

March 2020

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The Urban Lab of Europe !

The GUARDIAN project Journal N° 1

Project led by the Cities of Riba-Roja de Turia and Paterna



**CLIMATE
ADAPTATION**



The Guardian project

The **GUARDIAN** project addresses the increasing risk of peri-urban fire as a result of climate change, particularly prominent in the Mediterranean basin. The project aim is to improve the resilience of the affected peri-urban areas by reducing risk fire and limit its expansion to inhabited areas. To do so it will test an integrated set of actions combining preventive, pre-defensive and defensive irrigation with vegetation transformation, automated monitoring and self-defense training for the population in the affected areas. In the wildland area of La Vallesa, located in the two neighbour cities of Riba-Roja de Turia and Paterna, the partnership will develop a prevention and protection system covering all the cycle of fire risk management through the creation of transitional 'green belts' reusing treated waters. Based on a network of sensors, a monitoring and command system will be developed to calculate the amount and spatial distribution of irrigation to compensate soil moisture deficit, and will automatically deliver it to prevent and protect fires.

Partnership:

- Riba-roja de Túria
- Paterna
- Hidraqua
- Medi XXI
- Cetaqua
- IIAMA, Polytechnic University of Valencia (UPV)
- University of Valencia

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1. EXECUTIVE SUMMARY

GUARDIAN is a pioneering model of sustainable and innovative management of the natural environment, which will ensure the safety of the citizens of Riba-Roja and contribute to the preservation of the Natural Park of Túria and La Vallesa.

The urban areas of Riba-Roja and Paterna, share the protected wildland zone “la Vallesa”, which is part of the Natural Park “Parc Natural del Túria”, located in a highly urbanised environment. The wildland-urban interface (WUI) between this park and these two cities is subject to the growing risk posed by forest fires, further impacted by the effects of climate change. This hazard is maximised by its progressive incorporation within the urban area and certain degradation, mainly due to agriculture abandonment and insufficient forestry management.

The project adopts a combined strategy based on the use of recycled water for fire mitigation and protection, providing preventive irrigation and extinction water spraying patterns automatically programmed. GUARDIAN will implement the hydraulic infrastructure to supply recycled water from the Waste Water Treatment Plant “Camp del Túria II” to the WUI area of “la Vallesa”, and the elements (irrigation and sprinkler towers) which make up the defensive barrier. The operation of the fire prevention and suppression infrastructure will be based on sensor networks and forecast services processed by an automatic system. In order to support this hydraulic infrastructure, GUARDIAN will also make use of an existing wetland (“la Vallesa” pond) as an emergency reservoir. The required water quality for the project’s goals will be ensured thanks to

the implementation of an advanced modular water treatment implemented in the existing facility. Furthermore, GUARDIAN implementation actions will include vegetation treatment (i.e. reduction of tree density, pruning, shrub spacing, etc.) by which the ecologic conditions and the fire resilience of “la Vallesa” forest will be improved, and self-defense training for population in order to enhance risk perception, create awareness, communicate the basis of the project and improve self-protection through fire resilient gardening and household protection strategies.

The GUARDIAN consortium is led by the Riba-Roja City Council, acting as the main Urban Authority (UA) and has the Paterna City Council as Associated UA. Five more entities are included in the partnership: MEDI XXI, which is an environmental engineering company with expertise on fire risk mitigation and fire defence technological solutions; HIDRAQUA, the local water utility with long experience in the implementation of hydraulic infrastructures and water reuse; CETAQUA, a water technology centre providing R&D&I solutions to sustainable and efficient water cycle management; the Universitat Politècnica de Valencia (UPV) and the Universitat de València (UV), two public institutions of research and higher education in charge of designing the automated monitoring network of forest/weather conditions and validating the economic payback and efficiency of the project, respectively.

The present document is the first of a series of journals following the GUARDIAN project implementation process. It firstly presents the main climate change adaptation challenges

that GUARDIAN UAs are facing (i.e. wildfires and water scarcity), followed by a detailed description of the local characteristics. Next, the GUARDIAN approach is described, in terms of objectives, actions and results. The last part of

the document is devoted to review the potential challenges for implementation that the project is so far experiencing. Finally, an additional section on how the project fits the policy context is also included.

2. UNDERSTANDING SOME CLIMATE CHANGE ADAPTATION CHALLENGES IN URBAN ENVIRONMENTS: WILDFIRES AND WATER SCARCITY

European towns and cities are facing major challenges to get adapted to climate change. Although this is a global problem, urban environments have unique climate risks to mitigate: heat islands, flooding, draughts, coastal developments threatened by sea level rise, etc. GUARDIAN is an innovative project that proposes a novel strategy to face a particular climate threat present in many different urban areas of Europe: the risk of fire in interfaces adjoining wildlands. GUARDIAN is about getting urban settlements adapted to extreme weather events involving high risk of nearby forest fires, including water

scarcity due to severe draughts. GUARDIAN proposes a holistic combination of strategies to mitigate fires in wildland-urban interfaces relying on a smart use of water, on cost effective and sustainable ecosystem treatments and on population and target beneficiaries education and awareness.

To recognize the benefits of the GUARDIAN approach, first we must have a good understanding of what wildland-urban interface fires are, what consequences they entail and how important is to rationalize water use in a climate change societal context.

2.1 The risk of wildland-urban interface fires in Europe

Wildland-urban interface (WUI) fires, defined as those affecting areas where housing or any type of infrastructure meets the wilderness, represent a growing problem in Europe. As the climate warms, hot and dry seasons in southern countries are lengthening and wildfires are behaving more often as real **firestorms** with huge intensities and large destructive potential. In addition, **human pressure** close to wildlands is continuously growing with an increase of ignitions and the expansion of housing developments at the WUI.

The European Climate Adaptation Partnership has considered WUI fires to be one of the major impacts on urban areas, entailing large economic, social and environmental consequences. Recent events have left impressive figures in Mediterranean Europe: in 2016 three highly dramatic WUI fire events occurred. Wildfires blazed Madeira Island (Portugal) spreading through the old quarter of the capital Funchal. Almost 2000 people were evacuated in two WUI fires in Comunitat Valenciana (Spain) with fire jeopardizing dozens of touristic developments. The Rognac-Vitrolles fire (France) devastated

300 ha at the interface with one of the most crowded city of the country (Marseille), caused five injured and 5000 evacuated people and destroyed 25 homes. In June and October 2017, Portugal experienced the deadliest WUI fires in its history, with more than 110 deaths, hundreds wounded, and thousands of affected structures. In July 2018, a fire in the WUI caused 102 fatal victims (amongst them 11 children) and 187 injuries in Mati (Greece) with around 2000 structures damaged, out of which nearly 600 were entirely destroyed. In addition, recent fires in northern countries have revealed the vulnerability of WUI areas in those latitudes. The Vastmanland fire (Sweden, 2014), with 15,000 burned ha, is the largest forest fire in Sweden's

modern history. One thousand people were forced to evacuate, one person was confirmed killed and several fire entrapments of volunteer fire-fighters occurred. The Leardal fire (Norway, 2014) devastated the historic town of Leardal (Unesco World Heritage), consuming at least 30 wooden buildings and injuring 100 people.

Impact of forest fires in the EU (2000-2017 period)¹

- **Environmental losses: 8.5 million ha burnt (480,000 ha/year)**
- **Human losses: 611 people killed (34 deaths/year)**
- **Economic losses: EUR 54 billion (3 billion/year)**

2.2 Climate change and hydraulic resources

Water scarcity, i.e. the imbalance between water demand and availability, has been increasing in both intensity and frequency in many areas of Europe. The effects of climate change are affecting the availability of hydraulic resources, posing a growing risk to economy, communities and ecosystem services. Predictions for the Mediterranean region show a decrease in annual precipitation, which clearly means an increase of draughts leading to favourable conditions to forest fire occurrence.

In addition, there is a growing demand of water in urban areas due to a continuous population rise (with a clear link to rural depopulation). This increasing need for water is leading to an approach shift from just increasing its supply, to focus on the more efficient use of water by reducing losses, incorporating innovative water

treatment technologies for the valorization of waste water, using more efficient appliances, etc. Indeed, there is a clear need for a more sustainable and integrated approach to manage water resources. It is vital to use water in the most rational, responsible and sustainable manner, and when it comes to face forest fire risk in urban areas this is even more relevant.

Water scarcity and drought in the EU²

- **Water scarcity affects at least 11% of the European population and 17% of EU territory.**
- **Between 20-40% of Europe's available water is being wasted**
- **Water availability can decrease by 20-30% in a +2°C global warming scenario**

¹ Source: GFMC UNISDR (2018). Global Wildland Fire Network Bulletin no 23.

<https://gfmcoonline/wp-content/uploads/GFMC-Bulletin-01-2018.pdf>

² Source: European Union (2010). Water scarcity and drought in the European Union

https://ec.europa.eu/environment/pubs/pdf/factsheets/water_scarcity.pdf

2.3 Fostering resilient communities against WUI fires

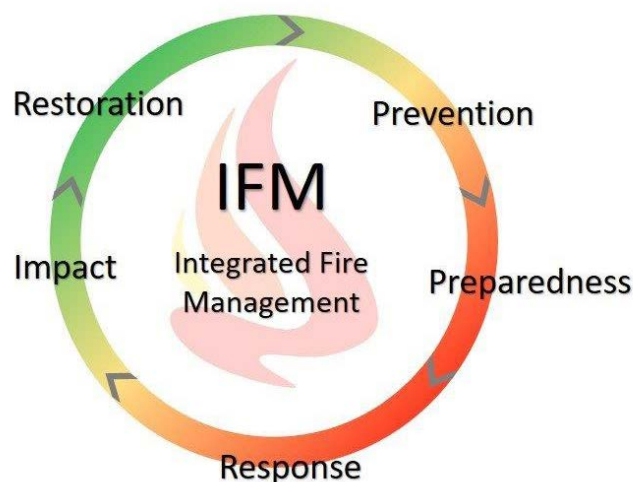
The Directorate General for Research and Innovation of the EC has already acknowledged that Europe is being placed in a **new wildfire context** -mainly due to climate change- with increasing risk of more extreme events³. Inevitably, this new situation has come to stay. Areas at risk from forest fires are projected to increase by 200% in Europe by the end of the 21st century. Moreover, the development of urban areas in the vicinity of forest areas, combined with a lack of risk awareness will increase the exposure and vulnerability of local communities posing tremendous management challenges in terms of firefighting and civil protection.

This new paradigm has to be faced with **holistic fire management strategies**, going far beyond the classical approach of favouring fire suppression over other actions. The trend in recurring and tragic WUI fires in Europe reflects the limits of conventional management approaches. The concept of **integrated fire management (IFM)** thus provides a very useful framework that includes the consideration of various socioeconomic and environmental aspects associated with fire management in its

complete circle: prevention, preparedness, response, impact and restoration. Indeed this is what GUARDIAN is all about. The GUARDIAN project proposes a combined strategy to **increase fire resilience in Riba-Roja and Paterna** communities grounded on the IFM concept, addressing different fire management pillars with innovative solutions to guarantee population and assets safety in case of WUI fire through:

- Ensuring high performance of green belts acting as fire barriers
- Valorizing recycled waste water for preventive irrigation and fire suppression
- Raising communities' fire risk awareness
- Improving ecosystems' quality in local natural areas

“Integrated Fire Management strategies are necessary to ensure that wildfires risks are managed in such a way that people and housing safety, economic growth, well-being, carbon sinks, biodiversity and ecosystem services are maintained or increased.”⁴



³ Source: European commission (2018). Forest Fires – Sparking firesmart policies in the EU.

⁴ Source: European commission (2018). Forest Fires – Sparking firesmart policies in the EU.

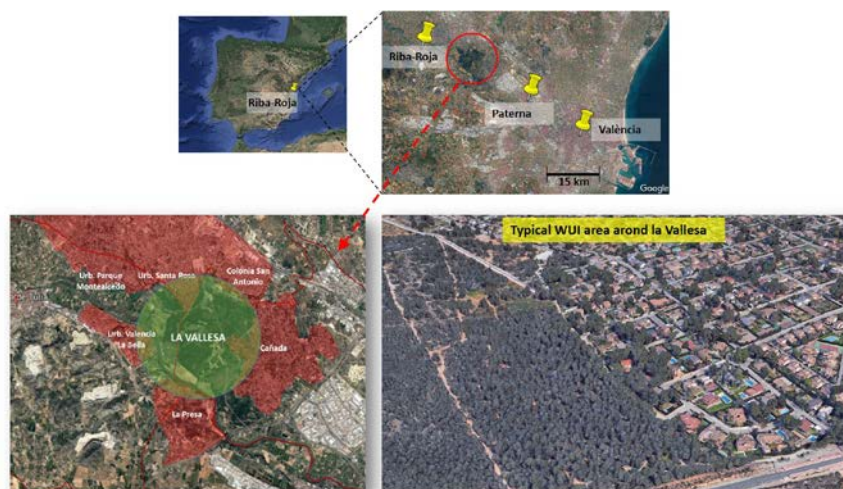
3. THE WUI FIRE PROBLEM IN RIBA-ROJA AND PATERNA

Within the vicinity of Valencia (capital of Comunitat Valenciana Spanish region) an increasing agglomeration of smaller cities and settlements is scattering and intermixing with forested lands. In case of wildfire, this friction of urban settlements with the wildland creates a potential exposure of structures and citizens that may entail tremendous consequences. Nowadays, these municipalities are overwhelmed by this situation, with population growing remarkably in summer (during the peak of the fire season) and being surrounded with forests (lacking silviculture and management), with abandoned agricultural fields and with a serious lack of water.

Facing self-protection is a challenge for these municipalities, with limited capacity for infrastructure development and access to water for fire prevention and protection. Furthermore, it has to be highlighted that there is insufficient

regulation on fire prevention and only some of the communities in those areas are aware of the dangers and the need for self-protection. Although the Spanish and Comunitat Valenciana administrations have some legislations in place, these are clearly deficient when addressing the factors and processes which take place in the destruction of communities and human life. Additionally, the lack of risk culture and community awareness is one of the main causes of defective policy implementation in most of Spanish (and Valencian) municipalities⁵.

Riba-roja and Paterna are two of these municipalities within the geographical area of the city of Valencia. The urban areas of Riba-roja and Paterna, share the protected wildland zone “la Vallesa”, which is part of the Natural Park “Parc Natural del Túria”, located inside a highly urbanized environment.



⁵ Pastor et al. (2019). Wildland-Urban Interface fires in Spain: summary of the policy framework and recommendations for improvement. Fire Technology <https://doi.org/10.1007/s10694-019-00883-z>

The wildland-urban interface between this park and the aforementioned cities is subject to the growing risk posed by forest fires, boosted by the effects of climate change. This hazard is maximized by its high level of anthropization (incorporation within the urban area) and certain degradation (agriculture abandonment, insufficient forestry management). In the period 2000-2016 Riba-Roja suffered 40 forest fires, while Paterna recorded 19. These **fires are becoming more frequent in the last years**, and due to the rapid urban development, potentially **more destructive**. The potential impact of fires over the adjoining urban areas of Riba-Roja and Paterna is not limited to the direct harm (life loss and material damage), but extends to support

infrastructures (e.g. existing power lines), air quality, soil erosion and has a negative overall effect on the local economy (e.g. tourism).

In the municipality of Riba-Roja, 12 housing developments and several disseminated nuclei expand the urban area. The city of Paterna also reflects a similar distribution, with 6 different population nuclei. The expansion of both cities to the surrounding areas within the current Túrria Natural Park was a constant of urban development, during the 20th century, creating residential areas embedded in the existing forests. Simultaneous agriculture decline within the area has contributed to its present configuration.

4. THE GUARDIAN INTEGRATED FIRE MANAGEMENT APPROACH

4.1 The ambition

The GUARDIAN project is a pioneering model of sustainable and innovative management of the natural environment, which will ensure the safety of the citizens of Riba-Roja and Paterna against WUI fires and will contribute to the preservation of the Natural Park of Túria and “la Vallesa” wildland zone. GUARDIAN is a relevant example of how IFM strategies can generate a big impact in WUI fire-prone zones, going beyond the conventional firefighting practices, and considering socioeconomic, climate and environmental parameters.

GUARDIAN aims at increasing fire resilience in the two municipalities of Riba-Roja and Paterna, through several actions of different nature: implementing a full hydraulic infrastructure which will deliver recycled water to the wildland-urban interfaces, training activities for citizens to increase fire risk perception and self-protection capabilities, and environmental works to improve ecosystems’ conditions. We can therefore distinguish four different focal points on which GUARDIAN is pivoting:

- Fire
- Water

4.2 The solution

The project proposes a combined strategy based on the **use of recycled water** for fire prevention and protection to provide preventive, pre-suppression and extinction irrigation/soaking patterns automatically programmed.

- Population
- Natural areas

To make all pieces of the puzzle fit together, GUARDIAN needs all partners working jointly and smoothly and establishing a strong partnership with emergency services, neighbourhood associations, local environmental organizations and water agencies. The project is complex and challenging and requires great effort from all actors to make everything coming together. As Francesc Hernández, full professor of the Universitat de València says:

“The project is ambitious, both regarding applied methods and techniques. It is innovative and provocative, as we will also calculate the costs of inaction showing that acting is more profitable than not doing it.”

Indeed, fighting fires at the wildland-urban interface does not only consist on suppression and civil protection actions when the fire shows up (likely in summer). It is more complex than that. It requires an integrated approach including a whole set of actions with different fire management objectives addressed to different targets.

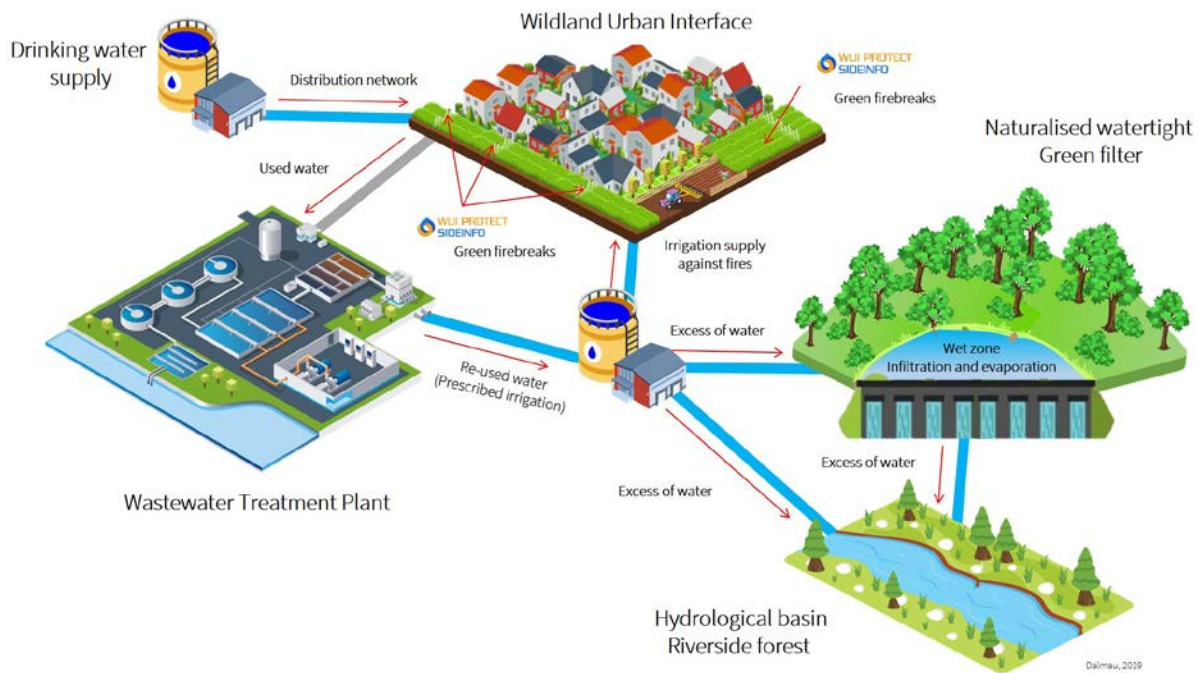
GUARDIAN will engineer and implement the **hydraulic infrastructure** to supply recycled water from the Waste Water Treatment Plant (WWTP) “Camp del Túria II” to the Wildland-Urban Interface area of “la Vallesa”, and the elements

(irrigation and sprinkler towers) which make up the defensive barrier.

Water to be used in GUARDIAN infrastructure will be previously treated in the WWTP to remove pesticide contents, implementing a **novel water treatment technology** developed under the EC LIFE+ programme aWARE (based on powdered

activated carbon with ozone and a membrane bio-reaction stage).

In order to support this hydraulic infrastructure, GUARDIAN will make use of an existing wetland (“la Vallesa” pond) as a **natural emergency reservoir** added to tanks. The water quality and general condition of this wetland will be improved



by replacing its current low quality inlets by high quality recycled water.

The operation of the fire prevention and suppression infrastructure will be based upon **sensor networks and forecast services** processed by an automatic system for the delivery of irrigation. Monitoring includes readings of ground sensors, vegetation condition and mid-size dead fuel. The resulting control command system (GUARDIAN CCS) will calculate the amount and spatial distribution of irrigation to compensate soil moisture deficit, and automatically deliver it. In case of high or very high fire risk, or in case of facing an approaching fire, GUARDIAN CCS will estimate, based on the expected evolution of

vegetation moisture, the amount, time and spatial distribution of pre-suppression irrigation.

Furthermore, **soil and vegetation works** (reduction of tree density, ladder fuels, pruning, shrub spacing, slash and vegetation debris reduction etc.) will be carried out, improving the ecologic condition and the fire resilience of “la Vallesa” forest.

In addition, **training** to upgrade the **preparedness of the population** will be carried out, in order to enhance risk perception and self-protection measures (e.g. fire resilient gardening, structures’ protection, etc.), to develop awareness on WUI fires and to communicate the basis and progress of the project.

4.3 Expected results...and (positive!) side effects

GUARDIAN main results involve **reducing, anticipating, mitigating and understanding WUI fire risk** by:

- Enhancing forest resilience through optimized forestry management.
- Monitoring key meteorological and vegetation variables.
- Implementing a water treatment-transport-supply system on strategic points.
- Employing a decision-making and delivery system of irrigation patterns.
- Increasing citizens' self-protection capacities.

Nevertheless, GUARDIAN outcomes are not only related to make communities more resilient to fire. GUARDIAN project will have **positive impact to the environment and local economy**. Let's highlight the most notorious positive "side effects":

- The preservation of the urban forest of "la Vallesa" in good ecological condition will help mitigating other climate change effects, e.g. heat island effect, soil erosion (and associated flood risk), while maximizing CO₂ absorption.
- Pesticide removal from the WWTP effluent will avoid its current discharge to the Túrria River improving also the water quality of the "la Vallesa" wetland.
- The valorisation of recycled waste water will create value from waste (pillar concept of circular economy) and it will open the way for other future uses.
- Forest transformation activities (brushwood removal, planting of fire resistant species) will make use of local workforce, contracted through job pools. The biomass thus produced could be turned into bio-energy, promoting local economy and increasing job opportunities.

5. THE GUARDIAN IMPLEMENTATION PHASE: REVIEW OF CURRENT CHALLENGES

As already seen in past UIA efforts, implementing innovating projects like GUARDIAN that require a high degree of involvement by different actors and stake-holders is a very challenging process. In this perspective, the UIA has identified seven cross-cutting challenges that might be relevant, with different meanings and intensities, for all UIA projects. These are mainly related to leadership, public procurement, organizational arrangements, co-implementation, monitoring and evaluation, communication and upscaling.

The set of GUARDIAN Journals will be reviewing the development of the project through the lens of these seven challenges. By these publications, we want the reader to understand the nature and intensity of these implementation threats and to get a clear idea of the strategies followed by the consortium to address them.

The GUARDIAN project is already facing some of these challenges in its first year of implementation phase. The overall survey at this stage tell us that the consortium has enough skills and resources to overcome all of them, so the global strategy of the consortium to deal with threats has proven successful.

In Table 1 a summarized analysis of how the consortium is facing the seven implementation challenges is provided. Inspired by a classic SWOT (strengths, weaknesses, opportunities and threats) analysis, we have concisely highlighted pros and cons that are helping or hampering the GUARDIAN implementation. Through a classic traffic-light system, we assess the level of risk against each challenge, where red is high, orange is medium and green is low.

Table 1. Summary of implementation challenges that the GUARDIAN project is facing. (H: high, M: medium; L: low)

Challenge	Level	Observations	
Leadership	M	Strengths & opportunities	<ul style="list-style-type: none"> ▶ Strong political support and implication from both Urban Authorities (Riba-Roja and Paterna). ▶ Tasks by GUARDIAN project manager guided by PRINCE2, a well-established project management method. ▶ GUARDIAN project manager with strong technical and soft skills.
		Weaknesses & threats	<ul style="list-style-type: none"> ▶ Not enough implication of supra-municipal administrations. ▶ Difficulties on meeting project deadlines.
Administrative procedures: permits & tendering	H	Strengths & opportunities	<ul style="list-style-type: none"> ▶ Full awareness of the GUARDIAN consortium of the difficulties regarding public procurement of innovation actions. ▶ Proactive reaction of the GUARDIAN consortium facing public procurement challenges.
		Weaknesses & threats	<ul style="list-style-type: none"> ▶ Permits to be granted by different administrations with diffuse responsibilities. ▶ Lack of administrative procedures adapted to innovative actions. ▶ Difficulties on managing permits for activities of general interest in private properties.
Cross-department working	L	Strengths & opportunities	<ul style="list-style-type: none"> ▶ Cross-department working team specifically set at Riba-Roja UA. ▶ Working team periodical meetings and well-defined tasks. ▶ Promotion of activities between departments to increase motivation and implication.
		Weaknesses & threats	<ul style="list-style-type: none"> ▶ Large number of departments involved at Riba-Roja UA with different degrees of motivation.
Participative approach for co-implementation	M	Strengths & opportunities	<ul style="list-style-type: none"> ▶ Feedback from all actors periodically gathered through dedicated workshops. ▶ High motivation and compromise from all GUARDIAN partners.
		Weaknesses & threats	<ul style="list-style-type: none"> ▶ Large number of stake-holders with different interests and expectations. ▶ Difficulties on engaging key actors.

Challenge	Level	Observations	
Monitoring and evaluation	L	Strengths & opportunities	<ul style="list-style-type: none"> ▶ Continuous monitoring of fire risk perception and project perception among citizens. ▶ GUARDIAN progress evaluation well documented. ▶ Specific partner devoted to validate the economic payback and efficiency of the project.
		Weaknesses & threats	<ul style="list-style-type: none"> ▶ Long time spend in project progress monitoring. ▶ Difficulty on defining impact indicators dealing with forest fires risk mitigation.
Communication with target beneficiaries	L	Strengths & opportunities	<ul style="list-style-type: none"> ▶ Different communication strategies addressed to different targets. ▶ Solid communication plan through the overall duration of the project.
		Weaknesses & threats	<ul style="list-style-type: none"> ▶ General lack of awareness on climate change adaptation needs between population.
Upscaling	L	Strengths & opportunities	<ul style="list-style-type: none"> ▶ High degree of project scalability in Mediterranean countries. ▶ Future upscaling already planned. ▶ Difficulties on exploitation coordination between the two different UAs already identified.
		Weaknesses & threats	<ul style="list-style-type: none"> ▶ Need of further investment to exploit and maintain the service.

Based on the above-gathered main points, a more detailed discussion of the seven implementation challenges is provided in diminishing order of risk detected:

- **Administrative procedures:** The GUARDIAN consortium is fully aware of the difficulties regarding bureaucratic procedures involving projects with high degree of innovation. The implementation of GUARDIAN project requires several types of permits, which have to be issued by different administrations with diffuse responsibilities and also by private individuals. GUARDIAN is already encountering implementation obstacles due to the lack of administrative procedures and expertise in public bodies to deal with permits and

authorization of innovative projects. By nature, novel projects might not be explicitly covered by current regulations and standards. This fact, together with the high level of risk aversion of public servants, is making the GUARDIAN project progressing slowly through the hard job of getting all permits and authorizations ready for the execution phase. However, GUARDIAN partners are persistent, have a wide knowledge of current regulations and are particularly proactive and forthcoming in the meetings with key administrations. They strongly believe on the benefits of GUARDIAN for the population and spreading their enthusiasm and determination is being key in this endeavour.

- **Participative approach for co-implementation:** The GUARDIAN project has a large number of key actors with a relevant role on implementation and exploitation: neighbourhood associations, environmentalist entities, local companies, WUI communities, fire, civil protection and environmental public agencies, etc. Feedback from all these actors is periodically being gathered through dedicated meetings, workshops and demonstration activities. In general, the GUARDIAN project is being well received but the degree of engagement differ among organizations. Particularly, getting real engagement from public bodies with rigid procedures and working protocols is being more challenging than ensuring participation from other type of organizations (e.g. NGO, local communities, etc.). This can be a critical issue during the exploitation phase, as in case

of fire, all stake-holders will have to be smoothly coordinated to manage efficiently the emergency. Furthermore, GUARDIAN methods and procedures will have to be included in protocols and decision-making processes to manage fire incidents, and this is something that has to be envisaged well in advance. On the other side, we want to highlight the high degree of motivation and compromise from all GUARDIAN partners benefiting co-implementation. GUARDIAN is being considered a strategic project for all members of the consortium. Urban authorities, private companies and universities are all committed to the UN Sustainable Development Goals⁶, so being part of the GUARDIAN project is just one more way of reinforcing and encouraging those objectives for all partners.



⁶ <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>



- **Leadership:** GUARDIAN has a solid support from the Riba-Roja and Paterna city councils at political level. However, if we go to supra-municipal scales, the engagement of administrations and politicians decreases. This threat has already been recognised by GUARDIAN partners and it is certainly an aspect to improve in order to guarantee real impact and scalability of the project. In terms of personal leadership, it has to be highlighted that GUARDIAN has a strongly skilled manager (both regarding technical and soft competences) who bases his management approach on proved successful methodologies. In particular, GUARDIAN management process is inspired on PRINCE2 project management method, widely used in several sectors all over the globe⁷. Although this is a helpful methodology to meet project objectives and milestones, unfortunately it has not prevented the consortium to fail meeting some project initial deadlines. This is also an issue where we can find some room for improvement in future implementation stages.
- **Monitoring and evaluation:** GUARDIAN main aim is to increase WUI fire resilience in Riba-Roja and Paterna communities. Evaluating the progress of achievement through appropriate measurable indicators of GUARDIAN is cumbersome, as the real impact of the project can only be overall evaluated in case of wildfire. However, some monitoring and evaluation strategies are already being put in place and some others will be soon designed by the Universitat de València. In particular, we want to mention the continuous monitoring of fire risk perception among the population through surveys and interviews. GUARDIAN has planned a fire risk perception monitoring strategy that will be executed through the whole duration of the project by which the degree of awareness of population will be checked in detail. With regard to GUARDIAN internal monitoring, a huge amount of effort is put by all partners to document the project progress. Every term, project documents dealing with monitoring and evaluation (e.g. daily log, project

⁷ Hinde, D. (2017). PRINCE2 study guide, second edition – 2017 updated. John Wiley and Sons.

monitoring plan, project management plan, etc.) are updated by the GUARDIAN Steering Committee. Despite being very time consuming, it is acknowledged by GUARDIAN partners that these documents help to keep track of the project progress and anticipate eventual deviations.

- **Communication with target beneficiaries:** GUARDIAN has come up with a complete communication strategy, which considers different media and different messages according to the different targets. GUARDIAN has been disseminating their methods and activities through local journals, exhibitions, conferences, etc. This is a cornerstone of the project, as GUARDIAN has to deal with

a general lack of understanding and awareness on climate change adaptation needs between general population. We all strongly believe that it is with more aware and educated key actors that a higher level of fire protection and resilience will be achieved. Within this communication plan, we would like to highlight fieldtrips to WUI fire-prone areas with residents. These activities have given us the opportunity to provide end-users with concrete real-world examples and evidences and have proved helpful to solidify messages and lessons learnt. Future incoming activities will involve, among others, the use of innovative approaches like Serious Games, which will be addressed to engage young population by using IT tools and methods.



- **Upscaling:** GUARDIAN project presents a high degree of scalability, not only in the vicinity of Riba-Roja and Paterna, but also through all Mediterranean countries. The consortium is already addressing scalability during the implementation phase, by planning further exploitation steps and identifying related challenges. GUARDIAN upscale will eventually have to deal with difficulties related to exploitation coordination between the two UAs as well with the need of further investment to exploit and maintain the service.
- **Cross-department working:** The UA of Riba-Roja has set a cross-department working team made up of representatives from different areas: environment, public services, media and press, economy and legal departments. Although there is a different degree of implication/motivation between departments, period meetings and promotion of activities are periodically undertaken to increase commitment with the GUARDIAN project and to concisely define roles and responsibilities.

6. HOW THE PROJECT FITS IN THE POLICY CONTEXT AT THE EU, NATIONAL AND REGIONAL LEVEL

As explained in Section 2, Southern Europe is being threatened by wildfires affecting urban interfaces every fire season with catastrophic consequences. Self-protection of communities is a first priority, demanding more resilient WUI scenarios grounded on solid policies and legislation. The European Union and its Member States are slowly articulating appropriate regulations for the protection of WUI areas, but it has been already acknowledged that there is a clear need to address the WUI fire policy analysis and improvement at national level as European mechanisms are not harmonized and standardized. Yet, it is focussing on local realities (in terms of landscape, ecosystems, meteorological conditions, socio-economic systems, land use, etc.) that solutions for the WUI fire global problem have to be found⁸.

The approach, methods and some key technology used in GUARDIAN are pioneering the frontline of fire prevention and protection in the WUI. The first baseline for innovation in GUARDIAN are the existing regulations and technical guidance for WUI spaces, which in Spain are reflected in the Law 893/2013 and in the Regional Regulation of Valencia adapted from it. The Spanish Law 893/2013 defines the framework for Forest Fire Civil Protection, which gives the Regional

Authority the responsibility for self-protection and prevention plans and for local action plans. Both refer to the construction of standardized firebreaks in the perimeter without further consideration of vegetation growth or fuel moisture control.

GUARDIAN is a logic follow-up of the latest trends in fire prevention which clearly pushes the envelope of such regulations, as discussed in the Lisbon meeting with DG Environment, DG Research, DG Civil Protection, DG Regional Development and DG Home Affairs (Feb. 2018, workshop on Megafires⁹), focusing on the ‘settlement scale’ or mesoscale and working on the innovative concept of transition zone (external mesoscale) for which is suggested to “create an environment of controlled risk in which fire fighting forces have a safe and efficient opportunity for fire suppression and houses protection”.

The use of recycled water in order to provide the hydric resources for prevention and suppression of WUI fires has no known precedent. Reused water has been applied to some extent in conventional fire fight, and it is actually regulated by Spanish Law (RD 1620/2007).

The project output will be integrated with the risk and emergency plans of Riba-Roja and

⁸ Pastor et al. (2019). Wildland-Urban Interface fires in Spain: summary of the policy framework and recommendations for improvement. Fire Technology

<https://doi.org/10.1007/s10694-019-00883-z>

⁹ <https://eustafor.eu/how-to-deal-with-megafires-in-europe/>

Paterna. The project is directly linked to the “Valencian Community Strategic Lines for Prevention of Forest Fires. 2017-2020 horizon”, document recently approved to develop

more efficient and sustainable strategies to support medium- and long-term planning of economically, ecologically and socially viable forest fire prevention.

Urban Innovative Actions (UIA) is an Initiative of the European Union that provides urban areas throughout Europe with resources to test new and unproven solutions to address urban challenges. Based on article 8 of ERDF, the Initiative has a total ERDF budget of EUR 372 million for 2014-2020.

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