## ESRIUNA SAFE AND EFFICIENT ROADS

\*

-----



.....

This project has received funding from the European Union Agency for the Space Programme under the European Union's Horizon 2020 research and innovation programme under grant agreement No 101004181.

The content of this presentation reflects only the author's view. Neither the European Commission nor the EUSPA is responsible for any use that may be made of the information it contains.



### TISA Workshop 15.03.2023: ➤ Road damage classification

Andras Csepinszky, Director of Advanced Automotive Technology at the <u>NNG</u>





#### Actual classification available in ESRIUM

- Terminology based on road operators POV
- Definitions reflecting maintenance priority
- SRTI & RTTI needs different approach
- No international consensus exists for both maintenance terminology and for traffic relevant classification
- No international consensus exist on nature of damage data e.g. it can be dynamic, static or even both for service perspective

1 Pavement damage classification (English / Magyar / Deutch)

Paveme nt	Damage			Description			
	Paveme nt_dam age Útburkol at_hiba	Cracking Repedés	Fatigue_(Allig ator)_crackin g Mozaikos_rep edés	Alligator or fatigue cracking is a series of interconnecting cracks caused by fatigue failure of the asphalt concrete surface under repeated traffic loading, (https:// pavementinteractive.org/glossary/alligator-cracking/)			
Asphalt Aszfalt Asphalt			Longitudinal_ cracking Hosszirányú_ repedés	Cracks parallel to the pavement's centerline or laydown direction. Can be a type of fatigue cracking or top-down cracking. https://pavementinteractive.org/reference-desk/ pavement-management/pavement-distresses/ longitudinal-cracking/			
			Transverse_c racking Keresztirányú _repedés	Cracks perpendicular to the pavement's centerline or laydown direction. Usually a type of thermal cracking https://pavementinteractive.org/reference-desk/ pavement-management/pavement-distresses/ transverse-cracking/			
			Block_cracki ng	Interconnected cracks that divide the pavement up into rectangular pieces. Blocks range in size from approximately 0.1 m2 (1 ft2) to 9 m2 (100 ft2). Larger blocks are generally classified as longitudinal and transverse cracking. Block cracking normally occurs over a large portion of pavement area but sometimes will occur only in non-traffic areas.			
				https://pavementinteractive.org/reference-desk/ pavement-management/pavement-distresses/block- cracking/			
			Slippage_cra cking	Crescent or half-moon shaped cracks generally having two ends pointed into the direction of traffic. https://pavementinteractive.org/reference-desk/ pavement-management/pavement-distresses/slippage- cracking/			

https://confluence.nng.com/display/ESRIUM/Road+surface+obstacle+types+classification



. 🍂

#### What is going on?

ect Browser 🛛 👻 🕂 🗙	Toolbox 🔫 🕂 🗙 👞	Start Page						
<u>8</u> 8 9 8 2 · 3 · ↑ + ®	More tools	Start Page X						
D2Enumeration» VehicleProblemCauseEnum	Common							_
C2Enumeration AccidentCauseEnum	D Artifacts		rehitest					
Control Con	All Marshall and Defense De	padConditionTypeEnum : Features						
Condition NonWeatherRelatedRoadCondition	and the second second second second	adConditionTypeEnum : Features X						
«D2Literal» dieselOnRoad	Coperations	Name	Туре	Scope	Stereotype	Alias	Initial Value	
«D2Literal» leavesOnRoad			1.45					
«D2Literal» looseChippings		@looseChippings	enumerationLiteral	Public	DZLiteral			
«D2Literal» looseSandOnRoad		IooseSandOnRoad	enumerationLiteral	Public	D2Literal			
«D2Literal» mudOnRoad		@mudOnRoad	enumerationLiteral	Public	D2Literal			
«D2Literal» oilOnRoad		oilOnRoad	enumerationLiteral	Public	D2Literal			
«D2Literal» petrolOnRoad		@petrolOnRoad	enumerationLiteral	Public	D2Literal			
«D2Literal» roadMarkingNotPresent				Public		4		
>>value		@roadMarkingNotPresent			D2Literal			
w *D2Literal * slipperyRoad		roadSurfaceInPoorCon	enumerationLiteral	Public	D2Literal			
🔷 «D2Literal» other 🗸 👻		@slipperyRoad	enumerationLiteral	Public	D2Literal			
Project Browser Strange Resources		øother	enumerationLiteral	Public	D2Literal			
		New Attribute					*	
				58				
ⅠⅠU為 注言 ×' × 🐁 🗋		Attribute (roadSurface		Notes Constraints Redefines Tagged Values				
		Containment	Not Specifie	<b>豊</b> 虹 ◇ ⊠ × ♀ ぼ ◎				
		Static Property	False	UML Profile for DATEX II-D2Literal (roadSurfaceInPoorCondition)				
		Const						
		Is Literal	True	definition	The road surface is o	damaged, severely rutted or	potholed (i.e. it is in a poor state of repair).	
		Transient	False	regulatoryContext				
		Derived	False					
		Derived Union	False					
		Is ID Multiplicity	[1]					
		Is Collection	False					
		Container Type						
							Close Help	
							Clock I Link	



#### What is going on?

ISO/AWI 22726-2 Intelligent transport systems –Dynamic data and map database specification for connected and automated driving system applications –Part 2: Logical data model of dynamic data

- Is referencing the road damage service use case as traffic relevant
- Keeps open the possibility to integrate DATEXII, TPEG, IVI, VICS etc. data for road damage
- All these standards needs to be extended to carry relevant information for SRTI use cases (for both human and machine drivers)
- Extension needs to be synchronized and SRTI relevant road damage classification and metadata needs to be specified



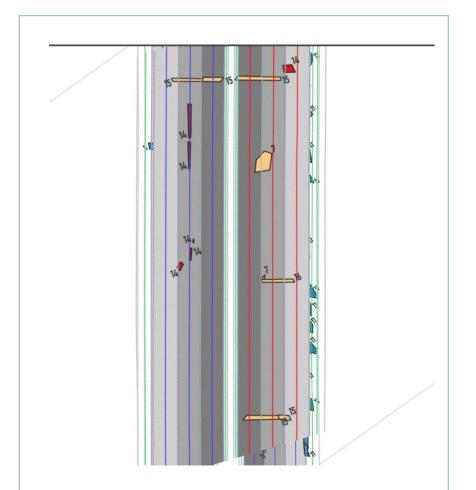
#### **Discussion points**

- Road damages needs to be classified for both
- Road maintenance
- In-Vehicle usage
- **Impact:** in-vehicle system requirements need to be considered (driver needs, vehicle needs, traffic needs, etc.)
- Fact: not all road damage type are dangerous for the vehicle and for the traffic
- **Impact:** business model may suggest vehicles avoiding non-dangerous road damages can benefit of incentivization (in case maintenance and in-vehicle usage are linked together) —is this business model realistic?
- ✓ Are road damage information dynamic or static by their nature?
- Impact: data service needs to be low latency or high latency? (C-ITS, SRTI, Map as a Service)
- Impact: Expected update frequency and data production processes need to be adjusted accordingly
- Impact: optimize data delivery strategy for in-vehicle usage
- ✓ Road damage data needs to have relevant content description
- Geolocalisation froad damage objects (need to avoid too many LR points as it can overload in-vehicle systems –if map matching happens in the car which is the case for C-ITS and SRTI services)
- 3D characteristics (voxel model?) to make SRTI relevance assessment possible (e.g. deep pothole with sharp edges risking tire failure)
- Metadata (validity time –it will disappear due to planned maintenance, severity for different vehicle types, etc)
- Fact: data relevance, confidence, reliability and trustworthiness is key for CCAM
- Fact: In vehicle systems have limited CPU and RAM for map-matching



#### Example damage sets

- Group of RWFs
- RWFs on the lane boundary...
- All lanes are corrupt, how to prioritize?





15/03/2023

# Thank you!

Presented by ESRIUM H2020 consortium partner:



### ESRIUM SAFE AND EFFICIENT ROADS

-----

Esrium\_H2020



**Esrium group** 

www.esrium.eu