The "Road" Towards Low Carbon Mobility

The Paris Agreement encourages raising mitigation ambition in Nationally Determined Contributions (NDCs) by reviewing and assessing the strength of their ambition and to formulate long-term low greenhouse gas emission development strategies. The current NDC's identify the transport sector as a significant mitigation source whose decarbonisation is critical in achieving economy-wide decarbonization.
This chapter is a synthesis report analysing the most recent data from the road sector and the factors behind its growth and development. The main ambition is to provide a status of global climate action related to the road transport sector, and the synergies between the State and non – state actors.

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CONTENTS

1 • STATUS OF ROAD TRANSPORT CARBON EMISSIONS

In 2016, the transport sector constituted about 23% share in total fuel combustion carbon emissions[1]. **Most of the Carbon emissions within the transport sector are from the road transport sector, which constitutes about three-quarters of transport carbon emissions[2]** i.e. about 6GT of direct Carbon emissions in 2017. Since 2000, road transport carbon emissions have increased at an annual rate of 2% becoming one of the fastest growing sub-sectors of fuel combustion emissions[3] over the past half-century. **However, since 2015, road transport carbon emissions growth has grown at a slower annual rate of 1.4% when compared with historic annual growth of 2%.** However, this slowing down of emission growth is not yet compatible with the findings of the IPCC Special Report on Global Warming of 1.5°C[4] i.e. ***limiting climate change to 1.5-degree Celsius means nothing short of de-carbonizing road transport sector around mid-century or soon afterwards and thus necessitates transformational changes in thinking, behaviour, and the combined actions of all stakeholders.***

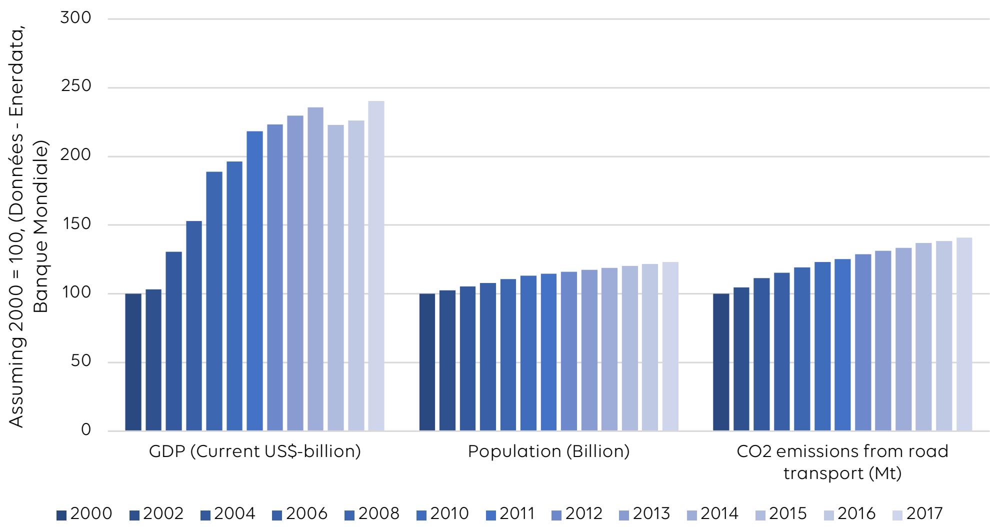


FIGURE 1. GROWTH IN ROAD TRANSPORT EMISSIONS

The entire growth in the road transport carbon emissions post-2000 has come from non-OECD countries (Table 1). The non-OECD countries share increased from 31% in 2000 to 47% in 2015[5] and most of the growth concentrated in Asian and African countries where road transport carbon emissions have doubled (Enerdata et Edgar). **However, in the last couple of years i.e. from 2014 to 2016, road transport emissions annual growth in the non-OECD countries have slowed down with an annual growth of 2%[6] mainly due to slowing down of growth in emissions in countries like Brazil, China, India, Indonesia, Malaysia and Saudi Arabia (Global Energy Statistical Yearbook, Enerdata).** The decline in Brazilian emissions underlined in this report, is an example of this link between growth and CO_2 emissions from road transport (Country profil Brazil – Road Transport section, Book 1), while the increase in Indian emissions underlines the strong impact on CO_2 from the increase in the car fleet (Country profil India – Road Transport section, Book 1).

	2005	2010	2016	2017
World	4,809.3777	5,237.1766	5,883.8007	5,983.9182
Italy	116.9636	103.7557	98.3021	96.5156
Netherlands	33.4361	32.7982	28.7313	29.2687
France	126.1286	118.9547	117.9526	118.646
United Kingdom	118.7426	110.2636	114.0851	114.2115
Sweden	21.2929	20.6226	18.3109	17.8555
Poland	33.4424	46.2345	51.1971	57.8695
Germany	150.1151	143.9549	157.2153	161.1553
Russia	114.881	143.3387	157.11	153.9852
Canada	126.0199	141.9901	142.0916	145.9141
United States	1 561.1449	1 469.1629	1 509.7615	1 516.4608
Australia	71.2071	74.8835	81.0902	84.3928
Japan	208.0171	193.8698	187.7446	186.2568
China	314.5042	467.6695	693.5187	717.2486
India	103.2084	176.0312	243.0412	260.7791
Indonesia	62.1026	88.2062	112.2836	116.3845
Mexico	125.7182	146.5216	151.9731	145.7665
Brazil	123.7752	149.6977	179.9659	184.7932
Colombia	19.9236	20.9936	29.9612	30.9587
Saudi Arabia	73.9228	103.3289	133.0469	130.3684
Algeria	19.3229	29.2905	41.4319	40.7904
Ivory Coast	1.0552	1.3077	2.8659	n.a.
Nigeria	28.5036	27.4846	23.7578	25.3636
South Africa	40.1567	45.0207	47.5597	49.7997

TABLE 1. GREENHOUSE GAS EMISSIONS (MTCO$_2$) BY COUNTRIES

(Source: Enerdata)

Within the road transport segment, the light-duty vehicles (cars) constitute about 60% of road transport emissions[6]. The road-based public transport services such as bus (including minibus) and two-and-three-wheelers constitute about 6% each respectively. However, there are significant variations in the magnitude of carbon emissions among different sub-modes across different countries. For example, the two-and-three-wheelers constitute about 2% and 11% of total road transport carbon emissions in OECD and non-OECD countries[7]. The two-wheelers are a significant source of emissions in the ASEAN, China, India and Africa[8].

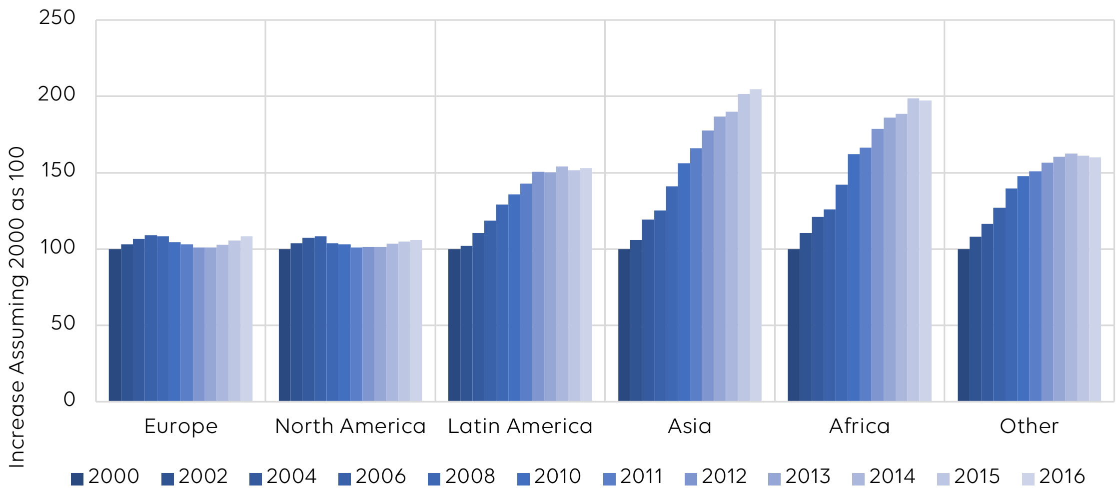


FIGURE 2. REGIONAL GROWTH IN ROAD TRANSPORT CARBON EMISSIONS (COMPARED TO A BASE 100)

An increasing share of CO_2 emissions is associated with road transport in and around cities. In 2013, the International Energy Agency estimated that urban road transport constitutes about half of road transport carbon emissions. In heavily urbanised countries like the US, urban transport constitutes about 60% of road transport carbon emissions while developing countries like India and South Africa, this share is about 41% and 44% respectively[9].

By 2050, the continuation of existing business-as-usual growth in road transport carbon emissions will result in global road transport carbon emissions increasing to about 10 Gt[10] to 17 Gt[11]. However, there is a large differentiation among road transport emissions trends between individual modes and countries. The road transport carbon emissions in the OECD countries could decrease by close to 30%, while it could increase by 100% in the non-OECD countries[12]. However, the scale of the transformation ahead in the road transport sector on the path toward a decarbonized transport system is well illustrated by recent studies on transport sector decarbonisation which illustrate a need to decarbonise to 2 to 3 Gt by 2050[13].

2 • WHY HAVE CARBON EMISSIONS INCREASED IN THE ROAD TRANSPORT SECTOR?

An understanding of CO_2 emissions from road transport globally requires a clear picture of several interlinked factors, i.e. transportation demand (activity), mode of travel, modal energy efficiency and carbon intensity (ASIF Framework[1]).

• HIGH GROWTH IN ROAD TRANSPORT DEMAND (ACTIVITY) • Globally, road transport accommodates nearly about 90% and 70% of passenger and surface freight demand[14]. Historically, growth in the demand for both passenger and freight road transport has been closely correlated with growth in economic activities. The global motorised road passenger mobility measured in motorised passenger-kilometres (pkm) increased from 27 trillion passenger kilometre in 2000 to about 41 trillion passenger kilometres in 2015 i.e. an increase from about 4400 passenger-kilometres to about 5600 passenger-kilometres per capita[15]. **The global road passenger transport demand experienced a sustained period of robust growth until the economic crisis of 2008. Since 2008, the OECD and non-OECD countries show diverse trends.** For example, in Europe[16], road passenger transport demand increased from about 10,180 km/capita in 2000 to about 10,570 km/capita in 2008. Since its peak in 2008, it had remained broadly stable, with only a slight overall reduction being a result of the economic recession from 2009 to 2012. In 2015, total passenger per-capita transport demand was the same as in 2000. The OECD passenger road passenger transport demand decreased from 13000 to about 10000 kilometres per capita. The non-OECD countries passenger transport demand measured in pkm increased from 2400 to 4600 kilometres per capita.

Passenger Transport Demand

In OECD countries, since 2008 financial crisis, the volume of passenger transport relative to GDP has reduced by 35 percent in Lithuania, 20 percent in Ireland, 9 percent in Switzerland and 8 percent in United Kingdom. In cities, implementation of demand management policies has resulted in reduction of vehicle travel. For example, implementation of the congestion charge scheme has reduced vehicle travel by more than 15 percent and reduced congestion by 30 percent and in the Stockholm congestion charge implemented in 2007 reduced kilometres driven in the inner city by 16 percent, and outside the city by 5 percent despite economic and population growth.

In non-OECD countries, the passenger mobility has been growing faster than the GDP. In countries like Burundi, China, Nigeria, Zambia, Vietnam, India, Georgia and Panama, the Car ownership has been growing with an annual rate of more than 10% since 2000. To reduce passenger transport demand, cities have been implementing several transport demand management strategies. For example, Singapore in 2018 has implemented zero growth strategy for vehicle ownership to move towards car-free society.

TEXT BOX 1

The global road freight transport demand increased from about 8 trillion tonne-kilometre in 2000 to about 24 trillion tonne-kilometres in 2015 i.e. an increase from about 1300 tonne-kilometres to about 4000 tonne-kilometres per capita. **Historically, the global road freight transport demand in terms of tonne-km bore an extremely stable relationship with economic growth, i.e. GDP with the road freight volumes showing very strong correlation to the economic environment, i.e. for every 1% increase in GDP per capita, road freight movement i.e. tonne-km per capita increases by 1.07% on average[17].** However, the intensity of freight demand and its growth could vary significantly among countries. For example, the OECD road freight transport demand increased from 4500 to about 9500 tonne-kilometres per capita and the non-OECD countries demand increased from about 500 to 2800 tonne-km per capita.

Freight Transport Demand

Since 2000, the freight vehicle ownership has grown by an annual rate of more than 10% in low- and middle-income countries like Lao PDR, Indonesia, Panama, Barbados, Vietnam, Morocco and Chile. In EU-28, the freight transport demand increased considerably between 2000 and 2007 with a reduction due to economic downturn in 2008 and, after a limited recovery, freight volumes have since remained largely stable. The total road freight transport demand (in tonne-km) in 2015 is about 14% higher than in 2000.

TEXT BOX 2

Increase in passenger and freight mobility has resulted in rapid expansion of vehicles on roads and thereby generating high motorised trips. From 2000 to 2015, the vehicle kilometre travel has increased by about 66% in global, 24% and 166% in OECD and the non-OECD countries[18]. If population and incomes grow in accordance with the expectations, and if there is no paradigm shift in the relationship between income and the demand for mobility as illustrated in *Figure 3*, then mobility will grow strongly in future with entire growth outside of the OECD region. The International energy agency estimates that by 2050, the road passenger and freight transport demand could increase to about 72 trillion passenger kilometres and 85 trillion tonne-kilometres[19].

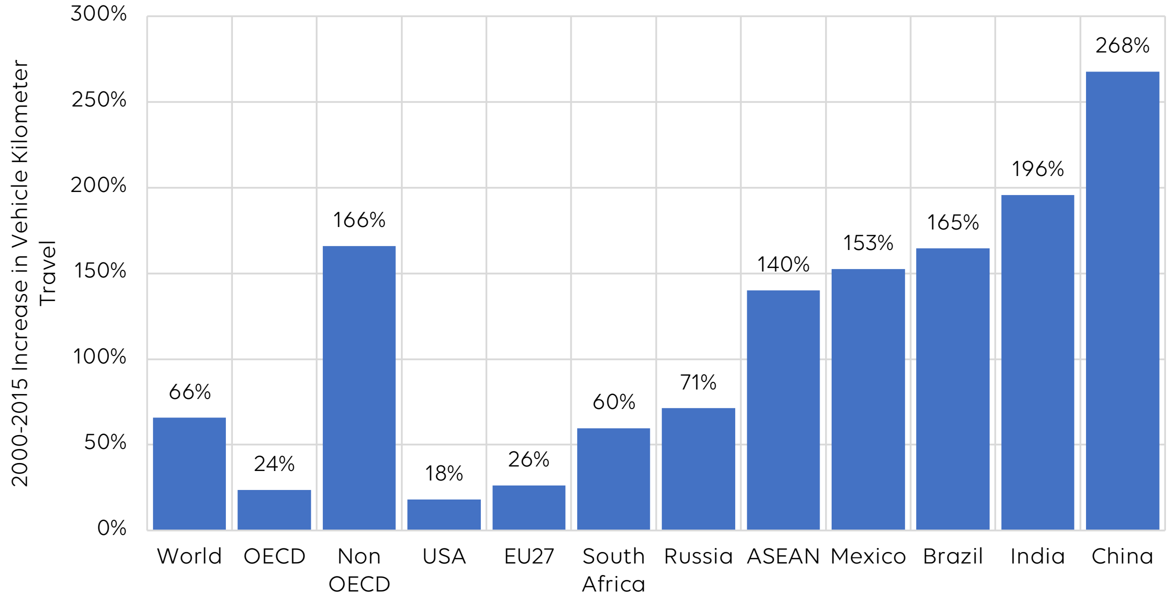


FIGURE 3. INCREASE IN VEHICLE KILOMETER TRAVEL

The policy response to reduce transport demand involves the use of "Avoid" strategies to change travel behaviour. These strategies reduce unnecessary travel through e.g. urban planning, logistics redesign and by behavioural changes. Reducing transport demand is perhaps the most difficult of the transitions as it has historically received less attention from stakeholders[20]. However, there exist several best practice examples from countries, cities and companies which have initiated transportation demand management strategies to reduce transport demand (in vehicle kilometres or in passenger/ tonne-kilometres travel) and have resulted in very high positive co-benefits. These strategies often consist of a mix of push and pull strategies to change travel behaviour using disincentives and incentives (few examples below).

Example	Description
Singapore	In October 2017, the Land Transport Authority (LTA) of Singapore announced that its vehicle growth rate would be reduced to zero (from 0.25%), effective February 2018. The main policies to reduce urban transport demand include urban planning (smart growth), electronic road pricing (ERP), vehicle quota system, public transit policies and improving walking and cycling facilities. The ERP scheme tackles traffic congestion by individual charging point, the direction of travel, time of day and vehicle type (based on road space occupancy).
London	London charge scheme (Introduced on Feb 2002) considers charging not only for crossing a cordon but also for movements within the cordon. The new transport strategy (2018) targets 80% of trips by foot, by cycle or by public transport by 2041 and full network road pricing. The London's congestion charge scheme has reduced vehicle travel by more than 15 percent and reduced congestion by 30 percent (immediate impact) and created an additional funding source for public transport and non-motorised transport improvements.
Mexico	In 2017, Mayor of Mexico City announced the "limitation of parking spaces in the city construction code". This new norm changes minimum parking requirements to maximum depending on the land use of the construction.
China	Several Chinese major cities are limiting the number of annual vehicle registrations with auctions (or lotteries). In recent years (2016 and 2017), the Beijing municipal government has proposed the implementation of dynamic tolls, dynamic parking fees according to the parking location, length of stay and arrival/departure time of parking, and consideration of congestion charging and dynamic fees for public transport and taxis to reduce road transport demand.
Unilever	'Big Bang' project in Europe focuses on using trucks and pallets efficiently. In 2017, the project increased truckload fill rates by 2% thus reducing truck trips. In China, Unilever made changes to the pallet size – adding one extra layer to increase load fill by 11%, creating savings of €500,000 as well as reducing CO_2 emissions.

TABLE 2. EXAMPLES OF AVOID STRATEGIES

State and non – state actors are implementing several initiatives to reduce transport activity. For example:

• The Paris Process on Mobility and Climate (PPMC) has developed a Global Macro-Roadmap (GMR)[21] for complete decarbonisation of the transport sector. The Roadmap is relevant for all continents and comprises eight components that are phased and articulated in synergy with each other. The avoid related components include urban transformation, optimizing supply chains to manage freight transport emissions, avoiding vehicle kilometres through greater intermodality and shared transport for commuting, shopping and accessing services. Some of the targets (2040/2060) include

- urban passenger trips are reduced to 20%, while, the combined share of trips by walking, cycling, and shared transport trips rises to 80% of all trips. A 50% reduction in private passenger vehicle kilometres travelled.
• The Shared Mobility Principles[22] for Livable Cities were launched at the 2017 Ecomobility World Festival in Kaohsiung, Taiwan. The shared mobility principles are designed to guide urban decision-makers and stakeholders toward the best integration of shared modes with the city land-use and transport networks.
• C40's TOD Network[23] and ITDP's TOD Standard[24] promotes integrated urban places designed to bring people, activities, buildings, and public space together, with easy walking and cycling connection between them and near-excellent transit service to the rest of the city.

• MODE SHARE (SHIFT IN TRANSPORT DEMAND) • Global motorised road transport demand comprises several modes and segments. **Globally, passenger cars contribute to about 52% of the global passenger mobility, bus-based public transport about 34%, and two-and-three wheelers about 14% of total passenger transport demand (in passenger-kilometres)**. However, there exists great diversity in the mobility pattern among different geographical regions and income levels. The passenger cars (LDV's) constitute about 84% (OECD) and 37% (non-OECD) of road passenger transport demand. The two-and-three-wheelers share in road passenger transport demand varies from 3% in OECD countries to 19% in non-OECD countries.

Since 2000, global motorised passenger transport volumes (in pkm) across the different modes have changed as follows:

• Passenger cars: -5%;
• Powered two-and-three-wheelers: +5%;
• Buses and mini-buses: 0%;

However, in the non-OECD countries, there has been tremendous mode shift from the buses and mini-buses to Cars and two-and-three-wheelers. The bus road passenger mode share has reduced from 58% (2000) to 43% (2015). About 60% of the global road passenger-kilometres travel occurs in the urban area. In the OECD countries, the urban share of passenger activity is about 66%, while in the low-and-middle income countries like India it is about 59%.

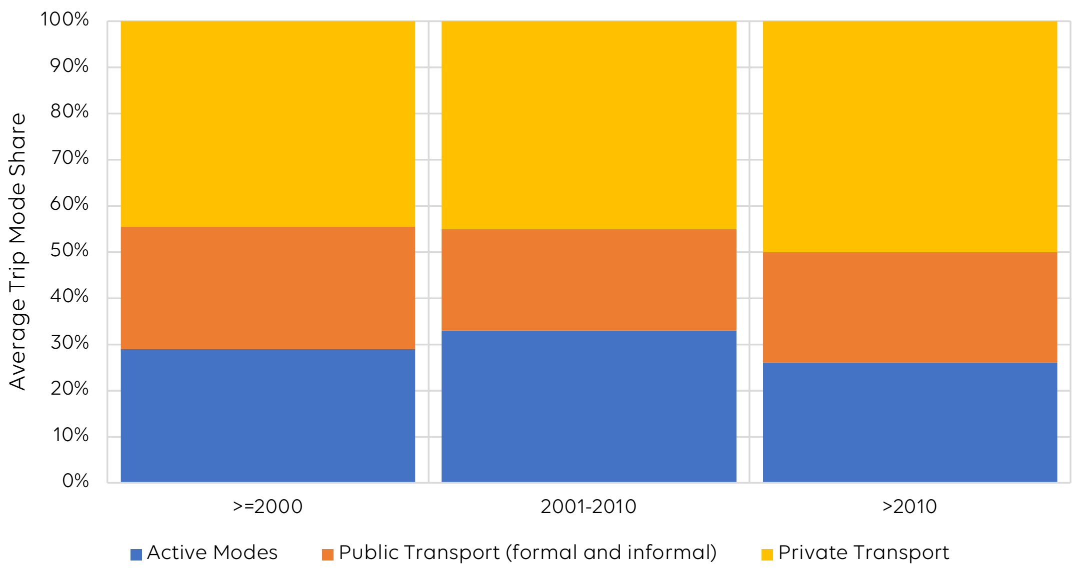


FIGURE 4. GLOBAL TRIP MODE SHARE (URBAN)

Urban freight constitutes only about 12% of the road freight activity (tonne-kilometres) but generates about 50% of freight road vehicle kilometre travel[25] as final products get delivered in low volumes, and at high frequencies in congested traffic conditions. The road transport plays a leading part in carrying surface freight in all countries. Since 2000, there is tremendous mode-shift towards road freight with its mode share (in total freight) increasing from 12% (2000) to 22% (2015)[26].

The policy response to change transport structure involves the use of the "Shift" strategies to improve trip efficiency. **These strategies induce a modal shift from the most energy and emission intensive mode (i.e. cars, road freight) towards more environmentally friendly modes (walking, cycling, public transit, railways, waterways).** The New Urban Agenda (NUA) adopted in 2016 with an overall emphasis on human-scale and people-centered planning, makes explicit references to improvement in walking, cycling and public transit infrastructure i.e. "*A significant increase in accessible, safe, efficient, affordable and sustainable infrastructure for public transport, as well as non-motorized options such as walking and cycling, prioritizing them over private motorized transportation*".

There exist several best practice examples from countries, cities and companies which have initiated modal shift strategies. For example, the EU's 2011 whitepaper[26] – "Roadmap to a Single European Transport Area" targets "thirty percent of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050, facilitated by efficient and green freight corridors. To meet this goal will also require appropriate infrastructure to be developed". The EU's Trans-European Transport Network (TEN-T) policy[28] daims at the development of multimodal core-network corridors, promoting modal shift and sustainable infrastructure and equipment.

In recent years, many cities have increased investments in public transport, walking and cycling infrastructure. **Globally, since 2000, the bus rapid transit system, light rail transit and metro rail infrastructure expanded by 835%, 88%, and 67%, respectively. By 2018, there are more than 1700 bike sharing systems globally[29].**

The State and non – state actors are also implementing several initiatives for modal shift. For example:

• The Global Sidewalk Challenge[30] raises the voice and profile for walking internationally and sets a challenge to governments, private businesses and NGO's to collaborate and invest in walking infrastructure, especially dedicated, safe and barrier-free sidewalks at transport hubs, to benefit the people who walk most by focusing on the places most walked in order to reduce traffic externalities.

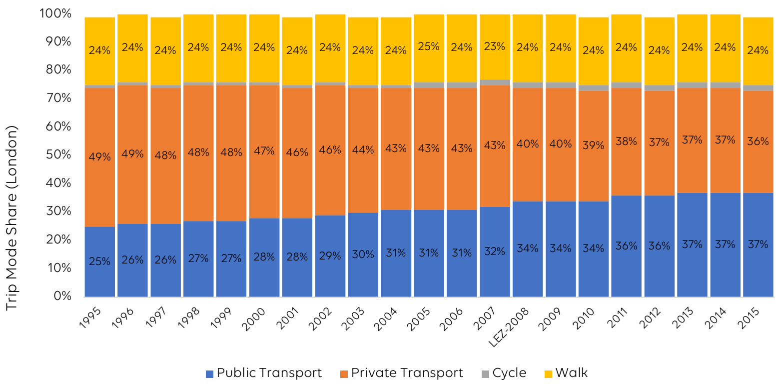
• In 2012, the European Commission launched the Sustainable Urban Mobility campaign "Do the Right Mix[31]" aiming to support sustainable urban mobility campaigners in 31 countries. The main objective of this initiative is to promote the advantages of combining different modes of transport. The campaign works with diverse stakeholders to take steps towards changing mobility behaviour in their neighbourhoods and cities by running their own 'actions'.

• Public Transport - UITP's Declaration on Climate Leadership targets doubling the market share of public transport by 2025 and pledged over 350 projects to climate action in over 80 cities around the world. The UIC Low Carbon Sustainable Rail Transport Challenge proposes 50% increase in rail's share of passenger transportation by 2030 and doubling by 2050 (2010 baseline), rail freight activity equal to that of road freight by 2030, and exceeding road freight volumes by 50% by 2050.

• In 2015 the UN Environment Share the Road Programme - with the support of the FIA Foundation - helped the Nairobi City County Government launch an NMT Policy for Nairobi which included a first of its kind commitment in Africa - earmarking 20% of their road construction budget to NMT investment[32].

Trip Mode Share

In London, the private transport trip mode share has declined from 49% in 1995 to about 36% in 2015, whereas those made by public transport have increased from 25% to 37% during the same period. Central London has seen the largest reduction in motor vehicle kilometres since 2000. The mode shift is mainly due to improvement in bus services, metro systems, walking, cycling and due to implementation of congestion charges. The 2018 London Mayor's Transport Strategy has the bold ambition to achieve about 80 percent of all trips in London by walking, cycling and by using public transport by 2041.



TEXT BOX 3

City	Mode Shift targets
Adelaide	Double the number of people cycling in the City (baseline 2011), Increase the number of car share vehicles available in the City to 100 vehicles.
Chengdu	65% Public Transit share by 2020 (of which metro to have a 35% share)
Chongqing	47% Public Transit trip share by 2020 (Metro to take 21% of total daily trips by 2020)
Copenhagen	By 2025, the city wants 75% of trips to be made by foot, bike, or public transit
Gothenburg	By 2035, A doubling of the number of journeys on foot or by bicycle. A doubling of the number of public transport journeys. A reduction by a quarter of the number of car journeys (compared to 2011)
Greater Kuala Lumpur/Klang Valley	Target 40% modal share for public transport in the urban areas by 2030 during AM peak periods
Hô Chi Minh	Public transport mode share of 47-50% by 2020
London	80 per cent of all trips in London to be made on foot, by cycle or using public transport by 2041
Nairobi	By 2025, Public Transit mode share to be 35%, Cycling to be 10% and walking to be 50% of trip mode share (for up to 5km trip length)
Phnom Penh	Public Transit mode share to be 30% of trip mode share by 2035
Shanghaï	Metro to take 60% of Public transport trips by 2020
Shenzhen	Public Transit and non-motorised vehicles to take 65% of overall trips by 2020
Singapore	A 75% public transport modal share during both the morning and evening peak hours by 2030, up from today's 64%.
Stockholm	The proportion of all journeys at peak hours performed by bicycle must be not less than 15 per cent by 2030. The proportion of local journeys made on foot will be at least 60 per cent in the inner city and 50 per cent in the suburbs by 2030
Taipei	12 per cent modal share for bicycles by 2020
Vancouver	By 2040, at least two-thirds of all trips will be made by foot, bike, and transit.

TABLE 3. CITIES WITH MODAL SHIFT STRATEGIES

• CHANGES IN ENERGY INTENSITY AND LOW CARBON FUEL • The transport energy intensity (defined as the ratio of energy consumption with passenger or freight activity) of the road transport sector varies significantly among modes and regions as illustrated in the figures below. All modes of passenger transport show improvement in transport energy intensity with light-duty vehicles showing the least progress. For individual modes, the energy intensity is much higher in OECD countries when compared with the non-OECD countries, mainly due to factors such as occupancy or loading, fuel efficiency, fleet composition, vehicle size i.e. bigger SUVs and mode split. International Energy Agency analysis of fuel economy for the past decade for new light-duty vehicles (LDVs) reveals about 1.5% annual improvement globally between 2005 and 2015[33]. Overall, globally, from 2005 to 2015, the energy intensity of passenger and freight road transport has improved by about 22% and 6% respect.[34]

Road Transport remains very dependent on oil, with the transport sector accounted for about two-thirds of global oil consumption in 2015 with the road sector alone accounting for half[35]. **At present, the transport sector is the least diversified energy end-use sector due to the high emphasis on energy density. About 93% to 98% of road transport modes are powered by petroleum products with limited penetration of biofuels and electricity. Liquid biofuels (ethanol and biodiesel) share in global road transport fuel is about 4%[36].**

Electricity share in road transport energy consumption has only increased marginally over the past 15 years in different modes. However, two-and-three wheelers are an exception and currently, they constitute about 20% of the fleet. In 2015, close to 38 million electric bikes were sold globally and out of which more than 90% was in China alone[37]**. For electric vehicles, it is important to consider how electricity is generated and its exposure to people/proximity of emissions to people. In 2016, globally, 26% of the electricity consumed by electric vehicles were renewable[38].** However, the transport sector could benefit from decarbonizing efforts in the electricity sector. By 2030, renewables could become the leading source of electricity by 2030 and the carbon intensity of the power sector is projected to improve by 30%[39].

The policy response to improve modal efficiency involves the use of "Improve" strategies to improve vehicle and fuel technologies and by optimising transport infrastructure. There exist several best practice examples from countries, cities and companies which have initiated such improvement strategies.

For example:

- The number of countries that have adopted a biofuel obligation/ mandate increased from 36 in 2011 to 68 in 2017 [41].
- In 2016, Brunei, Ethiopia, India, Morocco, Nigeria, United Arab Emirates & Viet Nam proposed reducing fossil fuel subsidies[42].
- In 2016, about 34 countries proposed energy efficiency improvement strategies for implementation in the Nationally determined contributions[43].
- About 83% of new LDV sales are in countries which have proposed fuel economy standards for LDVs[44]. For example, countries and regions like China, EU, Japan, Canada, US, Mexico, South Korea and India have established LDV fuel economy standards.
- About 48% of the new heavy-duty vehicle (HDV) sales are in countries which have proposed fuel economy standards for HDVs. For example, countries and regions such as China, EU, Japan have established HDV fuel economy standards.
- Countries and cities like Norway, Ireland, Netherlands, Slovenia, Paris, Scotland, Reykjavik, United Kingdom, France, etc. have announced target deadlines for a ban of new vehicles with gasoline and diesel engines.[45]

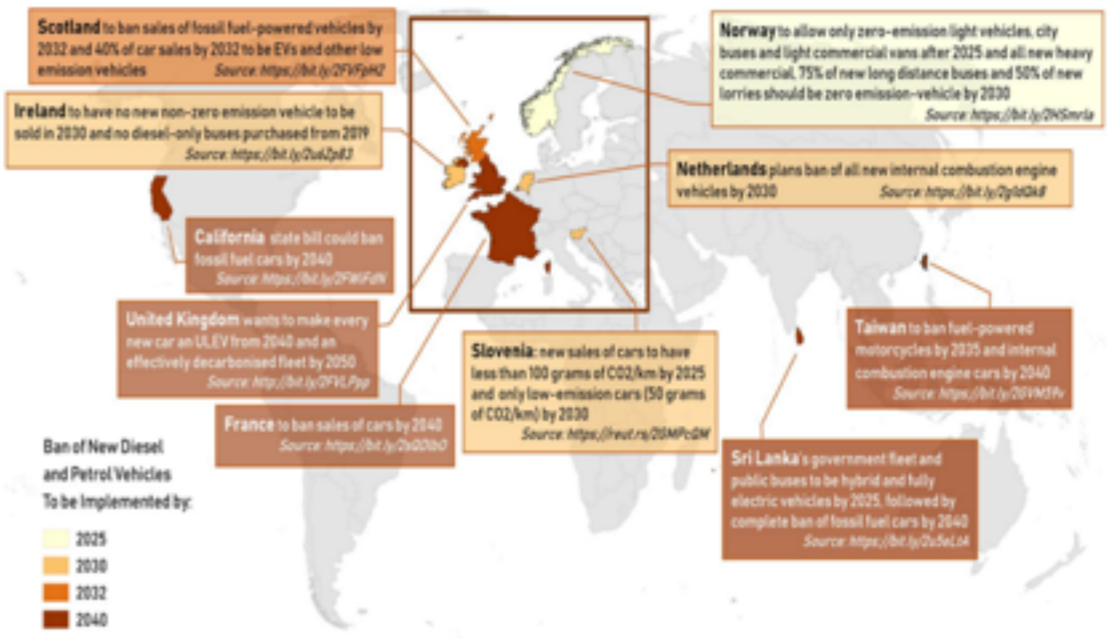


FIGURE 7. BAN ON NEW DIESEL AND GASOLINE VEHICLES (TARGETS)

The collapse of the diesel fleet and growth in the share of SUVs lead to an increase of emissions in Europe

Target because of its impact on human health, and progressively hunted in European cities (Hamburg, Paris ...), diesel is progressively losing its privilege and favour.

In France, the alignment of taxes on gasoline and diesel have led to rapid changes in behavior. In 2017, the market share of diesel vehicle sales decreased by 5% compared to the previous year. For number of companies, where this type of motorization has been almost hegemonic since the 1970s, the lastest results are spectacular; sales fallen by 34% in one year (September 2017 - September 2018).

But this rapid change has had a reverse effect on CO_2 emissions. In its annual report on new vehicle sales, the agency AAA Data notes that the average CO_2 emissions of new vehicles sold in 2017 were 111 grams per km, compared to 110 grams in the previous year. This is the first increase since 1995. Diesel production is one of the reasons for these changes. Diesel vehicles can emit up to 20% less CO_2 per km, and this mutation is one of the reasons for this increase.

The analysis of new vehicle emissions in Europe carried out by the Jato Dynamics institute reveals no other conclusion: 118.1 grams of CO_2 per km in 2017, against 117.8 g / km in 2016. This is a very disturbing trend that is moving Europe further and further away from the European Commission's target of 95 g / km on average by 2021 for new vehicles. But the return of the gasoline engines is not the only reason for this increase. The explosion in sales of SUVs, which are more powerful and heavier, is another key reason. SUV vehicles represent 30% of total vehicle sales in Europe in 2017, contributing significantly to this increase.

The improvement of technologies and motors, particularly electric motors, is necessary to achieve this goal 2021. However, sales of SUVs are struggling to take off, despite its advertisement campaigns: Renault Zoe, the best-selling electric vehicle in Europe, has reached sales level of only 30,000 units in 2017. Manufacturers' emissions (see figure 8) give some idea of the efforts required, although the good sales of Toyota due to success of its hybrid vehicles (300 000 units sold) is an interesting benchmark of a possible change of trend.

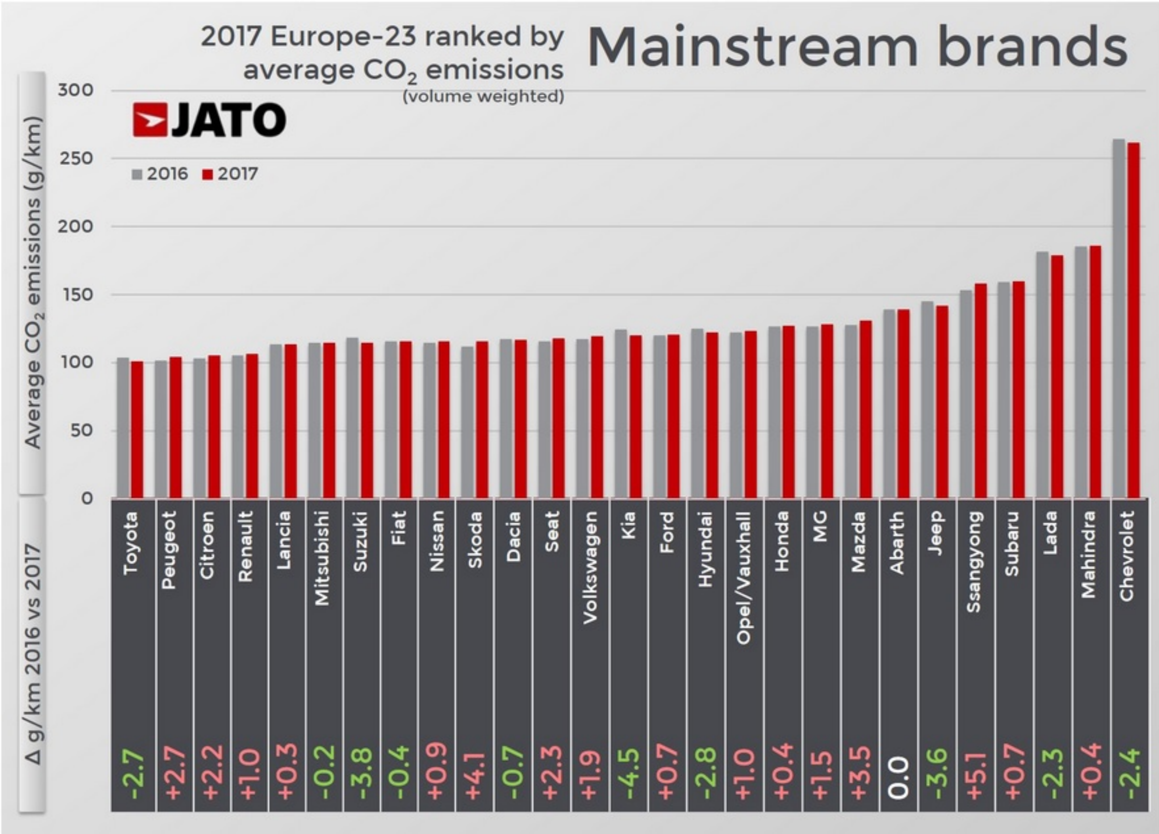


FIGURE 8. EMISSIONS OF CAR MANUFACTURERS IN EUROPE, IN 2016 AND 2017

Source: Jato Dynamics, 2018 - https://www.jato.com/brands-average-co2-emissions-110-130-g-km-counted-73-european-car-regs-2017/

TEXT BOX 4

State and non – state actors are implementing several initiatives for supporting government policies and actions on energy efficiency and decarbonising fuel.

For example:

• The Global Fuel Economy Initiative (GFEI) is supporting countries to put in place fuel economy strategies. The main ambition is to achieve an average improvement across all vehicles by 50% by 2050 (30% improvement of new car fuel economy, worldwide, by 2020 and 50% by 2030). The GFEI's campaign – '100 for 50by50' – was developed to gather new country commitments to the improvement in fuel economy. Currently, GFEI is supporting over 70 countries and the target is to get commitments on "50 by 50" mission from 100 countries.

• Global Macro-Roadmap (GMR) has proposed milestones as shown below to be considered as fleet averages for the concerned vehicle sector. For cities, the proposal suggests Zero Emission Zones (ZEZs), followed by Zero Emission Cities (ZECs), for both air pollutants and GHGs. Front-runners (leading cities) will aim for 2025 or 2030 as can be seen from the examples of Copenhagen and Oslo who have already committed to zero carbon by 2025. The recent announcements by France and the United Kingdom to ban the sales of petrol and diesel cars by 2040 also set important pre-cedents for the transition to ZECs.

• The C40 Clean Bus Declaration of Intent was officially announced in March 2015. The main goal of this initiative is to incentivize and help manufacturers and other stakeholders, such as multilateral banks, develop strategies to make clean bus technologies more affordable for cities. Currently, the 23 C40 signatory cities have committed to having over 40,000 buses (out of a total fleet of 166876) operating via clean technologies by 2020. Estimates suggest that, if these cities reach their 2020 clean bus targets, it would result in a cumulative 880,500 tons per year in GHG savings.

• The Electric Vehicles Initiative (EVI) announced a new campaign in 2017 called EV 30@30 to speed up the deployment of electric vehicles and target at least 30 percent new electric vehicle sales by 2030.

• The International Zero-Emission Vehicle Alliance (ZEV Alliance) is a partnership of governments acting together to accelerate the adoption of zero-emission vehicles (electric, plug-in hybrid, and fuel cell vehicles). The main objective is to accelerate the adoption of zero-emission vehicles. The target is to ensure that all passenger vehicle sales in their jurisdictions ZEVs by no later than 2050.

• US Smartway Initiative which is launched by the United States Environmental Protection Agency (EPA) has about 3,600 North American companies in the partnership. It helps companies identify and select more efficient partners i.e. freight carriers, transport modes, equipment, and operational strategies to reduce operational costs and improve supply chain sustainability. Since 2004, SmartWay has helped its partners save 215.4 million barrels of oil- equivalent and about $29.7 billion on fuel costs.

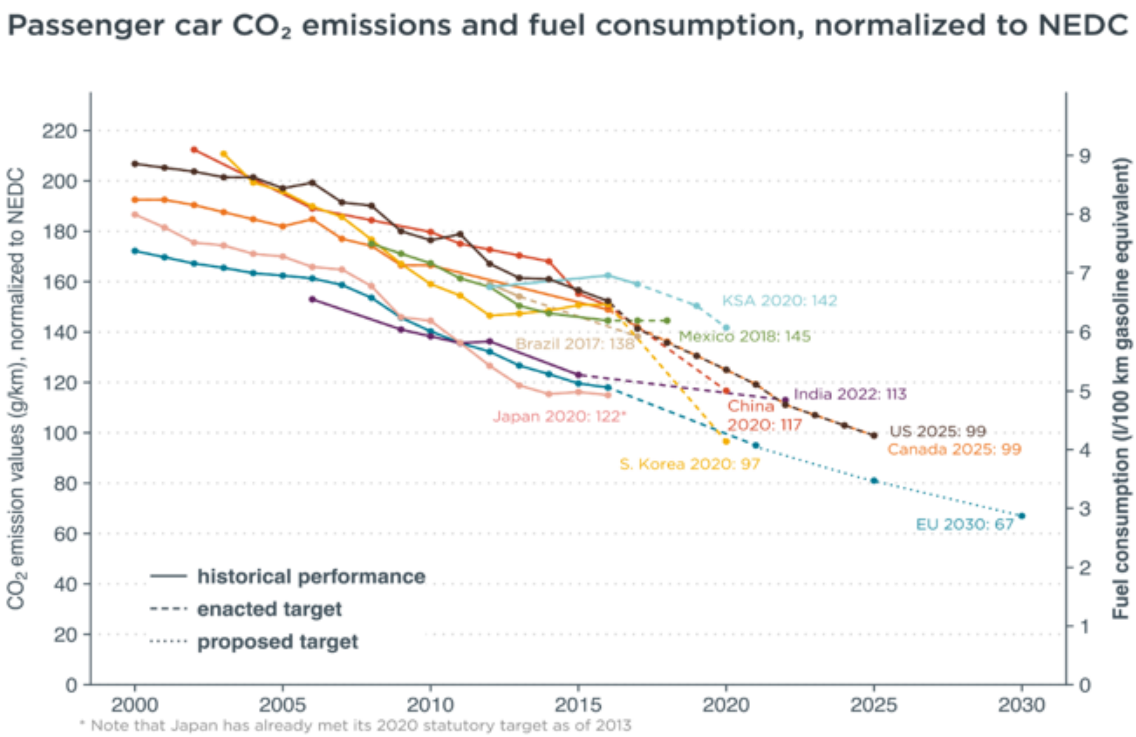


FIGURE 9. PASSENGER CAR CO_2 EMISSIONS (FUEL ECONOMY)

• L'initiative étasunienne Smartway, lancée par l'Environmental Protection Agency (EPA) des États-Unis, regroupe environ 3 600 entreprises nord-américaines. Il aide les entreprises à identifier et à sélectionner des partenaires plus efficaces, comme les transporteurs de fret, les modes de transport, les équipements et les stratégies opérationnelles, afin de réduire les coûts opérationnels et d'améliorer la durabilité de la chaîne d'approvisionnement. Depuis 2004, SmartWay a aidé ses partenaires à économiser 215,4 millions de barils d'équivalent pétrole et environ 29,7 milliards de dollars en coûts de carburant.

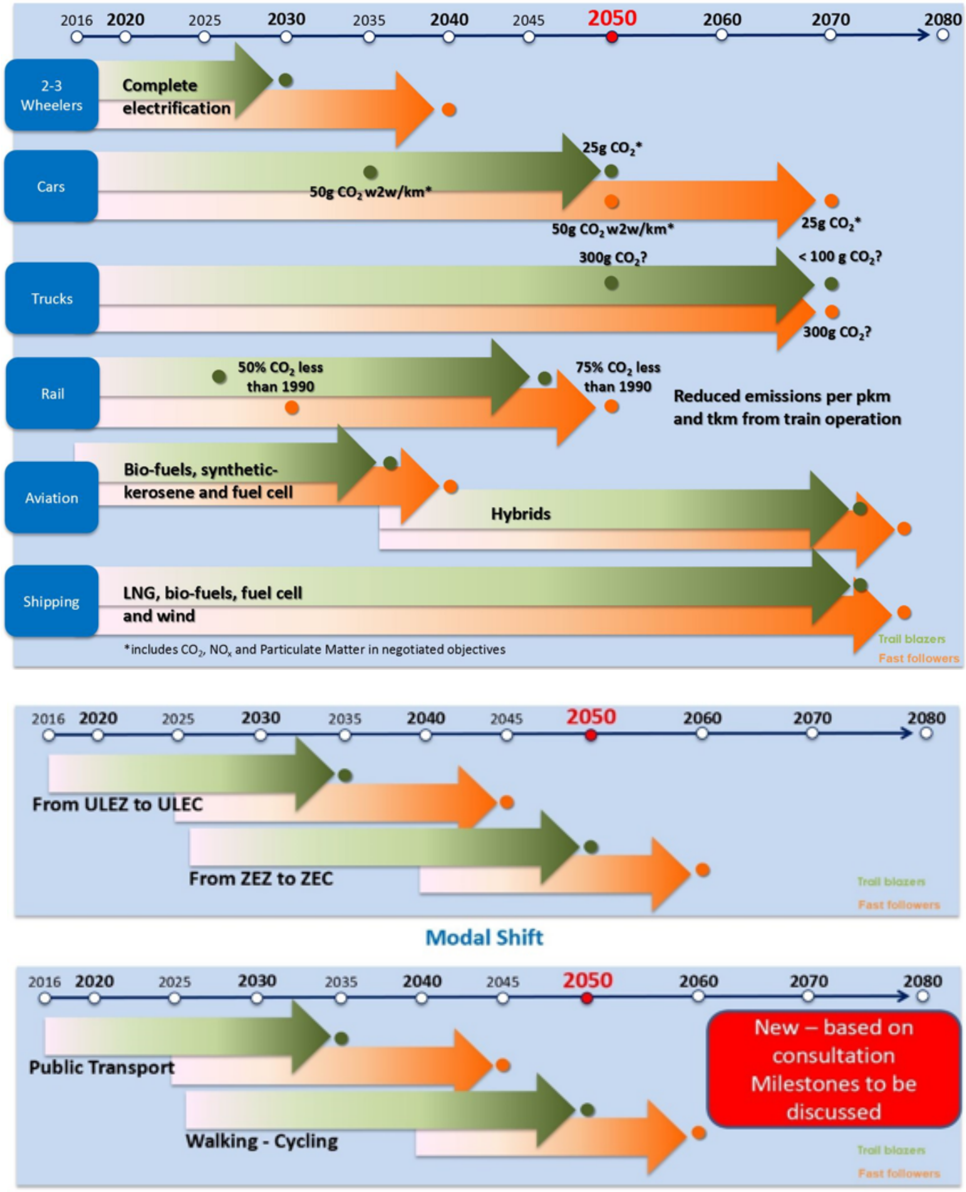


FIGURE 10. GLOBAL MACRO ROADMAP CONSULTATION TARGETS

CONCLUSION

Road transport carbon emissions are the result of a complex mix of human behaviour, economic growth, public policy and transport regulations. Overall, the global road transport carbon emissions have increased when compared with 2000 levels. The rapid increase in the travel demand (growing in non-OECD countries), modal-structure (shift towards energy-intensive modes, especially in non-OECD countries), energy intensity (minor improvement due to new technologies) and high carbon content of fuels (lack of penetration of low carbon fuels) interacted to determine overall increase in global road transport carbon emissions.

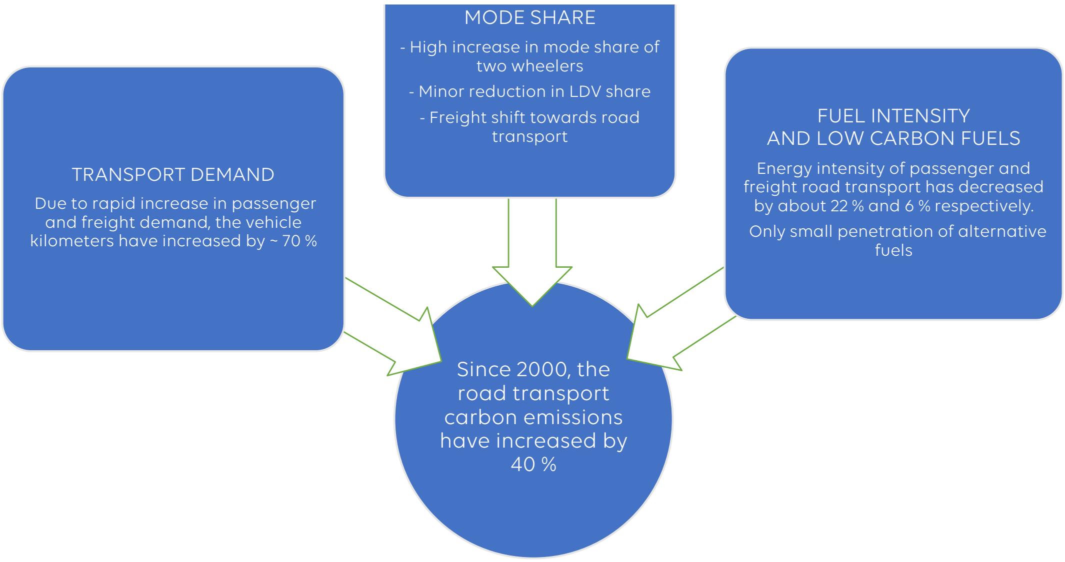


FIGURE 11. TREND IN ROAD TRANSPORT (2000 TO 2015)

The large differentiation among road transport emissions trends between individual modes and countries underscores the necessity of a heterogeneous approach to tackling current and future road transport sector emissions worldwide. Policy responses have been successfully implemented in OECD and non-OECD countries, demonstrating the potential of the road transport sector to contribute to rapid steps toward decarbonization on a global scale. However, there is no silver bullet to decarbonize road transport sector, instead, it is a range of strategies and initiatives that must be embraced in a comprehensive manner covering all modes of transport. A typical road transport low-carbon policy response includes a combination of 'Avoid' strategies, which reduce the need to travel (e.g. transport demand management); 'Shift' strategies, which move transport trips to more efficient modes (e.g. public transport improvements); and 'Improve' strategies, which increase the efficiency of existing trips (e.g. fuel economy standards).

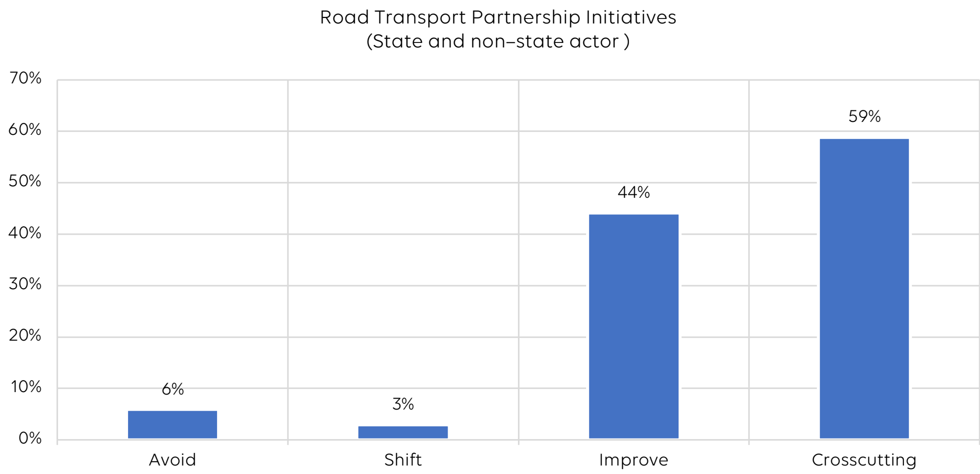


FIGURE 12. AVOID-SHIFT-IMPROVE INITIATIVES

Currently, road transport is one of the fastest growing sub-sectors in the economy-wide emissions indicating that the policies, measures and non-state actor initiatives over the past decade h**ave only been marginally effective**. An immediate lack of emission performance does not in itself suggests failure. However, as the best practice examples illustrate - policies, measures and non-state actor initiative's **effectiveness are increasing over time due to better awareness and capacity.** The role of the non-state actors in this transformation (especially in setting agenda) has been critical.

• To date, transport sector mitigation efforts have relied heavily on the technological transformation (i.e. 'Improve' measures)[36] . However, the non-state actor initiatives were more balanced (since not subject to the same political constraints as state-actors), promoting all three instruments of low carbon road transport thereby filling a critical gap.

• Non-state actors have financed the development of nearly one-quarter[37] of total transport sector carbon emissions quantification methodologies and tools to ensure that the action on transport and climate change is not held back by the absence of tools to analyse transport interventions for their climate impact.

• Recently, several countries and companies have set ambitious targets for the reduction of the carbon emissions from the transport sector, however, globally, there is a complete lack of transparency on the progress towards transport sector targets. Non-state actors play an essential role in reviewing voluntary pledges, measuring, verifying and communicating transport sector emission impacts outside the UNFCCC (sometimes even in enforcement as in Dieselgate).

• Many transport interventions (especially avoid and shift related) take longer to deliver first results due to slow turnover of stock and infrastructure and the huge sunk costs in the present transport system. By limiting future infrastructure deployment for carbon-intensive modes and by prioritising infrastructure for low carbon modes, the carbon trajectory can be lowered while at the same time enhancing the co-benefits and lowering the overall cost of the infrastructure. There is an increasing recognition that low carbon measures within the transport sector could be successful if widely supported by state and non-state actors, with strong political leadership and private sector commitments and if implemented at scale.

PLEASE DO NOT HESITATE TO REACT TO THIS STUDY, AND NOTIFY US COMPLEMENTARY REPORTS AND DATA VIA THIS ADDRESS: CONTRIBUTION@CLIMATE-CHANCE.ORG

ANNEXURE - GLOBAL AND REGIONAL INITIATIVES

	AVOID	SHIFT	Improve	CROSS CUTTING	CROSS-SECTORAL
"30 BY 30" RESOLUTION	Y		Y		
21ST CENTURY TRUCK PARTNERSHIP			Y		
BELOW 50			Y		
C40 CITIES CLIMATE LEADERSHIP GROUP (C40)				Y	Y
C40 CLEAN BUS DECLARATION			Y		
CARBON NEUTRAL CITIES ALLIANCE				Y	Y
CARING FOR CLIMATE					
CCAC: DIESEL INITIATIVE			Y		Y
CIVITAS				Y	
CLEAN AIR ASIA				Y	Y
COMPACT OF MAYORS				Y	Y
COVENANT OF MAYORS				Y	Y
"DO THE RIGHT MIX"-SUSTAINABLE URBAN MOBILITY CAMPAIGN	Y	Y			
DECARBONISING TRANSPORT INITIATIVE				Y	
EST INITIATIVE				Y	
ECOMOBILITY ALLIANCE				Y	
EUROCITIES				Y	Y
ELTIS, THE URBAN MOBILITY OBSER-VATORY				Y	
EV100			Y		
GLOBAL FUEL ECONOMY INITIATIVE (GFEI)			Y		
GLOBAL GREEN FREIGHT ACTION PLAN				Y	
GLOBAL STRATEGY TO INTRODUCE LOW-SULFUR FUELS AND CLEANER DIESEL VEHICLES (THE "GLOBAL STRATEGY")			Y		
GREEN FREIGHT ASIA NETWORK (GFAN)				Y	

	AVOID	SHIFT	Improve	CROSS CUTTING	CROSS-SECTORAL
GLOBAL MACRO ROADMAP				Y	
ICLEI - LOCAL GOVERNMENTS FOR SUSTAINABILITY				Y	Y
INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION (ICCT)			Y		
INTERNATIONAL ZERO-EMISSION VEHICLE ALLIANCE (ZEV ALLIANCE)			Y		
INITIATIVE FOR CLIMATE ACTION TRANSPARENCY				Y	Y
IPIECA			Y		Y
ITS FOR CLIMATE				Y	
KYOTO DECLARATION FOR THE PRO-MOTION OF ESTS IN CITIES				Y	
LCTPI LOW CARBON TRANSPORT FUELS			Y		
LCTPI: LOW CARBON FREIGHT				Y	
LEAN AND GREEN				Y	
LOGISTICS CARBON REDUCTION SCHEME (LCRS)			Y		
LOW CARBON ROAD AND ROAD TRANSPORT INITIATIVE (LC2RTI)			Y		
LOW CARBON VEHICLE PARTNERSHIP (LOWCVP)			Y		
LOW EMISSIONS DEVELOPMENT STRATEGIES (LEDS) GLOBAL PARTNERSHIP				Y	Y
MOBILISEYOURCITY				Y	
MARKET PLACE OF THE EUROPEAN INNOVATION PARTNERSHIP ON SMART CITIES AND COMMUNITIES				Y	Y
PARIS DECLARATION ON ELECTRO-MOBILITY ON CLIMATE CHANGE			Y		
PARTNERSHIP ON SUSTAINABLE, LOW CARBON TRANSPORT (SLOCAT)				Y	
PARIS PROCESS ON MOBILITY AND CLIMATE (PPMC)				Y	
PARTNERSHIP ON TRANSPARENCY IN THE PARIS AGREEMENT				Y	Y
PRIVATE FINANCING ADVISORY NETWORK (PFAN)			Y		
PUBLIC TRANSPORT DECLARATION ON CLIMATE LEADERSHIP (UITP)		Y			

	AVOID	SHIFT	Improve	CROSS CUTTING	CROSS-SECTORAL
REN21 (RENEWABLE ENERGY POLICY NETWORK FOR THE 21ST CENTURY)			Y		
SIDEWALK CHALLENGE	Y	Y			
SMARTWAY				Y	
SCIENCE BASED TARGETS				Y	Y
SUSTAINABLE MOBILITY FOR ALL (SUM4ALL)				Y	
TAXI4SMARTCITIES			Y		
TRANSPORT DECARBONISATION ALLIANCE (TDA)				Y	
THE CLIMATE REGISTRY				Y	Y
THE PRINCE OF WALES'S CORPO-RATE LEADERS GROUP (CLG)				Y	Y
TRANSFORMATIVE URBAN MOBILITY INITIATIVE (TUMI)				Y	
UITP DECLARATION ON CLIMATE CHANGE LEADERSHIP				Y	
UNDER2 COALITION				Y	Y
UNEP PARTNERSHIP FOR CLEAN FUELS AND VEHICLES (PCFV)			Y		
URBAN ELECTRIC MOBILITY INITIA-TIVE			Y		
URBAN ELECTRIC MOBILITY INITIA-TIVE (UEMI)			Y		
URBAN-LEDS PROJECT				Y	Y
VERRA (FORMERLY VERIFIED CAR-BON STANDARD)				Y	Y
WBCSD URBAN INFRASTRUCTURE INITIATIVE (UII)				Y	Y
WE MEAN BUSINESS COALITION				Y	Y
WORLD CYCLING ALLIANCE (WCA) AND EUROPEAN CYCLISTS' FEDERA-TION (ECF) COMMITMENT	Y				
WWF CLIMATE SAVERS				Y	Y
ZEV ALLIANCE			Y		

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