D3.3 First release of citizen engagement methodology

Project Acronym	SILVANUS
Grant Agreement number	101037247 (H2020-LC-GD-2020-3)
Project Full Title	Integrated Technological and Information Platform for Wildfire Management
Funding Scheme	IA – Innovation action

DELIVERABLE INFORMATION

Deliverable Number:	D3.3
Deliverable Name:	SILVANUS First release of citizen engagement methodology
Dissemination level:	PUBLIC
Type of Document:	DEMONSTRATOR
Contractual date of delivery:	31/03/2023 (M18)
Date of submission:	31/03/2023 (M18)
Deliverable Leader:	HB
Status:	Draft
Version number:	02
WP Leader/ Task Leader:	WP3 –SIMAVI; T3.5 - HB; T3.6 - MDS
Keywords:	Silvanus, Citizen engagement, Wildfire, Mobile app, CEP
Abstract:	Deliverable 3.3 provides the overall framework for citizen engagement in all phases of wildfire management. The framework describes the means and methods to engage citizens in wildfire prevention, retention and environment restauration, communication channels, messages and ways of involving local citizens, and public and private organisations used for this purpose.

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V1.0	31.03.2023	HB, MDS	Revised for submission based on the comments

Document History			
Version	Date	Contributor(s)	Description
V0.1	30.08.2022	HB	Table of contents/ Initial outline
V0.2	22.12.2022	HB	Revised structure
V0.3	27.01.2023	HB	Revised structure
V0.4	08.03.2023	Many	Revised content
V0.5	16.03.2023	Many	Revised for submission for internal review
V1.0	31.03.2023	HB, MDS	Revised for submission based on the comments
V2.0	05.09.2023	HB, MDS, KEMEA, MD, HRT, UISAV, SYNC, PUI, EDP	Revised for submission based on the reviewers comments

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List of acronyms and abbreviations

CEP	Citizen Engagement Program
CEA	Citizen Engagement App
EU	European Union
KPI	Key Performance Indicators
WP	Work Package
EmerPoll	EmerPoll is a poll management and aggregation framework primarily intended for Firefighters and Emergency Response Practitioners

List of beneficiaries

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48	COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION	CSIRO	Australia
50	FUNDACAO COORDENACAO DE PROJETOS PESQUISAS E ESTUDOS TECNOLOGICOS COPPETEC	COPPETEC	Brazil

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1. Executive summary

SILVANUS is envisaged to develop a platform for environmentally sustainable and climate resilient forest management in consultation with the stakeholders. The SILVANUS Citizen Engagement Programme (CEP) is devised to engage citizens towards improved awareness about wildfires and related risks, as well as prevention and safety measures to establish and nurture social and cultural attitudes and practices that lead to reduced wildfire hazard caused by human negligence or intentional activity. This document, deliverable D3.3, is related to Tasks *T3.5 - Citizen engagement programme for preventing wildfire* and *T3.6 - Mobile application for citizen engagement.* The deliverable is of type demonstrator relating to demonstrating a Citizen Engagement mobile application developed within the project, hereafter referred to as CEA. This report, therefore, acts as complementary documentation accompanying the demonstration of the first release of the CEA.

Furthermore, this report aims to present an outline of the CEP as a whole to render the context in which the CEA is being developed. Additionally, as the report's title suggests, this document also includes the first release of citizen engagement methodology. Therefore, the report covers the most relevant aspects of the overall CEP, starting with a presentation of the citizen engagement methodology, including a literature review covering conceptual foundation and citizen engagement practices in emergencies and wildfires, a citizen engagement framework, and preliminary related needs and requirements. Different tools were designed and used to develop CEP, including Citizen engagement study protocol and planning and design tools. CEA architecture, its different modules, fire reporting and notification using the Emerpoll (a poll management and aggregation framework primarily intended for Firefighters and Emergency Response Practitioners) are described and explained next. Different CEP activities have taken place, and others are planned, including poster campaigns and an educational course outline, and training workshops in a pilot event, which are all presented. The ethical consideration and related KPIs are also touched upon.

Deliverable D3.3 reports on the progress of the project in relation to the CEP activities up to the submission date (March 2023); however, the work in CEP continues on all fronts throughout, and major updates are expected by the end of the project. As the project proceeds, the CEP will be developed and fine-tuned according to the data from tests and validation of all its components, it will continue to address citizens' needs as discovered in further studies and pilots, and it will engage with citizens on a broader scale. Therefore, the teams of T3.5 and T3.6 regard their contributions as an integrative part of the whole project and its final products and services.

2. Scope of the document

2.1 Background

Forests cover almost one-third of the Earth's land area and, hence, form a vital global resource with financial, political, and socio-cultural implications. Globally, as reported by FAO[1], forests provide over 86 million green jobs and support the livelihoods of many more people. The positive impacts on human well-being and health, and the role of forests as a key cultural heritage have been highlighted.

Destruction of this natural capital bears adverse societal implications. However, the spread, intensity, and frequency of wildfires are growing due to climate change, as supported by recent data (e.g., MacCarthy et al., 2022)[2]. According to the *Annual Report on Forest Fires in Europe, the Middle East and North Africa* published by the Commission's Joint Research Centre[3] the fire season in 2021 was the second worst in the EU territory in terms of burnt area since the records began in 2006 with over 10,000 square kms burnt. Furthermore, according to the 2021 Annual Report by the European Forest Fires Information System (EFFIS) "around 96% of wildfires in the EU are caused by human actions" (page 5)[4].

Due to the key role played by humans in causing, managing, or having to live with the consequences of forest wildfires, the Citizen Engagement Programme (CEP) is a central aspect of the project, with the aim to raise awareness among citizens about the risks and causes of wildfires, engage them in sound practices to prevent or manage wildfires, and lead to a shift in attitudes and improved knowledge, and practices.

2.2 The scope of the Citizen Engagement Programme (CEP)

The SILVANUS CEP is devised to improve citizens' awareness and engagement about wildfires and related risks, as well as prevention and safety measures to establish and nurture social and cultural attitudes and practices that lead to reduced wildfire hazards caused by human negligence or intentional activity. CEP activities are being designed to target raising citizens' awareness and engagement concerning all phases of wildfire management, including A) Prevention, B) Response and C) Restoration. The aim is to develop innovative communication strategies for:

- Dissemination of knowledge and awareness about environmental assessment, climate conditions and weather forecast patterns, and how these factors interact with human activity. Towards this, various engagement modalities have been identified, including the use of different social media channels, social campaigns, stakeholder consultations and engagement efforts, and more, in addition to the CEA, which will all be deployed as more and more information becomes available and consolidated through the SILVANUS platform.
- Improved engagement of citizens in forest regions to motivate and empower them to take active steps towards forest protection, sustainability and wildfire prevention. For this, multiple forms of engagement have been identified, some of which have already been rolled out, some are currently

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[1] https://www.fao.org/state-of-forests/en/

[2] https://www.wri.org/insights/global-trends-forest-fires

[3] https://publications.jrc.ec.europa.eu/repository/handle/JRC130846)

[4]https://effis-gwis-cms.s3.eu-west-1.amazonaws.com/effis/reports-and-publications/annual-fire-reports/Annual_Report_2021_final_topdf1.pdf

in their preparatory phase, and others will be deployed later in the project life cycle as the SILVANUS platform matures and engagement functionalities can be included.

- Improved engagement and awareness relating to mitigating efforts during wildfires to maximise compliance towards the authority's response and maximising efficiency, to manage adverse consequences of forest fires (during the event and shortly after).
- Improved awareness and education regarding the forest restoration efforts, following wildfires, and motivating people towards active involvement and cooperation during the process of reforestation, highlighting the social, financial, environmental, and climate benefits of reforestation, both for local and extended communities.

The CEP strategies also consider the region's sociocultural framework and the local communities' characteristics to ensure maximum reach and involvement. Towards this, various studies have taken place, and others will take place in the coming months to learn more about the local communities and their specific needs and circumstances. In addition to document studies, secondary research, surveys, data collection and engagement with citizens through the CEA (when fully operational), the different pilot opportunities are also utilised for this purpose to gather data.

2.3 Scope and aim of this document

The release of deliverable D3.3 is related to Tasks *T3.5 - Citizen engagement programme for preventing wildfire* and *T3.6 - Mobile application for citizen engagement*. The deliverable aims to provide an outline of the Citizen Engagement Programme (CEP) developed within the SILVANUS project to render the context in which the Citizen Engagement mobile Application (CEA) is being developed. Furthermore, this report acts as complementary documentation accompanying the demonstration of the first release of the CEA.

More specifically, the report covers the most relevant aspects of the overall citizen engagement programme and provides the following:

1. Citizen engagement methodology, including a literature review covering conceptual foundation and citizen engagement practices in emergencies and specifically wildfires, a citizen engagement framework and preliminary related needs and requirements;
2. Citizen engagement study protocol and also a related planning and design tool;
3. CEA architectures and design;
4. Different activities have already been carried out and are planned to take place towards Citizen engagement, including poster campaigns, an educational course, and training and workshops in a pilot event.
5. Plan and method for testing and validating CEP activities Guidelines, inspired by the general citizen involvement and engagement principles.

This document has also referred to some parts of deliverables D2.1 (Majilingova et al., 2022), D1.5 (Kapellakou et al., 2022), D2.3 (Lazarou et al., 2022), and D8.1 (Anastasopoulos et al., 2022).

2.4 Purpose of the citizen engagement and its relation to the objectives of the project

The causes of wildfires can vary, however, the one mentioned most often in statistics and research is human neglect and lack of adequate caution and preventative measures. On a global level, the picture is rather complex, as the percentage of wildfires caused by human factors varies widely depending on the region and the specific circumstances. Whereas, in some areas of the world, lightning is a common cause of wildfires, in other areas, human activities such as agricultural burning and land-use changes are the primary causes of fires. According to the National Interagency Fire Center[5], in the United States, human-caused wildfires accounted for 84% of all wildfires between 2001 and 2020. This includes wildfires caused by campfires, debris burning, arson, and other human activities. In Canada, a similar pattern is observed, with human-caused fires accounting for approximately 60% of all wildfires. This can range from the intentional set of fire for whatever reason to the lack of understanding of the results of one's actions or absentmindedness. Human actions are also similarly reported to be the leading cause of wildfires (around 96%) in the EU (e.g., see European Forest Fires Information System - EFFI[6]).

It is important to note that even when a wildfire is caused by natural factors such as lightning, human activities such as inadequate forest management and climate change can exacerbate the severity and impact of the fire, as mentioned above. Therefore, natural and human factors need to be considered to prevent and manage wildfires. However, while humans often cause wildfires, they can also be utilised as active agents in preventing wildfires, mitigating the actions and behaviours that lead to these disasters. Citizen awareness, level of preparedness and understanding, and active engagement in fire prevention can help reduce the frequency of fires and diminish the harm they bring. Some research indicates that individual actions have only limited effect on effective wildfire management (Jakes et al., 2007), but in combination with community preparedness uniting collective, organisational and individual attempts around the whole cycle of wildfire management can result in positive changes (Gorriz-Mifsud et al., 2019). Therefore, even if individual actions may not be the decisive factor, local and broader groups' collective actions and activities can positively affect and sustain both preventative and mitigative efforts.

Thus, among other means, SILVANUS is looking into various ways to engage citizens in general wildfire prevention, response and forest restoration. It is also looking into how SILVANUS tools and services could be used to enhance citizen engagement and, in this way, to mobilise the power of human action towards wildfire prevention and management. The CEP activities and methods will not only be described and created but they will also be tested and assessed using various evaluation tools and in real pilot settings to provide feedback and review that will lead to the customisation and improvement of the elements included in the CEP.

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[5] https://www.nifc.gov/fire-information/statistics/wildfires

[6] https://effis.jrc.ec.europa.eu/

3 Citizen engagement methodology in the management of wildfire process

3.1 Conceptual foundation

Two complex concepts related to this document that require explanation are: "a citizen" and "citizen engagement". From the legal point of view, citizen concept relates to the legal relationship between the individual and the state. According to the Council of Europe (2020), a citizen is a **person (individual)** who, by place of birth, nationality of one or both parents, or naturalization is granted full rights and responsibilities as a member of a nation. However, modern understanding of citizenship is not only a legal construction, but relates "to one's personal sense of belonging, for instance the sense of belonging to a community which you can shape and influence directly" (Council of Europe, 2020), in other words, citizens are distinguished not only by the legal status, but also by their attitudes and participative actions, which is an important distinction from a layperson or a member of public, that will not possess such engaging attitudes, not to speak of taking appropriate actions. As well as citizens in legal terms, they can be of any age, occupation, sex or social and economic status. This meaning of "citizen" is used in such terms as "citizen science" (Hakley et al., 2021), "citizen participation" (Ianniello et al., 2018) or "environmental citizenship" (Hadjichambis et al., 2020). We also should mention that the categories of citizens can be very different and depend on the composition of the inhabitants in a particular area. Thus, it is challenging to define the categories of citizens.

Usually, citizens as individuals are contrasted with government, public institutions (be they local authorities or professional organisations), and with business organisations (Ianniello et al., 2018). Participatory research denotes groups representing economic, social or public interests as **stakeholders**. As a rule, these groups are organisations of some kind, e.g., industries, associations, schools, etc. These organisations consist of citizens, thus, there is no clear border between citizens and the representatives of such groups (Lindenow and Böhler-Baedeker, 2014). Moreover, often certain groups of citizens are organised as a result of their active participative interest and citizens can be easier reached through these groups as a result. Besides, any single citizen can belong to several interest groups and participate in several stakeholder organisations.

*In this report, we interpret the concept of **citizen as active individuals** who can be distinguished by their attitudes and participatory behaviour. Citizen engagement program aims to develop responsible attitude and behaviour towards wildfire or, in other words, to educate citizens out of the members of the public.*

There are many definitions of citizen engagement in scholarly literature and various reports. They vary from the redistribution of power between authorities and citizens' involvement in decision-making processes and participation in governance. We have chosen one that emphasises the communication between the involved actors that suits the purposes of the SILVANUS citizen engagement programme:

Citizen engagement "*is an interactive two-way process that encourages participation, exchange of ideas and flow of conversation between the citizens and the government. It reflects willingness on part of government to share information and make citizens a partner in decision making.*" (Singh and Kaushik, 2020, p. 50).

The World Bank, in a similar manner, defines citizen engagement as the "*two-way interaction between citizens and governments or the private sector ... that give citizens a stake in decision-making, with the objective of improving development outcomes*" (World Bank, 2018, p. ix), which adds the vital layer of

working towards improving outcomes, an essential aspect of both forest fires management and reforestation efforts management.

This definition lacks an important element of concerted participatory action of citizens that results from the communication and partnership in decision-making together with authorities and professional organisations. However, we regard two-way communication as one of the central measures within SILVANUS CEP, as we see significant importance in capturing citizens' attention and improving perceptions of wildfires, understanding one's own role in preventing them and acting responsibly in cases of fire.

We have not found many models of citizen engagement in wildfire management. However, the Australian Institute for Disaster Management has developed one for any emergency management in general (Figure 1) related to the context and purpose of community engagement, such as information, consultation, participation, collaboration, and empowerment.

Figure 1 - Community engagement model for emergency management (Australian Institute for Disaster Management, 2013, p. 6)

This model sets contexts and purposes for citizen engagement, identifying the actions of already engaged citizens and organisations. However, it does not explain how to capture citizens' attention, change their perception of wildfires, or understand their role in preventing and managing wildfires or ways to attract them to participate in the activities suggested in the model. We regard citizen involvement in decision-making and participation in activities as a change our citizen engagement programme needs to achieve. Thus, the citizen engagement programme is a tool to make a difference and cause changes in people's behaviour mainly through informing, persuasion, and education.

Therefore, we have added media effects theory to this model, suggesting that audiences can acquire knowledge, attitudes, emotional responses and change behaviour through interactions with media (Bandura, 2001; Potter, 2012) as a conceptual foundation for developing a citizen engagement approach. Despite being criticised for its simplistic approach and belief in media's direct impact on individuals, this model gives us a tool to approach the design of the CEP and analyse the literature on citizen engagement in wildfire management from active communicators' positions. However, we need to make the same adjustment here as for the chosen definition of citizen engagement – the communication model we apply is not only bidirectional but also participatory and involves multiple actors with multiple communication needs and ways of interacting with each other. In addition, we are interested in micro and media-level effects (on individuals and local communities) and will relate them to the needs of the SILVANUS project.

Therefore, we have treated entire citizen engagement as a result of bidirectional communicative activities helping to attract and engage citizens and their organisations in managing wildfires and data exchange with them and professional organisations during different phases of the fire management process. Table 1 below summarises a simplified model of communication measures (first column on the left) concerning the wildfire management phases (three middle columns) and desired communication effects (horizontal orange lines). The final column (the column to the right) includes the representatives of the authoritative bodies (marked as "the government" from the adapted definition of citizen engagement above) with the responsibility to share information and power with citizens in the decision-making and action.

The middle cells in the overlap of the types of activity and wildfire management phases provide an aim for any CEP activity related to a concrete phase of wildfire management. These aims are expressed in individual media effect terms, such as triggering, altering, reinforcing, etc., certain types of behaviour (e.g., exposure behaviour facing dangers and fears), but also cognitive processes, affection and attitudes, intentions and actions (Potter, 2012).

Table 1 - Simplified model of communication effects in relation to wildfire management stages

Type of activity	Prevention	Response	Recovery	Local authority/services
Awareness				
Inform	Triggering attention to the risk of forest fires	Triggering attention to alarm and danger	Triggering cognitive processes directed towards environment remediation	Improve informing policies

Educate	Altering existing knowledge about wildfire prevention	Triggering recall from memory of the safe and supportive behaviour instructions	Altering cognitive processing of environmental data	Develop competence of people
Attitudes (cultural values)				
Raise engagement	Reinforce feeling of belonging to the community and shared meaning of social norms	Triggering beliefs in the necessity of common action	Increase affection in the wild nature and the locality	Planning voluntary work and sharing responsibility
Promote safe practices	Altering established intentions and standards of participating in prevention	Triggering altered action standards	Reinforce standards of implementing safety measures during recovery	Support for returning inhabitants and organise their recovery activities
Behaviour				
Asist effective fire management	Alter exposure behaviour and safe behaviour habits in the community	Trigger altered exposure and safe behaviour habit	Reinforce cohesion of actions of community members and local authorities/services	Include citizen response in policies
Actions	Trigger acquired habit to report hazards and prevent risky behaviour	Trigger message-suggested action	Trigger collaborative actions	Action guidelines and instructions

The aims of the CEP lead to or at least relate to citizen engagement purposes in the context of emergencies and the implementation of its basic principles. Thus, form a link between the CEP and the actual behaviour of the individuals and communities in various wildfire management phases.

We have used this model in the analysis of the previous research, during which the communication means and measures in wildfire management were identified (see Table 3). It has also supported our own design of the CEP (Chapter 5).

3.2 Literature review

The literature review aimed to identify the existing knowledge on citizen engagement not for general disaster management but particularly in wildfire management. The questions raised were the following:

- How are citizens defined and perceived in the research and strategies related to wildfire management?
- What are the aims of citizen engagement in emergency/disaster management, and who sets them?
- What are the factors affecting citizen engagement, and what role does the motivation of citizens play, among other factors?
- What are citizen engagement methods, channels and means in wildfire management?
- What are the results of citizen engagement, and how are these measured?

The literature for this review was found in Web of Science using the query "wildfire management and citizen engagement" for 2002-2022. The query was developed after some trials and provided the most relevant results compared to other keywords. The search was carried out in September 2022. The database has found 68 articles, of which 60 were relevant to our purpose of establishing state-of-the-art in citizen engagement

related to wildfire management. Additional 17 articles were added after searching Google Scholar, and 77 articles were analysed for this review.

The retrieved articles have reflected research and best practice in several areas of the world, but mainly in the USA and Australia, as can be seen in Table 2. Three articles were on general issues and were not related to a particular geographical area.

Table 2 - Number of Articles found per Country and Region

Area or country studied	Number of articles
USA	27
Australia	25
Europe	9
Canada	8
Latin America	2
Russia	1
Tanzania	1

Most of the outcomes related to citizen engagement that researchers identify in their studies are not measured in some quantitative ways but rather seen as the long-term impact of and on changed behaviour:

- Fire volunteer groups suppose a social innovation in rural communities that help in their adaptation to climate change (Górriz-Mifsud et al., 2019)
- The actions of volunteers range from supporting firefighters' efforts, first attacks and/or year-round prevention (Górriz-Mifsud et al., 2019)
- Social learning and social memory interact, and new practices emerge as the participants embrace shared responsibility (Reid & Beilin, 2015; Reid et al., 2018).

The most crucial issue for the Citizen Engagement Programme is related to the means and channels of communication that can be employed for informing citizens, helping them to prepare for wildfire events, prevent them and protect themselves, others and their property, but also to actively participate in the creation of wildfire prevention policies, active support of first respondents and involvement in restoring activities after the disaster has happened. Table 3 shows the measures, means and channels found in the literature concerning all three phases of wildfire management.

Table 3 - Communication measures and means to engage citizens in relation to wildfire management stages

Type of activity	Prevention	Response	Recovery
Inform	Talks on local radio, and articles in the local press (Xanthopoulos et al., 2022) Personalised parcel information (Meldrum et al., 2021) Advertising through websites and social media (Otero et al., 2018) Dissemination of risk information materials (Eriksen & Prior, 2011)	Display signs (Eriksen &Prior, 2011) Plan for escape and evacuation	Report actual wildfire damages and losses (Tedim et al., 2012) Provide guidelines for recovery

	Direct contact between residents and forest services and other agencies (Xanthopoulos et al., 2022; Paveglio et al., 2009) Targeted local information campaigns with high visibility online and in locality (Paveglio et al., 2009) Branding fire management services (Paveglio et al., 2009) Instructions on how to control negligent fires, and fire prevention messages (Burns et al., 2002)		
Educate	Talks with high school students (Xanthopoulos et al., 2022) Creating supportive learning environments (Eriksen, 2014) Engage in citizen science (Ferster et al., 2013) Regular education programmes and courses (Paveglio et al., 2009) Develop local checklists to report wildfire damages and losses (Tedim et al., 2012)	Training for suppression targeting special groups (age, occupation, education, etc.) (Oliveira et al., 2020) Coexisting with wildfire (Otero et al., 2018)	Building connections between residents and nearby forests of nature areas (Ryan & Hamid, 2008) Raise interest in wild nature by conducting courses on biodiversity (Souzo-Alonsa et al., 2022) Train the public on restorations for their own land for rapid restoration (Souza-Alonso et al., 2022; Ryan & Hamid, 2008) Use restored areas as education centres (Souza-Alonso et al., 2022)
Raise engagement	Developing of democratic planning system (Bradsley et al., 2021) Engaging citizen associations in landscape valuation (Otero et al., 2018) Strengthen community networks (Eriksen, 2014) Applying interaction with local environmental knowledge (Eriksen & Prior, 2011)	Developing multi-actor GIS to coordinate interventions – co-design between all interested actors (Otero et al., 2018) Build a network of volunteer firefighters	Counteract land abandonment and help repopulation (Otero et al., 2018) Collaborative planning of restoration activities (Ryan & Hamin, 2008)
Promote safe practices	Hands-on experience and practice (Eriksen, 2014) Instructional videos (Xanthopoulos et al., 2022) Looking for new agricultural and management opportunities, transforming land use into safer modes (Otero et al., 2018	Smoke Sense app on mobile phones for promoting health protective actions from air pollution with tailored messages (Rappold et al., 2019; Hano et al., 2020) Infrastructure safety	Involvement in the creation of fire-safe landscapes (Otero et al., 2018) Documenting the public experience of fire in a participatory online map (Brennan & Corbett, 2013)
Assist effective fire management	Prepare property for protection (Penman et al., 2013) Neighbourhood fire mitigation programmes (McGee, 2011)	Plan and participate in mitigation measures (Gorriz-Mifsud et al., 2019) Assist safe escape Coordination of volunteer groups with professional firefighters (Gorriz-Mifsud et al., 2019)	Long-term interactions with citizens for trust building (Olsen & Shindler, 2010)
Actions	Involvement in participatory exhibitions (Otero et al., 2018)	Engagement in auxiliary extinction activities (Otero et al., 2018)	Volunteer participation in implementing restoration activities (Souza-Alonso et al.,

	Involve communities in prescribed fires (McCaw, 2013) Reporting hazards (Rappold et al., 2009)		2022; Xanthopoulos et al., 2022; Ryan & Hamin, 2008) Citizens provide information on local flora and fauna (Otero et al., 2018) Manage firewood economically, using for biomass boilers (Otero et al., 2018)

As we can see, the research shows a variety of means to engage citizens and their organisations in wildfire management in all parts of the world. The most complex measures of participatory co-design of wildfire strategies in fire-prone areas take a lot of effort and time, and they involve a combination of different channels and methods of involvement of the citizens in several different processes (Otero et al., 2018). Thus, lack of funding, time and human resource often is the reason to engage in smaller projects. However, the results presented above are achieved when they are directed to building trust among different actors and increasing the social cohesion of communities and groupings. Awareness campaigns alone seem not to achieve a high level of interest (McGee, 2011), and more hands-on practical engagements increase interest and preparedness levels (Eriksen, 2014). All in all, we can generalise what the previous research suggests about methods and channels for outreach and engagement:

- Passive information (radio, TV, social media, meetings) informs less than half of households, does not lead to preparedness, but is valued highly by recipients and shapes the plans for response to fire (Elrick-Barr & Smith, 2022).
- As a rule, experiential information drawn from one's own experience is used for action but not recognized as a source of information. Nevertheless, it creates a set of expectations and sensitizes people to some aspects more than others (Lidskog et al., 2019).
- Interactive face-to-face information helps common sense action but sometimes leads to unexpected solutions (Castellnou et al., 2019).
- Long-term collaborative actions (open courses, collaborative mapping, or other actions) build joint efforts and active movement and are among the most effective engagement means (Goritz-Misfud et al., 2019).
- Collective narratives create preferences for local sources of information and a level of mistrust of information provided by centrally orchestrated information sources about the fire. However, when local narratives are incorporated into centralized narratives or citizens are invited to contribute to centrally built narratives, they can serve as a source of trust, increased understanding and more efficient interaction between different actors (Cooper et al., 2020).

One of the relevant outcomes of the literature review for the SILVANUS project is the increasing knowledge (including published) on employing information technologies as means of citizen engagement in various ways. We have found some materials related to citizen engagement through information technologies for different purposes as shown below:
- Understanding the locality and wildfire consequences to it:
  - Landscape valuation design was done using GIS by different actors to provide information on diverse landscape values in participatory co-design activities (Otero et al., 2018)

- o Volunteered geographic information (VGI), or geographic information voluntarily created by private citizens enabled through technologies like social media and web-based mapping, contributes to increased social connectedness, understanding of local bushfire risk, and engagement in risk reduction. Local knowledge exchange was seen as valuable, but the social dimension appeared even more engaging than the specific information shared (Hayworth et al., 2016)
  - o Geoweb - an online participatory map that documents public experiences of the fire. Through a map interface, participants contribute their own multimedia information and comment on the contributions of others. Passive or active map use. Results demonstrate that while the mapping tool encourages users to interact with information about the fire, there are challenges in adding their own experiences (Brennan & Corbett, 2013)
- Social media can be used to increase public awareness and care about locations and people affected by the disaster:
  - o Facebook functions as an advocacy tool to inform large public audiences about devastations by wildfires in the South of the US in 2017, and engage them to respond to the crisis, especially agricultural issues as opposed to targeting limited specialised audiences (Kostelich, 2019)
  - o Those who followed news about the wildfire on social media expressed higher overall care and concern for those affected, which led to helping those impacted by the wildfire (Boulianne et al., 2018)

Some studies concern various applications intended to be used on mobile telephones. The spread of smartphones is rapid and wide in all countries of the world. According to Statista, currently, there are over 7 billion mobile phone users, and the penetration of smartphones in Europe is approaching 80%, with some countries already exceeding this number (Statista, 2023). Most mobile devices can be geolocated and increase the accuracy of localising the place of disaster (Ecker et al., 2020). Many smartphone apps are developed for different purposes, including emergency situations, health hazards, or natural disasters. The development of the WebRTC standard allows real-time communication in smartphone applications that support sending video, voice, and generic data between parties (https://webrtc.org/). This makes communication between two parties possible even without a downloaded app. Nevertheless, in this part, we explore the usage of apps in disaster situations as we are developing a multifunctional app with different features that may enhance citizen engagement in wildfire management phases.

- The citizens are willing to install a crisis management app for emergency and weather warnings and crime- and health-related warnings and wish to have the possibility for bidirectional communication. People in Germany also want one central app and are resistant to installing more than one crisis app (Kaufhold et al., 2020).
- Instant messaging for immediate information and instruction requires internationally recognised warning schemes. Warning messages follow consistent schemes across different hazards and countries, including colour codes, wordings, pictograms and other features like acoustic signals. Alert levels in a standardised system will be quickly recognised by the public, as demonstrated by the traffic lights scheme in many countries worldwide (Neussner, 2021).
- Smartphone applications are used to collect data about forest fuels and to answer questions about wildfires, the community, and experiences using the application. The limited piloting of one app has

shown that data collection by citizens, in this case, is related to the issues of responsibility and training. It shows potential but needs further testing (Ferster et al., 2013).

- Participants engage with a smartphone application to explore current and forecast visualisations of air quality, learn how to protect health from wildfire smoke and record their smoke experiences, health symptoms, and behaviours taken to reduce their exposure to smoke (Rappold et al., 2019). The primary form of engagement is information seeking through maps and air quality statistics, not providing information. Translation to Spanish increased its accessibility to a large population group (Hanno et al., 2020).

Thus, the literature review provides a possibility to understand the citizens as a rather heterogeneous concept, outlines to some extent different approaches to the disasters and needs for information and communication, provides an understanding of how to use different channels of communication and formulate the messages for the citizens in different situations and for different purposes. Specifically, it provides information about using social media, traditional and digital media, and especially smartphone apps. We also can learn about possible barriers of unexpected consequences of using different communication channels. However, citizen engagement in general terms, is seen as an inevitable and beneficial measure to prevent the consequences of huge forest disasters and to increase the efficiency of response and restoration activities.

As we see, the research addresses various aspects related to citizen engagement in wildfire management and offers valuable insights into our research questions. In the following, we summarise the answers to our five research questions:

How are citizens defined and perceived in the research and strategies related to wildfire management?
As a rule, citizens are defined and perceived in the context of wildfire management strategies. Research highlights the importance of involving in disaster management efforts different segments of society identified by criteria relevant to the research context or strategy itself (e.g., household members, indigenous local population, large public audiences or users of smartphones).

What are the aims of citizen engagement in emergency/disaster management, and who sets them?
Research reveals that the goals of citizen engagement encompass activities such as fire prevention, response, and recovery, and these objectives are shaped by both community needs and strategic planning and mainly set by local authorities and public organisations responsible for emergency responses in the localities.

What are the factors affecting citizen engagement, and what role does the motivation of citizens play, among other factors?
Motivation of citizens emerges as a significant factor, alongside considerations such as funding, time, and human resources working with local communities and individual citizens. The literature review acknowledges that these factors play a role in determining the scale and nature of engagement projects.

What are citizen engagement methods, channels and means in wildfire management?
Research thoroughly outlines the methods, channels, and means employed for citizen engagement in wildfire management. A comprehensive table, detailing identified communication measures for different phases of

wildfire management, emphasises the use of technology, interactive sessions, training, and community involvement.

What are the results of citizen engagement, and how are these measured?
The research recognizes that many outcomes of citizen engagement are qualitative in nature and relate to changed behaviour over the long term. The literature review highlights those actions such as participation in fire volunteer groups, collaboration with professional firefighters, and involvement in restoration activities have positive impacts on communities, fostering social innovation, learning, and increased community cohesion.

The findings of the review reveal the complexity of citizen engagement in wildfire management, emphasising the significance of building trust, community networks, and hands-on practical engagements. While awareness campaigns hold value, experiential, interactive, and collaborative actions yield more impactful results. The study also notes the growing role of information technologies, smartphone apps, social media, and geographic information sharing in enhancing citizen engagement.

In essence, the literature review underscores the diverse nature of citizen engagement, its potential benefits in disaster management, and the importance of tailoring approaches to different contexts and target audiences. The research provides insights into effective communication methods, the power of experiential learning, and the role of technology in enhancing citizen involvement to mitigate the impacts of wildfires.

3.3 EU reflections on citizen engagement in the context of the wildfire management project

Citizen engagement is a key element in the EU missions, especially in the Climate Mission. "The Horizon Europe calls on the Mission to require that participating regions and their partner organisations establish mechanisms to ensure the meaningful engagement of citizens and local stakeholders." (EU, 2003).
To address these issues, the EU has launched European Climate Pact that aims to:
- Raise awareness of climate issues and EU actions.
- Encourage climate action & catalyse engagement.
- Connect citizens and organisations that act on climate and help them to learn from each other (EU, 2023a).

SILVANUS is working in line with these objectives within the project framework and pays increased attention to the citizens' role in reducing the consequences of climate change addressed in the project as a whole.

4 CEP needs and requirements

4.1 Data from the questionnaire to the SILVANUS partners on citizen engagement

In order to comply with the requirements described in the previous paragraph, the task leader HB submitted in May 2022 a questionnaire to a list of previously identified partners. The questionnaire is based on understanding previous citizen involvement and engagement research and analysing the aims/roles of SILVANUS partners. Information collected through the questionnaire was confirmed and further enriched through bilateral meetings with selected project partners.

The questionnaire was sent to all 49 partners. 27 responses were received, 2 partners responded twice, and their data was integrated in one response; thus 25 valid responses were examined. 9 partners informed that they did not have any citizen engagement activities and did not provide other answers. 6 partners have their own citizen engagement programs. 10 partners do not have citizen engagement programs but have observed citizen engagement elsewhere and presented their observations. This presentation is based on the answers of 16 partners. The types of responding partner organisations were characterised as follows:

- Research and innovation
- Communication and cooperation
- Training of firefighters
- Rescue services
- Deployment of firefighters
- Medical services
- Sustainable development
- Policy preparation
- Preservation and monitoring of natural environment
- Agricultural production and management

The submitted questionnaire has addressed the following aspects:

- Aims of citizen engagement activities
- Organisations taking part in citizen engagement activities
- Categories of citizens engaged in wildfire management
- Main citizen engagement processes
- Tools of communication with citizens
- Feedback to citizens engaged in wildfire management

SILVANUS partners have identified three types of aims for citizen engagement activities:

PRACTICAL

- Fire prevention, warning and forest protection
- Support first responders with technological innovation
- build a network of volunteers supporting firefighting brigades
- Agricultural production

EDUCATIONAL

- Public awareness raising and promotion of fire prevention
- Developing competence of people, including children
- Raise interest in wild nature, organize ludic activities

RESEARCH

- Collect data
- Store data
- Indicate key problems

There was quite a wide range of organisations, which citizens create and participate in, or organizing the engagement activities [stakeholders in citizen engagement] that SILVANUS partners have named as important for wildfire management (table 4).

Table 4 - Organisations related to citizen engagement in wildfire management, identified by respondents in the survey

Organisations, in which citizens are involved (times mentioned)	Institutions organising engagement activities (times mentioned)
Voluntary firefighter associations (7)	Local authorities, police (8)
NGOs and associations of organisations (national parks, towns, environmental, cultural, agricultural) (11)	Research institutions (4)
	Professional firefighter brigades (3)
	Public administration (3)
Universities and schools (3)	Policymakers (2)
Private companies (2)	Ministry of Interior (1)

Examples of **categories of citizens (individuals)** mentioned by SILVANUS partners were rather numerous though overlapping:

- Elderly group
- People with disabilities
- Children and youth
- Farmers
- Shepherds
- Inhabitants with previous fire experience
- Social media users
- Everyone – local inhabitants
- Landowners

Other categories were also mentioned by SILVANUS partners, and we list them since they are part of the results of the survey. However, since these citizens also belong to emergency management or educational organisations and voluntary associations they can be regarded as part of stakeholder organisations.

- First responders
- Volunteer firefighters
- Teachers
- Students

Please note that the categories mentioned above are the results of the survey study and SILVANUS partner answers to the survey. Therefore, citizens' categories are not limited to the list above, and more categories may be added to the list in the future. To have a standard categorisation of citizens is also challenging since the categorisation is possible by different attributes.

The most important processes through which citizen engagement in wildfire management happens, as identified by the partners, are learning and training (mentioned 13 times) and voluntary work and involvement in action (mentioned 13 times). The other processes, such as deliberation and consultation, data collection or provision, were mentioned by several partners. Decision-making was the process mentioned only once. One of the partners also pointed out farming as the process through which citizen involvement might happen.

4.2 Study protocol to study users and requirements

T3.5 of SILVANUS WP3 is focused on developing a Citizen Engagement Programme (CEP) that will facilitate timely response to wildfires in all three project phases, increase the efficiency of professional organisations, minimize the harm caused by wildfires, and speed up the recovery of affected areas. Various investigations, pilot testing, and participation from interested partners ensure the CEP's relevance. HB has developed a study protocol to identify citizens' and stakeholders' needs and related requirements to implement a successful CEP and contribute to developing content for a mobile App for citizen engagement (CEA, T3.6). A need is a necessary prerequisite identified for users to achieve an intended outcome within a specific context, while a requirement provides the basis for designing and evaluating interactive systems that meet user needs. For instance, citizens and stakeholders may need information on protecting their property in fire-prone areas, and related requirements could include developing relevant content modules in a mobile App, creating channels for immediate messaging about fire spread and evacuation routes, and providing reliable and accessible information on local and national support for the reconstruction of damaged property. The study protocol targets all SILVANUS participants in contact with stakeholder concerned with wildfire deterrence and prevention. However, there are still many questions about the tasks of citizens, the level of engagement, their responsibilities and roles, legal and ethical issues, and the equipment and training they may need. This study protocol will help us investigate these since it contains a pool of related questions that can be used as guidance during the interview to facilitate conducting the studies in the relevant direction.

The study protocol, including the relevant questions for interviews and focus groups (question pool), the information sheet and the consent form are provided/presented in appendix 1 of this document.

4.3 Technical requirements and dataflows

The information on technical requirements related to the mobile application, CEA, and dataflows between the tools used by the citizens engaged in wildfire management and the SILVANUS platform were also collected by participating in the questionnaire about the functional requirements for SILVANUS Platform (for each phase A/B/C) prepared by the WP2 for internal and external stakeholders.

The literature review has proved that communication with citizens, interaction with them and engaging in various activities can help prevent wildfires, monitor the environment, and manage different activities during the fire and recovery phase after the disaster. As the citizen engagement programme within the project aims to develop a systematic approach in which specific methodologies and relevant tools are being developed that address the challenges of communicating fire safety, govern the moves of the population and involve the broad group of European and Global citizens in a meaningful activity, it was essential to explore the functional requirements for the platform and the tools used for citizen engagement. The requirements identified for addressing citizen engagement aimed to encompass a holistic overview of the various needs and requirements including culture, geographical area and other parameters.

As one can see (figure 2), the stakeholders have identified that the most important features of the CEA relate to the communication of the citizens with the professional services in fire notification situations (alarm pushed to the citizens and also reported by the citizens), but also the requirement for the SILVANUS platform in production content about the human impact on wildfires and educational material for safe behaviour in the forest.

Figure 2 - Partners requirements for CEA (Majlingova et al., 2022). A, B, and C refer to the disaster phases management (A for phase: Prevention & preparedness, B for phase B: Detection & response, C for phase C: Restoration)
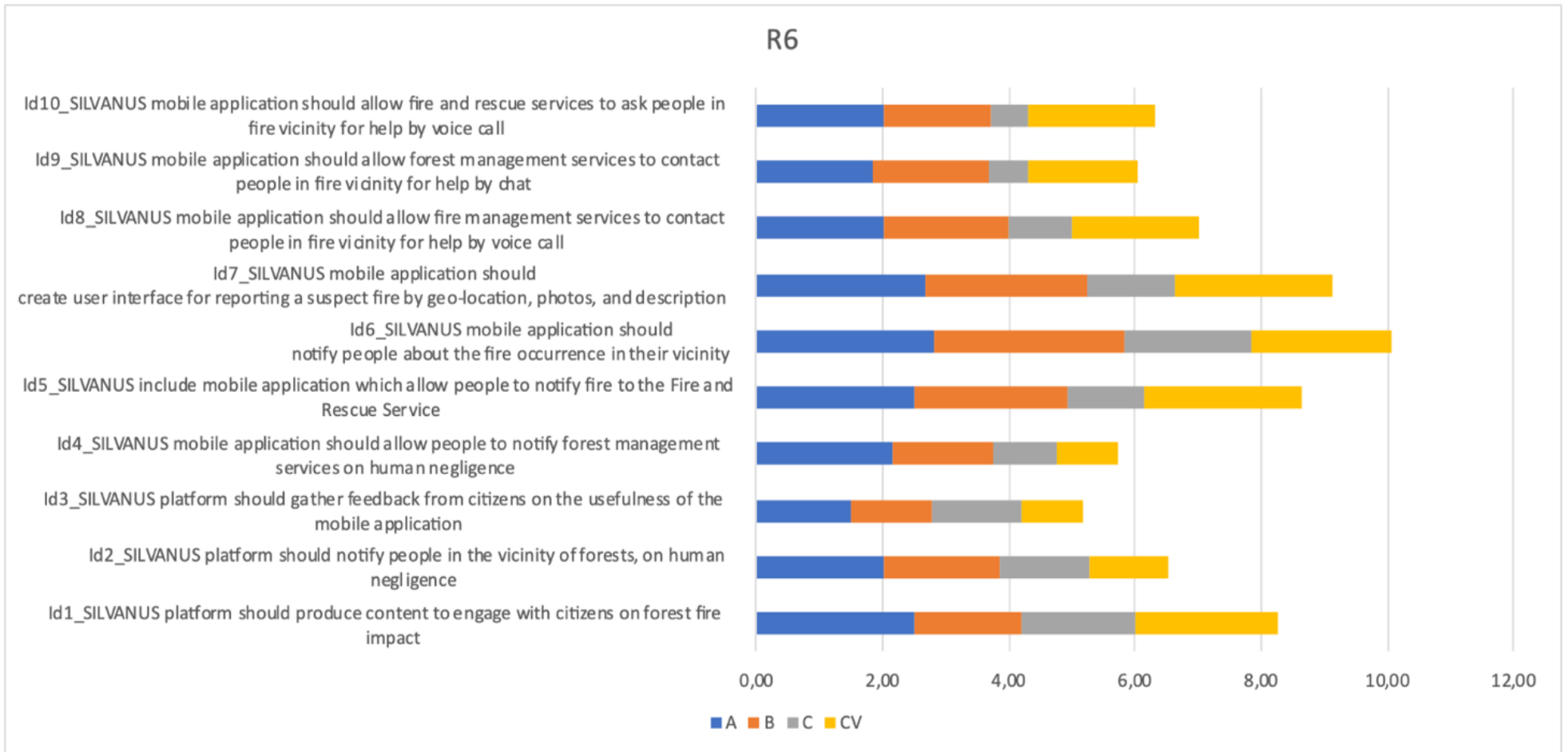
5 Citizen engagement models (modalities) developed in SILVANUS

A number of studies formed the foundation of the general design of the SILVANUS CEP. Early in the project, a major survey study was conducted within WP2 (Majlingova et al., 2022), as part of which the requirements for the SILVANUS CEP were identified. A further survey was conducted as part of T3.5 (See section 4.1 and Annex 1), where the existing levels of participation in CE activities were explored. Due to the expertise and areas of work of some of the partner organisations with their key roles in firefighting, rescue operations, close collaborations with authorities and citizens and more, this exercise was a further step in learning and fine-tuning the design of the SILVANUS CEP. Another study was designed to gauge the areas of work, expertise, networks, and potential contribution of those partners involved in T3.5 and T3.6 to these tasks. This was done through a survey, collaborative ideation workshops, mind-maps and visual depiction of sub-tasks, relations, competencies, and areas of contribution using the tool Miro. Further studies were conducted on various related Apps to map the current status, identify potential gaps, and inform the design of CEA. Finally, a further extensive study was conducted on various citizen engagement methodologies and modalities to identify those most suited to citizen engagement activities in wildfire prevention, management, and proactive sound practices.

Based on these studies, the three different phases of the project were then considered (A- Prevention and Preparedness, B- Detection and Response, and C- Forest Restoration Policies), and the following modes of engagement were selected: The CEA, use of Social Media channels (mainly LinkedIn and Twitter), communication through Mass Media (newspapers, radio, tv), organisation and participation in public events (e.g., festivals, fairs, popular scientific conferences, etc.), other forms of Participatory Engagements (e.g., online consultations, citizen opinion polls, camps, etc) and Social Campaigns (e.g., development of short sharp thought-provoking messages with visual elements that may lead to epiphany and an immediate realisation or comprehension of the messages that wish to convey). For the latter, a collection of powerful earlier campaigns in different areas were collected for analysis and inspiration. Furthermore, relevant members with communication and graphic design expertise have been added to the team working in this area.

Following the identification of the main components of the SILVANUS CEP, further work was conducted to define further details related to each of these modes of engagement. Regarding the CEA, it was decided that it will have a modular format and will be able to be tailored to personal needs and preferences (based on predefined set-ups or chosen by the user at each instance). Furthermore, the elements that were identified as integral included the possibility to interact with the user, i.e., the possibility to both provide and collect information, the potential to educate, and finally, the design and the content to entice engagement. For the CEA and all the other modes of engagement, a tool was developed to enable the definition of the following: the aim of the engagement; the intended target groups (e.g., general public or, more specifically, the locals affected, school children, tourists, members of civil protection authorities, forest/land owners, local administration, firefighters, etc.); levels of engagement (e.g., inform, consult, collaborate); the number of intended participants; frequency of this form of engagement; duration of this form of engagement; implementation; the actual content of the engagement activity.

Our tool also allows for the connection of each element of the CEP model (figure 3) to be linked with the different partner organisations participating in developing the detailed content. Work has started on

different fronts on developing the different modalities and sub-components. As the SILVANUS platform and the CEA mature, more and more of the intended features will be implemented.

Figure 3 - The overall design of the SILVANUS CEP.
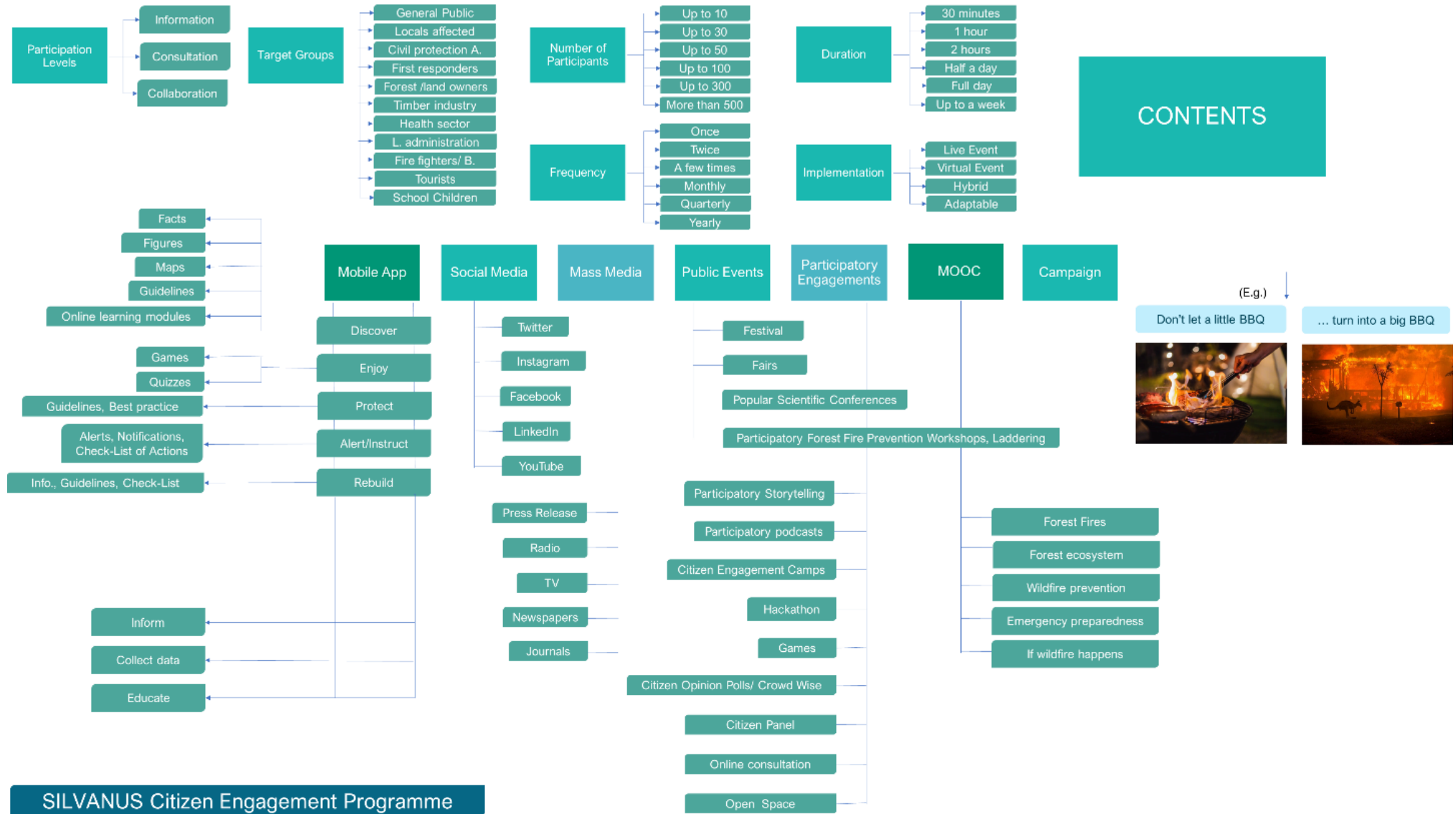
6 Tools developed and used to plan and design CEP

Planning and design tools are essential to organize and visualize project tasks and their specifications and resources required and to anticipate and mitigate potential risks. Planning and design tools help identify tasks and dependencies, allocate resources and project partners, and create an approximate timeline. Planning and design tools help to create a shared understanding among project team members about the scope, timeline, and expectations. This helps to avoid confusion and misunderstandings, which can cause delays or rework. Planning and design tools provide a platform for collaboration among team members. This allows team members to share information, write their ideas, and coordinate tasks, leading to better teamwork and improved project outcomes.

Figure 4 - SILVANUS CEP - Planning and Design Tool

Figure 5 - SILVANUS CE Poster and Campaign- Planning and Design Tool

Overall, planning and design tools are critical for project success. In task 3.5, two tools were created and are shown in Figure 4 and 5.

6.1 Planning and Design Tool for Citizen engagement

This tool helped to identify what features and functions should be in the CEA, what resources are needed and which partners can collaborate to develop and implement the feature. Here we present part of the result collected by this tool. The tools were discussed and filled during the monthly meetings by different partners and offline by partners. The other future results from the "needs and requirement study" using the study protocol will be inserted in the table later since the study is in progress at the time of writing this report. The studies involve citizens and other stakeholders using interviews and focus groups conducted by HB and other partners in different countries.

Table 5 shows some of the columns from the planning and design tool. The first column provides the title and name of the feature or the function (functional requirement). The second column provides data about the aim of the function related to citizen engagement. The third column shows the motivation for why this feature can be helpful and essential for citizens. The fourth columns provide the level of citizen engagement enabled by the function. The levels have been extracted from the model presented in this report in section 3.1. The fifth column also shows how the feature is connected to the users' needs. The tool also gathers additional data about, for example, how to implement the feature, the content needed, the resource needed, etc.

Table 5-The suggested functional requirements for the CEA gathered by using the planning and design tool

module Name	Function/ Feature Name	Aim	Why is it important to the overall CEP (business requirement)?	Type of citizen engagement (Information, consultation, participation, collaboration, empowerment)	Related user need
Fire Notification and Report Module/Service	Forest fire alert and notification	To inform the user about the current forest fires, specifically in the area close to the user.	It is part of CEP to engage citizens and enable them to respond faster to incidents.	Information	(1) Citizens should be notified if there is a forest fire near them. (2) Citizens should gain information about current forest fires in different areas to enable them, for example, to react and inform their families and friends in those areas. (3) The user shall be able to receive instructions about how to act in the situation.
	Reporting a fire	To send fire reports to authorities and fire response organisations.	It is part of CEP to engage citizens to collaborate with fire service and related authorities to enhance forest fire prevention and early detection.	Consultation/Collaboration	(1) Citizens should be able to report a fire for early detection and prevention. (2) Citizens should gain information about other reported fires in the vicinity of the citizens' residences.
	Forest Fire Warning with a possibility to "Report My Situation"	Warn Citizens in a given location about a forest fire.	To respond to emergencies and allow citizens to communicate with the Fire Responders in charge (Command Center).	Information/Collaboration/Participation	(1) Citizens should be warned about fires or related risks (smoke, fire spread forecast). (2) Provide citizens with relevant information related to their location (FF to address specific users at the incident site in real-time). (3) Give citizens a way to communicate (provide feedback) with the Fire Responders in charge (the Command Center or those in the field. (4) Enable citizens to report their situation (where they are located, where they are heading, how big a group there is in the forest)
	Reporting a fire and notification	To send fire reports to authorities and fire response organisations. Warn the user about nearby hazardous situations (natural disasters, man-made restrictions)	It is part of CEP to engage citizens to collaborate with fire service and related authorities to enhance forest fire early detection.	Information/Consultation/Collaboration	(1) Citizens should be able to report a fire for early detection and prevention. (2) Citizens should gain information about other reported fires in the vicinity of the citizens' residences.
Content Management System (Admin)		To manage the display and interactivity of the generic and pilot-specific content (guidelines, recommendations, checklists)		N/A	1) Admin should be able to insert and edit content/information for module "Guidelines" 2) Admin user should be able to navigate through the different categories of content
Guidelines	If you live next to a forest area	To educate and inform the citizens who live next to a forest area	improve awareness about fires, related risks, as well as prevention and safety measures (SILVANUS objectives)	Information	Citizens should have access to information and guidelines about what they need to do to minimize the fire risk and mitigate the fire consequences when they live next to a forest area.
	If you are in the forest/countryside(guidelines)	To educate and inform the citizens who are/live in the forest	improve awareness about fires, related risks, as well as prevention and safety measures (SILVANUS objectives)	Information	Citizens should have access to information and guidelines about what they need to do to minimize the fire risk and mitigate the fire consequences when they are/live in a forest area.
	Camping safely(guidelines)	Educate and inform the citizens about how to safely camp and holiday in forest areas or areas close to forests.	To establish and nurture social and cultural attitudes and practices that lead to reduced fire hazards caused by human negligence or actions.	Information	Citizens should have access to information and guidelines about what they need to do for safe camping and holidaying

	If you notice a fire(guidelines)	To educate and inform the citizens about how they should act and what they should do in case of noticing a wildfire	improve awareness about fires, related risks, as well as prevention and safety measures (SILVANUS objectives)	Information	Citizens should have access to information and guidelines about what they need to do when they notice a fire
	Equipment list you need (checklist)	To educate and inform the citizens about the list of equipment which helps deal with wildfire	improve awareness about fires, related risks, as well as prevention and safety measures (SILVANUS objectives)	Information	Citizens should have access to a checklist of equipment that they need to deal with wildfire
	If you are near a fire (guideline)	To educate and inform the citizens about how they should act and what they should do in case of approaching a wildfire	improve awareness about fires, related risks, as well as prevention and safety measures (SILVANUS objectives)	Information	Citizens should have access to information and guidelines that are useful when they are close to a wildfire
	If the fire reached you(guideline)	To educate and inform the citizens about how they should act and what they should do in case they are struck by wildfire	improve awareness about fires, related risks, as well as prevention and safety measures (SILVANUS objectives)	Information	Citizens should have access to information and guidelines about what they need or should do when they are close to a wildfire
	Important phones Numbers and communication plans	To provide citizens with necessary and helpful phone numbers when dealing with wildfire	To enable citizens to collaborate and communicate with related organisations and authorities in case of wildfire	Information	Citizens need to know the numbers to communicate with related organisations and authorities to prevent or respond to wildfires.
	Evacuation (guidelines and instructions)	To provide citizens with necessary and helpful information about evacuation	improve awareness about fires, related risks, as well as prevention and safety measures (SILVANUS objectives)	Information	Citizens should have access to information and guidelines about how to evacuate a wildfire
	After the fire is extinguished(guideline)	To educate and inform the citizens about how they should act and what they should do after a wildfire	improve engagement of citizens in forest regions to take steps towards forest protection	Information	Citizens should have access to information and guidelines about how they should act after a wildfire
	Fire suppression-small fires (guidelines)	To educate and inform the citizens about how they can extinguish and deal with early and small wildfires (not for developed fires)	improved engagement of citizens in forest regions to take steps towards forest protection	Information	Citizens should have access to information and guidelines about suppressing small fires to prevent disasters.
Pathfinder	Searching for an optimal evacuation path for citizen	To explore an optimal evacuation path for citizens who uses the application	Citizens may proceed with volunteer evacuation when they know the proper direction of safe evacuation relieving emergency units.	Participation/Empowerment	1) User should be able to initiate pathfinding functionality (by clicking the 'Pathfinder' button). 2) User should be able to analyse the evacuation path reported.
Citizen emergency indicator	Indicating that a citizen needs help (is under emergency conditions)	To show that citizen (user) needs help (is under emergency conditions)	CEP should improve a sense of safety regarding citizens who will get an easy way to communicate a need for use in emergency conditions (for example, first aid need, a need to support in evacuation)	Information/Participation	1) User should be able to click the 'SUPPORT' button).
Firefighting support	Indicating that citizens may	To show that citizens may support firefighting entities in	CEP should consider that citizens may state support for firefighting entities (for example, by access to	Information/Participation	1) User should be able to click the 'MY SUPPORT' button).

	support firefighting entities in terms of wildfire response	terms of wildfire response	private water supply sources, agricultural ploughs to make fire protection zones, UAVs with operators, chainsaws, and off-road vehicles)		

6.2 Poster and campaign creation tool

In T3.5, this tool was designed and used to collect ideas and material for running educational posters to raise citizen awareness. The tool was primarily used as a collaborative platform between the task partners. The tool could collect topics for poster design. Examples are:

- Protecting our house against wildfires
- 112 European Emergency Number
- Barbeque prohibition in or near forests
- Use of the fire extinguisher
- Making a family emergency plan
- Largest Wildfire (Country specific)
- Camping safely
- What to do when you notice a wildfire
- Wildfire Causes
- Vegetation wildfires: in general
- Statistical data on vegetation wildfires
- Advice and tips for citizens
- New technologies used in extinguishing forest fires
- Forest ecosystems
- Biological diversity and fire protection
- Forest Awareness
- Emergency Preparedness
- Safe Evacuation

The tool covers more data, such as the target group, poster language, design aspects, etc. The tool is a live tool and is revised and added to it continuously, allowing for partners to co-design according to their local needs and national context, but also to benefit from the exchange of ideas and the exploring of different needs and requirements in other parts of the world.

7 Citizen engagement app (CEA)

7.1 Application Concept

The SILVANUS Citizen Engagement App (CEA) is the main output of T3.6 (Mobile application for citizen engagement).

At its base, the CEA can be described as a fire management mobile app that is targeted to citizens as the main users and authorities/firefighters as the administrators. The general focus of CEA is to keep citizens informed, safe, and connected to emergency responders. The solution we propose is to provide citizens with real-time information and support during fire incidents, as well as useful data and guidelines from approved sources to help spread awareness and engagement. CEA aims to cover all the Phases of the SILVANUS Project by being a comprehensive tool to assist citizens in preparing for, responding to, and recovering from fire incidents. Additionally, it will help the authorities keep track of important fire-related events and have a system that keeps the related information centralized. CEA is designed to consider security, privacy, scalability, performance, and maintainability to ensure its effectiveness and user-friendliness. It is also designed to be part of the SILVANUS Ecosystem and provide a channel for the dissemination and collaboration of other products and components.

As described in Chapter 4 of this document, the CEA has a list of requirements that need to be fulfilled in order to meet the users' needs. These can be broken down into a rough set of features as shown in the list below:
.

- **Real-time fire alerts and notifications**: Citizens should be able to receive alerts and notifications about fires in their area, including the location, size, and potential threat level.
- **Map view**: The app should have a map view that shows the location of fires, as well as evacuation zones and other important information and analytics.
- **Guidelines:** The app should provide citizens with information on how to stay safe during a fire, including evacuation routes, shelter locations, and emergency contact numbers.
- **Community engagement:** The app should allow citizens to share information and updates about fires with each other, such as through a chat or forum feature. The app should also disseminate news regarding training activities and community events to further engagement.
- **Emergency response coordination:** The app should allow for coordination between citizens and emergency responders during a fire event.
- **Language support** for non-English speaking countries.
- **Accessibility features** for visually impaired or hearing-impaired users.
- **Push notification opt-out option and other permission options:** The app should allow the user to opt out on some specific features that need specific phone permissions, like the draw over other apps and location sharing permission. This will, of course, limit the functionality of the application.
- **Secure & Authenticated User Management:** The app should allow a safe way to sign up and log in as well as ensure that the user's personal information is handled properly.

With those concepts in mind, we have proceeded to design and implement a set of modules that will be detailed in the following sub-section.

7.2 Application Phases

As described in D2.1 (Majilingova et al., 2022), SILVANUS follows three Phases in combating the spread of wildfires:

- Phase A: Preparedness and Prevention.
- Phase B: Detection and Response.
- Phase C: Restoration and Adaptation.

The CAE has the potential to be applicable to all three of the SILVANUS Phases in different ways. For Phase A, the CAE aims to promote engagement and interconnection of the public and the forestry management representatives. This will be achieved by providing useful guidelines and other educational materials, promoting community engagement through news sharing and opening channels for direct communications. Modules to increase awareness by sending alerts regarding high fire risks and dangerous weather conditions will also be included.

Phase B modules will also be developed to enable the early detection of wildfires. Citizens will have channels to report said fires to the appropriate authorities. The official representatives will also be able to communicate and warn the public when fires are being detected through alert notifications and visual information depicted on interactive maps.

For Phase C, the CAE can promote the growing knowledge base, inform the public of reforestation events and promote community engagement, as well as disseminate other relevant information from other SILVANUS Components.

7.3 Use Cases

So far, we have identified two main use cases for the CAE, as reported in D8.1 (Anastasopoulos et al., 2022), as seen in the following tables (table 6 and 7).

Table 6 - Use case 8A

UC.8A Citizen engagement mobile application (CEA) - Dissemination of Educational Information and Wildfire Management	
Version	1.1
Phase	A/B
Pilot (if applicable)	PS 2, PS 4, PS 5, PS 8 (IT/ GR/ PT/ SK)
Year	2023-2025
Main functionality/Related UP	UP8: Provision of information and learning opportunities related to risks, fire threats, fire forecasts, safe practices, wildfire prevention, management, and after the event rehabilitation
Secondary functionalities (if applicable)	Collection of data (local contexts, lived experiences, multi-voice narratives)
Users and stakeholders	General Public [primary] • People living in wooded regions, Forest and land owners, Local population affected, Tourists, School children Secondary priority • Civil protection authorities, Local administrators

Input data types and HW sources/actuators	• First responders, Firefighters, Fire Brigades
	• Weather data (daily wind, temperature, and other weather prognosis and fire risk) • Material for understanding the fire risk prognosis model for users (Phase 1, based on the Greek pilot information available here: https://www.civilprotection.gr/en) • Fire danger assessment /fire risk levels (location based) • Fire in progress (fire front, location, extent, intensity, reports, maps) • Fire historical data • Flora and animal species affected
Data transport technologies	Exchange of data between mobile device and server for collection, processing and distributing the data to mobile users. PHP wrapper for translating web-based information to mobile app
Data repositories	Data will be stored and processed in the SILVANUS cloud
Data flows	API connection—SILVANUS Cloud (relevant repositories based on the modules we will develop) to Mobile App API Direct Connection with the data provider and Mobile App (for testing purposes)
Data analytics methods	Not applicable – Although, there will be integration with analytics methods developed in other modules (such as the fire risk index)
Data visualization and DSS	Dedicated mobile application user interface
Description	The citizen engagement programme, as a whole, identifies various modes of interactions between the SILVANUS system and citizens and defines prioritized modes of interactions and the information to be shared or collected. The citizen engagement mobile application serves an important role in disseminating information related to the awareness of wildfire prevention and response and collecting important information about events hazardous to the forests, processing and extracting high level information, and spreading awareness regarding forest fire prevention and restoration. We are planning to test the MVP with the Greek and Portugal pilots and escalate the development of the other modules for the Italian and Slovakian pilots.

Table 7 - Use case 8B

UC.8B Citizen engagement mobile application / Situational Awareness and Information Sharing	
Version	1.0
Phase	B/A
Pilot (if applicable)	PS 2, PS 4, PS 5, PS 8 (IT/ GR/ PT/ SK)
Year	2023-2025
Main functionality	Provision of a situational awareness and warning tool for citizens as well as an information sharing and communication tool between first responders and the public.
Secondary functionalities (if applicable)	The concept of information polling from citizens can be customized and used for other data collection and aggregation purposes.

Users and stakeholders	General Public [primary] • People living in wooded regions, Forest and landowners, Local population affected, Tourists, School children • First responders, Firefighters, Fire Brigades Secondary priority • Civil protection authorities, Local administrators
Input data types and HW sources/actuators	Input can be any information which should be distributed to the citizens in or around the incident site. Integration of inputs from other data services is also possible.
Data transport technologies	Exchange of data between mobile device and the distributed communication infrastructure for collection, processing, aggregation and distributing the data to and from mobile users. Technologies: MQTT (EMQX and specialized Erlang services)
Data repositories	Data will be stored and processed in the EmerPoll infrastructure (operational data) and possibly in the SILVANUS cloud (polling results).
Data flows	• Dashboard – creation and management of polls, possibly using information/data from other services • Mobile Devices – receive poll requests, reply by filling out simple reply forms; potentially can setup own polls • Dashboard – receives and aggregates poll replies • API — to access and manage poll status and results
Data analytics methods	Aggregated poll results can be used for further data analysis and decision support.
Data visualization and DSS	Dashboard and a dedicated mobile app user interface provided as a module.
Description	The citizen engagement programme identifies various modes of interactions between the SILVANUS system and citizens and defines prioritized modes of interactions and the information to be shared or collected. The mobile application will also serve as an important communication and information-sharing platform to reach relevant citizens. A need often arises during an extensive emergency event from the first responders' side to inform, warn or share relevant information (I.e., evacuation instructions) to citizens in a specific stricken region or territory. The concept of polls enables to distribute requests or information to citizens based on the publish/subscribe mechanism. Citizens can in advance subscribe to information channels to which requests or information are submitted in a semi-structured way along with pre-set "reply" forms. Citizens can reply and the returned information can be aggregated in real time to support further mitigation actions or decision support. This module is primarily planned to be used in phases B/A. The Slovak pilot will be the main pilot for the development of the module. Deployment to the other will follow based on the requirements. A partial development of this module is planned in the MVP (poll setup and information distribution).

Based on the above use cases, we have designed and developed modules that also reflect the requirements we have gathered from the CEP. To achieve that, we have split the modules into two main categories according to the applicable pilots:

- Pilot Agnostic Modules: Content and modules available to all pilots. Even if pilot-specific data were used to create them, the modules can be applied to all pilot cases.
- Pilot Specific Modules: Content and modules created for the needs of specific pilots. They have been developed with pilot-specific data and will be available only for those specific regions.

Except for this distinction, we have also created different categories for the modules according to their type and functionality, as described in the section below.

7.4 App Modules

As mentioned above, the CEA is designed to support the citizens before, during and after fire incidents. For that, we have split the modules into the following categories:

- **Explore Modules** [Phase A & C]: Content-providing modules related mostly to awareness spread.
- **Collaboration Modules** [Phase B]: Modules that aim to enable collaboration between citizens and/or the authorities.
- **Notification Modules** [Phase B]: Alerts and Notifications
- **Analytics/Status Modules** [All Phases]: Modules that include information about the region's current status.
- **User Management Modules** [Not related to SILVANUS Phases]: Authorization/Authentication modules as well as user settings that will ensure a good, personalized UX.

The modules that were produced by our efforts (either the initial design or both designed and implemented) can be seen in the visualization below (figure 6)

Figure 6 - The CEA Modules in their respective categories
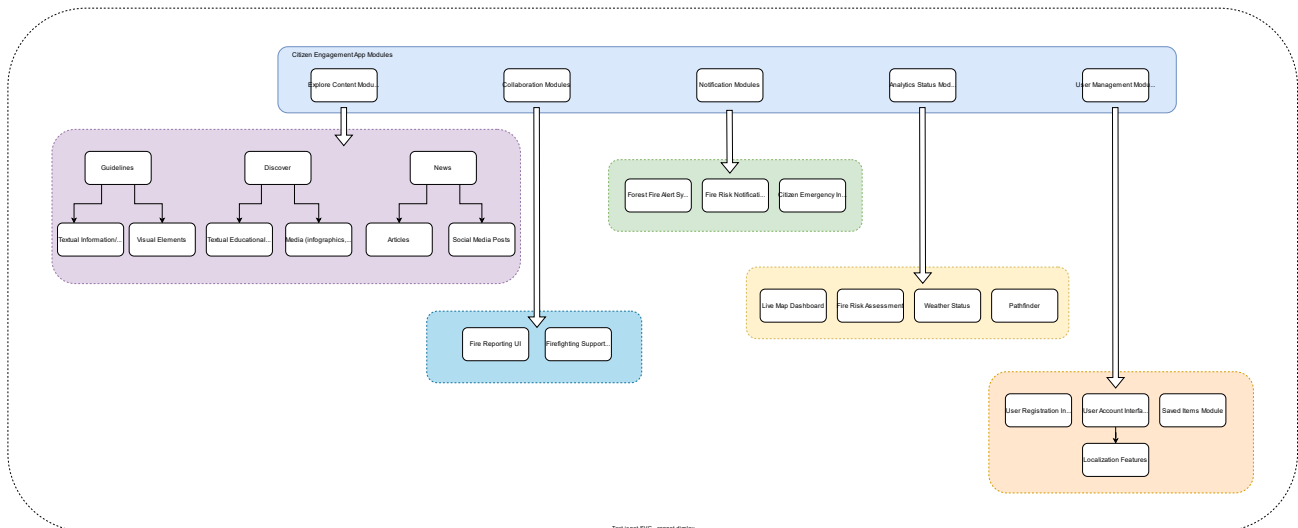
Until the end of the project, other modules might be produced as well as more internal collaborations between other SILVANUS Components. These modules/features will be detailed in future deliverables.

7.4.1 Explore Modules

The Explore Modules category currently contains three modules:

- **Guidelines** [pilot agnostic, active development]: improve awareness about fires, and related risks, as well as prevention and safety measures.
- **Discover** [pilot agnostic & pilot specific, active development]: provide interesting educational information and facts to promote awareness in an easy-to-understand way. It can contain graphics and other visuals.
- **News** [pilot agnostic & pilot specific, planned]: News feed from SILVANUS-approved sources.

7.4.2 Collaboration Modules

The Collaboration Modules category currently contains two modules:

- **Fire Reporting System** [pilot specific, active development]: Collect relevant information about the forest fire, for example, location, visual data using photo/video, and fire description using text/voice.
- **Firefighting Support System** [pilot specific, concept stage]: Indicating that citizens may support firefighting entities in terms of wildfire response.

7.4.3 Notification Modules

The Notification Modules category currently contains three modules:

- **Forest Fire Alert System** [pilot specific, active development]: Provide any relevant information to the user along with information accessible by SILVANUS services, for example, fire spread simulations, evacuation maps/routes, and POI.
- **Fire Risk Notifications** [pilot specific, planned]: Notifications regarding dangerous conditions and fire risks in the user's location.
- **Citizen Emergency Indicator** [pilot specific, concept stage]: Indicating that the user (citizen) is under emergency conditions.

7.4.4 Analytics/Status Modules

The Analytics/Status Modules category currently contains four modules:

- **Live Map Dashboard** [pilot agnostic & pilot specific, active development]: Provide a map dashboard according to the user's location. Depending on the pilot location and available services, various visualized information will appear on the map.
- **Fire Risk Assessment** [pilot specific, planned]: On-Demand parsed results from the Fire Risk Assessment Component or other similar Open-Source system.
- **Weather Status** [pilot specific, planned]: Weather reports and information.
- **Pathfinder** [pilot specific, concept stage]: search for an optimal evacuation path.

### 7.4.5 User Management Modules

The User Management Modules currently contains three modules:

- **User Registration Interface** [pilot agnostic, planned]: Interface for user registration.
- **User Account Interface** [pilot agnostic, planned]: User management interface containing settings, permissions, and localization & accessibility settings.
- **Saved Items Module** [pilot agnostic, planned]: A page containing every item the user wishes to save (favourites).

7.5 App Architecture

The CEA will be a part of the SILVANUS Ecosystem through its integration with the Kubernetes Cluster of the SILVANUS Cloud. The architecture we are aiming for can be detailed in the following schema (figure 7).

Figure 7 - CEA Architecture
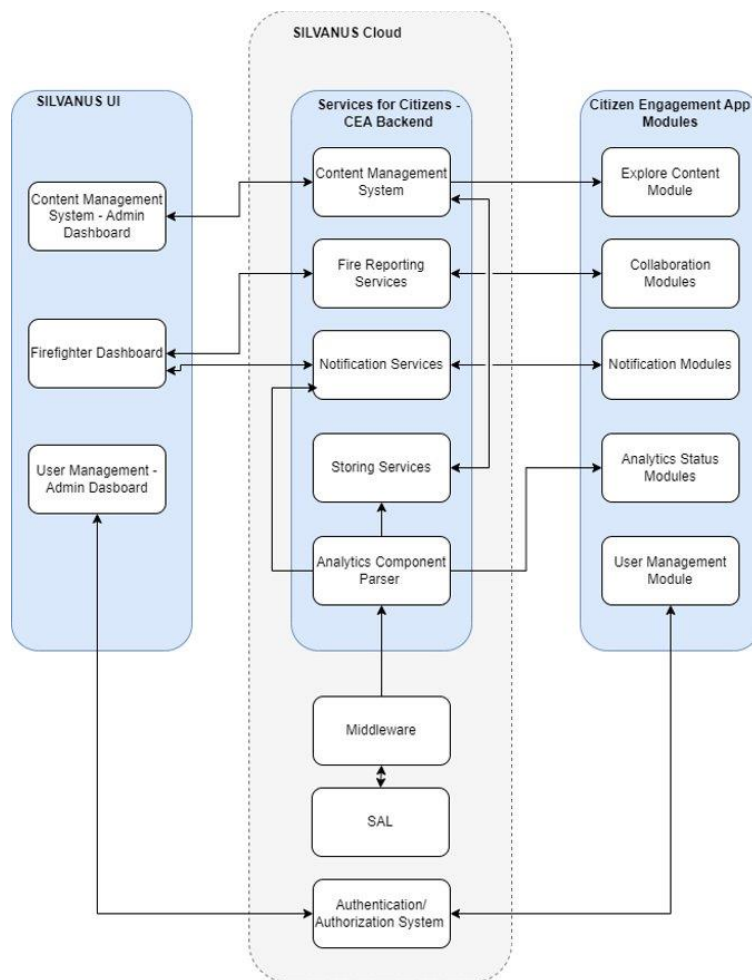
Currently, the basic backend systems communicate via external API (https) calls and through the MQTT protocol. As the maturity of the app progresses, more integrations will be available. The most crucial components will be detailed in the following subsections.

7.5.1 Content Management System

For the purposes of CEA, we have designed and developed a Content Management System (CMS) that helps provide the user with content.

This backend system provides a centralized platform for the management of the content, which can be accessed and manipulated through an intuitive, user-friendly interface. The CMS also includes a text and media library that allows for the central storage of all digital assets.

For the simple user (Citizen), the functionality of the CMS will be limited to accessing the relevant content, performing search queries through the CEA interface and saving them for future use. The Administrator will also have access rights to edit and create new content through the Admin Web Interface.

The CMS currently operates based on a specific ontology that is depicted through a JSON Schema. All content data must adhere to this structure as depicted below (figure 8).

Figure 8 - Part of the the CMS' JSON Schema


```json
{
  "definitions": {
    "content": {
      "type": "object",
      "additionalProperties": false,
      "properties": {
        "moduleId": {
          "type": "integer"
        },
        "type": {
          "type": "string"
        },
        "attributes": {
          "$ref": "#/definitions/Attributes"
        },
        "pilot": {
          "$ref": "#/definitions/Pilot"
        },
        "icon": {
          "type": "string"
        }
      },
      "required": [
        "attributes",
        "moduleId",
        "type",
        "pilot",
        "icon"
      ],
      "title": "Content"
    },
    "Attributes": {
      "type": "object",
      "additionalProperties": false,
      "properties": {
        "title": {
          "type": "string"
        },
        "data": {
          "type": "array",
          "items": {
            "$ref": "#/definitions/Datum"
          }
        }
      },
      "required": [
        "data",
        "title"
      ],
      "title": "Attributes"
    },
    "Pilot": {
      "type": "array",
      "items": {
        "enum": [
          "gr",
          "it",
          "pt",
          "sk"
        ]
      },
      "uniqueItems": true
    },
```

This schema is then translated into a set of APIs that can be accessed through https protocols and then are parsed to be displayed in the CEA as seen in the following app screenshot (figure 9).
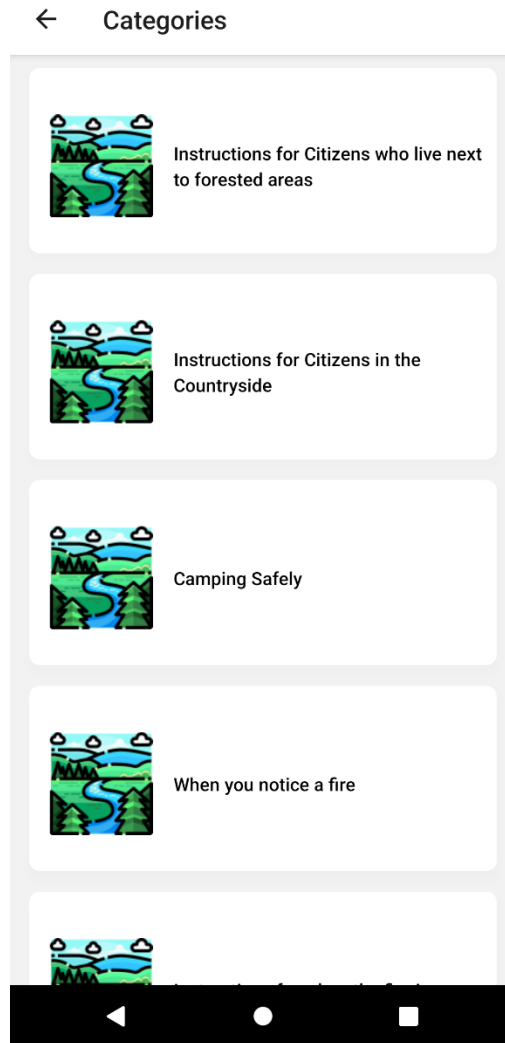
7.5.2 Fire reporting/notification system (MDS, UISAV)

Reporting and notification module allows CEA users to send and receive relevant information for a group of users in a given area. In the early stages of CEA's development, the reporting and notification services are focused only on exchanging information about wildfires. This module primarily uses an interactive vector map that helps users navigate in the terrain. The reporting and notification services are integrated based on EmerPoll channels where the users can subscribe to receive or provide specific information. In the fire reporting and notification case, the channel named 'FireReport' is designed to allow the users to submit location information, text and audio-visual information about the fire and also receive warning information related to the users' location. In the next development phase, the module will integrate all relevant information for users in a specific location provided by the SILVANUS project, which may include a fire spread model, emergency evacuation routes, a fire index map, etc.

In order to attract and motivate the general public to install and use CEA application, this module will provide additional channels aimed at the daily needs of a specific user group, for example, tourists can subscribe to a channel that allows them to send and receive information about the location of dangerous wildlife or report impassable hiking trails.

7.6 Walkthrough

In this section we will describe the functionality of the first version of the CEA.

The v1 of the CEA is deployed in the Android Play Store (currently under review) and is also expected to be available to the iOS Store soon. The first functionalities that have been integrated are:

- Content Modules including Guidelines, Discover and News
- Fire Reporting System
- Interactive Map

The above modules are being supported by the backend services that have been described in the previous sections.

When the user first downloads and installs the application is prompted to choose their region as seen below (figure 10).

Figure 10 - Landing Page of CEA as seen from an Android Phone
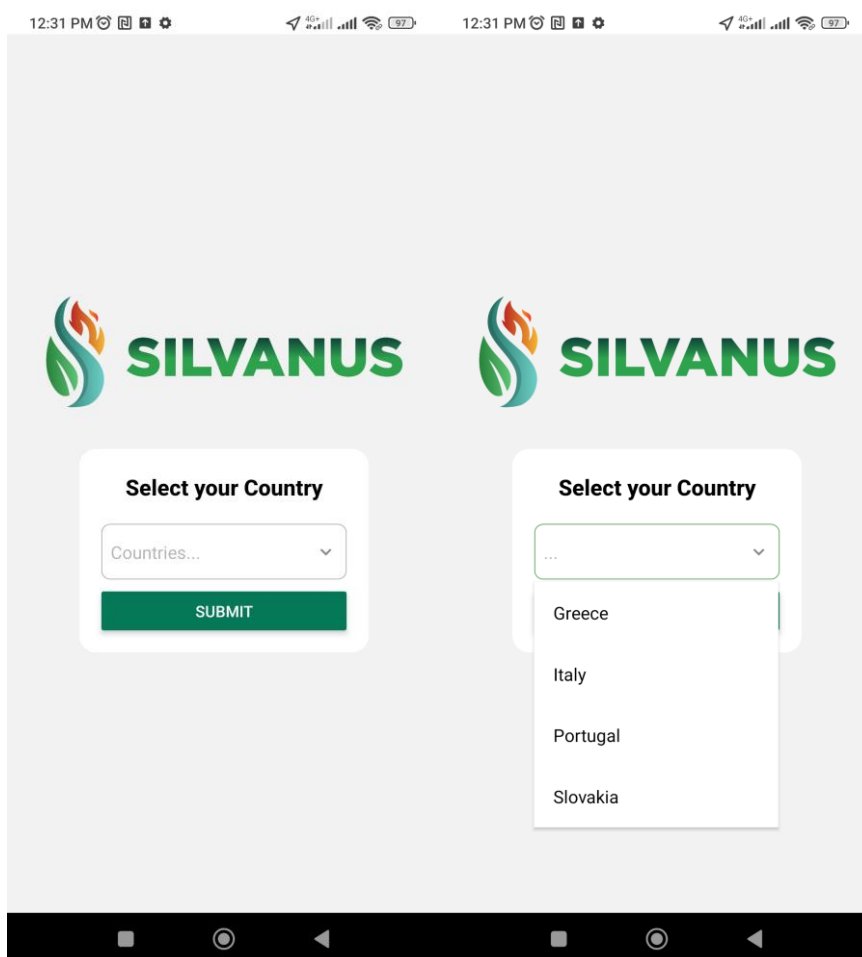
Since different pilot regions will also have pilot-specific modules, as described in section 7.3, the user's selection will determine the available modules displayed. Currently, as all available modules are pilot

agnostic/applicable to all pilots, all regions contain the same modules. The modules are also being translated into each pilot country's native language for a better user experience.

When the user chooses their region, they are navigated into the main/home page of the application as seen below (figure 11).

Figure 11 - Home Page of CAE containing the v1 modules.
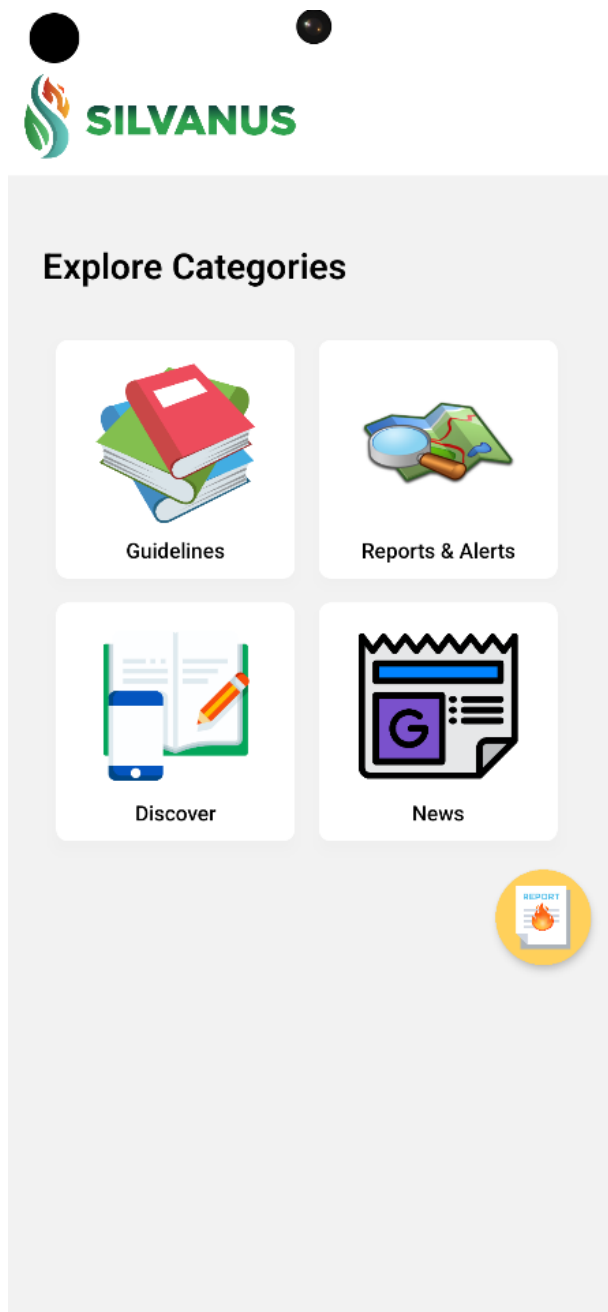
The available modules for v1 are the ones that were described above. The modules detailed in section 7.2 are currently under development and will be included in later versions.

When the user taps on the 'Guidelines' icon, they will be redirected to the Guideline module main screen, as seen below (figure 12).

Figure 12 - Main Page of Guidelines Module
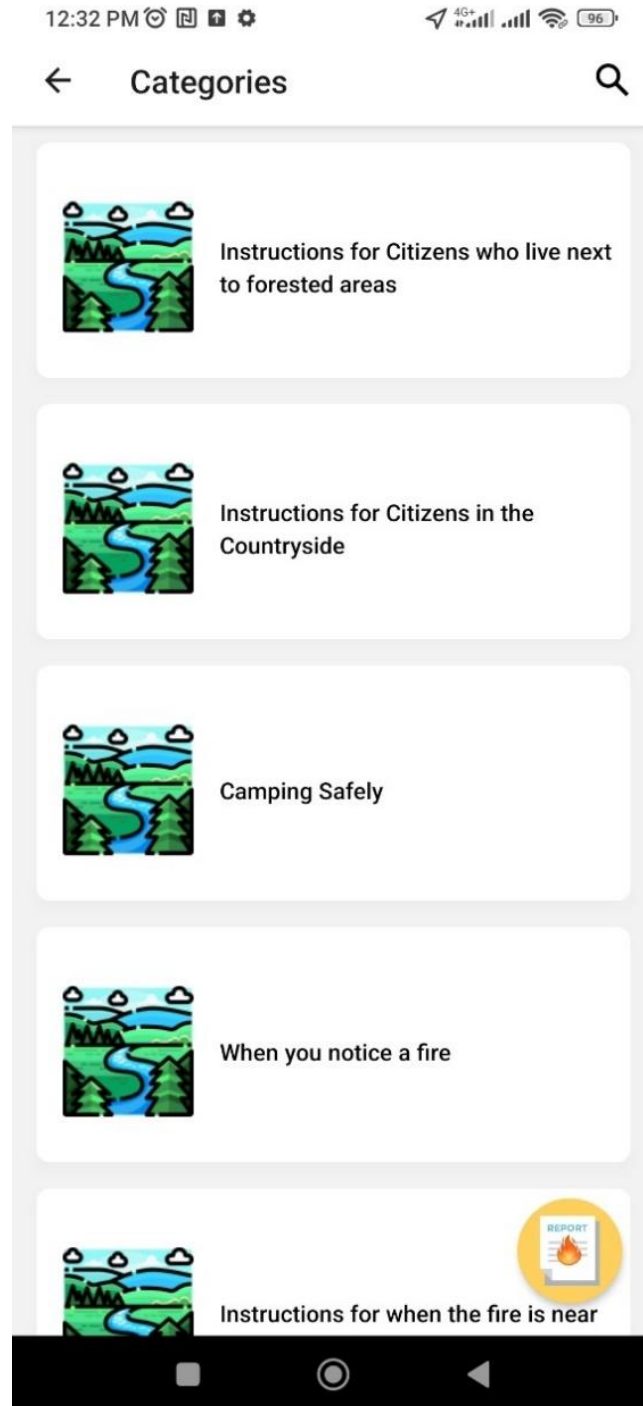
The user can find various topics and guides on what to do in specific, fire-related situations on this page. When they touch each category, they will be able to view the specific instructions for each of the guides, as seen below (figure 13)

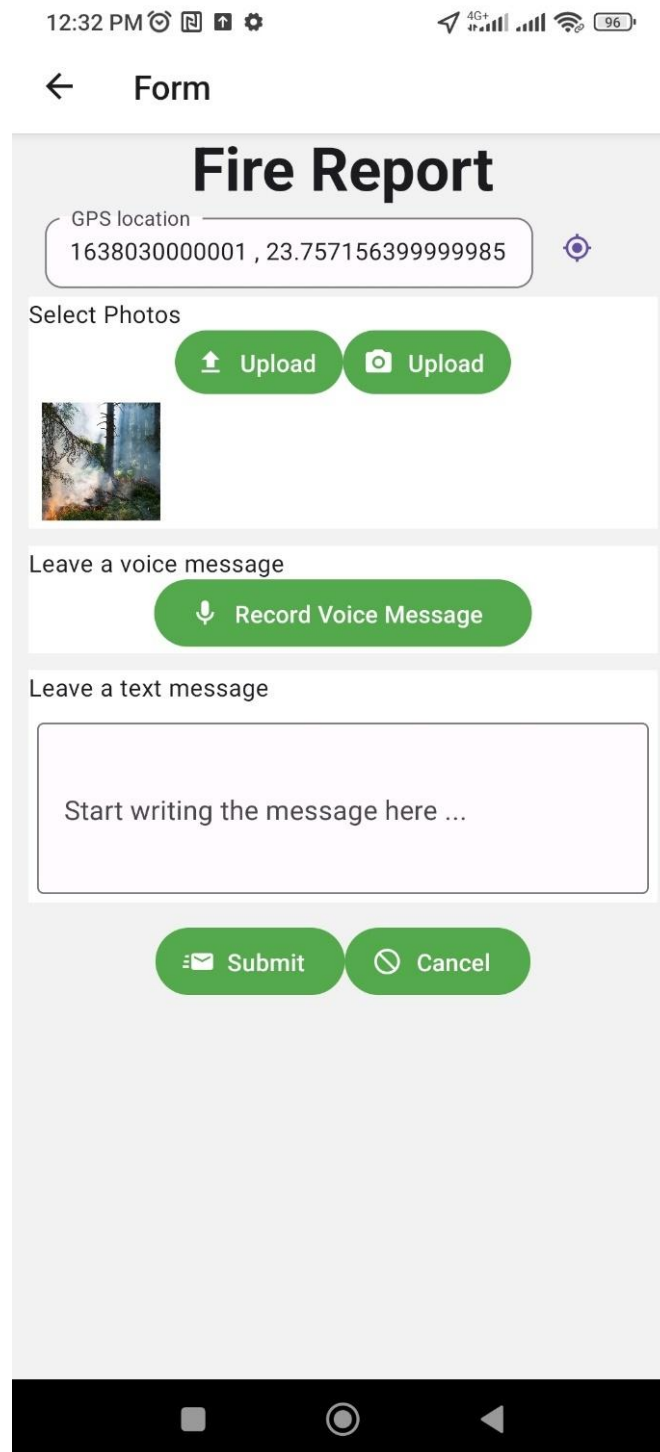**Figure 13 - Instructions for Citizens who live next to forested areas.**
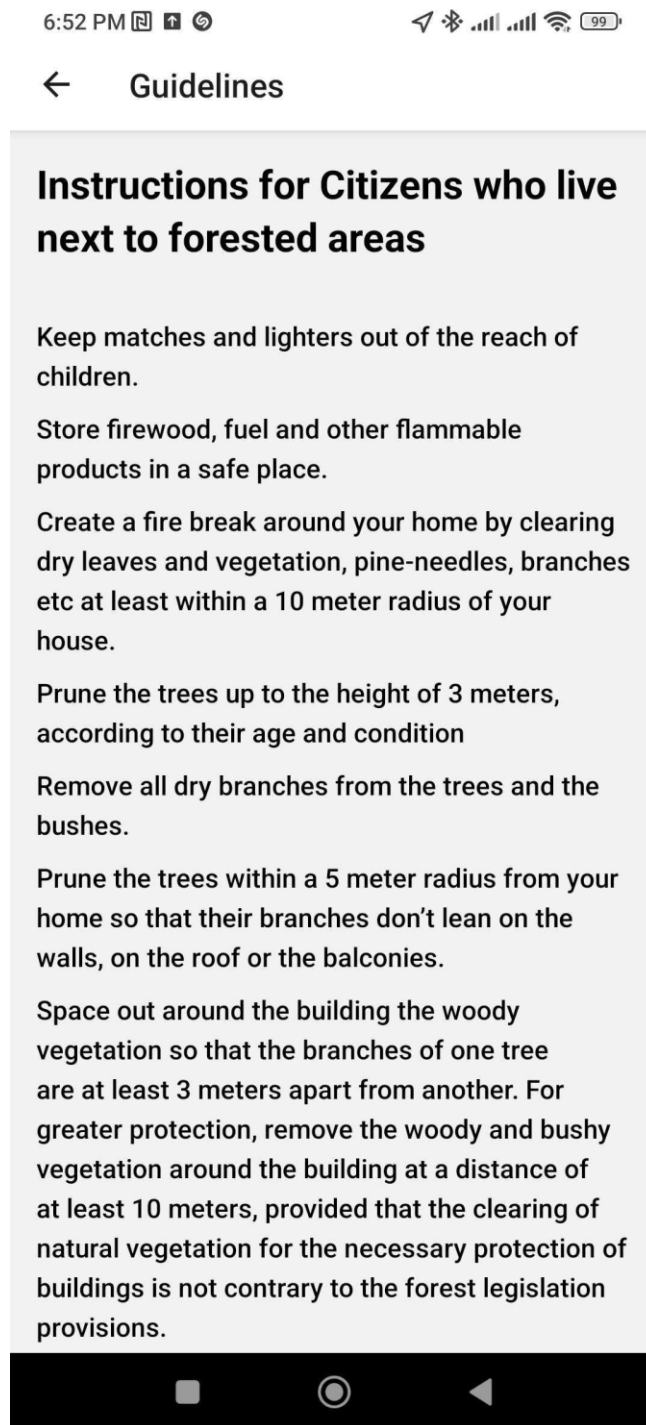
The user can also see the map of their area by clicking on the Reports & Alerts icon on the home page. They get redirected to the main Map element of the application, as seen in Figure 14

Figure 14 - Map feature depicting forested area in Slovakia
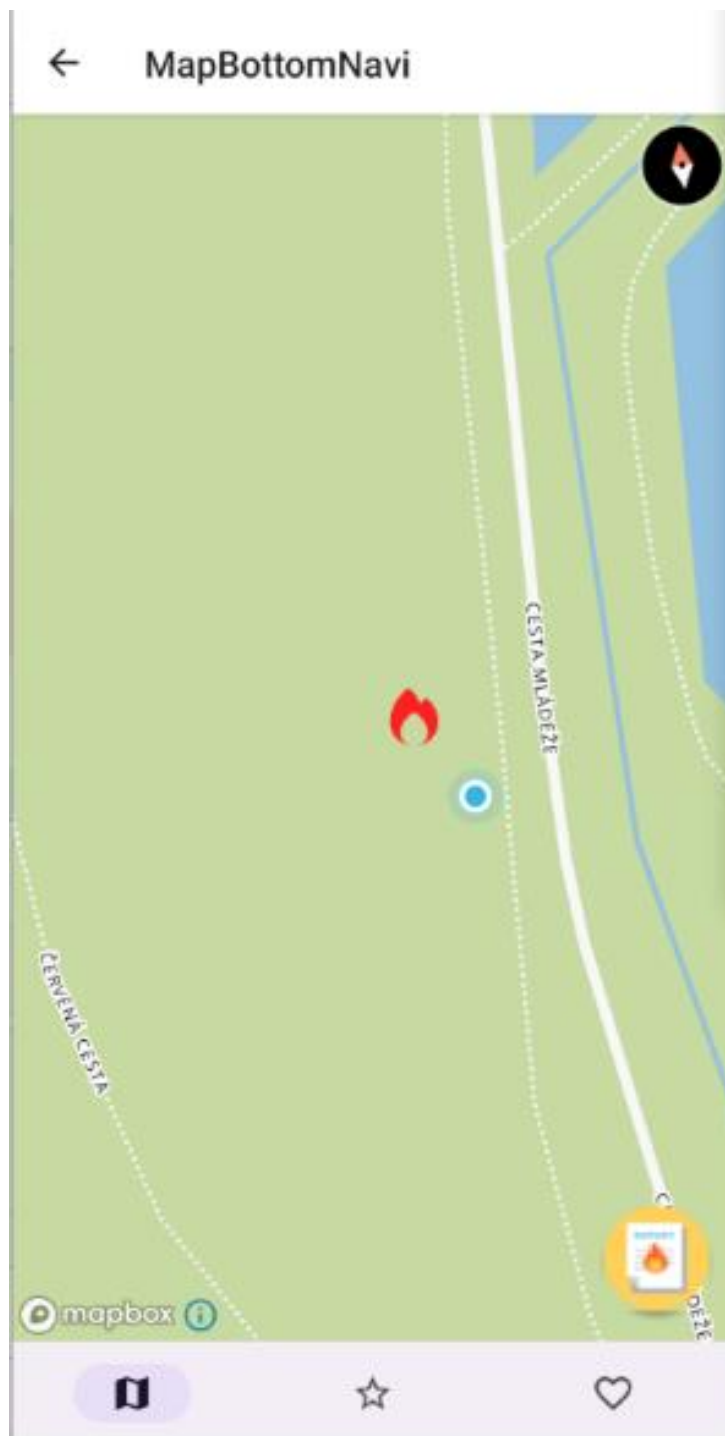
After providing the app with the location permissions per Google's privacy settings, the user can see their real-time location on the interactive map element. To report a fire, they need to press the button on the bottom right of the screen to make their report. When they press it, they'll immediately be redirected to the page in figure 15.

Figure 15 - Fire reporting Form

Here, the citizen will be able to directly send a photo, a voice message or a text message to the backend EmerPoll system. The system will then notify the SILVANUS Admin from that region. From there, the admin will be able to cross-check the reports and notify other users in the vicinity.

To receive notifications from other users as well, the user will be able to subscribe to different channels as described in section 7.5.2, as seen in figure 16.

Figure 16 - Available Channels for subscription
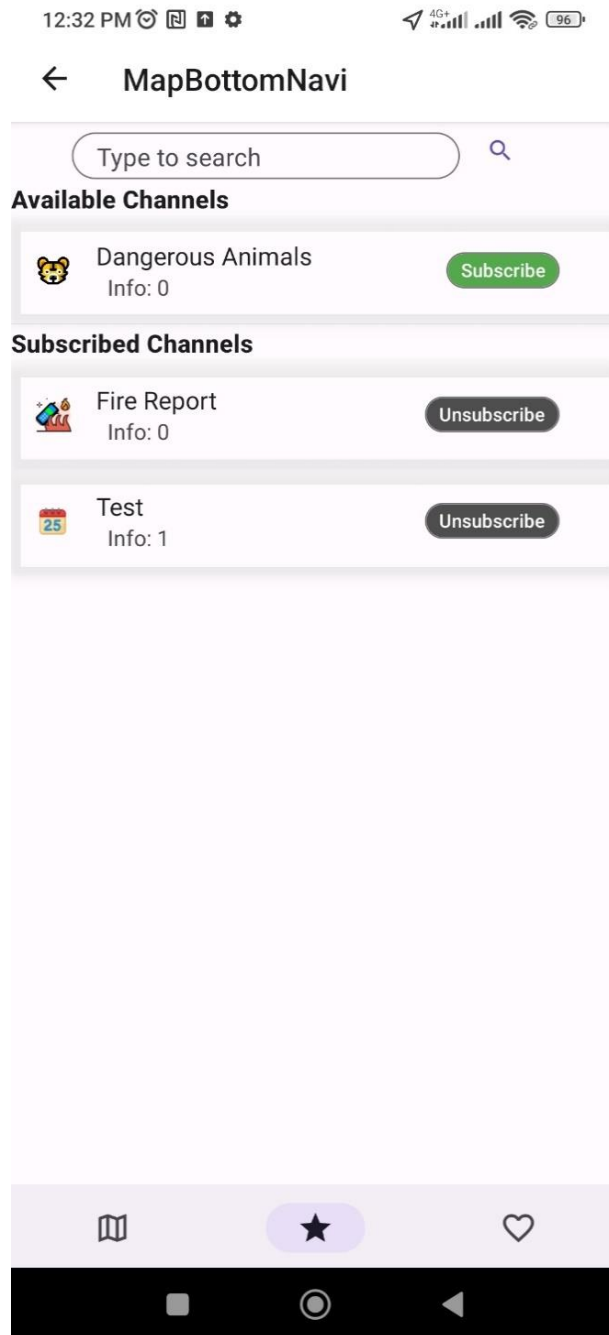
The rest of available modules (Discover, News) can also be seen below (figure 17). Since most of the information presented, there will be pilot specific, they are currently not as rich as the other modules.

Figure 17 - Discover & News Modules
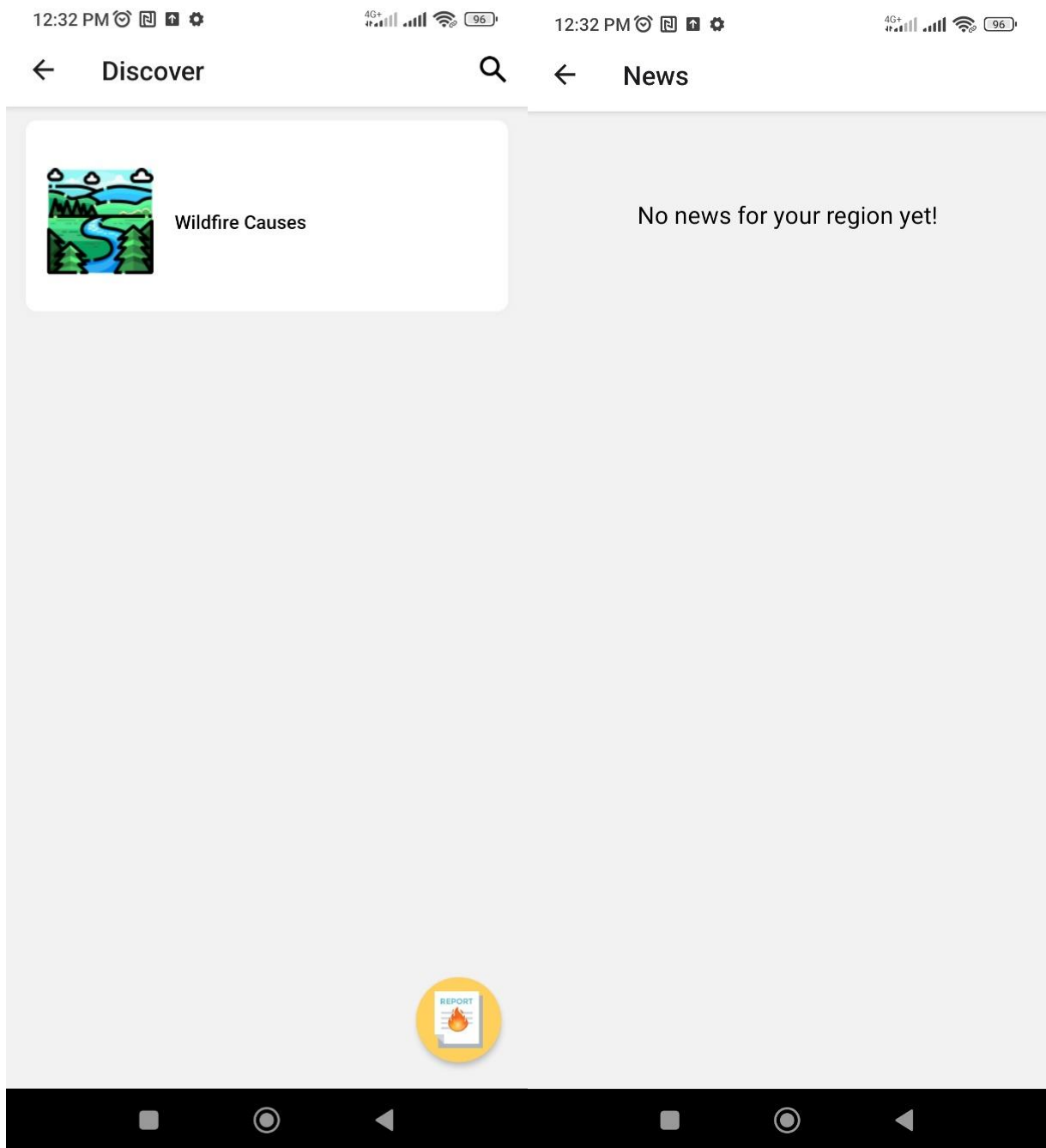
8 CEP activities (Accomplished and planned)

8.1 Educational poster to raise citizen awareness

A poster campaign can be an effective tool to engage citizens in the prevention and response to wildfires in several ways:

- Raising Awareness: A poster campaign can help raise awareness about wildfires' causes and risks. The posters can highlight the importance of preventing wildfires, the potential consequences of wildfires, and the role that citizens can play in preventing them.
- Communicating Important Information: Posters can share important information about how to prevent and respond to wildfires. For example, they can provide tips on creating a safe zone around homes, safely using campfires and barbecues, and what to do in case of a wildfire.
- Encouraging Action: A poster campaign can encourage citizens to take action to prevent wildfires. For example, the posters can urge citizens to report suspicious activity that may lead to wildfires or to dispose of cigarettes and other flammable materials properly.
- Promoting Collaboration: A poster campaign can encourage collaboration between citizens, government agencies, and other organisations involved in wildfire prevention and response. The posters can provide information on local volunteer opportunities and resources for reporting wildfires, which can encourage citizens to work together to prevent wildfires.

HB, HRT and SYNTHESIS have designed different posters in T3.5. The signs are being published towards a poster campaign in collaboration with MD. Sample posters are presented below (figure 18, 19, 20).

Figure 18 - SILVANUS Educational Posters by HB (some of the following posters are still under development)

Figure 19 - SILVANUS Educational Posters by HRT (some of the following posters are still under development)

Figure 20 - SILVANUS Educational Posters by SYNTHESIS (some of the following posters are still under development)

The Planning and design tool explained in section 6.2 was used by partners in different brainstorming and focus group meetings to gather ideas, key messages, and important topics to design posters. Posters were created to raise awareness among the public. Understandably, the audiences vary greatly based on country, district, urban, population density, demographics, psychographics, and prior experience/exposure to forest fires. Political, social, and technological contexts also affected the content and structure of the educational campaigns, as well as age diversity, digital literacy, and more. The messages were selected to be accessible and memorable to citizens based on analysing wildfire causes and how one can use these key messages to warn about certain potentially risky behaviours in nature and in wildfire-sensitive areas (barbecuing, etc.).

Each partner contributed to the poster campaign, highlighting issues relevant to their locality/audience while maintaining relevance and adaptability to a broader audience.
Partners were free to select among the posters created the ones that they believed would resonate better for their own audience and would have a significant appeal and resonance with everyday reality. For the selection of topics, most partners utilised their experience, as well as informal focus groups and the contributions/opinions of local stakeholders. The partners also aligned the poster content with the national and local campaigns instigated by local authorities. References to popular culture might have been included in the content, as well as expressions or phrases with a local connotation of significance. While certain nuances of the language might have been lost in translation, the effect in the native language remained.

Regarding the exhibition in a rural area, it was chosen based on the extent that it would attract audiences and also under the assumption that a lot of people interacting within forest areas might not be permanent residents but rather visitors. The choice of location also facilitated visibility with local and national stakeholders and provided a good environment and occasion for dissemination. Other partners, particularly in smaller countries, have also opted to showcase posters and disseminate them in urban areas as well, in order to inform and raise awareness to people who routinely commute between urban areas and forest areas for recreation, work, or holidays. For example, the exhibition in Rijeka - was successful thanks to the cooperation between the Croatian Firefighting Association and the local administration. General feedback from citizens was positive, and the highest interest was for the citizen engagement app – certain citizens would also insist on interaction and their own contribution, not only on absorbing messages.

For the posters, the messages were divided into the following categories of content: informational - awareness raising (environmental awareness, role of the forest in the ecosystem, highlighting the contribution of the forest into everyday life and climate, highlighting the detrimental effects of forest fires in everyday lives, regardless of location), preventative messages (content promoting preventive action and safeguards to prevent forest fires, particularly highlighting human activities that increase the risk of forest fires) and mitigating content (instructions on how to respond - navigate the event of a forest fire).
Particularly for the preventative messages and the content relating to the appropriate actions and response during a forest fire, the validation of firefighters was needed to ensure that the content shared aligned perfectly with the existing guidelines and was in accordance with the guidance offered by the local fire services. An example of that would be the guidelines or instructions for evacuation, which vary extensively from location to location and is therefore imperative that the conditions under which an immediate evacuation is advised are validated by the fire department.

8.1.1 Online educational poster campaign from 1st of March to end of 2023

HB, HRT, SYNTHESIS and MD have launched an educational poster campaign from the 1st of March to the end of 2023 (figure 21). In this campaign, a poster will be published bi-weekly. Each poster is selected by a group of partners based on the time and season of the year. Each poster is about citizen engagement, including raising awareness about wildfires and forests and changing their attitudes and behaviours in wildfire management processes. A group of experts verifies the posters before their first dissemination. It will be tried to involve more partners in this campaign. The minimum requirement to publish a poster in this campaign is:

- The SILVANUS logo must be included in the poster.
- EU logo and disclaimer must be included in the posters.
- SILVANUS QR code should be included in the poster in case there is space for that.
- SILVANUS Website address, Twitter, etc. should be included in the poster in case there is space for that.
- The colour used in the poster should be in harmony with the colours in the SILVANUS logo (not mandatory) - or use White with transparent background.
- Posters should have a 'single theme' related to citizen engagement, including raising awareness about wildfires and forests and changing their attitudes and behaviours in wildfire management processes.
- Posters that are being published for the first time must be validated and verified by task leaders/WP leaders and firefighters.

Currently, SILVANUS social media channels are used to publish the posters. However, the posters may be published in other channels, translated into different languages and used in other events. These activities are ongoing now.

Figure 21 - Launching online educational poster campaign for citizen engagement program
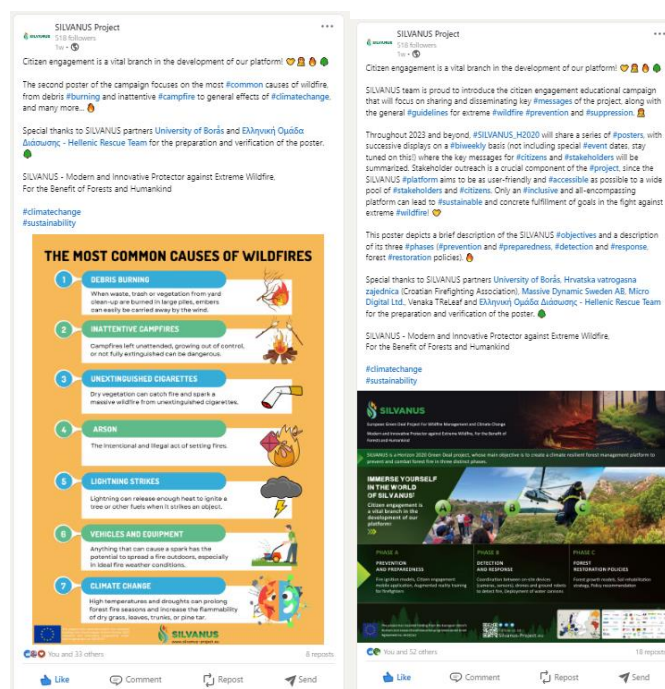
The use of innovative services such as online questionnaires, demographic target group selection, consultation with the environmentalists and feedback from advisory board members will all be analysed.

Citizen engagement campaigns coincide with the pilot exercises, particularly in areas close to the pilot sites (e.g., exhibitions in Rijeka in Croatia – close to the pilot site of Šapjane, and Limoges in France). The goal is to inform the citizens of SILVANUS pilots, the successful testing of which will advance the SILVANUS platform and bring long-term benefits to wildfire management in those local communities especially endangered by extreme wildfire. The organisation of citizen engagement campaigns has been supported by local administration in given areas (e.g., Rijeka, Bari, Limoges), and the campaigns have been covered by local and national news organisations in Croatia, France, Italy and Slovakia. Another purpose of the campaign is to notify the citizens about the interactive component of the SILVANUS platform, namely the citizen engagement app, where citizens can contribute directly to the platform.

8.1.2 Poster promotional and educational campaign - Croatia

SILVANUS is preparing a promotional and educational campaign to coincide with the implementation of 12 pilots in the first trial period between April and September 2023.

The first promotional poster campaign, organised by the SILVANUS partner Croatian Firefighting Association (HVZ), will occur between the 3rd and 12th of April of 2023 in the City of Rijeka, Croatia, on the main central street of Korzo. The City of Rijeka officially sponsors the campaign. Rijeka is the 3rd largest Croatian city, located in the Northern Adriatic region, with a population of 107,964 inhabitants (according to the 2021 Population Census). The town is approximately 20 kilometres from the Croatian pilot location in the training centre of Šapjane.

There will be ten two-sided bilingual posters (text will be displayed in Croatian on one side and English on the other) with a visual presentation of SILVANUS objectives, pilots, and citizen engagement key messages. Five posters will convey general SILVANUS key messages and will be applied and used in all of partner countries within their respective promotional campaigns, while five posters will focus on the Croatian pilot and on the general activities of the Croatian Firefighting Association, with an emphasis on educating the citizens on the most important wildfire prevention measures.

The general scheme for the posters is as follows:

SILVANUS General Project Posters

- General project information: description of objectives, phases of the project, key messages
- Announcement and visual presentation of the SILVANUS citizen engagement application
- Education programme on fire prevention – tips to citizens
- Detection and response activities
- Lines of defence and rings of protection

Country and Pilot-Specific Posters

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- Croatian Firefighting Association: Description and its mission, Croatian firefighting in numbers.
- Firefighting Association of Primorje-Gorski Kotar County: firefighting in numbers and description of the Training Centre Šapjane (Croatian pilot description).
- Statistical data on vegetation wildfires, Preventive actions taken.
- New technologies used in extinguishing forest fires.
- Deployment of a UGV and equipment by external stakeholders.

The posters will include a link to the SILVANUS website and an invitation to stakeholders for newsletter subscriptions. Figures 22 and 23 depict two of the posters that will be displayed.

Figure 22 - SILVANUS General Poster

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Figure 23 - SILVANUS Poster – The Announcement of the Citizen Engagement Application
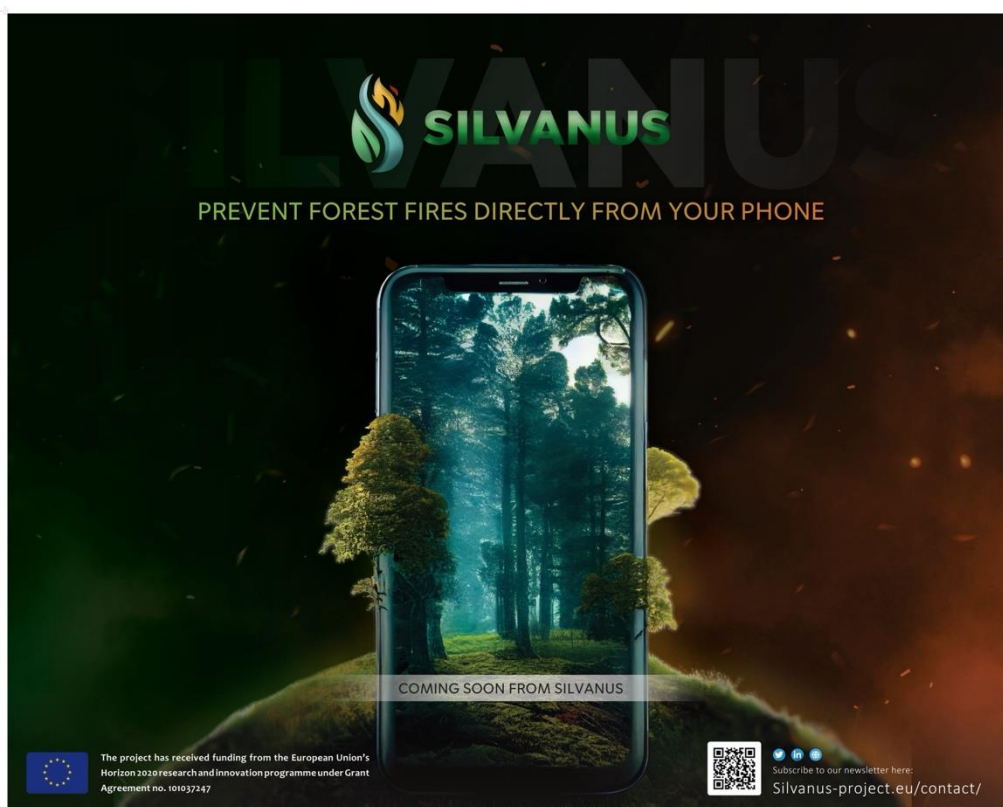
The posters will be available in the languages of SILVANUS consortium partner countries and will be displayed in other promotional campaigns that will coincide with the implementation of pilots. Along with live display sessions, the posters will be disseminated on the official SILVANUS website and social media channels.

8.2 CEP activities and events

8.2.1 Slovakia

Description of activities

In Slovakia, a national-scale firefighting exercise is held once a year for the purpose of monitoring the effectiveness of professional and volunteer firefighting units. On April 24-26 2023, the exercise took place in the region of Zvolen, Podpoľanie, which is typical for its difficult to access and rugged terrain covered by dense forest. The scenario of the exercise is set into the specific condition described in the following paragraph:

"A longer period of hot weather without precipitation (July, August). The moisture content of fine fuel reaches critical moisture values which means very high risk of forest fire. Fire hazard maps will inform about this danger. Since the initiator of the fire will be human activity (negligence), the fire will start from an open area near the forest covered with tall grass and will continue into the forest".

In this scenario, the ForestWatch camera system will detect the smoke, and the information (image, text and coordinates of the fire location) will be sent from the ForestWatch operation centre to the coordination centre of the integrated rescue system. The information will be registered as an emergency event in SW CoordCom. Meanwhile, the tourists spot the smoke and fire from nearby locations and use the CE mobile

application fire reporting module to report the fire by sending pictures and estimated locations to a dashboard visible in the operational centre. The first fire responder unit will be sent to the location that is approximated from all information sources. The fire alert will be sent to the users of the CE mobile application in the vicinity of the fire. During this event, the users can follow the guidelines contained in the CE mobile application.

Citizen engagement program was presented by the following ways:

- The concept of a fire reporting module using SILVANUS CEA was demonstrated on the 25th April 2023 as a part of the SILVANUS tools demonstrating wildfire detection and monitoring. The live demonstration was played and narrated, simulating a tourist spotting a fire in the forest, who was able to successfully send an approximate fire location, a message and pictures to EmerPoll system. Representatives of fire-fighters (HaZZ), municipalities, forestry and media saw the demonstration of capabilities of UAV and UGV in the field. The information flow at the C&C vehicle was demonstrated.
- On 26th April 2023, presentation of CEP to volunteer firefighters, municipalities, national parks, foresters and forest management representatives during the third day of the exercise. During this presentation, the possibilities of the future use and propagation of CEP was discussed. On the meeting, the core of the local Slovak and Czech focus group was established.

Target groups

Firefighters, volunteer firefighters, military firefighters from nearby air base, foresters, representatives of nearby cities and municipalities, representatives of conservation associations and national parks, technology provides (national/international), public research organisations and universities

Schedule

The exercise started on 24th April 2023 by organisational briefing followed by the technology deployment and testing.

On 25th April 2023, the activities described in table 8 were performed. The field demonstration was performed on 6 stages deployed at four sites to demonstrate the Slovak Operational Scenario. The focus was to demonstrate and to proof the readiness and coordination of firefighting units along with the technologies developed in SILVANUS project.

Table 8 -The field demonstration of the Slovak Operational Scenario

No.	Topic	Reponsible
1	Beginning of the Field Demonstration at Site 1, Stage 1 – Monitoring and Detection of Wildfire	3MON
2	Site 2, Stage 2 – Arrival of the first fire brigade on the fire scene and carrying out a reconnaissance	HaZZ, PLAMEN
3	Site 2, Stage 3 – Intervention Demonstration	HaZZ, PLAMEN, AF SR, 3MON
4	Site 3, Stage 4 – Gathering data for information support to the commander/command staff	HaZZ, PLAMEN, 3MON
5	Site 3, Stage 5 – Command staff: Demonstration of the use of gathered data in the command staff	TUZVO, UISAV, 3MON

| 6 | Site 4, Stage 6 – Completion of intervention + Tertiary data gathering by UAV and UGV | DELL |
| 7 | Debriefing | HaZZ, UISAV, 3MON |

On 26th April 2023, the Slovak Operational Scenario was summarized and pined-out pros and cons. The presentations described in table 9 were then performed.

Table 9 -The presentations on wildfire prevention and management

No.	Topic	Responsible
1	Wildfire Prevention from Forest Owners Perspective	OZ Poľana
2	Firefighters` Requirements on Wildfire Prevention and Mitigation	HaZZ
3	Wildfires in Podpolanie in the View of State Nature Conservancy	SOP SR
4	Forest Resilience and Biodiversity under Climate Change	NLC
5	SILVANUS Project Introduction	TUZVO
6	Slovak Pilot Demonstration Overview	UISAV
7	Pros and Cons of the Technology and Information Support in Wildfire Risk Management - Discussion	TUZVO
8	Implementation of the Stakeholder`s Questionnaire Survey	TUZVO

Expected benefits/outcomes
- Raise awareness about the possibilities of collaboration between citizens and municipalities, foresters, national parks by using CEA for fire prevention, well behaving the preserved forest areas and restriction information. [Phase A]
- Raise awareness about the possibilities of collaboration between citizens and volunteer/professional firefighters by using CEA for fire location reporting, fire severity estimation and also warning the citizens about the nearby fire threads. [Phase B]
- Collection of other requirements for the CEA functionality in order to increase its adoption among citizens and public authorities.

8.2.2 Greece

Description of Activities & Target Groups

In Greece, the SILVANUS Citizen Engagement Program (CEP) will be implemented in the North and Central Evia island. The CEP will mainly target schools in the area, but other promotional campaigns may also take place in parallel. More specifically the preliminary plan is:
- The first round will be implemented in December 2023 in the municipality of Dirfys-Messapion.
- The second round will take place in Spring 2024 (approximately May 2024) in the municipality of Isitaias-Aidipsou, which has been heavily affected by wildfires.
- The training program for schools may also be extended to other areas of the Region of Sterea Ellada (PSTE) as there is a strong interest from the school community and the local stakeholders.

In addition, volunteer groups and possibly citizens may also be invited in two exercises that will take place for the testing of SILVANUS components.

In the framework of the Citizens' Engagement, some additional workshops and training exercises are planned to be organised in Thessaloniki and in adjacent areas by HRT. The workshops target the general public, aiming to arm them with essential skills and understanding regarding forest fires and prevention.

Schedule

On 22 June 2022, a workshop in North Evia entitled "Preventing mega-fires and protecting local societies - The case of North Evia" was co-organized by KEMEA and PSTE. In this workshop, three EU Horizon 2020-funded projects participated, the first of them being SILVANUS. The other two were RISKPACC and FirEUrisk. In addition, the partners HRT and AUA of SILVANUS participated.

Besides the apparent dissemination purposes, the aim was to gather people representing the local society, such as citizens, professionals, local first responders and others, to discuss the challenges, problems and situations caused by the 2021 mega-fire.

SILVANUS managed to gather, for the first time, after the 2021 mega-fire incident, all the local stakeholders in one place to discuss what happened at the incident, the challenges faced and recommendations for the future form the perspective of each stakeholder. Feedback gathered is used mainly for future policies and strategies as well as the citizen engagement program. More information related to the June 2022 activity is described in Deliverable D10.2.

Until the end of the project, it is planned that two main pilot activities will take place in Greece, more specifically in the pilot area. Besides the CEP training that will take place in December 2023 and mid-2024 in Evia, similar events will take place in Thessaloniki, besides the dedicated citizen engagement programs mentioned previously (sections training, workshops, etc.). One discussion-based exercise will be implemented in Evia, specifically in Chalkida on the 31st of October with the participation of volunteers and the potential of local citizens as players and observers. The exercise will use the SILVANUS platform and modules with the participation of local citizens as players. More specifically, in the table-top exercise that will take place in October 2023, a scenario of a forest fire in North Evia will be presented in which the authorities involved (fire department, police, forest department, hospitals, etc.) will analyse the way to deal with the situation in all three phases (prevention, treatment, rehabilitation). Questionnaires will be given to the players to answer in order to determine how they respond.

Through the exercise, it will be discussed how better coordination can be achieved between the authorities, so that there is no overlapping of responsibilities. In addition, the way to involve citizens will be discussed, both in terms of informing about any fires and in the response stage.
Additionally, a field exercise will take place in Spring 2024 in N. Evia.

On June 28, 2023, was held a workshop, at the Municipal Hall of Thessaloniki, with 90 citizens in present. This particular event had two main objectives. The presentation of the SILVANUS project in general, as well as the mobile application developed in the context of T3.6. Authorities from civil protection, the fire service, and the forestry service attended the event to discuss about the Silvanus project and forest fire prevention with citizens.

Citizens will be trained in the following areas:
- Extinguishing a fire using a fire extinguisher.

- Ways to reduce the risk of fire spreading.
- Ways of prevention and self-protection.
- Presentation of Personal Protective Equipment.

Expected benefits/outcomes

CEP is supposed to have multiple benefits. There is going to be extensive information to citizens regarding their participation in all phases of fire management. In particular, the means and methods for citizen participation in fire prevention, conservation and restoration of the environment will be analysed. In addition, the methods of communication between them, the methods of escape will be analysed and, in general, the awakening and awareness of citizens on fire issues will be strengthened.

These efforts intend to empower all citizens with the knowledge and readiness required in the face of potential forest fire incidents. The ultimate goal is to enhance awareness surrounding fire-related hazards and foster the ability to mitigate these risks. An additional pivotal objective is to ensure a balanced representation of genders among the workshop presenters and attendees.

The envisaged outcomes encompass a population better prepared to respond effectively in forest fire scenarios. The initiative involves Greek partners from Silvanus Project in cooperation with the public authorities, various trainers who will conduct the sessions, and citizens, including those with specific needs, who will participate. This collective endeavour aspires to boost community resilience and safety in the event of forest fires.

8.2.3 Sweden

Description of activities

The Gothenburg Book Fair is an annual event held in Gothenburg, Sweden, that brings together publishers, authors, booksellers, and other industry professionals from Sweden and around the world. The fair has been held since 1985 and has become one of Sweden's largest cultural events. The fair offers a variety of events and activities, such as smaller and bigger seminars, panel discussions, booth activities, book signings, readings, and workshops. With typically around 100,000 international visitors over the four days of the fair, this annual event offers a great opportunity to reach a broad audience, both to share information through bigger seminars or panel discussions with around 200-300 participants or to engage with citizens in smaller seminars, or full day activities at organisational booths.

The University of Borås is present at the fair each year with a dedicated booth and typically holds various seminars and other events to promote topics of interest. The SILVANUS HB team participated in a well-received panel discussion about "climate change" in September 2022, where the SILVANUS project and its goals were presented and discussed. A proposal for a bigger seminar on the bookfair has also been submitted, which, if accepted, will be held in September 2023. Regardless, the HB booth will also be utilized to engage with its many visitors throughout the duration of the project. In addition to that, HB presented the SILVANUS for about 100 students as part of a full-day program about innovative and new studies at HB.

As part of the "needs and requirement study", HB, similar to other partners, involved various stakeholders and citizens. Furthermore, the HB team actively utilise the broad network at the University and HB's social media channels (including press releases) to disseminate information about SILVANUS, targeting both

citizens and related authorities and organisations, such as the Swedish Forest Agency and The Swedish Civil Contingencies Agency (MSB), rescue services in Sweden, and Swedish Forest Agency.

Target groups

General public, publishers, authors, booksellers, and other industry professionals from Sweden and around the world, students

Schedule

September 2022, September 2023

Expected benefits/outcomes

To reach a wider audience, usually citizens visiting the fair, students at the university to raise their awareness about wildfire and to introduce SILVANUS.

8.2.4 EU Green Week

Description of activities

SILVANUS organised a webinar on the project's general objectives during the EU Green Week on June 3rd 2022. The video of this webinar is available on the official SILVANUS YouTube channel: https://www.youtube.com/watch?v=MX90AupQrKM . SILVANUS will have another session on the project status and platform outputs in June 2023, which hopes to acquire additional feedback from citizens and stakeholders.

The 2022 webinar focused on the introduction and the objectives of the SILVANUS project, along with the demonstration of three pilots in Italy, Portugal, and Indonesia. The diverse pilots focus on various potential wildfire impacts, from the impact on biodiversity (focus of the Indonesian pilot), energy infrastructure (Portugal) and national park conservancy (Italy). This enabled the SILVANUS partners to present a versatile group of pilots that focused on different areas with various infrastructural challenges, such as the impact of extreme wildfire on local population, the electricity and water supply, and on forestry, underlying the holistic approach of the project, where all societal, economic, environmental, and health impacts are taken into consideration.

The wrap-up discussion focused on the alignment of SILVANUS goals with the main themes of the webinar, focusing on green transformation in environmental policy for carbon-neutral Europe by 2030 – biodiversity, zero pollution, and circular economy. The conclusions derived from the discussion were that extreme wildfire prevention (through training, land use change, forest restoration) is an essential component in preserving and restoring biodiversity, a vital contributor to a lack of widespread air and water pollution, and a benefit to the circular economy in terms of sustainable use of timber and promotion of forest resilience.

33 attendees were present at the live airing of the webinar via Microsoft Teams from countries such as Italy, Sweden, Indonesia, Portugal, Greece, and Croatia, and the recording was disseminated through the SILVANUS official YouTube channel. The aim of the webinar is therefore to reach out to as many stakeholder target groups as possible through its clear and accessible dissemination of SILVANUS project objectives. The

live audience of the webinar consisted of stakeholders from areas such as IT business, academia and firefighting organisations.

Target groups

General public, academia, IT business, energy sector, industry, firefighting associations

Schedule

June 2022 (1st webinar), June 2023 (2nd webinar)

Expected benefits/outcomes

Introduction of SILVANUS and its objectives to a wider audience of stakeholders and citizens. Constructive feedback from a variety of stakeholder target groups, from academia to IT business to firefighting associations, especially on the question of how SILVANUS results may help in achieving the green transformation for carbon-neutral goals. Further broadening of stakeholder pool and citizen interest in the outputs of SILVANUS (increasing the number of website visitors, social media followers and potential future platform users). Focus on introducing stakeholders and citizens to tangible results of the project, such as pilot exercise summaries and SILVANUS user product descriptions (with an emphasis on the citizen engagement app).

8.2.5 Building communication networks for Citizen engagements in Portugal

The Portuguese Pilot is focused on developing methodologies and tools to prevent wildfire ignition around critical infrastructures such as electric grids, energy generation facilities, or water and waste-water treatment facilities. Recovery actions are also dealt in this Pilot following-up the discussions taken for SILVANUS Phase C.

In the case of wildfires threatening critical infrastructures, besides population in general, also authorities, landlords or field activities people, need to be engaged in prevention, wildfire fighting and later recovery of the terrain. So, different channels and reference actors should be involved for effective action.

Table 10 summarizes the customization strategy to setup a communication network between different actors involved in preventing or fighting wildfires around critical infrastructures, based on the Portuguese National Plan for the Defence of Forest Against Wildfires.

Table 10 -The customization strategy to setup a communication network between different actors

Description of activities	Target groups	Schedule	Expected benefits/outcomes
Contact with local stakeholders	- Municipalities - Local forest associations - Grazing activity promoters - Landlords - Firefighters	On-going	- Engage these groups to change local culture of fire prevention - Exchange experiences regarding historical wildfires prevention, containing and restoration. - Building a network for wildfire prevention strategies update and

Description of activities	Target groups	Schedule	Expected benefits/outcomes
	- Local population in general		share of knowledge on terrain restoration
Presentation at local office	- Association of Municipalities of Cova da Beira region - Association Guardiões da Serra da Estrela[7] - Firefighters National School - Grazing activity promoters - Landlords - Forest located infrastructures managers - Consortium	Oct./ Nov. 2023	- Present SILVANUS in a broad manner and specifically the Portuguese Pilot from its aims. - Engage these groups to provide feedback regarding usefulness for locals - Prepare the demonstration according to audience expectations - Pave the way for future exploitation of results of the project by the stakeholders - Get local support for Pilot demonstration
Demonstration of functionalities and visit to field	- Association of Municipalities of Cova da Beira region - Association Guardiões da Serra da Estrela - Firefighters National School - Grazing activity promoters - Landlords - Forest located infrastructures managers - Consortium and other projects' representatives	May 2024	- Present the context of the project and last results from tools and other pilots to enlarge the range of potential beneficiaries - Detail the tools applicable to the Portuguese Pilot (Fire Index, biomass model, terrain maintenance model) and show the long-term results emphasising the benefits for its application against the state-of-the-art. - Showing the economic benefit from taking the flock to serve the purpose of preventing wildfires near critical infrastructures and earning something with that - Shown on field the results achieved and how the same philosophy can be replicated to other Portuguese and foreigner contexts
Post- demonstration meeting	Stakeholders that will show interest in continuing collaboration	Oct./Nov. 2024	- Project outcomes and their application for each stakeholder, feedback, and link with developers for improvement

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[7] The "Guardiões da Serra da Estrela" is an association that aims to recover the ecosystems of Serra da Estrela, through the involvement of civil society.

Description of activities	Target groups	Schedule	Expected benefits/outcomes
			- Share of results from the Portuguese cluster of partners and plan for their long-term application and continuous improvement. - Roadmap of future activities related with SILVANUS Centre for Adaptation Strategies and Development (CASD) and assessment of follow-up benefit for participants - Integration plan between SILVANUS outcomes and existing initiatives at Municipalities/Government level to optimize resources and leverage results

8.2.6 France (PUI)

Description of activities

The French pilot "Forest fire with Industrial accident in highly explosive plant" is envisaged to take place during September 2023 in La Jonchère, St Maurice, a rural area in Haute-Vienne, Nouvelle Aquitaine, only 34 km out from Limoges. The partners in charge will be the fire service, Prefecture, Municipalities, Agriculture and forest administration and with citizens' engagement under PUI's auspice. Many industries with a high risk of human dimensions (for example, SEVESO industries) are situated near residential or rural areas. Thus, managing a major accident in a delicate situation of forest fire is a challenge. With the production of smoke clouds and explosives, it is always important to minimize further risks.

The forest fire scenario has three active fronts, moving towards sensitive targets; With a large amount of smoke and wind exceeding 70 km/hour, the firefighters urgently need priority information:

- (a)mapping of the area;
- (b)identification of access paths,
- (c)urbanized areas,
- (d)roads and access routes;
- (e)temperature, dehydration of plants,
- (f)speed and direction of the wind, the anticipation of fire development and development axes.

There are two types of risks:

- 1) explosion of a delivery truck on the site and
- 2) explosion of one or three depots.

The pilot will also include a workshop demonstrating the citizen engagement app (CEA) to potential users. During the workshop, Android phones will be handed out by MDS to participants for testing the application. The purpose of this is two-fold:

- MDS will hand out a survey (Citizen Engagement App -- Retour d'information sur les tests internes) to the participants with questions regarding the user experience with the application. This is useful for the developers to collect feedback from more than 100 end users, specifically end users from schools and universities, and the feedback will be used to improve the application, both in regards of the content provided, the look and feel, and the translation of the CEA to French. Additionally, questions included in the survey can be used to drive future development and planned modules and functionalities.
- Interested participants can also provide their contact details to MDS to participate in beta testing of the CEA, while it is in internal testing mode on the Google Play store.

Target groups

fire service, Municipalities, Agriculture and forest administration

In this pilot, twitter and social media will be used and different groups will be involved:

-The school children of Saint Sylvestre

- The general population of Saint Sylvestre

- The board of ets EPC (explosive depot)

Schedule

29-30 September

Expected benefits/outcomes

To minimize the further risk in case of fore fires near industrial area

To involve citizens in a poster exhibition and testing the mobile app and get feedback from them

8.3 Educational course for citizens (MOOC)

MOOCs (Massive Open Online Courses) can be an effective tool to engage and empower citizens in both prevention and response to wildfires in several ways:

- Providing education to raise citizen awareness: through a MOOC, we can provide valuable information about wildfires, their causes, their effects, and the associated risks. MOOCs can also educate citizens on how to prevent wildfires, what to do in case of a wildfire, and how to take preparatory and mitigating steps. This can help citizens become more aware of the issue and take proactive steps to reduce the risk of wildfires, and it can also function as a communal hub of knowledge for whole groups, both formal and informal.
- Empowering citizens with knowledge: MOOC content can empower citizens with knowledge and skills that can be used to prevent and respond to wildfires. Course contents can include information about the causes of fires, best preventative methods, steps to be taken in cases of fire, and also useful practical information such as instructions on the proper use of fire extinguishers, creation of a defensible zone around one's homes, or how to evacuate safely during a wildfire, along with guidelines in terms of materials to be used during construction and practical guidance on managing areas (such as gardens or parks) adjacent to forest areas; along with information on identifying high-risk weather patterns and other circumstances that can prompt or exasperate a wildfire.

- Encouraging citizen participation: by providing informative material in a MOOC we can encourage citizens to get involved in wildfire prevention and response efforts in their communities. The contents can provide information on local volunteer opportunities and resources for reporting wildfires. This can help citizens to take meaningful steps and contribute to their community and hence act as a motivator to take action, building their own networks of volunteers in their local communities.

- Facilitating collaboration: By enabling network building, the MOOC can be utilised towards facilitating cooperation between citizens, government agencies, and other organisations involved in wildfire prevention and response. In addition, the MOOC and the resources provided can act as a platform for sharing information and best practices, allowing a discourse between government authorities, emergency services, local communities, and other relevant stakeholders.

- Broad reach: A MOOC, by its nature of being online and available to broad audiences, can be accessed easily using mobile phones, computers or other devices. The material in a MOOC can also be used to hold physical workshops and training programs specifically for citizen engagement in various settings, including –but not limited to- schools, churches, organisations, businesses, the hospitality industry, non-formal groups, volunteers and citizens/residents in general.

Overall, MOOCs can be a valuable tool for engaging citizens in wildfire prevention and response efforts by providing educational content, empowering citizens with knowledge and skills, raising awareness and encouraging participation, and facilitating collaboration. In CEP in T3.5, HB has developed a curriculum for a MOOC based on the discussion with partners involved in the task, especially those already engaged in developing and delivering various training programs (e.g., HRT and PUI). The curriculum is still under development, but a preliminary outline of the proposed curriculum is presented in Table 11:

Table 11 - First draft curriculum for a Citizen Engagement Educational Course

Citizen Engagement Educational Course (CEEC)

- **Introduction to SILVANUS and Citizen engagements program**
- **Forest fires**
  - Types and parts
  - Common causes of wildfire
  - Meteorological and topographic factors on fire behaviour
  - Combustible materials
  - Statistical data on vegetation wildfires
  - The largest fires - historical cases
- **Forests ecosystem & Woodlands**
  - Forest ecosystem
  - Forest awareness
  - Biological diversity and fire protection
  - Fire risk maps
- **Wildfire Prevention - Advice and tips for citizens**
  - Protecting your house against wildfires
  - Fire ignition prohibition in or near forests
  - Camping safely
  - Safety measures if you live next to a forest area
  - Needed actions when you visit the forest/countryside (guidelines)
- **Emergency Preparedness**
  - Emergency preparedness
  - Use of the fire extinguisher
  - Emergency backpack
  - Making a family emergency plan
  - Orientation and pathfinding
- **When wildfire happens**
  - Communication with the state authorities in case of fire
  - Citizen as first responder
  - What to do when you notice a wildfire
  - What to do if you are near a fire
  - What to do if the fire has reached you
  - Fire suppression
  - Evacuation
- **After a wildfire**
  - What to do after the fire is extinguished
- **Citizen involvement and awareness**
  - How to become a volunteer firefighter
  - How you as a citizen can help firefighting in forests
  - Training centres
  - Firefighting equipment for volunteer firefighters
- **Firefighting resources**
  - Firefighting association/authorities
  - Fire firefighting in numbers for the country
  - Dangers for firefighters on forest fires
  - New technologies used in extinguishing forest fires
  - Digitization in fire prevention and fire fighting
  - Key actions in firefighting

The curriculum in still under development.

8.3.1 A preliminary exploitation plan for the online course

Introduction:

Wildfires pose serious threat to both natural environments and human communities worldwide. In recent years, the impacts of climate change have become increasingly evident and severe. To mitigate the impacts of climate change and to create innovative ways to adapt to the changing climate landscape, it is imperative that we develop a culture of preparedness and prevention. A key step in this pursuit is raising awareness and promoting collective actions.

The educational course that is being prepared aims to educate the public about the actions they can take to reduce their vulnerability and to inform them about various issues related to wildfires and their causes. The course presents proactive measures to reduce the risk of wildfires occurring in the first place and promotes a culture of preparedness by discussing how to plan and organise resources and their actions to respond effectively to the emergency situations caused by wildfires.

Market Analysis:

The user needs and requirements studies conducted in the project have highlighted a need for further informational contents. However, our search on popular MOOC platforms such as Coursera, FutureLearn, and Udemy indicate that courses related to wildfires and wildfire prevention and management remain limited. For example, a search for "wildfire" on Coursera returns 13 results, however, with titles such as "The holocaust – An Introduction", "Journalism Skills for Engaged Citizens", "East Asian Religions & Ecology", etc., among the results, not many of the offered courses seem to cover what is intended by this course. Similar searches returned one (relevant) result on the FutureLearn platform and 31 results on the Udemy platform, however, majority of the results on the latter platform were related to different computer systems and firewalls rather than wildfires. Therefore, our examination of the field has identified both a need for such a course as well as limited responses to this need.

Unique Selling Proposition (USP):

This course is being developed based on scholarly investigations and will meet real expressed needs. Furthermore, the course is being created in collaboration with a strong and extended network of experts active in the SILVANUS project. The course will, therefore, be informative and based on a solid foundation. Finally, on its completion, the course will have been evaluated considerably by the experts in the project for both its content and design, rendering it to become a useful course filling an identified gap.

Commercialisation Strategy and Financial Plan:

An aim with this course is to promote broad awareness, create a culture of preparedness and to disseminate of some of the findings of the project for a greater use. As such, we intend to make this course available free of charge, without any financial gains.

The costs involved whether in PMs used or other costs will be covered mainly by the resources allocated within the project to the involved partners.

For costs that go beyond the resources available in the project, detailed plans will be drawn to enable commercialisation and return of investment by those involved. These considerations are planned to be explored more closely later in the process.

Promotion Strategy:

The promotion of this course (like other outcomes of the project) will be of interest to a broad range of people from the members of the project to local and national authorities, forest rangers and personnel involved in forest management, educators in environmental science and related fields, and more.

Therefore, it is likely that many different organisations will be involved in adoption and promotion of this course to ensure reaching the intended audiences. However, as a concrete example, a comprehensive promotion strategy will be implemented by HB as an academic partner leading the creation of this MOOC, where press releases will be issued to local and national media outlets to gain coverage and raise awareness about the course. Social media campaigns will be used for recurring posts and advertisements on platforms such as Twitter, Instagram, and LinkedIn to create awareness about the course and its importance. Through partnership and collaboration with environmental organisations, local government bodies, and educational institutions the course will be promoted through their networks. The course will also be promoted through various community outreach activities such as conducting webinars and online workshops in collaboration with community organisations to directly reach people living in wildfire-prone areas. Furthermore, information about the course will be made widely available through course information catalogues released by HB and the MOOC platform host.

The course will be hosted on a popular MOOC platform to ensure broad reach, accessibility, and user-friendliness. Additionally, we will explore partnerships with educational institutions to integrate the course into their curricula. This will not only provide students with valuable knowledge but also encourage its adoption on a broader scale.

Partnerships and Collaborations:

The creation of this course is led by the partner HB, however, this effort is strongly supported by other partners involved in tasks T3.5 and T3.6 and more directly by for example HRT, PUI, HZV, MD, MDS, UISAV, EDP, KEMEA, SYNC, and more

Risk Assessment:

Due to seriousness of the topic, the accuracy and correct formulation of the contents is of utmost importance, lack of which may bear severe consequences. To minimize the risk of erroneous information, the course contents will go through rigorous evaluation and reviews.

Considering that development of such a course was not envisaged at the time of proposal development, a risk may be limited possibility for development of an extensive instructive course withing the limitation of resources available. To address this issue, first we continually evaluate the feasibility of the content development as compared to the available PMs and other resources, to align the scope of the course with available resources. Second, the course contents will be designed in a way to allow extensions by interested parties beyond the project-end. Such extensions are deemed feasible as this topic is of interest to many organisations involved in this project.

A further risk may relate to low number of enrolments, we hope that promotion strategies described above and the fact that the course will be offered in the format of a MOOC (which typically entails large numbers of participants) will help reduce this risk.

Finally, to reduce the risk of outdated content and to ensure the course remains relevant and effective, we will actively seek feedback from participants through surveys and online forums. This feedback will be used to continuously update and improve the course content and delivery methods.

Monitoring and Evaluation:

By the nature of the course, and it being a MOOC, ample participation-monitoring statistics will be made available via the MOOC platform to help monitor the use of the course, including the number of enrolments, how far the students follow the course, where the course participants are located, why they choose to take the course and more. As mentioned above, regular course evaluations will also be conducted to enable course improvement.

Regulatory, Legal and Ethical Considerations:

This course may be adapted to become part of existing educational programmes. For this to happen, those interested will need to consider local institutional regulations for course provision and examination. On a broader scope, before releasing the course for broad consumption, relevant authorities will be consulted for accuracy of contents and compliance with legal considerations. Furthermore, all ethical issues involved in provision of online courses will be considered in line with similar considerations that the academic partners continually and expertly need to take into account in all their course provision activities.

9 Key Performance Indicators (KPIs) and Ethics

9.1 Plan and methods for testing and validation of CEP in collaboration with the pilot sites at the end of the project

Testing and validating the activities undertaken within the framework of the SILVANUS CEP is an important part of the project. We will try to get an overview of the impact of the CEP on several levels, as has been identified in the model of participatory action research (Johansson, 2019) (figure 24):
1) the societal change happening in a particular social context,
2) research findings from our activities increasing understanding of citizen engagement,
3) personal outcomes for the citizens involved in the CEP activities.

Figure 24 - The model of participatory action research (Johansson, 2019)
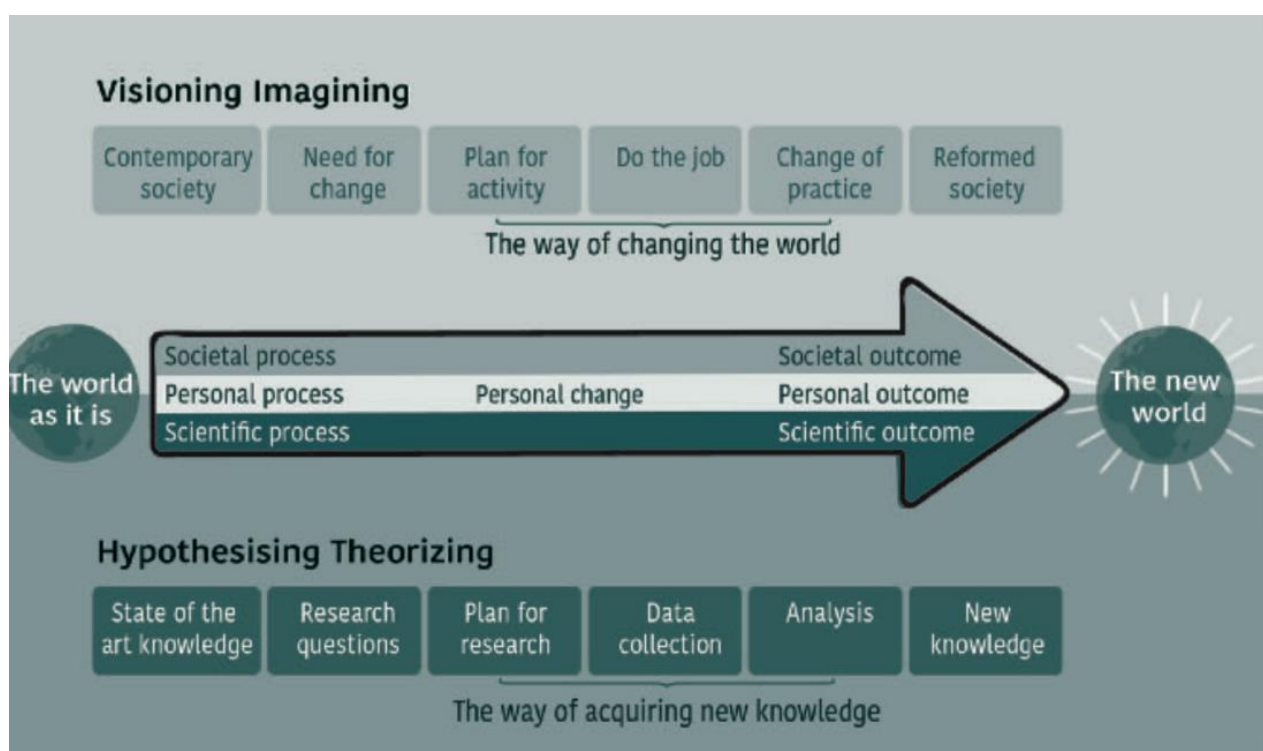
Testing and validation will provide an opportunity to not only judge the impact of the concrete CEP activities but also to collect data about the level of citizen engagement in different activities. This data then can be used to draw more general recommendations about the methods of citizen engagement in any European country according to their universality and influence on citizens' preparedness for wildfire situations in terms of raised awareness levels, changed attitudes and behaviour. The actual instruments validating the undertaken activities and measuring impact will be developed for each separate CEP action but re-used in different pilot sites and iterations of the same activity. In the following (table 12), we show the KPI related to citizen engagement.

Table 12 - KPIs (HB and MDS contribution to D2.3)

KPIs from GA	Implementation and monitoring methods
Social media engagement for forest management authorities, landowners, public authorities, and visitors of eight (8) pilot sites through at least three (3) platforms.	SILVANUS activities are continually reported and promoted through different channels (e.g. LinkedIn, public media, public events, pilot events). Records of the promotional activities are kept, and statistics on engagement are collected and monitored. It has been several activities and events until the time of writing this report. They can be found in Chapter 8 about CEP activities. The development of the online course mentioned in section 8.3 is also another example in which different stakeholders are engaged both in the design and contents of the course. The KPI is also monitored online through package management services, i.e., Google Play or Apple Store, social media platforms, etc. and by counting participants in pilot and other events. More information on this can be found in the deliverable D10.x in WP10 about dissemination.
Promotion of citizen engagement activities and use of citizen-engagement-toolkit through 500 local authorities.	The different citizen engagement activities are continually promoted through different channels and the reach of these communications is recorded. Once the CE App is fully tested and functional, it will also be promoted to a broad range of local authorities, and the level of its use will be monitored and studied through direct contacts and related surveys. The App has already been demonstrated and assessed in multiple cases and in connection to different pilots (Greece, Croatia, and France) since the time of when this report was initially submitted. The activities can be found in Chapter 8 about CEP activities.
Extend invitations to external stakeholder advisory group.	The SILVANUS project has established strong connections with its advisory group who are all kept informed of the activities in the project. It has been several activities until the time of writing this report. They can be found in Chapter 8 about CEP activities. There is already a list of relevant external stakeholders ready to be used. The development of the online course mentioned in 8.3 is also another example that we are involving internal and external stakeholders both in the design and also in the study of the course.
Citizen-engagement-tool-kit assessment by at least 200 engaged users.	The citizen engagement App is under construction and its first iteration has undergone initial testing and evaluations by a selected group. Once it is fully functional and has been reviewed and improved for broader release, it will be made available to a broader public and assessed by at least 200 engaged users. The results of these assessments will be systematically collected through surveys and will inform future revisions of the App.

The project's first period has been mainly assigned to developing and creating a citizen engagement program and a mobile app. However, there have been several cases in which citizens have been involved (see 8.2). There will be more involvement once the framework is in place in periods 2 and 3 of the project. The KPIs will be monitored every six months to ensure the progress aligns with the aimed time plan.

The CEP is ongoing (e.g., poster campaign) and the pilot events will be started shortly after writing this deliverable and will continue over a period in different locations. Currently, different evaluative measures are being developed for different purposes. Here are some examples:

1. The impact of the poster exhibition in Rijeka will be assessed by:
    a. Exploring if the poster campaign is mentioned in local media and in which ways (societal impact)
    b. Conducting a survey among the citizens taking part in the educational event on April 3-12 to identify how many of the participants have explored the contents of the posters and what contents are remembered most after the event. Some notions of the intention to apply the received information can also be measured (personal and societal impact).
2. The test of the mobile app undertaken in the pilot sites in Slovakia (April 24-25) will be evaluated in relation to the aims set in 7.1 (research and technology development)
3. SILVANUS social media poster campaign will be evaluated by measuring the numbers of visitors, likes, comments and downloads during the campaign itself. The comments will be captured and analysed qualitatively (societal and personal impact).
4. The MOOC developed within the CEP framework will be evaluated in relation to the goals identified in 8.12 (personal impact and educational development)
5. The knowledge increase will be captured by publishing articles and conference papers and measured in terms of accepted publications and reactions of peers.

9.2 Ethical aspects

Ethical considerations, routines, laws and methods in SILVANUS are part of T1.6 activities entitled "Management of external legal and ethical advisory board". Within this context, this task is going to identify, map and advise on the legal and ethical issues related to the research activities to be conducted under SILVANUS, providing guidance and steering to all WPs as regards SILVANUS solution. Therefore, for ethical consideration in T3.5 and T3.6, reference is made to T1.6 and the related deliverable about D1.5, which includes a section on T3.5 and T3.6 tasks as reproduced below in Table 13.

Table 13 - Ethical consideration by HB and MDS

Task	Leading Partner	Type of activity that is expected to involve humans	Participant	Briefly describe why the involvement of human participants is necessary based on the scope of the research activity	Timeline of activity
T3.5	**HB**	Potential interviews, questionnaires, participatory workshops, focus group	Both SILVANUS members and non-SILVANUS members	This task is about developing a citizen engagement program for preventing wildfires, and as such it demands contact with citizens, both for access to their lived experiences and participation in co-design activities as well as their involvement for testing and evaluations.	The activities related to this task will continue throughout the project.
T3.6	**MDS**		SILVANUS PARTNERS	Testing for the purpose of evaluating and feedbacking the	This is going to inform the deliverables

				mobile citizen engagement mobile app. e.g., testing usability aspects	: D3.3; D3.6. Timeline: M6-M42

The ethical considerations that are important in T3.5 include:

- ethical use of data collection instruments to protect the respondents. As part of T3.5, partners will conduct studies in which stakeholders (both internal and external) and citizens are involved in the interview and focus groups. We have already designed a study protocol, and as part of this study protocol, we have also attached a consent form and an information sheet (See section 6.1 and Appendix 3). These are prepared in collaboration between HB and KEMEA. These have been presented and discussed in our monthly meetings. Partners have received information on how to use the study protocol and the consent form when conducting studies or involving citizens. The files are in SharePoint and have been shared with all partners.

- to protect the interests of our partners - this is the ethical use of information from the project, and it is defined in the agreement of intellectual property that has already been discussed in other WPs: T3.5 and T3.6 have been active in the related meetings.

- to follow ethical guidelines in research - this is defined in research ethics documents in SILVANUS as part of T1.6 and D1.5

- to be ethical in our promotion activities - i.e., be honest, truthful, and trustworthy. Regarding the poster campaign and design and promotion activities, we have asked to form an expert group of firefighters (until now: PUI, HRT and in collaboration with KEMEA) to validate and verify the content of the material we are publishing as part of the Citizen Engagement program. This way, we want to avoid disinformation and make the information valuable and usable for citizens.

In the future, we will also refer to D1.5 to consider the ethical aspects of citizen engagement.

10 Concluding remarks and next steps

Citizen engagement is vital in raising citizens' awareness about wildfires and related risks and promoting improved attitudes and behaviours. The development of SILVANUS CEP has started both from theoretical and practical perspectives. Therefore, a CEP framework has been presented along with the conceptual framework.

Different tools have been used to collect data that form the contents for citizen engagement communications, posters and needed features in the mobile app:

- The mobile application and its various modules (e.g., guidelines, fire notification and report) development is going forward.
- An educational poster campaign has been launched, and different CE activities have been planned or will be planned in pilot events.

However, some challenges and needs remain to be addressed.

- First, there is a need for a deeper understanding of citizens' challenges and needs to be engaged in wildfire management processes. Therefore, different studies are planned to be conducted in the future by involving external and internal stakeholders and citizens.
- More specific KPIs will be defined and used to evaluate each CE activity's impact based on the details of activities.
- Other modalities for citizen engagement are in the process of being further developed and activated.
- Liaisons and synergies with other projects that study similar topics will be investigated in the future.
- Finally, ethical aspects will be investigated more in collaboration with T1.6.

Thus, we confirm that D3.3 is the first release of the citizen engagement programme marking the progress of the project in this direction to this date (March 2023) but is going on. The CEP will be developed and fine-tuned according to the data from tests and validation of all its components, to the citizens' needs discovered in further studies and pilots, to increasing expertise and knowledge of SILVANUS partners and stakeholders. The team of T3.5 and T3.6 regard their contributions as an integrative part of the whole project and its final products and services.

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APPENDIX 1: Questionnaire to SILVANUS partners on the existing level of the participation and citizen engagement

I.   The data about the partner

1.   The name of the organisation

2.   What is the nature of your involvement in the prevention, fighting and mitigating the risk of wildfires processes or any environmental activities:
     Please, mark what applies. Multiple answers are possible

        Policy preparation

        Research and innovation

        Firefighting and other technology development

        Deployment of firefighters

        Training of firefighters and rescuers

        Rescue services

        Medical services

        Preservation and monitoring of natural environment

        Agricultural production and management

        Sustainable development

        Restauration after fire

        Communication and cooperation

        Other (specify)

3.   Do you have any citizen engagement activities at present?

YES   NO

If YES, please, specify what these engagement activities are:

_____

_____

_____

4. Do you know or have seen other citizen engagement in prevention, fighting and mitigating the risk
    of wildfires processes or any environmental activities in the area of your organisation's competence
    or OF relevance to SILVANUS?

    YES   NO

    If YES, please, specify what these engagement activities are:

_____

_____

_____

5. Aspects of existing engagement programmes:

    What actors are involved in the engagement programmes:

    Organisations   Which ones? _____
    Citizens   Which groups? _____

    What are the aims   of existing citizen engagement programmes:
    _____

    _____

    In which processes citizens are engaged:

    Learning and training
    Data collection
    Consultation
    Deliberation
    Decision making
    Voluntary work
    Involvement in action (e.g., evacuation organisation)
    Other

The tools of existing citizenship engagement programme

Notifications to the citizens
Mobile apps for sending and receiving information
        Permanent face-to-face meetings
        Occasional meetings
        Online communication
        Local media information
        Social media collaboration platforms
        Phone communication
Response operations
Supportive actions (e.g., trasportation, food preparation)
        Other _____

Are there any feedback mechanisms to the citizens about their engagement?

YES   NO

If yes, what are they? _____

APPENDIX 2: CEP Study protocol

1. **FOREWORD**

Within the overall design of the SILVANUS WP3, T3.5 is concerned with developing Citizen Engagement Programme (CEP) that should ensure a timely response to the wildfire management throughout the three stages identified in the project: Phase A (preparedness), Phase B (response), Phase C (recovery). It should also help in increasing the effectiveness of the activities undertaken by professional organisations, in diminishing the harmful effect of wildfires on people, their property and forests in general, as well as speed up the restoration of affected areas. The relevance of the CEP is ensured by a number of investigations, pilot testing and involvement of all interested partners in the development of the CEP.

The study protocol is directed to all SILVANUS participants that are in contact with stakeholder and citizen organisations concerned with the culture of deterrence and prevention against wildfires.

a. **Objectives of the study protocol**

This study aims to identify the citizens and relevant stakeholders' needs and the related requirements to implement a successful CEP and contribute to the development of content for a mobile App for citizen engagement (T3.6).

b. **Terminology**

A need is prerequisite identified as necessary for a user, or a set of users, to achieve an intended outcome, implied or stated within a specific context of use (ISO, 2019).

A requirement is a set of requirements for use that provide the basis for design and evaluation of interactive systems to meet identified user needs (ISO, 2019). Requirements are implemented in the steps, solutions, actions, elements, apps, artifacts, processes, etc. to fulfil the user needs.

For example: citizens and stakeholders' need for information about protection of their property on the fire prone area. The related requirements can be: to develop a module with relevant content in a mobile App about securing the property against fire; to create a channel for immediate messaging about the spread of fire and suitable evacuation routes; to provide information to citizens about local and national support for reconstruction of damaged property in reliable and accessible media.

c. **Planning and important dates**

The results of the study will be included in the D3.3 (M18). Therefore, we recommend that SILVANUS partners contact relevant stakeholders and set interview/focus group meetings. The analysis of the studies results in English should be uploaded in the SILVANUS-ga Files WP3 Folder Tasks 3.5-3.6 Joint Efforts folder *CEP needs and requirements study* latest by 15 of February 2023.

2. INTRODUCTION TO THE STUDY PROTOCOL

a. Methodology for study protocol preparation

The needs and requirements for the CEP study protocol is based on the model of communication effects derived from Bandura's social cognitive theory of mass communication (Bandura, 2001; Potter, 2012). The table 1 below summarizes a simplified model of communication effects in relation to the wildfire management phases.

Type of activity	Prevention	Response	Recovery	Local authority/services
Awareness				
Inform	Instruct how to control negligent fires	Plan for escape	Provide guidelines for recovery	Improve informing policies
Educate	Promotion of fire prevention	Training for suppression	Organize ludic and educational activities in nature	Develop competence of people
Attitudes (cultural values)				
Raise engagement	Community building	Build network of volunteer firefighters	Raise interest in wild nature	Planning voluntary work
Promote safe practices	Establish preventative behaviour	Infrastructure safety		Support for returning inhabitants
Behaviour				
Asist effective fire management	Self-safety measures	Assist safe scape	Post-fire best practices	Include citizen response in policies
Actions	Reporting hazards Preventing risky behaviour	Assistance to responders in firefighting or evacuation	Be a tool for data collection	Action guidelines and instructions

Table 1: Simplified model of communication effects in relation to wildfire management stages

Simplified effects that should be produced by the CEP (or achieved by communication means and media) are marked on horizontal orange lines of the Table 1 as "raising awareness", "changing attitude" (including beliefs and opinions) and the most complex effect of "changing behaviour" of citizens. These effects are interpreted in the context of the wildfire management. Thus, yellow cells mark the columns with the "Type of activity" (far left column) that should produce the desired effect, which includes the activities of informing and educating for raising awareness; increase intent to engage and use of safe practices for changing attitudes; organise assistance and involvement in certain actions for the effect of changing behaviour. Three middle columns mark three stages of the wildfire management with the examples of actions (e.g., community building, promotion of fire prevention) within certain activities. These examples have been derived from an extensive literature review on citizens' engagement in fire management. Only one such action is shown in the table for each stage as an example. The CEP will include many more of such concrete actions adapted to certain contexts and pilots of SILVANUS. The far-right column lists what should be done by local authorities and service providers to ensure success of each activity.

This table was used to structure the interview schedule for individual and group interviews.

b. Selection of the respondents

Possible participants of the study can be identified by SILVANUS partner organisation in relation to their main tasks and activities as well as according to their knowledge of existing citizen engagement programmes within their sphere of competence or neighbouring spheres. Leaders or representatives of local and citizen organisations, representatives of citizen groups and relevant stakeholders in a fire prone area are candidates for interviews. Typical organisations to find respondents for group or individual interviews could be found in Table 2.

Organisations representing citizens	Institutions organizing engagement activities
Voluntary firefighter associations	Local authorities, police
NGOs and associations of organisations (national parks, towns, environmental, cultural, agricultural	Research institutions
	Professional firefighter brigades
Universities and schools	Public administration
Private companies	Policymakers

Table 2. Organisations of citizen engagement in wildfire management

The categories of citizens who could be involved in group or individual interviews are:

- Volunteer firefighters
- Students
- Children and youth
- Citizens as First responders
- Farmers
- Teachers
- Inhabitants with previous fire experience
- Social media users
- Everyone – local inhabitants
- Landowners
- Local administration/municipalities

c. Individual or group interviews

SILVANUS partner organisations can conduct either individual or group interviews according to their possibilities and resources. The individual interviews are easier to set up, while finding time suitable for a group interview may be more difficult due to time constraints of potential participants. On the other hand, a group interview provides a possibility to involve more people and get their views and opinions within a shorter time.

Individual interviews can be conducted by one person, while a group interview may be easier conducted by at least two persons – one managing the discussion, another – taking care of recording and observing reactions of the respondents in the group and taking notes.

Both individual and group interview participants should be informed of the aim of the interview, the place, time and duration of the interview.

d. Recommendation on how to conduct interviews and focus groups using the question pools

Persons conducting either individual or group interviews should get acquainted with the themes and questions of the interview and understand their aims to be able to manage the discussion within a group or lead the conversation with an individual respondent.

The premises should be chosen with care to allow focused discussion, especially for a group interview, but also provide a comfortable conversation area for an individual interview. The premises and the equipment should be checked and set before the start of the interview.

The individual interviews should last from 30 to 60 minutes, the group interviews could take 1,5 hours and not more than 2 hours.

The persons also have to present the project and explain the aim of the interviews for the participants even if that has already been done earlier. **The participants should sign the informed consent forms (provided in the Appendix 2) before the start of the interview and should have full understanding that they can quit the interview at any time and not answer the questions if they do not want.** The information they provide will be fully confidential and no personal information will be ever disclosed to the third parties. The participants also should fill in a short card about:

Organisation they represent:
Their role in organisation:
Areas of responsibility of the organisations:
Personal background: (education, experiences, …)
Active at which geographical area:
The name and contact information can be retained with their consent in case the leaders of the interviews would like to validate the transcripts of the interviews with the participants.

The question in the following table should be seen as a **question pool**. It means that some question might be less relevant or challenging to discuss for a specific group of participants. Therefore, the researcher may choose some of the questions or adapt them for different kinds of participants. Persons leading the interviews should seek to cover the recommended themes and questions, however, as the interviews are semi-structured, the sequence of the questions is free and emerging unexpected themes can lead to the discussions not covered in the study protocol.

INTERVIEW AND FOCUS GROUP STUDY: RECOMMENDED THEMES AND QUESTIONS (The researcher may choose some of the question. See the section 'd')

| Themes	Questions for individual interviews
Ice-breaker: Information about participants and their organisations	What do you do at your job? Who are your main target customers, collaborators? How do you get in touch with them? Could you provide some background information about your organisation? What are the areas of its responsibilities, activities, services it provides, Who does it serve, how it gets feedback on its services? What organisations or authorities are your collaborators; how do you work together?
Respondents' knowledge of citizens and citizen engagement	**Only interview studies:** Have you worked or are you working with some citizen engagement? **If yes,** can you describe your role, if you have any role in it? What was citizens role? Why is your organisation engaging citizens? What has worked well and what has not worked well in the case of existing citizen engagement programs? **If not**, do you know or have seen citizen engagement in preventing, fighting, and mitigating the risk of wildfires processes or any environmental activities in your organisation's competence or of relevance to SILVANUS? How does citizen engagement can help in wildfire management? **Only focus group studies:** Could you share your experience from work with or observation of citizen engagement activities? Is it a useful activity for the wildfire management, in your opinion? Why?

	What has worked well and what has not worked well in the case of existing citizen engagement programs? How does citizen engagement can help in wildfire management?
Analysis and evaluation of the CEP overview	Please have a look at our CEP overview. Show the figure in the Appendix 1 What methods for CEP will work for SILVANUS project do you think? Can you see them in the picture? If yes, do you think they will work well? What are their strengths? If no, what is missing? Do you see elements that should be removed? Why? If you were to choose one single module to be developed in this project what would that be? Do you have any suggestions as to how to improve this design? Do you see any challenges in implementing this design? Do you have any suggestions for how to measure the success and usefulness of these activities showed in design? What will be needed to implement this engagement programme [from a citizen perspective and involved organisations' perspective], do you think?
Awareness-raising	What do citizens need to know to raise their awareness in wildfire management in different phases (prevention, response, recovery)? What would be the best channels to provide this information for different phases? What are the best forms to train citizens to raise their awareness for engagement in wildfire management? How can local authorities and administrations help to increase awareness of citizens about wildfire?
Attitudes of citizens and stakeholder organisations towards wildfire management	What do citizens need to learn/do to raise their interest in wild nature and forests? What do citizens need to know/do to promote safe practice and preventive behaviour in wildfire management? Do you have examples of communities engaged in wildfire safety activities? If **yes** please answer the following question using that community as an example. If **not**, please express your opinion and thoughts freely about the following questions. - Can you describe that community? - What do you think is needed to create such a community? - What are the challenges to create it? - How do/should they operate? - How do/should they communicate? - What are the most effective ways of communication between this community and professional organisations involved in wildfire management? - Are they equally successful in preventing and responding to wildfires? - How does it differ between different wildfire management phases? - What do you think makes them successful?

	• What challenges does this community face? • Do/should they operate differently in different phases of wildfire management (A, B, and C)? Can you provide an example of a person who is really engaged in wildfire safety measures? Describe that person. What will it take to have more people like that person? Which communication means are the most effective? How can authorities and local administrations help to change the attitude of citizens regarding voluntary work and following safety practices in wildfire management?
Behaviour of citizens and stakeholder organisations towards wildfire management	How may citizen contribute to wildfire management with their actions? What do citizens need to learn/do to enable them to collaborate with first responders in wildfire management? What equipment/system/training they may need to collaborate with first responders? How can authorities and local administrations enable citizen to collaborate with first responders in wildfire management?
Communication media and content	Have you any examples of successful use of media for engagement citizens in wildfire management? What benefits were achieved? Different media have different attributes. How different media could improve information sharing and dissemination? Social media, local newspaper, radio, video, posters… What else will be useful? What media can be most useful in wildfire prevention? What media is most efficient in wildfire response? How to employ media (and which one) in recovery phase? What contents do you think should be included in which media? Do you have a good example if useful content that we could use? What type of information do citizens need before, during, and after wildfire? What content can citizens provide that would prove valuable to wildfire managers?
Content and features of the App	Have you seen any Apps for communicating with citizens? Can you tell us what did you like about them? What was wrong with them? If not, how media and mobile apps can be employed in wildfire management? What content the app should convey to the users? If there were an App which you could use to communicate with citizens: What information would you like to be shared through it? What would be the priorities?

	What would be the best way of sharing this information, do you have any format in mind?
	Is there any type of information that you think would be useful to collect from the citizens?

Appendix 1: Citizen engagement modes (make sure that the copy you show to the respondents is readable)
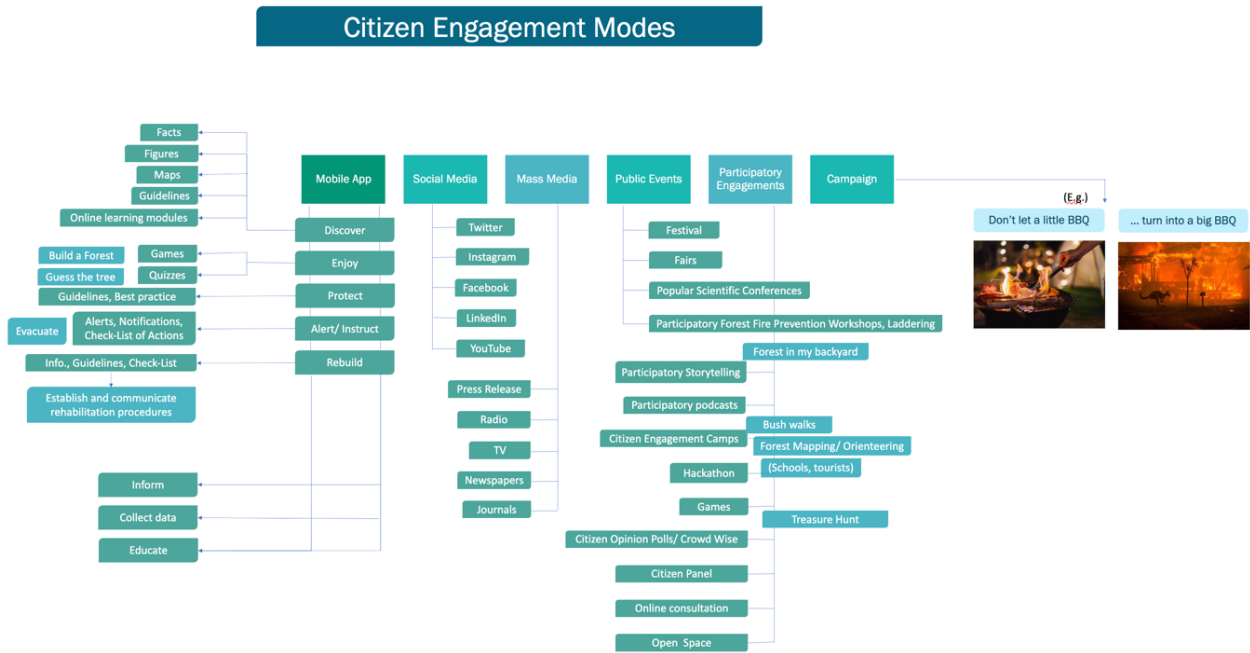
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Bandura, A. (2001) Social Cognitive Theory of Mass Communication, Media Psychology, 3:3, 265-299, DOI: 10.1207/S1532785XMEP0303_03

International Organisation for Standardization. (2019). Ergonomics of human-system interaction — Part 220: Processes for enabling, executing and assessing human-centred design within organisations (ISO Standard No. 9241-220:2019), https://www.iso.org/obp/ui#iso:std:iso:9241:-220:ed-1:v1:en:term:3.45

Potter, W. (2012). *Media effects*. SAGE Publications, Chapter 3, https://dx.doi.org/10.4135/9781544308500, https://www.sagepub.com/sites/default/files/upm-binaries/45690_Chapter_2.pdf

Information Sheet on SILVANUS CEP Development Study

…-…-202…

Dear Participant,

We the SILVANUS project members are in the process of conducting a study to define stakeholders' needs and requirements and would greatly appreciate your participation and to help us learn from your insights. On these pages you will find information about your participation in the study as well as the processing of your personal data associated to this.

Personal data related to this study will be processed in accordance with the EU General Data Protection Regulation 2016/679.

The key output of the H2020 SILVANUS project is the release of a climate resilient forest management platform to prevent and suppress forest fire over the course of 42 months. This will be achieved through the integration of a big-data processing framework capable of analysing various data sources such as climate models and weather data, earth observation sources, fire ignition models, and continuous interpretation of multi-spectral video streams. Weather data analytics using satellite sources will serve as a basis for on-site device integration, while calculation of fuel available and weather data will be utilized to model fire behaviour.

With the overall design of the SILVANUS Work Package 3 (WP3), the partners are developing Citizen Engagement Programme (CEP) to promote **citizen engagement** towards improved **awareness** about fires related risks as well as **prevention and safety measures** throughout the three stages identified in the project: Phase A (preparedness), Phase B (response), Phase C (recovery). It should also help in increasing the effectiveness of the activities undertaken by professional organisations, in diminishing the harmful effect of wildfires on people, their property and forests in general, as well as speed up the restoration of affected areas. The relevance of the CEP is ensured by a number of investigations, pilot testing and involvement of all interested partners in the development of the CEP.

This study aims to identify the citizens and relevant stakeholders' needs and the related requirements to implement a successful CEP and contribute to the development of content for a mobile App for citizen engagement (Task 3.6 in WP3).

You have been invited to participate in this CEP-related study as your contribution will be valuable for the purpose of our project. More specifically, the protocol is directed to all study participants whether a member of public or other stakeholders and citizen organisations concerned with the culture of deterrence and prevention against wildfires.

Participation in the CEP Study
Your participation in this research is important as the study aims to identify and better understand citizens and stakeholders' needs and requirements and therefore your participation will help us to learn from your insights and this will be crucial to a successful design and implementation of our Citizen Engagement Programme (CEP).

You will be asked to express your opinion about the possible role and contribution of citizens in prevention and management of wildfire.

The study will take place at the premises of: …………………..

And it will last approximately 1 to 2 hours.

The information on the hereby attached Consent Form will be kept securely by the organiser during the lifecycle of the SILVANUS project and for a 5-year period after its completion according to SILVANUS Grant Agreement.

The information will assist SILVANUS project to proceed in the development of CEP.

The present Information Sheet and the attached Consent Form for participation in research will be provided to you **before** the research activity and you will have time to carefully read them before deciding.

Your participation is **totally voluntary**. You have the right to **refuse entirely or partially** to participate and your refusal will not disadvantage you in any way.

In that case, you are free to **withdraw your consent** to your participation from any part of the present activity **at any time, without consequences**.

If you have any queries related to the SILVANUS project, you may contact us through https://silvanus-project.eu/contact/.

Processing of personal data

Personal data processed are:

Contact information such as name, surname, organisation, email address and potential recording of your participation in the study.

Purpose:

The personal data will be primarily used by members of Silvanus who conduct the study for the processing and analysis purposes. The information shared with other project members and used in any published result will be in aggregated format and anonymised. We will not use personal data for any other purpose, unless a new legal basis exists, in which case you will be notified or asked for renewed consent with full information about the further processing.

Legal basis:

Personal data is collected **based on your consent** [Article 6, 1(a) GDPR].

Data controller:

NAME of THE ORGANISER as the organizer of the study and PEGASO as the Coordinator of the SILVANUS project are the Data Controllers of your personal data's processing for the purposes explicitly identified above.

NAME THE ORGANISER and PEGASUS will collect and use the above-mentioned personal information only to the extent necessary for organisational purposes, to provide you with information about this study and process your application to participate.

Data Protection Officer:

NAME OF THE DPO OF THE ORGANISER and/or Delio Iazzetti delio.iazzetti@unipegaso.it

You can send your emails to these emails If you have any questions relating to the way we are planning to use your information. You can refer to these addresses if you want to exercise your rights or in the case you have any quarries related to the data protection policy.

Recipients:

NAME THE ORGANISER and PEGASO may share Identifiers and contact information such as name, surname, organisation, email address with the rest of the SILVANUS Consortium (https://silvanus-project.eu/about/consortium/) if you have agreed to be further contacted for the purpose of SILVANUS Project. We underline that SILVANUS Project is a HORIZON 2020 project that includes international partners. Therefore, if you agree to be further contacted (always within the purposes of the Project), your name and email may be shared with our Partners from Australia, Brazil and Indonesia.

Personal Data Retention:

Personal data on the Consent Form (name and surname) will be retained by the data controllers during the lifecycle of the project and for a 5-year period after its completion according to SILVANUS Grant Agreement. More particularly, your e-mail address (if you consent to further communication) will be retained during the lifecycle of the project (in case of the project's necessary extension, by the end of the agreed with the European Commission extended period); your image and/or voice (if registered – this depends on whether you will switch on the camera/microphone) will be retained during the lifecycle of the project (in case of the project's necessary extension, by the end of the agreed with the European Commission extended period). After this period, the information will be permanently deleted from the Consortium's databases, however, the webinar published online (social platforms) may subsist.

The appropriate safeguards (technical and organisational measures) will be implemented to prevent any unauthorised access, loss, destruction, transfer of your personal information.

Your Rights:

You have the right to:

• Request information about whether we hold personal information about you, and, if so, what that information is and why we are holding/using it.

• Request access to your personal information (commonly known as a "data subject access request"). This enables you to receive a copy of the personal information we hold about you and to check that we are lawfully processing it.

• Request rectification of the personal information that we hold about you. This enables you to have any incomplete or inaccurate information we hold about you corrected.

• Request erasure of your personal information. This enables you to ask us to delete or remove personal information where there is no good reason for us continuing to process it.

• Request the restriction of processing of your personal information. This enables you to ask us to suspend the processing of personal information about you.

• Request transfer of your personal information in an electronic and structured form to you or to another party (commonly known as a right to "data portability"). This enables you to take your data from us in an electronically useable format and to be able to transfer your data to another party in an electronically useable format.

Withdraw consent: when our use of your personal data is based on your consent, you have the option to withdraw your consent to our processing and delete your personal data at any time by sending us an email at NAME THE ORGANISER and/or delio.iazzetti@unipegaso.it. Once we have received notification that you have withdrawn your consent, we will no longer process your personal information for the purpose or purposes you originally agreed to, unless we have another legitimate basis for doing so in law. This means that if you want us to delete your personal data from our repositories at any point in time after you have given your consent, please contact us and we will do so immediately. Please note that the withdrawal does not affect the processing of your data which is based on the consent you have given before the withdrawal.

INFORMED CONSENT FORM

Date: _____

Participant name, surname: _____

Before you consent to participating in the study, please carefully read the participant information sheet and mark box below (with an X) if you agree. If you have any questions or queries before you give your consent, please let the organiser/interviewer know.

¨ I have read the Information Sheet for my participation in this study and for the processing of my personal data.

¨ I wish to participate in the study under the conditions set out in the Information Sheet.

¨ I consent to the use of the personal data collected.

¨ I consent that I can be contacted for a follow up. Participating such follow up is voluntary.

* Please choose one of the following:

¨ I give permission to the use of photos and/or videos from which I can be recognized for the purposes of dissemination of the results (i.e., project partners' websites and social media of the SILVANUS project).

¨ I want to be unrecognized from the dissemination material.

Participant's Name and Signature:

APPENDIX 3: Poster - large size :1420 x 1125 mm

SILVANUS

CONSEILS AUX CITOYENS POUR PRÉVENIR LES FEUX DE FORÊT

SI VOUS ÊTES EN FORÊT/CAMPAGNE/CAMPING OU HABITEZ À PROXIMITÉ DES FORÊTS

Ne faites pas de feu, n'ayez pas de barbecue
Pendant les saisons chaudes et sèches (Conditions de danger d'incendie élevé)

TODAY'S FIRE DANGER — PREVENT WILDFIRES

- ▶ Ne brûlez jamais de déchets, de feuilles ou de branches sèches.
- ▶ Ne faites pas de barbecues dans des endroits proches de la végétation sèche.
- ▶ Ne jetez pas de cigarettes allumées par terre hors de la voiture.
- ▶ Ne faites pas d'activités qui créent des étincelles et peuvent provoquer un incendie.

Savoir communiquer avec les autorités

- ▶ Prenez connaissance des risques d'incendie locaux et tenez-vous informé.
- ▶ Avertissez les autorités si vous constatez la présence de personnes au comportement à risque.
- ▶ Signalez tout incendie suspect ou la présence de personnes au comportement à risque.

Comment faire un feu en toute sécurité

Si vous devez faire un feu, utilisez les endroits appropriés. Agissez avec prudence (pas de feu pendant les saisons chaudes et sèches):

- ▶ Placez un cercle de pierres autour du feu.
- ▶ Mouillez bien la zone environnante et gardez un récipient d'eau à proximité.
- ▶ Avant de quitter les lieux, éteignez complètement le feu et les braises.

PROTÉGEZ VOTRE MAISON CONTRE LES FEUX DE FORÊT

Gardez les objets inflammables en lieu sûr

- ▶ Ne stockez pas d'objets inflammables (essence, bois de chauffage) à proximité de la maison.
- ▶ Protégez les surfaces extérieures en bois contre les incendies.
- ▶ N'installez pas de réservoirs de carburant près de la maison.

Gardez votre maison à l'abri du feu

- ▶ Taillez régulièrement les branches et les buissons.
- ▶ Créez une zone coupe-feu autour de votre maison en enlevant tous les matériaux inflammables (feuilles sèches, branches, etc.).
- ▶ Évitez l'utilisation de matériaux de construction inflammables.

L'équipement dont vous avez besoin

- ▶ Préparez une trousse d'urgence pour votre famille. Qu'est-ce qui pourrait aider?
  - › Réservoir d'eau
  - › Tuyaux d'eau
  - › Pompes
  - › Extincteur d'incendie

SUIVEZ-NOUS SUR: projet-silvanus.eu

APPENDIX 4: CEP Poster by HB

WILDFIRE PREVENTION AND SAFETY TIPS TO CITIZENS

PROTECT YOUR HOUSE

creating a defensible space

Remove all flammable material, like dry leaves and herb, branches in a 10 m perimeter around the house

Flamable material

Store flamable material in sheltered areas, avoid use of flamable building materials

Equipment to have

- Water tank
- Water pipes
- Pumps
- Fire extinguisher
- Power generator

Wildfire prevention needs your engagement

Keep trees trimmed

Trim tree branches and bushes near your home to reduce the risk of fire spread.

Ask for help

Call **112**
Free of charge from mobile phone, even without a SIM card OPERATES IN ALL EU MEMBER STATES!

The project has received project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement no. 101037247

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THE MOST COMMON CAUSES OF WILDFIRES

1 DEBRIS BURNING

When waste, trash or vegetation from yard clean-up are burned in large piles, embers can easily be carried away by the wind.

2 UNATTENDED CAMPFIRES

Campfires left unattended, growing out of control, or not fully extinguished can be dangerous.

3 UNEXTINGUISHED CIGARETTES

Dry vegetation can catch fire and spark a massive wildfire from unextinguished cigarettes.

4 ARSON

The intentional and illegal act of setting fires.

5 LIGHTNING STRIKES

Lightning can release enough heat to ignite a tree or other fuels when it strikes an object.

6 VEHICLES AND EQUIPMENT

Anything that can cause a spark has the potential to spread a fire outdoors, especially in ideal fire weather conditions.

7 CLIMATE CHANGE

High temperatures and droughts can prolong forest fire seasons and increase the flammability of dry grass, leaves, trunks, or pine tar.

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CITIZEN ENGAGEMENT PROGRAM

Effects of Wildfires

Ecosystem and Biodiversity Loss

Wildfires can damage land and make it uninhabitable for certain animals and plants.

Forest Destruction - Degradation

Forest fires can wipe out thousands of acres of trees and vegetation cover and degrade the vegetation.

Impact on Human Well-being and Health

Many civilians may lose their lives or be injured if they do not evacuate in time. Firefighters can lose their lives while fighting fires. Smoke and dust can cause breathing difficulties.

Soil Degradation

The high temperatures caused by wildfires can destroy the soil's nutrient value.

Economic Losses

Loss of property, negative impact on the tourism industry, loss of income for those who rely on forest products, damage to critical infrastructure can cause socio-economic disruption, the restoration work takes time and costs.

Air Contamination

Large amounts of smoke are released into the air during wildfires.

Don't let a little BBQ
... turn into a big BBQ

Don't have barbecues in the forests/countryside or places close to dry vegetation

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TIPS FOR CAMPING SAFELY TO AVOID WILDFIRE

CITIZEN ENGAGEMENT PROGRAM

Where to stay

Pitch your tent or park your caravan away from bushes or other inflammable materials Do not smoke or light candles inside tents or caravans.

Cooking

Avoid cooking inside a tent. Food oils will accumulate on the tent fabric, making it inflammable. Use grills only in authorised places.

Pay attention to...

Familiarise yourself with and obey all of the campsite rules, particularly with the prevention and emergency plans.

How to park your car

Park your vehicle in the designated parking areas in such a way as not to obstruct heavy emergency vehicles to get through.

When you are away

Whenever you are going to be away, and when you go to bed, unplug any equipment and switch off gas-powered equipment (e.g. lamps).

CAMP

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01 Never burn rubbish, dry leaves or branches

02 Don't have barbecues close to dry vegetation

03 Do not smoke and never throw lit cigarettes in open-air places

04 Stay informed about local fire conditions and weather patterns

05 Notify the authorities if you notice the presence of people with risky behavior

IF YOU ARE IN THE FOREST/COUNTRYSIDE

7 tips To prevent wildfire in forests

06 Report any suspicious fires to the authorities immediately

07 Bring your meal prepared, to avoid lighting fires.

IF YOU NOTICE A WILDFIRE

The response operation starts with you!

1. ■ Stay Calm

Do not panic, stay calm and try to evacuate the area against the wind

2. ■ Contact 112

Immediately contact the Fire Department / Security Forces by calling 112 (European Emergency Number)

3. ■ Provide Information

- the location and the exact point where you are
- the direction of fire,
- the kind of vegetation that is burning.

4. ■ Leave the Area

Go to an area clear of vegetation

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WHAT TO DO IF YOU GET TRAPPED IN A WILDFIRE

CITIZEN ENGAGEMENT PROGRAM

KEEP CALM

- Do not take shelter in a car.
- If your home is made of wood, seek shelter in a fire-resistant building.

IN THE HOUSE

- Close firmly all the doors and windows.
- Block up all the cracks with wet clothesto prevent smoke penetration.

RELOCATE FLAMMABLE OBJECTS

- Remove the curtains from the windows.
- Move any furniture away from windows and exterior doors.

EVACUATION

Do not abandon the building unless your escape is completely secured.

Follow the instructions and the routes suggested by the Authorities.

IF YOU ARE SURROUNDED BY FIRE

- Protect yourself from the radiation by lying on the ground behind a large rock or log
- Breathe air close to the floor through wet clothing

LEAVE THE AREA

- Stay away from areas with a lot of vegetation.
- if possible, identify an area with water where you can defend yourself from high temperatures.

IF YOU ARE UNABLE TO LEAVE ALONE

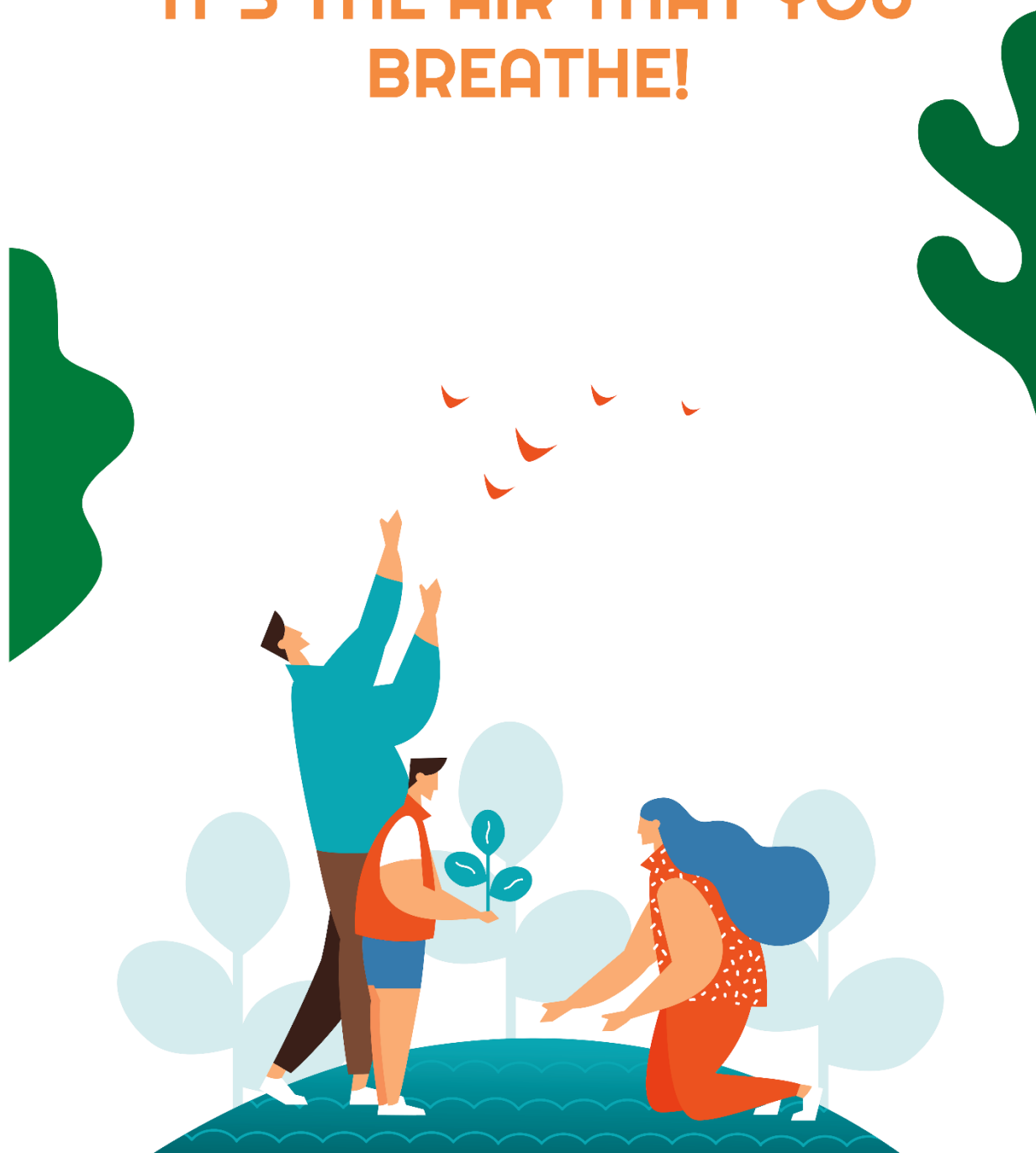Try to inform authorities and wait for the authorities to arrive.

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APPENDIX 5: CEP Poster by SYNTHESIS

PROTECT THE FOREST, IT'S THE AIR THAT YOU BREATHE!

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The project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement no.101037247

PROTECT THE FOREST,
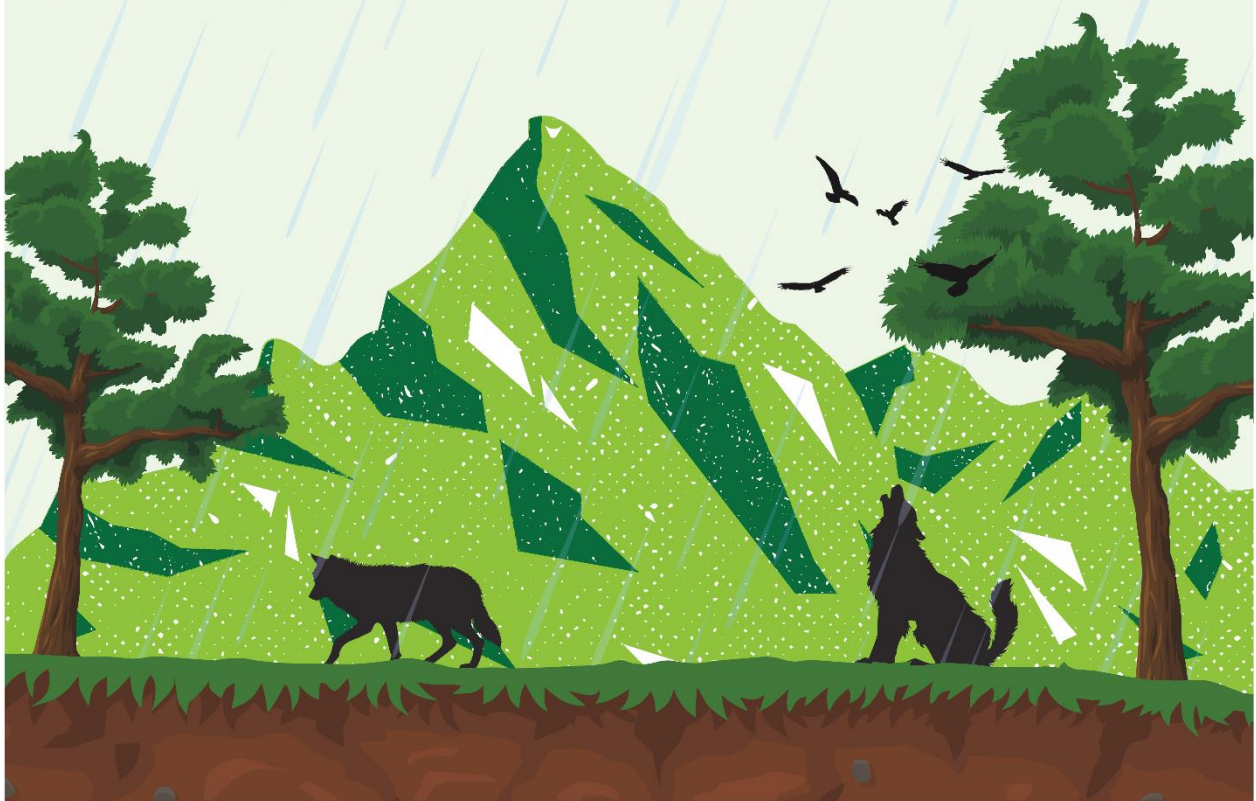# IT'S THE AIR THAT YOU BREATHE!

FORESTS ARE A KEY SOURCE OF QUALITY AIR, PRODUCING OXYGEN AND ABSORBING CARBON DIOXIDE. A SINGLE TREE CAN PRODUCE IN A DAY THE OXYGEN SUPPLY TO SUSTAIN 2-10 PEOPLE.

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WHEN YOU WISH IT WOULD RAIN DOWN, REMEMBER;

The Forest affects rainfall and can sustain microclimates that are beneficial for people and agriculture.

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YOU CALL IT **FOREST**, THEY CALL IT **HOME**!

Forests are a key source of quality air, producing oxygen and absorbing carbon dioxide. A single tree can produce in a day the oxygen supply to sustain 2-10 people.
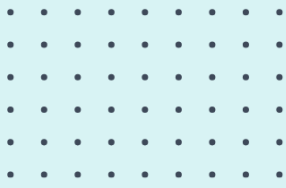
APPENDIX 6: CEP Poster by HRT

Barbecue **prohibition** *in or near forests*
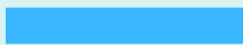
From May until October

- We never burn rubbish, dry leaves or branches

- We don't have barbecues in the countryside

- We don't throw lit cigarettes

- We don't litter the forest

- We don't perform labours, like welding or use of grinding machines

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Protecting our house against fires by:

- Creating a defensible space --> Remove all flammable material, like dry leaves, herb and branches in a 10 m perimeter around the house

- Avoiding use of flammable building materials

- Spreading flame retardant lacquer on the outer wooden materials

- Storing flammable material in sheltered areas

Protecting our house against wildfires

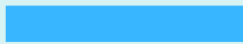## What could help?
- Water tank
- Irrigation pipes
- Pumps
- Fire extinguisher

OPERATES IN ALL EU MEMBER STATES!

EMERGENCY?
Call 112

112

- *Free of charge from mobile phone, even without a SIM card.*

- *Provision of caller location*

Connects you with:
-**Police**
-**Fire Service**
-**Emergency Medical Services**
-**Coast Guard**

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Making a family emergency plan

Step 1

Prepare an emergency kitbag, with:

- *A mobile charger, torch, radio, batteries and copies of important personal documentation*

- *Consumables, water and, if needed, baby and pet food for at least three days*

- *Medication for any family member that has health issues or any disability. Don't forget your doctor's contact info*

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Step 2

Making a family emergency plan

In case you need to evacuate:

- Make arrangements for family communications

- Agree on safe meeting points in case of separation of family members

EVACUATION PLAN

- The plan has to be applicable and comprehensible.
- Don' forget to take with you the emergency kitbag, money, supplies and your pet.
- If you require further assistance, prepare a list with relative and friends contact info.

Have in mind that phone networks might not work!
Stay informed by media and social media for any official instructions
Make timely decisions and act correctly and decisively!

Project Acronym	SILVANUS
Grant Agreement number	101037247 (H2020-LC-GD-2020-3)
Project Full Title	Integrated Technological and Information Platform for wildfire Management
Funding Scheme	IA – Innovation action

SILVANUS Citizen engagement programme questionnaire

Version 1.0

Responsible Partner: HB

Author list:

Section Question/Answer Summary

The question refers to	

2.2

2.3

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