



52nd ASECAP DAYS

Challenges of Future
Mobility | The Role of Road
Infrastructure

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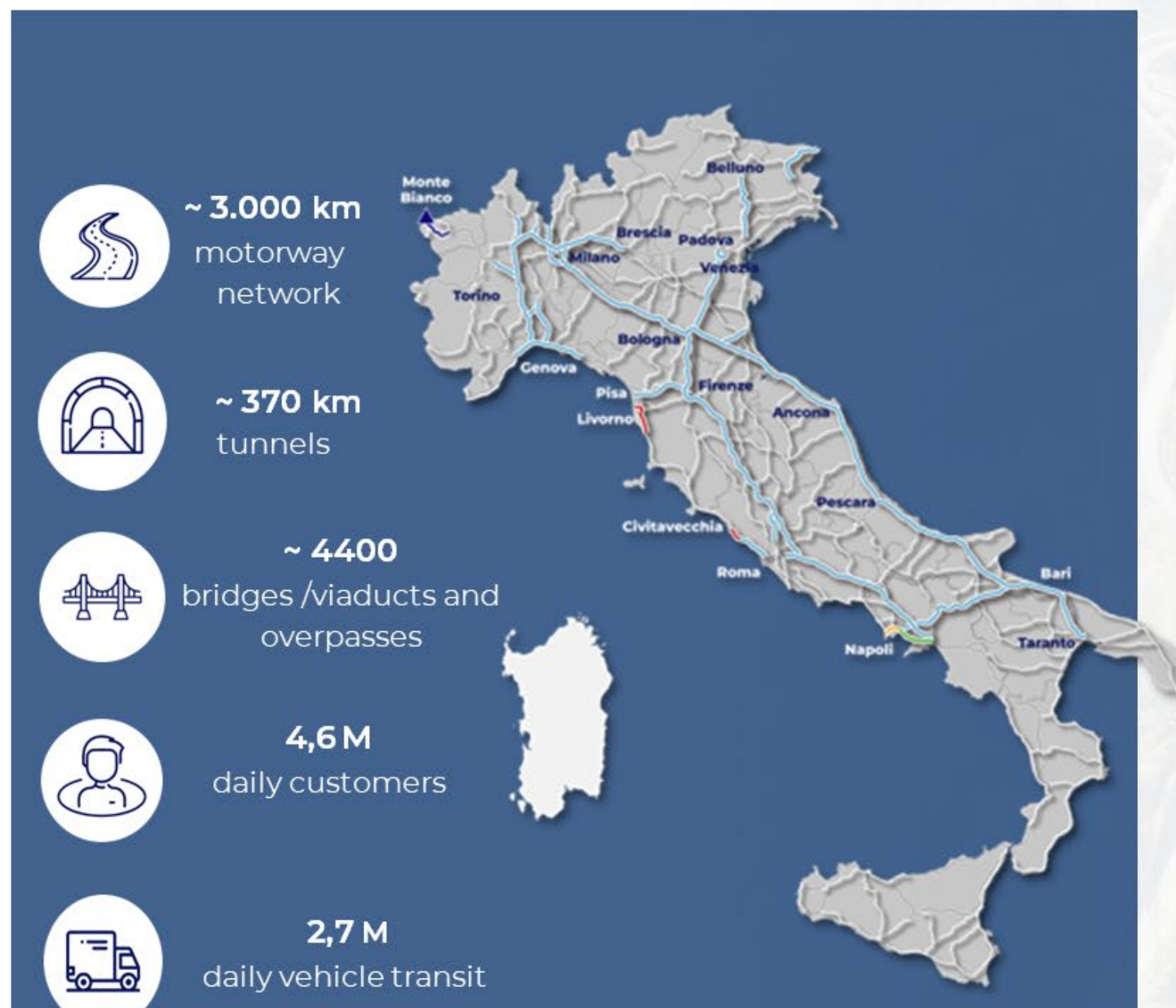


Managing tunnels on a large - scale highway network – ARGO, a Tunnel Management System

Antonio Sannino

Autostrade per l'Italia

The largest highway operator in Italy



autostrade // per l'italia



Technology
R&D



Engineering and
implementation



Construction and
related services



Energy from
renewable sources



Services for
travellers

around 3.000 km of highway
managed

4,6 million customers travel along
the network every day



~ 1800 overpasses

**Asset
Management
strategy**

- Database for full knowledge of the assets
- Improving preventive maintenance
- Maximise the effects of interventions

GUIDELINES EVOLUTION

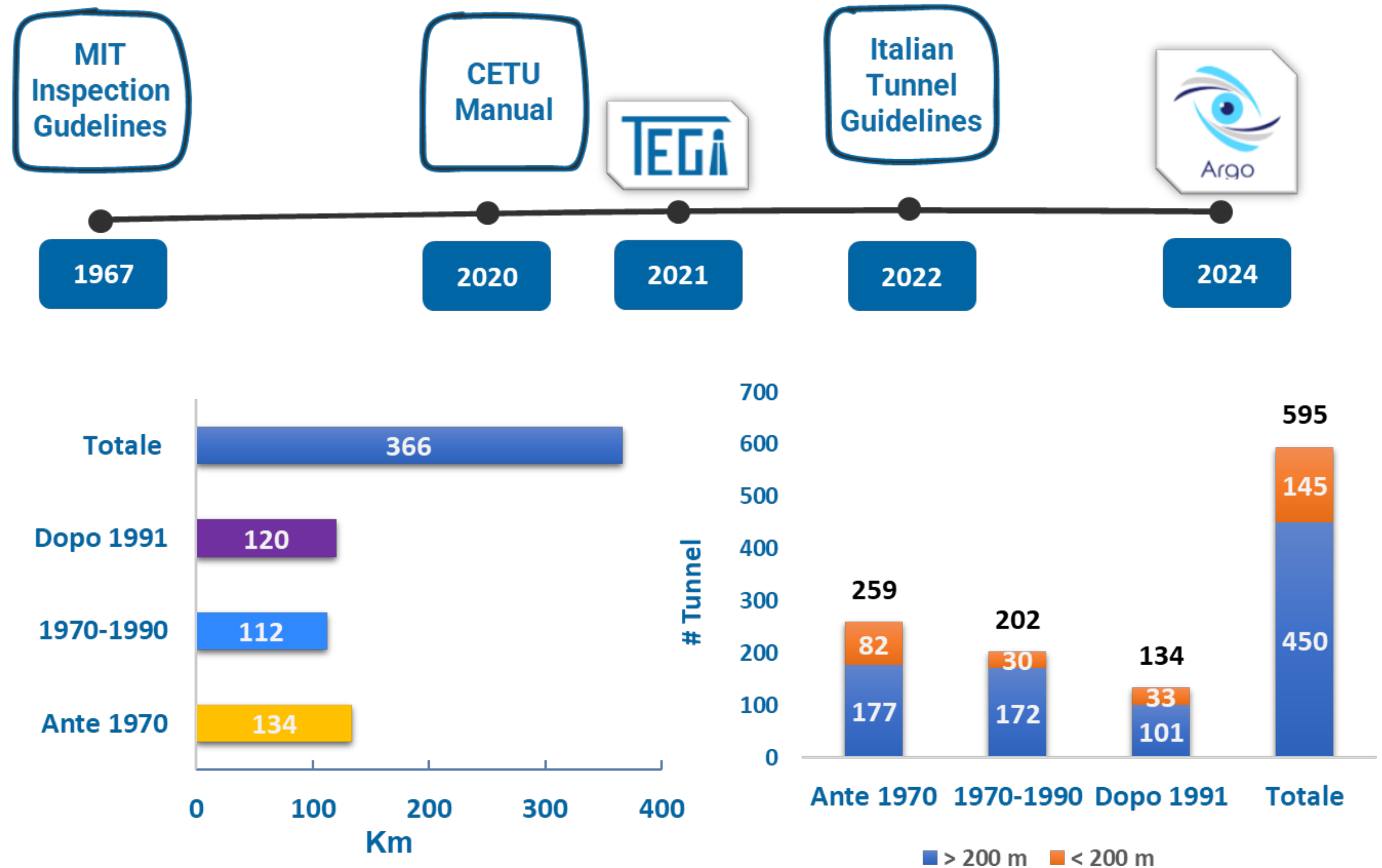
Highlights

In 2022 the Italian Guidelines for Existing Tunnels are in place leading the industry to a new approach in terms of tunnel asset management.

The assets involved in this new regulation are road tunnels **over 200 m long**.

ASPI is in charge for the management and maintenance of about 595 freeway tunnels, **450** of them have been triggered by the new Guidelines.

Starting from **January 2024** **ARGO** will replace the current inspection system **TEGI**.



Attention Class

The evaluation of the **attention class** is based on the data obtained during the data collect (*Level 0*) and tunnel investigation (*Level 1*). The attention class simply and speedily estimates the relevant risks for tunnels.

This leads to a results in terms of severity of the condition of each tunnel sub-element (*20 m long*) for each thematic area (*structural, geotechnical, idraulics, seismic etc.*).

The thematic areas (*exemption made for idraulics*) are then combined into a global risk rate (*COM*).

ALLEGATO 2 - CLASSE DI ATTENZIONE ED INDICE DI DIFFUSIONE

IN ACCORDO ALLE LINEE GUIDA PER LA CLASSIFICAZIONE E GESTIONE DEL RISCHIO, LA VALUTAZIONE DELLA SICUREZZA ED IL MONITORAGGIO DELLE GALLERIE ESISTENTI

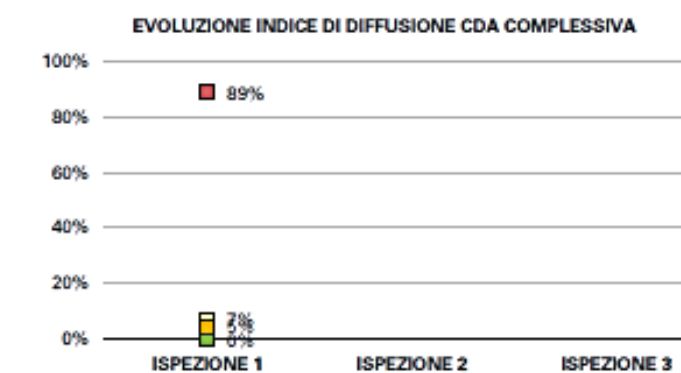
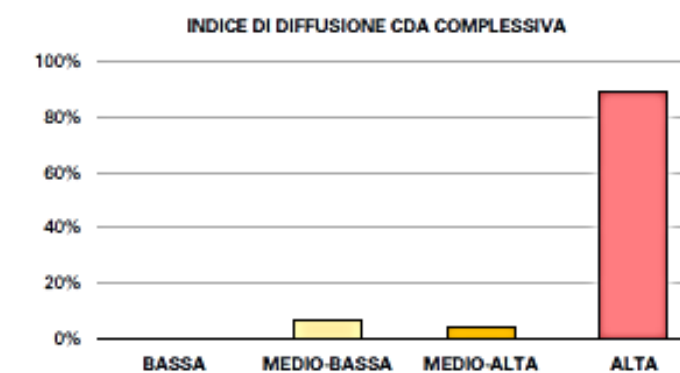
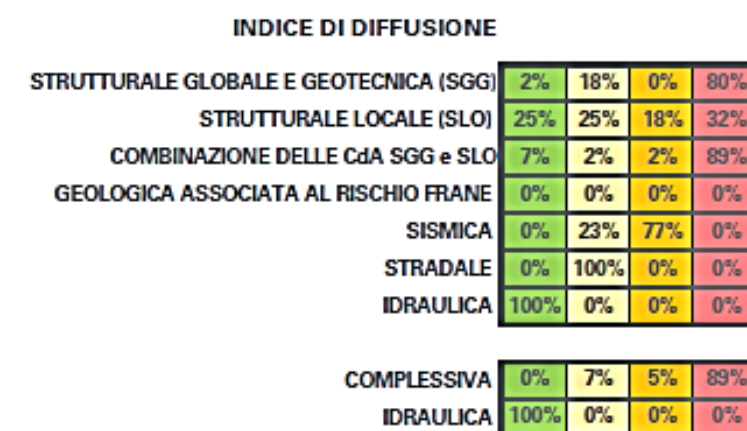
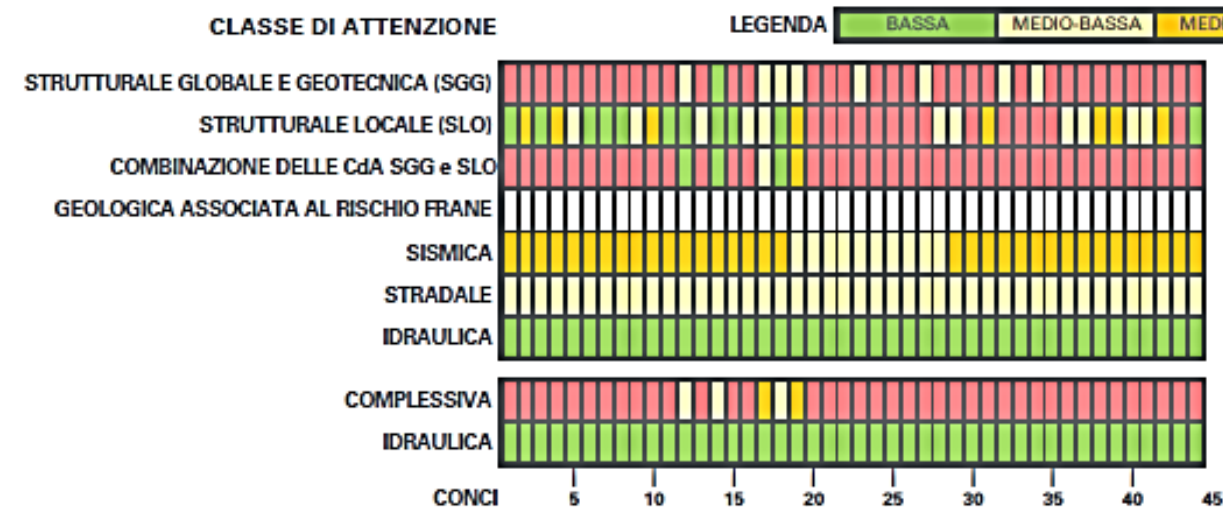


DATI ANAGRAFICI

Nome galleria	OLIMPIA SUD
Direzione	Genova
Canna	SX
Tratta	A26
Tronco	DT01
Stone	26.01.0028.0.8
Lunghezza	870 m
Numero conci	Cl 44
Progressiva di riferimento	pk. 74+873

DATI ISPEZIONE

Tipo ispezione	Approfondita (Assessment)
Data ispezione	05/08/2021 - Pre-interventi



TUNNEL ASSET MANAGEMENT



Consolidate

data and expertise created through decades of motorway's asset management



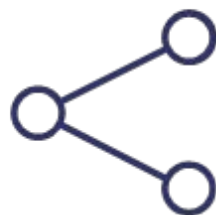
Innovate

instruments introducing state-of-the-art technologies and tools



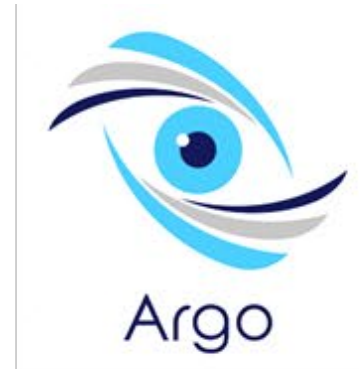
Increase

capabilities of key-figures operating in an increasingly demanding environment

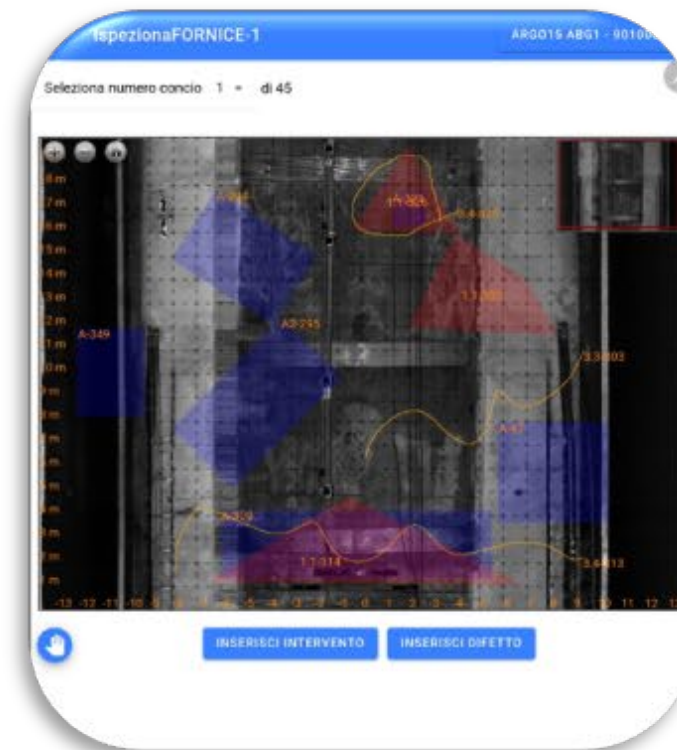


Share

and guarantee traceability of information with stakeholders in transparency

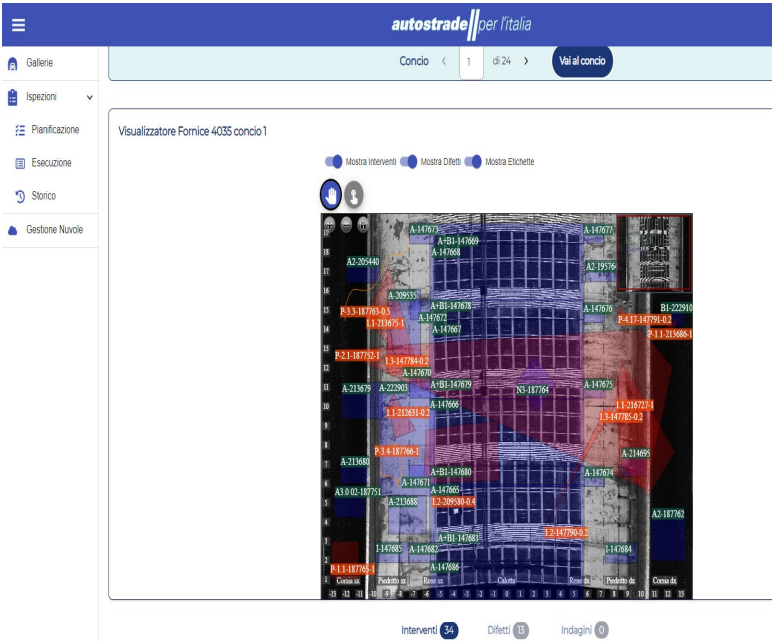


An **innovative**, integrated and certified system developed by **MOVYON** that integrate inspection and maintenance processes



ARGO – TUNNEL MANAGEMENT SYSTEM

Digital Asset Registry



Fully management of the information related of the infrastructure assets according to the Tunnel Guidelines

Inspection Process



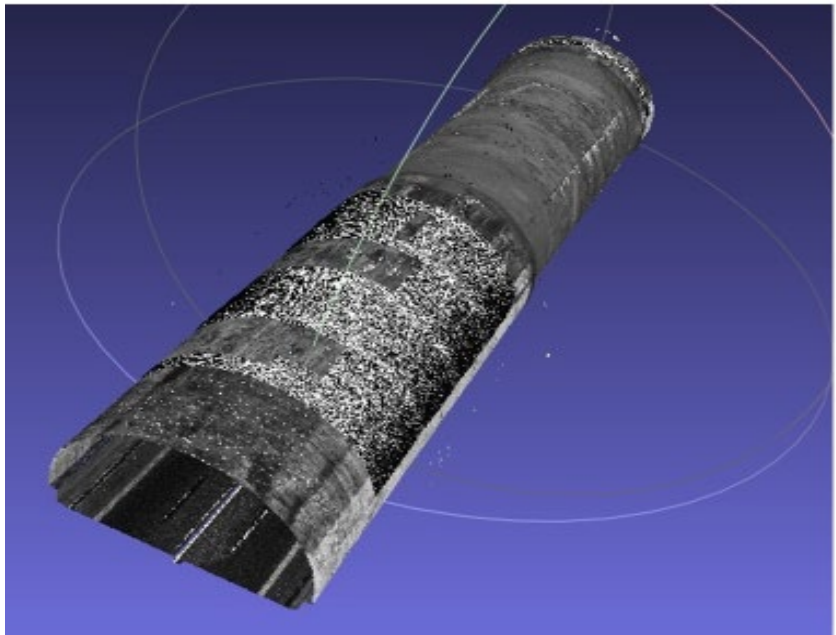
Fully management of the information related of the infrastructure assets according to the Tunnel Guidelines

3D Laser Scanning



Automatic detection of data from LS

Digital Twin

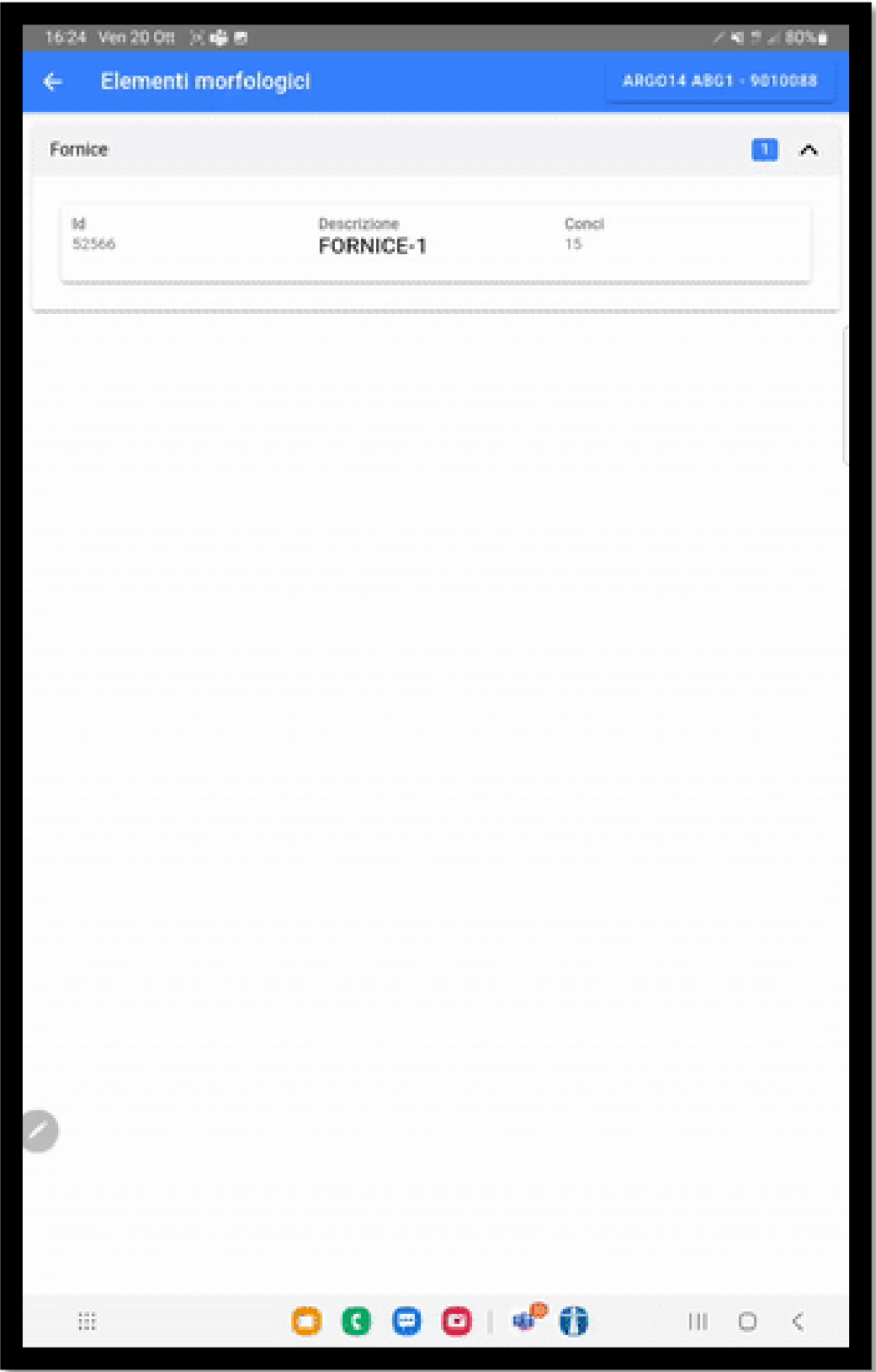
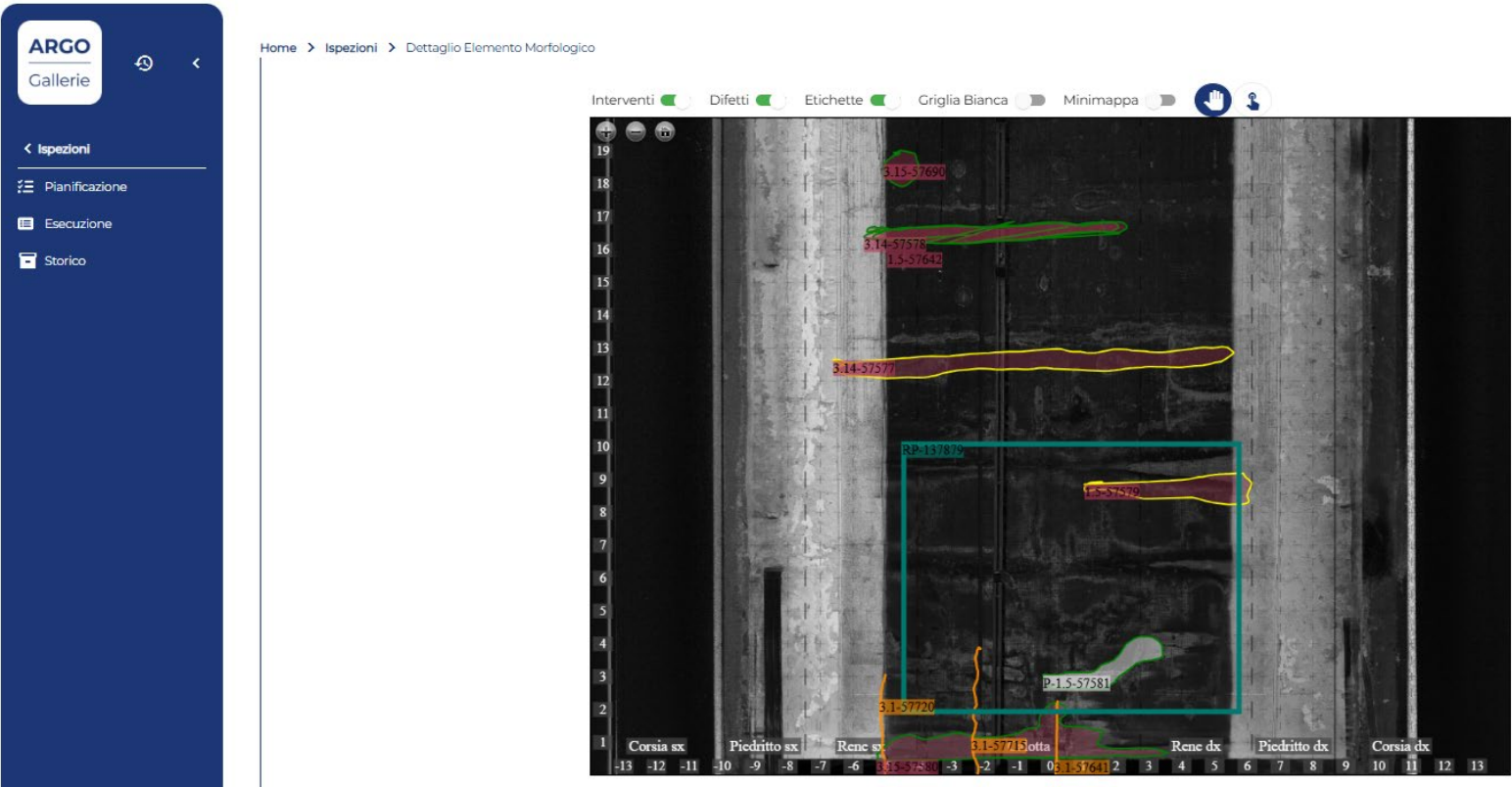


Use of Lidar and photogrammetry to obtain a digital twin of the asset

ARGO – TUNNEL MANAGEMENT SYSTEM

Highlights

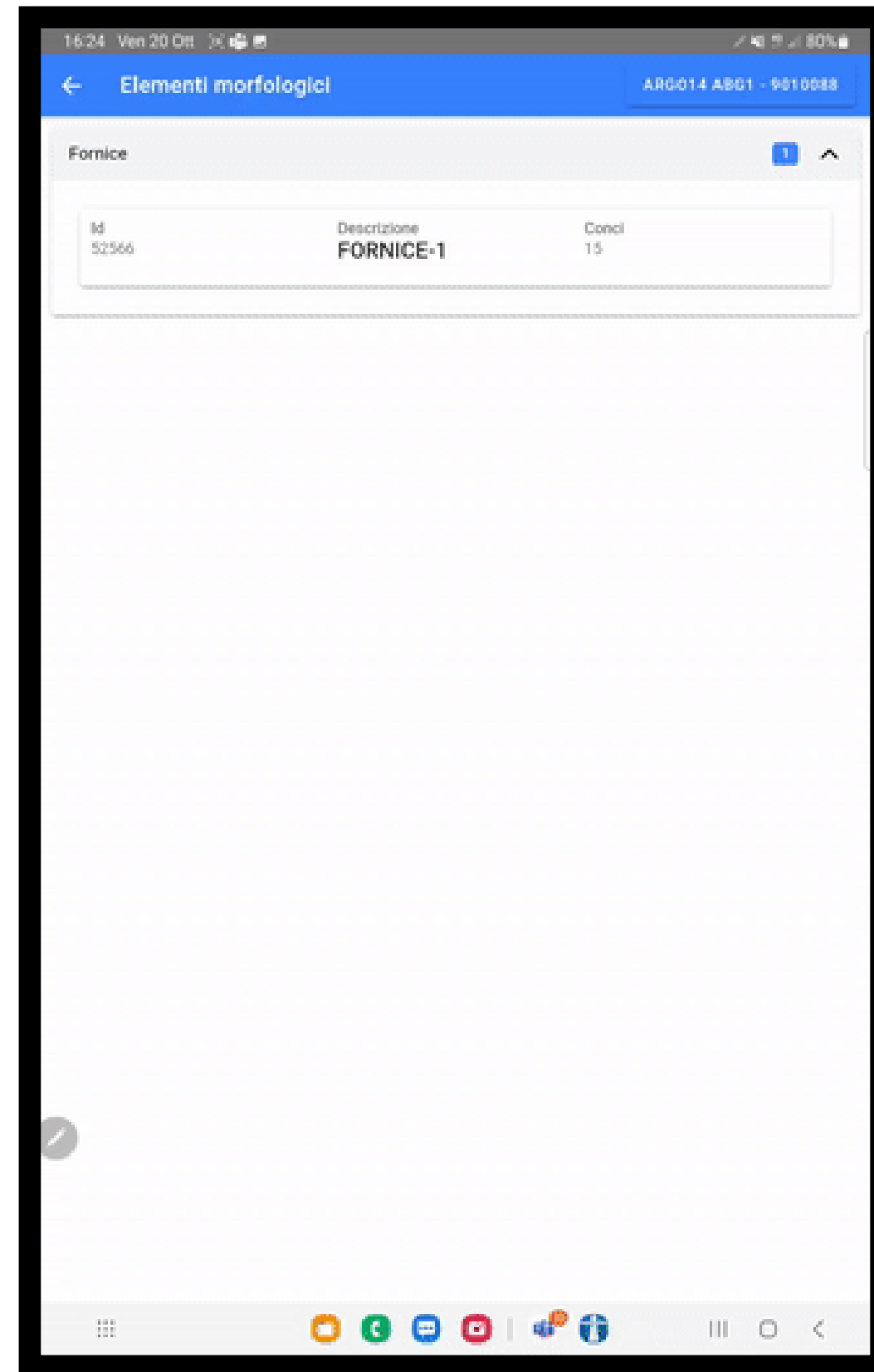
In the course of 2024, the inspection process related to tunnel surveillance was digitalized. The 597 tunnels of the ASPI network were inspected at least once using the ARGO Tunnels platform. Around 1,000 inspections were carried out in 2024, with a forecast of 2,500 inspections for the year 2025.



Highlights

The **field inspection** is performed by a **Mobile App** based on a three-dimensional point cloud of the tunnel which is converted to a two-dimensional surface representation that plays a crucial role to support the operator in the examination and mapping of the defects

-  Mobile App
-  2D LS Model
-  Guidelines Defects
-  Picture for each defeact
-  Inspection Process



ARGO – DESKTOP APPLICATION

Highlights

The data collected during onsite phase are subjected to a **postprocessing analysis** referring to the examination, validation and interpretation, to extract meaningful insights and make informed decisions regarding the condition of the tunnel.

- Back-Office Inspection
- LS Management
- Report
- Service Request
- Attention Class

Google Calendar - ...

Posta in arrivo - san...

WhatsApp

Posta - Antonio San...

Documents - UGNE...

Autostrade

Moto

Appunti

Utili

Tutti i preferiti

autostrade per l'Italia

Ispezioni

Planificazione

Esecuzione

Storico

Ispezioni da Assegnare

Crea Ispezione

Id	Tipo	Nome Opera	Stato	Codice Stone	Codice Age	Inizio Pianificato	Fine Pianificata	Data Creazione	Tronco	Autostrada
5001	Import da...	Galleria MONTEFORTE DX A16	In assegnazio...	160601907	18267	05/09/2023	05/09/2023	05/09/2023	6	A16
5002	Import da...	Galleria SCAMPITELLA DX A16	In assegnazio...	16060476...	18273	05/09/2023	05/09/2023	05/09/2023	6	A16
5003	Import da...	Galleria SCAMPITELLA SX A16	In assegnazio...	16060476...	18274	05/09/2023	05/09/2023	05/09/2023	6	A16
5004	Import da...	Galleria VALLESACCARDA SX A16	In assegnazio...	16060473...	18275	05/09/2023	05/09/2023	05/09/2023	6	A16
5005	Import da...	Galleria VALLESACCARDA DX A16	In assegnazio...	16060473078	18276	05/09/2023	05/09/2023	05/09/2023	6	A16
5007	Import da...	Galleria MONTEFORTE SX A16	In assegnazio...	160601908	18268	05/09/2023	05/09/2023	05/09/2023	6	A16
5008	Import da...	Galleria SANTELENA DX A16	In assegnazio...	16060329078	18286	05/09/2023	05/09/2023	05/09/2023	6	A16
5009	Import da...	Galleria SANTELENA SX A16	Assegnata	16060329...	18287	05/09/2023	05/09/2023	05/09/2023	6	A16
5011	Import da...	Galleria MONTEMILETTO SX A16	In assegnazio...	1606031508	18291	05/09/2023	05/09/2023	05/09/2023	6	A16
5012	Import da...	Galleria MONTEMILETTO DX A16	In assegnazio...	16060315...	18292	05/09/2023	05/09/2023	05/09/2023	6	A16

Aggiungi richiesta di manutenzione

Programmabilità

Seleziona

S - Intervento eseguito contestualmente all'ispezione

P - Intervento programmabile

P_{mg} - Manutenzione programmabile (sorveglianza)

P_{mp} - Manutenzione programmabile (sostituzione presidio)

P_{ma} - Manutenzione programmabile (difetto assessment)

P_{mi} - Manutenzione programmabile (impianti)

Inserisci massimo 300 caratteri

Annulla

Conferma

Nome utente

Ispezioni > Esecuzione ispezioni (profilo ispettore) > 1834 > Galleria Pietratagliata SX A23

< Fornice

Conci 28

Interventi 72

Difetti 126

Indagini 45

Bassa 12

Medio bassa 9

Medio alta 5

Alta 2

Ispezionate 64%

Non ispezionate 36%

Conci CDA

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

B MA B MA MA B A B B B MB MA A B B B B MB B B MB

Filtra concio

Apri +

Concio	Interventi	Difetti	Indagini	CDA	Stato
1	2	4	-	B	Ispezionato
2	2	4	3	MB	Non ispezionate
3	1	7	1	B	Da ispezionare
4	3	5	5	MA	Non ispezionate
5	2	5	2	MA	Ispezionato
6	3	7	2	B	Da ispezionare
7	3	7	5	A	Non ispezionate
8	6	3	1	B	Ispezionato
9	1	5	1	B	Non ispezionate
10	1	1	-	B	Ispezionato

Elementi per pagina 10 1-30 di 3

Highlights

Thanks to the integration of ARGO with the company's Data Lake, it has been possible to create constantly updated informative dashboards using the Tibco application, drastically increasing the speed of performing targeted analyses and in-depth insights on the data recorded by ARGO. ASPI began adopting Tibco for the management of its tunnels in 2024, in parallel with the roll-out of ARGO Tunnels.

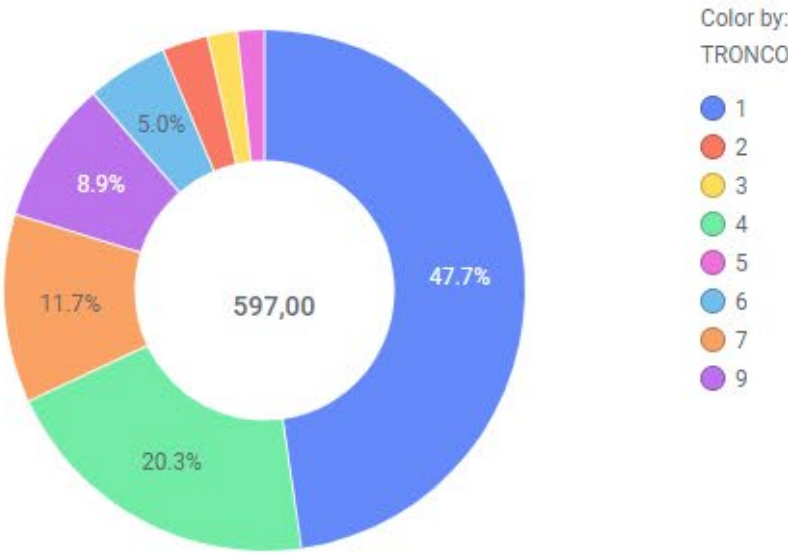
Elementi morfologici

ASSET_NUM...	NOME_OPERA	CODICE_STO...	CODICE...	CODICE_IOP
1755348	Galleria LARGNANO SX VAR	0104385508	18778.0	STAU0000GA...
1770238	Galleria OSCATO SX A30	3006020408	18269.0	STAU0030GA...
1749442	Galleria MONTE MORO DX A12	1201001207	18329.0	STAU0012GA...
2478892	Galleria MONTE MORO DX A12	1201001207	18329.0	STAU0012GA...
2478904	Galleria MONTE MORO DX A12	1201001207	18329.0	STAU0012GA...
2478905	Galleria MONTE MORO DX A12	1201001207	18329.0	STAU0012GA...
2478906	Galleria MONTE MORO DX A12	1201001207	18329.0	STAU0012GA...
1749309	Galleria CAMPASSO DX A26	2601001607	18352.0	STAU0026GA...
1749673	Galleria SIRI DX A10	1001006507	18393.0	STAU0010GA...
1749678	Galleria TAGLIOLO DX A26	2601002707	18427.0	STAU0026GA...
1749411	Galleria LUPO SX A10	1001001008	18459.0	STAU0010GA...
1749311	Galleria CAMPORA DX A07	0701034407	18492.0	STAU0007GA...
2490418	Galleria CAMPORA DX A07	0701034407	18492.0	STAU0007GA...
2490419	Galleria CAMPORA DX A07	0701034407	18492.0	STAU0007GA...

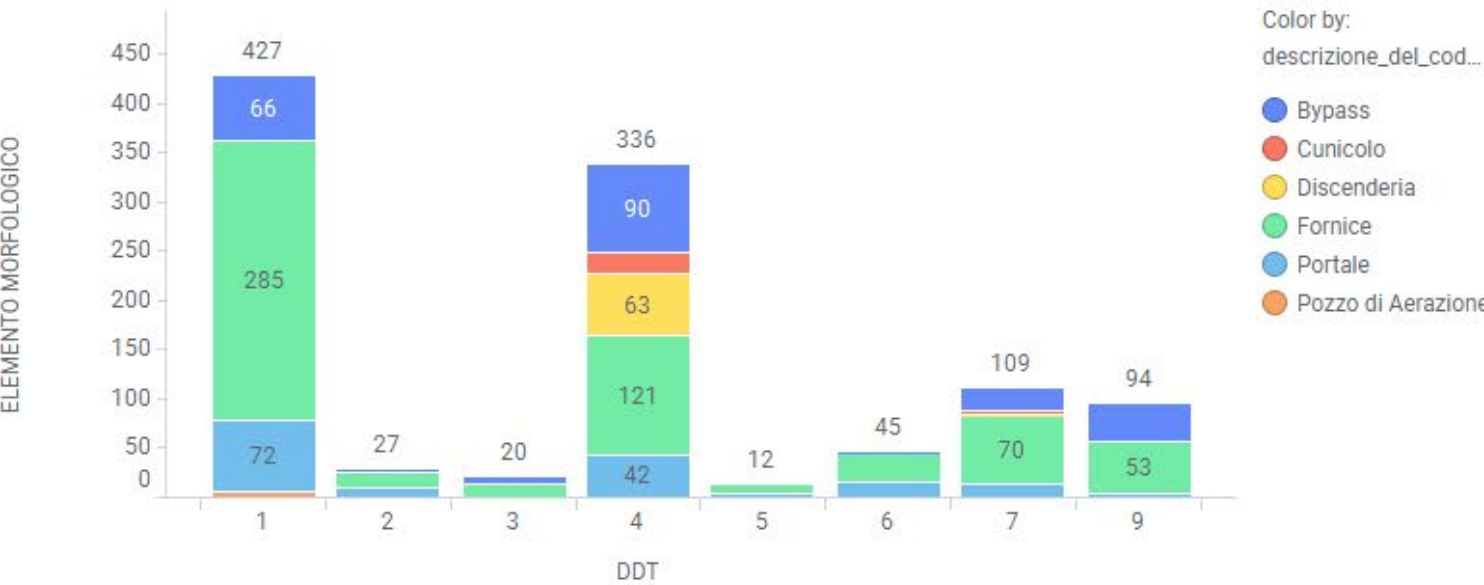
Map chart



Catasto fornici

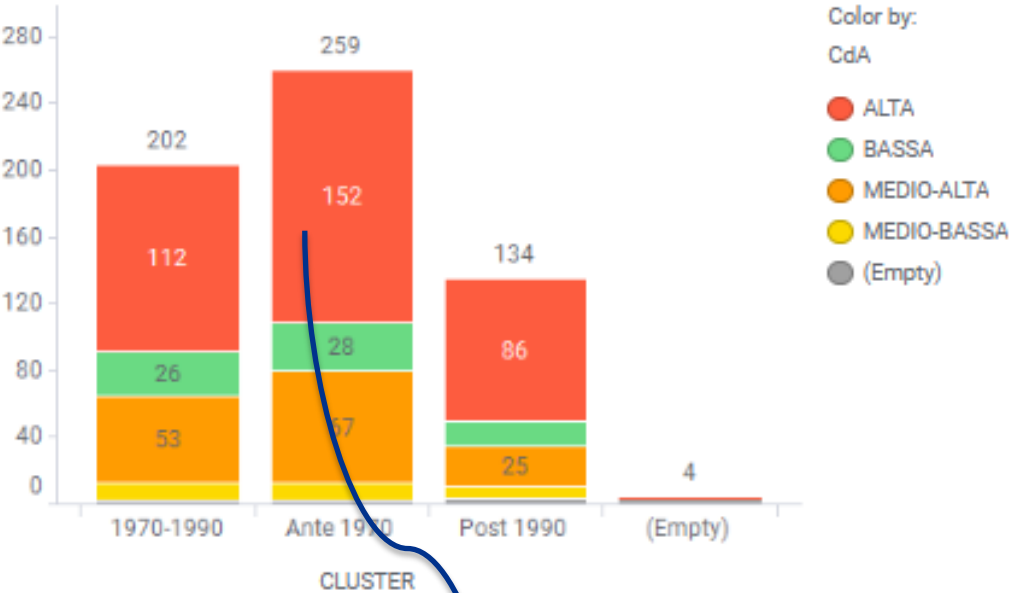


Elemento morfologico per DDT

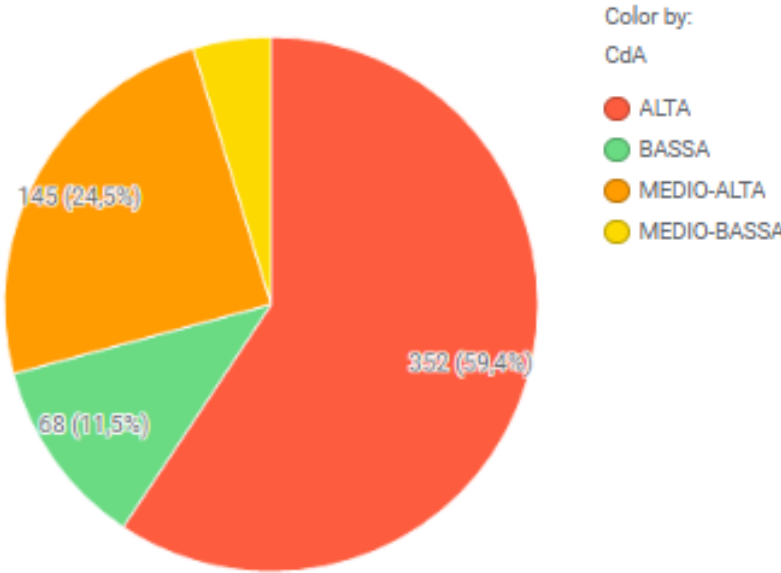


ARGO DASHBOARD

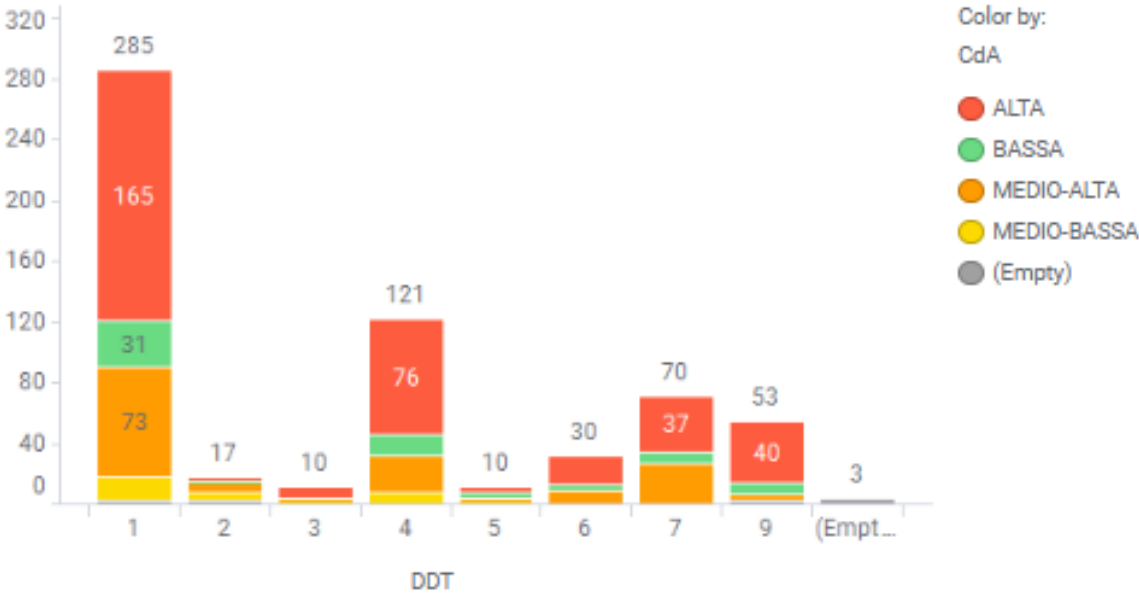
Distribuzione CdA per Cluster LLG



Distribuzione CdA



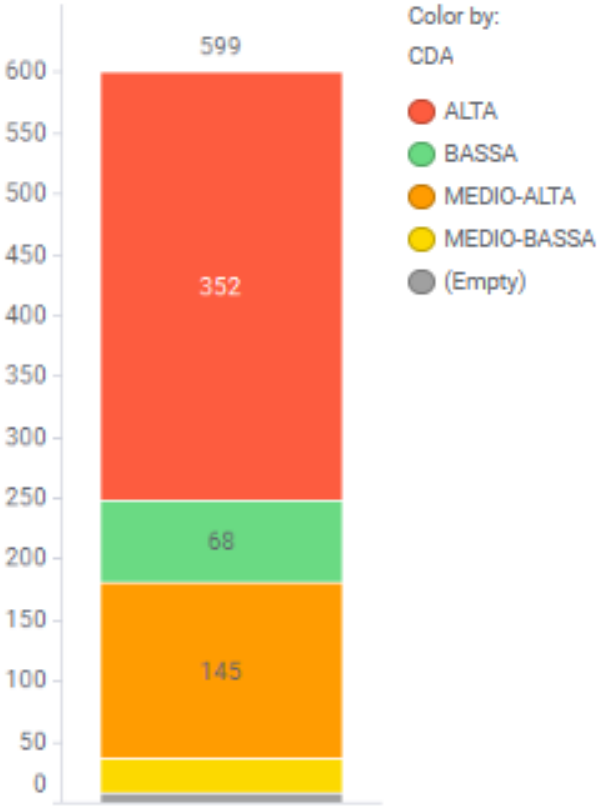
Distribuzione CdA per DDT



Visualizzazione CdA per concetti

CODICE_STONE	NOME_OPERA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
0103145516	Galleria CERETOLO DX-SX A01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0103146017	Galleria CALZAVECCHIO DX A01	4	3	3	3	3	2	2	2	3	2	3	2	3	3	2	3	2	3	2	3	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0103150017	Galleria MONTE MARIO DX A01	1	4	4	4	3	4	4	1	4	4	1	1	4	4	4	4	4	4	3	4	1	1	4	4	4	1	4	4	3	4	4	4	4	4	4	4
0103150018	Galleria MONTE MARIO SX A01	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	4	4	4	3	4	4	2	4	4	1	2	4	4	4	4	4	1	4	1	
01032518A8	Galleria SASSO MARCONI fs. A01	4	4	4	3	4	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0104155107	Galleria ALLOCCO DX A01	3	3	3	2	2	2	2	3	4	3	2	2	3	3	1	4	2	1	1	1	1	1	1	1	1	1	1	1	4	4	4	2	2	1	1	
0104155108	Galleria ALLOCCO SX A01	4	2	2	2	2	2	2	4	2	2	2	2	2	2	2	2	1	1	4	1	1	1	2	4	1	1	4	1	1	4	1	2	1	2	4	
0104155307	Galleria VADO DX A01	2	2	2	2	2	3	3	2	1	1	1	1	2	1	4	2	2	1	1	1	1	2	1	1	1	2	2	2	1	1	1	1	4	4	1	
0104155308	Galleria VADO SX A01	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	2	2	1	1	1	
0104155507	Galleria CAMPOLUNGO DX A01	3	4	4	4	4	4	4	4	4	4	4	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0104155508	Galleria CAMPOLUNGO SX A01	4	4	4	4	4	4	4	4	3	4	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0104156007	Galleria GARDELLETTA DX A01	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
0104156008	Galleria GARDELLETTA SX A01	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
0104160417	Galleria LE ROVINE DX A01	3	3	3	3	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0104160418	Galleria LE ROVINE SX A01	3	3	1	1	1	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0104161017	Galleria SERRA RIPOLI DX A01	3	3	3	4	3	3	2	2	1	2	1	1	2	2	2	3	3	3	3	3	4	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-
0104161018	Galleria SERRA RIPOLI SX A01	1	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-	
0104161317	Galleria LE SERRUCCE DX A01	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0104161318	Galleria LE SERRUCCE SX A01	3	1	1	3	1	3	1	1	1	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0104162617	Galleria I F RANZOI F DX A01	3	3	3	4	3	1	1	4	3	1	1	3	1	1	1	1	1	1	3	3	1	1	3	3	3	4	4	3	3	3	4	3	4	3	4	

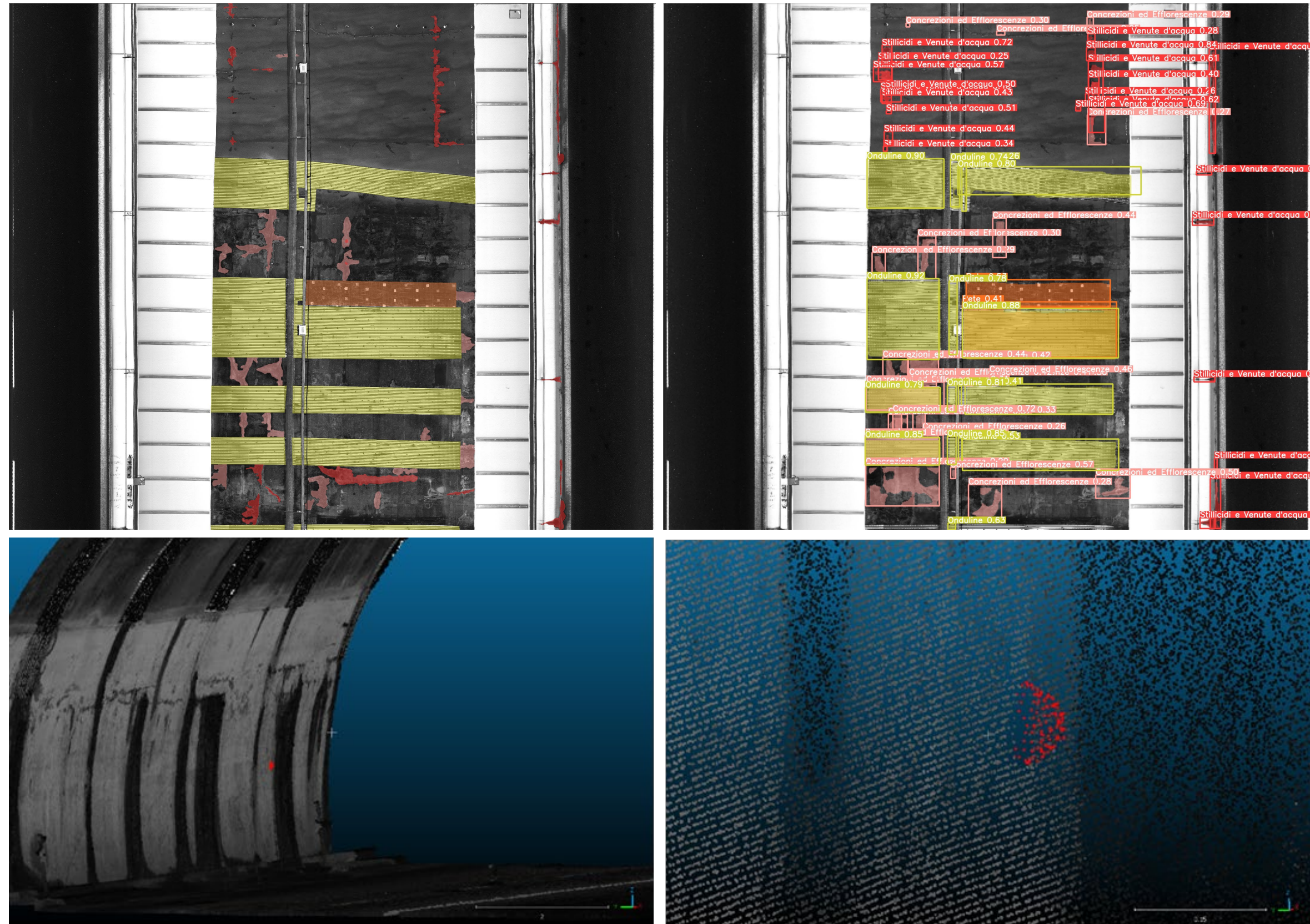
CdA Opere



Highlights

The algorithms (*testing phase*) of **automatic detection** are designed to identify various defects, such as cracks, deformations, water leaks.

Point cloud tunnel **change detection** (*testing phase*) involves the identification and analysis of differences between multiple point cloud scans of a tunnel taken at different times.



ASECAP DAYS



MADRID 2025

Thank You

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