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GREENHOUSE GAS PROTOCOL POLICY AND ACTION STANDARD

AN ACCOUNTING AND REPORTING STANDARD FOR ESTIMATING THE GREENHOUSE GAS EFFECTS OF POLICIES AND ACTIONS

GREENHOUSE GAS PROTOCOL

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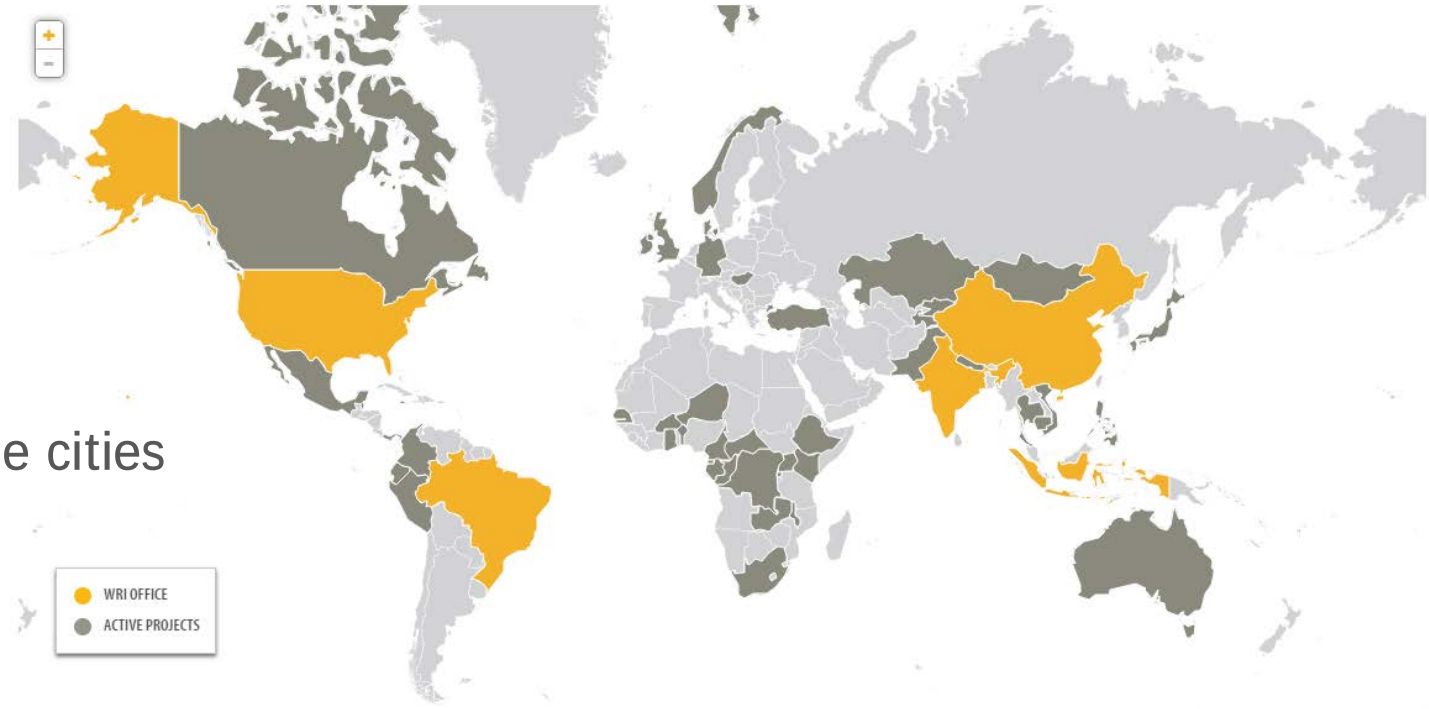
World Resources Institute

- *WRI is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity and human well-being*
- Issue areas:
  - Climate
  - Energy
  - Food
  - Forests
  - Water
  - Sustainable cities
- www.wri.org



The Greenhouse Gas Protocol

- The GHG Protocol sets the global standard for how to measure, manage, and report greenhouse gas emissions
- Convened in 1998 by WRI and WBCSD
- Provides:
  - Greenhouse gas accounting and reporting standards
  - Sector guidance
  - Calculation tools
  - Trainings (webinar, e-learning and in-person training)
- Standards and tools available free of charge at www.ghgprotocol.org

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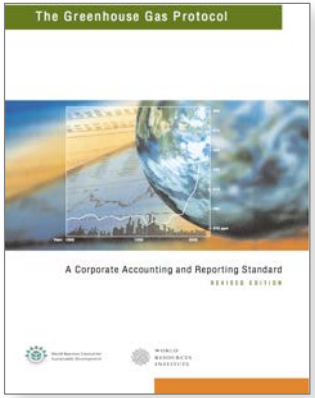
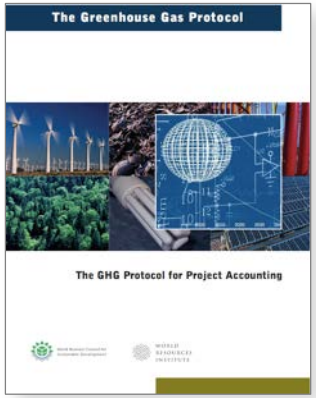
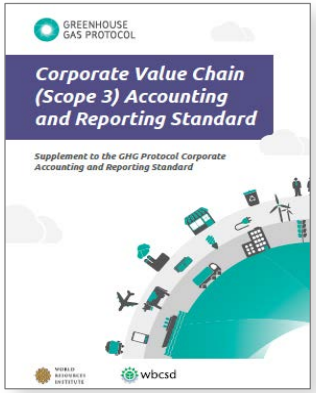
Greenhouse Gas Protocol standards



Corporate Standard



Project Protocol

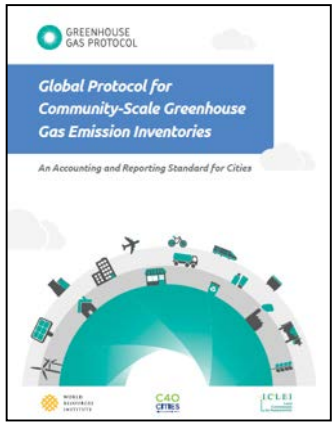


Corporate Value Chain (Scope 3) Standard

Product Standard

Policy and Action Standard

Mitigation Goal Standard



Global Protocol for Cities (GPC)

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Purpose of the standard

- To help users **assess the greenhouse gas effects** of policies and actions in an accurate, consistent, transparent, complete, and relevant way
- To help policymakers **develop effective strategies** for managing and reducing GHG emissions
- To support consistent and transparent **reporting** of emissions impacts and policy effectiveness

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Intended users

- Governments (city, sub-national, national)
- Donor agencies and financial institutions
- Businesses
- NGOs/research institutions

Applicability

- All types of policies/actions
- All countries
- All sectors (AFOLU, energy supply, industry, residential and commercial buildings, transport, waste)
- Policies and actions that increase or decrease GHG emissions

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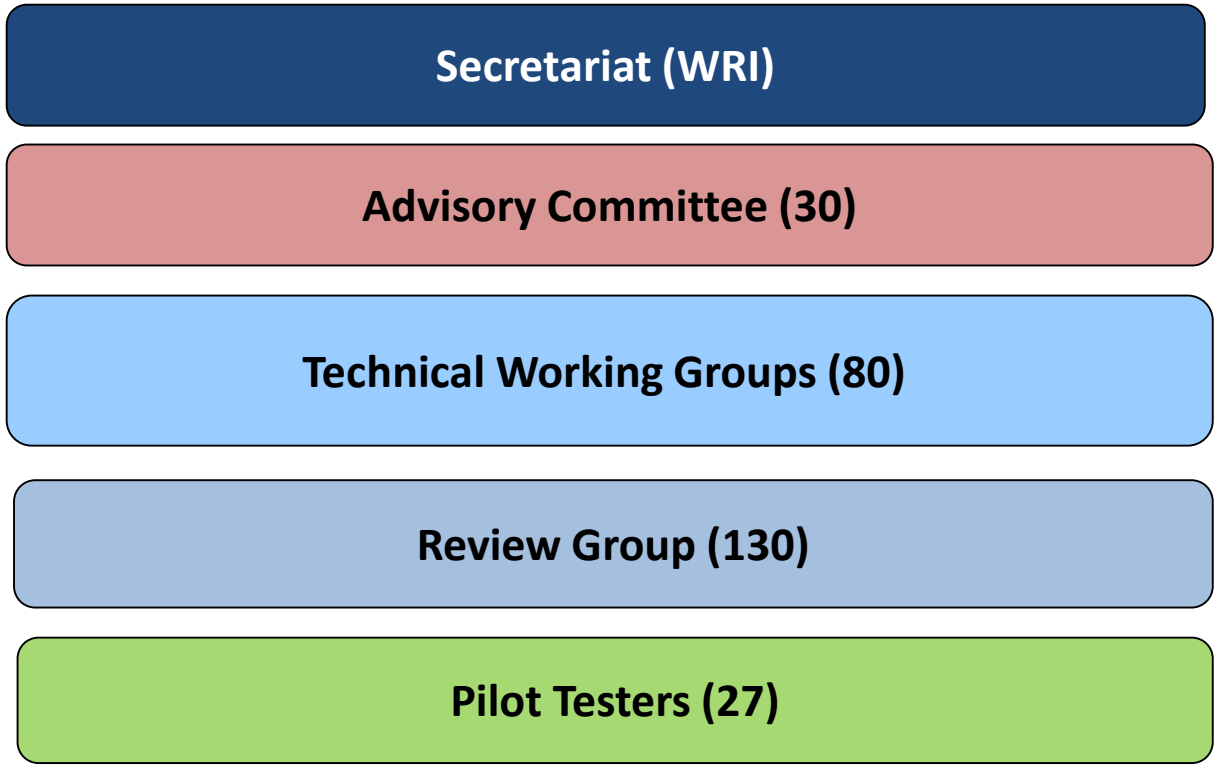
Standard development process

- 270 participants in 40 countries



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Pilot testing: 27 policies/actions in 20 countries/cities

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Overview of steps

1. Define objectives and define the policy or action

2. Identify effects

3. Estimate effects

4. Report results

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Chapter 2 Objectives

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Objectives of assessing policy/action impact

- **Inform policy selection and design** by comparing policy options based on their expected GHG effects
- **Evaluate policy effectiveness (and cost-effectiveness)** in delivering intended results
- **Report** on GHG effects of policies and actions
- **Attract and facilitate financial support** for mitigation actions by estimating GHG reductions

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Broader sustainable development impacts can be assessed

Category	Examples of non-GHG effects	
Environmental effects	• Air quality and air pollution (such as particular matter, ozone, carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen oxides (NO_x), lead, and mercury) • Water quality, water pollution, and water scarcity • Ozone depletion • Waste	• Toxic chemical/pollutants • Biodiversity/wildlife loss • Loss or degradation of ecosystem services • Deforestation and forest degradation • Loss of top soil • Loss or degradation of natural resources • Energy use
Social effects	• Public health • Quality of life • Gender equality • Traffic congestion	• Road safety • Walkability • Access to energy, thermal comfort, fuel poverty • Stakeholder participation in policy-making processes
Economic effects	• Employment and job creation • Productivity (such as agricultural yield) • Prices of goods and services (such as decreased energy prices) • Cost savings (such as decreased fuel costs) • Overall economic activity (such as GDP)	• Household income • Poverty reduction • New business/investment opportunities • Energy security/independence • Imports and exports • Inflation • Budget surplus/deficit

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Chapter 5 Defining the policy or action

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Overview of steps

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Types of policies and actions

Regulations and standards	Taxes	Subsidies
Emissions trading programs	Voluntary agreements	Information instruments
Infrastructure programs	Implementation of new technologies, processes, or practices	Financing and investment

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Clearly define the policy or action

- The title of the policy or action
- Type of policy or action
- Description of specific interventions

Overview

- The status of the policy or action
- Date of implementation
- Date of completion (if applicable)

Timeline

- Implementing entity or entities
- Objective(s) of the policy or action
- Geographic coverage
- Primary sectors, subsectors, and emission source/sink categories targeted
- Greenhouse gases targeted (if applicable)

Scope

- Other related policies or actions

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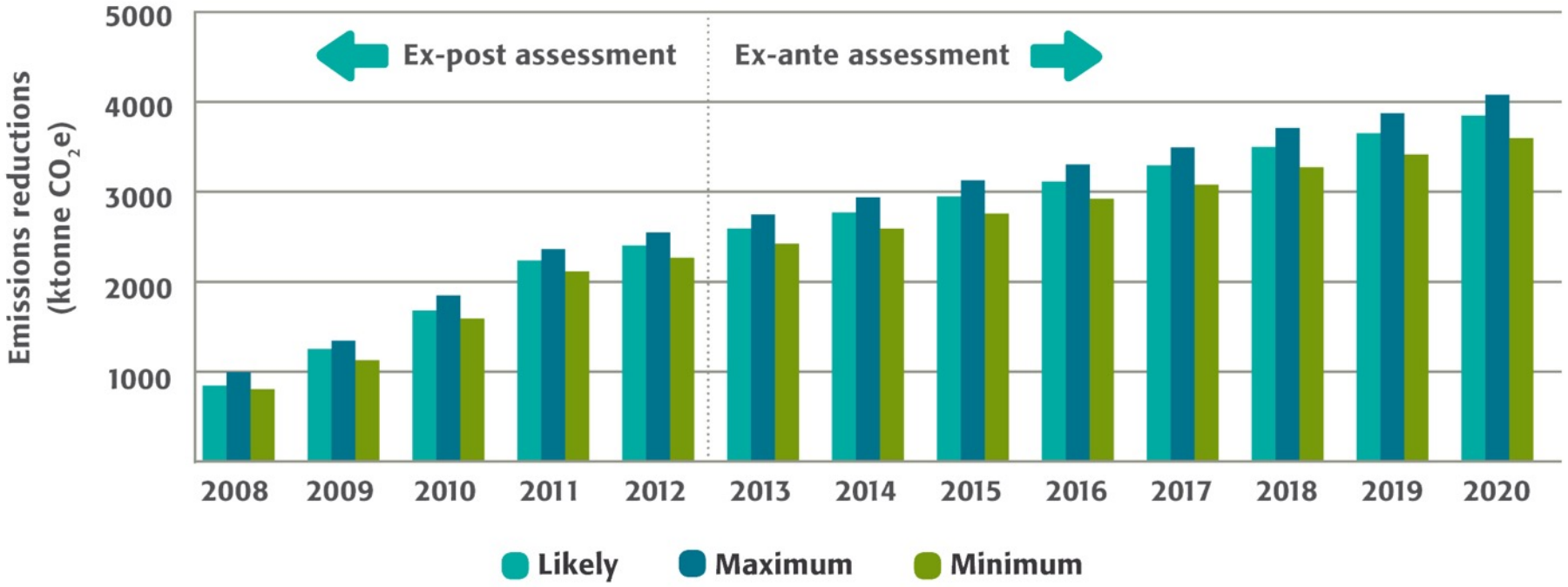
Choose ex-ante or ex-post assessment

Pilot example: Belgium's federal tax reduction for roof insulation



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Overview of steps

1. Define objectives and define the policy or action

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Chapter 6 Identifying Effects and Mapping the Causal Chain

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Types of effects

- Users should consider all possible types of effects:
  - Intended and unintended
  - Short- and long term
  - In-jurisdiction and out-of-jurisdiction
  - GHG increasing and GHG decreasing

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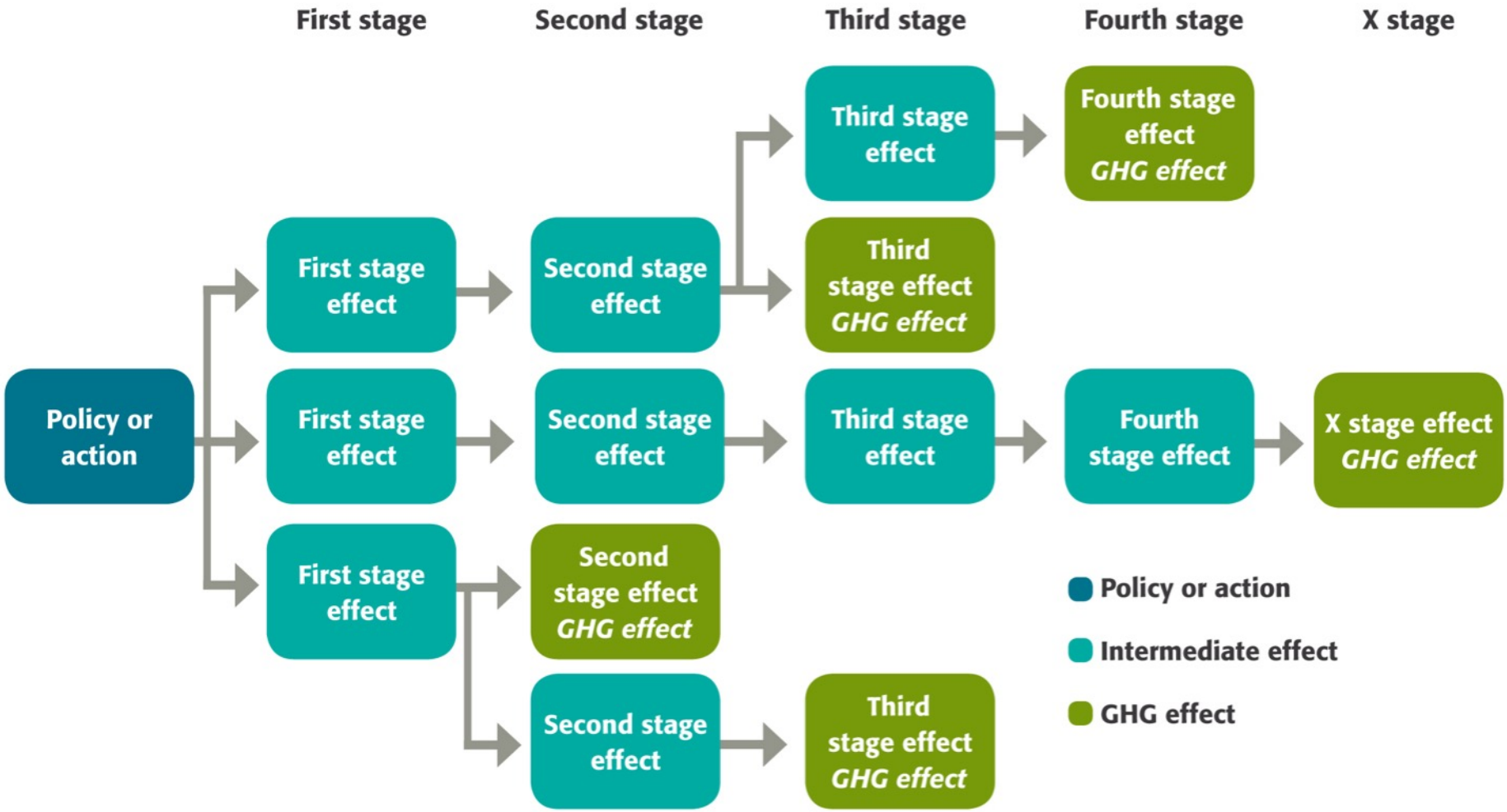
Mapping the causal chain



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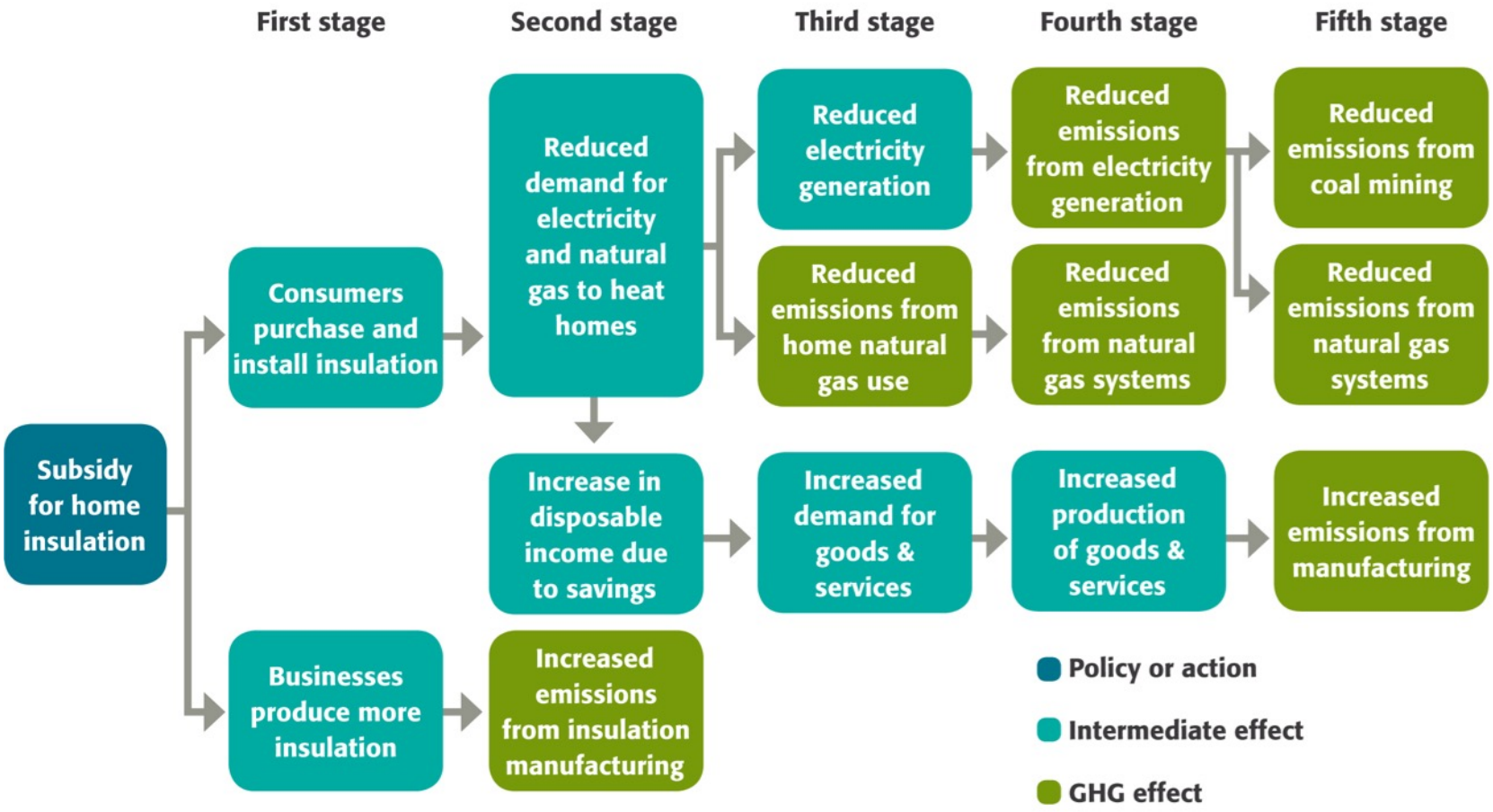
Example: Home insulation subsidy



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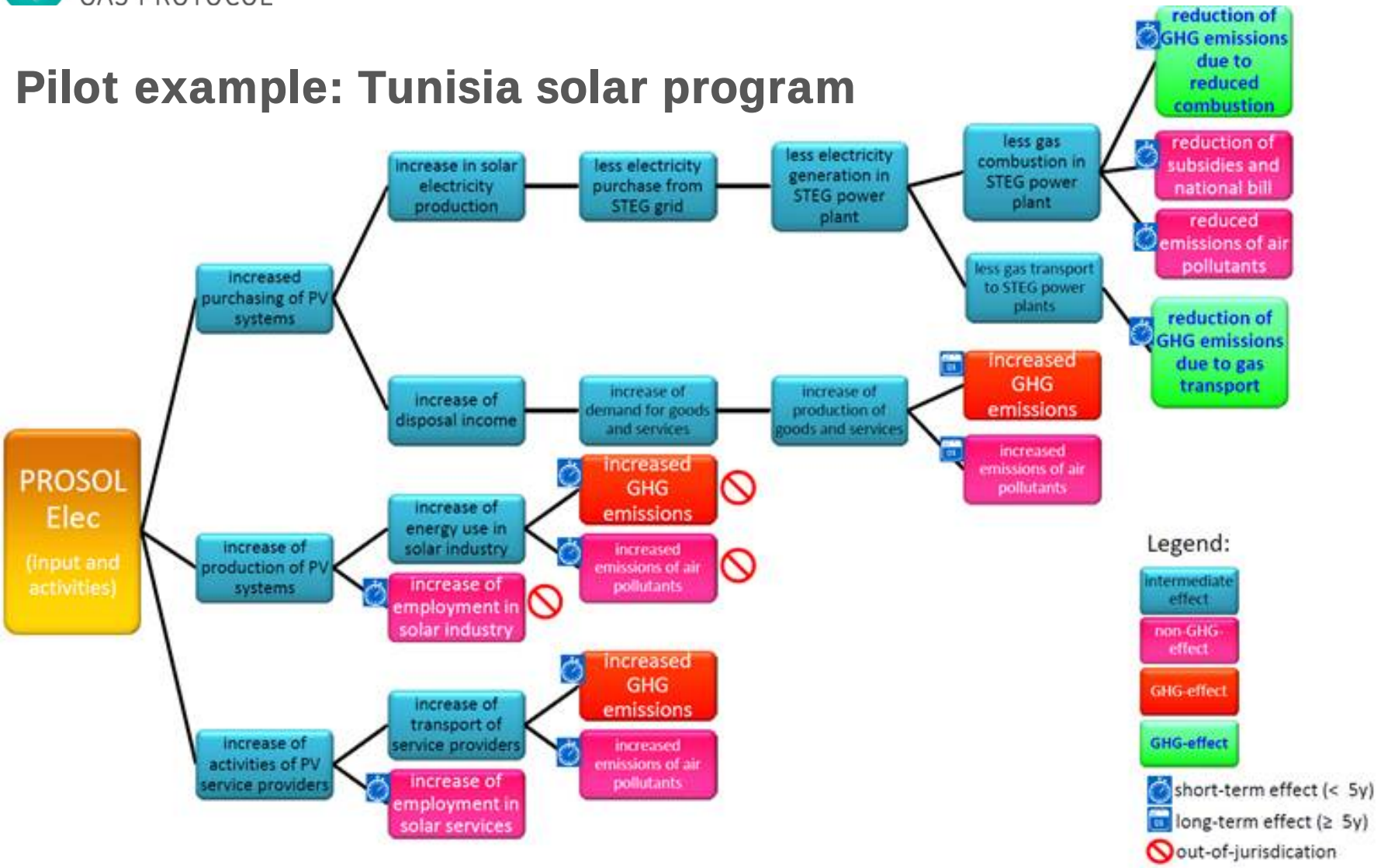
Pilot example: Tunisia solar program



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Chapter 7 Defining the GHG Assessment Boundary

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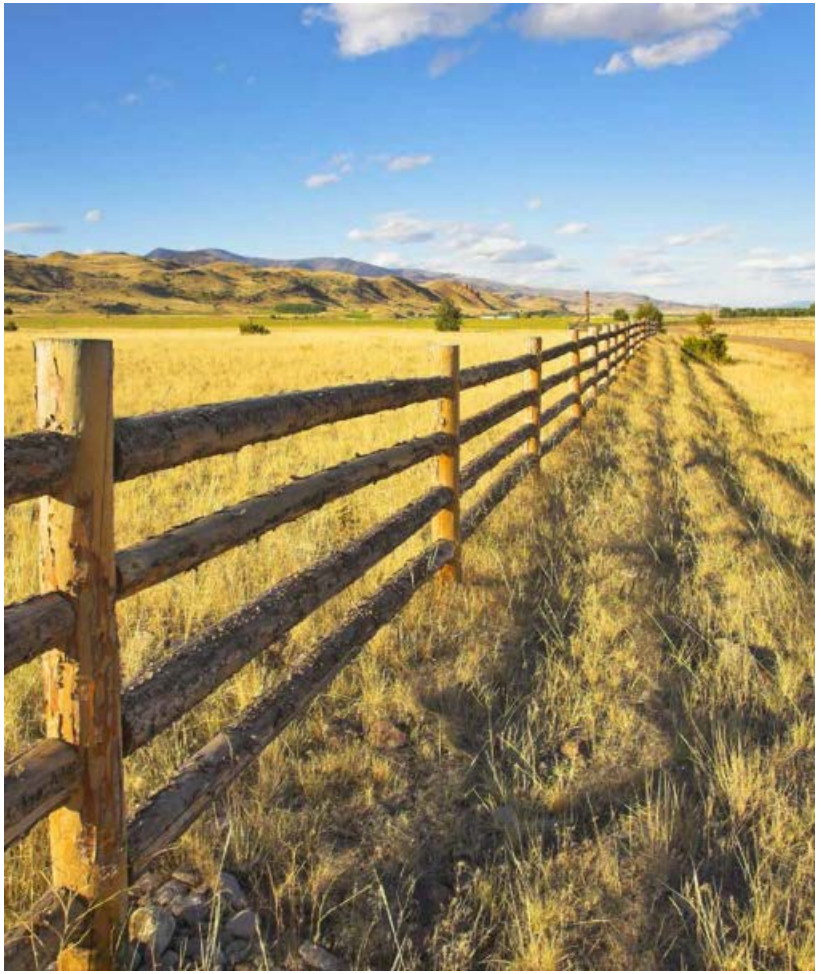
Assessing significance

- In order to identify significant effects, users should assess each potential GHG effect in terms of both:
  - The **likelihood** of each GHG effect occurring
  - The **relative magnitude** of each GHG effect



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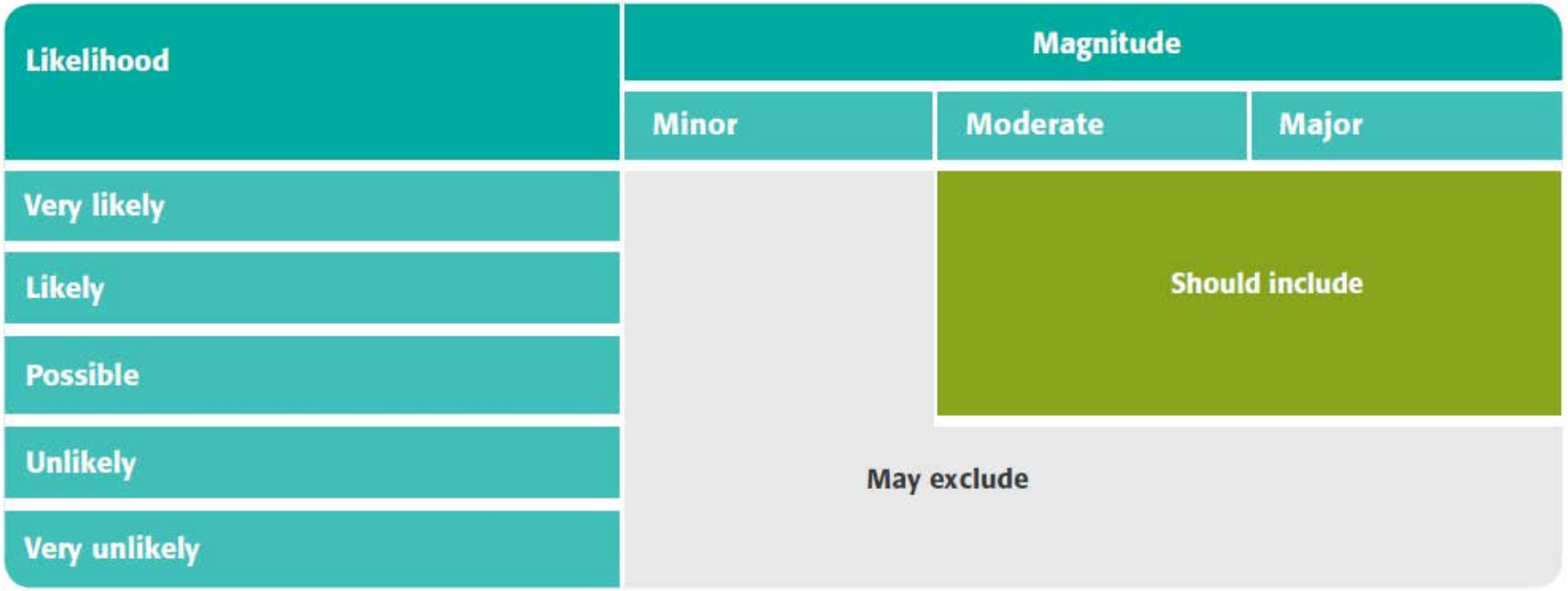
Determine significance of effects



Note: The area shaded green corresponds to significant GHG effects.

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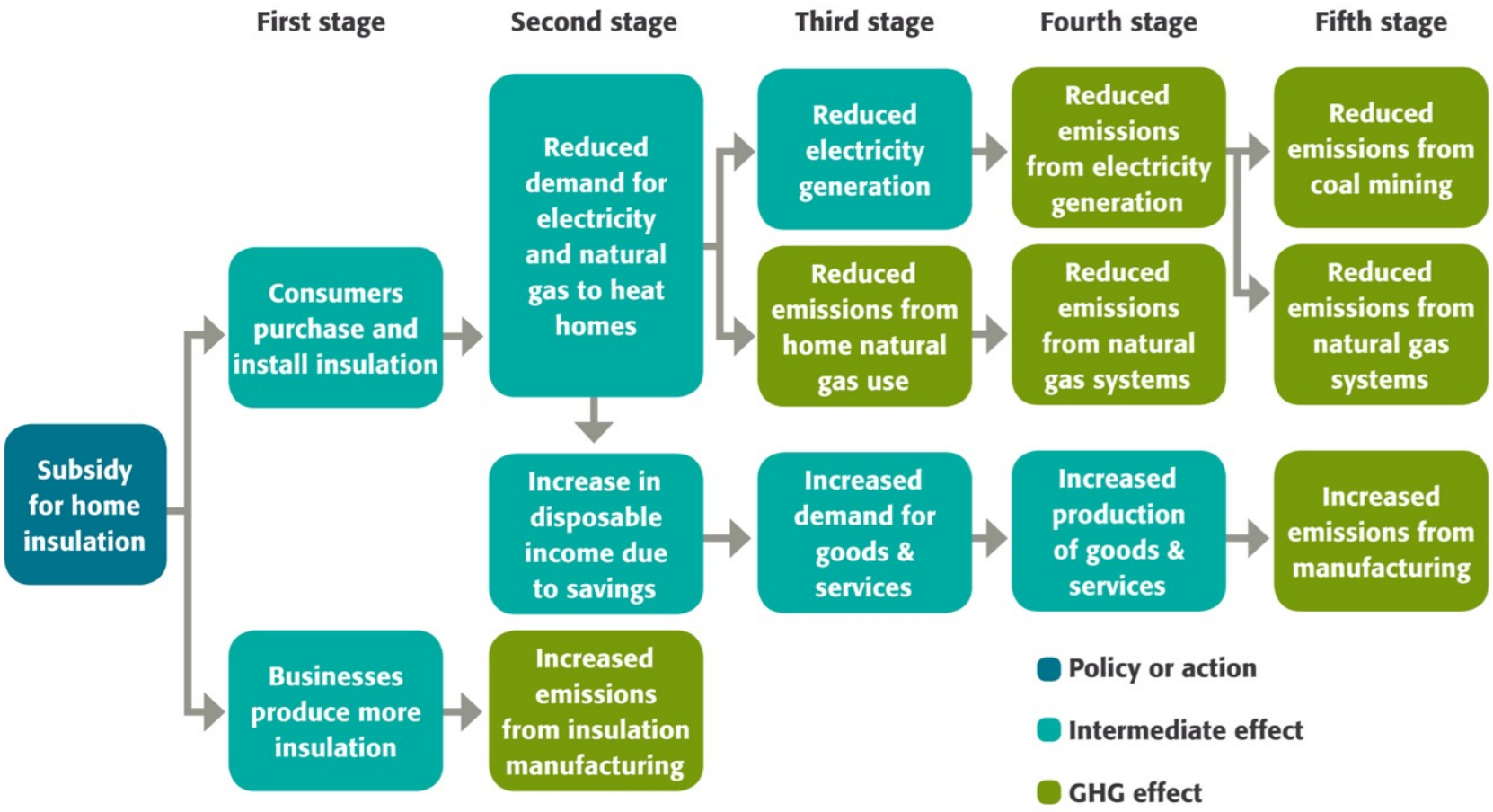
Example: Home insulation subsidy



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GHG effect	Likelihood	Relative magnitude	Included?
Reduced emissions from electricity generation			
CO_2	Likely	Major	
CH_4	Likely	Minor	
N_2O	Likely	Minor	
Reduced emissions from home natural gas use			
CO_2	Very likely	Major	
CH_4	Very likely	Minor	
N_2O	Very likely	Minor	
Increased emissions from manufacturing of goods and services			
CO_2	Possible	Minor	
CH_4	Possible	Minor	
N_2O	Possible	Minor	
Increased emissions from insulation manufacturing			
CO_2	Possible	Moderate	
CH_4	Possible	Minor	
N_2O	Possible	Minor	
HFCs	Possible	Moderate	

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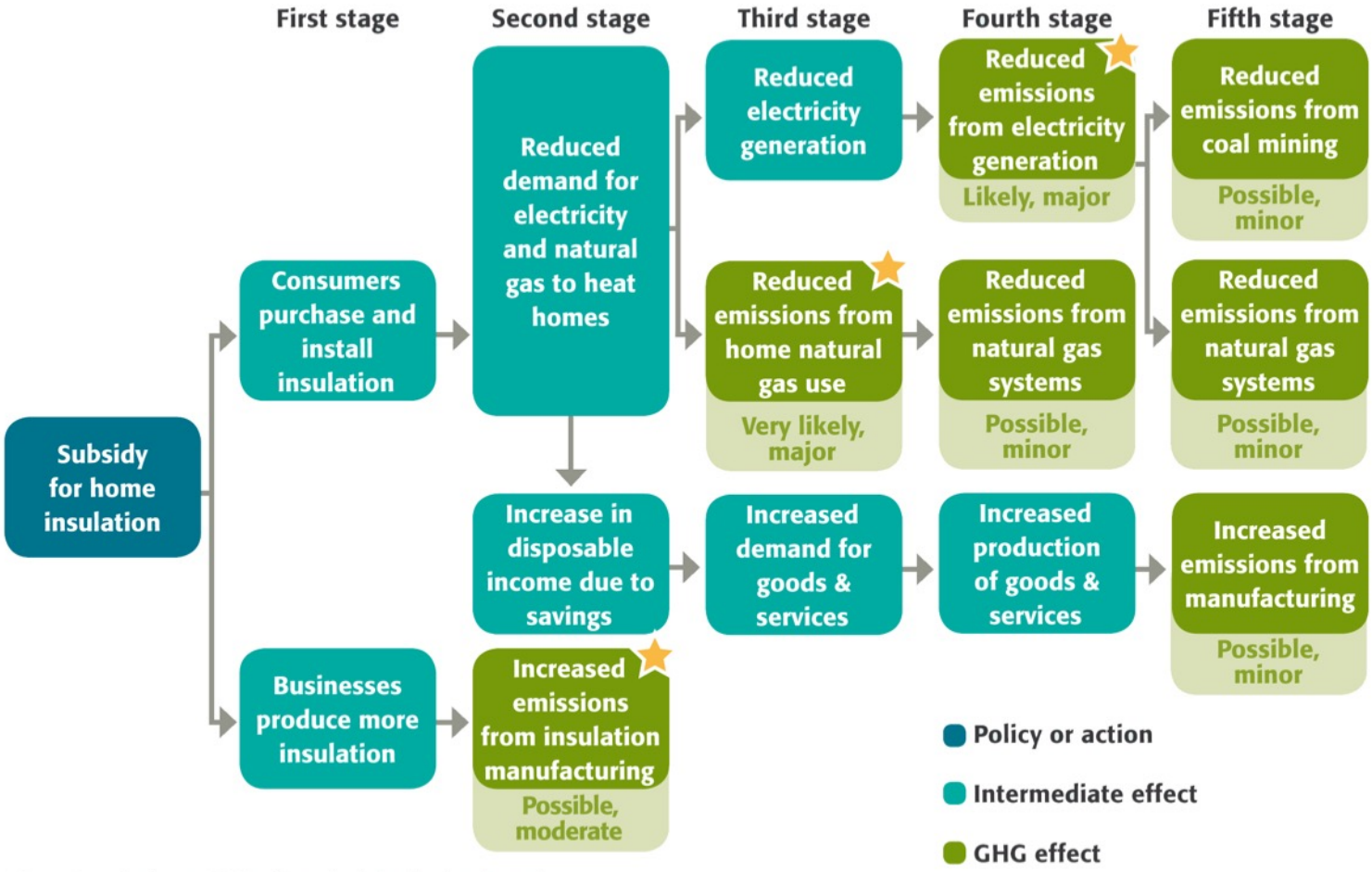
Example: Home insulation subsidy



Note: Stars indicate GHG effects included in the boundary.

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Summary of effects, sources/sinks and gases included

GHG effect included	Sources	Sinks	Greenhouse gases
Reduced emissions from electricity generation	Fossil fuel combustion in grid-connected power plants	N/A	CO_2
Reduced emissions from home natural gas use (space heating)	Residential natural gas combustion (space heating)	N/A	CO_2
Increased emissions from insulation manufacturing	Insulation manufacturing processes	N/A	CO_2, HFCs

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Overview of steps

1. Define objectives and define the policy or action

2. Identify effects

3. Estimate effects

4. Report results

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Estimating GHG effects: Key concepts

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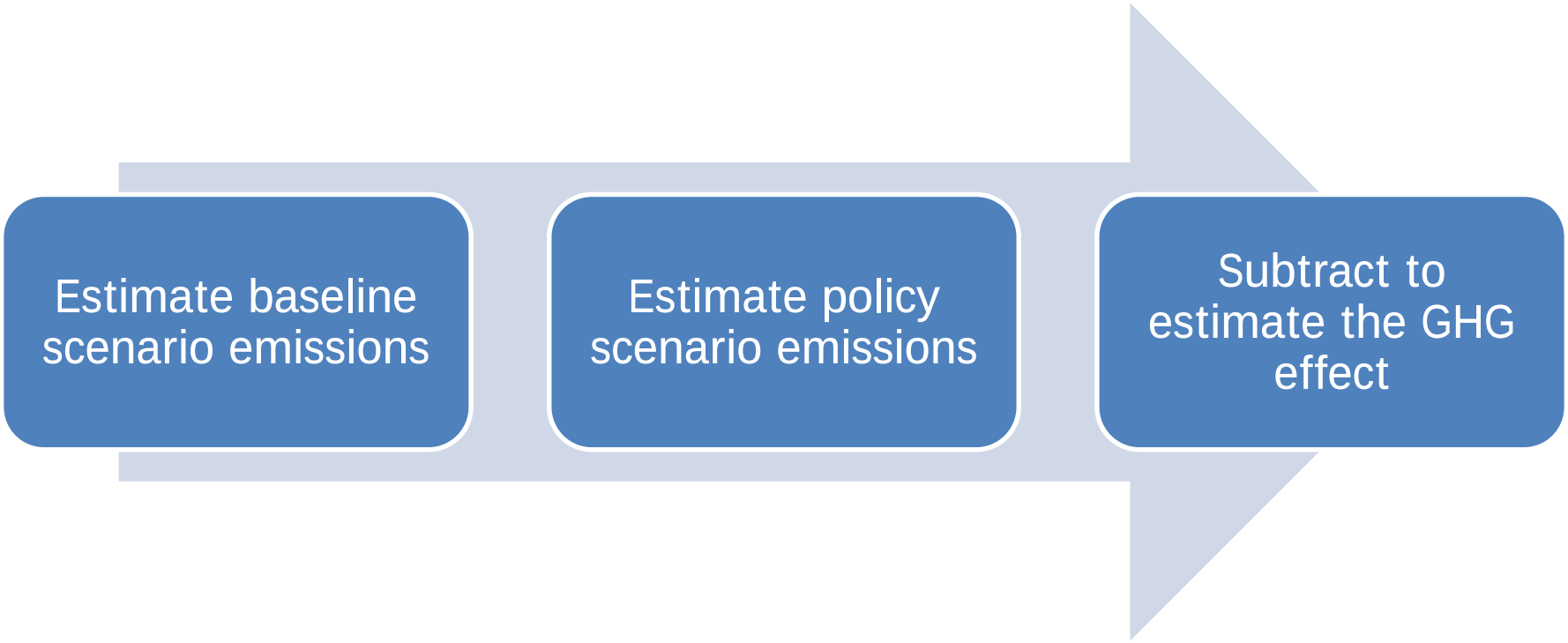
Basic steps



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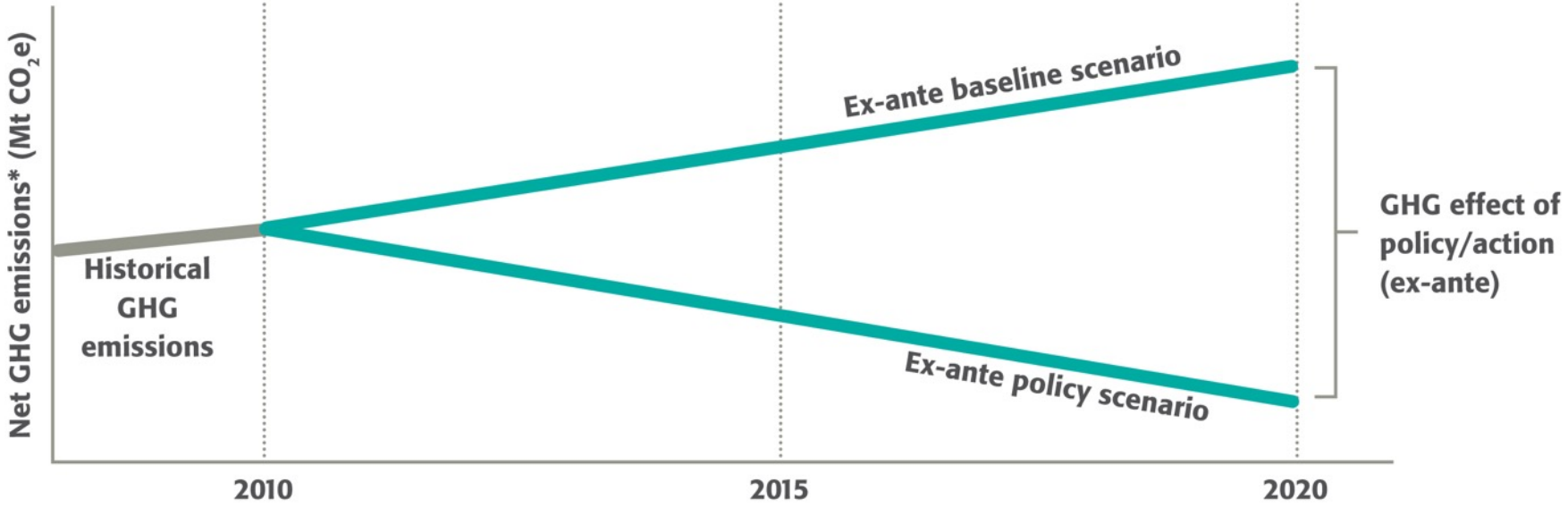
Estimating the GHG effect of a policy / action

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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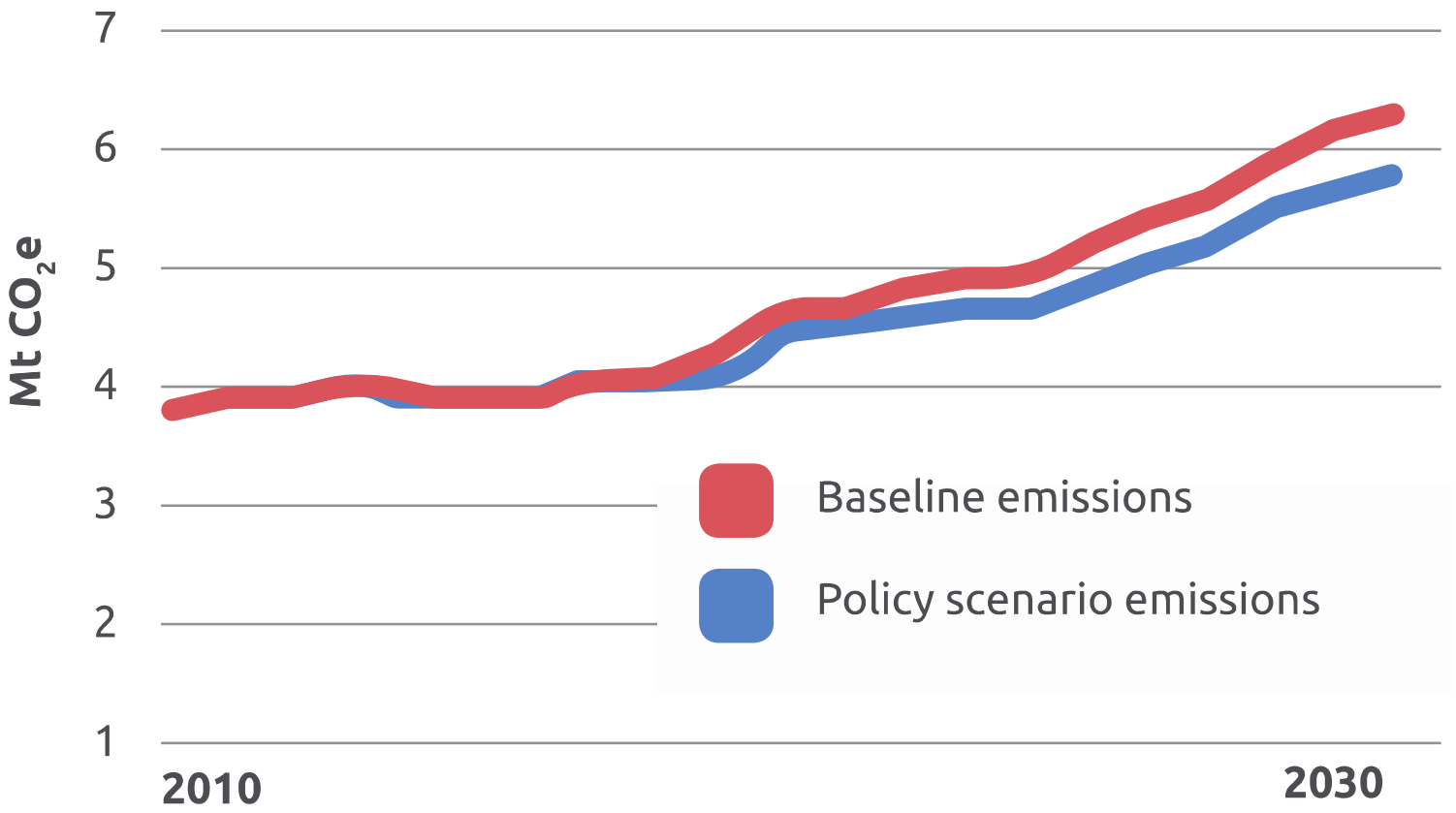
Pilot example: Tunisia solar energy program



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Chapter 8 Estimating baseline emissions

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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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Chapter 9 Estimating GHG effects ex-ante

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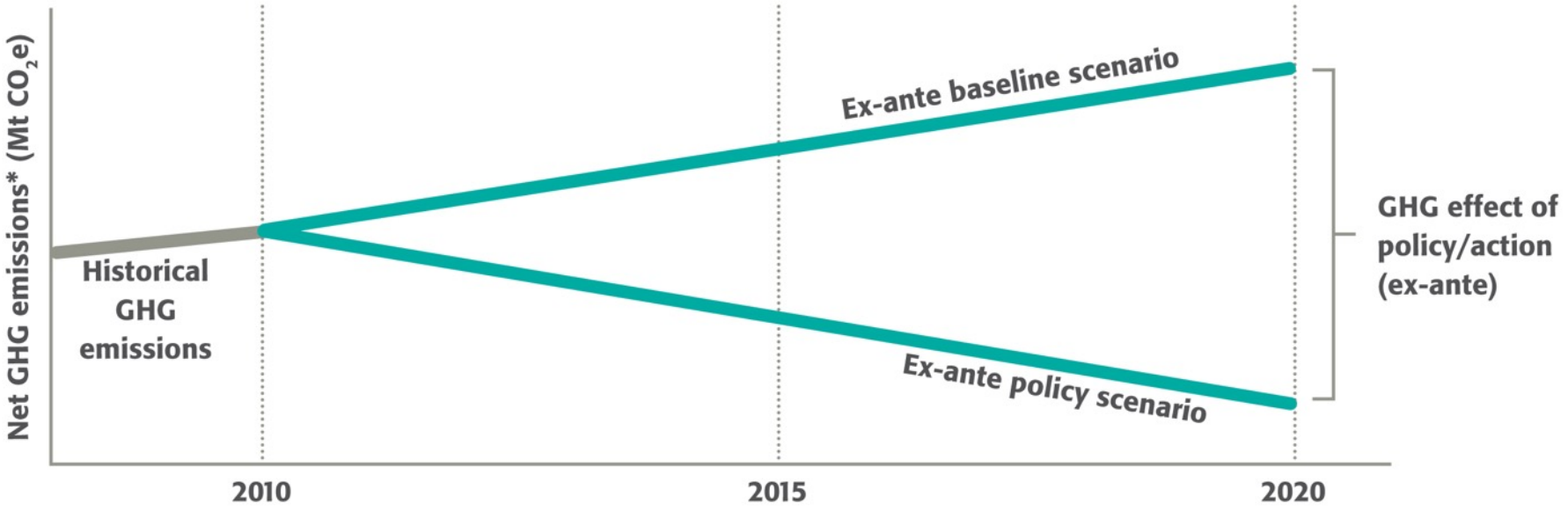
Ex-ante assessment



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

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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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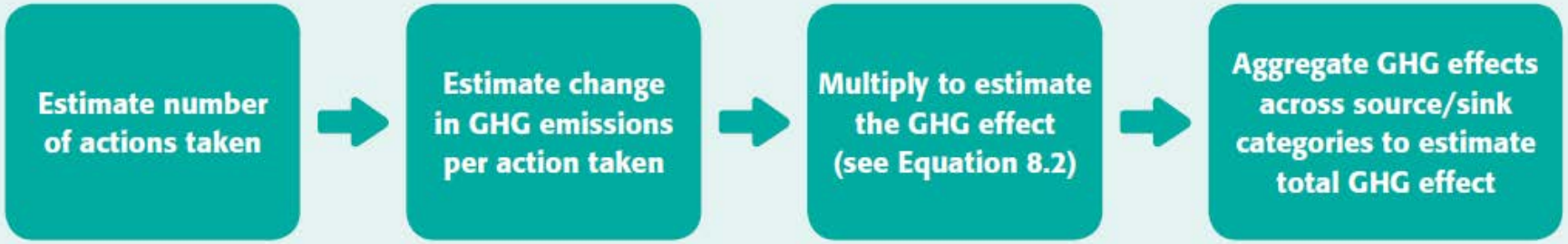
Simplified approach – 'deemed estimates' method

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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Chapter 10 Monitoring performance

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Purpose of monitoring

1. Monitor trends in key performance indicators to understand whether the policy or action is on track and achieving desired results
2. Collect data needed to estimate GHG effects for ex-post assessment

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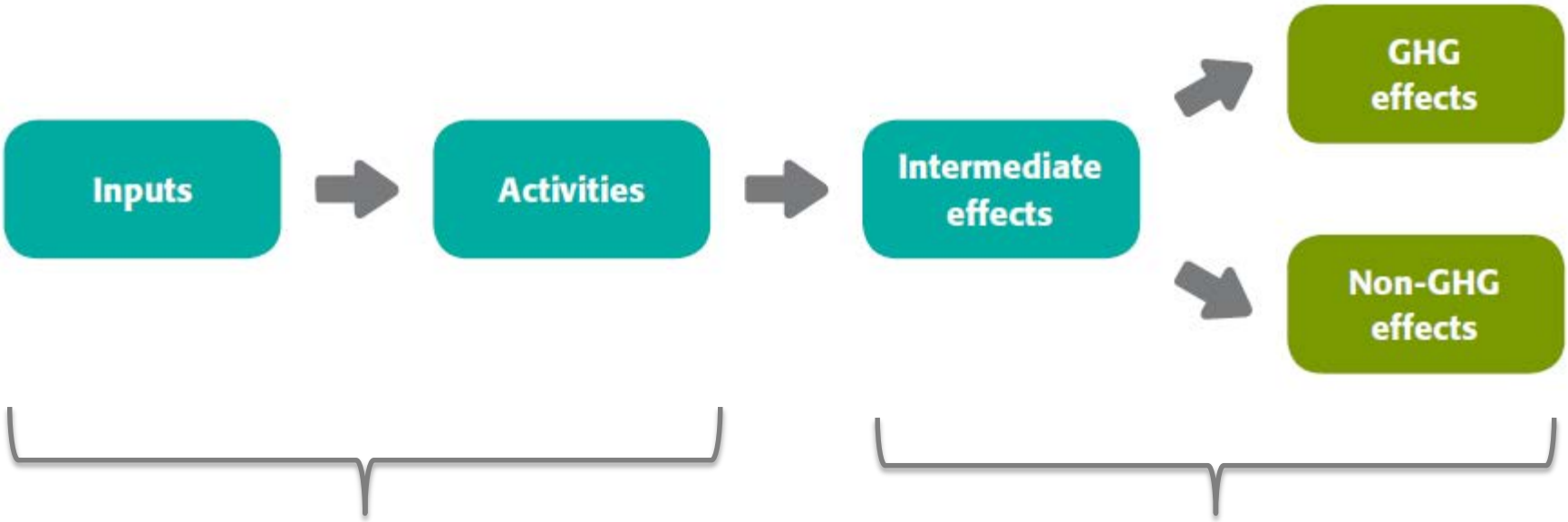
Key performance indicators for monitoring performance



Implementation indicators

Impact indicators

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Key performance indicators for monitoring performance

Indicator types	Definitions	Examples for a home insulation subsidy program
Inputs	Resources that go into implementing a policy or action, such as financing	Money spent to implement the subsidy program
Activities	Administrative activities involved in implementing the policy or action (undertaken by the authority or entity that implements the policy or action), such as permitting, licensing, procurement, or compliance and enforcement	Number of energy audits carried out, total subsidies provided
Intermediate effects	Changes in behavior, technology, processes, or practices that result from the policy or action	Amount of insulation purchased and installed by consumers, fraction of homes that have insulation, amount of natural gas and electricity consumed in homes
GHG effects	Changes in greenhouse gas emissions by sources or removals by sinks that result from the intermediate effects of the policy or action	Reduced CO_2, CH_4, and N_2O emissions from reduced natural gas and electricity use
Non-GHG effects	Changes in relevant environmental, social, or economic conditions other than GHG emissions or climate change mitigation that result from the policy or action (see Appendix C for examples)	Household disposable income from energy savings

Source: Adapted from W. K. Kellogg Foundation 2004.
Notes: GHG effects are typically not monitored directly but instead are estimated based on changes in various other parameters. In other frameworks, intermediate effects are called "outcomes" and GHG effects and non-GHG effects are called "impacts."

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Pilot example: Cape Town Electricity Saving Campaign

Indicator type	Indicators
Inputs	• Total investment in different elements (print media, radio, schools, direct marketing and internet) • Number of full time employees per skills category working on the campaign
Activities	• Number of newspaper and radio adverts • Number of flyers, posters or other print media disseminated • Schools visited and types of engagements • Number and type of direct marketing activities • Internet and social media updates
Intermediate effects	• Solar water heaters (SWHs) installed (where and when) • Electricity consumption

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Creating a monitoring plan

- The monitoring plan should describe:
  - Measurement or data collection methods and procedures
  - Sources of data
  - Monitoring frequency
  - The level of uncertainty in any measurements or estimates
  - Sampling procedures (if applicable)
  - Whether the data is verified, and if so, verification procedures used
  - Entity or person responsible for monitoring and roles and responsibilities of relevant personnel
  - Procedures for internal auditing, quality assurance, and quality control

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Monitoring plan example: Tunisia energy conservation NAMA in the building sector

Indicator or parameter (and unit)	Source of data	Monitoring frequency	Measured, calculated, or estimated (and uncertainty)	Responsible entity
GHG impact of thermal insulation				
Number of houses insulated and insulated area by type (roof, wall, glazing) and m^2	ANME information system (to be created)	Annual	Measured (Low uncertainty)	ANME
For existing dwellings: historical annual electricity and primary thermal energy consumption (kWh/m^2)	Energy bills	Annual	Measured (Low uncertainty)	Collected by energy counsellors; feed into ANME information system through electronic application file
For new dwellings: annual electricity and primary thermal energy consumption (kWh/m^2) of dwellings that do not apply to the program	Sampled metering on 50 new dwellings and survey to assess energy profile (baseline)	Annual verification	Measured for 50 dwellings and estimated for the rest (Medium uncertainty)	Collected by ANME control officers to build a baseline scenario for new dwellings

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Monitoring plan example: Tunisia energy conservation NAMA in the building sector (continued)

Indicator or parameter (and unit)	Source of data	Monitoring frequency	Measured, calculated, or estimated (and uncertainty)	Responsible entity
Job creation				
Number of employees in new and existing companies that provide energy services for buildings	ANME accreditation system and human resources department	Annual	Measured (Low uncertainty)	ANME
Creation of new companies				
Number of new companies created to provide energy services for buildings	ANME accreditation system and human resources department	Annual	Measured (Low uncertainty)	ANME
Saved energy costs for end users and saved energy subsidies for the Tunisian government				
(Energy savings by source from GHG ex-post assessment) × (Energy prices for electricity, natural gas, LPG, kerosene, wood, charcoal)	GHG ex-post assessment and ANME sources on energy prices and subsidies	Annual	Measured and calculated (Low uncertainty)	ANME

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Chapter 11 Estimating GHG effects ex-post

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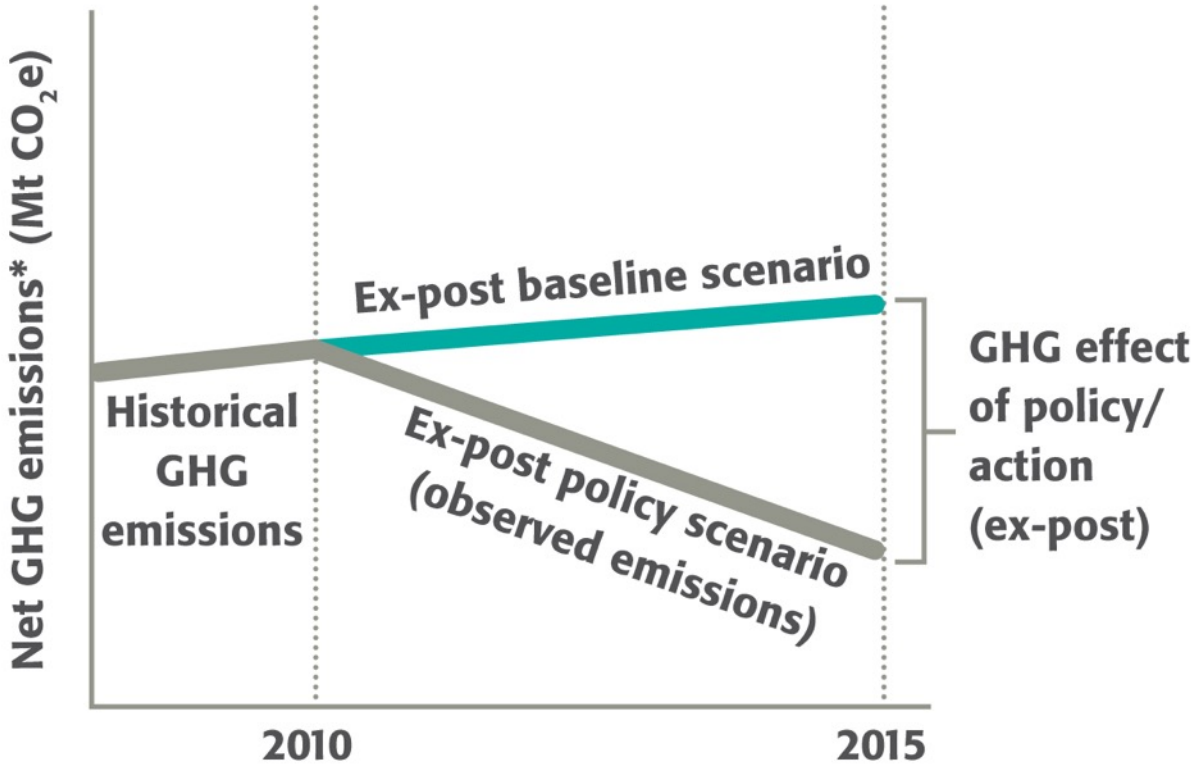
Ex-post assessment



Note: * From sources and sinks in the GHG assessment boundary.

- Should update baseline emissions every time an ex-post assessment is undertaken
- Should assess whether the effects identified in the causal chain actually occurred

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Overview of steps

1. Define objectives and define the policy or action

2. Identify effects

3. Estimate effects

4. Report results

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Chapter 14 Reporting

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Reporting requirements

- Five parts to the reporting requirements and template:

1. GHG assessment information
2. Description of the policy or action
3. Estimated change in GHG emissions and removals
4. Methodology
5. Optional reporting information

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Part 3: Estimated change in GHG emissions and removals

Year	Total net change in emissions and removals	Uncertainty range (quantitative estimate or qualitative description)
Year 1		
Year 2		
Year 3		
Year 4		
Year ...		
Total cumulative emissions and removals		

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Additional resources

- Sample reporting template
- E-learning course
- Excel calculation tool
- List of other relevant calculation tools and models
- Sector guidance documents
  - AFOLU
  - Energy supply
  - Residential and commercial buildings
  - Transportation
  - Waste