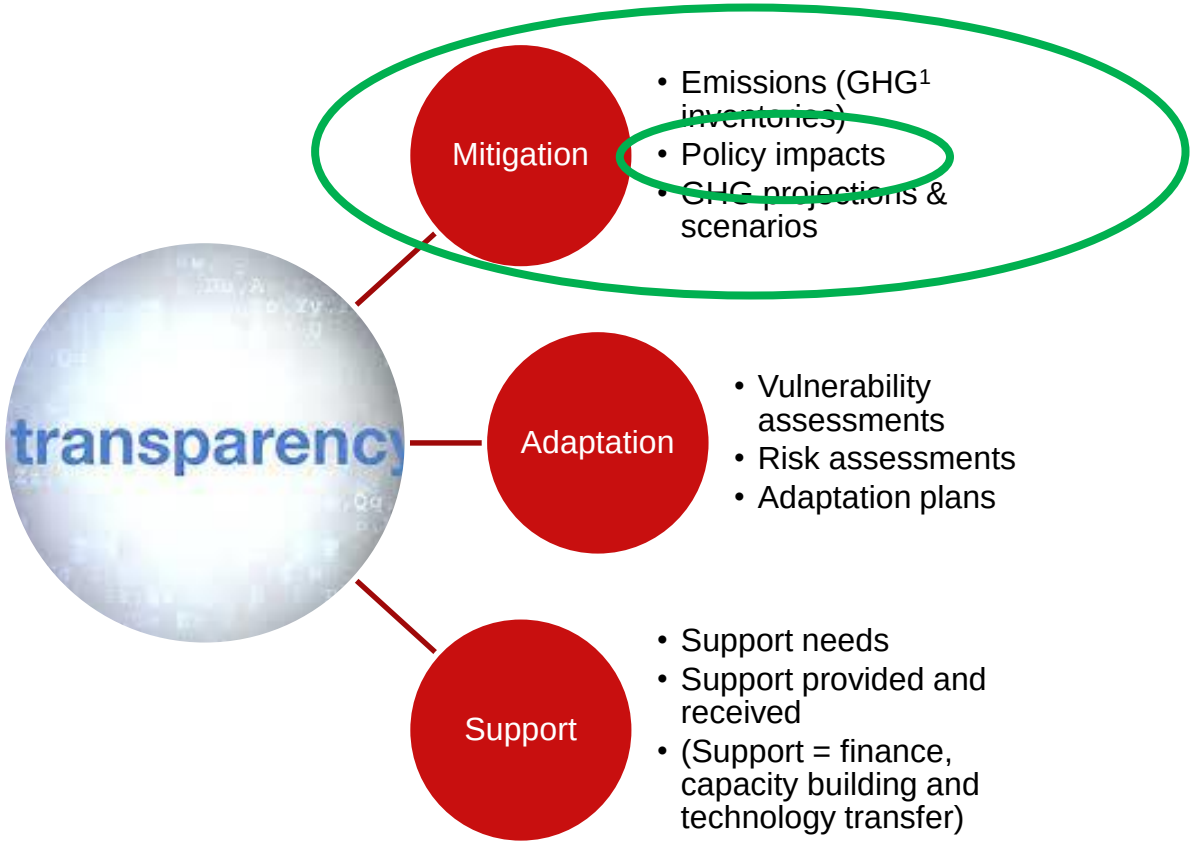
# MRV Training Module

## Overview of Transparency of Mitigation

James Harries

Jakarta, 25 April 2019

# What is transparency of mitigation?




[1] Greenhouse Gases

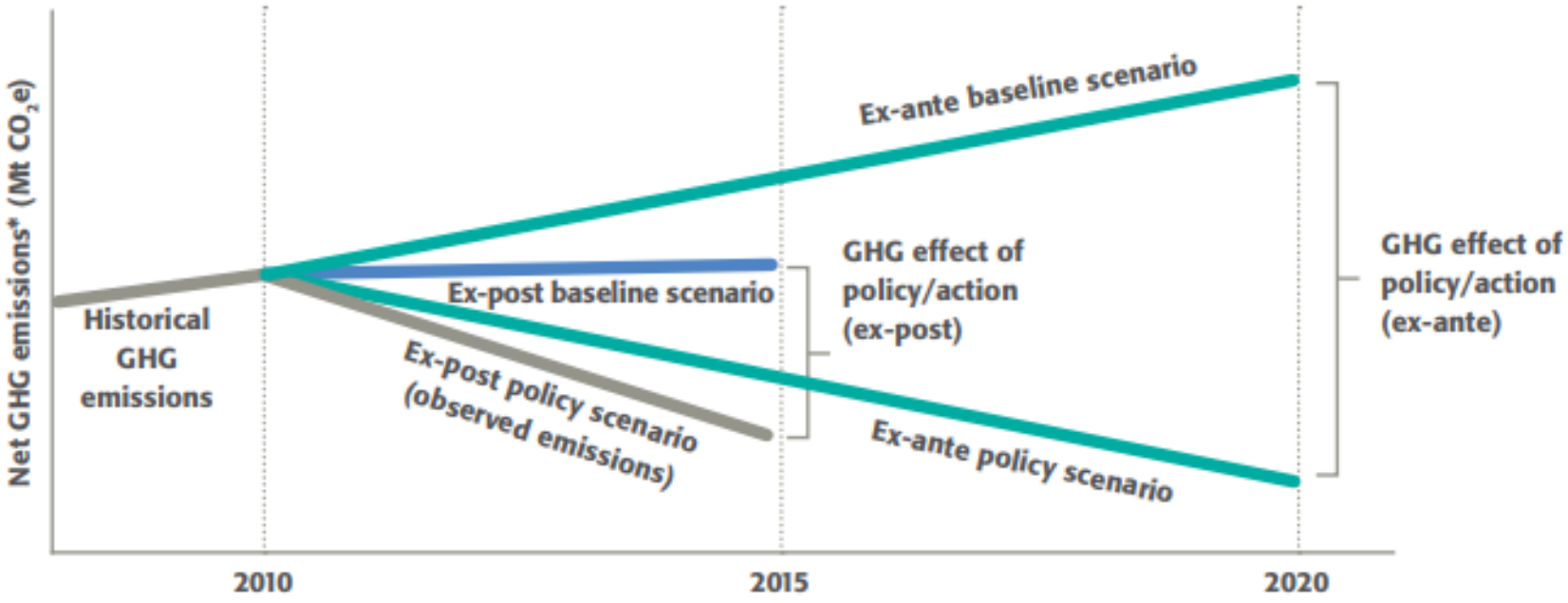
# Aim of transparency of mitigation measures

- To understand the impacts that individual policies (and groups) of policies are having on GHG emissions.
- To better understand the emissions trends seen in the GHG inventory.
- To inform decisions on policies – e.g. whether to amend, scrap etc.
- To understand other impacts from mitigation policies.

- Not just about reporting on policy impacts. Can also report on
  - Policy commitments (e.g. “we said we’d introduce policy X by 2018”) – was this done?
  - Actions (e.g. Environment Ministry to agree MoUs[1] with other ministries by 2019) – are there specific actions in an action plan?

[1] Memorandum of Understanding

# Assessing policy impacts – ex-ante and ex-post




Source: World Resources Institute

# Methodologies to assess GHG impacts of policies

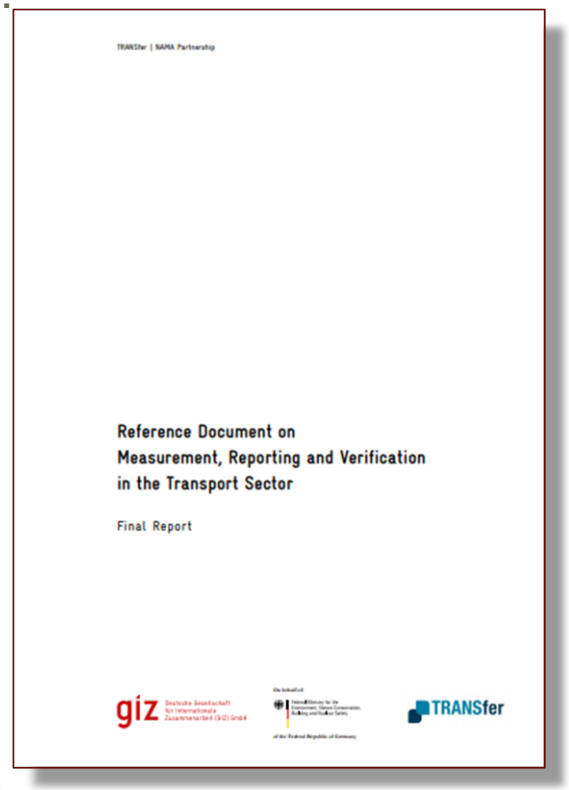
- WRI[1] policy and action standard
- Can be used before, during or after implementation of the policy
- Key steps:
  - Define the policy or action
  - Identify effects and map the causal chain
  - Define the GHG assessment boundary
  - Estimate baseline emissions
  - Estimate GHG effects ex-ante
  - Monitor performance over time
  - Estimate GHG effects ex-post
  - Assess uncertainty
  - Verification
  - Reporting


Source: World Resources Institute

[1] World Resources Institute

# More sector-specific guidance also available…

- For example, transport…

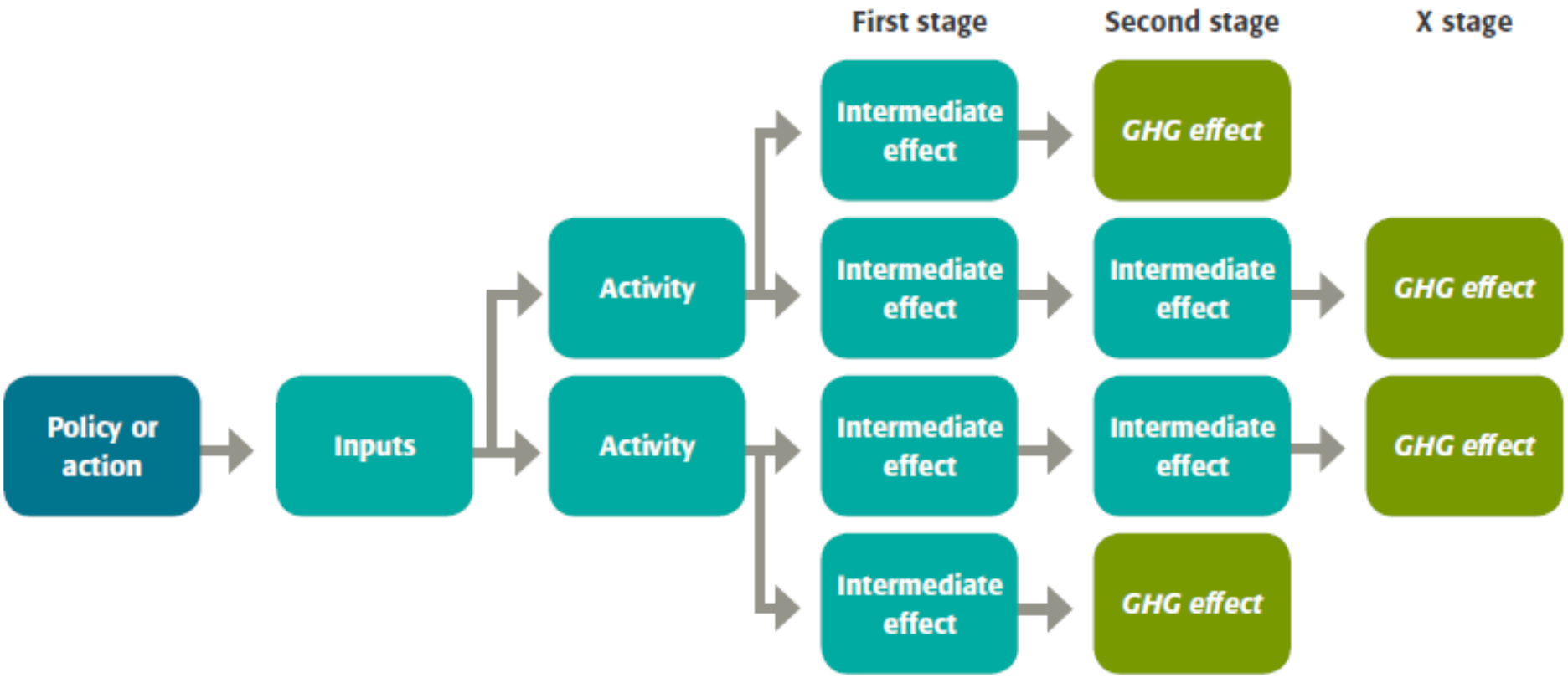




# The WRI Policy and Action Standard

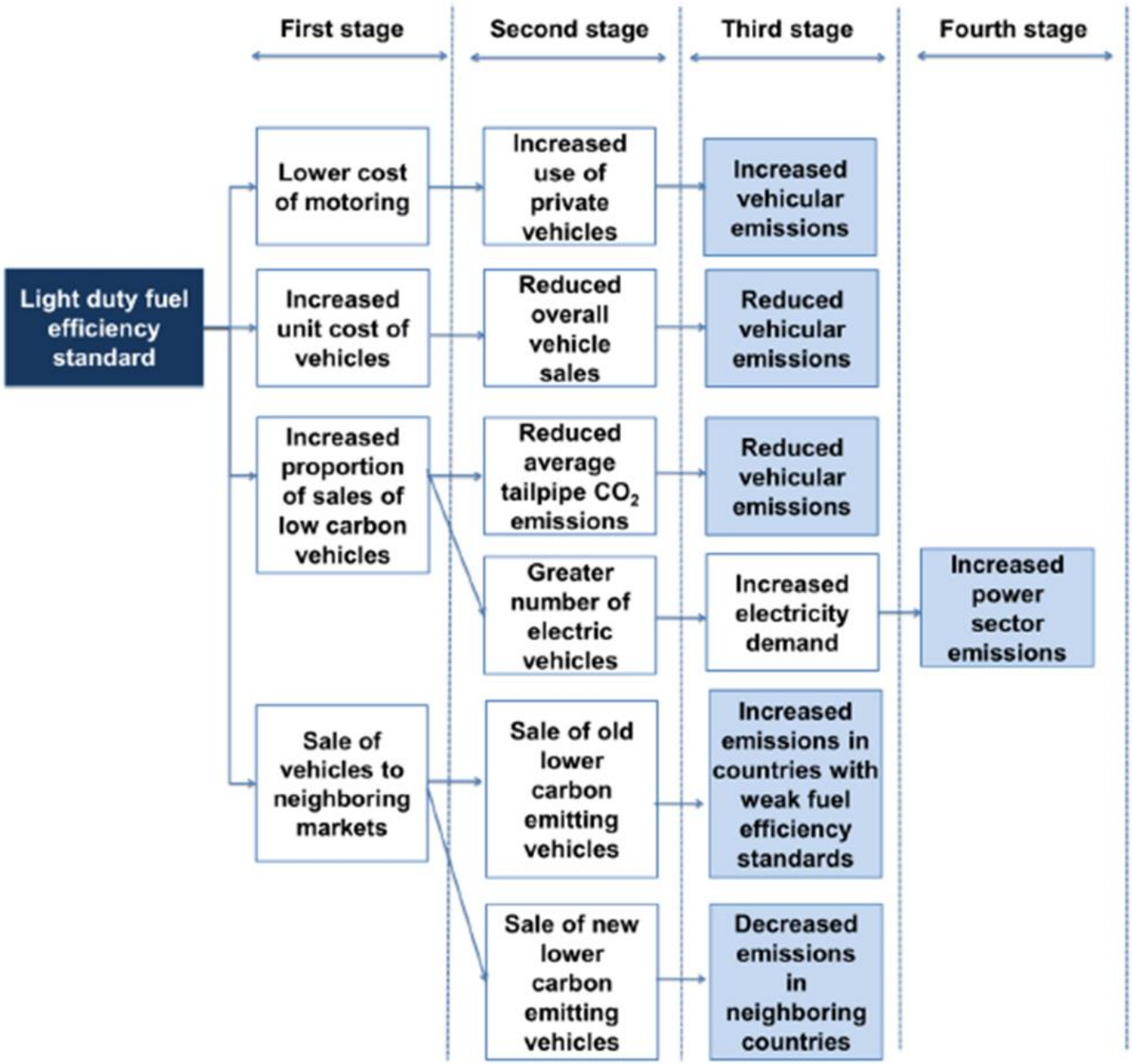
**Figure 3.1 Overview of steps**

| Overall steps | Detailed steps | Chapter |
|---|---|---|
| Define policy/action | Define the policy or action to be assessed; choose ex-ante or ex-post assessment | 5 |
| Identify effects | Identify all potential GHG effects of the policy or action; include them in a map of the causal chain | 6 |
| | Define the GHG assessment boundary around significant effects; identify the sources/sinks in the boundary | 7 |
| Estimate effects | Estimate baseline emissions for all affected sources/sinks included in the boundary | 8 |
| | Ex-ante assessment: Estimate policy scenario emissions for affected sources/sinks; subtract baseline emissions to estimate GHG effect | 9 |
| | Identify key performance indicators; monitor performance over time | 10 |
| | Ex-post assessment: Estimate policy scenario emissions for affected sources/sinks; subtract baseline emissions to estimate GHG effect | 11 |
| | Assess uncertainty (relevant to Chapters 8, 9, 10, and 11) | 12 |
| Verify | Verify results (optional) | 13 |
| Report | Report results and methodology used | 14 |

# Developing a causal chain

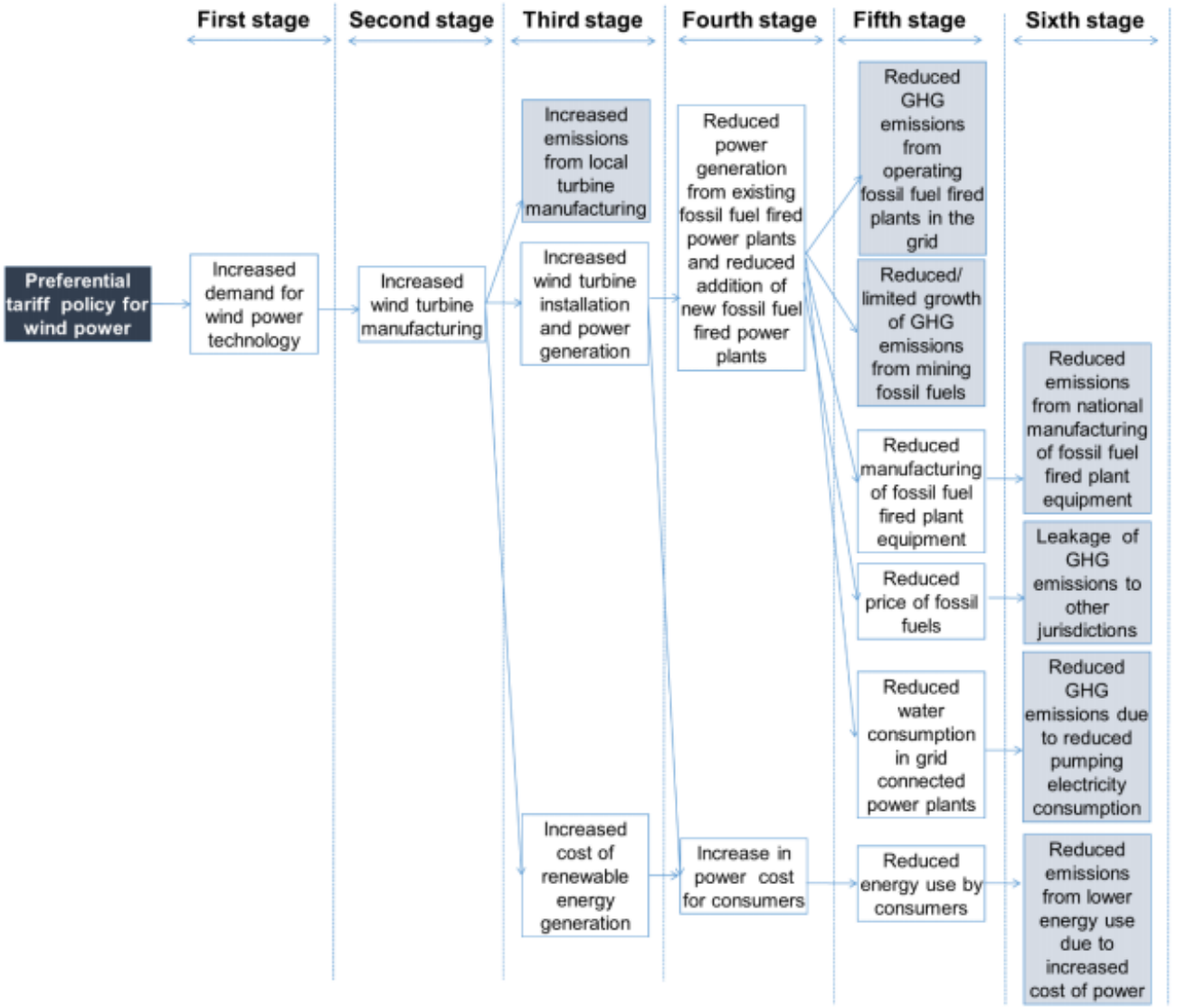



*Source: WRI Policy and Action Standard*



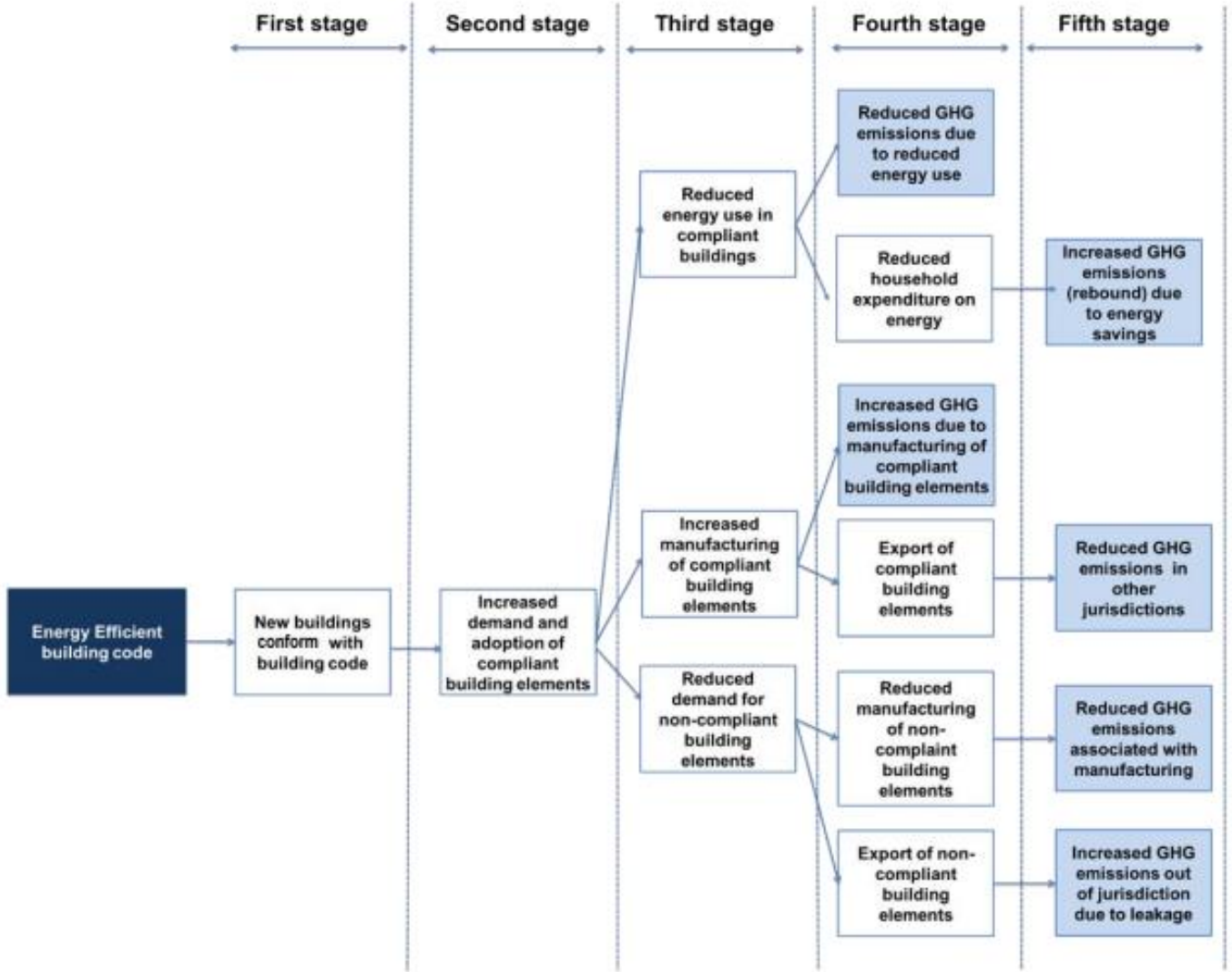

# Example of a causal chain (transport)

*Source: WRI Policy and Action Standard, transport guidance note*




# Example of a causal chain (energy supply)

*Source: WRI Policy and Action Standard, energy supply guidance note*




# Example of a causal chain (buildings)

*Source: WRI Policy and Action Standard, buildings guidance note*

# Which indicators to measure?

Not necessary or appropriate to measure all indicators

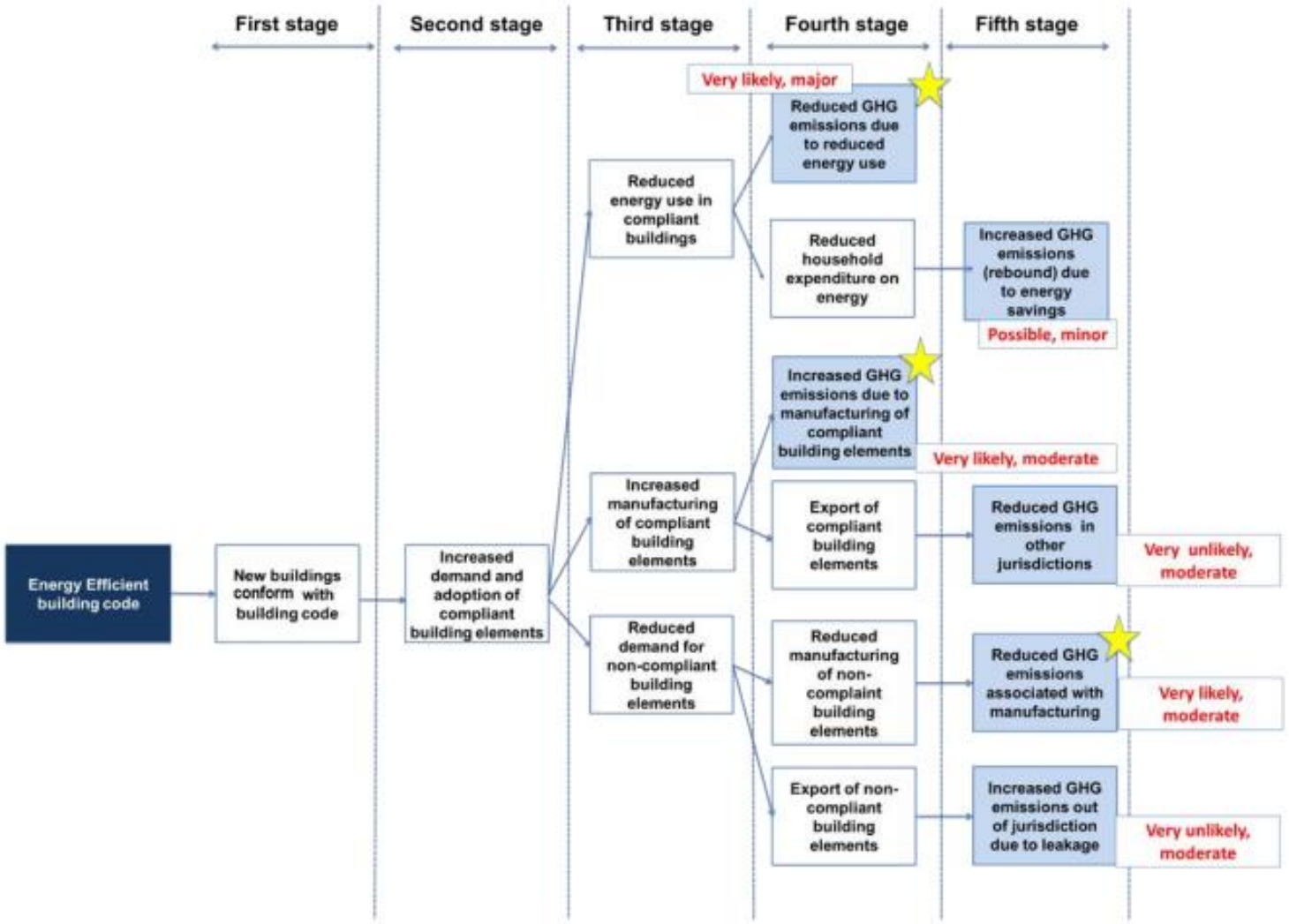
Focus on the most important ones – likelihood of impacts and magnitude of impacts

| Likelihood | Magnitude | | |
|---|---|---|---|
| | Minor | Moderate | Major |
| Very likely | May exclude | Should include | Should include |
| Likely | May exclude | Should include | Should include |
| Possible | May exclude | Should include | Should include |
| Unlikely | May exclude | May exclude | May exclude |
| Very unlikely | May exclude | May exclude | May exclude |

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

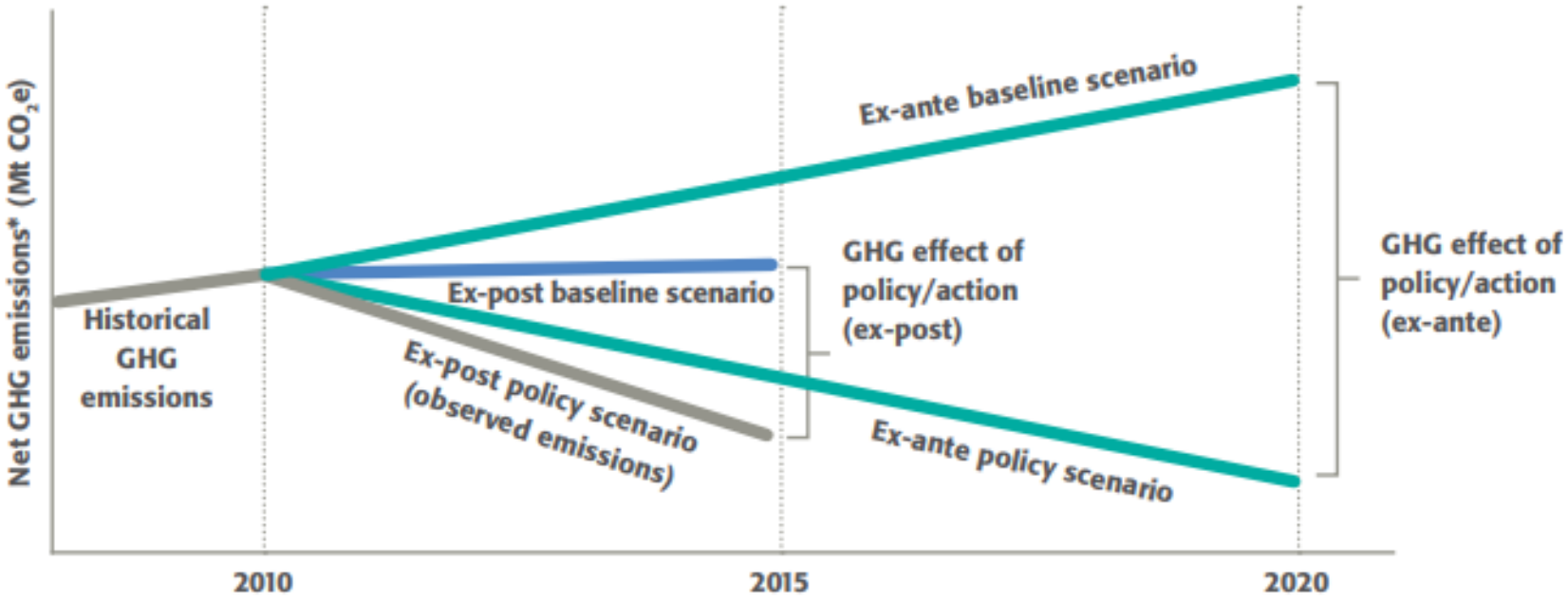
***Source: WRI Policy and Action Standard***

| GHG | Likelihood | Relative magnitude | Included? |
|---|---|---|---|
| **Reduced GHG emissions associated with energy use in new buildings** | | | |
| **$CO_2$** | Very likely | Major | **Included** |
| **$CH_4$** | Very likely | Moderate | **Included** |
| **$N_2O$** | Very likely | Minor | Excluded |
| **Increased GHG emissions (rebound) due to energy savings** | | | |
| **$CO_2$** | Possible | Minor | Excluded |
| **$CH_4$** | Possible | Minor | Excluded |
| **$N_2O$** | Possible | Minor | Excluded |
| **Increased GHG emissions associated with manufacturing of compliant elements** | | | |
| **$CO_2$** | Very likely | Moderate | **Included** |
| **$CH_4$** | Very likely | Minor | Excluded |
| **$N_2O$** | Very likely | Minor | Excluded |
| **HFCs** | Very likely | Major | Included |
| **Reduced GHG emissions associated with manufacturing of non-compliant elements** | | | |
| **$CO_2$** | Very likely | Moderate | **Included** |
| **$CH_4$** | Very likely | Minor | Excluded |
| **$N_2O$** | Very likely | Minor | Excluded |
| **Reduced GHG emissions in other jurisdictions due to compliant building elements exported** | | | |
| **$CO_2$** | Very unlikely | Moderate | Excluded |
| **$CH_4$** | Very unlikely | Minor | Excluded |
| **$N_2O$** | Very unlikely | Minor | Excluded |
| **Increased GHG emissions to other jurisdictions due to selling of non-compliant elements** | | | |
| **$CO_2$** | Very unlikely | Moderate | Excluded |
| **$CH_4$** | Very unlikely | Minor | Excluded |
| **$N_2O$** | Very unlikely | Minor | Excluded |


First stage
Second stage
Third stage
Fourth stage
Fifth stage
Energy Efficient building code
New buildings conform with building code
Increased demand and adoption of compliant building elements
Reduced energy use in compliant buildings
Increased manufacturing of compliant building elements
Reduced demand for non-compliant building elements
Very likely, major
Reduced GHG emissions due to reduced energy use
Reduced household expenditure on energy
Increased GHG emissions (rebound) due to energy savings
Possible, minor
Increased GHG emissions due to manufacturing of compliant building elements
Very likely, moderate
Export of compliant building elements
Reduced GHG emissions in other jurisdictions
Very unlikely, moderate
Reduced manufacturing of non-complaint building elements
Reduced GHG emissions associated with manufacturing
Very likely, moderate
Export of non-compliant building elements
Increased GHG emissions out of jurisdiction due to leakage
Very unlikely, moderate

| GHG effect | GHG sources | GHG sinks | Greenhouse gases |
|---|---|---|---|
| 1 Reduced GHG emissions associated with energy use | Residential and commercial fuel combustion on-site or distributed (heating and cooling) | N/A | $CO_2$, $CH_4$ |
| 2 Increased GHG emissions associated with manufacturing of efficient elements | Fossil fuel combustion for supplying energy to manufacturing process, fugitive emissions from HFCs | N/A | $CO_2$, HFCs |
| 3 Reduced GHG emissions associated with manufacturing of non-efficient elements | Fossil fuel combustion for supplying energy to manufacturing processes | N/A | $CO_2$ |

# Assessing policy impacts – ex-ante and ex-post




Source: World Resources Institute

# Examples of indicators

| Examples of policies | Examples of activity indicators |
|---|---|
| **Renewable portfolio standard** | Quantity of long-term contracts with renewable energy power generators established, number of renewable energy certificates (RECs) issued |
| **Fuel economy standard** | Number of emission certificates issued per year, number of vehicle manufacturers from which information on cars sold is collected by the government |
| **Subsidy for home insulation** | Amount of subsidies issued |
| **Energy efficiency standards for appliances** | Number of appliance standards and reporting templates published, number of appliance manufacturers from which information on sold appliances is collected |
| **Government buildings retrofit program** | Number of retrofit projects procured (for example, number of contractors selected for |

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| Examples of policies | Examples of intermediate effect indicators |
|---|---|
| **Renewable portfolio standard** | Total electricity generation by source (such as wind, solar, coal, natural gas) |
| **Public transit policies** | Passenger-kilometers traveled by mode (such as subway, bus, train, private car, taxi, bicycle) |
| **Waste management regulation** | Tonnes of waste sent to landfills, tonnes of waste sent to recycling facilities, tonnes of waste sent to incineration facilities |
| **Landfill gas management incentive** | Tonnes of methane captured and flared or used |
| **Sustainable agriculture policies** | Soil carbon content, tonnes of synthetic fertilizers applied, crop yields |
| **Afforestation/reforestation policies** | Area of forest replanted by type |
| **Grants for replacing kerosene lamps with renewable lamps** | Number of renewable lamps sold, market share of renewable lamps, volume of kerosene used for domestic lighting |
| **Subsidy for building retrofits** | Number of buildings retrofitted, energy use per building |
| **Information campaign to encourage home energy conservation** | Household energy use (sample of households or average use) |

*Source: WRI Policy and Action Standard*

# Not just about GHG emissions…

- Mitigation actions are not limited to achieving only mitigation, but can help you achieve all kinds of non-GHG-related objectives:
  - Job creation
  - Increased income
  - Improved air quality
  - Improved health
  - Increased crop production
  - Safeguarding biodiversity
  - Improving livelihoods
  - Improving water availability
  - .....you name it!
- It might bring stakeholders from different „universes“ together – e.g. climate change and development
- Monitoring and reporting approaches for many of these objectives already exist and can be integrated into the transparency system under the Paris Agreement

# GHG projections and scenarios

# Definitions

- What do we mean by emissions scenarios?

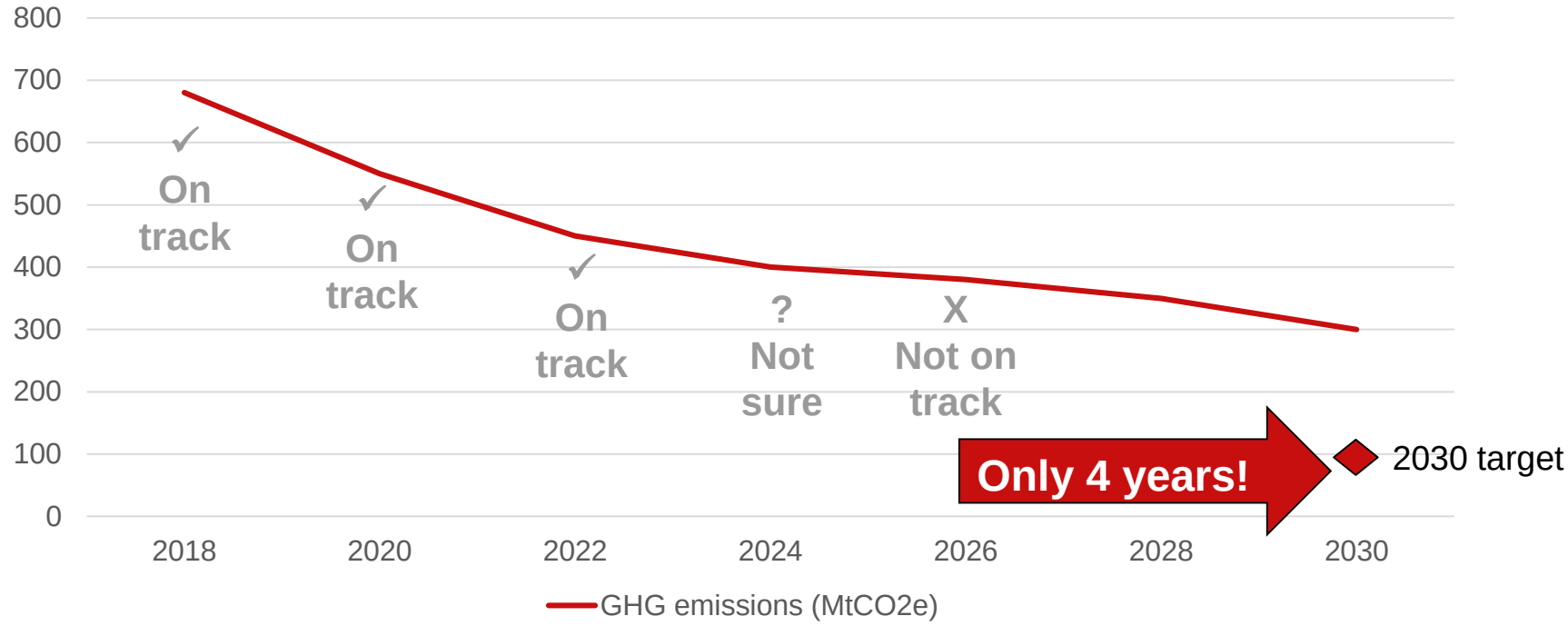
**IPCC[1] – "Scenarios are alternative images of how the future might unfold and are an appropriate tool with which to analyze how driving forces may influence future emission outcomes and to assess the associated uncertainties". ['*Emissions Scenarios', IPCC, 2000*]**

[1] Intergovernmental Panel on Climate Change

- Emissions scenarios = projections
- Not part of BUR[2] reporting (but an element of long-term strategies)
- But could be part of new regime under ETF[3]?
- Relevance for long-term strategies
  - Economy-wide, long-term mitigation goals (in the range of 15 to 30 years)
  - An assessment of cost-efficient mitigation options and their prioritisation
  - The stipulation of concrete short- and mid-term mitigation actions

[2] Biennal Update Reports
[3] Enhanced Transparency Framework

# Why GHG projections / scenarios are important

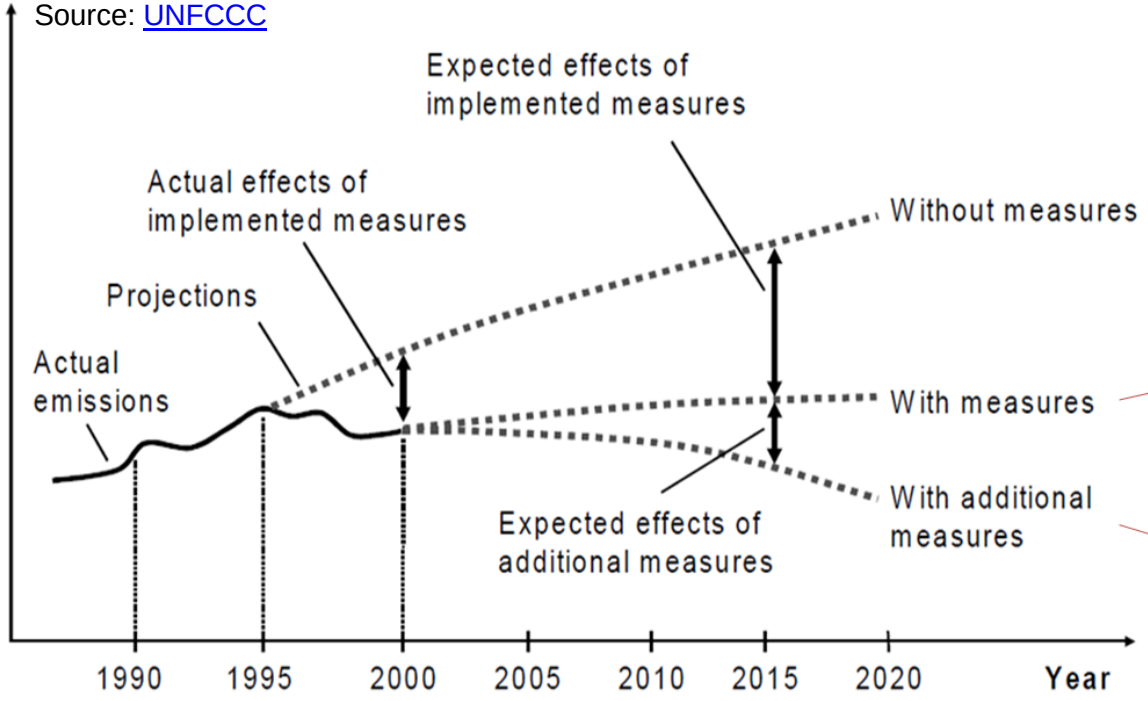



But takes time to introduce new policies…

- Policy design – 1-2 years?
- Political agreement – 0.5-1 year?
- Policy implementation – 1 year?
- Policy impacts – ???

# UNFCCC guidance on projections

Source: UNFCCC




**'Without measures'** - excludes all policies and measures implemented, adopted or planned after the base year

**'With (existing) measures'** - encompasses currently implemented and adopted policies and measures.

**"With additional measures"** - also encompasses planned policies and measures but includes an estimate of the impact of additional mitigation measures

| Implemented policies and measures | Adopted policies and measures | Planned policies and measures |
|---|---|---|
| • 1 or more of:<br>• National legislation in force<br>• One or more voluntary agreements have been established<br>• Financial resources have been allocated<br>• Human resources have been mobilized | • Official government decision has been made; and<br>• Clear commitment to proceed with implementation | • Under discussion<br>• Have a realistic chance of being adopted and implemented in future |

# Bottom-up versus top-down

**Top-down:**

Simple extrapolation model

Economic equilibrium model/CGE[1] (e.g. WorldScan

Econometric models (E.g. E3MG)

**Or hybrid (e.g. PRIMES, LEAP, POLES)**

**Bottom-up:**

Dynamic optimisation (e.g. MARKAL)

Accounting (e.g. end-use sector models)

Simulation (elements of POLES, NEMS)

[1] Computable general equilibrium

# Cement example – simple top-down forecasting

- Calculate current $CO_2$ emissions (including combustion and process emissions) emitted per tonne produced in various routes.
- Project forward production; base in short term on industry projections of production; in longer-term based on information from IEA[1] report which gives projections of demand on per capita basics combined with projections of population and economic growth.
- Assume exports follow same trend as domestic demand i.e. production follows trend in domestic demand.
- For reference case use industry view about any trends in the relative proportions of production coming from the different production routes, e.g. relative proportion of EAF output increasing in response to growing availability of steel scrap.
- Use industry view about business as usual improvements in energy efficiency pertaining to the future (e.g. incremental improvements and routine plant upgrades).
- From this data calculate total energy related GHG emissions and process related emissions

[1] International Energy Agency

(Example taken from *IEA, 2009 Energy Technology Transitions for Industry, Strategies for the next Industrial Revolution)*

# Baseline scenario

- Scenario against which mitigation options are measured
- Usually the 'with existing measures' scenario…

In report by Danish Energy Agency, OECD[1] and UNEP[2] Riso Centre, baseline scenario defined as "a scenario that describes future greenhouse-gas emissions levels in the absence of future, additional mitigation efforts and policies".

- …but can be 'without measures' (e.g. South Africa)
- Need to consider issue of 'early action' – should this be part of the baseline scenario?
- Choice of base year – may depend on data availability?
- Currently no international guidance on how to develop baseline emissions scenarios

[1] Organisation for Economic Co-operation and Development
[2] United Nations Environment Programme

# Further 'additional measures' scenarios

- Need to decide basis for developing alternative scenarios:
  - Different end points
  - Different pathways to same end-point
- Examples:
  - Ranking plus cut-off (simple extrapolation top-down approaches)
  - Different policy scenarios
  - 'Thematic' scenarios
    - E.g. UK Carbon Plan – 3 scenarios (higher renewables/more energy efficiency, higher CCS/more bioenergy, higher nuclear/less energy efficiency)
  - Sensitivity analysis – a form of scenario?