure that the information has been taken in, before providing some more information.

2.3 Multi-cultural aspects of relevance

The aforementioned communication elements are strongly impacted by cultural aspects. For instance, the same message may be interpreted in different ways depending on the cultural identity of the receiver(s), and one message can be better understood if delivered through a channel that is deemed suitable to a given cultural background.

In the IMPACT deliverables D1.1, D1.3 and D4.1, the most prominent cultural issues in crowd behaviour and management that are relevant for emergency communication were identified, as follows:

- Social identity
- Language and Education Level
- Signs comprehension
- Individual differences
- Spatial navigation

Both during emergencies and in the preventive phase, these cultural factors are important to take notice of. In the preventive phase, these cultural factors should be taken into account when preparing for multiple risk scenarios. Also interaction with communication systems are influenced by both socio-cultural backgrounds and individual factors:

1- interaction with media (broadcast media, social media, online news, embedded or wearable sensors);
2- interaction with explicit information (signage, dynamic screens);
3- interaction with implicit information in the physical environment (wayfinding, obstacles, landmarks).

A brief description of each issue, summarising and complementing previous work in D1.1, D1.3 and D4.1, is reported in the following sections.

2.3.1 Social identity

Social identity, sometimes referred to as cultural background, can be divided in [10]:

- General demographic characteristics: age, sex, educational and instruction levels, country of origin;
- Large social group identity: all the long-term fellowships or collective relationship with social groups one might declare to belong to;
- Transitory socio-cultural cluster: scope of travel or visit, familiarity with hubs and travel in general, mobility (depending on physical condition but also on hurry and weight carried), lone-traveler or group or family traveler, and others.

The social identities we all have, are powerful influences on our behaviour and to our in-group perception [5]. Communication management must be aware of spontaneous group affiliations, which may depend on the possible characteristics of its elements: if in-group enlargement is stimulated, competition and out-group perception may be mitigated [11].

2.3.2 Language and Education Level

Risk perception is influenced by the education and literacy level, as people with lower education level are more likely to misinterpret risk warnings and signs [12].

Non-english speaking travellers, together with low education levels and scarce familiarity with transport hubs or traveling in general, may be led to miscomprehension of warnings and signage, or even don’t have the chance to develop any awareness of warnings, if no preventive measure to ensure they understand or receive the communication otherwise has been put in place (e.g. dynamic translation systems, leaflets describing safety procedures in different languages, etc.).

2.3.3 Signs comprehension

Universally understood signs may overcome language barriers, but symbols and abstract contents may not be meaningful to a part of the population. A study conducted on a sample of 100 participants to verify whether persons from different cultures, age, groups and literacy levels interpret standard healthcare symbols correctly demonstrated that:

- participants find it harder to understand healthcare symbols than general purpose signs.
- symbols referring to abstract concepts were the most misinterpreted
• interpretation rates varied across cultural backgrounds and increased with higher education and younger age.
• pictograms with human figures and synthetic description of actions are better understood than abstract concepts

Nevertheless, some symbols were highly misinterpreted by all participants and require further support information to be understood, since the average comprehension rate was 68%. Researchers agree that internationally approved signs interpretation is spreading worldwide, but some signs still need to be examined [13] [14].

2.3.4 Individual differences

In D1.1 a review of individual differences, partially related to belonging cultures and partially to personal attitudes, reports that perception of risk, transparency, rule of law, personal freedom, power distance, time perception, are influencing reaction to warnings, level of compliance with authorities, situational awareness, walking speed, level of attention to communications and warnings, expectations.

Compliance largely depend on larger social identity, but is also influenced by the current condition of the specific passenger [15].

Situational awareness and walking speed are more directly connected to individual characteristics like age, language, physical condition and familiarity with specific hub or traveling in general.

The level of attention is influenced by several perception barriers, as for example: temporary isolation, being in a separated area or a restroom, on-going phone calls, reading, immersive thinking, hyper-connection with social networks, videogames or online activities. Voluntary and prolonged isolation - earplugs or eye-masks while travelling or waiting, level of intoxication, sleeping.

The way risk warning is framed influences individual reactions: a positively framed message, such as presenting the chance of survival, is more likely to persuade people to take risky options to save their lives. The degree of trust in the source is also very important, since individuals tend to sikard warnings coming from sources they do not trust while highly optimistic or self-confident people tend to underestimate risk:when individuals believe in a lower exposure to risk than the average individuals the may be subjected to the so-called optimism bias, thus more likely to ignore or underestimate the risk communication received.” [16].

2.3.5 Spatial navigation

This section explains how socio-cultural aspects affect spatial navigation behaviours, integrating the work carried out in D1.1 and D1.3.
As demonstrated by environmental psychology researches, environment provides information through its structure [17]. Certain conditions may hamper wayfinding, when spatial configuration promotes disorientation. Spatial orientation is understood as people's ability to identify their location, so they can navigate to any destination in the environment both cognitively and behaviourally [18]. Spatial navigation involves: building cognitive maps, elaborating implicit information through spatial configuration, navigating through landmarks, wayfinding in an unfamiliar environment, following familiar routes [19]. The “Space Syntax” configurational analysis offers a method of accurate quantitative descriptions of the way in which a space is organized. Architecture not only shapes materials, but shapes the spaces where people move and dwell, establishing the conditions for people to meet or to avoid each other, having a strong influence on social relationships [20]. The spatial configuration analysis relies on the topology and on the patterns, not on sizes or shapes: almost a half of the variance value of perception of buildings can be expressed in terms of how closely each space of the building is connected with the others: the spatial integration value. There is an evidence of how space integration values (ICD) have a predictive role on people’s behaviour [21].

Wayfinding experiments stated that misorientation may arise from:

- excess of symmetry and repetition: the large majority of participants felt “completely lost” in a repetitive and symmetric environment, while only a small part did in the regular but asymmetrical setting, being apparently excessive symmetry a drawback to wayfinding;
- excessive length of corridors and repetitive elements;
- changes in direction in the circulation systems;
- more rather than few options at each node (high ICD value – average number of connected decision points for each decision point) [22];
- the presence of several floors with the impossibility to build a global view of layout [23];
- the visibility of the edges of a setting: contradictions between the spatial layout of a setting and its delimitation can make it difficult for people to build a mental representation;
- general layout and spatial discrimination may help navigation, especially continuity of spaces, where it is possible to perceive easily the relationship that exists among them.

Thus, if correctly located, landmarks are of paramount importance [24]:

- they help create distinctiveness and are particularly useful when a symmetrical layout is given;
- they grant the visibility of destination;
- a central atrium or open space, where different floors are made visible, helps building a cognitive map but may also lead to the wrong assumption of identical layout for different floors.
Some other basic discoveries analysing wayfinding tasks during exploration of unknown environments are listed below:

- people tend to look for more accessible, less hidden and better connected places;
- people tend to go toward places where they can have a better visual access to other spaces (expectation for exploration);
- when people get lost, they try to reach more integrated places;
- to achieve a correct mental image of the setting, people need a dynamic perception, being able to visualize himself or herself within it and include an action plan or strategy to get to some part of it;
- a most effective strategy in wayfinding is to move to the required vertical position (floor) and then locate the correct horizontal position [25];
- also during emergencies, people tend to route following mental-scripts, performing essentially an “auto-pilot” on pre-determined paths and speed mode;
- people tend to exit through the main entrance used earlier for access [26] [27].

Communication with crowds during emergencies is a stressful factor for all people involved. Wayfinding design should consider people’s mental scripts, guiding them through space in a rather unconscious mechanism, making it more likely for them to follow familiar paths instead of the one suggested by directions given [28].

Reported findings are directly relevant to the IMPACT project as they point at the environmental filters (Section 2.2.6) that may cause disorientation that could be adequately compensated by alternative communication means.

2.4 Analysis of crowd behaviour in emergencies

Large people gatherings in public spaces represent scenarios in which crowd dynamics can be quite complex due to different factors. The traditional and current trend in social sciences studying crowds is still characterised by a non-dominant behavioural theory on individuals, groups and crowds dynamics [29].

A brief review of crowd behaviours is useful for the generation of emergency communication guidelines since it provides information on how to exploit positive crowd behaviours and characteristics whilst lowering panic phenomena and socio-cultural hazardous behaviours.

Following familiar paths

The most relevant behaviour observed during evacuations is the use of entrance door instead of closest exit, more generically the tendency to follow familiar paths, both for familiar as non-familiar occupants [30] [29].
Information seeking
Uncertainty is a common feature of extreme events: information seeking is the essential strategy to reduce uncertainty and individuals seek information in order to reduce it. Cross crises studies on ethnicity and socioeconomic status demonstrated in previous research that awareness of risk and associated behaviour varies across cultures and demographics: minorities or people with special needs are more vulnerable since they have lower access to information. Although differences on specific items did not emerge in the gender comparisons, women still reported greater levels of information seeking after a warning [32] [33].

Helping others linked to familiarity
The effect of social identities on peoples’ behaviour is crucial: a shared social identity amongst crowd members increases the prevalence of supportive behaviours among people in emergency evacuations [34]. Self-categorisation theory suggests that, when people categorise themselves as being in the same group, they are more likely to support each other [35]. Members of the public are more likely to participate in queuing if they identify with the person organising the situation [36] and a predominant helping attitude is observed being related to familiarity with the environment.

Waiting for others
During evacuation, members belonging to a group, such as families, often seek out and evacuate with the entire group even when evacuation is urgent [37]. When the agents have a high group compliance to their social groups, the presence of other group members change the trajectories of individual agents, resulting in different overall congestion patterns. On average, group behaviors slow down evacuations.

Following a leader
Survivors reported that rapid and decisive orders given by a person perceived to be a leader prompted them to initiate the evacuation [38]. The power of leadership is a tool to enhance the effectiveness of evacuation. Nevertheless “good leadership either minimizes catastrophes or prevents them, whereas weak leadership makes matters worse, compounding the damage” [39]. That role will be assumed by firemen, police officers and so on, recognizing an effective leader through behaviors like standing in a visible position, gesturing, and loudly directing people toward the exit or, alternatively, applying a method called “Follow Me”, characterized by concentrating the leader's action on one or two persons to bring them with the leader, but only in situations with a large number of leaders and a small number of evacuees [40]. Other researches regarding leadership in emergencies have found out the situation in which a leader can emerge [41] [42].

Herding
Herding behaviour occurs whenever people put aside their ability to act as individuals, seeing other people as both a source to understand what is happening and an example of how to behave [43]. In the exit choice context, herding behaviour means that the decision-maker chooses the most congested exit only because that is the most popular choice, rather than an exit with less people which may ensure a lower evacuation time, directly influenced by interacting social factors [44]. This behaviour is also observed in non-panic contexts [45].

**Panic and “phantom” panics**

Panic is usually referred to, by survivors of an accident, as an evaluation of other’s people apparent behavior, rarely recognizing their own. In other cases, though, people who declared themselves “panicking” in a past event, were eventually under high anxiety pressure, but mostly acted with rationality and a problem-solving attitude [46]. In addition, on one hand, panic do not prevent people from helping others, unless the surviving chances decrease to the point when anti-social behavior and competition prevails, being it a comprehensible utmost survival strategy.; on the other hand, panic has been often addressed as a co-factor causing stampedes, especially in large-scale events, where fatalities due to trampling or crushing may occur. An out-dated theory assumed that in escape panic, individuals tend to develop blind actionism. Is sure that when individuals are getting nervous the risk of a “phantom panic” ripple effect increases [47].

Other minor social behavior were observed, though they are often underestimated:

**The unresponsive bystander theory**

When too many people witness a threat or somebody in need for help, observers may assume somebody else already threw an alarm or that the actual risk or damage is unrellevant. This behavior is still true when observers assume that the situation is already under control and pass on without taking the responsibility of a confirmation check or raising a double alarm [48].

**Stop for luggage and using social media or video-recording**

Unsafe behaviours are rapidly increasing and are often reported in the news, though no specific literature or prevention measures have been set-up yet.

**Confirmation cues**

Researches have found that ethnic minorities are less likely to accept a warning message without confirming it with trusted sources, such as family and social networks, with the consequence of a reaction delay [49]. Being low-frequency travelers with scarce familiarity with foreign environments, migrants tend to agglomerate and scarcely integrate with members of the host countries, hence they are more likely to trust someone who they can identify with. This behaviour has been observed by
anthropologist and sociologist, also outside the transport domain, and is related to the need of granting group safety and conservation [50].

For what concerns gender differences, no significant differences has been found except that women are more likely to pay attention and believe in warnings, to warn others and to respond positively to risk.

2.5 Summary of emergency communication standards, regulations and best practices

This Section summarises the existing standards, regulations and best practices with respect to communication across the three transport domains (maritime, railway, aviation) that the IMPACT communication guidelines have to take into account. Generally speaking, the existence of resilient and reliable communication channels for first responders is crucial when dealing with the security and safety of the public. In emergency prevention, to support a fast and efficient reaction and during the management of an emergency, network availability and standard communication protocols among involved actors are essential. The existence of resilient and reliable communication channels for first responders is crucial when dealing with the security and safety of the public.

Main communication requirements of public safety agencies and safety operators during emergencies should be:

(i) reliable and robust voice communication;
(ii) allowing for co-operation and easy communication between all organisations;
(iii) short messaging for alarming and field task delivery, and to secure the validity of the information;
(iv) file transfer from the place of incident to support sites as the command centers or emergency call centers;
(v) offering communication from the field for daily office work.

Thus, interoperability standards and regulations about Emergency Telecommunications (EMTEL) have been developed. An extensive review in various applicative domain, including transport, by ETSI can be found in [51], [52], [53].

All Transport Hubs have safety signs, the European Council Directive 92/58/EEC [54] on minimum requirements for the provision of safety signs in different work environment, including Transport Hubs. The safety signs are also prescribed by international standards, in particular:

- ISO 7010 [55] prescribes safety signs for the purposes of accident prevention, fire protection, health hazard information and emergency evacuation
ISO 23601 [56] establishes design principles for displayed escape plans that contain information relevant to fire safety, escape, evacuation and rescue.

The shape and colour of each safety sign are according to ISO 3864-1 [57] and the design of the graphical symbols is according to ISO 3864-3 [58].

Audible evacuation signals are developed according to ISO 8201 [59].

ISO 9921:2003 [60] specifies the requirements for the performance of speech communication for verbal alert and danger signals, information messages, and speech communication in general.

ISO 7731:2003 [61] specifies the physical principles of design, ergonomic requirements and the corresponding test methods.

Some agencies, such as the Health and Safety Executive Agency in UK, after developing National Regulation on the basis of the ISO standards and of the EC directive, provided also very useful, detailed and practical Guidance on Regulation implementation, as in [62].

In the transport domain different regulations and best practices applies. A brief summary of what extensively described in [5] is reported below.

**Maritime Domain** - in the Maritime domain, there are specific symbols concerning maritime safety to be used on ships, that are adopted or advised in the Safety of Life at Sea (SOLAS) Convention and International Maritime Organization (IMO) resolutions [A.760], [MSC82 ] and [A.952]. The most important symbols can be found in SOLAS, Chapter III, Regulation 20.10. It is important to notice that it is recomended that standard IMO designs shall be used without text where English is not the first language of the passengers and crew.

Furthermore, in the directive of the European parliament and the council of the European Union safety rules and standard can be found in [63]. This document was analysed on the topic of communication and all the rules and standards concerning emergency communication are listed below. They concern both signage (e.g., lighting, posters and signs, etc.), aural alarms and verbal communications both for preventive safety instructions and during emergencies. There are no cultural factors addressed in these rules and standards. No specific instructions are given to specific cultural subgroups. There are also no regulations on which languages have to be used for emergency communication.

**Airport Domain** - There is a regulatory framework for airport emergencies. The international civil aviation documents refer to Airport design and definition of Airport operations, the emergencies that can occur in aviation operations and emergency plans to be performed in the situations as below:

- **Annex 17 – Security: Safeguarding International Civil Aviation Against Acts of Unlawful Interference**
Annex 14 — Aerodromes Volume I — Aerodrome Design and Operations

Airport Services Manual, Part 1 — Rescue and Fire Fighting (Doc 9137)

Airport Services Manual, Part 7 — Airport Emergency Planning (Doc 9137)

Annex 19 Safety Management Manual (Doc 9859),

Besides ICAO regulations there are also specific guidelines by IATA to support Airport design [64] and communication procedures [65]. All the above-mentioned documents do not have specific references to multi-cultural issues, apart from brief recommendations about languages and special needs.

**Railways Domain** - EU legislation [66] sets the framework for a harmonised approach to Rail safety in the EU. It lays down the conditions for granting the safety certification that every railway company must obtain before it can run trains on the European network. Moreover, within the European Network Rail, there are legislations and guidelines for guidance, signage and accessibility at train station, documented in the Technical Specification of the Interoperability (TSI) relating to safety in the rail system of the [67].

Deploying all National regulation and the ISO standards should in principle guarantee a common understanding of the safety signs by passengers of different cultures.

However, from various studies [68] [69] it appears that there is an influence of culture on how people find evacuation paths and that cultural minorities may have difficulties in wayfinding in hubs due to ineffective signage. While difficult wayfinding in routinary situations may simply make the travel experience less pleasant, it can create serious problems during emergencies.

The above findings show the need to take into account in a more extensive and integrated manner the multi-cultural factors in current communications standards, regulation and best practices across Transport modes, the IMPACT Multi-cultural Emergency Communication Guidelines, presented in next Section, will try to overcome this open issue.
3 The IMPACT emergency communication guidelines

This chapter presents the guidelines for communication to multicultural crowds. Before introducing the guidelines, the methodology used to generate the guidelines is described (section 3.1). Section 3.2 describes the general communication strategy to address communication to multi-cultural crowds.

Sections 3.3.1, 3.3.2 and 3.3.3 present the communication guidelines. Guidelines are context-based, in the sense that they are clustered by three categories: before emergency, during emergency and after emergency. For each context, a set of guidelines is proposed.

The IMPACT emergency communication guidelines aim is to help emergency communication teams building their context-specific tool for an effective multicultural crowd management. Far from being exhaustive, together with their generation methodology, the presented guidelines stand as a starting point for further actions: they do not provide a list of specific messages or actions, but trace a process for building collaborative partnerships and resilient organizational environment in terms of multi-cultural communication competences.

3.1 Communication guidelines mapping methodology

Figure 3 shows the main input sources for the generation of the IMPACT emergency communication guidelines.
The basic elements of communication introduced in section 2.2 as well as the relevant multicultural aspects (2.3) and crowd behaviours (2.4) were used as main sources of information for generating the IMPACT communication guidelines. Based on this approach, a mapping methodology has been set up. The methodology combines all the communication elements that are deemed suitable to the concerned environmental and multicultural filters, for any given reference context (pre, during and after emergency).

The starting point for generating the guidelines is the specific emergency phase. Then, for each phase, the relevant information should be identified by answering to the following questions:

1. Which are the objectives of the communication? (What to communicate)
2. Who are the main senders and receivers? (Who communicates and to Whom)
3. Which are the most suitable communication channels and codes to be used? (How/in which channel)
4. Which are the most relevant cultural and environmental filters that affect communication?

The guidelines are presented in the format of the table below, filled in with all concerned information.
The core of the guidelines is to select the most appropriate communication elements (what, who/to whom, how) for any reference scenario, taking into account the possible cultural and environmental filters of relevance. Filters are not intended only as obstacles to communication but, depending on the communication context and strategy chosen, they may on the contrary be favourable to overall emergency performance.

The communication guidelines presented in the following Sections could be customised and enriched by safety and security stakeholders according to the proposed methodology by answering to the main four questions.

3.2 High level communication guidelines for managing multicultural crowds in emergency

Before introducing the detailed list of context-based guidelines, some high level recommendations, addressing all the three contexts, are provided.

According to the European strategy on Cooperative Intelligent Transport Systems “the goal of efficiency and safety is to combine complementary communication technologies. An integrated system relies on the interoperability of its components, meaning that all systems need to be able to interact with each other: infrastructure, data, services, applications and networks. While standardisation activities are necessary, they alone are not sufficient to ensure interoperability” [70].

Independently from the chosen communication mean, information given to crowds should be:

- consistent on all channels;
- clear and intelligible;
- concise;
- inclusive.

The larger the number of people addressed, the wider the audience which can receive information. Important: be sure the same information reaches people with physical or cognitive impairments, low-english proficiency persons, people who are not paying attention to environmental cues and any other vulnerable audience expected to be in the specific transport hub.
To develop **effective inclusive communication skills**, communication management at all levels, including first-responders, should learn and keep always in mind to [71]:

- **take action** long before an emergency starts, and to give useful advice to all passengers and visitors as they step into a transport hub or, even better, reach them before they leave their homes, using all suitable means of communication;
- run a **cultural risk assessment**;
- build a plan for emergency multicultural communication: **strategic planning** is vital for the effectiveness of emergency performance, also for minor threats;
- allow **interoperability** and redundancy of communication network system;
- convey a **resilient safety approach** at an organizational level;
- consider **possible failures** of communication systems, due to any internal or external factor potentially interrupting communication;
- **check** periodically the **efficiency** of communication systems and continuously improve communication strategies;
- build a system that allows to modify, update or renew solutions: **re-tuning** must remain possible at any moment without heavy effort.

When framing emergency communication messages for a multicultural audience:

- avoid **information overload**
- avoid **generalization** from individual behaviours to entire cultures
- reflect critically on how intercultural **interactions** can influence situations and events.
- keep in mind **diversity** considering the presence of heterogeneous subgroups and the different levels of individual perception of risk and context.

### 3.3 List of guidelines according to the emergency phase

As anticipated in section 3.1, the guidelines are enlisted in tables, including a set of columns to identify the communication elements that are deemed suitable to the concerned context and relevant filters. Communication elements and filters are selected on the basis of the complete list provided in sections 2.1, 2.3 and 2.4. Figure 5 recalls all the possible communication elements and filters to be selected for each column.
3.3.1 Guidelines for multi-cultural communication: before emergency

Communication before emergency is characterised by three basic aspects: i) it is carried out with no time pressure, so that any intervention can be pre-defined and planned in advance; ii) the target of the communication is, for the most part, composed of people running ordinary activities or routines so that psychological processes can flow in a harmonized and effective way; iii) people presenting special needs have the possibility and time to be supported, by relatives or staff, and be identified in advance.

For this reason, the main principles for communication guidelines before emergency are to exploit time resources to predefine communication messages and collect information from customers.

The following guidelines instantiate these principles to multicultural crowds.

1. **Inform on behaviours to be taken in case of emergency.** The message has to be pre-defined. It has to be designed in order to reach all kinds of passengers. Adopt a multi-language and multi-channel and multi-code strategy and ensure consistency.

2. **Collect relevant information on individual differences and needs.** Build an automated database system to collect actual information about the sociocultural composition of the passengers.
3. **Build an effective multicultural communication plan for emergencies.** Be aware of how people move according to crowd dynamics, and all other different cultural influenced behaviours in the specific hub to reduce risks and injuries.

4. **Maintain the chance to further empower or modify communication strategy.** In the context of a dynamic context of transport hubs, take into account the principles of multicultural communication, paying attention to the main languages spoken together with the different levels of sign comprehension. Establish contacts with the related partner communities already in the planning phase, to be prepared for expected different scenarios.

5. **Recruit and train for multicultural competence.** Use database on socio-cultural composition of passengers to recruit, train and employ a front-line staff with multi-cultural competences, including communication skills as well as post-traumatic symptoms and recovery awareness.

6. **Establish contact and build partnership.** Establish contact and build partnerships with broadcast media agencies linked to specific cultural groups or other recognized online communities, who may provide support for emergency communication, in case of necessity.

7. **Educate and share mutual knowledge.** Develop long-term educational programs for schools and communities to raise awareness and share knowledge about safety and appropriate behaviors in a multicultural emergency context.

8. **Disseminate information.** Use databases to disseminate targeted information on all appropriate channels, starting from the broadest and most effective ones and including cross-references.

9. **Build and enable two-way communication systems.** Build a communication system that allows feedback and two-way communications, and acquaint audiences about its existence, providing users with trusted and recognizable application or mobile functions allowing them to signal their position if an emergency occurs.

10. **Adopt an inclusive approach and be an example for others.** Be aware of other countries’ practices and cultural codes to help prompt responses and stimulate an open and inclusive approach in others, reducing stress factors in crowds before, during and after emergencies.

11. **Raise safety awareness: knowledge.** Underline on a regular basis the importance of knowledge about safety instructions, providing a hub's safety instruction leaflet, printed and available online, addressed to all cultural groups and translated by mother-tongue professionals in as many as possible languages; be sure the instructions are to be found where related groups may easily find it.

12. **Raise safety awareness: practice.** Inform about good practices as: acquaintance about surrounding, evacuation locations and nearest exits, paying attention to public announcements over the public address system and looking periodically at display monitors in the terminal for visual messages to determine conditions.
13. **Reduce communication barriers.** To establish a broad and common basic safety procedure manual, provide cards with illustrated instructions and actions, widely representing the human diversity, without stereotyping, so as to stimulate a correct perception of risk and the common effort to save and be saved. These cards, comprehensible for all audiences from all cultures because they don’t contain written information, should be easily and constantly available in the transport hub.

14. **Improve recognizability.** Help broader comprehension across communication means: signs, panels, screens, printed materials or dynamic displays should use congruent symbols together with a textual explanation, eventually translated in the languages mostly represented in the hub.

15. **Facilitate information seeking.** Help people seek information ensuring that signs, panels, screens, printed materials or dynamic displays, potentially delivering safety instructions, are placed where people are expected to find or look for it; the information needed should be visible, reachable and readable in extreme conditions by all targeted audiences; consider the space needed for people who stopped for reading, to avoid slower evacuations.

16. **Stimulate wayfinding.** Ensure that whenever a plan is shown the “Heads-up” principle is respected: the orientation of the plan as displayed shall be related to the viewer’s position and identify the readers location with a clear “You Are Here” spot which works in conjunction with the plans orientation.

17. **Prevent cultural clashes.** Identify areas in the transport hub where in crowded situations people of different cultures or different needs get in close contact: if in normal conditions people already struggle to get along, there is a high probability for them to compete for survival during emergencies.
<table>
<thead>
<tr>
<th>ID</th>
<th>WHAT</th>
<th>WHO and to WHOM</th>
<th>HOW/on which channel</th>
<th>CULTURAL AND ENVIRONMENTAL FILTERS to be considered</th>
<th>Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Objective of the phase</td>
<td>Senders</td>
<td>Receiver(s)</td>
<td>Channel(s)</td>
<td>Code</td>
</tr>
<tr>
<td>1.</td>
<td>Inform on behaviours to be taken in case of emergency</td>
<td>Front-line staff</td>
<td>All</td>
<td>Face to face, Signage, printed materials, mobile devices</td>
<td>Both languages and symbols.</td>
</tr>
<tr>
<td>2.</td>
<td>Collect relevant information on individual differences and needs</td>
<td>Hub manager Safety and security manager</td>
<td>All</td>
<td>Face to face, printed materials, mobile devices</td>
<td>Language</td>
</tr>
<tr>
<td>3.</td>
<td>Build an effective multicultural communication plan for emergencies.</td>
<td>Hub manager Safety and security manager</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>4.</td>
<td>Maintain the chance to further empower or modify communication strategy</td>
<td>Hub manager Safety and security manager</td>
<td>N/A</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>
|   | **Recruit and train for multicultural competence** | Hub manager | Front-line staff | N/A | N/A | All | Social identity | Language | Individual differences | All | **communities already in the planning phase, to be prepared for expected different scenarios.**

5. **Recruit and train for multicultural competence** | Hub manager Safety and security manager | Front-line staff First responders | N/A | N/A | All | Social identity | Language | Individual differences | All | Use your data to recruit, train and employ a front-line staff with multi-cultural competences, including communication, skills and post-traumatic symptoms and recovery awareness.

6. **Establish contact and build partnership** | Hub manager Communication manager | Communities linked to specific cultural groups | Social media | Language | Network availability | Language | Social identity | Seek for information | Establish contact and build partnerships with broadcast media agencies linked to specific cultural groups or other recognized communities online, who may provide support for emergency communication, in case of necessity.

7. **Educate and share mutual knowledge** | Hub manager Communication manager | All potential audiences | Face to face | All codes | N/A | Social identity | Language | Individual differences | All | Develop long term educational programs for schools and communities to raise awareness and share knowledge about safety and appropriate behaviors in a multicultural emergency context.

8. **Disseminate information** | Hub manager Communication manager | All audiences | All channels | All codes | N/A | Social identity | Language | Individual differences | Seek for information | Use your database to disseminate targeted information on all appropriate channels, starting from the broadest and most effective ones and including cross-references.

9. **Build and enable two-way** | Hub manager | All audiences | Face to face, IOT, Spoken language, Noise, network | Social identity | Language | All | Build a communication system that allows feedback and two-
<table>
<thead>
<tr>
<th><strong>communication systems</strong></th>
<th>Communication manager</th>
<th>private devices, apps, website and social media</th>
<th>written language, symbols.</th>
<th>availabilit y</th>
<th>Individual differences</th>
<th>Sign comprehension</th>
<th>Spatial navigation</th>
<th>way communications, and acquaint audiences about its existence, providing users with trusted and recognizable application or mobile functions allowing them to signal their position if an emergency occurs.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>10. Adopt an inclusive approach and be an example for others</strong></td>
<td>Communication manager, Front line staff</td>
<td>All audiences</td>
<td>Face to face, printed materials, P.A, IOT, mobile devices</td>
<td>Spoken language, written language, symbols.</td>
<td>Noise, visibility</td>
<td>Social identity</td>
<td>Language</td>
<td>Individual differences</td>
</tr>
<tr>
<td><strong>11. Raise safety awareness: knowledge</strong></td>
<td>Communication manager</td>
<td>All audiences</td>
<td>Printed materials, P.A, IOT, mobile devices</td>
<td>Written language</td>
<td>Noise</td>
<td>Language</td>
<td>Seek for information</td>
<td>Underline on a regular basis the importance of knowledge about safety instructions, providing a hub’s safety instruction leaflet, printed and available online, addressed to all cultural groups and translated by mother-tongue professionals in as many as possible languages; be sure the instructions are to be found where related groups may easily find it.</td>
</tr>
<tr>
<td><strong>12. Raise safety awareness: practice</strong></td>
<td>Communication manager, Front line staff</td>
<td>All audiences</td>
<td>Signage Printed materials, P.A, IOT, mobile devices</td>
<td>Spoken and written language, animated video</td>
<td>Noise, visibility</td>
<td>Language</td>
<td>Social identity, Individual differences, sign comprehension</td>
<td>Seek for information</td>
</tr>
<tr>
<td></td>
<td><strong>Reduce communication barriers</strong></td>
<td>Communication manager, Front line staff</td>
<td>All audiences</td>
<td>Printed materials, IoT, mobile devices</td>
<td>Written language, symbols, animated video</td>
<td>Noise, visibility, network availability</td>
<td>Social identity, Individual differences, sign comprehension</td>
<td>Seek for information</td>
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<td></td>
<td><strong>Improve recognisability</strong></td>
<td>Communication manager</td>
<td>All audiences</td>
<td>Signage Printed materials, P.A, IoT, mobile devices</td>
<td>Written language, symbols, animated video</td>
<td>Noise, visibility, network availability</td>
<td>Social identity, Individual differences, sign comprehension</td>
<td>Seek for information</td>
</tr>
<tr>
<td></td>
<td><strong>Facilitate information seeking</strong></td>
<td>Communication manager</td>
<td>All audiences</td>
<td>Signage Printed materials, P.A, IoT, mobile devices, public space</td>
<td>Written language, symbols, animated video, landmark, wayfinding</td>
<td>Noise, visibility, network availability</td>
<td>Social identity, Individual differences, sign comprehension, spatial navigation</td>
<td>Seek for information</td>
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<tbody>
<tr>
<td><strong>16.</strong></td>
<td><strong>Stimulate wayfinding</strong></td>
<td>Communication manager</td>
<td>All audiences</td>
<td>Signage</td>
<td>Written language, symbols, animated video, landmark, wayfinding</td>
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<td></td>
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<td>Printed materials, IOT, mobile devices, public space design</td>
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<td>Noise, visibility, network availability</td>
<td>sign comprehension, spatial navigation</td>
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<td>Seek for information</td>
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<td>Ensure that whenever a plan is shown the “Heads-up” principle is respected: the orientation of the plan as displayed shall be related to the viewer’s position and identify the reader’s location with a clear “You Are Here” spot which works in conjunction with the plan’s orientation.</td>
</tr>
<tr>
<td><strong>17.</strong></td>
<td><strong>Prevent cultural clashes</strong></td>
<td>Communication manager, Front line staff</td>
<td>All audiences</td>
<td>Face to face, Public space design</td>
<td>Spoken language, symbols, spatial layout</td>
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<td>Noise, occupancy level</td>
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<td></td>
<td></td>
<td></td>
<td>Social identity, Language, Individual differences, sign comprehension, spatial navigation</td>
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<td></td>
<td></td>
<td></td>
<td>Cooperating, Helping others</td>
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<td></td>
<td>Identify areas in the transport hub where different cultures’ crowds and/or different needs get in close contact: if in normal conditions people already struggle to get along, there is a high probability for them to compete for survival during emergencies.</td>
</tr>
</tbody>
</table>

*Table 2: Guidelines for multi-cultural communication: before emergency*
3.3.2 Guidelines for multi-cultural communication: during emergency

Communication during emergency is featured by three basic aspects: i) it is carried out with time pressure; ii) the target of the communication is composed of people undergoing traumatic or stressful situations, so that “people” become “victims”. In this condition, psychological processes are altered by the ongoing experience and cannot flow in a harmonized and effective way; iii) people presenting special needs may not have the possibility to be supported by relatives and/or be too incapacitated to ask for help from staff.

The specific objective of communication during emergency are:

- Save lives and reduce injuries
- Protect property, environment and reputation
- Facilitate rescue response
- Promote cooperation

For this reason, the main principles for communication guidelines during emergency are to:

- exploit communication strategies and messages framed before emergency
- use information collected in advance to identify and reach vulnerable passengers
- apply a communication style that is clear and concise (for example, providing short messages and giving the main information for first)
- take into account the hypothetical incapacitation, both physical and psychological, experienced during an emergency by victims.

The following guidelines instantiate these principles to multicultural crowds.

18. **Issue effective messages.** Issue timely instructions to the public, including the brief description of the event occurring and likely to impact them, the reasoned actions and behaviours to adopt to protect their lives.

19. **Ensure redundancy.** All warning messages, previously framed for each audience or vulnerability identified, should be issued via any available channel and repeated consistently. Be simple, omit unnecessary details and make every word count.

20. **Reach all audiences.** Support with text and audio in different languages the meaning of what is being conveyed graphically and vice versa to ensure comprehension by all vulnerable audiences, validate any automatically translated text with a mother tongue, using existing partnership or staff members, to avoid errors.

21. **Reach audiences not familiar with main language used.** Identify in advance those members of crowds that do not understand the languages used for safety and risk communications, in order to reach them anyway, if needed, and be very careful with text-to-speech conversion equipment and translation technologies: craft messages that avoid non-standard language texts and terminology as non-English-speaking or low-educated audiences may not understand warnings, even when they are provided in a plain layman’s English.
22. **Maintain constant access to mobile communication networks.** Phone calls to family or friends, online resources and dedicated apps are more likely to be used during emergencies than hard-to-find phone numbers, especially if uncertainty is given about response-times. Though mobile communication networks have demonstrated low feasibility during communication overloads, it still represents the prevalent channel people will use when looking for up-to-date information.

23. **Enable feedback.** Acquaint people about the two-way official communication systems available and active, to match their need for confirmation cues and appropriateness of their actions; the lack of updates may result in a higher interruption rate to staff members involved in rescuing operations or, especially for most vulnerable groups, increases uncertainty and stress and activate information seeking through external trusted sources. thanks to a communication strategy plan previously developed, on-line first responders should be available at all times, being ready to mobilize extra communication resources and units when needed.

24. **Disseminate useful information.** Keep in contact with the partner communities somehow related to the audience involved, to maximize communication dissemination through their channels; other appropriate channels to share and issue warnings and updates are social media, special-needs or cultural communities’ dedicated apps or websites

25. **Take care about social media communication role.** The crowd plays a role in communication as well, as they are communicating directly or indirectly to the staff, also trough social media (loop-dynamic) sharing information with potential consequences, both positive and negative, on involved crowds behaviour and on the reputation of the Transport Service Providers (TSP).

26. **Prevent or promote specific crowd behaviours according to situation.** During an emergency: identical behaviours may alternatively save lives or lead people to wrong directions or death, depending on the specific scenario; be aware of crowd-behaviours concerning spatial navigation, wayfinding and proxemics, considering individual differences cultural factors and eventually their interactions during emergencies, to recognize and mitigate negative outcomes issuing correct directions and advices.

27. **Optimize evacuation process.** People tend to follow familiar routes and behave automatically, regardless of their culture, social identity or individual characteristics, especially when running away from danger; try not to oppose spontaneous behaviors or, if strictly necessary, alternative communication instruction should be clear and decisive enough to override them.

28. **Promote cooperation.** Be inclusive and recommend a helping attitude, especially towards vulnerable individuals or groups. Send trained and multilingual employees. Give similar advices using public audio announcements or pre-recorded videos in different languages and codes.

29. **Reach vulnerable audiences with last minute warnings.** Take in consideration the chance of damaged environment that prevents evacuation or access to some areas, or other physical obstacles slowing evacuations that vulnerable audiences may not be able to see or
recognize; be sure to use different sensory channels and languages to guide or de-route crowds.

30. **Manage the “emotional” atmosphere.** Be sensitive to the non-verbal communication of the involved parties, expressed through facial and vocal expression, proxemics (e.g. interpersonal distance), kinesics and gaze. To ‘read’ the emotional display means taking notice of changes in an individual’s body language.

31. **Be aware of and control own body language.** Inappropriate nonverbal behavior might serve as an aversive stimulus that triggers aggressive reactions, and hence a specific training is recommended for frontliners.

32. **Stimulate compliance.** It is recommended to demonstrate an attitude of empathy and show concern while being assertive and reliable; control is not on people but towards the situation; seek reciprocity and look for support from other crowd or staff members if the situation is about to escalate.
<table>
<thead>
<tr>
<th>ID</th>
<th>WHAT</th>
<th>WHO and to WHOM</th>
<th>HOW/in which channel</th>
<th>CULTURAL AND ENVIRONMENTAL FILTERS to be considered</th>
<th>Relevant crowd behaviours</th>
<th>Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Issue effective messages</td>
<td>Communication team, Frontline staff, First Responders</td>
<td>All audiences</td>
<td>Face to face, videos, dynamic way-finding signage</td>
<td>Spoken and written Language, symbols</td>
<td>Noise, visibility</td>
</tr>
<tr>
<td>19</td>
<td>Ensure redundancy</td>
<td>Hub managers, communication manager, Frontline staff, first responders</td>
<td>All audiences</td>
<td>Face to face, Public announcements, dynamic displays, Mobile and apps, signage</td>
<td>Spoken and written Language</td>
<td>Noise</td>
</tr>
<tr>
<td>20</td>
<td>Reach all audiences</td>
<td>Communication manager</td>
<td>All audiences</td>
<td>Face to face, Public announcements, dynamic displays, Mobile and apps, signage</td>
<td>Spoken and written language, symbols</td>
<td>Noise, visibility</td>
</tr>
<tr>
<td>21. <strong>Reach audiences not familiar with main language used</strong></td>
<td>Communication manager</td>
<td>All audiences</td>
<td>Face to face, Public announcements, dynamic displays, Mobile and apps, Spoken and written language</td>
<td>Noise, network availability</td>
<td>Social identity, Language, Individual differences</td>
<td>Information seeking</td>
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</table>

Identify in advance those members of crowds that do not understand the languages used for risk communications, in order to reach them otherwise, if needed and be very careful with text-to-speech conversion equipment and translation technologies: craft messages that avoid non-standard language texts and terminology as non-English-speaking or low-educated audiences may not understand warnings, even when they are provided in a plain layman's English.

<table>
<thead>
<tr>
<th>22. <strong>Maintain constant access to mobile communication networks</strong></th>
<th>Hub manager</th>
<th>N/A</th>
<th>Mobile personal devices and apps, IIS, Spoken and written language, symbols</th>
<th>Network availability</th>
<th>Social identity, Language, Individual differences</th>
<th>Information seeking</th>
</tr>
</thead>
</table>

Phone calls to family or friends, online resources and dedicated apps are more likely to be used during emergencies than hard-to-find phone numbers, especially if uncertainty is given about response-times. Though mobile communication networks have demonstrated low feasibility during communication overloads, it still represents the prevalent channel people will use when looking for up-to-date information.
<table>
<thead>
<tr>
<th>23. <strong>Enable feedback</strong></th>
<th><strong>All audiences</strong></th>
<th>Face to face, Public announcements, dynamic displays, Mobile and apps, signage</th>
<th>Spoken and written language</th>
<th>Noise, network availability</th>
<th>Social identity, Language, Individual differences</th>
<th>Information seeking, confirmation clues</th>
<th>Acquaint people about the two-way official communication systems available and active, to match their need for confirmation cues and appropriateness of their actions; the lack of updates may result in a higher interruption rate to staff members involved in rescuing operations or, especially for most vulnerable groups, increases uncertainty and stress and activate information seeking through external trusted sources. Thanks to a communication strategy plan previously developed, online first responders should be available at all times, being ready to mobilize extra communication resources and units when needed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>24. <strong>Disseminate useful information</strong></td>
<td><strong>Partner communities</strong></td>
<td>Mobile personal devices and apps (online and social media)</td>
<td>Spoken and written language, symbols</td>
<td>Network availability</td>
<td>Social identity</td>
<td>Information seeking</td>
<td>Keep in contact with the partner communities somehow related to the audience involved, to maximize communication dissemination through their channels; other appropriate channels to share and issue warnings and updates are social media, special-needs or cultural communities’ dedicated apps or websites.</td>
</tr>
<tr>
<td>25.</td>
<td><strong>Take care about social media communication role</strong></td>
<td><strong>Communication manager</strong></td>
<td>All audiences</td>
<td>written language, symbols</td>
<td>N/A</td>
<td><strong>Social identity</strong></td>
<td><strong>Language Individual differences</strong></td>
</tr>
<tr>
<td>26.</td>
<td><strong>Prevent or promote specific crowd behaviours according to situation</strong></td>
<td><strong>Communication manager, front line staff, First Responders</strong></td>
<td>All audiences</td>
<td>All channels</td>
<td>All codes</td>
<td>Noise, visibility, occupancy level,</td>
<td><strong>Spatial navigation</strong></td>
</tr>
<tr>
<td>27.</td>
<td><strong>Optimize evacuation process</strong></td>
<td><strong>Communication manager, First Responders</strong></td>
<td>All audiences</td>
<td>All channel</td>
<td>All codes</td>
<td>Visibility, occupancy level</td>
<td>Sign comprehension <strong>Spatial navigation</strong></td>
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should be clear and decisive enough to override them.

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<tr>
<td>28. <strong>Promote cooperation</strong></td>
<td>Front-line staff, First Responders</td>
<td>All audiences</td>
<td>Face to face, Public announcements, dynamic displays, Mobile and apps</td>
<td>Spoken and written language, symbols, Animated video</td>
<td>Noise</td>
<td>Social Identity</td>
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</tr>
<tr>
<td>29. <strong>Reach vulnerable audiences with last minute warnings</strong></td>
<td>Communication manager, Front line staff, First Responders</td>
<td>Vulnerable audiences</td>
<td>Face to face, Public announcements, signage, Mobile and apps, public space design</td>
<td>Spoken and written language, symbols, Wayfinding</td>
<td>Noise, visibility, occupancy level</td>
<td>Individual differences, Sign comprehension Spatial navigation</td>
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<tr>
<td>30. <strong>Manage the “emotional” atmosphere</strong></td>
<td>Communication manager, Front line staff, First Responders</td>
<td>All audiences</td>
<td>Face to face, public announcements</td>
<td>Spoken language, body language</td>
<td>Noise</td>
<td>Individual differences, social identity</td>
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</table>

Be inclusive and recommend a helping attitude, especially towards vulnerable individuals or groups. Send trained and multilingual employees. Give similar advices using public audio announcements or pre-recorded videos in different languages and codes.

Take in consideration the chance of damaged environment that prevents evacuation or access to some areas, or other physical obstacles slowing evacuations that vulnerable audiences may not be able to see or recognize; be sure to use different sensory channels and languages to guide or de-route crowds.

Be sensitive to the non-verbal communication of the involved parties, expressed through facial and vocal expression, proxemics (e.g. interpersonal distance), kinesics and gaze. To ‘read’ the emotional display means taking notice of changes in an individual’s body language.
<table>
<thead>
<tr>
<th>31.</th>
<th><strong>Be aware of and control own body language</strong></th>
<th>Front line staff, First Responders</th>
<th>All audiences</th>
<th>Face to face</th>
<th>body language</th>
<th>N/A</th>
<th>Individual differences, social identity</th>
<th>Helping attitude and Cooperation</th>
<th>Inappropriate nonverbal behavior might serve as an aversive stimulus that triggers aggressive reactions, a specific training is recommended for frontliners</th>
</tr>
</thead>
<tbody>
<tr>
<td>32.</td>
<td><strong>Stimulate compliance</strong></td>
<td>Communication manager, Front line staff, First Responders</td>
<td>All audiences</td>
<td>Face to face, public announcements</td>
<td>Spoken language, animated videos</td>
<td>N/A</td>
<td>Individual differences, social identity</td>
<td>Helping attitude and Cooperation</td>
<td>It is recommended to demonstrate an attitude of empathy and show concern while being assertive and reliable; control is not on people but towards the situation; seek reciprocity and look for support from other crowd or staff members if the situation is about to escalate.</td>
</tr>
</tbody>
</table>

Table 3: Guidelines for multi-cultural communication: during emergency
3.3.3 Guidelines for multi-cultural communication: after emergency

Communication after an emergency is featured by three basic aspects: i) it is carried out with no time pressure, so that any intervention can hopefully be personalized; ii) the target of the communication is composed of victims of traumatic events: psychological processes are altered by the abnormal experience and its consequences; iii) people presenting special needs may not have the possibility to be supported by relatives and/or be too incapacitated to ask the staff for help.

Any disaster engenders a series of psychological reactions: these are dramatically unpleasant and painful for the individual who experiences them, and can also have a negative impact on his/her interpersonal behaviour. However, these reactions are not deemed as psychopathological in its traditional meaning: they are normal reactions to abnormal and extreme events. In fact, when a traumatic event occurs, the automatic and ordinary psychological processes can be ineffective in controlling the sense of helplessness and vulnerability.

According to psychologists, the reactions following a traumatic event can be clustered in four kinds of symptoms, as follows:

- Physical, as for example sleep disorders, night sweats, heart-rate increase, nausea, muscular spasms
- Cognitive, as for example impairment of vigilance and sustained attention, confusion, intrusive thoughts and flashbacks concerning the traumatic event, memory disorders
- Emotional, as for example anxiety, irritability, anger, sadness, guilty, sense of helplessness
- Behavioural, as for example aggressivity, proneness to complain, silence, isolation, hypervigilance and hypercontrol.

Not only can these symptoms combine differently in people, depending on the individual personality, but also cultural differences on emotional expression play a relevant role. For example, some cultures discourage emotional expression and may make individuals more prone to isolation, sense of guilty and silence; while others promote even exaggerate emotional reactions, making individuals more prone to complain and become aggressive. So, isolation and silence do not necessarily mean that victims are fine. Aggressivity and complaint do not mean that people refuse the support provided. Different emotional expression levels largely depend on culture. This is why they should be accurately identified and managed.

Post-traumatic symptoms can be short-term (less than six months) or long term (more than six months). When these last for more than six months, they structure what is codified as Post-Traumatic-Stress-Disorder.

For all these reasons, the main principles for communication guidelines after an emergency are to:

- exploit time resources to personalize interventions
• implement different interventions for short-term and long-term effects of the traumatic event
• use information collected in advance to identify passengers with special needs
• apply a communication style that takes into account the symptoms experienced by victims.

The following guidelines instantiate these principles to multicultural crowds.

33. **Locate people in need of help.** Use all two-way communication available, also embedded or wearable sensors, IOT and social media to locate unreached victims and, whenever possible, to establish a direct active or passive feedback.

34. **Identify and reach people in need of help.** Before any further intervention, a multi-channel strategy should be in place to reach as many victims as possible, including people who cannot be easily localized, people who are not prone to ask for support, due to cultural factors or other conditions, people who is not familiar with mobile devices and applications.

35. **Help families and groups reunite.** Put in place a strategy to identify and bring together people belonging to the same groups, or facilitate the recognizeability of different post-event logistic areas, providing provisional signs and directions addressing all involved audiences. A post-event strategy for communication should be included in the preparedness phase.

36. **Reduce long-term post-traumatic symptoms occurrences.** Recognize and connect with people showing post-traumatic symptoms or, more generally, with all the people who may be potentially shocked (i.e. vulnerable subjects) according to personal sensitivity; if necessary, ask support and advice from a team of experts; inform them about the existence of free post event support, both legal and psychological

37. **Avoid cultural clashes.** Respect different cultures and individual needs, attempting a balanced approach between an inclusive and cross-cultural support and a respectful and soothing segregation, in time and space, of conflicting clusters assisted.

38. **Manage organization reputation.** Plan and follow the communication strategy set up for the related emergency scenario.

39. **Learn from experience.** Collect all available information about the event occurred, to build a database useful to revise and update emergency communication strategies. They will be of paramount importance for cultural risk assessment management and emergency preparedness.
<table>
<thead>
<tr>
<th>ID</th>
<th>WHAT</th>
<th>WHO and to WHOM</th>
<th>HOW/in which channel</th>
<th>CULTURAL AND ENVIRONMENTAL FILTERS to be considered</th>
<th>Relevant crowd behaviour</th>
<th>Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>33.</td>
<td>Locate people in need of help</td>
<td>Communication manager</td>
<td>Unreached audiences</td>
<td>mobile and apps, sensors and IOT, online and social media</td>
<td>physical interaction</td>
<td>embedded technology availability</td>
</tr>
<tr>
<td>34.</td>
<td>Identify and reach people in need of help</td>
<td>Hub manager, communication manager, Front-line staff, First Responders</td>
<td>All audience involved in the event</td>
<td>Face to face, mobile and apps, sensors and IOT, online and social media</td>
<td>Written or spoken language, physical interaction with sensors.</td>
<td>Noise, network availability, embedded technology availability</td>
</tr>
<tr>
<td></td>
<td>Help families and groups reunite</td>
<td>Communication manager, Front line staff, First Responders</td>
<td>All audiences involved in the event and external audiences (family, friends etc...)</td>
<td>Face to face, mobile and apps, sensors and IOT, online and social media, public space design</td>
<td>Written or spoken language, spatial layout</td>
<td>N/A</td>
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<tr>
<td></td>
<td>Reduce long-term post-traumatic symptoms occurrences</td>
<td>Front line staff, First Responders</td>
<td>All audiences involved in the event and external audiences</td>
<td>Face to face</td>
<td>Spoken and written language</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td><strong>Avoid cultural clashes</strong></td>
<td><strong>Communique manager, Front line staff, First Responders</strong></td>
<td><strong>All audience involved in the event</strong></td>
<td><strong>Face to face, public space design</strong></td>
<td><strong>Spoken language, body language</strong></td>
<td><strong>N/A</strong></td>
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<td></td>
<td><strong>Manage organizatio n reputation</strong></td>
<td><strong>Communique manager, Front line staff, First Responders</strong></td>
<td><strong>Public audience</strong></td>
<td><strong>Face to face, online and social media, public broadcast media and news agencies</strong></td>
<td><strong>Written or spoken language</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Learn from experience</strong></td>
<td><strong>Hub manager, communication manager</strong></td>
<td><strong>N/A</strong></td>
<td><strong>N/A</strong></td>
<td><strong>N/A</strong></td>
<td><strong>N/A</strong></td>
</tr>
</tbody>
</table>

*Table 4: Guidelines for multi-cultural communication: after emergency*
4 Conclusions

This deliverable has integrated and structured findings from WP1 and previous WP4 Tasks into Communication Guidelines, which aim to:

- improve security operators and first responders’ situational awareness and intercultural competences in all phases of an emergency;
- provide insights on how to train and prepare Transport Hubs operators and staff, properly communicate with multi-cultural crowds to optimise passengers’ reaction time, taking into account the diversity of cultures, background knowledge, experiences and attitudes;
- provide information to end users on how to exploit positive crowd behaviours and characteristics whilst lowering panic phenomena and socio-cultural hazardous behaviours that may arise before, during and after emergencies.

The basic elements of communication introduced in section 2.2 and the multicultural aspects, introduced in section 2.3, were used as main sources of information for generating the IMPACT communication guidelines. The core of the communication guidelines is to select the most appropriate communication elements for each phase of an emergency, taking into account the choice of the adequate content of the message and the specific information needed by people involved in an emergency. Guidelines are context-based, in the sense that they are clustered around three categories: “before emergency”, “during emergency” and “after emergency”. For each phase of an emergency, a set of guidelines was proposed.

Before emergency: the main principles for communication guidelines before emergency are to exploit time resources to predefine communication messages and collect information from customers. The following communication guidelines have been elicited:

1. Inform on behaviours to be taken in case of emergency
2. Collect relevant information on individual differences and needs
3. Build an effective multicultural communication plan for emergencies
4. Maintain the chance to further empower or modify communication strategy
5. Recruit and train for multicultural competence
6. Establish contact and build partnership
7. Educate and share mutual knowledge
8. Disseminate information
9. Build and enable two-way communication systems
10. Adopt an inclusive approach and be an example for others
11. Raise safety awareness: knowledge
12. Raise safety awareness: practice
13. Reduce communication barriers
14. Improve recognisability
15. Facilitate information seeking
16 Stimulate wayfindings
17 Prevent cultural clashes

**During emergency:** communication during emergency is featured by time pressure and stressful situations. Under these circumstances, the main communication objectives are to: (1) save lives and reduce injuries, (2) protect property, environment and reputation, (3) facilitate rescue response and (4) promote cooperation. The following communication guidelines have been elicited:

18 Issue effective messages
19 Ensure redundancy
20 Reach all audiences
21 Reach audiences not familiar with main language used
22 Maintain constant access to mobile communication networks
23 Enable feedback
24 Disseminate useful information
25 Take care about social media communication role
26 Prevent or promote specific crowd behaviours according to situation
27 Optimize evacuation process
28 Promote cooperation
29 Reach vulnerable audiences with last minute warnings
30 Manage the “emotional” atmosphere
31 Be aware of and control own body language
32 Stimulate compliance

**After emergency:** communication after an emergency is generally featured by less time pressure. In this phase, it is important to: (1) exploit time resources to personalize interventions; (2) implement different interventions for short-term and long-term effects of the traumatic event; (3) use information collected in advance to identify passengers with special needs and (4) apply a communication style that takes into account the symptoms experienced by victims. The following communication guidelines have been elicited:

33 Locate people in need of help
34 Identify and reach people in need of help
35 Help families and groups reunite
36 Reduce long-term post-traumatic symptoms occurrences
37 Avoid cultural clashes
38 Manage organization reputation
39 Learn from experience

To conclude, the IMPACT emergency communication guidelines aim to help emergency communication teams in building their context-specific tool for an effective multicultural crowd management by answering to the following questions:
1. Which are the objectives of the communication? (What to communicate)
2. Who are the main senders and receivers? (Who communicates and to Whom)
3. Which are the most suitable communication channels and codes to be used? (How/in which channel)
4. Which are the most relevant cultural and environmental filters that affects communication?

Far from being exhaustive, the presented guidelines stand as a starting point for further actions: they do not provide just a list of specific messages or actions, but trace a process for building collaborative partnerships and resilient organizational environment in terms of multi-cultural communication competences. In line with this, the communication guidelines could be customised for specific transport domains and they could be enriched by safety and security stakeholders, according to the proposed methodology.

We will present and validate the IMPACT guidelines during the final IMPACT event with ESG members and other external stakeholders from other domains. Feedback and recommendations will be integrated in future versions of the guidelines after the project completion.
5 References


[60] ISO 9921:2003 Ergonomics -- Assessment of speech communication

[61] ISO 7731:2003 Ergonomics -- Danger signals for public and work areas -- Auditory danger signals


[70] European commission, A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility - November 2016


6 Appendix

Below the description of main communication channels is provided.

**Face-to-Face.**

Face-to-face or personal communication is one of the richest channels of communication. Physical presence, the tone of the speaker's voice and facial expressions provide the recipients of a message with additional information to interpret the message. This channel suits best for complex or emotionally charged messages, because it allows for interaction between speaker and recipients to clarify ambiguity. A speaker can evaluate whether an audience has received his message as intended and ask or answer follow-up questions. Concerning emergencies, this kind of communication reveals effective when:

- the interaction is one to one, or one to a small group of people;
- when there is no time pressure;
- when the objective of communication is not to rapidly save/evacuate people, but rather to calm them down (for example, in stranded passengers scenarios).

Face-to-face communication is used by front-liners involved in a specific emergency scenario, and also by all staff members that may be asked for directions, advice or instructions at information desks, by telephone or radio. Face to face communications requires speech and language skills, but also emotional intelligence, body language, emotional stability and leadership. Efficient face-to-face communication, especially during and after an emergency, to individuals or small groups, means dealing with people facing a stressful situation, with no power of informed choice except the directions already received from staff members or automated public communication means.

In most cases, face-to-face communication with multi-cultural crowds will be enhanced if front-liners themselves come from a multi-cultural background and with proper cultural competence training: the more cultures and languages they will be representing, the more trustworthy reactions they will get in return, whenever their verbal communication is intrinsically efficient. Nevertheless, every staff member should be trained to handle emotions and high levels of stress or aggressivity: immediate verbal or physical reactions, on both sides, frequently function as communication barriers that are likely to escalate. A skilled frontliner must look beyond reactions, and learn to recognize, acknowledge and manage emotions and develop a multicultural competence.

**Signage.**

The static signage embedded in the physical environment, also if not directly related to emergency or safety issues, is delivered to a large public in order to orient crowds in a rather unfamiliar environment. It constitutes the key-stone of all the information complex, since it is the only information people can refer to if other means are unsuitable or malfunctioning.
The basic written or graphic content, the dimensions, colours and position of static signs follow shared international standards[55][57][58],[62] to guarantee reliability and accessibility to all audiences, and to avoid liability issues. Nonetheless, using validated symbols usually helps wide comprehension, but may also lead to misunderstandings, especially when readers are not already acknowledged about their meaning [13].

Signage, both vertical and horizontal, is divided in:

- identification: namely identifies where the reader is;
- directional: typically an arrow or direction sign, which appears at junctions or nodes, used to keep moving towards a destination;
- informational: useful additional information or warning;
- regulatory: informs the reader of regulations and requirements, adding mandatory actions to perform;
- wayfinding: continuous and easily identifiable orientation support, helping users to find their way through different paths.

Vertical signs can be hanging from ceilings, walls or portals or occasionally be mounted on movable supports. Horizontal signs are usually provided on floors or ceilings, thanks to special adhesive and eye-catching tapes or directly painted on surfaces with special varnishes. Dynamic signs like L.E.D. Electronic Signs (scrolled lettering), Digital Signage Systems on large displays and mobile devices also represent handful tools to increase spatial awareness, showing 2D and 3D maps and views of the environment and with own position flag. They may serve to provide up-to-date directional instructions, visualizing assigned routes and the position of rescuers and safe areas.

**Printed materials.**

Posters, information sheets and placards aim is to give more detailed information to all passengers. Usually long printed texts target passengers who are in search for further details and have some spare time to stop and read. If pocket sized, they can be carried away to eventually give instructions where and when needed. They are a useful tool to communicate specific programs, procedures or warnings. A conventional safety card in the seatbacks is widely used by now onboard the aircrafts, but rarely handful safety information is easily found inside the transport hubs, providing all passengers and visitors explanations of safety procedures and recommended behaviour in the event of an emergency. The same contents, readjusted for audiences from all cultures and needs, should be reproposed on cards and placards and necessarily translated in several languages. To overcome cultural barriers, recommended actions should also be meaningfully described with images, like in instruction booklets, or motion graphics, short animations or videos displayed on screens and available as on-line resource.

**Public announcements.**

Audio public address systems and plasma screens are being used for widespread internal emergency communications, but when a major emergency occurs, broadcast mass media
communication channels are involved. Broadcast channels are effective when there is time pressure, and the objective of communication is to save/evacuate as many people as possible. Emergency communication teams should keep in strict contact with mass media, providing detailed and useful updates.

**Sensors and Internet of Things.**
Sensors permit to automate processes that currently take place through manual labor or complex data networks and a central primary node where data analysis take place. Closed-Circuit Television (CCTV) surveillance, Occupancy Thermal Sensors, and many other devices embedded in the transport hub environment or integrated into personal mobile devices can be used in automatic detection control systems. Internet of Things (IOT), defined as a system of interrelated unique devices with the ability to transfer data without external input, represents an innovation in safety management. Turning everyday products essentially into smart objects, directly communicating with each other and exchanging data, IOT is already expected to be employed soon in surveillance systems as in wearable protective personal equipment, to automatically monitor and analyze risk-related activities. In transportation hubs and networks it has a great potential against safety and security threats but still poses high concerns about “data ethics”. Especially, wearable sensors or sensors integrated in personal devices pose serious questions about the acceptable balance between safety and privacy: mustering and evacuation processes are closely related to the willingness of passengers and crew to wear and permit to be located through tracking sensors. Measures should be taken to avoid access to personal movement data outside authorized evacuation procedure.” [10] [73].

**Private Mobile Devices and Apps.** An experiment demonstrated that a voluntary geographic information location of pedestrian can be used to locate injured and reduce evacuation times, or to enable voluntary geographic information of pedestrians on evacuation routes to help rescue teams [74][75]. Functions like the one described should be sufficiently simple to be operable by people from different socio-cultural backgrounds, but it is important to keep in mind that ethical issues are involved, because some individuals may deny use of location data and that some others travel without any personal mobile device. Electronic communication channels encompassing e-mail, Internet, intranet and social media platforms also have the chance to reach personal devices. This channel can be used for one-on-one, group or mass communication. In some cases, one-to-one tailored communications may be delivered thanks to customized apps or registration data inputs on hub networks portals and web-pages. Groups oriented or massive communications are less specific but more efficient if time is short and the message is fixed, like for example an immediate evacuation order. When using this channel during emergency, care must be taken to craft messages with timeliness, consistency and clarity. “In 2011, the Pew Research Center found that over 40% of cell phone owners used their cell phone during an emergency” [76]. “During an emergency, evacuees rely on social media to communicate with family, friends, and coworkers, often finding accessibility to social media more reliable than trying to make a phone call.” [77].
Public space design. The way public space is designed affects not only safety and security in general, but may enable or disable social interaction. The prevention of hazards and threats strongly rely on mutual help and control. Culture expresses itself in public spaces, spaces are fields of interactions, spaces communicate through their shape: the importance of configuration, visibility, connectivity, measurability, presence of landmarks is directly related to crowds’ behaviour.

Assuming that:

- public space is the setting of interactions and communication;
- public space itself influences the way people interact with each other;
- public space can be culturally inclusive or not and it has the potential to enable cooperation

Defining areas over which users may exercise certain safety and security rights, like grouping seats, controlling in-group and out-group members’ behaviours, taking charge of parcels of terminal space, stimulates self-surveillance and familiarity.

“Ensuring that spaces are not over-crowded or too densely occupied is also a measure to create a safe feeling, thus reducing not only the likelihood of crime but the fear of crime which is also a risk factor. Culture-specific measures to improve the comfort of all cultures’ passengers, with their specific needs as groups and individuals, shall focus on shared values and stimulate careful behaviours towards space, objects and of course others”[78]. The openness of spaces, the use of natural light and the attention for natural finishes and materials, help people develop and maintain politeness and good disposition to others. The feeling of being in a safe and comfortable environment changes the way people behave.

In transport hubs, all different kinds of cultures and behaviours coexist. Transport-hub are, per antonomasia, the non-places defined by Marc Auge [79]. In his remarkable book, the author explicited how people change their behavior in specific “de-culturalized” context. Abstaining from judgment, a communication manager should keep in mind that transport-hubs are uncommon territories where all people act and behave as strangers between strangers and that all kinds of crowd behaviours may arise, following context-specific dynamics. Many researches studied crowd dynamics, through algorithms or observational studies of realistic or actual scenarios of egress during emergencies, including multicultural factors, but yet no specific multicultural space layout guidelines exist.