Improved Robotic Platform to perform Maintenance and Upgrading Roadworks: The HERON Approach

Grant Agreement Number: 955356

D2.3: Geographic data and services inventory

Work package	WP2: End-Users Requirements, Metrics and System Design
Activity	Task 2.3: Geographic Data and Services inventorying and Open Data repositories gathering
Deliverable	D2.3: Geographic data and services inventory
Authors	Carlos Martin-Portugues Montoliu, Yannis Handanos, Franziska Schmidt, Mezgeen Rasol, Iason Katsamenis, Anastasios Doulamis, Dimitris Kalogeras
Status	Final (F)
Version	1.0
Dissemination Level	Public (PU)
Document date	29/06/2022
Delivery due date	31/05/2022
Actual delivery date	29/06/2022
Internal Reviewers	Eftychios Protopapadakis (ICCS), Nikolaos Doulamis (ICCS)
	This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement no 955356.

Document Control Sheet

Version history table			
Version	**Date**	**Modification reason**	**Modifier**
0.1	01/04/2022	Initial Table of Contents and basic structure of the deliverable	Iason Katsamenis
0.2	26/05/2022	OLO: Dataset Categories	Yannis Handanos
0.3	30/05/2022	Transpolis: Dataset Categories	Franziska Schmidt
0.4	30/05/2022	Dataset Sources and Services & Data Management Applications & Conlusions	Iason Katsamenis
0.5	20/06/2022	Transpolis: Dataset Categories update	Franziska Schmidt
0.6	27/06/2022	ACCI: Dataset Categories	Carlos Martin-Portugues Montoliu
1.0	29/06/2022	Final version ready for submission	Anastasios Doulamis

Legal Disclaimer

Table of Contents

List of Tables

List of Figures

Abbreviation Lists

Table 1: Abbreviations

Abbreviation	Definition
CC	Climate Change
CCTV	Closed-Circuit Television
CUD	Chaussée Urbaine Démontable (Demountable Urban Roadway)
DWF	Design Web Format
ITS	Intelligent Transportation System
RGB	Red, Green, and Blue
RI	Road Infrastructure
RT	Real-time
RUP	Removable Urban Pavement
UAV	Unmanned Aerial Vehicle
UGV	Unmanned Ground Vehicle
WP	Work Package

Table 2: Abbreviations of the Partners' names

Short name	Participant organization name
ICCS	Institute of Communications and Computer Systems
ACCI	Acciona Construcción S.A.
OLO	Olympia Odos Operation S.A.
UGE	Université Gustave Eiffel
ETHZ	Eidgenössische Technische Hochschule Zürich
ROB	Robotnik Automation
CORTE	Confederation of Organisations in Road Transport Enforcement
STWS	SATWAYS - Proionta Kai Ypiresies Tilematikis Diktyakon Kai Tilepikinoniakon Efarmogon Etairia Periorismenis Efthinis EPE
RISA	RisaSicherheitsanalysen Gmbh
INAC	InnovActs
IKH	Ainoouchaou Pliroforiki SA -IKnowHow-
RG	Resilience Guard Gmbh

Executive Summary

This deliverable is written in the framework of WP2 – End-Users Requirements, Metrics and System Design of the HERON project under Grant Agreement No. 955356. Deliverable 2.3, namely "Geographic data and services inventory" aims to provide all the necessary and available data which are needed for the realization of the HERON project. To this end, this document reports on the availability and specifications of various types of data, such as geometry, geotechnical, road-related, land use, temperature, climate, meteorological as well as risks and hazards data. This is going to be accomplished by making a list for all the aforementioned data categories, which summarizes the provided information by the HERON stakeholders. Thereby, the document presents the already collected datasets, as well as the information that could potentially be gathered or is still pending. This report illustrates the outcomes of Task 2.3, titled: "Geographic Data and Services inventorying and Open Data repositories gathering" corresponding to M5-M12 of the HERON project's period.

1 Introduction

1.1 Purpose of the Document

This document contains deliverable D2.3 “Geographic data and services inventory”. More specifically D2.3 is the last deliverable within WP2, namely “End-Users Requirements, Metrics and System Design” of the HERON project and it is a compilation of the work that was completed in the framework of Task 2.3 “Geographic Data and Services inventorying and Open Data repositories gathering”.

The objective of this task is to record all the available geographic and other data and services relevant to the demonstration sites, based on the requirements gathered via consultation with the users from the previous Task 2.1 “User Requirements, definition of the Use Cases and KPIs”. For each pilot case, a survey has been conducted on the existing data and services, searching in similar current or past projects, as well as in relevant research institutions, universities, public bodies, cooperatives, and private enterprises. Inventorying will tackle data and services based on either remote-sensing techniques or onsite measurements. It will address all relevant data and services, both historical and RT. Special consideration will be given to open data sources and repositories, accessible through related initiatives. Inventorying will be detailed and accurate, exploiting high-quality, efficient GIS applications and products, as well as other database management software.

The main objective of the current report is to record all data sources and services that will be necessary during the following phases of the HERON project. The available files and the files to be gathered in a specific timeframe are going to be part of this report. It is underlined that an additional main goal is to provide all materials needed to the corresponding HERON partners, in order to efficiently implement their respective technical deliverables.

The remainder of this document is organized as follows: Initially, Section 2 discusses the dataset categories and demonstrates all the data sources and services relevant to the demonstration sites that will be needed during the following phases of the project. Subsequently, Section 3 presents the dataset sources and services as well as the data management applications. Lastly, Section 4 concludes this deliverable report.

1.2 Intended Audience

The specific deliverable report is public and therefore can be accessed by any interested stakeholder, Members of the Consortium, and the Commission Services. It is emphasized that this is of exceptional interest to the end-users too, who are road agencies involved in the operation and management of the road infrastructures (RI). This is mainly due to the fact that the HERON platform can be utilized for educational objectives and various other requirements. The collection of the specific data as well as adapting the ITS products to real-life world needs is also one of the substantial tasks of the ITS industry.

2 Dataset Categories

Given the general scope and precise requirements of the HERON project, specifications have to be set for four areas of interest. It is noted that each of these includes a dataset category for which meticulous data collection is crucial, and to this end, in the following sections, a table is created which summarizes all the required data information. In particular, within this framework, the categories for which data details will be demonstrated in the subsections below (see Sections 2.1-2.4) are:

- Geometry and status of the asset data
- Road-related data
- Temperature distribution data
- Risks and hazards data

For each pilot case, i.e, (i) Spanish (Acciona) pilot (ACCI), (ii) French (Transpolis) pilot (UGE), and (iii) Greek (Olympia Odos) pilot (OLO), a survey, which is presented in the following subsections, has been conducted on the existing data and services, searching in similar current or past projects, as well as in relevant research institutions, universities, public bodies, cooperatives, and private enterprises.

2.1 Geometry and status of the asset data

The road network topology may provide further insights regarding the type and the appearance frequency of various defect types (e.g., potholes and cracks). As such, searching existing datasets may result in knowledge extraction, capable to serve the project's cause. An example of data appropriate for this work, that contains precise 2D and 3D topological and geometry characteristics of the road infrastructures, is summarized in the following table below. Furthermore, the ability to effectively examine, assess, recognize, and update the current status of land use in the various areas of interest is directly connected with the inspection and maintenance procedures of the road infrastructure in question. To this end, the availability of the data that are presented in Table 3 can be considered critical.

Table 3: Geometry and status of the asset data.

Data identification and availability	**Geometry and status of the asset data specifications/description**
Dataset description	• Road infrastructure geometric characteristics, including inventory, design, and location of the road infrastructures, ditches, slopes, transverse drainage works, road signs, road sections, tunnels, and bridges. • Land cover/use status for the year 2018 (OLO)
Sources	• As-built final design and signing studies are available in the technical departments of the pilot partners. • Corine Land Cover 2018 (Κάλυψη γης - Corine Land Cover 2018 — ΥΠΕΝ - Γεωχωρικές Πληροφορίες & Χάρτες (ypen.gr), Copernicus (CLC 2018 — Copernicus Land Monitoring Service), Environmental Impact Studies (EIS) of the Project (OLO).
Files format	DWF, XLSX, XLS, HEMAV, MPEG, MP4, PDF, PNG, JPG, GeoTiff (Raster), ESRI Geodatabase (SHP) (Vector), SQLite Database (Vector),
Data available for the Spanish pilot (Acciona Construction)	
Design Web Format (DWF) files	*Design Web Format (.dwf) files* that concern the following road-related subjects (indicatively) are available at the Technical Department: Road geometrical Design, Architectural Works, Hydraulic, Planting, Signing, Safety barriers, steel structures, Safety Design, Bridges, Culverts, etc. E.g: • Text Height.dwg (Drawing of points topologically defined in two • dimensions (x and y coordinates of each point • specified). The third dimension, corresponding to the points' altitude, is inferred in text format over each point.) • UTM coordinates Spanish road layout.dwg • Xplanta OPE pk 62-75 & 97.5-139.5.dwg

	• Xplanta OPE pk 75-97.5.dwg • Xplanta grouped road section_62_139.5_Spain.dwg • Xtopo.dwg (drawing that contains a grid of points juxtaposed with the road's geometric outline and topographic terrain contours. Included are fence, side road as well as neighboring vegetation, pipeline, and other boundaries)
Document (XLSX, XLS) files	*Excel document (.xlsx, .xls) files* containing historic and actual data on the status of the road, incidents, and maintenance operations. E.g.: • Road Surface Irregularities: C1L1_IRI_10_m_EN/ES.xlsx C1L2_IRI_10_m_EN/ES.xlsx C2L3_IRI_10_m_EN/ES.xlsx C2L4_IRI_10_m_EN/ES.xlsx • Cracks and wear of the A2 section: Cracking measurements_A2T2_I-6_20181217_ENG.xlsx • Incidents: Accidents_active filters_ 2018-11-28_ES_EN.xlsx
Image and video (HEMAV, MPEG, MP4, and JPG) files depicting features and defects of the motorway/infrastructure.	*Image and video (.hemav, .mpeg, .mp4, and .jpg) files* of the 77,5km of road section maintained by A2 Sociedad Concesionaria linked to the inventory and incidents and maintenance data
Data available for the French pilot (Université Gustave Eiffel)	
Document (PDF) files, for Transpolis	*Document (PDF and Autocad) files* giving the precise layout of the roads, the geometry, and the already installed equipment (in terms of sensors, safety barriers, etc.).
Images (JPG) files, for CUD elements	*Database of 134 images* (JPG) files, which shows the various possible damage states of the RUP elements.
There are currently **no images or video files depicting features and defects of Transpolis**: indeed, the road surfaces of this test site are always in mint condition. Within the HERON project, defects may be created and documented with images.	
Data available for the Greek pilot (Olympia Odos)	
Design Web Format (DWF) files	*Design Web Format (.dwf) files* that concern the following road-related subjects (indicatively) are available at the Technical Department: Road geometrical Design, Architectural Works, Hydraulic, Planting, Signing, Safety barriers, steel structures, Safety Design, Bridges, Culverts, etc.
Image and video files depicting features and defects of the motorway/infrastructure.	*Image (e.g., .png and .jpg) and various video files* of the road every 100m. in software Picassa, covering all 202Km of the road, each direction separately.

GeoTiff (Raster), ESRI Geodatabase (SHP) (Vector), SQLite Database (Vector), and Document (PDF)	*11 files (maps)* containing land use details covering the length of 202 km of the road
Standards	
Metadata	End-users data is stored in control centers and/or open databases. The datasets can be shared with HERON partners upon request.
Format and estimated size of the data	The format, as well as the size of the data, depends on the file category. Indicatively: - Design Web Format: some MB - Images: some MB - Video: some GB - Documents: some MB - Spreadsheets: some MB - SHP: 72.7 MB - GeoTiff: 23 MB
Activities and responsibilities of the HERON partners	
Owner of the data & copyright holder	ACCI, OLO, UGE
Partner responsible for data collection	ACCI, OLO, UGE
Partner responsible for data analysis	ICCS, IKH, ETHZ, ROB, STWS
Partner responsible for data storage	ACCI, OLO, UGE
Partner responsible for data backup	ACCI, OLO, UGE
Related WP(s)	WP3, WP4, WP5, WP6
Exploitation and sharing of the data	
Data exploitation	Necessary for the: - Models of the road infrastructure under study. - Vulnerability and risk analysis information. - Motion planning. - 3D mapping and autonomous navigation. - Augmented reality components.
Data access policy - Dissemination level (Public or Confidential)	*Confidential* (only for members of the HERON Consortium and Commission Services).
Data sharing, reuse, distribution, publication	Dissemination of the aforementioned data must always be authorized by ACCI/OLO/UGE. Notice of any scheduled publication will be given to ACCI/OLO/UGE at least 45 calendar days before the publication. The use of confidential information for any other purpose is considered a violation of this Agreement.
Archiving and preservation of the data	
Data storage and backup	At the ACCI, OLO, and UGE control centers, for the duration of the concession contract.

The following figures below are indicative samples of the available geometry and status of the asset data. In particular, initially, Figure 1 demonstrates an indicative layout plan of a small section of A2 including information on signaling, geometry, etc. Furthermore, Figure 2 presents an indicative photograph of A2, whereas Figure 3 shows an example of a road link geometry. In Figure 4 a detailed map of the Transpolis layout (e.g., roads, geometry, and

equipment) is depicted. In parallel, Figure 5 presents a set of RGB images with various possible damage states of the RUP elements. Lastly, Figure 6 illustrates a layout plan of Olympia Odos whereas Figure 7 shows a photographic sample with an indicative part of Olympia Odos. Also, Figure 8 demonstrates an indicative map sample of the land use data of the 1st part of the Korinthos – Patra Section, of Olympia Odos. Such data present the variation regarding the land use of the areas where the case studies are located.

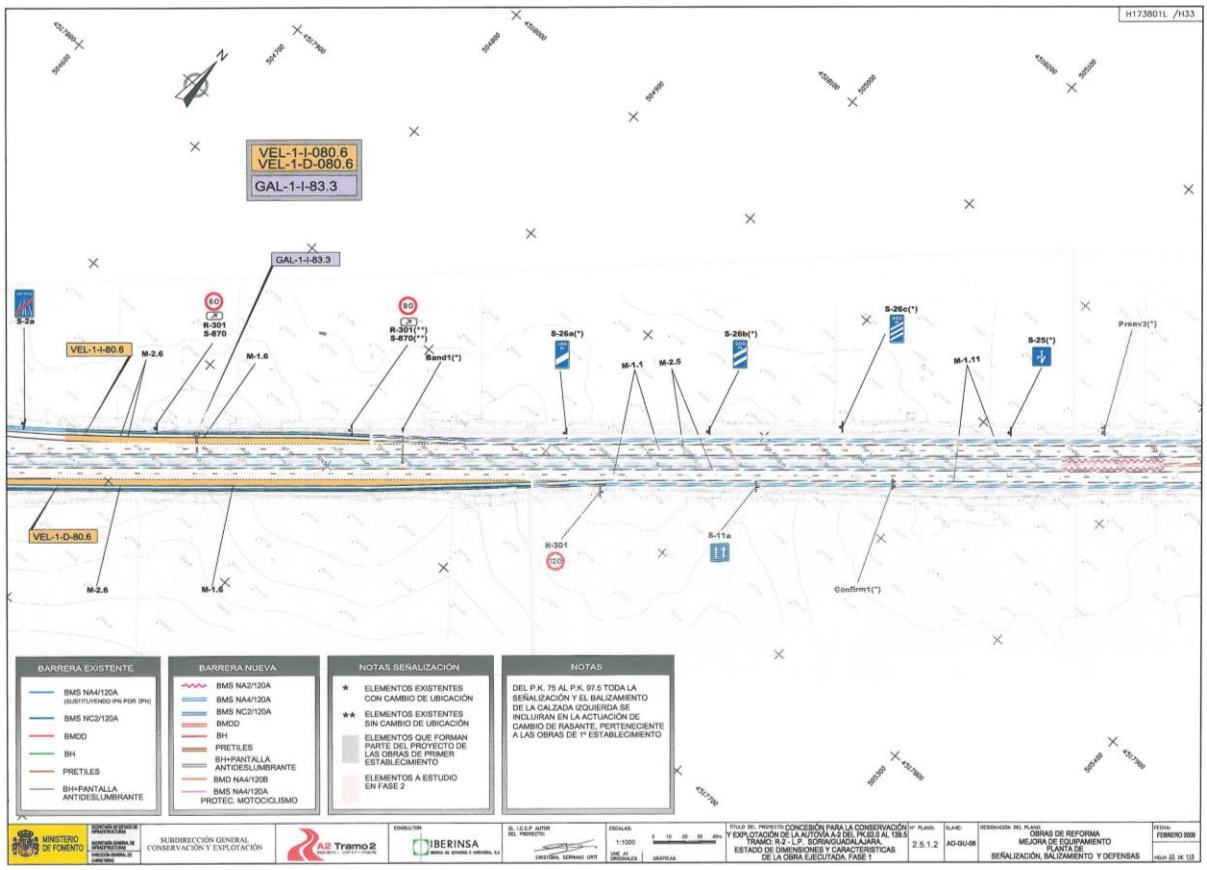


Figure 1: Indicative layout plan of a small section of A2 including information on signalling, geometry, etc.

Figure 2: Indicative photo of A2.

Figure 3: Example of a road link geometry.

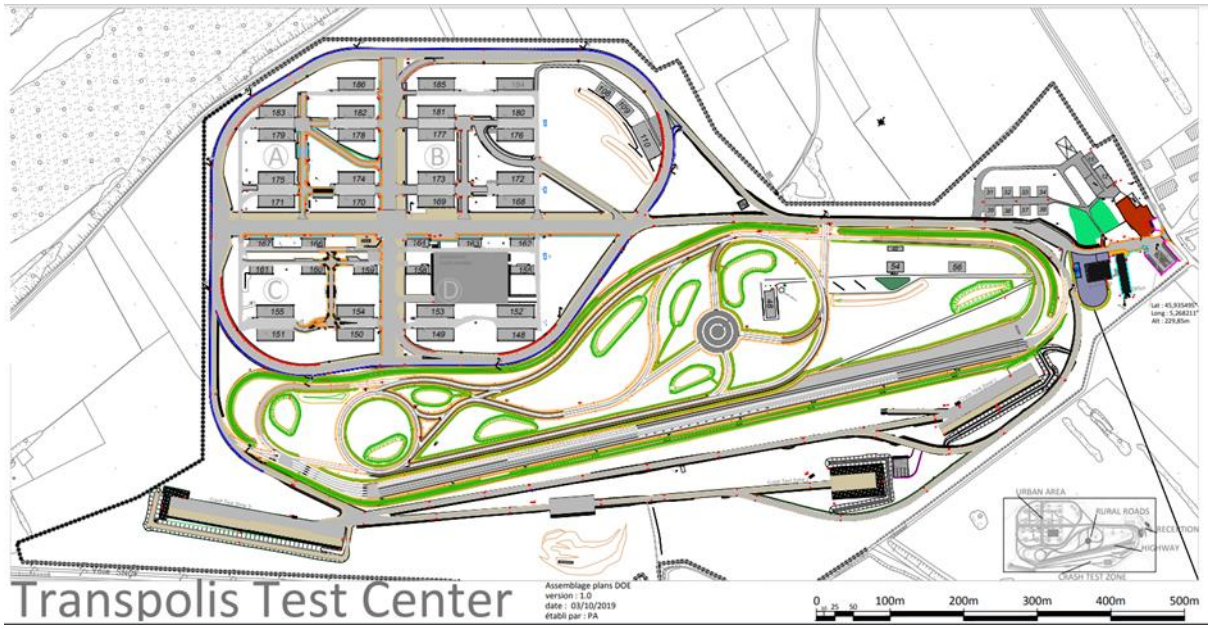


Figure 4: Indicative layout plan of Transpolis.

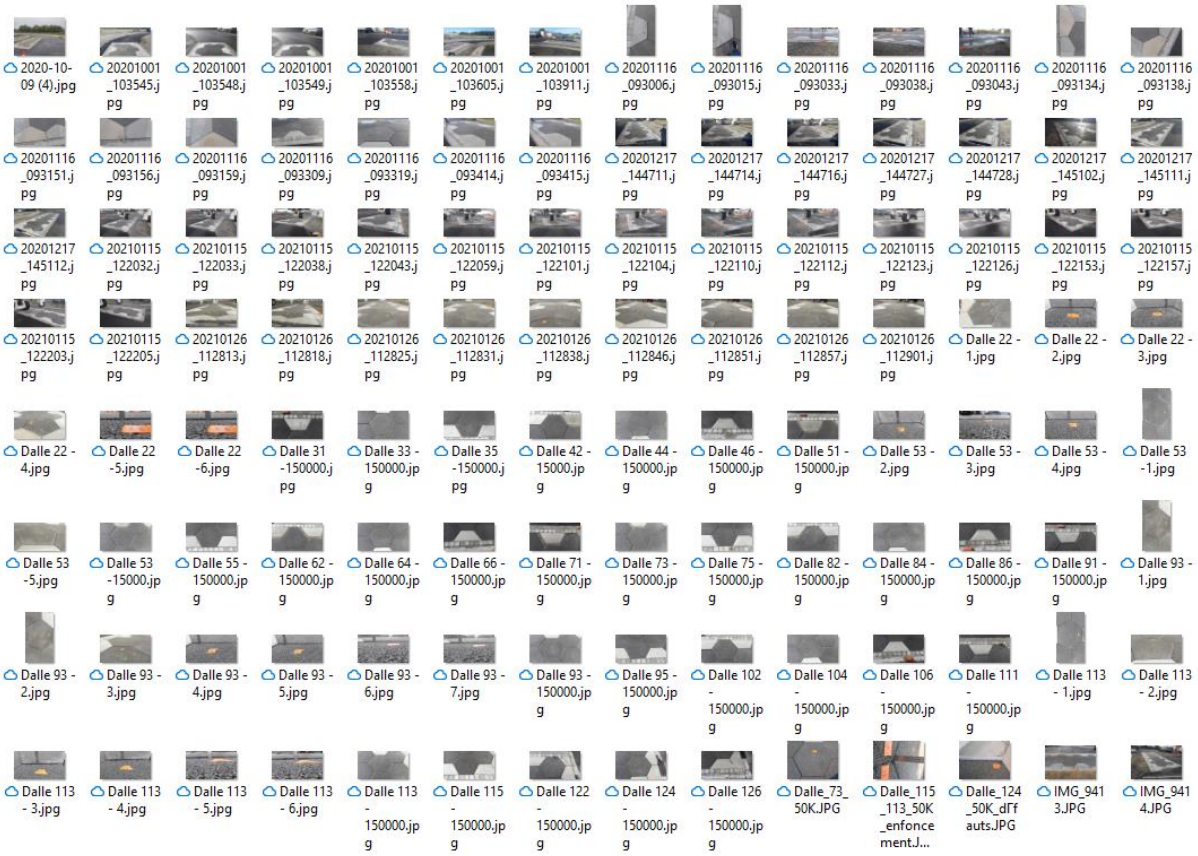


Figure 5: Indicative set of images from RUP experiments.

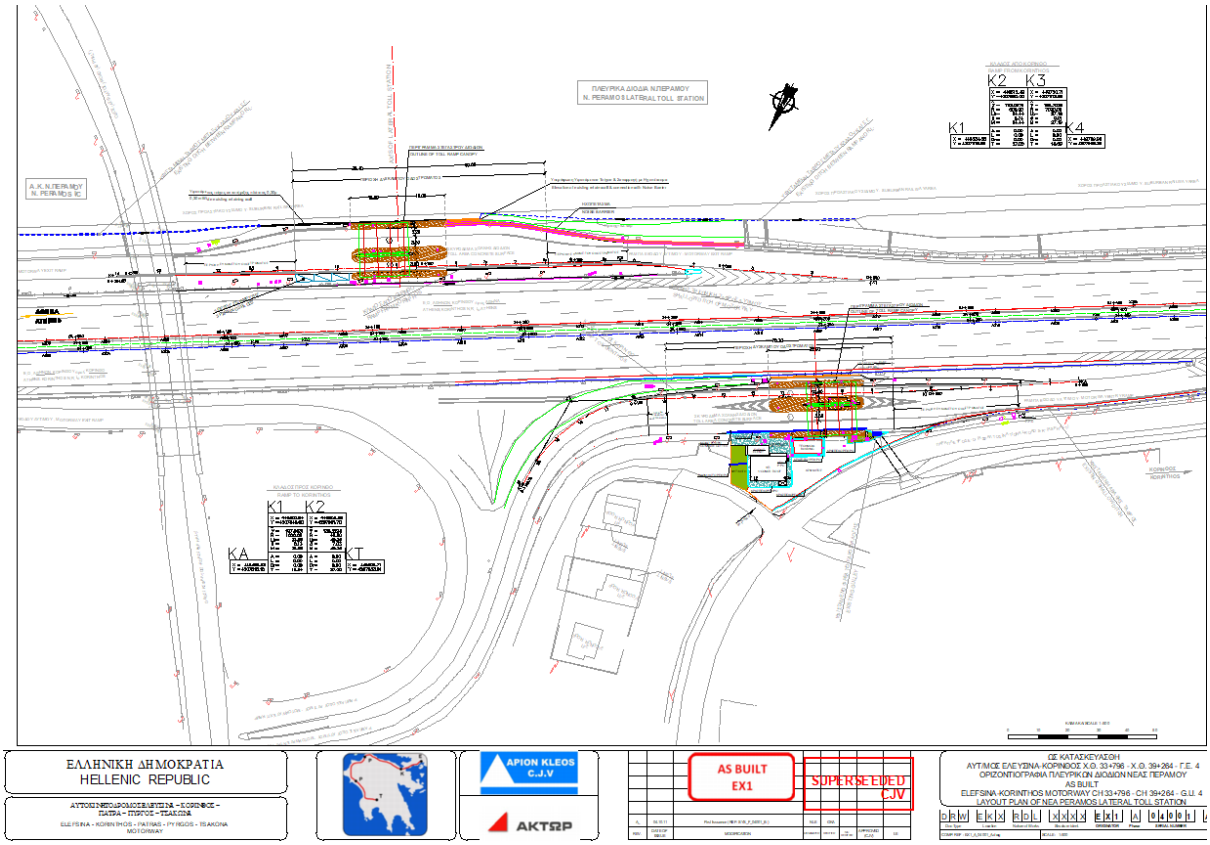


Figure 6: Indicative layout plan of Nea Peramos lateral toll station of Olympia Odos.

Figure 7: Indicative photo of Olympia Odos.

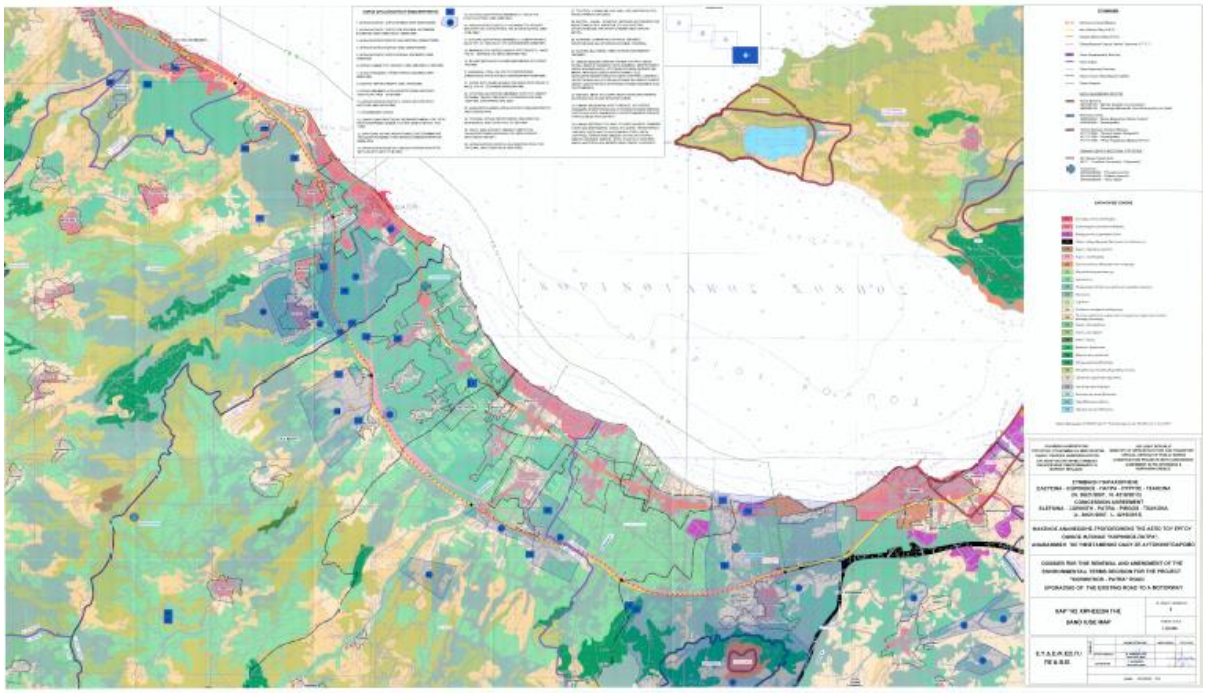


Figure 8: Indicative land use map of Olympia Odos (1st part of Korinthos – Patra Section).

2.2 Road-related data

Knowing the exact location of the various road elements and assets is crucial to having a clear picture of the current conditions of the road infrastructure and of the safety elements in the asset, as well as monitoring possible future needs, identifying missing and/or damaged elements such as signals, fences, bollards, information panels, etc. It is also noted that the realistic simulation of the road conditions that will yield precise and thus reliable outputs depends on this information and knowledge. In this context, the availability of the following data (see Table 4) can be considered crucial.

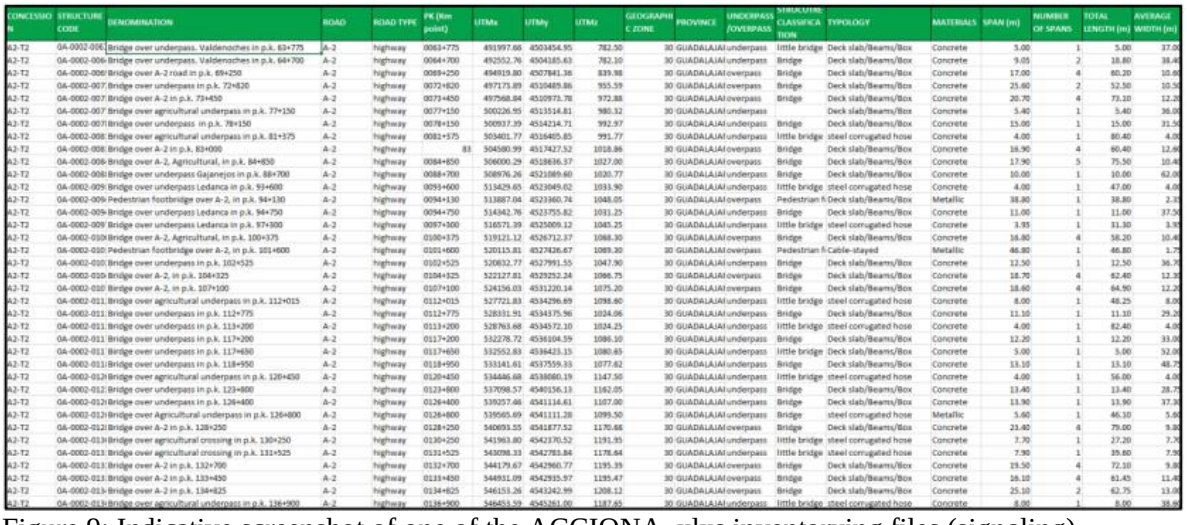
Table 4: Road-related data.

Data identification and availability	**Road-related data specifications/description**
Dataset description	• Inventory of road assets. • For the routine maintenance activities of Olympia Odos Motorway, the Operator has developed a customized software application (i-maint), which includes all assets of the road.
Sources	ACCI, OLO, and UGE databases
Files format	XLSX, PDF, PNG, MPEG, MP4, and JPG
Data available for the Spanish pilot (Acciona Construction)	
Spreadsheet (XLSX) and/or Document (PDF) files containing the inventory of road assets: Assets of all categories may be extracted as XLSX or PDF files	*Excel document (.xlsx) files* including inventory data for the whole asset and complementary elements (safety elements, signaling, etc.). E.g.: • Inventory Ditch Platform.xlsx • Inventory road elements_170209.xlsx • Inventory road sections.xlsx • Inventory slopes.xlsx • Inventory structures July 2016.xlsx • Inventory road signs.xlsx • Inventory transverse drainage works 170209.xlsx
Image and video (*PNG, MPEG, MP4, and JPG)* files from the CCTV	*Image and video (.png, .mpeg, .mp4, and .jpg) files* that can be extracted from the CCTV counting on the permission from the relevant traffic authority in case of incidents, accidents, or safety-linked issues.
Data available for the French pilot (Université Gustave Eiffel)	
Document (PDF) files, for Transpolis	*Document* (PDF) files giving the geotechnical elements about the testing site: • General document about the geotechnical study and diagnostic of the existing roadways, • The appendices of this report are the testing that has been done: map of the geotechnical investigations, identification tests, pressuremeter tests, Penetrometric surveys, and load descriptions.
Road-related data, in terms of inventory of assets and road equipment, **are not available for the Transpolis pilot**. Indeed, as it is a test site, pavements, equipment (like safety barriers, noise barriers, lighting poles, etc.), and horizontal/vertical signs are often modified for testing purposes. Within the	

HERON project, the needs for Transpolis are being described, and the test site will be arranged accordingly.	
Data available for the Greek pilot (Olympia Odos)	
Spreadsheet (XLSX) and/or Document (PDF) files containing the inventory of road assets: Assets of all categories may be extracted as XLSX or PDF files	Civil Works Road Assets are categorized under the following codes. BLD - Building FLT - Flametraps FNC - Fencing GRN - Green HSIGN - Horizontal signing NB - Noise Barriers PAV - Pavements Fexible pavements Rigid pavements RPS - Rockfall Protection Systems SB - Safety Barriers Metallic Safety Barriers Energy absorbers Emergency openings Concrete Safety Barriers Plastic Safety Barriers SD - Sewage Drainage Sewage Drainage Open Road Sewage Drainage Tunnels Sewage Drainage Culverts STR - Structures Bridges Joints Retaining Walls Culverts TCCLC - Tunnels, C+C, Lane Covers Tunnels και C+C Lane Covers TS - Toll Station Toll station Canopy Lane VSIGN - Vertical signing Gantries/Cantilevers Verical Signing
Standards	
Metadata	End-users data is stored in control centers and/or open databases. The datasets can be shared with HERON partners upon request.
Format and estimated size of the data	The format, as well as the size of the data, depends on the file category. Indicatively: - Documents: some KB - Spreadsheets: some MB - Images: some MB - Videos: some GB
Activities and responsibilities of the HERON partners	
Owner of the data & copyright holder	ACCI, OLO, UGE

Partner responsible for data collection	ACCI, OLO, UGE
Partner responsible for data analysis	ICCS, IKH, ETHZ, ROB, STWS
Partner responsible for data storage	ACCI, OLO, UGE
Partner responsible for data backup	ACCI, OLO, UGE
Related WP(s)	WP3, WP4, WP5, WP6
Exploitation and sharing of the data	
Data exploitation	Necessary for the: - Identification of the road assets along the road infrastructure. - Navigation support. - Manipulation actions. - Locating intervention areas. - Augmented reality components.
Data access policy - Dissemination level (Public or Confidential)	*Confidential* (only for members of the HERON Consortium and Commission Services).
Data sharing, reuse, distribution, publication	Dissemination of the aforementioned data must always be authorized by ACCI/OLO/UGE. Notice of any scheduled publication will be given to ACCI/OLO/UGE at least 45 calendar days before the publication. The use of confidential information for any other purpose is considered a violation of this Agreement.
Archiving and preservation of the data	
Data storage and backup	At the ACCI, OLO, and UGE control centers, for the duration of the concession contract.

Figure 9 constitutes an indicative analytical table containing the required format that all data of this category should follow. Emphasis should be placed on the detailed description of the various characteristics of road signs along the highway. It is noted that such elaborate work facilitates subsequent reporting and data analysis efforts.



CONCESSION	STRUCTURE CODE	DENOMINATION	ROAD	ROAD TYPE	PK (km point)	UTMx	UTMy	UTMz	GEOGRAPHIC ZONE	PROVINCE	UNDERPASS /OVERPASS	STRUCTURE CLASSIFICATION	TYPOLOGY	MATERIALS	SPAN (m)	NUMBER OF SPANS	TOTAL LENGTH (m)	AVERAGE WIDTH (m)
A2-T2	OA-0002-006	Bridge over underpass. Valdenoches in p.k. 63+775	A-2	highway	0063+775	491997.68	4503454.95	782.50	30	GUADALAJARA	underpass	little bridge	Deck slab/Beams/Box	Concrete	5.00	1	5.00	17.00
A2-T2	OA-0002-006	Bridge over underpass. Valdenoches in p.k. 64+700	A-2	highway	0064+700	492552.76	4504185.63	782.10	30	GUADALAJARA	underpass	Bridge	Deck slab/Beams/Box	Concrete	9.05	2	18.80	38.40
A2-T2	OA-0002-006	Bridge over A-2 road in p.k. 69+250	A-2	highway	0069+250	494919.80	4507841.36	839.98	30	GUADALAJARA	overpass	Bridge	Deck slab/Beams/Box	Concrete	17.00	4	80.20	10.60
A2-T2	OA-0002-007	Bridge over underpass in p.k. 72+820	A-2	highway	0072+820	497173.89	4510489.86	955.59	30	GUADALAJARA	overpass	Bridge	Deck slab/Beams/Box	Concrete	25.60	2	52.50	10.50
A2-T2	OA-0002-007	Bridge over A-2 in p.k. 73+450	A-2	highway	0073+450	497568.84	4510973.78	972.88	30	GUADALAJARA	overpass	Bridge	Deck slab/Beams/Box	Concrete	20.70	4	73.10	12.20
A2-T2	OA-0002-007	Bridge over agricultural underpass in p.k. 77+150	A-2	highway	0077+150	500226.95	4513514.81	980.32	30	GUADALAJARA	underpass		Deck slab/Beams/Box	Concrete	5.40	1	5.40	36.00
A2-T2	OA-0002-007	Bridge over underpass in p.k. 78+150	A-2	highway	0078+150	500937.39	4514214.71	992.97	30	GUADALAJARA	underpass	Bridge	Deck slab/Beams/Box	Concrete	15.00	1	15.00	31.50
A2-T2	OA-0002-008	Bridge over agricultural underpass in p.k. 81+575	A-2	highway	0081+575	503401.77	4516405.85	991.77	30	GUADALAJARA	underpass	little bridge	steel corrugated hose	Concrete	4.00	1	80.40	4.00
A2-T2	OA-0002-008	Bridge over A-2 in p.k. 83+000	A-2	highway	83	504580.99	4517427.32	1018.86	30	GUADALAJARA	overpass	Bridge	Deck slab/Beams/Box	Concrete	16.90	4	60.40	12.60
A2-T2	OA-0002-008	Bridge over A-2, Agricultural, in p.k. 84+850	A-2	highway	0084+850	506000.29	4518636.37	1027.00	30	GUADALAJARA	overpass	Bridge	Deck slab/Beams/Box	Concrete	17.90	5	75.50	10.40
A2-T2	OA-0002-008	Bridge over underpass Gajanejos in p.k. 88+700	A-2	highway	0088+700	508976.26	4521089.60	1020.77	30	GUADALAJARA	underpass	Bridge	Deck slab/Beams/Box	Concrete	10.00	1	10.00	62.00
A2-T2	OA-0002-009	Bridge over underpass Ledanca in p.k. 93+600	A-2	highway	0093+600	513429.65	4523049.02	1033.90	30	GUADALAJARA	underpass	little bridge	steel corrugated hose	Concrete	4.00	1	47.00	4.00
A2-T2	OA-0002-009	Pedestrian footbridge over A-2, in p.k. 94+130	A-2	highway	0094+130	513887.04	4523360.74	1048.05	30	GUADALAJARA	overpass	Pedestrian fo	Deck slab/Beams/Box	Metallic	38.80	1	38.80	2.30
A2-T2	OA-0002-009	Bridge over underpass Ledanca in p.k. 94+750	A-2	highway	0094+750	514342.76	4523755.82	1031.25	30	GUADALAJARA	underpass	Bridge	Deck slab/Beams/Box	Concrete	11.00	1	11.00	37.50
A2-T2	OA-0002-009	Bridge over underpass Ledanca in p.k. 97+300	A-2	highway	0097+300	516571.39	4525009.12	1045.25	30	GUADALAJARA	underpass	little bridge	steel corrugated hose	Concrete	3.95	1	31.30	3.35
A2-T2	OA-0002-010	Bridge over A-2, Agricultural, in p.k. 100+375	A-2	highway	0100+375	519121.12	4526712.37	1068.30	30	GUADALAJARA	overpass	Bridge	Deck slab/Beams/Box	Concrete	16.80	4	58.20	10.40
A2-T2	OA-0002-010	Pedestrian footbridge over A-2, in p.k. 101+600	A-2	highway	0101+600	520115.81	4527426.67	1089.30	30	GUADALAJARA	overpass	Pedestrian fo	Cable-stayed	Metallic	46.80	1	46.80	1.75
A2-T2	OA-0002-010	Bridge over underpass in p.k. 102+525	A-2	highway	0102+525	520832.77	4527991.55	1047.90	30	GUADALAJARA	overpass	Bridge	Deck slab/Beams/Box	Concrete	12.50	1	12.50	36.70
A2-T2	OA-0002-010	Bridge over A-2, in p.k. 104+325	A-2	highway	0104+325	522127.81	4529252.24	1066.75	30	GUADALAJARA	overpass	Bridge	Deck slab/Beams/Box	Concrete	18.70	4	62.40	12.30
A2-T2	OA-0002-010	Bridge over A-2, in p.k. 107+100	A-2	highway	0107+100	524156.03	4531220.14	1075.20	30	GUADALAJARA	overpass	Bridge	Deck slab/Beams/Box	Concrete	18.60	4	64.90	12.20
A2-T2	OA-0002-011	Bridge over agricultural underpass in p.k. 112+015	A-2	highway	0112+015	527721.83	4534296.69	1098.60	30	GUADALAJARA	underpass	little bridge	steel corrugated hose	Concrete	8.00	1	48.25	8.00
A2-T2	OA-0002-011	Bridge over underpass in p.k. 112+775	A-2	highway	0112+775	528331.91	4534375.96	1024.06	30	GUADALAJARA	underpass	Bridge	Deck slab/Beams/Box	Concrete	11.10	1	11.10	29.20
A2-T2	OA-0002-011	Bridge over underpass in p.k. 113+200	A-2	highway	0113+200	528763.68	4534572.10	1024.25	30	GUADALAJARA	underpass	little bridge	steel corrugated hose	Concrete	4.00	1	82.40	4.00
A2-T2	OA-0002-011	Bridge over underpass in p.k. 117+200	A-2	highway	0117+200	532278.72	4536104.59	1086.10	30	GUADALAJARA	underpass	Bridge	Deck slab/Beams/Box	Concrete	12.20	1	12.20	33.00
A2-T2	OA-0002-011	Bridge over underpass in p.k. 117+650	A-2	highway	0117+650	532552.83	4536423.15	1080.45	30	GUADALAJARA	underpass	little bridge	Deck slab/Beams/Box	Concrete	5.00	1	5.00	32.00
A2-T2	OA-0002-011	Bridge over underpass in p.k. 118+950	A-2	highway	0118+950	533141.61	4537559.33	1077.62	30	GUADALAJARA	underpass	Bridge	Deck slab/Beams/Box	Concrete	13.10	1	13.10	48.75
A2-T2	OA-0002-012	Bridge over agricultural underpass in p.k. 120+450	A-2	highway	0120+450	534446.68	4538080.19	1147.50	30	GUADALAJARA	underpass	little bridge	steel corrugated hose	Concrete	4.00	1	56.00	4.00
A2-T2	OA-0002-012	Bridge over underpass in p.k. 123+800	A-2	highway	0123+800	537098.57	4540156.13	1162.05	30	GUADALAJARA	underpass	Bridge	Deck slab/Beams/Box	Concrete	13.40	1	13.40	28.75
A2-T2	OA-0002-012	Bridge over underpass in p.k. 126+400	A-2	highway	0126+400	539257.46	4541116.61	1107.00	30	GUADALAJARA	underpass	Bridge	Deck slab/Beams/Box	Concrete	13.90	1	13.90	37.30
A2-T2	OA-0002-012	Bridge over Agricultural underpass in p.k. 126+800	A-2	highway	0126+800	539565.69	4541111.28	1099.50	30	GUADALAJARA	underpass	Bridge	steel corrugated hose	Metallic	5.60	1	46.10	5.60
A2-T2	OA-0002-012	Bridge over A-2 in p.k. 128+250	A-2	highway	0128+250	540693.55	4541877.52	1170.68	30	GUADALAJARA	overpass	Bridge	Deck slab/Beams/Box	Concrete	23.40	4	79.00	9.80
A2-T2	OA-0002-013	Bridge over agricultural crossing in p.k. 130+250	A-2	highway	0130+250	541963.80	4542370.52	1191.95	30	GUADALAJARA	underpass	little bridge	steel corrugated hose	Concrete	7.70	1	27.20	7.70
A2-T2	OA-0002-013	Bridge over agricultural crossing in p.k. 131+525	A-2	highway	0131+525	543098.33	4542783.84	1178.64	30	GUADALAJARA	underpass	little bridge	steel corrugated hose	Concrete	7.90	1	35.60	7.90
A2-T2	OA-0002-013	Bridge over A-2 in p.k. 132+700	A-2	highway	0132+700	544179.67	4542960.77	1195.35	30	GUADALAJARA	overpass	Bridge	Deck slab/Beams/Box	Concrete	19.50	4	72.10	9.80
A2-T2	OA-0002-013	Bridge over A-2 in p.k. 133+430	A-2	highway	0133+430	544931.09	4542935.97	1195.47	30	GUADALAJARA	overpass	Bridge	Deck slab/Beams/Box	Concrete	16.10	4	61.45	11.40
A2-T2	OA-0002-013	Bridge over A-2 in p.k. 134+825	A-2	highway	0134+825	546153.26	4543242.99	1208.12	30	GUADALAJARA	overpass	Bridge	Deck slab/Beams/Box	Concrete	25.10	2	62.75	13.00
A2-T2	OA-0002-013	Bridge over agricultural underpass in p.k. 136+900	A-2	highway	0136+900	546453.59	4545261.00	1187.45	30	GUADALAJARA	underpass	little bridge	steel corrugated hose	Concrete	8.00	1	8.00	38.00

Figure 9: Indicative screenshot of one of the ACCIONA .xlxs inventorying files (signaling).

2.3 Climate and meteorological data

Given the idea of the rapidly changing climatic patterns and conditions, temperature fluctuation of both natural and human-made surfaces along the road infrastructure is considered a critical subject. Precise and effective monitoring of temperature and climate/meteorological data are therefore crucial in order to reduce the potential defects, as well as their extent, to the road infrastructure and will directly affect the flight conditions for the HERON UAV. To this end, the availability of the following data (see Table 5) can be considered critical.

Table 5: Climate and meteorological data.

Data identification and availability	**Climate and meteorological data specifications/description**
Dataset description	• Thermal profile of the road corridor. • Thermal characteristics per georeferenced zone along the road surface. • Six meteo stations are available along the motorway of Olympia Odos. Each one of them provides on-line data.
Sources	ACCI, OLO, and UGE databases
Files format	KMZ, PDF, XLSX
Data available for the Spanish pilot (Acciona Construction)	
KMZ files containing meteorological data from A2 meteorological stations.	*KMZ files* that characterize climate characteristics of various zones along the Spanish A2 Highway (pk 62-pk 139.5). E.g.: • A2Tramo2_RST.kmz • A2Tramo2_RST_improved version.kmz
Document and Spreadsheet (PDF, XLSX) files from mappings, measurement, and sensors (A2 meteorological stations and Panoptis sensors)	*Documents and spreadsheet (.pdf, .xlsx) files* containing information about snow, ice heavy rain, wind, hail, fog, temperatures, etc..periodically downloaded to have historic data of climate conditions at A2. E.g.: • Mapa térmico_A2Tramo2_EN.pdf • Thermal Mapping_MG-en.pdf
Data available for the French pilot (Université Gustave Eiffel)	
Spreadsheet (XLSX) files containing meteorological measurement stations details	*Spreadsheet (.xlsx) files* that contain the available meteo data (including temperature data), which can be extracted as xlsx files for all specified periods of time. In particular, Transpolis SAS has a weather station where there is a possibility to extract data over a given period of time.
Data available for the Greek pilot (Olympia Odos)	
Spreadsheet (XLSX) files containing meteorological measurement stations details: Meteo Elefsina.xlsx Meteo Kakia Skala.xlsx Meteo Anc Korinthos.xlsx Meteo Akrata.xlsx Meteo Panagopoula.xlsx Meteo Eglikada.xlsx	*Spreadsheet (.xlsx) files* that contain meteo data (including temperature data). The available data can be extracted as xlsx files for a specified period of time.

Standards	
Metadata	End-users data is stored in control centers and/or open databases. The datasets can be shared with HERON partners upon request.
Format and estimated size of the data	The format, as well as the size of the data, depends on the file category. Indicatively: - Maps: some MB - Documents: some KB - Spreadsheets: some MB
Activities and responsibilities of the HERON partners	
Owner of the data & copyright holder	ACCI, OLO, UGE
Partner responsible for data collection	ACCI, OLO, UGE
Partner responsible for data analysis	ICCS, IKH, ROB
Partner responsible for data storage	ACCI, OLO, UGE
Partner responsible for data backup	ACCI, OLO, UGE
Related WP(s)	WP3, WP5
Exploitation and sharing of the data	
Data exploitation	Necessary for the: - Safe flight conditions of the HERON UAV. - Effective maintenance process of the road infrastructure under study by the HERON UGV. - 3D mapping and autonomous navigation.
Data access policy - Dissemination level (Public or Confidential)	*Confidential* (only for members of the HERON Consortium and Commission Services).
Data sharing, reuse, distribution, publication	Dissemination of the aforementioned data must always be authorized by ACCI/OLO/UGE. Notice of any scheduled publication will be given to ACCI/OLO/UGE at least 45 calendar days before the publication. The use of confidential information for any other purpose is considered a violation of this Agreement.
Archiving and preservation of the data	
Data storage and backup	At the ACCI, OLO, and UGE control centers, for the duration of the concession contract.

Figure 10 is a view of a thermal map on a background provided by Google Earth. In particular, the color variation indicates temperature changes in a way that allows different temperature zones to be easily identified. Also, Figure 11 demonstrates a screenshot of the A2 asset management system showing three of the meteorological stations in the A2 section showing real-time data. In parallel, Figure 12 presents a screenshot of the A2 Panoptis platform showing real-time climate data of different sensors in the A2 section. Lastly, Figure 13 and Figure 14 present indicative available meteo and temperature data of Olympia Odos.

Figure 10: Thermal map of an A2 section.

Figure 11: Screenshot of the A2 asset management system showing three of the meteorological stations in the A2 section showing real-time data that can be downloaded as .pdf or .xlsx. files.

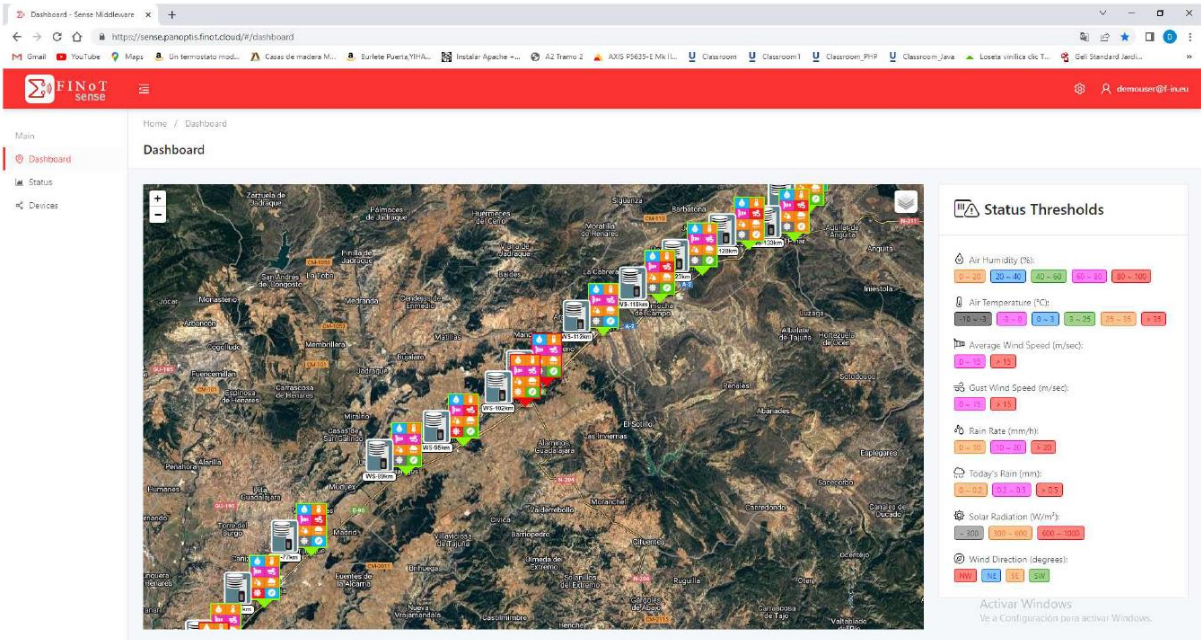


Figure 12: Screenshot of the A2 Panoptis platform showing real-time climate data of different sensors in the A2 section (data that can be downloaded as .pdf or .xlsx. files as well).

Date	Time	Surface Temperature °C	Subsurface Temperature 1 °C	Freeze Point °C	Water Depth μm	Saline Concentration %	Road Condition (NTCIP) [logic]	Visibility m	Ice Percentage %	Friction f	Air Temperature °C	Rel. Humidity %	Dew Point °C	Air Pressure (Rel) hPa	Precip Intensity mm/h	Precipitation Type [logic]	Wind Speed (peak) m/s	Wind Speed (avg) m/s	Wind Speed m/s	Precipitation Quantity l/m²	Wind Direction °
18/09/2020	00:00:00	27.60	28.90	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.10	1012.00	0.00	3.00	4.30	3.20	2.80	0.00	52.00
18/09/2020	00:01:00	27.60	28.90	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.10	1012.00	0.00	3.00	4.30	3.00	2.10	0.00	82.00
18/09/2020	00:02:00	27.50	28.90	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.10	1012.00	0.00	3.00	3.70	2.30	2.20	0.00	71.00
18/09/2020	00:03:00	27.50	28.90	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.10	1012.00	0.00	3.00	3.80	2.10	2.10	0.00	74.00
18/09/2020	00:04:00	27.50	28.90	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	23.90	83.00	21.00	1012.00	0.00	3.00	4.40	2.50	3.80	0.00	63.00
18/09/2020	00:05:00	27.50	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.10	1012.00	0.00	3.00	4.40	2.70	2.10	0.00	68.00
18/09/2020	00:06:00	27.50	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.10	1012.00	0.00	3.00	3.70	2.70	2.30	0.00	87.00
18/09/2020	00:07:00	27.50	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.10	1012.00	0.00	3.00	3.60	2.20	1.30	0.00	61.00
18/09/2020	00:08:00	27.40	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.10	1012.00	0.00	3.00	2.90	1.80	1.00	0.00	22.00
18/09/2020	00:09:00	27.40	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.10	1012.00	0.00	3.00	2.80	1.50	0.60	0.00	48.00
18/09/2020	00:10:00	27.40	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.10	1012.00	0.00	3.00	2.50	0.90	0.90	0.00	132.00
18/09/2020	00:11:00	27.40	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.10	1012.00	0.00	3.00	3.40	1.20	1.90	0.00	100.00
18/09/2020	00:12:00	27.50	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.00	1012.00	0.00	3.00	3.30	1.50	1.40	0.00	53.00
18/09/2020	00:13:00	27.50	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	23.90	83.00	21.00	1012.00	0.00	3.00	2.30	1.10	1.70	0.00	90.00
18/09/2020	00:14:00	27.50	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	23.90	83.00	21.00	1012.00	0.00	3.00	2.60	1.40	2.40	0.00	101.00
18/09/2020	00:15:00	27.50	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.00	1012.00	0.00	3.00	2.60	1.60	1.00	0.00	96.00
18/09/2020	00:16:00	27.50	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.00	1012.00	0.00	3.00	2.90	1.70	2.10	0.00	73.00
18/09/2020	00:17:00	27.50	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.00	1012.00	0.00	3.00	2.70	1.80	1.50	0.00	63.00
18/09/2020	00:18:00	27.50	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	20.90	1012.00	0.00	3.00	2.40	1.70	1.40	0.00	42.00
18/09/2020	00:19:00	27.50	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	20.90	1012.00	0.00	3.00	3.10	1.90	2.10	0.00	60.00
18/09/2020	00:20:00	27.50	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.00	1012.00	0.00	3.00	4.70	2.10	3.70	0.00	70.00
18/09/2020	00:21:00	27.50	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.00	1012.00	0.00	3.00	4.70	2.70	2.90	0.00	87.00
18/09/2020	00:22:00	27.40	28.80	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.00	83.00	21.10	1012.00	0.00	3.00	4.50	3.00	2.00	0.00	85.00
18/09/2020	00:23:00	27.40	28.70	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.10	83.00	21.20	1012.00	0.00	3.00	4.00	2.60	3.00	0.00	76.00
18/09/2020	00:24:00	27.40	28.70	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.10	83.00	21.20	1012.00	0.00	3.00	4.00	2.40	2.30	0.00	88.00
18/09/2020	00:25:00	27.40	28.70	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.20	83.00	21.20	1012.00	0.00	3.00	4.30	2.50	2.30	0.00	68.00
18/09/2020	00:26:00	27.40	28.70	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.20	83.00	21.30	1012.00	0.00	3.00	4.30	2.70	1.70	0.00	65.00
18/09/2020	00:27:00	27.40	28.70	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.10	84.00	21.20	1012.00	0.00	3.00	3.60	2.60	2.20	0.00	75.00
18/09/2020	00:28:00	27.40	28.70	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.10	84.00	21.20	1012.00	0.00	3.00	3.60	2.20	2.20	0.00	55.00
18/09/2020	00:29:00	27.30	28.70	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.10	84.00	21.20	1012.00	0.00	3.00	3.20	1.90	2.60	0.00	81.00
18/09/2020	00:30:00	27.30	28.70	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.10	84.00	21.30	1012.00	0.00	3.00	3.40	1.90	1.50	0.00	66.00
18/09/2020	00:31:00	27.30	28.70	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.10	84.00	21.30	1012.00	0.00	3.00	3.40	2.00	0.80	0.00	349.00
18/09/2020	00:32:00	27.30	28.60	-0.10	0.00	0.00	3.00	2000.00	0.00	0.82	24.10	84.00	21.30	1012.00	0.00	3.00	3.40	1.50	2.80	0.00	92.00

Figure 13: Example of detailed meteo extract file.

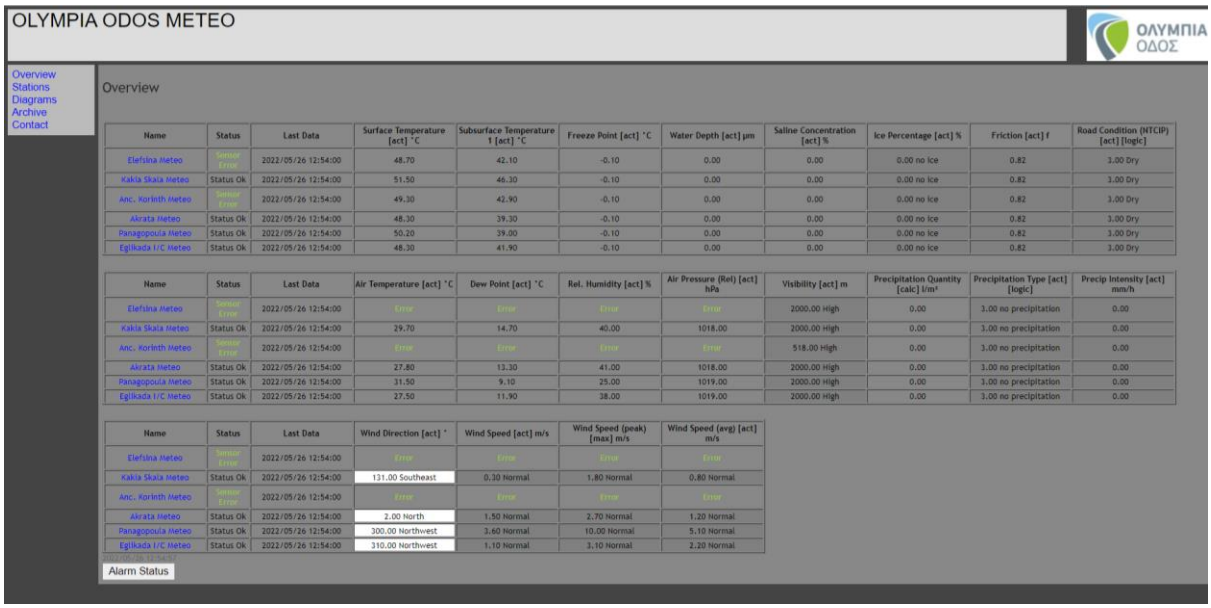


Figure 14: On-line available meteo data of Olympia Odos.

2.4 Risks and hazards data

Through the detailed analysis of the HERON's data, models that prognosticate critical phenomena, risks and hazards can be directly derived. This is feasible by considering existing data and services or future predictions regarding risks and hazards along the road infrastructures. An example of data appropriate for this work is summarized in the following table below.

Table 6: Risks and hazards data.

Data identification and availability	**Risks and hazards data specifications/description**
Dataset description	Road Accident Data as well as visual inspections of the road, organized in relevant databases
Sources	ACCI, OLO, and UGE databases
Files format	XLSX
Data available for the Spanish pilot (Acciona Construction)	
Spreadsheet (XLSX) files containing analysis of climatic change impact zones and effects.	Climatic change impact zones analysis. Includes information on zones sensitive to climate change, drainage capacity, potential hazards, risks, etc. E.g.: • Climate change_risk analysis_Spanish A2T2_ENG.xlsx • Risk assessment sheet 1-11.xlsx
Data available for the French pilot (Université Gustave Eiffel)	
Risks and hazards **are not available for the Transpolis pilot**. Indeed, Transpolis being a test site, the encountered hazards are supposed to be only those related to the testing (traffic loads and actions).	
Data available for the Greek pilot (Olympia Odos)	
Spreadsheet (XLSX) files containing specifications of the highway accidents: ELKO accidents.xlsx KOPA accidents.xlsx PbP accidents.xlsx	*Spreadsheet (.xlsx) files* that contain all accidents including both property damage only accidents and accidents with casualties which are recorded on the motorway
Spreadsheet (XLSX) files containing specifications of the road defects: Pavement settlement inventory.xlsx	*Spreadsheet (.xlsx) files* that contain detailed descriptions of defects all along the road.
Standards	
Metadata	End-users data is stored in control centers and/or open databases. The datasets can be shared with HERON partners upon request.
Format and estimated size of the data	The format, as well as the size of the data, depends on the file category. Indicatively: - Spreadsheets: some MB
Activities and responsibilities of the HERON partners	
Owner of the data & copyright holder	ACCI, OLO, UGE
Partner responsible for data collection	ACCI, OLO, UGE
Partner responsible for data analysis	ICCS, INAC

Partner responsible for data storage	ACCI, OLO, UGE
Partner responsible for data backup	ACCI, OLO, UGE
Related WP(s)	WP3, WP7
Exploitation and sharing of the data	
Data exploitation	Necessary for the: - Vulnerability and risk analysis information. - Deployment at the demonstration sites.
Data access policy - Dissemination level (Public or Confidential)	*Confidential* (only for members of the HERON Consortium and Commission Services).
Data sharing, reuse, distribution, publication	Dissemination of the aforementioned data must always be authorized by ACCI/OLO/UGE. Notice of any scheduled publication will be given to ACCI/OLO/UGE at least 45 calendar days before the publication. The use of confidential information for any other purpose is considered a violation of this Agreement.
Archiving and preservation of the data	
Data storage and backup	At the ACCI, OLO, and UGE control centers, for the duration of the concession contract.

Figure 15 shows indicative data samples associated with the risks and hazards category, and in particular, data associated with accidents and contain information related to the type of the accident, date, time, weather, illumination conditions, state of the road surface, detection source, category and number of vehicles, etc. Moreover, Figure 16 presents indicate information related to the descriptions of the various defects all along the Olympia Odos. More specifically the data include photographic samples and information regarding the location, traffic line, time, and type of the observed defects.

#	Φύλλο Συμβάντος	Τύπος Ατυχήματος	Ημ/νία Ανίχνευσης Συμβάντος	Ώρα Ανίχνευσης Συμβάντος	Κατεύθυνση	ΧΘ	Α/Κ	Κλάδος	Σήραγγα	ΣΔ	Καιρικές συνθήκες	Συνθήκες οδοστρώματος	Τεχνητός φωτισμός
5	6130	ΑΛΛΟ	18-Ιαν-09	10:52	Τ	42,5					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΦΩΤΙΣΜΟΣ ΗΜΕΡΑΣ
6	7031	ΑΝΑΤΡΟΠΗ ΣΤΗΝ ΟΔΟ	14-Φεβ-09	19:15	Ε	62,9					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΟΧΙ
7	7185	ΆΛΛΟ	20-Φεβ-09	13:35	Ε	81,7					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΦΩΤΙΣΜΟΣ ΗΜΕΡΑΣ
8	7755	ΚΑΡΑΜΠΟΛΑ>3 ΟΧΗΜΑΤΑ	08-Μαρ-09	23:00	Ε	43,2					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΟΧΙ
9	8067	ΣΤΑΘΜΕΥΜΕΝΟ ΟΧΗΜΑ	17-Μαρ-09	14:42	Τ	26,3					ΒΡΟΧΗ	ΒΡΕΓΜΕΝΟ	ΦΩΤΙΣΜΟΣ ΗΜΕΡΑΣ
10	8536	ΑΛΛΟ	31-Μαρ-09	22:14	Ε	34,7					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΟΧΙ
11	9180	ΑΛΛΟ	17-Απρ-09	04:07	Τ	75,9					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΝΑΙ
12	9668	ΑΛΛΟ	29-Απρ-09	19:12	Τ	82,5					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΝΑΙ
13	9933	ΑΛΛΟ	07-Μαϊ-09	23:40	Ε	82,8					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΟΧΙ
14	10033	ΑΛΛΟ	10-Μαϊ-09	20:30	Ε	26					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΟΧΙ
15	10537	ΑΛΛΟ	24-Μαϊ-09	14:28	Ε	35,9					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΟΧΙ
16	10549	ΚΑΡΑΜΠΟΛΑ>3 ΟΧΗΜΑΤΑ	24-Μαϊ-09	17:57	Ε	31,5					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΟΧΙ
17	11393	ΑΛΛΟ	11-Ιουν-09	18:20		33,7	3. Α.Κ. Ν. ΠΕΡΑΜΟΥ				ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΟΧΙ
18	11199	ΑΛΛΟ	08-Ιουν-09	04:29	Τ	30					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΝΑΙ
19	11254	ΑΛΛΟ	09-Ιουν-09	06:28	Ε	68,5					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΟΧΙ
20	11673	ΑΛΛΟ	18-Ιουν-09	03:48	Ε	29,3					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΝΑΙ
21	12247	ΠΑΡΑΣΥΡΣΗ ΠΕΖΟΥ	30-Ιουν-09	10:25	Τ	53,4					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΟΧΙ
22	12825	ΑΛΛΟ	12-Ιουλ-09	21:50	Ε	58,6					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΟΧΙ
23	12873	ΑΛΛΟ	13-Ιουλ-09	20:00	Ε	82,8					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΟΧΙ
24	13223	ΠΑΡΑΣΥΡΣΗ ΠΕΖΟΥ	22-Ιουλ-09	05:30	Ε	32,5					ΑΙΘΡΙΟΣ	ΚΑΝΟΝΙΚΕΣ	ΟΧΙ

#	Ελαφρά τραυματίες	Βαριά τραυματίες	Νεκροί	Αποτελέσματα	Πηγή Ανίχνευσης	ΑΛΛΟ	ΔΙΚΥΚΛΟ	ΙΧΕ	ΛΕΩΦΟΡΕΙΟ	ΜΕ	ΟΧΗΜΑ ΜΕ TRAILER/CARAVAN	ΦΟΡΤΗΓΟ	ΤΑΞΙ	ΦΟΡΤΗΓΟ ΜΕ ΕΠΙΚΙΝΔΥΝΟ ΦΟΡΤΙΟ	ΦΟΡΤΗΓΟ<2,5Τ	ΦΟΡΤΗΓΟ>2,5Τ
5			1	ΘΑΝΑΤΗΦΟΡΟ	ΆΛΛΗ		1									
6	1		1	ΘΑΝΑΤΗΦΟΡΟ	ΤΡΟΧΑΙΑ			1								
7	3		1	ΘΑΝΑΤΗΦΟΡΟ	ΤΡΟΧΑΙΑ			1								
8	8			ΕΛΑΦΡΥΣ ΤΡΑΥΜΑΤΙΣΜΟΣ	ΆΛΛΗ			13								
9			1	ΘΑΝΑΤΗΦΟΡΟ	ΥΠ-ΟΕ			1				1				
10			1	ΘΑΝΑΤΗΦΟΡΟ	ΆΛΛΗ		1					1				
11	3	1		ΒΑΡΥΣ ΤΡΑΥΜΑΤΙΣΜΟΣ	ΔΙΟΔΙΑ			1				1				
12	1			ΕΛΑΦΡΥΣ ΤΡΑΥΜΑΤΙΣΜΟΣ	ΥΠ-ΟΕ		1		1							
13	2			ΕΛΑΦΡΥΣ ΤΡΑΥΜΑΤΙΣΜΟΣ	ΔΙΟΔΙΑ			1				1				
14	1			ΕΛΑΦΡΥΣ ΤΡΑΥΜΑΤΙΣΜΟΣ	EXPRESS			1								
15	1			ΕΛΑΦΡΥΣ ΤΡΑΥΜΑΤΙΣΜΟΣ	EXPRESS		1	1								
16	2			ΕΛΑΦΡΥΣ ΤΡΑΥΜΑΤΙΣΜΟΣ	Άλλη		1	4								
17	1			ΕΛΑΦΡΥΣ ΤΡΑΥΜΑΤΙΣΜΟΣ	Άλλη		1	1								
18			2	ΘΑΝΑΤΗΦΟΡΟ	ΔΙΟΔΙΑ			1				1				
19	1	1		ΒΑΡΥΣ ΤΡΑΥΜΑΤΙΣΜΟΣ	Τροχαία			1								
20	1			ΕΛΑΦΡΥΣ ΤΡΑΥΜΑΤΙΣΜΟΣ	Τροχαία		1									
21	1			ΕΛΑΦΡΥΣ ΤΡΑΥΜΑΤΙΣΜΟΣ	ΥΠ/ΕΤ			1	1							
22	1			ΕΛΑΦΡΥΣ ΤΡΑΥΜΑΤΙΣΜΟΣ	Τροχαία		1									
23	2			ΕΛΑΦΡΥΣ ΤΡΑΥΜΑΤΙΣΜΟΣ	EXPRESS	1		1								
24	2		1	ΘΑΝΑΤΗΦΟΡΟ	Τροχαία			2								1

Figure 15: Example of ELKO accidents file.

Figure 16: Example of pavement settlement inventory of Olympia Odos.

3 Dataset Sources and Services & Data Management Applications

In an effort of organizing the sources from where the HERON's datasets were gathered, two categories of data sources and services were observed. In particular:

- **Open data**, which is openly and available to the public and thus can be freely accessed, used, reused, and redistributed.
- **Other data**, which is confidential and only available within the HERON partners of the consortium as well as the commission services.

Also, all parties involved should access the various **data management applications** listed in the below subsections, in order to enable efficient data processing.

3.1 Open data sources and services

Below, Table 7 briefly presents the open data sources and services that are essential for the project's future activities.

Table 7: Open data sources and services.

Data sources and services	Open data sources
Dataset description: Information that is openly and available to the public and thus can be freely accessed, used, reused, and redistributed.	
GEOSS-Data Core [1]	Global Earth Observation System of Systems (GEOSS) is a set of coordinated, independent Earth observation, information, and processing systems that interact and provide access to diverse information for a broad range of users in both public and private sectors.
Copernicus [2]	Copernicus is the European Union's Earth observation programme, looking at our planet and its environment to benefit all European citizens. It offers information services that draw from satellite Earth Observation and in-situ (non-space) data. Vast amounts of global data from satellites and ground-based, airborne, and seaborne measurement systems provide information to help service providers, public authorities, and other international organizations improve European citizens' quality of life and beyond. The information services provided are free and openly accessible to users.
SIOSE [3]	Information System on Land Occupation of Spain. A database that integrates all available land use information

CORINE Land Cover [4]	The CORINE Land Cover (CLC) inventory was initiated in 1985. Updates have been produced in 2000, 2006, 2012, and 2018. It consists of an inventory of land cover in 44 classes.
SRTM [5]	Shuttle Radar Topography Mission, which is an international research effort to generate a complete high-resolution digital topographic database of Earth.
OpenStreetMap [6]	OpenStreetMap is a collaborative project to create a free editable geographic database of the world. The geodata underlying the maps is considered the primary output of the project.
GeoNames [7]	The GeoNames geographical database covers all countries and contains over eleven million placenames that are available for free download.

3.2 Other data sources and services

Below, Table 8 briefly presents other (confidential) data sources and services that are essential for the project's future activities.

Table 8: Confidential data sources and services.

Data sources and services	Open data sources
Dataset description: Information that is restricted and only available within the HERON project.	
ACCI	Data from Acciona Construcción S.A. that is openly available within the HERON project.
UGE	Data from Transpolis SAS that is openly available within the HERON project.
OLO	Data from Olympia Odos Operation S.A. that is openly available within the HERON project.
AdapteCCa [8]	AdapteCCa is an open and collaborative platform that collects the contributions of people working on climate change (CC) adaptation. It offers access to information about impacts, vulnerability, and adaptation to CC and promotes communication amongst interested experts, institutions, organizations, and agents.

3.3 Data management software

Access to essential applications is necessary in order to activate the analysis and make feasible the effective data processing of the various datasets that were demonstrated in the previous sections and are needed for the scope of the HERON project. To this end, the utilization of open available applications can provide open access and make sure that there is an increased accessibility of the data collected. Nevertheless, to escalate the importance of the project's outcomes at the same time other applications are also needed. It is however noted that such software might need to be licensed. Table 9 below lists the aforementioned data management applications.

Table 9: Data management software.

Data management software	Files format
Open applications (openly available)	
Adobe Reader	PDF files
Google Earth	KMZ files
Google Docs	DOCX files
Google Sheets	XLSX files
Google Slides	PPTX files
QGIS	Georeferenced vector and raster data
Other applications (available with subscription)	
AutoCad	DWG files
Microsoft Word	DOCX files
Microsoft Excel	XLSX files
Microsoft PowerPoint	PPTX files
ArcGIS	Georeferenced vector and raster data
Adobe Photoshop	PSD files

4 Conclusions

The purpose of the present deliverable document is to record, document, and report all available data sources and services that will be necessary for the various implementation phases of the HERON project. Towards the ultimate goal of the project, which is to develop an integrated automated system to perform maintenance and upgrade roadworks, the standardization and gathering processes of relevant datasets is a crucial procedure. It is underlined that special attention was paid to providing access to both primary and meta information in the most accessible, consistent, and reliable way possible. Thereby, in the later stages of the HERON project, it will be possible to avoid interpretation errors and confusion, as well as decrease additional documentation efforts.

To this end, this deliverable presents the already collected datasets, data management software, as well as the information that could potentially be gathered or is still pending, that are related to various data categories, such as geometry, geotechnical, road-related, land use, temperature, climate, meteorological as well as risks and hazards data. These datasets are mainly provided and described by HERON partners ACCI, UGE, and OLO. The information includes maps, risk factors, climatic and temperature data, as well as road features, parameters, videos, and images. It is also emphasized that, except for the pilot providers, relevant data sources include public repositories. Lastly, various data flows have been documented that will be constantly updated throughout the HERON project.

References

[1] About GEOSS. Available: https://earthobservations.org/geoss.php. Last accessed 30/04/2022.
[2] About Copernicus. Available: https://www.copernicus.eu/en/about-copernicus. Last accessed 30/04/2022.
[3] Information System on Land Occupation of Spain. Available: https://www.siose.es/. Last accessed 30/04/2022.
[4] CORINE Land Cover. Available: https://land.copernicus.eu/pan-european/corine-land-cover. Last accessed 30/04/2022.
[5] SRTM Shuttle Radar Topography Mission. Available: https://gisgeography.com/srtm-shuttle-radar-topography-mission/. Last accessed 30/04/2022.
[6] OpenStreetMap. Available: https://www.openstreetmap.org. Last accessed 30/04/2022.
[7] GeoNames. Available: http://www.geonames.org/. Last accessed 30/04/2022.
[8] AdapteCCa. Available: https://www.adaptecca.es/. Last accessed 30/04/2022.