

o. Methodological sequence of participatory project

To achieve the specific objectives proposed: (1) to initiate the implementation process in accordance with the indications established in the Special Plan for Civil Protection and Emergency Care due to volcanic risk in the Autonomous Community of the Canary Islands (PEVOLCA by its initials in Spanish -Plan Especial de Protección Civil y Atención de Emergencias por riesgo volcánico en la Comunidad Autónoma de Canarias-); (2) to generate a meeting point that fosters a discussion forum that has continuity over time and facilitates the promotion of collaboration between agents linked to the implementation of the Island Action Plan against Volcanic Risk (PAIV by its initials in Spanish -Plan de Actuación Insular frente al riesgo Volcánico de la isla de Tenerife-); (3) to detect shortcomings, strengths, procedures, capacities and needs of the PAIV by the agents involved; and (4) to generate information-knowledge collectively for the definition, proper orientation and elaboration of the implementation, a methodological sequence is designed that begins by identifying the needs to initiate the participatory process and continues with direct contact with the agents from the participatory workshop that includes a panel of experts (*Second Island Conference on Civil Protection and Emergency Management* - Volcanic risk management: a multisectoral vision) in which operatives participating in the volcanic emergency in La Palma shared their experiences. Subsequently, a stage of analysis, processing and systematization of the information for the drafting of the implementation strategy is initiated, ending the project with a presentation, collection of contributions and validation of the next steps in the short and medium term.

Methodological stages						
Month 1	M 2	M3	Month 4	M5-7	M8-9	M10
Stage 1: identifying needs			Participatory workshop	Stage 2: analysis, information processing and drafting of the implementation strategy	Presentation, feedback and validation	Final delivery

Table 1: proposed structure for the participatory project. Prepared by the authors.

1. Agent mapping

For the agent mapping it was necessary to review the objectives of the research, the context, the time and resources allocated to carry it out. The use of PAR methodologies in risk planning and management makes sense once these tasks involve a series of actions where administrations, scientific entities, associations, economic sectors and the population as a whole have certain quotas of responsibility and commitment [1]. Throughout the project, a stakeholder analysis was conducted to define participation, taking into account: (a) which stakeholder groups should participate at the island scale with the objective in mind; (b) in which decisions participation can be assured; (c) when it is appropriate to promote a participatory project or process; and (d) what commitment is available in the medium and long term to provide continuity to the project and carry out actions [2].

This took into account: (a) the objective of initiating a long-term island-wide preparedness process, driven by the insular administration and government, with a given responsibility and competences; (b) the budget allocated for this project and the plausible commitment for the continuation of the project, due to the proximity of the elections to the autonomous Parliament, to the Island Councils and municipalities; (c) the local context and the circumstances in 2022 already mentioned; and (d) the lack of previous meetings for DRR due to the volcanic threat and the lack of knowledge about the predisposition for the coordination and development of the implementation with the quotas of responsibility and commitment that this implies for each of the parties. Thus, efforts are focused on generating the first meeting space with the participation of: (1) all the organisations and entities related to the Local Action Organisation Chart planned in the PAIV (Fig. 1); (2) all areas of the

Island Council that could develop actions in a preparation process; (3) representatives of the local councils of the whole island, or at least of the municipalities with a *Very High* and *High* threat level in the Risk Assessment of the Plan; and (4) representatives of emergency management in La Palma, both from the Island Council of La Palma and the Government of the Canary Islands.

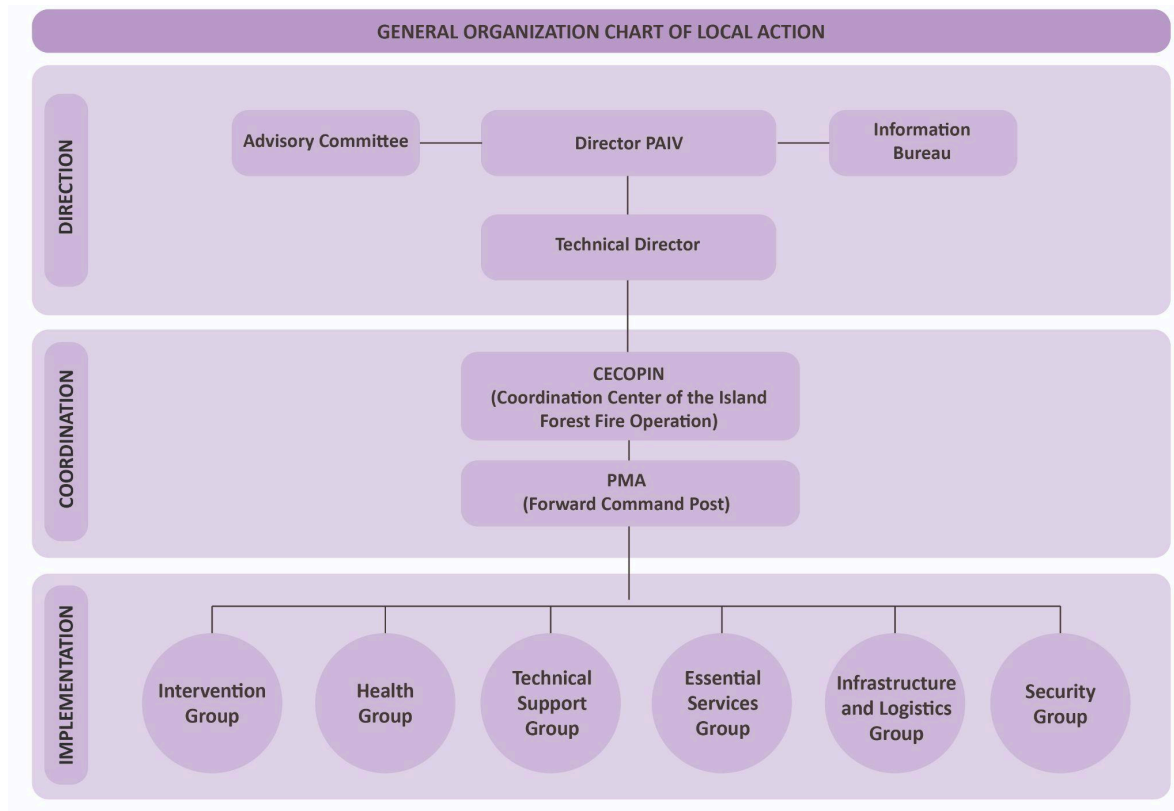


Fig. 1: General Organization Chart of Local Action [5].

This implementation process should progressively gain organizational complexity and involve a greater number of actors [3, 4], in order to gradually develop actions, review, and improve the implementation and preparedness proposals.

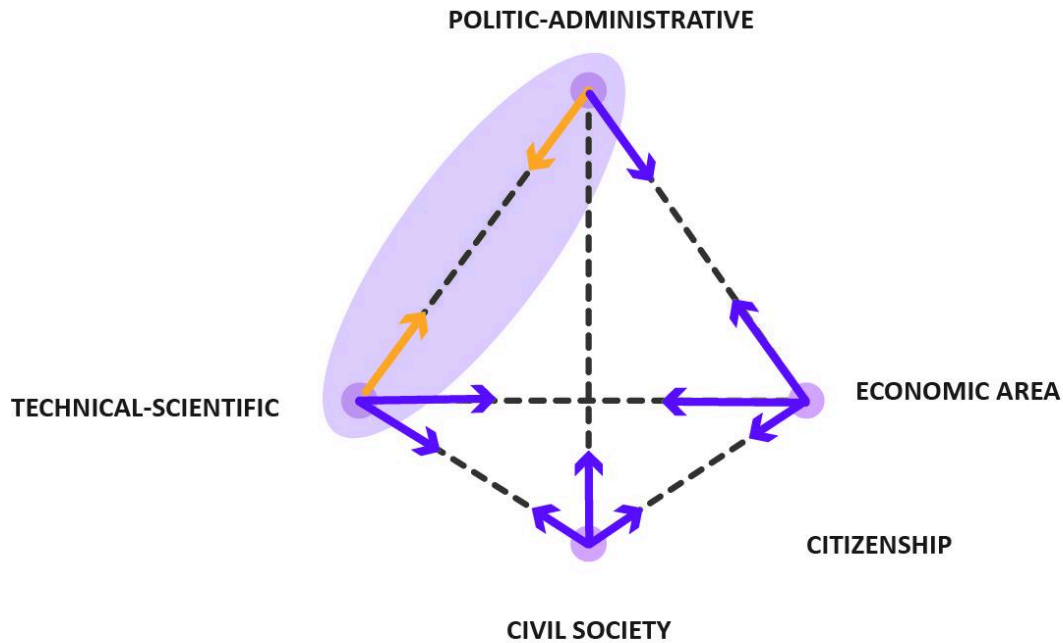


Fig.2. Activation of changes from the three categories of actors and possible breakdown of actors and agents.
Source: adapted from Marta Donadei [6].

Following the equilateral construction of the triangle proposed by Marta Donadei [6] (Fig. 2), based on De Manuel Jerez [7], the construction of a collective learning process where *the responsibility for making decisions that affect the habitat falls on society as a whole is observed in the scheme (Fig. 2), based on the creation of spaces for participation and consultation where politicians, technicians and citizens are called upon to share the will to initiate a long process of consultation, co-creation and cooperation* [6]. This drive has started from the technical-political base. Once this base has been built (to be strengthened), work must be done to involve the missing vertex to increase the impact on the final objective of reducing risks.

2. PAIV information summary, preliminary questionnaire and design participatory workshop

After the initial agent mapping has been carried out, invitations to all entities and organisations are formalised. Once the dialogue with each of the agents has begun, a preliminary questionnaire is conducted in order to explore the degree of knowledge that people had about the existence of the PAIV and its content. In addition, suggestions were collected related to the PAIV area or subplan in which they believed they could make the most significant contribution of reflections and experiences, or the one that could be most useful for their organization and team. The information gathered is then organized according to the PAIV sub-plans and an informative process is initiated. In order to carry out this process, each chapter of the Plan is summarized, simplifying and adapting the content with graphic material and summaries to help reading and understanding, and to facilitate possible contributions. Public access to all the contents of the Plan is also ensured through the Council's website.

Subsequently, with the purpose of generating a meeting space to promote collaboration among agents and the participatory drafting of the strategy, the design of the participatory workshop is initiated. It is important to remember that the workshop takes place within the framework of the *Second Island Conference on Civil Protection and Emergency Management. Volcanic risk management: a multisectoral vision*. The purpose of this conference was to promote knowledge and awareness of volcanic hazards.

At the first session, held on November 16, 2022, a day of discussion was held [8]. This meeting was designed as an open space for the exchange of ideas, where, through talks, video projections and presentations, the transmission of knowledge, meetings, interaction and debate were encouraged. The second session, on November 17, was planned as a participatory workshop, one of the key tools for actively involving participants (point 1). This workshop was organized as a dynamic and collaborative space in which to share knowledge, reflections, doubts, problems, generate proposals and plan concrete actions.

The participatory workshop is related to three of the specific objectives of this stage of the research, described in point 0: (2) to generate a meeting point; (3) to detect shortcomings, strengths, procedures, capacities and needs; (4) to generate information-knowledge collectively.

3. Participatory workshop

The participatory workshop took place throughout the morning, having organized three main dynamics in order to deepen the different topics and advance in the planned objectives. Prior preparation sought to motivate knowledge of the approved PAIV and to explain the objectives of the meeting, making it easier for each participant to take an active part, knowing that they would benefit from the knowledge and that they would be jointly responsible for the agreements reached.

The workshop began with a presentation of the Action Plan, the purpose and objectives of the meeting, the methodology and schedule of the dynamics planned throughout the morning and how this day was part of the preparation process that is being promoted with the drafting of the implementation strategy. The morning was conducted as shown in Table 2. Each of the dynamics, except for the plenary session, was carried out in smaller groups of 6 to 12 people, organized according to the sub-plans of the Plan: (1) Evacuation Plan; (2) Supply, shelter and social assistance plan; (3) Restoration of essential services plan; (4) Island transmission plan; (5) Communication and information to the population plan.

PARTICIPATORY WORKSHOP	DESCRIPTION OF THE DYNAMIC
PRESENTATION	presentation of the Action Plan, the purpose and objectives of the meeting, the methodology and schedule of the dynamics planned throughout the morning and how this day was part of the preparation process that is being promoted with the drafting of the implementation strategy.
ACTIVITY 1: BRAINSTORMING	Presentation of the content of the sub-plan that corresponds to each group by the facilitator, involving the participants and using graphic material created for each group. Subsequently, contributions, reflections, needs related to the Plan that each group is working on are presented.
BREAKFAST	Space for informal meetings and networks
DYNAMIC 2: PRIORITIZATION AND PLANNING OF ACTIONS FOR IMPLEMENTATION	Priorities of the contributions made in Dynamic 1 are identified through a prioritization matrix relating them to the courses of action of Chapter 7 of PAIV - Implementation: (1) Fine-tuning. Necessary infrastructure for the activation of the PAIV; (2) Assignment and training of the components involved in the PAIV; (3) Implementation of the necessary protocols, conventions and agreements; (4) Education and qualification programs; (5) Information campaigns for the population; (6) Training; (7) Maintenance and actions are planned based on the results. The dynamic is closed with a summary and joint evaluation of the process carried out and it is decided who will be in charge of sharing the work done in the plenary.
PLENARY	Sharing of the work done by groups with all the participants, collection of contributions or reflections on the work done and validation of the proposals. General input to the Plan, or to the workshop, is also provided online, in case there is not enough time to address all the issues. The plenary ends with an evaluation and closure, recording all the contributions.

Table 2: Structure of the participatory workshop. Prepared by the authors.

In this way, each group has had: (1) a facilitator person to develop the dynamics, in charge of fostering a participatory and horizontal environment, of transforming challenges or debates into learning and concertation opportunities, and in dynamizing the whole process; (2) a backup person to provide support in everything that was necessary throughout the workshop; (3) support graphic material for each of the participants, and the same graphic material adapted for group work; (4) support stationery; and (5) people from outside the groups who play the role of observers, support and time control for all the groups. Subsequently, all these people were responsible for facilitating, taking notes and providing support during the plenary.



Fig. 3 and 4: Photographs of the participatory workshop: plenary. Prepared by the authors.

5. Stage 2: analysis, information processing and drafting of the implementation strategy

The methodological proposal for the development of this phase included: (1) the organization, analysis and systematization of the information gathered; (2) presentation of the results with the participants in the workshop carried out to validate the contributions, reach consensus on the follow-up indicators, the planned time schedule, and incorporate possible observations and modifications; and (3) review of the implementation and delivery strategy. The development of stage (1) is shown below (Fig. 5).

The systematization and processing of all the content generated in the Workshop begins by organizing and analyzing the information gathered and recorded during the Meeting. Minutes and summary notes, visual records such as diagrams and photographs of the materials produced and lists of observations in the group dynamics and plenary sessions were used for the collection and recording. The organization of the material was developed by grouping the information according to the contents of the Action Plan, corresponding to Chapter 5 and each of its sub-plans on the one hand; and Chapter 7 and the courses of action, once prioritized (Dynamic 2), on the other; combining repeated topics. In addition, a content analysis of all the contributions was carried out, grouping them by thematic categories (Table 7); and a second analysis, according to the relevance observed by the participants, with the contributions prioritized and already linked to the Courses of Action (also explained below). All the data from the workshop were recorded and organized digitally so that they could be used as a reference for contributions that, although they may exceed the competencies of the Service or institution, or may not have been prioritized by the participants themselves, could be taken into account later or in possible future processes in volcanically active territories. The contributions were analyzed and organized using a spreadsheet and methodological processes of content analysis and coding. Fig.17 attempts to schematize the process carried out.

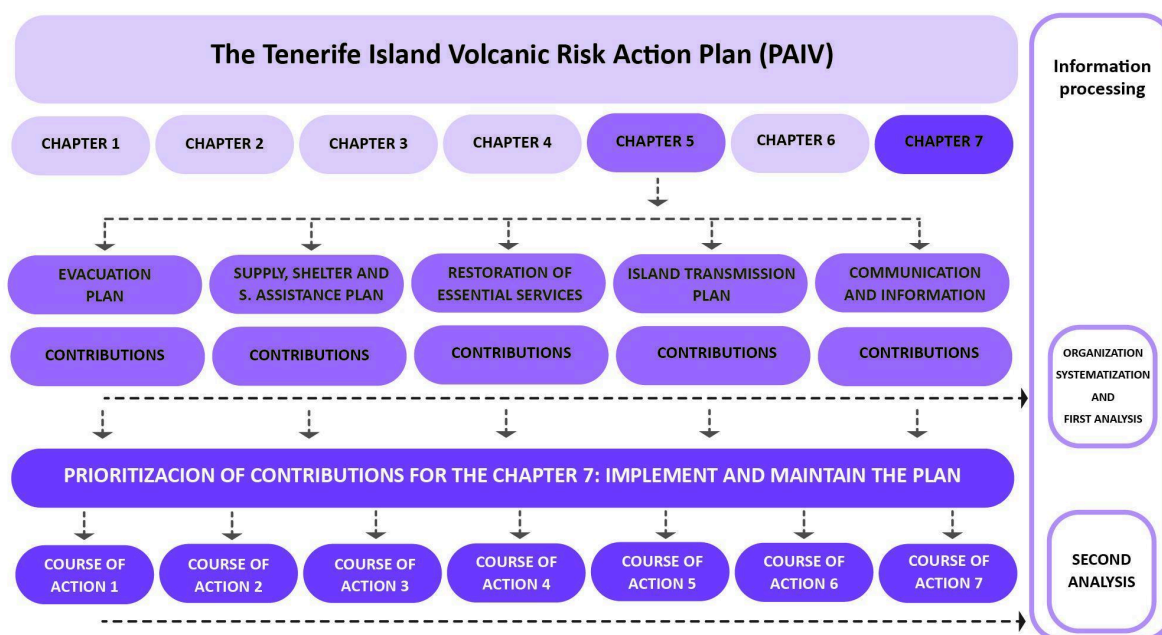


Fig. 5: process of collecting, organizing and systematizing information. Prepared by the authors

Once all the information generated in Dynamic 1 was organized, a first analysis was made taking into account the thematic categories in Table 3. From this analysis it can be deduced that: (1) the number of contributions for each of the working groups is between 30 and 55 contributions per group; (2) the total of all the contributions is around 220; (3) of all the contributions, most of them were related to the theme category 1: infrastructure, means and resources in all the groups, except in Table 5: communication and information, where the largest number of proposals focused on issues related to category 3-Training and Capacity Building (24%) and 4-Communication and information (22%).

Theme categories	
1.	Contributions related to Infrastructure, means and resources
2.	Contributions related to the criteria, approach and procedures of the PAIV
3.	Contributions related to Education and Training
4.	Contributions related to Communication and information
5.	Contributions related to Coordination, organizational structure and functions

Table 3: analysis categories of the contributions made in Dynamics 1. Prepared by the authors.

The second analysis (Fig. 5) is carried out with the information collected already prioritized and related to the lines of action foreseen in Chapter 7 of the PAIV (Table 4). Of the 220 contributions made in the first dynamic, 79 were prioritized and organized according to the courses of action (Dynamic 2).

Courses of action
Course of action 1: fine-tuning required infrastructure for PAIV activation
Course of action 2: assignment and training of the components involved in the PAIV
Course of action 3: establishment of the necessary protocols, agreements and arrangements with the different administrations and organizations
Course of action 4: development of education and qualification programs

Course of action 5: public information campaigns
Course of action 6: training exercises
Course of action 7: maintenance

Table 4: Courses of Action of Chapter 7. Prepared by the authors.

This second analysis was developed around two major groups: (1) fit in the subplan, organized according to the theme categories of the PAIV itself (25 established categories); and (2) operational situations in which the action should be carried out (green light, orange light, red light, or if it is an action related to all operational situations). The results highlight the relevance given to the green traffic light (readiness) operational situation: 57% of the contributions, which contrasts with the 4% related to the orange and red traffic lights. This makes sense with the parallel analysis of which theme category of the PAIV itself the prioritized contributions would fit into: 27% of the contributions fall into the *Means and Resources* category and 15% into the *Training and Capacity Building* category.

The following are a series of contributions that are particularly relevant to the proposed approach of this research: (1) establishing internal communication channels and tools (between entities and institutions involved); (2) training of informants in the communities; (3) synthesizing information and adapting it for the recipient groups; (4) removing the fear of alerting the population in preparedness processes and trusting them; (5) informing and training the population to act responsibly in emergency situations; (6) generating information pills for visitors and local population; (7) early warning network through neighborhood associations; (8) implementation of emergency plans by neighborhoods in Semáforo verde; (9) identifying small associations (third sector) that can facilitate and collaborate in emergency preparedness and management; (10) improving institutional coordination and coordination with the entities involved; (11) conducting drills in all areas and sub-plans of the PAIV.

Finally, work begins on each of the Courses of Action (Table 4), analyzing the determinations found in the PAIV in order to transform them into necessary actions already foreseen in the PAIV, and incorporating those generated during the participatory workshop. It is important to highlight that when planning the actions, the degree of relevance of the actions for the participants was taken into account. However, in view of the final strategy document, it should be noted that the presentation proposed to finalize the project could not be carried out, thus making it difficult to obtain the validation and possible feedback and modifications.

The entities represented in the participatory workshop are presented below. In some cases it was technical personnel, in others it was managerial, coordinating or political personnel. This diversity has enriched the variety of contributions and the knowledge generated. Table 5 lists the entities that presented papers at the *Second Island Conference on Civil Protection and Emergency Management*, presenting, among other matters, lessons learned in La Palma in 2021, and Table 6 lists the institutions or organizations that participated in each of the workshop tables.

Second Island Conference on Civil Protection and Emergency Management. Volcanic risk management: a multisectoral vision [8]

Tenerife Island Security Directorate and Technical Co-Direction of PEVOLCA during the volcanic crisis on La Palma 2021

Civil Protection and Emergency Attention Service of the Government of the Canary Islands

Technical Service of Security and Civil Protection of the Tenerife Island Council.

Department of Public Administration, Justice and Security

General Sub-Directorate for Civil Protection and Emergencies of the Government of the Canary Islands - PEVOLCA

Management
Operations Group during the volcanic emergency in La Palma 2021
Geophysical Center of the Canary Islands - National Geographic Institute in the Canary Islands: PEVOLCA Scientific Committee
Geological and Mining Institute of Spain-CSIC, PEVOLCA Scientific Committee and the Advisory Committee of the Civil Protection Emergency Plan of La Palma (PEINPAL by its initials in Spanish).
Gas Geochemistry and Thermography at INVOLCAN and PEINPAL Scientific Committee
Military Emergency Unit
Tenerife Island Fire Prevention, Fire Fighting and Rescue Consortium
Logistics and Emergency Management Center of the Red Cross in the Canary Islands
Candelaria and Icod de los Vinos Town Halls: volunteers
Civil Guard Operations Area
General Corps of the Canary Islands Police
Communications Office of the Department of Security of the Government of the Canary Islands
Canary Islands Radio Television

Table 5: Entities in charge of the presentations of the *Second Island Conference on Civil Protection and Emergency Management*. Prepared by the authors.

Work table: small groups of 6 to 12 people	entities, institutions, areas or organizations
Table 1: EVACUATION	Tenerife Island Council: Safety and Civil Protection Technical Service
	Tenerife Island Council: Tourism
	Civil Guard
	Canary Islands Emergency Service
	Garachico Local Police
	Red Cross
	Consortium of Firefighters of Tenerife
	Military Emergency Unit
	Guía de Isora Town Hall
	Municipal Operational Coordination Center Santa Cruz de Tenerife
	Emergency and Security Coordination Center (CECOES by its initials in Spanish)
	Interurban Transportation of Tenerife (TITSA by its initials in Spanish)
	Chair of Tourism of the University of La Laguna
	La Palma Island Council
Table 2: SHELTER	Red Cross
	Insular Institute of Social and Socio-sanitary Attention of Tenerife
	Canary Health Service and the ULL (University of La Laguna)

	Ashotel: Hotel and Extrahotel Association of Tenerife, La Palma, La Gomera and El Hierro.
	Military Emergency Unit
	Consortium of Firefighters of Tenerife
	Local Police of Guía de Isora
	Local Police of El Tanque
	Civil Protection Sta. Cruz de Tenerife Town Hall
	Tenerife Island Council: Safety and Civil Protection Technical Service
Table 3: REHABILITATION OF ESSENTIAL SERVICES	Spanish Electricity Network
	Tenerife Island Water Council
	Tenerife Island Council: Safety and Civil Protection Technical Service
	Aena Tenerife (State Company that manages airports in Spain)
	Santa Cruz de Tenerife Port Authority
	Civil Protection and Emergency Attention Service of the Government of the Canary Islands
	La Guancha Town Hall
Table 4: TRANSMISSIONS	Coordination Center of the Island Forest Fire Operation (CECOPIN by its initials in Spanish)
	Tenerife Island Council: Information Technology and Communication Service
	Brifor Operation
	Consortium of Firefighters of Tenerife
	Sta. Cruz de Tenerife Town Hall: Civil Defense
	Emergency and Rescue Group (GES by its initials in Spanish)
	Canary Islands Emergency and Security Network
Table 5: COMMUNICATION TO THE PEOPLE	Emergency and Security Coordination Center
	Tenerife Island Council Press Unit
	Communications Office of the Department of Security of the Government of the Canary Islands
	Tourism Directorate of the Tenerife Island Council
	Environmental Education Unit of Tenerife Island de Council
	State Meteorological Agency (AEMET by its initials in Spanish)
	Santa Cruz de Tenerife Town Hall: Communication Office for Public Safety
	National Geographic Institute, Geophysical Center of the Canary Islands
	Insular Council of Natural Environment Management and Safety Area
	Communication Department of Tourism of Tenerife
	Tenerife Island Council: Safety and Civil Protection Technical Service

Table 6: List of participating entities, areas, institutions, organizations. Prepared by the authors.

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