Wildland-Urban Interface Fire Touristic Infrastructure Protection Solutions		
WUITIPS		
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Deliverable 6.1 - Web tool

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Abstract	This report outlines the key features of the web tool designed and implemented to assess the vulnerability of tourist infrastructures. It provides an in-depth look at the system's rationale and architecture, as well as the vulnerability checklist and vulnerability index developed. The report also covers the technology used, including components, requirements, specifications, and functional validation, concluding with information on the exploitation of the web service.

(1) *Draft / Final*
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Content

1. About this deliverable

WUITIPS stands for Wildland-Urban Interface Fire Touristic Infrastructure Protection Solutions and it is a project funded by the Directorate General for European Civil Protection and Humanitarian Aid Operations (DG ECHO) and coordinated by the Universitat Politècnica de Catalunya (Spain). The project objective is to advance towards a harmonized understanding of the wildfire problem in touristic areas, providing knowledge on the impact of fire on buildings, installations, cultural heritage, infrastructures and the involved population and human behaviour as well as on the performance of fire risk mitigation measures used across EU. New insights will be integrated into a set of tools and guidelines for the appropriate and EU harmonised fire prevention and protection planning in trans-boundary areas in Europe, which are demonstrated in selected cross-border SP-FR (Spain-France) pilots. Thanks to a co-participatory process of key stakeholders from other EU trans-boundary areas, outcomes would be fully applicable at EU level.

The project comprises 7 work packages, with work package 6 "Integration and Implementation" dedicated specifically to the integration and showcase of selected / adapted models in pilot sites. The first task of WP6 is devoted to the development of a harmonized implementation guideline for prevention and protection planning based on the vulnerability assessment of touristic infrastructures. This vulnerability assessment has been implemented in a web service for tourist infrastructure managers and first responders. The aim of this deliverable is to provide details on how this web service has been conceived, tested and implemented. The structure of this deliverable is as follows:

In section 2, the architecture of the system and the vulnerability assessment methodology are provided and the last section contains information on how to visualize and exploit the tool.

2. System rationale and architecture

The WUITIPS web tool serves a threefold objective:

- Gathering data on wildland-urban interface touristic infrastructures (hereafter WUITI) useful for local risk management authorities that pertains to predefined vulnerability indicators, specifically focusing on the level of prevention and protection against wildfires.
- Calculating a vulnerability index (VI) based on the gathered information.
- Providing feedback to WUITI managers regarding their strengths and weaknesses in terms of wildfire resilience.

To achieve this goal, the web tool comprises two distinct IT components:

- A database (DB) that stores the declarative internal information related to WUITI.
- A website that enable users (i.e., WUITI managers) to input data into the database and access their vulnerability index (VI). The website also provides them with valuable information on enhancing protection and prevention measures of WUITIs in case of a high VI.

The database has been designed with seamless integration capabilities into the prevention and operational IT platforms from UPC, EPLFM and DDGI. This will enable fire prevention and intervention stakeholders to easily access and utilize this information.

Note that the integration of models and methods to characterize the various vulnerability components of touristic infrastructure across different scales has been perceived as highly challenging and complex, particularly due to the heterogeneity of tools, models, and official IT platforms provided by the WUITIPS partners. Consequently, the focus of the webtool is limited to vulnerability assessment at the property level based purely on declarative information from the WUITI managers. To this end, an ad-hoc assessment method has been developed within WP4, specifically tailored to meet the requirements and specifications of the tourist sector.

This web tool plays a pivotal role in enhancing the collection of information from WUITIPS pilot sites, making it easily expandable to other sites beyond the project's scope.

It has also to be highlighted that the web tool prioritizes the establishment and maintenance of a robust data confidentiality framework, ensuring a high level of data security and privacy.

2.1. Vulnerability model

The vulnerability model implemented in the web tool is feed with data inserted by the tourist infrastructure managers, these data being grouped into five main categories:

- Characteristics of the surrounding area
- Characteristics of the property
- Characteristics of the main building of the property (to be potentially used as a shelter)
- People vulnerability
- Emergency preparedness.

This data is collected in the form of a check list, which is detailed in Annex I of this document.

With this type of information, the webtool implements and provides as output displayed online a first level vulnerability index calculated instantaneously after data input by the WUITI manager, and refreshed every time the WUITI manager updates its information.

The index is calculated as:

$$Vulnerability\ Index\ =\ \frac{\sum\limits_{i=1}^{N} answer\_score_i}{N}$$

with:

- N: the total number of questions (same list for all zones)

- $answer\_score_i$: the score to the individual question i.

The questions related to the regulation in a specific zone (largely the case for France) are treated in a specific way:

- They are not asked to the WUITI owner,

- And their individual scores are taken to the lowest value (=highest protection is assumed) when calculating the vulnerability index.

Note that the individual scores are equally weighted due to the equal importance since all individual items can be considered equally important in increasing or decreasing the vulnerability of the WUITI to wildfires.

Furthermore, after score calculation, the user receives information on how to reduce the vulnerability according to the answers provided, detailed in Annex II of this document.

2.2. Technology

This section lists the different components, requirements and specifications of the webtool that have been taken into account during the design phase of the service.

2.2.1. Components

The web tool consists of two distinct IT components:

- The database, stored in a webGIS-based format, with geospatial data stored in a PostGreSQL database.
- The web site, hosted on a webserver at UPC, providing users with easy access to the tool's functionalities. It is coded in its frontend part in HTML, and in its backend part in Javascript.

2.2.2. Requirements

The general requirements, to which the webtool has to conform as a whole, are listed as follows:

Requirement number	Description
REQG1	The webtool has to be hosted and broadcasted from a classical Linux or Windows webserver, that would be hosted on machines at UPC.
REQG2	The webtool interface can be accessed in different languages.
REQG3	New WUITI managers can register easily their site into the webtool, and fulfil by themselves the web questionnaire, allowing a regional WUITI database to grow.
REQG4	WUITI database can be easily extracted from the webtool, in a format easily accessed by the Entente and DDGi web-GIS web plaforms, which will allow them to display the declarative information as additional information to their existing wildfire prevention information.

The specific requirements are focused on the inputs or the outputs of the webtool:

Requirement number	Targetted item of the webtool	Description
REQD1	Input webquestionnaire	Each input of declarative information has to be validated as pertinent information by at least 1 interviewed fire-fighter officer and 1 WUITI owner.
REQD2	Webtool connection	Two different connection modes: (1) WUITI manager, to input data and get returned different outputs (coarse vulnerability index, as well as recommendations to improve their protection against wildfire). (2) a multisite visualization capability, allowing regional authorities to connect and get synthetical information on the vulnerability index at regional scale over all WUITIs already connected to the webtool.
REQD3	Input webquestionnaire	The webtool will tailor the set of questions to the region of the WUITI: questions to the WUITI are supposed to be complementary to regulation (the webtool does not serve to verify if regulation is correctly followed by the WUITI manager). However, for comprehensive risk assessment, the regulation aspects have to be taken into account in the evaluation of the vulnerability index.
REQD4	Input webquestionnaire	The questions will be in 5 categories: – Characteristics of the surrounding area – Characteristics of the property – Characteristics of the main building of the property – People vulnerability – Emergency preparedness.
REQD5	Input webquestionnaire	Each question will consider either the WUITI site as a whole (non-spatialized information) or as a defined

		spatial definition inside the WUITI site (spatialized information)
REQD6	Outputs	The coarse vulnerability index can be visualized: 1/ either with its synthetical value 2/or with its independent components Additionally, a set of recommendations will be provided to improve the WUITI protection. Potentially, WUITIPS protection label will be displayed

2.2.3. Specifications

The general specifications, linked to the general requirements, are listed below:

Specification number	Requirement(s) addressed	Description
SG1	REQG1	In the initial version, the webserver is simply located as "localhost" on the machine where it has been developed. Then it will be ported on UPC server, with access via public IP.
SG2	REQG2	The webtool will be developed initially in English/French modes. Each language is made available by adding a file which contains the definition of the *lang* object. In this object, we store the different translated strings used on the website. For example, the file lang.en.js contains the variable *yes* containing the sting "Yes". To change the language displayed on a page, one would simply need to import the object from the other language file to have the translations. To add other languages to the website, you would simply need to create a new language file and to add the possibility for new users to choose this language. Other foreseen languages are Catalan, Spanish, Italian and Greek.
SG3	REQG3	A new WUITI owner can create his account by entering the different information required (contact info, location of the WUITI, language and zone). Then, he/she would be able to log into the webtool right away with his/her email address and password. Finally, he/she is able to answer the questions, and gets the vulnerability index right after completion.
SG4	REQG4	The format chosen in the DB is PostgreSQL, easily loadable in any webGIS platform.

The detailed specifications, linked to the detailed requirements, are listed in the table below.

Specification number	Requirement(s) addressed	Description
SD1	REQD1	We interviewed several fire-fighters and WUITI owners to determine which information would be pertinent to collect. Following this, every item was validated.
SD2	REQD2	A differentiated access is given depending on the role (four different roles): (1) *newOwner*: the role of a newly created owner account. A *newOwner* needs to answer the questionnaire to obtain a vulnerability index and to then be promoted to the *owner* role. (2) *owner*: the role of a WUITI owner who already answered the questions. An *owner* can see his/her vulnerability index, and the breakdown of his/her answers. He/She can also modify answers, and the information of the account if something has changed. He/She can finally read advice on things he/she could change to lower his/her vulnerability to wildfire. (3) *firefighter*: the role of a firefighter willing to see vulnerability indexes or other items to aid intervention. A *firefighter* can therefore see the answers of any WUITI by selecting it in a list, or see the answers for all WUITIs by item on a map. (4) *admin*: the role of the administrator of the webtool. The *admin* can do all the things that a *firefighter* can do. Moreover, he/she can administrate the users (modifying information, deleting user).
SD3	REQD3	When creating the account, a new owner is required to choose the zone in which his/her WUITI is located from a list of registered zones. For now, there are only two zones available, Eastern Pyrenees (Fr) and Catalonia. Each zone is linked to a list of questions. The French zone excludes the ones regarding items exposed to regulation. To add a new zone, one needs to add it to the DB and then add the possibility to select it for new owners.
SD4	REQD4	The categories for the questions are visible, thanks to color associations, found all throughout the webtool.
SD5	REQD5	All the questions are punctual as they are only linked to the GPS coordinates of the WUITI, except for a question that allows the owners to select and draw polygons on the map regarding relevant elements of the property.
SD6	REQD6	Once the questionnaire has been filled by the WUITI owner, the answers are collected and the

		coarse vulnerability index is calculated. For each question, a *question_score* has been added to the DB.
		For boolean questions (yes/no questions), the *question_score* is either 0 or 1, and represents the binary answer (1 for "yes", and 0 for "no") that will worsen your vulnerability index. For example, a *question_score* of 1 means that if you answer "no", your score for this question will be 0/1, which means that this does not increase the vulnerability of the WUITI.
		For questions with multiple options, there is no *question_score*, but rather an *option_score* ranging from 0 to 1 for each option. For example, if you select an option with an *option_score* of 0.5, the score for this question will be 0.5/1.
		Input answers are not taken into account when calculating the score as it is impossible to determine a score for all the possible inputs. Therefore, input answers are only useful for information to the first responders.
		Once all of these scores are computed, we can combine them to deduce a vulnerability index over 5 with the following formula: mean(scores)*5.
		Then, the vulnerability index is displayed with a breakdown of the scores for each question category. We chose to use a color association to indicate the level of vulnerability. For a vulnerability between 0 and 1.5, it is displayed in green, between 1.5 and 3.5 in orange and over 3.5 in red.
		Finally, a list of advice is displayed. Namely, for every question where the optimal answer was not selected, an advice is shown.

2.2.4. Functional validation by first users

The first users have been selected:

- for firefighters and fire risk managers among EPLFM and personal of SDIS66: 5 persons have been reviewing and agreed on the final list of individual items and related advice;
- for WUITIs: managers of two different campsites in the French test zone have passed the questionnaire (paper version) and agreed on the pertinence of the final list of individual items and related advice.

The vulnerability model has been tested by WUITI managers from France, Spain, Italy and Greece. Results of this validation have been successful and incorporated into the WUITI DB.

3.   Exploitation of the web tool

The web tool can be accessed currently internally at UPC, requiring a UPC agent to connect to VPN before opening the webpage. It is in ongoing transfer to public IP by UPC IT personal.

A user video has been created, explaining the different connection possibilities to the webquestionnaire for WUITI managers, fire-fighter and fire risk managers. It is available at following link:

https://mydisk.cs.upc.edu/s/ZqR2kbbPE5kK9Tw

The web tool will be maintained at UPC. Synergies between WUITIPS and FIREPRIME projects will be explored to unify and integrate platforms among projects.

Other WUITI sites will have the convenience of easily registering for the web tool and independently completing the web questionnaire, thereby facilitating the expansion of the database. Any future updates to the database, whether from existing registered WUITI sites or newly registered ones, will be promptly integrated into the EPLFM and DDGI IT platforms.

4. ANNEX I – Vulnerability Check list

Information to sign in - Touristic infrastructure data

Name of the business:

Type of service (hotel, camping, etc.):

Address:

Name of the person answering the questionnaire:

Position:

Contact data (email, phone number):

1. Description of the surroundings around the property

1.1. Is there a well-maintained fuel reduced fringe (i.e. shaded fuel break) around the property?

☐Yes   ☐ No

1.2. Is the infrastructure located in an isolated area (outside the urban area) surrounded by vegetation?

☐Yes   ☐ No

1.3. Is there more than one road that can be used for evacuation?

☐Yes   ☐ No

1.4. Is the property located on flat landscape?

☐Yes   ☐ No

1.5. Are there any other comments regarding the surroundings of the property that you would like to highlight?

2. Property vulnerability

2.1. Is there a busy parking lot on the property?

☐Yes   ☐ No

2.2. Do you conduct regular clearings (pruning, tree and shrub spacing, removal of dead fuels) on your property (at least every two years)?

☐Yes   ☐ No

2.3. What are the objectives of vegetation clearing?

☐ To limit fire intensity and propagation?

☐ To reduce horizontal and vertical continuities in vegetation?

☐ To totally prevent the fire from approaching the main building?

2.4. Are there patches of continuous vegetation within the property (e.g., hedgerows, large clumps of trees)?

☐ Yes   ☐ No

2.5. Is there an LPG tank (Liquefied Petroleum Gases, like propane or butane) in the open air on the property?

☐ Yes   ☐ No

2.6. Are there any other comments regarding presence of fuels (natural or man-made) in the property that you would like to highlight?

3. Building vulnerability (sheltering capacity)

3.1. Do you have a building that could host people in case of a wildfire emergency, with a structure not made of combustible materials (such as timber)? If yes, it will be called the "shelter building" below and you can go through the following questions of Section 3. If not, you can jump to Section 4.

☐ Yes   ☐ No

3.2. What is the main use of the shelter building (restaurant, reception, etc.)?

3.3. What material is the shelter building made of (load bearing walls)? Metal? Concrete?

3.4. Does the shelter building have combustible exterior insulation or cladding?

☐ Yes   ☐ No

3.5. Does the shelter building have, on each façade, more than 30% of the surface covered with glass?

☐ Yes   ☐ No

3.6. What material are the window frames made of (PVC/wood/ metal)?

3.7. What material are the shutters made of (No shutters/PVC/wood/metal)?

3.8. What is the roofing material made of? (Asphalt-composite shingles or combustible materials/Metal/ Clay)?

3.9. Are there gaps in the roof eave / wall-roof intersections?

☐Yes   ☐ No

3.10. Do you clean the gutters and roof at least once every year?

☐Yes   ☐ No

3.11. Are there unprotected vents or protected with combustible meshes?

☐Yes   ☐ No

3.12. Do you have a storage area for combustible materials (wood, gas bottles, etc.) adjacent to or within 5 m distance of the building?

☐Yes   ☐ No

3.13. Is there highly flammable vegetation (cypress, eucalyptus, pine, thuja, etc.) or combustible fencing materials located within 10m from the building?

☐Yes   ☐ No

4. People vulnerability

4.1. Do you inform tourists of the wildfire risk verbally or using posters and leaflets?

☐Yes   ☐ No

4.2. Do you have signs indicating an action plan in the event of a forest fire in at least the language of your country and in the predominant language of your foreign guests?

☐Yes   ☐ No

4.3. Might your guests or staff members be needing help during evacuation (e.g., people with reduced mobility, people over 75 years old, etc.)?

☐Yes   ☐ No

4.4. According to the number of guests, what category would your facility fit into (Small < 50 guests / Medium < 500 guests / Large > 500 guests)?

5. Emergency preparedness

5.1. Do you have an emergency plan? (If No, you can skip question 5.2)

☐Yes   ☐ No

5.2. Does your emergency plan include a sheltering area?

☐Yes   ☐ No

5.3. Is your staff trained to react to a forest fire? (If No, you can skip question 5.4)

☐Yes   ☐ No

5.4. What type of training have they received?

5.5. Do you have a fire alarm system (siren with its own power source and pre-recorded message, megaphone)?

☐Yes   ☐ No

5.6. Do you have outdoor automatic suppression systems (sprinklers or water curtain)?

☐Yes   ☐ No

5.7. Do you have an autonomous water reserve?

☐Yes   ☐ No

5.8. Do you have self-protection suppression equipment (fire extinguishers, armed fire taps)? (If No, you can skip question 5.9)

☐Yes   ☐ No

5.9. Is your staff trained to use this self-protection suppression equipment?

☐Yes   ☐ No

5.10. Do you have autonomous emergency lighting?

☐Yes   ☐ No

5.11. Is there at least one road that is at least 5m wide, large enough for fire trucks?

☐Yes   ☐ No

5.12. Do you have an area where fire trucks can turn easily?

☐Yes   ☐ No

5.13. Do you have a paper map of the property available to tourists and firefighters?

☐Yes   ☐ No

5.14. Is there always someone available (24/7)?

☐Yes   ☐ No

5.15. Do you have an emergency electricity source (Generator / Solar panels / Batteries / No emergency sources)?

☐Gasoline / LPG Generator   ☐Solar Generator   ☐Rechargeable Battery   ☐ No emergency sources

5. ANNEX II – Recommendations

The advice provided below have the same numbering as in ANNEX I.

1. Description of the surroundings around the property

1.1. In areas where the property is in contact with wildland vegetation, a fuel reduced fringe should be maintained annually. The characteristics of this fringe should comply with local regulations.

1.2. n/a

1.3. n/a

1.4. n/a

1.5. n/a

2. Property vulnerability

2.1. Consider moving busy parking lots away from the main building, as cars might ignite and endanger your building. If the parking lot is close to wildland vegetation, ensure there is a well-maintained fuel reduced fringe.

2.2. Clear the vegetation on your property according to local practices, guidelines or legislation.

Catalonia:
https://interior.gencat.cat/web/.content/home/030_arees_dactuacio/proteccio_civil/consells_autoproteccio_emergencies/incendi_del_bosc/documents/llibret_incendis_forestals_cast.pdf
France:
https://www.onf.fr/vivre-la-foret/+/1525::foire-aux-questions-faq-les-obligations-legales-de-debroussaillement-old.html]

2.3. Correct answers are 1 and 2.
Total prevention of fire propagation is not possible. Even after proper vegetation clearing, a very small fire spreading across grass near the building can cause significant damage if it ignites combustible elements nearby or attached to the building. Introducing non-combustible materials at the base of the building will effectively prevent the fire from reaching vulnerable elements of the building.

2.4. Generate fuel discontinuities within the property according to local practices

2.5. If there is an LPG tank, ensure it is not surrounded by combustible materials or vegetation, and regularly inspect it

2.6. n/a

3. Building vulnerability (sheltering capacity)

3.1. n/a

3.2. n/a

3.3. n/a

3.4. Consider improving the building's fire resistance with hardening strategies such as replacing combustible elements (e.g., cladding, insulation) with non-combustible options'

3.5. Consider using glazing systems with tempered glass and multiple panes.

3.6. It is preferable to use non-combustible framing systems (e.g., steel, aluminium) rather than combustible ones (PVC, timber).

3.7. Consider installing shutters to protect all glazing systems. Prefer non-combustible shutters (e.g., steel, aluminium) over combustible ones (PVC, timber). Ensure shutters are closed in the event of a fire.

3.8. Consider fire resistant roofing materials, such as clay tiles.

3.9. Keep your roof and eaves well-maintained to prevent gaps.

3.10. Regularly clean your roof and gutters to prevent the accumulation of debris such as dead leaves and pinecones, which could ignite.

3.11. Consider protecting vents with non-combustible mesh (maximum 2 mm in size).

3.12. Store gas bottles and other man-made fuels at least 5 meters away from the building.

 3.13. Remove highly flammable vegetation and combustible fences located within 10 m of the building

4. People vulnerability

4.1. Inform tourists of wildfire risk and emergency protocols upon their arrival

4.2. Ensure signs indicating an action plan in the event of a wildfire are visible and understandable

4.3. n/a

4.4. n/a

5. Emergency preparedness

5.1. Ensure you have an appropriate emergency plan that includes a wildfire scenario.

5.2. n/a

5.3. Ensure your staff receive training for wildfire emergencies.

5.4. n/a

5.5. Consider installing an alarm system to alert your guests in case of fire.

5.6. n/a

5.7. Consider installing adapted dedicated autonomous water reserve.

5.8. Make sure you have a self-protection suppression equipment in place according to the local regulations.

5.9. Provide training to your staff for wildfire emergencies, including the use of suppression equipment.

5.10. Consider installing an autonomous emergency lighting system in accordance with local regulations.

5.11. Consider ensuring a 5-meter width for access roads to allow fire-fighting engines access to your property.

5.12. Consider clearing an area to allow fire trucks to turn around.

5.13. Keep a paper map of your property available for both guests and firefighters.

5.14. When planning staff shifts, consider having at least one staff member available on-site 24/7.

5.15. Consider installing an emergency electricity source to power essential equipment, such as water pumps, lights, and a fixed phone line in the shelter area, for communication with the exterior in case of fire.