

**ISWIM**  
International Society for Weigh in Motion



# Introduction to Weigh-In-Motion

Hans van Loo  
International Society for Weigh-In-Motion

CVSA – ISWIM Workshop  
Sunday 21 September 2025

# Content

## 1. Weighing-In-Motion

- *Measurements*
- *Technologies*
- *Advantages*

## 2. Applications of WIM data

- *Weight enforcement*
- *Latest developments*

## 3. The best WIM system?

- *And other FAQ*

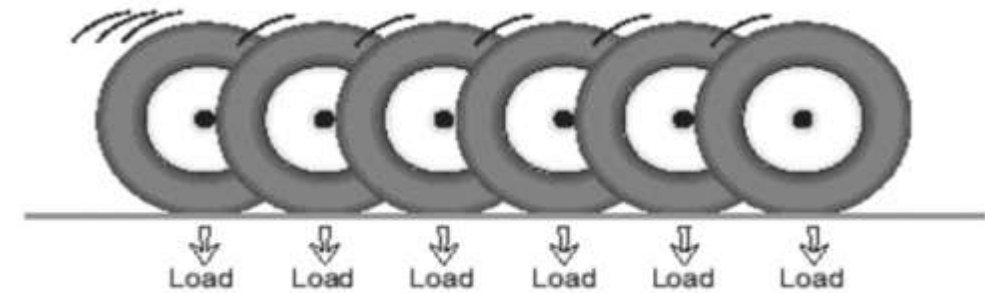
# Weigh-In-Motion



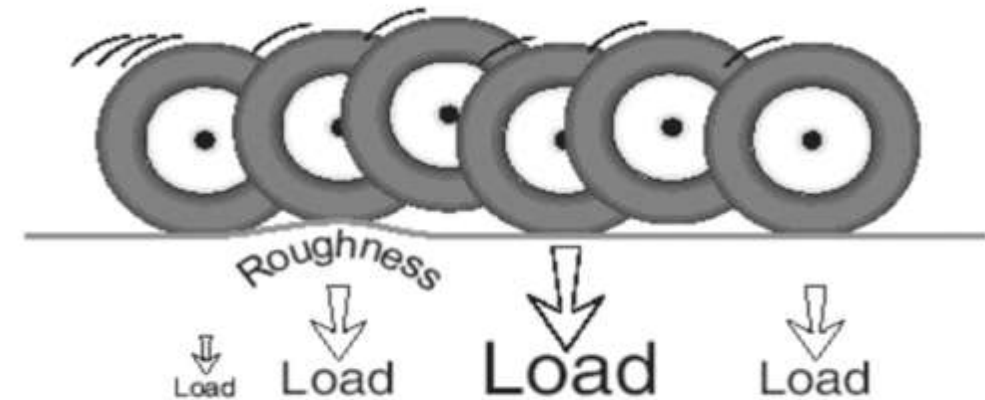
# Not Weigh-In-Motion

# Weighing-In-Motion

- Measuring the Dynamic tire forces of a moving road vehicle and;
- Calculating the Gross Vehicle Weight (GVW) and;
- Wheel, axle and axle group loads
  - the portion of the GVW carried by each wheel, axle, and axle group of a corresponding Static vehicle.



The load is relatively constant on smooth roads.

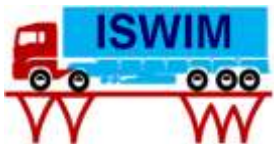


# Weigh-In-Motion Data

- **Vehicle Record**
- **Weighing data:**
  - Wheel loads
  - Axle loads
  - Axle group loads
  - Gross vehicle weight

## Additional data:

- Unique record number
- Location of measurement
- Lane and direction of travel
- Date and time of passage
- Vehicle speed
- Axle distances
- Wheel base and/or Vehicle length
- Vehicle classification



# Weigh-In-Motion Data

- **Often combined with:**
- **Cameras images of:**
  - Overview of vehicle
  - License plate number
  - Registration number
  - Dangerous good shield
  - Driver

## **3D-Scanner:**

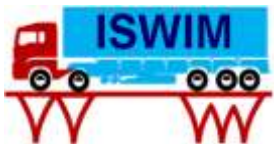
- Vehicle dimensions

## **RF-Tag Reader:**

- Vehicle identification

## **Tire Anomaly:**


- Missing tires
- Under/Over inflated tires



WIM Monitor Category Comparison

Bestand Verbinding Extra Filter Navigatie Help

04:04:38



- Overview
- License Plate
- Overloading
- Class

Datum: 02 maart 2004

Tijd: 10:57:21

Voertuig nr.: 551

Rijstrook: Rechter rijstrook

Meetlocatie: RW12;km41,8;noordbaan;Woerden

Sub Categorie: O2235


Sub Categorie (ORO): O2235

Sub Categorie (DWW): O2235\*

Lees logbestand(en) opnieuw

Snelheid (km/h): 75


	Asdruk (ton)	Lengte (m)
Totaal	140,4	27,85
	Asdruk (ton)	Afstand (m)
As 1	7,8	-
As 2	7,6	1,72
As 3	12,8	2,21
As 4	12,3	1,39
As 5	12,2	2,43
As 6	12,0	1,56
As 7	11,7	1,53
As 8	13,0	9,76
As 9	13,5	1,39
As 10	12,9	1,36
As 11	12,3	1,42
As 12	12,3	1,39



Bar chart showing axle load distribution (As 1 to As 12) with values ranging from approximately 7.6 to 13.5 tons.

B6-6L-69

OVERIGE



Rijkswaterstaat  
Dienst Weg- en Waterbouwkunde

Niet verbonden met WIM-systeem

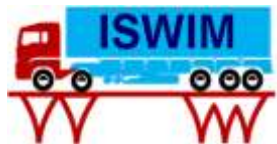
- Date
- Time
- Number
- Direction
- Location
- Class
- Speed
- GVW
- Axle loads
- Axle dist.

# Why WIM?

Vehicle *mass data* is critical to the ***design, management*** and ***operation*** of the **Road Infrastructure**

and

is important in the support of **Size & Weight Enforcement**



## 2<sup>nd</sup> Law of WIM:

Only a WIM system will provide a complete picture of the actual traffic loading at a particular location.

*ISWIM Guide for Users of Weigh-In-Motion*

[www.is-wim.net](http://www.is-wim.net)



# WIM Technologies

- Strips
  - Partial wheel load
- Scales & Plates
  - Full wheel load
- Bridge WIM
  - Response of bridge
- On-Board WIM
  - On vehicles



# WIM Technologies

- Strips
  - Partial wheel load
- Scales & Plates
  - Full wheel load
- Bridge WIM
  - Response of bridge
- On-Board WIM
  - On vehicles



**Forget the Technologies!  
Focus on the Applications!**



# Applications of WIM

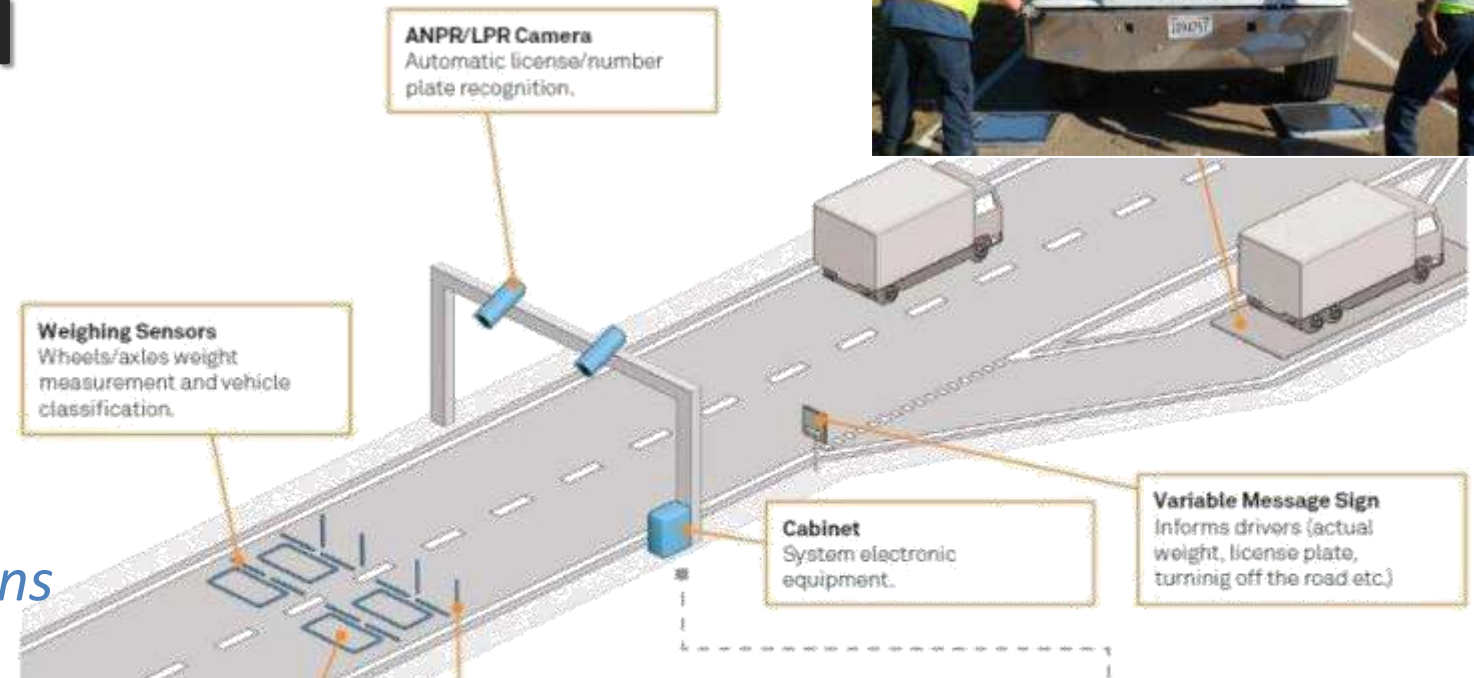
## Road Infrastructure:

- Statistics of traffic loading
  - Input for design codes
  - Planning of maintenance
- Special transports
  - Matching of permits and routes
- Bridge protection
  - Avoiding damages



# Applications of WIM

- **Weight Enforcement:**
  - Statistics & Planning
  - Pre-Selection for
    - *Road side controls*
    - *Permanent weigh stations*
  - Company Profiling
  - Direct Enforcement



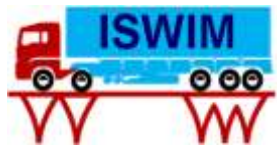
# Applications of WIM

## Weight Enforcement:

- Statistics & Planning
- Pre-Selection for
  - *Road Side Controls*
  - *Permanent Weigh Stations*
- Company Profiling
- Direct Enforcement

## Advantages:

- Info on Where and When
- Indication of Probable Overload
  - More efficient controls
  - No disturbance of Traffic flow
- Focus on ‘bad’ Companies
- **Direct Proof of Overload**
  - “Ultimate Application”



# Direct Weight Enforcement

- Advantages:
  - High efficiency combined with high effectiveness.
  - High control rate (>99%), operational 24/7
  - Low number of staff required
  - Suitable for high volume highways
- But ...
  - It is no magic solution for all overloading
  - It may be sensitive to evasion
  - Requires careful implementation!

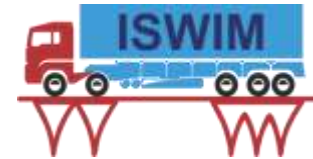


# Direct Weight Enforcement

## Status Quo:

- WIM Technology is ready
  - More Accurate Sensors
  - More Advanced Systems
- National Implementations in:
  - Czech, Hungary, Russia, Brazil, USA, Belgium, and
    - Since 2024: USA in New York City
  - In preparation: Germany, France, Poland, UAE, South Africa, ...
- Limited International Harmonization





# Implementation of WIM

## 3 Elements for implementation:

- Selection of a proper location
  - Pavement conditions
  - Traffic conditions
- Carefull installation
  - Depending on technology
  - Use experienced installation crews
- Periodical maintenance
  - Depending on technology
  - **Performance will deteriorate over time!**

### 1<sup>st</sup> Law of WIM:

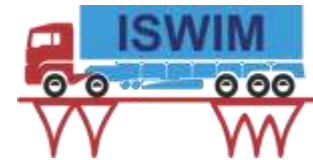
A WIM system installed on a good road may give good results; a WIM installed on a poor road will always give poor results.

*ISWIM Guide for Users of Weigh-In-Motion*

[www.is-wim.net](http://www.is-wim.net)

# FAQ about WIM

- What is the best WIM-sensor?
  - *Who cares, as long as the data is good!*
- What is the cheapest WIM-system?
  - *No WIM system at all!*
- How accurate should a WIM-system be?
  - *Depends on your application.*
  - *Don't forget about reliability!*
- What is the best WIM-system?
  - *I don't know! What is the best car?*
  - *Depends on application and conditions.*

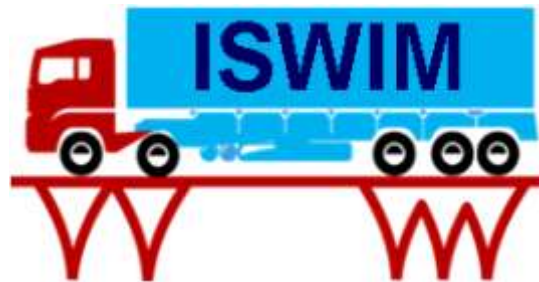


# Questions?

## Weigh-In-Motion

Hans van Loo

[Hans.vanloo.int@gmail.com](mailto:Hans.vanloo.int@gmail.com)



**ISWIM**

[www.is-wim.net](http://www.is-wim.net)

