



EGIS ROAD OPERATION PORTUGAL

EROP - INNOVATION REPORT

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Document information

GENERAL INFORMATION

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TABLE OF CONTENTS

1 - INTRODUCTION	9
2 - EROP D-TECH	11
2.1 - Status	11
2.2 - Description	11
2.2.1 - eMOM (Egis Operation and Maintenance Module)	11
2.2.2 - eMAPP (Egis Mobile Application)	12
2.2.3 - eProAsset (Asset Management Solution).....	12
2.2.4 - Reporting BI solution.....	13
2.2.5 - Inventory Update	13
3 - ADMINISTRATIVE AND HUMAN RESOURCES APP	14
3.1 - Status	14
3.2 - Description	14
4 - APP TO PERFORM SURVEYS.....	16
4.1 - Status	16
4.2 - Description	16
5 - INNOVATION GROUP.....	18
5.1 - Status	18
5.2 - Description	18
6 - INNOVATION CONTEST	19
6.1 - Status	19
6.2 - Description	19
7 - PATROLLING OPTIMIZATION	21
7.1 - Status	21
7.2 - Description	21
8 - EASY TEMPORARY SIGNS NEXT TO TUNNELS.....	22
8.1 - Status	22
8.2 - Description	22
9 - EASY TEMPORARY SIGNALIZATION.....	23
9.1 - Status	23
9.2 - Description	23
10 - ANIMAL DETERRENTS.....	24
10.1 - Status	24
10.2 - Description	24

11 - ROAD SAFETY CAMPAIGNS	25
11.1 - Status	25
11.2 - Description	25
12 - WINTER MAINTENANCE FORUM	26
12.1 - Status	26
12.2 - Description	26
13 - SELL SALT TO STAKEHOLDERS.....	28
13.1 - Status	28
13.2 - Description	28
14 - AID IN EMERGENCY ESCAPE LANES	29
14.1 - Status	29
14.2 - Description	29
15 - LOCAL AREA NETWORK (LAN) THROUGH A24 MOTORWAY	31
15.1 - Status	31
15.2 - Description	31
16 - LED LIGHTING IN A24 TUNNELS	33
16.1 - Status	33
16.2 - Description	33
16.3 - Proposed Solution	34
17 - PHOTOVOLTAIC PROJECTS (A24 O&M BUILDINGS AND TUNNELS)	36
17.1 - Status	36
17.2 - Description	36
18 - PHOTOVOLTAIC PROJECTS – OUTSIDE THE A24 MOTORWAY	38
18.1 - Status	38
18.2 - Description	38
19 - USE OF LIGHTER VEHICLES TO PERFORM MAINTENANCE	39
19.1 - Status	39
19.2 - Description	39
20 - ELECTRIFY THE FLEET	40
20.1 - Status	40
20.2 - Description	40
21 - ELECTRICAL VEHICLES CHARGERS AT O&M FACILITIES.....	41
21.1 - Status	41
21.2 - Description	41

22 - PERFORM WORKS OUTSIDE THE MOTORWAY TAKING ADVANTAGE OF EXISTING EQUIPMENT	42
22.1 - Status	42
22.2 - Description	42
23 - INTERNALIZE WORKS RELATED TO ACCIDENTS	43
23.1 - Status	43
23.2 - Description	43
24 - EASY BURNT PAVEMENT REPAIR.....	44
24.1 - Status	44
24.2 - Description	44
25 - EASY ROAD MARKING REPAIR	45
25.1 - Status	45
25.2 - Description	45
26 - EASY CONCRETE REPAIR.....	46
26.1 - Status	46
26.2 - Description	46
27 - OPTIMIZATION OF GREEN MAINTENANCE IN THE CENTRAL RESERVE..	47
27.1 - Status	47
27.2 - Description	47
28 - INSPECTION WITH DRONES.....	48
28.1 - Status	48
28.2 - Description	48
29 - INFRASTRUCTURE MONITORING WITH SATELLITE DATA.....	49
29.1 - Status	49
29.2 - Description	49
30 - VEGETATION MONITORING WITH SATELLITE DATA.....	50
30.1 - Status	50
30.2 - Description	50
31 - STOCK MANAGEMENT.....	51
31.1 - Status	51
31.2 - Description	51
32 - FINANCIAL SUPPORT (SIFIDE)	54
32.1 - Status	54
32.2 - Description	54

33 - OHS ONLINE TRAINING TO SUBCONTRACTORS.....	56
33.1 - Status	56
33.2 - Description	56
34 - OHS GROUP – SAFETY CORE	57
34.1 - Status	57
34.2 - Description	57
35 - WORK ALONE APP	58
35.1 - Status	58
35.2 - Description	58
36 - PREDICT, PREVENT AND REDUCE THE OCCURRENCE OF ROAD ACCIDENTS WITH WORKERS	61
36.1 - Status	61
36.2 - Description	61
37 - SAFETY FOOTWEAR.....	63
37.1 - Status	63
37.2 - Description	63
38 - PARKING IN REVERSE	64
38.1 - Status	64
38.2 - Description	64
39 - ECODRIVING.....	65
39.1 - Status	65
39.2 - Description	65
40 - FLEX BOLLARDS LED.....	67
40.1 - Status	67
40.2 - Description	67
41 - PLANTING OF GROUND COVER SPECIES.....	68
41.1 - Status	68
41.2 - Description	68
42 - BOTTLES FOR WORKERS AND FILTERED WATER IN BUILDINGS	69
42.1 - Status	69
42.2 - Description	69
43 - WASTE VALORISATION.....	70
43.1 - Status	70
43.2 - Description	70

44 - CONTAINER FOR WASTE AT O&M CENTRES	71
44.1 - Status	71
44.2 - Description	71
45 - LOW-COST RENOVATION OF TRAFFIC CONTROL ROOM	72
45.1 - Status	72
45.2 - Description	72
Annex I – table of projects.....	74

TABLE OF FIGURES

Figure 1 - Innovation projects implementation stages	9
Figure 2 - Screen shots from eConnected App	14
Figure 3 - Annual survey to motorway users.....	16
Figure 4 - Survey App	16
Figure 5 - Annual survey digitalization	17
Figure 6 - Internal survey App	17
Figure 7 - Inova Lab logotype	18
Figure 8 - Presentation slides	18
Figure 9 - "Concurso A24 - Empreender e Inovar" ceremony	20
Figure 10 - DATA4ALL innovation contest	20
Figure 11 - Patrolling walking	21
Figure 12 - Easy temporary signalization – installation examples	23
Figure 13 - Mirror deterrents	24
Figure 14 – Ultrasonic deterrents.....	24
Figure 15 - Wildlife ultrasonic deterrents	24
Figure 16 - Images of the campaigns conducted	25
Figure 17 - Images of the campaigns conducted in the first semester of 2025.....	25
Figure 18 - Images of the Winter maintenance forum.....	26
Figure 19 - Images of the 15 th Winter maintenance forum.....	27
Figure 20 - Salt warehouses	28
Figure 21 - AID in emergency escape lanes (example)	30
Figure 22 - AID in emergency escape lanes (example)	30
Figure 23 - LAN through A24	31
Figure 24 – Network architecture (example)	32
Figure 25 - Tunnel characteristics	33
Figure 26 - Possible solutions.....	34
Figure 27 - Reminder of lighting concepts	34
Figure 28 - Best solution (cross section)	35
Figure 29 - Project roadmap	36
Figure 30 - Use of lighter vehicles to perform maintenance – some examples	39
Figure 31 - 100% Electric patrol van	40
Figure 32 - Wallbox installation	41
Figure 33 - Temporary signalling for a Douro Vineyard Hotel.....	42
Figure 34 - Temporary signalling for a national road	42
Figure 35 - Internalize works related to accidents – work examples	43

Figure 36 - Easy burnt pavement repair – application examples	44
Figure 37 - Easy road marking repair – application examples	45
Figure 38 - Easy concrete repair – work examples.....	46
Figure 39 - Optimization of green maintenance in the central reserve – example of intervention site.....	47
Figure 40 - Inspection with drones – examples of inspections	48
Figure 41 - Infrastructure monitoring with satellite data – output examples	49
Figure 42 - Vegetation monitoring with satellite data – output examples	50
Figure 43 - Vegetation monitoring with satellite data – Burned areas detection	50
Figure 44 - Screen captures from the App	52
Figure 45 - Image from video online training.....	56
Figure 46 - eSafeMe PRO home window	58
Figure 47 - eSafeMe PRO App	59
Figure 48 - eSafeMe PRO button on desktop.....	59
Figure 49 - On/Off button.....	60
Figure 50 - Wingdriver dashboard	62
Figure 51 - Dashboard statistics	62
Figure 52 - Parking in reverse.....	64
Figure 53 - Ecodriving.....	65
Figure 54 - Ecodriving results	66
Figure 55 - Flex bollards LED – Régua Interchange	67
Figure 56 - Planting of ground cover species – Intervention areas.....	68
Figure 57 - Water fountain	69
Figure 58 - Water bottle	69
Figure 59 - Motorway cleaning with sweeper.....	71
Figure 60 – Low-cost renovation of Traffic control room	72

TABLE OF TABLES

Table 1 - Life cycle of lamp technologies	33
Table 2 - Sites technical figures	37
Table 3 - Projects technical figures	38
Table 4 - Sites wallboxes number	41

1 - INTRODUCTION

In line with the "Corporate Objectives 2024 – Expected Business Standards for O&M Companies", Egis Road Operation Portugal as an operating company is required to submit an Innovation Report to the Innovation Division of BU Conseil & Exploitation.

This report explains all the projects that the company is currently managing, which may be in a more developed phase or in a conceptual state.

All the projects, have a Status, where it is identified the stage of the project, taking in account 4 major stages¹:

1. Idea Generation: collection of innovation potentials, derivation of ideas, evaluation and release (or not) of ideas.
2. Concept Analysis: Extensive analysis and derivation of concepts for the solution and implementation. Definition of requirements and/or specifications.
3. Solution Development: Development and testing of the solutions in staging environments and/or production environment.
4. Production Implementation: Solution in a full use and integrated in the company processes.

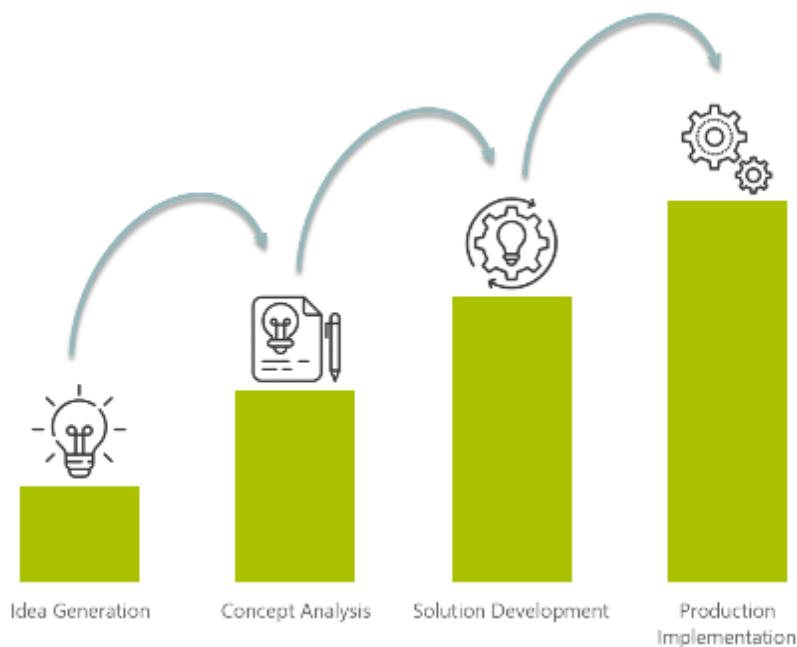


FIGURE 1 - INNOVATION PROJECTS IMPLEMENTATION STAGES

It is important to mention that Egis Road Operation Portugal was awarded with "COTEC Innovative Statute" in 2023 and 2024. This is the public recognition of Portuguese Companies that, due to the quality of their leadership, management, and innovative performance in the last year, are examples of value creation for the country.

Several public presentations / articles related to innovations of this document were also performed during the last years, like for instance ASECAP Days 2022, ASECAP Days 2023, EXPANDEO 2024, Portuguese Road and Rail Congress 2022 and 2025, or ESRI User's Conference 2024.

¹ Adaptation from <https://www.lead-innovation.com/en/insights/english-blog/the-4-phases-of-innovation> and <https://www.rivier.edu/academics/blog-posts/cultivating-a-robust-organization-5-stages-of-the-innovation-process/>

The present report concerns to the first semester of 2025.

All the projects that didn't have developments within the quarter are signalized with the note "No update in this report.".

Also, in Annex I it is presented a **table with the summary of the projects**. The order in the document, stage of each one, and a field of observations where it is also identified the ones that were updated or not, cancelled or finished.

2 - EROP D-TECH

2.1 - Status

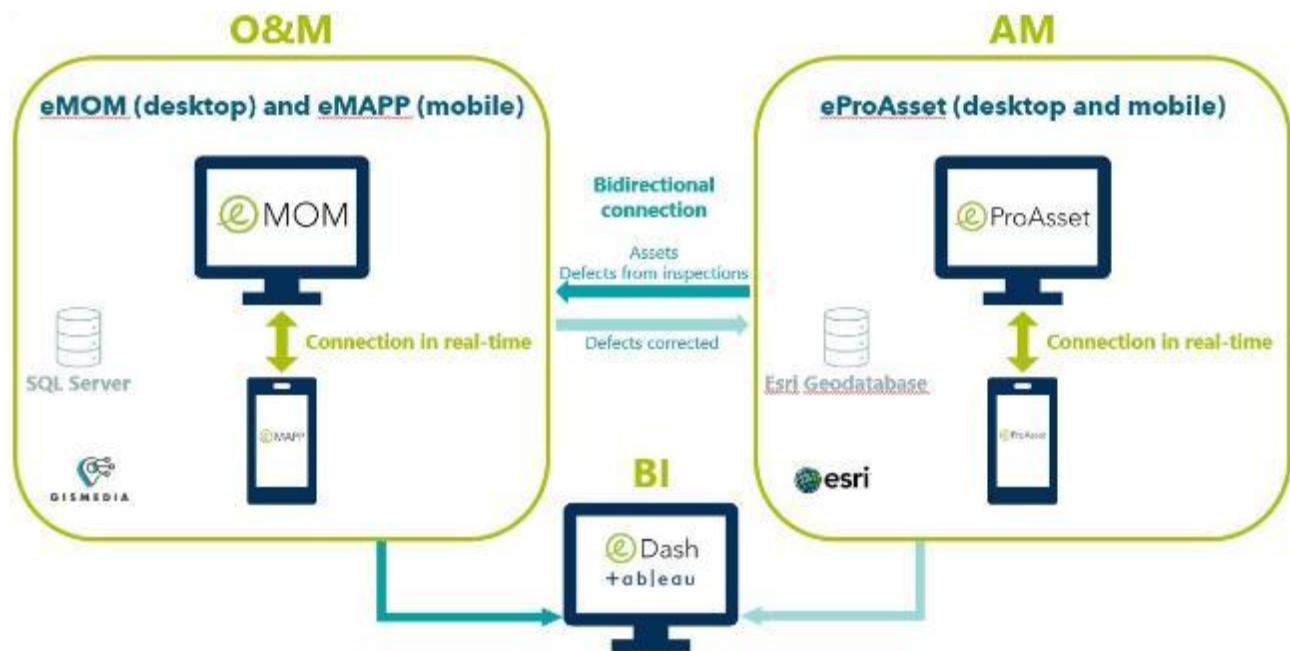
All the projects within EROP D-Tech (Digital Technologies) are in the stage of Production Implementation.

2.2 - Description

The project EROP D-Tech (EROP Digital Technologies) that embraces the overall digital solutions related to asset management, operation and maintenance is composed by the following subprojects:

- eMOM (Egis Operation and Maintenance Module)
- eMAPP (Egis Mobile Application)
- eProAsset (Asset Management Solution)
- Reporting | BI solution
- Inventory update

The system architecture is represented in the diagram below.



2.2.1 - eMOM (Egis Operation and Maintenance Module)

This solution is where the events (occurrences) in the road are registered, like incidents, accidents, patrolling, maintenance, winter maintenance or inspections.

Is the central solution in the Control Centre Room and is used by all collaborators. Ones feeding the database, inserting data every day and others using the several tools for consulting data.

Is also where foreman dispatch work orders for maintenance teams, or where defects are registered to be integrated in the work orders.

It's an ongoing solution. In terms of developments, the 2nd phase finished in December 2024 with the deploy of last work package related with Maintenance Planning.

During the first semester of 2025, the focus was on the migration of the base code. The migration was from PHP5 to PHP8.

Also, with the objective of possible deploy of the solution in other realities, it was developed the translation of eMOM and eMAPP to four languages: English, Spanish, French, German.

The last task during the semester, focused on the design of the webservices between eProAsset and eMOM.

Three Webservices are going to be created to do the connection between the solutions, besides one that already exists.

The Webservices are:

- Connection eProAsset -> eMOM, related to the asset inventory. This one allows to have in eMOM the assets of the geographic database (already exists).
- Connection eProAsset -> eMOM, related to the lists of components, subcomponents and defects to have the same information in both solutions.
- Connection eProAsset -> eMOM, related to the inspections made in eProAsset, the defects detected migrate to eMOM to enter in the maintenance planning and to be issued through work orders.
- Connection eMOM -> eProAsset, related to the correction of the defects. After the defect enters in the maintenance process, after it is corrected it returns to eProAsset to be accounted has corrected. In that way, in a next inspection campaign, there is no need to be verified.

2.2.2 - eMAPP (Egis Mobile Application)

eMAPP is the mobile application, that communicates in real time with eMOM. Is used nowadays by all the road workers, from patrollers to maintenance teams and to daily inspections.

It is a simple app installed in Android Smartphones (for now), so everyone in the company can install it and use it.

With eMAPP, the maintenance teams can open works or receive work orders, in a daily basis. They can take photos that stay associated to the work, before and after the repair.

It is also possible to open or receive accidents or incidents occurrences, to add information for the vehicles involved, victims, traffic constraints, or even if there was ambulances, police, firemen or others, and the specific and overall time spent in each moment.

Every collaborator that identifies a simple defect in an asset (daily inspections), can open an Intervention sheet, that will be taken for the work orders dispatch.

The foreman in a weekly basis issue the work orders for all maintenance teams that receives them in eMAPP, having some automatisms to help during the workday.

The developments of eMAPP focused on the translation.

2.2.3 - eProAsset (Asset Management Solution)

eProAsset is the solution initiated in 2023 to respond to asset management and technical inspections.

It is a Esri, Inc. based solution, includes a desktop solution and a mobile solution for technical inspections.

The applications are customizable. In desktop has been developed several maps for asset management, dashboards for analysis and follow up of the inspections.

During the first semester the developments were related to the inspection campaigns and the customization of the mobile apps and desktop interfaces for the inspections of:

- **Fences**
- **Complementary drainage**
- **Escape lanes**
- **Acoustic barriers**
- **Retaining walls**
- **Delineators**
- **Basins**
- **Buildings**

2.2.4 - Reporting | BI solution

To an improved process of decision making, EROP decided to use Tableau as the software to produce reports and dashboarding. This allows to identify patterns and trends and so, an easy and friendly analysis of data and therefore a comprehensive visualization of independent activities or interdependent activities. With this, EROP gained traction in processes of planning or reactive activities.

The work done in here is a continuous process. Although identified a group of reports in the beginning of this tool implementation, during time new necessities are identified and developed.

Presently, Tableau is connected with eMOM database.

During the first semester, the tasks were related with the review of the Dashboards of Maintenance and Interventions.

In the second semester there will be improvements of these reports.

2.2.5 - Inventory Update

Maintaining assets inventory data updated is one of the cornerstones to have a reliable system.

In 2021, it was done a Mobile Mapping Survey with LiDAR, that allowed to have the assets visible in the platform, all well collected. At the same time, assets like fences or deep drainage that are not visible, it was done a manual survey to update all the information.

With this good basis, it was decided to make twice a year an update of the assets data. All the changes of the assets during a semester are collected for then be transposed to the database.

Another way is when the inspections are made. Some fields are opened for the inspector correct if necessary.

In this last process, there is a second step of validation, by the asset and maintenance department. This methodology was implemented in the inspections of fences, complementary drainage, escape lanes, acoustic barriers and retaining walls.

3 - ADMINISTRATIVE AND HUMAN RESOURCES APP

3.1 - Status

This project is in the stage of Production Implementation in the areas described below, although is an ongoing project.

3.2 - Description

Taking advantage of the possibilities of the Microsoft tools named Power Apps and Power Automate, EROP has taken new steps towards the digitalization of the administrative and human resources procedures and corresponding documents.

This Power Apps tool (eConnected) basically allowed to internally develop an android based app, that was named eConnected, that can be installed in all the company smartphones and enables the possibility for the employees to automatically fill in several forms without the need of paper and with the advantage of sending the information in real time and allowing for the company receive it also in real time. Each employee has an individual access and password that can be created in the opening menu of eConnected.

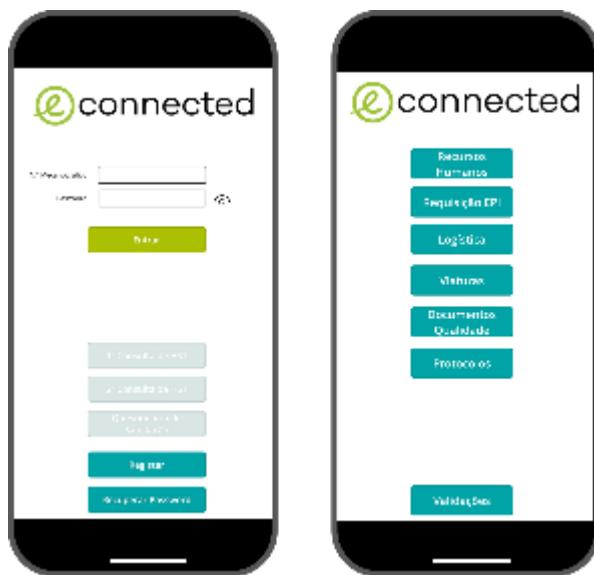


FIGURE 2 - SCREEN SHOTS FROM ECONNECTED APP

At this point, the following features were developed:

- Quality, Environment, Health and Safety
 - Health and safety survey
 - Online access to IMS documents and procedures
 - Online access to technical data sheets and safety data sheets
- Employee satisfaction survey
- Human resources
 - Training
 - Requisition
 - Evaluation
 - Effectiveness evaluation
 - Record of the work period (legal requirement)
 - Update of the employee data

- Vacation planning and approval
- Employees regular contacts
- Employees emergency contacts
- Online access to employees' benefits protocols
- Logistics
 - Requisition to buy products and services
 - Requisition to proceed with market consultation
- Vehicles
 - Record of kilometres
 - Record of working hours

The eConnected is constantly being evolved to include new features. During the first half, the app started to be developed to include personal protective equipment (PPE) management.

The main advantages for EROP are the following:

- Employees submit the information in real time
- Employees have online access to the information
- Company receives the information in real time
- Decrease the use of paper and consequent carbon footprint reduction
- Processes simplification
- Increase the efficiency
- Information is automatically transformed in data

4 - APP TO PERFORM SURVEYS

4.1 - Status

This project is in the stage of Production Implementation.

4.2 - Description

■ Annual Survey to motorway users

Each year, Egis Road Operation Portugal conducts an annual survey of motorway users. This survey targets approximately 1,500 users across three A24 interchanges: Chaves, Lamego, and Viseu EN16. During the survey, participants receive small gifts and informational flyers focused on safety practices, particularly when driving next to road work zones.



FIGURE 3 - ANNUAL SURVEY TO MOTORWAY USERS

In 2023, EROP introduced digital surveys, enabling enquirers to use mobile phones equipped with a custom-built app developed specifically for this purpose. This digital approach allows for real-time data collection, significantly reduces analysis time, and minimizes errors.

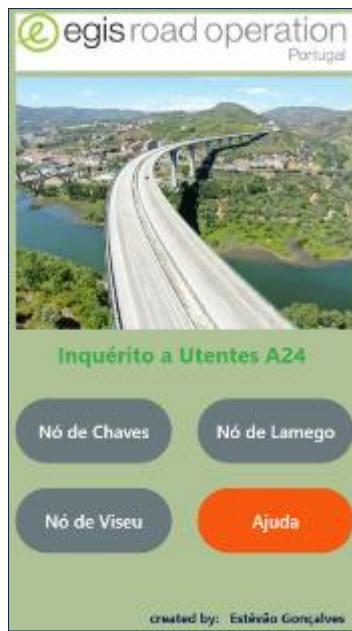


FIGURE 4 - SURVEY APP

By eliminating the use of large quantities of paper, this initiative also contributes to environmental sustainability by reducing natural resource consumption and waste production.

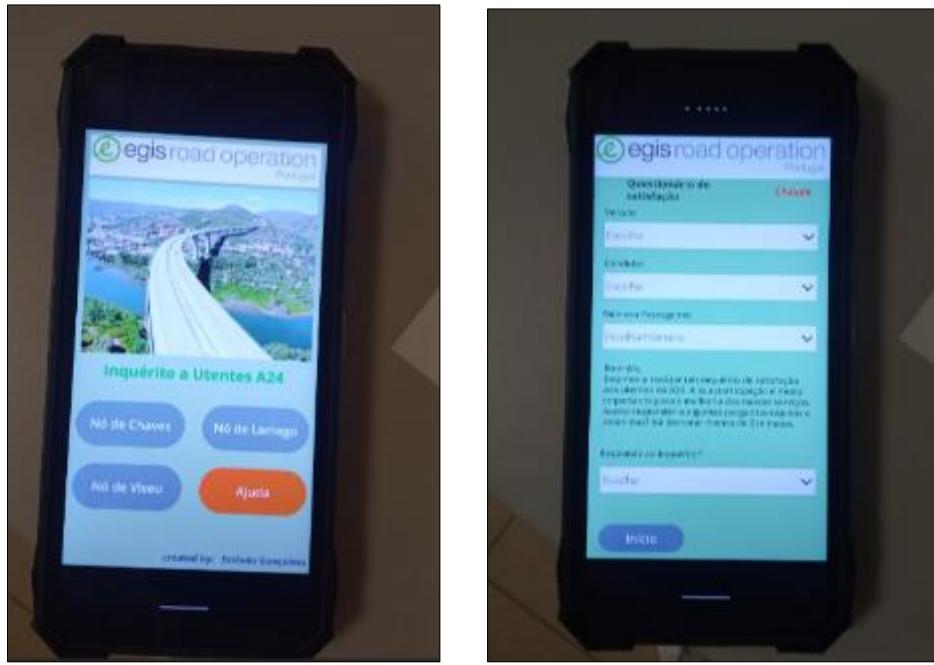


FIGURE 5 - ANNUAL SURVEY DIGITALIZATION

■ Internal Surveys to employees

Also, in 2023 was also implemented the realization of the safety surveys to the employees in digital mode. This turns to be more efficient in the data treatment. For this survey it was used the app eConnected developed internally for the digitalization of several internal processes.



FIGURE 6 - INTERNAL SURVEY APP

The workers satisfaction survey is also performed through the app eConnected.

5 - INNOVATION GROUP

5.1 - Status

The Innovation Group, designated as "Inova Lab", passed from the stage of Concept Analysis to Production Implementation.

NOTE: No update in this report.

5.2 - Description

The Inova LAB intends to foster the culture of innovation, within EROP, through the creation of an organizational environment that encourages and supports creativity, new ideas, experimentation and innovative thinking.

It aims to diffuse innovation culture through periodic meetings and events, to concentrate and manage in a high-level all the innovation projects and to present the projects results.

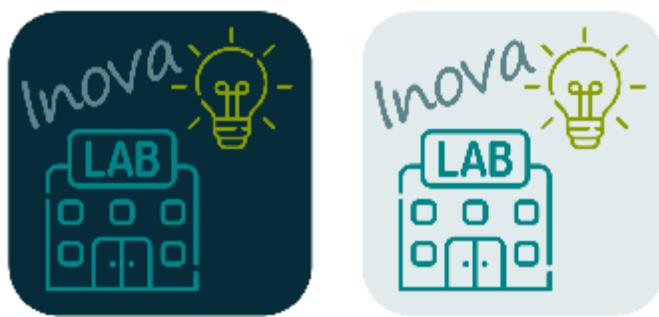


FIGURE 7 - INOVA LAB LOGOTYPE

The Innovation Lab Regulations are written and approved, and the designation and logotype are defined.

The first meeting was held on **21st November**, where it was presented a little of the history of innovation, what is innovation culture within an organization, how to implement, the purpose of Inova LAB and the key points.

After, a moment of brainstorming, where taking some ideas from the past and new ideas, a plan was established to: publicize success projects, identify new projects that can be promoted, and identification of also ways to develop these new projects.

Inova LAB - O que é?

O Inova LAB nasce da necessidade da a Erol Portugal ter um ambiente organizacional que incentive e apoie a criatividade, novo ideias, a experimentação e o pensamento inovador.

É um espaço agregador e de debate, que permite desempenhar um papel fundamental no processo de inovação, através da:

- Promover da empatia para a geração de novas ideias
- Promover da empatia para a avaliação de propostas
- Promover da empatia para a tomada de decisões com risco
- Promover da empatia para novas tecnologias e tendências

Ações implementadas

Edu Consultor

Edu Consultor

Edu Consultor

Edu Consultor

Edu Consultor

DIVULGAR

FIGURE 8 - PRESENTATION SLIDES

6 - INNOVATION CONTEST

6.1 - Status

This project is in the stage of Production Implementation.

NOTE: No update in this report.

6.2 - Description

Egis Road Operation Portugal already organized two innovations contest:

- In May 2022, a startup innovation contest was organized along with Norscut (A24 Concessionaire), Egis and Meridiam, called "A24 – Empreender e Inovar" (A24 - A24 Endeavor and Innovate).
- In January 2024, a consortium formed by Inova+ and Decsis Iberia "Data4all" in collaboration with EROP and Metropolitano de Lisboa, launched the Mobility Challenge offering the opportunity to 10 companies to test and validate their concepts for innovative products and services.

The winners of 2022 contest, were segmented by category:

- "Motorway and Technology" category
 - The first place went to "Smartpath", which proposes the positioning of beacons with LED lights (powered by solar energy) to delimit the branches at the motorway interchanges.
 - In second place was "Technology on wheels". It is about the development of roads supported by technologies that promote greater profitability and lower risks of human losses. The idea is to place ultrasonic distance sensors and an LED matrix, informing users in real time of non-compliance with the safety distance and warning of deviations in the path on the road. The technology is intended to ensure more security and improve flow. One of the highlights is the use of 5G technology.
- "Motorway and Environment" category
 - The first place was awarded to "Pavnext". The idea is to place technological equipment on the pavement in delimited areas of the highway, generating electrical energy through the movement of vehicles. This technology makes it possible to monitor traffic data, counting the number of vehicles and measuring their speed, as well as the energy generated. It is also possible to increase the security of sensitive areas, since the equipment reduces the speed of vehicles, through the friction generated. One of the strengths is the project's contribution to the reduction of energy consumption and costs at the site. This is a disruptive technology patented internationally.
 - In second place was "I Climate Advisor". It is a platform for presenting accurate weather forecasts for certain locations. They propose the creation of indicators to carry out maintenance on highways or estimate the number of vehicles – all based on weather forecasts and with the possibility of generating alert levels for motorway managers.



FIGURE 9 - "CONCURSO A24 - EMPREENDER E INOVAR" CEREMONY

The winners of the 2024 contest are developing their projects and are all described through this report.

Data4All

Challenge de Mobilidade

Estás pronto para levar
a tua inovação tecnológica
ao próximo nível?
Testa-a com os nossos
parceiros!

Metropolitano de Lisboa egis

375K € em prémios Candidaturas até 28 de fevereiro

FIGURE 10 - DATA4ALL INNOVATION CONTEST

7 - PATROLLING OPTIMIZATION

7.1 - Status

The "Patrolling Optimization" is in the stage of Production Implementation.

NOTE: No update in this report.

7.2 - Description

Since 2020 some stretches of the motorway are patrolled walking. This allows to reduce considerably the km driven. In October 2023, EROP started to patrol with EV (Electric Vehicles), and even more stretches are patrolled walking, reducing even more the carbon emission.

In the extremities of the Concession and interchanges with other roads that obligate to travel a greater distance to invert the direction, EROP implemented this solution. That allows us to reduce around 41 600 km driven per year. It is important to mention, that this solution was implemented considering the safety for the workers.

With this implementation, the EV ensure the total patrolling of the motorway. As mentioned, we registered a reduction of 73 km in one circuit and 41 km in the other per day, and the total time to perform the circuits is the same. It is also important to mention, that all contractual requests with the client are fulfilled. This also contributes to OHS (occupational health and safety), because typically these workers tend to be sitting for too long. A big reduction of our footprint is also reached, not only due to the decrease of driven km, but also because it allows us to patrol the entire motorway with EV.



FIGURE 11 - PATROLLING WALKING

8 - EASY TEMPORARY SIGNS NEXT TO TUNNELS

8.1 - Status

The "Easy Temporary Signs next to Tunnels" are in the stage of Concept Analysis and waiting for the Concessionaire's decision to implement.

NOTE: No update in this report.

8.2 - Description

Tunnels are sensitive infrastructures with rapid intervention needs, whether due to road accidents, tunnel closures (for example, due to a fire inside the tunnel), or other unscheduled events.

The idea is to install signs that allow the rapid closure of the tunnel, close one lane, or forbid traffic for vehicles carrying dangerous goods in each direction of the tunnels:

■ **Tunnel Closure:** install signs that allow the closing of the tunnel and traffic diversion at the interchange before the tunnel. It is also proposed to install a barrier to close the access ramps to the A24 towards the *Castro Daire* tunnel at the *Castro Daire* and Carvalhal Interchanges.

■ **Lane Closure:** install signs that allow to close a lane (right or left).

■ **Forbid Traffic for Vehicles Carrying Dangerous Goods:** install signs that effectively forbidden the passage of vehicles transporting dangerous goods.

These signs will be placed in their locations but concealed, as shown in the next two figures, with the possibility of quickly proceeding to the traffic constraint in the tunnel in the manner mentioned.



FIGURE 11 - EXAMPLES OF SIGNS TO INSTALL

Some of the signs, with small adaptations, will have multiple functionalities, namely in terms of distance or conditioned lane, in addition to the prohibition of passage for vehicles transporting dangerous goods.

9 - EASY TEMPORARY SIGNALIZATION

9.1 - Status

The "easy temporary signalization" project is in the stage of Production Implementation.

NOTE: No update in this report.

9.2 - Description

This project allowed the development of an innovative solution for fixing temporary vertical signage supports. The project was entirely developed by our employees.

With this solution, the same support allows us to place signs on all types of A24 metal guardrails.

In addition to the shorter intervention time when implementing temporary signage, our workers are exposed to danger for much less time.



FIGURE 12 - EASY TEMPORARY SIGNALIZATION – INSTALLATION EXAMPLES

10 - ANIMAL DETERRENTS

10.1 - Status

The "Animal Deterrents" is in the stage of Production Implementation.

NOTE: No update in this report.

10.2 - Description

Motorways are essential for fast and efficient transportation, but they can pose significant risks when animals wander onto them. Collisions between vehicles and wildlife not only endanger animals but also human lives. To mitigate these risks, were implemented in A24 Interchanges animal deterrents that reduce the entrance of animals on the mainline.

Three types of animal's deterrents were installed:

■ **Mirror Deterrents:** This equipment deters animals through the reflection when the light from the car's headlights hits the deterrent, producing an optical reflection that keep de animals away from de motorway.



FIGURE 13 - MIRROR DETERRENTS

■ **Ultrasonic Deterrents:** This equipment has a motion detection system and emits a powerful ultrasonic signal combined with uncomfortable flashing lights that keep de animals away from the motorway.



FIGURE 14 – ULTRASONIC DETERRENTS

■ **Wildlife Ultrasonic Deterrents:** This equipment emits sounds of animals in danger and screams of predators to scare animals and keep de animals away from the motorway.



FIGURE 15 - WILDLIFE ULTRASONIC DETERRENTS

11 - ROAD SAFETY CAMPAIGNS

11.1 - Status

The "Road Safety Campaigns" is in the stage of Production Implementation.

11.2 - Description

Throughout the years, public awareness campaigns are conducted using the Variable Message Signs (VMS) of the A24, the LinkedIn platform, and distributing flyers in the service areas. These actions are promoted under the scope of road safety and have the main objective of sensitizing drivers to adopt good practices and avoid accidents.

Below, some images of campaigns conducted.



FIGURE 16 - IMAGES OF THE CAMPAIGNS CONDUCTED

During this semester, several campaigns were performed. The Concessionaire (Norscut) was invited to participate in these campaigns along with us.



FIGURE 17 - IMAGES OF THE CAMPAIGNS CONDUCTED IN THE FIRST SEMESTER OF 2025

12 - WINTER MAINTENANCE FORUM

12.1 - Status

The "Winter Maintenance Forum" is in the stage of Production Implementation.

12.2 - Description

The Winter Maintenance Forum is a specialized event that brings together professionals, experts, companies, and authorities in the infrastructure maintenance sector, particularly those affected by adverse weather conditions during the winter.

It is the unique in Portugal with this thematic and that congregates several O&M companies.

The main objective of the forum is to discuss strategies, share knowledge and best practices, and present technological innovations for the effective maintenance of roads during the winter months.

The forum serves as a platform for the exchange of experiences and networking, promoting collaboration among different entities and contributing to the continuous improvement of motorways maintenance during the winter.



FIGURE 18 - IMAGES OF THE WINTER MAINTENANCE FORUM

Different stakeholders in the surrounding area of A24 motorway started to be involved on the organization of this event.

On 13 February 2025, Egis Portugal organized the 15th edition of Egis Winter Maintenance Forum at Castro Daire Village. This year, the Municipality of Castro Daire was involved in the organization of this important event.

Three presentations were given. The first one addressed the challenges that firefighters face during the winter season. The second one focused on winter maintenance in a Portuguese sub-concession (Subconcessão do Douro Interior – IP2 e IC2). In the third presentation, EROP provided an overview of the preparation for the winter maintenance season on the A24 motorway.

To conclude the event, a round table was held, featuring five winter maintenance experts who discussed future challenges in winter maintenance.

The number of attendees surpassed 90, including the Vice President of Castro Daire, the A24 Concessionaire (Norscut), the Emergency and Civil Protection Authority, law enforcement officials, as well as other authorities (police and firefighters), representatives from all Portuguese concessionaires, several municipalities, and the State Portuguese Infrastructures.



FIGURE 19 - IMAGES OF THE 15TH WINTER MAINTENANCE FORUM

13 - SELL SALT TO STAKEHOLDERS

13.1 - Status

The "Sell Salt to Stakeholders" is in the stage of Production Implementation.

NOTE: No update in this report.

13.2 - Description

During the winter season EROP sale salt to some stakeholders that have a critical activity to ensure the safety and maintain the infrastructures functionality.

Some of them, namely the municipalities face significant challenges in the purchasing process near the suppliers and have difficulties in ensuring adequate storage of the salt.

Under the scope of social responsibility, the sale of salt to the stakeholders that Egis perform not only ensures public safety and infrastructure maintenance but also supports the stakeholders in promoting reliable winter maintenance practices.



FIGURE 20 - SALT WAREHOUSES

14 - AID IN EMERGENCY ESCAPE LANES

14.1 - Status

The project "AID in emergency escape lanes" is in the stage of Concept Analysis.

NOTE: No update in this report.

14.2 - Description

Incident video detection for Emergency Escape Lanes with night vision (11 units), including CCTV cameras with Automatic Incident Detection (AID) and a surveillance system integration.

The requirements considered essential for the project are:

- i. Use of CCTV cameras with night vision capability
- ii. Elimination of external sensors, integrating the functionalities directly into the CCTV cameras
- iii. Integration with existing videowall (AVIGILON), including automatic event with audible alarm
- iv. Communication carried out through the Ethernet network
- v. Optional: Possibility to interact with motorway users (visual, audible or other)

The AID in Emergency Escape Lanes project is proposed for the 11 emergency escape lanes existing through A24 Motorway, is an advanced and comprehensive solution, developed to optimize road safety and operational efficiency. This integrated system aims to continuously monitor traffic conditions on emergency escape lanes, automatically and accurately identifying any incidents that may compromise the safety of motorway users.

The project includes video surveillance cameras equipped with advanced night vision, ensuring effective monitoring in all lighting conditions. These cameras offer a clear and detailed view, allowing for early detection of incidents, even at night.

This solution eliminates the need for independent external sensors by integrating the functionalities directly into the cameras. Smart sensors detect anomalous patterns, unexpected movements or emergency situations, triggering automatic alerts for a quick response.

The AID in Emergency Escape Lanes project features the ability to integrate with the existing video wall (AVIGILON), providing a centralized, real-time view of emergency escape lanes conditions. In the event of an incident, an event is automatically activated on the video wall, accompanied by audible alarms to promptly alert operators.

System communication will be implemented over the existing Ethernet network, ensuring efficient and low-latency connectivity. This approach allows the transmission of data in real time, facilitating an immediate response to detected incidents.

With this solution, the following benefits are expected:

- i. Faster response to incidents, minimizing reaction time
- ii. Improvement of road safety and prevention of emergency situations
- iii. Optimization of operational efficiency with a centralized and real-time view
- iv. Effective use of existing infrastructure, reducing implementation costs

Escapatórias A24 - Solução C

A analítica do dispositivo AXIS D2110-VE Security Radar irá detectar e filtrar o(s) objeto(s) detectado(s) na zona da escapatória, em qualquer momento do dia ou condição atmosférica e automaticamente irá rodar a camera AXIS P5676-LE PTZ Camera para a zona da escapatória onde foi detectada a detecção e gerar um pop-up no video wall.



FIGURE 21 - AID IN EMERGENCY ESCAPE LANES (EXAMPLE)

Escapatórias A24 - Opcional B

Esta alternativa, semelhante a solução anterior, propomos um sistema automático, que através da analítica do dispositivo AXIS D2110-VE Security Radar e/ou por acção de um operador da Sala de Controlo, irá enviar uma gravação em audio ou por comunicação através um sistema de audio ou SIP para o dispositivo AXIS C1310-E NETWORK HORN SPEAKER que estará na entrada da escapatória para alertar um condutor que esteja parado na entrada da mesma, evitando assim a deslocação de um veículo da concessionária.



FIGURE 22 - AID IN EMERGENCY ESCAPE LANES (EXAMPLE)

15 - LOCAL AREA NETWORK (LAN) THROUGH A24 MOTORWAY

15.1 - Status

The project "LAN through A24 Motorway" is in the stage of Production Implementation.

15.2 - Description

The project consists in the implementation of a Local Area Network (LAN) through A24 motorway to improve security and data communication.

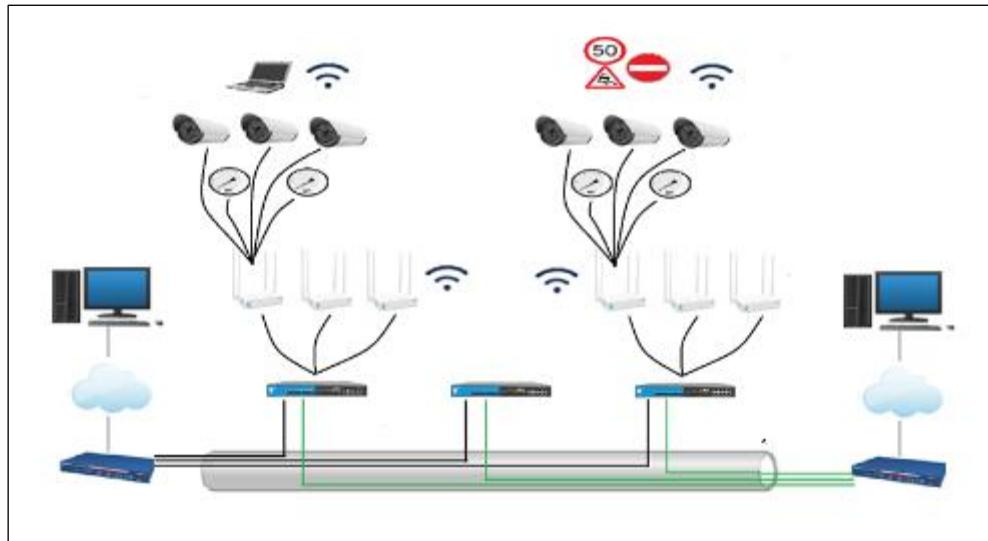


FIGURE 23 - LAN THROUGH A24

It interconnects all technical areas on the A24 with each other and with the O&M centre (*Lamego*), in order to allow the communication of the data collected by the CCTV system, telemetry and other systems that exist or will be installed in the future.

The main characteristics of the project are:

- i. The LAN will cover the 157 km of A24 motorway
- ii. Connections between the LAN and existing optical fiber network, including LAN Network configuration
- iii. The network created is reliable, with bandwidth available for current needs, planned for the future, and leave room for unforeseen applications
- iv. It able to create redundancy of data feeds into the critical elements of the system
- v. Reuse the optical fibers already installed
- vi. Make equipment as resilient as possible, having the highest MTBF possible
- vii. Supply and installation of hardware (switches, optical fiber converters) in existing technical areas – O&M centres (*Lamego* and *Pedras Salgadas*), Traffic Counting Stations (TCS), Tunnels and Emergency Escape Lanes, Meteo stations, etc.

The implemented solution involved the deployment of an Ethernet-based data network along the A24 motorway. This network is supported by the existing 157 km fiber optic backbone and is structured around a Switch Data Network architecture.

Core equipment was installed at key technical hubs, including the O&M centers in Lamego and Pedras Salgadas, the Régua or Rapada Tunnel building, and the Castro Daire Tunnel North building. These locations serve as primary nodes, while all other sites are designated as secondary nodes within the network.

The network was designed with a strong emphasis on robustness, efficiency, and resilience. It incorporates redundancy and security features, leveraging the existing infrastructure and undergoing comprehensive validation to ensure its operational viability and long-term functionality.

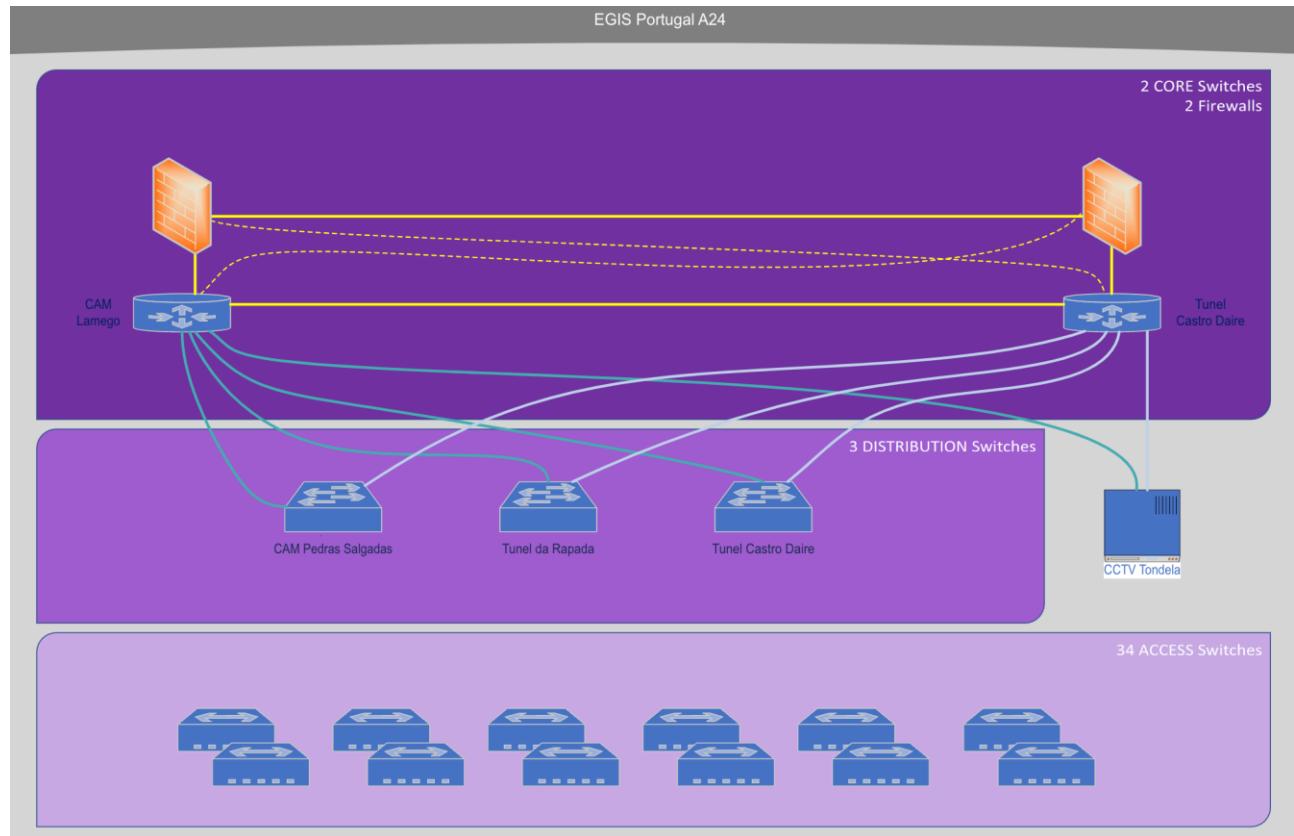


FIGURE 24 – NETWORK ARCHITECTURE (EXAMPLE)

The implementation of this solution ended in the first semester of 2025.

16 - LED LIGHTING IN A24 TUNNELS

16.1 - Status

The project "LED Lighting in A24 tunnels" is in the stage of Solution Development.

16.2 - Description

The purpose is the renewal of all A24 tunnels (*Castro Daire, Varosa and Régua*) lighting installations with the following main characteristics.



Castro Daire Tunnel

- Unidirectional tunnel (two tubes)
- Length: 818m
- HPS and fluorescent lamps
- One track of light (left lane)
- Speed limit: 80 km/h

Varosa Tunnel

- Unidirectional tunnel (two tubes)
- Length: 375m
- HPS lamps
- Two tracks of light (right and left lanes)
- Speed limit: 100 km/h

Régua Tunnel

- Bidirectional tunnel
- Length: 275m
- HPS lamps
- Two tracks of light
- Speed limit: 60 km/h

FIGURE 25 - TUNNEL CHARACTERISTICS

Usual lighting installations duration life considering our experiment return is 25 years.

The existing high-pressure sodium HPS and fluorescent lighting is reaching end of its life.

Regulation (CE) N° 245/2009 of March 18, 2009, implements directive 2005/32/CE with regard to the requirements in eco-design matters applicable to lamps. Lamps and power supplies (auxiliaries) the least effective are gradually banned of the European market since 2009. This regulation provides for the cessation of the marketing of **fluorescent lamps** at the **end 2023**. The end of high intensity discharge lamps, "high pressure sodium lamps" is not planned.

As a reminder, the life cycle of each lamp technologies:

Lamp	Lifetime	luminous flux conservation factor	Lamp survival factor
Fluorescent standard lamps)	16 000 hours	/	$\geq 0,90$
High pressure sodium HID (standard lamps)	16 000 hours	> 0,85	> 0,90
LED L90B10	100 000 hours	0,90	$\geq 0,90$

TABLE 1 - LIFE CYCLE OF LAMP TECHNOLOGIES

There are several objectives:

- To renew the end-of-life lightings and ensure their sustainability until 2030
- To save energy
- To do not reconsider the present HV / LV energy distribution
- To minimise the impact of renewal works on the highway operation

To have optimized lighting installations that can be upgraded with the last technological improvements of the market.

16.3 - Proposed Solution

To be sustainable, durable and optimized (to reach the best case), the renewal lighting study is based on the following working hypotheses:

- **LED technology** for all lights
- A **counter-beam lighting** technology for threshold and transition zones. These types of lights must be located on the axis of the lanes
- **Keep the actual wiring** installations as much as possible

To meet the objective of sustainable optimization of tunnel lighting, solutions are based on the following main concepts:

- The reinforcement and interior zone lighting are with LED technology
- The reinforcement lighting (threshold and transition zones) uses counter beam lighting contrast, cf. technical figures hereafter

The **counter beam solution is the best technology**, in compliance with safety, to optimise the luminance for threshold and transition zones (reinforcement lighting) and so to obtain the lowest power balance and consumption.

These concepts make possible to optimize, while respecting performance and safety, the quantity of luminaires, power balances and therefore energy consumption.

A renewal **solution with symmetrical reinforcement** luminaires is not the best solution.

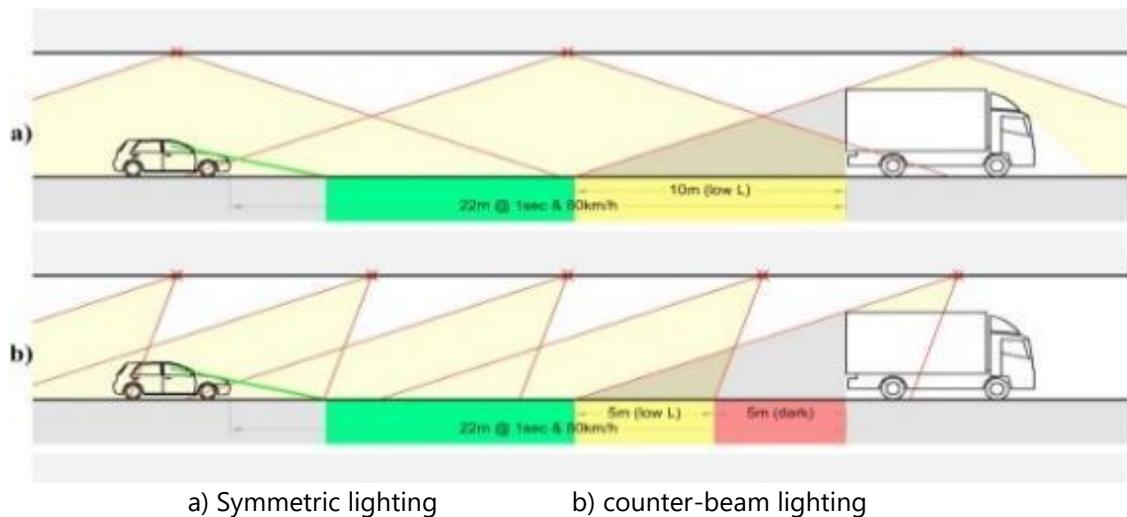


FIGURE 26 - POSSIBLE SOLUTIONS

	Transverse symmetrical lighting	Longitudinal symmetrical lighting	Counter beam lighting
Feature	light incident along the direction of tunnel cross section; symmetrical light distribution	light incident along the direction of tunnel vertical section; symmetrical light distribution	light incident along the direction of tunnel vertical section; non-symmetrical light distribution
Diagram			
Light distribution			

FIGURE 27 - REMINDER OF LIGHTING CONCEPTS

Taking into account the constraints and current technological performances / solutions proposed by lighting designers, the possible solutions are as follows:

- An "axial" solution on a single line for interior lighting + counter-beam reinforcement lighting

This solution (the best one) is based on the following main characteristics:

- Normal (corresponding to interior lighting) and reinforcements LED lightings are implanted on a single axial line of luminaires
- Reinforcements are performed with counter-beam luminaires
- Reinforcement luminance levels are in accordance with CIE 88-2004, cf. § 2.4.3

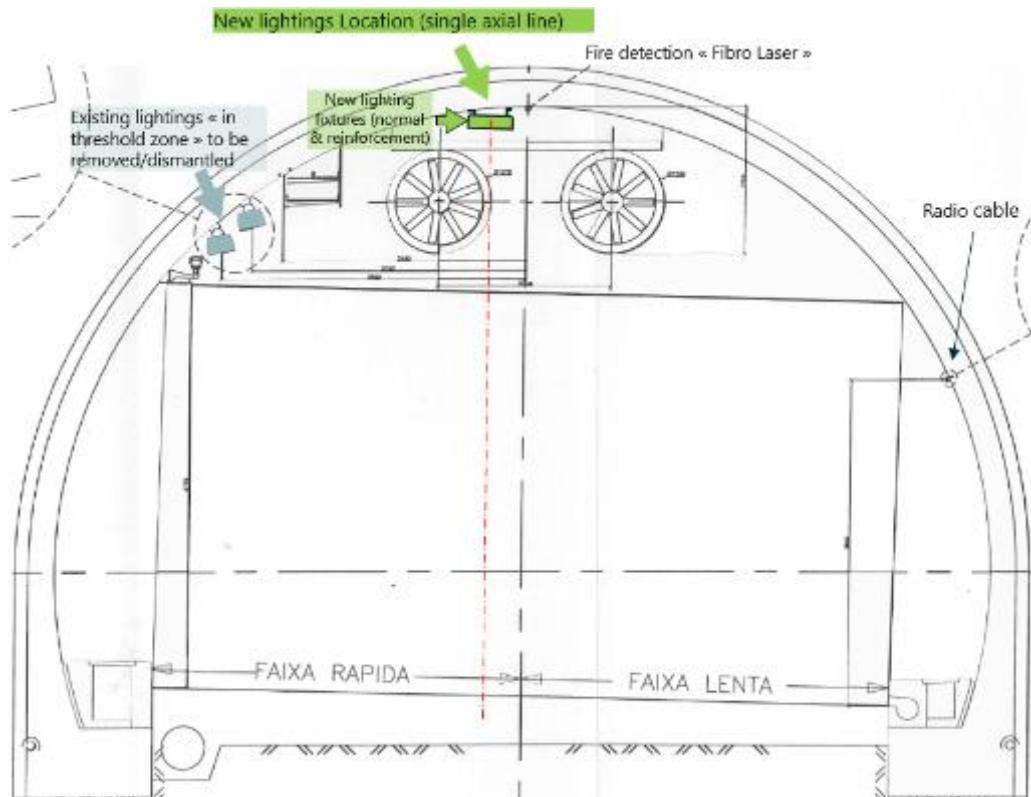


FIGURE 28 - BEST SOLUTION (CROSS SECTION)

The LED lighting was already implemented at Régua and Varosa Tunnel. Final configuration is expected to be performed by the end of the 2025. Castro Daire Tunnel implementation is on-going.

17 - PHOTOVOLTAIC PROJECTS (A24 O&M BUILDINGS AND TUNNELS)

17.1 - Status

The project "Photovoltaic Projects (A24 O&M buildings and tunnels)" is in the stage of Production Implementation.

The project is finished, meaning that there are not any new developments scheduled.

17.2 - Description

The decarbonization of electricity production is one of the major current concerns. One of the ways to achieve this goal is the production of electricity through renewable sources, one of them being the use of photovoltaic panels.

This project began in 2016 and consists of the installation of photovoltaic energy production systems in the infrastructures of the A24 motorway, following a strategy to increase sustainability, fundamentally seeking to reduce the environmental impact of the motorway operation, as well as to optimize costs and increase energy autonomy.

In road concessions and in particular on the A24 motorway, there are several infrastructures that consume a lot of energy, the most relevant being the tunnels and the O&M centres. These infrastructures have consumption cycles that are perfectly aligned with the cycles in which the intensity of sunlight is higher. So, the possibility of installing photovoltaic panels in these infrastructures for the production of electricity for self-consumption was explored, analysed and implemented.

In the first phase, design studies and analysis of consumption cycles were carried out to adapt the size of the installations to the real needs of energy consumption, and in this phase the places where the photovoltaic panels could be installed were also identified. Subsequently, financial models were developed to assess the profitability and return on the investment to be made.



FIGURE 29 - PROJECT ROADMAP

The project was implemented in two phases: phase 1 in the two O&M centres in *Lamego* and *Pedras Salgadas* and phase 2 in three buildings of tunnels (*Régua* and *Castro Daire* North and South), according to the following technical figures:

#	Site	Production Peak (kWp)	Production Estimation (MW / Year)	Quantity Pannels (un)
Phase 1	O&M Lamego	21,20	33,10	80
	O&M Pedras Salgadas	5,30	8,10	20
Phase 2	C. Daire-North tunnel	36,72	54,70	136
	C. Daire-South tunnel	75,60	117,80	280
	Régua tunnel	12,15	18,30	45
Total:		150,97	232,00	561

TABLE 2 - SITES TECHNICAL FIGURES

In conclusion, the main advantage of implementing energy production systems through renewable sources is the contribution to preservation of the environment, minimizing the impact produced by the operation of a road infrastructure, increasing sustainability and energy autonomy. At the same time, it is possible to reduce infrastructure costs with electricity, while obtaining a return on the investment made. At the end of the A24 motorway concession period, the infrastructure will also be valued, as it has lower operating consumption than it had initially.

18 - PHOTOVOLTAIC PROJECTS – OUTSIDE THE A24 MOTORWAY

18.1 - Status

The project "Photovoltaic Projects – Outside A24 motorway" is in the stage of Production Implementation.

The project is finished, meaning that there are not any new developments scheduled.

18.2 - Description

The increase in electricity consumption globally, caused by the general increase in economic and industrial activity, is generating major negative impacts on the environment, as electricity production is still largely based on non-renewable energy sources.

The decarbonization of electricity production is, therefore, one of the major current concerns. One of the ways to achieve this goal is the production of electricity through renewable sources, one of them being the use of photovoltaic panels. In fact, due to the relevance of the issue, there have been evolutions in this technology, which has increased its efficiency and economic attractiveness, especially in countries with high levels of potential for the production of electricity through photovoltaic systems, as is the case of Portugal.

Therefore, Egis Road Operation Portugal acquired a company (ValorPlanetário) that owned three small photovoltaic energy production units, located in Abrantes (centre of Portugal). With this deal, Egis Road Operation Portugal significantly increased its photovoltaic energy production to double (approximately), which has firmly contributed to the reduction of the ecological footprint of the EGIS group and to the achievement of the major goal...

"Egis is committed to help with solving the great equation of the 21st century: successfully blending improved people's quality of life with supporting communities in their social and economic development, whilst drastically reducing carbon emissions and achieving vital 2050 net zero targets."

The following table represents the technical figures of the three projects (Pego, CRIA and Alcaravela), after an upgrade made in 2022:

#	Site	Production Peak (kWp)	Production Estimation (MW / Year)	Quantity Pannels (un)
1	Pego	127,57	188,14	450
2	CRIA	41,28	67,11	144
3	Alcaravela	15,34	24,25	52
Total:		184,19	279,50	646

TABLE 3 - PROJECTS TECHNICAL FIGURES

In conclusion, the main advantage in energy production systems through renewable sources is the contribution to the preservation of the environment, minimizing the impact produced by the operation of a road infrastructure, increasing sustainability and energy autonomy, that are very important to the purpose and values of EGIS group.

19 - USE OF LIGHTER VEHICLES TO PERFORM MAINTENANCE

19.1 - Status

The "use of lighter vehicles to perform maintenance" project is in the stage of Production Implementation.

NOTE: No update in this report.

19.2 - Description

For EROP, reducing the ecological footprint is a constant objective. In addition to implementing ecological driving, we have been renewing our car fleet, seeking to acquire smaller, lighter and less polluting vehicles with a high percentage of electric vehicles.

This path, although more difficult for maintenance teams, due to the greater need to transport materials and tools, has been achieved by adapting the organization of maintenance activities and the tools used. An example is the acquisition of telescopic ladders.

Therefore, a large part of maintenance work has been able to be carried out with small vans. In this way, the use of larger vans is restricted to temporary signage activities and activities using large materials, such as guardrails, for example.



FIGURE 30 - USE OF LIGHTER VEHICLES TO PERFORM MAINTENANCE – SOME EXAMPLES

20 - ELECTRIFY THE FLEET

20.1 - Status

This project is in the stage of Production Implementation however it is intended to keep electrify the fleet in the next years.

20.2 - Description

Aiming towards carbon neutrality on the A24 motorway, Egis Road Operation Portugal is electrifying the fleet.

For 2024, an objective was defined: perform 50% of the driven kilometres with 100% electrical vehicles.

To achieve this goal, several activities were performed, like improving the aerodynamic of the vehicles, update procedures and training.

Since December 2023, the patrolling of the 157 km of our network is fully ensured by 100% electric vehicles.



FIGURE 31 - 100% ELECTRIC PATROL VAN

Egis Road Operation Portugal closed the year 2024 with approximately 50% of all driven kilometers completed using fully electric vehicles. In 2025, we continued to advance the electrification of our fleet, further reinforcing our commitment to sustainable mobility and reducing our environmental impact.

21 - ELECTRICAL VEHICLES CHARGERS AT O&M FACILITIES

21.1 - Status

The project "Electrical Vehicles Chargers at O&M Facilities" is in the stage of Production Implementation.

21.2 - Description

In line with the Egis group's strategy to reduce the ecological footprint and following the acquisition of more electric vehicles (EV), several wallboxes (electrical vehicles chargers) were installed at the buildings of O&M centres (*Lamego* and *Pedras Salgadas*) and *Castro Daire* North tunnel, with the aim of recharging the batteries of this type of vehicle. These chargers were installed by EROP team.

Since last report, a new wallbox was installed at Pedras Salgadas O&M Centre.

Building	Wallboxes (Quant.)
Lamego O&M Center	13
Pedras Salgadas O&M Center	3
Castro Daire North Tunnel	1

TABLE 4 - SITES WALLBOXES NUMBER

This system allows EV or PHEV vehicle drivers to recharge batteries safely and easily. With these wallboxes, it is possible to recharge the vehicle's battery up to 32A/22kW (three-phase voltage).



FIGURE 32 - WALLBOX INSTALLATION

22 - PERFORM WORKS OUTSIDE THE MOTORWAY TAKING ADVANTAGE OF EXISTING EQUIPMENT

22.1 - Status

This project is in the stage of Production Implementation however new opportunities may be identified in the future.

22.2 - Description

In accordance with our contract, Egis Road Operation Portugal maintains a fleet of vehicles, equipment, and materials that are not required for daily use. The objective of this project is to optimize the use of these resources—along with our internal expertise—by undertaking work beyond the A24 motorway.

To date, we have successfully carried out a variety of external operations, including guardrail repairs, fiber optic equipment (FOE) maintenance, photovoltaic panel servicing, and the implementation of traffic management measures.



FIGURE 33 - TEMPORARY SIGNALLING FOR A DOURO VINEYARD HOTEL



FIGURE 34 - TEMPORARY SIGNALLING FOR A NATIONAL ROAD

During this semester, several works were performed.

23 - INTERNALIZE WORKS RELATED TO ACCIDENTS

23.1 - Status

The "internalize works related to accidents" project is in the stage of Production Implementation.

23.2 - Description

EROP guarantees the operation and maintenance of the A24 motorway. When there are accidents, we are responsible for solving the defects resulting from them. Usually, in companies like ours, this type of work is subcontracted to external companies depending on the specialty.

The most common works are:

- Guardrails replacement
- Delineators replacement
- Drainage repair
- Concrete repair (including in engineering structures)
- Retaining walls repair (gabions including)
- Slopes repair
- Horizontal and vertical signalization replacement
- Pavement repair

With this project, we continuously specialize our employees, managing to carry out specialized work internally. This way we have a much faster response to accidents. Therefore, the works are less subject to market availability. On the other hand, the quality of work execution is superior.



FIGURE 35 - INTERNALIZE WORKS RELATED TO ACCIDENTS – WORK EXAMPLES

During this semester, several works were performed.

24 - EASY BURNT PAVEMENT REPAIR

24.1 - Status

The "easy burnt pavement repair" project is in the stage of Production Implementation.

NOTE: No update in this report.

24.2 - Description

On the A24, when a vehicle burns down, it is necessary to repair the pavement (the most affected area is the roadside).

Repairing this pavement damage typically involves the following steps: milling of existing surface layer and new surface layer paving. Considering that normally the damage is very superficial, this evasive method is difficult to implement in small areas. Therefore, at A24, since 2022, we have been testing a simple and less invasive methodology.

The results have been very positive, both due to its durability and surface characteristics. For example, the tests carried out demonstrated that this material has equal or better friction values compared to the adjacent pavement.



FIGURE 36 - EASY BURNT PAVEMENT REPAIR – APPLICATION EXAMPLES

25 - EASY ROAD MARKING REPAIR

25.1 - Status

The "easy road marking repair" project is in the stage of Production Implementation.

NOTE: No update in this report.

25.2 - Description

EROP guarantees the operation and maintenance of the A24 motorway. When there are accidents and incidents, we are responsible for resolving the anomalies resulting from them. Usually, in companies like ours, this type of work is subcontracted to external companies depending on the specialty.

As a result, one of the necessary works is to remark the highway in specific locations. This work, being punctual, is difficult to hire and quite expensive, due to the mobilization of equipment.

Therefore, we trained our teams to carry out this work internally, purchasing pavement horizontal marking paints. It is a process that has allowed us to respond more quickly, without being dependent on the availability of third parties.

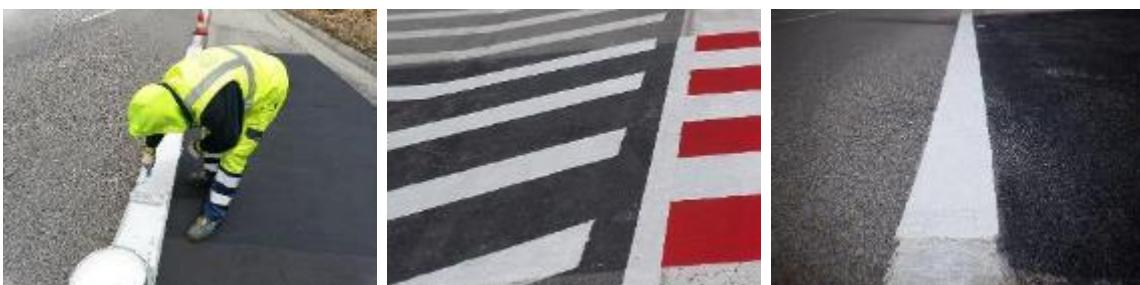


FIGURE 37 - EASY ROAD MARKING REPAIR – APPLICATION EXAMPLES

26 - EASY CONCRETE REPAIR

26.1 - Status

The "easy concrete repair" project is in the stage of Production Implementation.

NOTE: No update in this report.

26.2 - Description

EROP guarantees the operation and maintenance of the A24 motorway. Although major repairs are the responsibility of the Concessionaire, there are many specialized works we do. For example, concrete repairs, often with exposed iron reinforcement from corrosion.

These works are mostly in culverts, surface drainage, engineering structures (including bearing repairs), slopes, retaining walls, etc.

This type of work requires the use of quality materials with good performance, with good behaviour against exposed iron reinforcement from corrosion. On the other hand, interventions, which are sometimes specific, must be quick. Therefore, it is extremely important that the preparation of the material is quick.

In this way, techniques were developed using innovative materials that were alternative to conventional materials (sand, cement and water). Therefore, the preparation time and, consequently, the intervention time, are shorter. The quality is also better, as the final quality is less dependent on the preparation method.

This solution is made up of two materials. A product made from special cements, graded sands, resins and specific additives to protect iron reinforcement from corrosion and a mortar containing special sulphate-resistant cement, graded sand, synthetic fibres and additives to improve workability and adhesion.



FIGURE 38 - EASY CONCRETE REPAIR – WORK EXAMPLES

27 - OPTIMIZATION OF GREEN MAINTENANCE IN THE CENTRAL RESERVE

27.1 - Status

The "optimization of green maintenance in the central reserve" project is in the stage of Solution Development.

NOTE: No update in this report.

27.2 - Description

This project aims to apply alternative techniques to areas where green maintenance activities are more dangerous (example: central reserve). In these locations, workers are highly exposed to traffic and the projection of materials could cause danger to highway users.

Currently, critical areas have already been identified. These are essentially the uneven areas in the central reserve.

The solutions will involve planting plant species with controlled growth or covering the central reserve with materials that prevent vegetation growth.



FIGURE 39 - OPTIMIZATION OF GREEN MAINTENANCE IN THE CENTRAL RESERVE – EXAMPLE OF INTERVENTION SITE

28 - INSPECTION WITH DRONES

28.1 - Status

The "inspection with drones" project is in the stage of Production Implementation.

NOTE: No update in this report.

28.2 - Description

EROP started using its own drone to support inspections of road assets on the A24 motorway in 2020.

At the present time, assets inspected on A24 with drone support are:

- Buildings (roof inspection, gutters inspection, photovoltaic panels inspection, etc.)
- Engineering structures
 - Reduction in the use of the inverted platform
 - Security gains
 - Operational gains
 - Adequate image quality
 - Detail check in minuteness
 - Inspection of areas non-accessible with platform (columns, foundations in riverbeds/rugged lands)
- Landscape and environmental maintenance
 - Reduction in the need to use a lifting platform
 - Minimization of lane suppressions
 - Reduction of the inspection team's exposure to danger
 - Decreased interference with traffic
- Spot checks for specific situations (for example, high points in retaining walls and slopes).



FIGURE 40 - INSPECTION WITH DRONES – EXAMPLES OF INSPECTIONS

29 - INFRASTRUCTURE MONITORING WITH SATELLITE DATA

29.1 - Status

The "infrastructure monitoring with satellite data" project is in the stage of Production Implementation.

29.2 - Description

Together with Spotlite, we continue to develop A24 infrastructure monitoring, based on satellite images (InSAR and optical). These analyses continue in 2025.

For the A24 infrastructure monitoring, it is intended to verify the displacements evolution on the slopes/retaining walls and anticipate eventual problems in them (landslides, for example). Considering the digital terrain model (DTM), may facilitate the interpretation of movements on most step slopes.



FIGURE 41 - INFRASTRUCTURE MONITORING WITH SATELLITE DATA – OUTPUT EXAMPLES

30 - VEGETATION MONITORING WITH SATELLITE DATA

30.1 - Status

The “vegetation monitoring with satellite data” project is in the stage of Production Implementation.

30.2 - Description

Together with Spotlite, we continue to develop A24 vegetation monitoring, based on satellite images (InSAR and optical). These analyses continue in 2025.

For vegetation, it is intended to improve management tools, namely by obtaining information about Landsat Normalized Difference Vegetation Index (NDVI), cleaning area, tree height/ fall radius, tree health, fall susceptibility (winds), disease detection, invasive species detection, vegetation detection in the middle of the highway and quantify biomass. In 2024, with the inclusion of the Digital Terrain Model (DTM), the accuracy of tree height and fall radius quantification was improved. In 2025, a monthly analysis will be implemented, which is expected to allow for better monitoring of vegetation growth and intervention progress.



FIGURE 42 - VEGETATION MONITORING WITH SATELLITE DATA – OUTPUT EXAMPLES

Following the forest fires of September 2024, this technology allowed us to better identify the affected areas of the motorway.

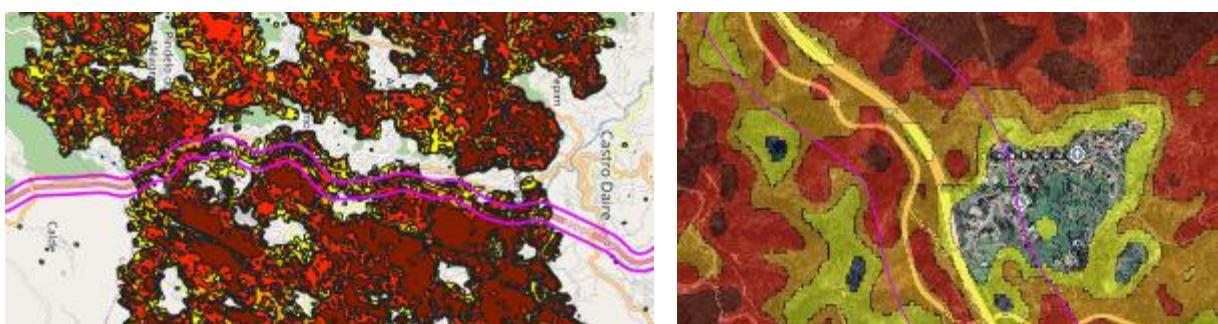


FIGURE 43 - VEGETATION MONITORING WITH SATELLITE DATA – BURNED AREAS DETECTION

At the end of 2024 and the beginning of 2025, the project was recognized with two awards from the Egis Group: namely, the O&M Signature Innovation Challenge (2nd prize) and the Innovation Challenge – 2025 (finalist, among the top 10).

31 - STOCK MANAGEMENT

31.1 - Status

This project is in the stage of Production Implementation.

NOTE: No update in this report.

31.2 - Description

By the end of 2013, the Portuguese Government amended the legislation regarding goods transportation, by forcing the sender to issue and report the transport document identifying all the stock that was going to be transported before the actual journey. The Portuguese Tax Authority created an online platform for this purpose to enable communications to be performed in real time, through the companies Enterprise Resource Planning (ERP) software.

Effectively, the Portuguese Decree-Law 198/2012 amended the goods transportation law from 2013 onwards, in order to establish rules to ensure the integrity of the transport documents, guaranteeing that Tax Authority has more effective control of these documents, to prevent the informal economy and the tax leakage. In addition, it has also become mandatory to notify the Tax Authority of the elements of the issued document, before the transport date/time.

Egis Road Operation Portugal (EROP) embraced the challenge as an opportunity to improve internal processes. Synergies have been established with software developers of ERP used in the company to create an application adapted to the reality of EROP, thus fulfilling the legal requirements and projecting this area for the future.

EROP has two Operation & Maintenance (O&M) Centres, *Lamego* and *Pedras Salgadas*, from where the teams leave to proceed with the O&M works. As a result, there are about 3,800 transport documents that are issued annually, which now have to be reported to the Tax Authorities before the teams leave the facilities with the vehicles.

The approach was to seek out a procedure for issuing and reporting the transport documents as automated as possible, so that the time and costs spent for this operation could be minimized. Simultaneously, it was necessary not only to integrate the transport of goods and associated stock movements, but also to create synergies between the ERP and the Road Maintenance Management System (RMMS) implemented in the company.

After identifying all the project requirements, several brainstorming meetings were held, first internally and then with some software developer providers, in order to find the best solution to meet all requirements and additionally to communicate automatically with the Tax Authority web platform. The need to insure a reliable and robust system, applicable to all locations and user friendly, led to the choice to develop a solution based on a personal digital assistant (PDA) system equipped with radio frequency identification (RFID) Barcode reader, that has recently evolved to an android based solution with smartphones using the optical reader.

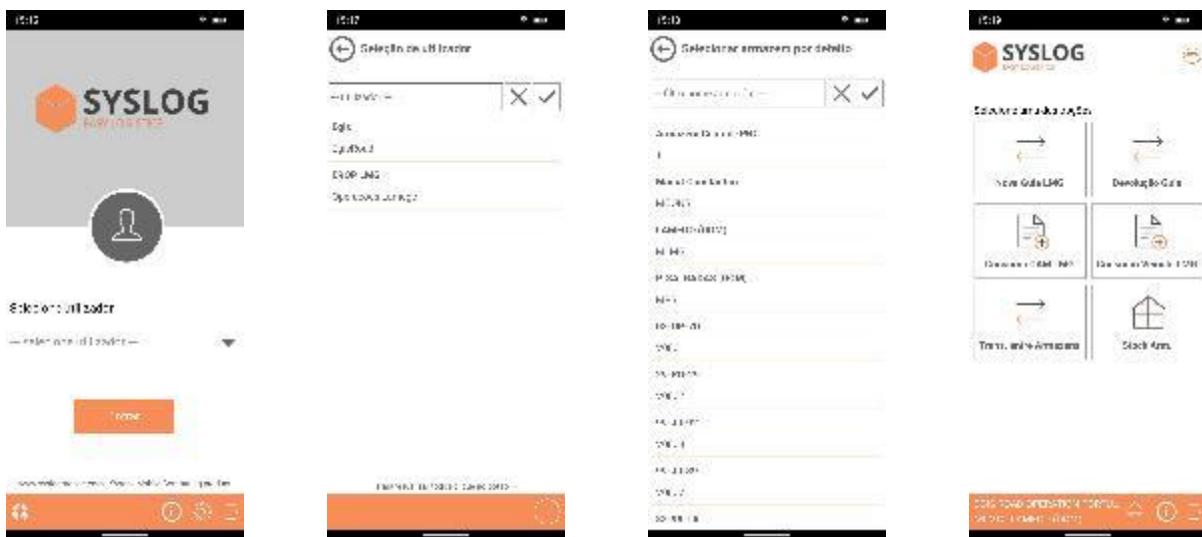


FIGURE 44 - SCREEN CAPTURES FROM THE APP

Barcodes were assigned to all stock items existing in the company. The warehouses have been adapted to allow a system with labels on the shelves, along with stock articles (supermarket type). Additionally, we developed a catalogue which contains all the references, names, barcodes and pictures of all existing stock items. These changes allowed an immediate and unambiguous identification of all the warehouse goods.

Simultaneously, the infrastructure was equipped with wireless routers with Internet access and an application was developed along with the software developers, that allows to issue transport documents directly from the smartphones, in real time and sync with the ERP.

In practice, the smartphone with the software reads the code of the goods to be transported in the warehouses and associate them with the vehicle that will transport them. The transport document is then issued and communicated via webservice to the Tax Authority, which attributes and returns a unique and distinctive key to this transport. The legislation requires that this key is recorded in the transport document, so the return key is automatically printed in the document in real time.

The efforts of EROP and software developers resulted in an almost immediate process, which takes only a few seconds since the issuance of the document to the paper printed version, accompanying the transport of the goods. The time spent for this action is thus minimized.

In the beginning of the next day, the items to be return to the warehouse are scanned again and the differences between the stock loaded and returned, automatically create a stock consumption document, that allows us to have a real time stock management.

This process has several advantages for EROP, among which stand out the following:

- Fully compliant with the legislation in force - The goods to be transported are reported before the transport and the document is printed with the Tax Authority Key
- Automated process, minimizing the time and costs - Operations to issue the Transport Document are quick and printing it on paper is almost immediate
- Reliable, robust and user-friendly infrastructure - The hardware and software installed are of recognized quality, meeting the needs of the company and its employees
- Applicable to all the locations - Both warehouses are properly prepared for issuing transport documents and the information is sent remotely to the ERP/Tax Authority
- Correct and functional recording of stock movements – Stock movements are recorded in the ERP and stock consumptions are made automatically

- Efficient supply and inventory management - The stock is constantly updated and available for real-time query
- Accounting stock control - All the stock movements are associated with the intervention area and the purpose of consumption, allowing a simplified cost centre allocation.

This new legal requirement that most companies considered as an obstacle to routine procedures, has proven to be an evolution opportunity for EROP. Thanks to the active participation and commitment of all company departments and software developers, who have worked tirelessly with us, the challenge was overcome.

The application was designed especially for our needs, fulfilling much more than the basic function of issuing transport documents. It is now a valuable tool in the logistics management and inventory control, which is now established in the company dynamics.

32 - FINANCIAL SUPPORT (SIFIDE)

32.1 - Status

The project is in the stage of Production Implementation (ongoing each year).

32.2 - Description

SIFIDE (*Sistema de Incentivos Fiscais à Investigação e Desenvolvimento Empresarial* - Tax Incentive System for Research and Business Development) is an instrument created by the Portuguese government to encourage investment in areas of innovation and research.

Through this system, companies are encouraged to invest in Research & Development (R&D) activities, aiming to stimulate innovation, increasing competitiveness and boosting the national economy.

The benefit essentially affects two business activities. The expenses considered within its scope are:

- Research expenses: incurred by the companies to acquire new scientific or technical knowledge
- Development expenses: incurred by the companies by exploiting the results of research or other scientific or technical knowledge with a view to discovering or substantially improving raw materials, products, services or manufacturing processes

Which expenses are eligible for SIFIDE:

- Expenditure on personnel directly involved in R&D tasks
- Operating costs
- Acquisitions of tangible fixed assets
- Cost of registering, acquiring and maintaining patents
- Expenditure on R&D audits
- Staff participation in the management of R&D institutions
- Hiring R&D activities from public entities (or with status) or reputable entities recognized by *Agência Nacional de Inovação* - National Innovation Agency (ANI)
- Expenses for demonstration actions
- Expenses relating to R&D activities associated with product eco-design projects
- Participation in the capital of R&D institutions and contributions to investment funds

All the income taxpayers who carry out an agricultural, industrial, commercial or service activity as their main activity can apply for this support system, provided they meet two cumulative conditions:

- Taxable profit is not determined by indirect methods
- No debts to the Tax Authority or Social Security

The benefit is that the amount considered as eligible by ANI, can be directly deducted from the income tax to be paid each year to the tax authorities.

The first submission was made in **2022** referring to the transact year of 2021, with 2 projects:

- **SOMIR** - Road infrastructure operation and maintenance system

The project main objective was to investigate and develop the new generation of the Egis operation and maintenance platform, aligning it with the latest trends in road infrastructure management and the principles of Industry 4.0.

■ **AIIR** - Update of road infrastructure inventory

The project intended to carry out research and development activities to advance an innovative solution, using digital tools and technology, aligned with the principles of Industry 4.0, which would allow the inventory of road assets.

In 2022, the two projects SOMIR and AIIR, continued, so in **2023** EROP applied again with these two projects, plus another one:

■ **MVBDS** - Vegetation Monitoring Based on Satellite Data

The main objective of this project is the study and development of an innovative vegetation monitoring system based on satellite data. This tool aims to provide Egis with a better and more efficient capacity to manage road vegetation maintenance.

In **2024**, the application for the year of 2023, included again SOMIR and MVBDS projects, and another one:

■ **eProAsset** - Integrated Asset Management

The project aims to study and develop an innovative solution for managing road assets, with tools that allow users to view, analyze and manage detailed information about the various assets belonging to the road infrastructure.

With the development of applications such as eProAsset GIS Assets and other specific modules for engineering structures, earthworks, supporting walls or drainage, the system not only centralizes critical data, but also facilitates the querying and manipulation of this data in an innovative way, allowing a more efficient response, enabling more sustained and assertive decision-making.

In **2025**, the application for the year of 2024, included again SOMIR, MVBDS and eProAsset projects.

33 - OHS ONLINE TRAINING TO SUBCONTRACTORS

33.1 - Status

This project is in the stage of Production Implementation.

NOTE: No update in this report.

33.2 - Description

In the aim of continuing to be training subcontractors in safety procedures, was created an online training to all subcontractors.

Every work done on the motorway has to have previous safety training. There are constant works being subcontracted, so it is normal every week have more than one session. It can also happen urgent work needs that require previous training.

So, as people validated to do the training can have some constraints, we created a training video, so we don't have to be present during the training time, allowing us to manage more efficiently the workload.

This solution benefit both staff and subcontractors, allowing a quick response to safety training needs and avoid the travel of the subcontractors to our O&M centres. It also contributes to our decarbonation objectives as there are less commuting from subcontractors to our offices reducing vehicle emissions.

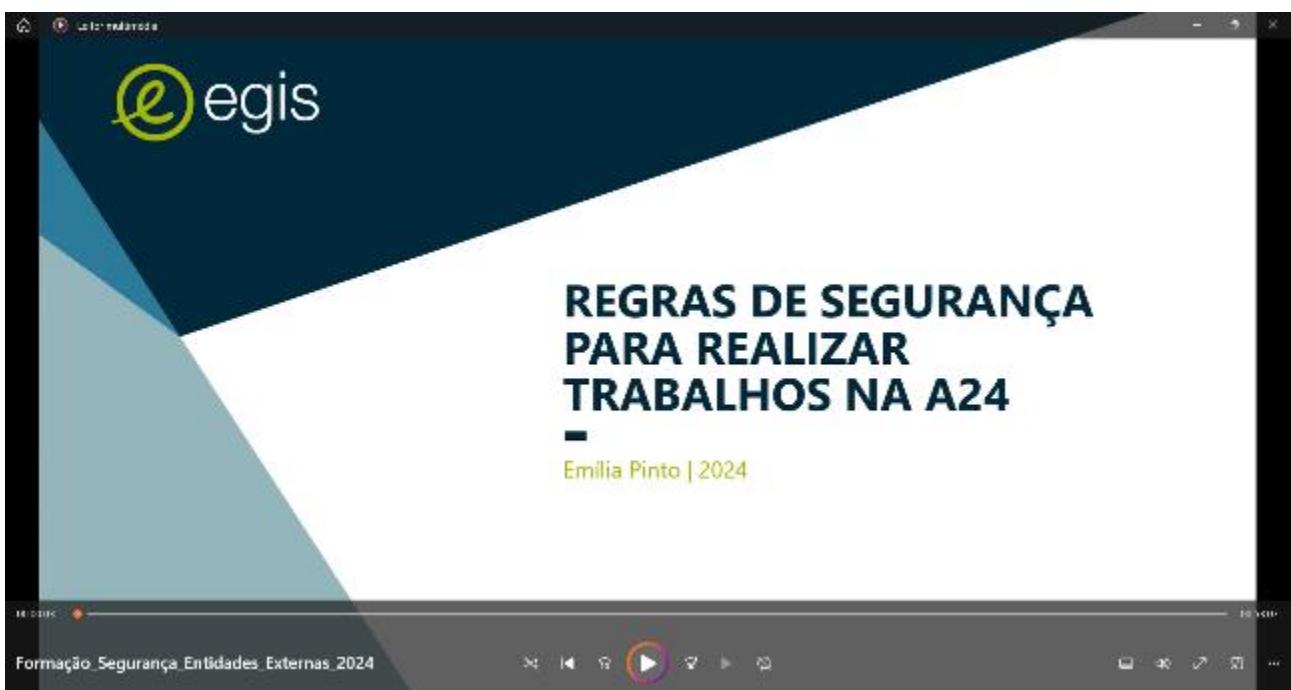


FIGURE 45 - IMAGE FROM VIDEO ONLINE TRAINING

34 - OHS GROUP – SAFETY CORE

34.1 - Status

This project is in the stage of Production Implementation.

34.2 - Description

The Safety Core is an Advisory Body of the General Management on matters of Safety and Health at Work. Its sole objective is to encourage and emphasize the consultation and participation of workers, in a reflection that allows identifying opportunities for improvement in the operability of OSH Management.

The Safety Core is constituted by the responsible for the EROP Integrated Management System and representatives from the different roles of the company.

IMS Responsible is responsible for the Safety Core. The Safety Core meets quarterly and whenever the IMS Responsible deems it necessary.

At each meeting is elaborated the resume, approved by all elements and then sent to the General Manager and made available for consultation by all employees.

The Safety Core can address specific or generic topics, and the provisions of ISO 45001:2017 (namely clause 5.4) and applicable legislation must be considered.

Although the main objective is to address topics related to ISO 45001 like risk management, accident analysis, and good practices to implement, the Safety Core is also involved in sensibilization campaigns.

During this semester, a meeting of this group was held.

35 - WORK ALONE APP

35.1 - Status

This project is in the stage of Production Implementation.

35.2 - Description

The Traffic Control Room (TCR) Operators have work schedules that origin the risk of isolated work. With the objective of safeguarding operators during these isolated work hours and allow the activation of internal and external rescue teams in case of need it was implemented a system that allow monitoring the safety of the isolated worker, making it possible to issue an alert if any unforeseen event occurs that puts the worker's safety and health at risk.

The isolated worker protection system is supported by a mobile application "eSafeMe PRO" that allows the following alerts to be issued:

- **Fall alert** – Alert issued automatically if the employee suffers a fall during the activity.
- **Voluntary alert in case of SOS** – Alert issued voluntarily by the employee, when exposed to an emergency situation.
- **Immobilization alert** – Alert issued automatically, in the event of an employee being immobilized for a certain period of time.

After issuing the alert, an email will automatically be sent, and a phone call made to a pre-defined contact list. Except for the voluntary alert in the case of SOS, all alerts will not be issued if the employee voluntarily performs recognition.

For the app to function correctly, it is essential to ensure that the cell phone is properly charged, and that there is continuous access to data (using the Wi-Fi network or through mobile data) and the GPS position. In this sense, the TCR employee must ensure that these functions are permanently activated.

The app is used by the TCR employee during the isolated work hours, between 6:00 pm on day N and 8:00 am on day N+1 and between 0:00 am and midnight on weekends and holidays. To do this, at the set time, the "eSafeMe PRO" application must be activated according to the following image:

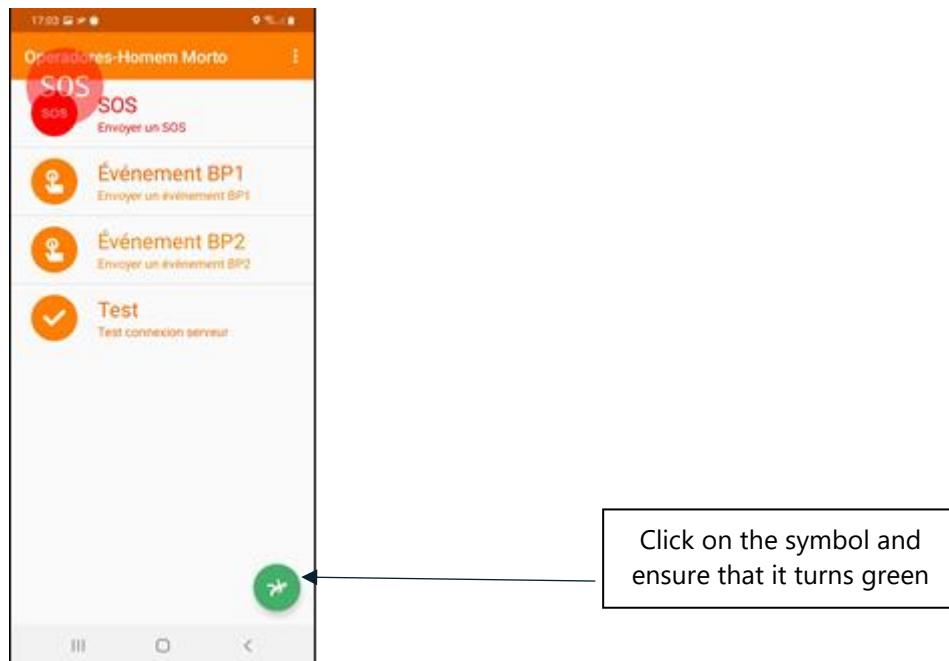


FIGURE 46 - ESAFEME PRO HOME WINDOW

After activation, the employee must quickly turn the cell phone downwards to verify that the system has been activated effectively. In this case, the cell phone's audible alarm must be activated.

From this moment on, the system is activated and will work as follows:

- **Fall alert** – Whenever employees walk inside and outside the building, they must carry the cell phone on which the application is installed. When a sudden movement made by the employee is detected, the cell phone's audible alarm will be activated autonomously. If the employee does not recognize the alarm after 30 seconds, an alert will be sent to the pre-defined contact list.
- **Voluntary alert in case of SOS** – Whenever the employee feels their health or physical integrity is at risk, they can issue a voluntary alert, activating the SOS function in one of the following four ways:
 - By pressing the SOS button on the application



FIGURE 47 - ESAFEME PRO APP

- Pressing the SOS button on the desktop for 3 seconds



FIGURE 48 - ESAFEME PRO BUTTON ON DESKTOP

- Pressing the on/off button 4 times



FIGURE 49 - ON/OFF BUTTON

- Constantly shaking the cell phone

After the voluntary activation of this function by the employee, an alert will immediately be sent to the pre-defined contact list. It should be noted that in this case, the cell phone's audible alarm will not be activated. To use the application again after activating this function, the employee will have to deactivate the application and activate it again.

- **Immobilization alert** – Alert issued automatically in the event of an employee being immobilized for a certain period (15 min). Whenever at the end of the defined time, no movement is detected by the employee, the audible alarm will be activated and if the employee does not recognize it after 30 seconds, an alert will be sent to the pre-defined contact list.

The alert will be received in two different ways:

- Email – Allows you to know what type of alert was activated, who activated it and know the position of the employee who needs assistance.
- Telephone call – Allows you to find out, through a pre-defined call, what type of alert has been activated and which employee needs assistance. At the end of the automatic message, the key (*) must be pressed to establish a telephone call with the TCR employee.

If the TCR employee does not answer the call, the Internal Emergency Plan (PGI-12-0-Vx) must be activated, 112 (European Emergency Telephone Number) must be contacted and the Internal Emergency Team must be activated.

The definition of the elements that will receive the alerts is made on the "eSafeMe PRO" platform weekly by the TCR employee according to the prevention scale.

Patrollers continue to use this app, namely when they are performing inspections to the fence.

36 - PREDICT, PREVENT AND REDUCE THE OCCURRENCE OF ROAD ACCIDENTS WITH WORKERS

36.1 - Status

This project was finished after being tested.

36.2 - Description

The challenge for Wingdriver is to predict, prevent and reduce the occurrence of road accidents.

WingDriverTM is the only company that implements Computer Vision and AI in smartphones to analyse combined facial analysis, vehicle inertial data, and vehicle surroundings to accurately identify drowsiness, fatigue, distraction, and other driver mood states to avoid accidents.

Their solution is based on:

- WingDriverTM Software Development Kit (SDK) - So that any mobile application company or car manufacturer can include these security features in their products.
- WingDriverTM Cloud data - Allows better risk assessment, reduces claims and their costs and, consequently, improves insurance products.
- WingDriverTM Demo app and White-label apps - Enable companies to launch mobility security applications without the need for software development and facilitate proof-of-concept activities.

Additionally, their Big Mobility Data strategy, combined with WingDriverTM's exclusive license to a deterministic algorithm developed by a team of sleep researchers at VTTI (Virginia Tech Transportation Institute), allows to integrate information about vehicle maneuvers with facial analysis for optimal detection highly robust of driver states. This allows to understand the correlation between driver behaviour and accidents with greater precision, accurately assessing driver risk.

In EROP this solution was tested with the patrollers during 2 months by using an application "Wingdriver" in the mobile phone that was placed in the vehicle allowing to monitor the driver behaviour and issue alerts for the non-safe behaviour identified.

The non-safe behaviours that can be identified and consequently issue alerts are related to sleep and distraction preventing the accident occurring.

The alerts are generated directly on the smartphone by emission of sounds and messages which alert the driver to take a safer behaviour.

These alerts and driving behaviour can be tracked by safety responsible on the dashboard allowing to take actions in case of need.

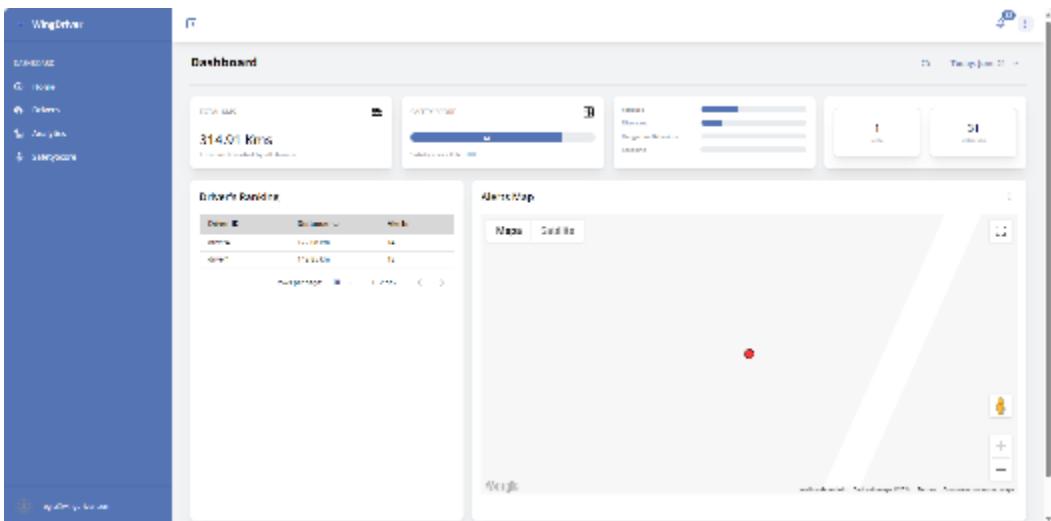


FIGURE 50 - WINGDRIVER DASHBOARD

This dashboard also information related to statistics created by the driving behaviour and alerts generated allowing to better evaluate the risks.



FIGURE 51 - DASHBOARD STATISTICS

37 - SAFETY FOOTWEAR

37.1 - Status

This project is in the stage of Production Implementation.

NOTE: No update in this report.

37.2 - Description

In order to ensure the individual protection of each EROP employee, appropriated to the activities performed, the PPE (Personal Protective Equipment) to be used is distributed by EROP considering the risks associated with the professional category.

As there were some suggestions of the employees to change the safety shoes and considering that the PPE selected cannot be in everyone's preferences, EROP implemented a new procedure for the employees who prefer another kind.

To uniformize the procedure it is defined that every employee who want to acquire a different kind of safety shoe than the one implemented in the company, must request the technical sheets to the supplier and send it to the IMS (Integrated Management System) Responsible. IMS Responsible then validates the characteristics and certification of this PPE, if it is approved it informs the employee to buy the safety shoes.

After buying the safety shoe the employee makes an expense note to this PPE that must be also validated by IMS Responsible ensuring that the technical sheets and certification are in place.

38 - PARKING IN REVERSE

38.1 - Status

This project is in the stage of Production Implementation.

NOTE: No update in this report.

38.2 - Description

One of the safety risks that exist in the companies is related to emergency situations and removing vehicles during those events.

To increase the safety of people during emergency situations it was defined that all vehicles must be parked in the parking lots, in reverse. This procedure facilitate evacuation in case of emergency, because it is just start and follow, allowing to evacuate quickly. These advantages are also applicable to all the situations when it is needed to drive a vehicle, because it is not needed any extraordinary manoeuvres to drive the vehicle outside the parking lot.



FIGURE 52 - PARKING IN REVERSE

39 - ECODRIVING

39.1 - Status

This project is in the stage of Production Implementation.

39.2 - Description

In line with the objective of reducing the ecological footprint, EROP has moved forward with the implementation of training on Ecodriving for its staff, concessionaire, subcontractors and external companies.

This training is intended to involve all staff and service providers in the objective of reducing the environmental impact during the execution of the work, as well as creating a wave of awareness for more ecological and safer driving, leading to a decrease not only in fuel consumption, and consequently gaseous emissions, but also less stress and the likelihood of accidents while driving.

These trainings have two main objectives:

- Reduction of carbon footprint and heavy metal emissions
- Reduction of fuel consumption and respective costs

These can be achieved by adopting the Ecodriving good practices learned in the training:

- Upgrade shift as soon as possible
- Reduce shift smoothly
- Maintain a constant speed
- Use the energy of movement
- Anticipate traffic and pedestrian flow
- Slow down and accelerate smoothly
- Check tire pressure regularly
- Eliminate unnecessary weights and equipment
- Switch off the engine during prolonged stops
- Use all driving assistance



FIGURE 53 - ECODRIVING

The training is done through a theoretical and practical training on site. Subcontractors and service providers have access to the theoretical training.

Staff and concessionaire is made also a practical training were first is made a driving through a defined route, then is given the theoretical training and ultimately it is made a second driving through the same route as the first applying what was learned in the theoretical training. In both driving are registered the time spent, medium speed and consumptions allowing to demonstrate the advantages of the training.

	A	B	C	D	E	F	Média
Condutor							
Condução habitual							
Distância (km)	36,5	36,5	36,5	36,5	36,5	36,5	36,5
Tempo (min)	63	55	57	58	59	52	57,3
Média (l/100km)	4,6	4,8	4,1	4,4	4,9	4,6	4,6
Após formação							
Distância (km)	36,5	36,5	36,5	36,5	36,5	36,5	36,5
Tempo (min)	61	57	59	55	60	53	57,5
Média (l/100km)	4	3,8	3,8	3,7	3,7	3,9	3,8
Comparação							
Variação (min)	-2	2	2	-3	1	1	0,2
Variação (l/100km)	-0,6	-1	-0,3	-0,7	-1,2	-0,7	-0,8
Economia (%)	13,0	20,8	7,3	15,9	24,5	15,2	16,1

FIGURE 54 - ECODRIVING RESULTS

During this semester, several trainings were conducted.

40 - FLEX BOLLARDS LED

40.1 - Status

The "flex bollards LED" project is in the stage of Production Implementation.

NOTE: No update in this report.

40.2 - Description

The "flex bollards LED" project aims to create an alternative solution for lighting at interchanges on the A24 motorway.

To this end, an innovative solution is being used with LED flex bollards, which help to better signal the exit lanes of motorway interchanges.

Currently, this methodology is already installed at an A24 interchange (*Régua* interchange). It is intended that the installation will be extended, in a first phase, to another interchange (*Valdigem* interchange), and in subsequent phases to other interchanges.

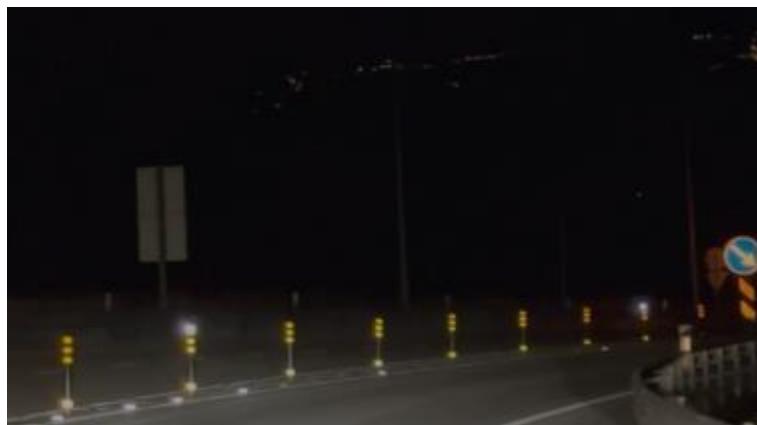


FIGURE 55 - FLEX BOLLARDS LED – RÉGUA INTERCHANGE

41 - PLANTING OF GROUND COVER SPECIES

41.1 - Status

The "planting of ground cover species" project is in the stage of Production Implementation.

NOTE: No update in this report.

41.2 - Description

The work with Universidade de Trás-os-Monte (Vila Real University, close to A24), regarding some options for agricultural practices, has progressed. The work concerning the planting of ground cover species is already completed in two places on the A24. Now, the work is in the maintenance phase along with the monitoring of the species in strategic areas. The next steps will involve a feasibility analysis for other locations on the A24.



FIGURE 56 - PLANTING OF GROUND COVER SPECIES – INTERVENTION AREAS

42 - BOTTLES FOR WORKERS AND FILTERED WATER IN BUILDINGS

42.1 - Status

This project is in the stage of Production Implementation.

NOTE: No update in this report.

42.2 - Description

With the objective to provide better work conditions it was implemented in the several sites along the motorway filtered water fountains. This implementation allows workers to have access to quality water whenever they need it.

Along with this action, thermos water bottles were also distributed so that employees can carry a greater quantity of water with them in better storage conditions.



FIGURE 57 - WATER FOUNTAIN



FIGURE 58 - WATER BOTTLE

43 - WASTE VALORISATION

43.1 - Status

This project is in the stage of Idea Generation.

NOTE: No update in this report.

43.2 - Description

During our activities are generated several kinds of wastes like plastics, metal, wood, PPE, etc.... All these wastes are sent to licensed waste operators with costs to our company.

The idea is to search and implement ways to send these wastes to entities that value them decreasing our costs with the waste management, and also giving second live to some waste that can be recycled for specific purposes. For example, uniforms may be used to create recycled fibers that can be used by textile companies.

44 - CONTAINER FOR WASTE AT O&M CENTRES

44.1 - Status

This project is in the stage of Production Implementation.

NOTE: No update in this report.

44.2 - Description

Annually it is made the cleaning of the motorway with a sweeper. The wastes generated are a mix of sludge with big quantity of water. Until 2022 the wastes were delivered in the waste receiving entity every day in the end of the workday, but since that year we started to store the waste in a container in the O&M centres and only deliver the wastes when the container is full.

Due to this change the quantity of sludge sent for treatment was reduced due to the decrease of the amount of diluted water in waste. Also, the driver kilometres have decreased, because the driver's no longer driver every day to the waste receiving entity.

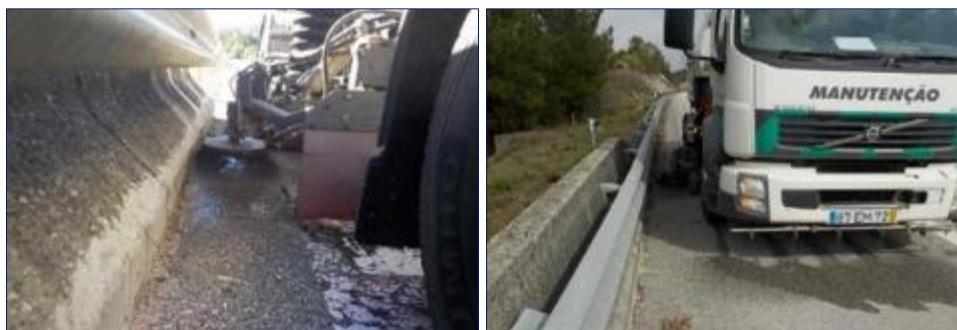


FIGURE 59 - MOTORWAY CLEANING WITH SWEEPER

45 - LOW-COST RENOVATION OF TRAFFIC CONTROL ROOM

45.1 - Status

This project is in the stage of Production Implementation.

45.2 - Description

To enhance the operational environment and boost efficiency, a low-cost renovation was undertaken at A24 Traffic Control Room. The primary focus of this renovation was the painting of the videowall walls. By choosing a fresh and modern colour scheme, the room was able to create a more visually appealing and stimulating workspace for the operators.

The new colour palette was carefully selected to reduce eye strain and improve concentration levels, facilitating better. This budget-friendly upgrade not only revitalized the control room's appearance but also contributed to a more productive and positive atmosphere for the staff.

Overall, this cost-effective approach to renovation demonstrated that significant improvements in workplace environments could be achieved without extensive financial investment. The painted videowall walls now serve as a testament to the power of simple yet impactful changes in enhancing operational efficiency and employee well-being.



FIGURE 60 – LOW-COST RENOVATION OF TRAFFIC CONTROL ROOM

ANNEX I – table of projects

THEME / PROJECT	ORDER	OBSERVATIONS	STAGE
EROP D-TECH	2	Updated	Production Implementation
ADMINISTRATIVE AND HUMAN RESOURCES APP	3	Updated	Production Implementation
APP TO PERFORM SURVEYS	4	Updated	Production Implementation
INNOVATION GROUP	5	No update	Production Implementation
INNOVATION CONTEST	6	No update	Production Implementation
PATROLLING OPTIMIZATION	7	No update	Production Implementation
EASY TEMPORARY SIGNS NEXT TO TUNNELS	8	No update	Concept Analysis
EASY TEMPORARY SIGNALIZATION	9	No update	Production Implementation
ANIMAL DETERRENTS	10	No update	Production Implementation
ROAD SAFETY CAMPAIGNS	11	Updated	Production Implementation
WINTER MAINTENANCE FORUM	12	Updated	Production Implementation
SELL SALT TO STAKEHOLDERS	13	No update	Production Implementation
AID IN EMERGENCY ESCAPE LANES	14	Still in concept analysis No update	Concept Analysis
LOCAL AREA NETWORK (LAN) THROUGH A24 MOTORWAY	15	Finished	Production Implementation
LED LIGHTING IN A24 TUNNELS	16	Updated	Solution Development
PHOTOVOLTAIC PROJECTS (A24 O&M BUILDINGS AND TUNNELS)	17	Finished	Production Implementation
PHOTOVOLTAIC PROJECTS – OUTSIDE THE A24 MOTORWAY (VALORPLANETÁRIO)	18	Finished	Production Implementation
USE OF LIGHTER VEHICLES TO PERFORM MAINTENANCE	19	No update	Production Implementation
ELECTRIFY THE FLEET	20	Updated	Production Implementation
ELECTRICAL VEHICLES CHARGERS AT O&M FACILITIES	21	Finished	Production Implementation
PERFORM WORKS OUTSIDE THE MOTORWAY TAKING ADVANTAGE OF EXISTING EQUIPMENT	22	Updated	Production Implementation
INTERNALIZE WORKS RELATED TO ACCIDENTS	23	Updated	Production Implementation
EASY BURNT PAVEMENT REPAIR	24	No update	Production Implementation
EASY ROAD MARKING REPAIR	25	No update	Production Implementation
EASY CONCRETE REPAIR	26	No update	Production Implementation
OPTIMIZATION OF GREEN MAINTENANCE IN THE CENTRAL RESERVE	27	No update	Solution Development
INSPECTION WITH DRONES	28	No update	Production Implementation
INFRASTRUCTURE MONITORING WITH SATELLITE DATA	29	Updated	Production Implementation
VEGETATION MONITORING WITH SATELLITE DATA	30	Updated	Production Implementation
STOCK MANAGEMENT	31	No update	Production Implementation

THEME / PROJECT	ORDER	OBSERVATIONS	STAGE
FINANCIAL SUPPORT (SIFIDE)	32	Updated	Production Implementation
OHS ONLINE TRAINING TO SUBCONTRACTORS	33	No update	Production Implementation
OHS GROUP – SAFETY CORE	34	Updated	Production Implementation
WORK ALONE APP	35	Updated	Production Implementation
PREDICT, PREVENT AND REDUCE THE OCCURRENCE OF ROAD ACCIDENTS WITH WORKERS	36	Finished	Canceled
SAFETY FOOTWEAR	37	No update	Production Implementation
PARKING IN REVERSE	38	No update	Production Implementation
ECODRIVING	39	Updated	Production Implementation
FLEX BOLLARDS LED	40	No update	Production Implementation
PLANTING OF GROUND COVER SPECIES	41	No update	Production Implementation
BOTTLES FOR WORKERS AND FILTERED WATER IN BUILDINGS	42	No update	Production Implementation
WASTE VALORIZATION	43	No update	Idea Generation
CONTAINER FOR WASTE IN O&M CENTERS	44	No update	Production Implementation
LOW-COST RENOVATION OF TRAFFIC CONTROL ROOM	45	New	Production Implementation
AID IN INTERCHANGES	-	Canceled	Canceled
MONITORING THE A24 MOTORWAY WITH AI	-	Canceled	Canceled

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