Agenda

1. Background
2. Data Sourcing
3. BEA City Example
4. **Calculating impacts**
5. Wrap-up and Q&A

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Attributing changes in emissions to specific policies/actions

- Attribution is challenging since GHG emissions can change due to a variety of factors, including:
  - The policy/action being assessed
  - Other policies/actions that affect the same emissions sources
  - External factors, such as changes in GDP, energy prices, weather, etc.

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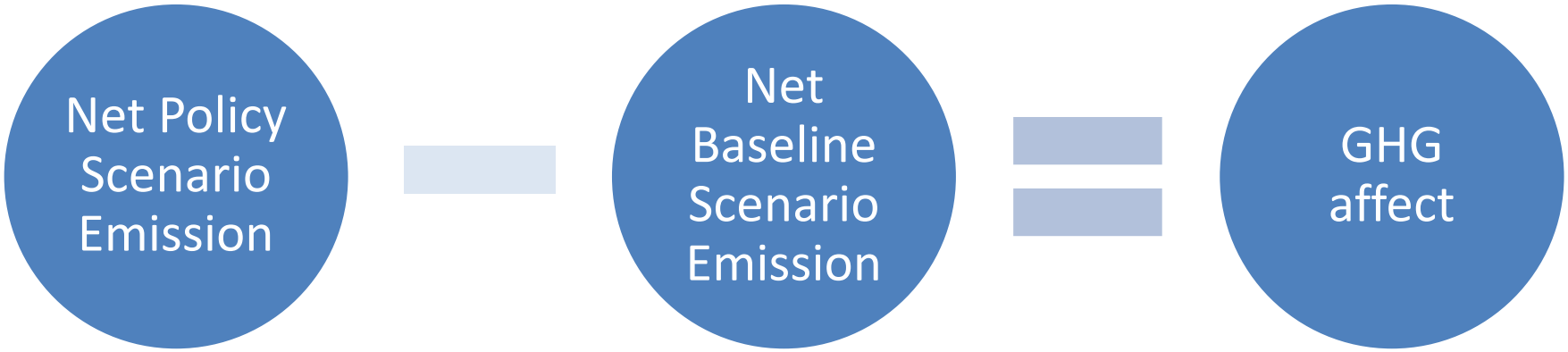
Basic steps



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Baseline scenario and policy scenario

- **Baseline scenario**: A reference case that represents the events or conditions most likely to occur in the **absence** of the policy or action being assessed

- **Policy scenario**: A scenario that represents the events or conditions most likely to occur in the **presence** of the policy or action being assessed
  - The same as the baseline scenario except that it includes the policy or action being assessed

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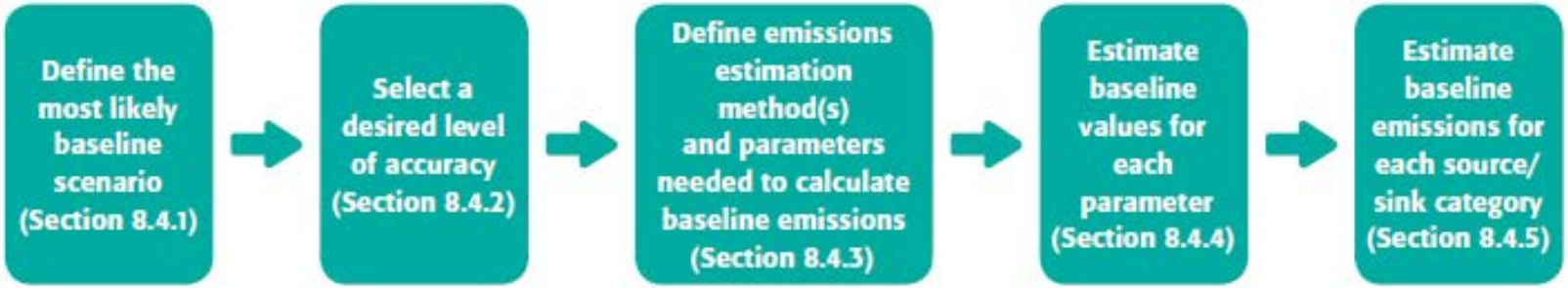
Estimating baseline emissions

Figure 8.6 Overview of steps for estimating baseline emissions using the scenario method



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Choose type of baseline comparison

- For ex-post assessment, two methods are available:
  - **Scenario method**: A comparison of a baseline scenario with a policy scenario for the same group or region
  - **Comparison group method**: A comparison of one group or region affected by the policy or action with an equivalent group or region that is not affected by the policy or action

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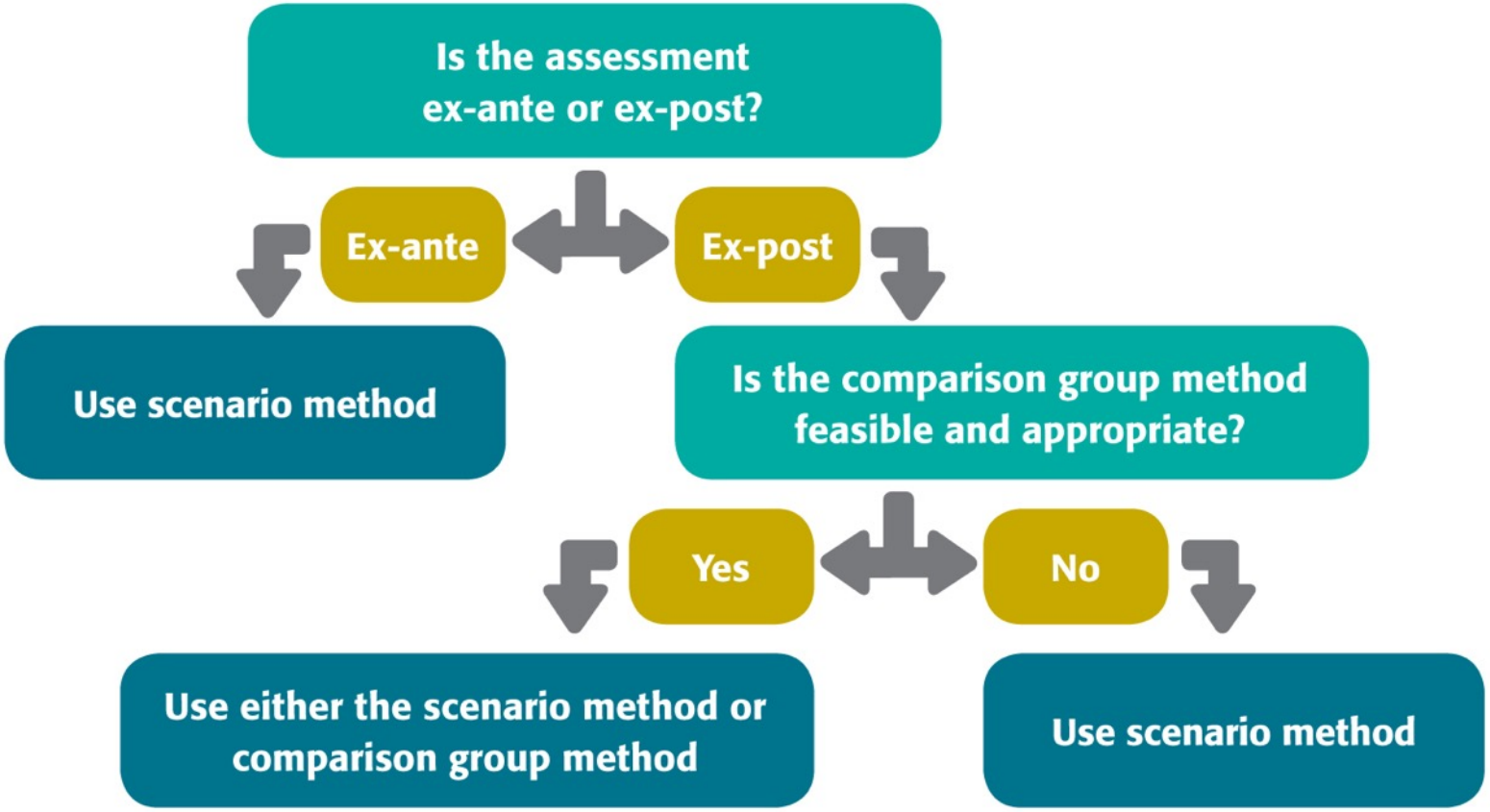
Guidance for choosing the type of comparison



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Defining the most likely baseline scenario

- The most likely scenario depends on drivers that would affect emissions in the absence of the policy or action being assessed
- Two types of drivers:
  - **Other policies or actions:** Other policies, actions, and projects expected to affect the same emissions sources and sinks
  - **Non-policy drivers:** Other conditions such as socioeconomic factors and market forces expected to affect the same emissions sources and sinks
- Should include drivers that are significant

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Example: Estimating baseline emissions

- GHG sources to be estimated (from home insulation subsidy example):

GHG effect included in the GHG assessment boundary	Affected sources	Baseline emissions
Reduced emissions from electricity use	Fossil fuel combustion in grid-connected power plants	?
Reduced emissions from home natural gas use (space heating)	Residential natural gas combustion	?
Increased emissions from insulation production	Insulation manufacturing processes	?
Total baseline emissions		?

Note: The table provides data for one year in the GHG assessment period.

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Example (cont'd): Estimating baseline emissions

- **Step 1**: Define an equation and all parameters to calculate baseline emissions

Baseline emissions for residential natural gas use in 2020 (t CO_2e) =

baseline natural gas use (MMBtu) x baseline emission factor (t CO_2e/MMBtu)

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Example (cont'd): Estimating baseline emissions

- **Step 2**: Determine baseline values for each parameter by identifying policy and non-policy drivers and assumptions

Parameter	Baseline value(s) applied over the GHG assessment period	Methodology and assumptions to estimate value(s)	Data sources
Natural gas used for space heating	1,000,000 MMBtu/ year from 2010–25	Historical data • Average annual natural gas used for space heating over the previous 10 years is 1,250,000 MMBtu/year • The trend over the past 10 years has been constant (after normalization for variation in heating degree days and cooling degree days) rather than increasing or decreasing Implemented and adopted policies included in the baseline scenario: • Federal energy efficiency standards (expected to reduce natural gas use by 10% in the baseline scenario) • Federal energy tax (expected to reduce natural gas use by 7.5% in the baseline scenario, taking into account overlaps with the federal energy efficiency standards) Non-policy drivers included in the baseline scenario: • Natural gas prices are projected to increase by 20% (expected to reduce natural gas use by 2% in the baseline scenario based on price elasticity of natural gas) • Free rider effect: 10% of households that receive the subsidy are expected to install insulation even if they did not receive the subsidy (expected to reduce natural gas use by 3% in the baseline scenario, given 30% expected reduction in energy use per home insulated)	National energy statistical agency; peer-reviewed literature: Author (Year). Title. Publication.

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Example (cont'd): Estimating baseline emissions

- **Step 3**: Estimate baseline emissions

Baseline emissions for residential natural gas use in 2020 =

1,000,000 MMBtu x 55 kg CO_2e/MMBtu = 55,000,000 kg CO_2e

= 55,000 t CO_2e

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Example (cont'd): Estimating baseline emissions

- Reporting results:

GHG effect included in the GHG assessment boundary	Affected sources	Baseline emissions
Reduced emissions from electricity use	Fossil fuel combustion in grid-connected power plants	**?**
Reduced emissions from home natural gas use (space heating)	Residential natural gas combustion	**55,000 t CO_2e**
Increased emissions from insulation production	Insulation manufacturing processes	**?**
Total baseline emissions		**?**

Note: The table provides data for one year in the GHG assessment period.

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Example: Estimating baseline emissions

- **Step 4**: Aggregate baseline emissions across effects/sources

GHG effect included in the GHG assessment boundary	Affected sources	Baseline emissions
Reduced emissions from electricity use	Fossil fuel combustion in grid-connected power plants	**50,000 t CO_2e**
Reduced emissions from home natural gas use (space heating)	Residential natural gas combustion	**55,000 t CO_2e**
Increased emissions from insulation production	Insulation manufacturing processes	**5,000 t CO_2e**
Total baseline emissions		**110,000 t CO_2e**

Note: The table provides data for one year in the GHG assessment period.

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Estimating GHG effects ex-ante

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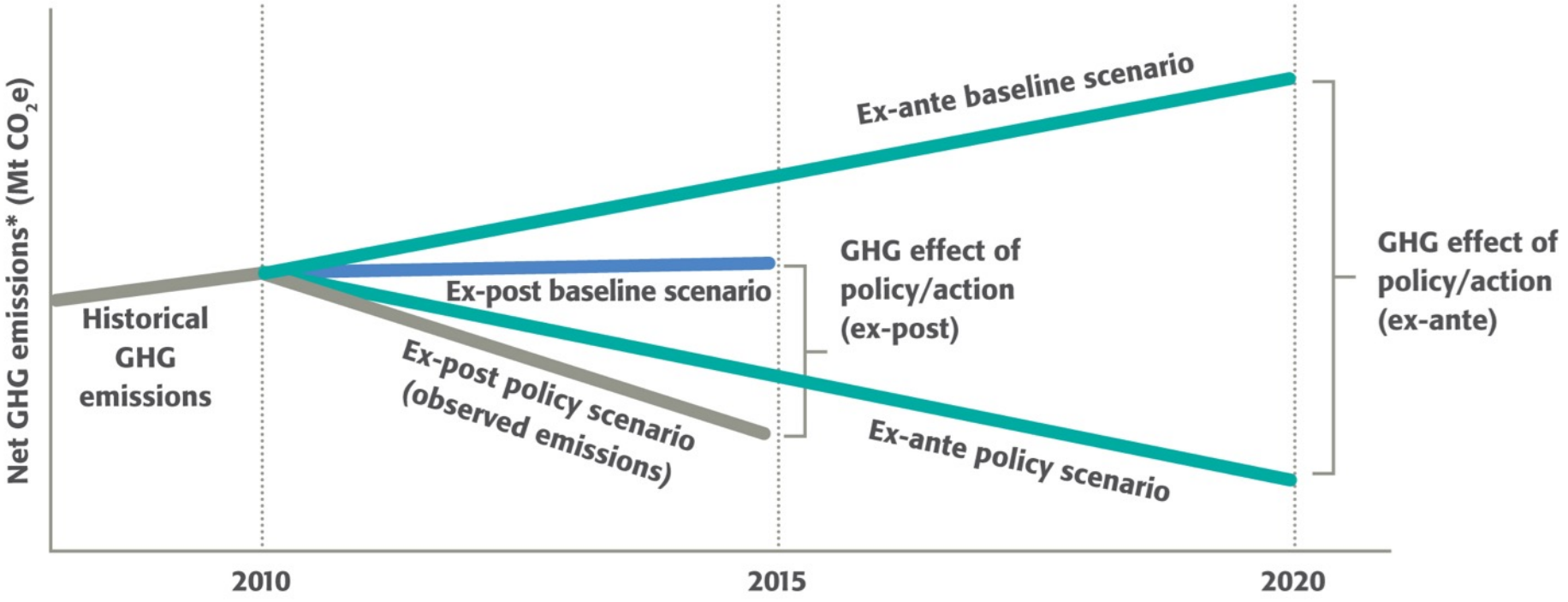
Ex-ante and ex-post assessment



Note: * Net GHG emissions from sources and sinks in the GHG assessment boundary.

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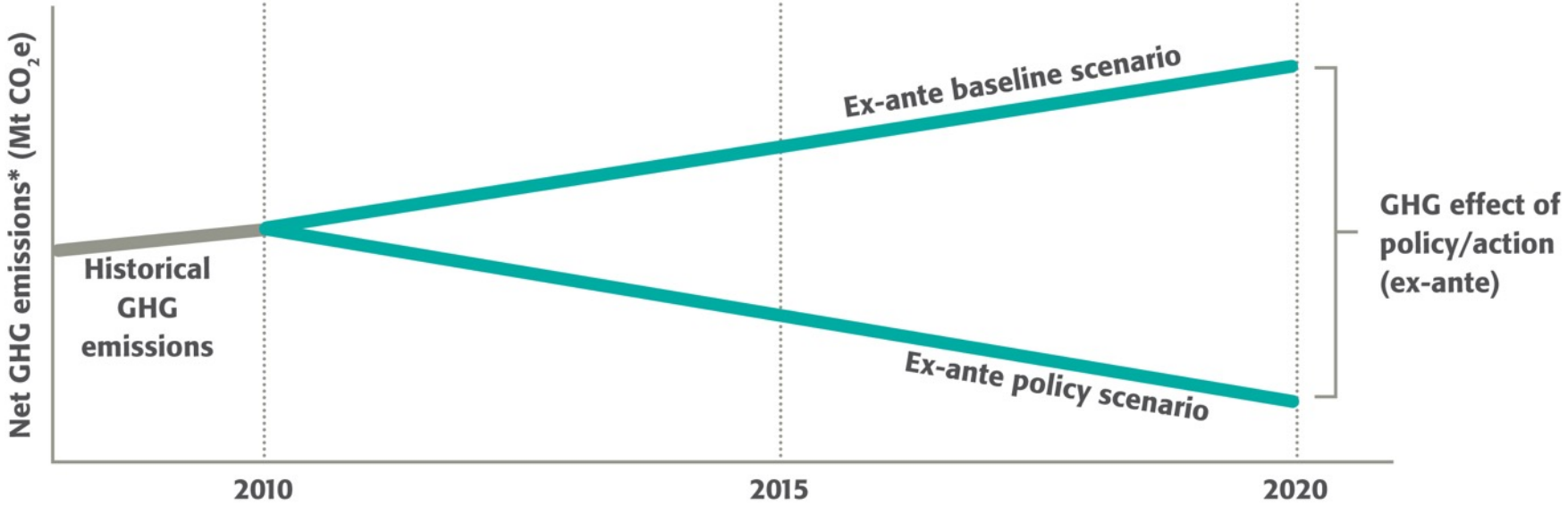
Estimating the GHG effect of a policy / action

Total change in GHG emissions resulting from the policy or action (t CO_2e) = Total policy scenario emissions (t CO_2e) – Total baseline scenario emissions (t CO_2e)



Note: * Net GHG emissions from sources and sinks in the GHG assessment boundary.

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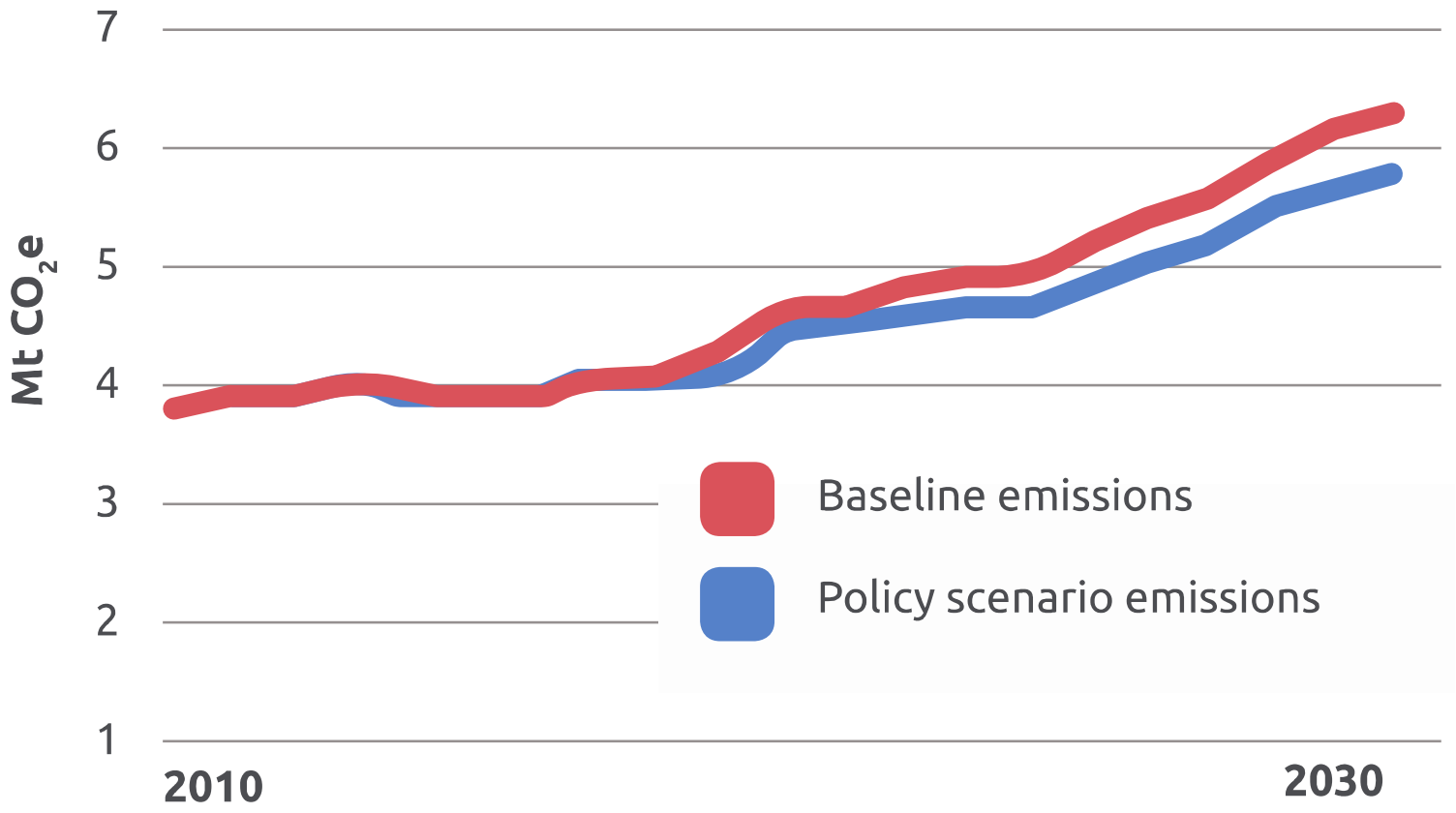
Pilot example: Tunisia solar energy program



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Estimating policy scenario values for parameters

- For GHG sources or sinks not affected by the policy or action:
  - Use baseline values
- For GHG sources or sinks that are affected by the policy or action:
  - Estimate policy scenario values

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Example: Estimating policy scenario emissions

- **Step 1**: Identify parameters to be estimated

Policy scenario emissions for residential natural gas use in 2020 (t CO_2e) =

Policy scenario natural gas use (MMBtu) x baseline emission factor (t CO_2e/MMBtu)

- In this example the only parameter affected by the policy is the amount of natural gas used

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Example (cont'd): Estimating policy scenario emissions

- **Step 2**: Estimate policy scenario values for parameters

Parameter	Policy scenario value(s) applied over the GHG assessment period	Methodology and assumptions to estimate value(s)	Data source(s)
Natural gas used for space heating	1,000,000 MMBtu/year from 2010–14; 910,000 MMBtu/year from 2015–25	Values calculated based on 30% anticipated uptake of the insulation subsidy starting in 2015 and remaining constant through 2025; and 30% energy use reduction per home with insulation (based on previous studies of similar policies)	Peer-reviewed literature: Author (Year). Title. Publication.
Natural gas emission factor	55 kg CO_2e/MMBtu (constant)	Same value as in baseline scenario since the policy does not affect this parameter	National energy statistical agency

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Example (cont'd): Estimating policy scenario emissions

- **Step 3**: Estimate policy scenario emissions

Policy scenario emissions for residential natural gas use in 2020 =

900,000 MMBtu x 50 kg CO_2e/MMBtu = 50,050,000 kg CO_2e

= 45,000 t CO_2e

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Example: Estimating the GHG effect ex-ante

- **Step 4**: Subtract to determine change in emissions

Change in emissions = Policy scenario emissions – baseline scenario emissions

GHG effect included	Affected GHG sources	Baseline emissions	Policy scenario emissions	Change
Reduced emissions from electricity generation	Grid-connected power plants	50,000 t CO_2e		
Reduced emissions from home natural gas use	Residential natural gas use	55,000 t CO_2e		
Increased emissions from insulation production	Insulation manufacturing facilities	5,000 t CO2e		
Total				

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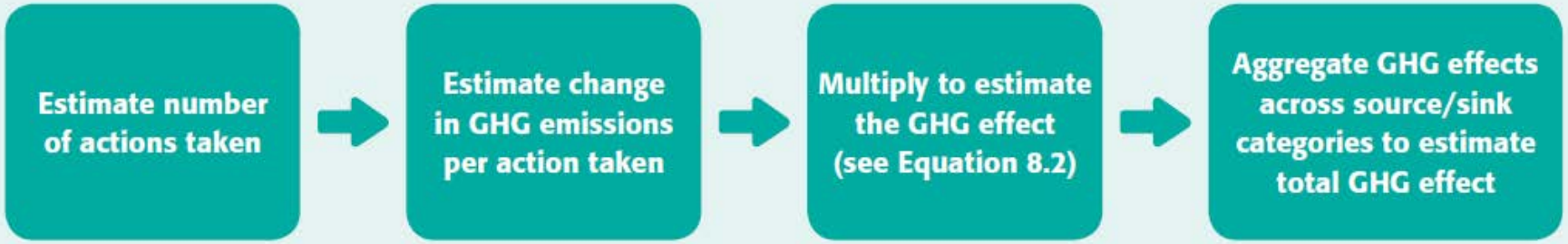
Simplified approach – 'deemed estimates' method

Figure 8.4 Steps in carrying out the deemed estimates method



Equation 8.2 Calculating GHG effect using the deemed estimates method

Change in emissions and removals =
number of actions taken as a result of the policy ×
(policy scenario emissions and removals for each affected unit, source, or sink –
baseline emissions and removals for each affected unit, source, or sink)

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BEA Webinar Series for Cities: Tools for Sustainability

- Webinar #1: Standards to Achieve City Sustainability (April 26/27)
- Webinar #2: Energy and Emissions: Mapping the Impacts (May 23)
- **Webinar #3: Using Data to Measure Policy Impacts (June 27/28)**
- Webinar #4: Reporting Results for Success (July 18)

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Thank You

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Now: Q&A session