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Economic Commission for Europe

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Item 2 of the provisional agenda
Activities of United Nations Economic Commission for Europe bodies and other United Nations organizations of interest to the Working Party: Alignment of the work of the Working Party with the Inland Transport Committee strategy

IRU Green compact and digitalization

Transmitted by the International Road Transport Union

IRU contribution for a more sustainable road transport

IRU Green Compact: leading decarbonisation efforts

Green Compact is an IRU project leveraging datasets and modelling to determine a realistic and cost-effective pathway to fully decarbonise the commercial road transport industry.

1. The commercial road transport industry, providing an essential service to economies and communities, is committed to fully decarbonise the sector by 2050.
2. Representing a responsible industry, IRU and its members have adopted a clear roadmap to decarbonise the industry as outlined in the IRU Green Compact.
3. The Green Compact researches, tests and scales up realistic operational solutions to decarbonise commercial road transport as effectively as possible, while continuing to meet demand for passenger and goods transport services.
4. With five pillars, the Green Compact covers a comprehensive set of actions with a holistic approach, factoring in growing transport demand, regional flexibility, and energy availability.
5. There is no one single solution, but a combination of technologies and best practices to reduce CO2 emissions in road transport.

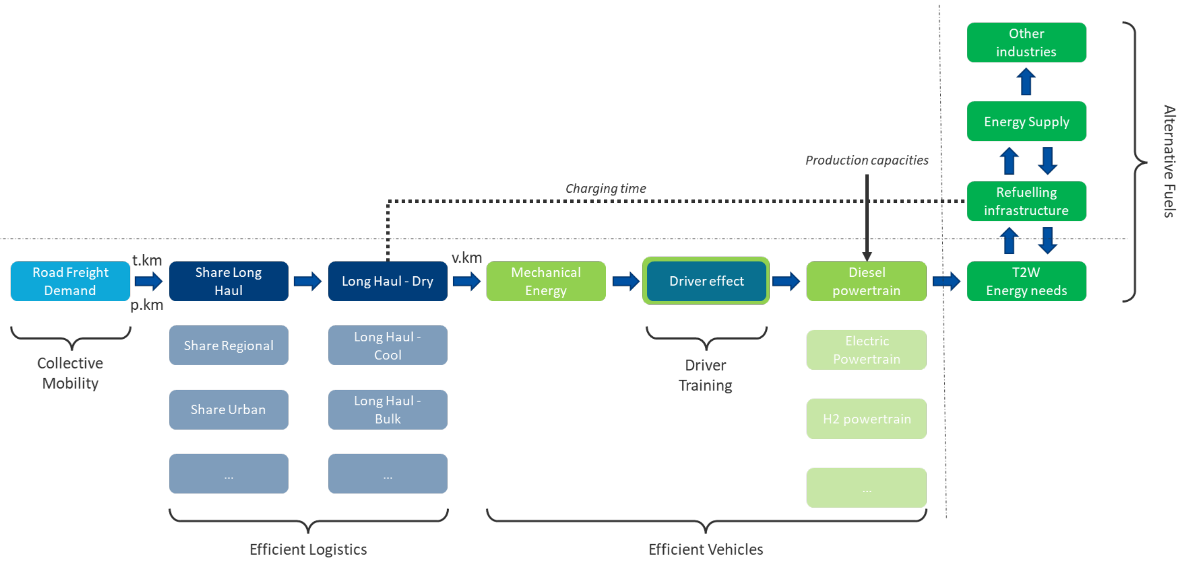

Figure 1: IRU Green Compact modeling

Tracking CO2 emission use over time is essential to deliver carbon neutrality. This must be done using the well-to-wheel approach. A zero-emission vehicle is not truly a zero-emission vehicle until the source of its energy is carbon neutral.

Each Green Compact pillar demonstrates varying approaches and actions depending on the economic and social development of a country, how primary energy is produced, the availability of alternative fuels and the structure of the road transport sector (size of companies, financial standing, geography), but all play a crucial role in collectively achieving net zero emissions.

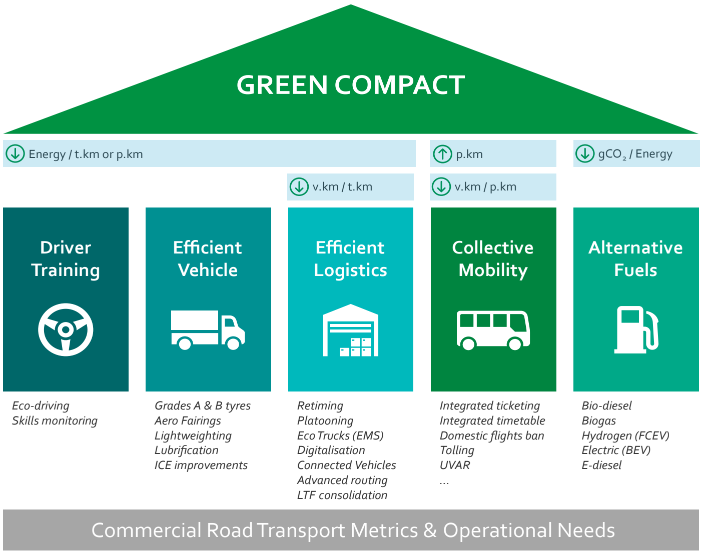

Figure 2: IRU Green Compact pillars

One similarity for all regions and economies is a "duplex" approach: to both drive efficiency wins and continue to develop alternative fuel availability and infrastructure in parallel. This approach results in the most cost effective and efficient way to reach carbon neutrality by 2050.

a. Efficiency wins: Making logistics, vehicles, and drivers more efficient, using proven technology and approaches, has been demonstrated to reduce CO2 emissions from commercial road transport by approximately 50%.

b. Alternative fuels: New alternative fuels are also needed. The wide range of transport needs across the globe means that all types of alternative fuels are needed during the transition to 2050, including electric, hydrogen and carbon neutral fuels for internal combustion engines such as bio energies and e-fuels.

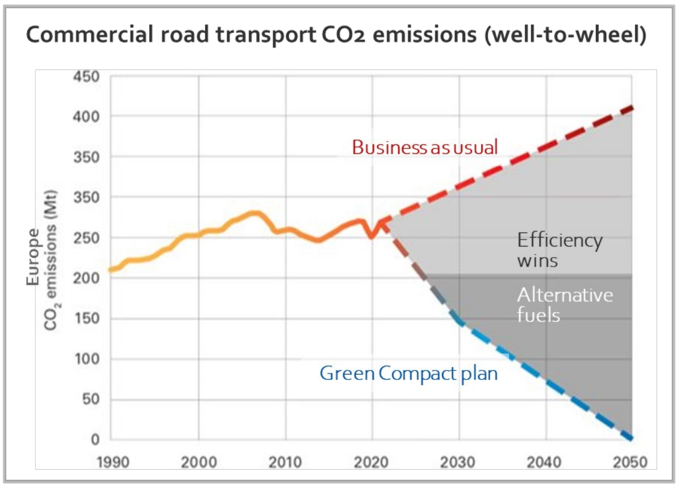

Figure 3: IRU Green Compact on emission curves

A technology-neutral approach is essential. Business incentives are required to expedite the penetration of clean technologies, and mitigate high upfront costs for new investments, especially by small and medium sized transport operators. Adequate alternative fuel infrastructure needs to be effectively deployed.

Global coordination and open-minded policymakers with a strong disruptive political will to scale up existing pragmatic decarbonisation solutions are needed. The duplex approach necessitates action on all fronts now, both efficiency wins and alternative fuel development.

Role of border crossing facilitation in road transport decarbonisation

International operations are a significant aspect of worldwide road transport, and border crossing facilitation is a key factor in decarbonising the industry. Hampered border crossing disrupts vehicle movement, leading to increased energy consumption either through extended idling or stop-and-go cycles.

Idling is necessary to power cooling units, air conditioning, and accessories while the vehicle is awaiting border customs clearance. The longer the vehicle idles, the more energy it consumes, and consequently, the more CO2 it emits into the atmosphere. Modelling results indicate that in GCC regions, idling could account for up to 50% of the carbon dioxide a truck emits during its journey.

Stop-and-go cycles increase energy consumption. They typically occur at the truck's least efficient operating points, when the energy demand to start the truck is highest, only to be followed by a quick stop.

Facilitating border crossings aids in reducing both idling and overconsumption caused by stop-and-go traffic. Decreasing the time spent at the border directly reduces idling consumption. Simplifying the passage of trucks with streamlined processes and dedicated fast lines also decreases the number of stop-and-go cycles. This has a positive impact on fuel consumption and carbon emissions.

Borders must be prepared to accommodate trucks powered by alternative fuels. Unlike traditional vehicles, electric or hydrogen-powered trucks do not idle. However, their energy needs remain the same and are met by batteries. Lengthy waiting times at the border can significantly reduce the operational range of these trucks once they leave the border. This necessitates the installation of charging and refilling stations near, if not at, border control checkpoints. These locations may not yet be equipped to handle hundreds of vehicles requiring 350 kW charging from electric grids. Streamlining border crossings is crucial for the successful implementation of alternative powertrains, which are necessary for advancing decarbonisation.

Exploring border crossing facilitation as a pathway towards decarbonisation: IRU study in GCC actual operation

IRU has not only conducted studies aiming at establishing a decarbonisation roadmap from a broad perspective, but also conducted studies to determine impacts of border crossing facilitation for specific transport operations.

Using a vehicle dynamic model (IRUSTM in its version 1.6) and telematics data provided by a transport operator working in the GCC region, a comparison has been done, looking at CO2e emissions, between three configurations:

- a first configuration based on current transport operations.
- a second configuration, with transport operation including efficient vehicles, efficient driver and eco-trucks based on Euro VI diesel powertrain.
- a third configuration, with transport operation including efficient vehicles, efficient driver and eco-trucks based on electric powertrain.

Figure 4: type of tractor considered in this study.

Here is given a synthesis of the main parameters considered by the vehicle dynamic model:

Table 1: List of parameters used by the modelling.

	First configuration	Second configuration	Third configuration
Tractor	Volvo-Trucks FH 6x4	Volvo-Trucks FH 6x4	Volvo-Trucks FH 6x4
Engine	Diesel Euro IV	Diesel Euro VI	Electric
GCW	45 tonnes	60 tonnes	60 tonnes
Total length	16.5 meters	25.25 meters	25.25 meters
Tyre	6.5 kg/tonne (label D)	4.5 kg/tonne (label B)	4.5 kg/tonne (label B)
Drag coefficient	0.65	0.55	0.55
Cooling power	10 kW	15 kW	15 kW
Payload	28 tonnes	34 tonnes	31 tonnes
Efficient driver	No	Yes	Yes

Results are given in the next table, through a specific format, meaning they gives the amount of CO2e released in the atmosphere (WTW assumption[1]) per tonne of goods moved. As there are three days covered by the telematics data, we are giving the value for each day and for each configuration. It is assumed that there is no altitude change for all three days as there is no data associated in the telematics.

Table 2: Specific carbon emissions according to vehicle configuration

	Day 1	Day 2	Day 3
First configuration	24.1 kgCO_2e /tonne	47.8 kgCO_2e /tonne	33.9 kgCO_2e /tonne
Second configuration	15.3 kgCO_2e /tonne	29.9 kgCO_2e /tonne	21.3 kgCO_2e /tonne
Third configuration	9.5 kgCO_2e /tonne	17.7 kgCO_2e /tonne	13.3 kgCO_2e /tonne

On average, the second and third configurations achieved respectively -37% and -62% CO2e emission reduction compared to the first.

With a specific consumption of 155 kWh/100km on average, the third configuration has an operational range of 400 km when using the largest battery available on the market today. With a daily distance of 700+ km recorded during the second day, it means such configuration will need to find 350 kW charging stations on its way, as there are only two hours rest windows at best observed the same day.

These emission numbers don't include yet waiting time at the border. In idling, the model is showing that the first configuration consumes about 0.28 L/tonne/hour, and the second **configuration about 0.23 L/tonne/hour. There is no idling for BEVs, but energy is needed to cool** the goods. With a power of 15 kW, an efficiency at 90% and a carbon intensity for power generation at 0.5 kg/kWh, it means that carbon emissions when stopped is about 0.27 kg/tonne/hour. By calculating CO2e emissions at the border between non TIR crossing (24 hours) and TIR crossing (4 hours), the next table emerges:

Table 3: CO2e comparison when crossing a border

	First configuration	Second configuration	Third configuration
TIR crossing	No	Yes	Yes
Time at the border	24 hours	4 hours	4 hours
Hourly CO2e	0.95 kg/tonne/hour	0.78 kg/tonne/hour	0.27 kg/tonne/hour
Specific CO2e	22.8 kg/tonne	3.1 kg/tonne	1.1 kg/tonne
Savings specific	Reference	-86 %	-95 %
Total CO2e	640 kg	106 kg	33 kg

The second configuration in combination with TIR eliminates about 86% of CO2e emissions when crossing the border per tonne of goods transported. The third configuration goes even further with 95% reduction when

[1] 3.4 kg of CO_2e per liter of Diesel, 0.5 kg of CO_2e per kWh of electricity consumed.

combines with TIR. Nevertheless, the third configuration will lose more than 10% of its operational range while waiting the mandatory 4 hours.

Also interesting, by using the data of this transport operators, regular border crossing increased daily CO2e emissions by more than 50% in regular operations. By using TIR, emissions at the border represent less than 20% of daily CO2e emissions.

In synthesis, idling at border crossing could increase the carbon emission of the truck's journey by 50%. Faster border crossing, such as done under TIR, could reduce idling emissions, and then their contribution to overall emissions by 30%. At the same time, allowing larger trucks on roads such as EMS could lead to further CO2 reduction (54%), while the use of electric trucks, which carry out transport under TIR, could lead to 75% reduction in carbon emissions if the enabling conditions are in place.

Digitalisation to amplify border-crossing facilitation benefits for decarbonisation

TIR digitalisation through the implementation of eTIR in line with Annex 11 of the TIR Convention is expected to amplify the TIR benefits for decarbonisation featured above and bring them beyond border-crossing facilitation.

The stages of the life-cycle of the paper TIR carnet will be removed contributing to the decarbonisation effects, as the shipments of TIR carnets from IRU to TIR associations and of used TIR carnets from TIR associations to IRU, normally made by air, won't be necessary. Moreover, transport companies won't need to drive to TIR associations issuing stations to receive TIR carnets and return the used ones. In some countries this means over 100 km of journey saved.

Furthermore, while TIR is broadly used for a combination of road and maritime transport with a Ro-Ro leg carried out by sea, the use of TIR for a combination of road and maritime transport, carried in sea containers, as well as for other possible combinations involving rail transport is restricted, because of the need to send the paper TIR carnet to all customs offices en route. For example, for the TIR transport exiting from Indian ports, the TIR carnet needs to be physically sent to the port of entry of the UAE, Oman or Iran, which is logistically challenging.

The connections ensuring the exchanges of required TIR data between all private sector partner, IRU and UNECE have already been implemented. The last connection to be completed is the interconnection between the UNECE's eTIR international system and the customs systems of respective countries. In order to speed up the completion of TIR digitalisation, UNECE's TIR secretariat has also developed the eTIR National Application, which customs can use even before the full interconnection of their systems with the eTIR international system. Joint efforts of public and private sector partners are needed to ensure the fastest transition to eTIR, which is also in line with the Roadmap for the Digitalisation of Multimodal Data and Document Exchange Along the Trans-Caspian Transport Corridor, Using United National Legal instrument and Standards adopted by the SPECA Summit, Baku, 24 November 2024.
