

Bhutan

Green Roads Profile

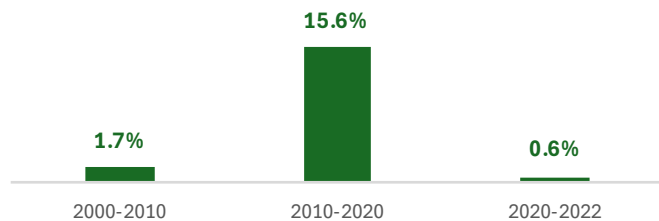
General

Road length (2022)
18,343 kilometers

Subregion
(1) **South Asia**

Income class
Low and lower middle income

Average annual growth rate of road length



Population (2024)
(1) **792.4 thousand**

Land area
38 thousand sqkm (2,3)

Urban population
45%

Rural population
55% (2)

Gross domestic product (GDP PPP, 2022)
10.78 billion USD

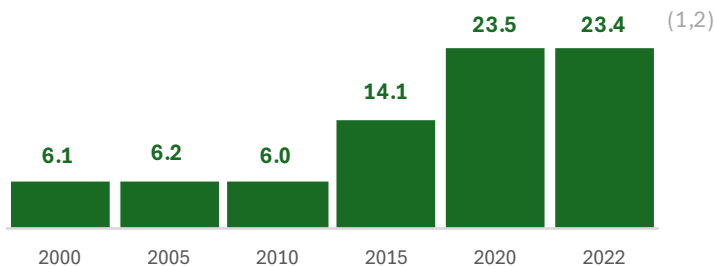
GDP per capita (PPP, 2022)
13,781 USD (2,3)

Bhutan's road network is comprised of 16.3% motorways, highways, and primary roads and 83.7% secondary roads, local roads, and other roads

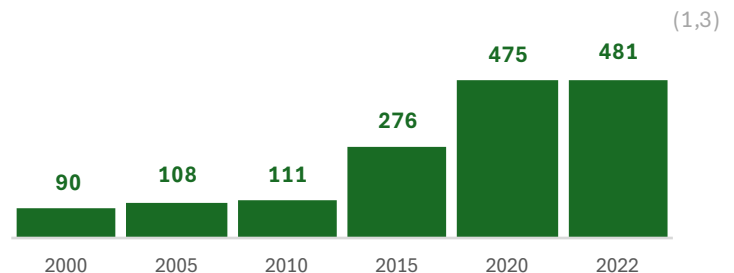
Road infrastructure availability (2022)
23.4 kilometers per thousand population

Road infrastructure density (2022)
(1,2) **481 meters per square kilometer** (1,3)

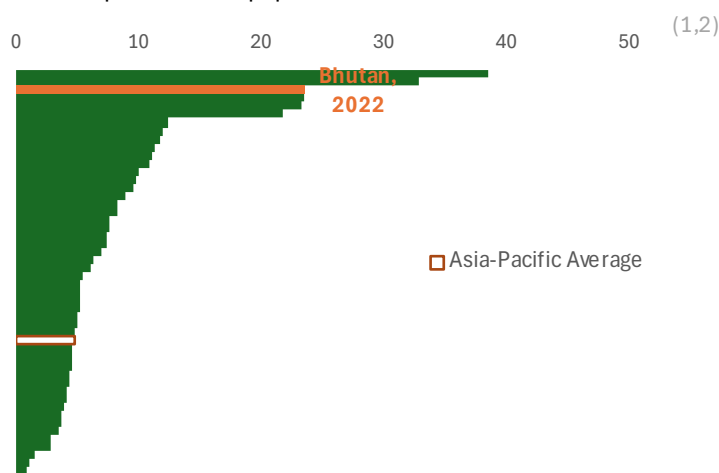
Road infrastructure availability trend, kilometers per thousand population



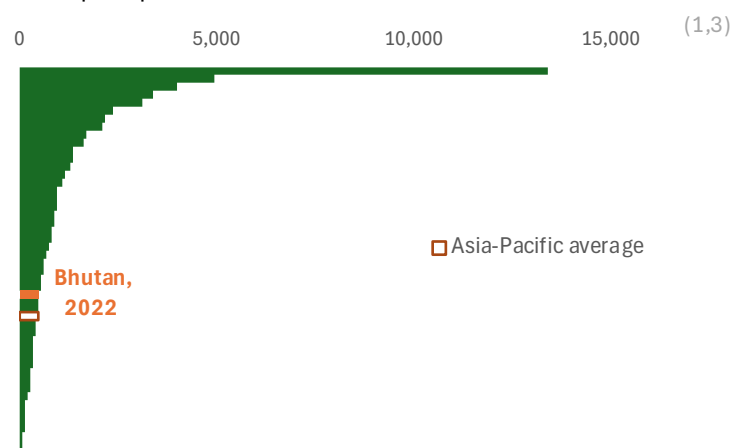
Road infrastructure density trend, meters per thousand population



Road infrastructure availability in Asia-Pacific, kilometers per thousand population

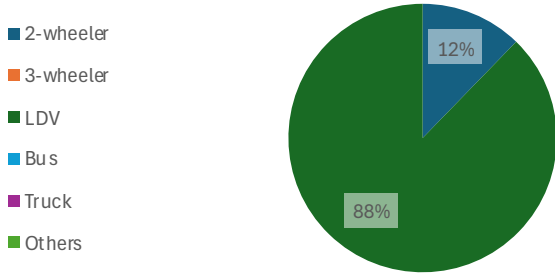


Road infrastructure density in Asia-Pacific, meters per square kilometer



Road vehicles (2022)
102 thousand vehicles

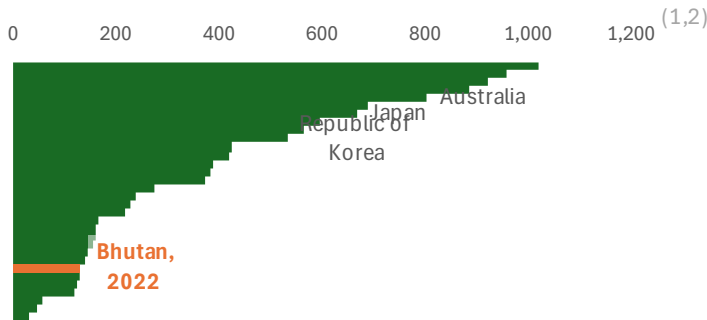
Share of vehicles by type



Motorization rate (2022)
131 vehicles per thousand population

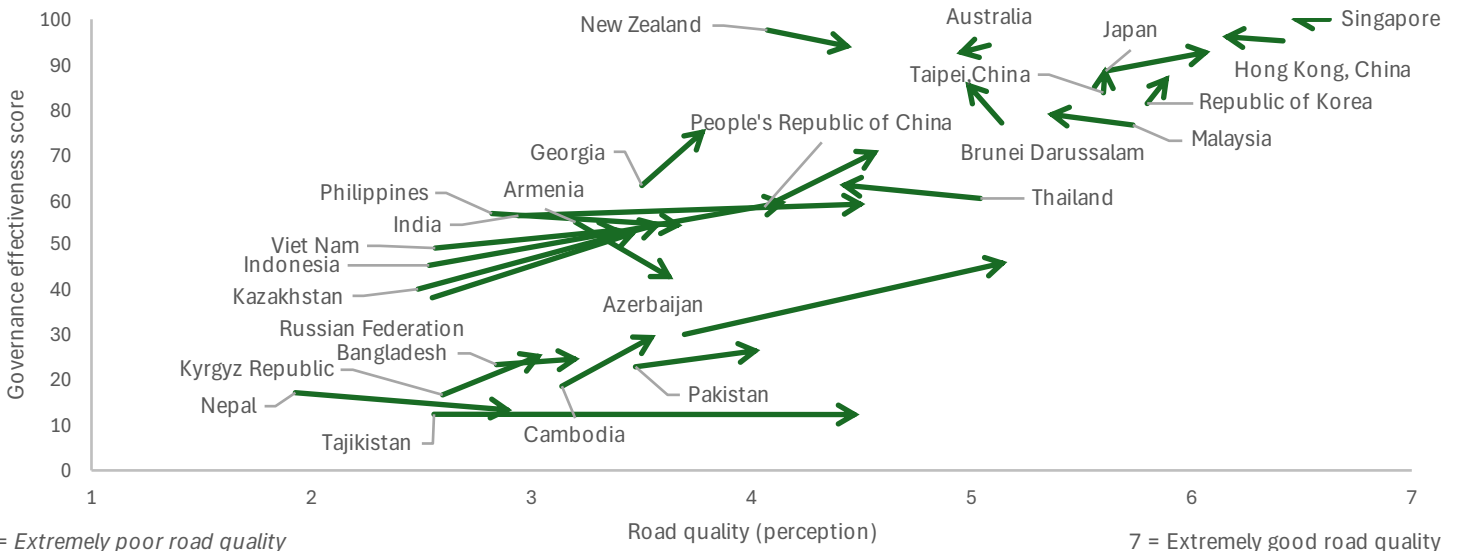
In 2000, Bhutan had 29 vehicles per thousand population. By 2022, this has increased to 131 compared with Asia-Pacific average of 577 in 2022.

Motorization rate in Asia-Pacific, vehicles per thousand population



Road vehicles include 2- and 3-wheelers, LDVs, buses and other informal public transport, trucks, and other unclassified types

Road quality (perception) vs. governance effectiveness score (2009-2019)



1 = Extremely poor road quality

7 = Extremely good road quality

Public-private partnership investments in road sector, cumulative million USD

(1)

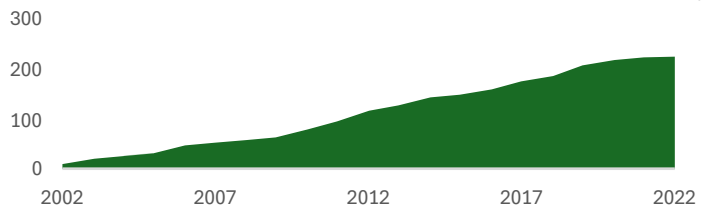
Share of road in total public-private partnership investments

(1,2) Official development assistance in road sector, cumulative million USD

(5)

Share of road in total official development assistance

(5)



Developed with the support of:



Quality of Life and Fostering Inclusive Growth

Rural access index (2023)
63%

(6)

Based on 2015 estimates, only 16% of the population could reach the nearest city in 30 minutes, another 9% could reach in 1 hour, and another 34% could reach only after 3 hours.

Rural population without access to all-season roads (2023)
0.18 million

(2,6)

Logistics performance index score (2023)

2.5/5

(10)

National street network disconnectedness index

| Infrastructure score

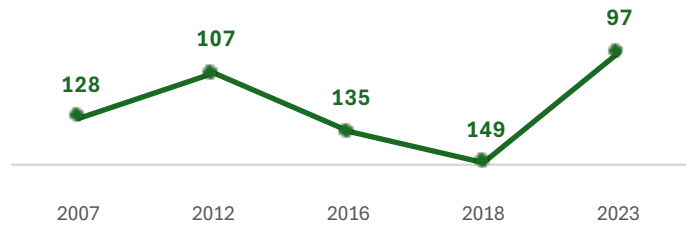
(7)

2.2/5

(10)

Logistics performance index ranking trend

(10)



Road crash fatalities (2019)
124 deaths

(8)

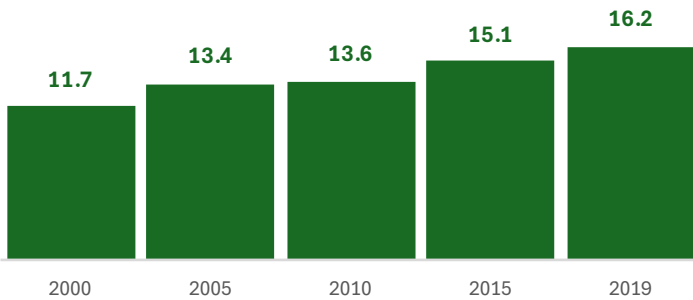
Road crash fatality rate per 100 thousand population

(2,8)

Percent of firms choosing transportation as their biggest obstacle - Manufacturing (2015)

8.2%

(11)



Asia-Pacific average is 15.7 fatalities per 100 thousand population

Percent of respondents answering high/very high - Level of Fees and Charges on Road transport

n.d.

(11)

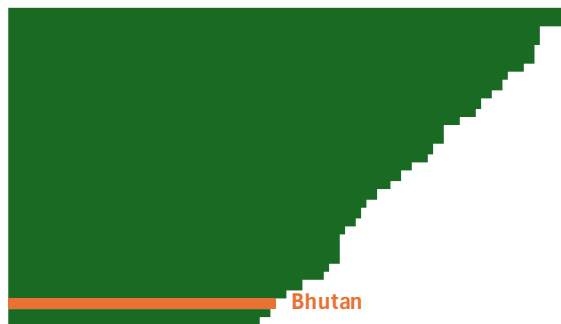
Level of fees and charges for less than full truck loads are considered

Mean speed in Asia-Pacific, kilometers per hour (2022)

0 20 40 60 80 100 120 (9)

Mean speed (2022)
51 kilometers per hour

(9)

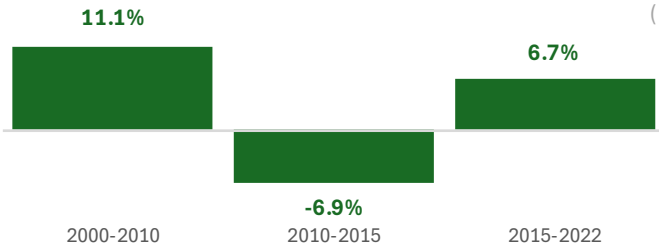


Employment in transport sector (2022)
16.6 thousand employees

Share of transport sector in total employment (2022)
 (12) **4.2%** (12)

Average annual growth rate of transport sector employment

Share of females in total transport sector employment (2022)
 (12) **10.3%** (12)

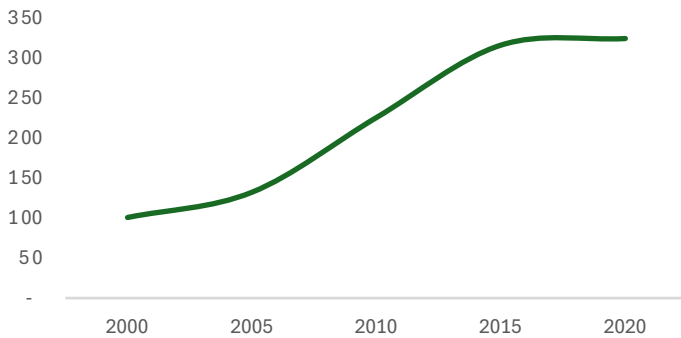


Decarbonization

Road transport energy consumption trend

Assuming 2000 value as base (100)

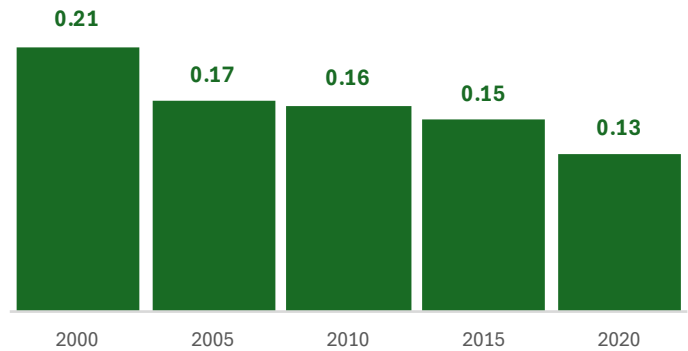
(13) **100% of Bhutan's transport energy consumption is in the road sector.**



Between 2000-2010, Bhutan's road transport energy consumption grew 8.4% annually. Between 2010-2020, road transport energy consumption grew 3.7% annually.

Road transport energy intensity with GDP, TJ per USD (PPP)

(3,13)



Asia-Pacific average is 0.4 MJ per USD in 2020

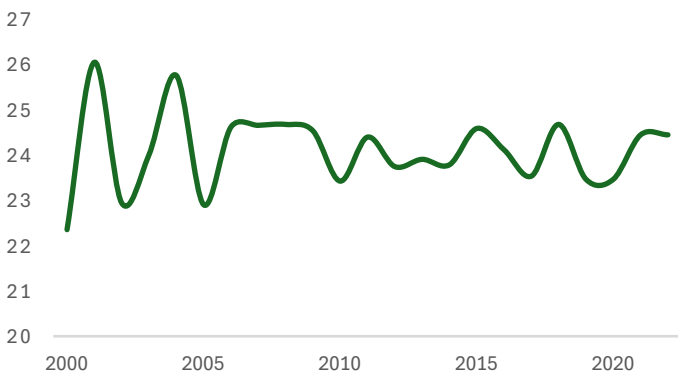
Grid emission factor (2022)

24.4 gCO₂ per kWh

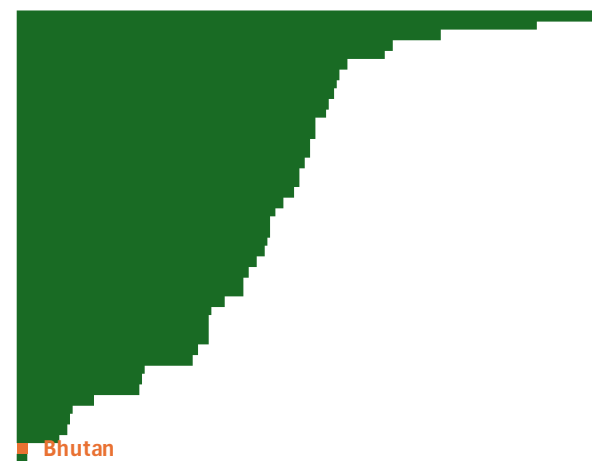
Grid emission factors in Asia-Pacific, gCO₂ per kWh

(14) 0 200 400 600 800 1000 1200 1400 (14)

Grid emission factor trend, gCO₂ per kWh

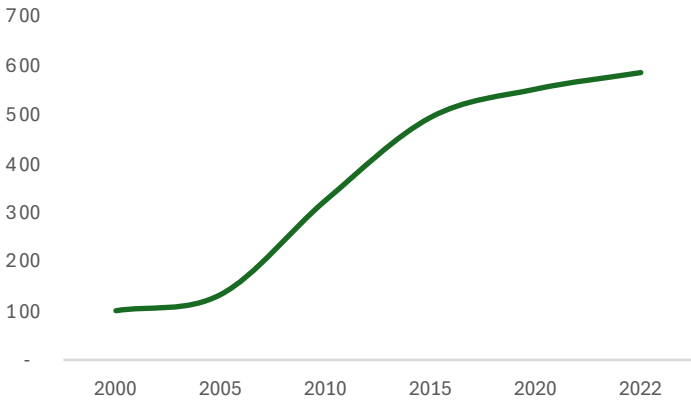


(14)



Road transport CO2 emissions trend

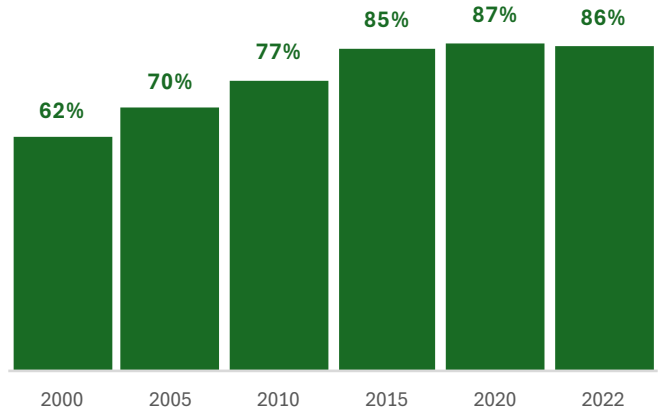
Assuming 2000 value as base (100)



(15)

Share of road transport in total transport CO2 emissions

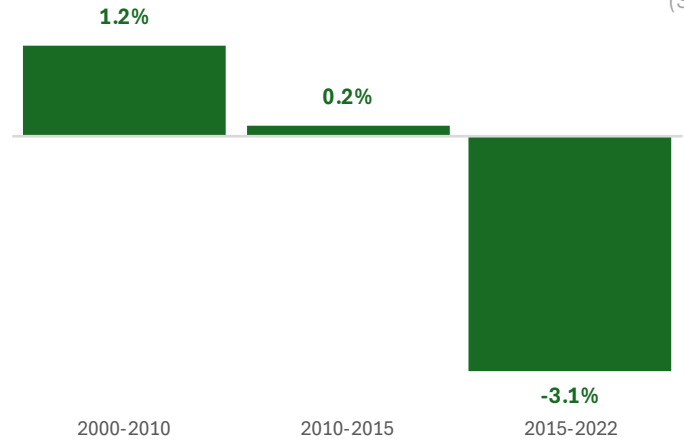
(15)



Between 2010-2019, Bhutan's road transport fossil CO2 emissions was growing 9.1% annually. After the COVID-19 pandemic, road transport CO2 emissions was growing 3.0% annually.

Road transport CO2 emissions intensity with GDP trend

(3,15)



Transport fossil fuel subsidies, cumulative from 2010 to 2022

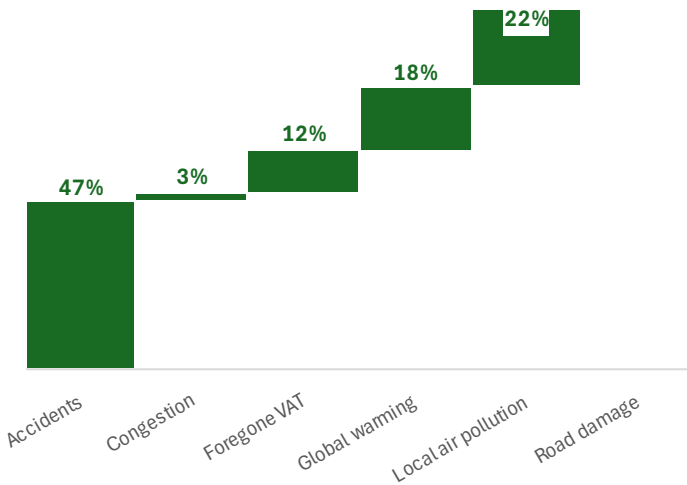
None

0.0% of Asia-Pacific total

(16)

Implicit fossil fuel subsidies due to externalities

(17)



Data includes all sectors and all fuel types

Climate Resilience and Disaster Preparedness

Expected annual damages to road and rail infrastructure due to hazards (2019)
2.45 million USD

(18)

National road vulnerability index ranking (2023)
202nd out of 208 countries

(20)

Share of road in total transport infrastructure in multihazard average annual loss to transport infrastructure (2023)
99.6%

(19)

Share of population in low elevated coastal zones (2018)
0.0%

(21)

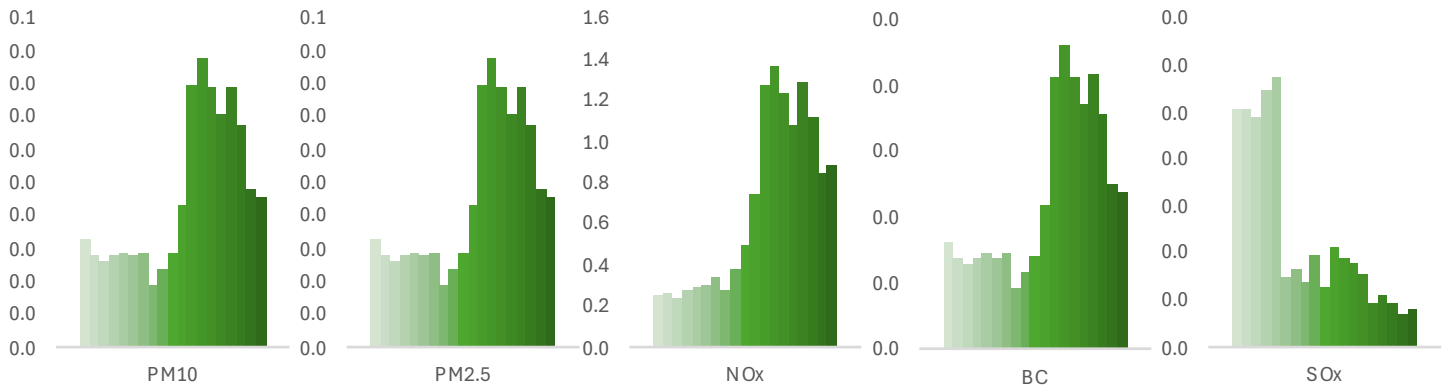
Pollution, Water and Land Management, Preserving Biodiversity, and Sustainable Materials

Paved roads (2012)
31%

(1)

Road transport air pollutant emissions, thousand tonnes (2000-2018)

(15)



In 2022, road transport contributed 22.1%, re-suspended dust contributed 17.6% in transport PM10 emissions. In total, road transport contributed about 4.0% in total PM10 emissions in Bhutan.

Deaths due to occupational exposure to diesel engine exhaust | 2000-2010
3 deaths

| 2011-2018
4 deaths

Terrestrial and marine protected areas (2022)
49.7%

(3)

(22) (% of total territorial area)

Terrestrial protected areas
49.7%

(13) (% of total land area)

Marine protected areas
n.d.

(% of territorial waters)

(3)

Share of biofuels in road transport energy consumption (2020)
n.d.

Domestic consumption per capita, tonnes (2024)
 | Bhutan
29.5 tonnes

| Asia-Pacific
13.8 tonnes

Forest area (2021)
71.5%

(23) (% of land area)

(3)

Domestic consumption is the total amount of materials directly used in the economy (used domestic extraction plus imports), minus the materials that are exported.

Developed with the support of:



Policy Measures

Policy document	Year	Road-related measures
Bhutan. National communication (NC). NC 3.	2021	Active transport infrastructure expansion, General infrastructure improvements, Disaster notification/ early warning system, Transport infrastructure resilience, Investment required for specific projects, Reference to finance mechanisms within country, Adaptation-related education and training, Development of transport plan/ policy
Low Emission Development Strategy (LEDS) - Surface Transport	2021	Active transport infrastructure expansion, Passenger and freight load limits
National Transport Policy 2017 - Policy Protocol Report	2017	Active transport infrastructure expansion, General infrastructure improvements, Vehicle inspection and maintenance, Climate-resilient design standards, Technical standards for road infrastructure, Development of transport asset management plan/policy, Performance-based transport maintenance contracts, Routine transport asset maintenance, General transport asset management, Road charging and tolls, Vehicle taxes, General transport finance, Reference to finance mechanisms within country, Measures to improve rural-urban connectivity, Road infrastructure expansion, Development of road plan/ policy, National road safety strategy, Road-side checks on overloading, Audits/ star rating for existing roads for road safety
Second Nationally Determined Contribution - BTN	2021	Active transport infrastructure expansion, General infrastructure improvements, Investment required for specific projects
The Alternative Renewable Energy Policy 2013	2013	Active transport infrastructure expansion, Fossil fuel subsidy elimination
Bhutan transport 2040 Integrated strategic Vision	2013	General infrastructure improvements, Vehicle inspection and maintenance, Technical standards for road infrastructure, Transport asset condition assessment, Routine transport asset maintenance, Technologies on transport asset management, General transport asset management, Vehicle taxes, Measures to improve rural-urban connectivity, Road infrastructure expansion, Development of road plan/ policy, National road safety strategy, Road-side checks on overloading, Audits/ star rating for existing roads for road safety
Global Status Report on Road Safety 2018	2018	Design standards for sidewalks and bicycle paths, Upgrading high risk locations for road safety, National road safety strategy, National speed law, Audits/ star rating for existing roads for road safety, Audits/ star rating required for new road infrastructure for road safety
12th Five Year Plan 2018-23	2019	General infrastructure improvements, Vehicle inspection and maintenance, Reference to finance mechanisms within country, Disaster monitoring and risk assessment for transport infrastructure
Voluntary National Review 2021 - BTN	2021	Climate-resilient design standards, Transport infrastructure resilience, Road infrastructure expansion, Development of transport plan/ policy
National Environment Strategy (2020)	2020	Disaster notification/ early warning system, Transport infrastructure resilience, General transport asset management, Disaster monitoring and risk assessment for transport infrastructure
Technology Action Plan Report	n.d.	Transport infrastructure resilience, General transport asset management, General transport finance, Development of road plan/ policy
High Ambition Coalition COP 26 Leaders' Statement	2021	Fossil fuel subsidy elimination
National Gender Equality Policy	2020	General infrastructure improvements
First Nationally Determined Contribution - BTN	2015	Disaster notification/ early warning system, Transport infrastructure resilience, Development of transport adaptation/ emergency/ disaster plan/ policy
Bhutan National Adaptation Programme of Action	2008	Disaster notification/ early warning system, Relocation from climate-risk areas
Economic Development Policy (2016)	2016	Road infrastructure expansion
Road Sector Master Plan (2007-2027)	2007	Transport infrastructure resilience, General transport asset management, General transport finance, Road infrastructure expansion
Road Safety Opportunities and Challenges: Low- and Middle-Income Country Profiles	2020	Vehicle inspection and maintenance, Implementation of vertical deflections on roads

Policy Targets

Policy document	Target year	Road-related targets
Low Emission Development Strategy (LEDS) - Surface Transport	2050	<ul style="list-style-type: none"> >75% of urban road should be covered with dedicated NMT tracks Construct min. 10 km of footpath every year Aviation: TAT per departing passenger = 30 mins. (40 mins - 2017) TAT for clearing one Arriving airbus passenger = 30 mins. (45 mins - 2017) Number of security incidents detected during dummy runs = 60 Compliance status to BCAA safety and security requirements=100%
12th Five Year Plan 2018-23	2023	<ul style="list-style-type: none"> Status of Safety Management System Implementation = 100% (65% - 2017) Frequency of domestic flights = 2 to YDA, 4 to BDA and 2 to GDA (3 to BDA and 1 to GDA (2017)) Number of flight deviation due to weather decreased = 5 (10 - 2017) Lack of effective implementation for safety improved to ICAO minimum standard = 40% (50% - 2016) Lack of effective implementation for security improved = 45% (63.78% - 2009)

Notes



(*) Policy measures and targets were extracted from policy documents as listed in the ATO National Transport Policies Database

<https://bit.ly/ATOpolicyrepository>

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- (20) Koks, et al. (2023), <https://iopscience.iop.org/article/10.1088/2634-4505/acd1aa>
- (21) Environmental Vulnerability Indicators (UN, 2018), <https://www.un.org/development/desa/dpad/least-developed-country-category/evi-indicators-ldc.html>
- (22) Global Health Data Exchange (GBD, 2019), <https://vizhub.healthdata.org/gbd-results/>
- (23) Global Materials Flow Database (UNEP, 2023), <https://www.resourcepanel.org/global-material-flows-database>

Disclaimer

This profile was developed by Asian Transport Outlook in support of TA-6756 Improving Infrastructure Sustainability Through Better Asset Management – Developing a Green Roads Toolkit and Guidance for ADB Projects. The ATO is an initiative developed under TA-6763 REG: Accelerating Innovation in Transport - Asian Transport Outlook: Phase 3 (55119-001) of the Asian Development Bank (ADB) and is also being supported by the Asian Infrastructure Investment Bank (AIIB) through Purchase Order No. CW39446 AIIB Support: Asian Transport Outlook Phase 3.

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