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Innovation in Transport for Sustainable Cities and Regions

Operation and safety of tramways in interaction with public space: State of the art

Presenter

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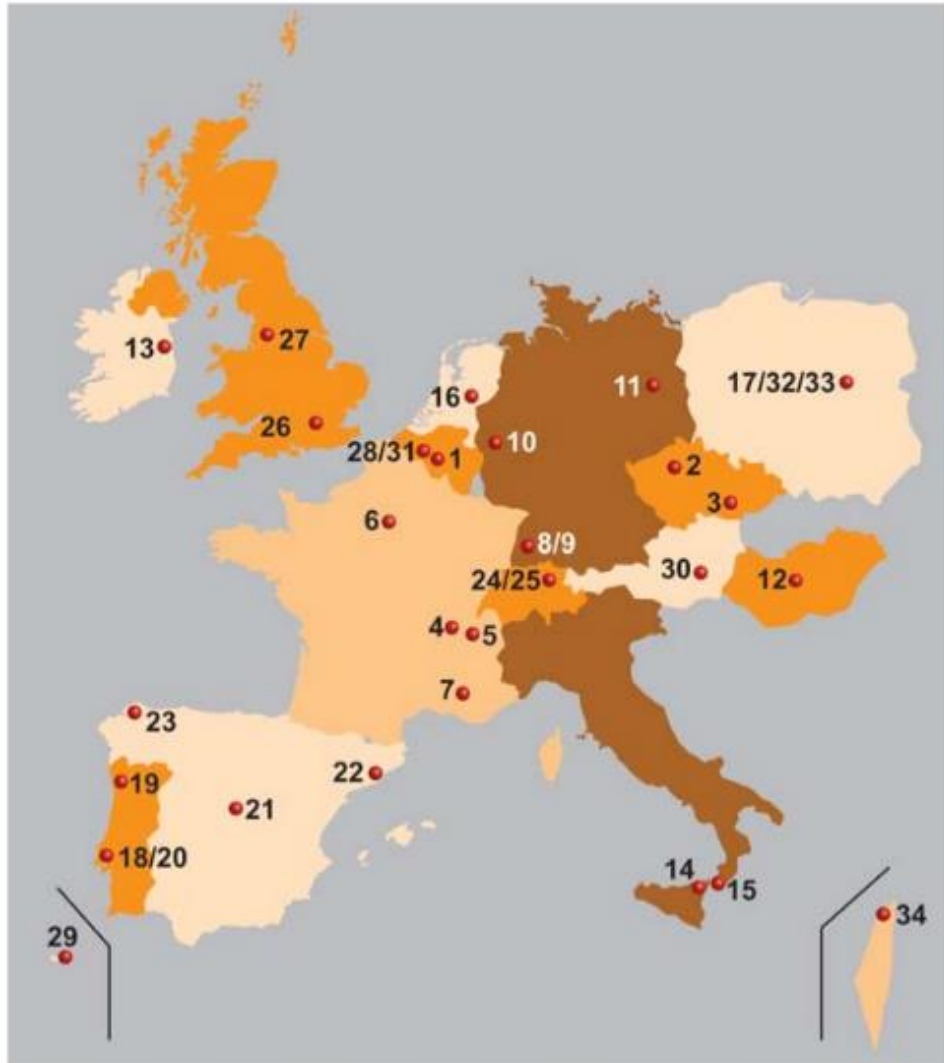
COST ACTION TU 1103

Operation and safety of tramways in interaction with public space

34 entities from 15 countries

+ UITP (International Association of Public Transport)

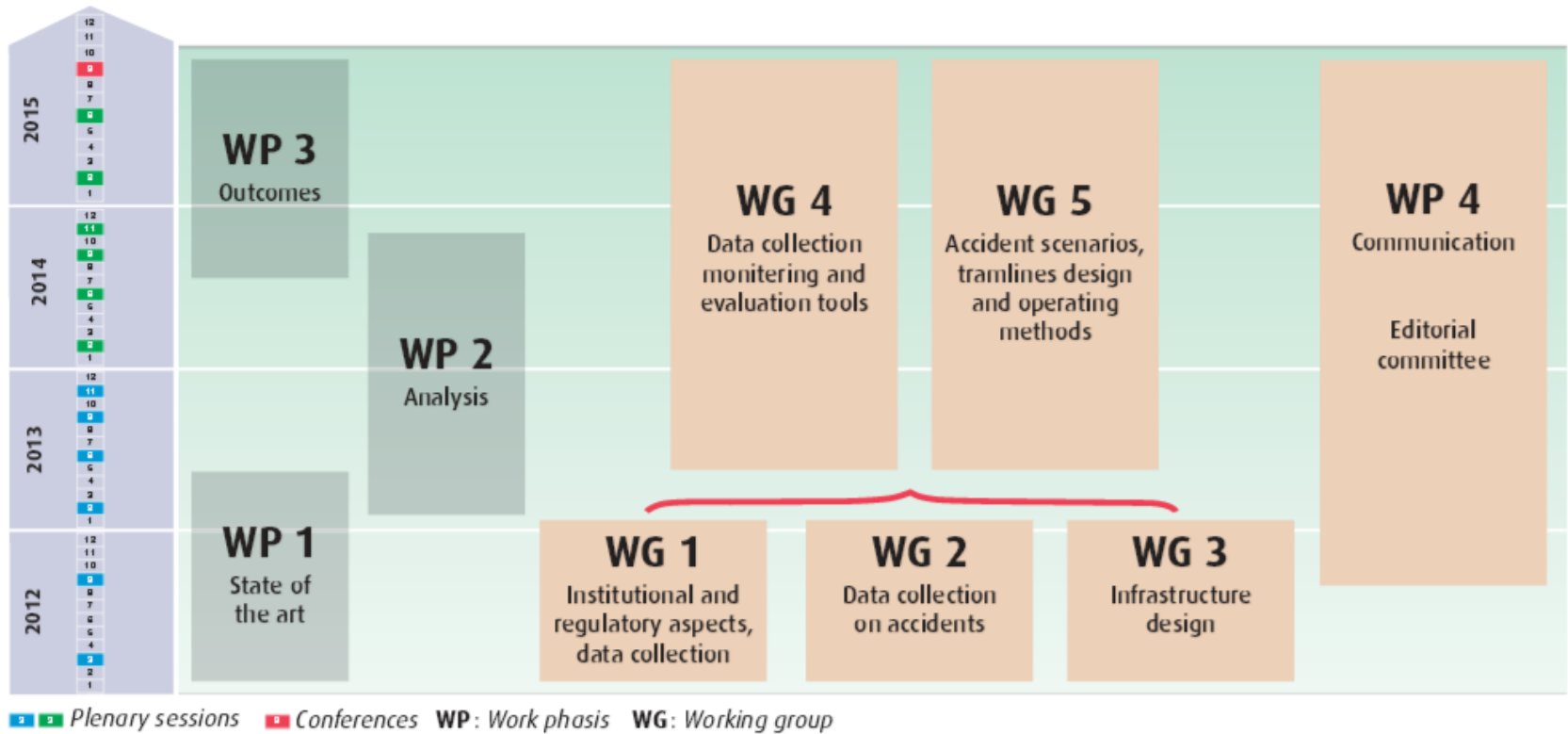
<http://www.tram-urban-safety.eu/>





COST ACTION TU 1103

Operation and safety of tramways in interaction with public space

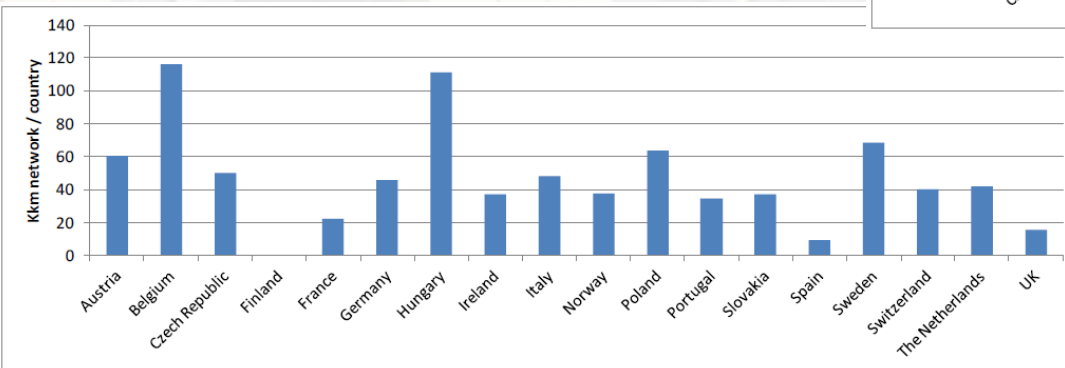
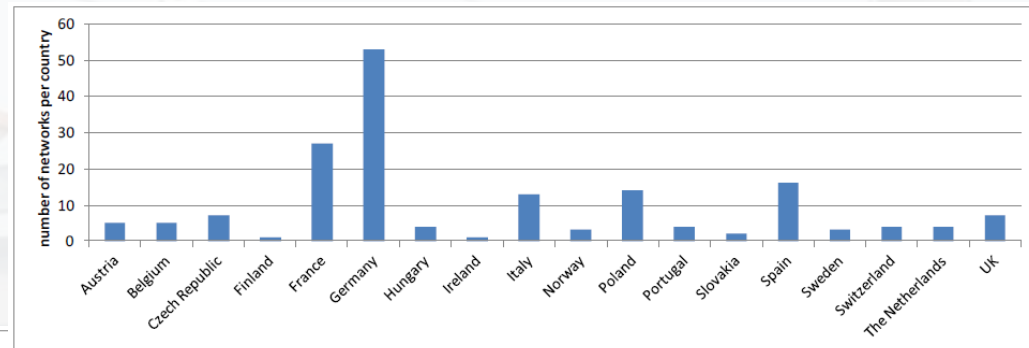


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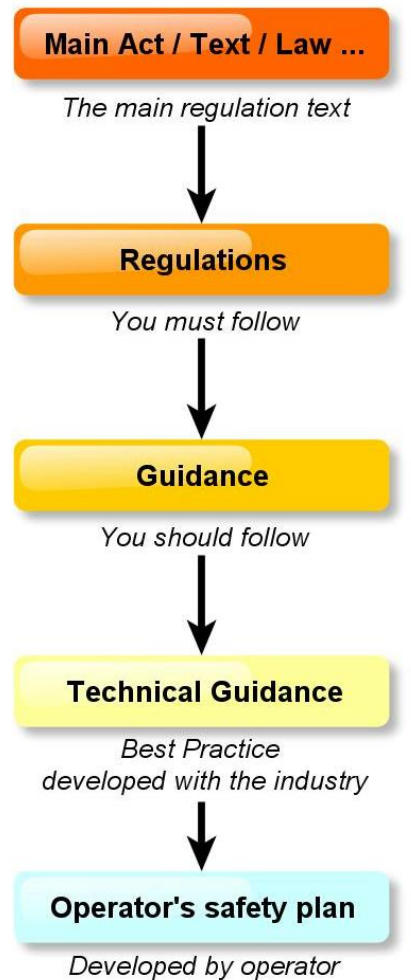
WG1 – INSTITUTIONAL AND REGULATORY ASPECTS

- Questionnaire about the key points of light rail management at a national level:
 - First part: light rail networks
 - Number of networks in operation, construction and extension;
 - Length of the network;
 - Number of passengers, etc.



WG1 – INSTITUTIONAL AND REGULATORY ASPECTS

- Questionnaire about the key points of light rail management at a national level:
 - Second part: regulation
 - Main regulation
 - Philosophy behind it.
 - Third part: actors
 - Who is responsible for accidents investigation?
 - Who is responsible for accidents evaluation?
 - Forth part: urban insertion
 - Priority of light rail
 - Typical places for accidents
 - Essential risk factors





WG2 – DATA COLLECTION ON ACCIDENTS

- General vision about accident data collection procedures
- Looking for a common terminology: event, accident, incident, etc.
- Accidents data more commonly collected:
 - Total number of events
 - Total number of events by type
 - Total number of fatalities
 - Total number of injured people (seriously and slightly)
 - Total number of victims (passengers and third parties)
- Safety indicators:
 - Events by km run
 - Collisions by km run
 - Number of accidents by intersection
 - Number of events by passenger·km
 - Total number of events
 - Total number of events by type
- Need to make a reference to the kind of infrastructure where the accident happens
- Proactive approach considering quasi-accidents: emergency brakes





WG3 – INFRASTRUCTURE DESIGN

Interaction points

- Main points of the LRT infrastructure whose design has to be properly studied in order to guarantee the safety of the system in its interaction with the public space
- Broad sense: interaction location + signalling and signage
- Main distinction:
 - Stops/Stations:
 - Low speed of LRV when approaching the stop
 - Most people around stops/stations are LRT users: aware of approaching vehicles as they want to board them, but risky situations:
 - Users hurrying to catch the LRV → riskier behaviour
 - Tendency to cross the tracks via inappropriate paths (direct route)
 - Accumulation of users in the limited space of the platform → passing each other through the unsafe zone of the platform or even through the tracks
 - Possible existence of standing LRVs which restricts the visibility of other approaching LRVs
 - Rest of the infrastructure (“between stations”):
 - Speed as high as it is allowed by the maximum operational speed of the infrastructure, the vehicle acceleration capability, and the circumstances of the track (drive on sight)
 - Pedestrians less aware of the existence of the LRT system or of the approaching LRVs



WG3 – INFRASTRUCTURE DESIGN

Interaction points

- Identification of interaction points and third parties in conflict

Interaction point	Third party		
	Pedestrian	Road vehicle	Cyclist
Road junctions (cars and cyclists) with tramway		X	X
Road junctions (cars and cyclists) with a left-turn		X	X
Roundabouts		X	X
Tramway segregation along the street (lanes and sidewalks)	X	X	X
Tramway segregation on mixed streets (cars and cyclists)		X	X
Tramway perception in pedestrian areas	X		
Pedestrian crossings	X		X
Cyclist in segregated areas			X
Stops and accesses	X	X	X
Interchange areas	X	X	X
Traffic signals (road vehicles and pedestrians)	X	X	X
Line signalling	X	X	X



WG3 – INFRASTRUCTURE DESIGN

Interaction points

- Interaction points data collection → template

ES1_8	BARCELONA - Trambaix: Crtra. Reial - Av. Baix Llobregat			
Location	City	Network	Line	Section
	Sant Just Desvern	Trambaix	T3	Carretera Reial - Av. Baix Llobregat
Operation Mode	segregated tramway	mixed zone	banalized space	
	X			
Interaction Points between LRT and	pedestrians	cars	cyclists	
		Roundabouts		
Landscape and surroundings context	Description			
	Carretera Reial: Is a wide avenue in a not very densely populated area, although there are quite a few companies. The platform of the tramway is very wide as well and the crossroads are mainly roundabouts. This particular roundabout is one of the most dangerous as the track of the tramway crosses off-centered, leaving a very little space for the cars to react if they don't respect the red light that protects the platform.			
Location	station		between stations	
			X	



WG3 – INFRASTRUCTURE DESIGN

Interaction points

Conclusions (good and bad design practices) about:

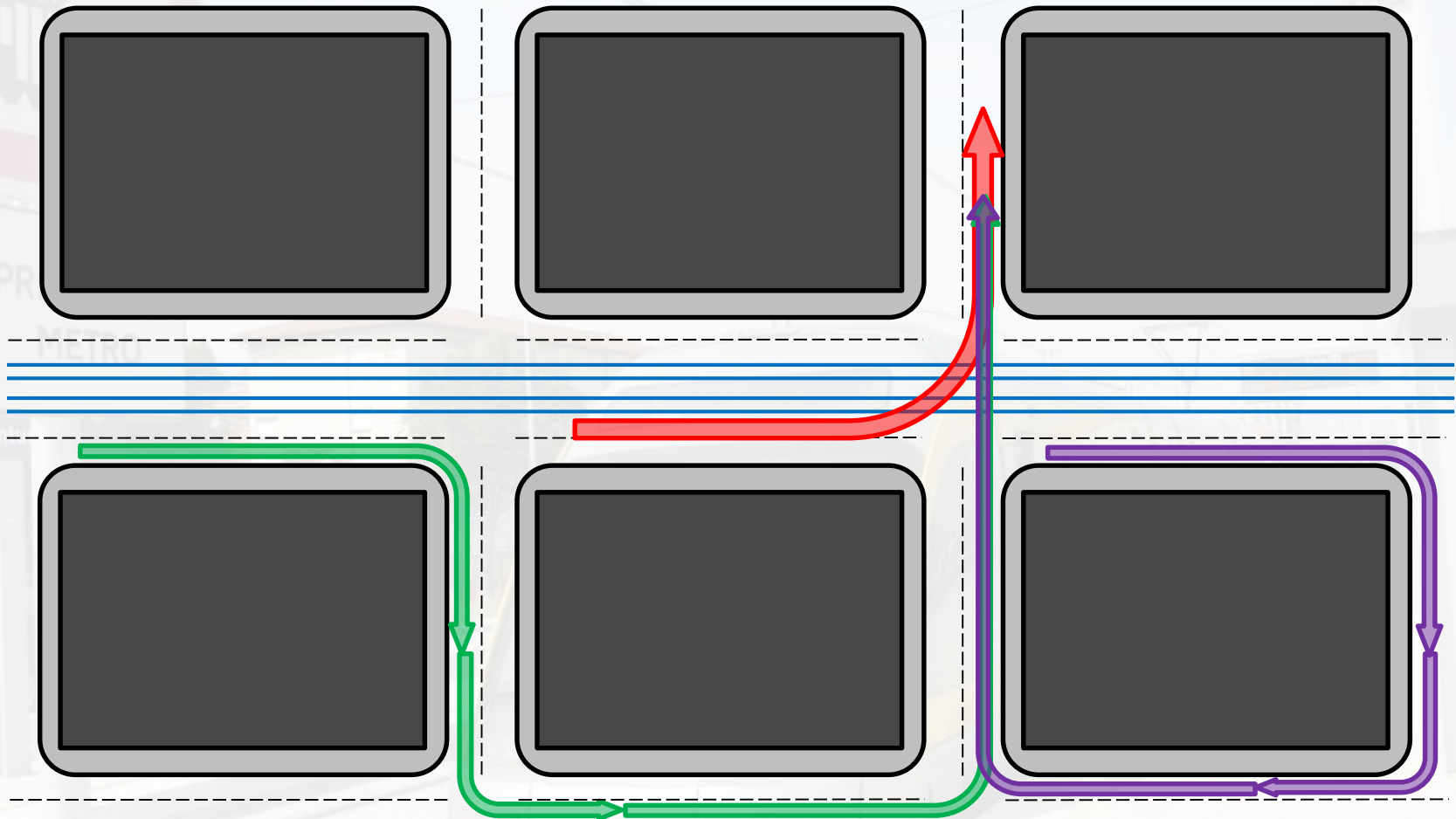
- Stations/Stops
 - Pedestrian pathways at stations
 - Platform design
- Between stations
 - Pavement treatment of LRT channel
 - LRT separators on segregated channels
 - Intersections
 - Left-turn intersections
 - Roundabouts
 - Pedestrian and cyclist crossings
 - Other innovative solutions at intersections
 - LRT channel differentiation and protection by means of pavement, marks, fences and barriers
 - OCS (overhead contact system) poles locations



WG3 – INFRASTRUCTURE DESIGN

Interaction points – Left-turn junctions

Transforming left-turns in other kind of movement

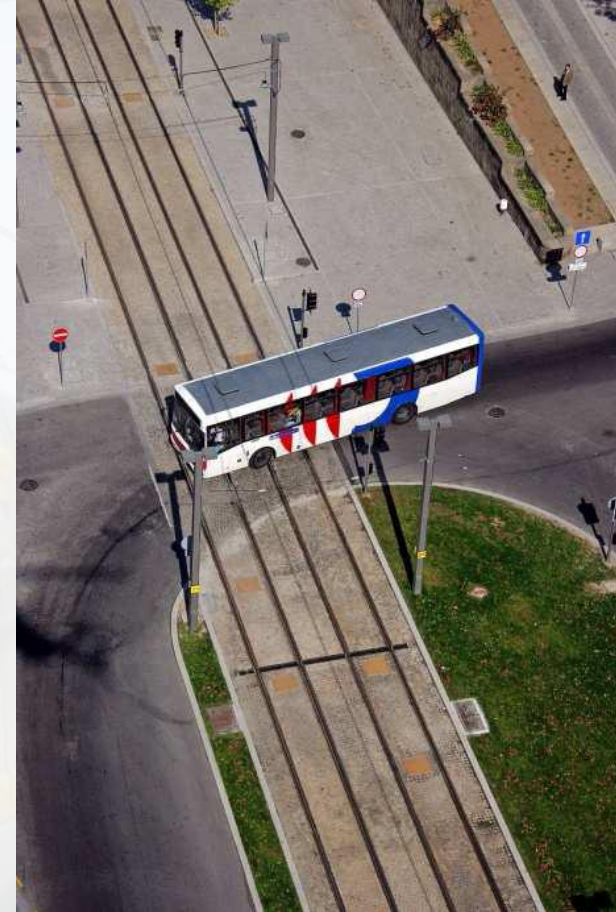




WG3 – INFRASTRUCTURE DESIGN

Interaction points – Left-turn junctions

Transforming left-turns in other kind of movement





WG3 – INFRASTRUCTURE DESIGN

Interaction points – Left-turn junctions

Avoiding forbidden left-turns



Plastic bollards leaving space for crossing vehicles coming from the perpendicular street, but complicating the left-turn to offender car-drivers

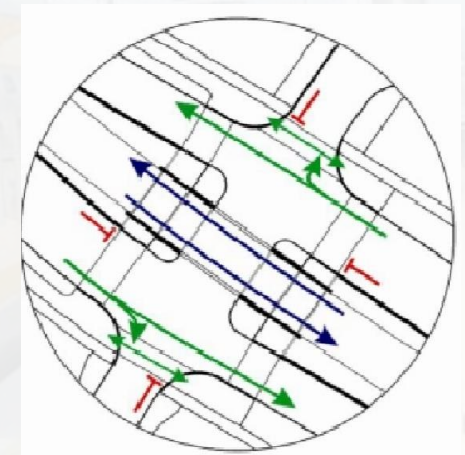


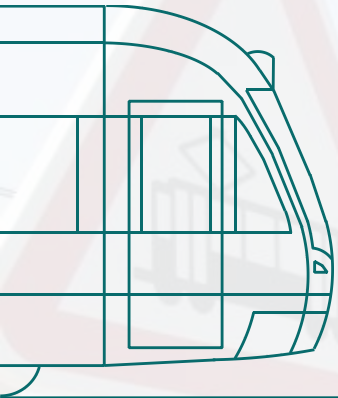


WG3 – INFRASTRUCTURE DESIGN

Interaction points – Left-turn junctions

Avoiding misreading of turning and straight on traffic lights





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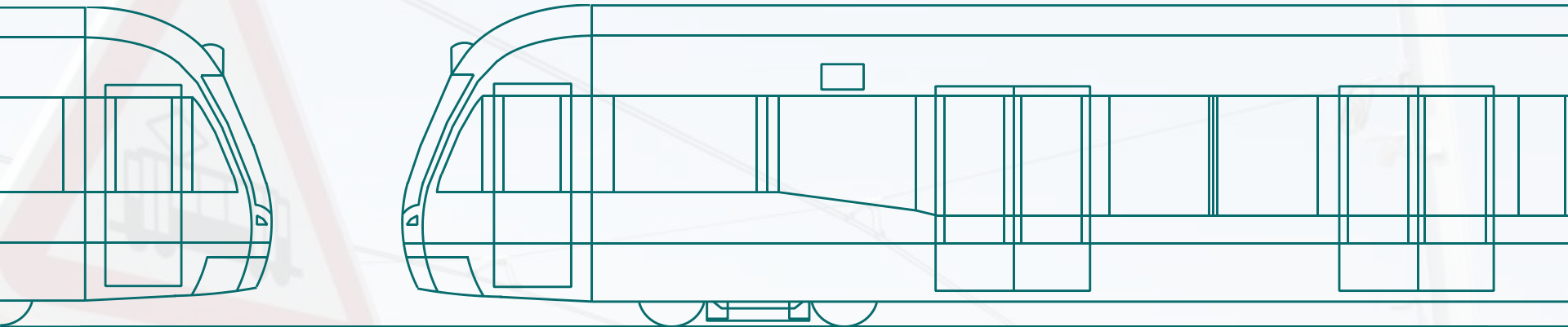
And all the members of the Action who had contributed to this paper



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