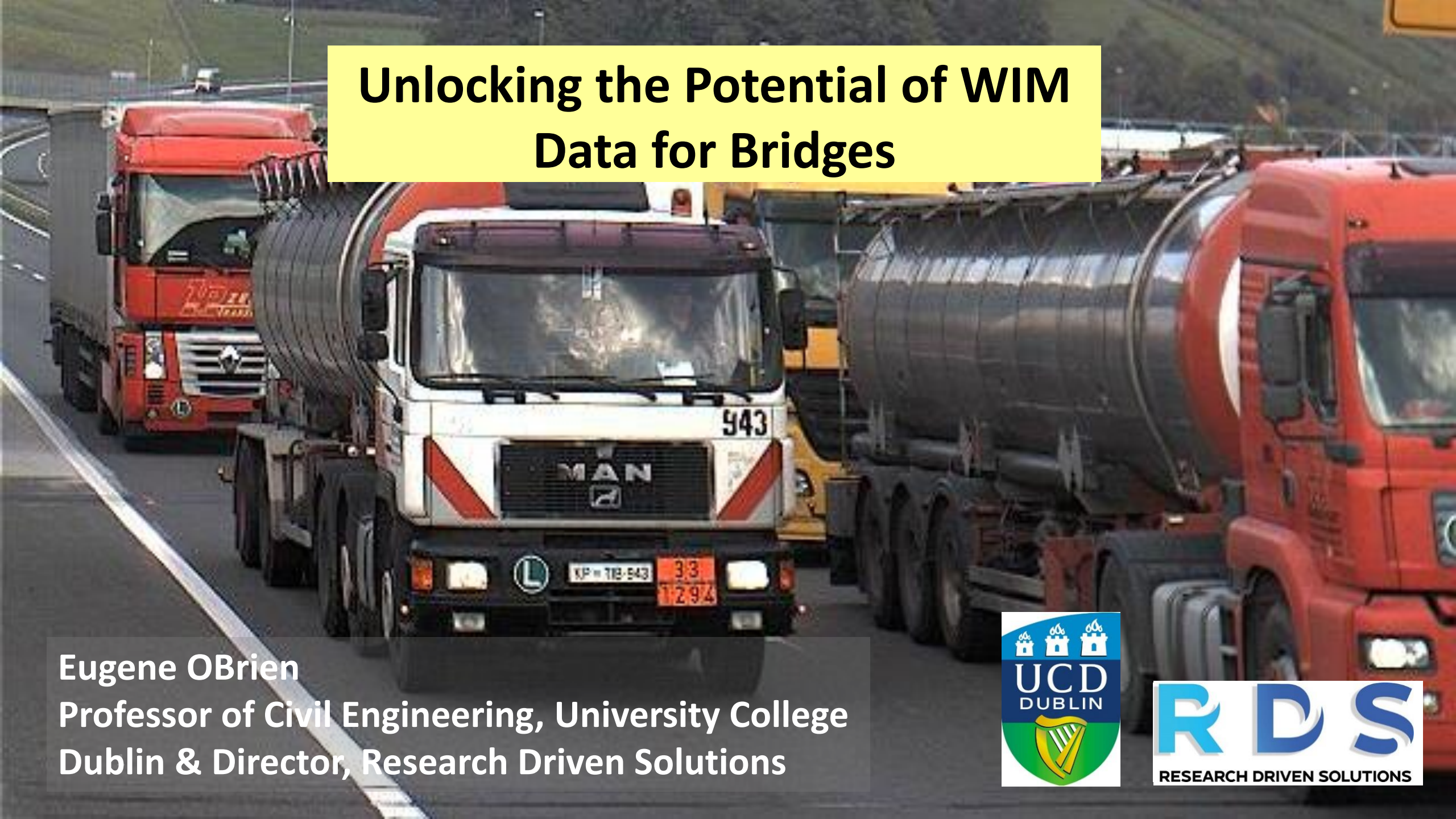
Unlocking the Potential of WIM Data for Bridges



Eugene OBrien
Professor of Civil Engineering, University College Dublin & Director, Research Driven Solutions

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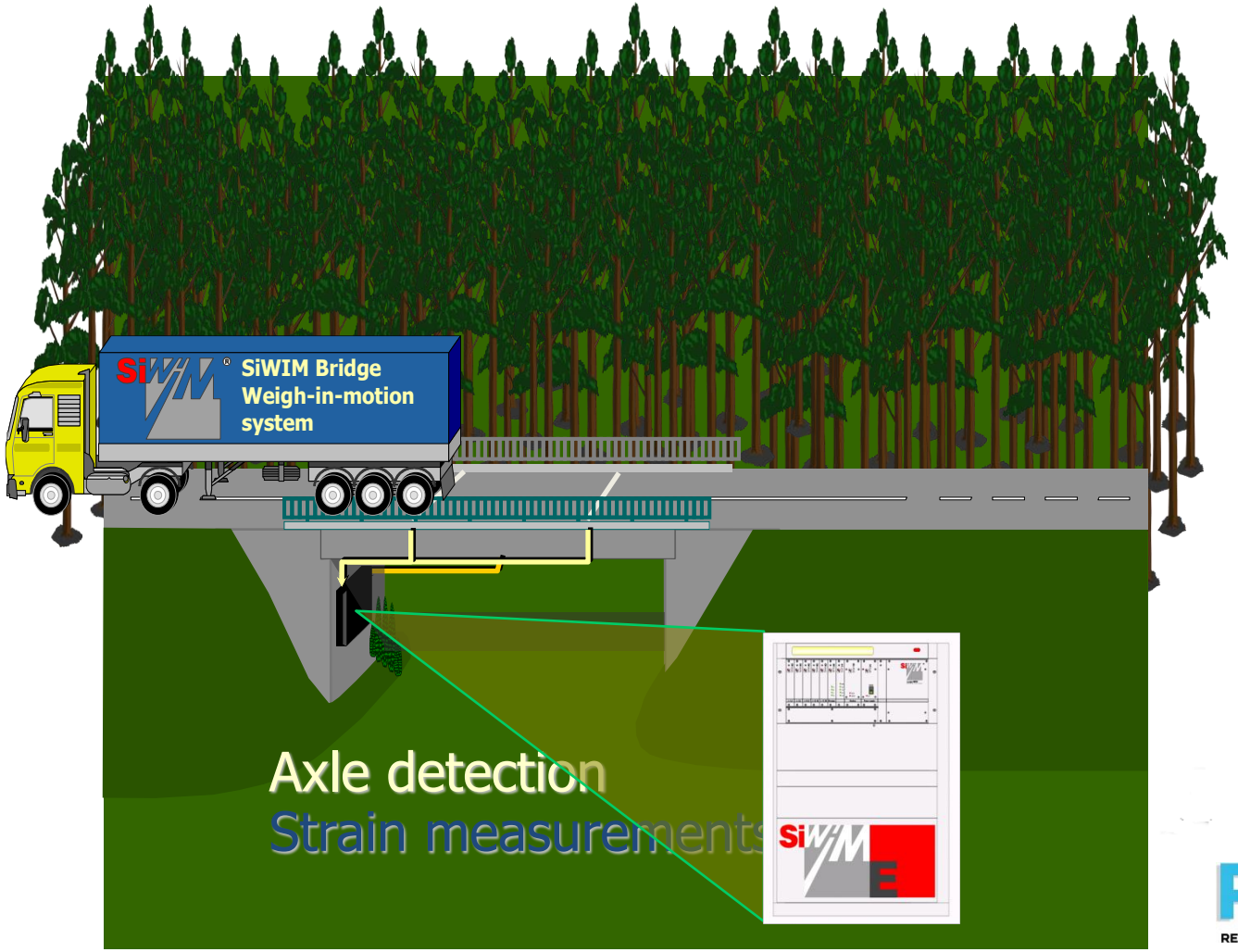
This is not a webinar on Bridge Weigh-in-Motion

- Bridge WIM uses a bridge as a scales to weigh passing trucks
- Strain transducers are attached to the underside of the bridge
- And used to calculate the weight of the truck and its axles



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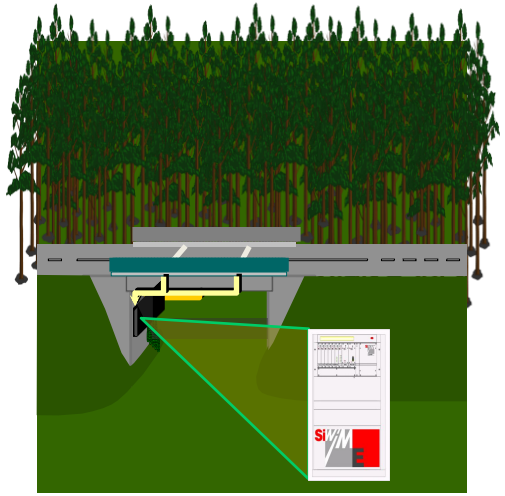

Bridge WIM system provides WIM data

Pavement WIM system also provides WIM data

- for pavement design/assessment
- for bridge design/ assessment/load control
- for economic studies
- for enforcement of legal weight limits

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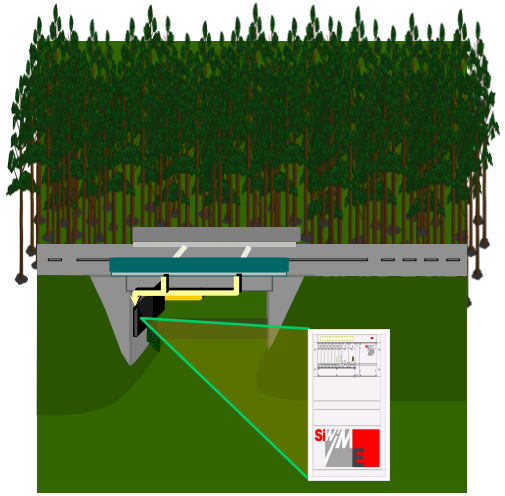

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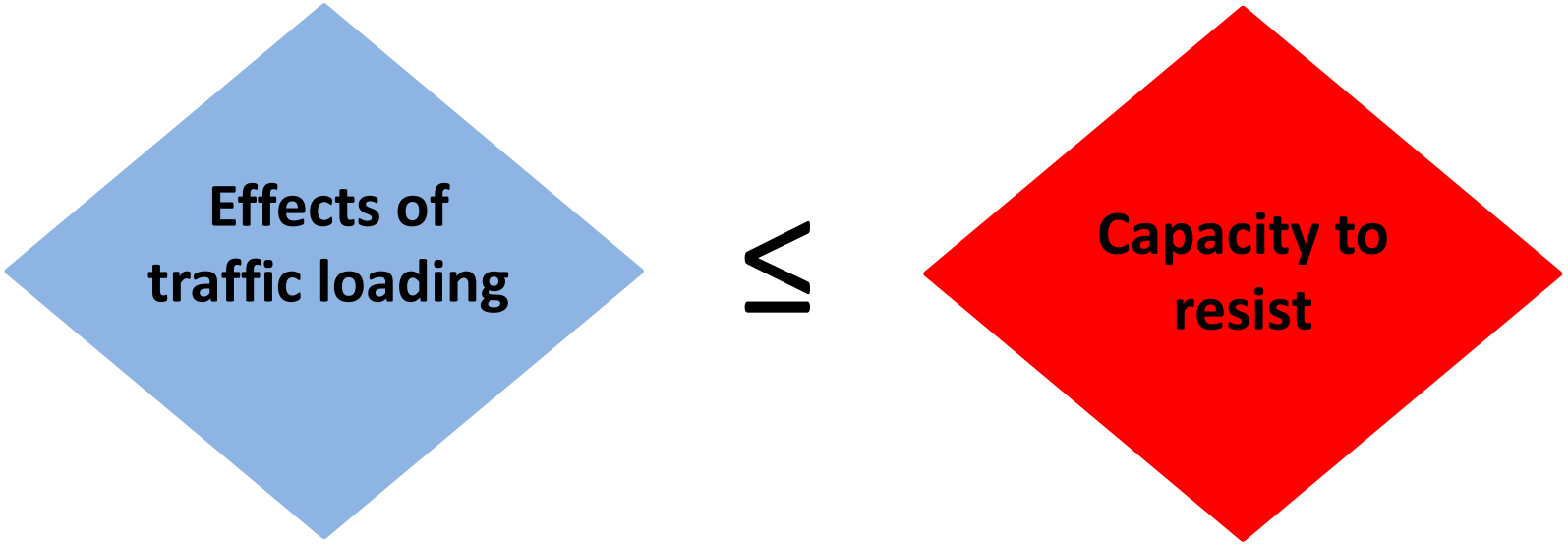
Load & Resistance Factor Design

- WIM data can be used in bridge safety assessments



- A bridge is safe if the effect of load (e.g. bending moment) is less than the capacity to resist it
- But often, little is known about the traffic loading
- This is critical information in any assessment of bridge safety (reliability or otherwise)

Load & Resistance Factor Design

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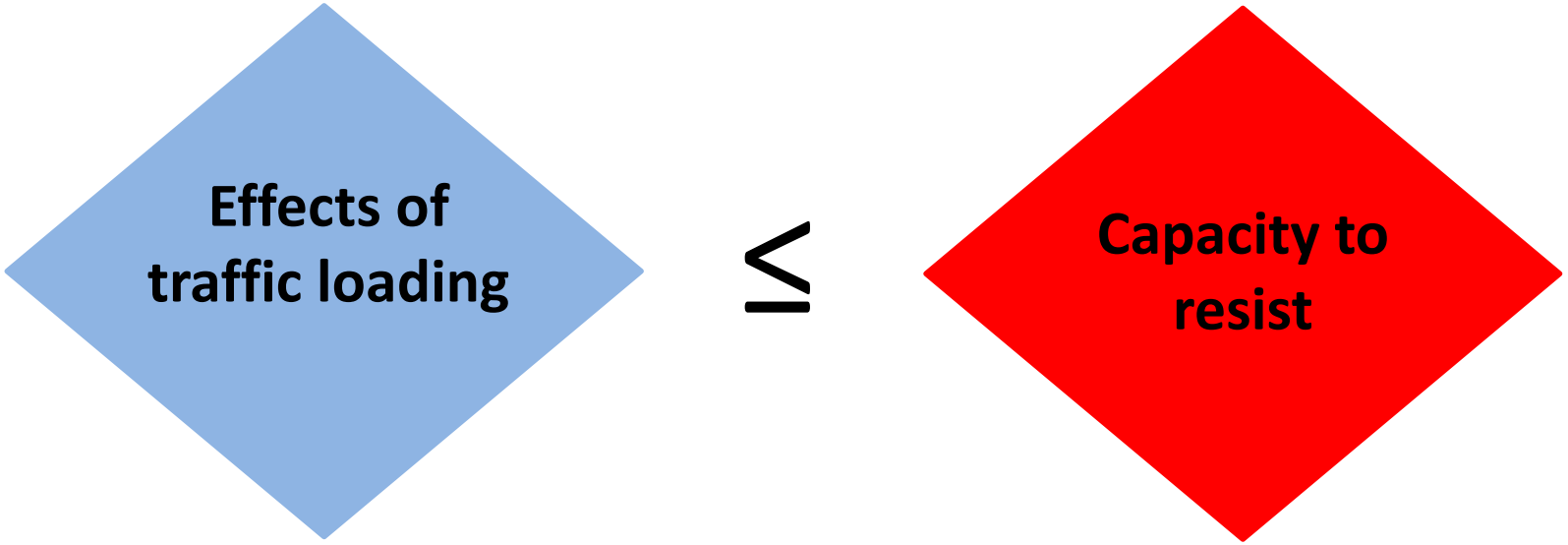
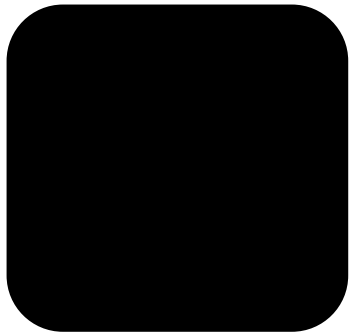
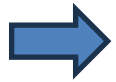


- WIM Data tells us about the traffic loading on our bridge

Site-specific Bridge Live Load Models

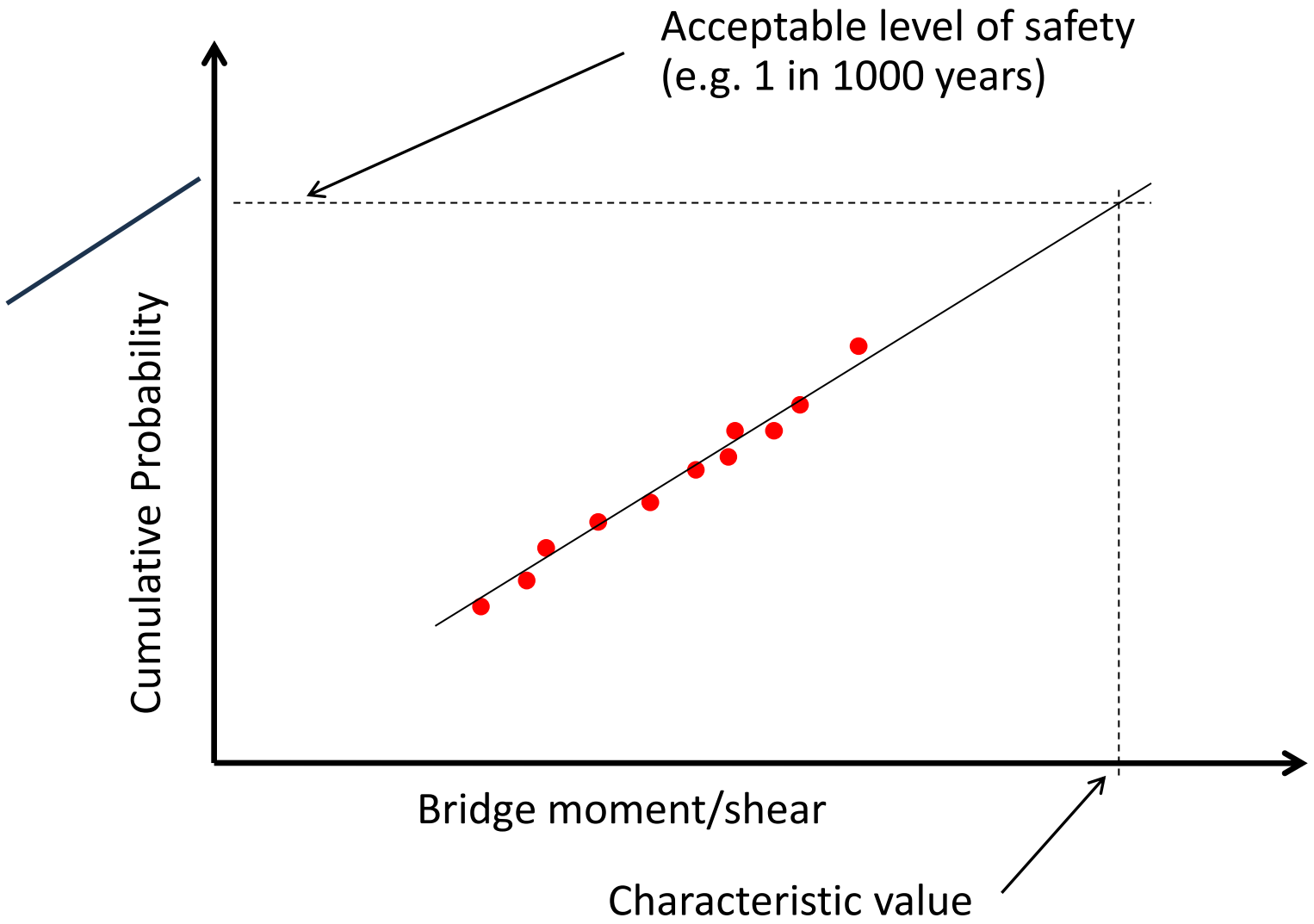
- If we have WIM data, we can calculate a site-specific load level on the bridge
- As standards are conservative, the site-specific loading is often much less than what the standard specifies





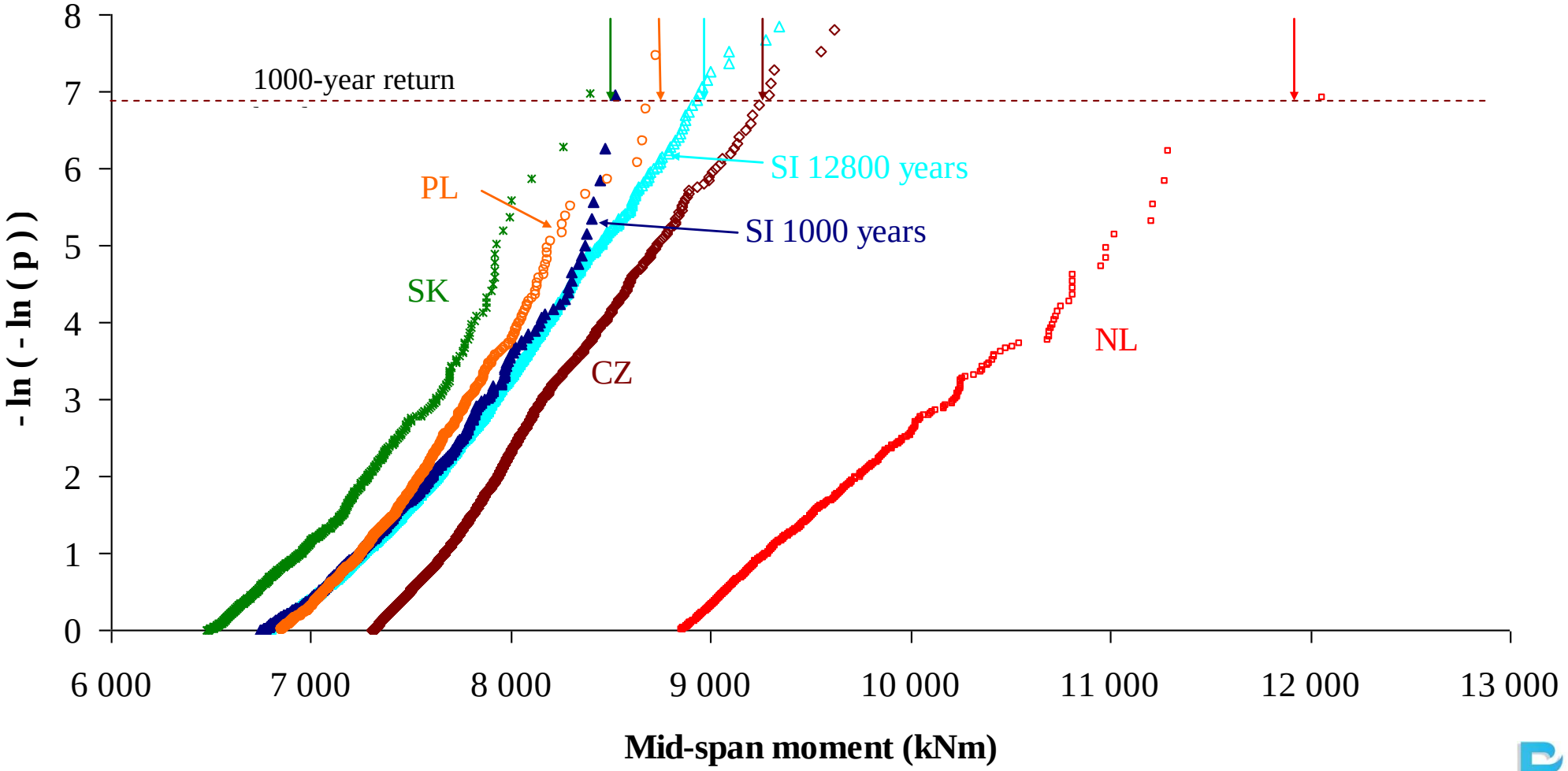
Once in 75-year moment/shear on bridge

Site-specific Bridge Live Load Models



Double log scale emphasises the extremes

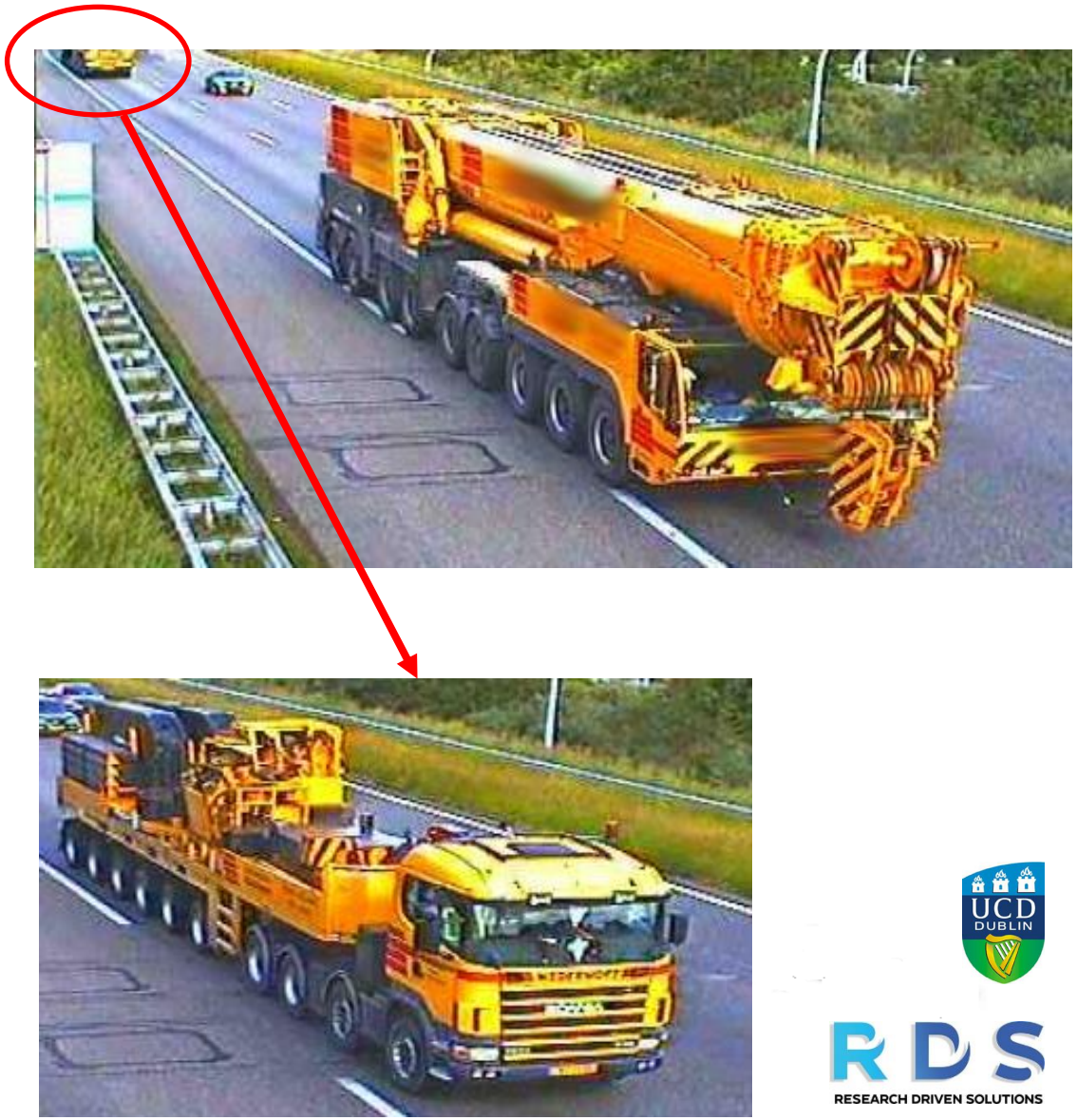
Site-specific Bridge Live Load Models



Site-specific Bridge Live Load Models

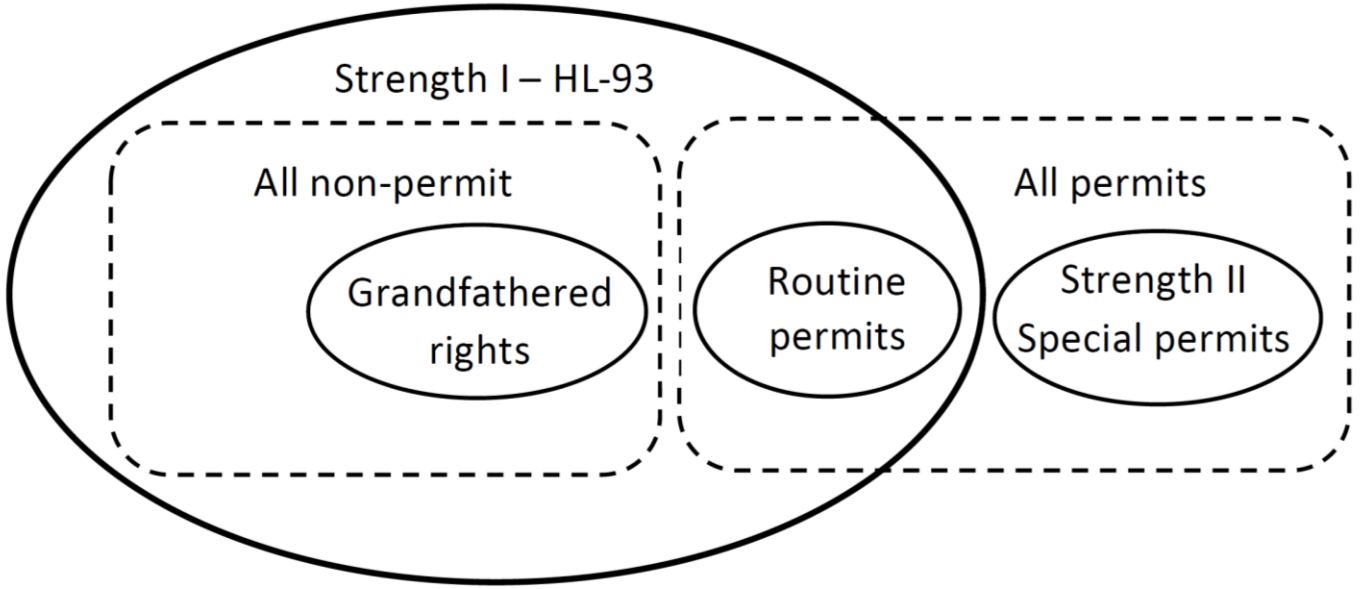
- Bridges under two lanes of opposing-direction traffic are the easiest to handle – traffic in each direction is statistically independent

- Highway Bridges carrying multiple same-direction lanes require Scenario Modelling or some other assumptions



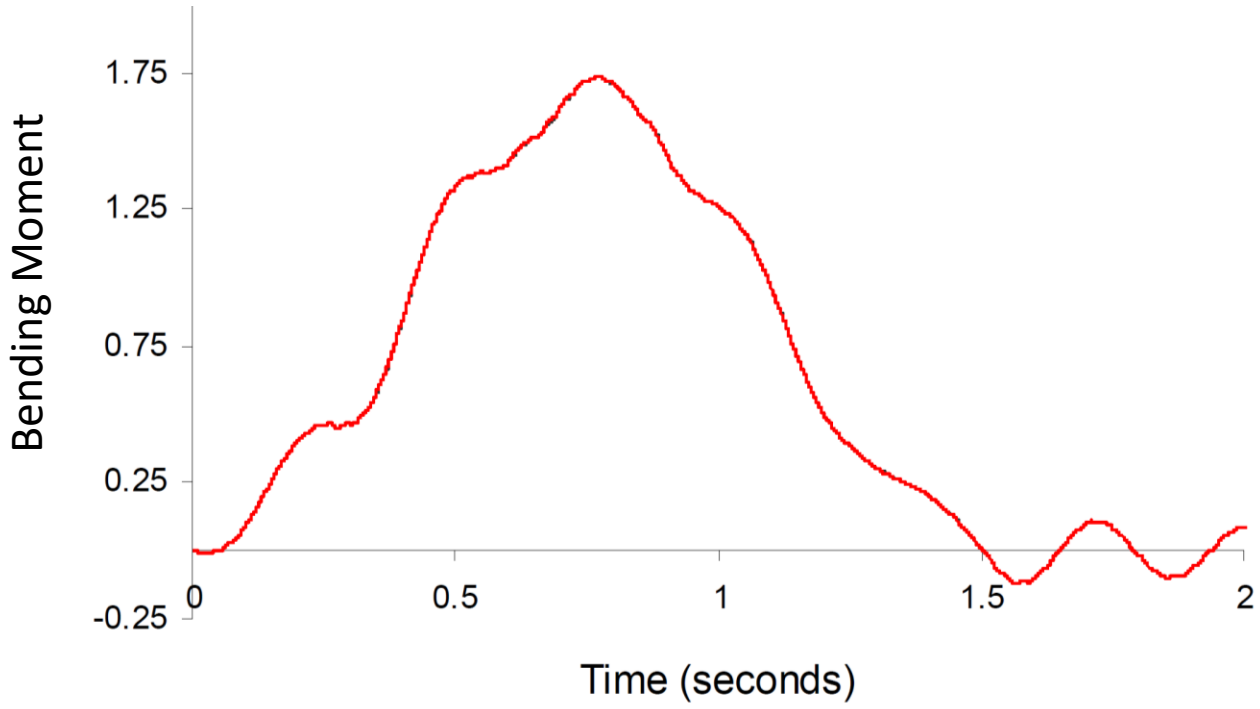
Site-specific Bridge Live Load Models

- **Permit vehicles should be filtered out and treated separately – they have different statistical properties**



Site-specific Bridge Live Load Models

- Dynamics can be dealt with by applying a factor to the results of the characteristic maximum moments/shears
- In my experience, this factor is less than 10% (the highest dynamic effects come from lighter trucks)



Unlocking the Potential of WIM Data for Bridges

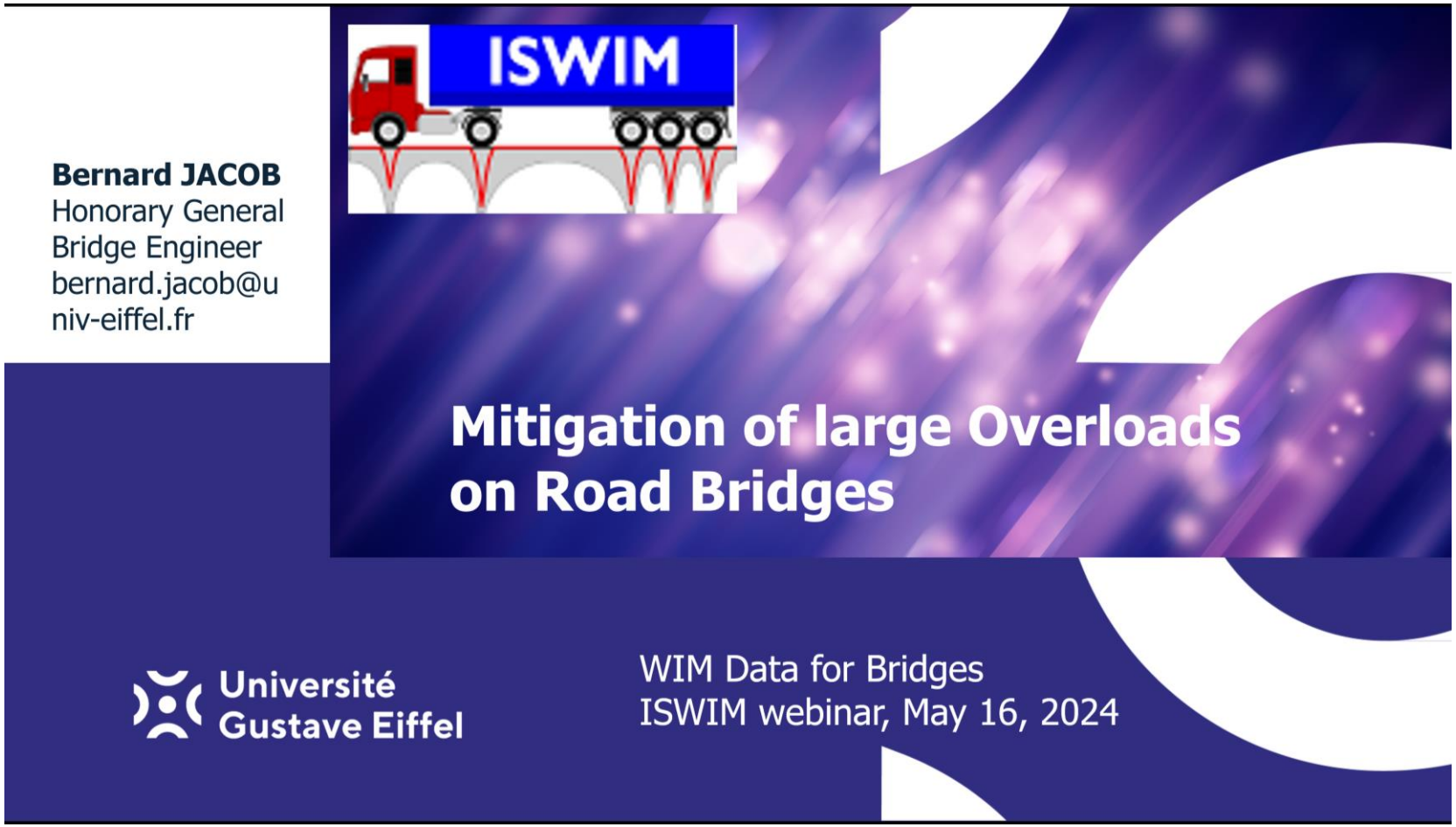
- Today's presentations…..

Site-specific Bridge Live Load Models

Sylwia Stawska, Modjeski & Masters Inc, USA

- Site-specific live load models allow weaker bridges to be retained in service

Using WIM Data for Bridge Protection
Bernard Jacob, University Gustave Eiffel, France



- We can protect vulnerable bridges from overload using WIM measurement

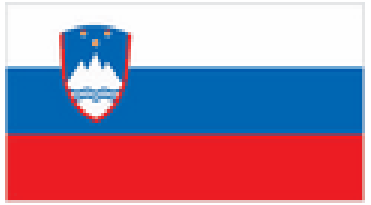
Using Intelligent Access to Re-engineer Bridges for Heavy Vehicles

Gavin Hill, Transport Certification Australia

- The concept of Intelligent Access will allow heavier trucks on those bridges that can carry them and will improve compliance with legal weight limits

Using WIM data to optimise decisions on under-strength bridges

Aleš Žnidarič, Slovenian National Building and Civil Engineering Institute ZAG



- How WIM data can identify the most vulnerable bridges and prioritise them for strengthening/replacement

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Fatigue – Bridge WIM Data for Remaining Life Prediction
Heikki Lilja, Consulting Engineer, Finland

- **WIM data can be used in fatigue calculations of remaining life prediction**