

Post-2012 Emission Reduction Targets



What constitutes a fair level of effort for individual Parties?

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Overview

- Concept of equity within the UNFCCC and Kyoto
- International approaches used to determine post-2012 targets
 - Methodology/criteria
 - Results
 - Strengths and weaknesses
- Integrating various elements into a conceptual framework to 'Assess Comparable Effort' (ACE)
- Generating results in an interactive model – 'Assessing Comparable Effort – Interactive Support Tool' (ACE-IST)



UNFCCC and the Kyoto Protocol

- Article 3.1 of the UNFCCC states action should be taken..... ‘on the basis of *equity* and in accordance with their *common but differentiated responsibility and respective capability*’
- Current Kyoto targets range from -8% to +8% compared to 1990
- Bali Action Plan includes reference that mitigation efforts need to be made while ‘*ensuring comparability of effort*’
- European Commission also have agreed to targets ‘*provided that other developed countries commit themselves to comparable emission reductions*’



International Approaches

- 1) European Commission
- 2) The Japanese Government
- 3) Netherlands Environmental Assessment Agency
- 4) International Institute for Applied Systems Analysis



European Commission Proposal



The EU has proposed a 30% reduction target by 2020 compared to 1990 for Annex 1 as a whole

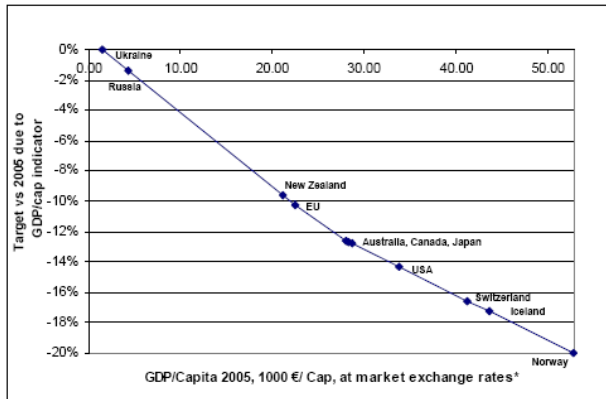
The EU is willing to take on a reduction target of 30% if the future international agreement is sufficiently ambitious

Four indicators used as criteria to assess comparability:

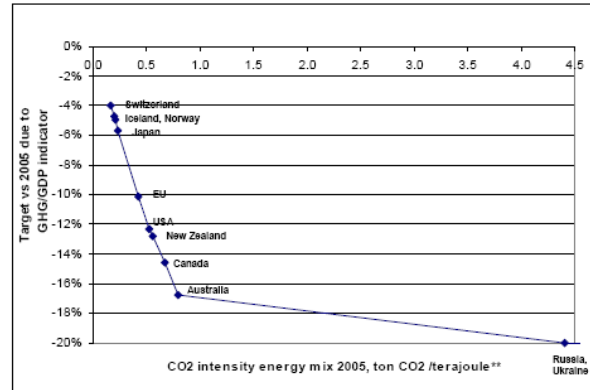
- 1) Income (GDP/Capita, 2005)
- 2) Efficiency (GHG/GDP, 2005)
- 3) Population trends (1990 – 2005)
- 4) Past efforts (1990 – 2005 growth in gross emissions)



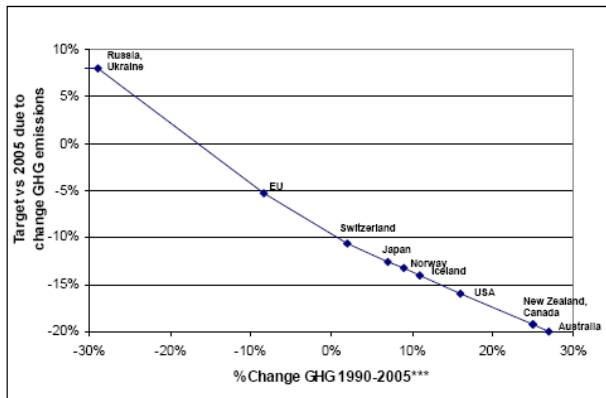
European Commission Proposal



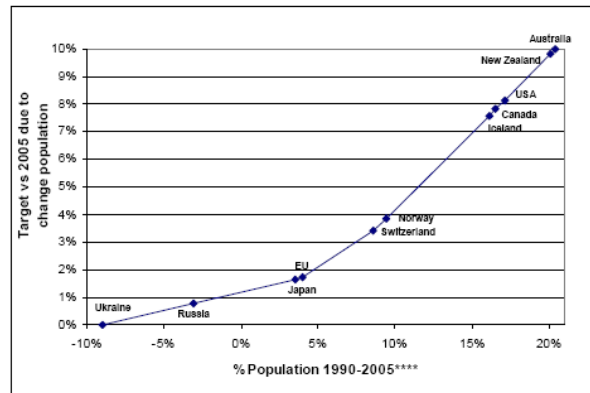
* Source: Adapted from World Bank and Eurostat



** Source: Data from IEA Statistics, 2007, CO2 Emissions from Fuel Combustion 1971 – 2005



*** Source: Data database UNFCCC website



**** Source: UN population data



European Commission Proposal



Targets – results from equal weighting of each criteria

	Share according to GDP/cap	Share according to GHG/GDP	Share according to GHG '90-'05	Share according to Population '90-'05	Target relative to 2005	Target relative to 1990
	(a)	(b)	(c)	(d)	(e) = (a+b+c+d)	
EU27	-10.2%	-10.1%	-5.2%	1.7%	-24%	-30%
Australia	-12.6%	-16.7%	-20.0%	10.0%	-39%	-24% ³⁸
Canada	-12.6%	-14.6%	-19.3%	7.8%	-39%	-23%
Iceland	-17.3%	-4.9%	-14.0%	7.6%	-29%	-21%
Japan	-12.8%	-5.6%	-12.5%	1.7%	-29%	-24%
New Zealand	-9.6%	-12.8%	-19.3%	9.8%	-32%	-15%
Norway	-20.0%	-4.7%	-13.3%	3.9%	-34%	-28%
Russia	-1.4%	-20.0%	8.0%	0.8%	-13%	-38%
Switzerland	-16.5%	-4.0%	-10.7%	3.4%	-28%	-27%
Ukraine	0.0%	-20.0%	8.0%	0.0%	-12%	-60%
USA	-14.3%	-12.3%	-15.9%	8.2%	-34%	-24%



European Commission Proposal



Strengths of approach

- Simple – uses currently available data
- Equitable – attempts to factor in a range of different criteria

Weaknesses of approach

- No rationale for weighting chosen within and between criteria
- Past efforts should be relative to Kyoto Target
- ‘Mitigation potential (‘efficiency’) not well captured with GHG/GDP’ [OECD]
- Costs of meeting targets are varied and could be perceived as unequitable



European Commission Proposal



Economic implications of meeting the 2020 target

Change compared to baseline	Target vs 2005	Economic Welfare	GDP	Employment	Private Consumption
EU27	-24%	-1.4%	-1.2%	-0.4%	-1.8%
USA	-34%	-0.7%	-0.8%	-0.4%	-1.2%
Japan	-29%	-0.6%	-0.6%	-0.3%	-1.0%
Canada	-39%	-2.2%	-2.0%	-0.7%	-3.4%
Australia & New Zealand	-38%	-1.9%	-2.0%	-0.8%	-3.2%
Other OECD Europe	-30%	-1.5%	-1.0%	-0.1%	-2.0%
Commonwealth of Independent States	-12%	-1.4%	-3.0%	-1.5%	-3.4%
Average Developed Countries	-27%	-1.0%	-1.0%	-0.6%	-1.5%



Two composite indices using indicators

Composite Index 1:

- Emissions per capita
- Mitigation potential
- GDP per capita

Composite Index 2:

- Emissions per capita
- Mitigation potential
- GDP per capita
- Mitigation costs (% GDP costs)





Japanese Government's proposal

How to ensure comparability of efforts among developed countries

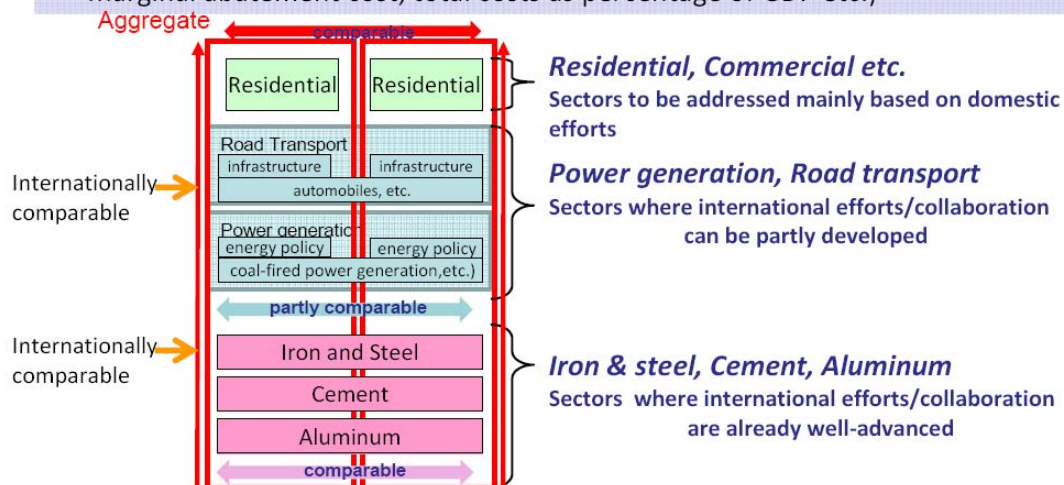
(1) Aggregate potential of each sector to estimate national potential

Iron & steel, cement, aluminum : based on international efficiency indicator

Power generation, road transport : based on international efficiency indicator and national policy

Commercial, residential : based on national policy

(2) Cross-check and adjust the level of aggregated national target from the viewpoint of comparability, using various indicators (e.g. GHG intensity, marginal abatement cost, total costs as percentage of GDP etc.)





Japanese Government's proposal

Targets should be based on:

1) Sectoral mitigation potential (efficiency indices)

- Residential and Commercial
- Power generation
- Transport
- Industry – Steel, Aluminium and Cement

2) An assessment of total costs of meeting target as % of GDP – using marginal abatement cost curves





Japanese Government's proposal

Strengths of approach

- Acknowledges that costs are a key part of an assessment of what is fair
- Uses sectoral-based analysis to determine potential (not GHG/GDP)

Weaknesses of approach

- Only takes into consideration 'cost' as a basis for equity
- Data to compare sectoral efficiencies may be difficult to find
- Do not propose how sectoral efficiencies could be used/compared against aggregate costs/MACCs



Netherlands Environmental Assessment Agency

Exploring comparable
post-2012 reduction
efforts for
Annex I countries

Background Studies



Netherlands Environmental Assessment Agency



Netherlands Environmental Assessment Agency

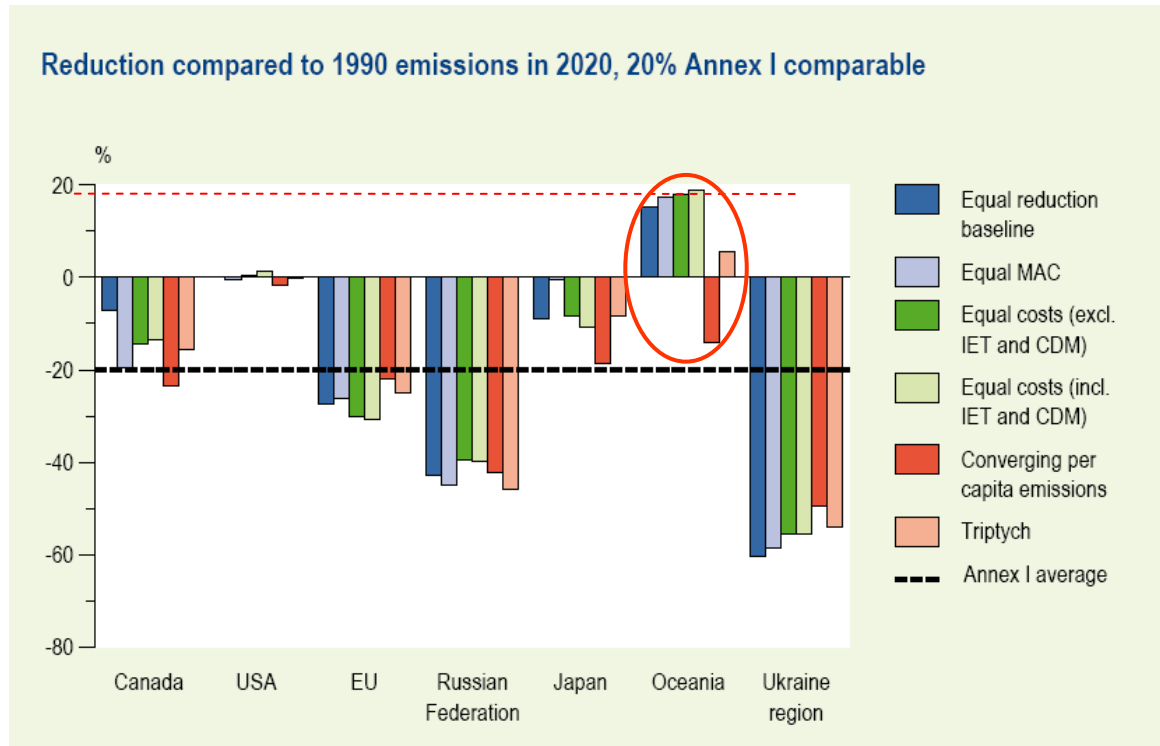
Two conceptual approaches for “comparable efforts” :

1. Equal effort: based on country’s sharing the effort or burden according to a defined indicator.
 - Efforts are needed to change the current state or to change a likely baseline or reference development
 - For example, equal reduction below BAU, equal MAC and equal costs as %-GDP
2. Equal endpoint: the countries’ effort is based on achieving the “*same state in the future*”
 - For example, equal emissions intensity per sector, or per capita emissions, Triptych.



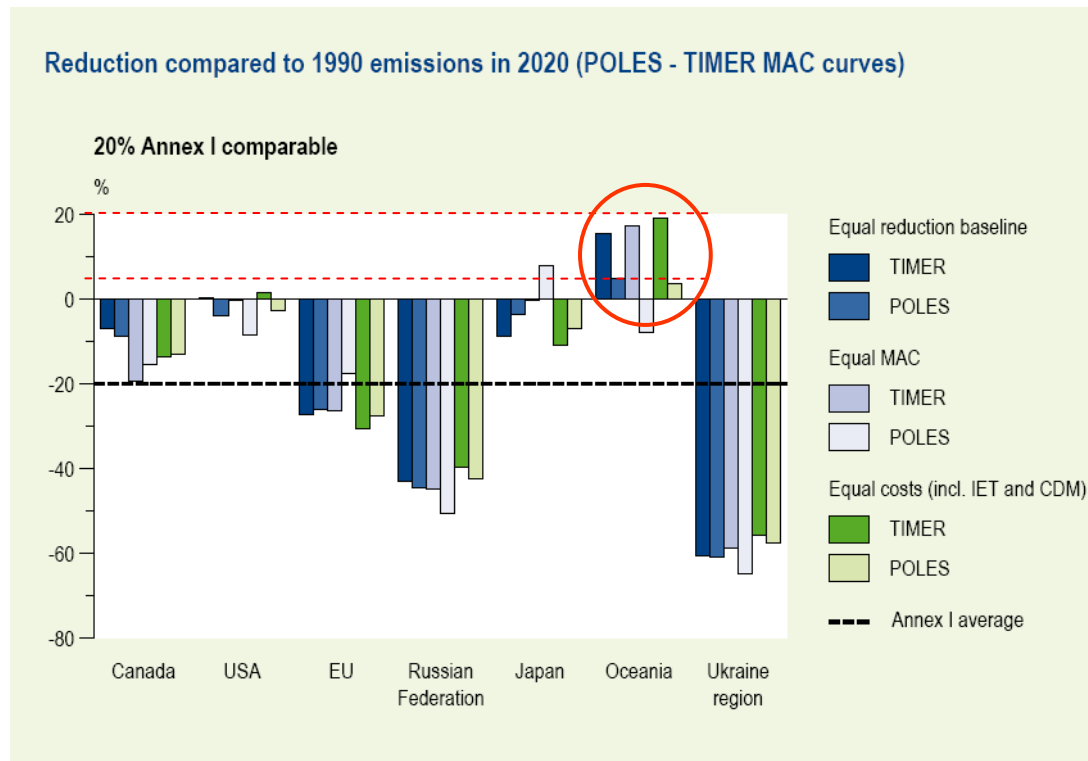
Netherlands Environmental Assessment Agency

Results for countries are relatively similar under each approach



Netherlands Environmental Assessment Agency

The results change for some countries using different models



Netherlands Environmental Assessment Agency

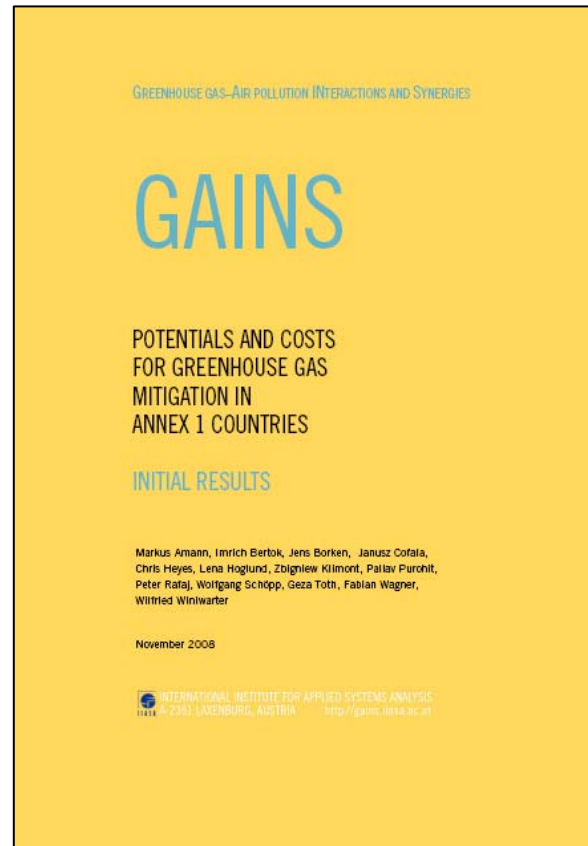
Strengths of approach

- Uses a range of different criteria
- Uses sensitivity analysis to show how different models change results
- Generates a set of (relatively) independent results

Weaknesses of approach

- Only uses 2 models in their sensitivity analysis
- No transparency of underlying data
- Does not integrate criteria – i.e. only cost, or only GHG/capita
- Does not provide results for smaller countries – like New Zealand





International Institute for Applied Systems Analysis

Large independent modelling exercise

Post-2012 targets (2020) for Annex 1 Parties are based on the costs of meeting the target, as a % of GDP

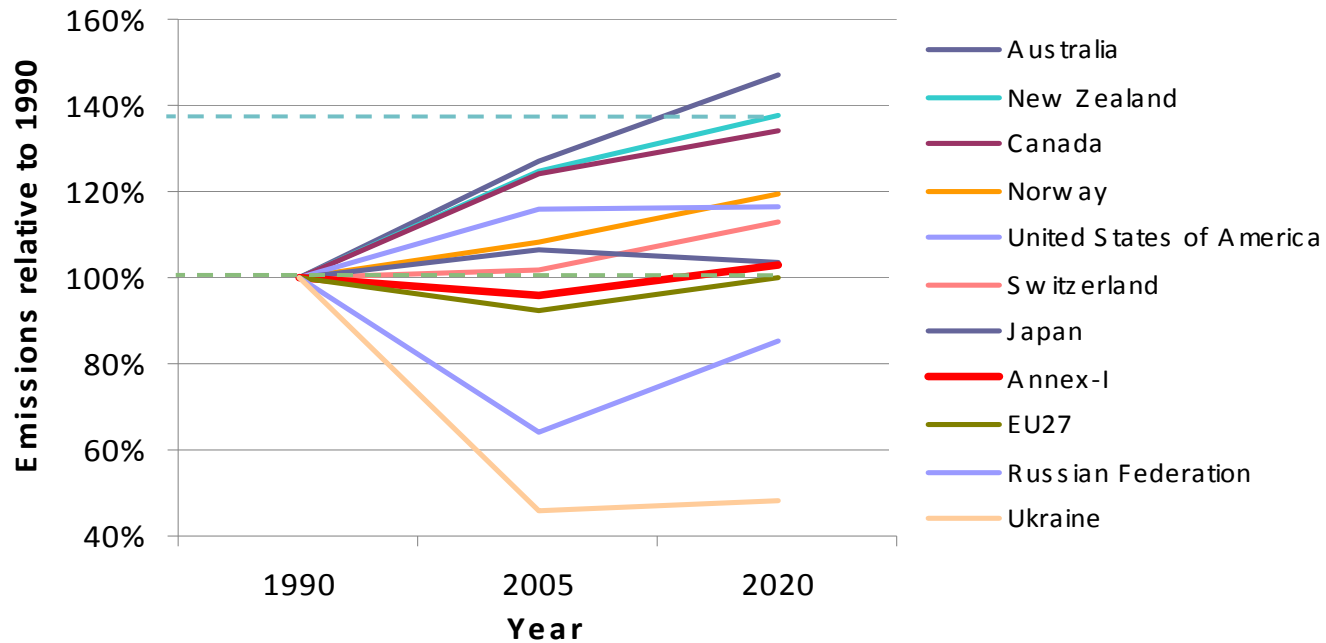
The primary inputs to this model are:

- Baseline projections in 2020
- Marginal abatement costs in 2020
- GDP projections in 2020



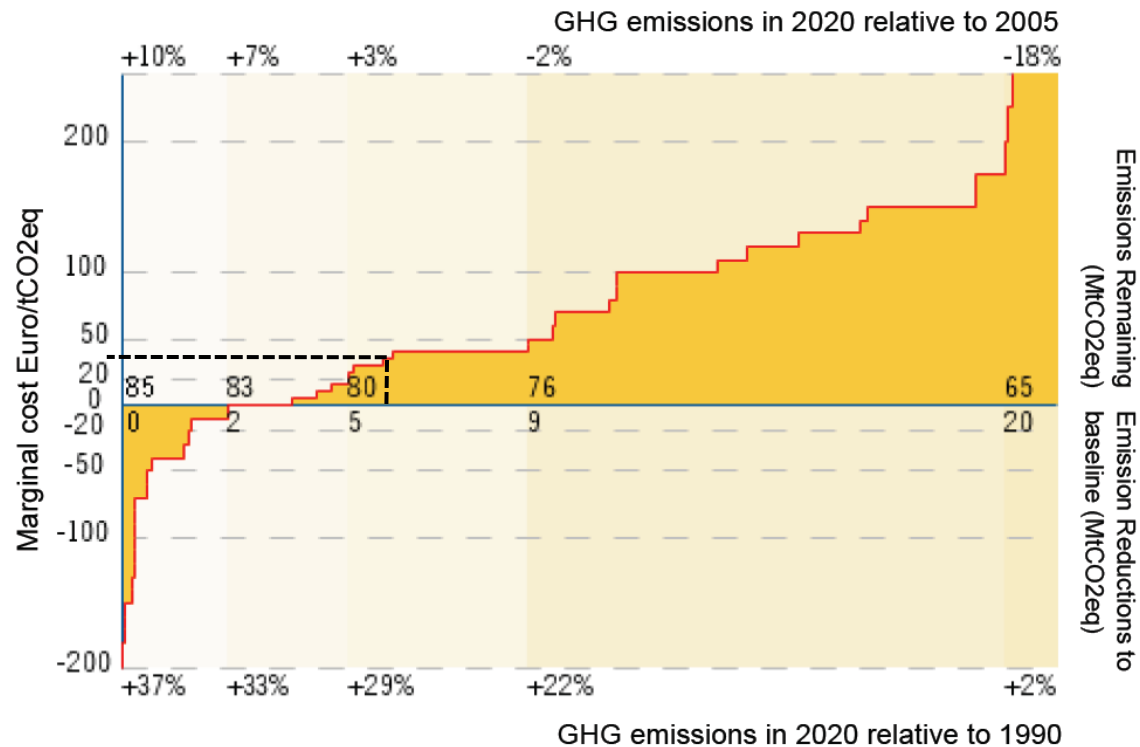
International Institute for Applied Systems Analysis

Baseline projections out to 2020



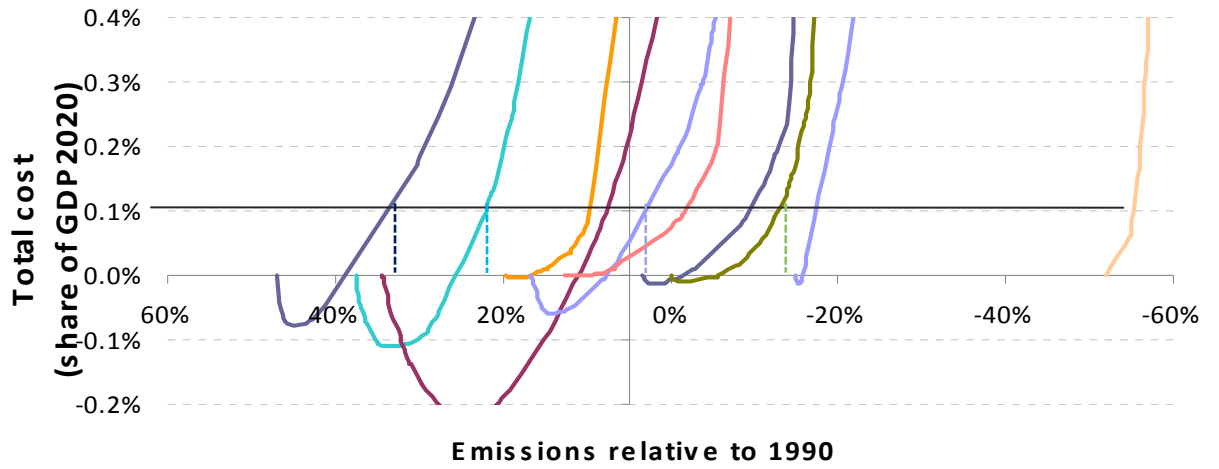
International Institute for Applied Systems Analysis

Mitigation costs in 2020



International Institute for Applied Systems Analysis

Using the total cost of abatement define targets as % of GDP



- Australia
- New Zealand
- Canada
- Norway
- United States of America
- Switzerland
- Japan
- EU27
- Russian Federation
- Ukraine



International Institute for Applied Systems Analysis

Strengths of approach

- Data is publicly available
- Measures the cost of meeting targets – a key factor in assessing equity
- Requesting from Parties more accurate data

Weaknesses of approach

- Focuses only on costs
- Underlying MACC data has been questioned, in some cases



Assessing Comparable Effort (ACE) Framework

Within the negotiations there is a need for a framework within which effort can be measured

The concept of effort being measured in terms of the costs faced by a country in meeting a specific target is widely accepted

However, other criteria also need to be integrated, to ensure compatibility with Article 3 of the Convention.

Initial presentation on this framework in Poznan (see UNFCCC)



Assessing Comparable Effort (ACE) Framework

The ACE framework uses a simple three step process to assess the comparability of individual countries' targets:

- 1) Develops a 2020 baseline/reference scenario for emissions
- 2) Estimates the costs of reducing emissions below this baseline
- 3) Integrates relative wealth/responsibility indicators



Assessing Comparable Effort (ACE) Framework

Emissions

Country A 

Total (MT) relative to 1990 (%)

84 +40
78 +30
72 +20
66 +10
60 0
52 -10

1990

2000

2010

2020

“equal cost target”

“equity target”

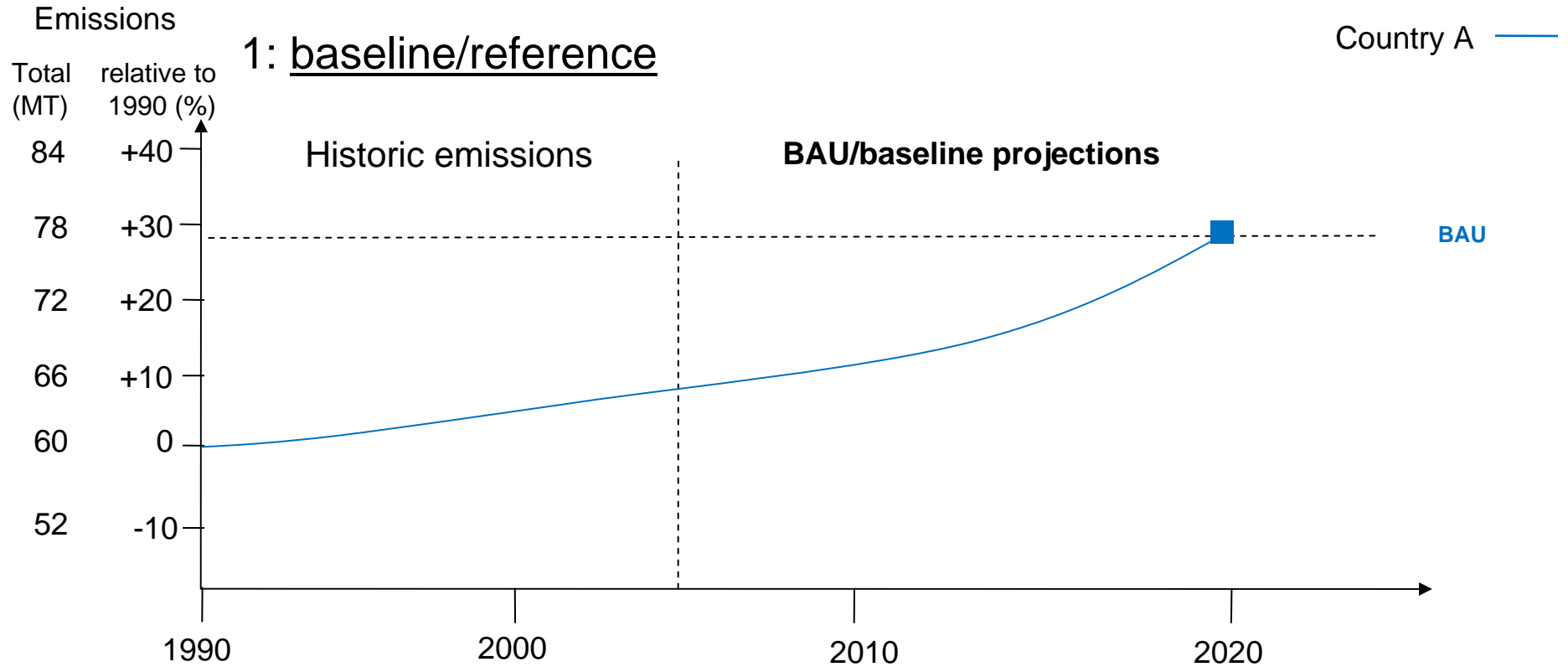
1: baseline/reference

2: mitigation potential

3 equity variance



Assessing Comparable Effort (ACE) Framework

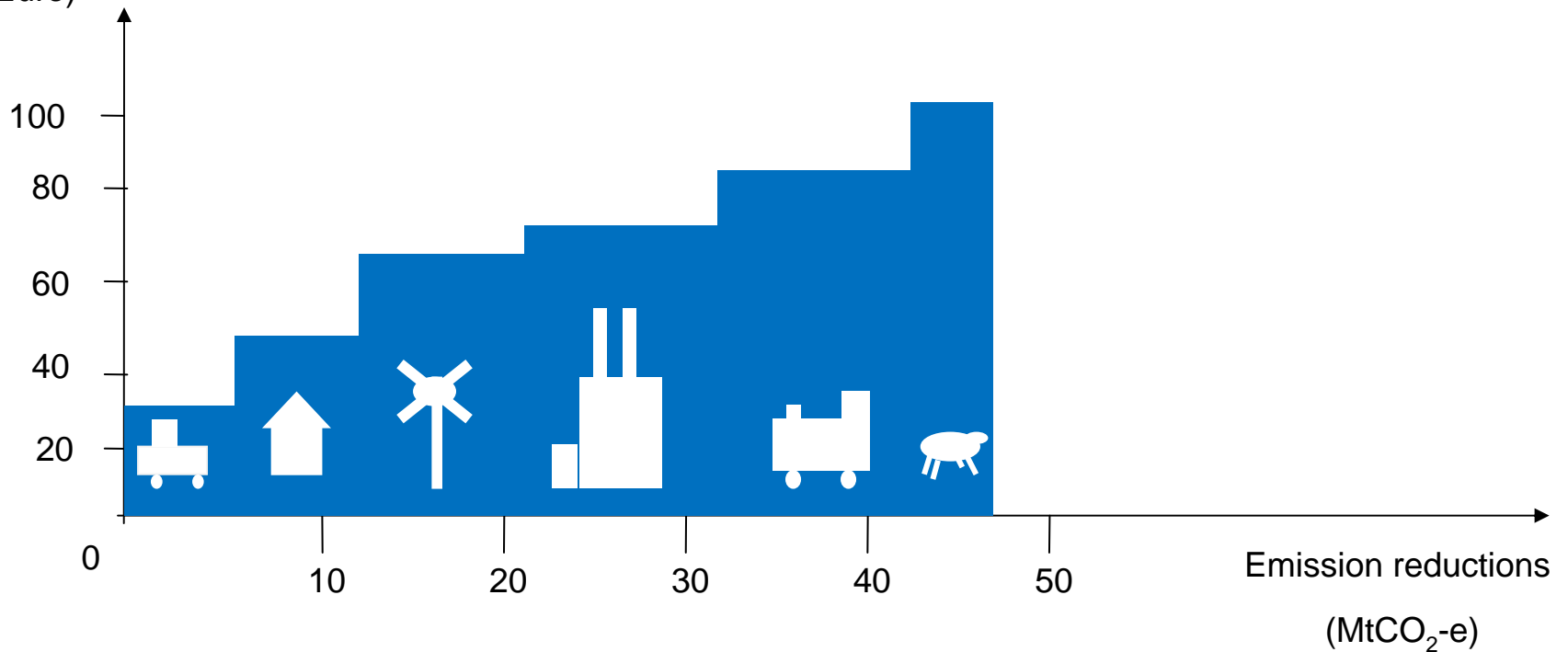


Assessing Comparable Effort (ACE) Framework

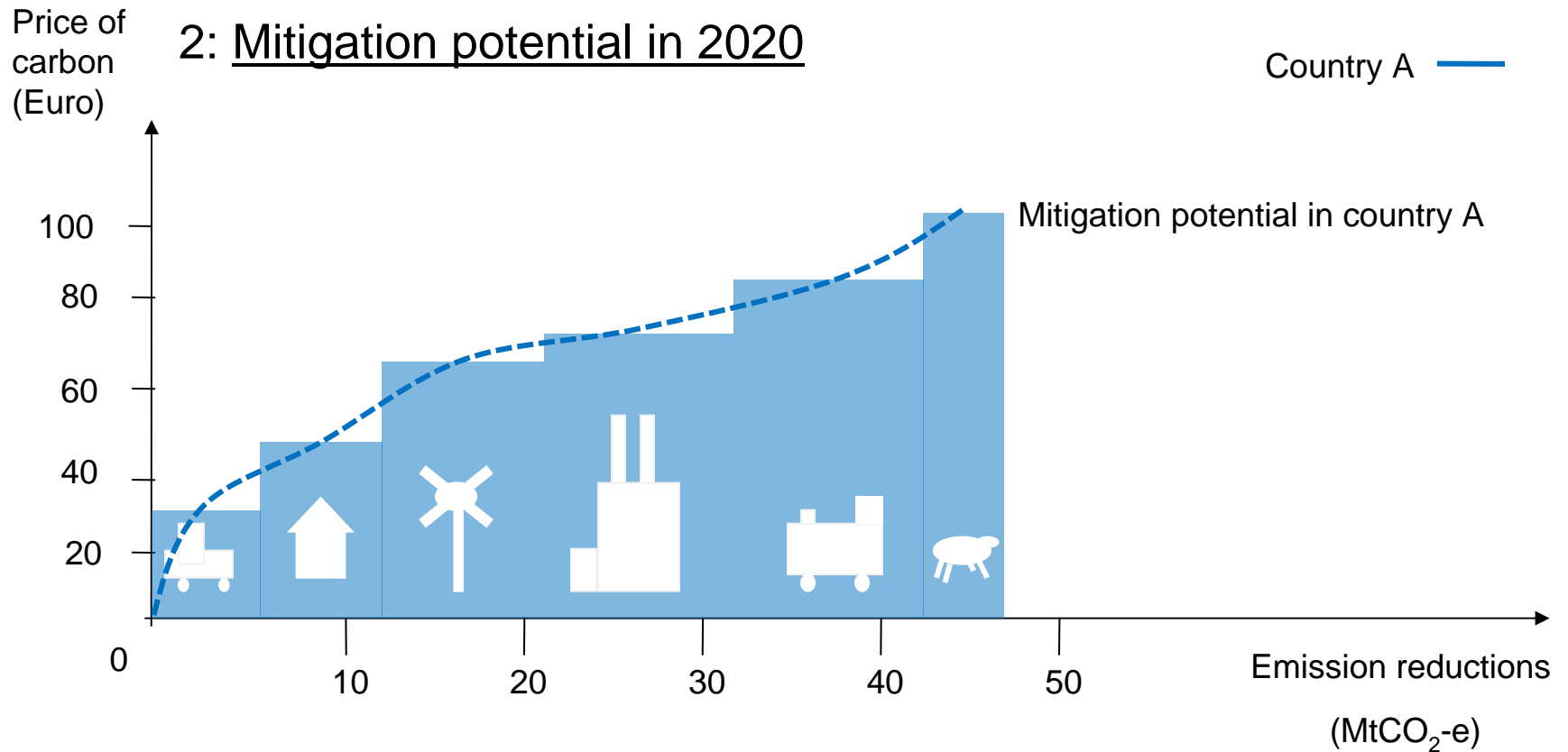
Price of carbon (Euro)

2: Mitigation potential in 2020

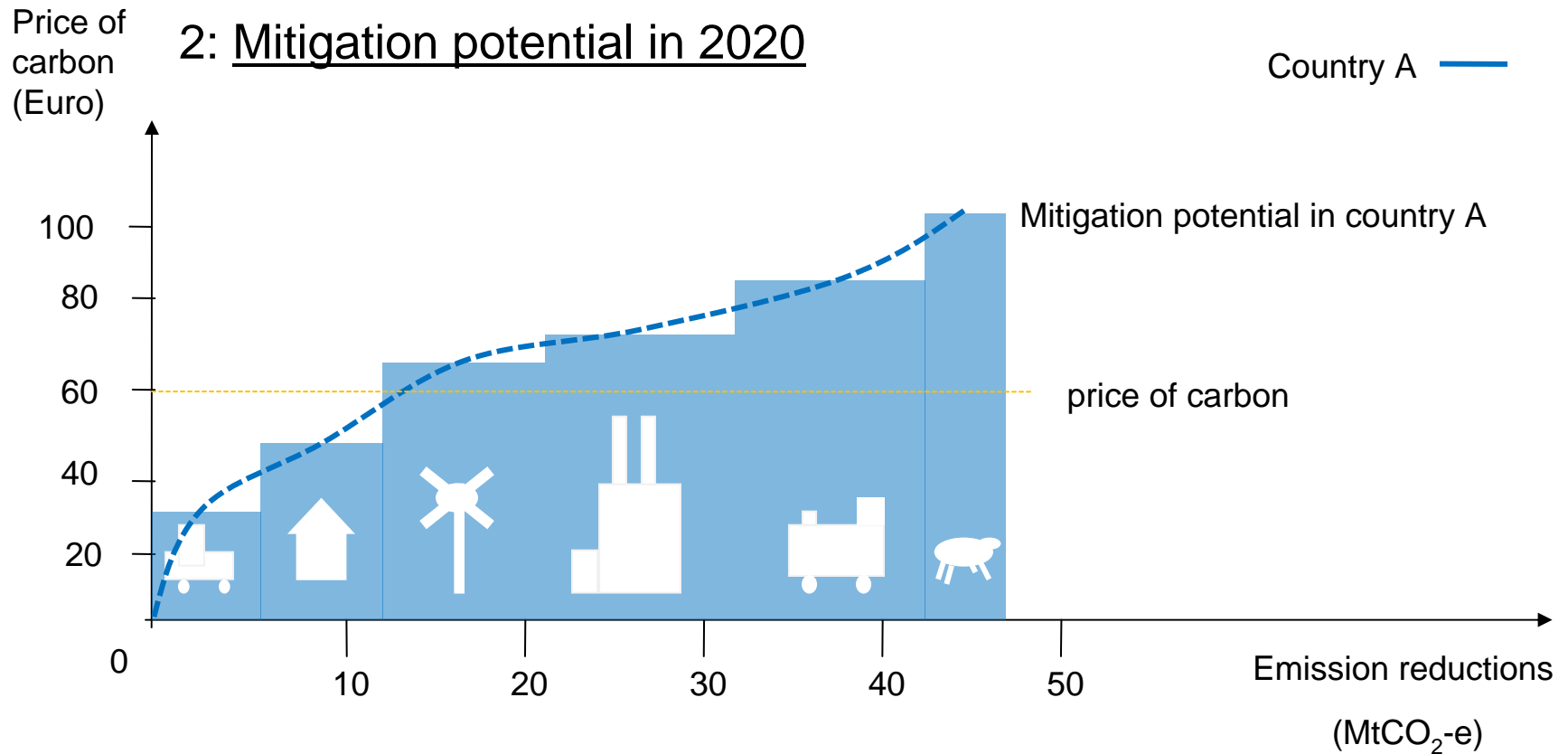
Country A 



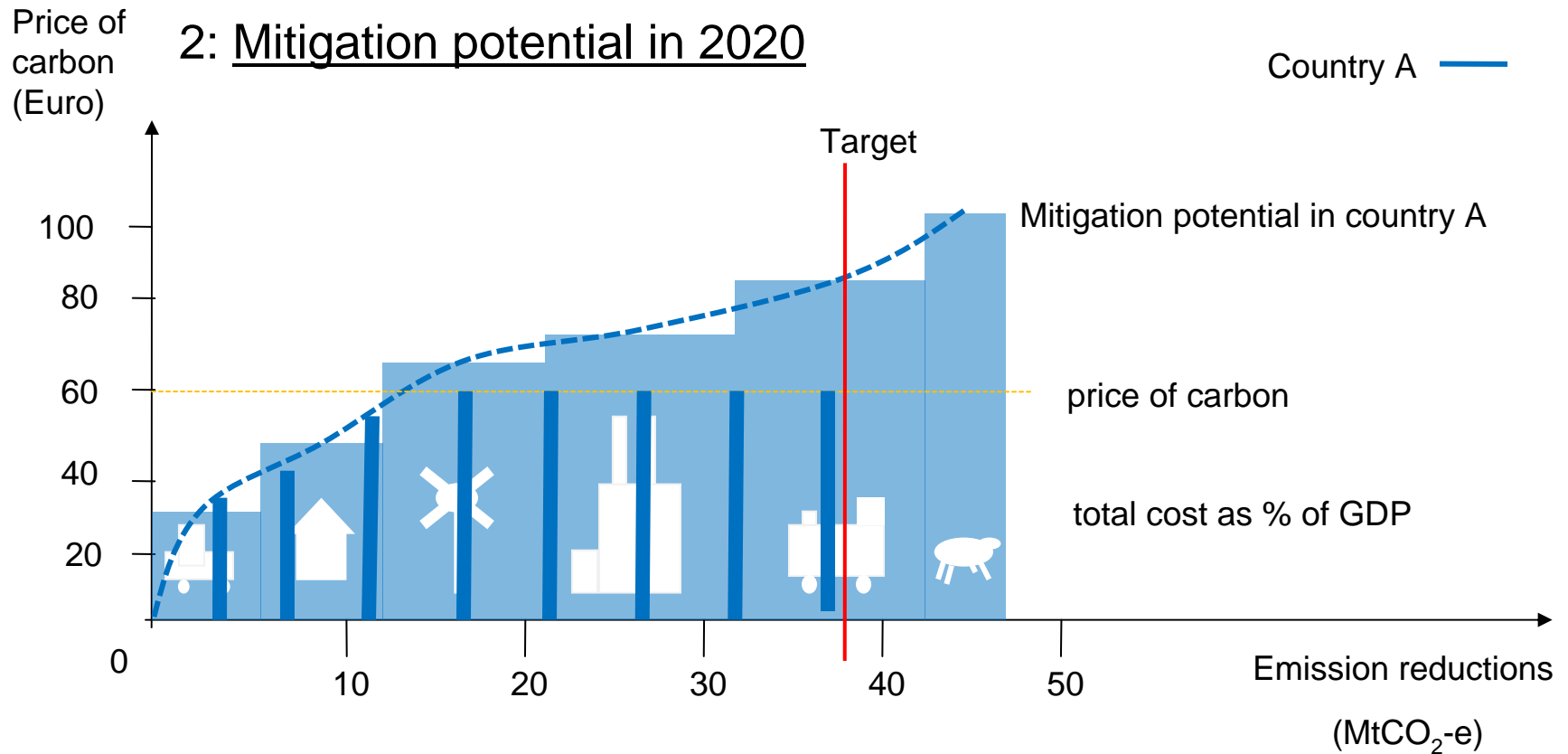
Assessing Comparable Effort (ACE) Framework



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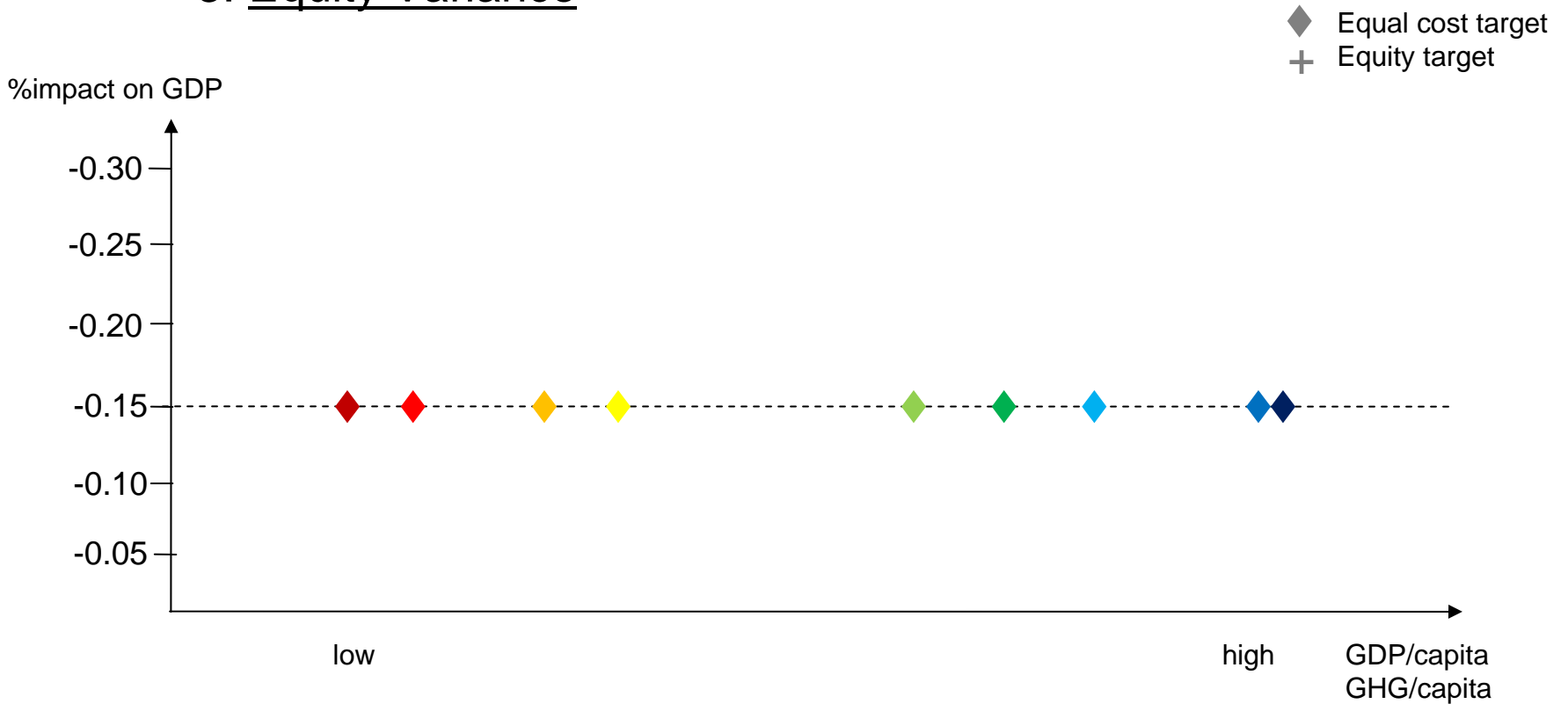


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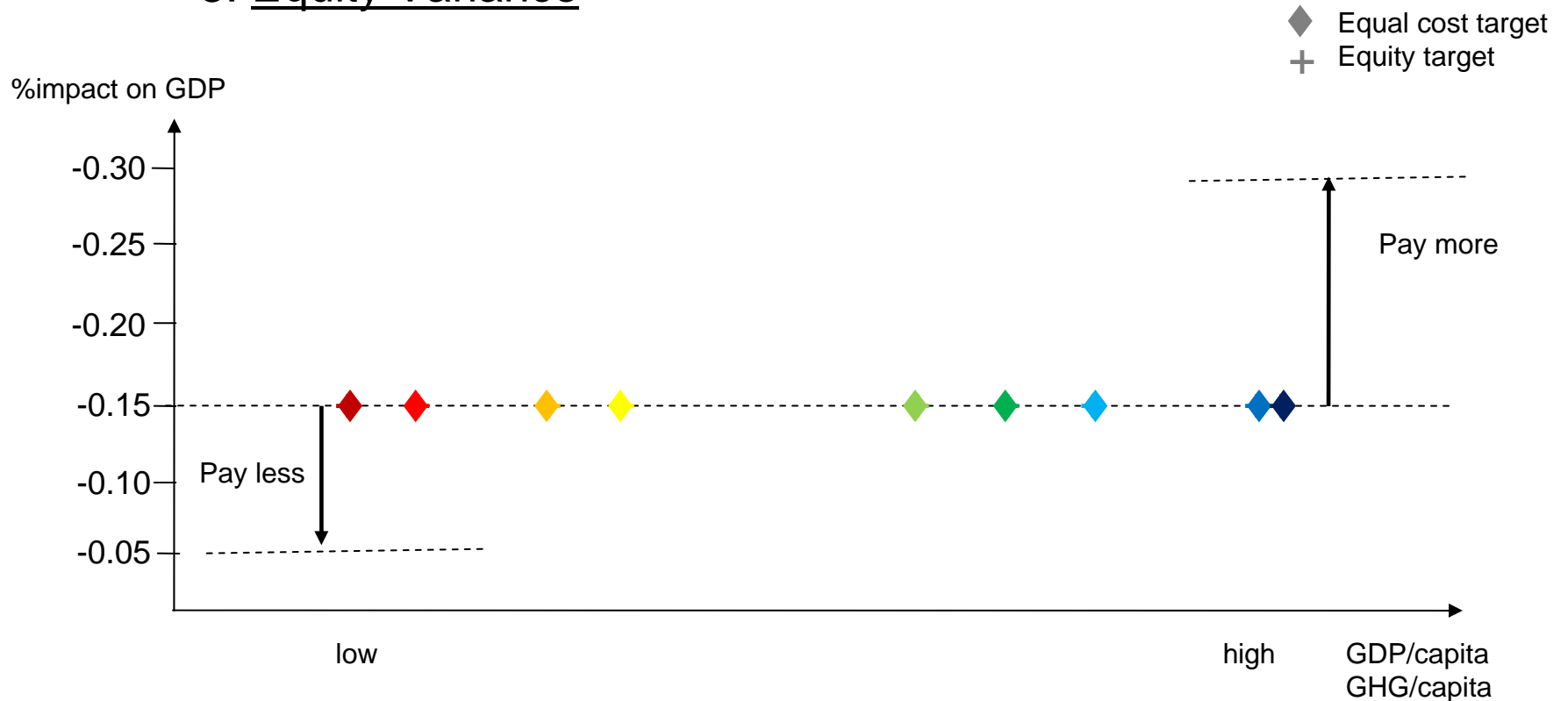
Assessing Comparable Effort (ACE) Framework

3: Equity Variance



Assessing Comparable Effort (ACE) Framework

3: Equity Variance



Assessing Comparable Effort (ACE) Framework

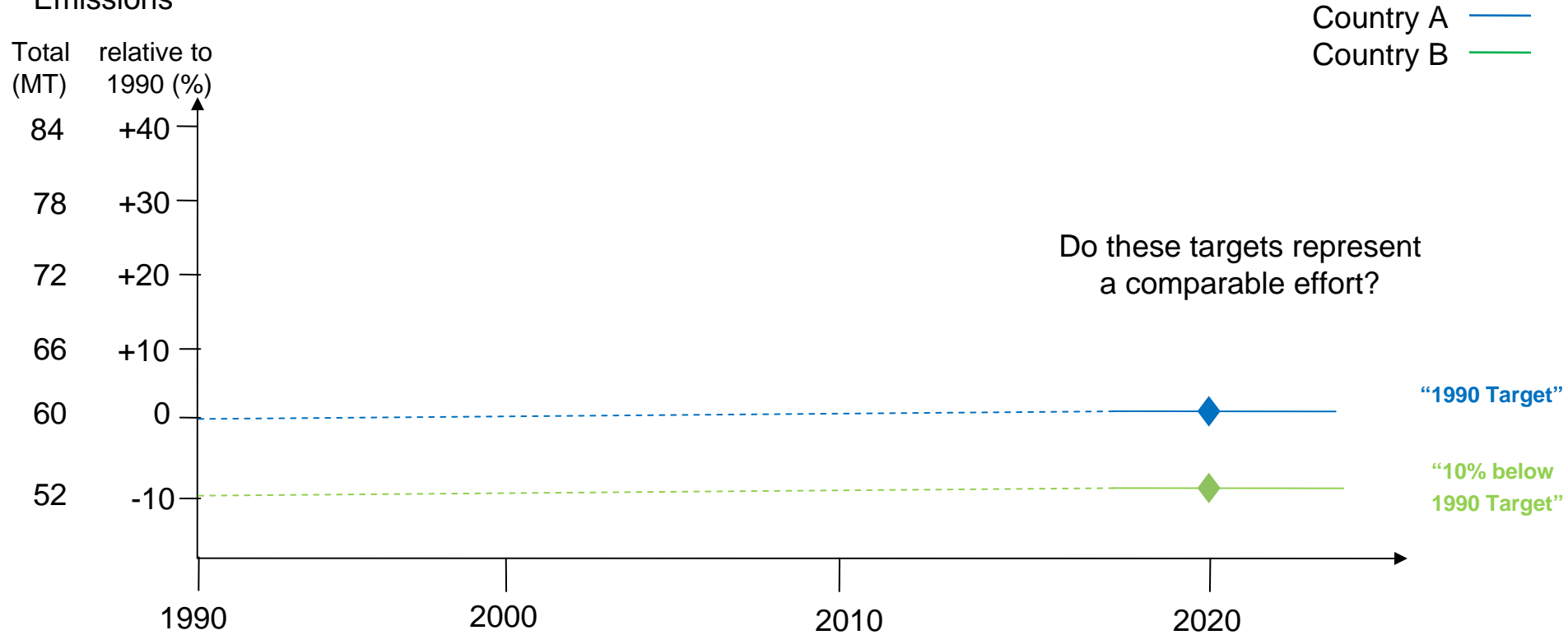
Estimating the costs faced by a country

- The cost that a country will face in meeting a target is a function of:
 1. BAU emission projections during the commitment period
 - Population/GDP growth
 - Emission intensity
 2. Cost of reducing emissions below BAU
 - Structure of the economy – domestic emission profile and sectoral mitigation potential – “domestic MAC”



Assessing Comparable Effort (ACE) Framework

Emissions

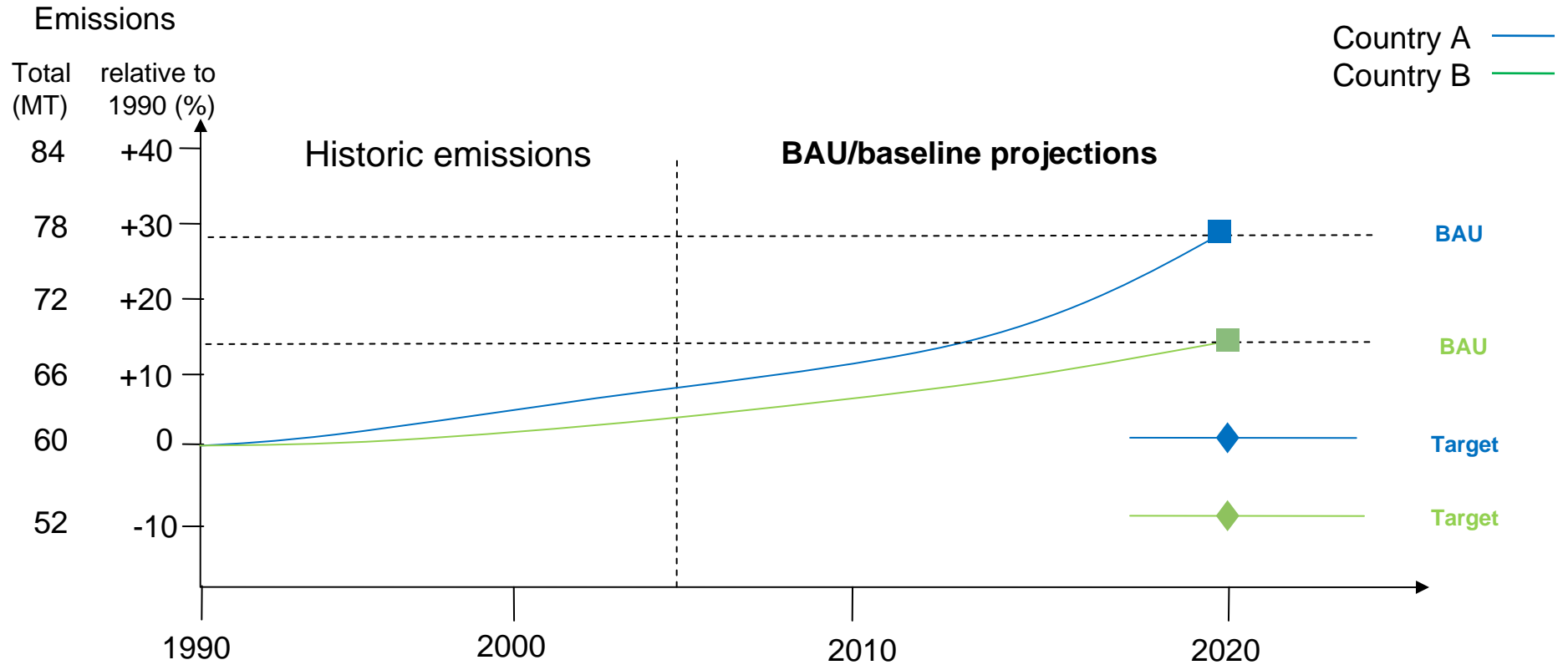


Assessing Comparable Effort (ACE) Framework

1. *Where are the countries BAU emissions in 2020?*



Assessing Comparable Effort (ACE) Framework



Assessing Comparable Effort (ACE) Framework

1. *Where are the countries BAU emissions in 2020?*

Country A

+30 % of 1990

Country B

+15% of 1990



Assessing Comparable Effort (ACE) Framework

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2. *What are the costs of meeting the target?*



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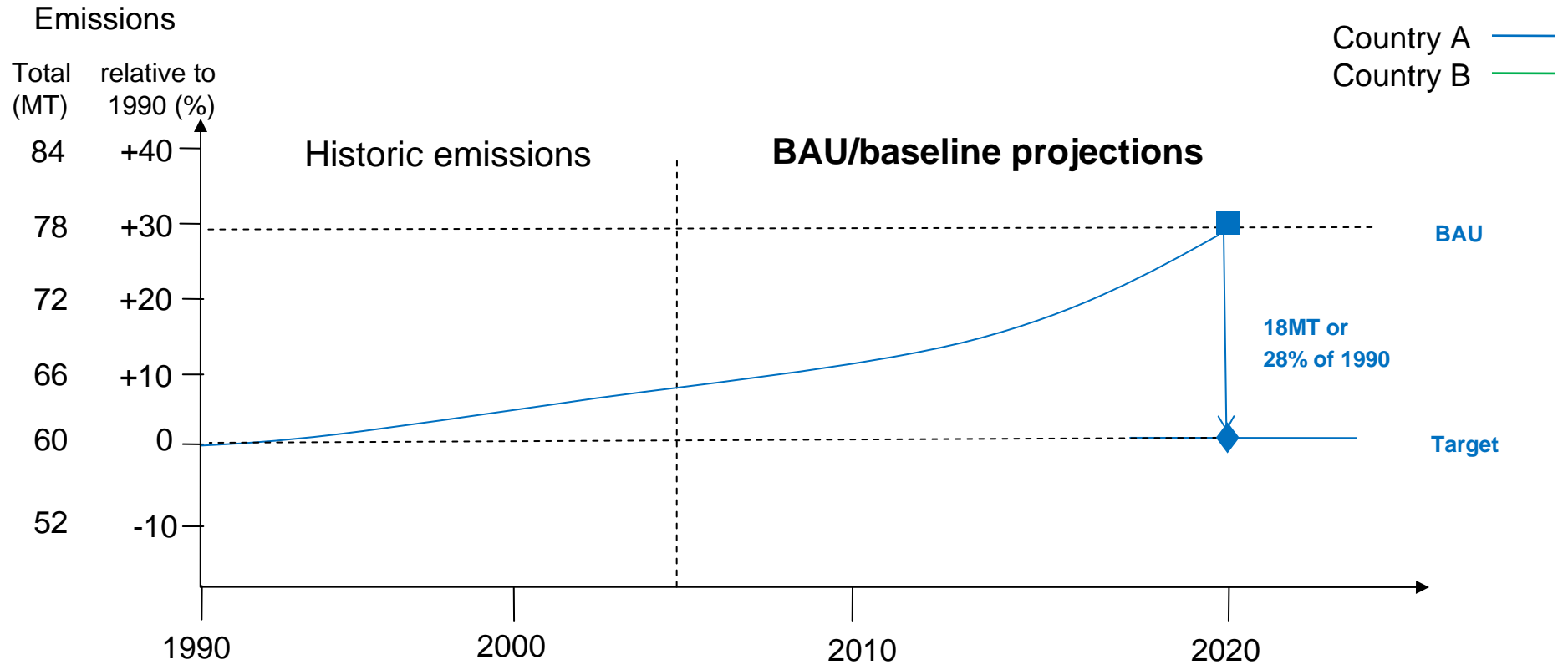
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2. *What are the costs of meeting the target?*

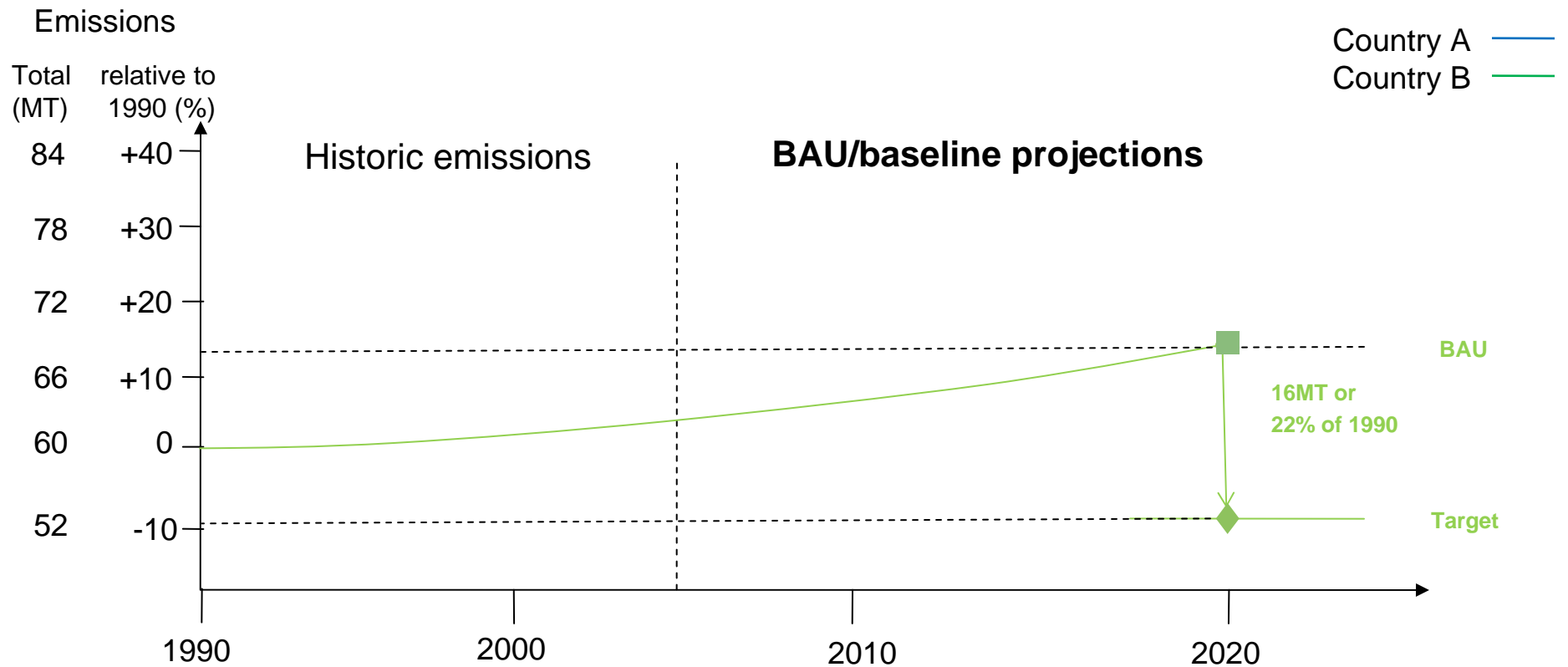
a) How many reductions are required?



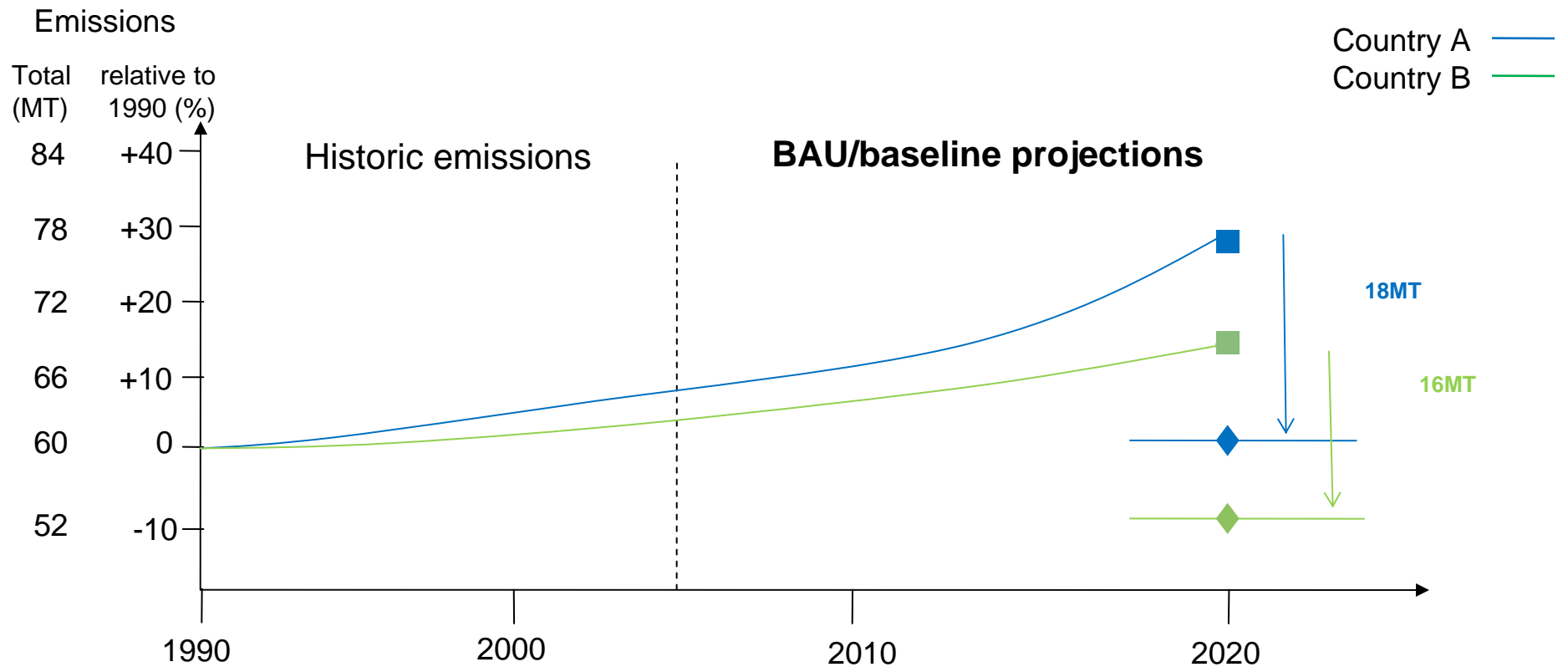
Assessing Comparable Effort (ACE) Framework



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Country A 18MT Country B 16MT



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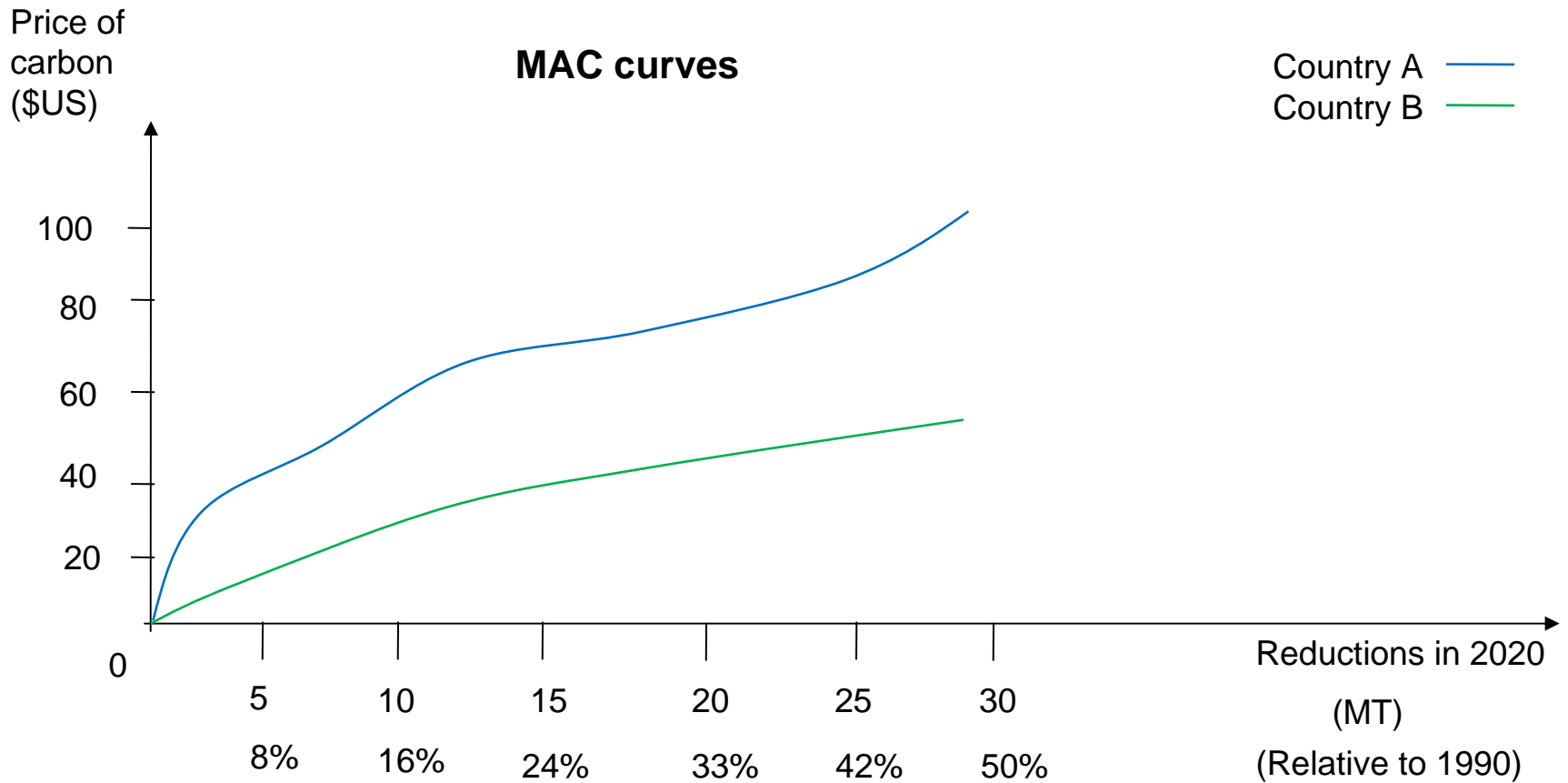
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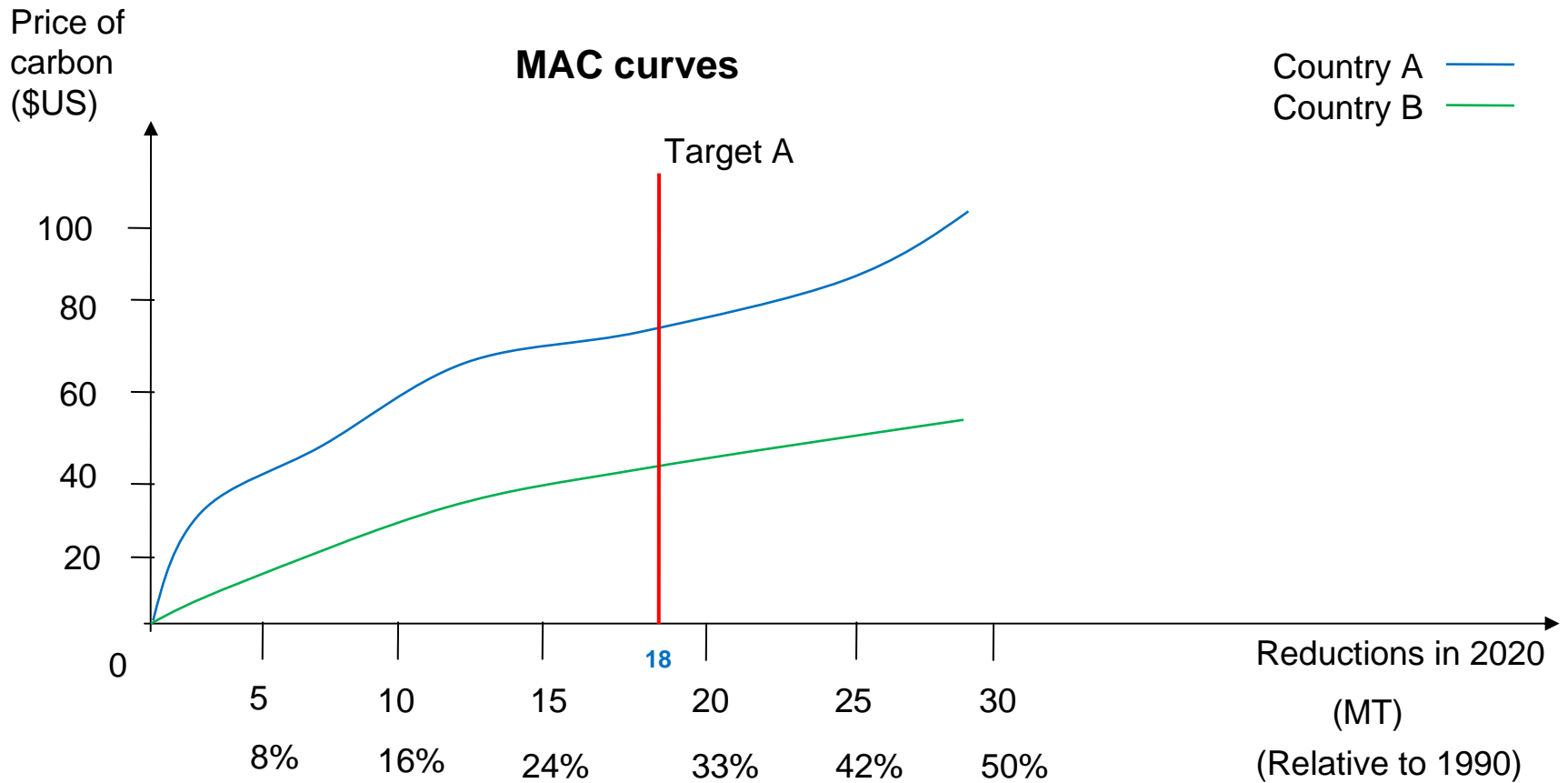
b) *How much does it cost to reduce these emissions?*



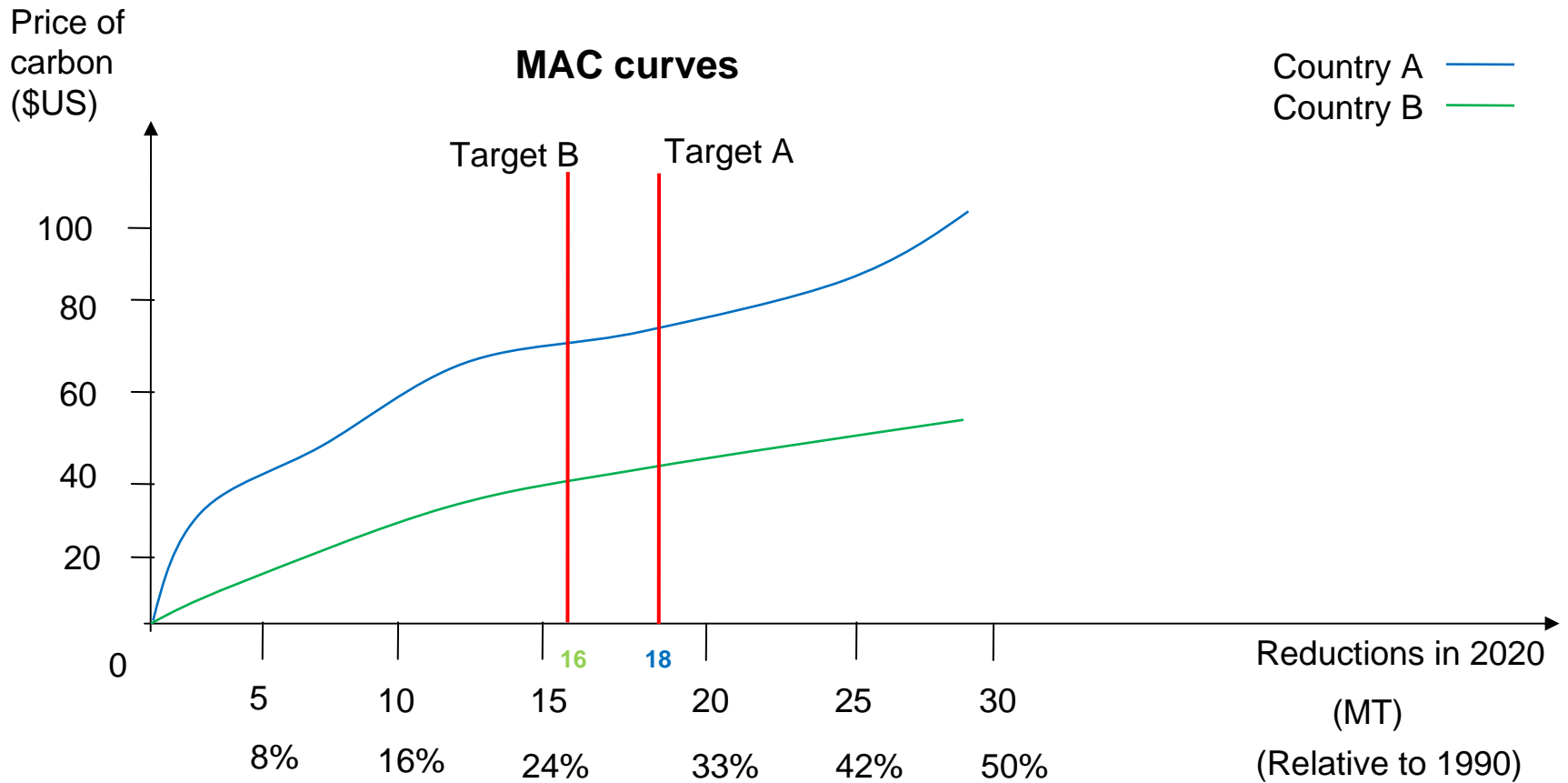
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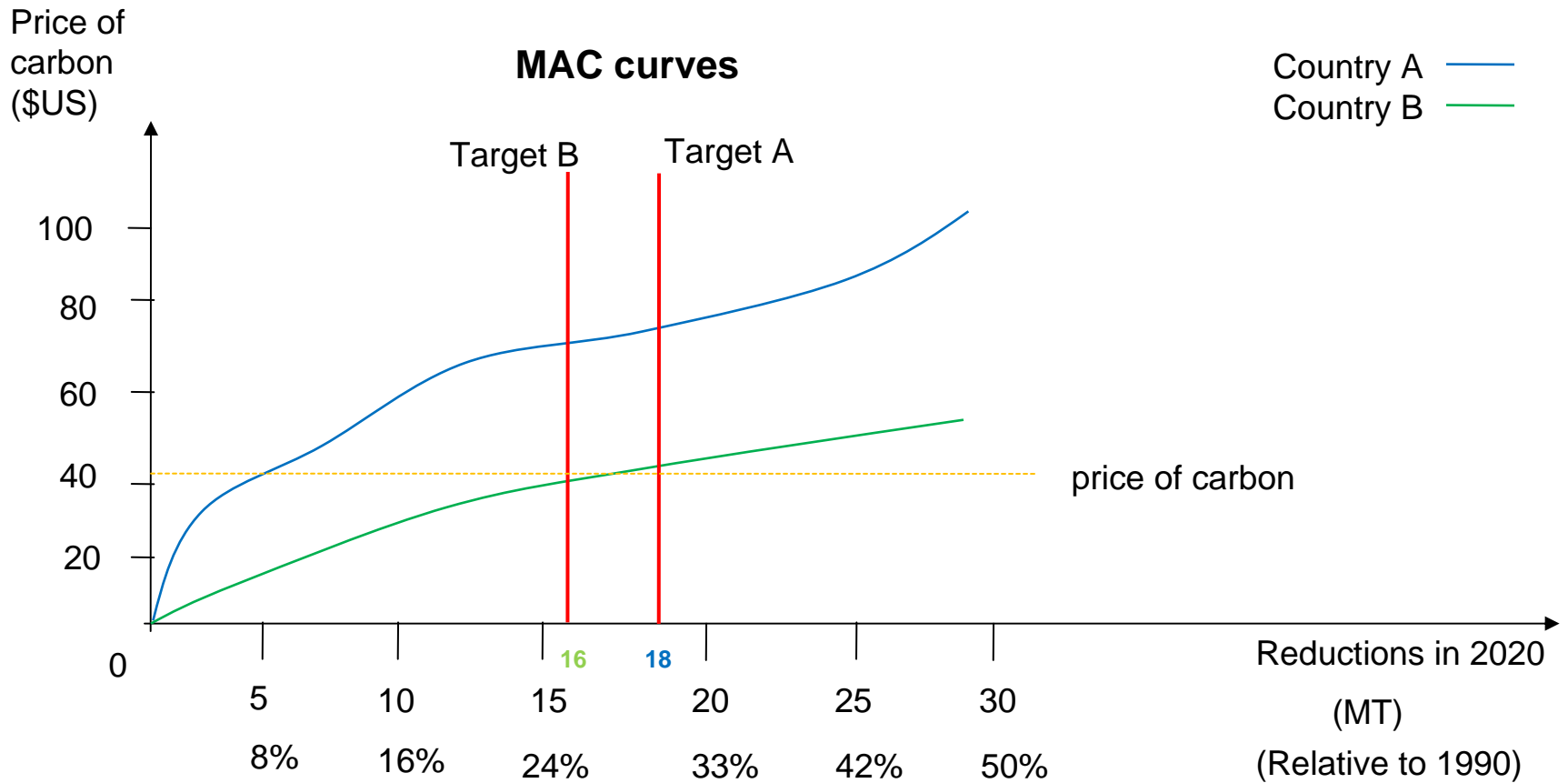
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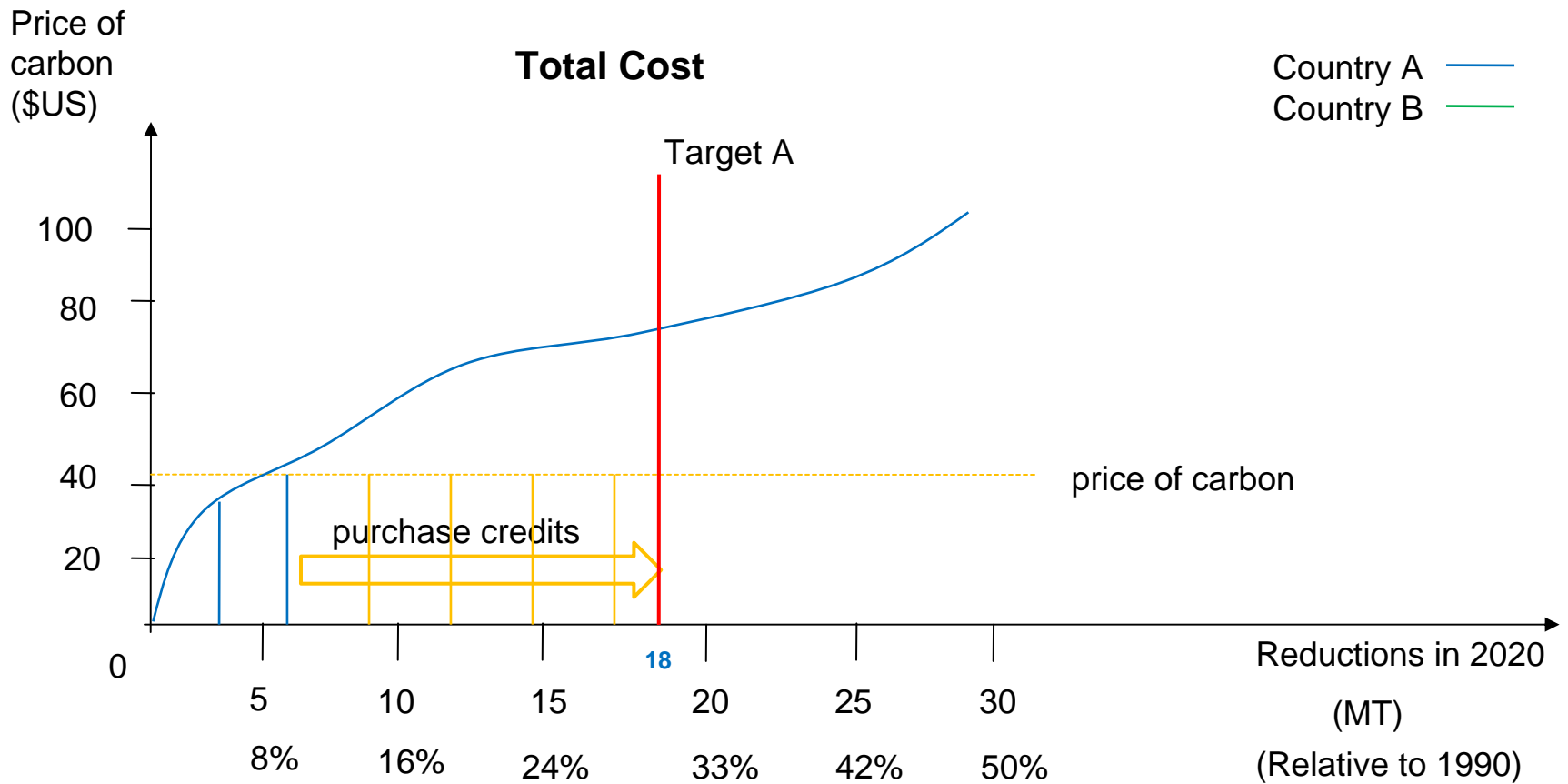
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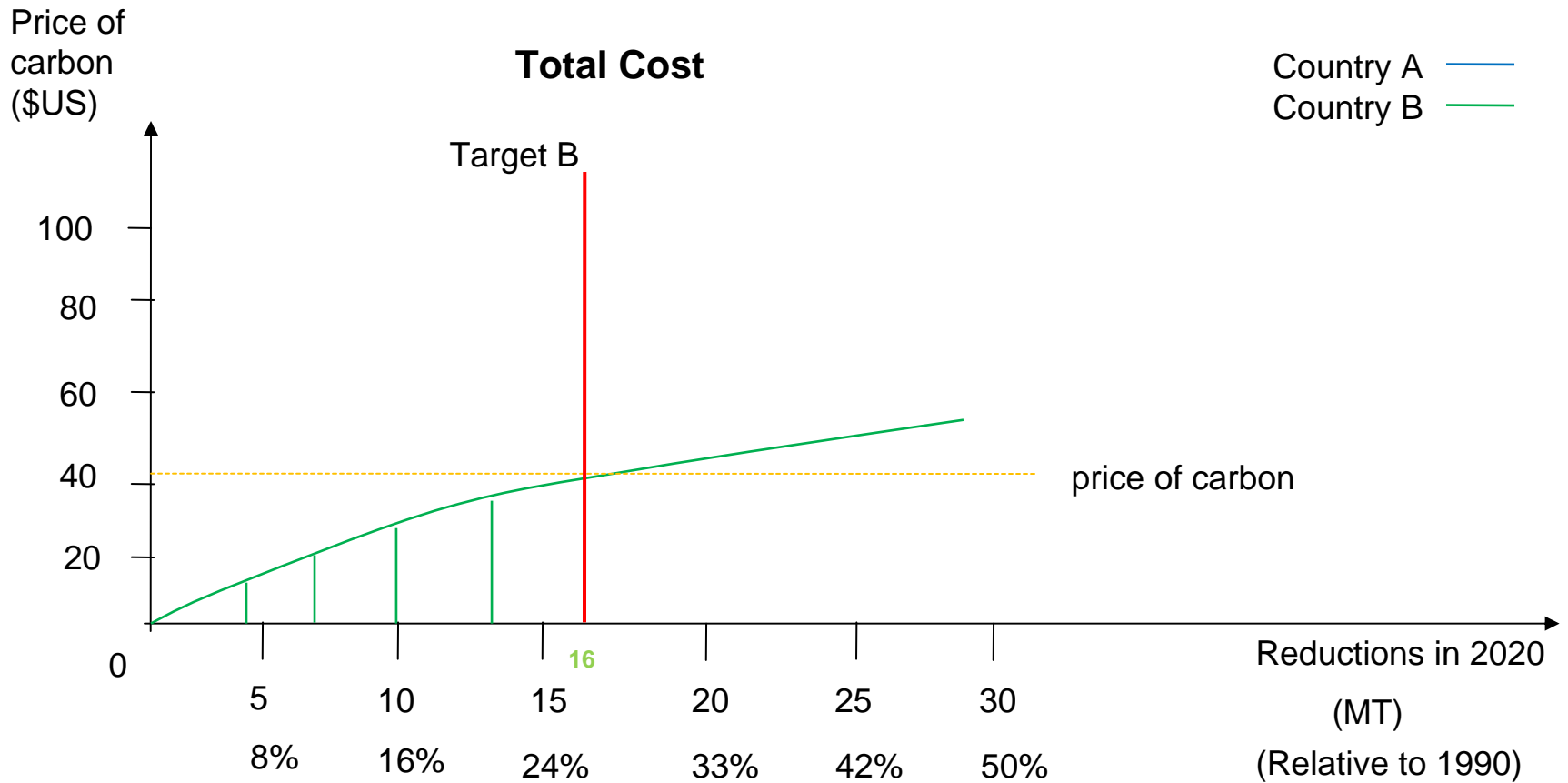
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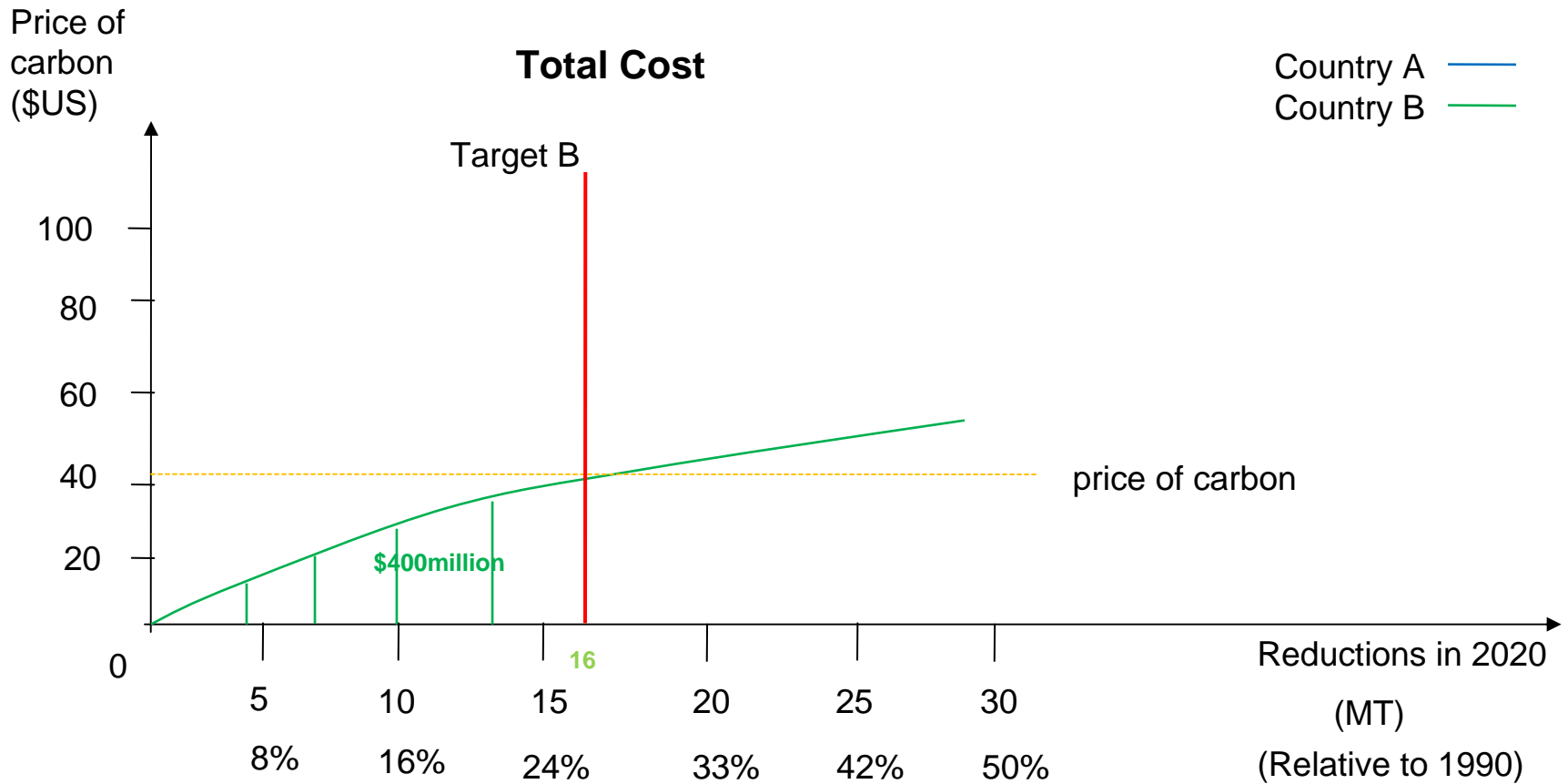
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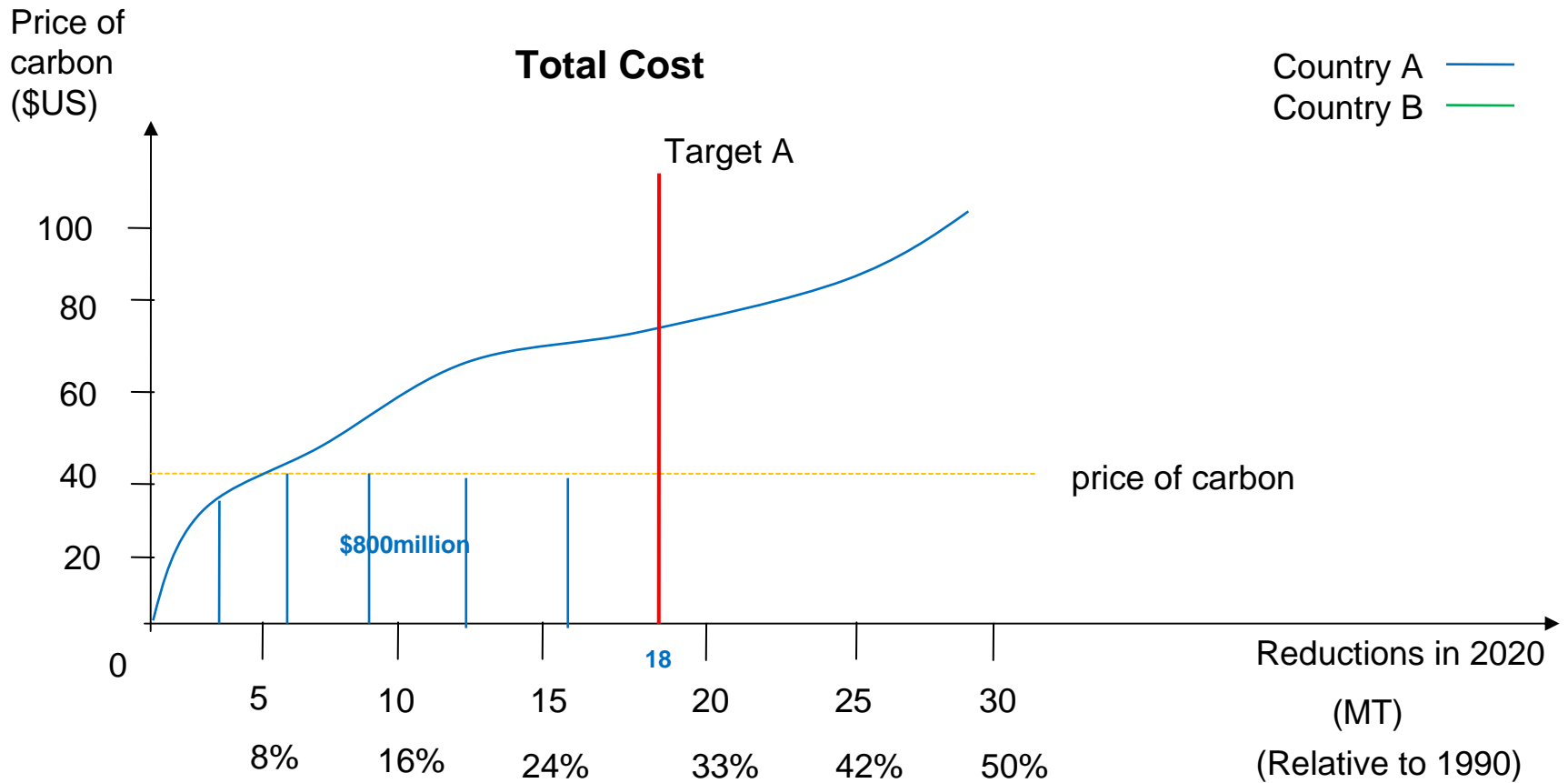
Assessing Comparable Effort (ACE) Framework



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Assessing Comparable Effort (ACE) Framework



Assessing Comparable Effort (ACE) Framework

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Country A +30 % of 1990 Country B +15% of 1990

2. *What are the costs of meeting the target?*

a) *How many reductions are required?*

Country A 18MT Country B 16MT

b) *How much does it cost to reduce these emissions?*

Country A \$800m Country B \$400m



Assessing Comparable Effort (ACE) Framework

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Country B \$400m
GDP \$500b



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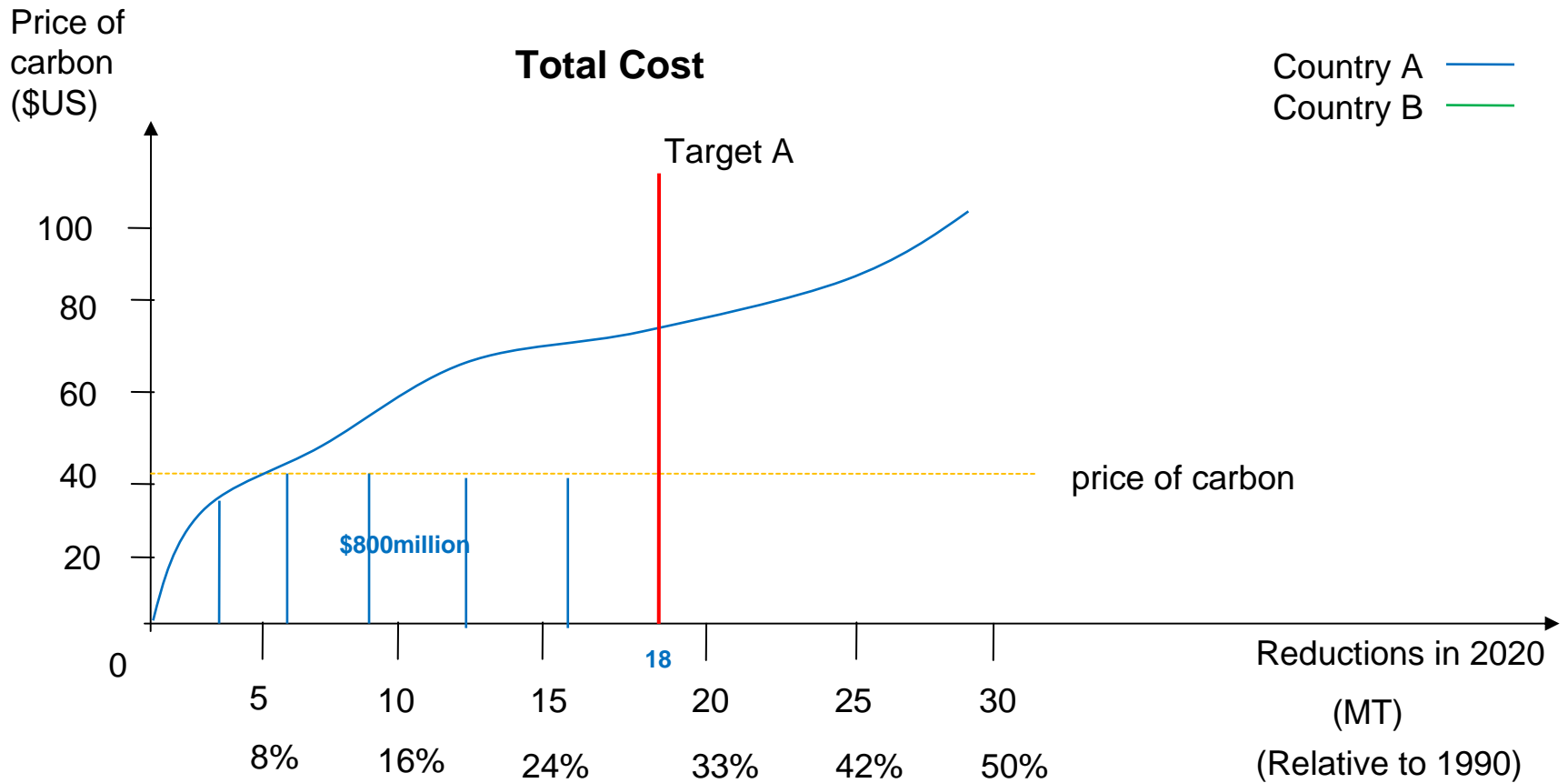
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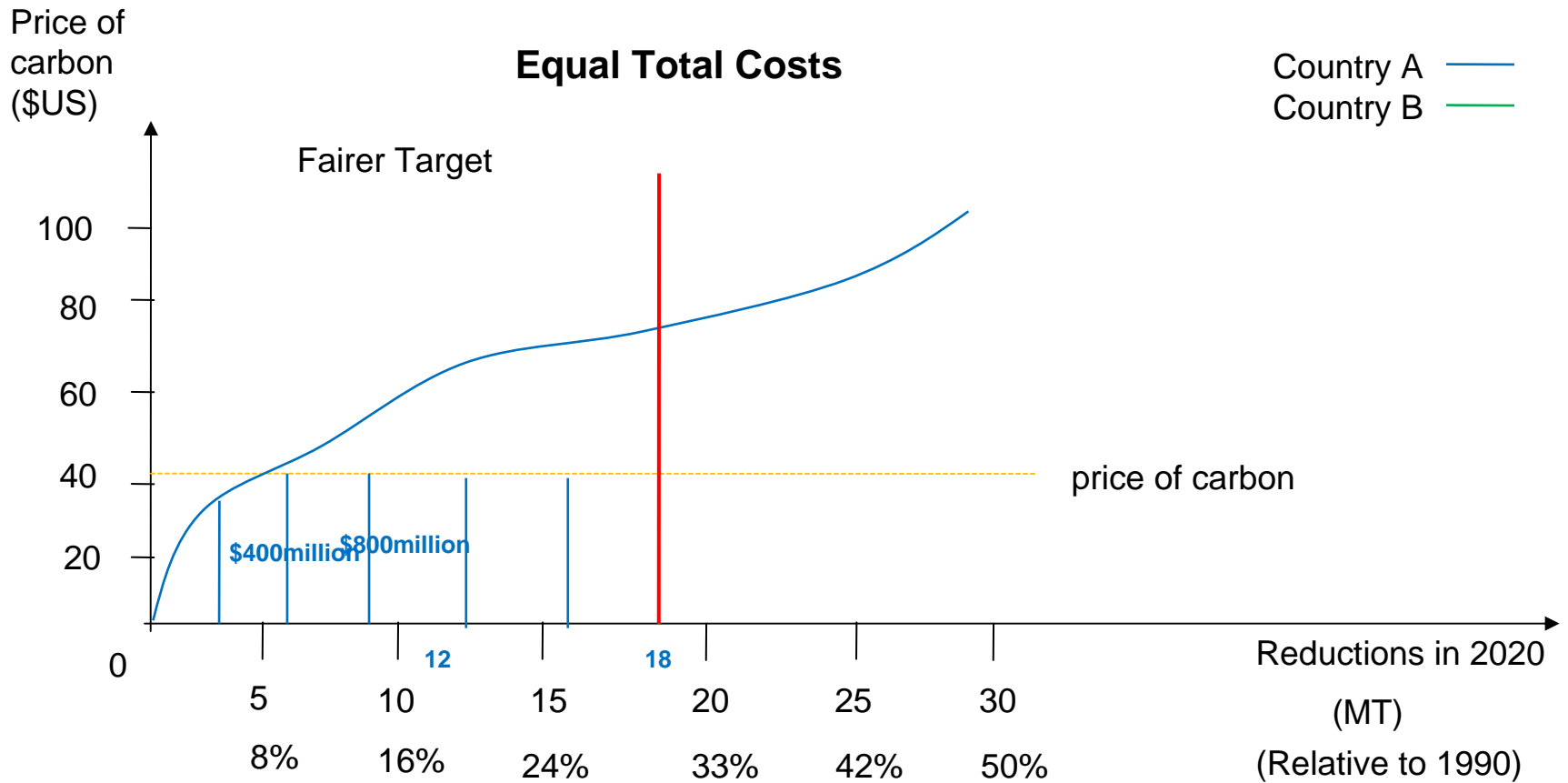
Country A	\$800m	Country B	\$400m
GDP \$500b	0.16% of GDP	GDP \$500b	0.08% of GDP



Assessing Comparable Effort (ACE) Framework



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? MT

Country B

16MT

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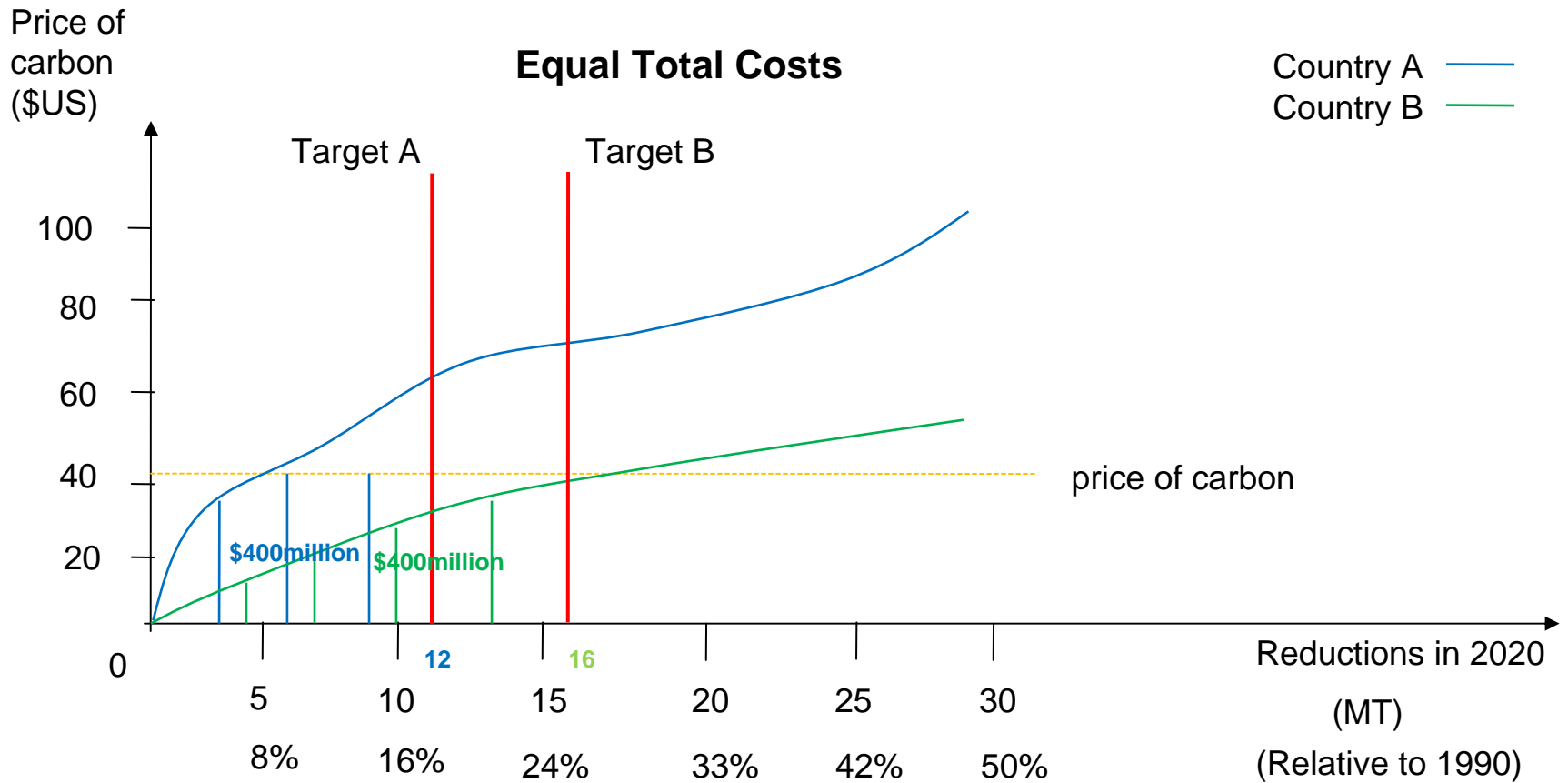
Country A 12MT Country B 16MT

b) *How much does it cost to reduce these emissions?*

Country A \$400m Country B \$400m
GDP \$500b GDP \$500b
0.08% of GDP 0.08% of GDP

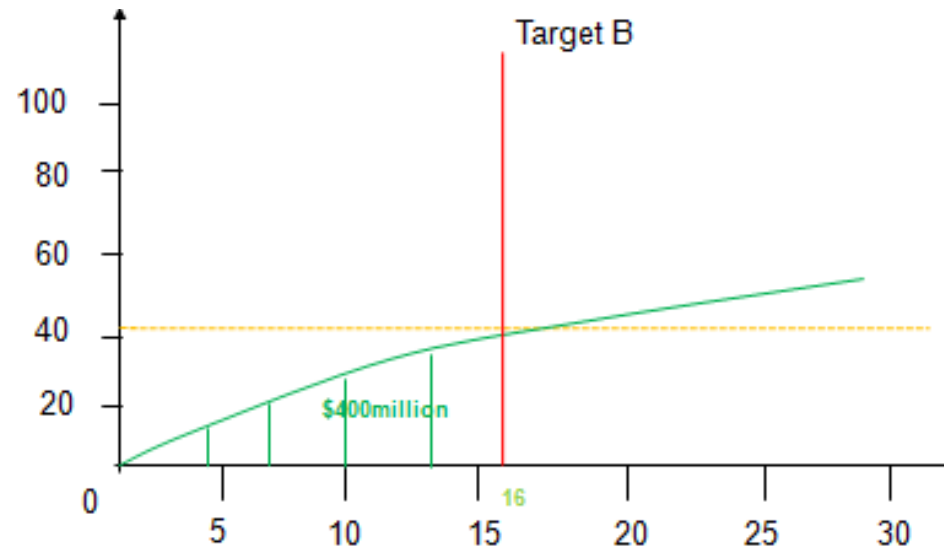
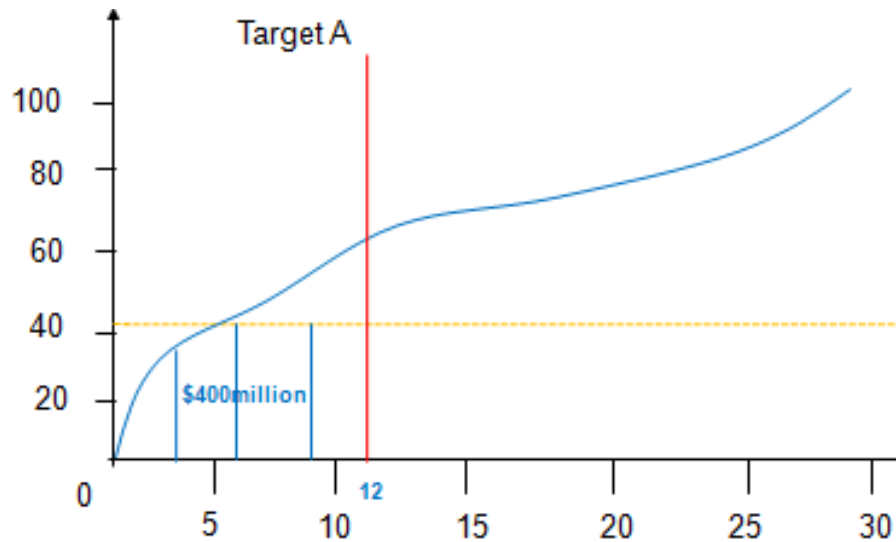


Assessing Comparable Effort (ACE) Framework



Assessing Comparable Effort (ACE) Framework

Equal areas = Equal total costs



Assessing Comparable Effort (ACE) Framework

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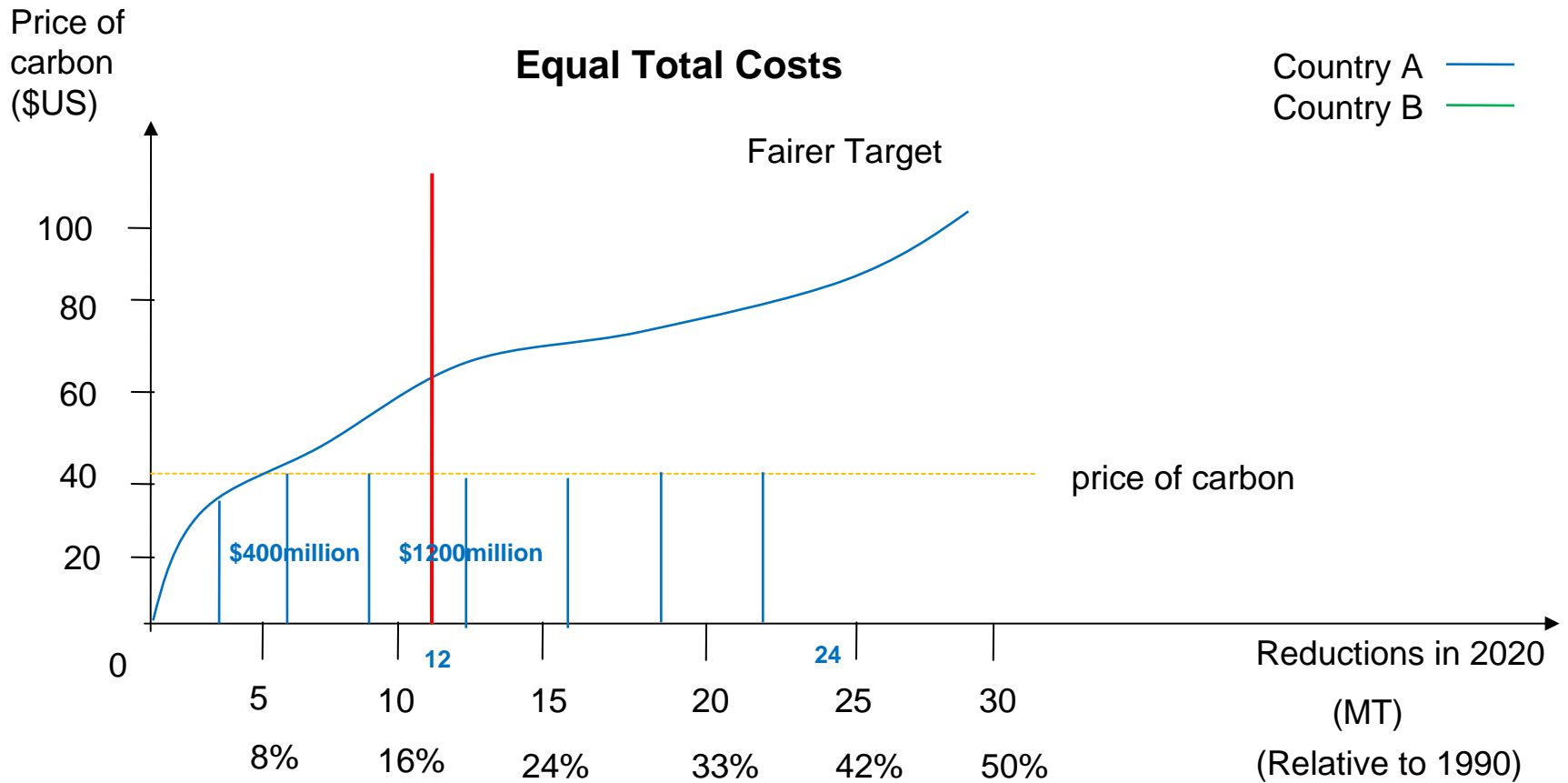
Country A ? MT Country B 16MT

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Country A	\$1200m	Country B	\$400m
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Assessing Comparable Effort (ACE) Framework



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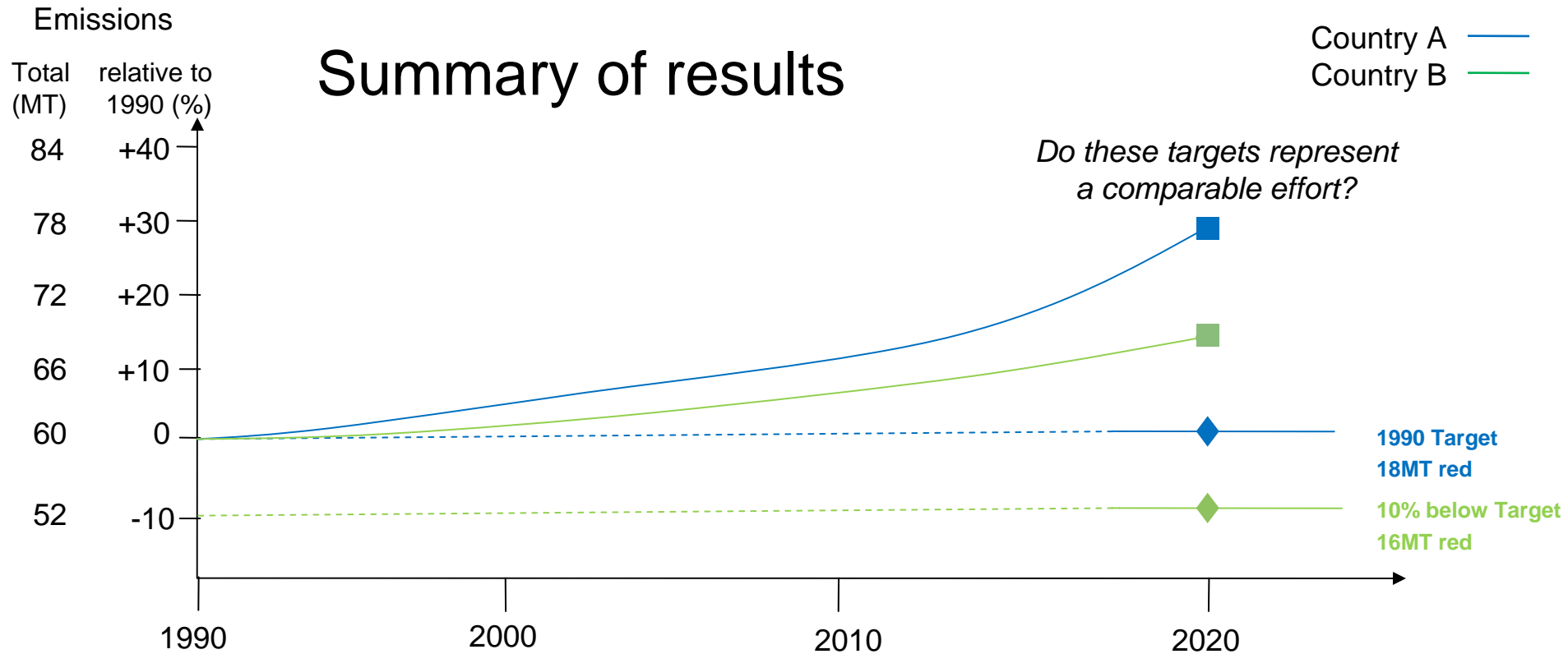
Country A 24 MT Country B 16MT

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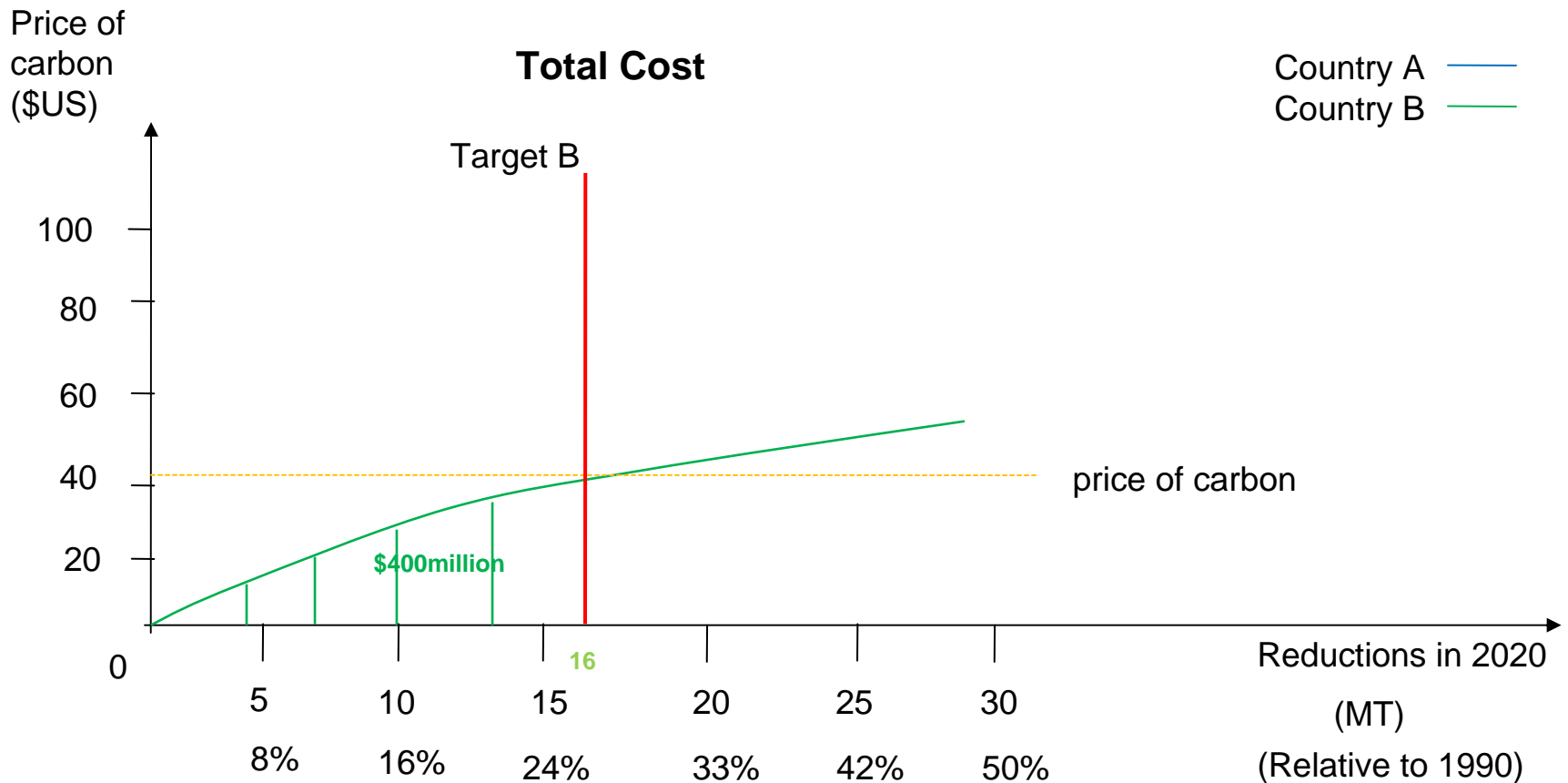
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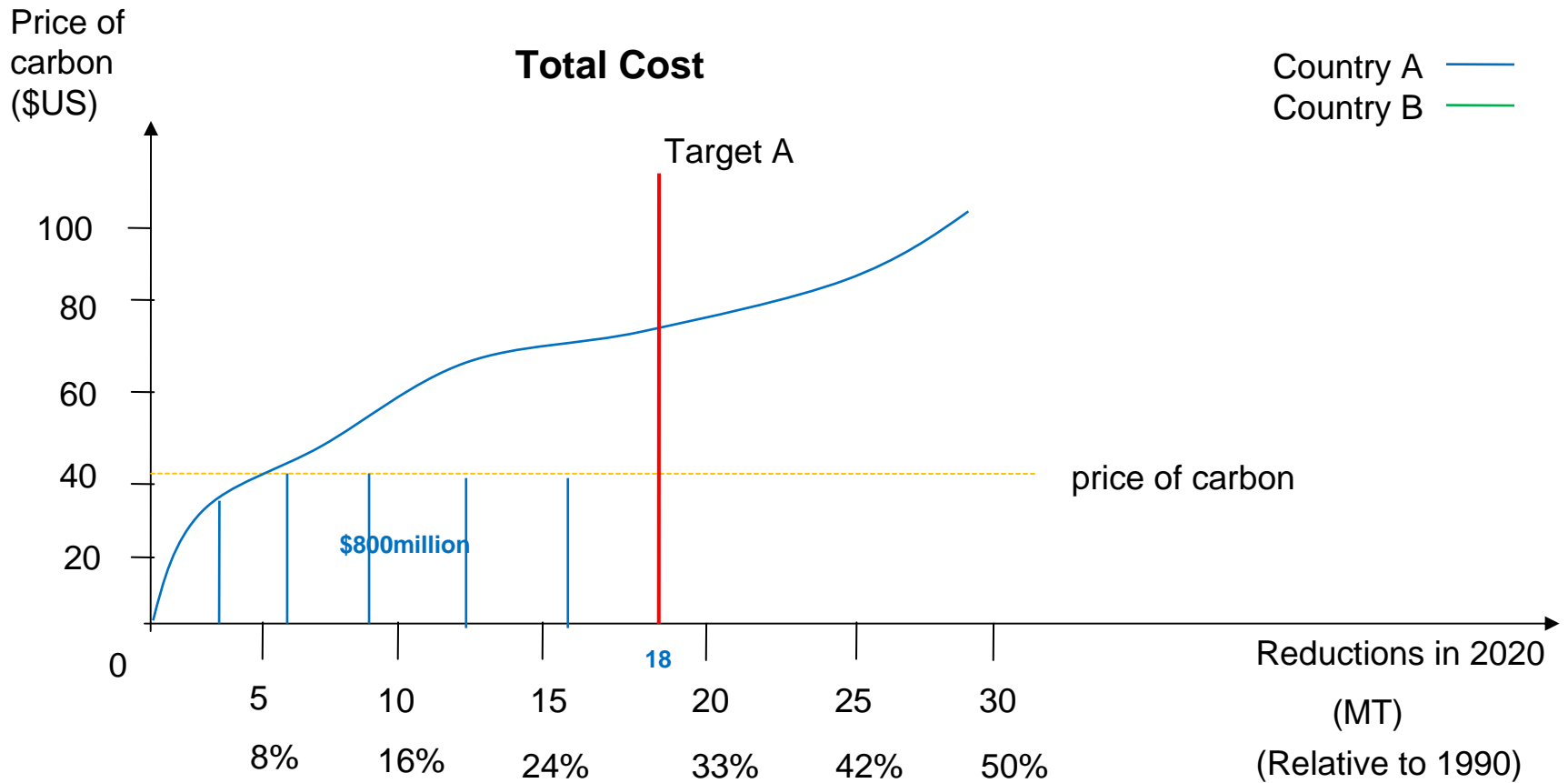
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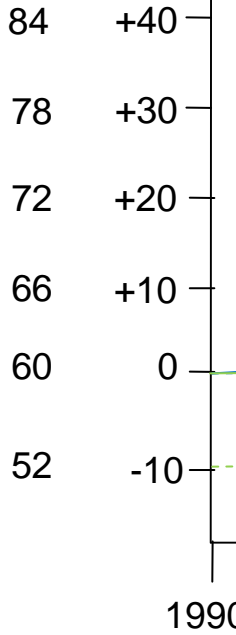


Assessing Comparable Effort (ACE) Framework

Emissions

Country A —
Country B —

Total (MT) relative to 1990 (%)



Country A	\$800m	Country B	\$400m
GDP \$500b	0.16%	GDP 500b	0.08%

Do these targets represent a comparable effort?

NO

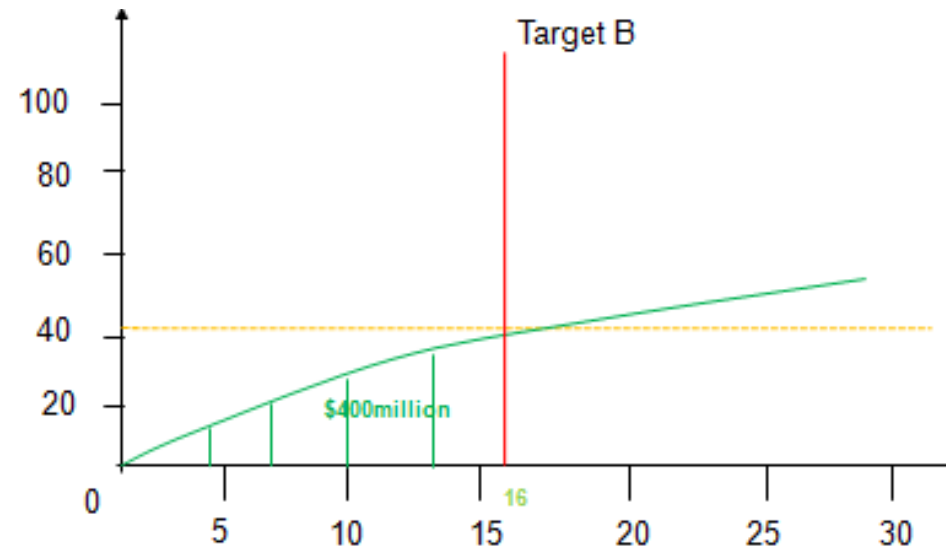
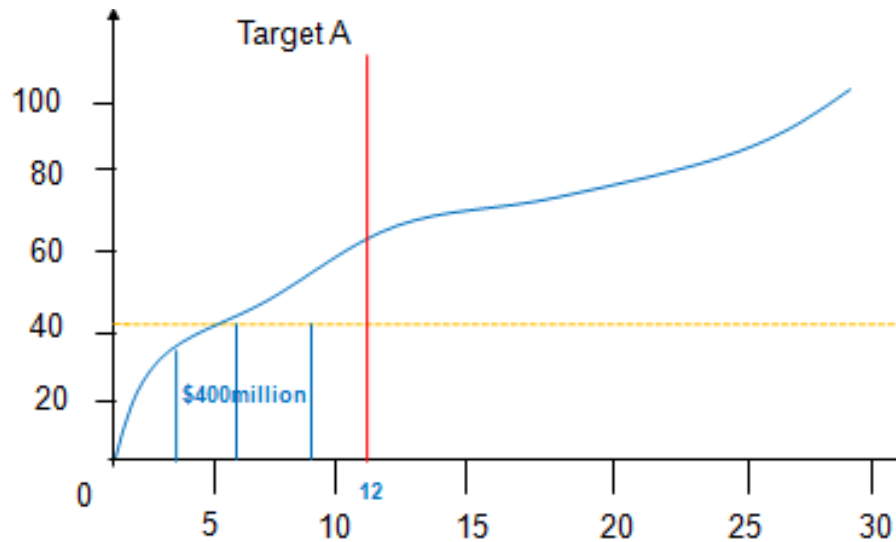
1990 Target
18MT red

10% below Target
16MT red



Assessing Comparable Effort (ACE) Framework

Equal areas = Equal total costs



Assessing Comparable Effort (ACE) Framework

Emissions

Total (MT) relative to 1990 (%)

84 +40
78 +30
72 +20
66 +10
60 0
52 -10

Fairer targets

Country A —
Country B —

Target 12MT red
Target 18MT red
Target 16MT red

1990

2000

2010

2020



Assessing Comparable Effort (ACE) Framework

Emissions

Total (MT) relative to 1990 (%)

84 +40
78 +30
72 +20
66 +10
60 0
52 -10

Fairer targets

Country A	\$400m	Country B	\$400m
GDP \$500b	0.08%	GDP \$500b	0.08%

Country A —
Country B —

Target
12MT red

Target
16MT red

1990

2000

2010

2020



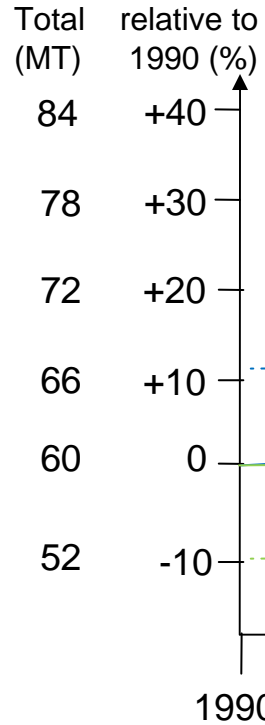
Assessing Comparable Effort (ACE) Framework

Emissions

Country A —
Country B —

Fairer targets

Country A	\$1200m	Country B	\$400m
GDP \$1500b	0.08%	GDP \$500b	0.08%

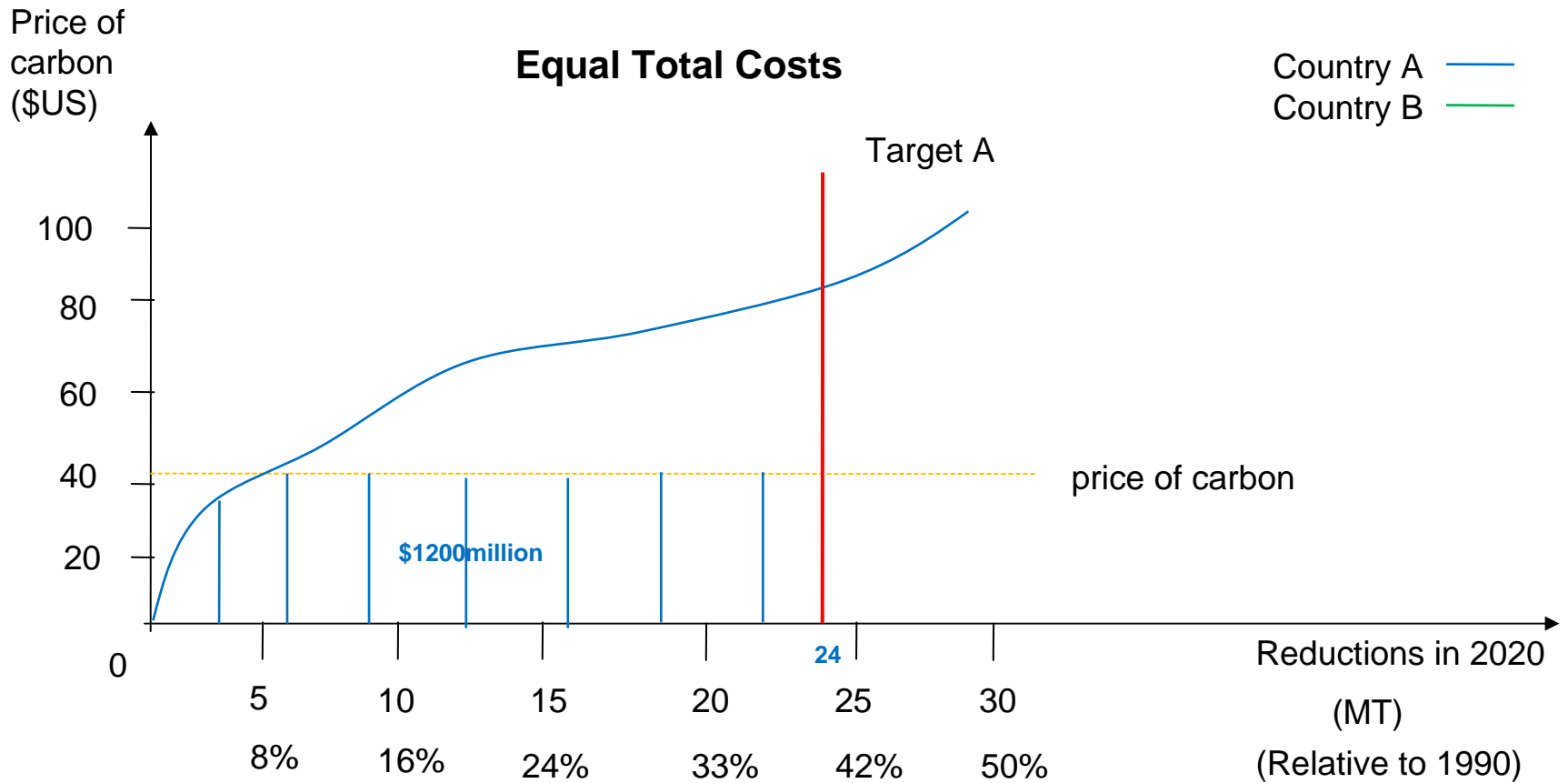


? — Target
MT red

— Target
16MT red



Assessing Comparable Effort (ACE) Framework



Assessing Comparable Effort (ACE) Framework

Emissions

Total (MT) relative to 1990 (%)

84 +40
78 +30
72 +20
66 +10
60 0
52 -10

Fairer targets

Country A	\$1200m	Country B	
\$400m			
GDP \$500b	0.08%	GDP \$500b	0.08%

Country A —
Country B —

24MT red

Target = -6%

Target = -10%

1990

2000

2010

2020



Assessing Comparable Effort (ACE) Framework

Sharing the costs equally between countries is a useful start

However, CBDR&RC has a broader meaning of equity

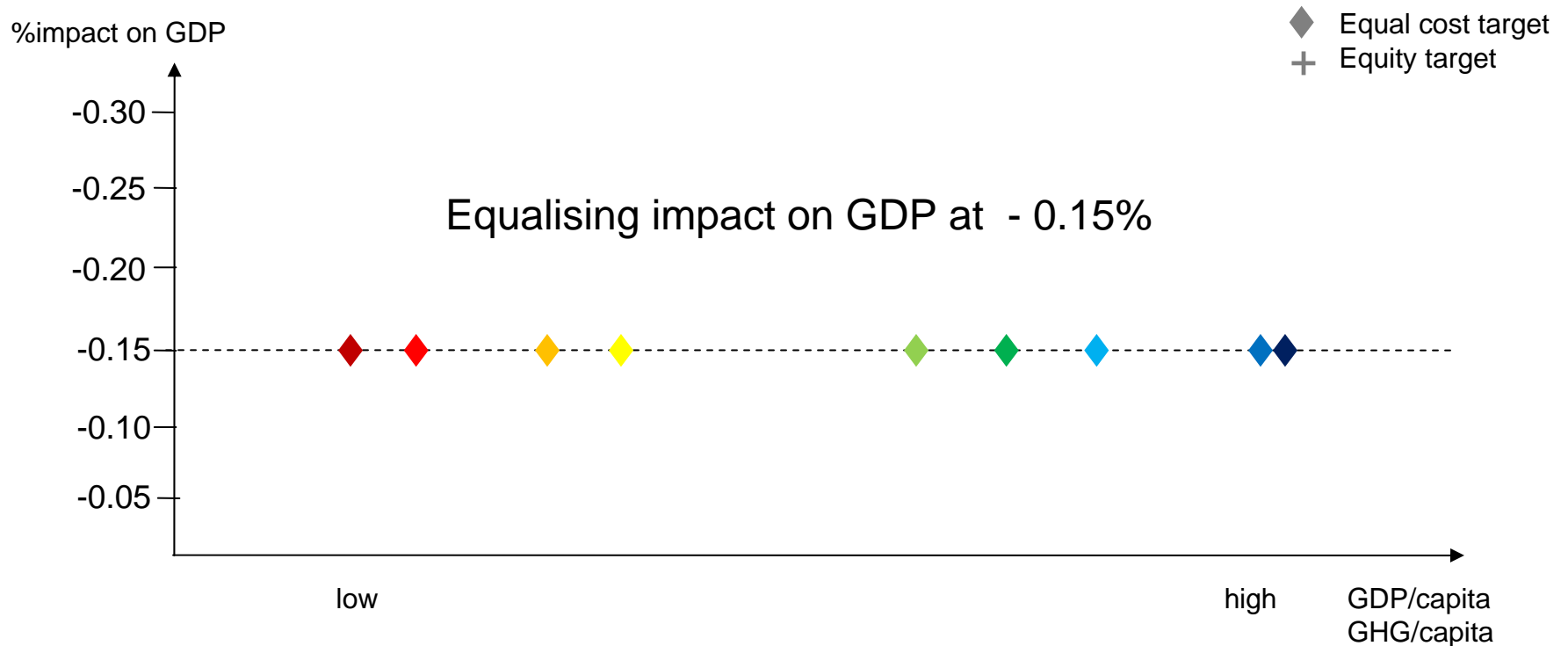
GDP/capita could be taken into account – it is widely agreed that those with higher incomes should pay a relatively greater share

GHG/capita - correlated with GDP/capita, but with an emissions focus ensures responsibility for reducing *emissions* is explicit



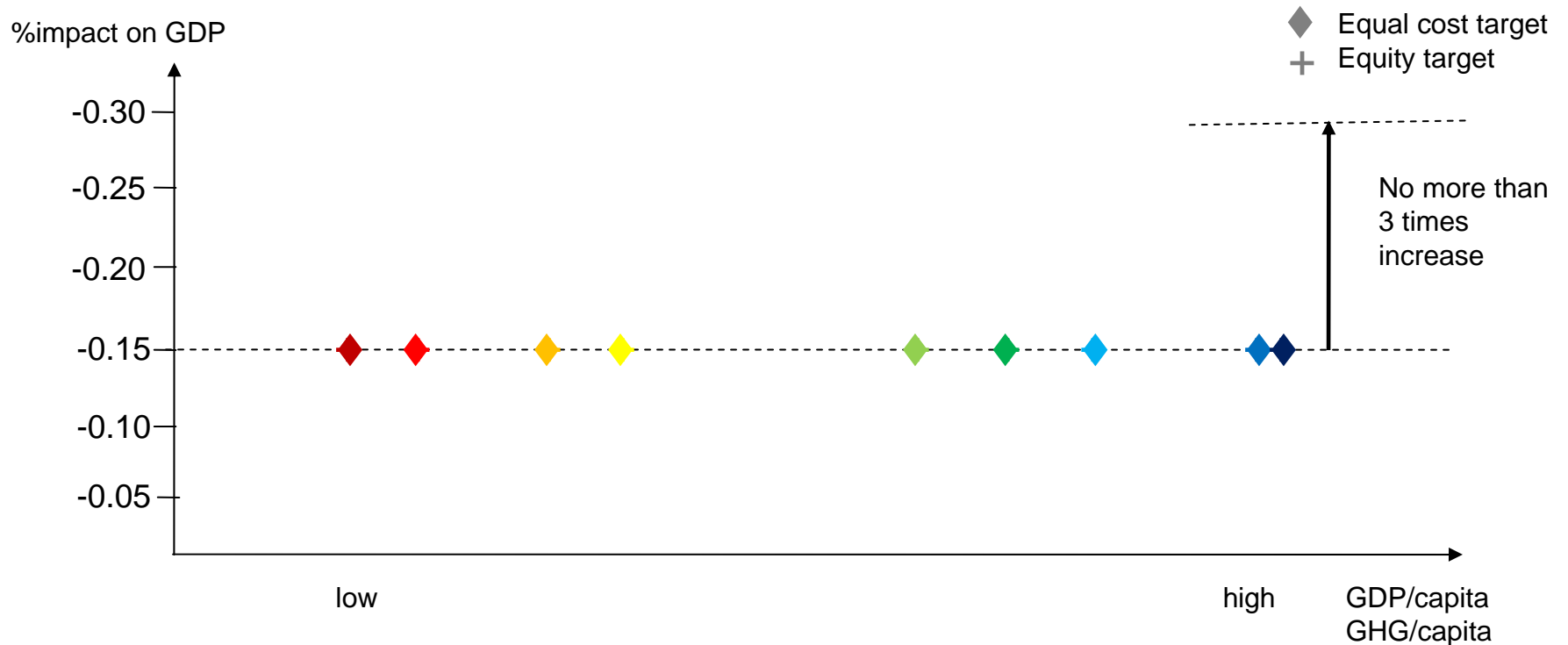
Assessing Comparable Effort (ACE) Framework

Integrating the equity criteria of GDP/capita and GHG/capita



Assessing Comparable Effort (ACE) Framework

3: Equity Variance



Assessing Comparable Effort (ACE) Framework

Conclusions



Assessing Comparable Effort (ACE) Framework

Conclusions

- 1) Baseline emissions, relative to the base year, are a key input into determining a fair target: *higher population and economic growth = less reductions relative to base year*



Assessing Comparable Effort (ACE) Framework

Conclusions

- 1) Baseline emissions, relative to the base year, are a key input into determining a fair target: *higher population and economic growth = less reductions relative to base year*
- 2) The structure of an economy and domestic emissions profile are also important: *more efficient = less reductions*



Assessing Comparable Effort (ACE) Framework

Conclusions

- 1) Baseline emissions, relative to the base year, are a key input into determining a fair target: *higher population and economic growth = less reductions relative to base year*
- 2) The structure of an economy and domestic emissions profile are also important: *more efficient = less reductions*
- 3) Capability and responsibility need to also be taken into account: *higher GHG or GDP/capita = more reductions*



Assessing Comparable Effort Interactive Support Tool (ACE – IST)



Assessing Comparable Effort - Interactive Support Tool (ACE-IST)

Baseyear 1990

A In

B In

C In

D In

E In

F In

G In

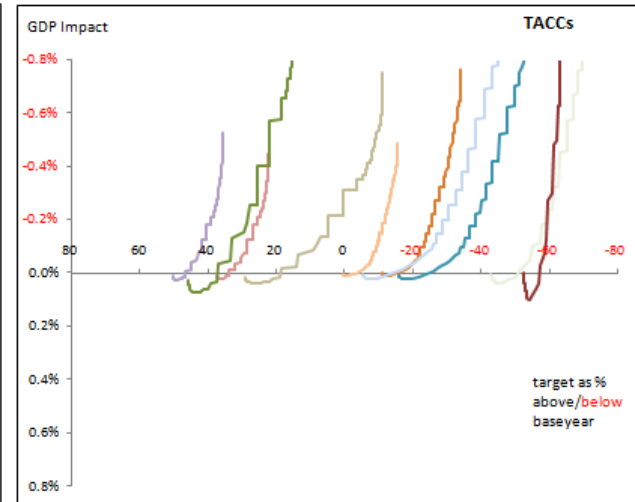
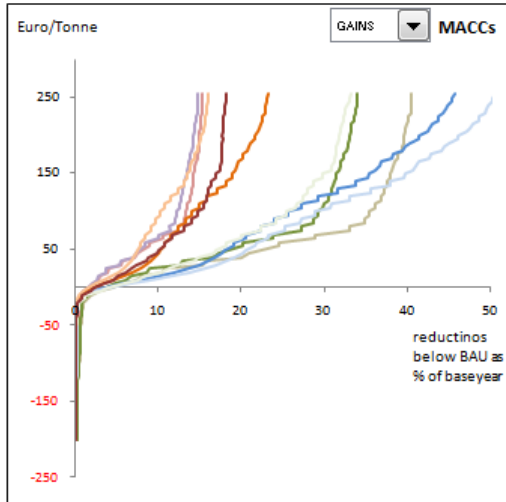
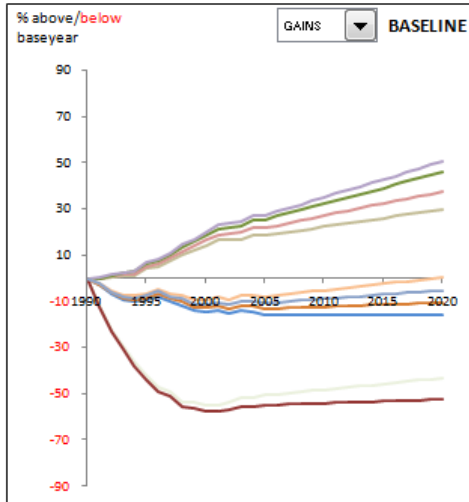
H In

I In

J In

ALL In

C Price (€) No trade



Calculate targets

Cost as %GDP 0.20%

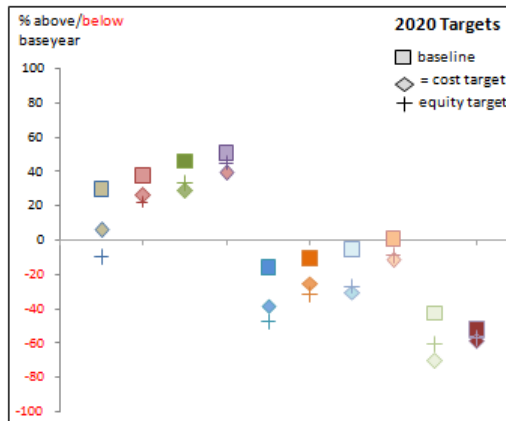
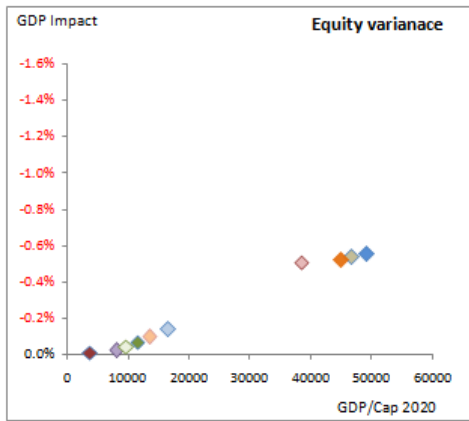
A Solve

Annex 1

Equity

GDP/Cap 2020

2015 2006

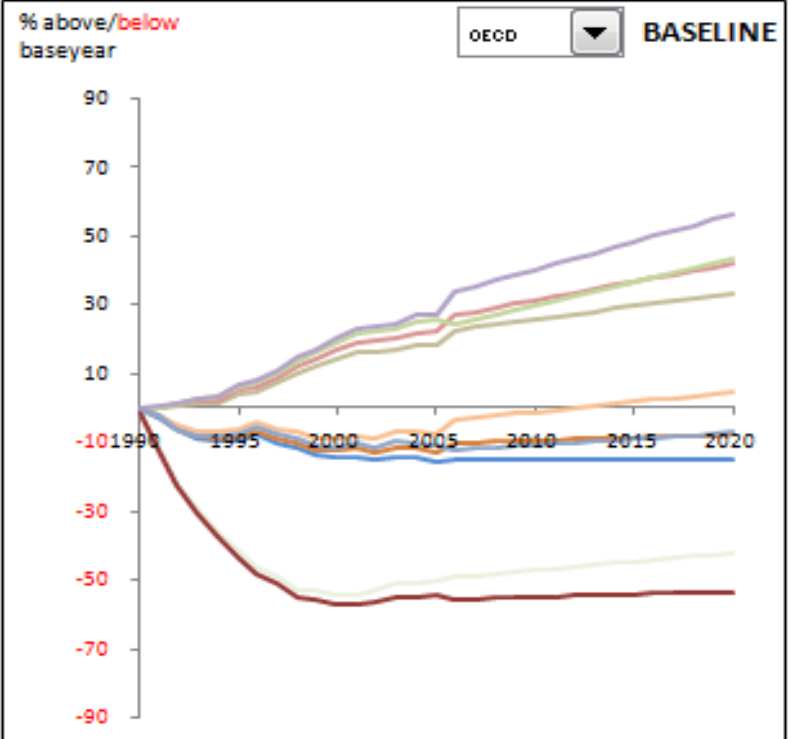
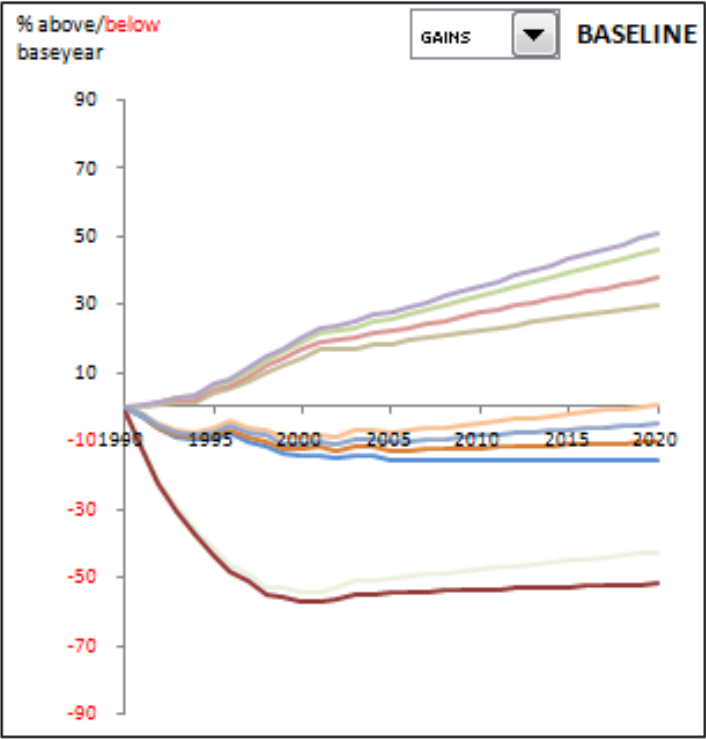


PARTY	2020 Target	percapita	% GDP	2015 Target
A	-10%	-30%	-0.54%	-0%
B	22%	-11%	-0.51%	22%
C	33%	-9%	-0.07%	31%
D	45%	-4%	-0.03%	39%
E	-48%	-38%	-0.55%	-37%
F	-32%	-24%	-0.52%	-26%
G	-27%	-23%	-0.14%	-21%
H	-9%	-10%	-0.10%	-9%
I	-61%	-32%	-0.04%	-57%
J	-57%	-10%	-0.01%	-56%
TOTAL	-25%			-20%

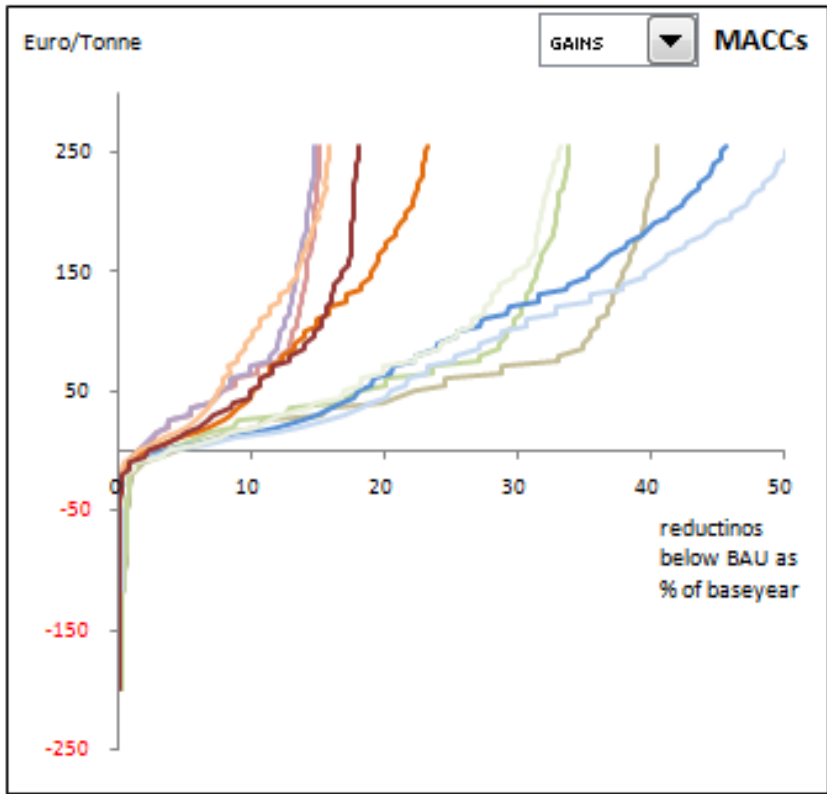


ACE-IST: Baseline

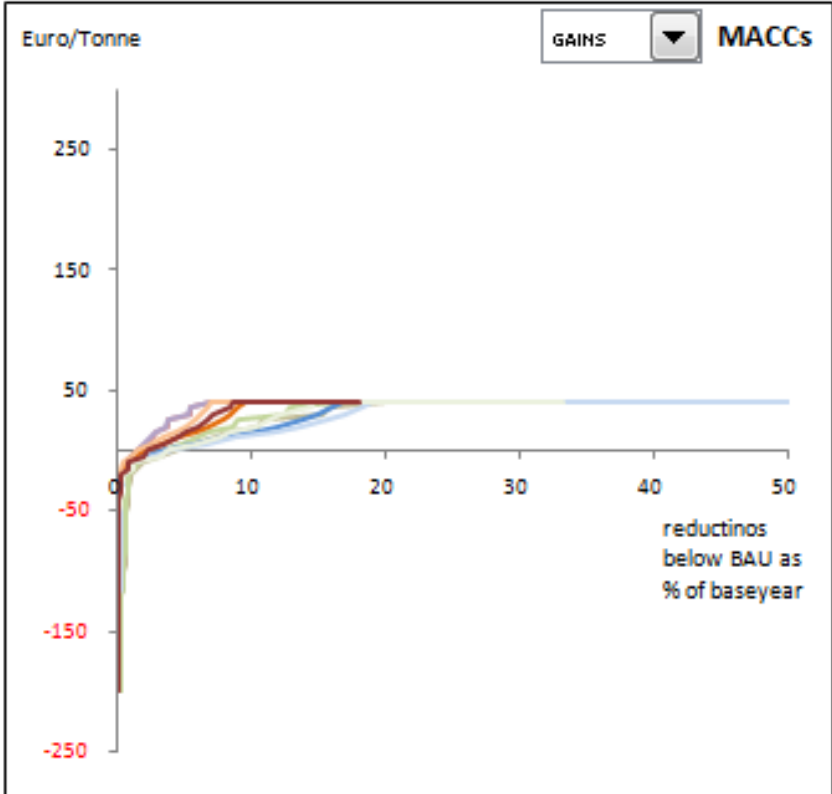
Baseyear	1990	▼
A	In	▼
B	In	▼
C	In	▼
D	In	▼
E	In	▼
F	In	▼
G	In	▼
H	In	▼
I	In	▼
J	In	▼
ALL	In	▼



ACE-IST: Marginal Abatement Cost Curves



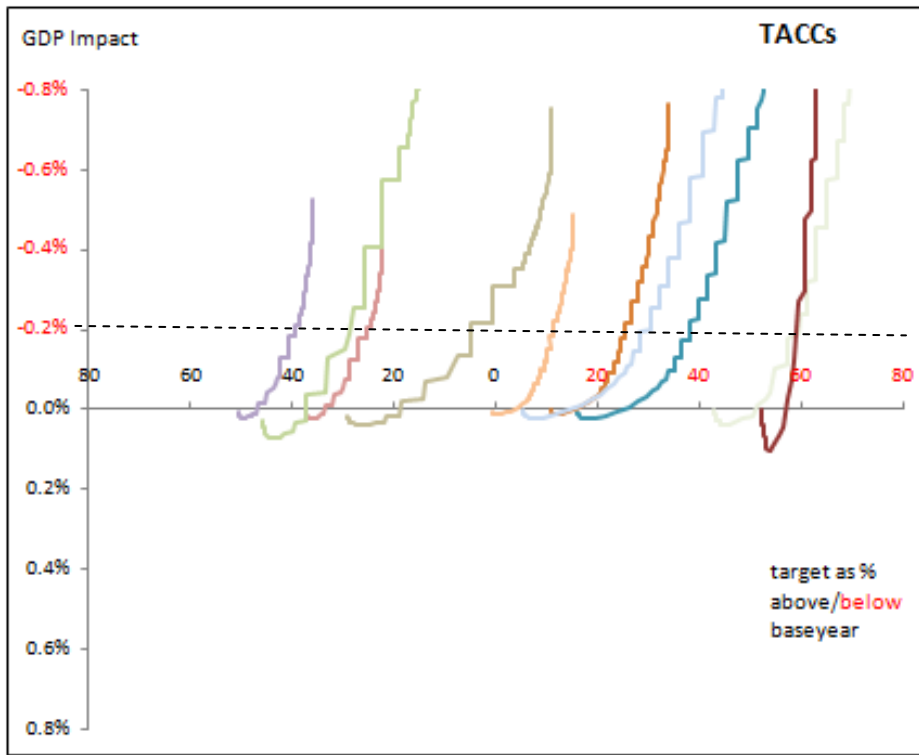
C Price (€) No trade ▼



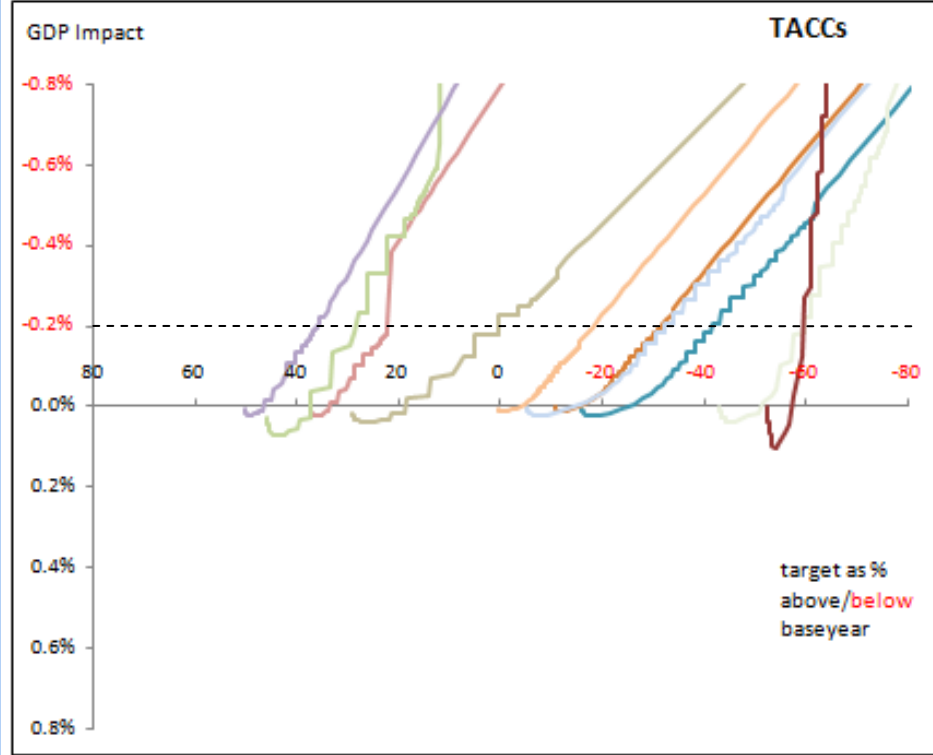
C Price (€) 40 ▼



ACE-IST: Total Abatement Cost relative to GDP



C Price (€) No trade ▼



C Price (€) 40 ▼



ACE-IST: Results

PARTY		2020 Target	percapita	% GDP	2015 Target
A	<input type="checkbox"/> Fix	-10%	-30%	-0.54%	-0%
B	<input type="checkbox"/> Fix	22%	-11%	-0.51%	22%
C	<input type="checkbox"/> Fix	33%	-9%	-0.07%	31%
D	<input type="checkbox"/> Fix	45%	-4%	-0.03%	39%
E	<input type="checkbox"/> Fix	-48%	-38%	-0.55%	-37%
F	<input type="checkbox"/> Fix	-32%	-24%	-0.52%	-26%
G	<input type="checkbox"/> Fix	-27%	-23%	-0.14%	-21%
H	<input type="checkbox"/> Fix	-9%	-10%	-0.10%	-9%
I	<input type="checkbox"/> Fix	-61%	-32%	-0.04%	-57%
J	<input type="checkbox"/> Fix	-57%	-10%	-0.01%	-56%
TOTAL		-25%			-20%



ACE-IST: Results

Calculate targets

Cost as %GDP 0.20%

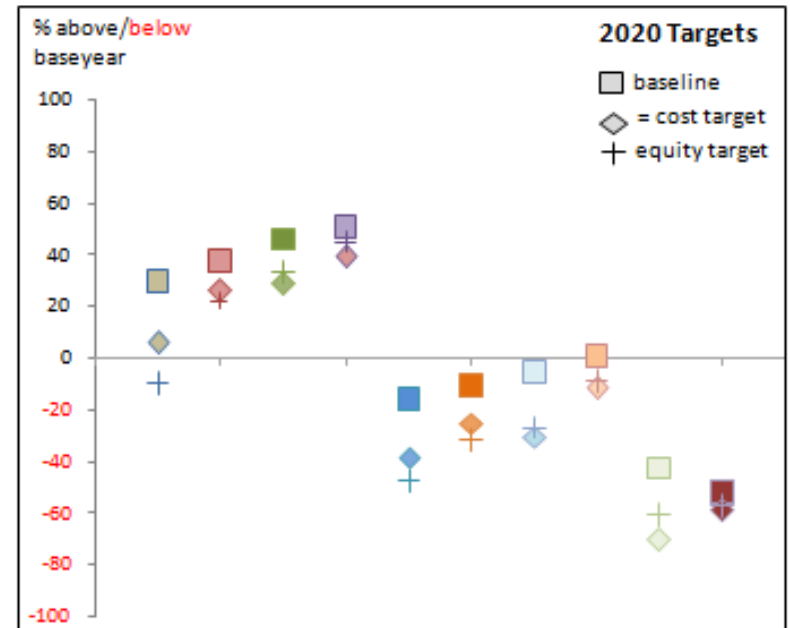
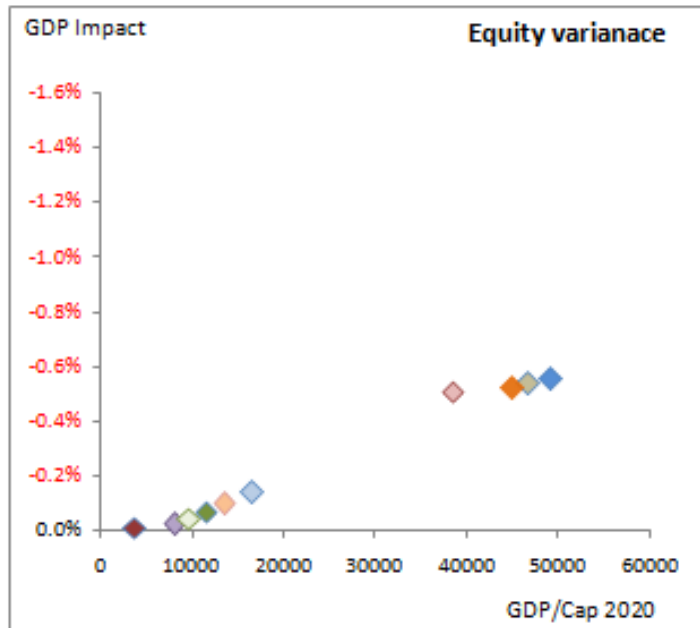
A

Annex 1

Equity

GDP/Cap 2020

2015 2006



ACE-IST: Next Steps

Plan to present results from ACE-IST in June

Welcome any data on:

- i) 2020 baseline projections for all countries
- ii) 2020 MACCs for all countries
- iii) 2020 GDP and population projections for all countries

Please send this data to:

ben.gleisner@treasury.govt.nz
steven.cox@maf.govt.nz
amelie.goldberg@mfe.govt.nz
daniel.twaddle@mfe.govt.nz



ACE-IST

Thank you

