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A decarbonized transport model for Spain in 2050

Policy recommendations for the transition

Madrid, April 2017

Main conclusions

Transport decarbonization requires more ambitious targets and policies

From today to 2030, Spain needs to carry out the following actions in order to boost transport decarbonization:

- Develop a fleet of 6,000,000 electric vehicles for passenger transport
- Foster freight transport by railway to 15-20% of total freight traffic
- Reduce the emissions from ships while they are docked at the berth

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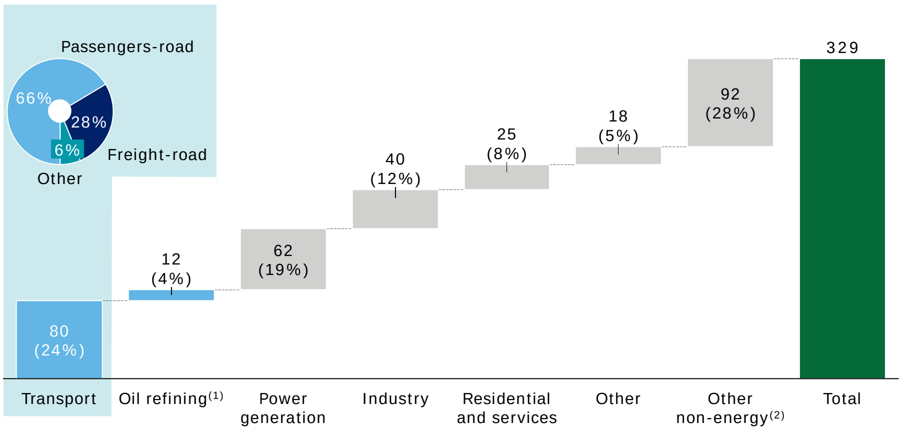
The transport sector is the largest source (24%) of GHG emissions in Spain

GHG emissions by economic sector in Spain in 2014
($MtCO_2$ equiv.; %)



Note: Does not include GHG emissions derived from air and maritime international transport
(1) 2/3 of the petroleum products result from refining are used by the transport sector
(2) Includes agriculture, cattle, land use, waste and non-energy uses
Sources: UNFCCC; IDAE; Monitor Deloitte analysis

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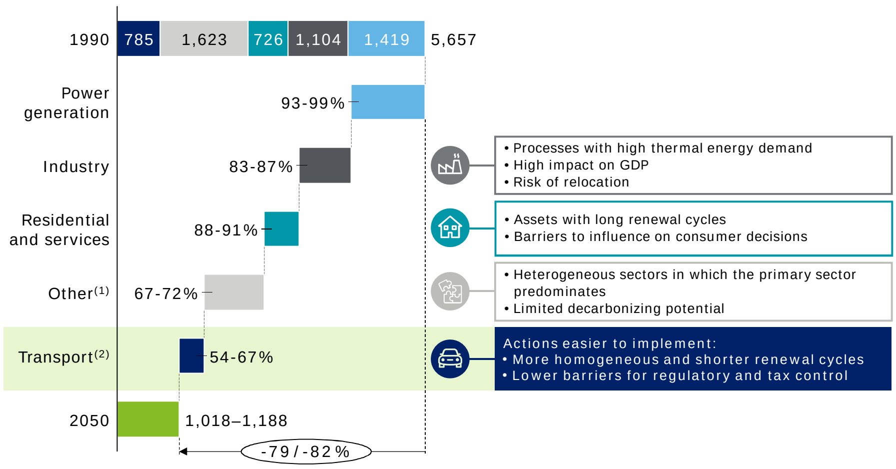
The transport sector must assume more ambitious targets than those defined by the Roadmap 2050 (~60% compared to 1990)

Emission reductions by sector between 1990 and 2050 in Europe according to the Roadmap 2050 ($MtCO_2$ equiv.)

Limitations in Europe to decarbonize relevant economic sectors



(1) Includes fugitive emissions, other energy transformation industries, fishing, agriculture and other
(2) Includes emissions from international aviation
Source: European Commission; UNFCCC; Monitor Deloitte analysis

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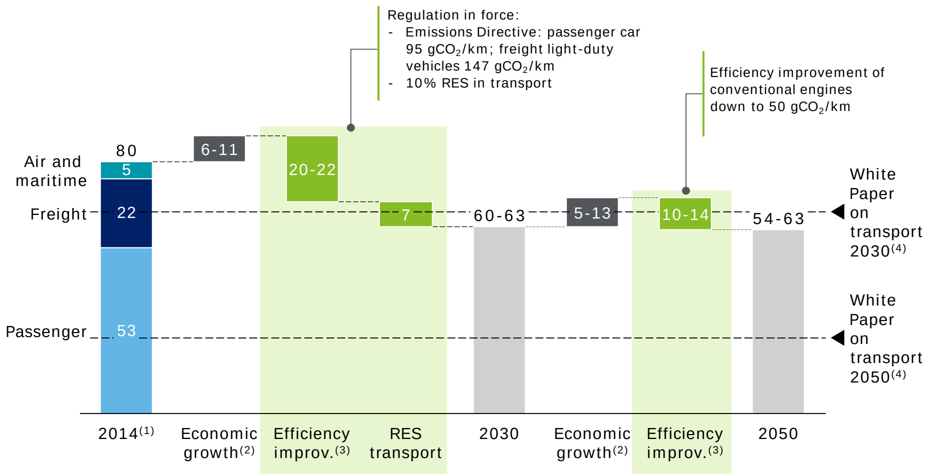
The regulation in force does not guarantee the accomplishment of transport GHG emission targets in 2030

Impact of the regulation in force on the evolution of GHG emissions from transport until 2050 ($MtCO_2$ equiv.)



(1) Does not include the emissions derived from international maritime and air transport
(2) Average annual GDP growth: 0.8%-1.6%
(3) Until 2021: emissions reduction according to the Emissions Directive targets. From 2021 to 2050: Linear evolution of the emissions factor down to 50 gCO_2/km (passenger cars) and 77 gCO_2/km (freight light-duty vehicles) in 2050
(4) Extrapolation of emission reduction targets for the European transport sector: 2030 + 8% and 2050 -60%, both compared to 1990. Does not include emissions derived from international aviation

Source: European Commission; WEO; EIU; UNFCCC; Monitor Deloitte analysis

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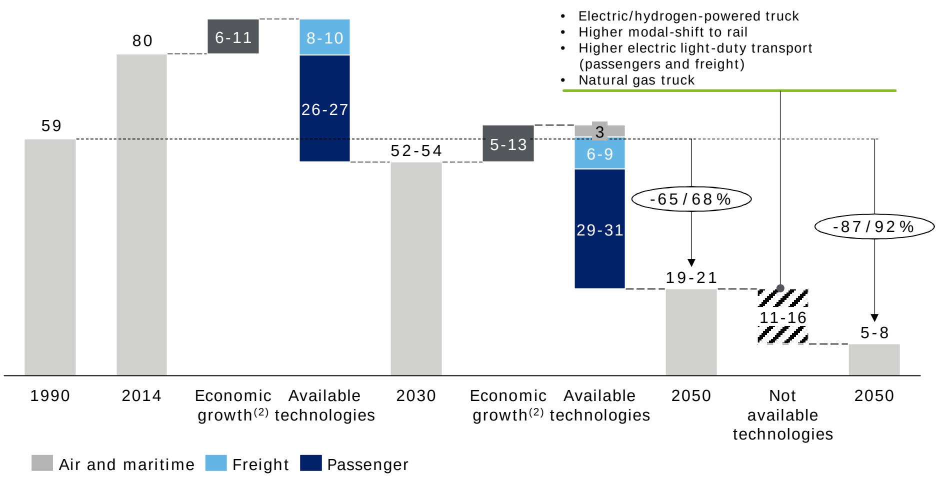
Transport electrification would allow to reduce 68% of GHG emissions (vs. 1990) by deploying already available technologies

Transport sector GHG emissions reduction by decarbonization lever[1] ($MtCO_2$ equiv.)



(1) GHG emissions reduction derived from the application of the decarbonization levers explained on the report
(2) Annual average GDP growth: 0.8%-1.6%

Source: UNFCCC; WEO; EIU; European Commission; Monitor Deloitte analysis

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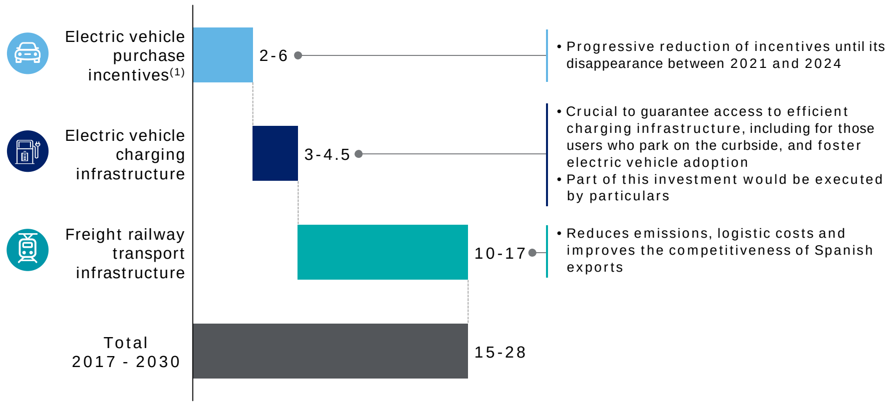
It will be necessary to invest between 15 and 28 billion euros until 2030 to decarbonize the Spanish transport sector

Funds needed between 2017 and 2030 to decarbonize the Spanish transport sector
(€ billion)



Note: Does not include necessary incentives for electric freight transport vehicles and its associated charging infrastructure, incentives for natural gas freight transport vehicles and investments to provide shoreside electrical power to a ship at berth
(1) Initial incentive has been estimated to obtain a cost 20% lower for the electric vehicle compared to the conventional one in terms of total cost of ownership. Incentive range derived from the last years with available incentives considered as needed (2021 / 2024)
Source: Monitor Deloitte analysis

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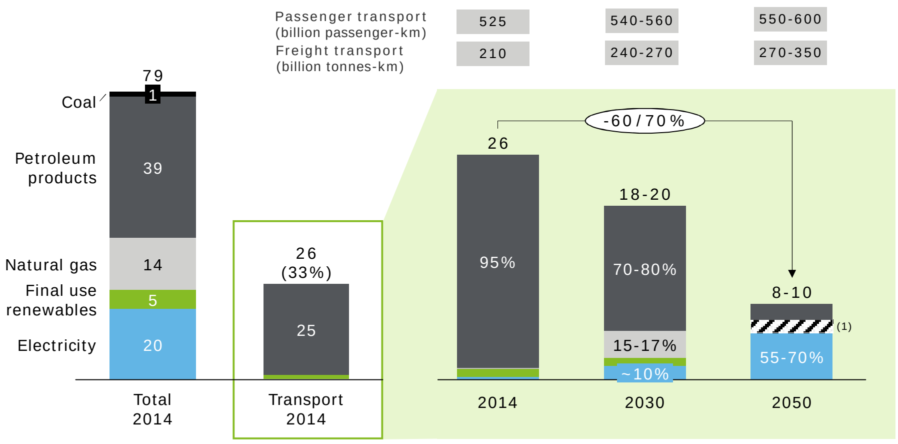
In 2050, Spain would need 60-70% less final energy for ground transport in case the different transport subsectors get electrified

Final energy consumption by energy carrier
(Mtoe)



Transport decarbonization will have a relevant contribution to the energy efficiency improvement of the Spanish energy model

(1) Fuel dependent on the applied decarbonization levers for heavy-duty freight transport. Range estimated in case of electric heavy-duty truck covers between 47% and 52% of freight transport demand
Source: IDAE; Monitor Deloitte analysis

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