# OUTPUT FACT SHEET

## Pilot actions (including investment, if applicable)

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| Project index number and acronym | CE1410 REIF |
| Output number and title | O.T2.1 - Pilot actions |
| Investment number and title (if applicable) | I1.1 Pilot action Luka Koper: Setting up innovative coordination platforms; testing cameras with optical recognition of characters on wagons |
| Responsible partner (PP name and number) | Luka Koper d.d., PP09 |
| Project website | interreg-central.eu/reif |
| Delivery date | 30.9.2021 |

**Summary description of the pilot action (including investment, if applicable) explaining its experimental nature, demonstration character and transnational added value**

The pilot actions consisted of the installation and testing of cameras to register numbers on wagons going to Port of Koper's Terminal for iron ore and coal and automated data processing. The pilot action aimed at determining if the use of these cameras is technically feasible and adequate to increase the port's capacities to handle rail freight.

The pilot tackled challenges in the port of Koper that some data about railway transport and traceability of goods during their trips, are not always automatically or quickly shared with stakeholders, which would be useful to optimize the transport time, or to optimize the usage or limited railway infrastructures connected with port's area. The REIF pilot action has helped to do one of the first steps with optimizing railway services with digitalization and automatization.

Three major challenges were addressed by the pilot action:

— how to ensure robust label detection and recognition mechanism that will withstand the environmental conditions of outdoor installation in an industrial environment,

- how to ensure a solution with a wide range of open communication mechanisms to connect to any platform,
- possible upgrade of the solution in the future, whether the manufacturer of the solution also develops similar solutions which could be the basis for a complete solution (recognition of registration plates, recognition of container numbers etc).

The pilot action was implemented at the rail section of port (in Terminal for Iron ore and coal) to optimize the process of reading and registering the incoming/outgoing wagons by testing cameras (optical character registering) and then processing the data through the IT system. The cameras provided data read directly from wagons has been collected in the database and the pictures taken from the wagons are also being saved in the database. With optimal solution developed, there will be no need for operator to go on the field and to manually write down the wagon's numbers. Even in case that the cameras are not able to accurately detect the numbers, the operator can check the photography on the PC screen and then type the correct number into the database.

Luka Koper's pilot action is one of the cases how REIF project helps several areas in CE to cope with already existing challenges in the promotion of regional freight transport.

Key stakeholders in the port (representatives of the terminals, IT department, Strategic Development Department, Investment Department, Operations Department) were involved in the process of developing and implementing pilot action. Also, Market Player Working Group meeting was organized, where pilot action was discussed. The solution provider was chosen in August 2020 through public procurement procedure. In September 2020 the cameras were installed. After that, a 6 months period was dedicated for testing the proper working/establishing functionality of the cameras. Several cameras' positions, locations and different lightning settings were tested and optimized. After the testing period, the second procurement procedure was carried out for establishing functionality of the system. The second phase of the pilot action was carried out to check if the solution is appropriate for integration on IT platform and if the results of first phase are satisfactory. The second phase consisted of establishing the IT platform to process and present the characters registered from wagons in form of useful database.

The optical character registering of wagons has not been tested with such technology before in the port of Koper. The wagons that are carrying iron ore and coal are the most "hard to read" due to special characteristics of the cargo. Iron ore and coal are the type of cargo that is dirty and dusty, therefore the characters on the wagons are often hard to register (low contrast among characters on the wagon due to dust and dirt). Recognition success was very high on several types of wagons, close to 100%, with exception of one type of wagon - Rocktainer Ore wagon where the recognition was not so high comparing to other types of wagons. The possibility for improvement comes with next cameras' software release, so it is expected that also characters on Rocktainer Ore wagons will be successfully registered - close to 100% accuracy. In terms of camera location, the combination with several cameras (3 cameras) in the same location proved to be the most effective, which also coincides with the logic of portals that locate several cameras, sensors and lighting fixtures on the same frame.

Important knowledge and valuable experiences were gained with REIF pilot action, which will be helpful for further planning and implementing such technology in the port area. The knowledge and experience are valuable for all partners dealing with logistics and transportation, regardless the territory on region.

## NUTS region(s) concerned by the pilot action (relevant NUTS level)

SI, Slovenia

## Investment costs (EUR), if applicable

The investment was carried out in two phases:
1. The purchase and installation of cameras (14.784,30 EUR without VAT)
2. Functional layout of the system for detection and recognition of characters on wagon (9.223,50 EUR without VAT)

In total: 24.007,80 EUR without VAT

## Expected impact and benefits of the pilot action for the concerned territory and target groups and leverage of additional funds (if applicable)

The investment in development of managing data systems, can allow stakeholders to fasten their services, which attracts new customers and improves flows of cargo. With the development of tools for digitalization or informatization of data flows, to improve and optimize operative tasks and the upgrade of the existing railway operative management system there is a possibility to speed up the registering and monitoring of incoming or outgoing wagons.

The pilot action led to improved knowledge of Luka Koper employees and development of technology solution idea for further investing in automated optical character reading of wagon's characters in the Iron ore and coal terminal. Based on pilot action results the solution will be furtherly discussed, and the next software upgrade could be planned in the next Luka Koper investment plan.

The constant operative processes could be simplified using new technology. The benefits are not only foreseen for the employees at the port / terminal, but also for the company by time and money savings, for the subregion and as well for the state of Slovenia – as an encouragement to use the railways.

In case of further expanding such technology (to be discussed in the future) in the port we have gained knowledge on how to place the structure at key locations, equip it with the appropriate communication infrastructure and install sensory and lighting elements in accordance with gained experience. The decision of further investments in the upgrading and upscaling of such technological solution is currently being discussed among key stakeholders.

## Sustainability of the pilot action results and transferability to other territories and stakeholders

The system for now serves as a backup storage/database of wagons registered for the Terminal of iron ore and coal and it gives a possibility of building database of wagons and double-checking. After the project end, the idea and the need expressed is to further develop pilot action. There is a plan to get the latest software upgrade which will enable more accurate registering of characters on one type of wagons which was not satisfactory at the time of pilot action (Rocktainer Ore). After the upgrade there is a plan to integrate the cameras, software and the database with the ongoing processes in the Terminal for Iron ore and coal (to be included in the Plan of investments 2022 of Luka Koper).

Other Central European ports and terminal operators will benefit from the learning collected in the implementation and evaluation of the investment. The optical character recognition technology can be used in all logistic processes regardless the region or territory.

The experiences and knowledge learned from the pilot action are valuable for other partners, especially ones that are managing cargo transporting on railway. Since, iron ore and coal are special types of cargo (due to dirt and dust enabling the accurate registering of characters on wagons), the experience is valuable to actors dealing with the transportation of similar cargo.

Lessons learned from the development/implementation process:

- Cooperation of several actors and stakeholders is important, as well as upper management support towards developing new solutions and technology.
- The developing and testing such solution takes time; duration of the testing period has to be properly planned (several positions of cameras, several lightning positions and triggers have been tested in order to find optimal solution for different types of wagons).
- The use of more than one camera improves the accuracy of registered data.
- Even small-scale solution as was REIF pilot action can be of great importance and benefits the rail process; for some cases it is not necessary to purchase and implement expensive OCR solutions (for example OCR portals for registering containers numbers).

If applicable, contribution to/ compliance with:
- relevant regulatory requirements
- sustainable development – environmental effects. In case of risk of negative effects, mitigation measures introduced
- horizontal principles such as equal opportunities and non-descrimination

Relevant regulatory requirement have been complied with in terms of implementing proper public procurement procedure.

Promotion of rail transport instead of road transport is in line with sustainable development goals, since rail transport is more environment friendly than road transport (significantly lower emissions from rail). There is no risk that pilot action has a negative environmental effect.

Horizontal principles have been respected and integrated. In the project equal opportunity, non-discrimination, gender equality and environmental sustainability are evident. The pilot action is beneficial for equal opportunity and non-discrimination, since there is less hard manual work foreseen with pilot action full implementation – no need to go on the field in the dangerous environment (near the railway tracks) which was mostly reserved for male workers. With the implementation of pilot action there is a possibility to work from office in safer environment. Gender equality is evident from the fact that REIF project manager in the port of Koper is woman.

References to relevant deliverables (e.g. pilot action report, studies), investment factsheet and web-links
If applicable, additional documentation, pictures or images to be provided as annex

The output is based on the following deliverables:
- D.T2.1.1 Pilot Activity Concept & launch report – Luka Koper
- D.T2.1.3 Establishment of Market Player Working Group for each pilot action
- D.T2.1.6 Pilot evaluation report
  Download link: https://www.interreg-central.eu/Content.Node/REIF/Pilot-action--1---Port-of-Koper---Cameras-for-automated-read.zip

Pilot action video documentation is available on:
https://www.youtube.com/watch?v=xBfF4FArX1g&list=PL5JQwU6Wpap8HqzmxeV2_BqsMYxMOv8pH
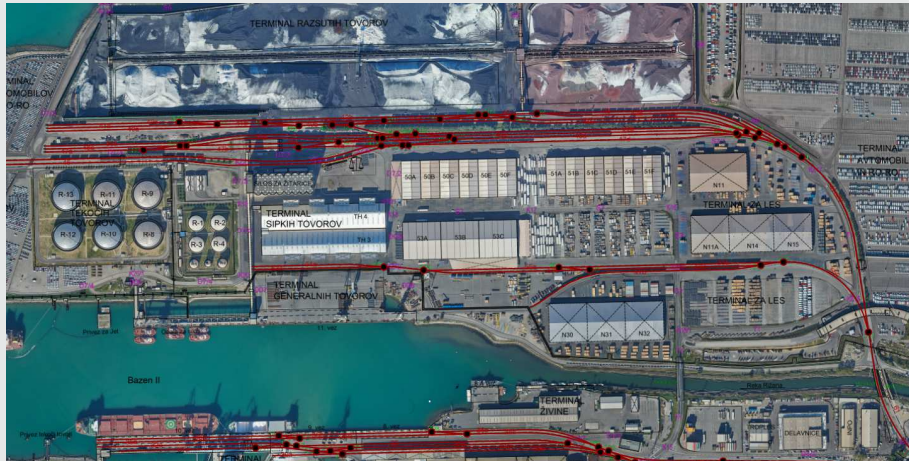
Figure 1: Location of the cameras
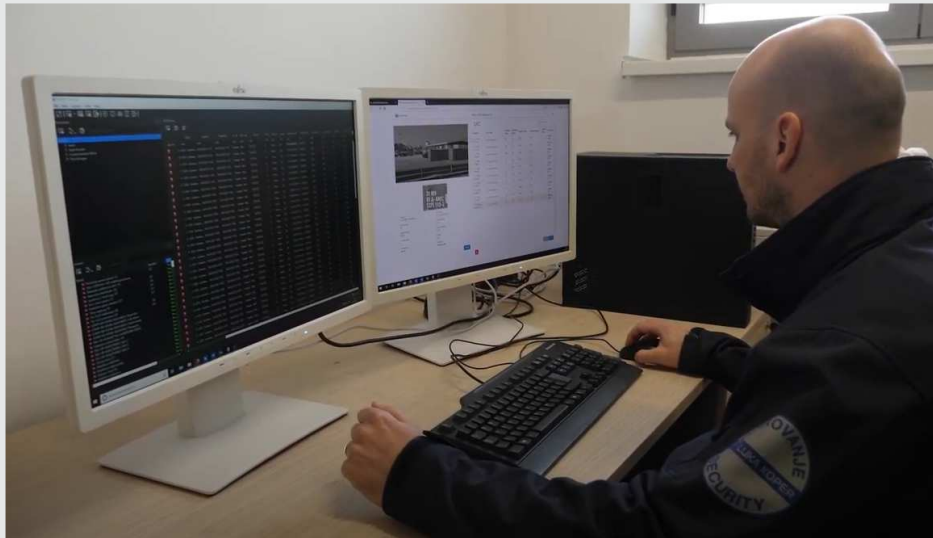


Figure 2: One of the cameras

Figure 4: Working with the database of registered wagons



Figure 5: Characters on wagons to be detected and registered