Towards Decarbonising Transport 2018

A Stocktake on Sectoral Ambition in the G20

Spotlight: The Transport/Energy Nexus

Imprint

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A 2018 Stocktake on Sectoral Ambition in the G20

On behalf of

Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

of the Federal Republic of Germany

Published: November, 2018

15-2018-EN

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Please cite as
Vieweg, Marion; Bongardt, Daniel; Hochfeld, Christian; Jung, Alexander; Scherer, Elena; Adib, Rana; Guerra, Flávia (2018): *Towards Decarbonising Transport – A 2018 Stocktake on Sectoral Ambition in the G20. Report on behalf of Agora Verkehrswende and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).*

About

Acknowledgements

The authors would like to thank Holger Dalkmann, Philipp Lendle (GIZ), Laura E. Williamson (REN21) and Hannah E. Murdock (REN21) for their valuable input regarding the data and policies.

Agora Verkehrswende

In partnership with key players in the fields of politics, business, academia and civil society, Agora Verkehrswende aims to lay the foundation for a comprehensive climate protection strategy for the German transport sector, with the ultimate goal of complete decarbonisation. The climate protection strategy elaborated by Agora Verkehrswende is focused on transitioning the entire transport system from fossil fuels to electricity and fuel generated by renewables. Other important aspects of the strategy include increasing the efficiency of the entire transport system by avoiding unnecessary transport demand, transitioning to environmentally friendly modes of transport and increasing the efficiency of individual transport modes. Active collaboration is required at all levels of politics to bring about the transformation of the transport sector, from the level of national and international policy down to local municipalities. The think tank seeks to consider the necessary interaction between these various levels while striving to promote a shared understanding between stakeholders on promising ways to transition to a decarbonised transport system.

Agora Verkehrswende is a joint initiative of the Stiftung Mercator Foundation and the European Climate Foundation.

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is a globally active provider of international cooperative services for sustainable development and education. As a federally owned enterprise, it supports the government of Germany in achieving its objectives in the field of international cooperation for sustainable development. GIZ's Advancing Transport Climate Strategies (TraCS) project is funded through the International Climate Initiative of the German Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). Its objective is to enable policymakers in the partner countries of Vietnam and Kenya to specify the contribution that will be made by the transport sectors to their Nationally Determined Contributions (NDCs). In addition, GIZ seeks to develop detailed knowledge on mitigation potential in order to raise the level of ambition pursued by both countries. At the international level, TraCS organises active exchange between implementing partners, technical experts and donor organisations in order to enhance methodological coherence in the quantification of transport sector emissions.

Renewable Energy Policy Network for the 21st Century (REN21)

REN21 is a global renewable energy policy network that connects a wide range of key actors. REN21's goal is to facilitate knowledge exchange, policy development and joint action towards a rapid global transition to renewable energy.

REN21 brings together governments, non-governmental organisations, research and academic institutions, international organisations and industry to learn from one another and build on successes that advance renewable energy. To assist policy decision-making, REN21 provides high-quality information, catalyses discussion and debate, and supports the development of thematic networks.

REN21 facilitates the collection of comprehensive and timely information on renewable energy. This information reflects diverse viewpoints from both private and public sector actors, serving to dispel myths about renewable energy and to catalyse policy change. It does this through six product lines: Renewables Global Status Report (GSR); Regional Status Reports; Global Futures Report (GFR); Thematic Reports; Renewables Academy; and the International Renewable Energy Conferences (IREC).

Preface

Dear readers,

The extreme weather events of 2018 have given us a taste of things to come if man-made climate change continues at its current pace. Although the international community took a step in the right direction in Paris three years ago by resolving to keep the global temperature rise well below 2 degrees Celsius, global emissions of greenhouse gases continue to increase. The objective of preventing "dangerous anthropogenic interference with the climate system" seems as distant today as in 1992, when world leaders formally ratified the UN Convention on Climate Change at the Rio Earth Summit.

The transport sector is responsible for roughly one quarter of emissions from the burning of fossil fuels, with road traffic being the largest culprit. Most transport emissions are produced by G20 countries, and emission levels are still rising. However, if we are to meet the Paris climate target, those emissions must drop to near zero by 2050. This represents an enormous challenge, and one we must begin addressing now. For it involves more than merely replacing internal combustion engine vehicles with electric ones. We also need to transform the entire transport system and couple it to the electricity sector.

There is no single solution to making the transport sector carbon neutral. We need a multitude of measures – including some measures that are currently controversial. One thing is certain: if we postpone necessary measures, future efforts to keep global warming below the 2-degree mark will have to be all the more radical.

This study provides a clear picture of the state of G20 transport emissions, analyses already existing approaches for decarbonising the transport sector, and stresses the urgency of putting ambitious climate action on the political agenda. In the process, we hope to promote discussions about climate friendly transport, not just in G20 countries but everywhere. After all, the transformation of the transport sector can succeed only when the entire international community works together.

Tanja Gönner
Chair of the Management Board
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Christian Hochfeld
Executive Director
Agora Verkehrswende

Dear readers,

Globally, modern renewables only cover 10.4 % of the total final energy demand. Transport represents 30% of the total final energy demand but only slightly over 3% is of this energy is supplied by renewable energy, mainly biofuels. Compared to other sectors, the power sector in particular, renewable energy uptake in transport lags far behind.

To decarbonise transport, renewable energy for transport must be developed and accelerated. Moreover, the integration of renewables in the transport sector is fundamental to decarbonising the energy sector.

Stronger integration of the transport and energy sectors is crucial to reach the goals of the Paris Agreement and requires the development of effective policies, planning, coupled with ambitious targets. Developing renewable energy in transport also offers numerous, additional benefits, such as enhanced energy security, increased opportunities for sustainable economic growth and jobs, and – depending on the renewable fuel – improved local air quality.

Ambitions for developing electric mobility are rising and electricity will play an increasing role in road transport. This in turn creates opportunities for high shares of renewable electricity for trains, light rails, trams and two-, three-, and four-wheeled electric vehicles. However, the electrification of transport needs to be coupled with renewable energy-based decarbonisation of the electricity sector. This process can be driven by explicit measures that integrate policies to stimulate the use of renewable electricity in transport, e.g. by introducing renewable electricity mandates or binding financial and fiscal incentives for electric mobility. Phasing out fossil fuel subsidies to create a level playing field needs to accompany such measures.

Analysis of the transport sector in the G20 reveals that many challenges remain in driving the decarbonisation of transport and energy in an integrated way. I am very pleased that Agora Verkehrswende, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), and the Renewable Energy Policy Network for the 21st Century (REN21) have joined forces to underline the importance of coupling decarbonisation efforts in transport and energy. I hope this joint effort will prove helpful for policymakers in the G20, and globally, to recognise the opportunities that coupling transport and energy offer and in turn to raise the level of ambition for a decarbonised future.

Rana Adib
Executive Secretary
Renewable Energy Policy Network
for the 21st Century (REN21)

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Acronyms

BAU	Business-as-usual (scenario)
BEV	Battery electric vehicle
CNG	Compressed natural gas
CO_2	Carbon dioxide
COP	Conference of the Parties
EELP	Energy Efficiency Leading Programme (of the G20)
ERS	Electric road systems
ETS	Emission trading system
EV	Electric vehicle
FCEV	Fuel cell electric vehicle
G20	Group of Twenty
GDP	Gross Domestic Product
GFEI	Global Fuel Economy Initiative
GFR	Global Futures Report
GHG	Greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GSR	Global Status Report
HDV	Heavy duty vehicles
ICCT	International Council on Clean Transportation
ICE	Internal combustion engine
IEA	International Energy Agency
INDC	Intended Nationally Determined Contribution
IREC	International Renewable Energy Conferences
IRENA	International Renewable Energy Agency
ITF	International Transport Forum
LDV	Light duty vehicles
LPG	Liquefied petroleum gas
NDC	Nationally Determined Contribution
NEV	New energy vehicle
NMT	Non-motorised transport
OECD	Organisation for Economic Co-operation and Development
PHEV	Plug-in hybrid electric vehicle
REN21	Renewable Energy Policy Network for the 21st Century
SDG	Sustainable Development Goal
SLoCaT	Partnership on Sustainable Low Carbon Transport
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
VRE	Variable Renewable Electricity
ZEV	Zero emission vehicle

01

BACKGROUND

01 | Background

Following the ground-breaking UN Climate Change Conference in Paris in 2015, another milestone in international climate action will be reached in 2018. As foreseen by the Paris Agreement, January 2018 saw the start of a facilitative dialogue to take stock of the collective efforts made by signatories towards their long-term climate goals. This process, known as the Talanoa Dialogue, poses the following questions:

- Where are we?
- Where do we want to go?
- How do we get there?

Input received from Parties and stakeholders will be collected in a synthesis report and presented at the UN Climate Change Conference in Katowice, Poland[1]. In the run up to this conference, the present publication seeks to answer the above questions for the transport sector.

We concentrate on G20[2] countries, as collectively these nations account for two-thirds of the world's population, but are responsible for more than 80% of current global greenhouse gas (GHG) emissions. The vast majority of these emissions, which average at 5 tonnes per capita, are CO_2 emissions from burning fossil fuels to produce energy. The transport sector currently consumes more than half of global oil demand and accounts for 23% of global energy-related CO_2 emissions,[3] and emissions from the sector continue to grow rapidly. According to the latest Transport Outlook (OECD/ITF 2017a), CO_2 emissions could increase by 60% by 2050.

Climate action in transport is imperative to reach the goals of the Paris Agreement, keep global warming well below 2 degrees centigrade and to achieve the Sustainable Development Goals (SDGs). G20 members bear the greatest responsibility for the global transport sector's impacts on air quality, climate change and energy consumption – accordingly, they are in the driver's seat. Although there is strong motivation among G20 members to reduce the climate and health impacts of the transport sector, the level of ambition on carbon abatement still varies significantly between countries. Furthermore, the implementation of measures to achieve stated ambitions is generally falling short.

In order to highlight the crucial importance of the transport sector, Agora Verkehrswende, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the Renewable Energy Policy Network for the 21st Century (REN21) have compiled this report, which summarises the mitigation policies enacted for the transport sector by G20 countries. By providing a snapshot of efforts to decarbonise transport, we aim to show where more action is needed. Ultimately, we hope this report represents a valuable tool for the climate community to gain a better understanding of the overall status of CO_2 mitigation policies in the transport sector. With many countries already preparing for the submission of their next Nationally Determined Contributions (NDCs), due in 2020, we hope this analysis helps to spur further ambition by showcasing good examples.

The report analyses and describes the status of the transport sector in the G20 countries, including in particular their level of ambition towards decarbonisation. To provide context, section 4.1 emphasises the contributions that will be required from the transport sector to achieve the climate protection goals of the Paris Agreement, which seek to limit global warming to well below 2°C.

The factsheets on each G20 member shed light on the specific situation and challenges in each country, including existing goals and efforts. The report concludes by comparing stated ambition with implemented policies and actions while also considering required global reductions in the transport sector.

This publication is an update to the 2017 report. It focuses on new developments while also highlighting the need to integrate the power and transport sectors. While the introductory sections are largely unchanged (save for updating with fresh data), section 4 now provides more detail regarding the challenges facing the mobility and energy transition while also exploring the nexus between power generation and the transport sector. The country factsheets have also been updated with new data (when available) and information on policy developments over the last year.

1 COP24, 3–14 December 2018.
2 The G20 comprises 19 countries plus the EU. These countries are Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the UK and the USA. The group is a central forum for international cooperation on financial and economic issues.
3 Including upstream emissions.

02

MOBILITY TODAY AND TOMORROW

02 | Mobility today and tomorrow

The mobility of people and goods is an essential component of today's society and our global economy. Transport systems are crucial to personal freedom, as they enable choices about where to work, live and spend free time. Yet they also play a vital economic role, facilitating the international movement of goods and development of global production chains.

While the transport system of today brings many benefits, it also comes at a cost. Road fatalities and injuries are increasing; vehicle-related air pollution causes millions of premature deaths annually; and transport-related health care expenditures are substantial (SuM4All 2017). In 2013 around 1.25 million people died around the world as a consequence of road crashes, and some 50 million people suffered non-fatal injuries, about half of which were vulnerable road users, such as pedestrians and cyclists (GIZ 2017b). At the same time over 3 million early deaths were attributed to outdoor air pollution, with 75% occurring in G20 countries (Miller, Du and Kodjak 2017).

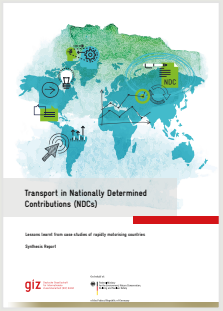
The transport sector is also an important contributor to global warming. CO_2 emissions from the sector account for 23% of energy-related greenhouse gas emissions (IEA 2018a) and have increased by 30% since 2000 (OECD/IEA and IRENA 2017). They are expected to increase by another 60% by 2050, if adequate measures are not taken (OECD/ITF 2017a).

Historically, transport activity is closely correlated with economic development. Indeed, economic growth and trade are the main drivers of transport demand (OECD/ITF 2017a). Population growth and increasing income levels also lead to increasing transportation volumes.

Growing concern for the environment and technological solutions that enable remote work and new mobility services can help to reduce rising demand for transport (SuM4All 2017).

The adoption of the Paris Agreement in 2015 represents a landmark that will require climate-related effects to be taken more prominently into considera-

Transport in NDCs



The paper "Transport in NDCs – Lessons learnt from case studies of rapidly motorising countries" synthesizes the quantitative analysis of all NDCS and a qualitative, in-depth assessment of the transport sector's role in NDC development in seven rapidly motorising countries. The study focuses on identifying factors limiting ambition in the first round of NDCs. Four key lessons learnt are:

1. Lack of transport data limits sectoral ambition due to uncertainty about what is feasible to achieve
2. Buy-in from key transport actors is essential for ambitious sector targets
3. NDCs should be more closely linked with transport sector strategies
4. Transport authorities need more climate change expertise and environment and energy authorities need more transport expertise

The paper concludes with recommendations for climate ministries, transport authorities and the international donor community concerning how to improve the second round of NDCs.

The study was supported by International Climate Initiative of the German Ministry for the Environment, Nature Conservation and Nuclear Safety.

The report can be downloaded at:
https://www.changing-transport.org/wp-content/uploads/2017_Transport-in-NDCs.pdf

tion in policy-making and transport planning. As of September 2017, 140 of the 163 NDCs analysed for this report identify transport as an important source of GHG emissions and as an area for action.[4] A total of 105 NDCs specifically define mitigation actions in the sector, while 23 NDCs set a GHG reduction target for transport (GIZ 2017a).

The transport sector is additionally influenced by another important milestone: the adoption of the Sustainable Development Goals. Sustainable transport is implicit in seven of the 17 goals (OECD/ITF 2017a), is covered directly by three targets, and alluded to in eight other targets.

Transport policies face the challenge of accommodating partially conflicting demands on the transport system. On the one hand, enabling mobility is important for economic development and satisfying personal mobility needs. On the other hand, such policies should seek to minimise detrimental effects on the environment, human health and safety.

Transport-related SDG targets — Table 2.1

SDG 2 Zero hunger	Target 2.3. Double the agricultural productivity and income of small scale food producers (access to markets)
SDG 3 Good health and well-being	**Target 3.6.** Halve number of global deaths and road injuries from traffic accidents **Target 3.9.** Reduce deaths and illnesses from pollution
SDG 7 Affordable and clean energy	Target 7.2. Increase substantially the share of renewable energy in the global energy mix Target 7.3. Double the global rate of improvement in energy efficiency
SDG 9 Industry, innovation and infrastructure	Target 9.1. Develop sustainable and resilient infrastructure
SDG 11 Sustainable cities and communities	**Target 11.2.** Provide access to safe, affordable, accessible and sustainable transport systems for all Target 11.6. Reduce the adverse environmental impact of cities
SDG 12 Responsible consumption and production	Target 12.c. Rationalise inefficient fossil-fuel subsidies
SDG 13 Climate action	Target 13.1. Strengthen resilience Target 13.2. Integrate climate change measures into national plans

Source: OECD/ITF (2017a)

4 Equalling 167 countries with a transport related NDC, as the EU's NDC includes its 28 member countries.

Reconciling these goals in a way that is inclusive and ensures accessibility for all is a major challenge for policy-makers and transport planners of the future. Coherent and rapid action is necessary now to lay the foundation for structural change. Indeed, near-term action is essential for ensuring the transport system of tomorrow contributes its due share to climate change mitigation while also enabling safe, healthy and inclusive development.

03

G20 IN THE DRIVER'S SEAT

03 | G20 in the driver's seat

The economies of the G20 are responsible for the lion's share of economic activity. Home to 64% of the world's population, the G20 generate 80% of global GDP, use almost 80% of total primary energy and were responsible for over 80% of global energy related CO_2 emissions in 2014 (OECD/IEA and IRENA 2017).

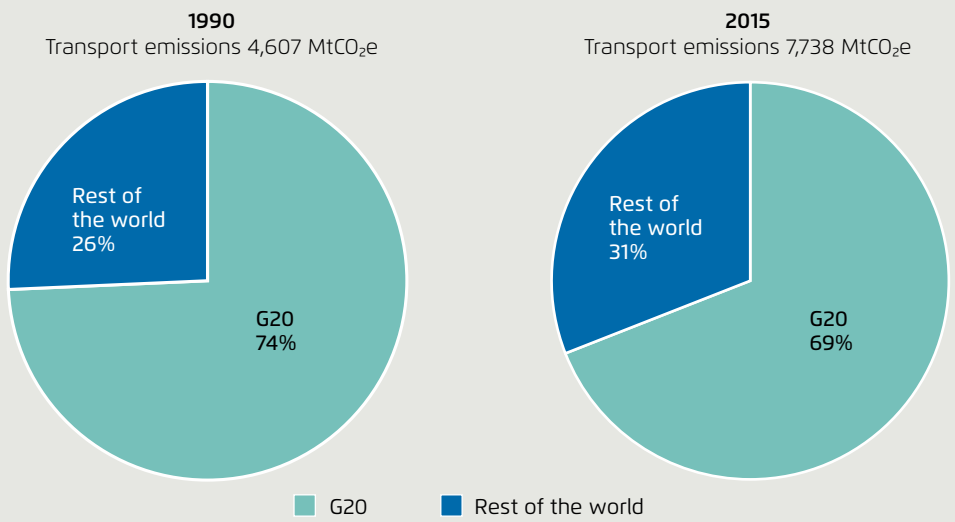
Recognising its responsibility for global emissions, the G20 stated at its July 2017 summit that the Paris Agreement is irreversible, despite the withdrawal of the US. The G20's strong commitment to climate action is further emphasised through the adoption of the Climate and Energy Action Plan for Growth (G20 2017b).

In the transport sector the G20 jointly emitted 74% of global emissions from fuel combustion in 1990. Despite continuing growth in emissions, this share dropped to 69% in 2015, indicating that non-G20 countries are increasing transport-related emissions at a higher rate (IEA 2018a). On average, inhabitants of G20 countries emitted 1.12 t CO_2 for transport activities in 2015. The figure for the rest of the world is 1.03 t CO_2, around 12% less. Accordingly, despite growing emissions in other countries, robust action by the G20 is essential for meaningful progress in the decarbonisation of the transport sector.

Individual G20 members face divergent challenges when it comes to transport. China still has relatively low per capita emissions, but transport related emissions have increased by 682% to 837 Mt CO_2 since 1990, making it the third largest emitter in the sector after the US (with 1,710 Mt CO_2) and EU (with 887 Mt CO_2). Per capita and total emissions from transport in Indonesia and India have nearly tripled, although their absolute levels remain low, due to the very low starting point in 1990. As illustrated in figure 3.2, the US, Canada, Australia and Saudi Arabia, by contrast, have relatively high per capita emissions from the transport sector, and these have changed only moderately since 1990, with the exception of Saudi Arabia, which has seen a 188% increase.

These trends highlight how developed and emerging economies are subject to divergent trends and challenges. They also underscore the need for enhanced action on all sides. While emerging economies need to address rapid motorisation and staggering growth rates in the transport sector, industrialised countries need to bring down high per capita emissions, and, by extension, total emission levels.

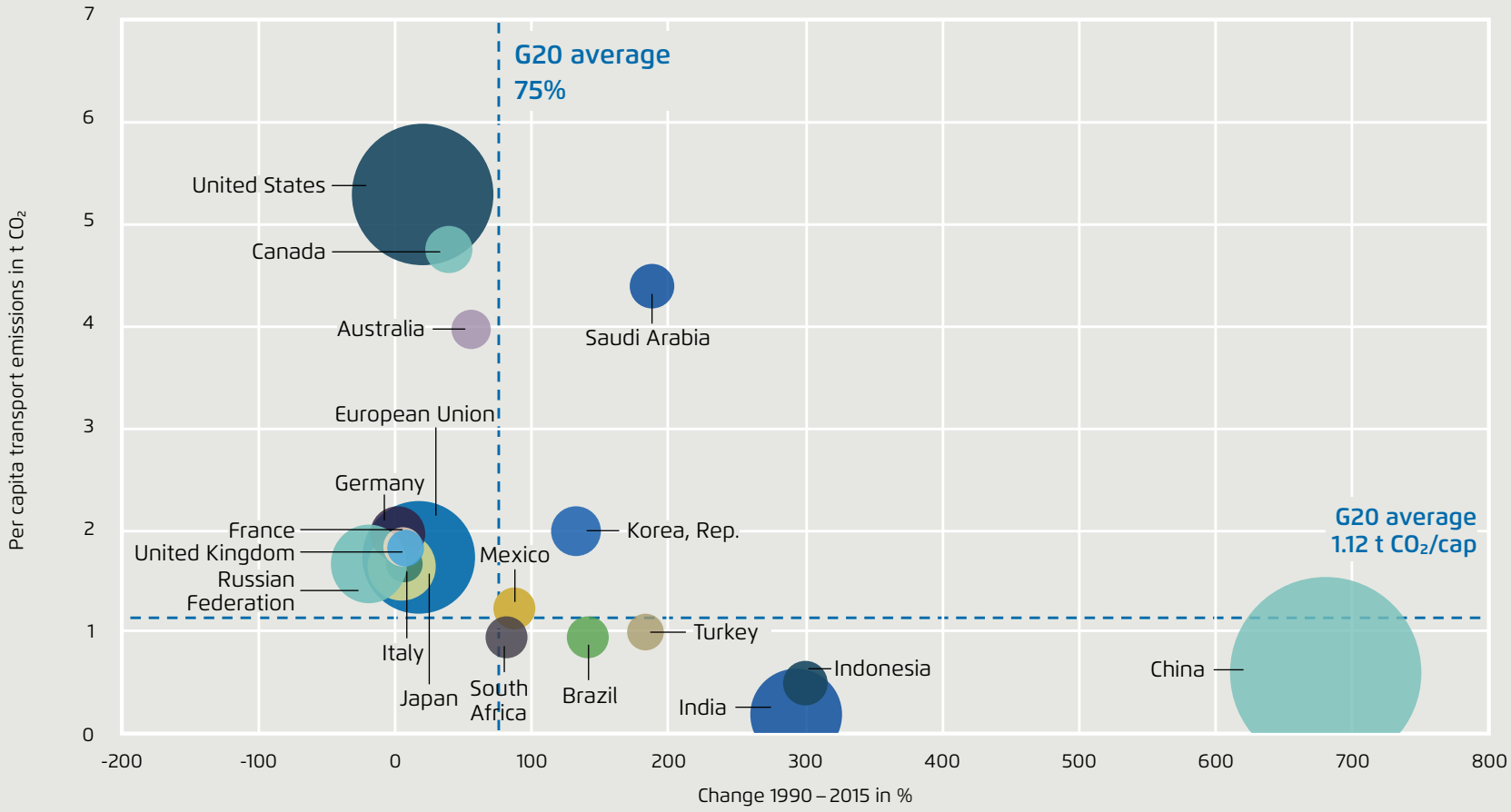
CO_2 emissions from the transport sector 1990 – 2015 Figure 3.1



Source: Authors' illustration based on data from IEA (2018)

G20 per capita emissions and change in the transport sector

Figure 3.2

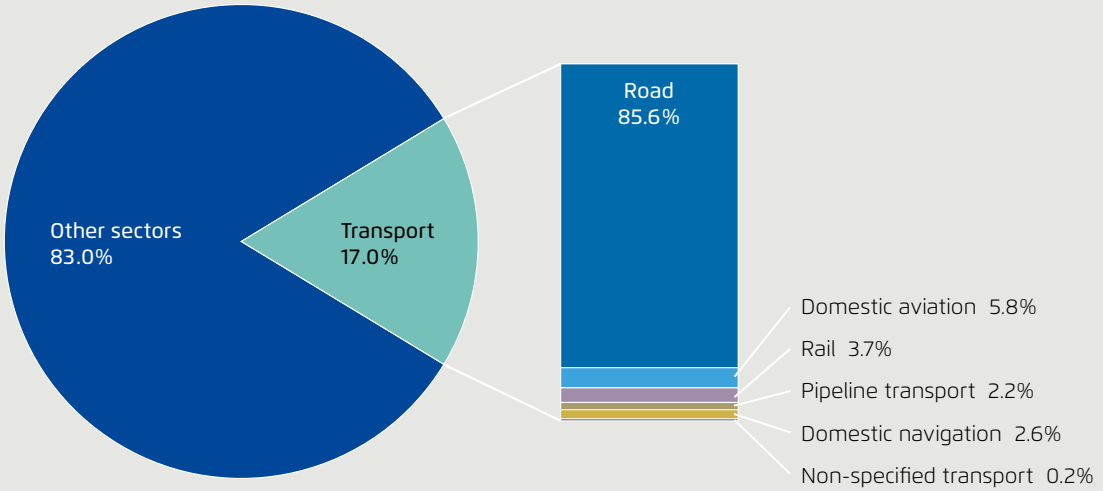


Source: Authors' figure based on data from IEA (2018) and World Bank (2018)
Note: the size of bubbles indicates total emissions from the transport sector

Road transport continues to be the largest source of GHG emissions in the transport sector. In the G20 it was responsible for 86% of sector emissions in 2015. With a 6% share, domestic aviation has become the subsector with the second largest emissions. However, the greatest need for action is clearly in the area of road transport.

Figure 3.4 shows one reason for the continued strong role of road transport. There is a strong relationship between per-capita income and vehicle ownership.[5] It also illustrates the clear divide between emerging economies and developed countries within the G20. To achieve needed levels of decarbonisation, car ownership in developed countries will need to peak in the medium term and growth in emerging economies needs to be successfully limited.

Share of transport subsectors in emissions in the G20, 2015 Figure 3.3



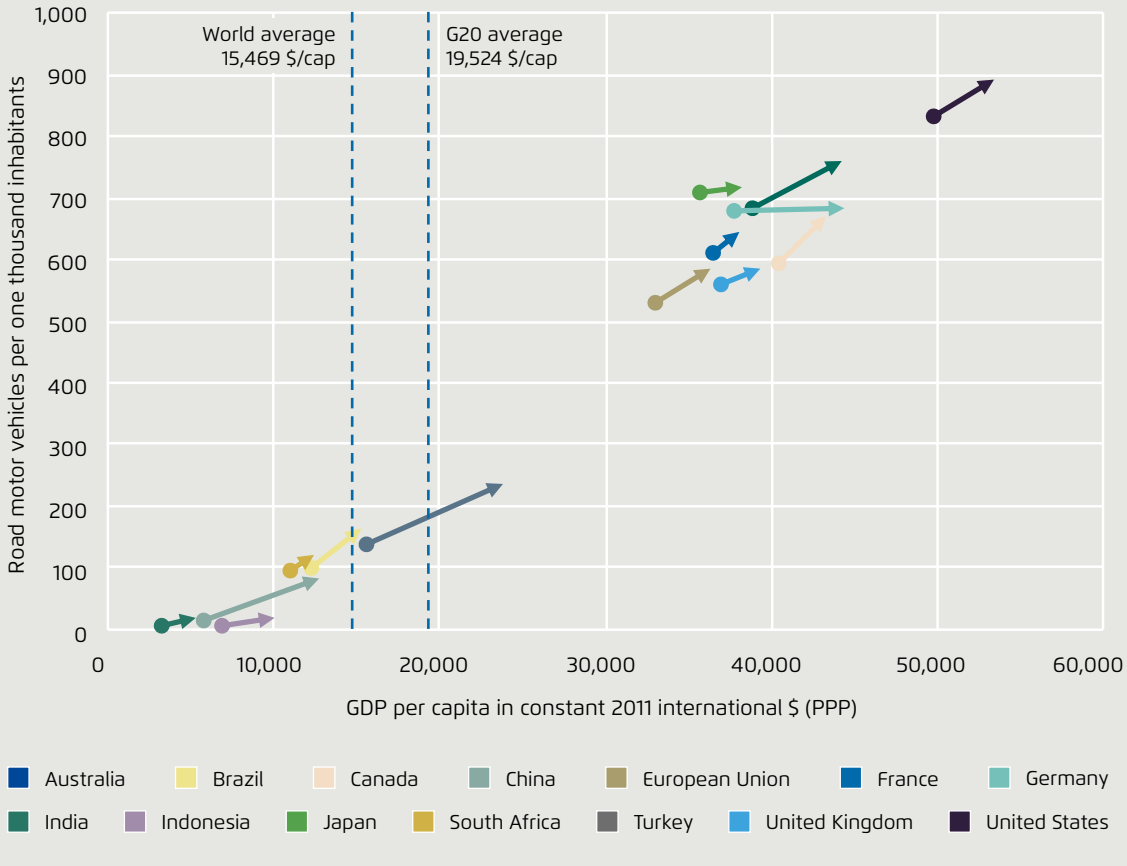
Source: Authors' illustration based on data from IEA (2018)

5 Data related to vehicle ownership are difficult to obtain and are not always comparable between countries, as vehicle registration systems vary. Nevertheless, we can assume that available data are suitable to illustrate broad trends.

The trend towards greater private vehicle ownership in conjunction with population growth is resulting in increased travel by car (as measured in passenger-kilometres) and increased freight transport (as measured in tonne-kilometres). The trend towards greater overall travel distances can be observed in all countries, despite the large differences in growth. Only a few G20 countries have seen growth in transport activity slow or reverse in recent years, such as Japan and the UK (OECD/ITF 2017a).

Development of per capita GDP and vehicle ownership in selected G20 countries, 2005–2015

Figure 3.4



Source: Authors' figure based on data from ACEA (2017); OECD/ITF (2017a, 2018c); World Bank (2018).

04

THE SECTOR IS FAR FROM MEETING THE DECARBONISATION CHALLENGE

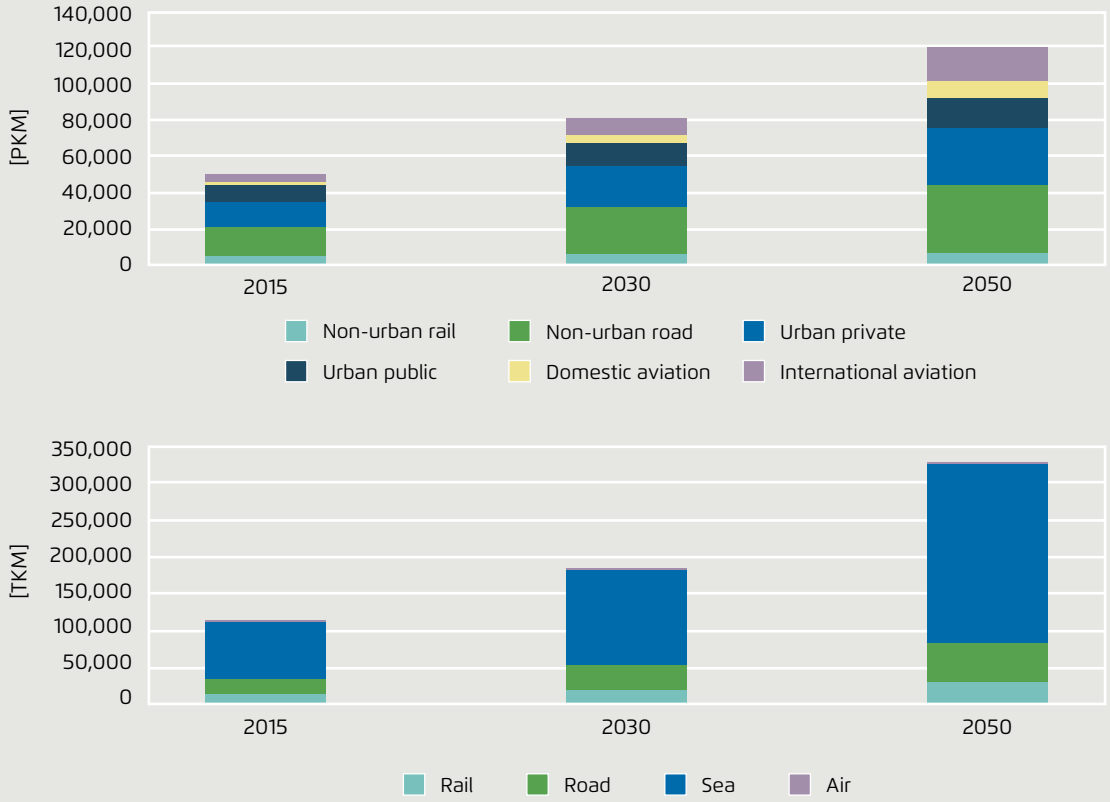
04 | The sector is far from meeting the decarbonisation challenge

Transport-related GHG emissions are clearly on the rise and policies so far have not resulted in an observable slowing of this trend at the global level. A meta-analysis of emission scenarios in the transport sector, conducted by the Partnership on Sustainable Low Carbon Transport (SLoCaT), indicates that by 2050, global transport sector CO_2 emissions could be in the range of 9 to 20 Gt (with an average of about 13 Gt, i.e. 93% above 2010)(Gota, Medimorec, et al. 2018).

"Continuing growth in passenger and freight activity could outweigh all mitigation measures unless transport emissions can be strongly decoupled from GDP growth" (IPCC 2014)

The International Transport Forum (ITF) comes to similar results in its recent Transport Outlook 2017. They estimate that transport demand will increase substantially until 2050 for passengers as well as freight (see figure 4.1), leading to 13.3 Gt CO_2 emissions by 2050. In passenger transport, growth will be most pronounced in road travel and aviation, with the highest growth in international aviation. Growth in the freight sector will be dominated by seaborne travel, continuing the existing trend (OECD/ITF 2017a).

Projected development of passenger and freight volumes — Figure 4.1

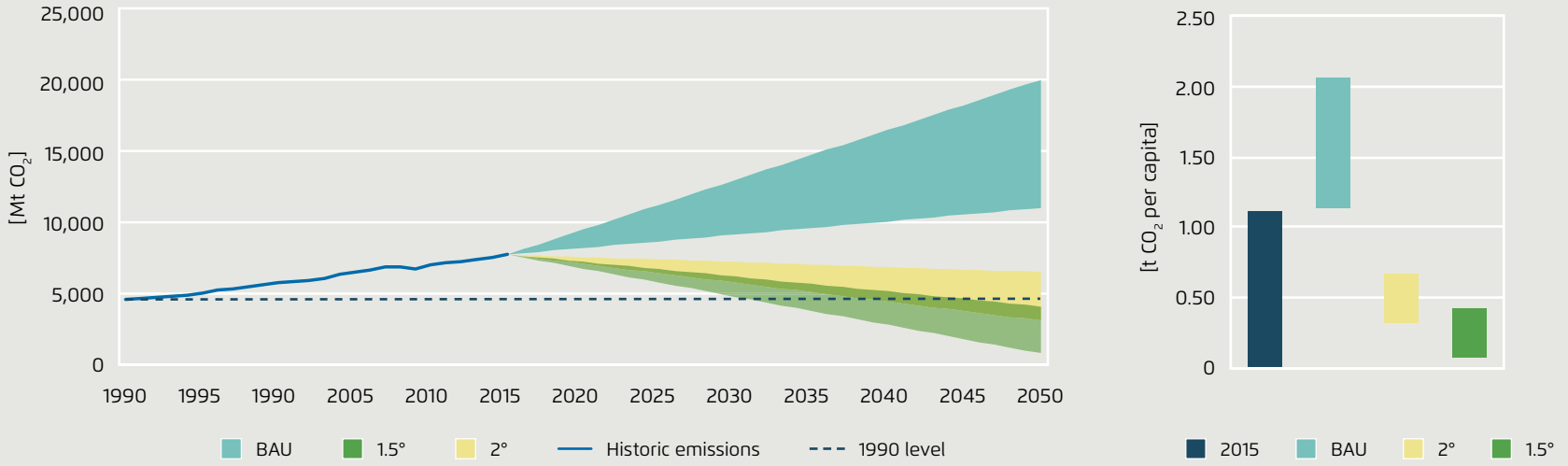


Source: Authors' figure based on data from OECD/ITF (2017a).

4.1 Low-carbon pathways require substantial reductions

2°C. Emission scenarios that are consistent with the agreed objective to limit warming below 2°C would require the transport sector to substantially deviate from historic trends. Emissions in 2050 range between 3.1 and 6.5 Gt CO_2 in different scenarios (Gota, Huizenga, et al. 2018), more or less reducing emissions from the sector back to 1990 levels. This assumes that all other sectors reduce emissions accordingly.

Transport sector emissions: business-as-usual development and required reductions under 2°C and 1.5°C scenarios — Figure 4.2



Note: Simplified illustration based on historic levels and projected 2050 levels. Individual scenarios are likely to peak around 2020 and then decrease emissions at higher rates afterwards.
Source: Authors' figure, historic emissions based on data from IEA (2018), projections based on data from Gota, Medimorec, et al. (2018).

Emission reductions of the magnitude required by low-carbon scenarios rely on ambitious policies and investment in all areas. These scenarios envision changing mobility patterns, including reducing the need to travel, moving transport to more efficient modes, and enhancing vehicle efficiency. The remaining energy needs to be provided by low or zero-carbon fuels (Agora Verkehrswende 2017a; Gota, Huizenga, et al. 2018). A vast majority of required reductions will need to be made in G20 countries (OECD/IEA and IRENA 2017).

1.5°C. To ensure that global warming remains below 1.5°C, emissions in the transport sector would need to be reduced to between 0.8 and 4.1 Gt CO_2 by 2050 (Gota, Medimorec, et al. 2018). This would mean reducing per capita emissions from the sector by up to 90% compared to current levels. The IPCC special report on the impacts of global warming of 1.5 C just confirmed that 1.5°C pathways require an acceleration of the mitigation solutions already featured in 2°C-consistent pathways and additionally require more action in areas so far receiving less attention, such as mode shift and travel demand management (IPCC 2018).

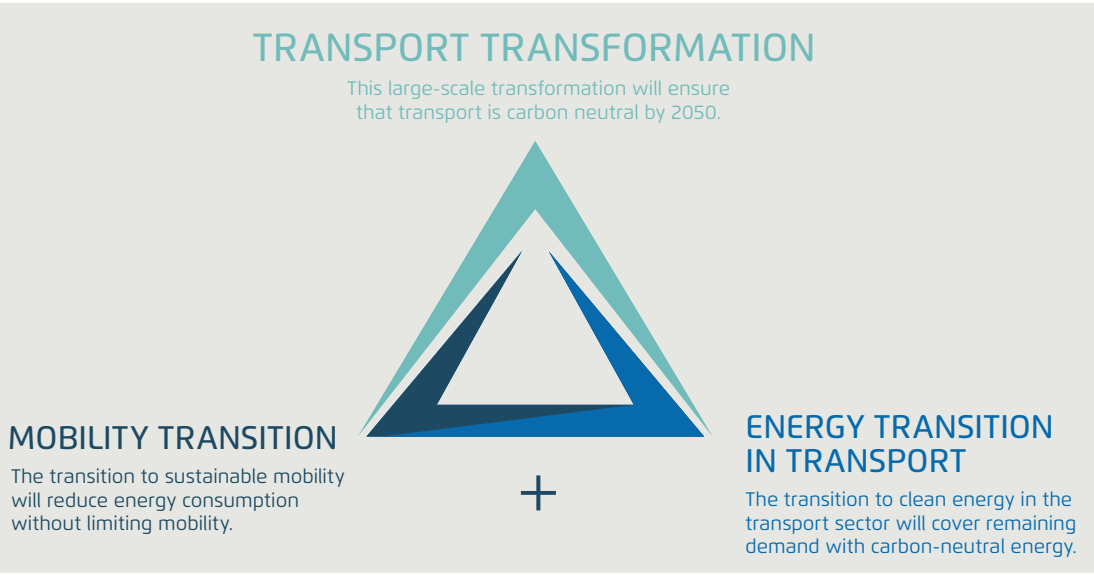
In 2015 emissions from the transport sector in G20 countries increased by 2.7% compared to 2014, growing faster than in the two years before. Moving towards a 2°C let alone 1.5°C compatible trajectory will become more and more difficult the longer the reversal of this trend is delayed.

4.2 Repercussions for policies and measures

Having a clear and ambitious vision for the future of the transport sector is crucial for bringing about radical change in the movement of people and goods. In this regard, an important first step is formulating a Nationally Determined Contribution (NDC) and setting corresponding targets in national energy policy.

However, setting targets is a futile endeavour in the absence of clear policies and measures that will bring about their attainment. Legislators must pass laws that encourage the testing and implementation of new ideas and concepts. Yet they must also promote the accelerated expansion of proven low carbon systems and ensure policies take a holistic approach, addressing the linkages to other sectors, such as energy and land use. Public transport infrastructure, for example, will be

The geometry of the Transport Transformation — Figure 4.3



Source: Agora Verkehrswende (2017a).

key not only to reducing GHG emissions in passenger transport, but also to improving urban quality of life by reducing congestion, air pollution and traffic fatalities.

The broader changes needed to transform the transport sector are illustrated with the aid of the diagram shown in figure 4.3. The "mobility transition" is about changing how people get around. Its goal is decreasing final energy consumption in the transport sector without restricting individual mobility. The "energy transition in transport" refers to the technological transformation needed to serve mobility demand more efficiently while generating lower emissions (Agora Verkehrswende 2017a). The success of the "transport transformation" as a whole thus rests on both a "mobility transition" and an "energy transition in transport". The model is a further elaboration of the "Avoid, Shift and Improve" strategy (GIZ 2014).

In the following sections, we discuss and categorise the measures taken by each country according to the framework presented in figure 4.3. Although individual measures often address more than one area, for simplicity's sake we assign them to where we see the main focus. Support programmes for public transport, for example, primarily seek to encourage a modal shift, but often contain provisions to enhance fuel efficiency.

The following sections outline key categories of measures that will be required to ensure sufficient emission reductions in the transport sector. In this year's report we focus on the clean energy transition while highlighting important linkages to the power sector. We subsequently assess whether G20 countries are on track to achieving climate-related objectives.

4.3 The mobility transition

The mobility transition aims to increase the overall efficiency of the transport system without limiting mobility. Motivating people to use more efficient modes of transport for personal travel and the movement of goods is a key aspect of this transformation. Yet another important aspect is to reduce travel distances without compromising mobility. There are a variety of ways to achieve this, including optimised traffic routing using modern communications technology, and urban planning solutions that make travel unnecessary.

In most cases, supporting the shift to more efficient modes of transport requires the expansion and improvement of public and non-motorised transport infrastructure, as well as the expansion of infrastructure for low-carbon freight options. Low-carbon options for getting around and moving goods (such as rail transport), need to become more attractive, and not just economically. They also have to be convenient while offering a high level of service, particularly when it comes to personal transport decisions. With a view to passenger transport, this shift can be considerably bolstered by integrating traditional forms of public transport with more attractive and safe sidewalks and bicycle lanes, as well as through the broader adoption of new mobility services such as carsharing and ridepooling. Digital systems that allow users to find and pay for individual mobility options via smartphone also have an important role to play. When inexpensive parking is not readily available and opening a mobile app is all that is needed to find the nearest shared, zero-carbon mobility solution, we will be one step closer to a successful transformation of the transport sector.

Decisions concerning how to ship goods mainly depend on delivery cost and timeline of delivery. These factors, in turn, depend on various circumstances that are not easily influenced by policy-makers. A major determinant – namely, the availability of infrastructure – largely depends on government policy frameworks and investment decisions (Mulholland et al. 2018). In the freight sector, combined transport will need to play an increasing role, such that longer distances are covered by rail or waterway, with road transport only covering the "first and last mile".

Bringing about such change will require new technological solutions. Yet it is even more crucial to adopt the right policy frameworks and engage in strategic public investment. In the following, we discuss various measures in this vein that governments can undertake to support the transformation of the transport sector.

Climate Protection in the Transport Sector: Policy Options for Achieving Germany's 2030 Sector Target

The German government's 2050 Climate Protection Plan has set the goal of achieving a 40 to 42% reduction in transport sector emissions by 2030 (in relation to 1990 levels; see country factsheet Germany). Far from being on a downward trend, German transport-sector emissions have increased slightly over the last quarter century. As a consequence, achieving Germany's 2030 target will only be possible if an assortment of ambitious measures is adopted over the near term. "Climate Protection in the Transport Sector: Measures for Achieving Germany's 2030 Sector Target" is a study commissioned by Agora Verkehrswende that was carried out by the Öko-Institut and the International Council on Clean Transportation (ICCT). The study investigates how transport sector emissions would be impacted by various policy measures, both individually and in combination.

The study identifies a "climate protection gap" – that is, the difference between the 2030 target and expected emission levels in 2030 given business-as-usual policies – equal to 48 million tonnes of CO_2. The first part of the study quantifies the extent to which this gap can be closed through various policy options. It shows that no single instrument is sufficient to ensure attainment of the 2030 target.

The study assesses the benefits associated with twelve different policies while considering varying levels of ambition. For example, reducing car emissions by 45% between 2021 and 2030 would lead to a drop in emissions equal to 10 million tonnes of CO_2. By contrast, a 75% reduction in car emissions would prevent the release of 20 million tonnes of CO_2. An autobahn toll for cars equal to 2 cents per kilometre driven would reduce emissions by 1.8 million tonnes. By contrast, a 4 cent per kilometre toll on all roads would reduce emissions by 12.8 million tonnes. Meanwhile, increasing the tax on diesel fuel to the same level as the tax on petrol would prevent the release of 3.7 million tonnes of CO_2. Making the tax on diesel 15 cents higher than the tax on petrol would reduce emissions by 9.2 million tonnes. At the same time, reforming the taxation of company cars could prevent the emission of up to 5.8 million tonnes of CO_2, and a 120 km/h speed limit on the autobahn could decrease emissions by up to 3.5 million tonnes.

Beyond reducing CO_2 emissions, policies that strengthen public transport and encourage active mobility could produce considerable supplemental benefits: They would reduce the noise pollution associated with vehicle traffic, improve air quality, free up public space for alternate uses, and reduce resource consumption. This, in turn, would generate positive effects for human health and society as a whole.

The second part of the study considers three conceivable scenarios. Each scenario features a different combination of instruments and associated ambition levels. According to the findings of this section, about 30 million tonnes in reductions can be achieved by improvements in vehicle efficiency and electrification. Accordingly, supplemental instruments that bring about reductions equal to around 20 million tonnes would be needed to close the remaining gap to the 2030 target. If this gap is to be closed with measures that promote lower transport demand and the use of alternate forms of transport rather than with technical improvements that increase efficiency, then it would be necessary to introduce very high fuel taxes or usage-based road tolls. However, political and social acceptance for such measures is not universal.

Theoretically, it would also be possible to promote widespread use of synthetic fuels that are produced with renewable electricity. However, this would be the most expensive form of climate protection, due to the conversion losses associated with transforming electrical power into liquid fuel. Furthermore, it is unlikely that synthetic fuels can be produced in the quantities needed to meet the 2030 abatement target.

A key insight furnished by the study is that no single policy instrument can serve as a "silver bullet" for reaching the 2030 target. The 40% reduction goal can only be achieved through a combination of measures – including measures that are politically controversial. Furthermore, the adoption of rather unpopular taxation measures will become all the more necessary given a low level of ambition in the area of vehicle efficiency standards and electrification.

The German-language study, titled *Klimaschutz im Verkehr: Maßnahmen zur Erreichung des Sektorziels 2030*, can be downloaded free of charge at

https://www.agora-verkehrswende.de/veroeffentlichungen/klimaschutz-im-verkehr-massnahmen-zur-erreichung-des-sektorziels-2030/.

Achieving a 1 million tonne reduction in CO_2 emissions in 2030 would require in Germany

4–5
g/km
reduction in car emission threshold

3,5
ct/km
increase in truck usage costs

17%
increase in active mobility

0,5
million
cars in electric vehicle fleet

5
ct/litre
increase in diesel tax

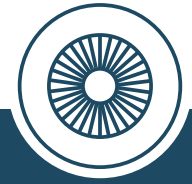
0,34
ct/km
increase in car usage costs

6%
reduction in urban car traffic

25–30
g/km
reduction in truck emission threshold

Calculations by Öko-Institut; 2030 values based on scenario findings.

Required mobility measures



The G20 factsheets, examine whether each country has measures in place in the following areas:

National programmes to support a shift to public transport:
We examined whether measures are in place to support a shift from private to more efficient public modes of transport. In this connection, we did not look at city planning or other activities at the local or regional levels, but only measures implemented by national governments. Considered measures included:

- Incentive schemes for or investments in the construction/expansion of public transport infrastructure
- National subsidies for public transport to increase its financial attractiveness to customers
- National awareness raising/marketing campaigns

Measures to support low-carbon freight logistics:
We examined whether measures are in place to support the shift from road freight to rail and ship. This can include:

- Infrastructure investment programmes: Incentive schemes for the construction/expansion of logistics hubs that allow the transfer of goods to low-carbon modes; direct investment in logistic infrastructure by national governments
- National incentive programmes for low carbon trucks/lorries (specific vehicle tax, road tax, retrofit programmes) and programmes to implement systemic improvements in road freight operations and logistics
- National capacity-building programmes

Two types of measures are not considered here: First, policies that aim to reduce demand for passenger or freight transport – for example, by encouraging the local sourcing of goods, or the IT-based optimization of traffic flows. However, we are not aware of any country that has implemented such measures at the national level and have therefore not included this category of policy in our assessment. Second, integrated land use planning is an important enabler of a sustainable transport system. Responsibility for such planning, however, generally lies with local or regional authorities. We are aware of the important interaction between land use and transport planning. However, the focus of this report is on direct policy measures at the national level related to the transport sector.

National-level measures to support new mobility services:
Measures that support new forms of mobility and decreased reliance on individual transport (i.e. privately owned cars):

- Financial incentive schemes for shared mobility (at the regional or national level)
- National legal frameworks in place for shared mobility

National measures to support non-motorised transport (NMT):
Measures at the national level that aim to support the shift from private motorised modes to walking and cycling:

- Incentive schemes for the construction/expansion of NMT infrastructure (pedestrian zones, bicycle lanes, etc.)
- Direct investment in NMT infrastructure
- National regulations for the design of non-motorised transport facilities
- National cycling development strategies
- Awareness raising/marketing campaigns

Road charges:
This includes all road charges implemented at the national level (but not at the city level, e.g. in London), such as:

- General road charges
- Charges for individual types of roads (e.g. highways)
- Road charges for specific types of vehicles (e.g. trucks)

4.4 The energy transition in transport

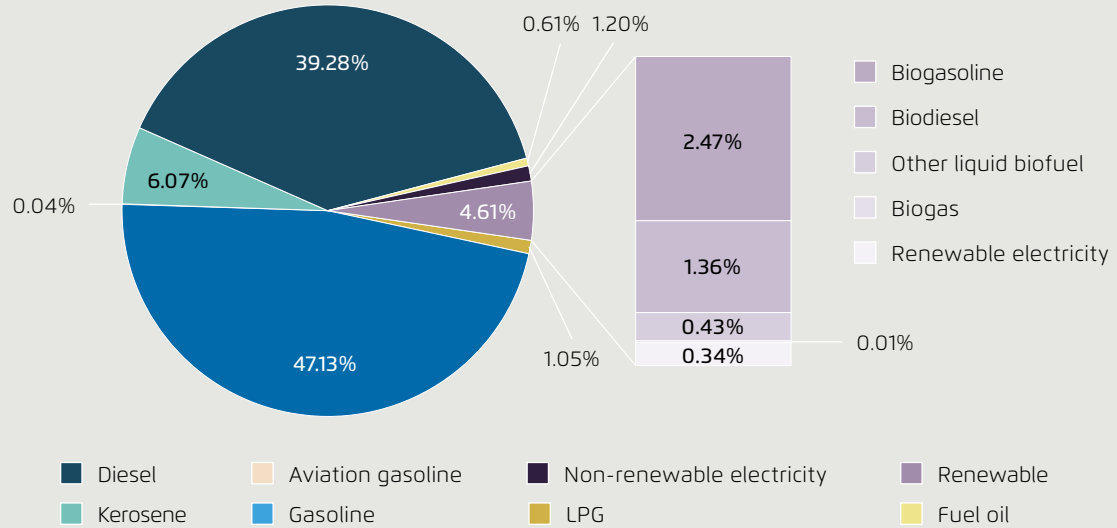
The role of carbon-neutral energy is increasing

Energy efficiency is important for reducing final energy requirements, but has technical limitations and is often outpaced by increasing vehicle weight and usage. Fuel economy and/or CO_2 emission standards are proven instruments for achieving improvements in efficiency. However, even significantly more stringent standards would not bring about sufficient decarbonisation. Remaining energy needs will need to come from zero- or near zero-carbon options, such as biofuels (Agora Verkehrswende 2017b).[6]

Currently, only a small fraction of fuels used in the transport sector is renewable. Over 95% of the energy used in G20 countries in the sector is fossil based.

The share of renewables used in the transport sector is significantly lower than that of other energy sectors, such as power or heating (REN21 2018). The bulk of renewable energy used in the sector takes the form of biogasoline (2.5%) and biodiesel (1.4%). Renewable electricity still plays a minor role, covering just 0.3% of demand in 2016.

Energy use in the transport sector in G20 countries in 2016 — Figure 4.4



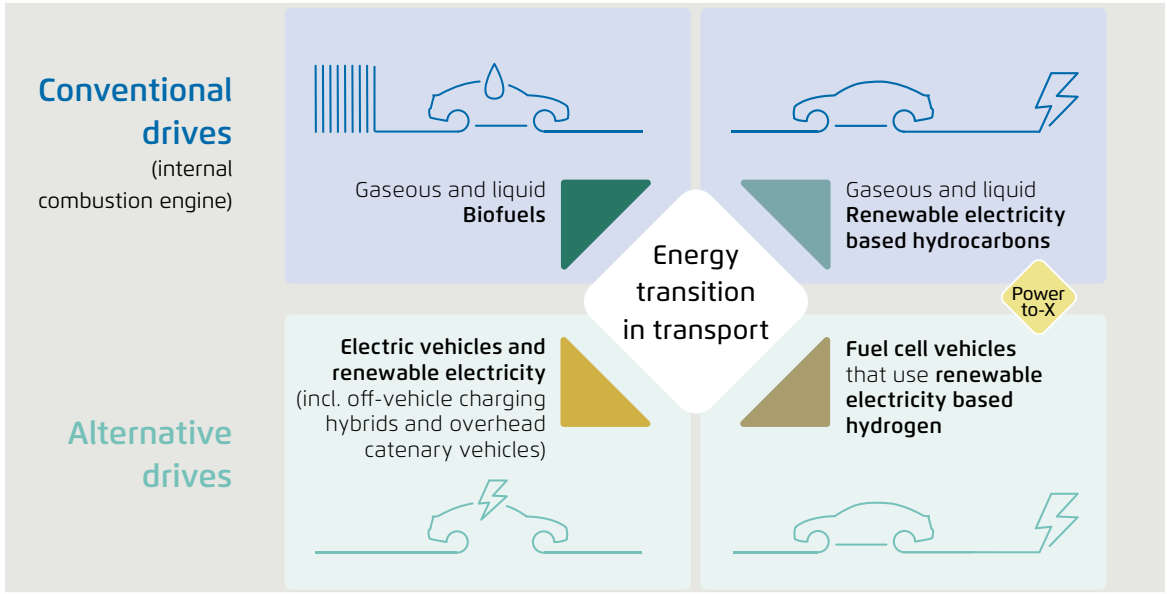
Source: Authors' illustration based on data from IEA (2018).

Renewable energy solutions in the transport sector take a variety of forms. They may harness new propulsion technologies or rely on traditional combustion engines burning non-conventional fuels. Apart from biofuels, all rely on electricity generated from renewable sources (see figure 4.5).

Many G20 nations and other countries around the globe are placing a strong focus on expanding the deployment of biofuels. To date, an emphasis has been placed on low-level blends, that is, petroleum products that contain 5% to 10% biofuel. For deep decarbonisation, high-level blends are necessary. This requires biofuels with properties that make them interchangeable with fossil fuels, or adjustments to engine technology.

6 Although biofuels are a renewable energy source, GHG emissions from biofuels depend on a range of factors, including the feedstock used and the production process (IRENA, OECD/IEA, and REN21 2018).

Renewable energy options in transport Figure 4.5



Source: Hochfeld (2016); IRENA, OECD/IEA, and REN21 (2018)

Given the many concerns about the sustainability of biofuels, the sustainable sourcing of these fuels needs to be ensured. While 15 of the G20 members have mandatory biofuel targets and three more have set non-mandatory biofuel targets, only ten have mandatory sustainability criteria. In addition, Canada has voluntary guidelines and China has subsidies tied to certain sustainability criteria.

As an alternative to the use of biofuels, there are various propulsion solutions based on renewable electricity. The most efficient of these is the direct use of electricity in battery electric vehicles (BEV). The market for BEVs and plug-in-hybrid electric vehicles (PHEV) has witnessed rapid growth in recent years.

The electric passenger car fleet saw strong growth in 2017. China almost doubled its EV fleet, reaching a market share of 2.2%. Germany also doubled its EV stock (albeit from a very different starting point), achieving a market share of 1.6%. The slowest market growth can be seen in South Africa and the US, while Mexico and Brazil have the lowest market share within the G20. The electric vehicle market is still dominated by passenger cars, although the use of electric trucks is picking up, particularly in urban areas, and the fleet of electric busses is growing, driven mainly by growth in China.

Using electricity, one can generate various fuels for conventional vehicles, as well as produce hydrogen, which can be used to power fuel cell electric vehicles (FCEV). All indirect uses of renewable electricity generate conversion losses, which can be quite substantial, adding to overall energy needs. Conversion also adds costs and reduces competitiveness, but can have a role in specific applications (Agora Verkehrswende 2017b). The advantages and disadvantages of power-to-X and electro-fuel solutions are discussed further in a separate section below.

Regardless of which technological solutions achieve widespread adoption, the electricity to power them must come from renewable sources: this is an essential prerequisite for the deep decarbonisation of the transport sector.

Sustainability of biofuels

As a renewable source of energy for the transport sector, biofuels bring a number of advantages. In addition to their potential for reducing GHG emissions, they can improve energy security and promote rural development in countries that have resources for domestic production.

With rising demand, there are growing concerns about the sustainability of biofuels. This includes questions related to the net GHG effects of the biofuel supply chain, taking into account emissions from direct and indirect land-use change.

Other important sustainability issues arise from increased competition for land with other uses, particularly food crops, and resulting effects on food availability and prices. Risks related to land, forest and water resource degradation are also increasingly being discussed by experts.

Biofuels are often grouped based on input feedstocks, which produce large differences in their carbon footprint and overall sustainability:

- *First generation:* biofuels produced from food crops or animal feed crops entail limited GHG emission reductions and have a high potential for negative effects in other environmental and socio-economic areas.
- *Second generation:* biofuels produced from dedicated energy crops, waste and residues have much higher potential for emission reductions. The sustainability of other aspects is highly dependent on local factors.
- *Third generation:* biofuels produced from microalgae are still in the early development and life-cycle emission reductions are not certain.

Source: Royal Academy of Engineering (2017)

Power-to-X: the silver bullet?

The transformation of variable renewable electricity (VRE) into liquid or gaseous storable energy forms is often seen as an additional option for solving a multitude of challenges, including the decarbonisation of the transport sector.

Challenges

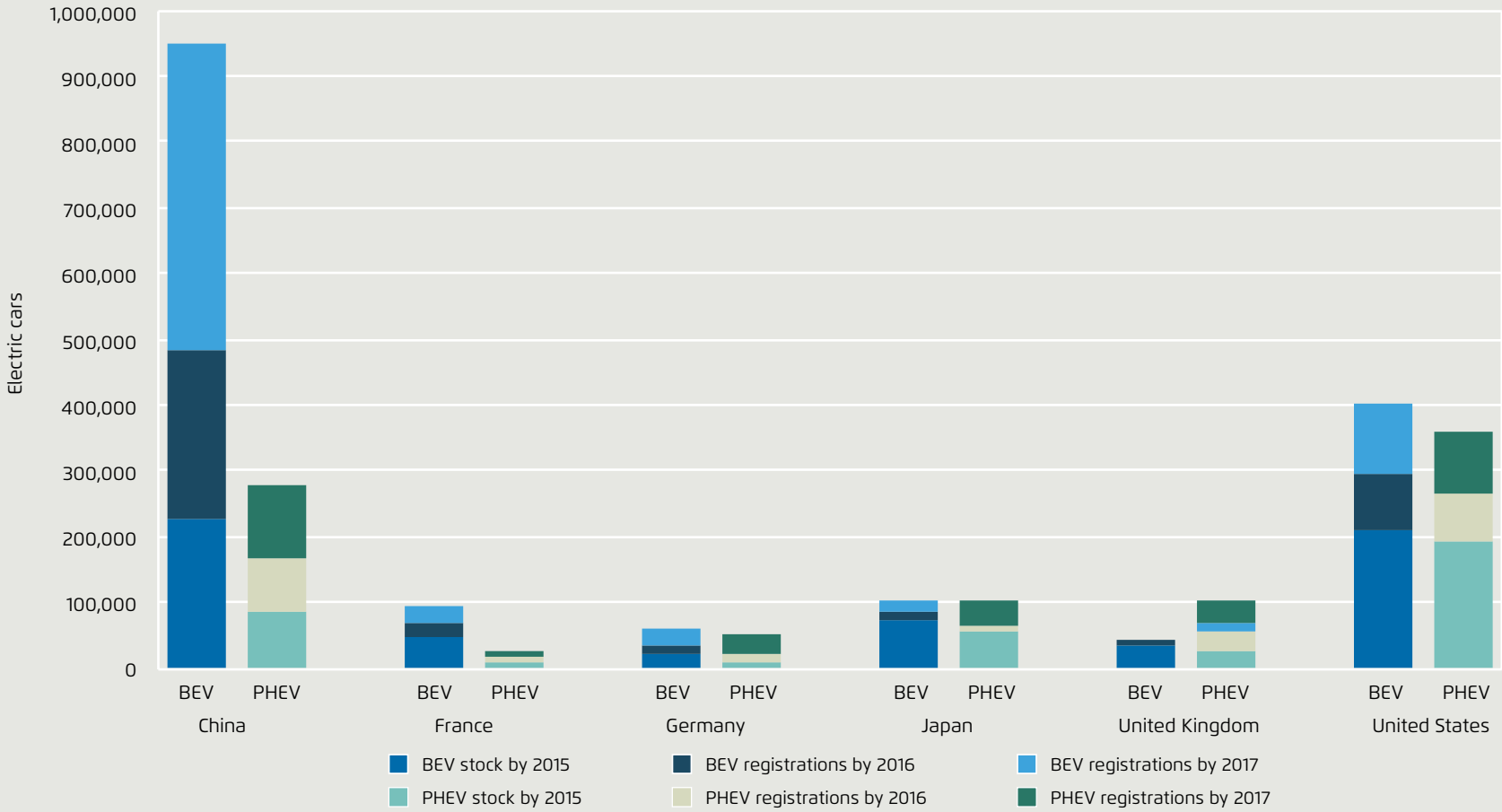
Compared to the direct use of electricity, any form of synthetic fuel requires more or less complex conversion. This results in conversion losses (see figure 4.7) and entails additional costs. Synthetic fuels are more expensive than the direct use of electricity in vehicles due to greater total electricity demand in combination with the cost of conversion technology. Deep decarbonisation based on synthetic fuels would mean skyrocketing demand for electricity, particularly considering the inefficiency of conversion. While some observers have argued that this demand could be covered by excess power generation from intermittent renewables, this is not a realistic option, given the volume of electricity that would be needed. (Agora Verkehrswende, Agora Energiewende, and Frontier Economics 2018).

Benefits

The synthetic fuels produced through power-to-X technologies are energy-dense, can be stored and transported, and are often compatible with existing power systems (Agora Verkehrswende, Agora Energiewende, and Frontier Economics 2018). Synthetic fuels

Electric car stock in selected G20 countries

Figure 4.6



Source: Authors' figure based on data from IEA (2017a)

Electricity in freight

The electrification of **road freight** is still in its early stages. Barriers to large-scale implementation include requirements related to energy density, specific power (W/kg), temperature management, safety, and the durability and number of discharge cycles a battery can undergo before losing too much capacity. The requirements are lower for lighter trucks with shorter annual mileages. In the case of heavy duty trucking and long distances, alternatives to purely battery powered vehicles need to be developed, such as electric road systems (ERS) that allow vehicle charging en route (Mulholland et al. 2018).

In the **shipping sector**, successful decarbonisation will need to integrate measures from three different areas: technological measures, operational measures, and alternative fuels and energy. Renewable energy can power electric vessels directly, but they can also be the basis for different propulsion technologies (towing kites, rotors, wind turbines) and alternative fuels (sustainable biofuels, hydrogen or ammonia). Purely electric[7] and hybrid ferries[8] have been operational for a number of years in Nordic countries and the fleet is expected to grow in the near future. Several electric cargo vessels are near commissioning,[9] although at the moment these vessels are estimated to be less profitable than alternative fuel options (OECD/ITF 2018a).

In the **aviation sector**, electric-powered commercial airplanes appear to be feasible, yet major technical challenges remain, particularly with a view to engine technology and battery power-to-weight ratios. The initial deployment of zero emission technologies is expected in smaller airplanes travelling shorter distances by harnessing a combination of electrification and alternative fuels, but even this solution is at a nascent stage (Hall, Pavlenko, and Lutsey 2018).

Electrification is more challenging with longer distances and heavier vehicles. In the area of short-distance road freight and short-to-medium-distance passenger ferries, low and zero emission technologies have been improving, and many applications are ready for deployment. In the case of long-haul transportation and aviation, additional R&D and government support are needed. Government policies should seek to promote vehicle efficiency, e.g. through fuel economy standards, low carbon fuel standards and supply mandates. Furthermore, vehicle taxation rates should be differentiated to promote alternative fuel vehicles (Mulholland et al. 2018).

can be a solution when the direct use of electricity is a problem, e.g. in aviation and shipping (see box on electricity in freight).

Case Studies

In 2013, German utility Uniper Energy Storage built the world's first demonstration plant for storing wind energy in the natural gas grid. The WindGas Falkenhagen facility uses electrolysis to produce hydrogen, which can then be burned as transport fuel or fed into the gas grid. In 2017, the company launched the second phase of this pilot project, adding a methanisation plant, which expands potential uses (Uniper n.d.). Similar WindGas projects exist or are under construction in Denmark (Renewable Energy Focus 2014), Japan (SCCIJ 2017) and France (Engie 2018). However, all of these projects feed directly into the gas grid, so the main end use is for power and heat generation.

7 The first all-electric ferry has been operating in Norway for over two years and a major Norwegian transport group recently placed a large order for ferries that will be operational in 2020 (see https://electrek.co/2018/03/05/all-electric-ferries-battery-packs/).

8 Scandlines operates the world's largest hybrid ferry fleet, with six of eight vessels running on a combination of conventional diesel and electricity (see https://www.scandlines.com/about-scandlines/greenagenda).

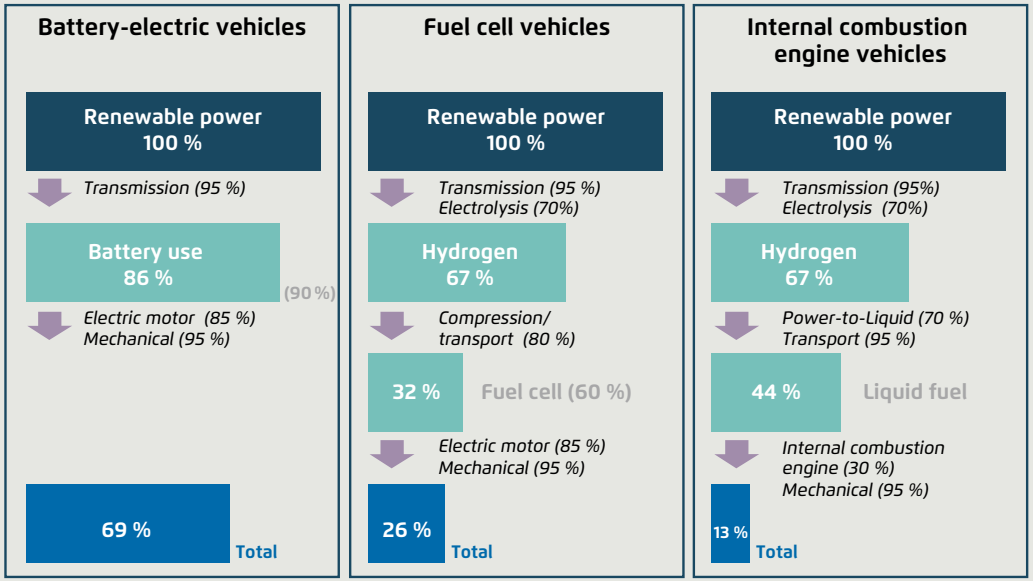
9 Examples include China's first all-electric cargo ship, which is – ironically – destined to transport coal (see https://qz.com/1137026/chinas-first-all-electric-cargo-ship-is-going-to-be-used-to-transport-coal/) and a – potentially crewless – container barge planned to operate between Antwerp, Amsterdam and Rotterdam starting this summer (see https://www.theguardian.com/environment/2018/jan/24/worlds-first-electric-container-barges-to-sail-from-european-ports-this-summer).

Another promising step was taken in the SOLAR-JET research project, which succeeded in generating synthetic kerosene from concentrated solar radiation. Shell Global Solutions in Amsterdam refined the solar thermal hydrogen into jet fuel (Kraemer 2017). Solar jet fuel represents an industrial growth opportunity for G20 countries with good solar resources, such as Australia, China and the US.

Take away

When it comes to decarbonising road transport, the direct use of electricity is more efficient as well as technically and economically more viable. Accordingly, it should be the preferred option. Power-to-X solutions are (currently) more expensive and far less efficient. In aviation, and to a lesser extent in shipping, the conversion of renewable energy to liquid or gaseous forms can be a solution to help decarbonise particularly long-distance trips. However, it is essential that the power consumed for fuel production must come from renewables. When CO_2 is required as in input, this needs to come from a sustainable biogenic origin or – preferably – from the atmosphere (Transport & Environment 2017). In this way, there is a clear argument in favour of targeted policy support and research frameworks for power-to-X technologies that favour the most efficient technology solution for each application.

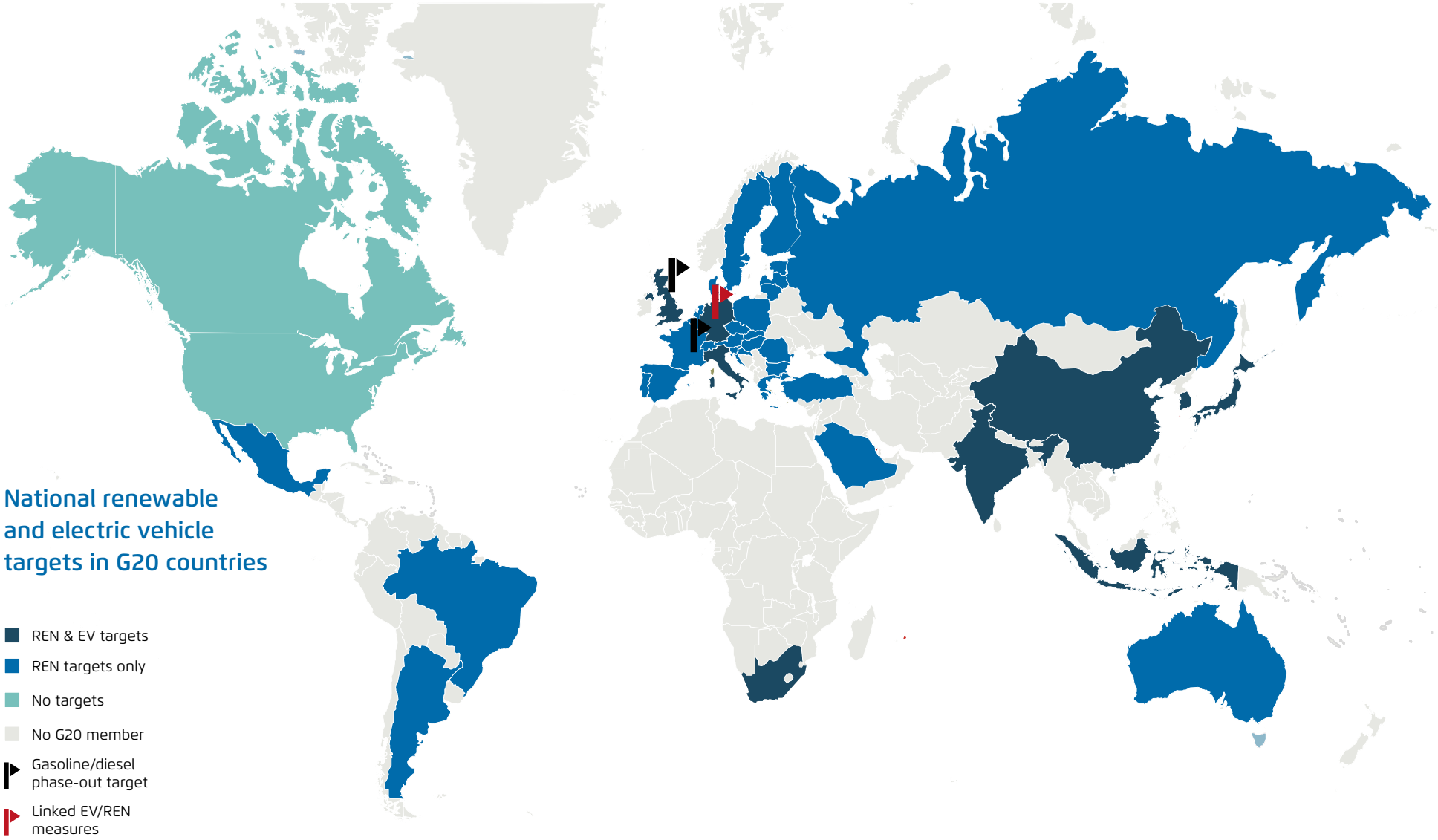
Efficiencies for different electricity-based technology solutions — Figure 4.7



Note: Individual efficiencies are indicated in parentheses. Multiplied together, the individual efficiencies yield the overall cumulative efficiencies in the boxes.
Source: Agora Verkehrswende, Agora Energiewende, and Frontier Economics (2018)

Electricity used for transport needs to be renewable

With the growing electrification of transport, the GHG intensity of power generation becomes increasingly relevant. GHG effects from electrification are closely tied to the grid emission factor and future developments in the power generation sector. True decarbonisation can only be achieved with a fully decarbonised electricity generation system.



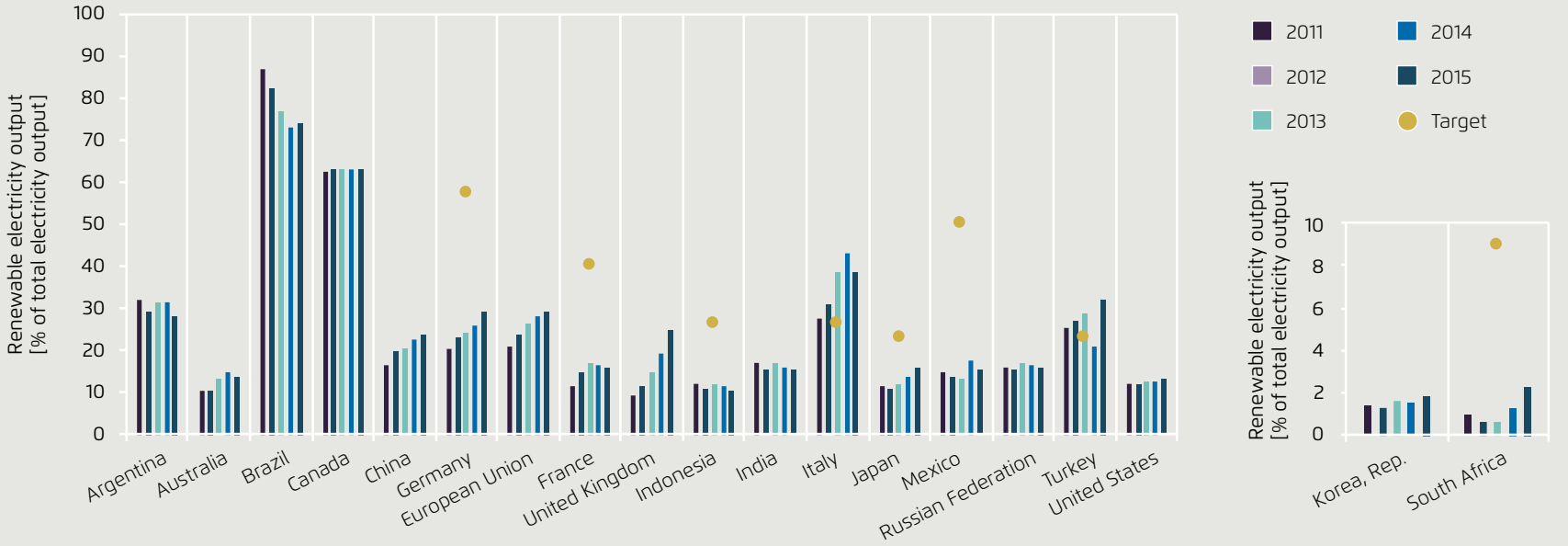
Sources: REN21 2018 and various sources (see annex I).

The adoption of targets for renewable electricity generation provides one indication of progress in this area. Only three G20 members – Canada, the UK and the US – have not yet set national targets for renewable electricity generation. Seven Canadian provinces and 32 US states have set some form of renewable electricity targets (REN21 2018). And while Canada, the US and Mexico have agreed to source 50% of the region's electricity from non-carbon sources by 2025 (REN21 2017), it is unclear how far this commitment will be implemented, particularly under the current US administration.

The renewable power targets set in each country can vary widely and are not easily comparable due to different time frames and units used. Also, the starting points of each country diverge considerably. Most G20 countries are planning to increase renewable electricity generation, although with varying speeds of deployment (see figure 4.8).

Share of renewables in electricity output and targets for selected G20 members

Figure 4.8



Note: Targets are only shown for countries that have "share of generation" targets and are for different time scales.
Source: REN21 (2018), World Bank (2018).

Linking incentives for electric mobility to the use of renewable power can be an effective tool for achieving the deep decarbonisation of the transport sector.

Decarbonising power generation is particularly important for countries aiming to increase electric-powered transport. Ten of the G20 countries have targets for electric vehicles, but these targets show varying degrees of ambition. France has announced it plans to phase out GHG emitting vehicles by 2040. By this year, the UK also aims to end the sale of conventional diesel and petrol cars.

Within the G20, Germany is the only country thus far to implement measures that link the two areas. Germany's 300-million-euro subsidy programme for electric charging infrastructure restricts funding to charging stations that supply renewable electricity. In addition to setting targets for renewable electricity generation, linking incentives to the use of renewables can be an effective policy instrument. However, it should be supplemented with measures to support renewable generation technologies.[10]

The current levels of ambition shown by all countries will not allow the full decarbonisation of power generation over the medium term. While half of the G20 countries made progress in expanding the share of renewable electricity generation in the years up to 2015, nine saw declines in 2015 or in preceding years. Canada has a high but relatively constant share of renewables in power generation. Brazil, by contrast, showed strong declines in 2011–14, despite starting with the highest level of deployment.

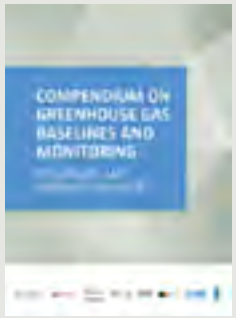
All countries except Canada have support mechanisms in place at a national level to promote investment in renewables. Eight of the G20 countries have feed-in tariffs in place, and some have been transitioning to the competitive setting of feed-in prices (using auctions) or to hybrid approaches in which some capacity is auctioned and some receives pre-set tariffs (usually small-scale installations). Five countries operate only with competitive auctions and nine countries have renewable obligations, tax exemptions or other financial incentives in place.

However, renewable electricity targets and support measures are only one piece of the puzzle. Reducing the carbon intensity of power generation is what matters in the end. If fossil fuel capacity is added as renewables grow, we will remain far from achieving decarbonisation targets, and the electrification of the transport and heating sectors will bring limited benefit.

On average, the grid emission factor in the G20 member states has remained fairly stable since 1990 (see figure 4.9). While it is necessary to consider that each country's decarbonisation efforts are proceeding from a different starting point, the pace of decarbonisation is generally too slow, except in a few, mostly European, countries.

Estimating effects of instruments

A new guidance document published by the UNFCCC helps practitioners finding methodologies for estimating the GHG effects of measures in the transport sector. The Compendium on Greenhouse Gas Baselines and Monitoring illustrates existing methodologies for the GHG quantification of different types of transport mitigation actions.



The compendium can be downloaded at https://www.changing-transport.org/publication/the-passenger-and-freight-transport-volume-of-the-compendium-on-ghg-baselines-and-monitoring/

10 For an overview of measures to support renewable power generation at different levels see IRENA, OECD/IEA, and REN21 (2018).

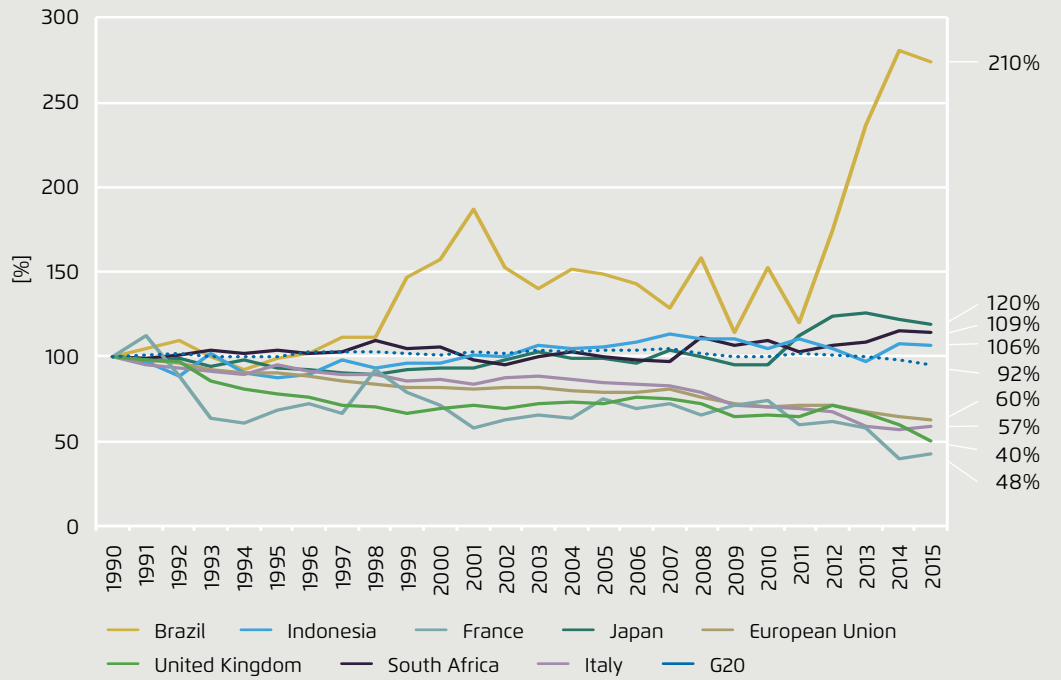
The power and transport sectors need to be better integrated

Enhancing the share of renewables in electricity generation is a prerequisite for decarbonising the transport sector. However, the closer integration of supply and demand across sectors also offers opportunities to support higher levels of renewable power generation (REN21 2017).

With a higher share of renewables, power systems are becoming more decentralised. As a result, there is an increasing need to accommodate small-scale distributed generation, as well as bi-directional flows of energy. In addition to the various changes that are required on the supply side to deal with the new renewables-based system, there is also a need for "demand side management", which is primarily discussed by experts with a view to industry and households. However, the transport sector can also play an important role in furthering this integration. With increasing digitalisation in combination with a growing shares of electric vehicles, the time-managed charging of EVs can support grid stability and provide a "mobile buffer" (REN21 2017).

At the same time, smart solutions developed for renewable electricity integration, such as peer-to-peer trading and "virtual power plants", have the potential to inspire compelling new solutions for challenges faced in the area of vehicle charging infrastructure. The smart integration of energy sectors will depend in part on the expansion of high-speed data networks. Yet there is also a clear need for policymakers to establish legislation, standards and guidelines that ensure data security and privacy, facilitate safe and sustainable business models, and promote the deployment of smart energy solutions.

Development of grid emission factors in selected G20 countries — Figure 4.9



Source: Authors' illustration based on data from IEA 2018a.

Required measures related to energy

The G20 factsheets provide information concerning whether countries have measures in place in the following areas:

This includes regulations that impose a mandatory standard for either energy efficiency or the CO_2 emissions of vehicles or vehicle fleets.

Pricing instruments:
This includes all measures that aim to promote low-carbon modes of transport via pricing incentives. This can include:

- Carbon/energy taxes (not included: vehicle taxes based on engine size)
- The inclusion of transport in emissions trading
- Subsidies for low carbon transport (when this isn't covered by any other measures, e.g. EV, road charges, public transport programmes, low-carbon freight)

Reducing vehicle mass is an important aspect in enhancing energy efficiency and can deliver substantial emission reductions (OECD/ITF 2017b). We have not included this here as a separate measure, as we are not aware of any country that has introduced specific measures in this area. In theory, energy/emission standards have the potential to support the uptake of lighter vehicles, although in practice this is mostly not the case, as the price signal is not strong enough. Pricing instruments and vehicle labelling can be assumed to promote lighter vehicles, but here, as well, the price signal needs to be strong enough to have significant impact.

Mandatory vehicle labelling:
Regulations that impose mandatory labelling of vehicle energy efficiency and/or CO_2 emissions.

Support mechanism for electric vehicles & charging infrastructure:
This includes measures that promote the adoption of EVs (battery and plug-in hybrid), but not research and development. It includes:

- Incentive programmes (tax benefits, direct payments, etc.) for the purchase of electric vehicles
- Infrastructure programmes for building or supporting charging infrastructure
- Regulations that provide special benefits for electric vehicles (such as preferential parking, separate lanes, etc.)
- Regulations that mandate an electric vehicle quota

Support for other low-carbon fuels and propulsion systems:
This includes the same types of measures listed above for electric vehicles, but instead for low-carbon fuels (biofuel, hydrogen, CNG, etc.)

05

TAKING STOCK: IS THE G20 ON THE RIGHT PATH?

05 | Taking stock: Is the G20 on the right path?

Focus on transport remains low in NDCs

The Paris Agreement requires countries to submit nationally determined contributions (NDCs)[11] to the UNFCCC. This has offered signatories a unique opportunity to develop a vision for low-carbon development in all sectors. While the time frame for developing the initial NDCs was extremely short, it led many countries to engage in a very first assessment of mitigation options and seek a domestic consensus on future development. Thus, despite its shortcomings and the fact that the aggregate level of ambition is not sufficient to achieve agreed-upon objectives (UNEP 2017; UNFCCC 2016), the process has been extremely valuable.

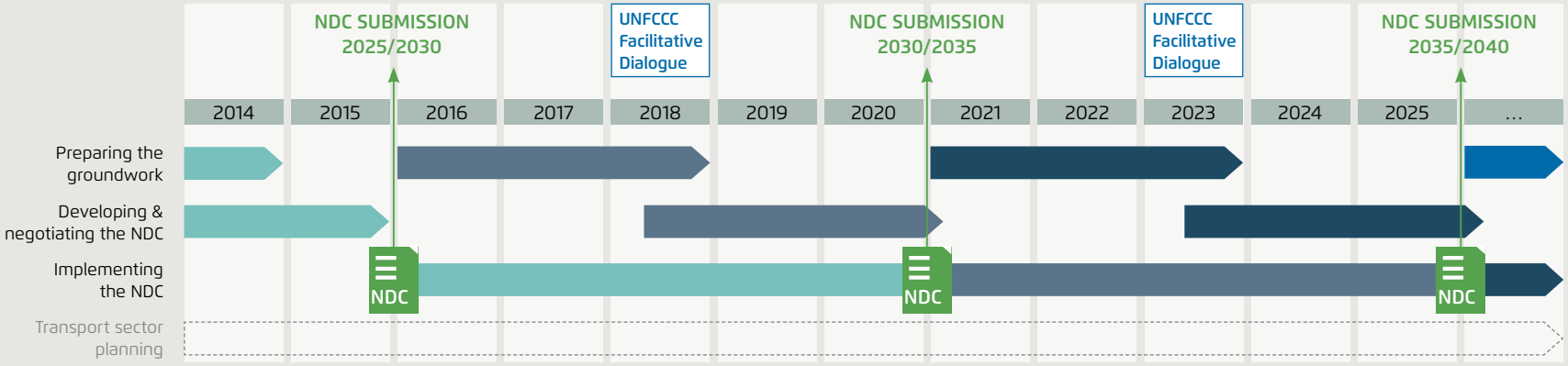
Although transport is mentioned in the majority of NDCs as an important source of GHG emissions, only 23 countries set specific targets for the transport sector. A larger number of countries – 105 in total – define transport-related mitigation actions (GIZ 2017b). Within the G20, only Japan has communicated a quantitative GHG emissions target for the sector (27% below 2013 by 2030).

However, Germany and France have communicated sectoral targets in their long-term strategies submitted to the UNFCCC in 2016/17 (Germany: 40–42% below 1990 by 2030; France: 70% below 2013 by 2050). Furthermore, the green growth strategy submitted by the UK in 2018 aims to end the sale of new conventional petrol and diesel cars and vans by 2040. In their NDCs, Brazil, China, India and South Africa include quantitative targets related to individual measures and 12 out

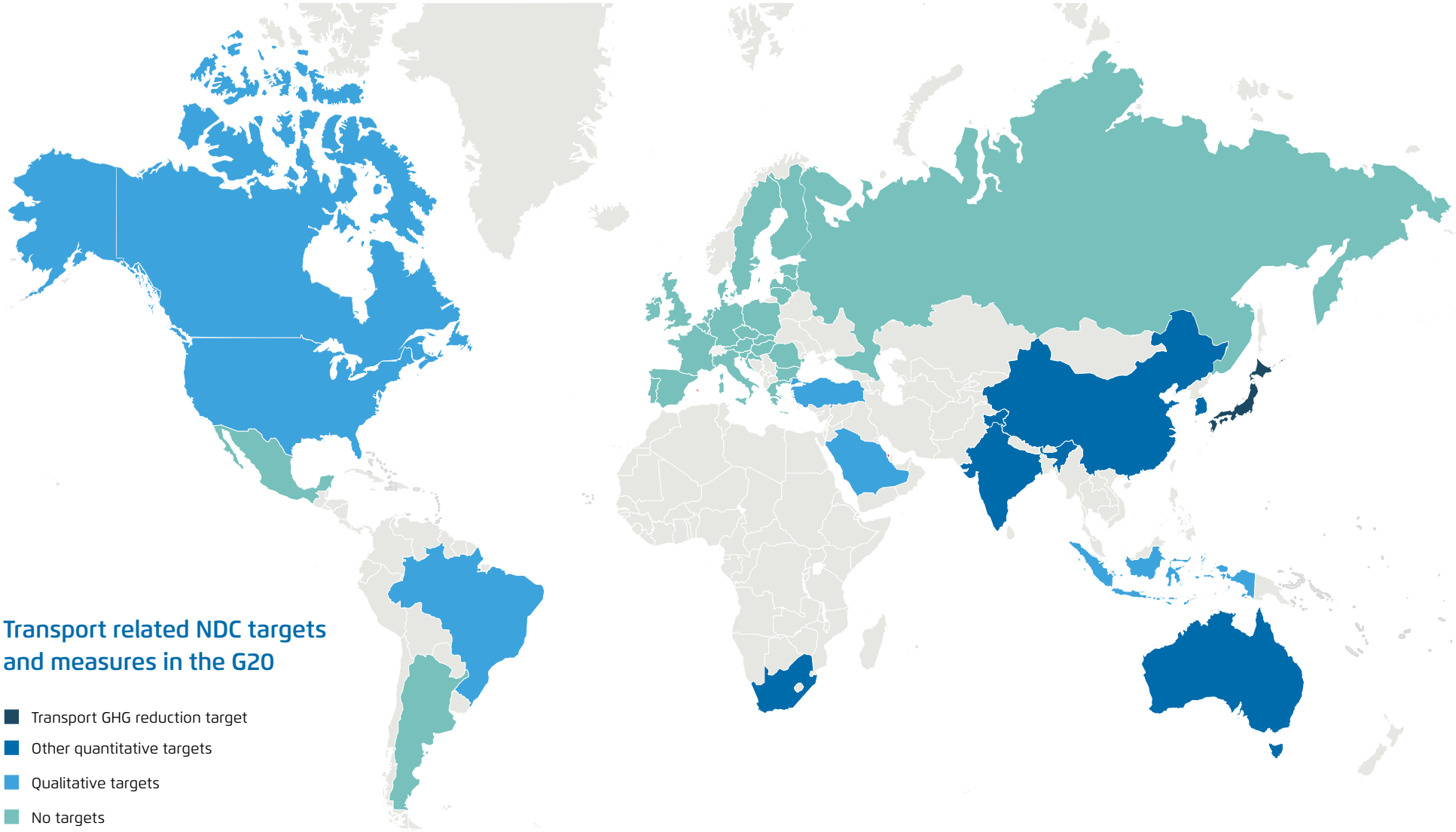
11 Not all parties have ratified the Paris Agreement, so their intended nationally determined contribution (INDC) is used in this analysis. In regard to the G20, this applies to Turkey and Russia.

The NDC submission cycle

Figure 5.1

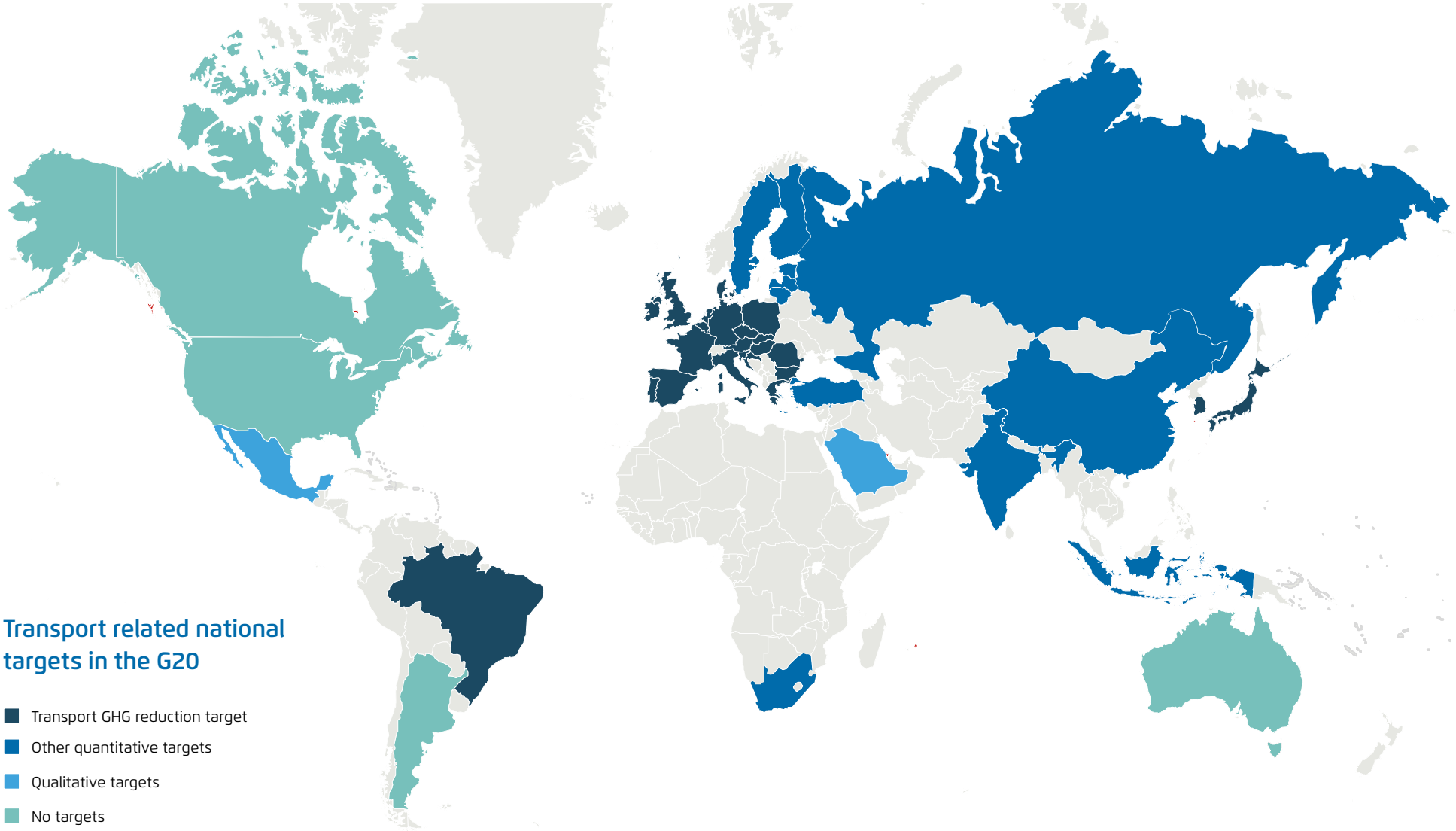


Source: GIZ (2017b).



Source: NDC and INDC submissions to the UNFCCC.

Note: Argentina submitted its NDC in 2016. It does not contain any mention of transport specific measures, unlike the INDC originally submitted in 2015.



Sources: See annex I.

of the 20 countries mention specific transport-related measures. By contrast, the EU does not make any reference to mitigation in the transport sector in its NDC.

Australia, South Africa and the US only mention one transport related mitigation measure, while India, Japan and Turkey present a wide range of strategies to reduce emissions in the sector. A few countries also include quantitative goals for individual measures, such as Brazil's 18% target for sustainable biofuels, Canada's 30% target for urban public transport, India's 36% to 45% target for rail in total land transport, and South Africa's 20% target for hybrid-electric vehicles.

While G20 countries devote less attention to the transport sector than non-G20 countries in their NDCs, all countries globally show a concern for improving passenger transport, promoting efficiency and adopting alternative fuels (SLoCaT 2016). Nevertheless, all countries will need to significantly step up their ambition in the transport sector in the next round of NDC submissions to meet the objectives of the Paris Agreement.

The process established by the Paris Agreement requires each country to submit NDCs on a cyclical five-year basis, and each submission must be progressively more ambitious than the last. Many countries are already in the process of preparing their next NDC submissions.

According to latest analysis by the International Transport Forum, current NDCs could stabilise transport sector emissions roughly at 2015 levels. Emissions would thus remain well above what would be required according to the IEA's 2DS and ITF's Low Carbon Scenario (OECD/ITF 2018b). However, considering the very limited information available in the NDCs, the ITF analysis rests on many assumptions, many of which are excessively optimistic. We hope this report encourages countries to quantify transport-sector targets and to build upon their vision for the measures to be implemented.

National ambition exceeds NDC targets, but still falls short

Generally, G20 countries show more ambition in national policy than stated in their NDCs at the international level. Seven G20 countries have set quantitative GHG emission targets for the transport sector in their national strategies or legislation. Eight of the G20 countries have quantitative targets not related to GHG emissions. Four of these have quantitative targets related to efficiency, and four have targets related to specific technologies. Furthermore, the EU and all four EU states in the G20 have renewables targets for the transport sector. China has set intensity targets for individual transport subsectors and Turkey has set targets for the share of different transportation modes. Both Mexico and Saudi Arabia have adopted qualitative long-term goals. Table 5.1 provides an overview of national transport-related targets beyond NDCs.

Additionally, half of the G20 countries have set deployment targets for electric vehicles. China has set an absolute target of 5 million EVs by 2020 and supports this through the new energy vehicle (NEV) mandate which requires minimum sales shares for NEVs. The UK, Germany and South Africa have also set absolute targets, although the German government has already acknowledged that it will not meet its 1 million EV target by 2020.

The EU provides a benchmark of 15% EV sales by 2025 and 30% by 2030 in the proposed post-2020 CO_2 emission targets for cars and vans. India originally announced it plans to become a 100% e-vehicle nation by 2030, but has now scaled back this target to a 30% share of EV sales and 100% share of BEV sales for urban busses. Korea also revised its original target of 1 million EVs by 2020 down to 200,000 EVs.

Only four of the G20 countries – Argentina, Australia, Canada and the US – have no target at the national level. Many of the others even have multiple targets.

One explanation for the discrepancy between national and international ambition may be the short time frame provided to prepare the NDCs. This discrepancy reveals room for stepping up international ambition in the transport sector. Nevertheless, the national targets remain insufficient for limiting global warming to well below 2°C.

Overview of transport-related targets in national strategies and legislation — Table 5.1

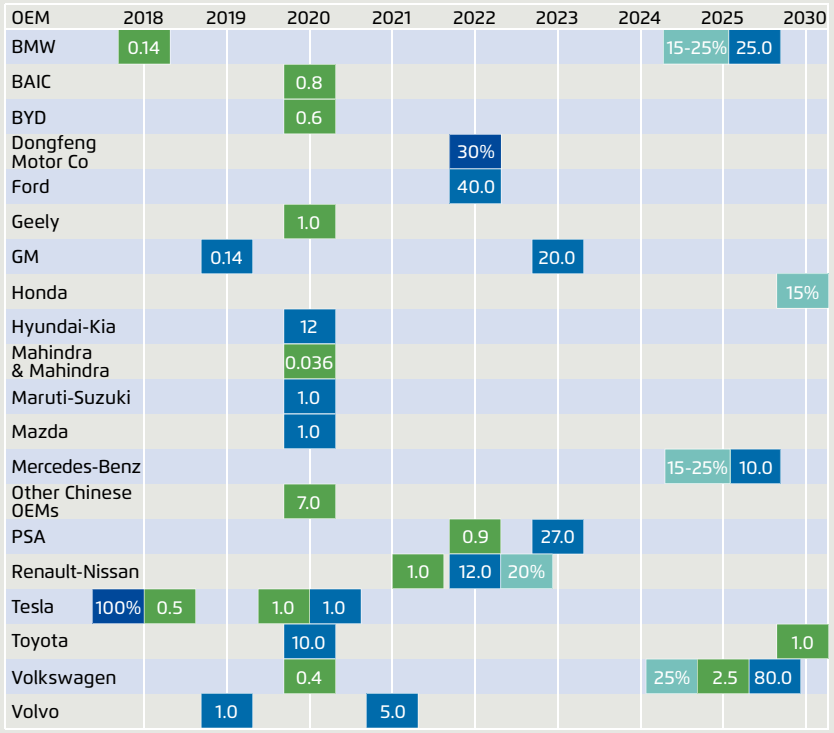
Country	CO_2 target	Efficiency target	Renewables targets	Mode share targets	Phase out fossil fuel vehicles	Technology targets**	EV deployment targets
Argentina							
Australia							
Brazil	48–60 $MtCO_2e$ reduction by 2020						
Canada							
China	Intensity targets by mode						✓
European Union	60% by 2050 relative to 1990		✓				✓
France	29% compared to 2013 levels by the third carbon budget		✓*		By 2040	✓	
Germany	Absolute target of 95 – 98 $MtCO_2e$ by 2030	✓	✓*				✓
India						✓	✓
Indonesia		✓					✓
Italy			✓*				✓
Japan	NDC target					✓	✓
Korea, Rep.	34.3% below BAU by 2020					✓	✓
Mexico							
Russian Federation		✓					
Saudi Arabia							
South Africa		✓					✓
Turkey				✓			
United Kingdom	17% – 28% lower than 2009 levels by 2027		✓*		By 2040		✓
United States							

Note: *Indicates targets based on EU regulation; **Technology targets include general "clean vehicle" targets that are either broader than EV targets or target different technologies (e.g. CNG)
Sources: see annex I.

Manufacturers take up the EV challenge

Vehicle manufacturers are now increasingly setting targets for EV deployment. Chinese manufacturers have set the highest absolute sales goals, and German carmakers are now seeking to catch up.

The VW emissions scandal has certainly spurred great efforts in this area, but the role of government policy cannot be overlooked. This is particularly true with regard to Chinese policy, as China is an important outlet market for vehicle manufacturers.



Source: IEA (2018)

5.1 Reality check: existing measures not yet sufficient

So how much progress have G20 countries made in implementing measures to achieve stated goals? Our analysis can only partially answer this question. While we have highlighted policies that could positively impact future developments, we have not assessed whether individual measures are adequate for achieving stated targets, let alone the objectives of the Paris Agreement. Considering observed emission trends, it is clear that existing measures are, in sum, not yet sufficient.

> "In sum, current measures are not yet adequate, but it is generally easier to ratchet up existing measures than to implement new ones." (Vieweg, et al., 2017)

The existence of abatement targets for transport indicates that governments have moved from developing visions to implementing actions. While these actions are in most cases not yet adequate, it is generally easier to ratchet up existing measures than to implement completely new ones. Our report highlights clear gaps in existing policy, yet to quantify these gaps – particularly with relation to the 2°C and 1.5°C pathways – additional research would be needed.

G20 collaboration

Since the adoption of the Energy Efficiency Action Plan in 2014 the G20 countries have been collaborating on the issue of vehicle efficiency, especially for heavy duty vehicles (G20 2014). In 2016, the Energy Efficiency Leading Programme (EELP) translated the action plan into a long-term plan (G20 2016). The programme is supported by the Transport Task Group (TTG), with technical support from the International Council on Clean Transportation (ICCT) and the Global Fuel Economy Initiative (GFEI). In June 2018, the G20

Latest developments in mobility

Approved in June 2018, **China** adopted the *3-Year-Plan on the Further Development of Structural Adjustment in the Transport Sector*, which focuses on increasing railway and waterborne transportation capacity, accelerating intermodal transport, and green urban freight logistics (State Council 2018).

The 2017–18 Budget of **Australia** includes a 10 billion Australian dollar *National Rail Program* to invest in major passenger rail projects (Commonwealth of Australia 2017). Unfortunately, a replacement policy to the National Cycling Strategy that ended in 2017 has yet to be adopted.

Overview of existing mobility measures across G20 countries — Table 5.2

	National programmes to support shift to public transport	Measures to support low-carbon freight logistics	National-level measures to support new mobility services	National measures to support non-motorised transport	Road charges
Argentina	✓	✓			✓
Australia	✓	✓			
Brazil	✓	✓			
Canada		✓			
China	✓	✓	✓	✓	✓
EU	✓	✓	✓	✓	
France	✓	✓		✓	✓
Germany	✓	✓	✓	✓	✓
India	✓	✓		✓	
Indonesia	✓			✓	✓
Italy	✓				✓
Japan	✓	✓			✓
Korea, Rep.	✓	✓	✓	✓	
Mexico	✓	✓			✓
Russian Fed.	✓	✓			✓
Saudi Arabia	✓	✓			
South Africa	✓				✓
Turkey	✓	✓		✓	✓
UK	✓	✓	✓	✓	✓
United States	✓	✓	✓	✓	

Note: The existence of measures does not imply their adequacy. ✓ existing Source: See annex I.

Energy Ministers agreed to include "behaviour change" in the implementation plan of the EELP to support innovation and technological progress (G20 2018). Further initiatives at the G20 level include (G20 2017a):

- G20 Energy Efficiency Investment Toolkit
- Voluntary Action Plan on Renewable Energy adopted under the Chinese Presidency
- G20 Toolkit of Voluntary Options on Renewable Energy Deployment adopted under the Turkish Presidency
- Commitment to rationalise and phase out, over the medium-term, inefficient fossil fuel subsidies that encourage wasteful consumption, recognising the need to support the poor
- Energy Efficiency Hub (planned)

Mobility

Measures that aim to support low-carbon mobility choices are summarised in table 5.2. Most countries focus on support for public transport and low-carbon freight logistics. Support for new mobility services is lacking in almost all G20 countries and only half of the countries have any type of measure to support non-motorised transport. Road charges are used in 12 countries as a pricing instrument to motivate a shift to other transport modes.

12 In Australia LDV standards are currently under discussion, but not yet in force.

Overview of existing energy measures across G20 countries — Table 5.3

	Energy/ carbon emission standards LDV	Energy/ carbon emission standards HDV	Pricing instru-ments	Mandatory vehicle labelling	Support mech-anism for elec-tric vehicles AND charging infrastructure	Mandatory biofuel targets	Support for other lowcar-bon fuels & propulsion systems
Argentina			✓	✓	✓	✓	✓
Australia				✓	✓		✓
Brazil	✓				✓	✓	✓
Canada	✓	✓	✓	✓		✓	✓
China	✓	✓		✓	✓		✓
EU	✓		✓	✓		✓	✓
France	✓		✓	✓	✓	✓	✓
Germany	✓		✓	✓	✓	✓	✓
India	✓	✓	✓	✓	✓	✓	✓
Indonesia			✓				✓
Italy	✓			✓	✓	✓	✓
Japan	✓	✓	✓	✓	✓		✓
Korea, Rep.	✓		✓	✓	✓	✓	✓
Mexico	✓		✓		✓	✓	✓
Russian Fed.			✓		✓		✓
Saudi Arabia	✓			✓			
South Africa				✓		✓	
Turkey				✓	✓	✓	
UK	✓		✓	✓	✓	✓	✓
United States	✓	✓	✓	✓	✓	✓	✓

Note: The existence of measures does not imply their adequacy. ✓ existing Source: See annex I.

Latest developments in energy

Positive development in the area of *HDV carbon emission/fuel efficiency standards* include the new HDV standards adopted in **India** in April 2018 (ICCT 2018b), proposed standards for the EU published in May 2018 (European Commission 2018), Canada's work on an updated HDV standard (Government of Canada 2017), and new standards being developed in Korea (Government of the Republic of Korea 2017) and Mexico (ICCT 2018c).

In December 2017 **Argentina** adopted a *carbon tax* which will enter into force beginning in 2019 (The World Bank 2018). It has also introduced mandatory vehicle labelling (The World Bank 2018).

In **China** the *New Energy Vehicle (NEV) mandate* entered into force in April 2018, introducing mandatory targets for the NEV credits, which are assigned to vehicles based on their specifications. NEV credit targets of 10% in 2019 and 12% in 2020 of the conventional passenger vehicle market have been set (ICCT 2018a).

In **India** the *Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME)* support for EV ran out March 2018. Amid varying political messages, no replacement has been put in place yet. It appears that the electric vehicle policy discussed earlier this year will be replaced by an action plans for promoting the use of EVs (Ghosh 2018).

In July 2018 the **UK** passed the *Automated and Electric Vehicles Act*. This act will support the improvement of electric charging infrastructure, particularly along motorways, and harmonizes insurance for automated and conventional driving. This will increase the confidence of drivers that they are covered when they hand over control to the vehicle (Gov.uk 2018).

Energy

As illustrated in table 5.3, two thirds of the countries have implemented mandatory vehicle labelling and biofuel targets, and even more countries have support measures for other low-carbon fuels. Only 14 of the 20 have mandatory energy or carbon related emission standards for light duty vehicles.[12] The largest gap in implementation remains in efficiency standards for heavy duty vehicles. Only four countries have implemented such standards so far. Although 16 of the G20 countries have measures in place to support electric vehicles, most currently have insufficient levels of renewable electricity to enable this measure to deliver deeper decarbonisation.

> "There are huge gaps in the implementation of energy or CO_2 related emission standards for heavy duty vehicles and in support for new mobility and non-motorised transport." (Vieweg, et al., 2017)

5.2 Counterproductive: Fossil fuel subsidies

National policies, laws and regulations that impact transport sector emissions have developed over an extended time frame and are not always fully consistent. While there may be ambition to decarbonise the sector, counterproductive measures are often in place that work against this goal. While such measures can take many forms, in this section we take a closer look at fossil fuel subsidies.

In 2009 the G20 agreed to "phase out and rationalize over the medium term inefficient fossil fuel subsidies" (G20 2009). Since then, government price controls over transport fuels have been eliminated or reduced in many countries, including Brazil, Mexico, Indonesia and India. In Indonesia and India this has led to a sharp decline in the overall level of subsidies for fossil fuels in the transport sector. In Brazil the drop has been less dramatic. In Mexico, meanwhile, overall subsidies for the sector are down from their peak levels in 2012, but the introduction of new subsidies for fishers and farmers and a tax benefit for gasoline consumption on the northern border in order to reduce "fuel tourism" outweigh the price support phase-out achieved over the last two years (OECD/IEA n.d.).

Direct subsidies for fossil transport fuels are also decreasing in most countries, but many direct and indirect subsidies remain in place. Most G20 members support specific fuel uses, such as agriculture, or specific types of fuels, such as diesel, LPG and CNG. Aviation also benefits in many countries from tax exemptions or breaks.

Further direct investment and indirect subsidies are provided in some countries for the exploration and production of oil and oil products. Such support is at cross purposes with the measures introduced to support renewable energy, efficiency and low-carbon modes of transport, as they undermine the competitiveness of such solutions (Asmelash 2017; Bast et al. 2014).

Globally, fossil fuel subsidies were more than double the estimated subsidies for renewable power generation in 2016 (REN21 2018), despite existing commitments and ongoing efforts. More leadership is required from the G20 to set an example and provide guidance. In particular, G20 countries should develop clear timeframes in their national implementation strategies for the phase-out of fossil fuel subsidies (Asmelash 2017).

06

THE WAY FORWARD

06 | The way forward

More rapid action is needed

Delayed action will require more painful changes later

While there were promising policy developments in some countries over the last year, far more ambition is needed in the transport sector to achieve the objectives of the Paris Agreement. Far from slowing down, year-over-year growth in transport-sector emissions accelerated to 2.7% in 2015; where negative growth is what is actually needed.

Only a few countries are moving forward with new action

Despite some positive trends in the area of fuel efficiency and emission standards for heavy duty vehicles and in EV policy support, new large-scale measures to support the rapid decarbonisation of the transport sector have been lacking.

A focus on fuel standards and electrification is not enough

Not enough focus on changing mobility patterns

Last year many countries took steps towards the electrification of road transport, setting objectives for EV penetration, sales and charging infrastructure, although with varying degrees of ambition. In many cases, these objectives were backed up with specific support policies.

A sole focus on vehicle technology will not be sufficient for decarbonisation given a growing population, increasing motorisation rates and growing vehicle sizes. Indeed, more efficient transport systems are essential for achieving a decarbonisation pathway in the transport sector. Measures that support a shift to more efficient, less carbon-intensive modes of transport remain too few and far between. While all countries are investing in public transport infrastructure, this investment has often failed to keep pace with rising demand. Greater efforts are needed to develop new mobility services and make public transport, low-carbon freight alternatives and non-motorised transport more attractive.

Measures that reduce transport demand without compromising mobility are needed

The G20's EELP implementation plan recognises the importance of "behavior change". While this is a welcome first step, countries also need to implement policies that reduce transport demand. Modern communication technologies are an important catalyser of change in this area, for they enable optimised traffic routing and provide alternatives to travel, such as videoconferencing. In this connection, it is important to remember that harnessing the power of information technology to lower transport demand necessitates broad access to reliable, high-speed communication infrastructure.

Ongoing efficiency efforts must be complemented by measures to reduce vehicle weight

One development undermining efforts to augment the energy efficiency of light duty vehicles is the trend toward larger, heavier vehicles such as SUVs. To ensure that efficiency gains ultimately achieve envisaged carbon reductions, measures need to be tailored in a way that encourages the use of smaller, lighter vehicles.

Electricity used in the transport sector needs to come from renewables

Support measures that target electrification or power-to-X technologies should be linked to renewable requirements

Greater electrification and the expansion of power-to-X fuels will only further decarbonisation in tandem with greater reliance on zero or low carbon electricity. Grid emission factors in G20 countries are not declining at the required pace. While most countries show at least moderate improvement in grid emission factors, four G20 countries – namely, Brazil, Indonesia, Japan and South Africa – now have higher GHG emissions per kWh in relation to 1990.

Fossil-fuel subsidies should be eliminated

Many countries have started to reduce fossil-fuel subsidies, such as India, which phased out price controls for transport fuels in late 2014. However, overall subsidy levels are still distorting the market, giving carbon-intensive modes of transport an undue advantage. Revenues spent or forfeited to finance fossil-fuel subsidies could instead be used to support low-carbon fuels, promote new propulsion systems or enhance the availability and cost-competitiveness of public transport.

Eliminating effects that distort the price of fossil fuels would also support a higher share of renewables in the power mix. As electrification is an important tool in many countries for addressing local air pollution, a shift towards fully renewable power generation would help to reduce GHG emissions in the power sector while also supporting zero-carbon transport options.

G20 activities should reflect the need for integrated system approaches

Thinking "outside-of-the-box" is required

Many of the necessary developments in the transport sector, such as electrification and digitalisation, require closer integration with other sectors. The organisational structure of G20 working groups and task forces should reflect this fact. By pooling the knowledge of information technology, transport, and power grid experts, it should be possible to identify measures that can promote greater integration between the power and transport sectors, and, by extension, guide the decarbonisation of the transport sector and of the energy economy as a whole.

07

COUNTRY FACTSHEETS

07 | Country Factsheets

G20 Transport Sector Factsheets: Our Contribution to Enhanced Transparency

The country factsheets aim to provide a comprehensive snapshot of the transport sector in each G20 member country. We spotlight factors impacting the transportation needs within a country, such as population, per capita GDP, land area and the urbanisation rate.

The factsheets also highlight transport sector emissions as a share of total emissions while illuminating both historical trends and prospective future developments under a business-as-usual scenario. Mobility indicators provide insight into motorisation rates and transport volumes, while our energy-related indicators show fuel use, gasoline and diesel prices as well as the status of electric vehicle adoption. Furthermore, the factsheets peek over the rim of the 'transport box', providing some information regarding the closely linked power and biofuel sectors.

Data availability in the transport sector is limited and the quality of data is often poor. When available, we have used consistent datasets, such as those from the World Bank, the IEA and the International Transport Forum. In some cases, we supplement these data with other sources. Accordingly, the data are not necessarily fully comparable between countries. However, they effectively serve their main purpose: to enhance our understanding of the situation in individual countries, and to identify significant differences between countries. Information on all data sources can be found in annex I.

This report does not assess implemented measures with a view to their stringency or how far they are able to achieve stated goals or the objectives of the Paris Agreement. The factsheets present measures that from their design or intention could potentially contribute to mitigation. National sources are not always available in English. Due to resource constraints, we were not able to analyse all potentially relevant documents, so additional measures may exist.

A core aim of the factsheets is to assess the level of ambition in each nation, including the steps taken to implement the measures we have identified. NDCs represent the key vehicle for ambition at the international level. The factsheets summarise each country's overall commitment, transport related targets included in the NDC, and mitigation measures relevant to transport. Additionally, the factsheets show the national targets that countries have set for the transport sector or individual subsectors, if they exist.

ARGENTINA

Argentina is characterised by long travel distances and a high level of urbanisation, with over 90% of the population living in urban areas. Travel between cities relies almost exclusively on road transport, including well-developed and low-cost bus services. With increasing affordability, air transport has been growing in importance.

Argentina revised its original INDC, moving from an 18% below BAU emissions reduction target to an absolute emission target of less than 483 Mt CO_2e by 2030. It has not set any targets for the transport sector. Argentina introduced a carbon price in January 2018 (which will impact the transport sector), and it has also implemented a mandatory vehicle labelling scheme. While undertaking significant steps to revive rail transport for passengers and freight, Argentina lacks policies to support alternative modes of transport and energy efficiency. It is one of the few G20 countries that has not yet implemented CO_2 or energy efficiency standards.

Sources: 3rd National Communication 2015; CIA World Factbook; Encyclopedia Britannica

2,780,400 km²
TOTAL AREA (2016)

16.18 people/km²
POPULATION DENSITY (2017)
WORLD AVERAGE: 58

2.1%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.83 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: **0.72** Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

18,934 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: **19,524**

WORLD AVERAGE: **15,469**

0.72%
SHARE IN GLOBAL GDP (2017)

POPULATION

44.3 mio people
POPULATION CURRENT (2017)

0.6%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION

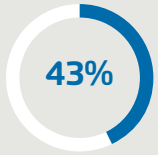
91.7% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

19.0 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)



Source: World Development Indicators

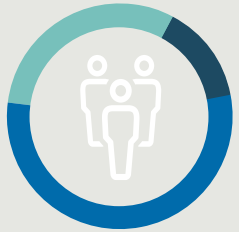
MOBILITY

300 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2017)

= 100 Inhabitants
= 100 Motor vehicles

Sources: AFAC, ITF/OECD, World Development Indicators

54,471 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2016)



Passenger-km per mode (2016)
- Road, Car: 55%
- Road, Bus: 31%
- Rail: 14%

368,501 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2017)

Tonne-km per mode (2017)
- Road: n.a.
- Inland waterways: 7%
- Rail: 2%
- Pipeline: 90%
- Domestic air: 1%

* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

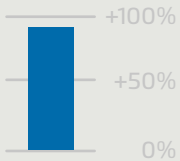
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Argentina's total CO_2 emissions from fuel combustion have increased by 93% since 1990. The overall upward trend slowed during the economic crises of 2000 and 2009. Emissions in the transport sector increased by 65% over the same period. Under business-as-usual, transport emissions are expected to grow between 3% and 70% up to 2030. Road transport is the subsector with the largest emissions.

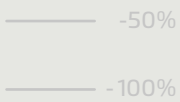
191.4 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2015)

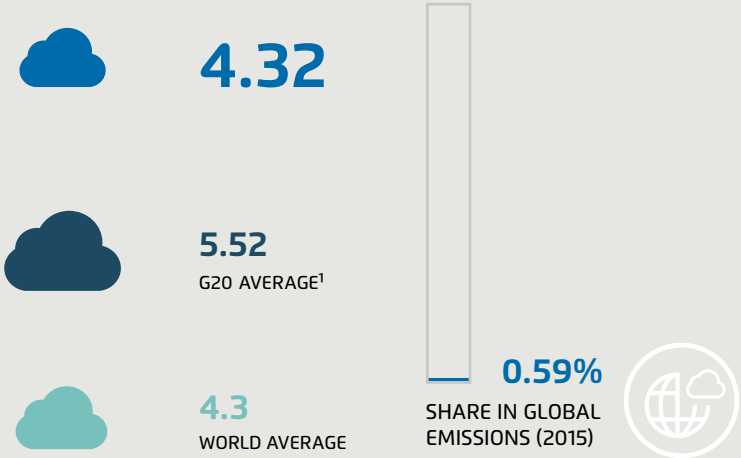


93%

CHANGE IN TOTAL EMISSIONS (1990–2015)



TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2015)



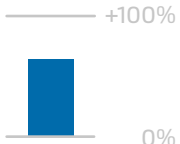
t CO_2 per capita

Sources: UNDESA, IEA CO2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

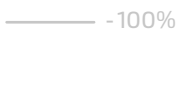
46.8 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2015)

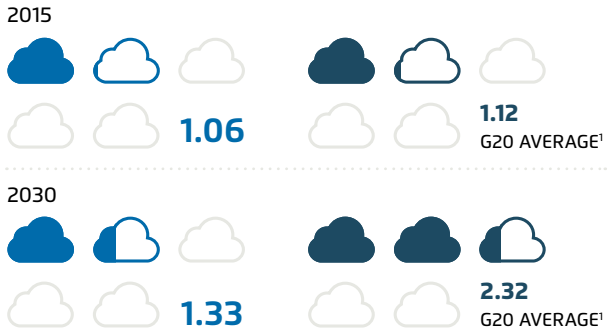


64.8%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2015)



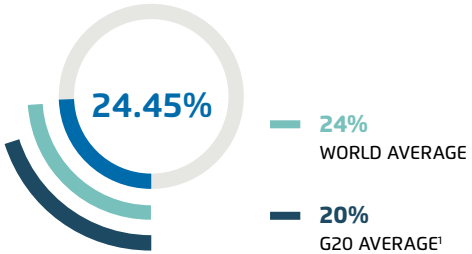
TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2015/2030)



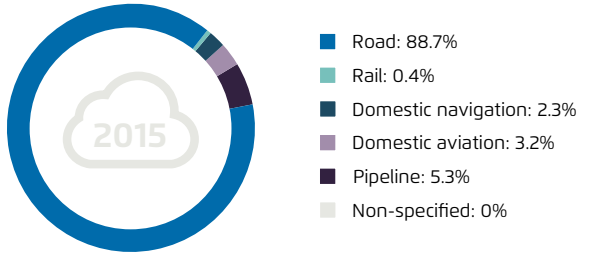
t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2015)

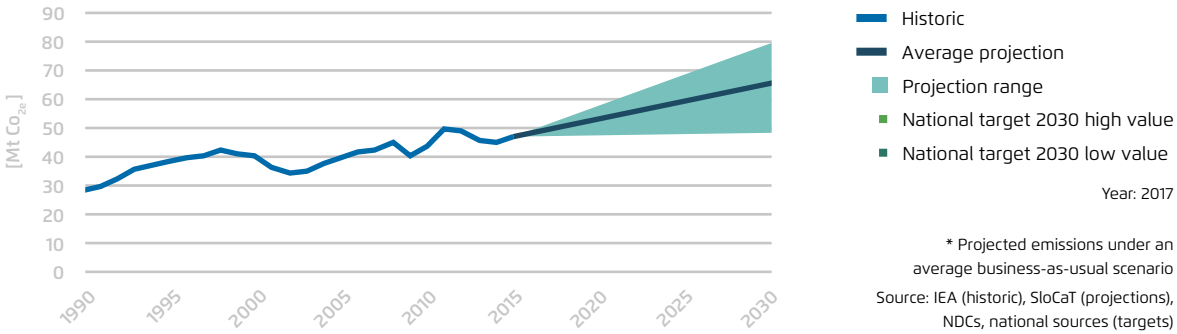


TRANSPORT EMISSIONS BY SUBSECTOR



Source: IEA

Historic and projected* emissions in the transport sector



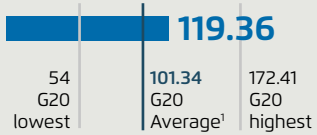
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

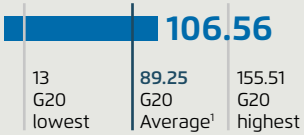
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



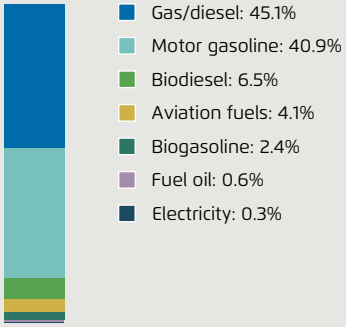
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre



* local currency prices converted using OECD annual exchange rates

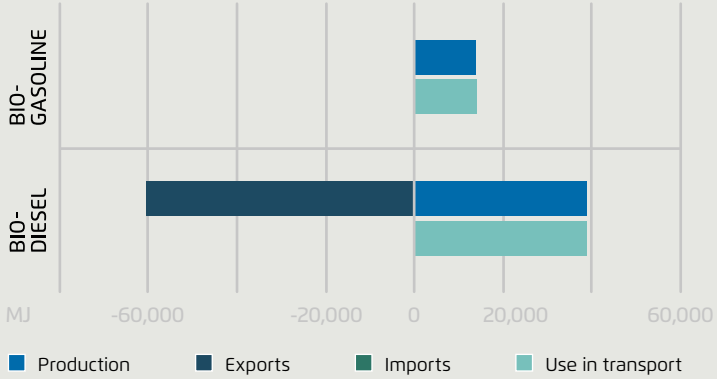
Energy use in transport by fuel



Year: 2016 Source: IEA

0%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use**



** Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

NO DATA
BATTERY

NO DATA
PLUG-IN HYBRID

NEW REGISTRATIONS OF ELECTRIC CARS (2016)

NO DATA
BATTERY

NO DATA
PLUG-IN HYBRID

NO DATA
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)

SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)

PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2016)

NO DATA
SLOW CHARGE

NO DATA
FAST CHARGE

16,434*
SLOW CHARGE
G20 AVERAGE[1]

5,678*
FAST CHARGE
G20 AVERAGE[1]

*number of units

LINKAGES TO THE ENERGY SECTOR

The majority of electricity in Argentina is generated using natural gas, and a third of power generation is from hydro. The 2007 feed-in tariff law set an 8% target for renewable energy consumption by 2017 and mandated the creation of a trust fund that pays a premium for electricity produced from renewables. Since 2016, three auction rounds have been conducted under the 'RenovAr' auctioning scheme, leading to the contracting of 4.5 GW of renewable electricity.

Existing targets for renewable electricity generation

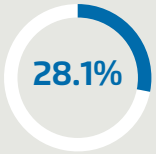
2018: 8% | 2019: 9% | 2021: 16%
2023: 18% | 2025: 20%

SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

No capacity targets

376 gCO_2/kWh
GRID EMISSION FACTOR (2016)



SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

NO DATA
ELECTRICITY USE IN TRANSPORT (2016)

SHARE IN TOTAL ELECTRICITY USE

Sources: IEA, REN21, World Development Indicators * Including hydropower

AMBITION

NDC target

Committed to not exceed net emissions of 483 million tons of carbon dioxide equivalent (tCO_{2e}) by the year 2030

Transport related target
no mention

Transport related measures
no mention

Targets at national level

Argentina does not have specific national targets for the transport sector. The draft National Plan for Transport and Climate Change foresees a range of measures that place a strong focus on freight; together, these measures could cut emissions 7.2% by 2030 compared to BAU.

EV deployment targets

No EV deployment targets or objectives.

Source: NDC, Climate Action Tracker; Argentina INDCs, UNFCCC; Draft National Plan for Transport and Climate Change

TRADE-OFFS

Sustainability of biofuels

There are no specific environmental or social/economic sustainability criteria for biofuels in Argentina. However, being a major exporter of biodiesel, the government of Argentina closely monitors other countries' criteria and regulations in order to avoid restrictions on its exports.

Source: IEA Consumption subsidies

Subsidies

0.22 Billion USD

LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (REAL 2016 DOLLARS)

IEA Consumption subsidies

No further information is available.

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	Law N° 27.132 reactivates the passenger and cargo railways, the renewal and improvement of railway infrastructure and the incorporation of technologies and services that contribute to the modernization and efficiency of the public railway system.
✔ **Measures to support low-carbon freight logistics**	Law N° 27.132 reactivates the passenger and cargo railways, the renewal and improvement of railway infrastructure and the incorporation of technologies and services that contribute to the modernization and efficiency of the public railway system. There is also a road freight efficiency pilot programme.
National measures to support new mobility services	No measures at national level
National measures to support non-motorised transport	No measures at national level
✔ **Road charges**	Nation-wide highway toll

Energy

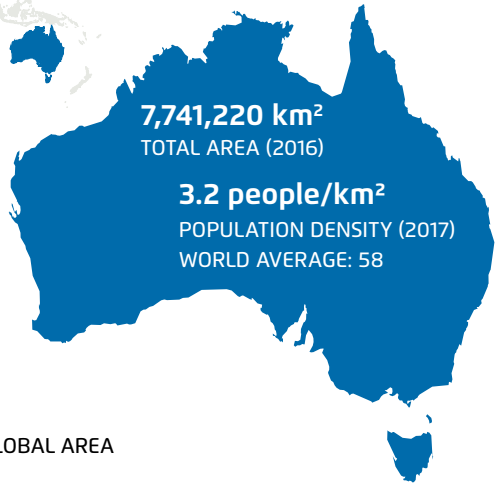
Energy/carbon emission standards LDV	No standard
Energy/carbon emission standards HDV	No standard
✔ **Pricing instruments**	Carbon tax adopted December 2017 to enter into force January 2019
✔ **Mandatory vehicle labelling**	Resolution 797-E / 2017 requires fuel consumption to be declared for each new vehicle model starting from 2018, an Energy Efficiency vehicle label will then be developed and applied from 2019.
✔ **Support mechanism for electric vehicles & charging infrastructure**	Reduced import tax for electric and hybrid cars from 35% down to 0–5% for models with manufacturing plants in the country.
✔ **Support for other low-carbon fuels and propulsion systems**	Law 26.093 (2006) for the Regulation and Promotion of the Production and Sustainable Use of Biofuels Law 26.123 (2006) Promotion of Hydrogen Energy
✔ **Mandatory biofuel targets**	Argentina has a mandatory share of 12% for biofuels.

Source: See national sources Argentina

AUSTRALIA

Transport in Australia is characterised by long travel distances. The country's population is concentrated along the eastern and southeastern coastlines, leaving large swathes of the country sparsely populated. 95% of the large rail system outside urban centres is used for freight. Extensive urban sprawl and low-density suburban development lead to long commuting times and heavy reliance on personal vehicle ownership.

Australia's goal of reducing emissions 26–28% below 2005 levels by 2030 does not include a specific transport sector target. Transport measures at the national level are scarce, although Australia's 40% energy productivity target for 2030 compared to 2015 includes the transport sector. Australia is one of the few G20 countries that does not yet have energy or CO_2 related emission standards for light duty vehicles.



5.8%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

Sources: CIA World Factbook; Australian Government 2015; 7th National Communication

0.94 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72 Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

44,649 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524

WORLD AVERAGE: 15,469

0.94%
SHARE IN GLOBAL GDP (2017)

POPULATION

24.6 mio people
POPULATION CURRENT (2017)

0.3%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION

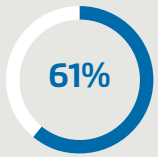
85.9% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

14.9 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)



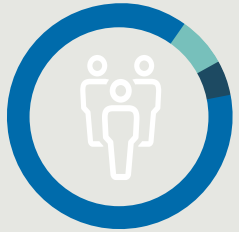
Source: World Development Indicators

MOBILITY

762 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2016)

= 100 Inhabitants
= 100 Motor vehicles

311,876 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2015)



Passenger-km per mode (2015)
- Road, Car: 88%
- Road, Bus: 7%
- Rail: 5%

615,517 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2015)

Tonne-km per mode (2015)
- Road: 35%
- Inland waterways: 0%
- Rail: 65%
- Pipeline: 0%
- Domestic air: 0%

Sources: ITF/OECD, World Development Indicators

* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

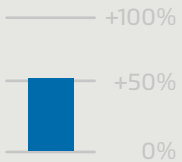
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Australia's total CO_2 emissions from fuel combustion have increased by 51% since 1990. The country has one of the highest per capita emissions globally, almost three times the G20 average and almost four times the global average. Transport sector emissions have outpaced overall growth and have increased almost 55% since 1990. While road transport plays the most important role in generating emissions from the sector, domestic aviation has been increasing in importance and now is responsible for 9.3% of transport sector emissions, the highest share in the G20. Emissions from the sector are projected to grow between 8% and 66% by 2030.

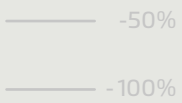
392.4 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2016)



51%

CHANGE IN TOTAL EMISSIONS (1990–2016)



TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2016)

15.95

5.52

G20 AVERAGE[1]

4.3

WORLD AVERAGE

1.21%

SHARE IN GLOBAL EMISSIONS (2016)

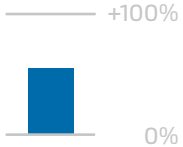
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

96.1 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2016)

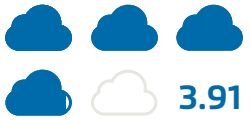


55%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2016)

TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2016/2030)

2016



3.91

1.12

G20 AVERAGE[1]

2030

4.54

2.32

G20 AVERAGE[1]

t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2016)

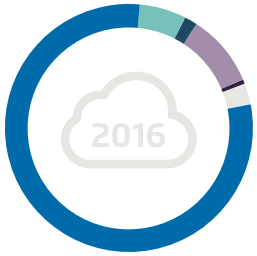
24%

WORLD AVERAGE

20%

G20 AVERAGE[1]

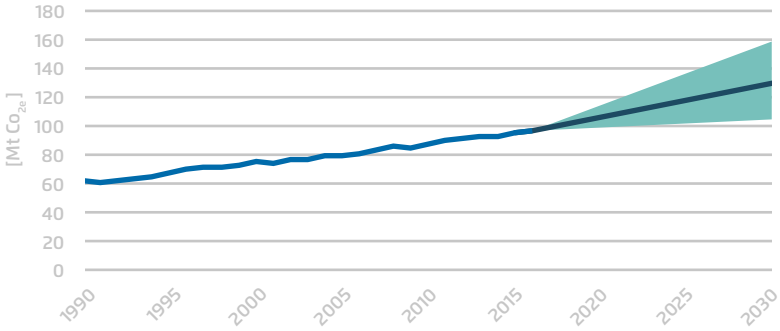
TRANSPORT EMISSIONS BY SUBSECTOR



- Road: 79.8%
- Rail: 6%
- Domestic navigation: 1.7%
- Domestic aviation: 9.3%
- Pipeline: 0.7%
- Non-specified: 2.6%

Source: IEA

Historic and projected* emissions in the transport sector



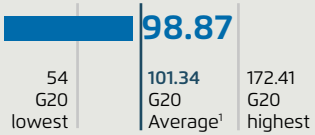
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

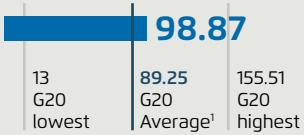
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



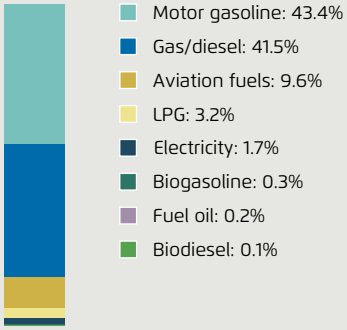
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre

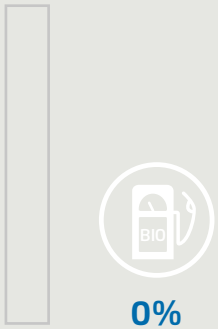


* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel

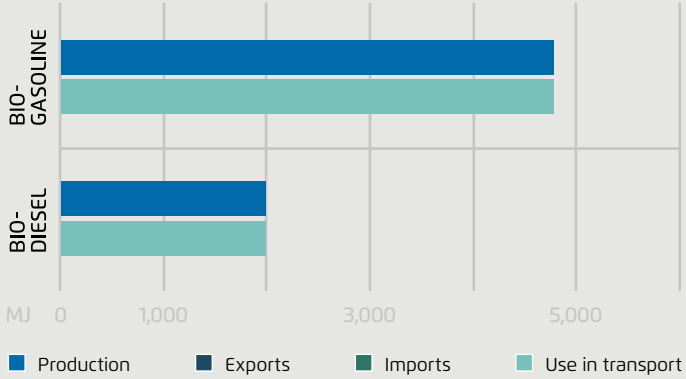


Year: 2016 Source: IEA



0%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

3,420
BATTERY

3,920
PLUG-IN HYBRID

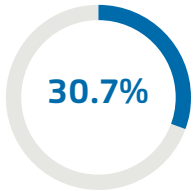
NEW REGISTRATIONS OF ELECTRIC CARS (2016)

1,210
BATTERY

1,080
PLUG-IN HYBRID

0.1%
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)



SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)

PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2017)

436* SLOW CHARGE

40* FAST CHARGE

16,434* SLOW CHARGE G20 AVERAGE[1]

5,678* FAST CHARGE G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

Coal is still the dominant fuel source for power generation in Australia, representing almost two-thirds to total generation (compared to a global average of 39%). The renewable energy target consists of two main schemes:

- the Large-scale Renewable Energy Target (LRET), which creates a financial incentive for large renewable energy power stations, and
- the Small-scale Renewable Energy Scheme (SRES), which encourages owners to install small-scale renewable energy systems.

Existing targets for renewable electricity generation

The Renewable Energy Target (RET) was reviewed by the Government and reduced in June 2015 from the previously legislated 41,000 GWh to 33,000 GWh, which is expected to account for 23.5% of total generation. In December 2017, a 100% exemption from the RET liability was introduced for emissi-ons-intensive trade-exposed (EITE) activities.

Existing targets for capacity

No capacity targets

758.7 gCO_2/kWh
GRID EMISSION FACTOR (2016)

SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

Sources: IEA, World Development Indicators, Clean Energy Council Australian Government * Including hydropower

AMBITION

NDC target

Committed to a 26–28% reduction in GHG emissions in 2030 compared to 2005

Transport related target
No mention

Transport related measures
National Energy Productivity Target:
- 40% improvement between 2015–30 (including efficiency improvements in light and heavy vehicles)

EV deployment targets

No EV deployment targets or objectives

Targets at national level

Australia does not have specific national targets for the transport sector.

Source: NDC, The Sixth National Communication of Australia

TRADE-OFFS

Sustainability of biofuels

There are no specific environmental or social/economic sustainability criteria for biofuels in Australia.

Source: OECD

Subsidies

A$

7.66 Billion AUD

~5.87 BILLION USD
LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

Source: OECD

Energy prices are generally deregulated in Australia. However, businesses can claim Fuel Tax Credits (FTCs) under certain circumstances. FTCs represent the bulk of total subsidies (81%). Additionally, there are excise tax reductions for aviation fuels and "alternative fuels" (LPG, natural gas).

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	The 2017–18 Budget includes a $10 billion National Rail Program to invest in major passenger rail projects. It also includes $20 million to support faster rail connections between capital cities and regional centres. The „Smart Cities and Suburbs Program", started in 2017, supports projects that improve the livability, productivity and sustainability of cities and towns.
National-level measures to support new mobility services	No measures at national level
✔ **Measures to support low-carbon freight logistics**	Credit generation through mode shift under the Emission Reduction Fund
National measures to support non-motorised transport	The Australian National Cycling Strategy 2011-16 was extended by one year and was to be replaced by a National Active Transport Strategy by 2018, which so far has not been approved
Road charges	No general charges at national level 16 toll roads operational (mostly PPPs)

Energy

Energy/carbon emission standards LDV	Under discussion
Energy/carbon emission standards HDV	No standard
Pricing instruments	No CO_2 or energy consumption based taxes
✔ **Mandatory vehicle labelling**	Fuel consumption labelling standard (ADR81/02)
✔ **Support mechanism for electric vehicles & charging infrastructure**	There is currently no overarching electric vehicle policy at the federal level, but most states have policy frameworks supporting EV Fleet incentives Discount on luxury car tax Information programmes
✔ **Support for other low-carbon fuels and propulsion systems**	Credit generation through reducing the emissions intensity of vehicles in the land and sea transport sectors under the Emission Reduction Fund Discount on luxury car tax
Mandatory biofuel targets	No national requirements.

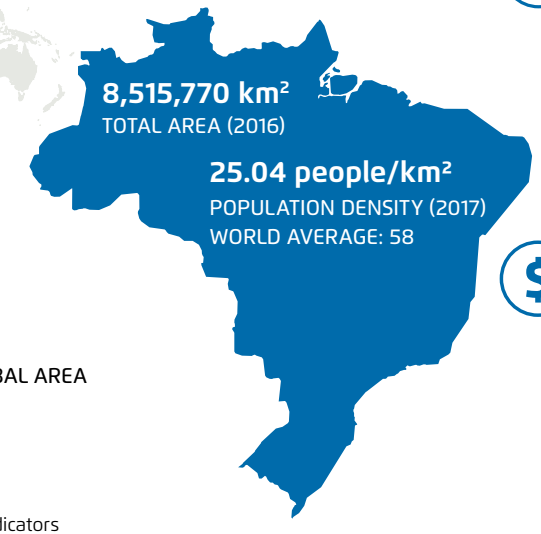
Source: See national sources Australia

BRAZIL

Brazil is characterised by long travel distances, with most urban centres lying along its 7,500 km coastline. Inland areas, including the Amazon rainforest, are sparsely populated. Air transport plays an important role, with 4,000 airports in operation, the second largest number globally. While Brazil has large highway and rail networks, they are relatively small given the country's size. Rail is mostly used for freight transport. Although Brazil has an extensive network of navigable rivers, just 14% of cargo is transported using inland navigation.

The national target of reducing transport sector emissions by 48–60 Mt CO_2 by 2020 could see sector emissions return to 2011 levels. Although Brazil has enacted a range of other measures, particularly in the area of biofuels, there are still significant gaps in the promotion of public transport and new modes of transport. The new regulation 'Rota 2030' was published on 6 July 2018 and includes a mandatory efficiency improvement for vehicles of 11% by 2022 and tax reductions for electric vehicles.

Sources: U.S. Department of Commerce; CIA World Factbook



6.3%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.75 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72

Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

14,103 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524

WORLD AVERAGE: 15,469

2.53%
SHARE IN GLOBAL GDP (2017)

POPULATION

209.3 mio people
POPULATION CURRENT (2017)

2.8%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION

86.3% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

86.6 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)

Source: World Development Indicators

MOBILITY

162 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2014)

= 100 Inhabitants

= 100 Motor vehicles

Sources: ITF Outlook 2017

NO DATA
PASSENGER TRANSPORT VOLUME*

Passenger-km per mode
No data

NO DATA
FREIGHT TRANSPORT VOLUME**

Tonne-km per mode
No data

* Includes road and rail transport, not aviation and non-motorised transport modes

** Includes road, rail, inland waterways, pipeline transport and domestic air transport

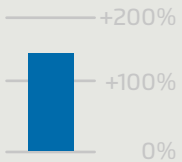
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Brazil's total CO_2 emissions from fuel combustion have increased by 145% since 1990, with the transport sector growing at a proportional rate (140%). Per capita emissions are, nevertheless, still below the G20 and world average. The transport sector is responsible for 44% of total emissions, the largest share within the G20. This high share is attributable to the extremely large percentage of electricity generation from renewables (74%). Road transport is responsible for 90% of the emissions within the transport sector, followed by domestic aviation with almost 6%.

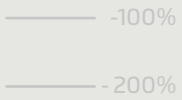
450.8 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2015)

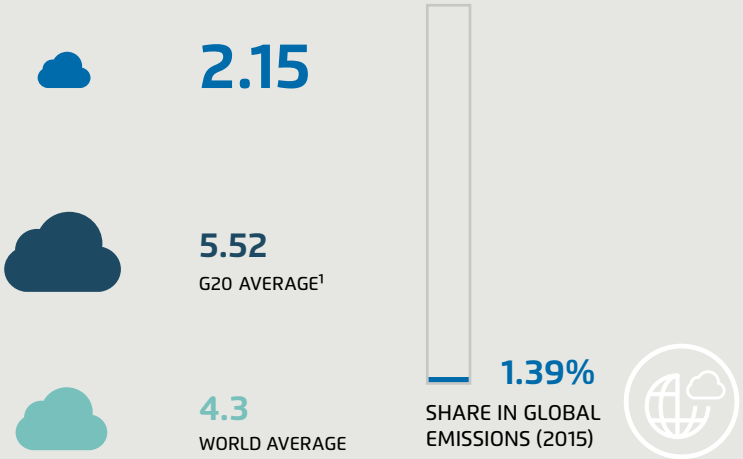


145%

CHANGE IN TOTAL EMISSIONS (1990–2015)



TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2015)



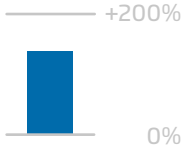
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

197.3 Mt CO_2

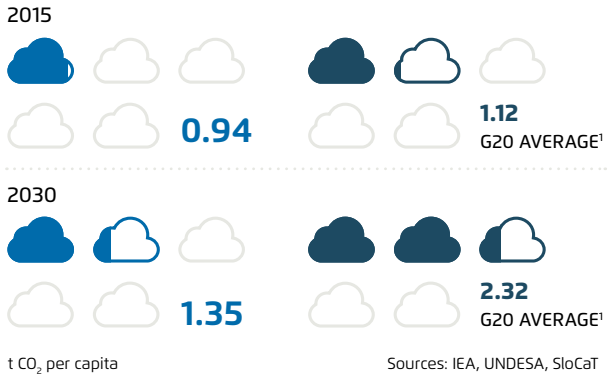
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2015)



140%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2015)

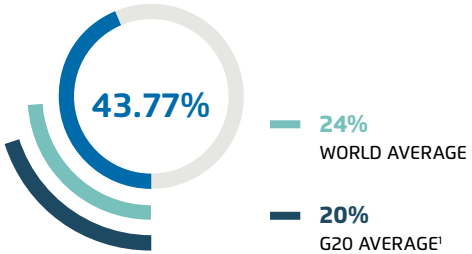
TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2015/2030)



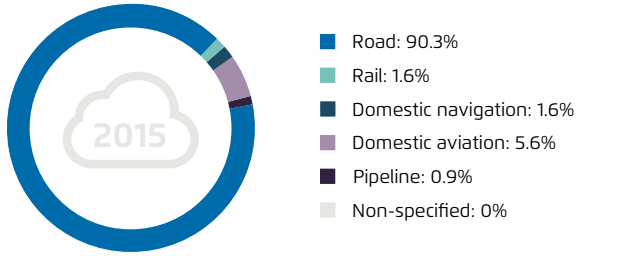
t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2015)

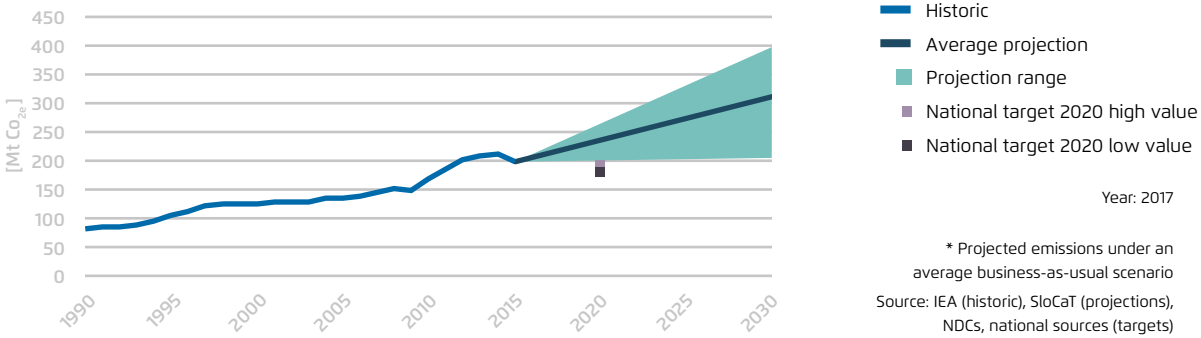


TRANSPORT EMISSIONS BY SUBSECTOR



Source: IEA

Historic and projected* emissions in the transport sector



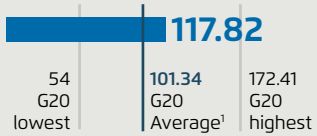
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

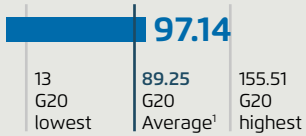
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



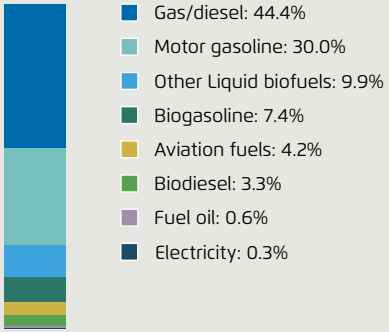
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre

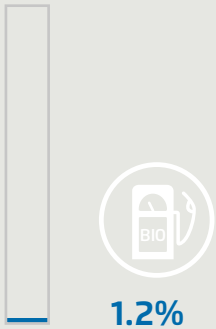


* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel

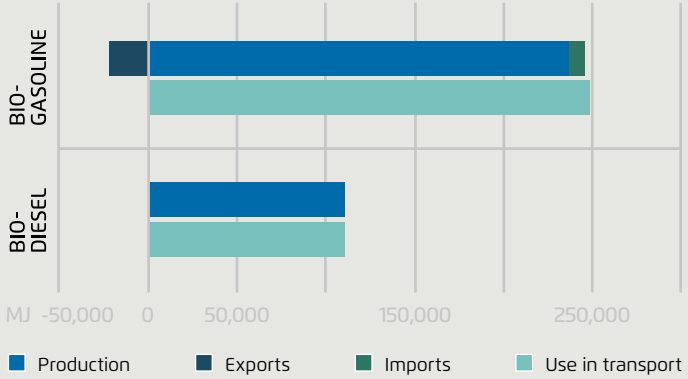


Year: 2016 Source: IEA



1.2%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

320
BATTERY

360
PLUG-IN HYBRID

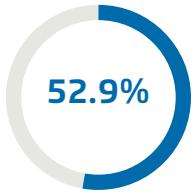
NEW REGISTRATIONS OF ELECTRIC CARS (2016)

70
BATTERY

290
PLUG-IN HYBRID

0.02%
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)



SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)

PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2015)

50*
SLOW & FAST CHARGE

*number of units

16,434*
SLOW CHARGE
G20 AVERAGE[1]

5,678*
FAST CHARGE
G20 AVERAGE[1]

Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

Brazil already has a high share of renewable electricity generation due to abundant hydropower, and most fossil fuel-based generation relies on natural gas. Since 2002 the PROFINA programme has encouraged renewable energy development by providing for 20-year power purchase agreements (PPAs). Since 2005, concessions have been awarded using an auction model, providing renewable electricity at lower cost than the feed-in tariff offered through PROFINA.

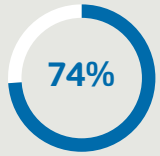
Existing targets for renewable electricity generation

2030: 23% (excluding all hydro)
SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES (EXCLUDING ALL HYDRO)

Existing targets for capacity

BY 2021: BIO-POWER: 19.3 GW
HYRDO: 7.8 GW | WIND: 19.5 GW

120 gCO_2/kWh
GRID EMISSION FACTOR (2016)



SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

NO DATA
ELECTRICITY USE IN TRANSPORT (2016)

SHARE IN TOTAL ELECTRICITY USE

Sources: IEA, REN21, World Development Indicators * Including hydropower

AMBITION

NDC target

- Committed to a 37% reduction in GHG emissions in 2025, and a 43% reduction in GHG emissions in 2030 compared to 2005

Transport related target

- By 2030 Brazil aims to increase the share of sustainable biofuels to approximately 18%

Transport related measures

- Promote efficiency measures
- Improve infrastructure
- Improve public transport in urban areas

Source: NDC, National Climate Change Plan (PNMC) 2008

EV deployment targets

No EV deployment targets or objectives.

Targets at national level

- Brazil has set a 48–60 $MtCO_{2e}$ reduction target for the transport sector by 2020 through increased use of biofuels.

TRADE-OFFS

Sustainability of biofuels

There are no environmental sustainability criteria in Brazil's biofuel mandates. Greenhouse gas emission reduction levels are not considered, nor is indirect change in land use.

Source: OECD

Subsidies

R$

48.48 Billion BRL

~15.19 BILLION USD
LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

Source: OECD

Prices for natural gas and for petroleum products in Brazil were officially deregulated in January 2002 with the elimination of formal price controls. Oil and gas producers benefit from special tax incentives for infrastructure development as well as a special tax regime for equipment used in the exploration and development of hydrocarbon resources. There are also preferential loans to companies along the oil and gas supply chain. According to latest OECD estimates, support relevant for the transport sector has decreased by around 17%. However, due to a nationwide strike of truck drivers in May 2018, the Brazilian government introduced a temporary diesel subsidy until 31 December 2018 (leading to a total discount of 0.46 BRL per litre of diesel).

IMPLEMENTATION

Mobility

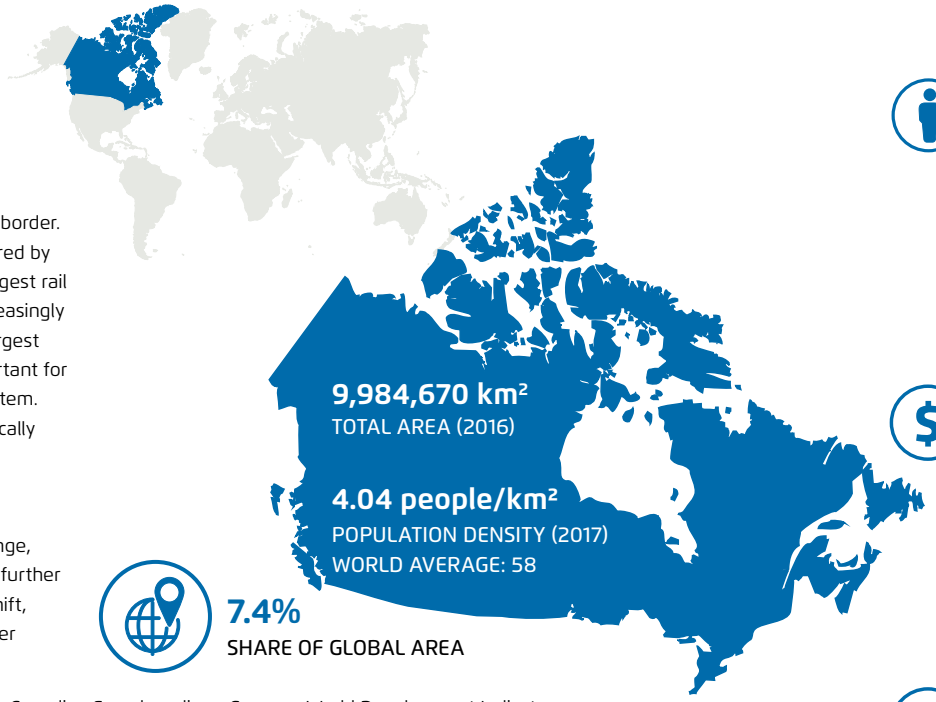
✔ **National programmes to support shift to public transport**	National Urban Mobility Policy (PNMU) Big Cities Mobility: upgrading public transportation systems Mobility law (2012)
✔ **Measures to support low-carbon freight logistics**	Despoluir: Environmental Transport Programme
National measures to support new mobility services	No measures at national level
✔ **National measures to support non-motorised transport**	National Urban Mobility Policy (PNMU) Mobility law (2012)
Road charges	No general charges at national level The Urban Mobility Law (2012) authorizes municipalities to implement congestion pricing to reduce traffic flows

Energy

✔ **Energy/carbon emission standards LDV**	Fuel effiency targets effectively set through the 'Innovar' programme expired end of 2017. The new regulation 'Rota 2030' was published on 6 July 2018 and includes a mandatory efficiency improvement for vehicles of 11% by 2022.
Energy/carbon emission standards HDV	No standard
Pricing instruments	No CO_2 or energy consumption based taxes
Mandatory vehicle labelling	Brazilian Vehicle Labeling Program (PBEV) voluntary labelling
✔ **Support mechanism for electric vehicles & charging infrastructure**	Import tax exemption for EVs Reduction of Industrial Product Tax (IPI) under the Rota 2030 scheme
✔ **Support for other low-carbon fuels and propulsion systems**	Proálcool programme: Gas stations obliged to sell ethanol, ethanol price lower than gasoline's, guaranteed remuneration of the producer; Reduction of taxes for vehicles using hydrous ethanol
✔ **Mandatory biofuel targets**	Brazil has a mandatory share of 27% for bioethanol and in 2017 introduced a mandatory share of 8% for biodiesel, increased from its previous level of 5%, which further increase to 9% in 2018 and is scheduled to increase to 10% in 2019.

Source: See national sources Brazil

CANADA



Canada is the second largest country in the world by area. Around two thirds of Canadians live within 100 km of the US border. The country features large forests and extensive areas covered by continuous permafrost. Despite having the world's fourth largest rail system, passengers are mainly transported by road and increasingly by air. With 36,450 civilian aircraft, Canada has the second largest civilian airfleet in the world. Nevertheless, railways are important for freight transport, and are interconnected with the US rail system. The Great Lakes are an important water route, both domestically and for freight transport to the US.

Canada has no specific targets for the transport sector. The Pan-Canadian Framework on Clean Growth and Climate Change, adopted at the end of 2016, aims to implement measures to further strengthen efficiency, low-carbon technology and a modal shift, including the introduction of carbon pricing, which is still under development.

Sources: 7th National Communication; CIA World Factbook; The Canadian Encyclopedia

7.4%
SHARE OF GLOBAL AREA

0.92 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72 Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

44,018 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524

WORLD AVERAGE: 15,469

1.39%
SHARE IN GLOBAL GDP (2017)

Sources: World Development Indicators

POPULATION

36.7 mio people
POPULATION CURRENT (2017)

0.5%
SHARE IN GLOBAL POPULATION (2017)

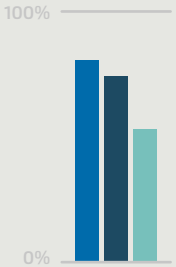
Source: World Development Indicators

URBANISATION

81.4% of total
URBAN POPULATION (2017)

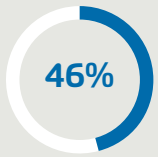
75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE



16.8 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)



Source: World Development Indicators

MOBILITY

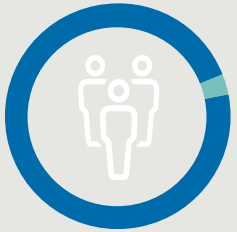
669 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2016)

= 100 Inhabitants

= 100 Motor vehicles

Source: ITF/OECD, World Development Indicators, Transportation in Canada 2016

506,940 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2016/17)



Passenger-km per mode (2016/2017)
- Road, Car: 97%
- Road, Bus: 3%
- Rail: 0%

704,729 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2017)

Tonne-km per mode (2017)
- Road: 25%
- Inland waterways: 4%
- Rail: 41%
- Pipeline: 30%
- Domestic air: 0%

* Includes road and rail transport, not aviation and non-motorised transport modes

** Includes road, rail, inland waterways, pipeline transport and domestic air transport

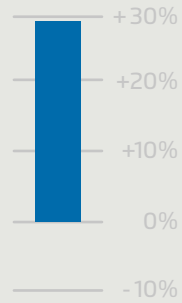
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Canada's total CO_2 emissions from fuel combustion have increased by 29% since 1990, with transport sector emissions increasing by 38% over the same period. Transport sector emissions represent almost a third of total emissions, due to the high share of renewable electricity generation. Per capita emissions are among the highest globally, more than four times as high as the global average. Canada has an unusually high share of emissions from pipeline transport, which is the third largest contributor at over 5%, after road transport and aviation.

540.8 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2016)



29%

CHANGE IN TOTAL EMISSIONS (1990–2016)

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2016)

14.73

5.52

G20 AVERAGE[1]

4.3

WORLD AVERAGE

1.67%

SHARE IN GLOBAL EMISSIONS (2016)

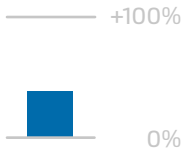
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

172.4 Mt CO_2

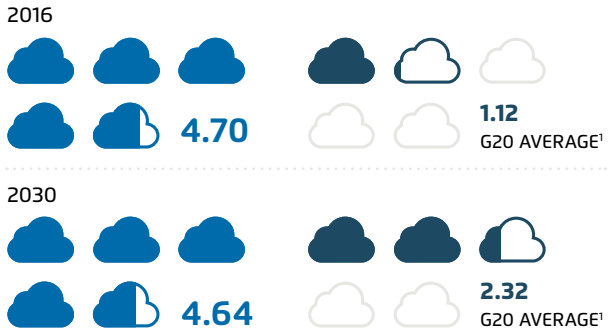
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2016)



38.3%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2016)

TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2016/2030)



t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2016)

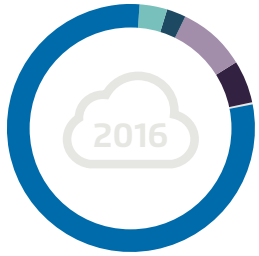
24%

WORLD AVERAGE

20%

G20 AVERAGE[1]

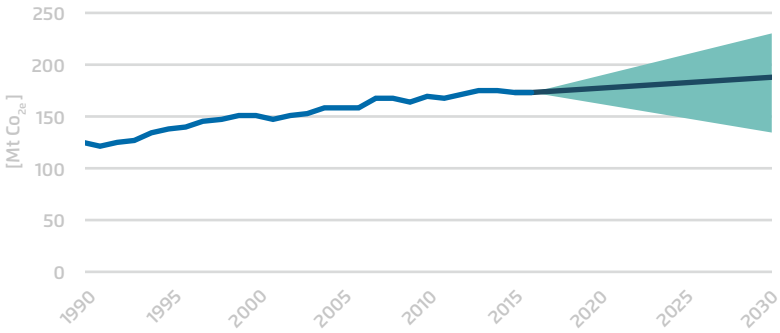
TRANSPORT EMISSIONS BY SUBSECTOR



- Road: 79.4%
- Rail: 3.4%
- Domestic navigation: 2.5%
- Domestic aviation: 9.1%
- Pipeline: 5.4%
- Non-specified: 0.2%

Source: IEA

Historic and projected* emissions in the transport sector



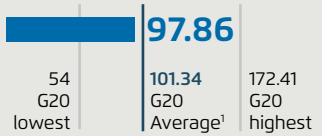
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

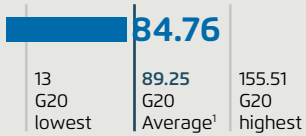
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



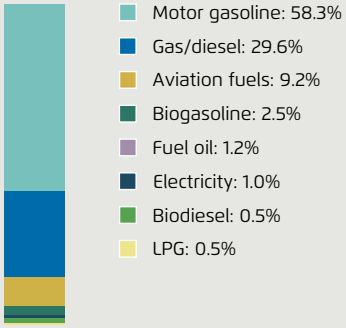
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre

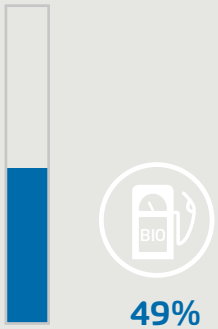


* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel

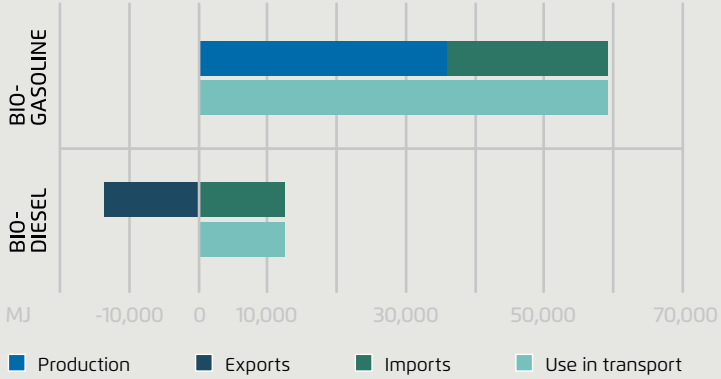


Year: 2016 Source: IEA



49%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

23,620
BATTERY

22,330
PLUG-IN HYBRID

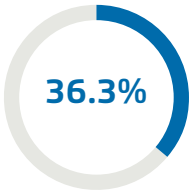
NEW REGISTRATIONS OF ELECTRIC CARS (2016)

8,710
BATTERY

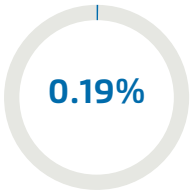
7,970
PLUG-IN HYBRID

1.1%
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)



SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)



PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2017)

5,168*
SLOW CHARGE

673*
FAST CHARGE

16,434*
SLOW CHARGE
G20 AVERAGE[1]

5,678*
FAST CHARGE
G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

Canada already has a high share of renewable electricity generation due to abundant hydropower. Some 15% of power is generated using nuclear energy. Canada currently does not have an incentive scheme for renewable electricity generation at the national level. The ecoENERGY Innovation Initiative ended in 2011. There are a range of different support schemes operational at the provincial level.

Existing targets for renewable electricity generation

While there is no national target, there are provincial targets in Alberta, British Columbia, New Brunswick, Nova Scotia and Saskatchewan

Existing targets for capacity

No capacity targets

149.5 gCO_2/kWh
GRID EMISSION FACTOR (2016)

SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

NO DATA
ELECTRICITY USE IN TRANSPORT (2016)

SHARE IN TOTAL ELECTRICITY USE

Sources: IEA, REN21, World Development Indicators * Including hydropower

AMBITION

NDC target

Committed to a 30% reduction in GHG emissions in 2030 compared to 2005

Transport realated target

By 2030 Brazil aims to increase the share of sustainable biofuels to approximately 18%

Transport related measures

- Carbon price starting in 2018
- Develop a clean fuel standard
- Set increasingly stringent standards for LDV and HDV
- Develop zero-emission strategy
- Support fuel switching in the rail, aviation, marine, and off-road sectors

EV deployment targets

No transport specific national target.

Targets at national level

No EV deployment targets or objectives

Source: NDC, Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy 2016

TRADE-OFFS

Sustainability of biofuels

Canada has defined a set of non-mandatory principles for sustainable biofuels.

Source: OECD

Subsidies

C$

1.82 Billion CAD

~1.40 BILLION USD
LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

Source: OECD

Canada reformed its fiscal support for fossil fuel exploration at the end of 2016 (through changes to the Canadian Exploration Expense [CEE] Claims), and its fiscal support for oil and gas production (through changes to elements of flow-through shares renunciation). In both cases, subsidies have not been fully eliminated. Subsidies for the consumption of transport-related fossil fuels remain high and have increased in recent years.

IMPLEMENTATION

Mobility

National programmes to support shift to public transport	No measures at national level
✔ **Measures to support low-carbon freight logistics**	SmartWay Initiative (in coordination with the U.S.) FleetSmart programme ecoMOBILITY Program ecoTECHNOLOGY for Vehicles Program ecoFREIGHT Program
National-level measures to support new mobility services	No measures at national level
National measures to support non-motorised transport	No measures at national level
Road charges	No general charges at national level

Energy

✔ **Energy/carbon emission standards LDV**	Passenger cars: 99 g/km (2025) Light commercial: 139 g/km (2025)
✔ **Energy/carbon emission standards HDV**	Heavy-duty Vehicle and Engine GHG Emission Regulations
✔ **Pricing instruments**	Excise tax on high CO_2 vehicles Nationwide carbon price / ETS under development
✔ **Mandatory vehicle labelling**	EnerGuide Label for Vehicles
Support mechanism for electric vehicles & charging infrastructure	Only at provincial level Canada-Wide Zero-Emission Vehicle Strategy under development
✔ **Support for other low-carbon fuels and propulsion systems**	Renovabio programme ecoEnergy for Biofuels program Clean Fuels Standard under development, expected to be adopted 2019 Canada-Wide Zero-Emission Vehicle Strategy under development
✔ **Mandatory biofuel targets**	Canada has a mandatory share of 5% for bioethanol and 2% for biodiesel.

Source: See national sources Canada

CHINA

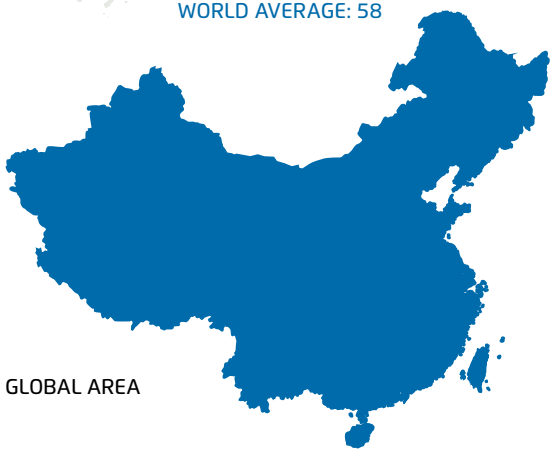
China is the world's most populous country and 4th largest by area. China has the second largest railway network globally, and has been rapidly motorising, moving from only 16 private cars per 1000 inhabitants in 2005 to 83 private cars per 1000 inhabitants in 2014. A similar growth can be seen in freight.

China has set a 60–65% carbon intensity improvement target, a 30% public transport target for urban centres by 2020, and carbon intensity targets for individual transport modes. Additionally, the country has set targets for electric vehicles and 'new energy vehicles', which are planned to represent 7-10% of sales by 2020. China has a wide range of policies in place to support energy-efficient and low-carbon vehicles and a new 3-Year Plan aims at reducing the carbon intensity of the freight sector.

Sources: ITF 2011; CIA World Factbook

9,562,911 km²
TOTAL AREA (2016)

147.67 people/km²
POPULATION DENSITY (2017)
WORLD AVERAGE: 58



7.1%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.74 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72 Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

15,309 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524

WORLD AVERAGE: 15,469

18.22%
SHARE IN GLOBAL GDP (2017)

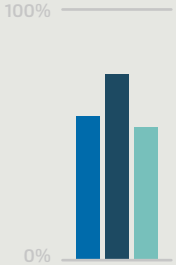
POPULATION

1,386.4 mio people
POPULATION CURRENT (2017)

18.4%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION



58% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

378.1 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)

Source: World Development Indicators

MOBILITY

83 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2014)

= 100 Inhabitants

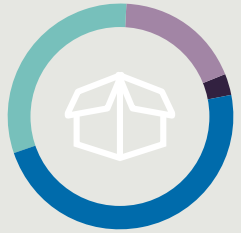
= 100 Motor vehicles

Source: ITF Outlook 2017, ITF/OECD, World Development Indicators

2,280,800 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2016)

Passenger-km per mode (2016)
- Road: 45%
- Road, Bus: n.a.
- Rail: 55%

12,854,525 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2016)



Tonne-km per mode (2016)
- Road: 48%
- Inland waterways: 31%
- Rail: 18%
- Pipeline: 3%
- Domestic air: 0%

* Includes road and rail transport, not aviation and non-motorised transport modes

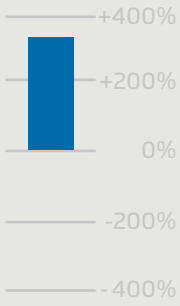
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

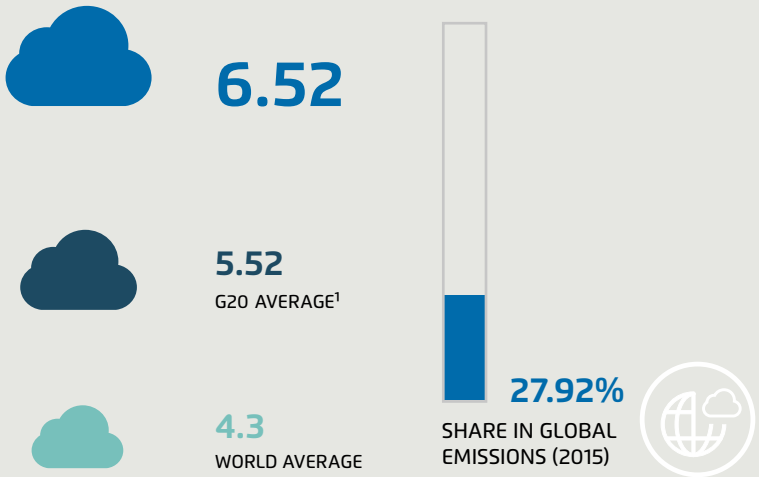
China's total CO_2 emissions from fuel combustion have grown by 336% since 1990, making it the largest global emitter by far. Transport sector emissions have grown by 682% over the same period due to rapid motorisation and greatly increased transport activity. Nevertheless, the sector only represents a little over 9% of total national emissions, the lowest share within the G20, mainly due to the high levels of coal use in electricity generation and industry. Emissions in the transport sector are projected to potentially more than double by 2030 compared to 2015 levels. China is the only country with notable electricity-related emissions from road transport. This is due to the massive surge of electric vehicles in many cities, combined with the high carbon intensity of electricity generation.

9040.7 Mt CO_2
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2015)



336%
CHANGE IN TOTAL EMISSIONS (1990–2015)

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2015)

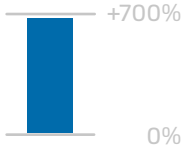


t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

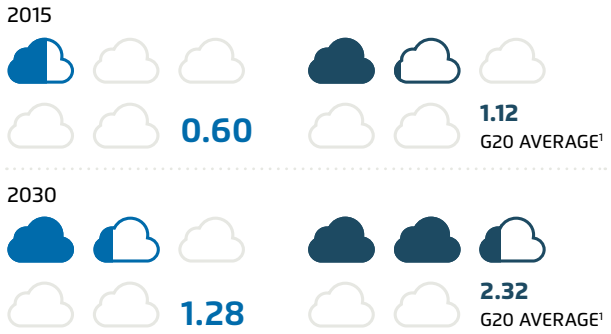
TRANSPORT SECTOR EMISSIONS

836.6 Mt CO_2
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2015)



681.9%
CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2015)

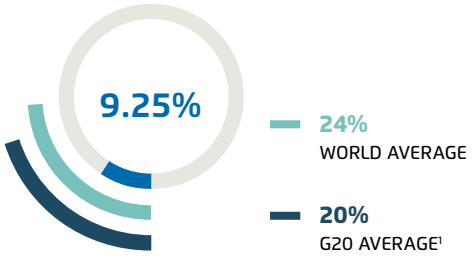
TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2015/2030)



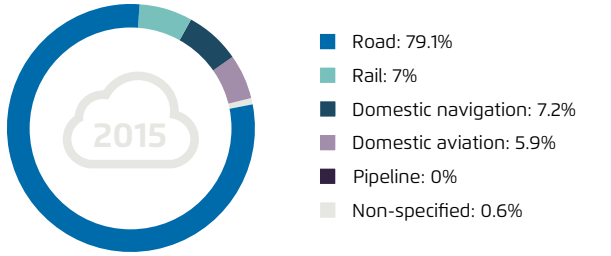
t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2015)

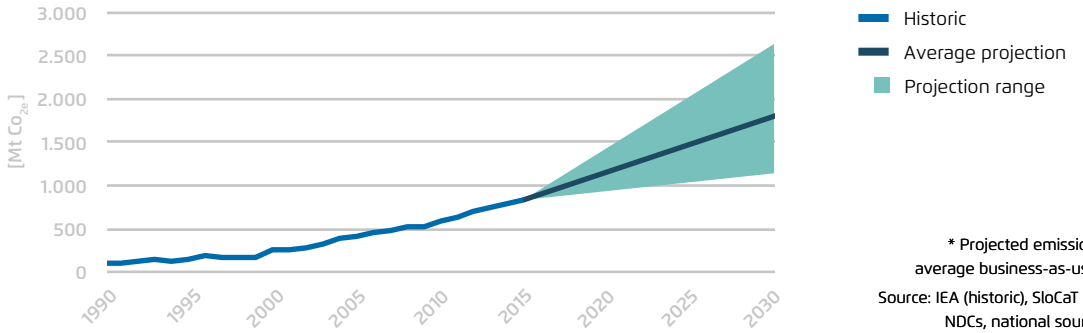


TRANSPORT EMISSIONS BY SUBSECTOR



Source: IEA

Historic and projected* emissions in the transport sector



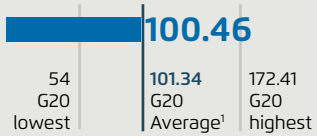
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

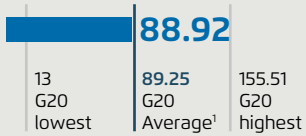
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



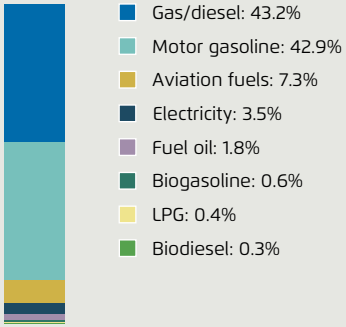
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre



* local currency prices converted using OECD annual exchange rates

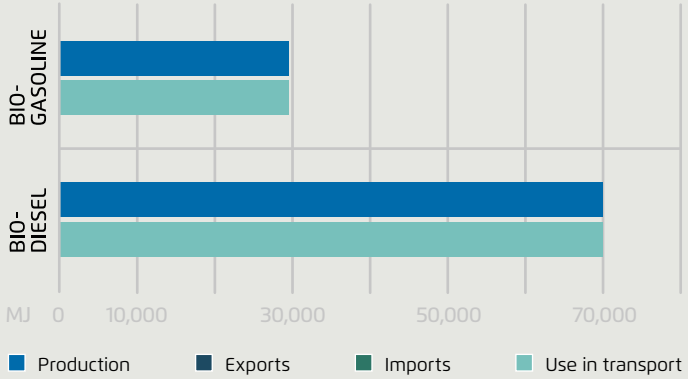
Energy use in transport by fuel



Year: 2016 Source: IEA

0%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

951,190
BATTERY

276,580
PLUG-IN HYBRID

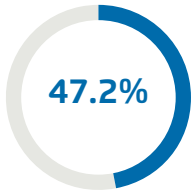
NEW REGISTRATIONS OF ELECTRIC CARS (2016)

468,000
BATTERY

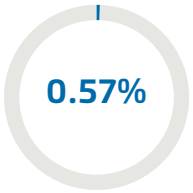
111,000
PLUG-IN HYBRID

2.2%
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)



SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)



PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2017)

130,508*
SLOW CHARGE

83,395*
FAST CHARGE

16,434*
SLOW CHARGE G20 AVERAGE[1]

5,678*
FAST CHARGE G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

Coal is still the dominant fuel source for power generation in China, representing 70% of total generation (global average: 39%). In 2016, China launched a series of 5-year plans for RES, which set 2020 targets for individual technologies. The renewable power purchase guidelines for wind and solar, also published in 2016, mandate grid enterprises to buy renewable power at a nationally determined benchmark price. To promote PV industry sustainability, the National Energy Administration introduced a new mechanism for managing the scale of PV projects and for competitive bidding.
In March 2018, China announced Renewable Electricity Quotas, which will introduce renewable energy obligations for electricity users and provinces, differentiated by hydro and other renewables. In April 2018 the Action Plan for the Development of a Smart Photovoltaic Industry was approved; this policy aims to strengthen the PV manufacturing industry.

Existing targets for renewable electricity generation

2020: 27%
SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

By 2020:
Hydro: 340 GW | Solar: 110 GW | Wind: 210 GW

627.4 gCO_2/kWh
GRID EMISSION FACTOR (2016)

SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

Sources: IEA, REN21, World Development Indicators * Including hydropower

AMBITION

NDC target

Committed to lower carbon dioxide emissions per unit of GDP by 60–65% in 2030 compared to 2005 and to peak in GHG emissions by 2030 or earlier.

Transport realated target

- Promote the share of public transport in motorised travel in large- and medium-sized cities (30% share by 2020)

Transport related measures

- Improve the quality of gasoline and promote new types of alternative fuels and new energy vehicles and vessels
- Develop dedicated transport system for pedestrians and bicycles in cities and advocate green travel
- Develop smart transport and green freight transport

Targets at national level

- 30% public transport share in cities
- 5% CO_2 reduction per road revenue passenger km
- 13% CO_2 reduction per road freight tonne km
- 15% CO_2 reduction per unit of railway traffic
- 13% CO_2 reduction per unit of waterway traffic
- 11% CO_2 reduction per unit of civil aviation traffic

EV deployment targets

- 5 million EVs by 2020
- 4.8 million EV charging points by 2020
- New energy vehicle (NEV) mandate: 12% NEV credit sales of passenger cars by 2020
- NEV sales share: 7–10% by 2020, 15–20% by 2025 and 40–50% by 2030

Source: NDC, National Plan on Climate Change (2014–2020) GIZ Sustainable Transport in China; IEA EV Outlook 2018

TRADE-OFFS

Sustainability of biofuels

China promotes the development of ethanol production using non-food grain feedstocks. Policies and defined subsidy benefits have historically discouraged ethanol production using corn, wheat, and rice feedstocks. State policies prescribed that biofuel development (including fuel ethanol and biodiesel) should not compete for arable land with crops designated for human consumption.

Source: OECD

Subsidies

71.65 Billion CNY

~10.6 BILLION USD
LEVEL OF FOSSIL FUEL SUBSIDIES
IN THE TRANSPORT SECTOR (2016)

Source: OECD

Fossil fuel prices in China are regulated by national, regional, and local authorities. Subsidies for fossil fuels in China mainly come in the form of direct payments under the petroleum price-reform support programmes. Support for gasoline under the programmes stopped in 2016 and support for diesel has decreased to roughly one-third of the amount provided in 2014. Since 2009, aviation fuel for domestic flights is exempt from excise tax.

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	Transit Metropolis Programme 2011: encourages and supports cities in improving their public transport systems, inter-modal integration and transit-oriented developments.
✔ **Measures to support low-carbon freight logistics**	3-Year-Plan for the Further Development of Structural Adjustment in the Transport Sector (approved in June 2018)
✔ **National measures to support new mobility services**	In August 2017, the MoT together with the Ministry of Housing and Urban-Rural Development (MoHURD) released a guiding policy draft for the promotion of car-hailing. Since May 2018 a tentative regulation for the road testing of intelligent connected vehicles (ICVs) has been in place.
✔ **National measures to support non-motorised transport**	In August 2017 guidelines for bike-sharing were released
✔ **Road charges**	Charges for all types of vehicles on highways

Energy

✔ **Energy/carbon emission standards LDV**	Phase IV fuel efficiency target for 2020: 5l/100km Passenger cars: 117 g/km Light commercial: 166 g/km
✔ **Energy/carbon emission standards HDV**	Phase 2 fuel efficiency standards tighten vehicle consumption limits for tractors, trucks and coaches
✔ **Pricing instruments**	Aviation covered in national ETS
✔ **Mandatory vehicle labelling**	Fuel economy labeling for vehicles under 3500 kg
✔ **Support mechanism for electric vehicles & charging infrastructure**	New Energy Vehicle (NEV) mandate (in force since April 2018) Government subsidies for public charging infrastructure Acquisition tax and excise tax exemption, circulation and ownership tax exemption
✔ **Support for other low-carbon fuels and propulsion systems**	New Energy Vehicle (NEV) mandate (in force since April 2018) Subsidies for the purchase of energy-efficient vehicles U.S.-China Race to Zero Emissions (R2ZE) challenge (buses and heavy duty vehicles) Biofuels for air transport approved for usage
✔ **Mandatory biofuel targets**	China does not have a national requirement for biofuels. However, the National Climate Change Plan (2014) sets a target of 130 billion cubic meters of biofuel consumption by 2020.

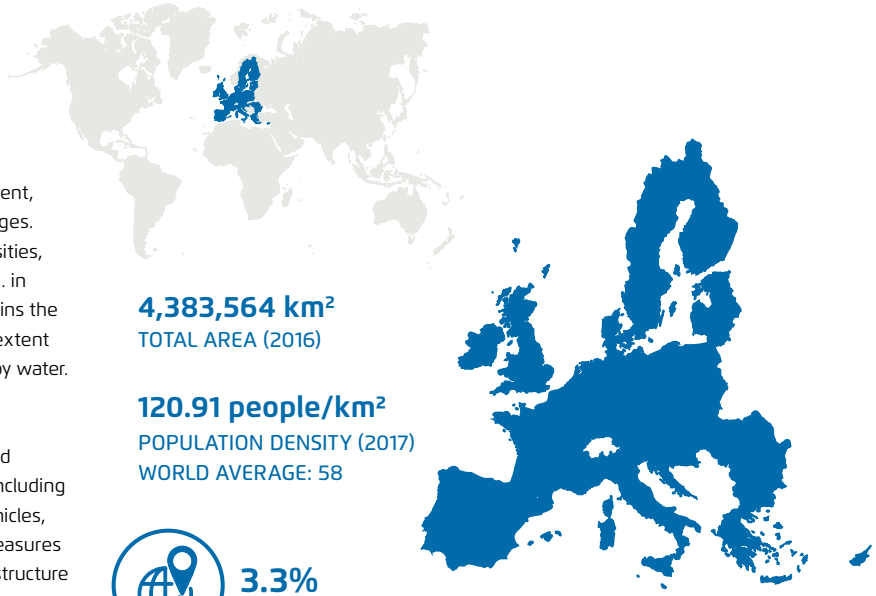
Source: See national sources China

EUROPEAN UNION

The EU comprises 28 member states on the European continent, each of which have divergent transport systems and challenges. Most EU member states have relatively high population densities, although there are numerous regions with low densities (e.g. in Sweden, Finland or the centre of Spain). Road transport remains the most important travel mode for passengers and to a lesser extent for freight. Approximately one-third of goods are transported by water.

The EU has the long-term goal to reduce GHG emissions by at least 60% by 2050 relative to 1990. Many measures related to the efficiency of vehicles are governed by EU legislation, including CO_2 emission standards for passenger cars and light duty vehicles, and mandatory labeling requirements. The EU has limited measures to support a modal shift, and mainly uses guidelines and infrastructure funds to support member states in the area of climate policy.

Sources: 7th National Communication



4,383,564 km²
TOTAL AREA (2016)

120.91 people/km²
POPULATION DENSITY (2017)
WORLD AVERAGE: 58

3.3%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

NO DATA*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: **0.72** Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

37,205 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: **19,524**

WORLD AVERAGE: **15,469**

16.37%
SHARE IN GLOBAL GDP (2017)

POPULATION

512.5 mio people
POPULATION CURRENT (2017)

6.8%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION

75.4% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

NO DATA
POPULATION IN URBAN AREAS OF > 1 MIO (2017)
SHARE IN TOTAL POPULATION (2017)

Source: World Development Indicators

MOBILITY

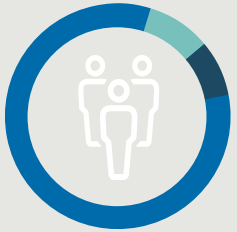
587 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2016)

= 100 Inhabitants
= 100 Motor vehicles

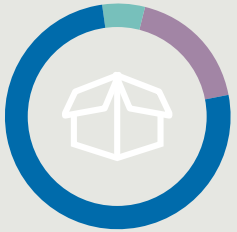
Sources: ACEA, Eurostat

NO DATA
PASSENGER TRANSPORT VOLUME*

NO DATA
FREIGHT TRANSPORT VOLUME**



Passenger-km per mode (2016)
- Road, Car: 83%
- Road, Bus: 9%
- Rail: 8%



Tonne-km per mode (2016)
- Road: 76%
- Inland waterways: 6%
- Rail: 18%
- Pipeline: 0%
- Domestic air: 0%

* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

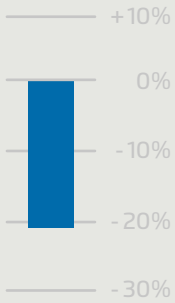
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Total CO_2 emissions from fuel combustion in the European Union have decreased by 21% since 1990. Transport sector emissions during the same period have increased by almost 17%, and could grow up to 59% by 2030. Road transport is responsible for 93% of transport sector emissions, with rail generating 2.5% of emissions.

3201.2 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2015)



-21%

CHANGE IN TOTAL EMISSIONS (1990–2015)

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2015)

6.25

5.52
G20 AVERAGE[1]

4.3
WORLD AVERAGE

9.89%
SHARE IN GLOBAL EMISSIONS (2015)

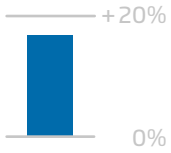
t CO_2 per capita

Sources: UNDESA, UNFCCC, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

886.9 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2015)



17%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2015)

TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2015/2030)

2015

1.73

1.12
G20 AVERAGE[1]

2030

2.19

2.32
G20 AVERAGE[1]

t CO_2 per capita

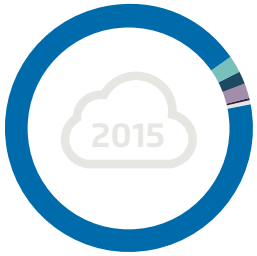
Sources: UNFCC, IEA, UNDESA, SLoCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2015)

24%
WORLD AVERAGE

20%
G20 AVERAGE[1]

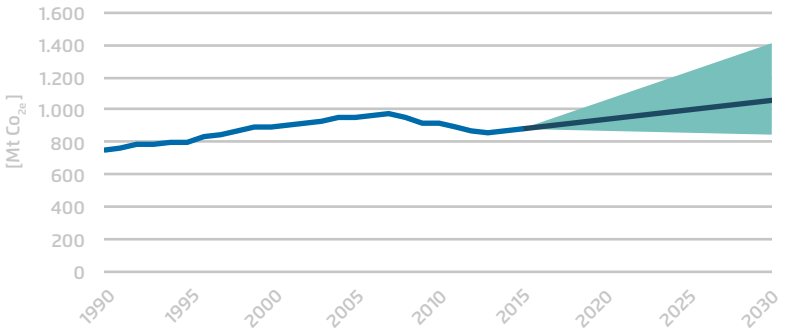
TRANSPORT EMISSIONS BY SUBSECTOR



- Road: 93.4%
- Rail: 2.4%
- Domestic navigation: 1.6%
- Domestic aviation: 1.8%
- Pipeline: 0.4%
- Non-specified: 0.4%

Source: IEA

Historic and projected* emissions in the transport sector



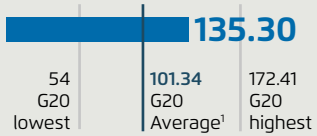
Year: 2017

* Projected emissions under an average business-as-usual scenario

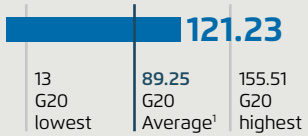
Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



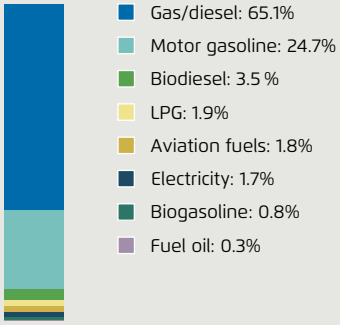
DIESEL PRICE (2017)
US Cents/Litre



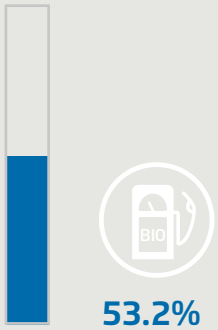
Source: European Commission*

* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel

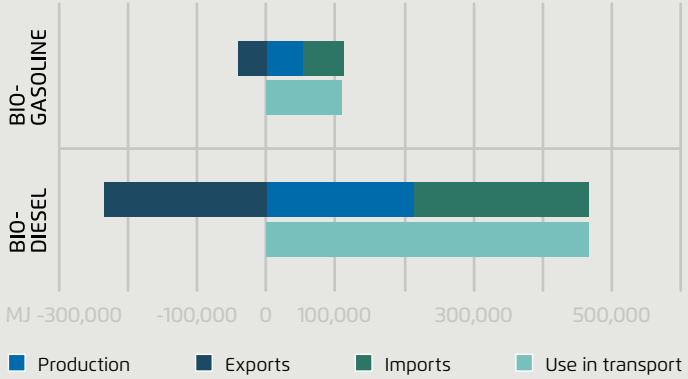


Year: 2016 Source: IEA



53.2%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

NO DATA
BATTERY

NO DATA
PLUG-IN HYBRID

NEW REGISTRATIONS OF ELECTRIC CARS (2016)

NO DATA
BATTERY

NO DATA
PLUG-IN HYBRID

NO DATA
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)

%

SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)

%

PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2015)

76,420 *
SLOW CHARGE

6,908 *
FAST CHARGE

16,434 *
SLOW CHARGE
G20 AVERAGE[1]

5,678 *
FAST CHARGE
G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

The EU has set renewable energy targets and requires member states to define action plans for meeting their obligations. It does not have any EU-wide support mechanisms, but has issued guidance for the design of support schemes.

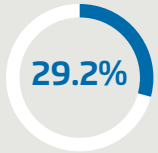
Existing targets for renewable electricity generation

No specific target for renewable electricity generation. This is included in the overall renewable energy target of 20% renewable energy in gross final energy consumption by 2020 and 32% by 2030

Existing targets for capacity

No capacity targets

299 gCO_2/kWh
GRID EMISSION FACTOR (2016)



SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

NO DATA
ELECTRICITY USE IN TRANSPORT (2016)

SHARE IN TOTAL ELECTRICITY USE

Sources: IEA, EC, World Development Indicators * Including hydropower

AMBITION

NDC target

Committed to at least 40% reduction in GHG emissions in 2030 compared to 1990

Transport realated target

No mention

Transport related measures

No mention

EV deployment targets

- Proposed post-2020 targets for cars and vans: 15% EV sales by 2025 and 30% by 2030

Targets at EU level

60% reduction in GHG emissions in EU transport sector by 2050 relative to 1990.

Additional targets:

- Minimum 10% share of renewables in final energy consumption of the transportation sector by 2020
- As of 2017, biofuels and bio-liquids must achieve a 50% emissions reduction to qualify as such.

The 2011 White Paper on Transport aims to cut conventional car use in cities 50% by 2030, and to phase them out completely by 2050.

Source: NDC, EU 7th National Communication; Grantham Research Institute; IEA EV Outlook 2018; EU White Paper 2011

TRADE-OFFS

Sustainability of biofuels

The EU Renewable Energy Directive establishes two sets of criteria to promote the sustainability of biofuels production: (1) GHG emissions savings and land use requirements must be at least 50% (60% for new installations in 2018), and (2) biodiesel may not be produced on land that was converted from high carbon density conditions such as rainforests.
To demonstrate compliance with the EU sustainability criteria, biofuels need to be validated by national verification systems or by one of 20 voluntary schemes approved by the EC. In 2015, the ILUC Directive capped the share of conventional biofuels that can be used to meet the transport sector's 10% blend target at 7%. It also requires that advanced biofuels comprise 0.5% of the transport sector's energy use by 2020. To further incentivize advanced biofuel use, the amendment allowed MS to double count the contribution of advanced biofuels to meeting these binding targets.

Subsidies

NO DATA

LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

The EU does not provide direct subsidies for fossil transport fuels. Subsidies in the sector are defined at the members state level.

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	Connecting Europe Facility (CEF) for Transport Action Plan on Urban Mobility
✔ **Measures to support low-carbon freight logistics**	Connecting Europe Facility (CEF) for Transport European Rail Network for Competitive Freight (Regulation EU 913/2010) Proposed revisions of the Eurovignette Directive 1999/62/EC and of the European Electronic Tolling Service (EETS) Directive 2004/52/EC could promote a move from vehicle-based taxes to distance-based charging for heavy goods vehicles
✔ **National-level measures to support new mobility services**	European Strategy on Cooperative Intelligent Transport Systems
✔ **National measures to support non-motorised transport**	Support for the development of cycle infrastructure in eligible regions under the European Structural and Investment Funds
Road charges	No EU-wide charges apply; user charges for heavy goods vehicles

Energy

✔ **Energy/carbon emission standards LDV**	EU CO_2 efficiency targets Passenger cars: 95 g/km (2021) Light commercial: 147 g/km (2020) Proposed targets for 2030 would reduce average emissions of new cars and vans by 30% compared to 2021
✔ **Energy/carbon emission standards HDV**	Proposed targets for average CO2 emissions from new lorries presented in May 2018: In 2025, 15% lower than in 2019; In 2030, at least 30 % lower than in 2019
✔ **Pricing instruments**	Inclusion of domestic and international aviation in EU-ETS
✔ **Mandatory vehicle labelling**	Car Labelling Directive 1999/94/EC
Support mechanism for electric vehicles & charging infrastructure	Standards for interoperability of charging infrastructure No known direct incentives for EVs at the EU-level.
✔ **Support for other low-carbon fuels and propulsion systems**	Renewable energy targets 2020: 10% of transport fuels from renewable sources Fuel Quality Directive (2009/30/EC) requires member states to reduce the GHG intensity of fuel by 6% by 2020
✔ **Mandatory biofuel targets**	The EU has a mandatory requirement of 10% renewable energy in transport by 2020

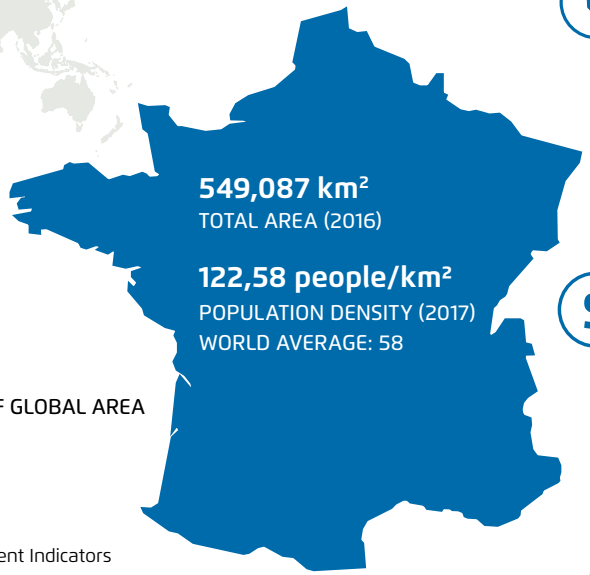
Source: See national sources EU

FRANCE

With 67 million inhabitants, France is the second most populace country in Europe. Nearly 20% of the population is clustered in the Paris region, and the transport system is similarly centralised, with many roads and railway lines leading to and from the French capital. Road transport is by far the leading mode of transport for passengers and freight, despite the country's extensive rail and waterway systems.

France has set ambitious targets for the transport sector. By 2020 it aims to reduce transport emissions back to 1990 levels. By 2050 emissions are to be reduced by 70% in relation to 2013 levels. France has implemented a wide range of measures to promote low-carbon transport and energy sectors, including the goal of removing GHG emitting cars from the market by 2040.

Sources: BUR 2016; CIA World Factbook; Climate Plan 2017



0.4%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.90 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72 Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

38,606 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524

WORLD AVERAGE: 15,469

2.22%
SHARE IN GLOBAL GDP (2017)

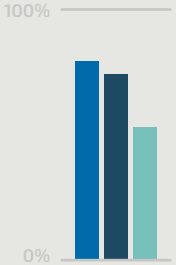
POPULATION

67.1 mio people
POPULATION CURRENT (2017)

0.9%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION



80.2% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

15,2 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)

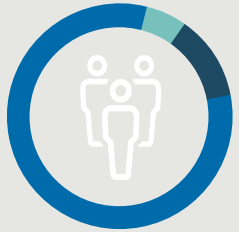
Source: World Development Indicators

MOBILITY

643 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2016)

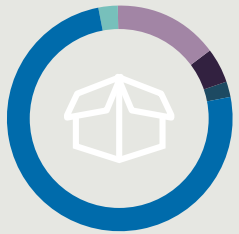
= 100 Inhabitants
= 100 Motor vehicles

925,853 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2017)



Passenger-km per mode (2017)
- Road, Car: 82%
- Road, Bus: 6%
- Rail: 12%

218,214 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2017)



Tonne-km per mode (2017)
- Road: 75%
- Inland waterways: 3%
- Rail: 15%
- Pipeline: 5%
- Domestic air: 2%

Sources: ITF/OECD, World Development Indicators

* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

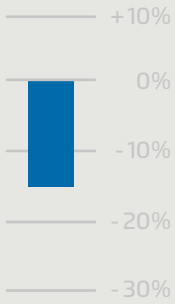
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Total CO_2 emissions from fuel combustion in France have decreased by 15% since 1990 and per capita emissions are just below the world average. Over the same period, however, transport sector emissions have increased by over 7%, after falling from a peak in 2002. Under a business-as-usual scenario, sector emissions are projected to increase up to 29% by 2030. As the French energy sector relies heavily on nuclear power, energy-sector CO_2 emissions are relatively low, causing transport to represent 42% of emissions in 2015.

292.9 Mt CO_2

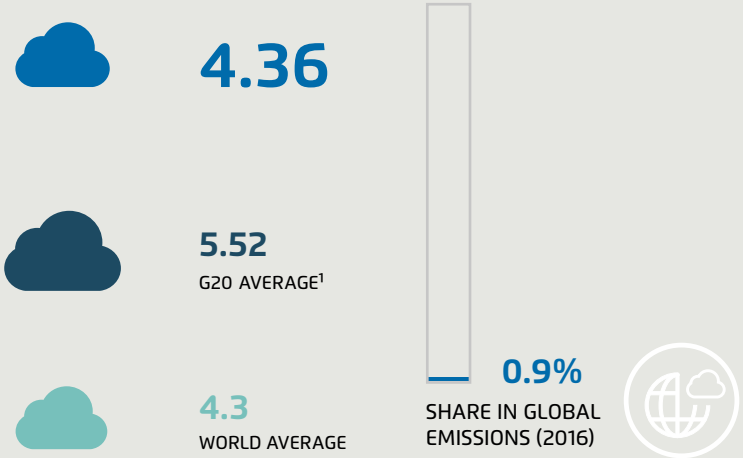
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2016)



-15%

CHANGE IN TOTAL EMISSIONS (1990–2016)

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2016)



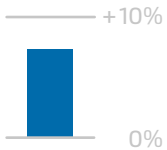
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

121.9 Mt CO_2

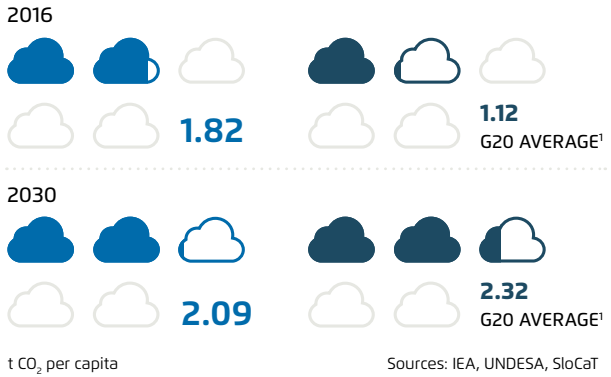
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2016)



7.4%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2016)

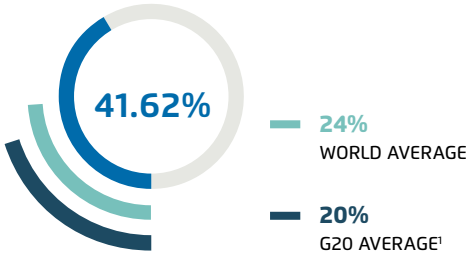
TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2016/2030)



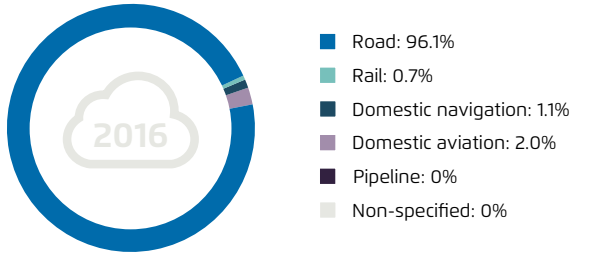
t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2016)

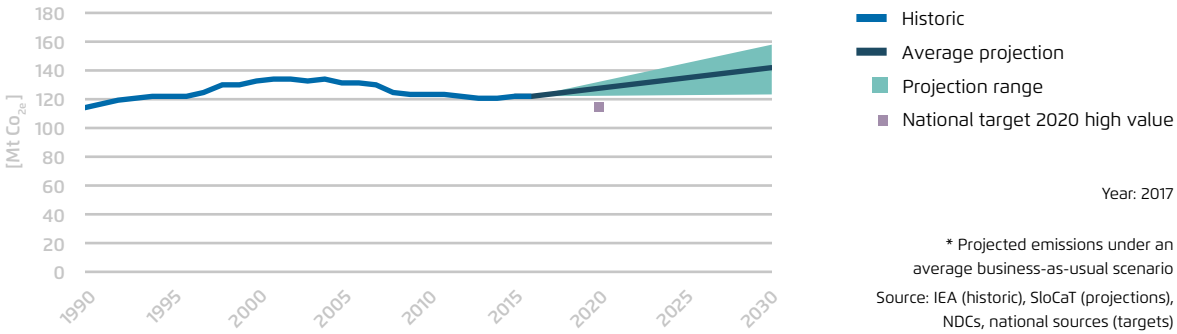


TRANSPORT EMISSIONS BY SUBSECTOR



Source: IEA

Historic and projected* emissions in the transport sector



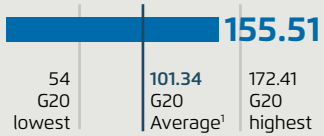
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

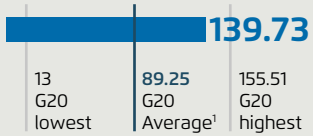
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



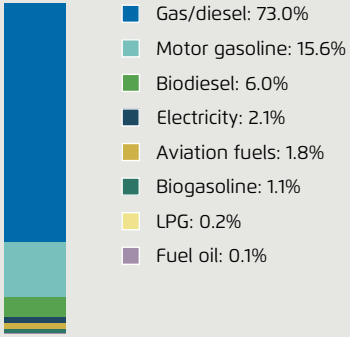
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre

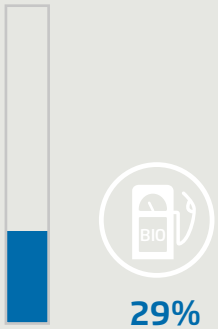


* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel

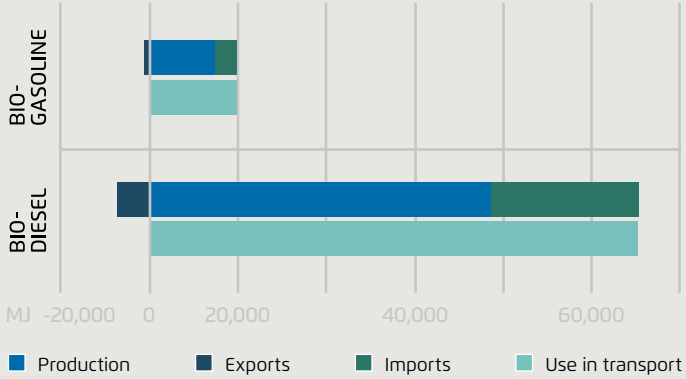


Year: 2016 Source: IEA



29%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

92,950
BATTERY

25,820
PLUG-IN HYBRID

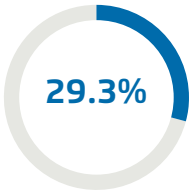
NEW REGISTRATIONS OF ELECTRIC CARS (2016)

25,980
BATTERY

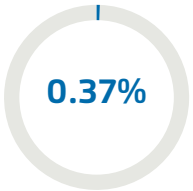
8,790
PLUG-IN HYBRID

1.7%
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)



SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)



PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2017)

14,407* SLOW CHARGE

1,571* FAST CHARGE

16,434* SLOW CHARGE G20 AVERAGE[1]

5,678* FAST CHARGE G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

France has the lowest grid emission factor within the G20, thanks to power generation predominantly from nuclear, followed by renewables. Various policies promote RES development in France, including a feed-in and premium tariff system, tax incentives, training programmes, certification schemes and R&D support.

Existing targets for renewable electricity generation

2020: 23% | 2030: 40%
SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

Hydro: 25.8–26.05 GW by 2030
Solar: 18.2–20.2 GW by 2023
Wind (onshore): 20.8–26 GW by 2023
Wind (offshore): 3 GW by 2023
Ocean: 380 MW by 2020

52.3 gCO_2/kWh
GRID EMISSION FACTOR (2016)

SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

NO DATA
ELECTRICITY USE IN TRANSPORT (2016)

SHARE IN TOTAL ELECTRICITY USE

Sources: IEA, Convenant of Mayors, World Development Indicators, RES LEGAL Europe * Including hydropower

AMBITION

NDC target

See EU: committed to a 40% reduction in GHG emissions in 2030 compared to 1990

Transport realated target

No mention

Transport related measures

No mention

EV deployment targets

Currently under revision

Targets at national level

- In 2009 France set the target of reducing greenhouse gas emissions from transport to their 1990 level by 2020.
- The Low Carbon Strategy submitted to the UNFCCC sets a target to reduce transport emissions by 29% compared to 2013 levels by the third carbon budget, and by at least 70% by 2050.
- In July 2017, France set the goal to taking greenhouse gas emitting cars off the market by 2040.
- A target of 0.7 TWh of bioNGV was set for 2018 and 2 TWh in 2023, so that bioNGV will represent 20% of NGV consumption in 2023.

Source: NDC, Law no 2009-967; National Low Carbon Strategy 2016; Climate Plan 2017

TRADE-OFFS

Sustainability of biofuels

The EU Renewable Energy Directive establishes two sets of criteria to promote the sustainability of biofuels production: (1) GHG emissions savings and land use requirements must be at least 50% (60% for new installations in 2018), and (2) biodiesel may not be produced on land that was converted from high carbon density conditions such as rainforests.
To demonstrate compliance with the EU sustainability criteria, biofuels need to be validated by national verification systems or by one of 20 voluntary schemes approved by the EC. In 2015, the ILUC Directive capped the share of conventional biofuels that can be used to meet the transport sector's 10% blend target at 7%.
It also requires that advanced biofuels comprise 0.5% of the transport sector's energy use by 2020. To further incentivize advanced biofuel use, the amendment allowed MS to double count the contribution of advanced biofuels to meeting these binding targets.

Subsidies

4.78 Billion EUR

~5.39 BILLION USD
LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

Source: OECD

While France is taking a lead in ending support to fossil fuel exploration and production (with a few exemptions), fossil fuel subsidies mainly take the form of partial or full exemptions and VAT and excise duty refunds on oil products, including full excemption on consumption taxes for certain French oversees territories. Users in the farming, forestry and construction sectors as well as road freight above 7.5t benefit from lower rates of excise tax. Petroleum products sold in Corsica benefit from a reduced VAT rate. Domestic aviation and domestic freight on waterways are exempt from excise tax. Overall support relevant for the transport sector increased by around 17% between 2014 and 2016.

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	Development of High Speed Railway Lines (HSL) and dedicated-lane public transport (757 km of additional new high-speed lines put into service between 2015 and 2020)
✔ **Measures to support low-carbon freight logistics**	Objectif CO_2 Financial support scheme for „combined transport" where the main link of the transport chain is rail, waterway or maritime
National measures to support new mobility services	A „mobility law" is currently under development and will include elements to promote shared mobility.
✔ **National measures to support non-motorised transport**	Action Plan for Soft Mobility - Walking and Cycling Bicycle milage allowance (voluntary) scheme Tax reductions for companies providing bicycles for employees Obligation to create secure bicycle parking Financial assistance for electric bicycles
✔ **Road charges**	Heavy vehicle eco-tax per km for using the national private road network General tolls apply for most highways

Energy

✔ **Energy/carbon emission standards LDV**	EU CO_2 efficiency targets Passenger cars: 95 g/km (2021); Light commercial: 147 g/km (2020)
Energy/carbon emission standards HDV	Proposed targets for average CO_2 emissions from new lorries presented in May 2018: In 2025, 15% lower than in 2019; In 2030, at least 30 % lower than in 2019
✔ **Pricing instruments**	Bonus-malus system based on CO_2 Tax on high CO_2 cars; Carbon tax on fossil fuels not covered by the EU-ETS
✔ **Mandatory vehicle labelling**	National implementation of the EU Car Labelling Directive 1999/94/EC
✔ **Support mechanism for electric vehicles & charging infrastructure**	CO_2/km-based eco bonus-malus scheme Tax credit or subsidies for the installation of residential or workplace chargers; Mandated share of 'installation ready' charging infrastructure for new buildings; Company car tax credits
✔ **Support for other low-carbon fuels and propulsion systems**	Energy Transition for Green Growth Law 2015: 15% of transport fuels from renewable sources EU Fuel Quality Directive (2009/30/EC) requires member states to reduce the GHG intensity of fuel by 6% by 2020
✔ **Mandatory biofuel targets**	Mandatory shares of 7.5% for bioethanol and 7.7% for biodiesel, with limited shares for the double counting of advanced biofuels.

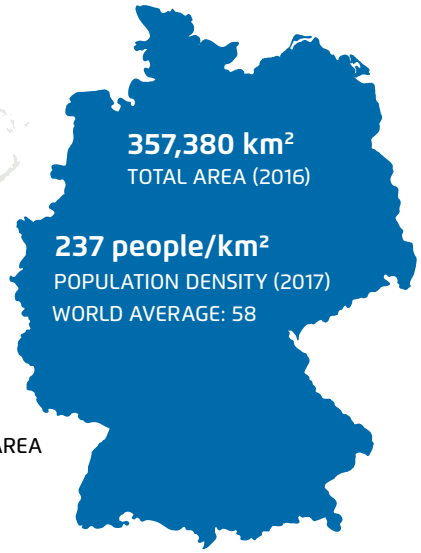
Source: See national sources France

GERMANY

Germany is the most populous country in Europe, with particularly dense urban clusters on its western borders. Despite its comparatively small size, the country has the 12th largest railway network and the 18th largest waterway system worldwide. High levels of local congestion and air pollution are an issue, particularly in select urban centres.

Germany has set an absolute target for domestic transport sector emissions in 2030 of 95–98 Mt CO_2. While the original target of one million electric cars on the road by 2020 will not be met, the government has established a support scheme for electric charging stations. Germany has implemented a number of measures to enhance energy efficiency and reduce the carbon content of fuels, but has done less to promote alternative modes of transport.

Sources: 7th National Communication; CIA World Factbook; IEA EV Outlook 2018



0.3%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.93 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72 Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

45,229 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524

WORLD AVERAGE: 15,469

3.21%
SHARE IN GLOBAL GDP (2017)

POPULATION

82.7 MM people
POPULATION CURRENT (2017)

1.1%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION

77.3% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

7,9 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)

Source: World Development Indicators

MOBILITY

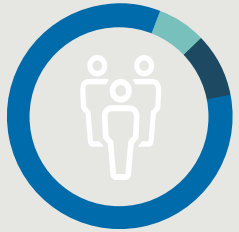
685 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2016)

= 100 Inhabitants

= 100 Motor vehicles

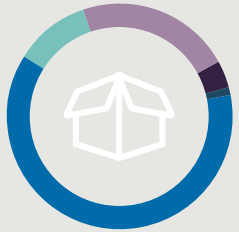
Sources: ITF/OECD, World Development Indicators

1,123,094 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2016)



Passenger-km per mode (2016)
- Road, Car: 84%
- Road, Bus: 7%
- Rail: 9%

506,523 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2017)



Tonne-km per mode (2017)
- Road: 62%
- Inland waterways: 11%
- Rail: 22%
- Pipeline: 4%
- Domestic air: 1%

* Includes road and rail transport, not aviation and non-motorised transport modes

** Includes road, rail, inland waterways, pipeline transport and domestic air transport

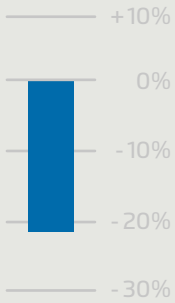
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Germany's total CO_2 emissions from fuel combustion have decreased by 22% since 1990. Emissions in the transport sector increased up to 1999, decreased until 2009 and have been slowly growing since then. In 2016, emissions from transport were 1.5% up from 1990 levels. Given current trends, transport sector emissions are projected to grow by as much as 41% by 2030 while also capturing a larger share of overall emissions. Road transport is by far the largest source of German transport-sector emissions, with a 94% share, followed by rail, representing just below 4% of emissions.

731.6 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2016)



-22%

CHANGE IN TOTAL EMISSIONS (1990–2016)

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2016)

8.85

5.52

G20 AVERAGE[1]

4.3

WORLD AVERAGE

2.26%

SHARE IN GLOBAL EMISSIONS (2016)

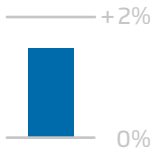
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

161 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2016)

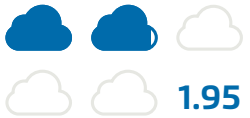


1.5%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2016)

TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2016/2030)

2016

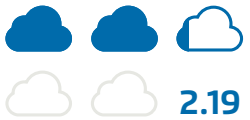


1.95

1.12

G20 AVERAGE[1]

2030



2.19

2.32

G20 AVERAGE[1]

t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2016)

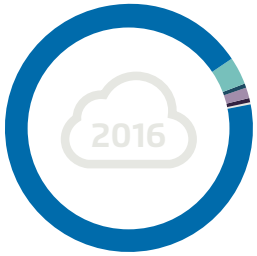
24%

WORLD AVERAGE

20%

G20 AVERAGE[1]

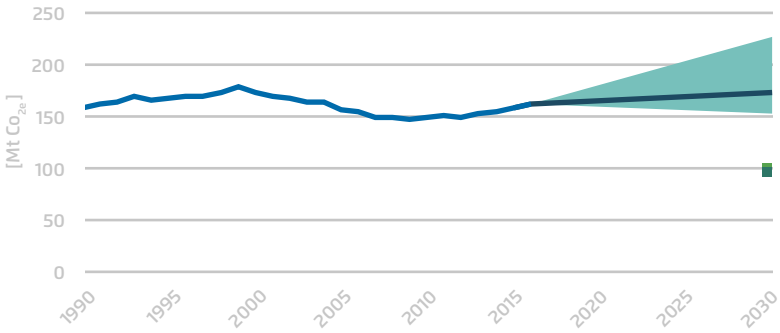
TRANSPORT EMISSIONS BY SUBSECTOR



- Road: 93.7%
- Rail: 3.7%
- Domestic navigation: 0.5%
- Domestic aviation: 1.4%
- Pipeline: 0.4%
- Non-specified: 0.2%

Source: IEA

Historic and projected* emissions in the transport sector



- Historic
- Average projection
- Projection range
- National target 2030 high value
- National target 2030 low value

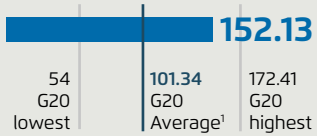
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

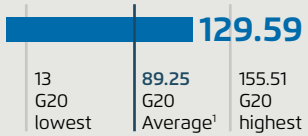
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



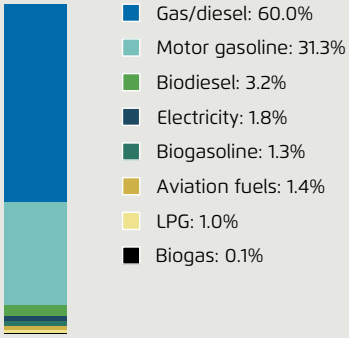
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre

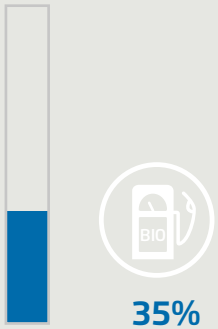


* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel

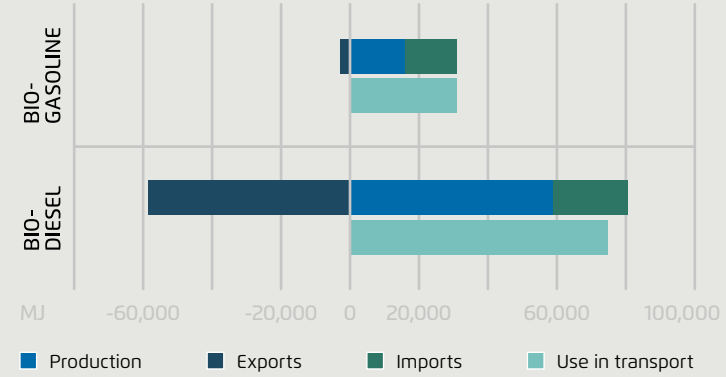


Year: 2016 Source: IEA



35%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

59,090
BATTERY

50,470
PLUG-IN HYBRID

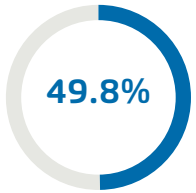
NEW REGISTRATIONS OF ELECTRIC CARS (2016)

25,980
BATTERY

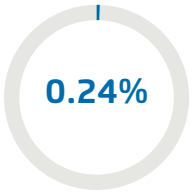
29,500
PLUG-IN HYBRID

1.6%
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)



SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)



PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2017)

22,213* SLOW CHARGE

16,434* SLOW CHARGE G20 AVERAGE[1]

2,076* FAST CHARGE

5,678* FAST CHARGE G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

Coal is still the dominant fuel source for power generation in Germany, representing 44% of the power mix (global average: 39%). Germany has a renewable energy law (EEG) that regulates access for renewables and provides incentives. The law used to set fixed feed-in tariffs for individual technologies over a 20-year period. In 2017 an auction system was rolled out for solar, wind and biomass. Rooftop PV installations below 750 kW still receive a fixed feed-in tariff. In 2017 the tenant electricity surcharge was added to the EEG, which supports electricity produced and consumed in the same residential building. Since 2018 large solar PV and onshore wind developments are being jointly tendered in pilot projects in order to test technology-neutral tendering.

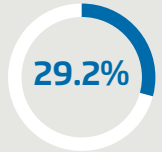
Existing targets for renewable electricity generation

2025: 40–45% | 2035: 55–60% | 2050: 80%
SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

Biomass: 100 MW added per year
Solar: 2.5 GW added per year
Wind (onshore): 2.5 GW added per year
Wind (offshore): 6.5 GW added by 2030

446.7 gCO_2/kWh
GRID EMISSION FACTOR (2016)



SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

Sources: IEA, REN21, World Development Indicators * Including hydropower

AMBITION

NDC target

See EU: committed to a 40% reduction in GHG emissions in 2030 compared to 1990.

Transport realated target

no mention

Transport related measures

no mention

EV deployment targets

- Germany set a target of 1 million electric cars by 2020, but already announced that this target will not be met
- Target of 100,000 public electric charging stations to be installed by 2020

Targets at national level

- The National Climate Plan 2050 sets an absolute target for 2030 at 95–98 $MtCO_{2e}$.
- The Energy Strategy from 2010 sets the target to reduce primary energy consumption in the transport sector by 10% by 2020 and 40% by 2050.
- The National Sustainability Strategy 2016 set targets to reduce primary energy consumption for passenger transport and freight by 15–20% by 2030 compared to 2005.
- The transport system in Germany will be virtually decarbonised by 2050.

Source: NDC, National Climate Plan 2050; Energy Strategy 2010; National Sustainability Strategy 2016; IEA EV Outlook 2018

TRADE-OFFS

Sustainability of biofuels

The EU Renewable Energy Directive establishes two sets of criteria to promote the sustainability of biofuels production: (1) GHG emissions savings and land use requirements must be at least 50% (60% for new installations in 2018), and (2) biodiesel may not be produced on land that was converted from high carbon density conditions such as rainforests. To demonstrate compliance with the EU sustainability criteria, biofuels need to be validated by national verification systems or by one of 20 voluntary schemes approved by the EC. In 2015, the ILUC Directive capped the share of conventional biofuels that can be used to meet the transport sector's 10% blend target at 7%. It also requires that advanced biofuels comprise 0.5% of the transport sector's energy use by 2020. To further incentivize advanced biofuel use, the amendment allowed MS to double count the contribution of advanced biofuels to meeting these binding targets.

Source: OECD

Subsidies

1.41 Billion EUR

~1.59 BILLION USD
LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

Source: OECD

Kerosene for aviation and fuel used for domestic navigation are exempt from fuel tax and international flights are additionally exempt from VAT. Tax deductions for commuting and for company fleets incentivise the use of cars at the expense of more climate friendly modes of transport. Subsidy levels in the transport sector have increased slightly since 2014.

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	Increase in federal funds for local rail transport Support for the national introduction of e-ticketing and improved passenger information
✔ **Measures to support low-carbon freight logistics**	Public grants for transport hubs to support modal shift Subsidies for the expansion and re-activation of unused rail infrastructure
✔ **National measures to support new mobility services**	Car-sharing law (legal framework to enable community-level support through parking priviliges and stations on publicly owned areas)
✔ **National measures to support non-motorised transport**	National Cycling Plan 2020
Road charges	Toll for heavy goods vehicles on highways (Federal Trunk Road Toll Act), depending on the pollutant class From 1 July 2018 expansion to other federal roads and approved increase in tolls from 2019

Energy

✔ **Energy/carbon emission standards LDV**	EU CO_2 efficiency targets Passenger cars: 95 g/km (2021); Light commercial: 147 g/km (2020)
Energy/carbon emission standards HDV	Proposed targets for average CO_2 emissions from new lorries: In 2025, 15% lower than in 2019; in 2030, at least 30% lower than in 2019.
✔ **Pricing instruments**	Circulation tax partly based on CO_2 VAT discount for public transport
✔ **Mandatory vehicle labelling**	National implementation of the EU Car Labelling Directive 1999/94/EC
✔ **Support mechanism for electric vehicles & charging infrastructure**	Purchase rebates for EVs Ten-year circulation tax exemption, reduced to five years from 2021 300 mio euro investment subsidy programme for charging infrastructure Proposed tax rebates for electric company cars
✔ **Support for other low-carbon fuels and propulsion systems**	Renewable energy targets 2020: 10% of transport fuels from renewables Subsidies for LNG use in shipping Subsidies for purchase of efficient/low carbon trucks
✔ **Mandatory biofuel targets**	10% EU mandate applies to Germany; Germany mandates biofuel share to yield 4% emissions reduction, set to increase to 6% by 2020.

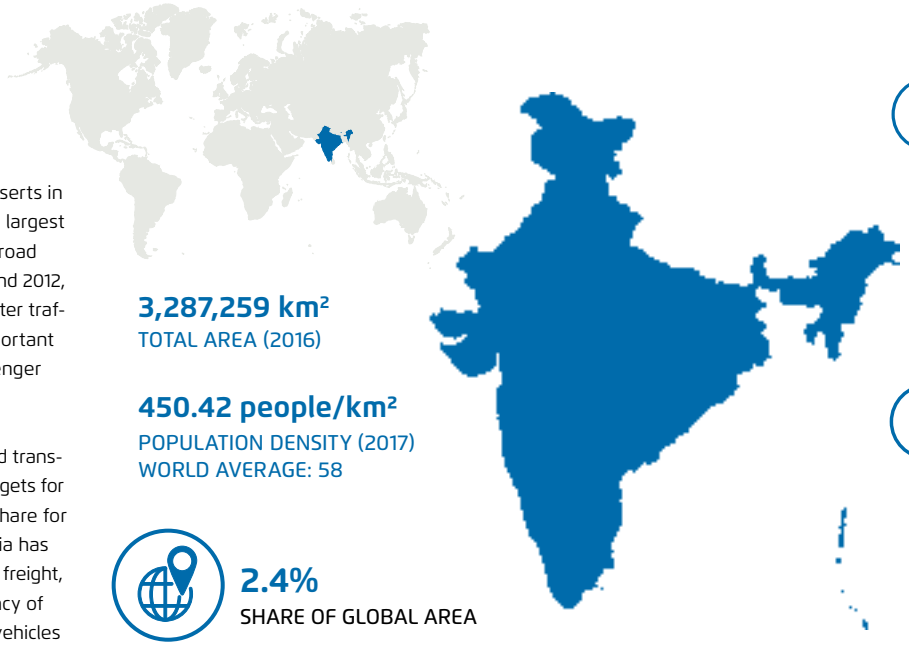
Source: See national sources Germany

INDIA

India is very densely populated, with the exception of the deserts in the northwest and mountains in the north. It hast he second largest road network in the world after the US. The total number of road vehicles grew at an average of 10% per year between 2005 and 2012, which, together with increasing urbanisation, has led to greater traffic congestion and air pollution. Indian Railways (IR) is an important transport provider, serving a large share of freight and passenger traffic demand. Some 48% of the rail network is electrified.

India is committed to further increasing the share of rail in land transport to 45%, but does not have overall emissions or energy targets for the transport sector. Important targets include a 30% sales share for electric cars and a 100% share for electric buses by 2030. India has measures in place to support public transport and low-carbon freight, as well as policies to enhance the energy and carbon efficiency of vehicles, including a fuel efficiency standard for heavy duty vehicles since April 2018.

Sources: BUR 2015 India; CIA World Factbook; IEA EV Outlook 2018



3,287,259 km²
TOTAL AREA (2016)

450.42 people/km²
POPULATION DENSITY (2017)
WORLD AVERAGE: 58

2.4%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.62 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72

Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

6,427 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524

WORLD AVERAGE: 15,469

7.39%
SHARE IN GLOBAL GDP (2017)

POPULATION

1,339.2 mio people
POPULATION CURRENT (2017)

17.8%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION

33.6% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

203.2 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)

Source: World Development Indicators

MOBILITY

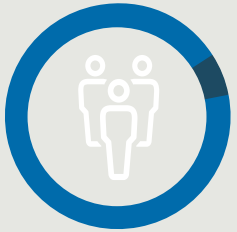
17 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2014)

= 100 Inhabitants

= 100 Motor vehicles

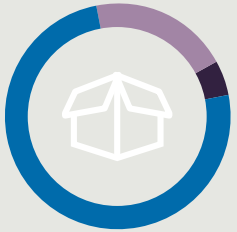
Source: ITF Outlook 2017, ITF/OECD, World Development Indicators

18,099,835 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2016)



Passenger-km per mode (2016)
- Road: 94%
- Road, Bus: 0%
- Rail: 6%

3,238,569 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2017)



Tonne-km per mode (2017)
- Road: 75%
- Inland waterways: 0%
- Rail: 20%
- Pipeline: 5%
- Domestic air: 0%

* Includes road and rail transport, not aviation and non-motorised transport modes

** Includes road, rail, inland waterways, pipeline transport and domestic air transport

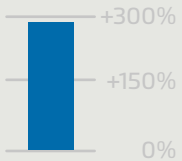
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

India's total CO_2 emissions from fuel combustion have grown by 290% since 1990. Transport sector emissions have grown at almost the same rate, increasing nearly 300% over the same period, but they represent an uncharacteristically low share of overall emissions (just over 12%). With 1.5 t CO_2 for total emissions and 0.19 t CO_2 for the transport sector, per capita emissions are the lowest in the G20. Nevertheless, transport sector emissions could more than quadruple up to 2030. Road transport is the main contributor to sector emissions, followed by rail transport with just over 8%.

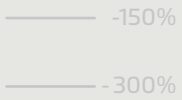
2066 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2015)

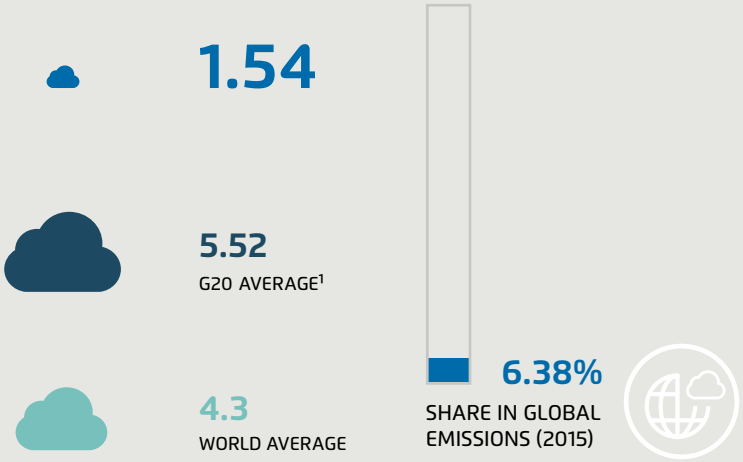


290%

CHANGE IN TOTAL EMISSIONS (1990–2015)



TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2015)



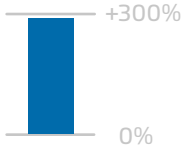
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

254.4 Mt CO_2

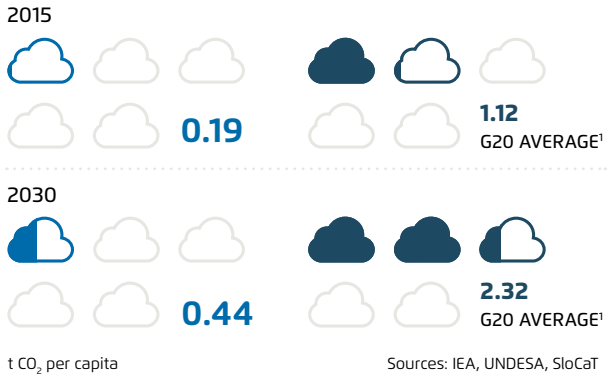
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2015)



293.8%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2015)

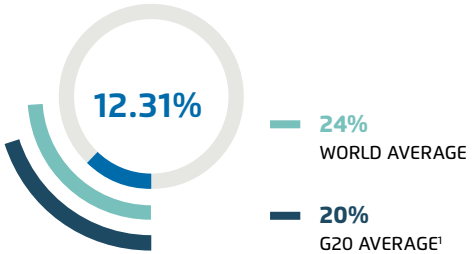
TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2015/2030)



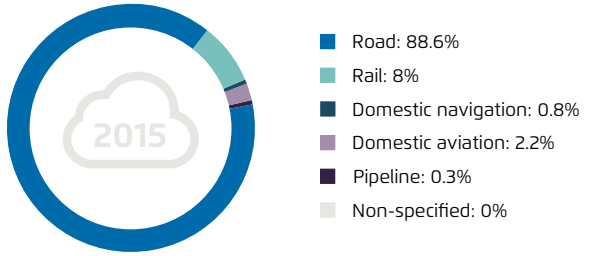
t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2015)

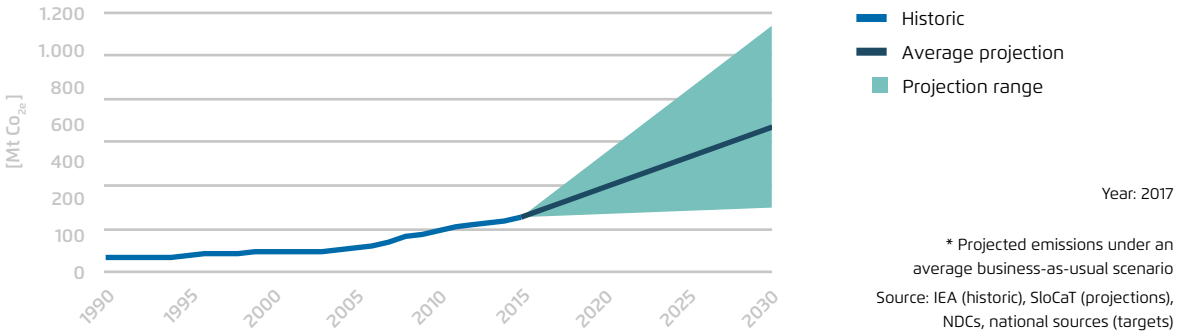


TRANSPORT EMISSIONS BY SUBSECTOR



Source: IEA

Historic and projected* emissions in the transport sector



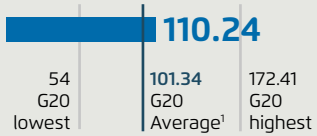
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

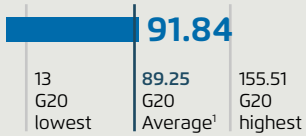
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



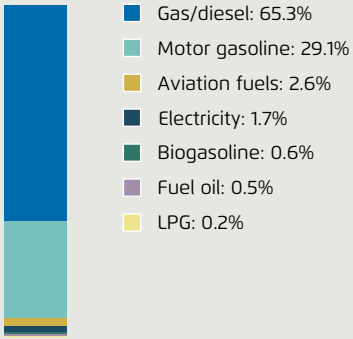
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre



* local currency prices converted using OECD annual exchange rates

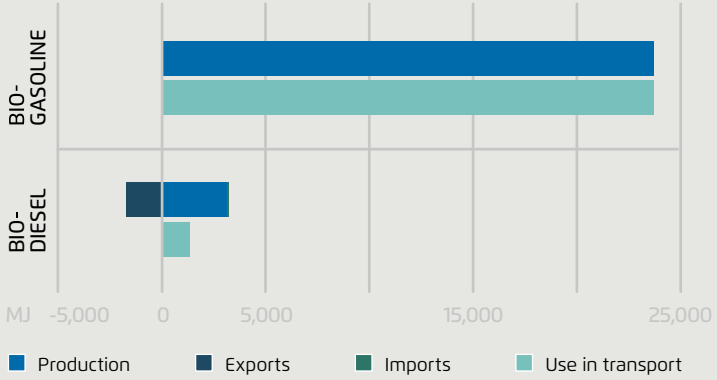
Energy use in transport by fuel



Year: 2016 Source: IEA

0%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

6,800
BATTERY

NO DATA
PLUG-IN HYBRID

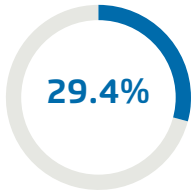
NEW REGISTRATIONS OF ELECTRIC CARS (2016)

2,000
BATTERY

NO DATA
PLUG-IN HYBRID

0.06%
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)



SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)

PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2017)

222*
SLOW & FAST CHARGE

16,434*
SLOW CHARGE
G20 AVERAGE[1]

5,678*
FAST CHARGE
G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

The development of renewables in India is driven by the 2003 Electricity Act and the 2005 National Electricity Policy, which stipulate that utilities must procure a certain percentage of power from renewables and mandate an increase in electricity from non-conventional sources. Other incentives are generation based incentives (GBI), feed-in tariffs (FIT), depreciation benefits and tax incentives. In 2011, India launched the Renewable Energy Certificates (REC) programme, a market-based mechanism for renewable energy development and investment. The Indian Renewable Energy Development Agency (IREDA) provides loans and channels funds for renewable energy development. Under the Indian Electricity Grid Code (IEGC) wind and solar power projects have to be dispatched before any other power source. Since 2010, reverse auctions have been used to procure solar PV and solar thermal capacity. In 2017, the wind energy tendering policy has been moved to the reverse auction method.

Existing targets for renewable electricity generation

(excluding hydro >25 MW) 2030: 40%
SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

By 2022: Electricity: 175 GW
Bio-power: 10 GW | Hydro (small-scale): 5 GW
Solar PV: 20 million lighting systems
Solar PV and CSP: 100 GW | Wind: 60 GW

725.8 gCO_2/kWh
GRID EMISSION FACTOR (2016)

SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

Sources: IEA, World Development Indicators, REN21; IRENA REmap India 2017

* Including hydropower

AMBITION

NDC target

Committed to reducing the emissions intensity of GDP by 33–35% in 2030 compared to 2005

Transport realated target

Increase the share of railways in total land transport from 36% to 45%

Transport related measures

- Promotion of hybrid and electric vehicles
- National policy on biofuels
- Passenger car fuel-efficiency standards
- Construction of metro lines, urban transport and mass rapid transport projects
- Promote growth of coastal shipping and inland water transport

EV deployment targets

- 30% electric car sales by 2030.
- 100% BEV sales for urban buses by 2030.

Targets at national level

India does not have a specific national emission target for the transport sector, but the National Electric Mobility Mission Plan 2020 aims to achieve a 30–35% share of CNG vehicles in new vehicle sales by 2020 and foresees 5–7 million electric vehicles by 2020.

Source: NDC, National Electric Mobility Mission Plan 2020; IEA EV Outlook 2018

TRADE-OFFS

Sustainability of biofuels

Biofuel are only to be derived from non-feed stock that is grown on degraded soils or wastelands not otherwise suited for agriculture, thus avoiding a possible conflict between fuel and food security. No biofuels may be produced from sugarcane or sugarcane juice.

Subsidies

23.73 Billion INR

~0.36 BILLION USD
LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

Source: OECD

Price subsidies for petrol and diesel were completely discontinued in the second half of 2014, and the compensation scheme for under-recoveries incurred by downstream oil companies has also been phased out. There are currently no consumption subsidies in place. There are some subsidies for LPG, but these mainly target LPG use for households (cooking). Some subsidies for oil extraction/production remain.

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	Expansion of metro rail systems Smart Cities Mission Atal Mission for Rejuvenation and Urban ransformation Urban Green Mobility Scheme is awaiting approval
✔ **Measures to support low-carbon freight logistics**	Dedicated Freight Corridors (DFCs) for rail freight Various initiatives to support Coastal Shipping and Inland Water Transport Development of multi-modal logistics parks (MLPs)
National measures to support new mobility services	No support measures at national level, but transport bill to be passed in 2018 includes regulatory measures related to „taxi aggregators".
✔ **National measures to support non-motorised transport**	National Bicycle Sharing Scheme incl. various guidelines and toolkits
Road charges	No general charges at national level

Energy

✔ **Energy/carbon emission standards LDV**	CO_2 efficiency target 2022: 113 g/km
✔ **Energy/carbon emission standards HDV**	Fuel efficiency standard for HDV >12t since 1 April 2018 From 2021 on average 10.4% increase in efficiency required
Pricing instruments	No CO_2 or energy consumption based taxes.
✔ **Mandatory vehicle labelling**	BEE Fuel Savings Guide label
✔ **Support mechanism for electric vehicles & charging infrastructure**	FAME Scheme (includes several omponents, such as demand incentives and pilot projects) ended 31 March 2018, but was extended to end September 2018 or until approval of phase 2
✔ **Support for other low-carbon fuels and propulsion systems**	Hydrogen Corpus Fund National bio-diesel mission National policy on biofuels Bio-diesel Purchase Policy Price control of ethanol and bio-diesel Indian Railways Organization for Alternate Fuels (IROAF)
✔ **Mandatory biofuel targets**	India has a mandated share of 22.5% for bioethanol (up from 10%), and 15% for biodiesel.

Source: See national sources India

INDONESIA

Indonesia, an archipelago with more than 17,000 islands, relies heavily on inter-island transport links. While the larger islands of Java, Sumatra, and Sulawesi have extensive road-dominated transport systems, many of the smaller, less developed islands rely on incomplete, fragmented, and poorly maintained road networks for internal travel and underdeveloped infrastructure for inter-island shipping. Java and Sumatra both have rail networks, but they offer limited freight service. The air sector is evolving rapidly, with strong growth driven by discount airlines.

Indonesia does not have CO_2 targets for the transport sector, although an energy efficiency target for transport is under discussion and the climate change action plan (RAN GRK) includes targets for individual measures. Measures implemented to date concentrate on the expansion of public transport and non-motorised transport systems in urban areas. Few measures are in place to support the energy/CO_2 efficiency of vehicles.

Sources: Asian Development Bank; 3rd National Communication

1,910,931 km²
TOTAL AREA (2016)

145.73 people/km²
POPULATION DENSITY (2017)
WORLD AVERAGE: 58

1.4%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.69 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: **0.72**

Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

11,189 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: **19,524**

WORLD AVERAGE: **15,469**

2.54%
SHARE IN GLOBAL GDP (2017)

POPULATION

264 mio people
POPULATION CURRENT (2017)

3.5%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION

54.7% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

35.1 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)

Source: World Development Indicators

MOBILITY

50 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2014)

= 100 Inhabitants

= 100 Motor vehicles

NO DATA
PASSENGER TRANSPORT VOLUME*

NO DATA
FREIGHT TRANSPORT VOLUME**

Passenger-km per mode
No data

Tonne-km per mode
No data

* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

Sources: ITF Outlook 2017

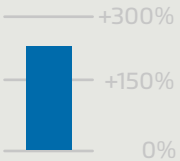
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Indonesia's total CO_2 emissions from fuel combustion have more than doubled since 1990, while transport sector emissions have almost tripled over the same period and could triple again up to 2030. Per capita emissions are among the lowest within the G20. Also, due to the geography of Indonesia, rail plays a very limited role. Road transport dominates sector emissions, although navigation and air transport do play an important role in connecting the country's islands.

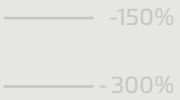
441.9 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2015)



230%

CHANGE IN TOTAL EMISSIONS (1990–2015)



TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2015)

1.67

5.52
G20 AVERAGE[1]

4.3
WORLD AVERAGE

1.36%
SHARE IN GLOBAL EMISSIONS (2015)

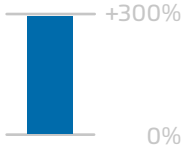
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

128.6 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2015)



299.4%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2015)

TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2015/2030)

2015

0.49

1.12
G20 AVERAGE[1]

2030

0.83

2.32
G20 AVERAGE[1]

t CO_2 per capita

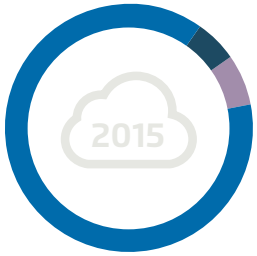
Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2015)

24%
WORLD AVERAGE

20%
G20 AVERAGE[1]

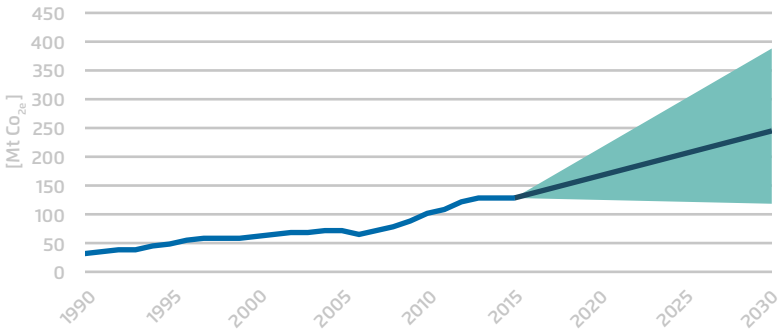
TRANSPORT EMISSIONS BY SUBSECTOR



- Road: 87.9%
- Rail: 0%
- Domestic navigation: 5.6%
- Domestic aviation: 6.5%
- Pipeline: 0%
- Non-specified: 0%

Source: IEA

Historic and projected* emissions in the transport sector



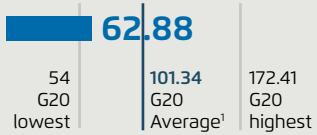
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

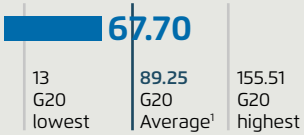
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



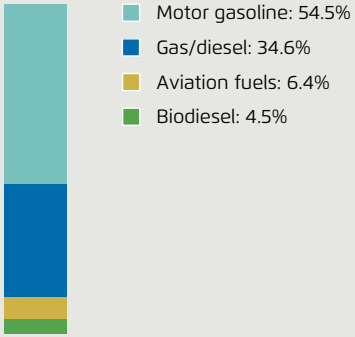
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre

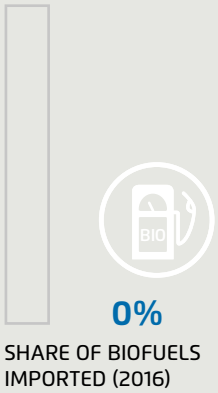


* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel

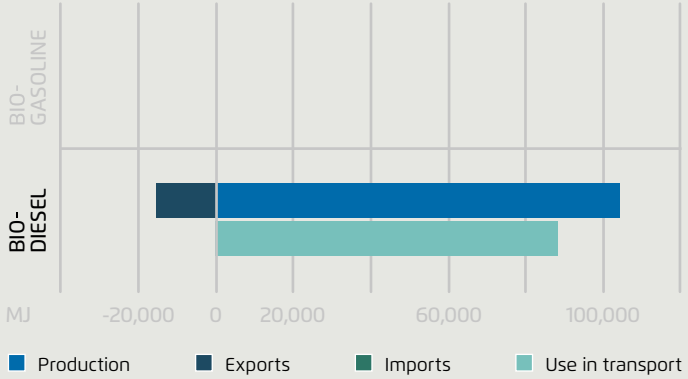


Year: 2016 Source: IEA



0%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

NO DATA
BATTERY

NO DATA
PLUG-IN HYBRID

NEW REGISTRATIONS OF ELECTRIC CARS (2016)

NO DATA
BATTERY

NO DATA
PLUG-IN HYBRID

NO DATA
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)

%

SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)

%

PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2016)

NO DATA
SLOW CHARGE

NO DATA
FAST CHARGE

16,434*
SLOW CHARGE
G20 AVERAGE[1]

5,678*
FAST CHARGE
G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

Coal is still the dominant fuel source for power generation in Indonesia, representing 56% of total generation (global average: 39%). In February of 2017 Indonesia issued its latest feed-in tariff regime for renewable energy. The regulation covers all renewable energy types and sets a price based on negotiations between independent power producers and the national electricity company PLN, capping renewable power purchase prices at 85 per cent of the local average generation cost. The regulatation was replaced in August 2017 by Regulation 50/2017, expanding the scheme to wave and tidal energy. In May 2017 a pre-qualification process was announced to develop 167.5 MW of solar projects in Sumatra, indicating that auctioning could be used in the future.

Existing targets for renewable electricity generation

2025: 23% in TPES (excluding traditional uses of bioenergy)
2050: 31%
SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

By 2025: Geothermal: 12.6 GW | Hydro: 2 GW
Pumped storage: 3 GW
Solar: 5 GW by 2020 | Wind 100 MW

729.1 gCO_2/kWh
GRID EMISSION FACTOR (2016)

SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

Sources: IEA, World Development Indicators, REN21, IRENA REmap Indonesia 2017

* Including hydropower

AMBITION

NDC target

Committed to a 29% unconditional, 41% conditional reduction in GHG emissions in 2030 compared to BAU

Transport realated target

no mention

Transport related measures

- Implementation of biofuel in the transportation sector (Manadatory B30)
- Additional CNG fuel stations

EV deployment targets

To achieve 1% and 5% share, respectively, of electric and hybrid vehicles by 2050.

Targets at national level

Indonesia does not have a national target for the transport sector, but the National Master Plan for Energy Conservation (RIKEN) sets goals for efficiency in different sectors. A 2014 draft version of the RIKEN that will set a 20% efficiency target for the transport sector (over BAU) is awaiting approval.
Another goal is to utilise natural gas for urban public transport in order to reduce GHG emissions by 3,070 Gg CO_2e by 2020. Additional measures aim to reduce emissions by 35,146 Gg CO_2e by 2020. The measures with the greatest contribution: the development of intelligent transport and parking systems; the implementation of BRT systems; and the rejuvenation of the pubic transport fleet.

Source: NDC, IEA Policy Database; Indonesia's 3rd National Communication; IEA EV Outlook 2018

TRADE-OFFS

Sustainability of biofuels

Indonesia has no specific regulations for biofuel sustainability. However, there are several sustainability certification schemes available for biodiesel feedstocks and palm plantations. Programmes cover a range of common sustainability criteria, including greenhouse gas emissions, land use, biodiversity and labor.

Source: OECD

Subsidies

16,513.43 Billion IDR

~1.23 BILLION USD
LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

Source: OECD

The Indonesian Government compensates state-owned Pertamina for selling Premium RON 88 gasoline, solar diesel, and kerosene fuels below market-level prices. Following the reform of 2015, gasoline is now sold at market price and only a small subsidy remains. Also, support for diesel has decreased dramatically. Total subsidies provided in the transport sector in 2016 were only 8% of those provided in 2014.

IMPLEMENTATION

Mobility

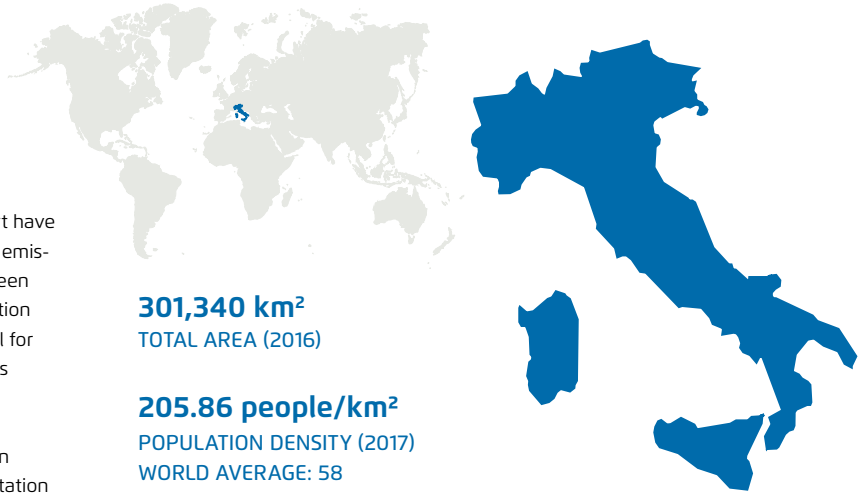
✔	**National programmes to support shift to public transport**	Development of Intelligent Transport System (ITS), including bus priority system and shift to mass transportation Introduction of BRT systems in 12 cities Enhancing rail infrastructure, incl. electrification Sustainable Urban Transport Programme (SUTRI NAMA)
	Measures to support low-carbon freight logistics	No measures at national level
	National measures to support new mobility services	No measures at national level
✔	**National measures to support non-motorised transport**	Building of nonmotorized transport infrastructure in 12 cities
✔	**Road charges**	No general charges, but some toll roads Expansion of toll roads under development

Energy

	Energy/carbon emission standards LDV	No standard
	Energy/carbon emission standards HDV	No standard
✔	**Pricing instruments**	Luxury tax reduction for efficiency vehicles (based on fuel efficiency)
	Mandatory vehicle labelling	No mandatory labelling
✔	**Support mechanism for electric vehicles & charging infrastructure**	Covered under pricing instruments Import duty cuts for spare parts announced
✔	**Support for other low-carbon fuels and propulsion systems**	Pilot project to improve the use of natural gas as city transportation fuel in 9 cities Subsidy for biodiesel, covering difference to conventional diesel
✔	**Mandatory biofuel targets**	Indonesia has a mandatory share of 3% for bioethanol and 20% for biodiesel (up from 5%), which is scheduled to increase to 30% by 2020.

Source: See national sources Indonesia

ITALY



Italy has well-developed road and railway systems.
Both transport demand and the importance of road transport have increased since 1990. After peaking in 2007, transport sector emissions have been on the decline, falling more than 20% between 2007 and 2013, mainly due to the economic crisis in combination with greater penetration of energy efficient vehicles. Atypical for Europe, Italy has a very large fleet of motorbikes and mopeds (about 9.6 million vehicles in 2015).

Italy does not have specific transport-related carbon emission targets, but it has the goal to shift 10 percent of car transportation demand in 2030 to public transport, carpooling, bikes and walking as well as speeding up the introduction of less carbon intensive vehicles and to have 125,000 publicly accessible charging stations for electric vehicles installed by 2020. It has implemented all EU directives at the national level, but has limited additional measures to support a modal shift or vehicle efficiency.

Sources: 7th National Communication; BUR 2015 Italy; CIA World Factbook; IEA EV Outlook 2018

301,340 km²
TOTAL AREA (2016)

205.86 people/km²
POPULATION DENSITY (2017)
WORLD AVERAGE: 58

0.2%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.89 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72 Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

35,220 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524
WORLD AVERAGE: 15,469

1.83%
SHARE IN GLOBAL GDP (2017)

POPULATION

60.6 mio people
POPULATION CURRENT (2017)

0.8%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION

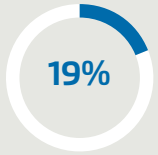
70.1% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

11.3 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)



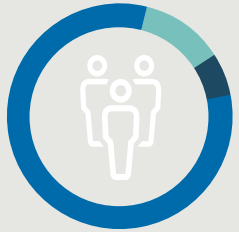
Source: World Development Indicators

MOBILITY

869 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2016)

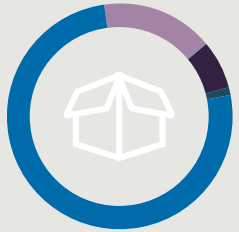
= 100 Inhabitants
= 100 Motor vehicles

859,819 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2016)



Passenger-km per mode (2016)
- Road, Car: 82%
- Road, Bus: 12%
- Rail: 6%

140,420 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2016)



Tonne-km per mode (2016)
- Road: 76%
- Inland waterways: 0%
- Rail: 16%
- Pipeline: 7%
- Domestic air: 1%

Sources: ITF/OECD, World Development Indicators

* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

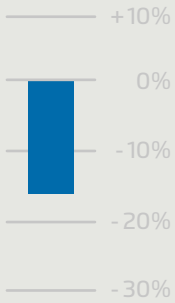
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Italy's total CO2 emissions from fuel combustion have decreased by 16% since 1990 and per capita emissions are just below the world average. Transport emissions have grown by 6% over the same period. After peaking in 2007, they decreased until 2013, increased in 2014 and have been declining since. At 31%, the share of transport sector emissions is above world and G20 averages. Road transport is by far the main contributor to Italian emissions, with a 91% share, followed by domestic navigation and aviation.

328.4 Mt CO_2

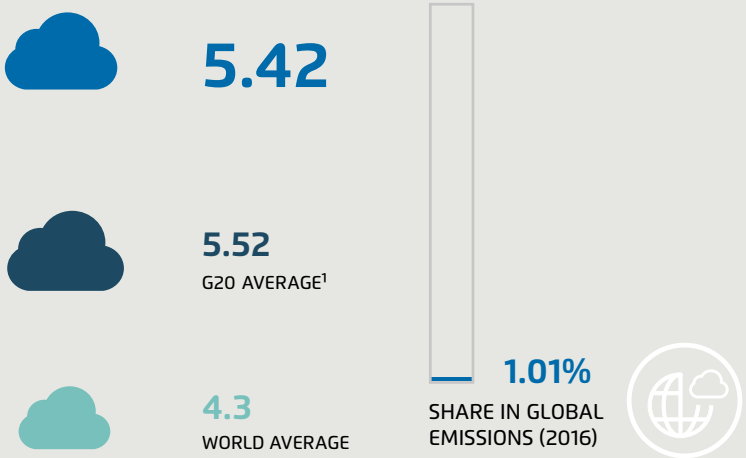
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2016)



-16%

CHANGE IN TOTAL EMISSIONS (1990–2016)

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2016)



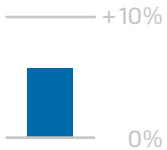
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

101.7 Mt CO_2

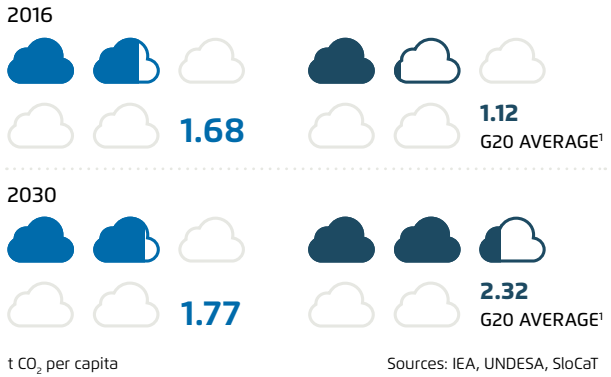
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2016)



5.8%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2016)

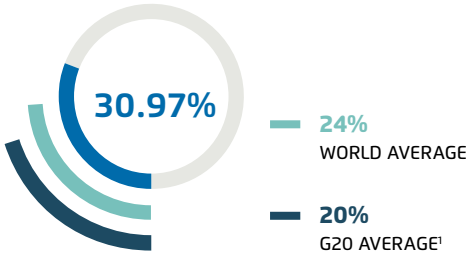
TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2016/2030)



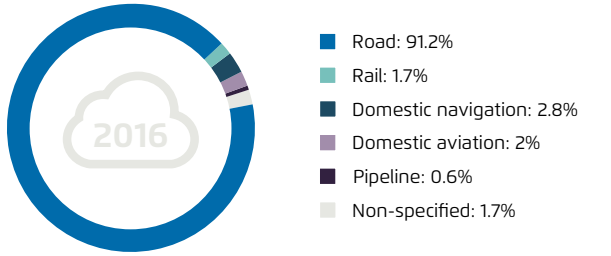
t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2016)

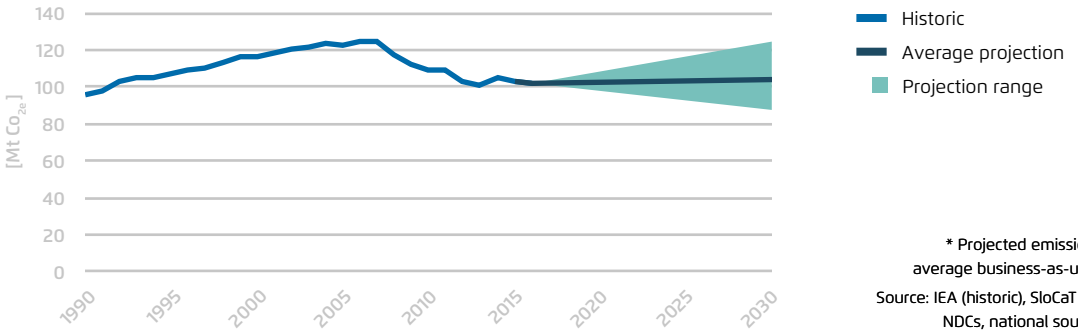


TRANSPORT EMISSIONS BY SUBSECTOR



Source: IEA

Historic and projected* emissions in the transport sector



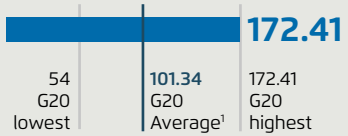
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

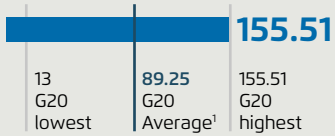
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



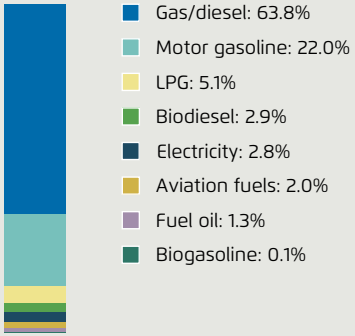
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre

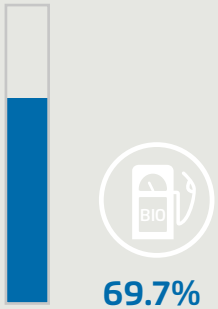


* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel

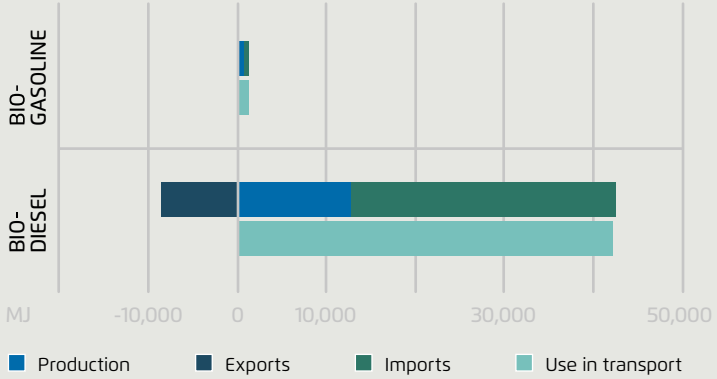


Year: 2016 Source: IEA



69.7%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

NO DATA
BATTERY

NO DATA
PLUG-IN HYBRID

NEW REGISTRATIONS OF ELECTRIC CARS (2016)

NO DATA
BATTERY

NO DATA
PLUG-IN HYBRID

NO DATA
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)

%

SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)

%

PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2015)

1,679 *
SLOW CHARGE

70 *
FAST CHARGE

16,434 *
SLOW CHARGE
G20 AVERAGE[1]

5,678 *
FAST CHARGE
G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

Non-renewable electricity in Italy is mostly generated using natural gas, with a small share coming from coal. Electricity from renewable sources is mostly promoted through a combination of premium tariffs, feed-in tariffs and tender schemes. Tax regulation mechanisms are also in place for investment in RES-E plants. Interested parties can make use of net metering. Grid operators are obliged to give priority access to renewable energy plants. They are also obliged to give priority dispatch to electricity from renewable sources. Plant operators can oblige the grid operator to expand the grid if the connection of a plant requires this expansion.

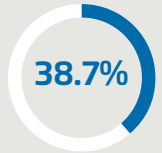
Existing targets for renewable electricity generation

2020: 26%
SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

By 2020 Bio-power: 2.8 GW | Geothermal: 920 MW
Hydro: 17.8 GW
Solar: 23 GW by 2017
Wind (onshore): 12 GW
Wind (offshore): 680 MW

330.6 gCO_2/kWh
GRID EMISSION FACTOR (2016)



SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

Sources: IEA, REN21, World Development Indicators * Including hydropower

AMBITION

NDC target

See EU: committed to a 40% reduction in GHG emissions in 2030 compared to 1990

Transport realated target

no mention

Transport related measures

no mention

EV deployment targets

- 125,000 publicly accessible charging stations by 2020.
- Increase the electrical vehicles to more than 10% of fleet by 2030, including cars (0.8 million) and electric vans (0.5 millions).

Source: NDC, Italy's 7th National Communication; IEA EV Outlook 2018

Targets at national level

- Modal shift of about 10% of car transportation demand in 2030 to public transport, carpooling, bikes and walking.
- Speed up the replacement of vehicle fleet with new vehicles, including CNG cars (up to 1.7 million), LPG cars (up to 2.7 million), CNG vans (up to 1 million).
- Expansion of LNG heavy duty trucks up to 30% of the fleet and LNG ships up to 50% of total national fuel consumption.

TRADE-OFFS

Sustainability of biofuels

The EU Renewable Energy Directive establishes two sets of criteria to promote the sustainability of biofuels production: (1) GHG emissions savings and land use requirements must be at least 50% (60% for new installations in 2018), and (2) biodiesel may not be produced on land that was converted from high carbon density conditions such as rainforests. To demonstrate compliance with the EU sustainability criteria, biofuels need to be validated by national verification systems or by one of 20 voluntary schemes approved by the EC. In 2015, the ILUC Directive put a cap on the share of conventional biofuels that can be used to meet the transport sector's 10 percent blend target at 7 percent and a requirement that advanced biofuels comprise a minimum share of 0.5 percent of transport sector's energy use by 2020. To further incentivize advanced biofuel use, the amendment allowed MS to double count the contribution of advanced biofuels to meeting these binding targets.

Source: OECD

Subsidies

9.30 Billion EUR

~10.48 BILLION USD
LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

Source: OECD

Fuel used in domestic and EU-wide shipping is exempt from excise tax. Rail transport, public transport, taxis, and agricultural and military use benefit from varying rates of reduced excise tax. Trucking companies can obtain partial refunds for excise tax paid on diesel fuel. The bulk of support is from various forms of tax reductions, with reduced rates for diesel representing more than half of overall subsidies (support to agriculture: 22%; trucking: 14%). Relatively small new subsidies were introduced in 2014 for fuel use in agriculture and a tax relief for fuel used in transshipment operations was introduced in 2016.

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	National Operational Programme on Infrastructures and Networks (NOP)
Measures to support low-carbon freight logistics	No specific measures
National measures to support new mobility services	No current measures, but incentive programme in the early 2000s
National measures to support non-motorised transport	No specific measures
✔ **Road charges**	Tolls apply to most highways in Italy

Energy

✔ **Energy/carbon emission standards LDV**	EU CO_2 efficiency targets Passenger cars: 95 g/km (2021) Light commercial: 147 g/km (2020) Proposed targets for 2030 would reduce average emissions of new cars and vans by 30% compared to 2021
Energy/carbon emission standards HDV	No standard Proposed targets for average CO_2 emissions from newlorries: In 2025, 15% lower than in 2019 In 2030, at least 30 % lower than in 2019
Pricing instruments	No CO_2 or energy consumption based taxes
✔ **Mandatory vehicle labelling**	National implementation of the EU Car Labelling Directive 1999/94/EC
✔ **Support mechanism for electric vehicles & charging infrastructure**	National Infrastructure Plan for Recharging Electric Vehiclessets forth planning, standards, and incentives.
✔ **Support for other low-carbon fuels and propulsion systems**	Renewable energy targets 2020: 10% of transport fuels from renewables Fuel Quality Directive (2009/30/EC) requires member states to reduce the GHG intensity of fuel by 6% by 2020
✔ **Mandatory biofuel targets**	The EU has a mandatory requirement of 10% renewable energy in transport by 2020, with a cap of 7% for first generation biofuels. This target also applies to Italy. Additionally, Italy is the first member to introduce a mandatory share of 0.6% for advanced biofuels by 2018, scheduled to increase to 1% in 2022.

Source: See national sources Italy

JAPAN

Despite its small size, Japan has the 11th largest railway network and the 6th largest road network globally. Since the 1990s, passenger transport volumes, including modal shares, have remained almost constant. The share of transport captured by air traffic is small, but has grown significantly in recent years. The shift from coal to oil as an energy source and the development of heavy industry in coastal areas have been associated with rising domestic maritime freight volumes. By contrast, the growth in rail-based freight traffic has barely increased and is relatively small, while the share of passengers transported by rail stands at 31%.

Japan defines the contribution of each sector to its NDC, and is targeting GHG reductions in transport of 27% below 2013 by 2030. The 2016 Plan for Global Warming Countermeasures defines the goal of achieving a 50–70% market share for new sales of next-generation low-carbon vehicles by 2030 and the country aims to have EVs account for 20–30% of car sales by 2030.

Sources: Japan's 7th National Communication; CIA World Factbook; IEA EV Outlook 2018

377,962 km²
TOTAL AREA (2016)

347.78 people/km²
POPULATION DENSITY (2017)
WORLD AVERAGE: 58

0.3%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.90 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72 Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

39,002 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524

WORLD AVERAGE: 15,469

4.24%
SHARE IN GLOBAL GDP (2017)

POPULATION

126.8 mio people
POPULATION CURRENT (2017)

1.7%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION

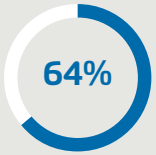
91.5% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

81.6 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)



Source: World Development Indicators

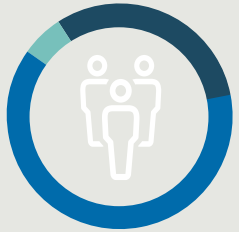
MOBILITY

719 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2016)

= 100 Inhabitants
= 100 Motor vehicles

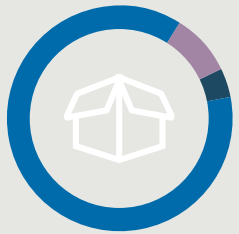
Sources: ITF/OECD, World Development Indicators

1,292,485 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2009)



Passenger-km per mode (2009)
- Road, Car: 63%
- Road, Bus: 6%
- Rail: 31%

240,940 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2016)



Tonne-km per mode (2016)
- Road: 87%
- Inland waterways: 0%
- Rail: 9%
- Pipeline: 0%
- Domestic air: 4%

* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

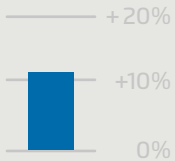
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Japan's total CO_2 emissions from fuel combustion have increased by 11% since 1990, with transport sector emissions increasing by 3% over the same period. After peaking around 2000, emissions in the transport sector have decreased relatively constantly, supported by a variety of measures to enhance vehicle efficiency. Road transport is responsible for 86% of sector emissions, with rail, domestic navigation and aviation capturing almost equal shares of remaining emissions.

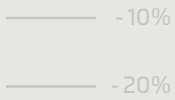
1147.1 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2016)



11%

CHANGE IN TOTAL EMISSIONS (1990–2016)



TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2016)

9.05

5.52
G20 AVERAGE[1]

4.3
WORLD AVERAGE

3.54%
SHARE IN GLOBAL EMISSIONS (2016)

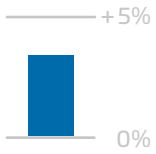
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

207.5 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2016)



3.4%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2016)

TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2016/2030)

2016

1.64

1.12
G20 AVERAGE[1]

2030

1.78

2.32
G20 AVERAGE[1]

t CO_2 per capita

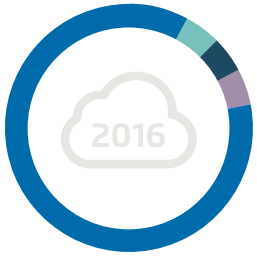
Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2016)

24%
WORLD AVERAGE

20%
G20 AVERAGE[1]

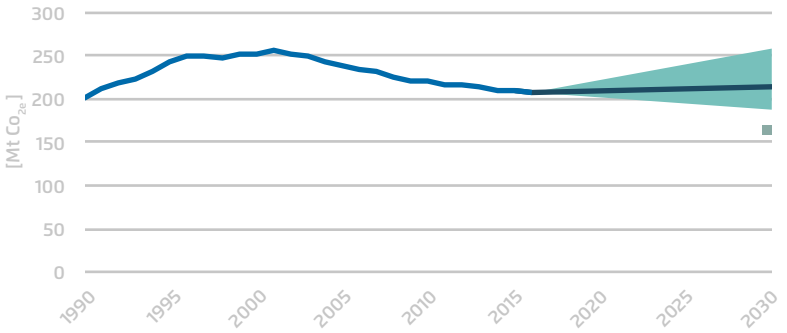
TRANSPORT EMISSIONS BY SUBSECTOR



- Road: 86%
- Rail: 4.6%
- Domestic navigation: 4.7%
- Domestic aviation: 4.7%
- Pipeline: 0%
- Non-specified: 0%

Source: IEA

Historic and projected* emissions in the transport sector



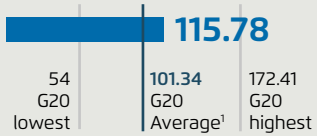
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

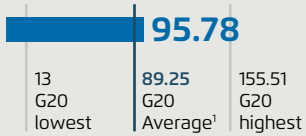
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



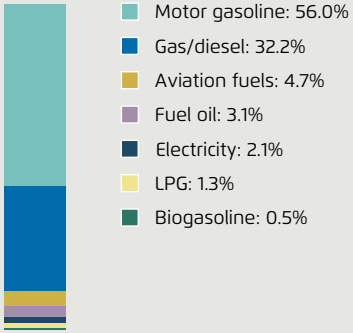
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre



* local currency prices converted using OECD annual exchange rates

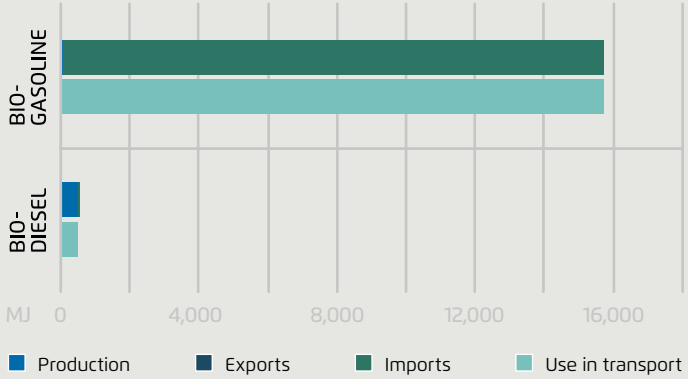
Energy use in transport by fuel



Year: 2016 Source: IEA

97%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

104,490
BATTERY

100,860
PLUG-IN HYBRID

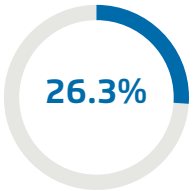
NEW REGISTRATIONS OF ELECTRIC CARS (2016)

18,100
BATTERY

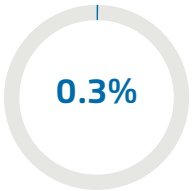
36,000
PLUG-IN HYBRID

1%
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)



SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)



PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2017)

21,507* SLOW CHARGE

7,327* FAST CHARGE

16,434* SLOW CHARGE G20 AVERAGE[1]

5,678* FAST CHARGE G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

Non-renewable electricity in Japan is mostly generated using natural gas (40%), coal (33%) and oil (10%). Nuclear power generation is negligible since the shut-down of plants following Fukushima. Japan has operated a feed-in tariff (FIT) since 2012 that is differentiated by technology. Guaranteed price levels have decreased over time. In April 2017 Japan introduced a reverse auction system for large-scale PV projects.

Existing targets for renewable electricity generation

2030: 22–24%
SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

Ocean: 1.5 GW by 2030

543.8 gCO_2/kWh
GRID EMISSION FACTOR (2016)

SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

NO DATA
ELECTRICITY USE IN TRANSPORT (2016)

SHARE IN TOTAL ELECTRICITY USE

Sources: IEA, REN21, World Development Indicators * Including hydropower

AMBITION

NDC target

Committed to a 26% reduction in GHG emissions in 2030 compared to 2013

Transport related target

Transport sector emissions 27% below 2013 (163 Mt CO_2) by 2030

Transport related measures

- Improvement in fuel efficiency of cars
- Eco-friendly ship transport
- Improve energy consumption efficiency of aviation and railways
- Intelligent Transport Systems (ITS)
- Optimization of truck transport
- Modal shift to rail

EV deployment targets

- 20–30% electric car sales by 2030.

Targets at national level

Japan does not have a specific national emission target for the transport sector, but the 2016 Plan for Global Warming Countermeasures introduces a target of 50% to 70% for the market share of next-generation low-emission vehicles in new automobile sales in 2030.

Source: NDC, Energy Policies of IEA Countries; Japan. 2016 Review; IEA EV Outlook 2018

TRADE-OFFS

Sustainability of biofuels

In the "Act on Sophisticated Methods of Energy Supply Structures" of 2010, the GOJ established an environmental sustainability standard for biofuels that required that bioethanol not compete with the food supply, and that biofuels reduce greenhouse gas (GHG) emissions by at least 50 percent from the emissions of gasoline, based on a life cycle assessment (LCA). In April 2018, a revision of the Act was announced that raises the GHG reduction requirement to 55% and allows corn-based ethanol from the US to be imported in addition to sugarcane-based ethanol from Brazil.

Source: OECD

Subsidies

7.49 Billion JPY

~0.07 BILLION USD

LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

Source: OECD

Energy prices are not regulated in Japan, and there are no direct consumer subsidies. There are, however, a number of schemes to support the exploration, extraction and refining of oil products, aiming to ensure power system reliability. As oil is also used in electricity generation, not all of these subsidies can be directly allocated to the transport sector, so are not included in our estimate. Most subsidies directly impacting the transport sector relate to support for filling stations and distribution, which aims to ensure security of supply in remote areas. While support for measures to protect the environment was phased out in 2015, subsidies for regional energy supply bases increased by almost 50% between 2014 and 2016.

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	Low Carbon City Act (Eco-City Act) requires local governments to develop Low-Carbon Development Plans plans and promote the use of public transportation Subsidies and tax incentives available for construction and promotion of public transport systems
✔ **Measures to support low-carbon freight logistics**	Improving the user-friendliness of railways and coastal shipping Improving distribution system efficiency through improved truck transport and improved port terminal facilities Promoting voluntary measures to improve truck transport and undertake modal shifts (from trucks to railways)
National-level measures to support new mobility services	No measures at national level
National measures to support non-motorised transport	No specific measures
✔ **Road charges**	Tolls apply to most expressways in Japan

Energy

✔ **Energy/carbon emission standards LDV**	Fuel efficiency target 2020: 20.3 km/L
Energy/carbon emission standards HDV	Top runner
✔ **Pricing instruments**	Eco-Car Tax Break and Subsidies for taxes on tonnage, acquisition, and ownership, based on fuel efficiency and type of vehicle. Hybrids, plug-in hybrid electric, electric, fuel cell, clean diesel, and natural gas vehicles qualify for tax breaks. Carbon tax from 2012-2016
✔ **Mandatory vehicle labelling**	Fuel Efficiency Labelling System
✔ **Support mechanism for electric vehicles & charging infrastructure**	Battery capacity and electric range-based purchase subsidy, vehicle tax exemption, reduced road tolls, public procurement preference and discounted/free charging
✔ **Support for other low-carbon fuels and propulsion systems**	Incentives for fuel cell vehicle buyers and HRS infrastructure Government purchase of Hydrogen Fuelled vehicles
✔ **Mandatory biofuel targets**	No national mandate. Japan has set a target of 800 Ml per year by 2018.

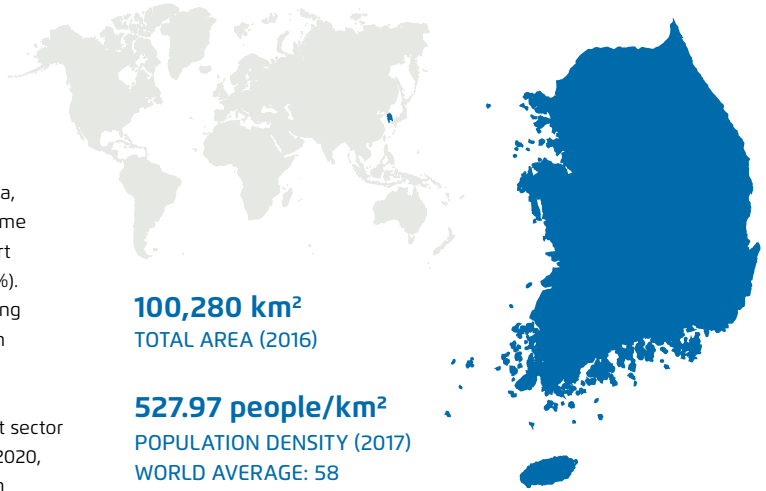
Source: See national sources Japan

KOREA, REP.

South Korea lies on the southern half of the Korean Peninsula, bordering both the Sea of Japan and the Yellow Sea. With some 82% of the population living in urban areas, subway transport captures an unusually large share of passenger transport (8%). South Korea boasts a well-developed railway system, including a number of high-speed trains that have diverted travel from air to rail (while also inducing additional travel demand).

As part of its Low Carbon, Green Growth vision, the transport sector is expected to slash GHG emissions by 34.3% below BAU by 2020, making transport the sector to provide the greatest emission reductions. The roadmap for achieving the 2030 economy-wide target of a 37% reduction below BAU is not yet published, but it is expected that the transport sector will again have the largest rate of reduction. GHG emissions and average fuel efficiency standards for heavy-duty vehicles is currently under development.

Sources: BUR 2017 Korea; BUR 2014 Korea; CIA World Factbook; KOTI 2015



100,280 km²
TOTAL AREA (2016)

527.97 people/km²
POPULATION DENSITY (2017)
WORLD AVERAGE: 58

0.1%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.90 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72 Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

35,938 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524

WORLD AVERAGE: 15,469

1.59%
SHARE IN GLOBAL GDP (2017)

POPULATION

51.5 mio people
POPULATION CURRENT (2017)

0.7%
SHARE IN GLOBAL POPULATION (2017)

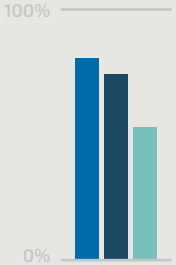
Source: World Development Indicators

URBANISATION

81.5% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE



25.8 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)

Source: World Development Indicators

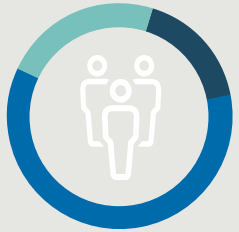
MOBILITY

464 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2015)

= 100 Inhabitants
= 100 Motor vehicles

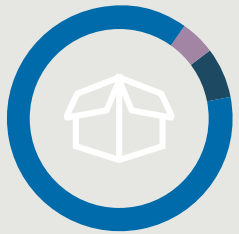
Sources: ITF/OECD, World Development Indicators

451,756 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2016)



Passenger-km per mode (2016)
- Road, Car: 60%
- Road, Bus: 23%
- Rail: 17%

154,479 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2016)



Tonne-km per mode (2016)
- Road: 88%
- Inland waterways: 0%
- Rail: 5%
- Pipeline: 0%
- Domestic air: 7%

* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

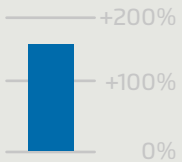
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Total CO_2 emissions from fuel combustion in the Republic of Korea have increased by 158% since 1990, with the transport sector growing a bit more slowly, registering a 132% increase over the same period. Per capita emissions are almost double of the world average. Road transport is by far the main contributor, with a 93% share, followed by aviation (3.6%) and rail (1.7%), the majority of which is from electricity use.

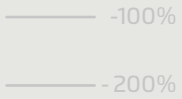
598.6 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2016)



158%

CHANGE IN TOTAL EMISSIONS (1990–2016)



TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2016)

11.63

5.52

G20 AVERAGE[1]

4.3

WORLD AVERAGE

1.85%

SHARE IN GLOBAL EMISSIONS (2016)

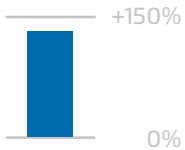
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

101.3 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2016)

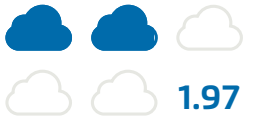


131.8%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2016)

TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2016/2030)

2016

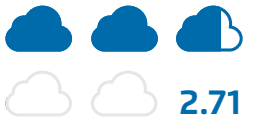


1.97

1.12

G20 AVERAGE[1]

2030



2.71

2.32

G20 AVERAGE[1]

t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2016)

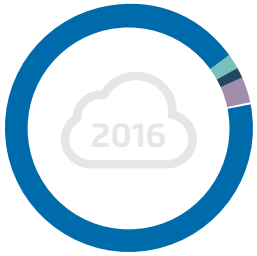
24%

WORLD AVERAGE

20%

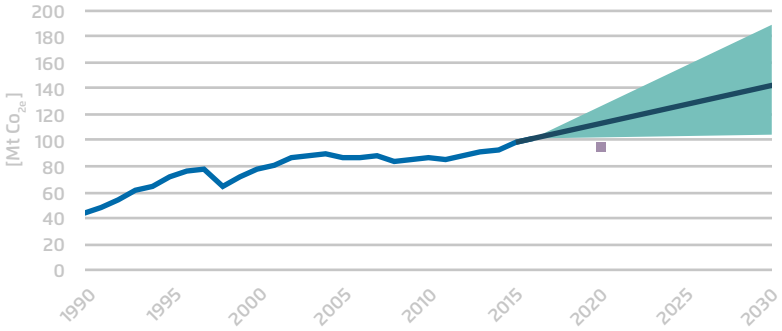
G20 AVERAGE[1]

TRANSPORT EMISSIONS BY SUBSECTOR



- Road: 93.4%
- Rail: 1.7%
- Domestic navigation: 1.4%
- Domestic aviation: 3.6%
- Pipeline: 0%
- Non-specified: 0%

Historic and projected* emissions in the transport sector



- Historic
- Average projection
- Projection range
- National target 2020 high value

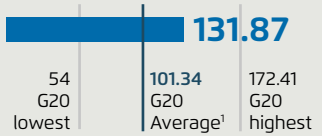
Year: 2017

* Projected emissions under an average business-as-usual scenario

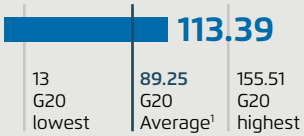
Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



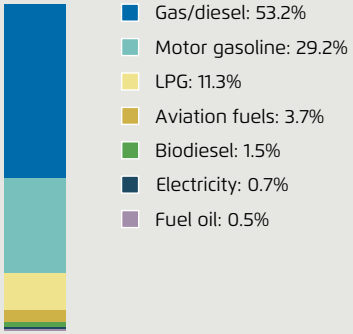
DIESEL PRICE (2017)
US Cents/Litre



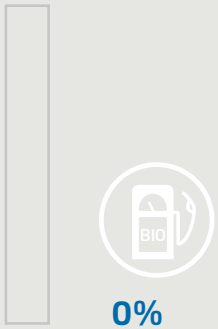
Source: Globalpetrolprices.com*

* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel

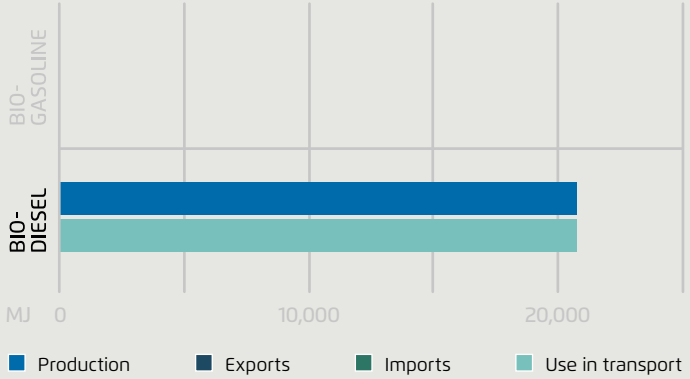


Year: 2016 Source: IEA



0%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

24,070
BATTERY

1,840
PLUG-IN HYBRID

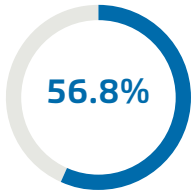
NEW REGISTRATIONS OF ELECTRIC CARS (2016)

13,300
BATTERY

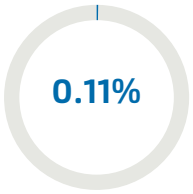
1,410
PLUG-IN HYBRID

1.3%
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)



SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)



PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2017)

3,081*
SLOW CHARGE

2,531*
FAST CHARGE

16,434*
SLOW CHARGE
G20 AVERAGE[1]

5,678*
FAST CHARGE
G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

The main energy sources for power generation in South Korea are coal (43%), nuclear power (30%) and natural gas (22%). In January 2012 the Renewable Portfolio Standard (RPS) replaced the existing feed-in tariff system in order to accelerate Korea's renewable energy deployment and create a competitive market environment for the sector. The RPS programme requires the 13 largest power companies to steadily increase the share of power generation from renewables starting in 2024. By 2020, the mandatory supply rate under the RPS system will be raised to 7.0% (from 3.0% in 2015).

Existing targets for renewable electricity generation

2018: 5%
2019: 6%
2020: 7%
2030: 20%

SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

No capacity targets

521.4 gCO_2/kWh
GRID EMISSION FACTOR (2016)

SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

Sources: IEA, REN21, World Development Indicators * Including hydropower

AMBITION

NDC target

Committed to a 37% reduction in GHG emissions in 2030 compared to BAU

Transport related target

no mention

Transport related measures

Strengthen the average emission standard from 140g/km in 2015 to 97g/km in 2020
Create incentives, including tax reductions, for electric and hybrid vehicles
Expand infrastructure for environmentally friendly public transport

EV deployment targets

• 200 000 EVs in PLDVs by 2020
The initial target was 1 mio vehicles by 2020 (Eco-friendly vehicle distribution plan 2016–2020 only foresees 89,300 vehicles (BEV, PHEV, FCEV)

Targets at national level

As part of its Low Carbon, Green Growth vision, the transport sector is expected to reduce GHG emissions by 34.3% below BAU by 2020, providing the largest sectoral reduction to contribute to the overall national target. Additionally, the government announced to take steps to make clean vehicles account for 30% of all vehicles by 2020.

Source: NDC, BUR 2014; Asian NGV Communications; IEA EV Outlook 2018

TRADE-OFFS

Sustainability of biofuels

No measures to ensure the sustainability of biofuels could be identified.

Source: OECD

Subsidies

1,300.97 Billion KRW

~1.15 BILLION USD
LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

Source: OECD

The bulk of support for the consumption of fossil fuels in South Korea can be attributed to the tax exemptions for fuels used in the agriculture and fishery sectors. According to latest OECD estimates, the support provided through these exemptions decreased by around 23% between 2014 and 2016.

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	Public Transportation Master Plan Expansion of high-speed rail system Nation-wide unified fare-collection system Expansion of BRT systems and transfer facilities
✔ **Measures to support low-carbon freight logistics**	Green and Smart Transport Partnership Multi-Modal Transit Center Development Master Plan Intelligent Transportation System Master Plan Sustainable National Transport and Logistics Master Plan Testing and certification system for green ship technology
✔ **National measures to support new mobility services**	Bike-share mostly introduced and operated with budgetary support from the government
✔ **National measures to support non-motorised transport**	Korean Bicycle Master Plan Master Plan for the National Bike roads Network New Town Bicycle Project
Road charges	No national road charging schemes only area charging schemes (traffic congestion pricing in Seoul)

Energy

✔ **Energy/carbon emission standards LDV**	Passenger cars: 97 g/km (2020) Light commercial: 181 g/km (2020)
Energy/carbon emission standards HDV	A standard on GHG emissions and average fuel efficiency will be applied to mid- to large-sized vehicles (The standard is planned to be introduced in 2018 and a pilot project will be carried out from 2019)
✔ **Pricing instruments**	Traffic/Energy/Environment Tax on gasoline and fuels
Mandatory vehicle labelling	Rational Energy Utilization Act
✔ **Support mechanism for electric vehicles & charging infrastructure**	Central purchase subsidies for EVs Tax reductions
✔ **Support for other low-carbon fuels and propulsion systems**	Promotion of natural gas for buses (subsidies and low priced natural gas)
✔ **Mandatory biofuel targets**	South Korea has a mandatory share of 3% in 2018, up from 2.5% in 2017.

Source: See national sources Korea

MEXICO

Most of the population of Mexico lives in the centre of the country, with approximately a quarter of inhabitants living in and around Mexico City. Railways only connect major centres, and buses are the main mode of passenger transport between cities. Mexico has the third largest number of airports globally and air transport accounts for 1.7% of passengers transported (more than rail or navigation), with the rest falling to road transport. The focus on road transport is less pronounced in freight: just over half of freight tonnage is transported by road, followed by navigation, which accounts for almost one-third. Mexico faces a particular challenge related to its vehicle fleet, which is largely composed of old, inefficient vehicles from the US.

Mexico has no national or international target for the transport sector. Existing policy measures focus on expanding public transport infrastructure and vehicle efficiency; there is limited support for low-carbon vehicles and fuels.

Sources: 5th National Communication 2012 Mexico; BUR 2015 Mexico; CIA World Factbook; IEA Mexico Energy Outlook 2016

1,964,380 km²
TOTAL AREA (2016)

66.44 people/km²
POPULATION DENSITY (2017)
WORLD AVERAGE: 58

1.5%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.76 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72

Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

17,336 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524

WORLD AVERAGE: 15,469

1.92%
SHARE IN GLOBAL GDP (2017)

POPULATION

129.2 mio people
POPULATION CURRENT (2017)

1.7%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION

79.9% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

50.8 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)

Source: World Development Indicators

MOBILITY

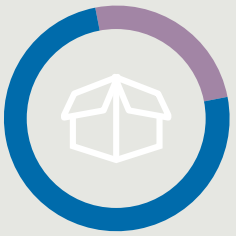
278 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2015)

= 100 Inhabitants
= 100 Motor vehicles

NO DATA
PASSENGER TRANSPORT VOLUME*

343,397 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2017)

Passenger-km per mode
No data



Tonne-km per mode (2017)
- Road: 75%
- Inland waterways: 0%
- Rail: 25%
- Pipeline: 0%
- Domestic air: 0%

Sources: ITF/OECD, World Development Indicators

* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

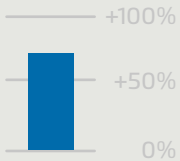
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Mexico's total CO_2 emissions from fuel combustion have increased by 73% since 1990, with transport sector emissions rising by 87% over the same period and projected to increase between 25% and 102% by 2030 under the business-as-usual scenario. Transport is responsible for over a third of total emissions, 15% more than the G20 average. Rail and domestic navigation play a minor role in sector emissions, with road causing almost 97% of emissions.

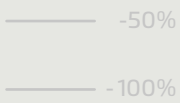
445.5 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2016)

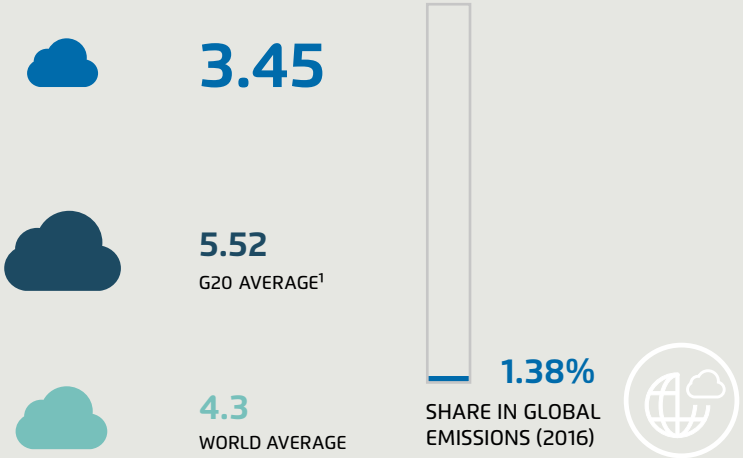


73%

CHANGE IN TOTAL EMISSIONS (1990–2016)



TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2016)



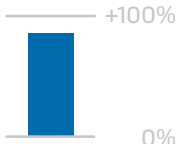
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

155.9 Mt CO_2

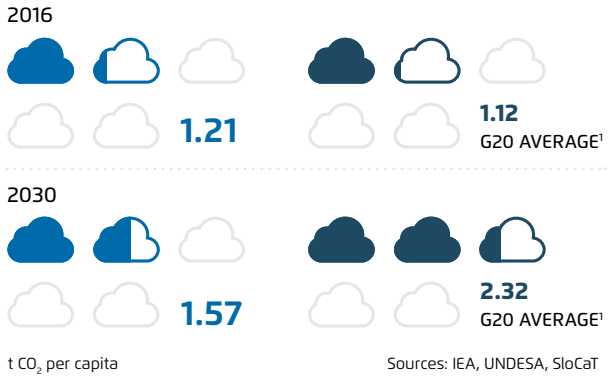
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2016)



86.7%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2016)

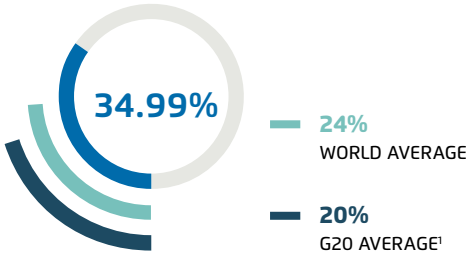
TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2016/2030)



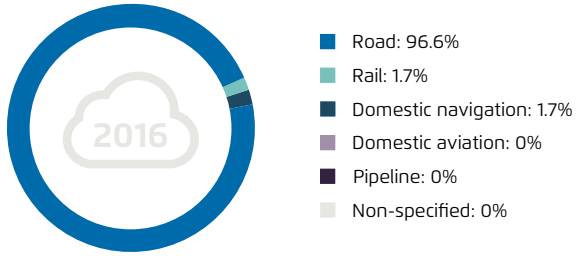
t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

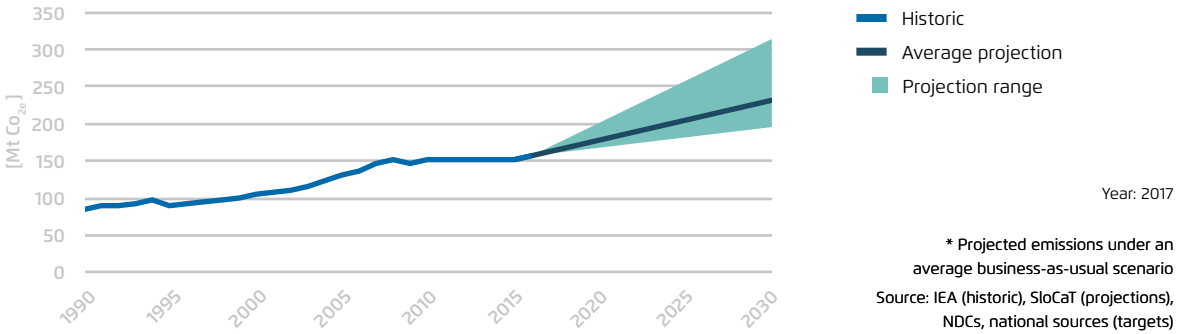
SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2016)



TRANSPORT EMISSIONS BY SUBSECTOR



Historic and projected* emissions in the transport sector



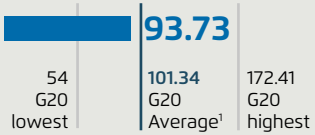
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

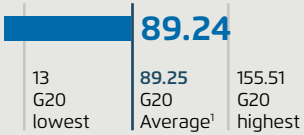
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



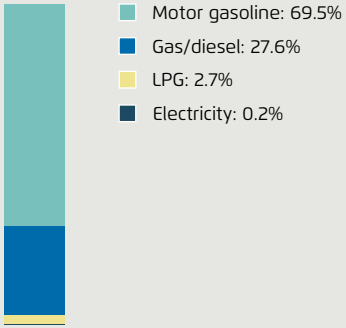
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre

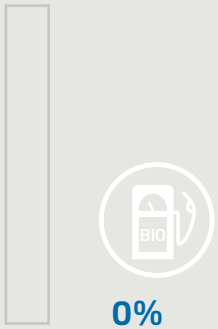


* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel



Year: 2016 Source: IEA



0%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*

* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

780
BATTERY

130
PLUG-IN HYBRID

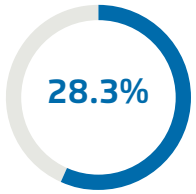
NEW REGISTRATIONS OF ELECTRIC CARS (2016)

210
BATTERY

50
PLUG-IN HYBRID

0.02%
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)



SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)

PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2017)

1,486*
SLOW CHARGE

42*
FAST CHARGE

16,434*
SLOW CHARGE
G20 AVERAGE[1]

5,678*
FAST CHARGE
G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

Mexico's targets for 2024 are to be met through renewable energy auctions and a quota and a clean-energy certificate (CEC) system. This is further supported by energy reform policies that started liberalizing the energy market in 2013. Retail suppliers are now required to have a given share of their electricity from clean sources and must buy CECs to demonstrate that they have complied with the quota obligation. This obligation is set to an annual base and increases every year.

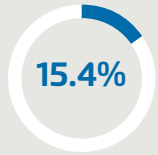
Existing targets for renewable electricity generation

2024: 35%
2030: 37.7%
2050: 50%
SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

No capacity targets

464.3 gCO_2/kWh
GRID EMISSION FACTOR (2016)



SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

Sources: IEA, REN21, World Development Indicators * Including hydropower

AMBITION

NDC target

Committed to a 25% reduction in GHG emissions in 2030 relative to BAU, including a 22% reduction in GHG emissions and a 51% reduction in Black Carbon by 2030

Transport related target
no mention

Transport related measures
no mention

Targets at national level

Mexico does not have quantitative transport-specific national targets, although the long-term strategy outlines a qualitative vision for the next 10, 20 and 40 years.

EV deployment targets

No EV deployment targets or objectives

Source: NDC, Mexico's Climate Change Mid-Century Strategy 2016

TRADE-OFFS

Mex$

Sustainability of biofuels

According to the Bio-Fuels Promotion & Development Law (LPDP), biofuel production needs to respect food safety and sovereignty. The legislation also sets up a bio-fuel regulatory inter-agency mechanism, the Inter-Agency Bio-fuel Development Commission, which assign permits based on the amount of surplus corn production.

Source: OECD

Subsidies

67.86 Billion MXN

~3.59 BILLION USD
LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

Source: OECD

The federal government used to set domestic prices for gasoline and diesel using excise taxes. In late 2014, Mexico eliminated the direct support it provided for the consumption of gasoline and diesel fuel through the IEPS, the country's floating excise tax. There are also fuel-tax credits available for the agriculture and fishery sectors, for commercial vessels, for passenger and cargo transportation, and for diesel used for purposes other than fuelling vehicles, which have increased slightly since 2014. Additionally, Mexico introduced a number of new subsidies, further supporting fishers and farmers. and a tax benefit for gasoline consumption on the northern border to reduce 'fuel tourism'. Together, the new subsidies outweigh the phase-out of the IEPS support.

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	Federal Support Programme for Mass Transit (PROTRAM), with a focus on mass transit, specifically BRTs, LRTs, metros and suburban rail systems
✔ **Measures to support low-carbon freight logistics**	Transporte Limpio
National measures to support new mobility services	No measures at national level
National measures to support non-motorised transport	No measures at national level
✔ **Road charges**	Tolls apply on major highways

Energy

✔ **Energy/carbon emission standards LDV**	Passenger cars: 145 g/km (2018) Light commercial: 196 g/km (2018)
Energy/carbon emission standards HDV	Under development
✔ **Pricing instruments**	Carbon tax on fossil fuels (except natural gas) of USD 3.50 per tCO_2 Rules passed in December 2017 allow Mexican-origin CERs to be used to meet 20% of the carbon tax obligation
Mandatory vehicle labelling	No mandatory labelling
✔ **Support mechanism for electric vehicles & charging infrastructure**	Government-led electric taxi programs in Mexico City and Aguascalientes Program to develop charging infrastructure in several large cities
✔ **Support for other low-carbon fuels and propulsion systems**	Bio-Fuels Promotion & Development Law
✔ **Mandatory biofuel targets**	Mexico recently introduced a mandatory share of 10% for bioethanol.

Source: See national sources Mexico

RUSSIAN FEDERATION

Russia is the world's largest country by area. Its population is heavily concentrated to the west of the Urals. Large parts of Siberia are permanently covered in permafrost. The density of transport infrastructure varies significantly by region. It is densest in the European part of Russia, while some parts of Siberia and the Far East lack good transport access, which is an important barrier to economic development. One-third of all rural settlements are still not connected to the paved road network. While Russia has inherited an extensive state-owned railway system, investment has not keep up with maintenance needs or increasing freight transport demand. The majority of roads are not suitable for heavy vehicles: less than 30% of federal and regional roads are designed to handle standard modern axle loads of 10 tonnes or more. As a result, the road transport share is relatively low, with the majority of freight being transported by rail. Buses, including in particular private minibuses, are the main mode of transport, with rail capturing most of the remaining share.

Sources: OECD Economic Department 2015; ITF/OECD

17,098,250 km²
TOTAL AREA (2016)

8.82 people/km²
POPULATION DENSITY (2017)
WORLD AVERAGE: 58

12.7%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.80 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72 Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

24,766 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524

WORLD AVERAGE: 15,469

3.12%
SHARE IN GLOBAL GDP (2017)

POPULATION

144.5 mio people
POPULATION CURRENT (2017)

1.9%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION

74.3% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

33.2 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)

Source: World Development Indicators

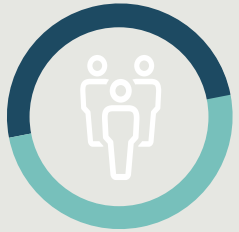
MOBILITY

233 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2009)

= 100 Inhabitants
= 100 Motor vehicles

Sources: ITF/OECD, World Development Indicators, Federal Bureau of Statistics, Germany

246,515 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2017)



Passenger-km per mode (2017)
- Road, Car: 0%
- Road, Bus: 50%
- Rail: 50%

4,083,264 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2017)

Tonne-km per mode (2017)
- Road: 6%
- Inland waterways: 1%
- Rail: 61%
- Pipeline: 32%
- Domestic air: 0%

* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

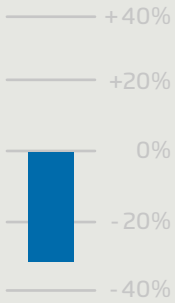
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Total CO_2 emissions from fuel combustion in the Russian Federation have decreased by 32% since 1990, with the transport sector only decreasing by 19% over the same period. The share of transport emissions in total emissions is low compared to the G20 average. Transport sector emissions are characterised by large emissions from pipeline operations, representing a quarter of the sector's emissions, and rail plays an important role, generating almost 9% of total sector emissions, the highest share in the G20. With just under 55%, road transport has the lowest share in total sector emissions within the G20.

1,469 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2015)



-32%

CHANGE IN TOTAL EMISSIONS (1990–2015)

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2015)

10.17

5.52

G20 AVERAGE[1]

4.3

WORLD AVERAGE

4.54%

SHARE IN GLOBAL EMISSIONS (2015)

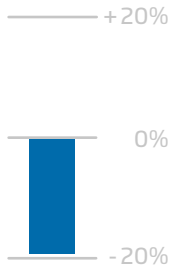
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

240.6 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2015)

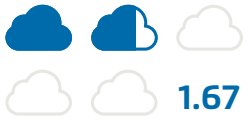


-19.5%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2015)

TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2015/2030)

2015

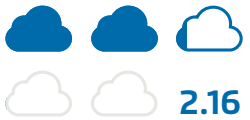


1.67

1.12

G20 AVERAGE[1]

2030



2.16

2.32

G20 AVERAGE[1]

t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2015)

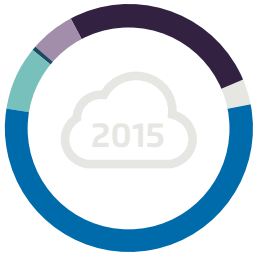
24%

WORLD AVERAGE

20%

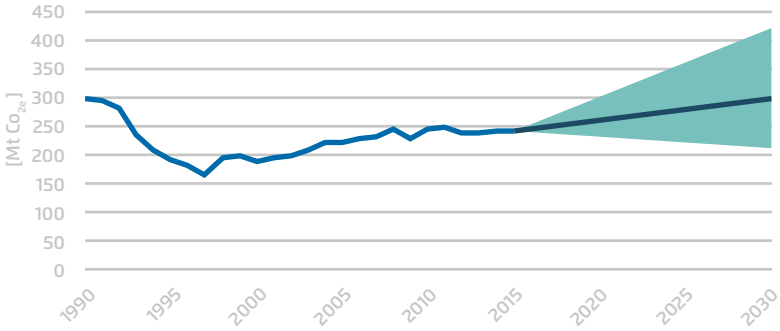
G20 AVERAGE[1]

TRANSPORT EMISSIONS BY SUBSECTOR



- Road: 55.7%
- Rail: 8.3%
- Domestic navigation: 0.7%
- Domestic aviation: 5.6%
- Pipeline: 26.5%
- Non-specified: 3.2%

Historic and projected* emissions in the transport sector



Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

ENERGY

GASOLINE PRICE (2017)
US Cents/Litre

67.91

54 G20 lowest | **101.34 G20 Average[1]** | 172.41 G20 highest

Source: Globalpetrolprices.com*

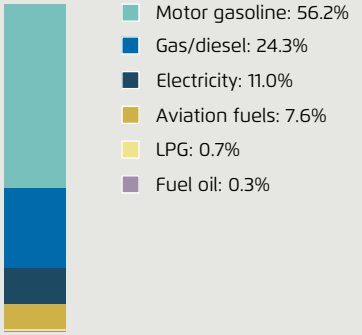
DIESEL PRICE (2017)
US Cents/Litre

64.16

13 G20 lowest | **89.25 G20 Average[1]** | 155.51 G20 highest

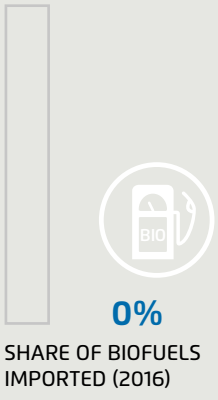
* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel



- Motor gasoline: 56.2%
- Gas/diesel: 24.3%
- Electricity: 11.0%
- Aviation fuels: 7.6%
- LPG: 0.7%
- Fuel oil: 0.3%

Year: 2016 Source: IEA



0%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*

* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

NO DATA
BATTERY

NO DATA
PLUG-IN HYBRID

NEW REGISTRATIONS OF ELECTRIC CARS (2016)

NO DATA
BATTERY

NO DATA
PLUG-IN HYBRID

NO DATA
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)

%

SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)

%

PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2017)

120 *
SLOW & FAST CHARGE

16,434*
SLOW CHARGE
G20 AVERAGE[1]

5,678*
FAST CHARGE
G20 AVERAGE[1]

*number of units Source: Euroasia Network, 2017

LINKAGES TO THE ENERGY SECTOR

Around half of Russia's electricity is generated using natural gas, with nuclear and coal providing the majority of the remaining generation. The main support mechanism for renewable energy is a capacity auction system that guarantees capacity payments over 15 years. Various other measures were adopted in 2009 to promote renewables, including a 5% renewables quota for power loss compensation and the coverage of grid connection costs.

Existing targets for renewable electricity generation

2020: 4.5% (excluding hydro >25 MW); 20% (including hydro)

SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

No capacity targets

357.8 gCO_2/kWh
GRID EMISSION FACTOR (2016)

SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

Sources: IEA, World Development Indicators, REN21; IRENA REmap Russia 2017

* Including hydropower

AMBITION

NDC target

Committed to a 25–30% reduction in GHG emissions in 2030 compared to 1990, provided maximum estimate of absorbing capacity of forests is taken into account

Transport related target
no mention

Transport related measures
no mention

EV deployment targets

No EV deployment targets or objectives

Targets at national level

The Transport Strategy of the Russian Federation does not set mandatory targets, but the measures aim to reduce specific carbon dioxide emissions in road transport by 20–22% by 2030, and by 50–51% in rail transport compared to 1990 levels.

According to Decree No. 767 (2013), by 2020 at least half of the public and municipal transport in major Russian cities (with a population of more than 1,000,000 people) is supposed to be converted to gas.
The main goal of the state policy in the field of civil aviation for the long term is to reduce the specific CO_2 emissions by 20–34% by 2030 relative to 2011.

Source: INDC, BR 2016, NC7

TRADE-OFFS

Sustainability of biofuels

No focus on supporting biofuels, subsequently no measures to ensure sustainability.

Source: OECD

Subsidies

408.77 Billion RUB

~7.01 BILLION USD
LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR

Source: OECD

Prices for petroleum products are deregulated and set by the market, although in practice the government often intervenes to limit price increases, most notably through the use of export taxes. The producers of oil and natural gas such as Rosneft, Gazprom and LUKOIL attract the largest share of all support for fossil fuels, primarily through partial or full exemptions from the federal extraction tax, almost half of which applies to the transport sector. In 2015, tax exemptions for aviation fuels were introduced and in 2016 additional producer supportwas created to decrease extraxtion taxes depending on deposit properties. Overall, subsidies directly or indirectly affecting the transport sector increased by around 70% between 2014 and 2016.

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	Transport Strategy (2014) includes expansion of public transport infrastructure and services including high speed rail
✔ **Measures to support low-carbon freight logistics**	Transport Strategy (2014) includes expansion of transport hubs, upgrade and expansion of railway cargo fleet, among others
National measures to support new mobility services	No measures at national level
National measures to support non-motorised transport	No measures at national level
✔ **Road charges**	„Platon", a road charging system for trucks introduced in 2015, charges all trucks over 12 tonnes when driven on federal highways Around 1,100 km of roads are subject to general tolls for all vehicles

Energy

Energy/carbon emission standards LDV	No standard
Energy/carbon emission standards HDV	No standard
✔ **Pricing instruments**	The vehicle registration tax increases with vehicle and engine size, as well as with CO_2 emissions.
Mandatory vehicle labelling	No mandatory labelling
✔ **Support mechanism for electric vehicles & charging infrastructure**	The import duty on electric vehicles was abolished in 2015 but re-instated in 2017. Instead, the national strategy for automotive development, adopted in March 2018, aims at supporting domestic vehicle production, including electric vehicles. This includes plans to excempt automotive components for EV assembly in Russia from custom duties.
✔ **Support for other low-carbon fuels and propulsion systems**	Focus of support is on promoting a shift to natural gas: Incentives for the development of CNG and LNG refuelling infrastructure and pilots with natural gas vehicles Reduced import customs duties and purchase subsidies for vehicles running on gas
✔ **Mandatory biofuel targets**	No requirements or targets are in place. The transport strategy assumes that the share of all alternative fuels will increase from 4% in 2011 to 17–20% by 2020.

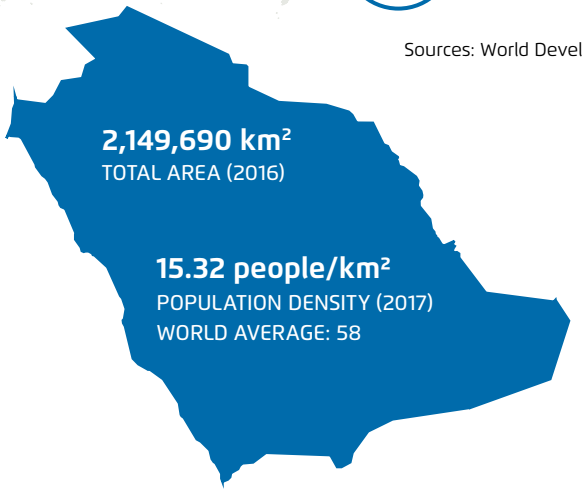
Source: See national sources Russian Federation

SAUDI ARABIA

Most of Saudi Arabia's population is concentrated in a wide band across the middle of the peninsula. Saudi Arabia does not have any rivers, but does have good access to maritime shipping, with extensive coastlines in the Persian Gulf and Red Sea. Road transport is the most important mode of transport, and the country is rapidly motorising, with 760,000 vehicles imported annually.

The Kingdom does not have specific targets for the transport sector, but in recent years it has started to expand public transport and rail infrastructure, and has also implemented a fuel efficiency standard for light duty vehicles as part of the Saudi Energy Efficiency Program, under which various initiatives for heavy duty vehicles are also under discussion. Few additional measures have been enacted to support a modal shift or low-carbon vehicles.

Sources: 3rd National Communication; CIA World Factbook; BUR 2018 Saudi Arabia



1.6%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.85 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72 Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

49,045 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524
WORLD AVERAGE: 15,469

1.39%
SHARE IN GLOBAL GDP (2017)

POPULATION

32.9 mio people
POPULATION CURRENT (2017)

0.4%
SHARE IN GLOBAL POPULATION (2017)

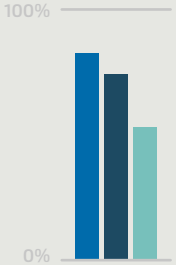
Source: World Development Indicators

URBANISATION

83.6% of total
URBAN POPULATION (2017)

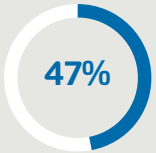
75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE



15.4 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)



Source: World Development Indicators

MOBILITY

133 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2005)

= 100 Inhabitants
= 100 Motor vehicles

NO DATA
PASSENGER TRANSPORT VOLUME*

NO DATA
FREIGHT TRANSPORT VOLUME**

Passenger-km per mode
No data

Tonne-km per mode
No data

* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

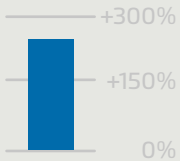
Sources: Federal Bureau of Statistics, Germany

[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

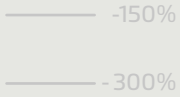
TOTAL EMISSIONS

Total CO_2 emissions from fuel combustion in Saudi Arabia have increased by 252% since 1990, with the transport sector growing a bit more slowly with an increase of 188% over the same period. Per capita emissions are the highest in the G20 for total emissions and the third highest for transport emissions. The emission profile in the transport sector is unusual, with no reported emissions for rail, pipeline or navigation and road transport generating 98% of sector emissions.

531.5 Mt CO_2
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2015)



252%
CHANGE IN TOTAL EMISSIONS (1990–2015)



TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2015)

16.14

5.52
G20 AVERAGE[1]

4.3
WORLD AVERAGE

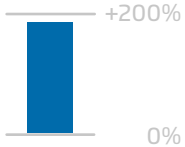
1.64%
SHARE IN GLOBAL EMISSIONS (2015)

t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

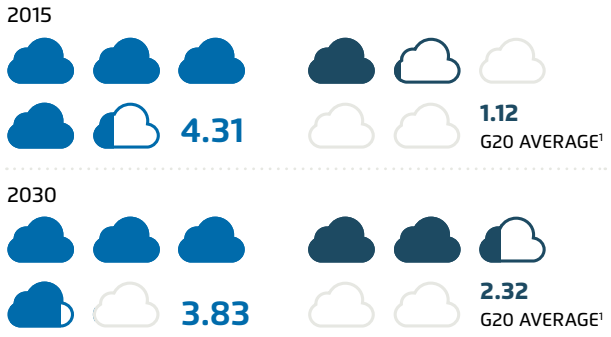
TRANSPORT SECTOR EMISSIONS

142.1 Mt CO_2
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2015)



187.7%
CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2015)

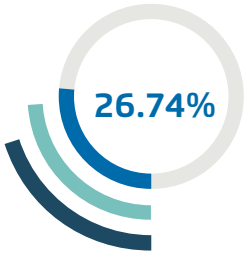
TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2015/2030)



t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

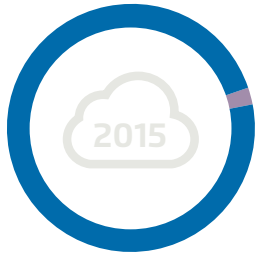
SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2015)



24%
WORLD AVERAGE

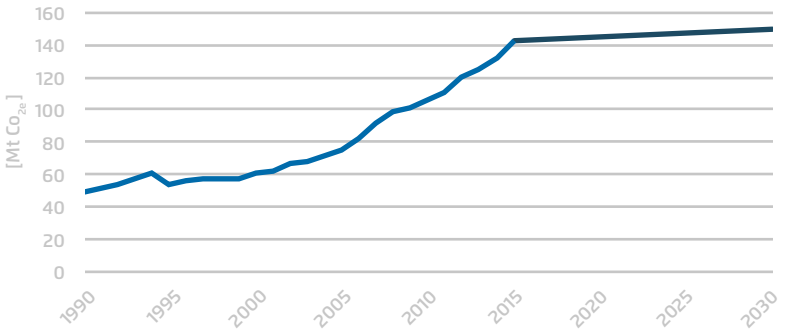
20%
G20 AVERAGE[1]

TRANSPORT EMISSIONS BY SUBSECTOR



- Road: 89%
- Rail: 0%
- Domestic navigation: 0%
- Domestic aviation: 2.0%
- Pipeline: 0%
- Non-specified: 0%

Historic and projected* emissions in the transport sector



Year: 2017

* Projected emissions under an average business-as-usual scenario

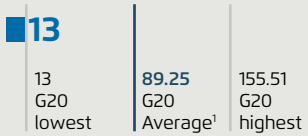
Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

ENERGY

GASOLINE PRICE (2018)
US Cents/Litre

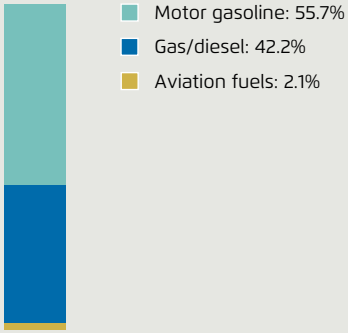
Source: Globalpetrolprices.com*

DIESEL PRICE (2018)
US Cents/Litre

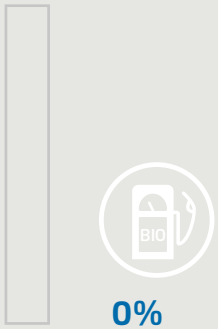


* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel



Year: 2016 Source: IEA



0%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*

* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

NO DATA
BATTERY

NO DATA
PLUG-IN HYBRID

NEW REGISTRATIONS OF ELECTRIC CARS (2016)

NO DATA
BATTERY

NO DATA
PLUG-IN HYBRID

NO DATA
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK

SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK

PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE

NO DATA
SLOW CHARGE

NO DATA
FAST CHARGE

16,434*
SLOW CHARGE
G20 AVERAGE[1]

5,678*
FAST CHARGE
G20 AVERAGE[1]

*number of units

LINKAGES TO THE ENERGY SECTOR

Saudi Arabia mostly relies on natural gas and oil to generate electricity. However, the country aims to expand its renewables base with an initial target of 3.45 GW by 2020 that will involve three rounds of tendering for wind, solar PV, concentrated solar power (CSP) and waste-to-energy technology. Development of a further 6.05 GW is targeted by 2023.

Existing targets for renewable electricity generation

No data

Existing targets for capacity

Electricity: 9.5 GW by 2023; 54 GW by 2040
Geothermal, waste-to-energy, wind: 13 GW by 2040
Solar PV and CSP: 41 GW by 2040

713.6 gCO_2/kWh
GRID EMISSION FACTOR (2016)

0.0%
SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

Sources: IEA, REN21, World Development Indicators * Including hydropower

AMBITION

NDC target

Committed to an annual reduction of 130 $MtCO_2e$ in 2030 relative to BAU

Transport related target

no mention

Transport related measures

- Introduction of efficiency standards in the transport sector
- Promotion of development and use of mass transport systems in urban areas

Targets at national level

Saudi Arabia does not have transportspecific national targets, although Vision 2030 sets out qualitative objectives to increase usage of public transportation and improve efficiency of railways.

EV deployment targets

No EV deployment targets or objectives

Source: NDC, 3rd National Communication; Vision 2030

TRADE-OFFS

Sustainability of biofuels

No mandates or support mechanisms in place and very limited use of biofuels. No sustainability regulation in place.

Source: IEA Consumption subsidies

Subsidies

19.41 Billion USD

LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

Source: IEA Consumption subsidies

No further information is available.

IMPLEMENTATION

Mobility

✔	**National programmes to support shift to public transport**	The Kingdom established the Public Transport Authority (PTA) in 2012 and allocated 200 billion Saudi riyals for public transport projects and for regulating the public transport services within and between cities. Saudi Railway Master Plan Public transport projects in all major cities
✔	**Measures to support low-carbon freight logistics**	North-South Railway (NSR) project Saudi Railway Master Plan
	National measures to support new mobility services	No measures at national level
	National measures to support non-motorised transport	No measures at national level
	Road charges	No toll system

Energy

✔	**Energy/carbon emission standards LDV**	Passenger cars: 142 g/km (2020) Light commercial: 186 g/km (2020)
	Energy/carbon emission standards HDV	No standard
	Pricing instruments	No CO_2 or energy consumption based taxes
✔	**Mandatory vehicle labelling**	Fuel economy labelling requirements
	Support mechanism for electric vehicles & charging infrastructure	No measures at national level
	Support for other low-carbon fuels and propulsion systems	No measures at national level
	Mandatory biofuel targets	No requirements or targets in place

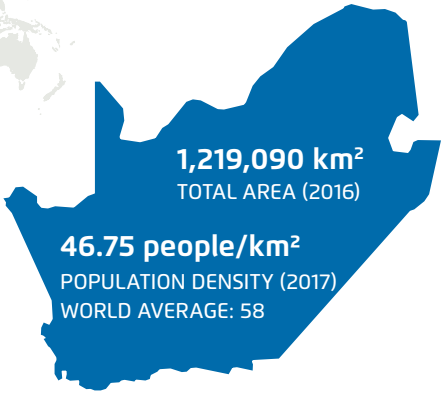
Source: See national sources Saudi Arabia

SOUTH AFRICA

South Africa's transport sector is dominated by road travel, but the country has good port and rail infrastructure and a growing airline industry. The country is the most urbanised in Africa, with nearly two-thirds of the population living in urban areas. Domestic travel patterns are characterised by large distances between places of residence and employment, and low-density urban development. South Africa has a higher than world average car ownership ratio.

The National Energy Efficiency Strategy 2005 set a national energy intensity target of 12% by 2015, with the transport sector slated to account for a 9% improvement in intensity relative to a 2000 baseline. The draft post-2015 revision of the strategy includes a 20% reduction in average vehicle energy intensity (MJ/km) by 2030, relative to a 2015 baseline, but has not yet been approved. The draft Green Transport Strategy, currently undergoing public consultation, envisions reducing GHG emissions by 5% by 2050 (without specifying the base year for reductions).

Sources: 2nd National Communication 2011 South Africa; BUR 2014; BUR 2017; CIA World Factbook; Department of Transport



0.9%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.67 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72

Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

12,295 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524

WORLD AVERAGE: 15,469

0.60%
SHARE IN GLOBAL GDP (2017)

POPULATION

56.7 mio people
POPULATION CURRENT (2017)

0.8%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION

65.9% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

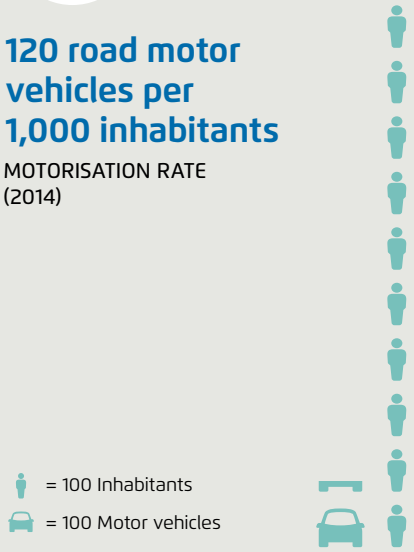
19.9 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)

Source: World Development Indicators

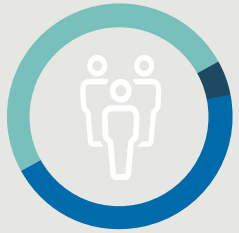
MOBILITY

120 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2014)



Sources: ITF Outlook 2017, World Development Indicators, ERC 2012

266,389 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2014/2006)



Passenger-km per mode (2014)
- Road, Car: 45%
- Road, Bus: 50%
- Rail: 5%

NO DATA
FREIGHT TRANSPORT VOLUME**

Tonne-km per mode
No data

* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

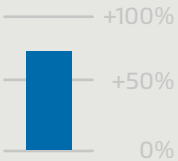
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

South Africa's total CO_2 emissions from fuel combustion have increased by 75% since 1990, with transport sector emissions increasing by 82% over the same period. Emissions from the sector are projected to grow between 44% and 135% by 2030. Some 5.6% of sector emissions are from rail transport. Aviation has also grown in importance in recent years, now representing 6% of sector emissions. Transport sector emissions represent only 13% of national emissions. This can be explained by the high carbon intensity of the power sector, which dominates South Africa's emissions profile.

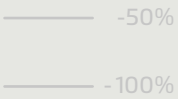
427.6 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2015)



75%

CHANGE IN TOTAL EMISSIONS (1990–2015)



TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2015)

7.54

5.52

G20 AVERAGE[1]

4.3

WORLD AVERAGE

1.32%

SHARE IN GLOBAL EMISSIONS (2015)

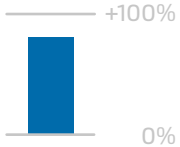
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

53.6 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2015)



81.7%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2015)

TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2015/2030)

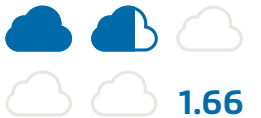
2015

0.95

1.12

G20 AVERAGE[1]

2030



1.66

2.32

G20 AVERAGE[1]

t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2015)

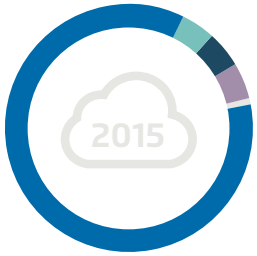
24%

WORLD AVERAGE

20%

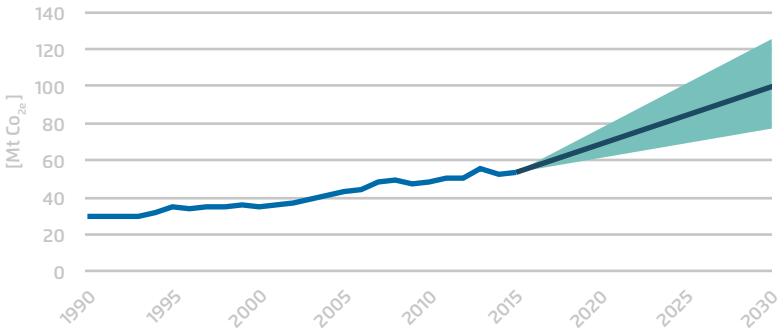
G20 AVERAGE[1]

TRANSPORT EMISSIONS BY SUBSECTOR



- Road: 87.6%
- Rail: 5.4%
- Domestic navigation: 6.0%
- Domestic aviation: 0%
- Pipeline: 0.1%
- Non-specified: 0.8%

Historic and projected* emissions in the transport sector



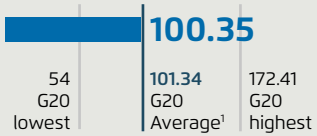
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

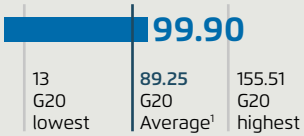
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



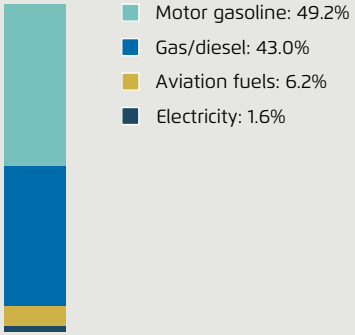
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre

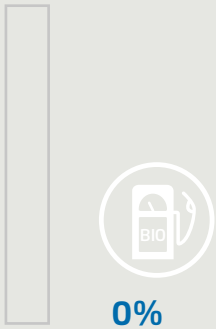


* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel



Year: 2016 Source: IEA



0%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*

* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

330
BATTERY

530
PLUG-IN HYBRID

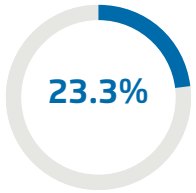
NEW REGISTRATIONS OF ELECTRIC CARS (2016)

70
BATTERY

130
PLUG-IN HYBRID

0.1%
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)



SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)

PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2017)

87*
SLOW CHARGE

37*
FAST CHARGE

16,434*
SLOW CHARGE G20 AVERAGE[1]

5,678*
FAST CHARGE G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

Coal is the dominant fuel source for power generation in South Africa, representing 93% of generation (global average: 39%). Between 2009 and 2011, a feed-in tariff was the main policy mechanism for promoting renewable energy. The tariff was replaced by a competitive bidding process, known as REIPPP, in 2011. Between 2011 and 2016, reverse auctions were held for the construction of 3,625 MW of renewable energy capacity. In 2018, long-overdue IPP contracts were finally signed and a fifth round of auctions for 1.8 GW capacity was announced for 2018, aiming to revive the scheme.

Existing targets for renewable electricity generation

2030: 9%
SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

Electricity: 17.8 GW by 2030

945.2 gCO_2/kWh
GRID EMISSION FACTOR (2016)

SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

Sources: IEA, REN21, World Development Indicators * Including hydropower

AMBITION

NDC target

South Africa's has committed itself to GHG emissions by 2025 and 2030 in a range between 398 and 614 Mt CO_{2e}

Transport related target

- 20% of hybrid-electric vehicles by 2030

Transport related measures

- Integrate electric and hybrid vehicles

EV deployment targets

- More than 2.9 million EVs by 2050, with R6.5 trillion to be invested in the industry over the next four decades
- The EV Industry Road Map plans to introduce a policy to ensure that 5% of total annual fleet requirements by state and state-owned enterprises are comprised of EVs, increasing by 5% thereafter until 2020

Targets at national level

The draft Green Transport Strategy, currently in the process of public consultation, envisions reducing GHG emissions by 5% by 2050 (the base year is not specified). The National Energy Efficiency Strategy 2005 set a national energy intensity target of 12% by 2015, with the transport sector contributing a 9% improvement in intensity relative to a 2000 baseline. The draft post-2015 revision of the strategy includes a 20% reduction in average vehicle energy intensity (MJ/km) by 2030 relative to a 2015 baseline.

Source: NDC, Department of Energy; IEA EV Outlook 2018; Department of Transport

TRADE-OFFS

Sustainability of biofuels

A Biofuels Feedstock Protocol is currently under consideration that aims to address food security concerns to safeguard the switching from food production to biofuels feedstock. Among the conditions in the Protocol is the use of idle land for commercial and small-scale feedstock production under rain-fed conditions. Furthermore, the use of maize and potatoes for biofuel production would be prohibited, as well as deforestation for the purpose of feedstock production.

Source: OECD

Subsidies

R

27.49 Billion ZAR

~2.06 BILLION USD
LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR

Source: OECD

The prices of gasoline, diesel and kerosene are set by reference to the Basic Fuel Price, which is determined on the first Wednesday of each month by the Department of Energy, using international market prices as the benchmark. The government also sets maximum retail prices for LPG. Domestic wholesale and transport costs are added to the Basic Fuel Price, together with a number of other taxes and levies. The bulk of government support goes to petroleum products, mainly due to the exemption from the Value-Added Tax on sales of gasoline and diesel. Subsidies have increased steadily over the last years.

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	The Transport Flagship Programme will developed an enhanced public transport programme to promote lower-carbon mobility The Integrated Public Transport Network aims at the integration of urban public transport
Measures to support low-carbon freight logistics	Transnet's Market Demand Strategy focuses on increasing rail's market share from 23% in 2011/2012 to 35% by 2018/19, but it is unclear if/how this is supported by policy
National measures to support new mobility services	No measures at national level
National measures to support non-motorised transport	No measures at national level In 2008 a draft non-motorised transport policy was published, but not approved
✔ **Road charges**	Tolls apply to around 20% of public roads

Energy

Energy/carbon emission standards LDV	No standard
Energy/carbon emission standards HDV	No standard
✔ **Pricing instruments**	Registration tax based on CO_2 Carbon tax under discussion, scheduled to come into effect January 2019
✔ **Mandatory vehicle labelling**	South African Fuel Economy Label
Support mechanism for electric vehicles & charging infrastructure	No measures at national level
Support for other low-carbon fuels and propulsion systems	No measures at national level
✔ **Mandatory biofuel targets**	South Africa has mandatory shares of 2% for bioethanol and 5% for biodiesel.

Source: See national sources South Africa

TURKEY

785,350 km²
TOTAL AREA (2016)

104.91 people/km²
POPULATION DENSITY (2017)
WORLD AVERAGE: 58

0.6%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

Turkey is located between the Black Sea and the Mediterranean. The most densely populated area is found around the Bosphorus in the northwest, with 20% of the population living in Istanbul. With the exception of Ankara, urban centers remain small and scattered throughout the interior of Anatolia. The majority of transport is road-based, with diesel playing a major role and LPG having an uncharacteristically high share in sector fuel use. International aviation is playing an important role in the tourism sector, but domestic aviation has also seen substantial growth for passenger and freight transport.

Turkey's Climate Change Action Plan 2011-2023 sets targets for increasing the share of rail and navigation in passenger and freight transport. The strategies developed thus far focus predominantly on achieving this modal shift, meaning few measures are in place to encourage vehicle efficiency or low-carbon alternatives.

Sources: 6th National Communication; CIA World Factbook

0.77 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72 Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

25,129 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524

WORLD AVERAGE: 15,469

1.74%
SHARE IN GLOBAL GDP (2017)

POPULATION

80.7 mio people
POPULATION CURRENT (2017)

1.1%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION

74.6% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

29.9 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)

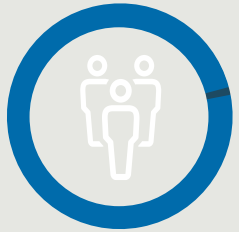
Source: World Development Indicators

MOBILITY

237 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2016)

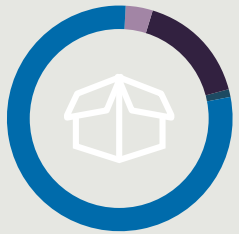
= 100 Inhabitants
= 100 Motor vehicles

305,177 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2016)



Passenger-km per mode (2016)
- Road: 99%
- Road, Bus: 0%
- Rail: 1%

320,977 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2016)



Tonne-km per mode (2016)
- Road: 79%
- Inland waterways: 0%
- Rail: 4%
- Pipeline: 16%
- Domestic air: 1%

Sources: ITF/OECD, World Development Indicators

* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

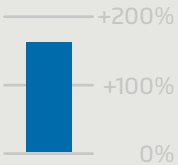
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Turkey's total CO_2 emissions from fuel combustion have increased by 163% since 1990, but per capita emissions are still below G20 and global average. Transport sector emissions have increased by 183% over the same period and are projected to grow a further 69% by 2030. Road transport and aviation together represent almost 97% of sector emissions.

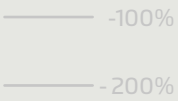
338.8 Mt CO_2

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2016)

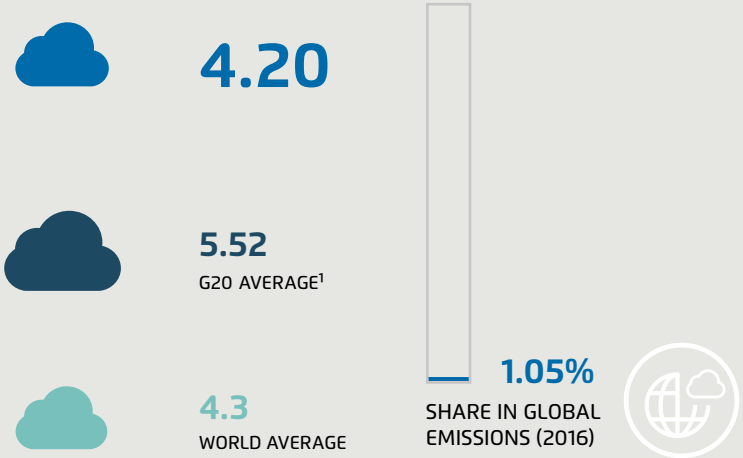


163%

CHANGE IN TOTAL EMISSIONS (1990–2016)



TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2013)



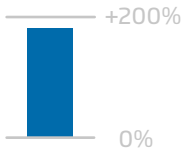
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

79 Mt CO_2

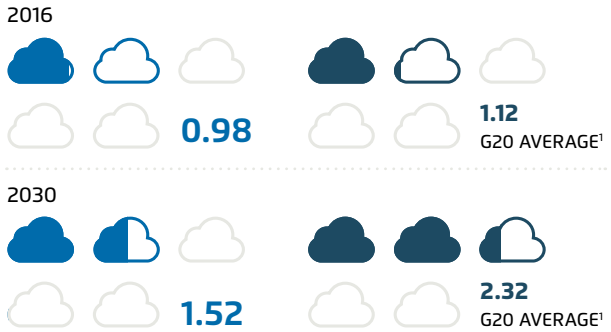
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2016)



183.2%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2016)

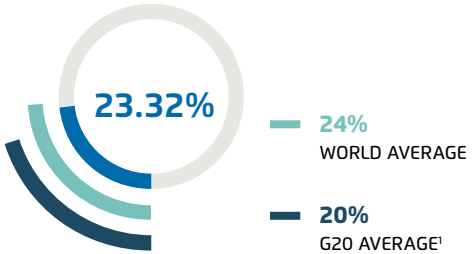
TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2016/2030)



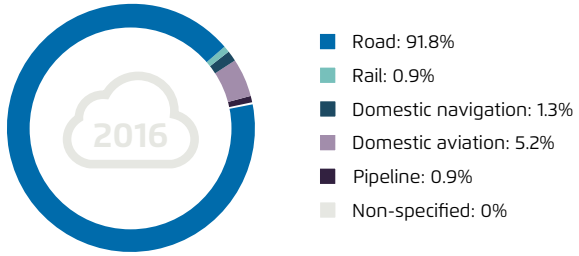
t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

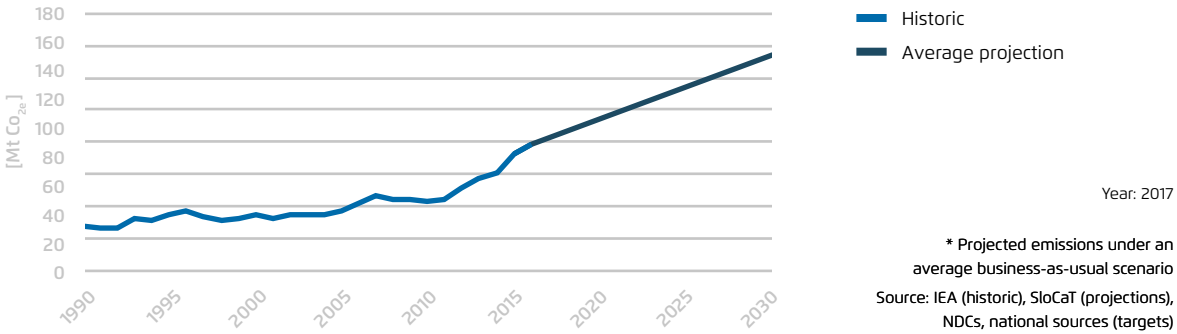
SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2016)



TRANSPORT EMISSIONS BY SUBSECTOR



Historic and projected* emissions in the transport sector



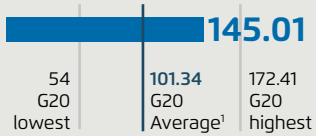
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

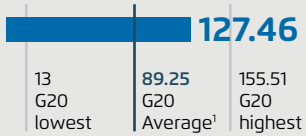
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



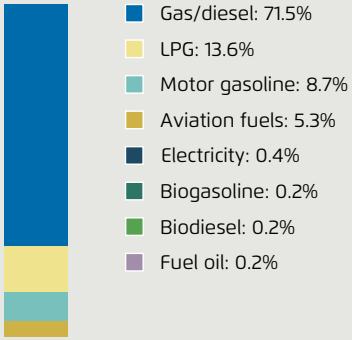
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre



* local currency prices converted using OECD annual exchange rates

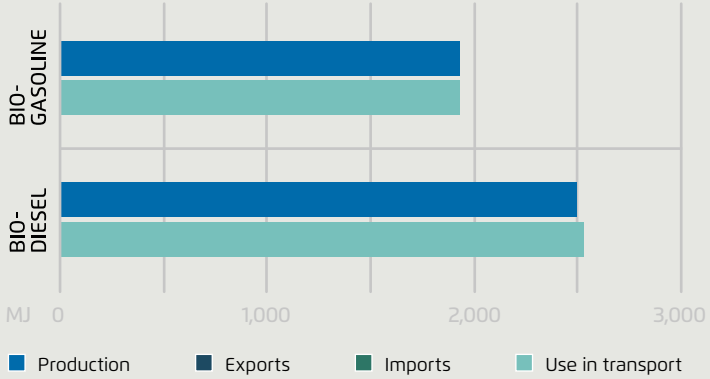
Energy use in transport by fuel



Year: 2016 Source: IEA

0%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

NO DATA
BATTERY

NO DATA
PLUG-IN HYBRID

NEW REGISTRATIONS OF ELECTRIC CARS (2016)

NO DATA
BATTERY

NO DATA
PLUG-IN HYBRID

NO DATA
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK

%

SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK

%

PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2017)

200* SLOW & FAST CHARGE

16,434* SLOW CHARGE G20 AVERAGE[1]

5,678* FAST CHARGE G20 AVERAGE[1]

*number of units

Source: Electric Vehicle-Mobility in Turkey, 2017

LINKAGES TO THE ENERGY SECTOR

Non-renewable electricity in Turkey is mostly generated using natural gas (38%) and coal (29%). In Turkey, renewable electricity production is mainly promoted through a guaranteed feed-in tariff set by the Turkish Renewable Energy Resources Support Mechanism (YEKDEM). The feed-in tariff is limited to 10 years. The system also includes purchase guarantees, connection and dispatch priorities, lower license fees, license exemptions in exceptional circumstances and various practical conveniences in project preparation and land acquisition. Since 2016, the right to develop 'Renewable Energy Resource Areas' (YEKA) is granted through reverse auctions.

Existing targets for renewable electricity generation

2023: 30%
SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

Solid biomass: 1 GW
Geothermal: 1 GW
Hydro: 34 GW
Solar PV: 5 GW
Wind: 20 GW
by 2023

464.5 gCO_2/kWh
GRID EMISSION FACTOR (2016)

SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

Sources: IEA, REN21, World Development Indicators * Including hydropower

AMBITION

NDC target

Committed up to 21% reduction in GHG emissions in 2030 compared to BAU

Transport related target

no mention

Transport related measures

• Ensuring modal shift from road to maritime and rail

EV deployment targets

No EV deployment targets or objectives

Targets at national level

The Climate Change Action Plan 2011-2023 sets forth the following targets:

• Increasing the share of railroads in freight transportation from 5% in 2009 to 15%, and in passenger transportation from 2% in 2009 to 10% by 2023,
• Increasing the share of seaways in freight transportation from 2.6% of tonne-kilometres in 2009 to 10%, and in passenger transportation from 0.37% of passenger-kilometres in 2009 to 4%, and
• Decreasing the share of highways in freight transportation from 80% of tonne-kilometres in 2009 to below 60%, and in passenger transportation from 90% of passenger-kilometres in 2009 to 72%.

Source: INDC, Climate Change Action Plan 2011–2023

TRADE-OFFS

Sustainability of biofuels

No measures to ensure sustainability of biofuels were found.

Source: OECD

Subsidies

5.97 Billion TRY

~1.64 BILLION USD
LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR

Source: OECD

Prices for gasoline and diesel fuel in Turkey are among the highest in the world owing to high excise taxes on fuel. There are limited subsidies for oil exploration and the bulk of support goes to fuel tax exemptions for agriculture, ships in cabotage lines and aviation. Data is only available from 2014 for most subsidies but is based on the most recent data. Support affecting the transport sector increased by around 20% between 2014 and 2016.

IMPLEMENTATION

Mobility

✔	**National programmes to support shift to public transport**	2012 EE Strategy and Climate Change Action Plan to develop efficient transport systems and to increase the share of maritime and rail transport
✔	**Measures to support low-carbon freight logistics**	2012 EE Strategy and Climate Change Action Plan to develop efficient transport systems and to increase the share of maritime and rail transport
	National measures to support new mobility services	No measures at national level
✔	**National measures to support non-motorised transport**	Climate Change Action Plan to develop and improve bicycle and pedestrian transport
✔	**Road charges**	Toll charges on selected motorways and bridges

Energy

	Energy/carbon emission standards LDV	No standard
	Energy/carbon emission standards HDV	No standard
	Pricing instruments	No CO_2 or energy consumption based taxes
✔	**Mandatory vehicle labelling**	Energy label similar to EU regulation
✔	**Support mechanism for electric vehicles & charging infrastructure**	Reduced special consumption tax for electric vehicles
	Support for other low-carbon fuels and propulsion systems	No measures at national level
✔	**Mandatory biofuel targets**	Turkey has a mandatory 2% share for bioethanol

Source: See national sources Turkey

UNITED KINGDOM

In the UK a large share of the population lives in and around London, but significant urban clusters are also located in central Britain, the Scottish lowlands, southern Wales, and the east of Northern Ireland. The UK is connected to mainland Europe via the Channel Tunnel, and also lies along important sea lanes. Road transport is the most important mode of passenger and freight transport, although domestic navigation accounts for a significant share of freight (nearly one-third).

The UK has a national target to reduce GHG emissions from transport by 17–28% below 2009 levels by 2027. The Green Growth Strategy 2017 sets the goal to ban sales of new conventional petrol and diesel cars and vans by 2040. The 2017 Green Growth Strategy sets the goal of banning the sale of new conventional petrol and diesel cars and vans by 2040. The UK also aims to have 396,000 to 431,000 electric cars on the road by 2020.

Sources: 6th National Communication; BUR 2015 UK; CIA World Factbook; Clean Growth Strategy 2017; IEA EV Outlook 2018

243,610 km²
TOTAL AREA (2016)

272.90 people/km²
POPULATION DENSITY (2017)
WORLD AVERAGE: 58

0.2%
SHARE OF GLOBAL AREA

Sources: World Development Indicators

0.91 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: 0.72 Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

39,753 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: 19,524 WORLD AVERAGE: 15,469

2.25%
SHARE IN GLOBAL GDP (2017)

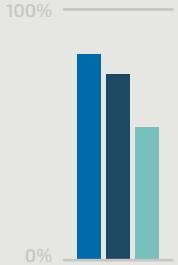
POPULATION

66.0 mio people
POPULATION CURRENT (2017)

0.9%
SHARE IN GLOBAL POPULATION (2017)

Source: World Development Indicators

URBANISATION



83.1% of total
URBAN POPULATION (2017)

75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE

17.6 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)

Source: World Development Indicators

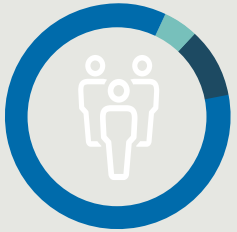
MOBILITY

585 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2016)

= 100 Inhabitants
= 100 Motor vehicles

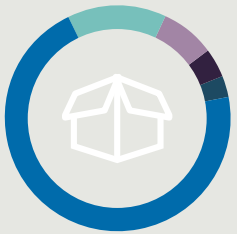
Sources: ITF/OECD, World Development Indicators, UK Department of Transport

788,632 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2017)



Passenger-km per mode (2017)
- Road, Car: 85%
- Road, Bus: 5%
- Rail: 10%

219,464 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2017)



Tonne-km per mode (2017)
- Road: 71%
- Inland waterways: 14%
- Rail: 8%
- Pipeline: 4%
- Domestic air: 3%

* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

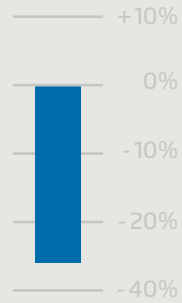
[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Total CO_2 emissions from fuel combustion in the UK have decreased by 32% since 1990. Emissions in the transport sector increased by almost 5% in the same period. As a result, the transport sector is now responsible for almost a third of total emissions. But emissions from the sector increased between 1990 and 2007 and started declining afterwards. Since 2013 transport emissions have been rising again. Per capita emissions in the sector are 63% above the G20 average.

371.1 Mt CO_2

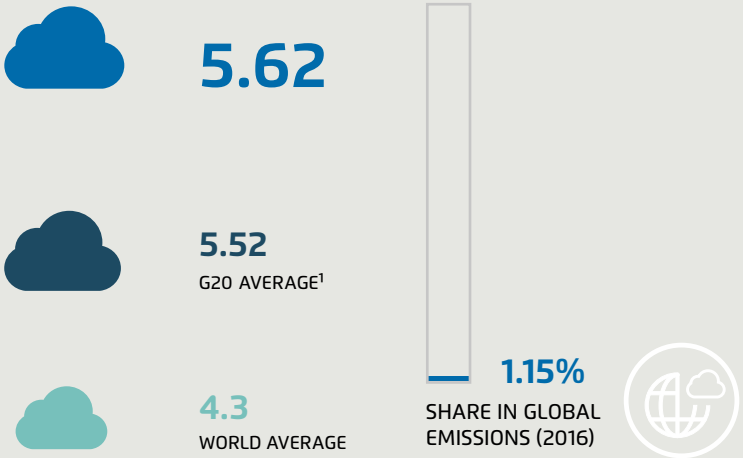
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2016)



-32%

CHANGE IN TOTAL EMISSIONS (1990–2016)

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2016)



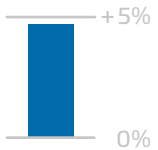
t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

120.5 Mt CO_2

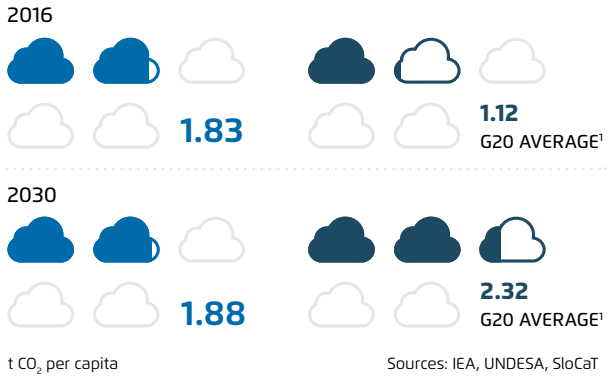
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2016)



4.8%

CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2016)

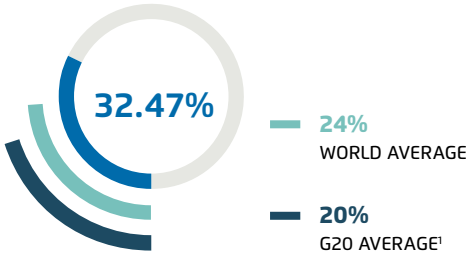
TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2016/2030)



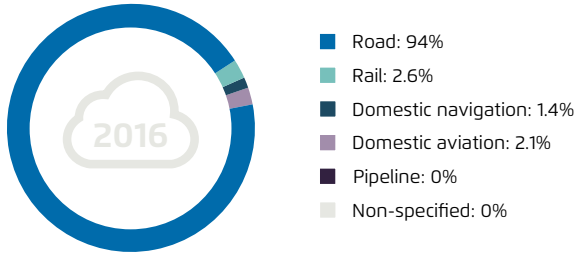
t CO_2 per capita

Sources: IEA, UNDESA, SloCaT

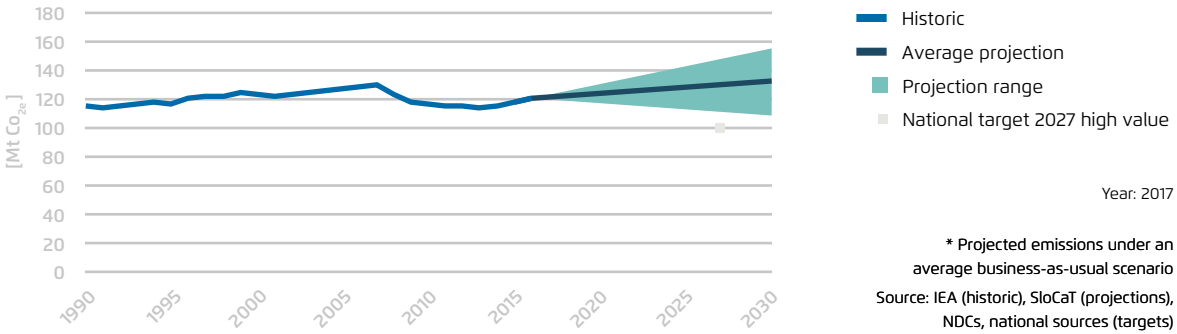
SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2016)



TRANSPORT EMISSIONS BY SUBSECTOR



Historic and projected* emissions in the transport sector



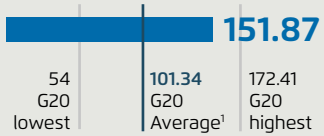
Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

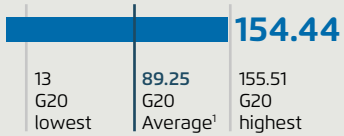
ENERGY

GASOLINE PRICE (2017)
US Cents/Litre



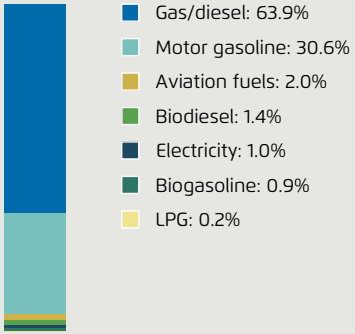
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre

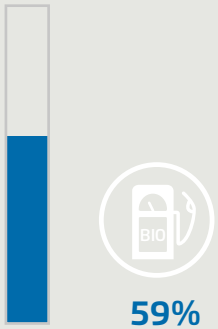


* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel

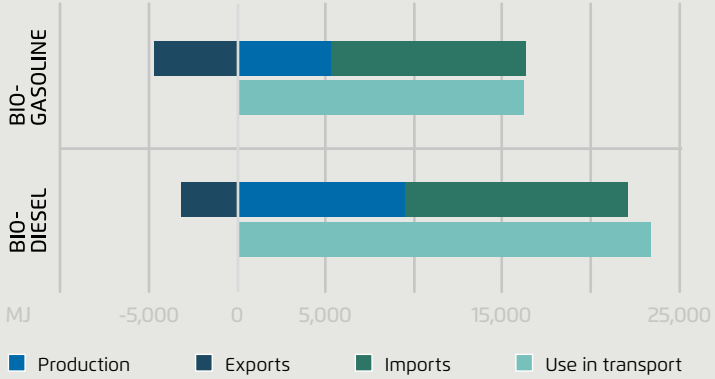


Year: 2016 Source: IEA



59%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

45,010
BATTERY

88,660
PLUG-IN HYBRID

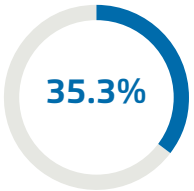
NEW REGISTRATIONS OF ELECTRIC CARS (2016)

13,550
BATTERY

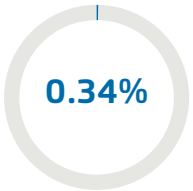
33,700
PLUG-IN HYBRID

1.7%
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)



SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)



PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2017)

11,497* SLOW CHARGE

2,037* FAST CHARGE

16,434* SLOW CHARGE G20 AVERAGE[1]

5,678* FAST CHARGE G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

Non-renewable electricity generation in the UK is nearly evenly distributed between natural gas, coal and nuclear. Renewable electricity sources are supported through a number of different mechanisms: There is a feed-in tariff for plants up to 5 MW in size, and larger plants can benefit from the "Contracts for Difference" scheme. Under the quota system, electricity suppliers of more than 5 MW of capacity are obliged under the Renewables Obligation Orders to supply a certain proportion of electricity from renewable sources ("quota") to their customers.
Renewables are also exempt from paying a taxon on fossil-fuel power generation.

Existing targets for renewable electricity generation

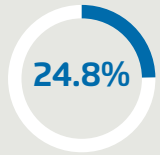
No national target, provincial target of 100% by 2020 in Scotland

SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

Wind (offshore): 39 GW by 2030

278.2 gCO_2/kWh
GRID EMISSION FACTOR (2016)



SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

Sources: IEA, REN21, World Development Indicators * Including hydropower

AMBITION

NDC target

See EU: committed to a 40% reduction in GHG emissions in 2030 relative to 1990

Transport related target

no mention

Transport related measures

no mention

EV deployment targets

- 396,000 to 431,000 electric cars by 2050.

Targets at national level

- The Carbon Plan from 2011 aims for transport emissions to be 17%-28% lower than 2009 levels by 2027.
- The government's goal is for nearly all new cars and vans to be zero emission vehicles by 2040 and for almost every car and van on the road to be a zero emission vehicle by 2050.
- End the sale of new conventional petrol and diesel cars and vans by 2040.

Source: NDC, Grantham Research Institute; Clean Air Strategy 2017; Clean Growth Strategy 2017; IEA EV Outlook 2018

TRADE-OFFS

Sustainability of biofuels

The EU Renewable Energy Directive establishes two sets of criteria to promote the sustainability of biofuels production: (1) GHG emissions savings and land use requirements must be at least 50% (60% for new installations in 2018), and (2) biodiesel may not be produced on land that was converted from high carbon density conditions such as rainforests. To demonstrate compliance with the EU sustainability criteria, biofuels need to be validated by national verification systems or by one of 20 voluntary schemes approved by the EC. In 2015, the ILUC Directive put a cap on the share of conventional biofuels that can be used to meet the transport sector's 10% blend target at 7% and a requirement that advanced biofuels comprise a minimum share of 0.5% of transport sector's energy use by 2020. To further incentivize advanced biofuel use, the amendment allowed MS to double count the contribution of advanced biofuels to meeting these binding targets.

Source: OECD

Subsidies

£

Billion GBP

LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

Source: OECD

The UK does not subsidise end-user prices for transportation fuels. While several non-governmental research organisations have published estimates of UK government support for production, no data on production support are reported officially.

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	Local Sustainable Transport Fund provides funding to promote public transport
✔ **Measures to support low-carbon freight logistics**	Delivering trials of Heavy Goods Vehicle (HGV) platoons £20 million for the Low Emission Freight and Logistics Trial
✔ **National measures to support new mobility services**	Automated and Electric Vehicles Act (July 2018)
✔ **National measures to support non-motorised transport**	Local Sustainable Transport Fund Cycling and Walking Investment Strategy Transforming Cities Fund
✔ **Road charges**	Toll charges on selected motorways, bridges and tunnels (traffic congestion charges in London and Durham peninsula)

Energy

✔ **Energy/carbon emission standards LDV**	EU CO_2 efficiency targets
✔ **Energy/carbon emission standards HDV**	Proposed targets for average CO_2 emissions from new lorries
✔ **Pricing instruments**	Circulation tax based on CO_2 Vehicle Excise Duty (VED) and the Company Car Tax System linked to CO_2
✔ **Mandatory vehicle labelling**	National implementation of the EU Car Labelling Directive 1999/94/EC
✔ **Support mechanism for electric vehicles & charging infrastructure**	CO_2/km-based and zero-emission range-based purchase subsidy scheme Fuel duty exemption Reduced taxation for company cars Support for charging infrastructure deployment
✔ **Support for other low-carbon fuels and propulsion systems**	Renewable energy targets 2020: 10% of transport fuels from renewables Fuel Quality Directive; Clean Vehicles Directive
✔ **Mandatory biofuel targets**	Mandatory 9.75% biofuel share in 2020 and 12.4% share in 2030

Source: See national sources UK

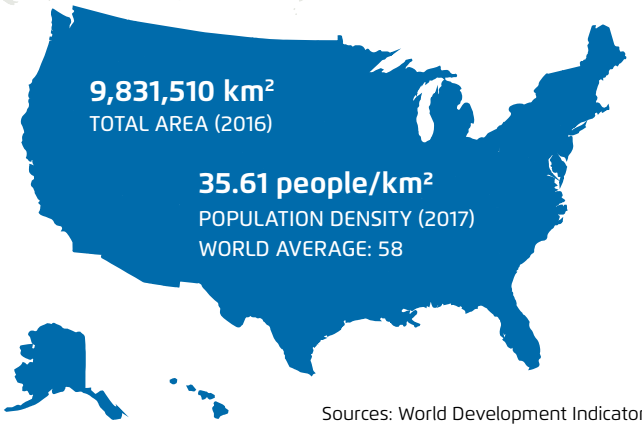
UNITED STATES

The US features large urban clusters on its western and eastern seaboards, while inland areas are less densely populated. The large distances between cities make air travel an increasingly important mode of transport, accounting for more than 11% of passenger transport volumes. Automobiles and light trucks still dominate passenger transport, and the highway share of passenger miles traveled in 2013 was about 87%. Mass transit and rail travel play a minor role in passenger transport, but rail plays an important role in freight, accounting for one-third of freight volumes.

The US has not set specific targets for the transport sector. The NDC showcases one of the main instruments, the light-duty and heavy-duty fuel economy standards.

Sources: Climate Action Report 2014 USA; CIA World Factbook; ITF/OECD

7.3%
SHARE OF GLOBAL AREA



Sources: World Development Indicators

0.92 HDI*
HUMAN DEVELOPMENT INDEX* IN 2015

WORLD AVERAGE: **0.72**
Source: UNDP

* The human development index is a value from zero to 1, with 1 representing the highest possible development according to the covered indicators

54,225 constant 2011 international $ (PPP)
GDP PER CAPITA (2017)

● = 1,000 $

G20 AVERAGE[1]: **19,524**
WORLD AVERAGE: **15,469**

15.16%
SHARE IN GLOBAL GDP (2017)

POPULATION

325.7 mio people
POPULATION CURRENT (2017)

4.3%
SHARE IN GLOBAL POPULATION (2017)

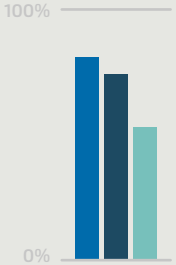
Source: World Development Indicators

URBANISATION

82.1% of total
URBAN POPULATION (2017)

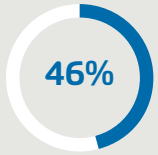
75.02%
G20 AVERAGE[1]

54.83%
WORLD AVERAGE



149.5 mio people
POPULATION IN URBAN AREAS OF > 1 MIO (2017)

SHARE IN TOTAL POPULATION (2017)



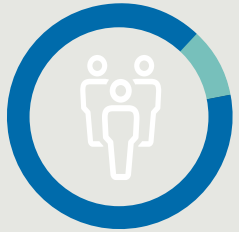
Source: World Development Indicators

MOBILITY

891 road motor vehicles per 1,000 inhabitants
MOTORISATION RATE (2016)

= 100 Inhabitants
= 100 Motor vehicles

5,469,091 mio passenger-km
PASSENGER TRANSPORT VOLUME* (2016)



Passenger-km per mode (2016)
- Road, Car: 90%
- Road, Bus: 10%
- Rail: 0%

6,783,067 mio tonne-km
FREIGHT TRANSPORT VOLUME** (2017)

Tonne-km per mode (2017)
- Road: 43%
- Inland waterways: 7%
- Rail: 36%
- Pipeline: 13%
- Domestic air: 1%

Sources: ITF/OECD, World Development Indicators

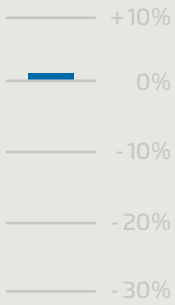
* Includes road and rail transport, not aviation and non-motorised transport modes
** Includes road, rail, inland waterways, pipeline transport and domestic air transport

[1] G20 average includes the EU and excludes individual EU member states (France, Germany, Italy, UK) to avoid double counting

TOTAL EMISSIONS

Total CO_2 emissions from fuel combustion in the US have increased by 1% since 1990, with emissions from the transport sector increasing by 20% over the same period to more than one-third of total emissions. Per capita emissions are the third highest in the G20, only surpassed by Saudi Arabia and Australia. Per capita transport emissions are the highest in the G20. Aviation plays an important role in domestic transport, representing almost 10% of sector emissions, the highest share in the G20.

4828.3 Mt CO_2
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION (2016)



1%
CHANGE IN TOTAL EMISSIONS (1990 – 2016)

TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION PER CAPITA (2016)

14.82

5.52
G20 AVERAGE[1]

4.3
WORLD AVERAGE

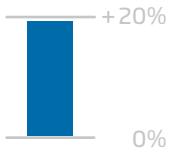
14.91%
SHARE IN GLOBAL EMISSIONS (2016)

t CO_2 per capita

Sources: UNDESA, IEA CO_2 emissions from fuel combustion

TRANSPORT SECTOR EMISSIONS

1710 Mt CO_2
TOTAL CO_2 EMISSIONS FROM FUEL COMBUSTION IN THE TRANSPORT SECTOR (2016)



19.8%
CHANGE IN TRANSPORT SECTOR EMISSIONS (1990–2016)

TOTAL CO_2 EMISSIONS PER CAPITA IN THE TRANSPORT SECTOR (2016/2030)

2016

5.25

1.12
G20 AVERAGE[1]

2030

5.32

2.32
G20 AVERAGE[1]

t CO_2 per capita

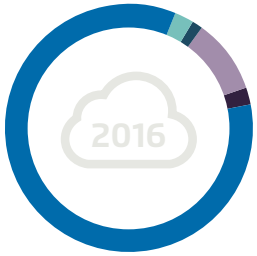
Sources: IEA, UNDESA, SloCaT

SHARE OF TRANSPORT EMISSIONS IN TOTAL CO_2 EMISSIONS (2016)

24%
WORLD AVERAGE

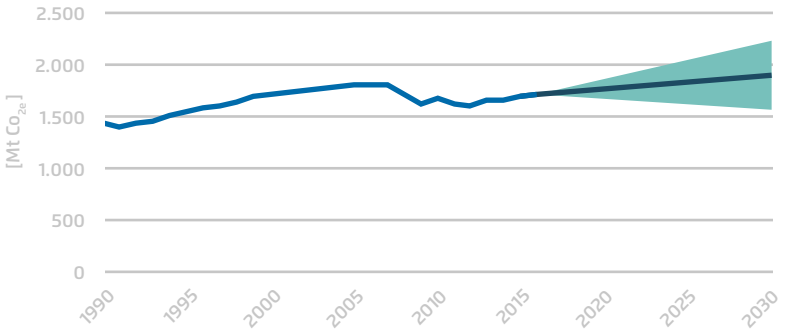
20%
G20 AVERAGE[1]

TRANSPORT EMISSIONS BY SUBSECTOR



- Road: 84.4%
- Rail: 2.3%
- Domestic navigation: 1.4%
- Domestic aviation: 9.7%
- Pipeline: 2.2%
- Non-specified: 0%

Historic and projected* emissions in the transport sector



Year: 2017

* Projected emissions under an average business-as-usual scenario

Source: IEA (historic), SloCaT (projections), NDCs, national sources (targets)

ENERGY

GASOLINE PRICE (2017)
US Cents/Litre

54	70.00	172.41
G20 lowest	101.34 G20 Average[1]	G20 highest

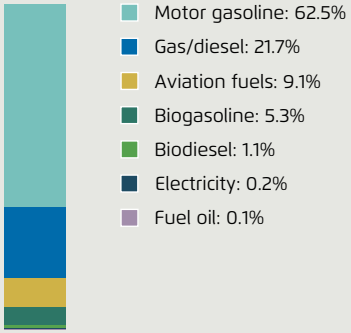
Source: Globalpetrolprices.com*

DIESEL PRICE (2017)
US Cents/Litre

13	68.00	155.51
G20 lowest	89.25 G20 Average[1]	G20 highest

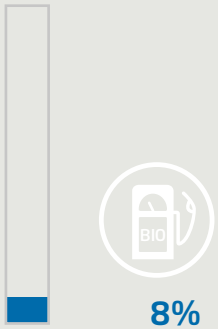
* local currency prices converted using OECD annual exchange rates

Energy use in transport by fuel



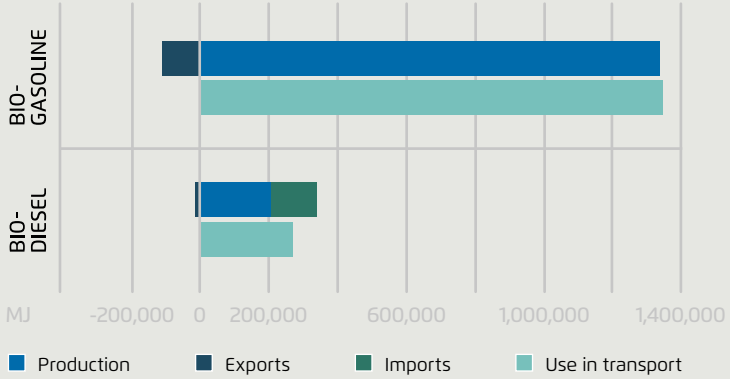
- Motor gasoline: 62.5%
- Gas/diesel: 21.7%
- Aviation fuels: 9.1%
- Biogasoline: 5.3%
- Biodiesel: 1.1%
- Electricity: 0.2%
- Fuel oil: 0.1%

Year: 2016 Source: IEA



8%
SHARE OF BIOFUELS IMPORTED (2016)

Biofuel supply and use*



* Excluding biogas, as this is mostly used in other sectors Year: 2016 Source: IEA

ELECTRIC VEHICLES

TOTAL STOCK OF ELECTRIC CARS (2016)

401,550
BATTERY

360,510
PLUG-IN HYBRID

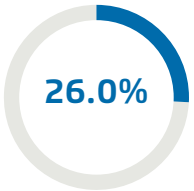
NEW REGISTRATIONS OF ELECTRIC CARS (2016)

104,490
BATTERY

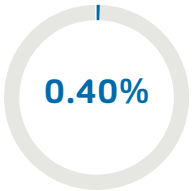
93,860
PLUG-IN HYBRID

1.2%
MARKET SHARE OF ELECTRIC CARS IN THE NATIONAL MARKET (2017)

SHARE OF NEW REGISTRATIONS IN TOTAL EV STOCK (2017)



SHARE OF ELECTRIC CARS IN TOTAL PASSENGER CAR STOCK (2017)



PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE (2017)

39,601*
SLOW CHARGE

6,267*
FAST CHARGE

16,434*
SLOW CHARGE G20 AVERAGE[1]

5,678*
FAST CHARGE G20 AVERAGE[1]

*number of units Source: IEA, 2017

LINKAGES TO THE ENERGY SECTOR

In the US, coal and natural gas are the primary fuels for power generation, followed by nuclear with a 19% share. One of the main policies for supporting renewables is the Renewable Electricity Production Tax Credit (PTC). Originally enacted in 1992, the PTC provides a per-kilowatt-hour tax credit for a ten-year period beginning on the placed-in-service date for electricity generated by qualified energy resources. From 2017 onward only wind is eligible for the PTC and the scheme is scheduled to expire at the end of 2019. A second policy for supporting renewables is the Business Energy Investment Tax Credit (ITC), which, depending on the technology, applies corporate tax credits at varying rates. The Residential Renewable Energy Tax Credit allows US residents to claim a credit of 30% of qualified expenditures for their personal tax.

Existing targets for renewable electricity generation

No national target. De facto state-level targets have been set through existing RPS policies.

SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES

Existing targets for capacity

No capacity targets

433.2 gCO_2/kWh
GRID EMISSION FACTOR (2016)

SHARE OF RENEWABLES IN ELECTRICITY PRODUCTION* (2015)

Sources: IEA, REN21, World Development Indicators * Including hydropower

AMBITION

NDC target

Committed to a 26–28% reduction in GHG emissions in 2025 relative to 2005

Transport related target

no mention

Transport related measures

- Introduce fuel economy standards for light-duty vehicles for the model years 2012–2025 and for heavy-duty vehicles for the model years 2014–2018

EV deployment targets

- 3 300 000 EVs in eight states by 2025 (California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island, Vermont).
- ZEV mandate in ten states: 22% ZEV credit sales in passenger cars and light-duty trucks by 2025.7 (California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island, Vermont, Maine, New Jersey).
- California: 1.5 million ZEVs and 15% of effective sales by 2025, and 5 million ZEVs by 2030.

Targets at national level

The US does not have specific national targets for the transport sector.

Source: NDC, US Mid-Century Strategy for Deep Carbonization 2016; IEA EV Outlook 2018

TRADE-OFFS

Sustainability of biofuels

To meet environmental objectives, lifecycle greenhouse gas emissions need to show a minimum reduction relative to a petroleum baseline. Thresholds are defined for different combinations of feedstock, production processes and fuels and ranges from 20 to 60 percent.

Source: OECD

Subsidies

0.56 Billion USD

LEVEL OF FOSSIL FUEL SUBSIDIES IN THE TRANSPORT SECTOR (2016)

Source: OECD

Automotive fuels in general are exempt from state sales tax, as special taxes on these fuels are levied at the state, and in some cases, local level. Federal tax breaks are available for various types of offshore oil and gas production. The Strategic Petroleum Reserve (SPR) is also a source of support for the oil industry, as its costs are covered entirely by the federal government. Overall, support for transport-relevant extraction/production areas decreased by around one-third between 2014 and 2016. Additionally, specific forms of rapid depreciation options for exploration and refining have been yielding income for the government due to reduced capital investment in the sectors.

IMPLEMENTATION

Mobility

✔ **National programmes to support shift to public transport**	New Starts and Small Starts Programmes (transit rail and busway investments) Pilot Program for Transit-Oriented Development Planning
✔ **Measures to support low-carbon freight logistics**	SmartWay Initiative (in coordination with Canada)
✔ **National measures to support new mobility services**	Mobility on Demand Sandbox Program Federal Automated Vehicles Policy „Self Drive Act" passed the House in Sept 2017 but still needs to pass Senate
✔ **National measures to support non-motorised transport**	Bicycle and Pedestrian Program Strategic Agenda for Pedestrian and Bicycle Transportation
Road charges	No toll system at federal level The Federal-aid Highway Program enables states and public entities to implement toll systems

Energy

✔ **Energy/carbon emission standards LDV**	Passenger cars: 99 g/km (2025) Light commercial: 139 g/km (2025)
✔ **Energy/carbon emission standards HDV**	Phase 1 (2014–18): 5–9% fuel saving compared to 2010 baseline Phase 2 (2018–27): 9–12% fuel saving compared to 2010 baseline
✔ **Pricing instruments**	Gas-guzzler tax on high-CO_2 vehicles
✔ **Mandatory vehicle labelling**	EPA Motor Vehicle Fuel Economy Label
✔ **Support mechanism for electric vehicles & charging infrastructure**	Tax credit of USD 2,500 to USD 7,500 to be phased out after 200,000 units per manufacturer are sold for use within the country 2 billion USD earmarked by Electrify America to invest in charging infrastructure between 2017–2027
✔ **Support for other low-carbon fuels and propulsion systems**	Clean vehicle rebate project: rebates for zero emission vehicles Energy Policy Act: pilot projects for advanced vehicles Low or No Emission Vehicle Program
✔ **Mandatory biofuel targets**	The Renewable Fuel Standard sets absolute targets at 68.6 billion litres of renewable fuels, including 1.1 billion litres of cellulosic biofuel, 7.9 billion litres of biomass-based diesel, and 16.2 billion litres of advanced biofuel in 2018. This was scheduled to increase to 136 billion litres of renewable fuels by 2022.

Source: See national sources US.

09

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10

ANNEX: DATA SOURCES FOR FACTSHEETS

10 | Annex: Data sources for factsheets

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In partnership with key players in the field of politics, economics, science and civil society, Agora Verkehrswende aims to lay the necessary foundations for a comprehensive climate protection strategy for the German transport sector, with the ultimate goal of complete decarbonisation by 2050. For this purpose we elaborate the knowledge base of climate protection strategies and support their implementation.

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Agora Verkehrswende is a joint initiative of Stiftung Mercator and the European Climate Foundation.