Transport Pricing Guidance

Guidance for assessing the greenhouse gas impacts of transport pricing policies

May 2018

How to identify the GHG impacts of pricing policies to assess

6. IDENTIFYING IMPACTS: HOW PRICING POLICIES REDUCE GHG EMISSIONS

This chapter provides a process for identifying the most common GHG impacts of transport pricing policies, and guidance for users to identify any additional impacts their policies may have. A list of impacts is provided, as well as a causal chain indicating which impacts are included in the GHG assessment boundary. Guidance is also provided on defining the assessment period. The steps in this chapter are closely interrelated. Users can carry out the steps in sequence or in parallel, and the process may be iterative.

Figure 6.1: Overview of steps in the chapter

- Identify GHG impacts (Section 6.1)
- Define the GHG assessment boundary (Section 6.2)
- Define the assessment period (Section 6.3)
- Identify sustainable development impacts (if relevant) (Section 6.4)

Checklist of key recommendations

- Identify all potential GHG impacts of the policy and associated GHG source categories
- Develop a causal chain
- Include all significant GHG impacts in the GHG assessment boundary
- Define the assessment period

6.1 Identify GHG impacts

GHG impacts are the changes in GHG emissions that result from the policy. For most transport pricing policies being assessed using this guidance, the relevant GHG impacts are likely to be reduced emissions from reduced vehicle travel, shifts to other transport modes and shifts to more fuel-efficient
vehicles. Guidance is also provided for identifying GHG impacts for policies where significant impacts arise from the use of revenues.

6.1.1 Identify intermediate effects

In order to identify the GHG impacts of the policy, it is useful to first consider how the policy is implemented by identifying the relevant inputs and activities associated with implementing the policy. Inputs are resources that go into implementing the policy, while activities are administrative activities involved in implementing the policy. These inputs and activities lead to intermediate effects, which are changes in behaviour, technology, processes or practices that result from a policy. They can be categorised either by how stakeholders are expected to respond to the policy, or to the other intermediate effects of the policy, and can also include the mitigation action or change in behaviour that is mandated or incentivised by the policy. These intermediate effects then lead to the policy's GHG impacts (the reduction in emissions).

Users should identify all intermediate effects that may lead to GHG impacts. The key intermediate effects of the increase in fuel costs are reduced vehicle travel, a shift to other transport modes, and a shift to more fuel-efficient vehicles. The reduction in vehicle travel occurs through two main channels: 1) a reduction in overall vehicle trips, and 2) a modal shift, which contributes to both a reduction in overall vehicle trips as well as a shift to more efficient transport alternatives. The degree of modal shift depends on the quality of the available substitutes and other factors including social standing and safety.

The intermediate effects of fuel pricing policies include:

- Increased fuel prices
- Increased fuel prices, with greater increases for more carbon-intensive fuels such as gasoline
- Reduced vehicle travel
- Increased switching to more efficient and alternative fueled vehicles
- Increased purchase of more fuel efficient and alternative fueled vehicles

6.1.2 Identify potential GHG impacts

It is a *key recommendation* to identify all potential GHG impacts of the policy and associated GHG source categories. Guidance for this is provided below, and further discussion on the process is available in the *Policy and Action Standard*.

The key GHG impacts are the reductions in GHG emissions directly resulting from the identified intermediate effects. Other emissions impacts depend on how pricing revenue is used, as discussed below.

Stakeholder consultation can help to ensure the completeness of the list of GHG impacts. Refer to the ICAT *Stakeholder Participation Guidance* (Chapter 8) for information on designing and conducting consultations. Relevant stakeholders may include departments or ministries of transport, ministries of finance, national governments, city governments, transportation associations, public transit authorities, energy planning offices, taxation bureaus, construction industry, trucking industry, fleet operators, vehicle manufacturers, and consumers.
Users should identify all the GHG source categories associated with the GHG impacts of the policy. Example source categories are provided in Table 6.1.

**Table 6.1: Example GHG sources for fuel pricing policies**

<table>
<thead>
<tr>
<th>Source category</th>
<th>Description</th>
<th>Emitting entity or equipment</th>
<th>Relevant GHGs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road transport, light duty vehicles (LDV)</td>
<td>Fuel combustion from light duty vehicles</td>
<td>Passenger vehicles, light duty trucks, motorcycles</td>
<td>CO₂</td>
</tr>
<tr>
<td>Road transport, heavy duty vehicles (HDV)</td>
<td>Fuel combustion from heavy duty vehicles</td>
<td>Heavy duty trucks and buses</td>
<td>CO₂</td>
</tr>
<tr>
<td>Rail transport</td>
<td>Fuel combustion and electricity use from locomotives</td>
<td>Diesel and electric locomotives</td>
<td>CO₂</td>
</tr>
</tbody>
</table>

Importance of how revenues from pricing policies are used

Impacts related to the use of available revenue generated from the policy cannot be quantified with the proposed calculations in this guidance. It is however crucial to bear in mind that the use of revenue has a significant influence on GHG impacts. Users should account for the impacts of the use of revenues by assessing them at least qualitatively and discussing them in the interpretation of their assessment results, as described in Section 8.3.

Increased revenues may be used for different purposes, including:

- Use in government spending, which may lead to higher emissions if spent on roadways, for example, rather than infrastructure for public transport, bicycle lanes, etc.
- Revenue neutral redistribution to households through:
- Lowering taxes, possibly increasing consumer spending and in turn increasing emissions from households
- Paying targeted subsidies to poor populations to provide a social cushion for subsidy removal
- Equal per capita redistribution
- Earmark for transport infrastructure, which tends to increase emissions if invested in roadways rather than public transport and bicycle lanes, among others.
- Earmark for transport efficiency increases (e.g., promoting public transport), which tends to decrease emissions

For example, several cities primarily use revenue to expand public transport and non-motorised transport facilities, which may reinforce emission reductions given that public transport emissions are likely to be relatively small. Many road pricing policies, in contrast, use the revenue to expand roadway capacity, which tends to increase emissions.

Thus, the use of revenues may further decrease or increase GHG emissions, or, revenues may be used to cushion the social burden of removing fuel subsidies, for example by introducing targeted (e.g., per capita) subsidies for the fraction of the population most impacted by fuel subsidy removal.
6.1.3 Develop a causal chain

It is a key recommendation to develop a causal chain. A causal chain is a conceptual diagram tracing the process by which the policy leads to GHG impacts through a series of interlinked logical and sequential stages of cause-and-effect relationships. Developing a causal chain can help identify effects not previously identified. Figure 6.2 shows a high-level illustrative example of a causal chain. Causal chains will vary from policy to policy, as will the strength of the links in the causal chain. Users should create their own causal chains, most likely with more (and different) detail from that shown in Figure 6.2.

Consultations with different stakeholder groups affected by or with influence on the policy can help with development and validation of the causal chain by integrating stakeholder insights on cause-and-effect relationships between the behaviour change and expected impacts. Refer to the ICAT Stakeholder Participation Guidance for information on identifying and understanding stakeholders (Chapter 5) and designing and conducting consultations (Chapter 8).

Where users are also applying the ICAT Sustainable Development Guidance, the causal chain can be used as a starting point for a causal chain mapping exercise that includes sustainable development impacts as well as GHG impacts.

Figure 6.2: Example causal chain for fuel pricing policies
6.2 Define the GHG assessment boundary

The GHG assessment boundary defines the scope of the assessment in terms of the range of GHG impacts. It is a key recommendation to include all significant GHG impacts in the GHG assessment boundary. The identified GHG impacts and the associated GHG source categories should be categorised for magnitude and likelihood, and included in the GHG assessment boundary if categorised as moderate or major in magnitude and very likely, likely or possible in likelihood (i.e., deemed significant). The Policy and Action Standard provides further information about categorising GHG impacts.

For pricing policies, the relevant GHG impacts are reduced GHG emissions from vehicle travel, caused by reduced vehicle kilometres travelled, a shift to less GHG-intensive transport modes, and a shift to more fuel-efficient vehicles. These GHG impacts are included in the assessment boundary, because they are categorised as either likely or very likely and of moderate or major relative magnitude.

Users should note that GHG emissions resulting from the use of revenue may indeed be significant and are therefore included in the GHG assessment boundary. However, these GHG impacts have not been included in the GHG assessment boundary of the guidance. Emissions may increase or decrease depending on how revenue is used, and users should ensure that they account for these impacts.

Table 6.2 lists GHG impacts and source categories of fuel pricing policies. Users should check the list to ensure that each of the GHG impacts is categorised appropriately for their policy. Any GHG impacts that are categorised as moderate or major in magnitude and very likely, likely or possible in likelihood should be included in the GHG assessment boundary.

<table>
<thead>
<tr>
<th>GHG impact</th>
<th>GHG</th>
<th>Likelihood</th>
<th>Relative magnitude</th>
<th>Included?</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced GHG emissions from reduced vehicle kilometres travelled (VKT) in</td>
<td>CO₂</td>
<td>Likely</td>
<td>Major</td>
<td>Included</td>
<td>It is likely that car drivers will react to higher fuel prices, which will lead to reduced vehicle travel. Since CO₂ is the major emissions source in the transport sector, this will result in a major impact.</td>
</tr>
<tr>
<td>road transport (LDV/HDV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced GHG emissions from reduced VKT in road transport (LDV/HDV)</td>
<td>CH₄</td>
<td>Likely</td>
<td>Minor</td>
<td>Excluded</td>
<td>CO₂ emissions are the most significant GHG source. However: if the policy increases the use of compressed natural gas (CNG), CH₄ leakage may be significant and should be included</td>
</tr>
<tr>
<td>Reduced GHG emissions from use of less GHG-intensive modes</td>
<td>CO₂</td>
<td>Likely</td>
<td>Major</td>
<td>Included</td>
<td>Depends on the policy implementation and the quality and availability of substitutes, as well as consumer behaviour;</td>
</tr>
</tbody>
</table>
6.3 Define the assessment period

The GHG assessment period is the time period over which GHG impacts resulting from the policy are assessed. It is a key recommendation to define the assessment period based on the time horizon of the GHG impacts included in the GHG assessment boundary of the policy.

The ex-ante GHG assessment period is usually determined by the longest-term impact included in the GHG assessment boundary. The GHG assessment period can be longer than the implementation period, and should be as long as necessary to capture the full range of significant impacts based on when they are expected to occur.

For an ex-post assessment, the assessment period can be the period between the date the policy or action is implemented and the date of the assessment or it can be a shorter period between those two dates. The assessment period for a combined ex-ante and ex-post assessment should consist of both an ex-ante assessment period and an ex-post assessment period.

In addition, users can separately estimate and report impacts over any other time periods that are relevant. For example, if the assessment period is 2020–2040, a user can separately estimate and report impacts over the periods 2020–2030, 2030–2040 and 2020–2040.

Where possible, users should align the GHG assessment period with other assessments being conducted using ICAT guidance. For example, where users are assessing the pricing policy’s sustainable

| Reduced GHG emissions from more efficient VKT | CO₂ | Likely | Major | Included | Depends on quality and availability of substitutes, their ability to compete in the market, and consumer behaviour (e.g., mode shift or carpooling); considered significant for most fuel pricing policies |
| GHG emission reductions decrease, since the revenue is spent on roadways | CO₂ | Possible | Major | Excluded for the purposes of the guidance; should be accounted for where relevant | Depends on how revenues are used; may be significant |
| GHG emission reductions increase, since the revenue is spent on public transport infrastructure | CO₂ | Possible | Major | Excluded for the purposes of the guidance; should be accounted for where relevant | Depends on how revenues are used; may be significant |
development impacts using the ICAT Sustainable Development Guidance in addition to assessing GHG impacts, the assessment period should be the same.

6.4 Identify sustainable development impacts (if relevant)

Pricing policies have other sustainable development impacts in addition to their GHG impacts. Sustainable development impacts are changes in environmental, social or economic conditions that result from a policy, such as changes in economic activity, employment, public health, air quality and energy security.

Table 6.3 identifies examples of sustainable development impacts associated with pricing policies. Refer to the ICAT Sustainable Development Guidance to conduct a full assessment of sustainable development impacts of their policy.

Table 6.3: Example sustainable development impacts of pricing policies

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Impact category</th>
<th>Examples of specific impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental</td>
<td>Air quality</td>
<td>Reduced particulate emissions from fossil fuel generation</td>
</tr>
<tr>
<td>Social</td>
<td>Impact of higher fuel prices on low-income households</td>
<td>If revenues are not used to improve affordable transport options or introduce direct per capita subsidies, exemptions, discounts or special rebates to disadvantaged groups to compensate for higher energy costs, there may be negative social impacts</td>
</tr>
<tr>
<td></td>
<td>Improved traffic levels and reduced congestion</td>
<td>If revenues are invested to improve alternative transport modes, traffic and congestion problems may be significantly reduced</td>
</tr>
<tr>
<td></td>
<td>Increased mobility for non-drivers</td>
<td>If revenues are invested to improve alternative transport modes, mobility is increased for non-drivers</td>
</tr>
<tr>
<td></td>
<td>Improved health and quality of life</td>
<td>Improved air quality, reduced traffic conditions, increased walkability in urban areas, increased bicycle lanes, and increased access to public transport modes</td>
</tr>
<tr>
<td>Economic</td>
<td>Growth of sustainable industries</td>
<td>Increased source of revenue for public transit infrastructure</td>
</tr>
<tr>
<td></td>
<td>Costs and cost savings</td>
<td>Cost savings from switch to low-GHG fuel-efficient vehicles, for which fuels or electricity cost less per unit of energy</td>
</tr>
</tbody>
</table>