Report on pilot actions replicability

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DISCLAIMER

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1 Introduction

The transfer of project results and main outputs requires appropriate guidelines delivering the methodologies used and a description of the context where projects have been implemented. This report represents the output through which project partners and stakeholders may be able to better understand the methodological frame used for the pilot actions implementation and to replicate and scale-up them in other territorial contexts. As final deliverable of pilot actions, the contents of this document may provide valuable insights, through the FRAMESPORT Toolbox (D.5.4.2), for the strategy consultation and for the structure of the FRAMESPORT strategy paper.

This report describes the Pilot Action n.2 deployed in the Canal Port of Rimini and its replicability aspects, outlining the methodology, the actions carried out, the results and the final considerations, in order to allow future replication in other cities willing to address the problem of the safety around the small port areas.

2 Pilot action in a nutshell

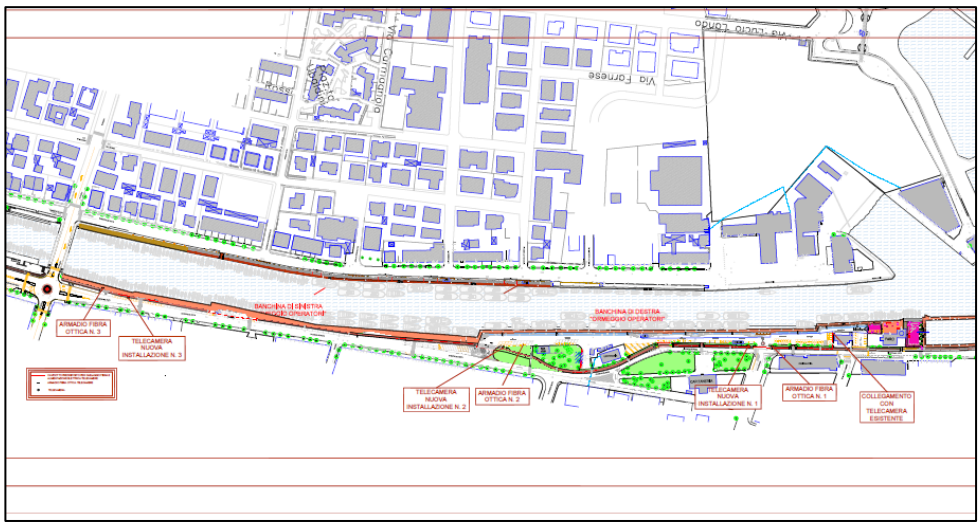
2.1 Contextualization

The Action Pilot Action n° 2 was deployed in the Canal Port of Rimini (Emilia Romagna – Italy), an area affected by problems related to social decline and perceived low security by citizens. The overall objective was to **counteract the phenomena of improper use of the public spaces by improving the monitoring actions and increasing safety**.

The specific objectives defined together the stakeholders can be summarised as follows:

1. Enhance site security measures. The Port Authority has developed a safety plan (not publicly available) to evaluate potential risks associated with the area's activities and implement preventative measures in collaboration with transport companies. In this regard, the Pilot Action of FRAMESPORT serves as a supportive measure for the security of personnel responsible for conducting checks (including the aforementioned Port Authority and the Municipal Police).
2. Address social decline and poor hygiene issues on the site. Several individuals interviewed expressed concerns regarding problems such as makeshift camps on boats or docks and unclean areas. Monitoring, particularly during nighttime, can aid in implementing timely or preventative actions to promote improved decorum within the area.
3. Enhance surveillance during public events. The area, known for its strong appeal to tourists and recreational activities, hosts numerous events and demonstrations that attract a significant number of people. An automated monitoring system greatly assists the surveillance personnel responsible for overseeing the area in their control efforts.
4. Ensure compliance with regulations. The ordinances governing the utilization of public spaces regulate the mixed-use nature of the area, including activities like walking, fishing, and docking. Non-compliance with these regulations can lead to issues in harmonizing the various activities. The surveillance system can assist in analysing the utilization of spaces at different times of the day and throughout the year, identifying anomalies, and facilitating dialogue and collaboration among stakeholders.

The area addressed by the Pilot Action is represented in the following map:



2.2 Overall vision of the pilot

After conducting site inspections and engaging in discussions with stakeholders, the final design of the Pilot Actions was established, which can be summarized as follows based on the current situation:

- the existing video surveillance system experienced frequent malfunctions due to poor connectivity.
- the area had limited coverage under the current system.

During the preparatory phase, technology scouting was conducted, and the outcomes were as follows:

- Cameras were identified as the most suitable system since they do not require 24-hour manual operation.
- Upgrading the current system was deemed necessary.

- Although the video analysis feature for automatic detection of exceptions and alarms was an intriguing option, it was discarded for this action due to its complexity and the limited available budget.

Based on this analysis, the decision was made to enhance the existing system by adding three more cameras and upgrading one existing camera. The upgrade involved replacing the previous radio connection with a more reliable optical fiber connection.

No discrepancies with respect to initial expectations were reported.

3 State-of-the-art and literature review

The surveillance systems used in similar contexts were preliminary analysed and they can be summarised as follows:

1. **Video surveillance by Cameras**. The system typically comprises the following components:

   - **Cameras**: these are the primary devices that capture video footage. The main characteristics can be summarised as follows:
     - ✓ Type of signal: analog (and digital, the latter more up-to-date and equipped with built-in electronics that process the signal before sending it to the operations center. This aspect has numerous advantages such as: greater immunity to disturbances and attenuation, higher image quality and the possibility to perform video analysis as better described below.
     - ✓ Video quality: defined per:
       - ➢ Resolution, number of pixels that make up an image
       - ➢ Frequency (number of images acquired per unit of time). The "fluidity" of the video increases proportionally to the frequency of image acquisition even if this involves a greater consumption of data in transmission. Modern cameras have automatic frequency control systems that are modified, depending on the settings, to optimize quality without impacting excessively on data consumption.
       - ➢ Sensitivity: the ability of the camera to acquire images according to the lighting conditions of the environment; it is measured in lux and differs for color or black and white shooting.
       - ➢ Illumination: the ability of a camera to take pictures in low natural light conditions (mainly at night) thanks to infrared devices (lights and filters) which, although they do not detect colours, capture good quality images
     - ✓ Motion Control: either fixed or PTZ (PAN / TILT / ZOOM) that allow to be commanded to move horizontally (PAN), vertically (TILT) and to change focus and depth of the images (ZOOM).
     - ✓ Video Analysis: consisting of a set of software modules capable of processing the images acquired by the cameras to obtain a description of the video content. Artificial

Intelligence modules may be included and the information retrieved can be related to specific predefined events or alarms such as:

- ✓ motion detection, capable of detecting movements in areas or moments in which this situation is perceived as an anomaly,
- ✓ crossing of borders or gates, capable of detecting when the framed subject crosses a predetermined border such as the threshold of a door for indoor environments or a road (the latter used in vehicle counting);
- ✓ autotracking, able to use the PTZ functions to follow a subject for a preset time;
- ✓ other advanced detections, which can be configured according to specific needs and which fall within a varied range of cases which includes, among other things, the detection of eyepiece blinding events, permanence of the subject, presence or absence of objects, abnormal speed. These features are very useful for detecting degradation phenomena, people counting, anomalous behaviours.

- **Video Management System** (VMS): the VMS is responsible for managing the video feeds from multiple cameras. It allows users to view, record, and analyse the video footage. The VMS provides a user interface for controlling cameras, accessing recordings, setting up motion detection, and managing other system settings.
- **Digital Video Recorder (DVR) or Network Video Recorder (NVR):** these devices are used to record and store the video footage from the cameras. DVRs are typically used in analog systems, while NVRs are used in IP (Internet Protocol) systems. They provide storage capacity and allow for easy retrieval of recorded footage.
- **Network Infrastructure:** in IP-based systems, a reliable network infrastructure is required to connect the cameras, NVRs, and other components. This includes routers, switches, Ethernet cables, and network connections to enable data transmission between the devices.
- **Power Supply**: cameras and recording devices require power to operate. Depending on the system, power may be supplied through electrical outlets or using Power over Ethernet (PoE) technology, where both power and data are transmitted through a single Ethernet cable.
- **Storage Devices**: in addition to the DVR or NVR, additional storage devices may be used to increase the storage capacity of the system. This can include external hard drives, network-attached storage (NAS) devices, or cloud storage options.
- **Video Analytics Software**: advanced video surveillance systems may include video analytics software that uses algorithms to analyse the video footage in real-time. This software can

detect and alert users about specific events or behaviours, such as motion detection, facial recognition, object tracking, or abnormal activity.

2. **Drones.** A significant advancement in the domain of video surveillance involves the utilization of professional drones capable of flying long distances, up to 20 km, with a maximum speed of 80 km/h and approximately two hours of autonomy. These drones are well-suited for video surveillance operations, particularly for specific patrols or inspections of vast areas or buildings, owing to their high-resolution cameras equipped with optical zoom capabilities that deliver excellent definition. These devices are often accompanied by planning software and encrypted communication systems to ensure enhanced safety. They also incorporate dedicated sensors like thermal sensors, which can detect the presence of individuals within the monitored areas even when visibility is limited. While police forces commonly employ these drones for civil protection or intelligence purposes, they are also extensively used for civilian video surveillance, particularly in areas where installing fixed surveillance systems is impractical or costly. In such applications, the required functionalities encompass photogrammetry, inspections, and even promotional videos. Operating drones necessitates the involvement of pilots who have received training and certification from the national civil aviation authority (ENAC in Italy). Consequently, organizations that employ drones regularly typically have staff members possessing the necessary skills. However, rental services are available for those requiring drones on an occasional basis.

4 Pilot action development and main obstacles

4.1 Step-by-step procedure

After the preparatory phase, where the context was defined, the activities carried out consisted of:

- **Final design of the Pilot Actions,** determined after conducting site inspections and summarising discussions with relevant stakeholders. The “as-is” contextual situation shown an existing video surveillance system that frequently experiences malfunctions due to poor connectivity. Moreover, the area has limited coverage under the current system.
- **Technology scouting** conducted to identify the best solution: cameras were deemed the most suitable system as they do not require manual operation 24/7. Also, upgrading the current system was necessary. The video analysis feature, which enables automatic detection of exceptions and alarms, was considered an interesting option. However, due to its complexity and budget constraints, it was not included in this action. Based on this analysis, the decision was made to enhance the existing system by adding three more cameras and upgrading one existing camera. The upgrade involved replacing the previous radio connection with a more reliable optical fiber connection.
- **Preparation of technical specifications** needed to procure the necessary equipment, ensuring compliance with existing regulations and compatibility with the current IT infrastructure.
- **Tender procedures**, to select the provider.
- **Roadworks** to prepare the site for cabling.
- **Installations, connections and setup** of cameras, along with pre tests in the control center.
- **Final test and approval of the system** along with the official release to the Local Police and Port Authority, that have their control center connected to the system.

4.2 Target groups and stakeholders

During the preparatory phase, a solid stakeholder engagement process was carried out and a number of interviews conducted since 2021 with:

- Institutional stakeholders and primary users of the port who were part of the process of co-creation and identification of the needs of the pilot action, namely the Local Police and the Port Authority, together with the Municipality of Rimini;
- Subjects using the port services that have a role as observers in the pilot action (sea workers, consult body of port operators, shipyard, recreational associations, infrastructure managers, hotels).

This involvement provided a thorough identification of problems and needs and a clear definition of requirements that led to the design of the Pilot Action.

4.3 Main obstacles

In order to prevent and tackle potential risks, a risk analysis was preliminary conducted and a risk plan defined as an internal quality control system of the action.

Following the main classes and related risks identified:

- Technological risks:
  - Unclear requirements, difficult relationships with stakeholders
  - Poor information on existing technological infrastructure for potential reuse
  - Delay in the preparation of the tender
- Operational/Organizational risks
  - The system is not well accepted by operators
- Behavioural risks
  - conflict in operational tasks attribution
- Legal risks
  - Security problems not sufficiently analysed
  - Legal issues related to GDPR regulation.

Each risk was assessed with a quantification and related mitigation actions put in place and updated during the execution of the actions. Details about the risk plan are reported in D 5.2.1.

Finally, no relevant obstacles were identified during the development apart a slight delay in the operations due to extended time in the tender process and in the preparation works.

4.4 Identified KPIs and related achievements

The following table reports the KPIs considered relevant by the authorities and that have been measured during the monitoring phase.

Indicator	Unit of Measure	Target value	Achieved value	Time horizon for monitoring
Number of equipment installed	#	3	3 + 1 revamped with better connectivity	05/2021-06/2023
Number of operations monitored (events subject to check from agents)	Average events/day	50	50 (estimated based on monitoring period)	06/2023
Number of different activities type monitored (type of events)	#	3	3 (Pedestrian, bicycles, cars)	06/2023
Percentage of coverage of identified area to monitor (The coverage has been estimated considering the area effectively covered by multi-optic cameras out of the total field, see picture below)	%	80%	80%	06/2023

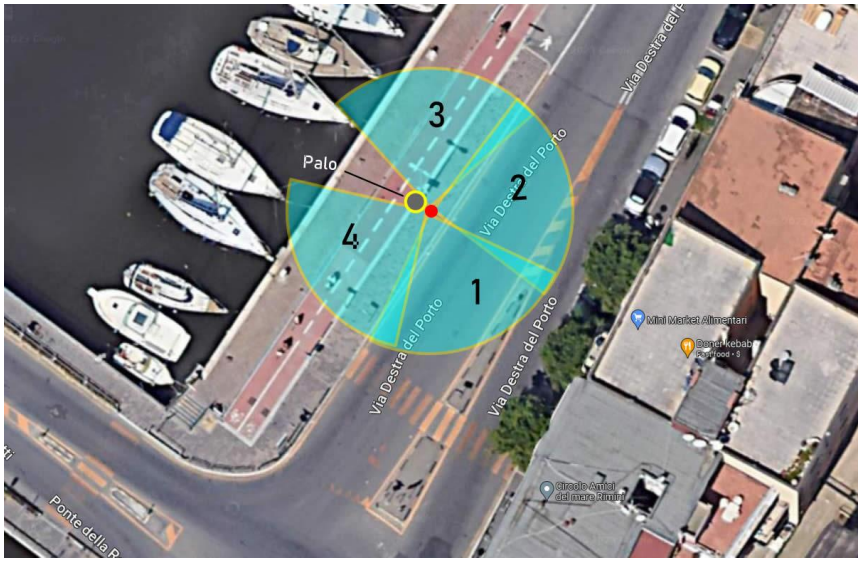


Figure 1 – optical fields of a camera and black spot (<20%)

The results of the monitoring have been considered in line with the expectations and the system, after the positive test, is now fully operational.

5 Final consideration, tip&tricks

This document reported all the aspects relevant for the replicability of the pilot action related to solve safety problems in small ports by video surveillance systems, that can be summarised as follows:

1. Conduct thorough site inspections and engage in discussions with stakeholders to understand the specific contextual requirements and challenges.
2. Evaluate the existing systems in terms of compliance to the defined requirements and assess the need for upgrades.
3. Prepare technical specifications for equipment procurement, ensuring compliance with relevant regulations and compatibility with existing IT infrastructure.
4. Facilitate the tender assignment process and carry out necessary roadworks if needed.
5. Oversee the installation and connection of the surveillance system by the selected provider, ensuring adherence to specifications and requirements.

By following these suggested actions, the pilot action design and implementation can serve as a model for replication in other territories, taking into account their unique contexts and requirements.

Annex: Pilot action synthesis

Please fill the following table with the information related to your pilot action. Please, use concise bullet points where indicated.

Project partner	PP2	**Pilot action number**	3	**Macro-theme***	ICT
Pilot action name		Development of monitoring system for port operations and public events in the canal port's area			
Group of stakeholders involved (bullet points)		• Institutional stakeholders (Local Police, Port Authority, Municipality of Rimini) • Subjects using the port services that have a role as observers in the pilot action (sea workers, consult body of port operators, shipyard, recreational associations, infrastructure managers)			
Main steps (bullet points)		• **Final design of the Pilot Actions,** • **Technology scouting** • **Preparation of technical specifications**. • **Tender procedures**, to select the provider. • **Roadworks** • **Installations, connections and setup** of cameras • **Final test and approval of the system**			
KPIs (bullet points)		• Number of equipment installed • Number of operations monitored • Number of different activities type monitored • Percentage of coverage of identified area to monitor			
Main obstacles (bullet points)		No relevant obstacles were identified during the development apart a slight delay in the operations due to extended time in the tender process. In order to prevent and tackle potential risks, a risk analysis was preliminary conducted and a risk plan defined as an internal quality control system of the action. Each risk was assessed with a quantification and related mitigation actions put in place and updated during the			

	execution of the actions. Details about the risk plan are reported in D 5.2.1.
Advice and suggestions	1. Conduct thorough site inspections and engage in discussions with stakeholders to understand the specific contextual requirements and challenges. 2. Evaluate the existing systems in terms of compliance to the defined requirements and assess the need for upgrades. 3. Prepare technical specifications for equipment procurement, ensuring compliance with relevant regulations and compatibility with existing IT infrastructure. 4. Facilitate the tender assignment process and carry out necessary roadworks if needed. 5. Oversee the installation and connection of the surveillance system by the selected provider, ensuring adherence to specifications and requirements.
Other comments	

* Use the following acronyms:

- **ICT**: ICT application and service development
- **P&M**: Spatial planning and management
- **BSN**: Business oriented aspects
- **T&K**: Training and knowledge
- **E&E**: Environment and energy aspects