



WUIVIEW
Wildland-Urban Interface Virtual Essays Workbench

Grant Agreement ECHO/2018/826522

Summary of the Action



Disclaimer

The content of this document represents the views of the authors only and is their sole responsibility. The European Commission does not accept any responsibility for use that may be made of the information it contains.

Pastor, E., Caballero, D., Cozzani, V., Heymes, F. Ribeiro, L.M., Vilalta, O., Sjöström, J. (2019). WUIVIEW - Wildland-urban interface virtual essays workbench: summary of the action. CERTEC-UPC Technical Report 1902. 6 pp.

This publication is freely available at:

https://www.wuiview.org/download/Summary%20of%20the%20action_def.pdf

Call

Prevention Projects in Civil Protection, 2018. European Commission Union Civil Protection Mechanism

General Objective

The main aim of WUIVIEW project is **to design, setup, test and operate a virtual workbench service for the performance-based analysis of fire environments in the surroundings of buildings at the wildland-urban interface**. In line with the objectives of the Union's Civil Protection Mechanism and the present Call for proposals, the WUIVIEW action will develop an innovative risk management tool that will help WUI communities adapting to face the new generation of forest fires that have already arisen due to climate change. Once implemented, WUIVIEW will become a powerful platform to perform essays and simulation studies dealing with structures survivability, sheltering assessment, building subsystems hazard testing and fire protection systems evaluation. The development of the system will improve knowledge base on microscale fuels fire hazards and on building systems and materials vulnerability, which will be of help to develop better policies and standards to prevent WUI disasters.

WUIVIEW service will cover important needs of current European WUI fire-prone areas (Mediterranean) and of emerging new WUI-fire realities (Northern countries), which are expected to increase in the coming years. In one hand, human pressure in the landscape is continuously growing in Europe and wildfire potential is also increasing associated with housing developments and climate change, leading to new WUI-fire prone regions. On the other hand, innovative design solutions and new materials (e.g. biobased) are certainly appearing from the building and construction sector all over Europe. WUIVIEW will definitely serve as a workbench service to test and develop more resilient emerging WUI-fire scenarios.

The project is also educational oriented. The WUIVIEW outputs and outcomes will finally lead to a higher degree of awareness between fire practitioners and more educated residents at the wildland-urban interface.

Expected results

Result #1. The WUIVIEW project **will improve knowledge base on WUI microscale fire risk management**. Fire agencies, home-owners, fire practitioners, regulatory bodies and researchers will benefit from this result. Target-specific material will be generated within the framework of the Action: educational leaflets (WUI communities), guidelines for microscale management (home-owners and fire agencies), PBD good practicing (fire practitioners), scientific-based recommendations for policy improvement (regulatory bodies), and research articles (scientific community) will be available at the WUIVIEW portal.

Result #2 and #3. The WUIVIEW project will **improve awareness on WUI microscale fire risk management problem**. Target activities of different nature (workshops, webinars, conferences, posts in social networks) will help disseminating the needs addressed and the solutions provided by this Action. Furthermore, these activities will help **strengthening the links between relevant WUI-fire risk actors**. The WUIVIEW project has been conceived with a clear RRI (Responsible Research and Innovation) approach and will certainly represent a platform by which coordination and cooperation between home-owners, fire practitioners, fire agencies and regulatory bodies will be promoted and motivated.

Result #4. The WUIVIEW system will provide **fire practitioners with new capabilities for fire risk managing, engineering, research, and fire safety building design**. Professionals will have available a new tool for fire risk analysis, based on an open-source code, so that they will have free access to the modelling library and database to undertake performance-based simulations. Fire engineers and architects will have advanced technology available to develop new skills to face emerging WUI fire safety problems. This may ultimately lead to develop new career and growth opportunities within the framework of fire DRR (Disaster Risk Reduction) services.

These results are clearly in line with the Prevention Call Priority objectives of achieving a higher level of resilience against disasters, particularly those exacerbated by climate change. The WUIVIEW Action will definitely foster a culture of WUI fire disasters prevention: WUIVIEW will improve knowledge and awareness, will provide and promote risk assessment strategies and will drive engagement of different societal actors. It is with more aware, educated and capable WU-fire actors that a higher level of protection will be achieved.

Methodology

The work planned is programmed in three main phases (Figure 1). To set up the WUIVIEW simulation framework (Phase 1), we will characterize fire hazard of ornamental vegetation (WP2) and non-vegetal WUI fuels and LPG infrastructures (WP3). A detailed survey on fire protection systems and thermal properties of building materials together with a review on building codes and regulations will also be undertaken (WP4).

In the analysis phase (Phase 2) we will get insights on the response to fire of typical building systems and materials relying on PBD methodology. Based on a predefined inventory of pattern scenarios (WP5) and using previously gathered fire hazard and building characteristics, we will run WUI fire simulations to analyse homes survivability and sheltering capacity (WP6) under different conditions.

WUIVIEW has originally been conceived to become a consultancy service to assess WUI vulnerability in real scenarios after the Action's lifetime. The technical feasibility of the service will be demonstrated in the final phase of the project (Phase 3). WP7 will make use of the WUIVIEW workbench to assess WUI fire hazards and house fire performance (Figure 2) of preselected (in WP5) real WUI developments. The whole project will be continuously coordinated and managed through WP1. Similarly, the outputs will be disseminated during the entire duration of the project (WP8).

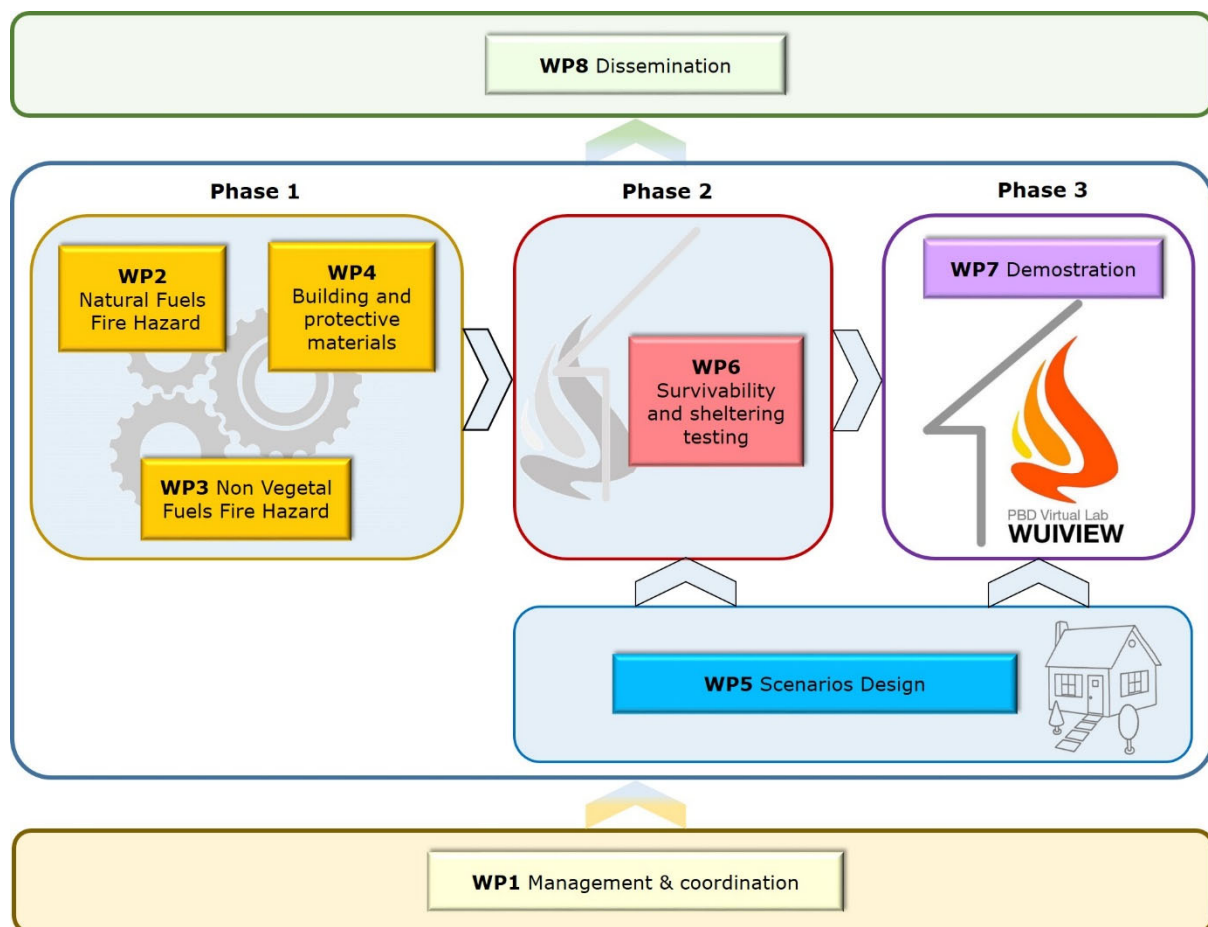


Figure 1. Structure of the WUIVIEW project

Description of technical WPs

- WP2: WUI Natural fuels hazard characterization
The main objective of this WP is to obtain quantitative information on real-scale fire hazard of the natural fuels typically present at the Wildland-Urban Interface. In this WP, real-scale experiments will be performed testing ornamental vegetation whose burning behaviour have not been ever quantified. In parallel, a literature survey on experimental studies involving natural fuels at the WUI, with some similarity to the ones performed in here, will be undertaken. Finally, a data base containing burning characteristics ready for simulation purposes will be set, gathering information on mass loss rate, heat release rate, flame temperatures and flame geometry.
- WP3: Artificial fuels hazard characterization
The main objective of this WP is to obtain quantitative information on real-scale fire hazard of the artificial fuels and critical infrastructure typically present at the Wildland-Urban Interface. Existing information of artificial fuels commonly present at the WUI microscale will be gathered: combustible stored material, fences, household appliances, etc. Special focus on LPG (Liquified Petroleum Gas) will be included. Experiments to complement collected information will be performed.
- WP4: WUI Building and protective materials characterisation
There are two main objectives of WP2: i) to obtain quantitative information on thermal properties and fire protection characteristics of building materials and systems typically used at the Wildland-Urban Interface; ii) to review the state of the art in terms of building codes and regulations (following both prescriptive and performance-based approaches) specifically focused on WUI microscale.
- WP5: Scenarios Design
In this WP we will set-up an inventory of pattern scenarios, based on previous WUIWATCH project lessons learned, to be tested in WP6 in terms of survivability and sheltering performance. We will also prepare and design scenarios for the demonstration phase (WP7). In particular, we will implement techniques of 3D object modelling to capture and transfer the information of real world cases into virtual 3D scenarios.
- WP6: Testing on structure survivability and sheltering capacity
The objective of WP6 is to analyse building systems survivability and sheltering capacity following a performance-based-design (PBD) approach. Selected scenarios including 1) vulnerable building systems and 2) natural and/or artificial burning fuels will be modelled according to WP2, WP3 and WP4 findings. Fire impact will be assessed following the guidelines and performance criteria established in WP4, by means of CFD simulations (FDS and Pyrosim). Sensitivity of key variables will be studied and prevention/protection measures will be proposed.
- WP7: Development of study cases (demonstration)
The objective of this WP is to showcase the methods and findings of the WUIVIEW virtual laboratory by analysing real WUI settlements. The degree of survivability and defensibility of a selected number of houses and structures will be analysed using a PBD approach. According to the outcomes of the simulations and the findings of previous WPs, a number of prevention and protection measures will be suggested to be presented to both firefighters and homeowners.

The consortium

A multi-disciplinary, highly qualified consortium has been assembled with frontline research entities, a private firm with long experience in risk management at the WUI, and an industrial partner representing fire protection companies. Thanks to our diverse backgrounds and previous collaborations, we complement and know each other very well.

UPC, leading the WUIVIEW Action, hosts the CERTEC, which is a research organization with large experience on technological, environmental and natural risks. This mainstreaming grants it unique characteristics to deal with fire hazard characterization, vulnerability analysis and civil protection challenges. CERTEC has engineering background and experience in all types of fire incidents. CERTEC has large computational resources. *(P.I. Elsa Pastor)*

ADAI, a non-profit institution associated to the University of Coimbra, has a worldwide recognized expertise of 30 years of research in forest/WUI fires and hosts the largest laboratory for forest fire experimentation in Europe. ADAI is responsible for fire behaviour/safety modules of firefighting training programs in Portugal. ADAI members have a wide experience on international projects. *(P.I. Luis Mario Ribeiro)*

ARMINES, represented by Mines d'Alès, hosts the "Laboratory of Industrial Environment Engineering" which is a European point of reference of natural-technological risk interactions. They have experimental facilities and proven experience to study burning dynamics of non-natural fuels. They have large computational resources. *(P.I. Frederic Heymes)*

PCF (Pau Costa Foundation) is non-profit organization, based in Spain, acting as an international platform devoted to forest fire and fire ecology management, training and dissemination. They have a large experience in international projects and cooperation activities. *(P.I. Oriol Vilalta and David Caballero)*

UBO (University of Bologna, Italy), is an academic institution with large experience on safety and sustainability of industrial processes and loss prevention. UBO has experience in developing innovative methodologies and models for hazard and risk analysis. *(P.I. Valerio Cozzani)*

RISE, is a Swedish technical research institution with a broad focus on infrastructure as well as the built and natural environment. RISE has performed many studies on boreal forests fuels characterization, risk assessment and fire behaviour as well as characterisation of fire spread from vegetation to buildings. *(P.I. Johan Sjöström)*