



Strengthening Sustainable and Digital Trade Routes and Logistics Concepts Between Eastern Partnership Countries and with the EU

Decarbonizing transport with digitalization: platforms, tools and impact

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AI EXPERT OF MC MOBILITY CONSULTANTS

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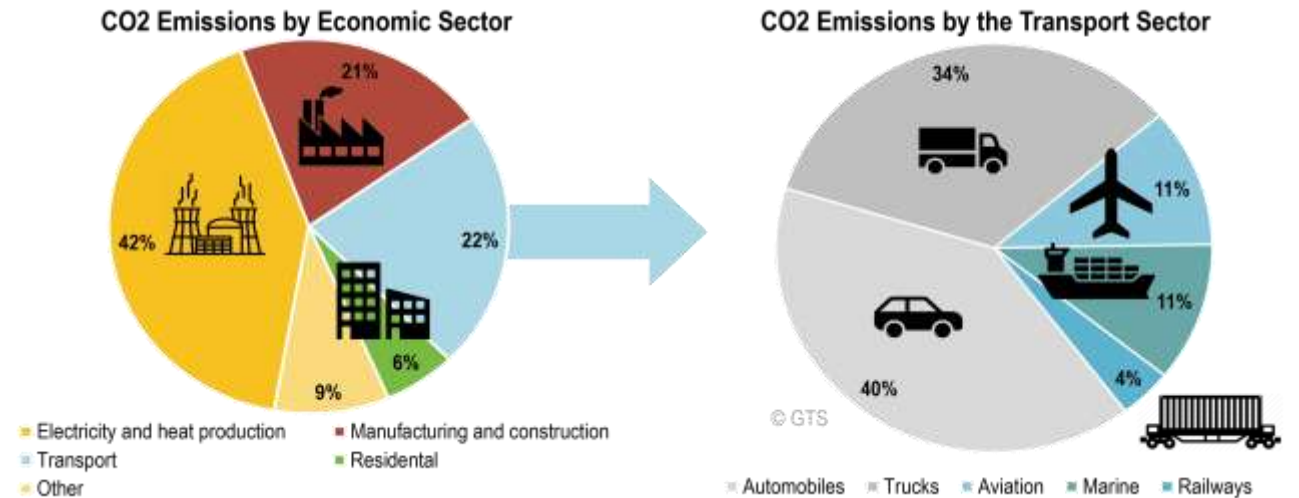


Implemented by



The Scale of the Problem

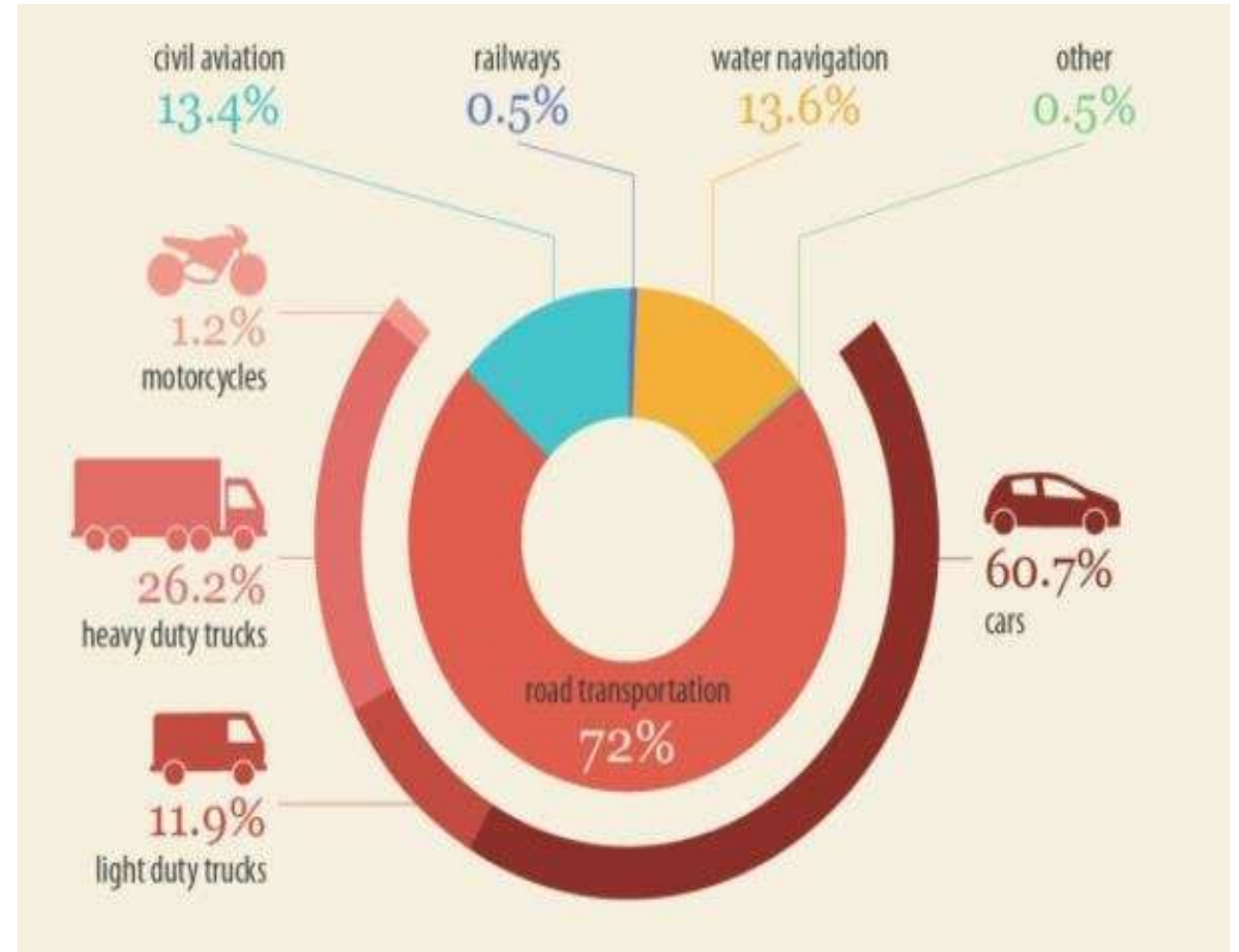
- The transport sector is responsible for nearly **one-quarter (22-25%)** of global, direct CO2 emissions from fuel combustion.
- This share is even higher in developed economies (e.g., ~29% in the US).
- Unlike other sectors, transport emissions have been rising, not falling, over the last two decades.



The Main Culprits

Breakdown of Global Transport Emissions:

- **Road Transport (72%):** The clear majority, with freight (trucks) being a significant and growing portion.
- **Aviation (13,4%):** Difficult to decarbonize.
- **Maritime (13,6%):** The backbone of global trade, but a single container ship can emit as much as 50 million cars.
- **Rail (0.5%):** The most efficient but underutilized for freight.



The "Hidden Carbon" of Inefficiency

The problem isn't just the fuel we burn, but the fuel we *waste*:

- **Port Congestion:** Ships and trucks spend days idling, burning fuel while waiting to be loaded or unloaded.
- **Empty Miles:** Globally, it's estimated that **20-30%** of all truck miles are "empty miles," with no cargo.
- **Administrative Bottlenecks:** Trucks idling at border crossings, waiting for paper documents to be stamped.



Why This Matters: A Dual Crisis

1. Climate Impact:

- Transport is a primary driver of climate change, directly linked to extreme weather events.

2. Human Health Impact:

- Emissions (NO_x, SO_x, PM_{2.5}) from road and maritime transport are a major source of urban air pollution, leading to severe respiratory illnesses.



The Regulatory Push



Global Frameworks

The Paris Agreement (2015): Set the global goal to limit warming to well below 2°C, preferably 1.5°C. This puts implicit pressure on all sectors.

International Maritime Organization (IMO):

- **2023:** Carbon Intensity Indicator (CII) and EEXI enforced. Ships are now graded A-E on efficiency.
- **2030/2040/2050 Goals:** Net-zero GHG emissions by or around 2050, with interim goals for 2030 (20-30% reduction) and 2040 (70-80% reduction).



Europe's Ambition: The EU Green Deal

- The EU's flagship policy to become the **first climate-neutral continent by 2050**.
- This is not just a suggestion; it's a legally binding target.
- The transport sector is a primary focus, with a target of a **90% reduction in transport-related emissions by 2050**.



EU "Fit for 55" Package

This is the legislative "how-to" for the Green Deal.

Key Transport Policies:

1. Emissions Trading System (ETS) Expansion:

- Maritime shipping is being phased into the EU ETS.
- A new, separate ETS for road transport and buildings is established.

2. CO2 Standards for Vehicles:

- Stricter CO2 standards for new cars and vans.
- New, binding CO2 reduction targets for heavy-duty vehicles (trucks).

3. Alternative Fuels Infrastructure (AFIR):

- Mandates for EV charging and hydrogen refuelling stations across Europe.



Other Global Examples

- **USA: EPA SmartWay Program**
 - A voluntary partnership that helps freight companies measure, benchmark, and improve fuel efficiency and emissions.
 - SmartWay partners have saved **397 million barrels of oil** since 2004.
- **China: Green Freight Initiative**
 - National policies promoting cleaner trucks, alternative fuels, and more efficient logistics operations.



GLEC



Policy objectives are implemented with policy tools

- EU aims for **climate neutrality by 2050** under the European Green Deal
- **Transport** sector accounts for **~25% of EU GHG emissions**
- Growing regulatory pressure for **transparent emission accounting**
- Corporate Sustainability Reporting Directive (CSRD) requires large companies to **report emissions**, but scope of directive will gradually expand
- CountEmissions EU proposal (2023) references ISO 14083 methodology for transport reporting

INTERNATIONAL
STANDARD

ISO
14083

First edition
2023-03

Greenhouse gases — Quantification and reporting of greenhouse gas emissions arising from transport chain operations

Gaz à effet de serre — Quantification et déclaration des émissions de gaz à effet de serre résultant des opérations des chaînes de transport

Who is reporting what?

Scope 1 Direct emissions

Direct emissions from company-owned vehicles, equipment, and facilities

Scope 2 Indirect emissions

Indirect emissions from purchased electricity, heat, and steam

Scope 3 Value chain emissions

All other indirect emissions in the value chain, including subcontracted transport (often 75% of total emissions)

Methodological background

GLEC

GLEC Framework provides guidance on the calculation and reporting of freight transport systems, chains and operations. This framework, first published in 2016, brings together in one place concepts and learning from the world's leading approaches for calculating greenhouse gas emissions arising from freight transport

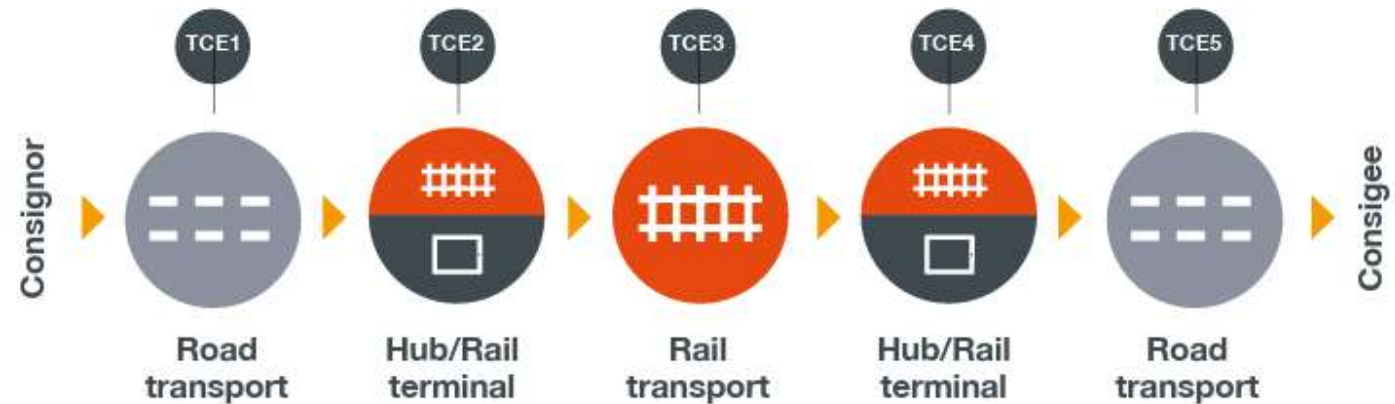
ISO 14 083

ISO standard is using the GLEC Framework as a basis, with the objective of providing an internationally accepted and established format for the calculation and reporting of transport related GHG emissions

GLEC Framework Foundations: Calculation granularity

- **Tank-to-Wheel (TTW):** Direct operational emissions from fuel combustion
- **Well-to-Tank (WTT):** Upstream emissions from fuel/energy production and distribution
- **Well-to-Wheel (WTW):** TTW + WTT = Complete emission footprint (Includes refrigerant leakage, idling, cleaning operations, and energy infrastructure)

Example of a transport chain and its TCEs

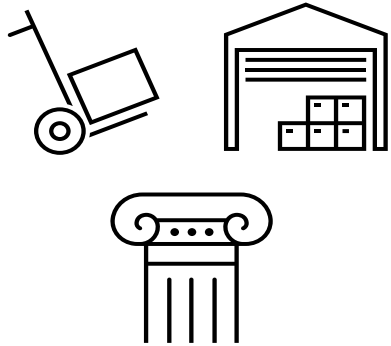


Calculating the transport activity of a TCE

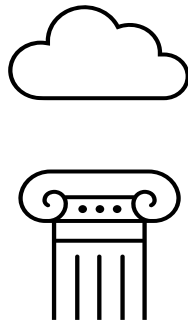
$$\text{Transport Activity of a TCE in tkm} = \left[\text{Mass of shipment 1 in tonnes} \times \text{Transport Activity Distance of shipment 1 in km} \right] + \left[\text{Mass of shipment 2 in tonnes} \times \text{Transport Activity Distance of shipment 2 in km} \right] + \dots$$

GLEC Framework Foundations: the Four Pillars

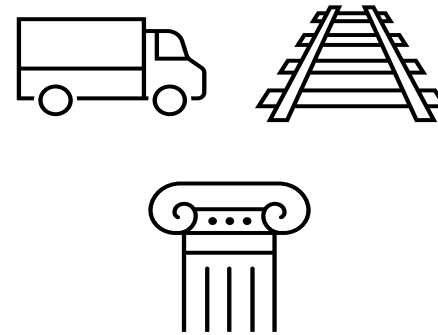
Complete Coverage:
All operations in the
transport chain



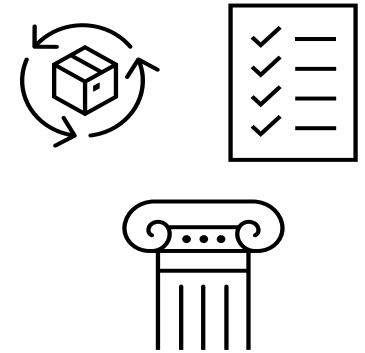
Comprehensive
GHGs: All IPCC
greenhouse gases
(CO₂, CH₄, N₂O,
HFCs, etc.)



Full Lifecycle: Well-
to-wheel (WTW)
emissions including
energy provision



Global Alignment:
Harmonized with
ISO 14083, GHG
Protocol, and
industry standards



GLEC Framework Foundations: Calculation granularity

1

Calculate Transport Activity:
 $\text{Mass (tonnes)} \times \text{Distance (km)} = \text{tonne-kilometers}$

2

Identify Emission Intensity:
Link TCE to Transport Operation Category (TOC) or Hub Operation Category (HOC)

3

Calculate Emissions:
 $\text{Activity} \times \text{Emission Intensity} = \text{Total GHG Emissions}$

How can you adopt GLEC?

1

Primary Data:
Direct measurements
and actual consumption
(highest accuracy)

2

Modeled Data:
Calculations using
available operational
parameters

3

Default Data:
Industry averages
(lowest accuracy, last
resort)

GLEC Framework Foundations: Data Quality and Sources

Adopt GLEC Framework methodology	Integrate into business processes and systems	Calculate emissions using primary data where possible	Report with third-party assurance	Act on results for continuous improvement
<p>Secure management commitment, establish cross-functional team, conduct GLEC training, assess current capabilities, develop business case for adoption, and allocate necessary resources.</p>	<p>Incorporate calculations into TMS/ERP systems, map operations to Transport Chain Elements, establish TOCs/HOCs, design data collection protocols, and train operational staff</p>	<p>Establish emission baseline using primary data where possible, implement three-step calculation process, ensure well-to-wheel coverage, validate data quality, and select appropriate calculation tools</p>	<p>Prepare documentation, engage third-party verification, ensure transparency requirements, communicate to stakeholders, and align with CDP/SBTi/regulatory standards</p>	<p>Integrate emissions into KPIs, set science-based targets, leverage procurement decisions, optimize operations, guide investments, and establish continuous monitoring for improvement</p>

The Digital Enabler



What is "Digitalization in Transport"?

“It's the use of data, connectivity, and software to build a smarter, more predictive, and more efficient transportation system.

- **Before (Analog):** Paper logs, radio calls, fixed schedules, reactive maintenance.
- **After (Digital):** Real-time data, predictive ETAs, dynamic routing, automated processes, and predictive maintenance.



The Core Logic: How Digital Fights Carbon

- Digitalization provides **VISIBILITY**
- Visibility allows for **OPTIMISATION**
- Optimization leads to **EFFICIENCY**
- Efficiency is the fastest path to **DECARBONISATION**

**You can't manage what you can't measure.
Digitalization lets us measure everything.**



Lever 1: Asset Optimization

Getting more from less:

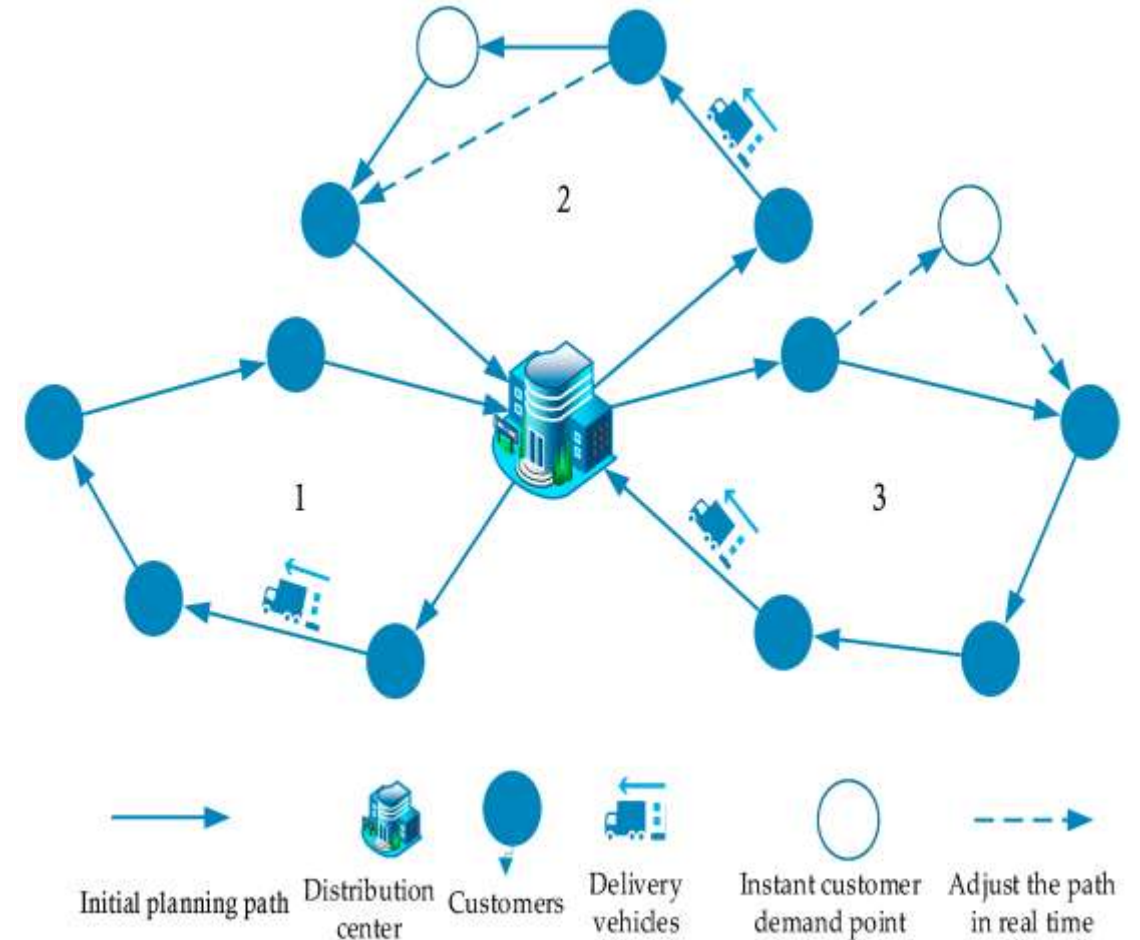
- **The Problem:** Empty miles, partially full containers, and idle assets (trucks, ships) burning fuel for no reason.
- **The Digital Solution:**
 - Digital freight-matching platforms to fill empty truck backhauls.
 - AI-powered load consolidation to ensure every container and truck is as full as possible.



Key Lever 2: Route & Speed Optimisation

Finding the most fuel-efficient path.

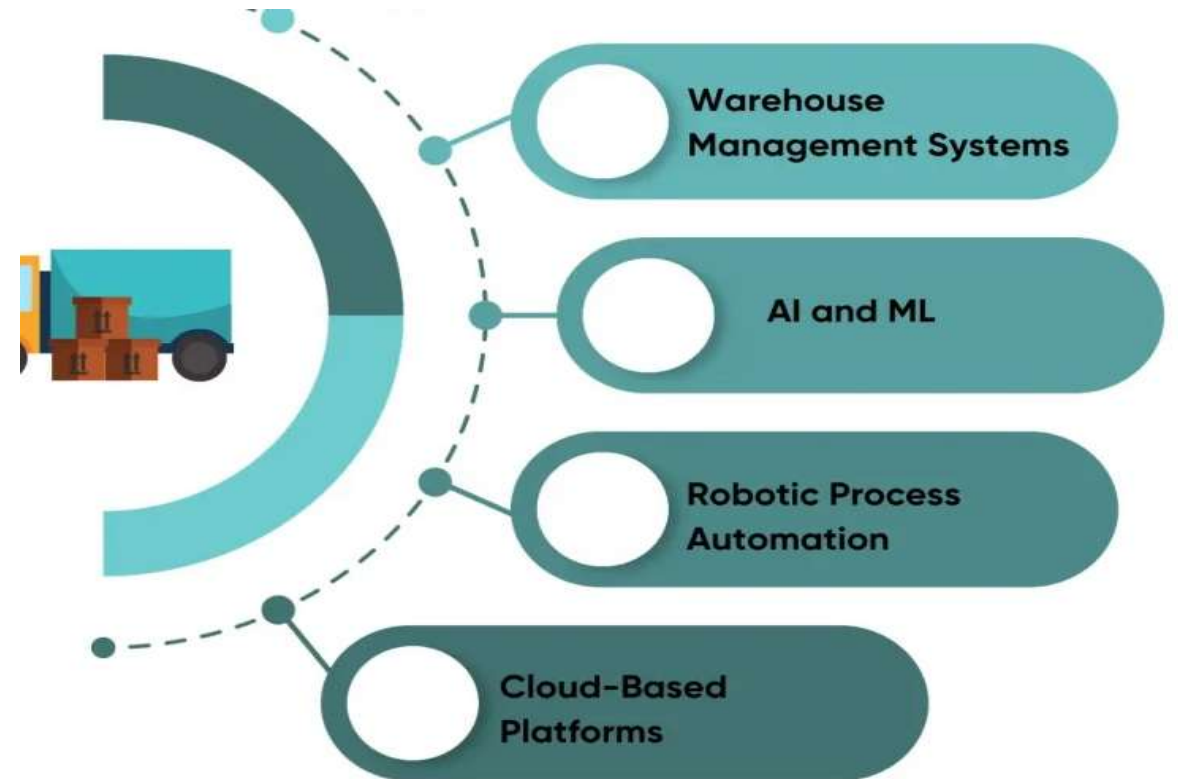
- **The Problem:** Trucks stuck in traffic, ships sailing too fast ("hurry up and wait"), and drivers taking inefficient routes.
- **The Digital Solution:**
 - Dynamic routing systems that adjust to real-time traffic and weather.
 - "Just-in-Time" arrival platforms for ports, allowing ships to slow-steam, saving massive amounts of fuel.
 - to ensure every container and truck is as full as possible.



Key Lever 3: Process Automation

Reducing friction and idling.

- **The Problem:** Trucks idling for hours at borders, warehouses, and ports due to manual paperwork, inspections, and gate processing.
- **The Digital Solution:**
 - Digital customs clearance (Single Window systems).
 - Automated gate systems using OCR.
 - Electronic Proof of Delivery (e-POD).



Key Lever 4: Data Sharing & Collaboration

Creating a smarter, integrated network.

- **The Problem:** The port doesn't know when the truck is coming. The terminal doesn't know what's on the ship. The customer doesn't know where their cargo is. This "information silence" creates buffer, waste, and inefficiency.
- **The Digital Solution:**
 - **Port Community Systems (PCS):** A central platform for all port stakeholders (terminals, customs, hauliers) to share data.
 - Real-time visibility platforms (e.g., Project44, FourKites).



Key Platforms



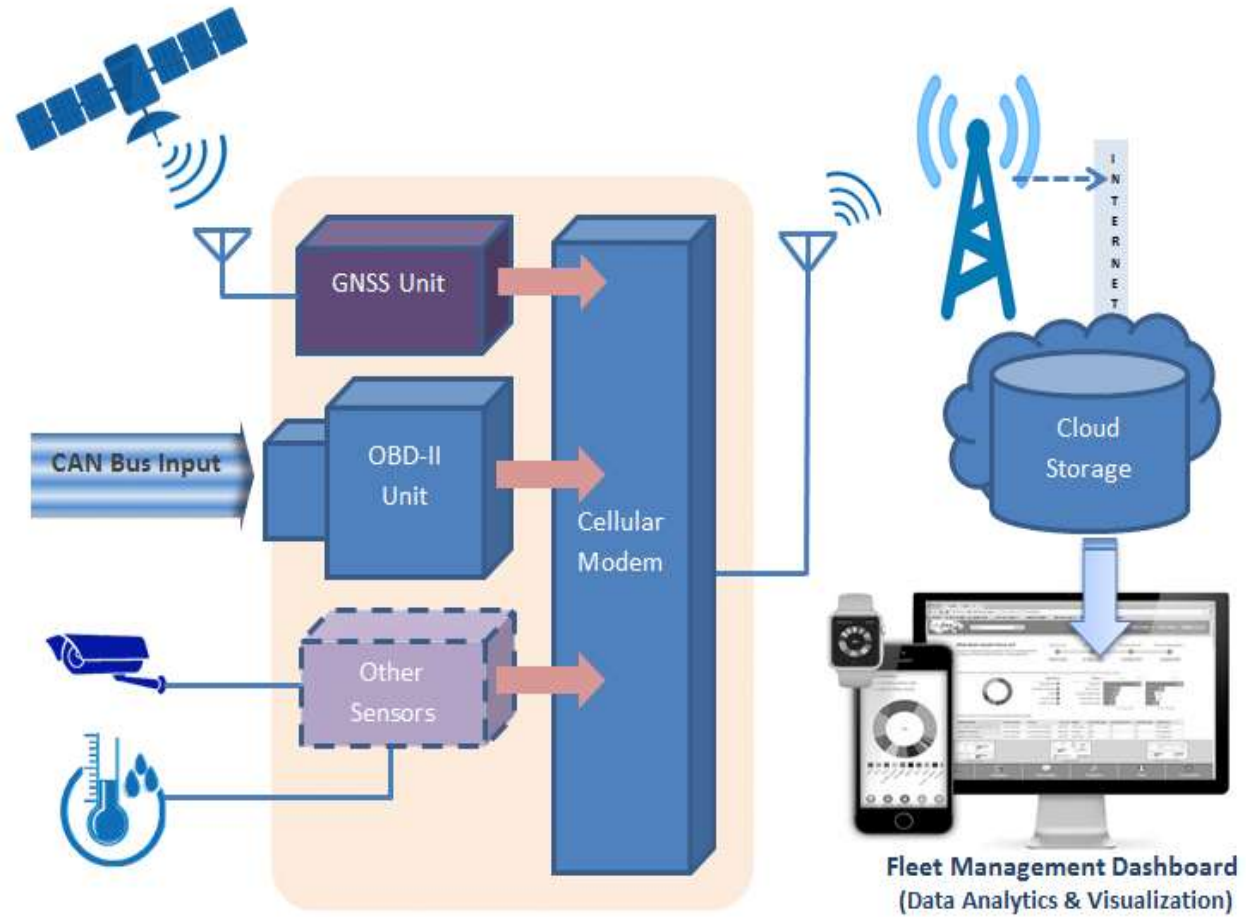
Platform 1: Transport Management System (TMS)

- **What it is:** A software platform used by shippers (e.g., retailers, manufacturers) to plan, execute, and optimize the physical movement of goods.
- **How it Cuts CO2:**
 - **Load Consolidation:** Combines small shipments into one full truckload.
 - **Route Optimisation:** Uses algorithms to find the shortest, most fuel-efficient route.
 - **Mode Selection:** Helps choose between rail, road, or sea to balance cost and carbon.



Platform 2: Fleet Management System (FMS)

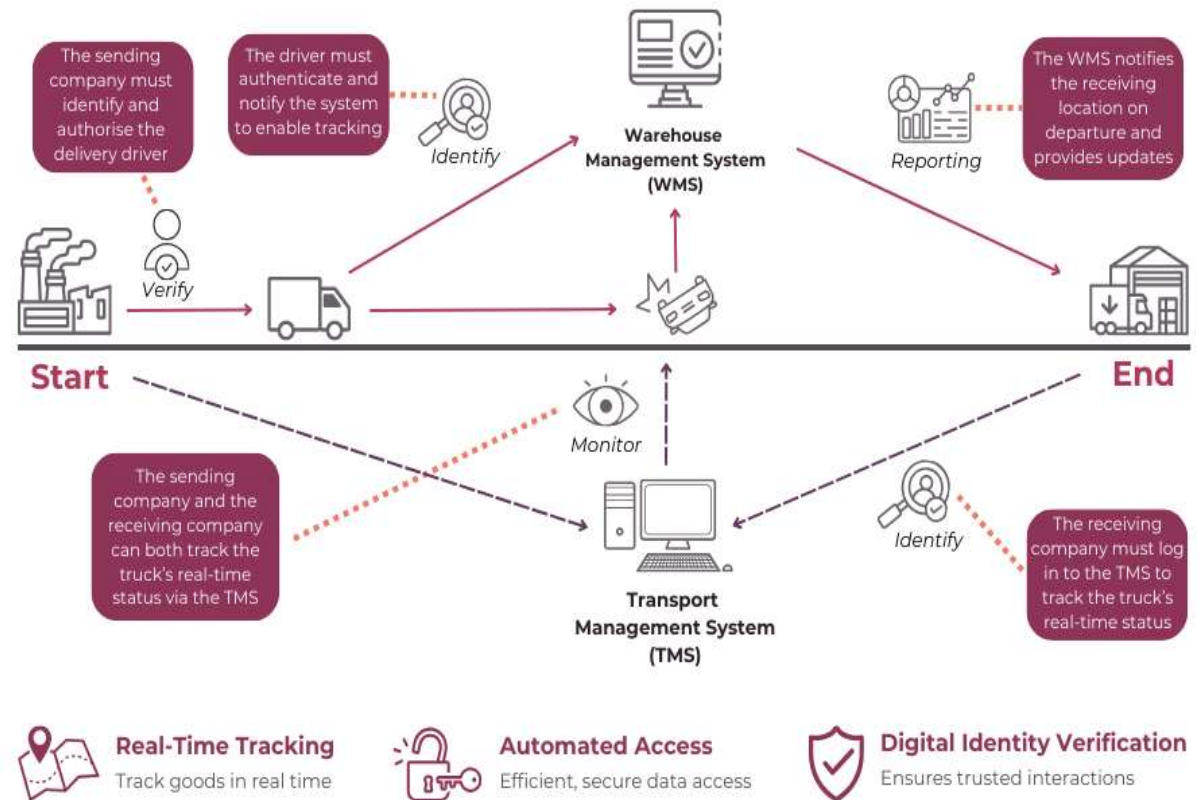
- **What it is:** A platform used by carriers (e.g., trucking companies) to manage their fleet of vehicles using telematics and GPS.
- **How it Cuts CO2:**
 - **Driver Behaviour:** Monitors and corrects inefficient driving (hard braking, speeding, idling).
 - **Fuel Management:** Tracks fuel consumption in real-time, identifying inefficient vehicles.
 - **Predictive Maintenance:** Schedules repairs before a breakdown, keeping the engine at peak efficiency.



Platform 3: Data Sharing & Visibility Platforms

- **What it is:** "Control tower" platforms that aggregate data from multiple sources (carriers, TMS, IoT sensors) to provide a single source of truth.
- **Examples:** Port Community Systems, National Single Windows (for customs), private platforms (Project44, etc.).
- **How it Cuts CO2:**
 - Provides predictive Estimated Times of Arrival (ETAs).
 - This allows warehouses to prepare staff, terminals to schedule cranes, and trucks to arrive *just in time*, eliminating systemic idling.

Workflow for Trusted Goods Deliver From Verification to Handover

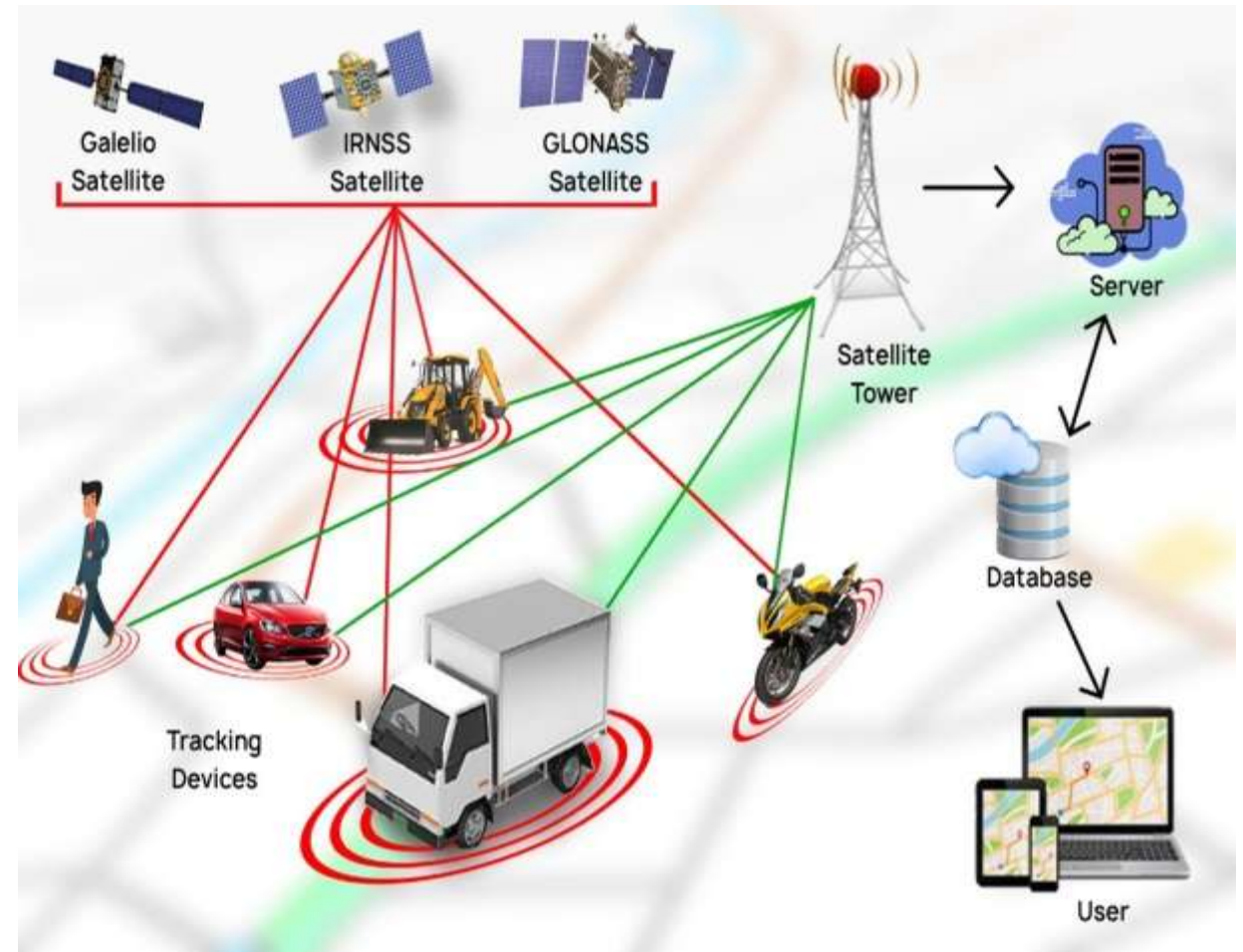


Core Tools



Tool 1: Internet of Things (IoT)

- **What it is:** A network of physical devices (sensors, gateways) that collect and share data from the real world.
- **In Transport:**
 - **Vehicle Telematics:** GPS, engine diagnostics, fuel sensors.
 - **Smart Containers:** Location, temperature, and door opening sensors.
 - **Smart Infrastructure:** Sensors in roads or ports that detect congestion.
- **Impact:** Provides the raw, real-time data that all other platforms and tools need to function.



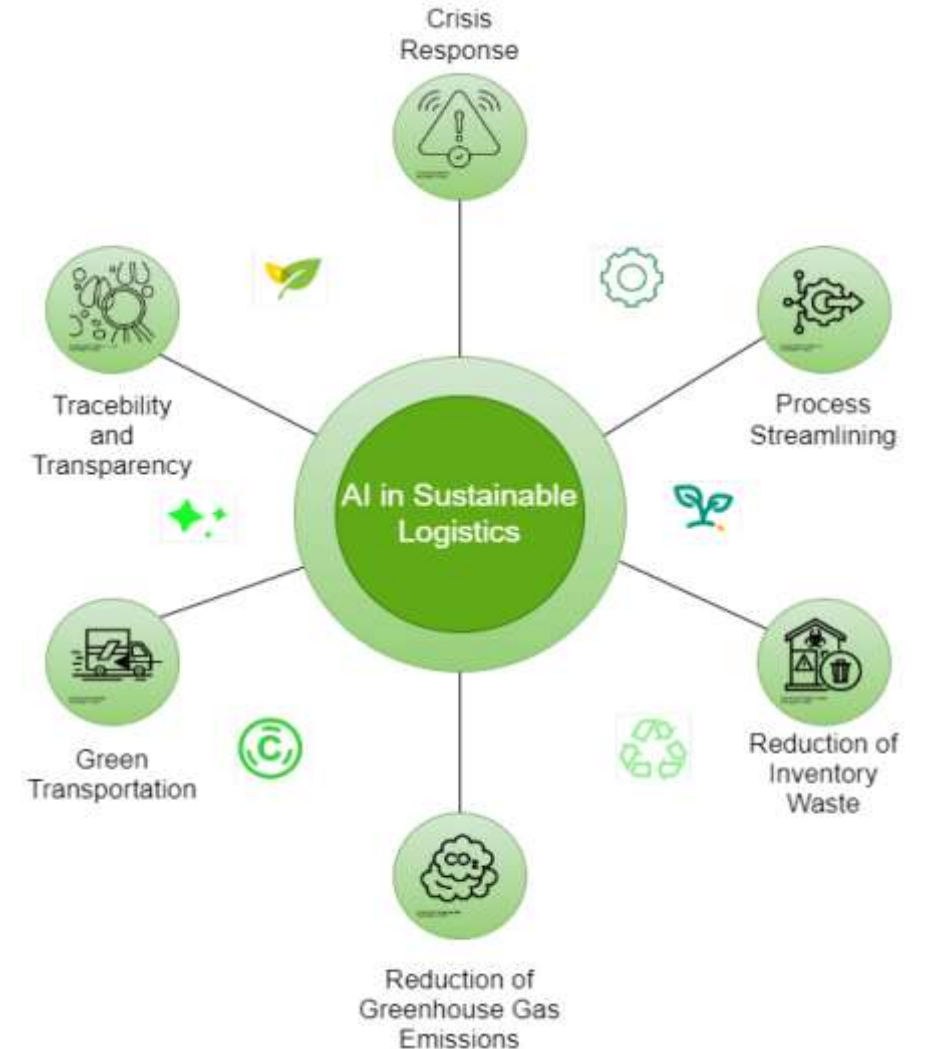
Tool 2: Big Data & Predictive Analytics

- **What it is:** The practice of analysing massive, complex datasets (Big Data) to find patterns and predict future events.
- **In Transport:**
 - Analysing years of traffic data to predict congestion hotspots.
 - Forecasting cargo volumes at a port to optimise staffing.
 - Predicting an accurate ETA based on traffic, weather, and driver hours.
- **Impact:** Turns "what happened" into "what will happen," allowing for proactive, rather than reactive, decisions.



Tool 3: AI & Machine Learning

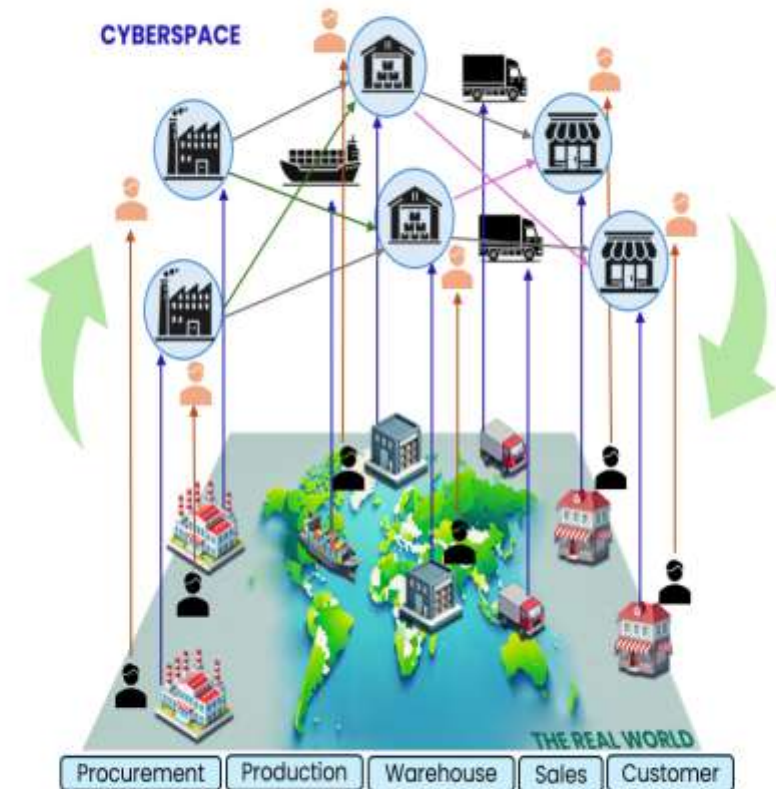
- **What it is:** The "brain" that performs the optimisation. AI models learn from data to make intelligent, automated decisions.
- **In Transport:**
 - **Dynamic Routing:** AI finds the *truly* optimal route in real-time, which is too complex for a human to calculate.
 - **AI for Customs:** Powers risk-assessment engines (see Case Studies).
 - **Predictive Maintenance:** AI models listen to engine sounds or sensor data to predict failures.



Tool 4: Digital Twins

- **What it is:** A living, real-time virtual simulation of a physical asset, process, or system. A digital twin of a port, for example, mirrors every ship, crane, and truck movement.
- **In Transport:**
 - **Simulate "What ifs":** "What if we change the terminal layout? What's the impact on truck flow and emissions?"
 - **Optimise in Real-Time:** The twin can find the single best move for a crane or straddle carrier to minimise travel and fuel use.
- **Impact:** Allows for massive efficiency gains to be tested and proven risk-free in a virtual world before being deployed in the real one.

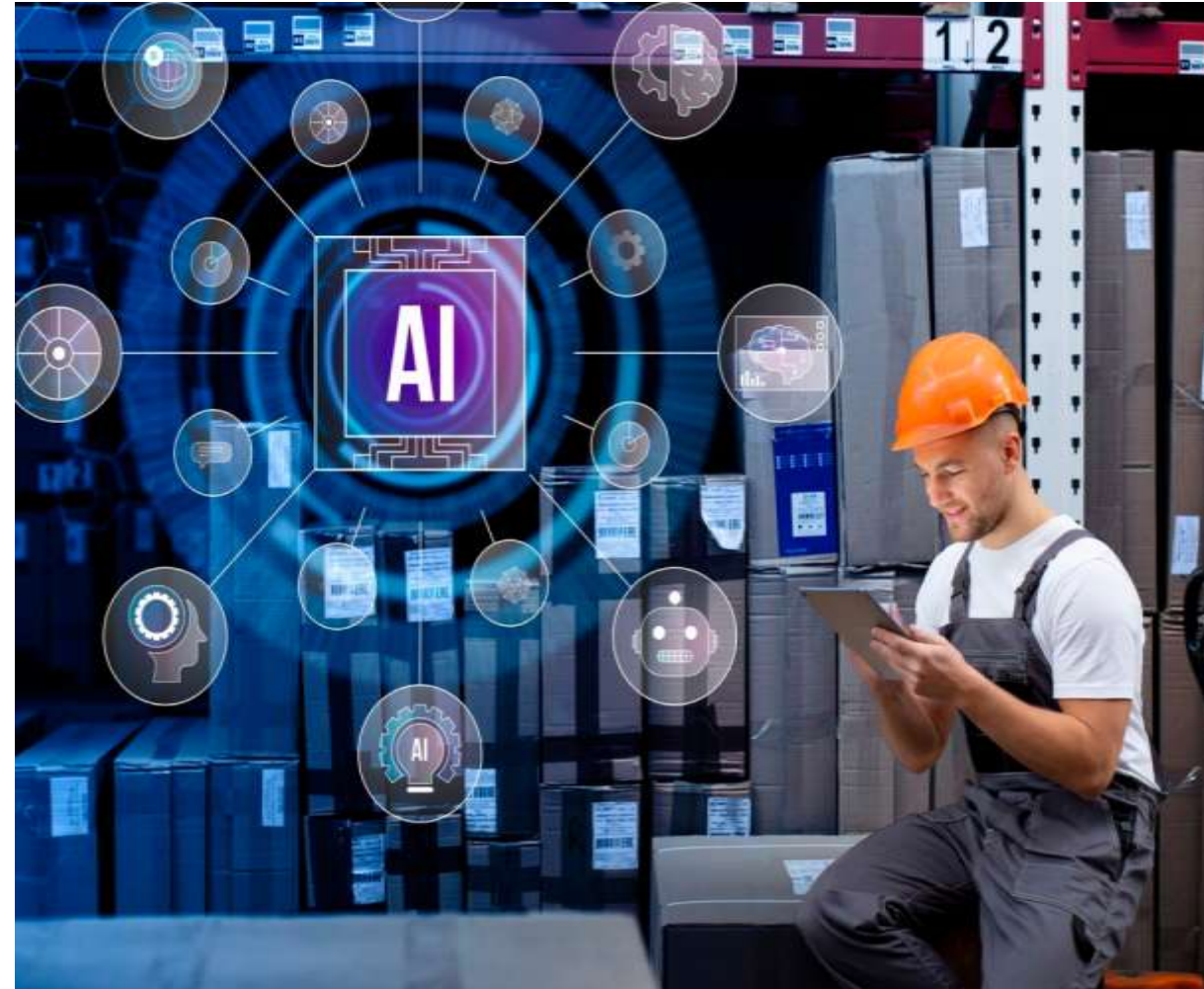
DT is a model of company's supply chain in cyberspace



Feedback the optimised plans over entire supply chain to the real world

Tool 5: OCR & Intelligent Document Processing (IDP)

- **What it is:**
 - **OCR (Optical Character Recognition):** Reads text from a scanned document (e.g., a paper invoice).
 - **IDP (AI-powered):** Understands the *context* of the text (e.g., "This number is the Invoice Total," "This name is the Consignee").
- **Impact:** This is the key tool for automating administrative bottlenecks at borders and warehouses. It digitizes the paper trail, turning piles of forms into structured data that software can process in seconds.



Case Studies



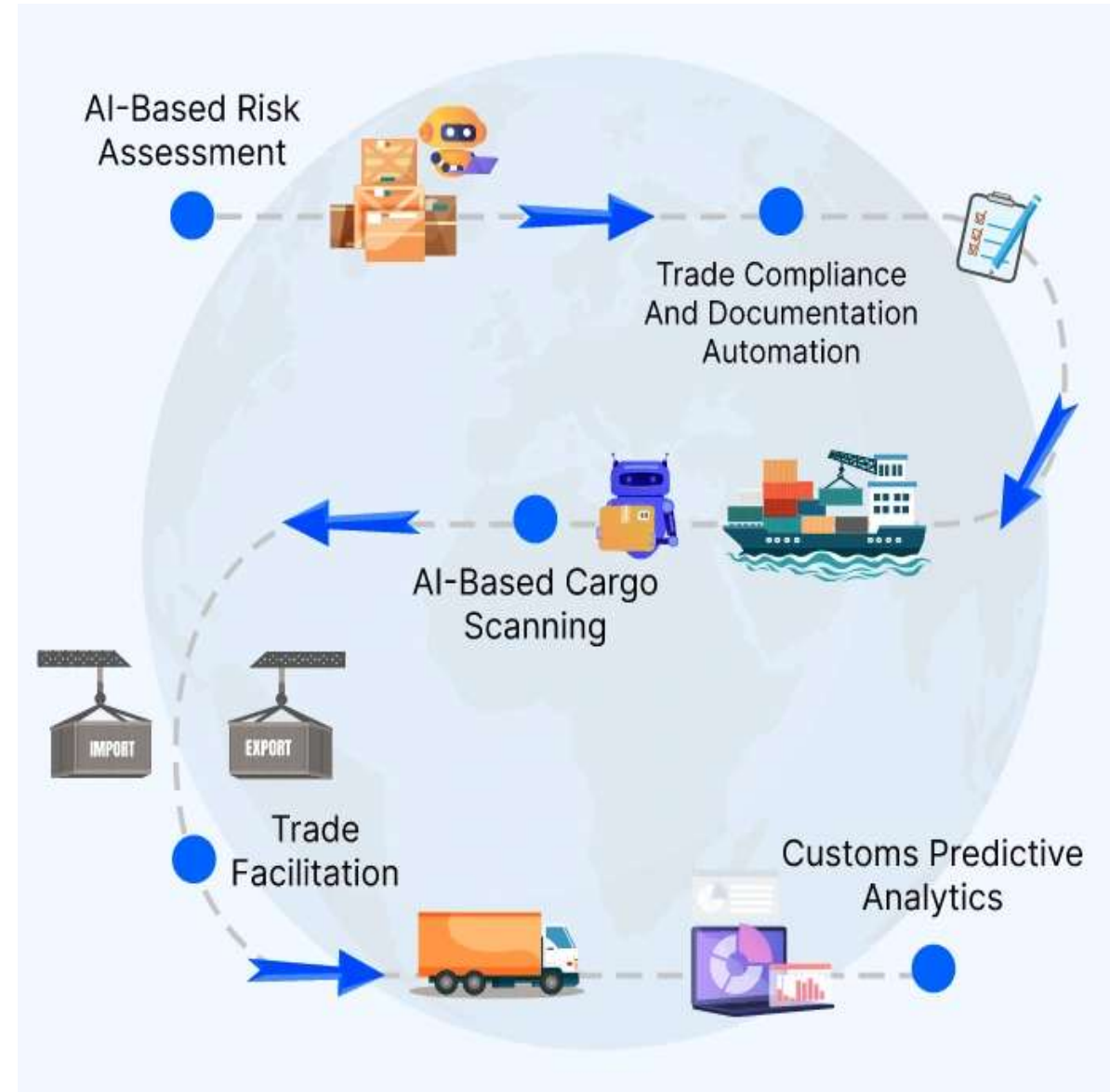
Case 1: Port of Rotterdam "Pronto"

- **Platform:** A data-sharing platform (Port Community System) for all port call stakeholders.
- **What it does:** Shares a single, "just-in-time" sailing plan based on terminal, pilot, and tugboat availability.
- **How it Cuts CO2:**
 - Ships no longer "hurry up and wait." They can use "**slow steaming**" (sailing at a more fuel-efficient speed) because they know their exact arrival slot.
 - Terminals can pre-plan all crane and truck movements.
- **Impact:** A 20% reduction in emissions per port call is possible, saving thousands of tons of CO2 per ship.



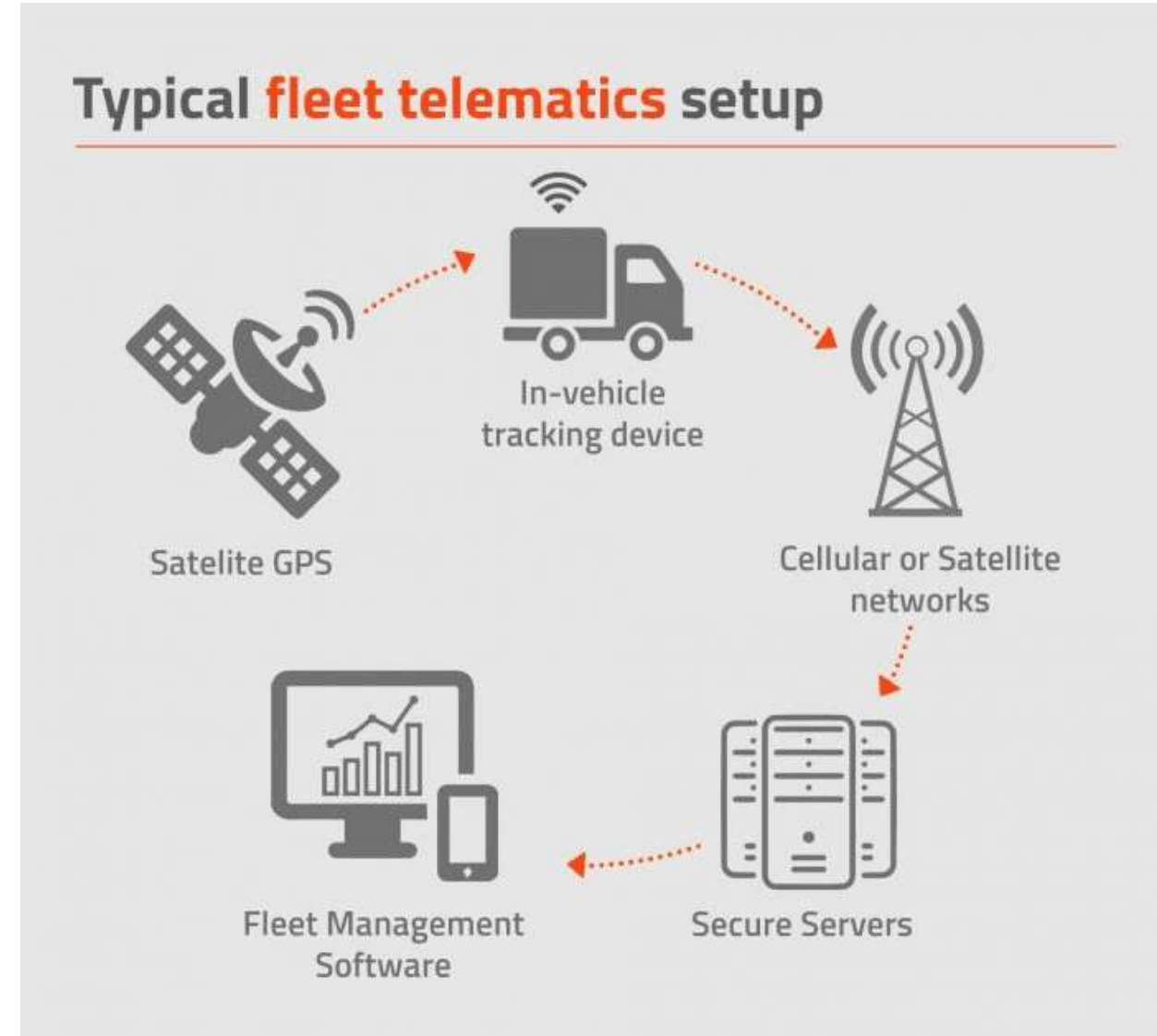
Case 3: AI-Powered Risk Assessment (Global Customs)

- **Tool:** AI & Machine Learning.
- **What it does:** AI models scan 100% of customs declarations *before* goods arrive. They analyse complex data (shipper history, route, cargo type, value) to assign a risk score.
- **How it Cuts CO2:**
 - **"Green Lanes":** 90%+ of low-risk cargo is pre-cleared for immediate release.
 - **Targeted Inspections:** Officers focus only on the 5-10% of high-risk cargo.
- **Impact:**
 - Fewer unnecessary physical inspections (which require moving containers, trucking to a lab).
 - Drastic reduction in port-side congestion and truck idling times.



Case 4: Logistics Giants (DHL, Maersk)

- **Platform:** Advanced Fleet Management Systems (FMS).
- **Tool:** IoT & AI.
- **What they do:**
 - **Maersk:** "Remote Container Management" (RCM) uses IoT to monitor refrigerated containers ("reefers"). This optimizes energy use and prevents wasted trips to manually check them.
 - **DHL:** Uses AI-powered routing and telematics to monitor eco-driving (less speeding/braking).
- **Impact:**
 - DHL has improved its carbon efficiency by **35%** since 2007.
 - Proves that digital tools provide direct, measurable CO2 and fuel savings.



The Impact



Environmental Impact

Digitalization is the most cost-effective decarbonization lever available today:

- **Route Optimization:** Can reduce fuel consumption by **10-15%**.
- **Load Optimization:** Can reduce empty miles by **20-30%**.
- **Just-in-Time Arrivals:** Can reduce shipping fuel consumption by **5-10%**.
- **Process Automation:** Can eliminate millions of "idling hours" at ports and borders.



Economic Impact

Green is Profitable:

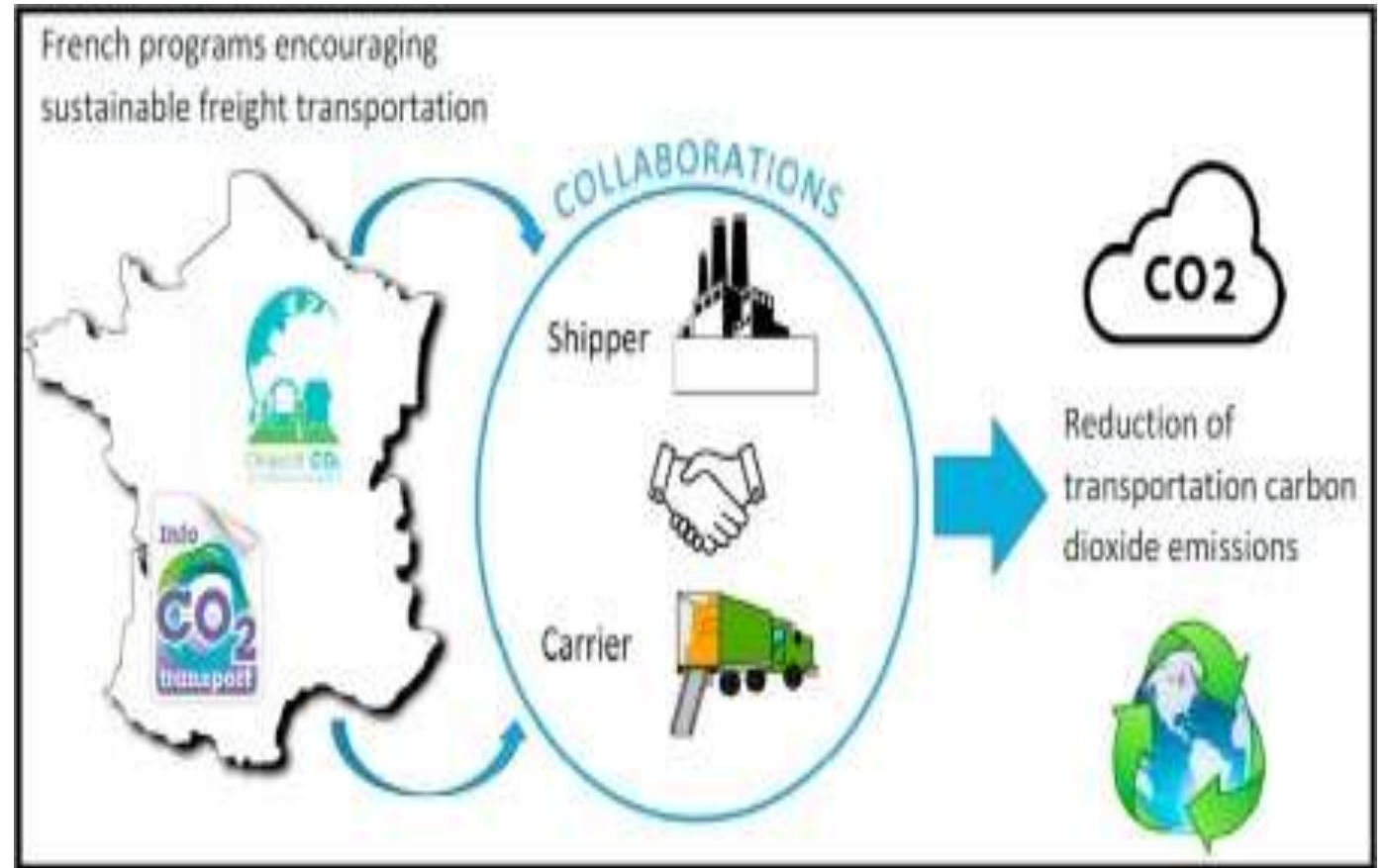
- **Fuel Savings:** Less fuel burned = millions in cost savings.
- **Operational Efficiency:** Faster clearance = lower demurrage (port fees), better asset turnover (more trips per truck).
- **Resilience:** A visible, predictive supply chain is less vulnerable to shocks.
- **Compliance:** Digital tools make it easy to *prove* regulatory compliance (e.g., for EU ETS), avoiding fines.

What actions has the road transport sector taken to reduce its impact on the environment?



The Biggest Challenge: Collaboration

- **The Problem:** Technology is not the main barrier. **Trust** is.
- Carriers, shippers, ports, and (especially) competitors are hesitant to share data.
- **The Solution:**
 - **Common Standards:** Need for global data standards (e.g., DCSA for maritime).
 - **Secure Platforms:** Neutral platforms that share "the answer" (e.g., "Truck 123 is 30 mins late") without sharing sensitive commercial data.



The Future: A "Physical Internet"

- The end goal is a fully integrated, autonomous, and predictive logistics network.
- A "**Physical Internet**" where cargo moves as seamlessly as data packets on the internet.
- **Digital Twins** will manage entire corridors.
- **AI** will orchestrate millions of decisions.
- **Autonomous electric trucks** will move goods 24/7.
- This is the *only* way to meet a 90% reduction target while supporting global trade.



CONCLUSIONS



Key Takeaways

- **Efficiency is the "First Fuel":** Before we switch to expensive green hydrogen or biofuels, we must first stop wasting the fuel we already have. Digitalization is the tool to stop this waste.
- **Data is the New Fuel:** In a digitalized system, the company with the best data and predictive ability will be the most efficient, the most profitable, and the most sustainable.
- **Digitalization is not optional:** It is the essential, legally-mandated, and commercially-critical engine for meeting the 2030, 2040, and 2050 climate goals.





THANK YOU!

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