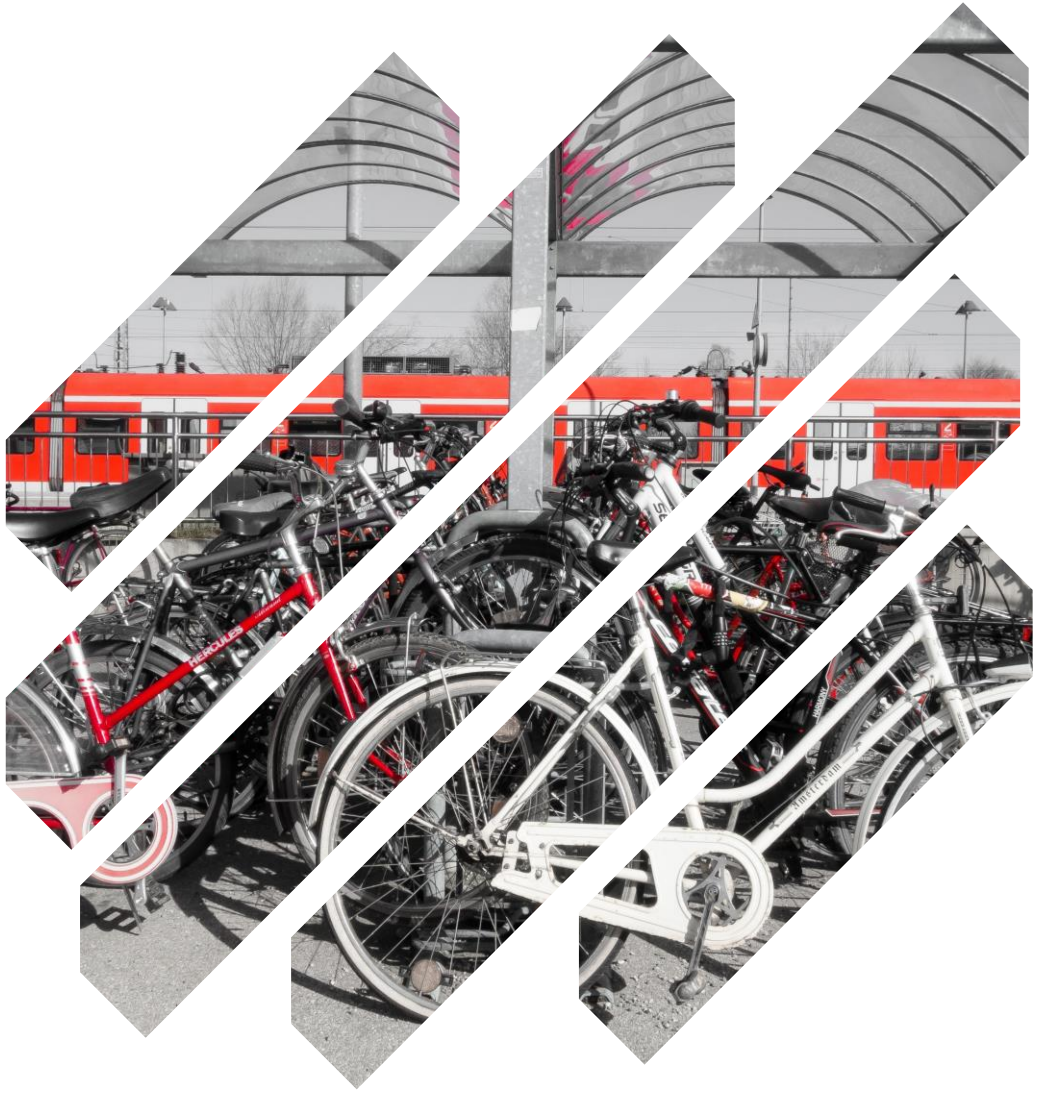
trace

NEW CLIMATE INSTITUTE

Transport sector climate action co-benefit evaluation tool



Developed with support from:

ICAT | INITIATIVE FOR Climate Action Transparency

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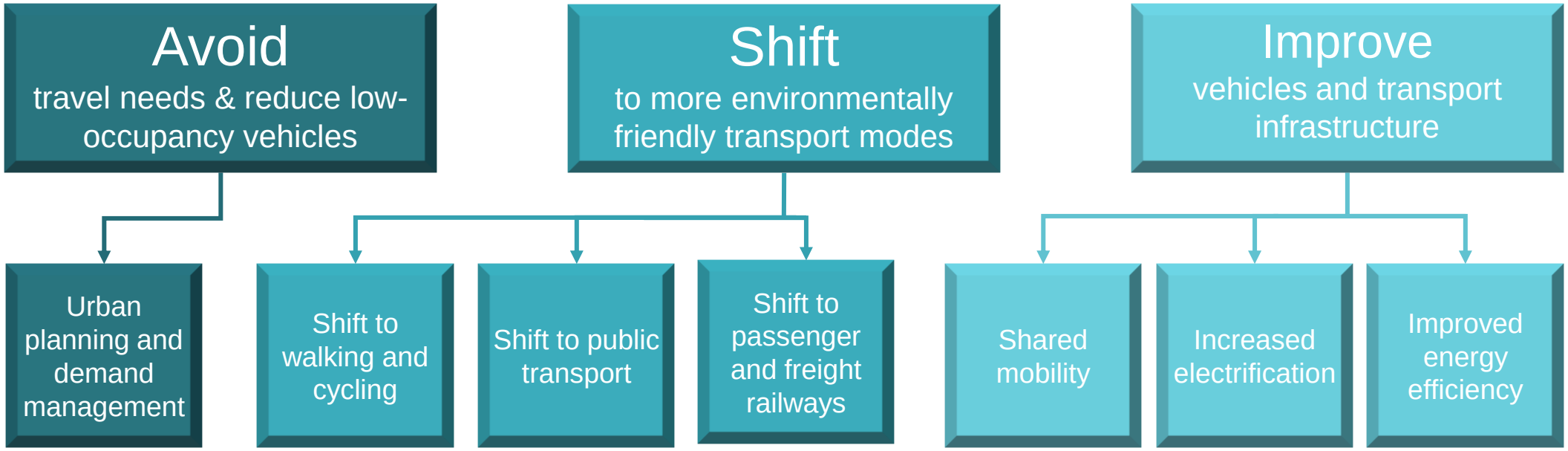
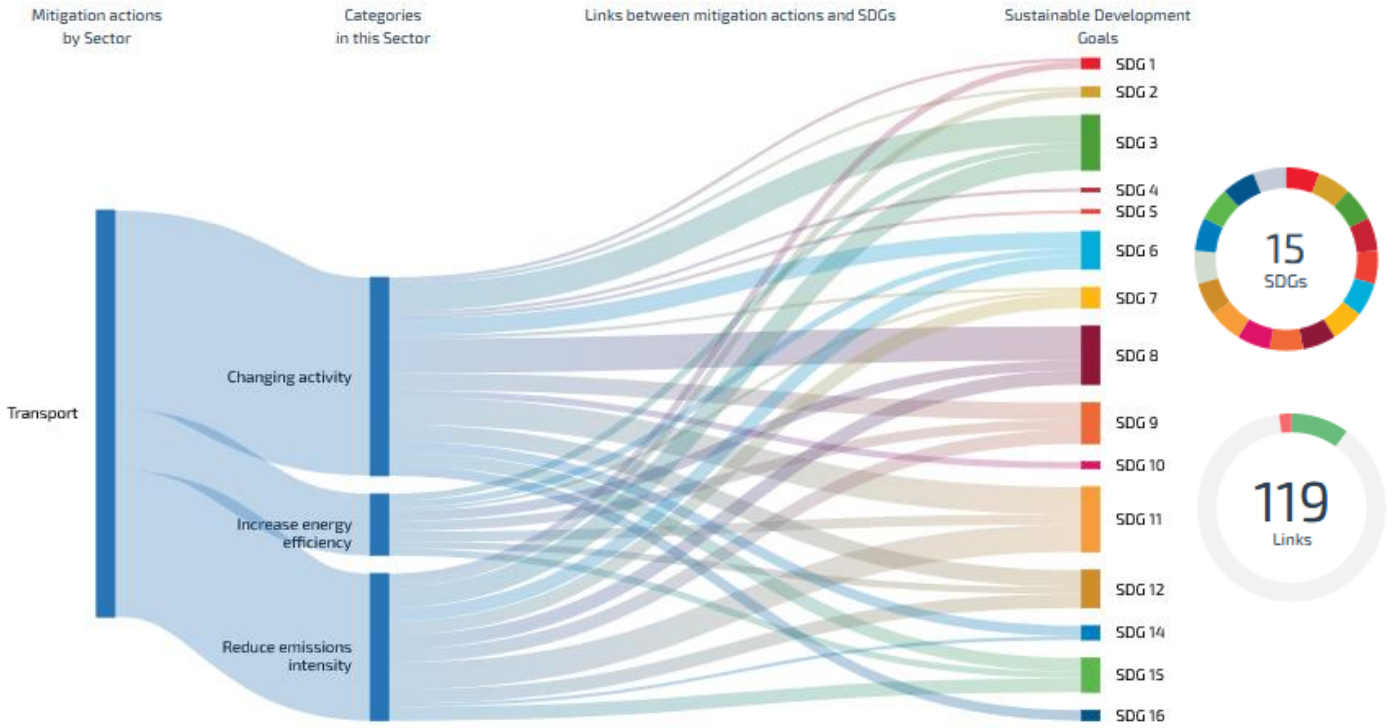
1. Introduction to climate and sustainable development linkages for transport
2. Overview of TRACE tool
3. Impact assessment methodology
4. Illustrative outputs

Mapping of decarbonisation measures



Linkages between climate action in the transport sector and the Sustainable Development Goals

- Decarbonising the transport sector can impact a number of Sustainable Development Goals (SDGs) mostly offering benefits
- Sustainable mobility has direct links to several SDGs and is an important enabler for many additional ones



Derived from **SDG Climate Action Nexus tool (SCAN-tool)**

Linkages with specific SDGs and their targets

GOAL 3: Good Health and Well-being

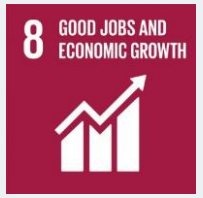
- By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
- By 2030, halve the number of global deaths and injuries from road traffic accidents

GOAL 11: Sustainable Cities and Communities

- By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport
- By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality
- Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning

GOAL 9: Industry, Innovation and Infrastructure

- Develop quality, reliable, sustainable and resilient infrastructure to support economic development and human well-being, with a focus on affordable and equitable access for all



GOAL 8: Promote sustainable economic growth and decent work for all

- By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities.

Climate action co-benefits quantified in TRACE

 Congestion (travel time)	Reducing the volume of traffic on roads – such as through reducing journeys, increasing vehicle occupancy, shifting to mass (public) transport and more active travel – can limit travel times and lead to important economic benefits through raising productivity as well as leisure time.
 Road accidents	Reducing the volume of traffic on roads can limit the number of accidents between vehicles and with cyclists and pedestrians. However, less congested roadways with faster flowing traffic can increase the severity of the accidents that do occur.
 Fuel savings	Reducing vehicle journeys, increasing vehicle occupancy, shifting to mass (public) transport, using more efficient vehicles as well as electrifying the transport fleet can all serve to reduce spending on gasoline and diesel products; providing users with economic savings.
 Air pollution health impacts	Reducing vehicle journeys, increasing vehicle occupancy, shifting to mass (public) transport, using more efficient vehicles as well as electrifying the transport fleet all reduce local air pollutants with direct health benefits for those living and working in cities as well as reducing public health costs.

Modelled in AIRPOLIM-T and included w/ soft link

COMPASS: navigating climate action impacts

Analyse sustainable development impacts

Suite of analytical tools to help understand the impacts of climate action on sustainable development objectives:

- SDG Climate Action Nexus tool (**SCAN**)
- Economic Impact Model for Electricity Supply (**EIM-ES**)
- Air Pollution Impact Model for Electricity Supply (**AIRPOLIM-ES**)
- Air Pollution Impact Model for Transport (**AIRPOLIM-T**)
- **Transport sector climate action co-benefit evaluation tool (TRACE)**
- Sustainable development climate action green recovery screening tool (**SCREEN**)
- Economic impacts of climate regulation in trade (**CLIMTRADE**)

Track and analyse GHG emission scenarios

PROSPECTS+ is a tool to track and project GHG emission scenarios from all key emitting sectors. It allows users to adjust key emissions levers in each sector and provides a dashboard of critical indicators and reporting tools to analyse emissions across time under a range of pathways.

Climate action aggregation tool (**CAAT**) facilitates a range of analysis of non-state and subnational climate action

Assess sectoral climate policies

Tools to support policy impact projections drawing on technology S-curve modelling logic:

- **EV policy impact assessment tool**
- **RE policy impact assessment tool**
- Buildings policy impact assessments
- Industrial (cement + steel) policy impact assessments

Overview of TRACE

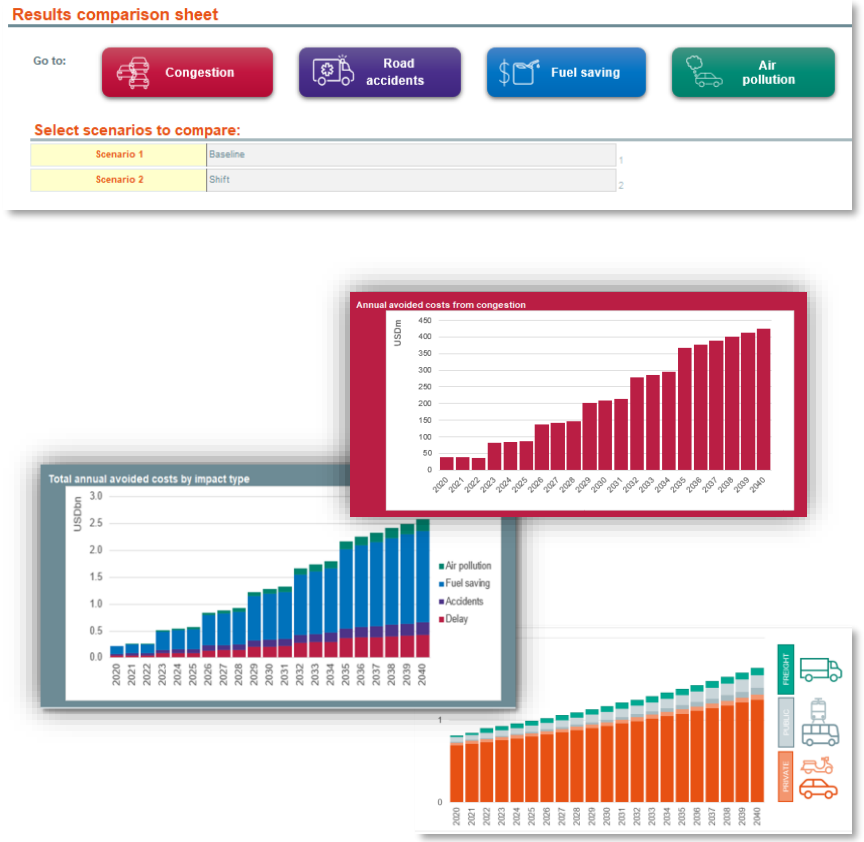
Understanding data requirements, calculations and outputs

Introducing TRACE

TRACE assesses wider benefits of decarbonising urban transportation. Co-benefits and related cost reductions are often not taken into account in decision processes, likely because they are not easy to capture. TRACE enables a better understanding of these additional benefits, which can support a paradigm shift from ‘effort sharing’ the global burden of tackling climate change to a degree of ‘opportunity sharing’ the positive impacts of decarbonisation at a more local level.

TRACE quantifies and monetises key co-benefits of decarbonisation pathways for the urban transport sector. Rather than an in-depth analysis of the impacts, the tool signals key opportunities, highlights how they derive from climate action and points to where further assessment may be helpful to develop compelling policy instruments that can deliver ambitious climate action and provide important contributions to a range of sustainable development objectives. TRACE includes a dashboard to easily compare the impact assessment between emission reduction pathways, highlighting cost savings for key co-benefits between a “business-as-usual” scenario and decarbonisation scenarios.

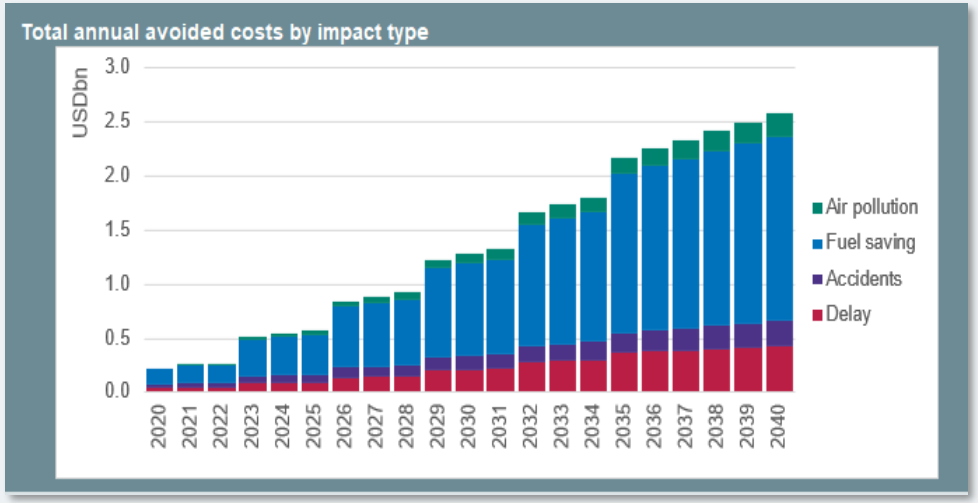
We recommend using TRACE in addition to decarbonisation pathway modelling. TRACE does not model the transport sector pathways themselves, but complements existing tools by facilitating analysis of the broader impacts associated with such pathways.

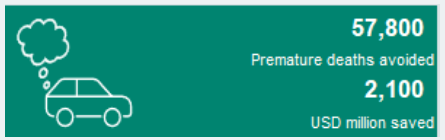


Transport sector climate action co-benefit evaluation tool // TRACE

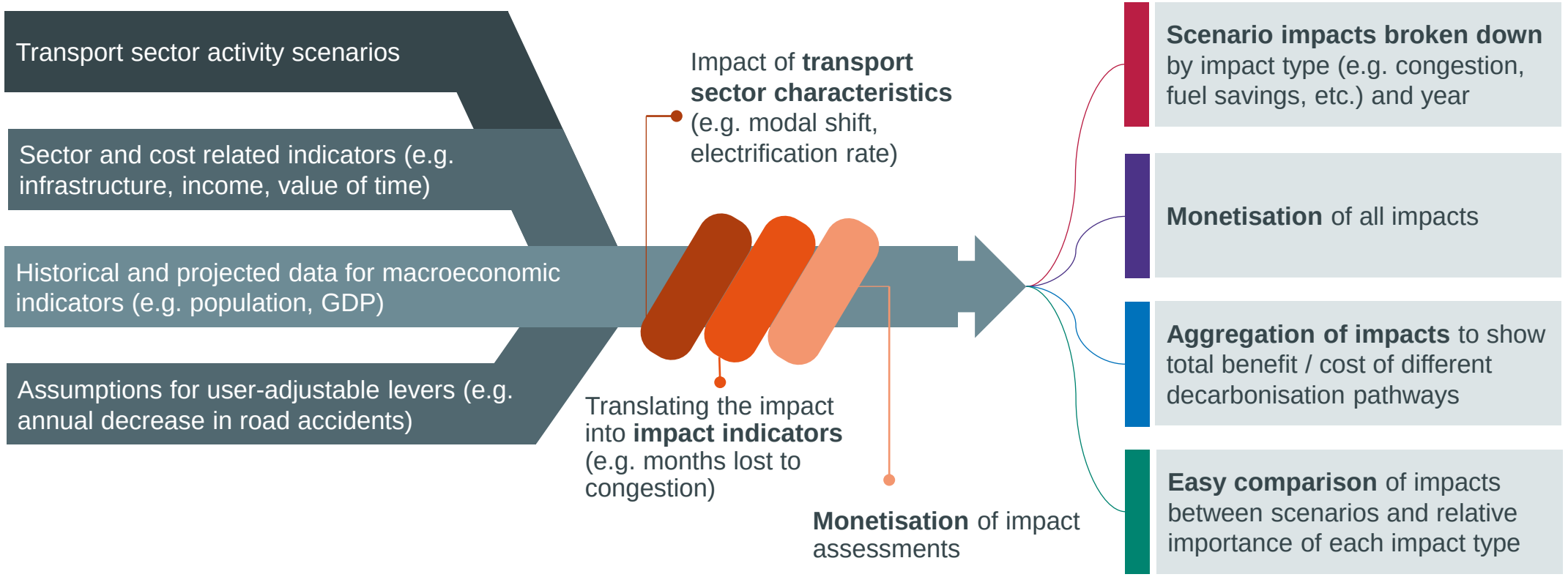
compass toolbox

- Tool to quantitatively estimate selected socioeconomic impacts of climate action in the transport sector
- User-friendly Excel model facilitating a comparison of benefits of future transport sector scenario pathways
- Urban transport focus for avoid, shift, improve mitigation measures (modelled separately)
- Forward-looking impact assessment to inform decisions taken today
- Assessment of impacts across a range of co-benefits: congestion, accidents, fuel saving and health





TRACE inputs, calcs and outputs



INPUTS | CALCULATIONS | OUTPUTS

Modelled scenarios for the urban transport sector are a key input to TRACE

- TRACE takes modelled scenarios for urban transport system(s) as a starting point
- These can be derived from modelling tools such as PROSPECTS+, CTI, LEAP (and others)
- Depending on the format of the urban transport modelling, data may require pre-processing to match data input fields within TRACE

Transport sector pathways

Use this sheet to input general data on the urban transport sector pathway for the scenario
The scenario data in this sheet is used across the calculations for different impact types

General input data		Unit	2020	2021
Population	Population	k people	10,000	10,200
GDP	GDP	USDk	50,000,000	52,500,000
GDP / capita	GDP / capita	USD /capita	5,000	5,147

Transport activity by transport mode and fuel type				Unit	2020	2021
Activity	Walking		ActivityWalking	pkm		
Activity	Cycling		ActivityCycling	pkm		
Activity	LDV	Electricity	ActivityLDVElectricity	pkm		
Activity	LDV	Diesel	ActivityLDVDiesel	pkm		
Activity	LDV	Gasoline	ActivityLDVGasoline	pkm	100,000,000,000	103,000,000,000
Activity	LDV	CNG-LPG	ActivityLDVCNG-LPG	pkm		
Activity	2W	Electricity	Activity2WElectricity	pkm		
Activity	2W	Diesel	Activity2WDiesel	pkm		
Activity	2W	Gasoline	Activity2WGasoline	pkm	5,000,000,000	5,150,000,000
Activity	2W	CNG-LPG	Activity2WCNG-LPG	pkm		
Activity	Bus	Electricity	ActivityBusElectricity	pkm		
Activity	Bus	Diesel	ActivityBusDiesel	pkm	2,000,000,000	2,200,000,000
Activity	Bus	Gasoline	ActivityBusGasoline	pkm	2,000,000,000	2,200,000,000
Activity	Bus	CNG-LPG	ActivityBusCNG-LPG	pkm		

Vehicle occupancy			Unit	2020	2021
Occupancy	LDV	OccupancyLDV	person/vehicle	1.8	1.8
Occupancy	2W	Occupancy2W	person/vehicle	1.2	1.2
Occupancy	Bus	OccupancyBus	person/vehicle	50.0	50.0
Occupancy	Light rail	OccupancyLight rail	person/vehicle	100.0	100.0
Occupancy	HDV large	OccupancyHDV large	person/vehicle	1.0	1.0
Occupancy	HDV small	OccupancyHDV small	person/vehicle	1.0	1.0
Occupancy	Small cargo	OccupancySmall cargo	person/vehicle	1.0	1.0

Load factor			Unit	2020	2021
Load	HDV large	LoadHDV large	tonne/vehicle	10.0	10.0
Load	HDV small	LoadHDV small	tonne/vehicle	1.0	1.0
Load	Small cargo	LoadSmall cargo	tonne/vehicle	0.2	0.2

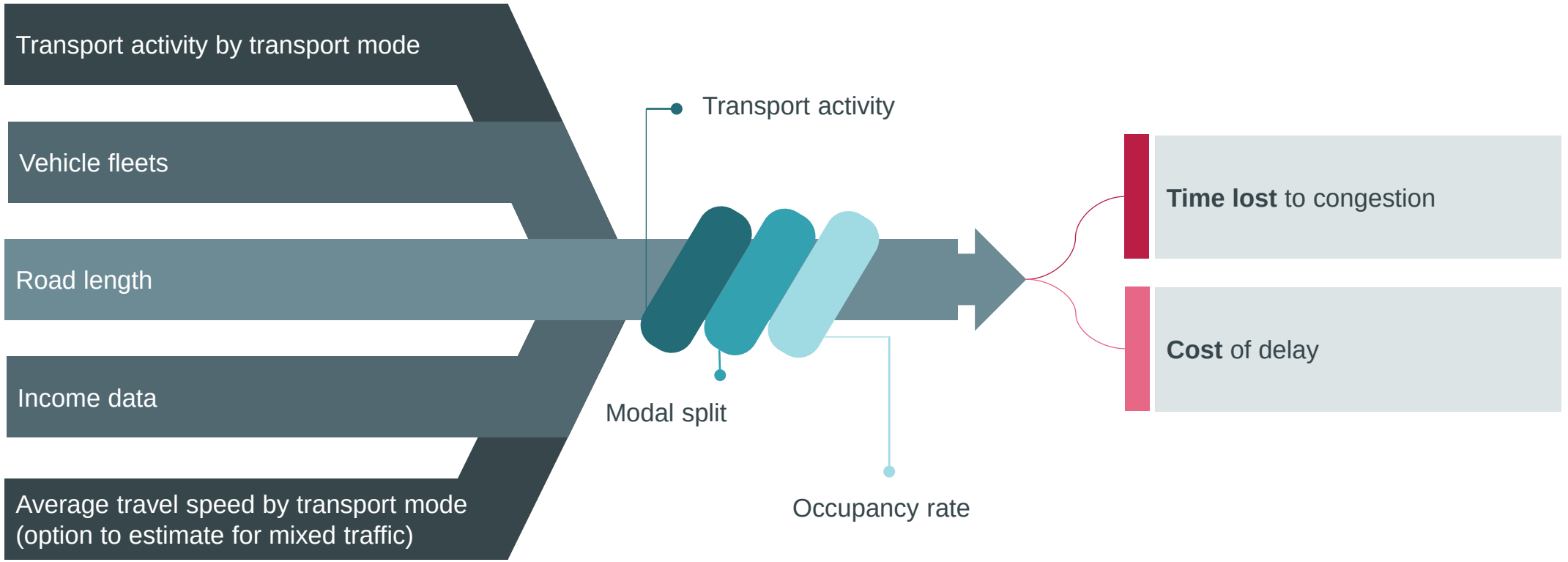
Average annual distance travelled			Unit	2020	2021
Distance	LDV	DistanceLDV	vkm	15,000	15,000
Distance	2W	Distance2W	vkm	8,000	8,000
Distance	Bus	DistanceBus	vkm	40,000	40,000
Distance	Light rail	DistanceLight rail	vkm	30,000	30,000
Distance	HDV large	DistanceHDV large	vkm		
Distance	HDV small	DistanceHDV small	vkm		
Distance	Small cargo	DistanceSmall cargo	vkm		

- Walking
- Cycling
- Two and three wheelers
- LDV (light-duty vehicles)
- Buses
- Light rail (metros & trams)
- HDV (heavy-duty vehicles) large
- HDV small
- Small cargo

Assessing impacts

Methods by impact type

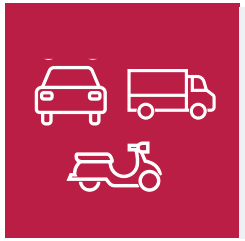
Congestion impact assessment



INPUTS | LEVERS | OUTPUTS

Congestion: calculation steps

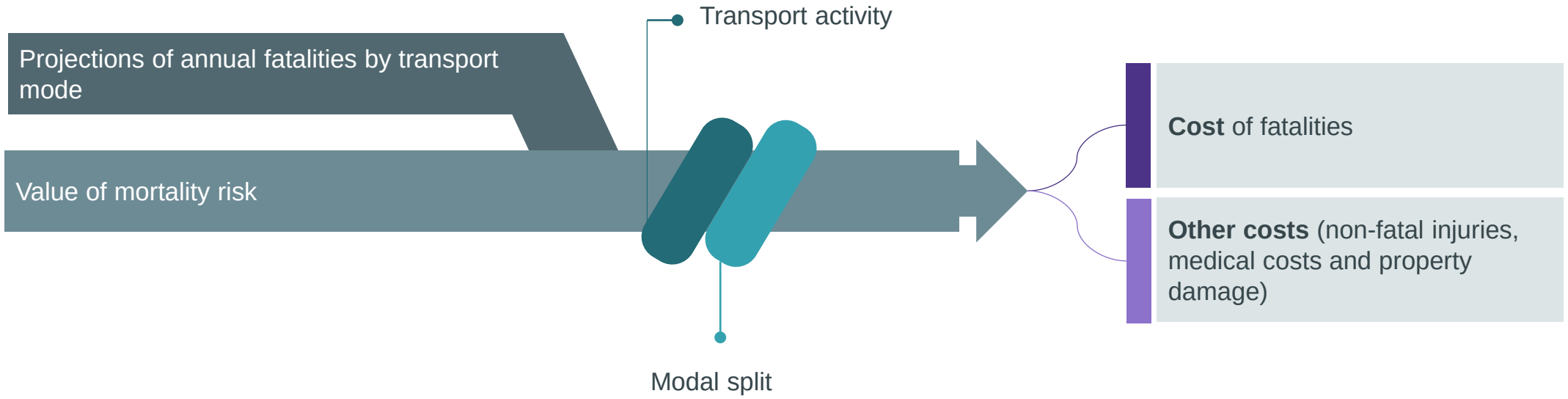
STEP 1
Estimate average delay per kilometre based on variables, including e.g. cars per capita, road capacity and GDP, and default coefficients for their impact on delay



STEP 2
Estimate total delay by transport mode using activity information, such as annual distance travelled and vehicle occupancy rates

STEP 3
Convert delays into congestion costs based on a valuation of travel time

Road accidents impact assessment



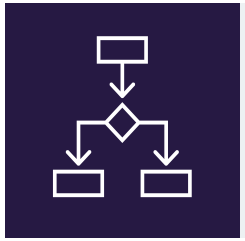
INPUTS | LEVERS | OUTPUTS

Road accidents: calculation steps

STEP 1
Estimate/project road fatalities per transport mode over time

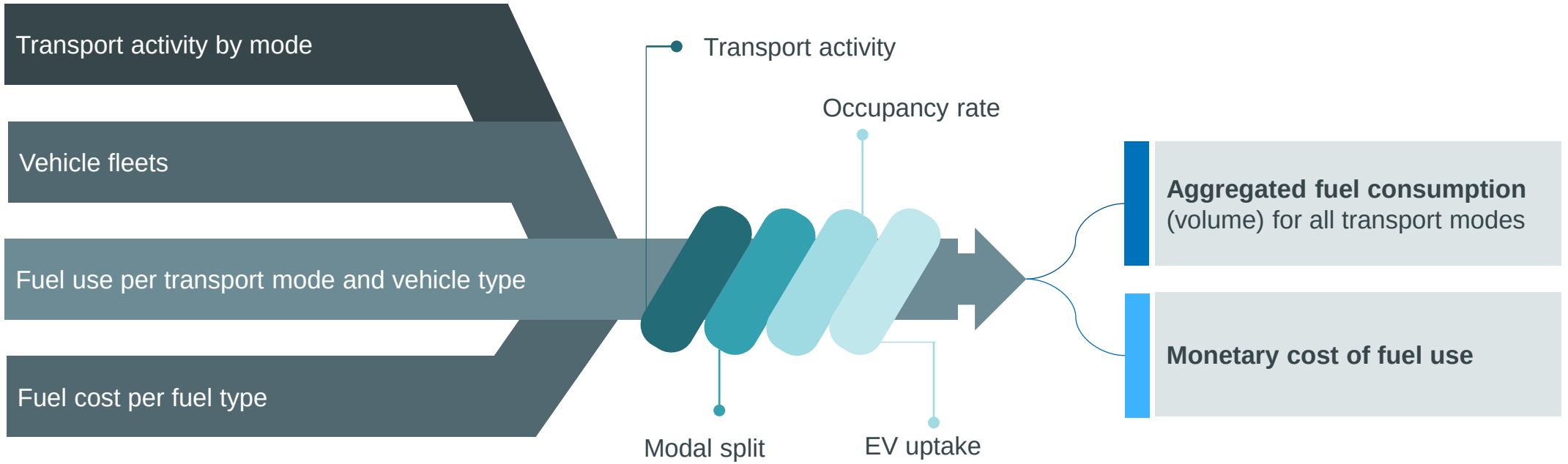
STEP 2
Derive external cost of road accidents (including impact on other traffic participants)

STEP 3
Monetise accidents based on the costs of fatalities



STEP 4
Derive other non-fatal costs from road accidents, such as injury, medical costs and property damage

Fuel savings impact assessment



INPUTS | LEVERS | OUTPUTS

Fuel savings: calculation steps

STEP 1
Convert fuel consumption into litres of gasoline equivalent (Lge) for all fuel types

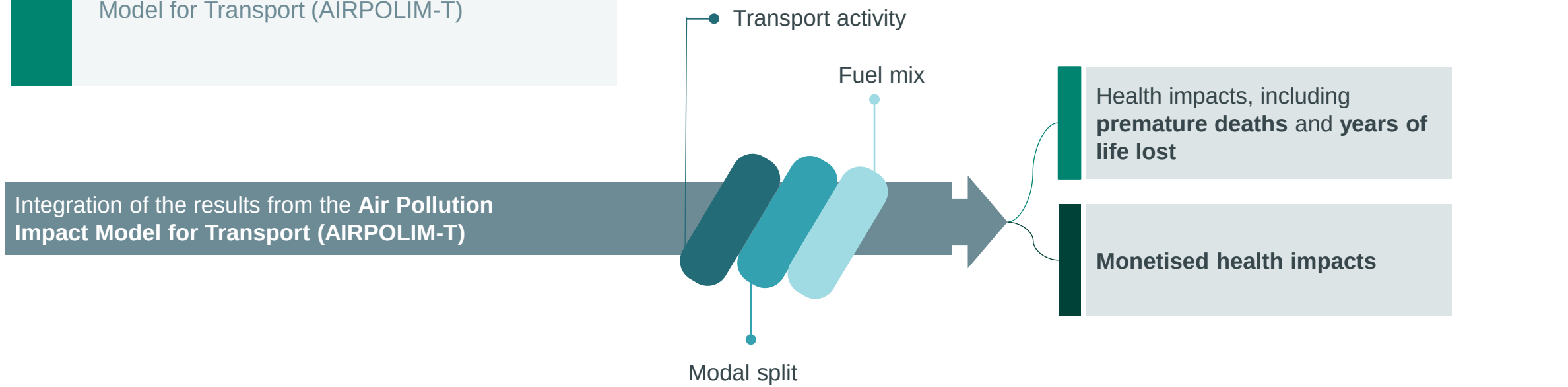
STEP 2
Calculate fuel consumption in Lge by transport mode

STEP 3
Monetise fuel consumption

Air pollution health impacts

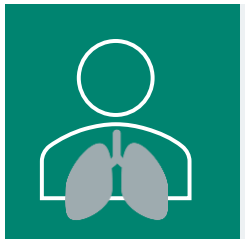
compass toolbox

To include the health impacts of air pollution from transport sector emissions into TRACE, the tool can integrate results from NewClimate Institute's Air Pollution Impact Model for Transport (AIRPOLIM-T)



Air pollution health impacts: calculation steps

STEP 1
Estimate air pollutant emissions



STEP 2
Estimate the intake of air pollutants by the exposed population

STEP 3
Apply dose-response functions and country-specific, age-weighted mortality rates

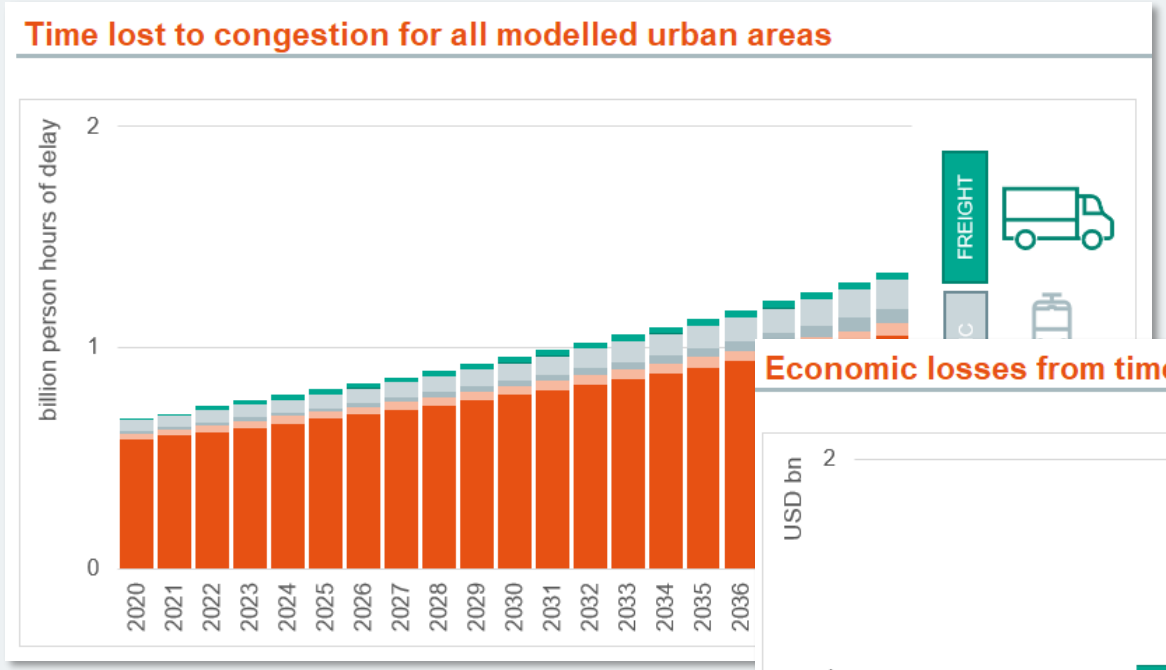
STEP 4
Derive air pollution induced health impacts including premature deaths and years of life lost, and related costs

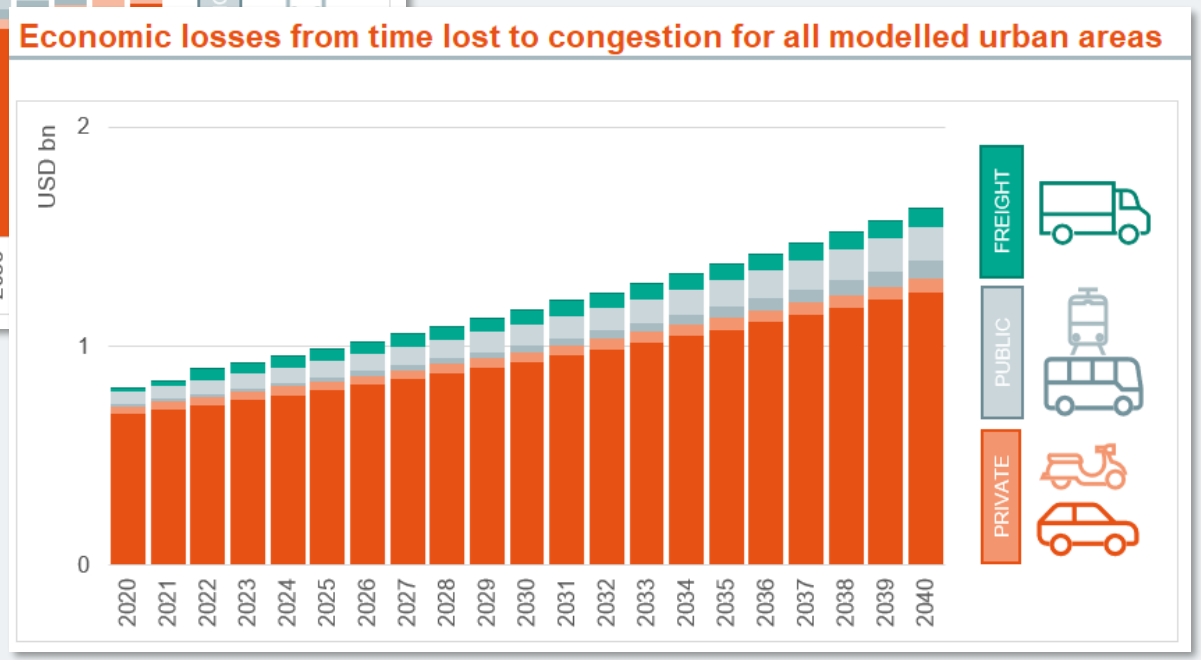
Illustrative outputs

Quantified co-benefits

Scenario results: **Congestion**

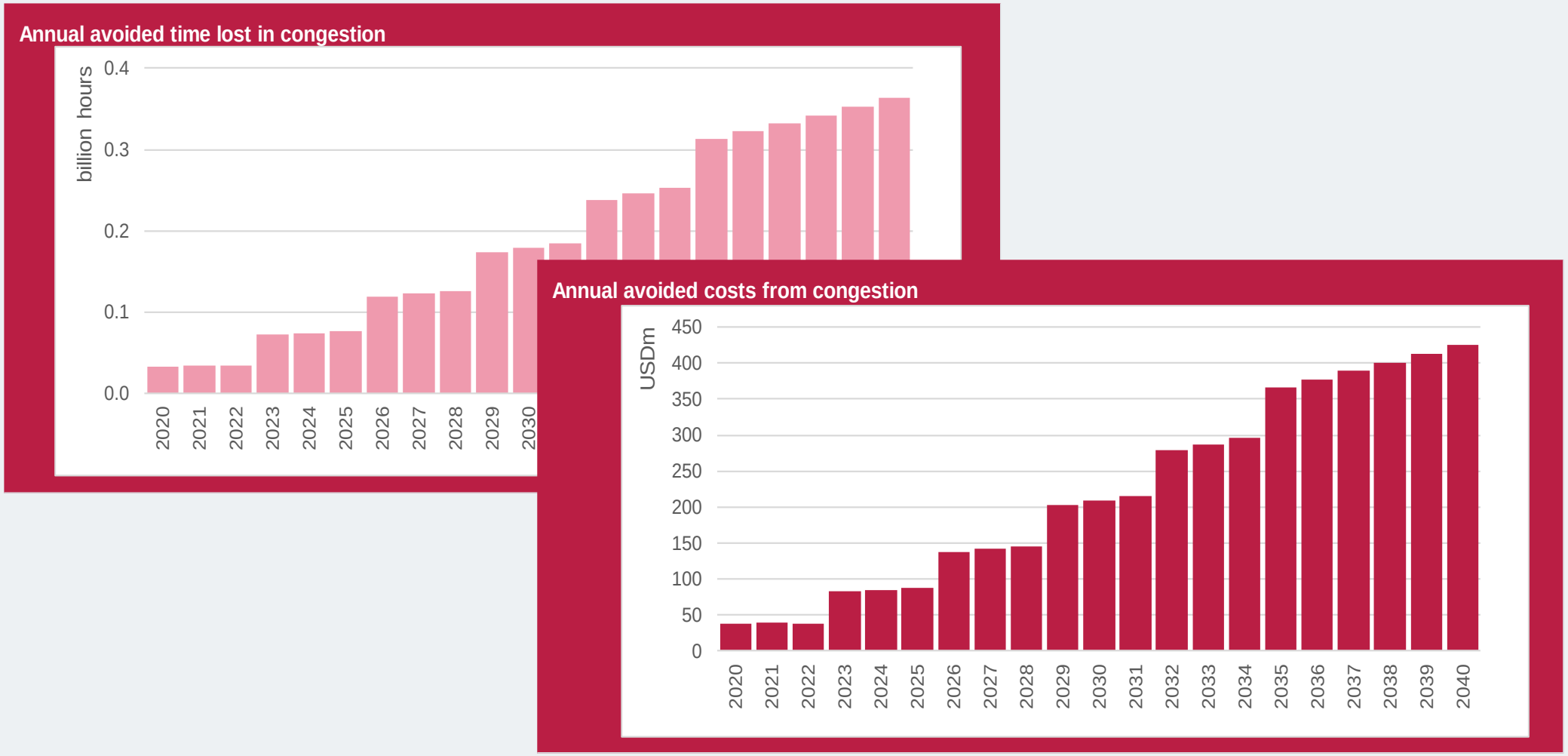
Illustrative results





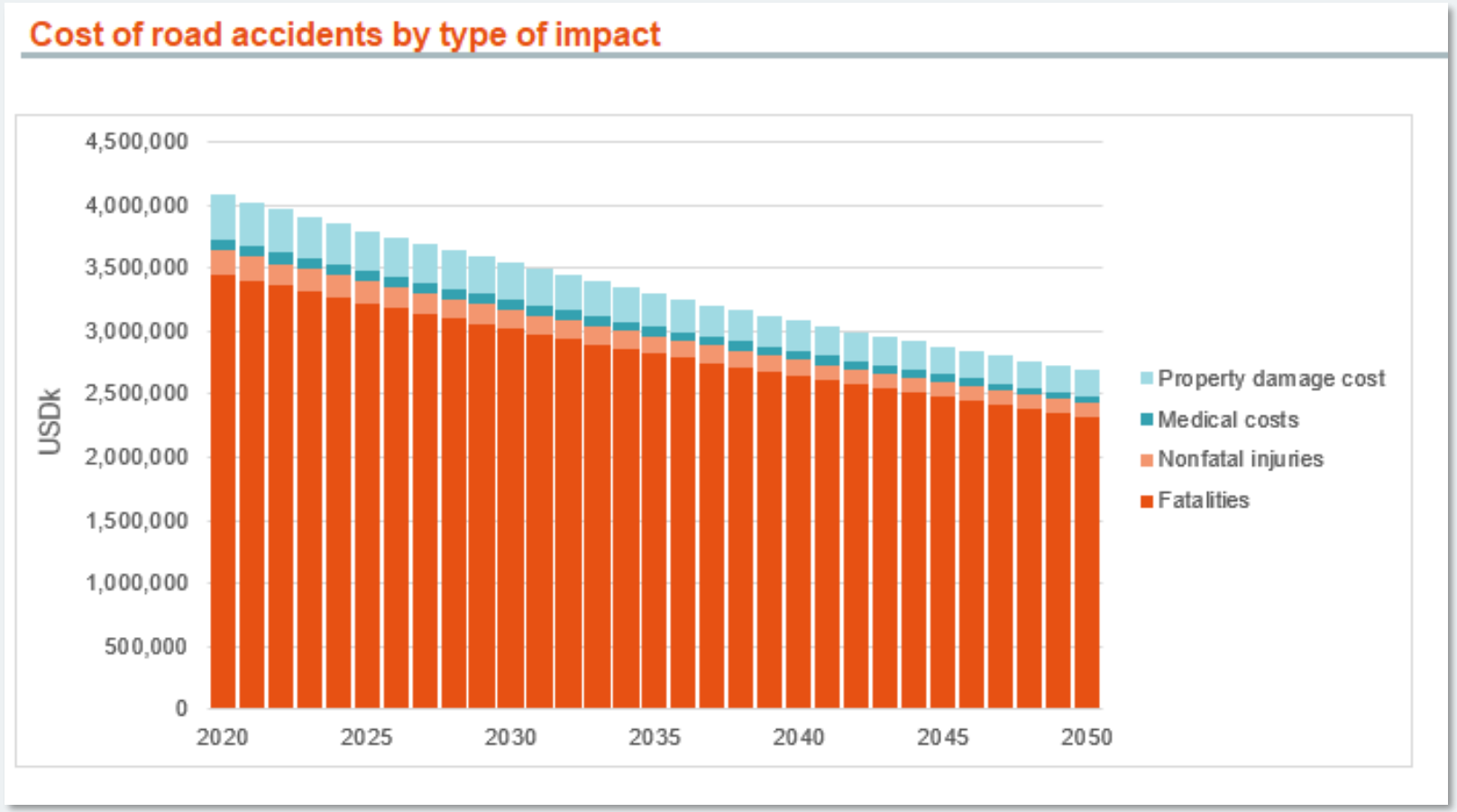
Comparing scenario results: **Congestion**

Illustrative results



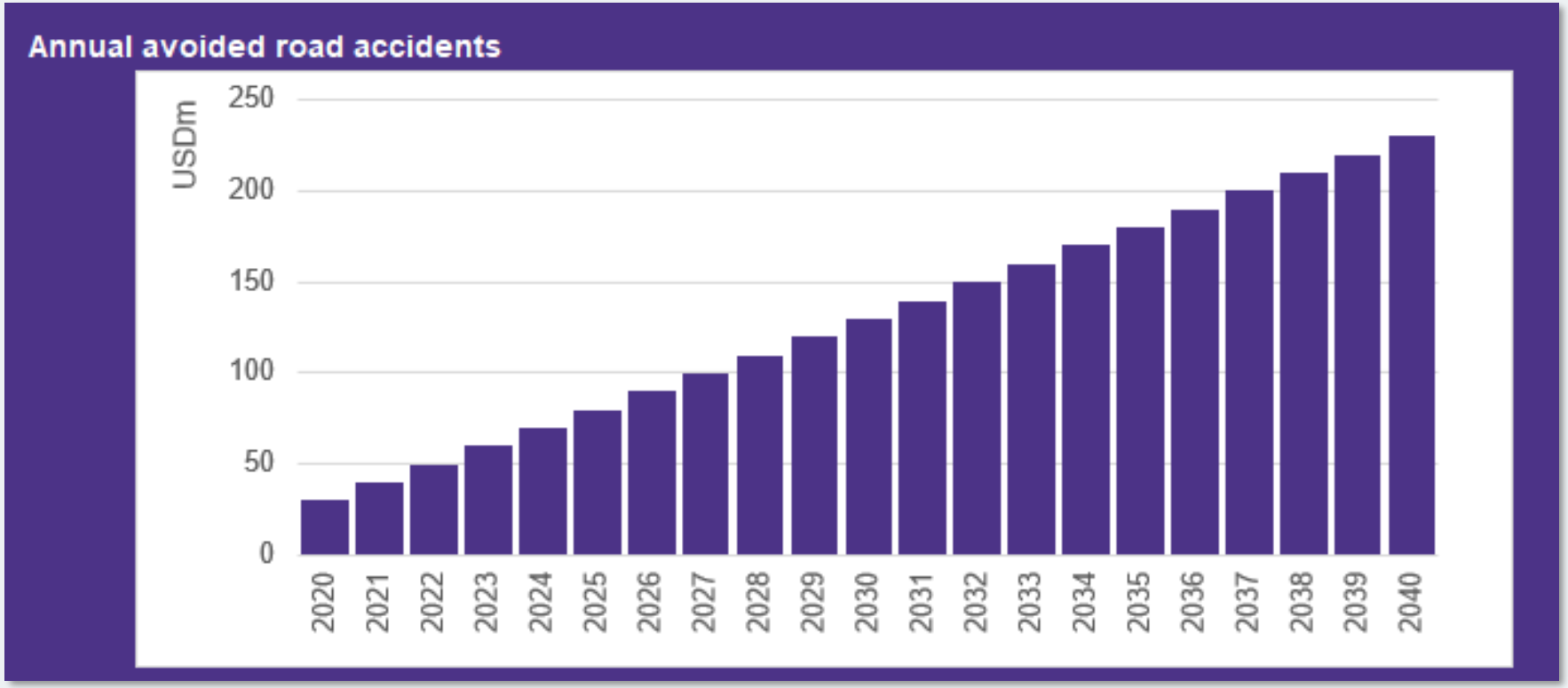
Scenario results: **Road accidents**

Illustrative results



Comparing scenario results: **Road accidents**

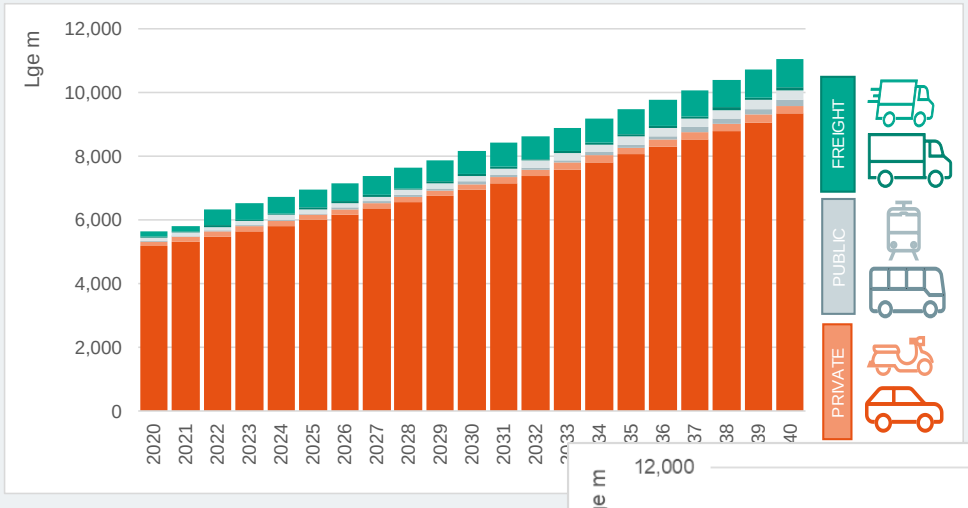
Illustrative results

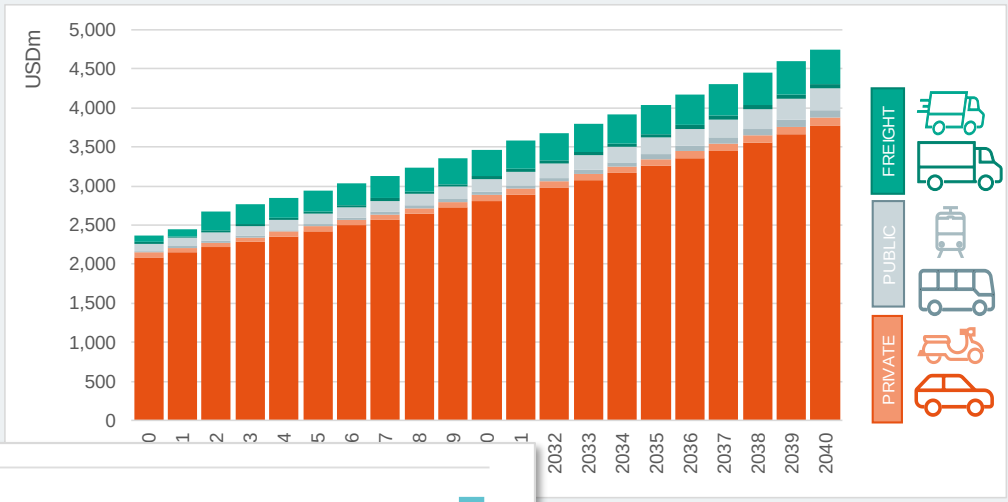


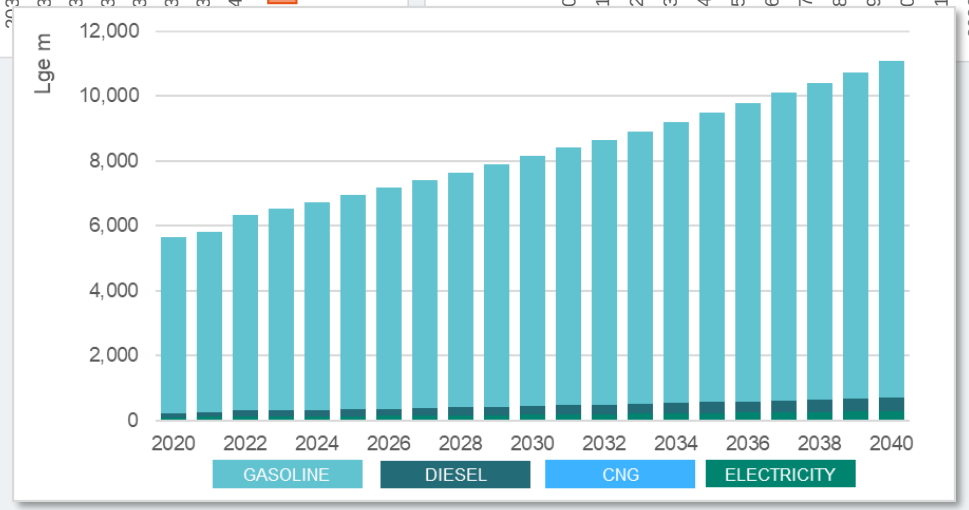
Scenario results: **Fuel savings**

Illustrative results

Annual fuel consumption and fuel cost

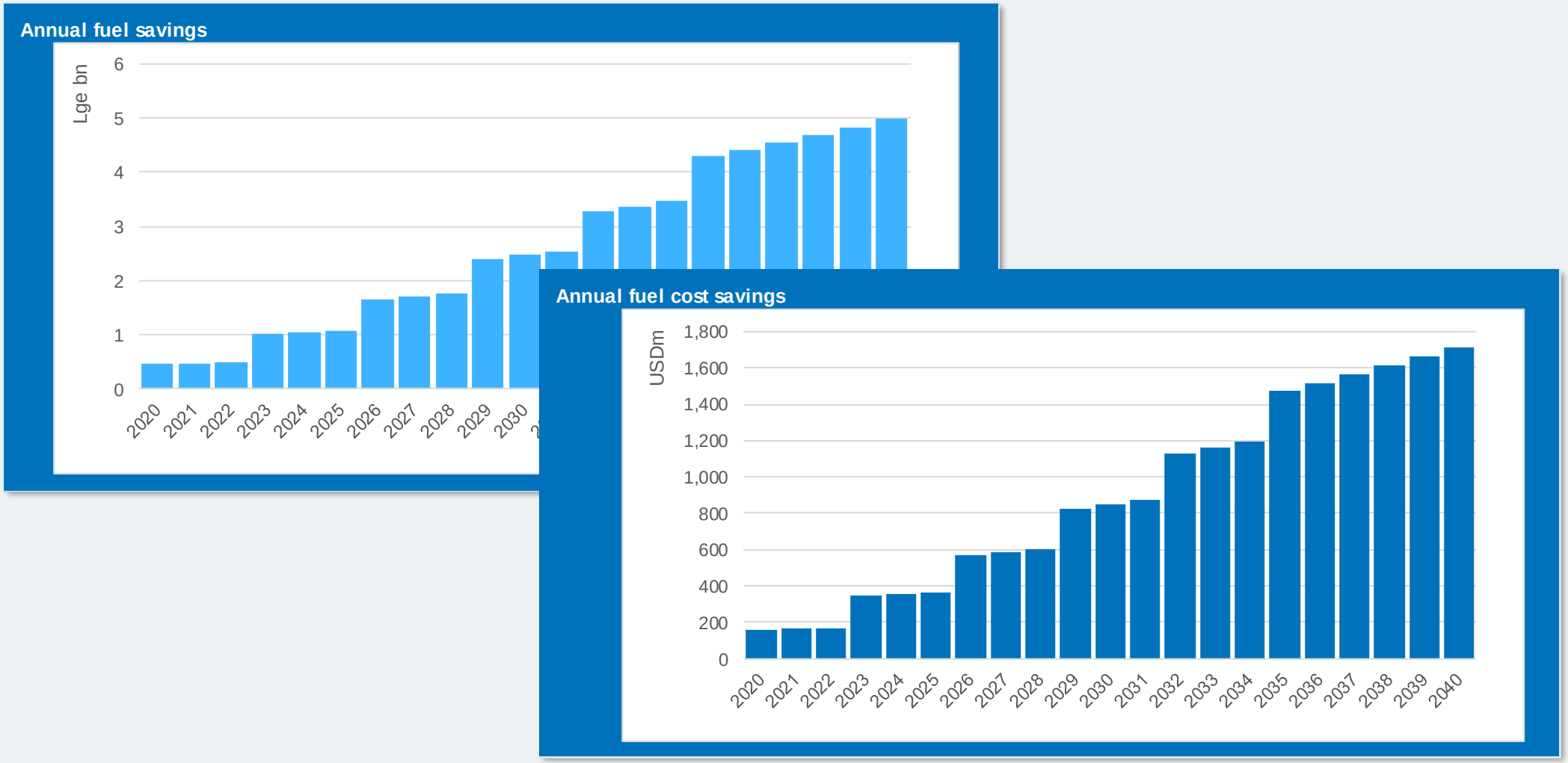






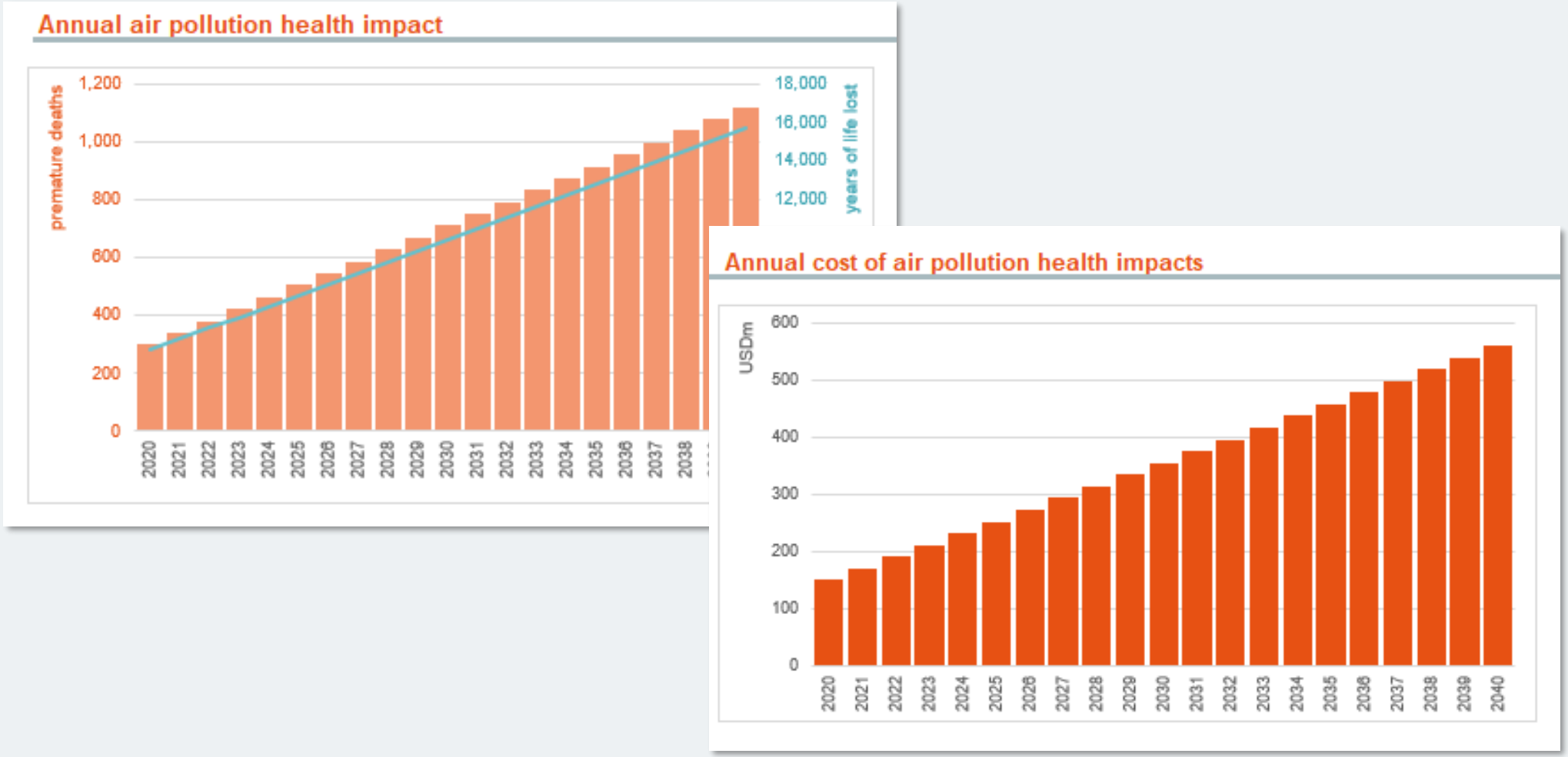
Comparing scenario results: **Fuel savings**

Illustrative results



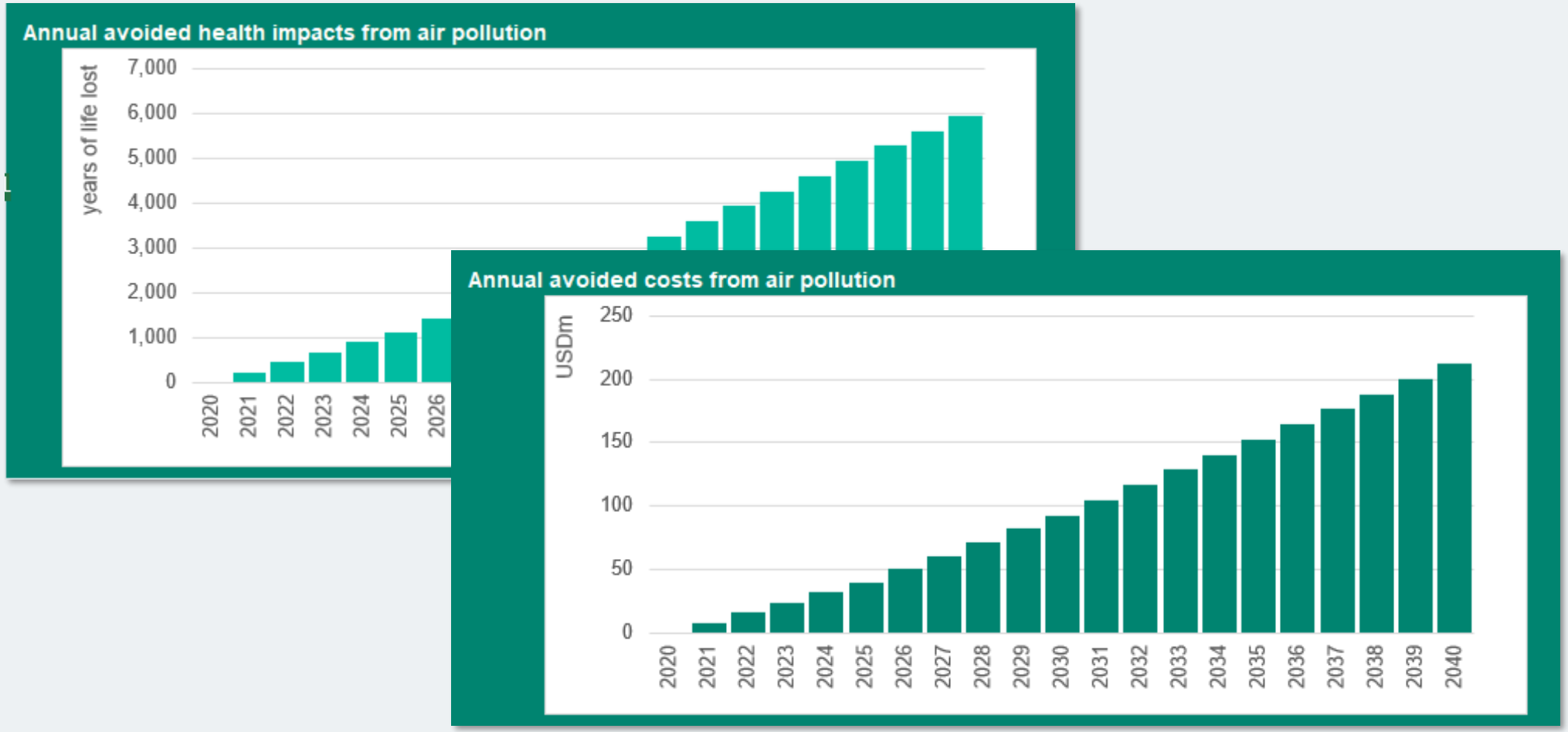
Scenario results: **Air pollution**

Illustrative results

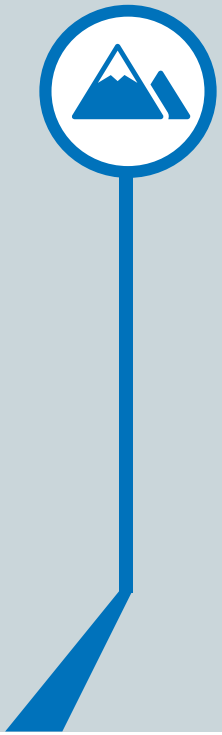


Comparing scenario results: **Air pollution**

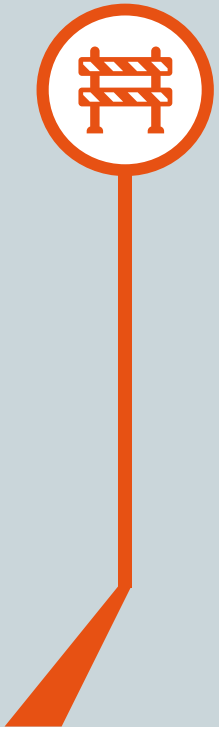
Illustrative results



Challenges and limitations to applying TRACE



- Variety of data required, e.g. scenario data, transport infrastructure data, socio-economic data
- Processing of transport sector activity scenarios (input to TRACE) may require additional assumptions, depending on the tool used and its granularity



- Focuses exclusively on estimating selection of non-climate impacts from transport sector pathway scenarios (emissions pathways not calculated in TRACE)
- Analysis covers selected transport modes in urban settings with a focus on road transport

QUESTIONS / COMMENTS / FEEDBACK

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