3 Overview of transport pricing policies

Three recently adopted major international agreements outline a collective strategy for sustainable development and climate change, and emphasize the urgency of action in the transport sector: the 2030 Agenda for Sustainable Development (2015), the Paris Agreement (2015) and the New Urban Agenda (2016). To meet the target in the Paris Agreement to limit temperature increase to 1.5–2°C above pre-industrial levels, the goal of the transport sector is to reduce emissions from 7.7 Gt per year to 2–3 Gt per year by 2050. The greater goal is decarbonization and transition to a "net zero emission" economy, where emissions are reduced to a minimum and remaining emissions from specific sectors are sequestered by other means.[10]

3.1 Pricing policies

Because they provide benefits in addition to GHG emissions reductions, transport system changes can be considered win–win GHG emissions reduction solutions. Policies that provide sustainable development benefits can be justified even where they have relatively high costs per unit of emissions reduction. For example, high-quality public transit systems have high costs and low direct emissions reductions. But public transit provides other environmental, social and economic benefits, including reduced vehicle ownership and more compact urban development. On the other hand, some policies, such as fuel efficiency mandates and subsidies for alternative fuels, can have "rebound effects". Rebound effects entail increased consumption as a result of increased efficiency and reduced consumer costs. Certain policies may increase total vehicle travel, and therefore external costs such as traffic and parking congestion, roadway infrastructure costs, accidents and sprawl.

In this methodology, the term "price" refers to the direct financial cost of using a good. Various price changes can affect the mode and frequency of travel, and consequent fuel consumption and GHG emissions. In many countries, current prices often fail to reflect the marginal costs of transport activities, which is economically inefficient and unfair. For example, most roads and parking facilities are unpriced – motorists use them on a first-come, first-served basis, which leads to traffic and parking congestion, and urban vehicle travel beyond what is economically optimal.

Similarly, vehicle insurance and registration fees are generally fixed costs. Motorists pay the same amount regardless of how many kilometres they drive each year. This tends to overcharge owners of vehicles that have lower annual kilometres and undercharge vehicles that have higher annual kilometres, relative to the crash and roadway costs they result in. In addition, current prices often do not reflect external costs such as the health costs of air pollution or traffic accidents. Many of the policies covered in this methodology are therefore justified on basic economic and social equity principles (i.e. marginal-cost pricing and polluter pays), considering the factors discussed in Sections 3.1.2 and 3.1.4.

3.1.1 Influence on travel and fuel consumption

Pricing policies vary in their travel impacts. When evaluating how a pricing policy affects travel and fuel consumption, it is useful to consider how travellers actually perceive a price change. For example, a fuel price increase encourages motorists to drive less, to drive more efficiently (i.e. accelerating more smoothly and reducing speeds), and to choose more fuel-efficient vehicles or alternative-fuel vehicles, when possible. A high vehicle fee, such as a distance-based registration fee or purchase tax, may encourage some households to reduce their vehicle ownership or purchase a lower-fee vehicle. High parking fees, in city centres and other locations, have been found to cause people to change how they travel (e.g. cycling, ride sharing, using public transit instead of driving), where they travel (e.g. from a city centre to other destinations with cheaper parking) or where they park (e.g. to the fringe of the city centre where parking is cheaper), or to find ways to circumvent the fees

[10] Huizenga and Peet (2017).

(e.g. parking illegally).[11] These factors are important considerations when evaluating a pricing policy's costs and benefits.

Motor vehicles tend to have high fixed and low variable costs. This means that, even though automobiles are expensive to own, they are relatively inexpensive to use. A typical car costs several thousand dollars annually in fixed expenses (e.g. depreciation, financing, insurance, registration fees, maintenance, residential parking), but only about $0.20[12] per kilometre in variable expenses (e.g. fuel, tyre wear). Adding a daily parking fee or road toll of $2.00 represents a relatively small increase in total vehicle costs, but doubles the variable costs for a commuter with a 10 kilometre round trip to work. Similarly, the impacts of an increase in a transit fare depend on a traveller's travel mode, trip distances and income.

3.1.2 Factors to consider when planning and evaluating price changes

The impacts of pricing policies depend on how they are structured and how revenues are used. Pricing policies are more effective in reducing GHG emissions where revenues are used to improve low-carbon travel, such as through expanded pedestrian and cycling infrastructure or public transit services. Where revenues are used to improve affordable travel options (e.g. walking, cycling, public transit) or used in other ways that benefit the poor (e.g. bus rapid transit systems funded by local fuel taxes or parking fees), pricing policies can be more effective in achieving social equity objectives.

The impacts of these policies depend on markets, which change over time. For example, when choosing which vehicles to purchase, potential buyers may respond to fuel price increases by purchasing more fuel-efficient and alternative-fuel vehicles, or by choosing more city-accessible homes that require less driving. In general, long-run elasticities are about 3 times as large as short-run elasticities. For example, where a fuel tax increase causes a 10% reduction in fuel consumption in the first year, it should provide a 30% reduction over the long run (more than five years) if maintained in magnitude, accounting for inflation.[13] Travellers take higher prices into account when making durable decisions such as where to live and how many vehicles to own. For example, a household is more likely to decide to commute by transit and reduce its vehicle ownership after fuel prices have remained high for an extended period.

To maximize economic efficiency and minimize welfare losses, price changes are most effective when they are gradual and predictable, allowing the public to anticipate the impacts of the changes when making long-term decisions. The availability of alternative travel options greatly amplifies the impacts of pricing policies.

Many pricing policies have rebound effects, where an increase in energy efficiency stimulates more vehicle travel, which offsets some of the potential GHG emissions reductions or energy savings. The price elasticities in this methodology are based on empirically determined elasticities, and therefore do (to some extent) include rebound effects. It is important to keep in mind that such effects occur and can affect estimated GHG impacts of a policy.

3.1.3 List of pricing policies

Table 3.1 gives an overview of pricing policies in the transport sector, and their vehicle travel and emission impacts. The methodology is not applicable to every policy in this overview table. It is applicable to fuel subsidy reduction or removal, increased fuel tax or levy, road pricing policies and vehicle purchase incentives for more efficient vehicles, as explained in Chapter 1. For more detailed information on each of these policies, see Chapter 10 and Appendix C.

[11] Litman (2016).

[12] Examples provided throughout the methodology use US dollars as the currency, but are not specific to the United States. The given values are rough estimates that are not valid for every country.

[13] For more information on elasticities, see Appendix B for a list of literature.

TABLE **3.1**

Overview of pricing policies

Policy	Description	Vehicle travel and emissions impacts
Reduced fuel subsidies	Removal or reduction of subsidies that reduce the price of vehicle fuel below its fair-market cost. Fuel can be considered highly subsidized if it is priced below international crude oil prices, and moderately subsidized if it is priced below fuel production and roadway costs.	• Increased fuel prices may lead to reduced vehicle travel and/or increased switching to more fuel-efficient and alternative-fuel vehicles.
Increased fuel tax/levy	Increased taxes may include general taxes that apply to many goods and special taxes specific to vehicle fuel.	• Increased fuel prices lead to reduced vehicle travel and/or increased purchase of more fuel-efficient and alternative-fuel vehicles.
Carbon taxes	Carbon taxes are based on a fuel's carbon content, and are therefore a tax on CO_2 emissions.	• By increasing fuel prices, with greater increases for more carbon-intensive fuels such as gasoline, carbon taxes lead to reduced vehicle travel and/or increased purchase of more fuel-efficient and alternative-fuel vehicles.
Increased vehicle tax/levy	Fees on motor vehicle purchases and ownership, including high fees (to ration or reduce vehicle ownership); high import duties on vehicles; and vehicle taxes and fees that increase with vehicle weight, engine size or fuel intensity	• Very high vehicle ownership fees lead to reduced total vehicle ownership. • High duties on imported vehicles may encourage motorists to retain older and less efficient vehicles. • Taxes and fees that vary by vehicle weight, engine size or fuel intensity can encourage motorists to purchase smaller and more efficient vehicles. • Taxes and fees that vary by fuel type or that subsidize vehicles that use low-carbon fuels can encourage motorists to choose lower-carbon-fuelled vehicles.
Road pricing (road tolls and congestion pricing)	Motorists pay directly for driving on a particular roadway in a particular area. Road pricing has two general objectives: revenue generation and congestion management.	• Tolls reduce vehicle travel on affected roadways. • Congestion pricing reduces vehicle travel under congested conditions. • Overall impacts are modest because they only apply to a minor portion of total vehicle travel.
More efficient parking pricing	Parking charges for motorists, and "cash out" parking so that non-drivers receive comparable benefits	• Various impacts, depending on conditions, including reduced vehicle ownership, modal shift, shift of destinations, shift in parking locations and shift to illegal parking
Distance-based vehicle insurance and registration fees	Vehicle charges are based on the amount a vehicle is driven during a time period. This includes pay-as-you-drive vehicle insurance, distance-based registration fees, distance-based vehicle purchase taxes, distance-based vehicle lease fees, weight–distance fees and distance-based emissions fees.	• Various impacts, depending significantly on the policy and its conditions

TABLE **3.1,** continued

Overview of pricing policies

Policy	Description	Vehicle travel and emissions impacts
Public transit fare reforms	Fare reforms include reduced fares, free transfers, universal transit passes and more convenient payment systems (e.g. passes, electronic payment cards, mobile telephone payment systems).	• Most transit travel has low price elasticities, but certain policies have relatively large impacts on travel (e.g. universal transit passes, which can significantly increase transit travel).
Company car tax reforms	Reduced tax structures that encourage employers to subsidize employees' car travel	• Reduced total vehicle travel and emissions, but reforms may also increase the purchase of diesel vehicles
Smart Growth pricing reforms	Higher fees are charged for sprawled development, reflecting the higher costs of providing public infrastructure and services to more dispersed locations.	• Implementation of traffic, parking and stormwater management systems that reduce infrastructure burdens, resulting in more accessible communities where residents drive less

3.1.4 Addressing social equity concerns

Pricing reforms are often criticized as regressive because they are believed to place a larger tax burden on lower-income populations than on higher-income populations. However, this is not necessarily the case. This perception is based on an understanding that a given tax or fee represents a greater portion of income for a lower-income than a higher-income household, which would make the reform regressive. However, this is only the case where all households purchase the same transport-related goods and services. Lower-income households have been shown to drive less and use less fuel than higher-income households. There are two general ways to evaluate pricing equity:

- **Horizontal equity** assumes that public policies should not favour one group over others, which implies that people should "get what they pay for and pay for what they get" unless subsidies are specifically justified. By this measure, transport pricing tends to increase fairness and social equity, since it charges motorists directly for the roads, parking, accident risk, pollution and other costs they impose on other people.

- **Vertical equity** assumes that public policies should favour physically, economically or socially disadvantaged groups over more advantaged groups – for example, through "progressive" price structures that charge disadvantaged people less. Although transport price increases often seem regressive, since a given tax or fee represents a larger portion of income for lower-income than higher-income households, they are generally less regressive than other transport funding options, such as using general taxes to pay for roads, or incorporating parking facility costs into building rents. Since motor vehicle travel tends to increase with income, the distribution of road, parking and fuel subsidies tends to be regressive – that is, lower-income people receive far smaller subsidies than higher-income people.

Some subsidies are hidden and indirect, and careful analysis is needed to understand their equity impacts. For example, some countries subsidize vehicle fuel sales in various ways, and others apply low fuel taxes, which are a hidden subsidy for driving. In such cases, it is necessary to calculate the total amounts of subsidy and under-taxing, analyse how these savings are distributed by income class, and estimate the tax reductions or additional public benefits that these subsidies could provide if redirected to lower-income households.

Transport pricing can be very progressive (i.e. significantly benefiting disadvantaged people) if:

- it includes needs-based subsidies or discounts, so that disadvantaged people pay less than advantaged people
- revenues are used in ways that benefit disadvantaged groups – for example, to support inclusive and affordable transport options (walking, cycling, public transit and universal design features)
- it reduces more regressive taxes such as property and sales taxes.

Other public policies can help achieve transport equity – for example, by developing affordable housing in accessible urban locations so that physically and economically disadvantaged residents can walk or bicycle to local services and jobs, rather than needing to pay public transit fares.

3.1.5 Elements of successful pricing policies in the transport sector

Several common elements of transport pricing policies have proven effective in reducing GHG emissions, achieving sustainable development benefits and addressing social equity concerns. Pricing policies have proven most effective where policymakers:

- account comprehensively for all significant sustainable development impacts and rebound effects so that all stakeholders understand the full benefits that result
- address social equity concerns by using revenues in ways that benefit disadvantaged groups, including investments in affordable transport modes. In some cases, disadvantaged groups may receive direct subsidies, exemptions, discounts or rebates
- implement pricing policies as an integrated package with complementary and reinforcing transport and land-use emissions reduction strategies (e.g. improving low-carbon travel modes), and Smart Growth policies that support more compact urban development
- implement pricing policies predictably and gradually, using comprehensive stakeholder consultations to improve them, increase their acceptance and incorporate inflation factors.

Generally, fuel price increases at the national level may have a large GHG mitigation impact, but may also face strong political opposition. While planning for and assessing pricing policies, it is important to account for the earmarking of revenues, which may significantly influence the mitigation impact.

3.2 A national system for tracking the transport sector

Countries implement monitoring, reporting and verification (MRV) systems in the transport sector to support and improve policy planning, implementation and assessment, with the underlying objective of enhancing the environmental, social and economic impacts of policies. This section highlights the importance of transport sector MRV systems that enable policymakers to understand the total national GHG emissions in the transport sector and the impacts of the mitigation actions being implemented. For more information on, and examples of, MRV systems, see the *Reference Document on Measurement, Reporting and Verification in the Transport Sector.*

3.2.1 Building and strengthening a national-level MRV system for the transport sector

The specific nature of an MRV system depends on whether countries have committed to an economy-wide target, a sector-wide mitigation target or individual mitigation policies. Whereas a full inventory of GHG emissions is needed to assess a sectoral mitigation target, assessment of a specific mitigation policy involves estimating GHG emissions reductions within the GHG assessment boundary against a baseline scenario.

Transport GHG emissions can be quantified using two types of data: energy use (top-down) and travel activity (bottom-up). Bottom-up data allow users to quantify and monitor emissions resulting from a policy in much more detail. Where possible, these two approaches should be aligned, since consistency is necessary for many steps undertaken in the assessment.

The transport sector involves a diverse array of interconnected activities, including policies that directly and indirectly affect one or more components. As a result, GHG emissions are dependent on the level of travel activity (A), the modal structure (S), the fuel intensity of each mode (I) and the fuel's carbon content, which determines the emission factor (F) that is used. The relationship between these parameters is represented by the "ASIF" equation or "ASIF framework". The ASIF framework used in the bottom-up approach establishes a connection between mitigation actions and GHG emissions, and helps users identify transport indicators for the assessment. For more information on the ASIF framework, see the *Reference Document on Measurement, Reporting and Verification in the Transport Sector.*

When building or strengthening a national MRV system, it is important to consider national circumstances and capacity. When defining the type of data necessary to track policies, it is important to identify what data are needed; how data will be processed; and the entities responsible for data collection, analysis and monitoring. To the extent possible, countries should use existing domestic arrangements, processes and systems for data collection and management. Countries should establish new institutions where they are lacking.

3.2.2 Benefits of a robust national MRV system

A robust national transport MRV system has multiple benefits beyond the tracking of GHG emissions reductions. A robust system supports policymakers and stakeholders in decision-making by allowing them to:

- identify national sectoral priorities and improve transport planning at the national and subnational levels
- assess progress on transport policies being implemented and identify where to focus new GHG emission reduction efforts
- understand and evaluate the effectiveness of transport policies in achieving GHG emissions reductions and sustainable development objectives
- improve efficiency by reducing redundancy in data collection and processing, by establishing clear roles and responsibilities
- ensure transparency, accuracy and comparability of information
- assist different institutions with domestic and international reporting to the United Nations Framework Convention on Climate Change (UNFCCC)
- communicate to donors on achievements made possible through their funding
- attract additional public and private finance.

3.2.3 Institutional setting for robust transport sector data

The institutional setting is a key component of a successful MRV system. Information on key performance indicators and parameters can be dispersed among a number of institutions. Given the wide variety of data needed for impact assessment and the number of different stakeholders involved, strong institutional arrangements serve an important function. Institutions play a central role in collecting, processing and reporting relevant data. Strong institutional arrangements need to be backed up by a legal framework (a law, regulation or decree) to ensure that key actors are empowered to perform their functions.

The institutional arrangements that are required depend on the scope of the MRV and whether it relates to national or subnational actions (e.g. cities). Countries may already have institutional arrangements in place to conduct these activities. Where this is the case, they can consider expanding their MRV system to monitor the impact of pricing policies.

A technical coordinator, or coordinating team or body is often assigned to lead MRV processes in which responsibilities have been delegated to different institutions. Since data can be widely dispersed between these institutions, the coordinating body oversees the procedures for data collection, management and reporting. The coordinating body may also oversee technical and institutional capacity-building, and monitor quality control and quality assurance standards with other participating institutions. This collaboration aims to maximize synergies, enhance efficiency and streamline the work between the institutions involved.

Users may find it helpful to identify, inform and consult stakeholders when setting up the coordination team and planning the assessment. Refer to the ICAT *Stakeholder Participation Guide* for guidance on identifying and understanding stakeholders (Chapter 5), forming multi-stakeholder bodies (Chapter 6), providing information to stakeholders (Chapter 7), designing and conducting consultations (Chapter 8), and engaging in general with stakeholders throughout the entire impact assessment process.

The establishment of a data clearing house, or a virtual repository that collects and stores data, has proven useful for data management in several countries. In many cases, the clearing house is integrated into the country's statistical bureau.

Where strong institutional arrangements do not yet exist, countries can identify and strengthen a governmental body to ensure that it has adequate capacity and authority to be responsible for the MRV system and establish appropriate legal arrangements. Institutional mandates help to strengthen the procedures and the system, and may also help secure funding from the government to ensure the continuity of the process. Users can refer to the UNFCCC *Toolkit for Non-Annex I Parties on Establishing and Maintaining Institutional Arrangements for Preparing National Communications and Biennial Update Reports*,[14] as well as Table 6 in the *Reference Document on Measurement, Reporting and Verification in the Transport Sector*, for support on establishing or improving the institutional arrangements for a robust MRV system.

[14] Available at: http://unfccc.int/files/national_reports/non-annex_i_natcom/training_material/methodological_documents/application/pdf/unfccc_mda-toolkit_131108_ly.pdf.

4 Using the methodology

This chapter provides an overview of the steps involved in assessing the GHG impacts of pricing policies, and outlines assessment principles to help guide the assessment.

Checklist of key recommendations

- Base the assessment on the principles of relevance, completeness, consistency, transparency and accuracy

4.1 Overview of steps

This methodology is organized according to the steps a user follows in assessing the impacts of a pricing policy (see Figure 1.1). Depending on when the methodology is applied and the approach chosen, users can skip certain chapters. When assessing vehicle purchase incentives and road pricing policies, users can skip to Chapter 10 after Chapter 6.

4.2 Planning for the assessment

Users should review this methodology, the *Introduction to the ICAT Assessment Guides* and other relevant assessment guides, and plan the steps, responsibilities and resources needed to meet their objectives for the assessment in advance. This includes identifying the expertise and data needed for each step, planning the roles and responsibilities of different actors, and securing the budget and other resources needed. Any interdependencies between steps should be identified – for example, where outputs from one step feed into another – and timing should be planned accordingly.

The time and human resources required to implement the methodology and carry out an impact assessment depend on a variety of factors, such as the complexity of the policy being assessed, the extent of data collection needed and whether relevant data have already been collected, whether analysis relating to the policy has previously been done, and the level of accuracy and completeness needed to meet the stated objectives of the assessment.

4.2.1 Choosing a desired level of accuracy based on objectives

A range of options exists for assessing GHG impacts that allow users to manage trade-offs between the accuracy of the results, and the resources, time and data needed to complete the assessment, based on objectives. Some objectives require more detailed assessments that yield more accurate results (to demonstrate that a specific reduction in GHG emissions is attributable to a specific policy, with a high level of certainty), whereas other objectives may be achieved with simplified assessments that yield less accurate results (to show that a policy contributes to reducing GHG impacts, but with less certainty around the magnitude of the impact).

Users should choose approaches and methods that are sufficient to accurately meet the stated objectives of the assessment and ensure that the resulting claims are appropriate – for example, whether a policy contributes to achieving GHG emissions reductions or whether emissions reductions can be attributed to the policy. Users should also consider the resources required to obtain the data needed to meet the stated objectives of the assessment.

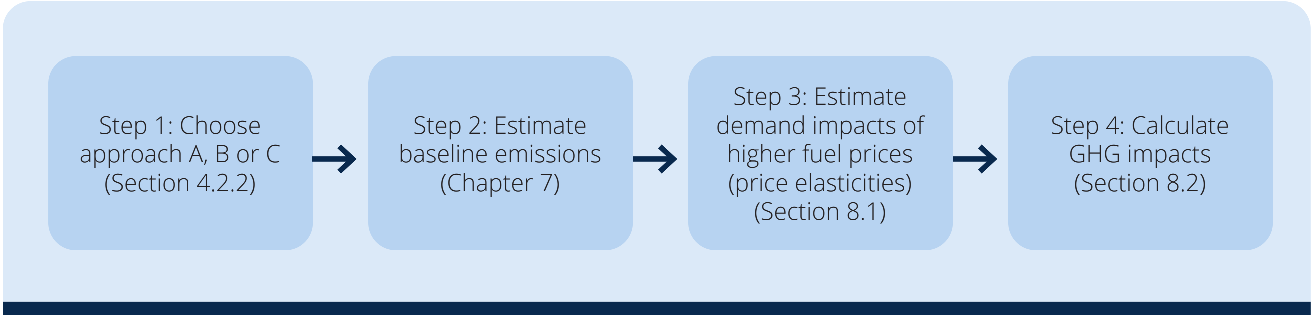
4.2.2 Approaches to GHG impact assessment

The methodology outlines four principal steps for assessing the impacts of a policy, shown in Figure 4.1. Within each principal step are further steps that users follow to calculate GHG impacts.

Step 1 of assessing a policy (choosing the approach for estimating the GHG impacts of the policy) is covered in this section. To assess a vehicle purchase incentive or a road pricing policy, users should proceed directly to Chapter 10.

FIGURE **4.1**

Four key steps in assessing the impacts of pricing policies



Chapters 7–9 provide methods for estimating the GHG impacts of pricing policies. Approaches for vehicle purchase incentive and road pricing policies are addressed in Chapter 10. The methodology provides three approaches for users. The choice of approach depends on the level of data available and the expertise of the user:

- **Approach A** estimates the GHG impacts of a pricing policy for the sum of gasoline- and diesel-related emissions from a country's transport sector, and is appropriate for users with an undifferentiated fuel mix (national, subnational or municipal level).

- **Approach B** estimates the GHG impacts separately for gasoline- and diesel-fuelled vehicles for users with a differentiated fuel mix (national, subnational or municipal level).

- **Approach C** is not comparable to approaches A and B. It estimates the GHG impacts for passenger transport separately for passenger cars, and bus- and rail-based public transport for users who have differentiated fuel mix data and data on passenger kilometres (PKM)[15] and tonne kilometres (TKM).[16] In the methodology, freight transport is excluded, to keep the explanations and calculations simple. Users can apply the approach and include freight transport using TKM. However, when GHG impacts are assessed using approach C, as described in this methodology, the results will not reflect the same system boundaries and scope as approaches A and B. Results from approach C provide a higher level of detail.

These approaches focus on gasoline and diesel. The same approaches could be used for other fuels, such as liquefied petroleum gas (LPG) or compressed natural gas (CNG), by using analogous equations with different input data (i.e. travel activity data, emission factors and elasticity values).

The *Reference Document on Measurement, Reporting and Verification in the Transport Sector* (Section 2.1) defines two types of data sets: top-down "energy use" and bottom-up "travel activity" data, as described in Section 3.2.1. Approaches A and B are based on the top-down approach, whereas approach C is based on both the top-down and the bottom-up approaches.

Comparison of the three approaches

The three approaches lead to different results. Moving from approach A to approach C, the level of detail necessary for the assessment increases (e.g. including electric vehicles in the assessment requires much more data), which has an impact on the results. GHG emissions reductions estimated with approach A tend to be higher than with approach B, since approach A does not differentiate between the fuel types, and diesel fuel usually has a lower price elasticity than gasoline.

Approach C is not comparable to approaches A or B because it includes only passenger transport. Additionally, approach C allows the geographical system boundaries to be set for an urban context rather than at the national level. By assessing several urban regions using approach C, larger regions can

[15] PKM equals the numbers of passengers multiplied by the kilometres travelled with a specific vehicle (vehicle kilometres). For example, if two people travel in one passenger car for 20 kilometres, this equals 2 people × 20 km = 40 PKM.

[16] TKM is based on the same concept as PKM, but for freight and using tonnes as the unit. For example, if 3 t of a good are transported for 20 kilometres in a heavy-duty vehicle, this equals 3 t × 20 km = 60 TKM.

be aggregated and analysed. It is also possible to apply two different approaches (e.g. approach B at the national level and approach C for an urban region) to conduct a national assessment while still gaining valuable insights from approach C on the impacts of mode shift. Through the use of cross-price elasticities, approach C accounts for a decrease in the GHG emissions reductions related to modal shifts, which is not reflected in the results of approaches A or B.

Table 4.1 provides an overview of the differences between approaches A, B and C, and helps users choose the most appropriate approach for their assessment.

4.2.3 Methods for obtaining or estimating data

It is recommended that users use country-specific data. Where country-specific data are not available, default values can be used, such as those provided by the Intergovernmental Panel on Climate Change (IPCC) for emission factors and net calorific values (NCVs). For possible data sources for elasticity values, see Appendix B. Sections 7.2 and 7.3 briefly discuss how to include biofuels (e.g. bioethanol or biodiesel, possibly as proportions of fossil fuels) in the estimation.

For planning purposes, it is helpful for the user to identify the desired approach before beginning an impact assessment. The approach should be selected based on the user's objectives, capacity and resources (see Figure 4.2). If the user's objective is to understand the impact of a policy and use that information to meet a variety of objectives – such as informing policy design, improving policy implementation, evaluating policy effectiveness, reporting on policy impacts, and attracting finance based on policy impacts – users should assess impacts using a more robust approach.

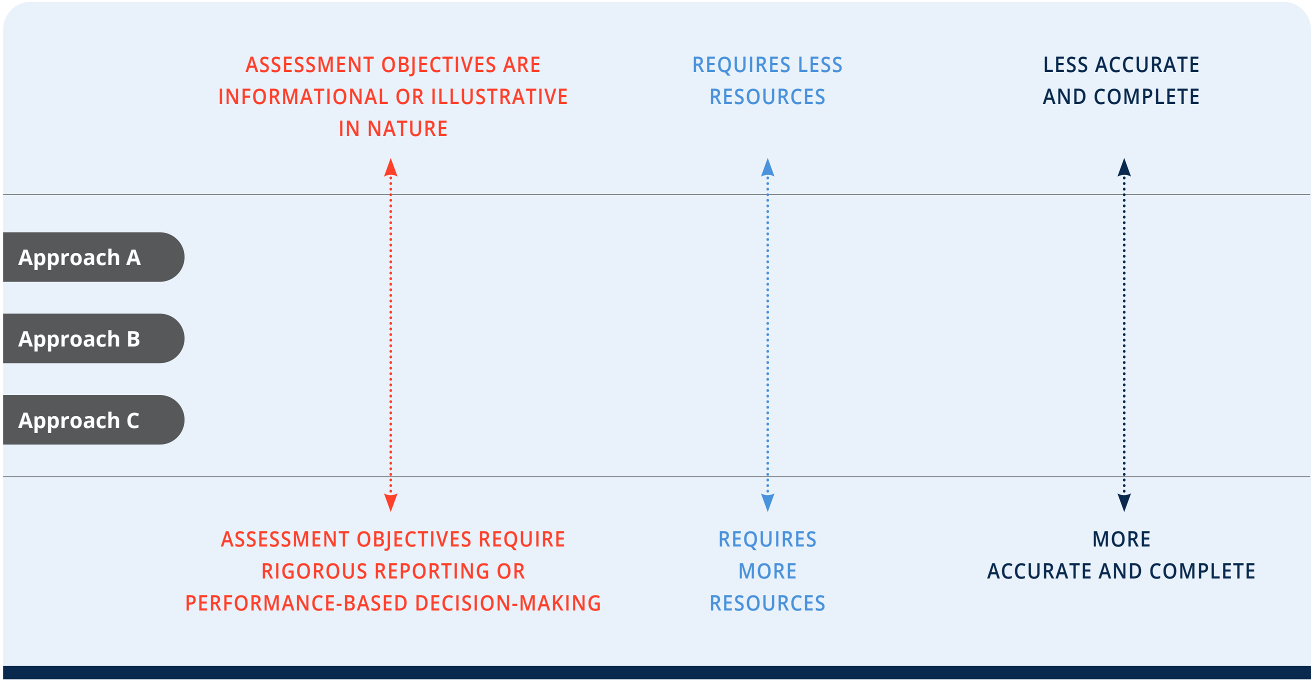
TABLE **4.1**

Overview of approaches covered by the methodology

Approach	Data requirements	Boundaries and coverage		
		Geographical system boundaries	Passenger/freight	Fuel types
A	Only general fuel consumption data (Basis for calculation: top-down energy-use data)	National, subnational or municipal	Ground transport (passenger and freight)	Fuel mix (unspecified mix of gasoline, diesel and/or other transport fuels)
B	Specific gasoline and diesel consumption data (Basis for calculation: top-down energy-use data)	National, subnational or municipal	Ground transport (passenger and freight)	Gasoline and diesel
C	Comprehensive bottom-up travel activity data (e.g. distance travelled by mode j) (Basis for calculation: top-down energy-use data and bottom-up travel activity data)	Regional, urban	Only passenger transport in an urban context However, the assessment can be conducted for several (large) cities to enable a more extensive geographical coverage	Gasoline, diesel and electricity

FIGURE **4.2**

Range of approaches for estimating GHG impacts based on data availability



4.2.4 Expert judgment

It is likely that expert judgment and assumptions will be needed to complete an assessment where information is not available. Expert judgment is defined by the IPCC as a "carefully considered, well-documented qualitative or quantitative judgment made in the absence of unequivocal observational evidence by a person or persons who have a demonstrable expertise in the given field".[17] The goal is to be as representative as possible to reduce bias and increase accuracy. The user can apply their own expert judgment or consult experts.

When relying on expert judgment, information can be obtained through methods that are known as expert elicitation. The *2006 IPCC Guidelines for National Greenhouse Gas Inventories* provides a procedure for expert elicitation, including a process for helping experts understand the elicitation process, avoiding biases, and producing independent and reliable judgments.[18]

Expert judgment can be associated with a high level of uncertainty. As such, experts can be consulted to provide a range of possible values and the related uncertainty range, or to help select suitable values from a range of values. Expert judgment can be informed or supported by broader consultations with stakeholders.

It is important to document the reason that no data sources are available and the rationale for the value chosen.

4.2.5 Planning stakeholder participation

Stakeholder participation is recommended at many steps throughout the methodology. It can strengthen the impact assessment and the contribution of policies to GHG emissions reduction goals in many ways, including by:

- establishing a mechanism through which people who may be affected by, or can influence, a policy have an opportunity to raise issues and have these issues considered before, during and after policy implementation

[17] IPCC (2000).

[18] IPCC (2006).

- raising awareness and enabling better understanding of complex issues for all parties involved, thereby building their capacity to contribute effectively
- building trust, collaboration, shared ownership and support for policies among stakeholder groups, leading to less conflict and easier implementation
- addressing stakeholder perceptions of risks and impacts, and helping to develop measures to reduce negative impacts and increase benefits for all stakeholder groups, including the most vulnerable
- increasing the credibility, accuracy and comprehensiveness of the assessment by drawing on diverse expert, local and traditional knowledge and practices – for example, to provide inputs on data sources, methods and assumptions
- increasing transparency, accountability, legitimacy and respect for stakeholders' rights
- enabling enhanced ambition and financing by strengthening the effectiveness of policies and the credibility of reporting.

Various sections throughout this methodology explain where stakeholder participation is recommended – for example, in identifying a complete list of GHG impacts (Chapter 6), estimating baseline emissions (Chapter 7), estimating GHG impacts (Chapter 10), monitoring performance over time (Chapter 11) and reporting (Chapter 12).

Before beginning the assessment process, users should consider how stakeholder participation can support the objectives, and include relevant activities and associated resources in their assessment plans. It may be helpful to combine stakeholder participation for impact assessment with other participatory processes involving similar stakeholders for the same or related policies, such as those being conducted for assessment of sustainable development and transformational impacts, and for technical review.

It is important to ensure conformity with national legal requirements and norms for stakeholder participation in public policies. Requirements of specific donors, and of international treaties, conventions and other instruments that the country is party to should also be met. These are likely to include requirements for disclosure, impact assessments and consultations. They may include specific requirements for certain stakeholder groups (e.g. United Nations Declaration on the Rights of Indigenous Peoples, International Labour Organization Convention 169).

During the planning phase, it is recommended that users identify stakeholder groups that may be affected by, or may influence, the policy. Appropriate approaches should be identified to engage with stakeholder groups, including through their legitimate representatives. Effective stakeholder participation could be facilitated by establishing a multi-stakeholder working group or advisory body consisting of stakeholders and experts with relevant and diverse knowledge and experience. Such a group may provide advice and potentially contribute to decision-making; this will ensure that stakeholder interests are reflected in design, implementation and assessment of policies.

Refer to the ICAT *Stakeholder Participation Guide* for more information, such as how to plan effective stakeholder participation (Chapter 4), identify and analyse different stakeholder groups (Chapter 5), establish multi-stakeholder bodies (Chapter 6), provide information (Chapter 7), design and conduct consultations (Chapter 8), and establish grievance redress mechanisms (Chapter 9). Appendix G of this document summarizes the steps in this methodology where stakeholder participation is recommended and provides specific references to relevant guidance in the *Stakeholder Participation Guide*.

4.2.6 Planning technical review (if relevant)

Before beginning the assessment process, users should consider whether technical review of the assessment report will be pursued. The technical review process emphasizes learning and continual improvement, and can help users identify areas for improving future impact assessments. Technical review can also provide confidence that the impacts of policies have been estimated and reported according to ICAT key recommendations. Refer to the ICAT *Technical Review Guide* for more information on the technical review process.

4.3 Assessment principles

Assessment principles underpin and guide the impact assessment process, especially where the methodology provides flexibility. It is a *key recommendation* to base the assessment on the principles of relevance, completeness, consistency, transparency and accuracy, as follows:[19]

- **Relevance.** Ensure that the assessment appropriately reflects the GHG impacts of the policy and serves the decision-making needs of users and stakeholders – both internal and external to the reporting entity. Applying the principle of relevance depends on the objectives of the assessment, broader policy objectives, national circumstances and stakeholder priorities.

- **Completeness.** Include all significant impacts – both positive and negative – in the GHG assessment boundary. Disclose and justify any specific exclusions.

- **Consistency.** Use consistent assessment approaches, data-collection methods and calculation methods to allow meaningful performance tracking over time. Document any changes to the data sources, GHG assessment boundary, methods or any other relevant factors in the time series.

- **Transparency.** Provide clear and complete information for stakeholders to assess the credibility and reliability of the results. Disclose and document all relevant methods, data sources, calculations, assumptions and uncertainties. Disclose the processes, procedures and limitations of the assessment in a clear, factual, neutral and understandable manner with clear documentation. The information should be sufficient to enable a party external to the assessment process to derive the same results if provided with the same source data. Chapter 12 provides a list of recommended information to report to ensure transparency.

- **Accuracy.** Ensure that the estimated impacts are systematically neither over nor under actual values, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users and stakeholders to make appropriate and informed decisions with reasonable confidence about the integrity of the reported information. If accurate data for a given impact category are not currently available, users should strive to improve accuracy over time as better data become available. Accuracy should be pursued as far as possible, but, once uncertainty can no longer be practically reduced, conservative estimates should be used. Box 4.1 provides guidance on conservativeness.

In addition to the principles above, users should follow the principle of comparability if it is relevant to the assessment objectives – for example, if the objective is to compare multiple policies based on their GHG impacts, or to aggregate the results of multiple impact assessments and compare the collective impacts with national goals (discussed further in Box 4.2).

- **Comparability.** Ensure common methodologies, data sources, assumptions and reporting formats, such that the estimated impacts of multiple policies can be compared.

In practice, users may encounter trade-offs between principles when developing an assessment. For example, a user may find that achieving the most complete assessment requires using less accurate data for a portion of the assessment, which could compromise overall accuracy. Users should balance trade-offs between principles depending on their objectives. Over time, as the accuracy and completeness of data increase, the trade-off between these principles will likely diminish.

BOX **4.1**

Conservativeness

Conservative values and assumptions are more likely to overestimate negative impacts or underestimate positive impacts resulting from a policy. Users should consider conservativeness in addition to accuracy when uncertainty can no longer be practically reduced, when a range of possible values or probabilities exists (e.g. when developing baseline scenarios), or when uncertainty is high.

Whether to use conservative estimates and how conservative to be depends on the objectives and the intended use of the results. For some objectives, accuracy should be prioritized over conservativeness, to obtain unbiased results. The principle of relevance can help guide what approach to use and how conservative to be.

[19] Adapted from WRI (2014).

BOX **4.2**

Applying the principle of comparability when comparing or aggregating results

Users may want to compare the estimated impacts of multiple policies – for example, to determine which policy has the greatest positive impacts. Valid comparisons require that assessments have followed a consistent methodology – for example, regarding the assessment period, the types of impact categories, impacts and indicators included in the GHG assessment boundary, baseline assumptions, calculation methods, and data sources. Users should exercise caution when comparing the results of multiple assessments, since differences in reported impacts may be a result of differences in methodology rather than real-world differences. To understand whether comparisons are valid, all methods, assumptions and data sources used should be transparently reported. Comparability can be more easily achieved if a single person or organization assesses and compares multiple policies using the same methodology.

Users may also want to aggregate the impacts of multiple policies – for example, to compare the collective impact of multiple policies in relation to a national goal. Users should likewise exercise caution when aggregating the results if different methods have been used and if there are potential overlaps or interactions between the policies being aggregated. In such a case, the sum would either overestimate or underestimate the impacts resulting from the combination of policies. For example, the combined impact of a national fuel pricing policy and a national policy promoting electric vehicles in the same country will probably be less than the sum of the impacts of the two policies when assessed separately, since they affect the same activities. Chapter 5 provides more information on policy interactions.