Transport sector climate action co-benefit evaluation tool

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ICAT Initiative for Climate Action Transparency
CONTENT

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

Avoid
travel needs & reduce low-occupancy vehicles

Shift
to more environmentally friendly transport modes

Improve
vehicles and transport infrastructure

Urban planning and demand management

Shift to walking and cycling

Shift to public transport

Shift to passenger and freight railways

Shared mobility

Increased electrification

Improved energy efficiency

Introducing TRACE
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.

Introducing TRACE
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.
Introducing 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
NewClimate Institute | Slide 7

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

Introducing TRACE
Overview of TRACE

Understanding data requirements, calculations and outputs
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

Introducing TRACE

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

Total annual avoided costs by impact type

- Air pollution
- Fuel saving
- Accidents
- Delay

![Chart showing total annual avoided costs by impact type from 2020 to 2040.]

- 2020: 0.0 USD billion
- 2040: 3.0 USD billion

Key benefits:

- 3,992 million hours saved
- 4,700 USD million saved
- 55,000 million LPG saved
- 18,900 USD million saved

- 2,700 premature deaths avoided
- 2,100 USD million saved
TRACE inputs, calcs and outputs

**Inputs**
- Transport sector activity scenarios
- Sector and cost related indicators (e.g. infrastructure, income, value of time)
- Historical and projected data for macroeconomic indicators (e.g. population, GDP)
- Assumptions for user-adjustable levers (e.g. annual decrease in road accidents)

**Calculations**
- Impact of transport sector characteristics (e.g. modal shift, electrification rate)
- Translating the impact into impact indicators (e.g. months lost to congestion)
- Impact of transport sector characteristics
- Monetisation of impact assessments

**Outputs**
- Scenario impacts broken down by impact type (e.g. congestion, fuel savings, etc.) and year
- Monetisation of all impacts
- Aggregation of impacts to show total benefit / cost of different decarbonisation pathways
- Easy comparison of impacts between scenarios and relative importance of each impact type
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.
Assessing impacts

Methods by impact type
Congestion impact assessment

- Transport activity by transport mode
- Vehicle fleets
- Road length
- Income data
- Average travel speed by transport mode (option to estimate for mixed traffic)

Inputs: Income data
Levers: Modal split, Occupancy rate
Outputs: Time lost to congestion, Cost of delay

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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

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- Projections of annual fatalities by transport mode
- Value of mortality risk
- Transport activity
- Modal split

INPUTS

LEVERS

OUTPUTS

Cost of fatalities

Other costs (non-fatal injuries, medical costs and property damage)
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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

- Transport activity by mode
- Vehicle fleets
- Fuel use per transport mode and vehicle type
- Fuel cost per fuel type

LEVERS

- Modal split
- Occupancy rate
- EV uptake

OUTPUTS

- Aggregated fuel consumption (volume) for all transport modes
- Monetary cost of fuel use

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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

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).

Integration of the results from the Air Pollution Impact Model for Transport (AIRPOLIM-T)

- **Inputs**: Transport activity, Fuel mix, Modal split
- **Levers**: Integration of results from AIRPOLIM-T
- **Outputs**: Health impacts, including premature deaths and years of life lost, Monetised health impacts

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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

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Comparing scenario results: Congestion

Illustrative results

Annual avoided time lost in congestion

Annual avoided costs from congestion

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Scenario results: **Road accidents**

**Cost of road accidents by type of impact**

- Property damage cost
- Medical costs
- Nonfatal injuries
- Fatalities

Illustrative results

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Comparing scenario results: Road accidents

Illustrative results

Annual avoided road accidents

USDm

250
200
150
100
50
0

2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040

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Scenario results: Fuel savings

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Annual fuel consumption and fuel cost
Comparing scenario results: Fuel savings

Illustrative results

Annual fuel savings

Annual fuel cost savings

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Scenario results: **Air pollution**

**Annual air pollution health impact**

- premature deaths

**Annual cost of air pollution health impacts**

- USDm
Comparing scenario results: Air pollution

Illustrative results

Annual avoided health impacts from air pollution

Annual avoided costs from air pollution
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