Application of WIM for Weight Enforcement

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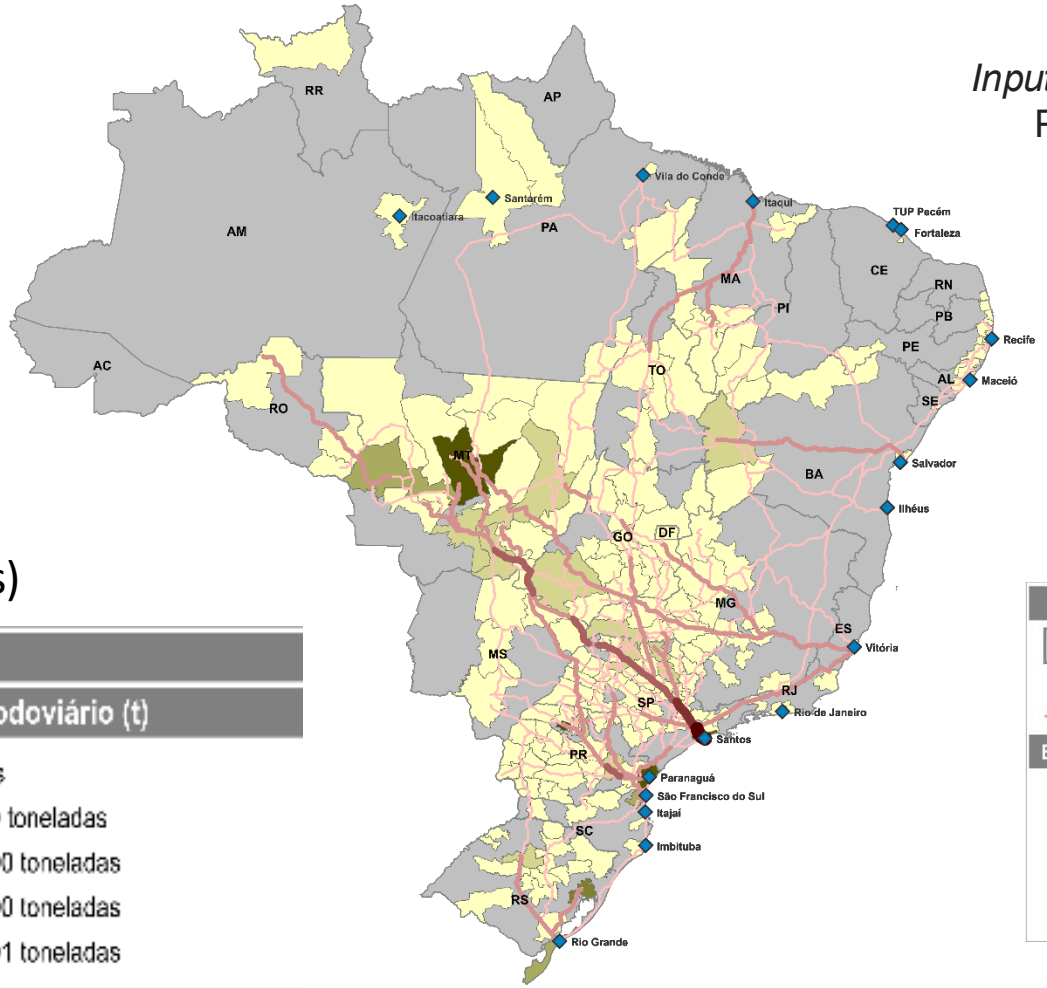
UFSC

Transport in Brazil

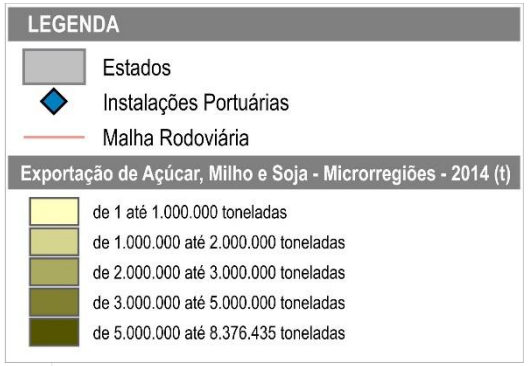
Main roadways and highways



Input - o exportation flux, ref. year 2014
Products: Sugar, Corn and Been, by grouped in microregions.
source: AliceWeb.

Volumes (tons)

Production (tons)



Application of WIM in Brazil

- Brazil has recently advanced the application of Weigh-In-Motion (WIM) technology to enforce weight regulations on federal highways.
- Two federal bodies responsible for enforcement activities:
  - **National Department of Infrastructure and Transportation** (**DNIT**), responsible for non-concession federal highway network

DNIT
PIAF and UMO-D

  - **National Land Transport Agency** (**ANTT**), responsible for concession federal highway network

ANTT
HS-WIM
"Sandbox"

Contran Resolution No. 882/2021

- Establishes the weight and dimension limits for vehicles traveling the roads of Brazil, ratifies CONTRAN Deliberation No. 246 of November 25, 2021:
  - Establishes the weight and dimension limits for vehicles and combinations subject to inspection (cargo and passenger vehicles)
  - Defines tolerance for enforcement
  - Addresses exceptions for vehicles in circulation (passenger transport, liquid cargo, AET - Special Transit Authorization, etc.)
  - Defines cargo vehicle combinations
  - Defines limits for vehicles on international trips, buses, and bi-articulated vehicles

Contran Resolution No. 902/2022

- Provides for the use of integrated automated systems for vehicle weight and dimensions enforcements, dispenses the physical presence of the traffic authority or its agent at the verification site:
  - The physical presence of the road authority or its agents in areas designated for inspection is not mandatory
  - Enforcements instruments must be subject to INMETRO inspection
  - Penalties apply for evading the weighing station
  - Penalties also apply for evading or exiting the designated weighing area
  - Violations and citations may be issued based on system records (including data and images)
  - Administrative procedures are required (GVW or/and axle overload)

INMETRO Ordinance n°19, February 2022

- Approves the consolidated Metrological Regulation for WIM systems (both low and high speed), it includes:
  - Type approval
  - Initial and subsequent verification
  - Metrological supervision
  - Test procedure, types of vehicles

Maximum Permissible Error: GVW (Gross Vehicle Weight)

Percentagem do valor verdadeiro convencional da massa do veículo (7.6)		
Classes de exatidão	Aprovação de Modelo, verificação inicial e verificação subsequente (±)	Supervisão metrológica (±)
1	2,50%	5,00%
2	3,50%	7,00%
3	5,00%	10,00%

Maximum Permissible Error: Single Axle and Axles/Axle Groups

Percentagem da média corrigida da carga por eixo e conjunto de eixos (7.10)		
Classes de exatidão	Aprovação de Modelo, verificação inicial e verificação subsequente (±)	Supervisão metrológica (±)
A	4,00%	8,00%
B	6,00%	12,00%
C	8,00%	16,00%

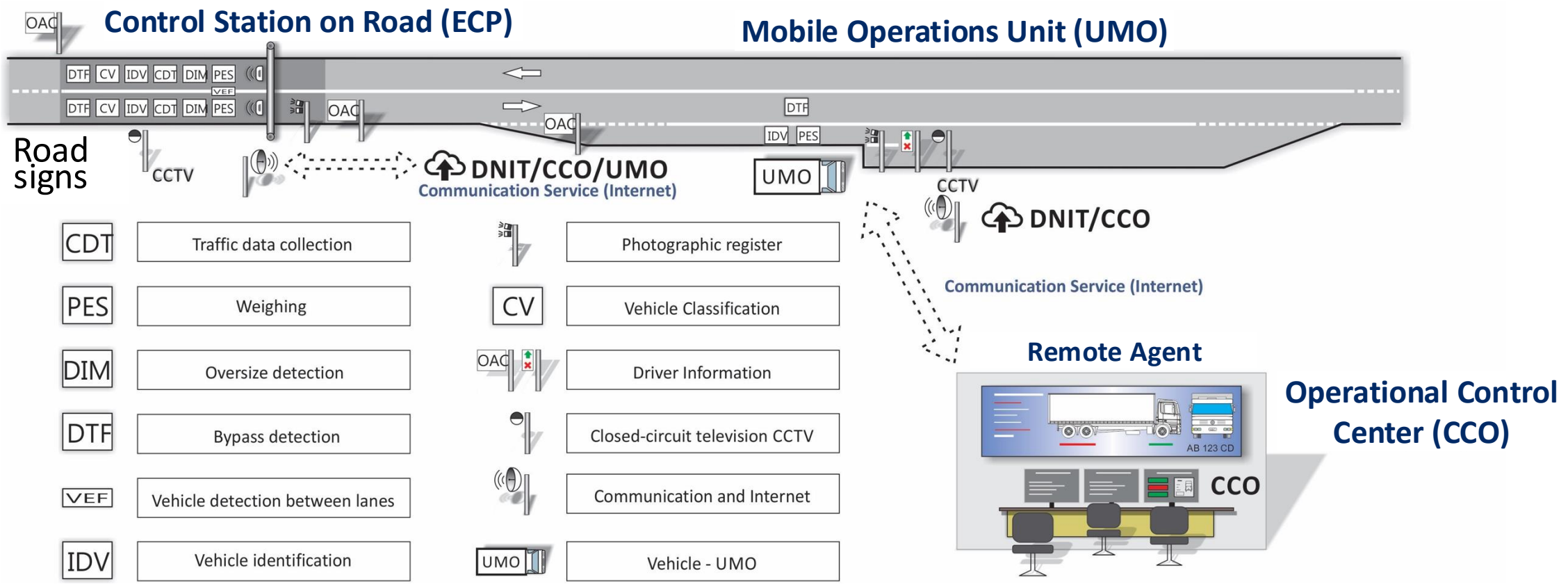
DNIT WIM Program

- DNIT has implemented the *Unidade Móvel Operacional* (UMO) program, which integrates High-Speed WIM (HS-WIM) technology with mobile enforcement units
  - Improve road safety and pavement performance on federal highways
  - Improve the performance of overload enforcement
  - Automate the pre-selection of overload enforcement
  - Optimize the activity of DNIT Traffic Agents with the help of technology
  - Allow free flow of trucks and buses without overload and reduce inspection time
- These units are equipped with both static portable scales (UMO-E) and dynamic portable scales (UMO-D), enabling versatile and mobile enforcement operations

DNIT WIM Program

- Model : HIGH-SPEED ECP, UMO and CCO

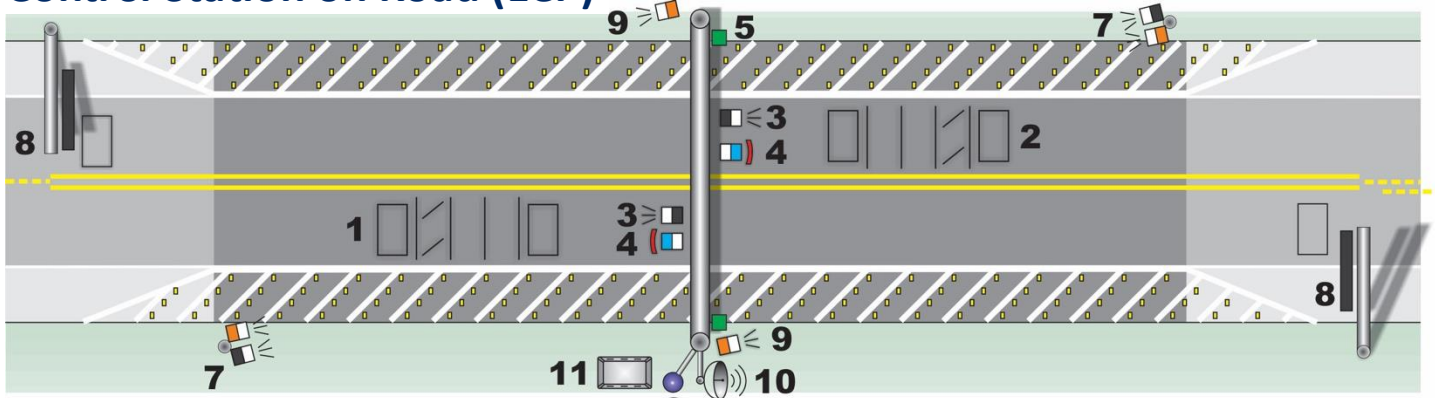
Mixed Weight Station – PPM
(Single Lane Model)



DNIT WIM Program

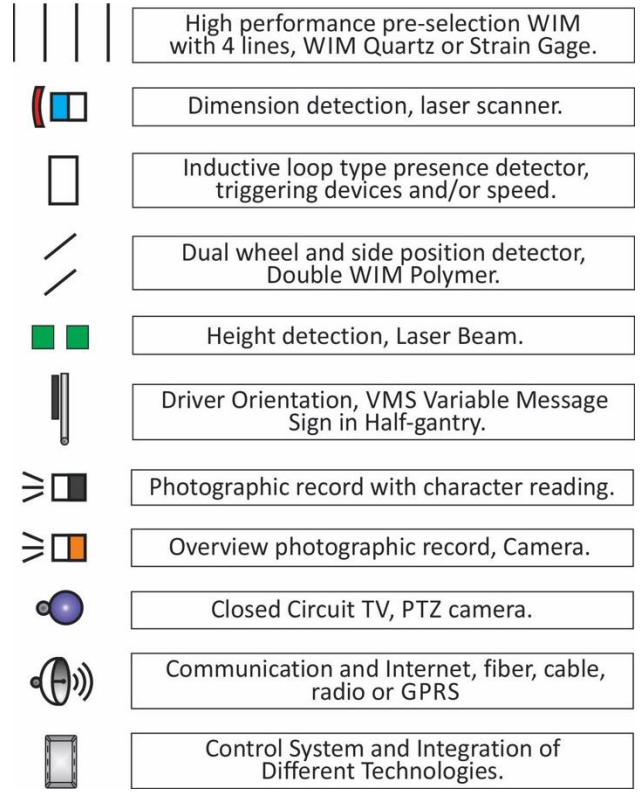
- The HS-WIM systems are certified by INMETRO

Control Station on Road (ECP)



Differentiated pavement solution

Data transmission to the DNIT system and communication with UMO and CCO



- A 2017 national procurement led to the deployment of 15 UMO-D and 46 UMO-E across Brazil

DNIT WIM Program

- A dedicate Location Tool developed by LabTrans/UFSC was used to shouse the locations for implementing UMO
- The pavement design considered was COST-323 Class I for WIM (thick asphalt pavement)
- DNIT will provide a room for the Agents to monitor the inspection

ANTT WIM Program

- Concurrently, ANTT introduced Brazil's first HS-WIM for direct enforcement under a regulatory sandbox initiative
- In partnership with the ***Ecovias do Cerrado*** concessionaire on BR-364 and BR-365, the agency replaced four traditional weigh stations with HS-WIM systems

ANTT WIM Program

- ANTT Sandbox uses HS-WIM to direct enforcement, promoting fairness and reducing the social and environmental costs of overloaded transport

ANTT WIM Program

- INMETRO, as a partner in the project, tested and certified all four WIM sites in accordance with INMETRO ordinance No. 19

INMETRO verification Report	Dates
HS-WIM BR 365 km 640 Faixa 1	jun/25
HS-WIM BR 365 km 640 Faixa 2	set/24
HS-WIM BR 364 km 12 Faixa Leste	mai/25
HS-WIM BR 364 km 12 Faixa Oeste	mai/25
HS-WIM BR 365 km 649 Faixa 2	mai/25
HS-WIM BR 364 km 110 Faixa Leste	jun/25
HS-WIM BR 364 km 110 Faixa Oeste	jun/25

Serviço Público Federal
MINISTÉRIO DA ECONOMIA
INSTITUTO NACIONAL DE METROLOGIA, QUALIDADE E TECNOLOGIA - INMETRO

Verificação inicial, subsequente e supervisão metrológica de instrumentos de pesagem automáticos para veículos rodoviários em movimento

Dados e Instruções - Registro de Medição IPEM-MG nº 13644455170625

Dados do Requerente:						
Razão Social:	ECORODOVIAS CONCESSOES E SERVICOS S/A					
CNPJ:	08.873.873/0001-10					
Endereço:	Rod. dos Imigrantes S/N KM 28,5 1 E 2 ANDAR			Bairro:	Alvarenga	
Cidade:	São Bernardo do Campo		UF:	SP	CEP:	09845-000
Contato:	Bruno Araújo Silva	Telefone:	(34)9 9935-8680	E-mail:	Bruno.araujo@ecovias.com.br	

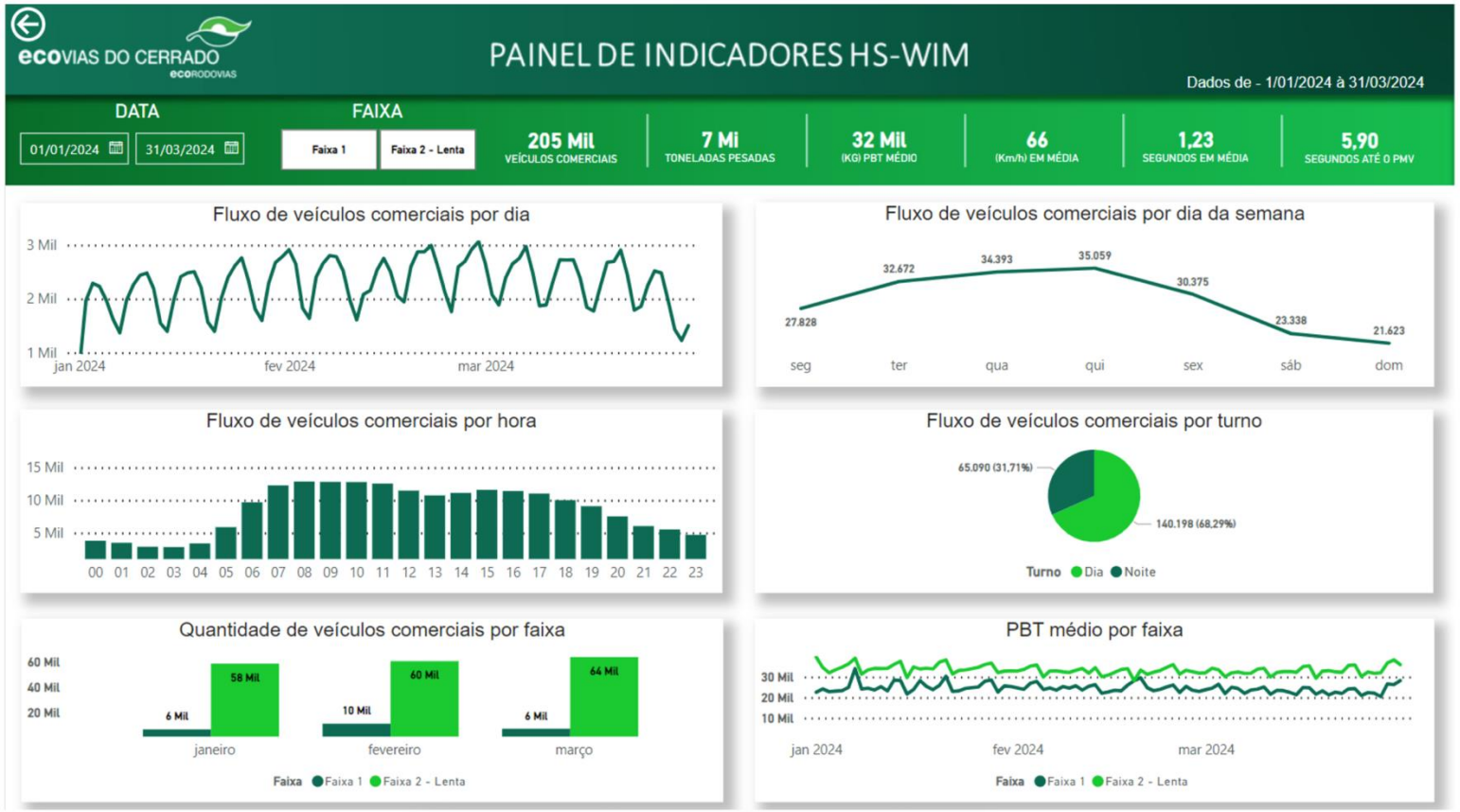
Local de instalação:	Rodovia BR365 km 640 - Uberlândia-MG - Faixa 1		
Classes de Exatidão:	1 A	Parâmetros de ajuste:	** Fatores Observações
Atividade do CML*:	Verificação subsequente		
EMA (Massa do veículo):	2,5%		
EMA (Por eixo):	4%		
Nº Ident. Placa de Pesagem :	5204AC08		
**Identificação do software :	1CD1A11A / 13 de Junho de 2025 / 13:30 horas (ID Metrológico)		

Class 1A:

- 2,5% of the true value of GVW
- 4% of the axle weight

ANTT WIM Program

- HS-WIM Dashboard – Commercial Vehicle Monitoring (Jan–Mar 2024)



- Key indicators from the HS-WIM system on the ***Ecovias do Cerrado*** highway

KM 640 BR - 365/MG

Ecovias do Cerrado | Trimester Report | From January to Mars 2024

ANTT WIM Program

- Overloaded vehicle detections increased, reaching 17.07% of all commercial traffic in December 2024
- GVW reduces to 2,54% in Dec. 2024, while Axle increases to 5,47%

Overload type	Qty (Jul 24)	%	Qty (Oct 24)	%	Qty (Dez 24)	%
Axle only	2.821	1,50%	7.947	6,09%	13.072	5,47%
GVW only	11.880	6,50%	1.433	1,10%	6.069	2,54%
Both axle and GVW	3.505	1,90%	4.285	3,28%	21.655	9,06%
TOTAL	18.206	9,90%	13.655	10,90%	40.796	17,07%

KM 640 BR - 365/MG
Ecovias do Cerrado | Trimester Report

Conclusions

- These efforts demonstrate Brazil's commitment to modernizing freight transport regulation through innovative, scalable, and sustainable WIM technologies
- It took a long period for Brazil to implement the regulatory and technical changes needed to allow high-speed WIM for direct enforcement
- Both DNIT and ANTT are playing complementary roles:
  - DNIT, through the UMO program, deploying HS-WIM systems on federal highways
  - ANTT, through concession contracts, is incorporating HS-WIM as a contractual requirement for highway concessions
- The convergence this two projects (ANTT and DNIT) are improving road safety, reducing pavement damage, and enhancing transport efficiency

Thank you !!!

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