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Module 3: Mitigation

Mitigation and Adaptation

Two sides of the same coin

We have to mitigate to avoid the unmanageable….

And we have to adapt to the unavoidable

Prof. Schelluber, Potsam Institute

Mitigation and Adaptation

Agroforestry Photo source: Scitizen (2009)

- Both adaptation and mitigation depend on capital assets (including social capital).
- Mitigation and adaptation policies can be related to sustainable development goals.
- Nature of benefits vary:
  - Mitigation: global and long-term
  - Adaptation: local and shorter term
- Trade-offs between mitigation and adaptation
  - National level: often viewed as competing priorities
  - Local level: increasing recognition of overlaps, especially when natural energy, and sequestration systems intersect
  - Particularly important for developing countries and LDCs relying on natural resources for energy and development
  - Examples emerging in bioenergy, forestry, agriculture

Source: IPCC (2007) AR4 WGIII

Climate Change:
Two side of the same coin. How ?

MITIGATION- ADDRESSING A GLOBAL PROBLEM

Renewable energy, energy savings, energy conservation, GHG reduction etc.

ADAPTATION- ADDRESSING A LOCAL PROBLEM

Adjusting natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities

To combat climate change, one can minimise it via mitigation, or cope with it via adaptation. Even though these objectives are two sides of the same coin, their synergies and conflicts tend to be overlooked.

Mitigation Key Features

Focus on Mitigation

Definition:
Mitigation is defined as any anthropogenic interventions that can either reduce the sources of greenhouse gas (GHG) emissions (abatement) or enhance their sinks (sequestration).

Therefore, the term "mitigation" refers to:
Efforts to cut and/or prevent the emissions of greenhouse gases – limiting the magnitude of future warming
Encompass attempts to remove greenhouse gases from the atmosphere

Mitigation can be extended to the protection of natural carbon "sinks" like for example the forests and oceans (in this specific case new sinks can be created through, for example, forest regeneration)

Objective of Mitigation :

To avoid significant human interference with the climate system and stabilize greenhouse gas levels in a timeframe sufficient to allow ecosystems to adapt naturally to climate change, ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

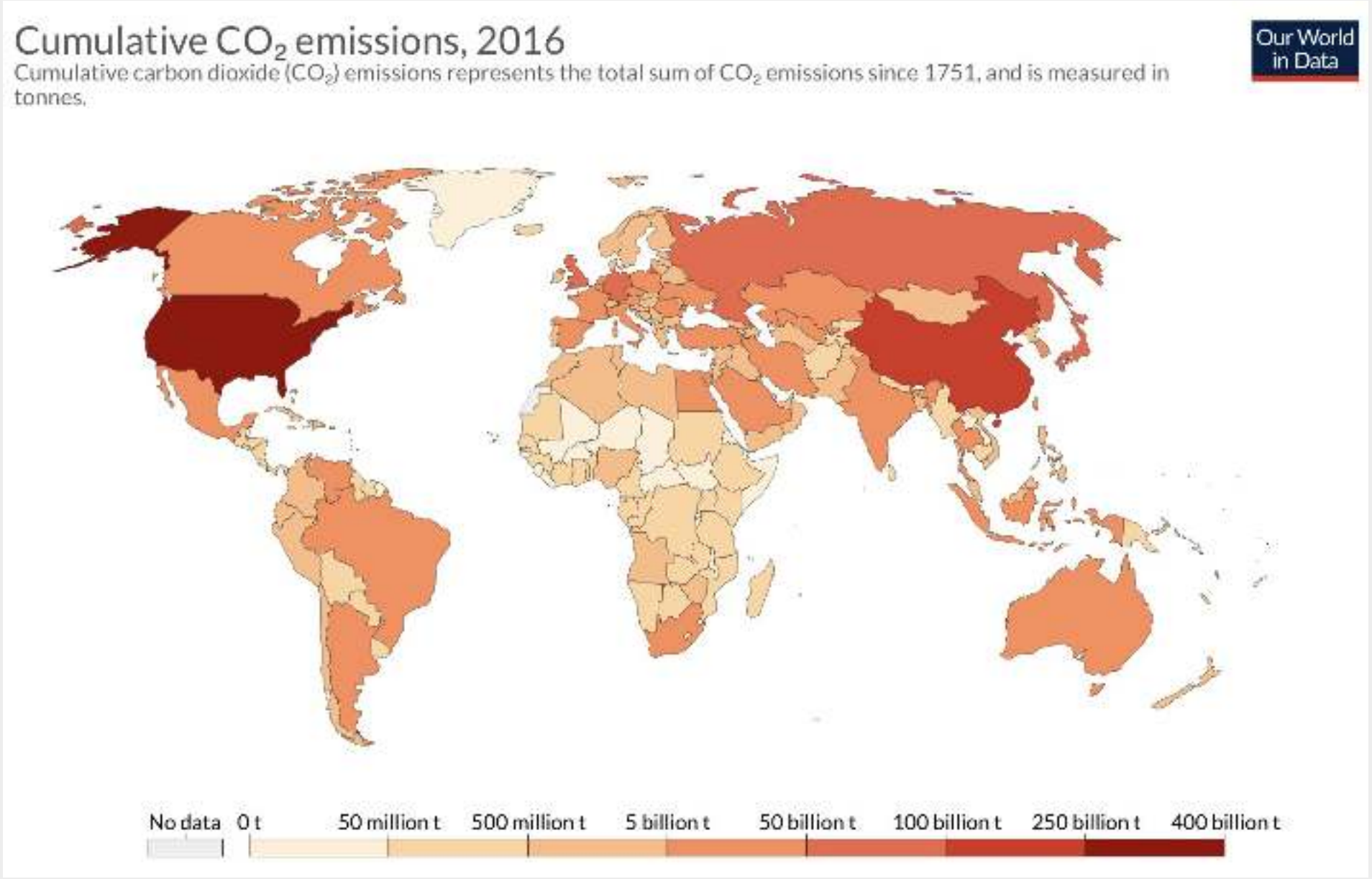
“ 2014 report on Mitigation of climate change from the United Nations Intergovernmental Panel on climate change, page 4”

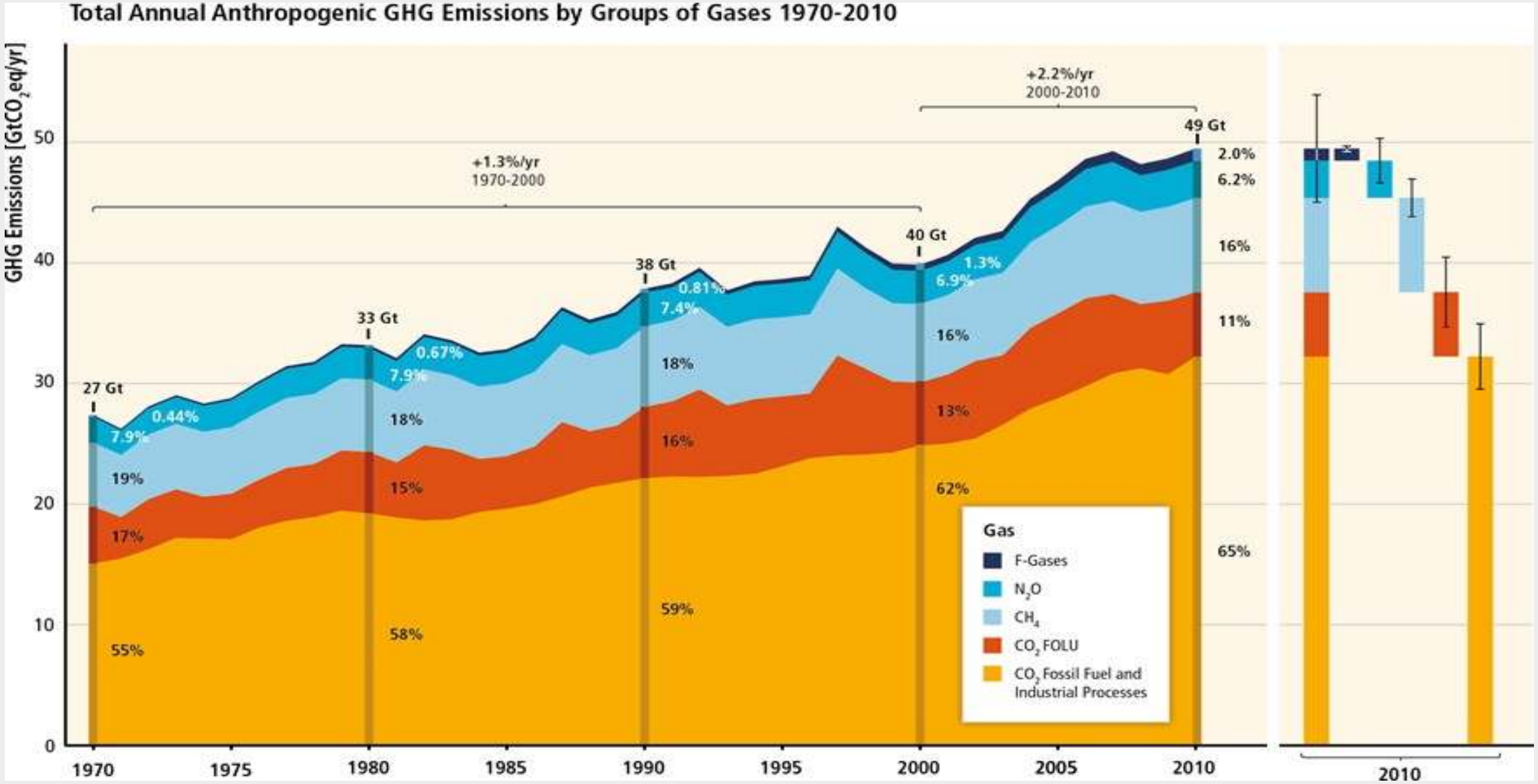
Greenhouse Gases

Greenhouse gases affecting Mitigation

Type of GHG	Human sources	Percentage of Total Global GHG emissions (2010)
Carbon Dioxide CO2	Fossil fuel combustion, land use changes, cement production	76%
Methane CH4	Fossil fuel, mining, livestock, rice agriculture	16%
Nitrous oxide N20	Agriculture, land use change	6%
** Hydrofluorocarbones Perfluorocarbons Sulphur hexafluoride Nitrogen trifluoride	-Liquid coolants -Refrigerant, electronics industry -Insulator in electronics, magnesium industry -Electronics and photovoltaic industries	<2%
** The gases mentioned in the previous cell are not ruled under the Kyoto Protocol but the Montreal one.		

Emissions worldwide



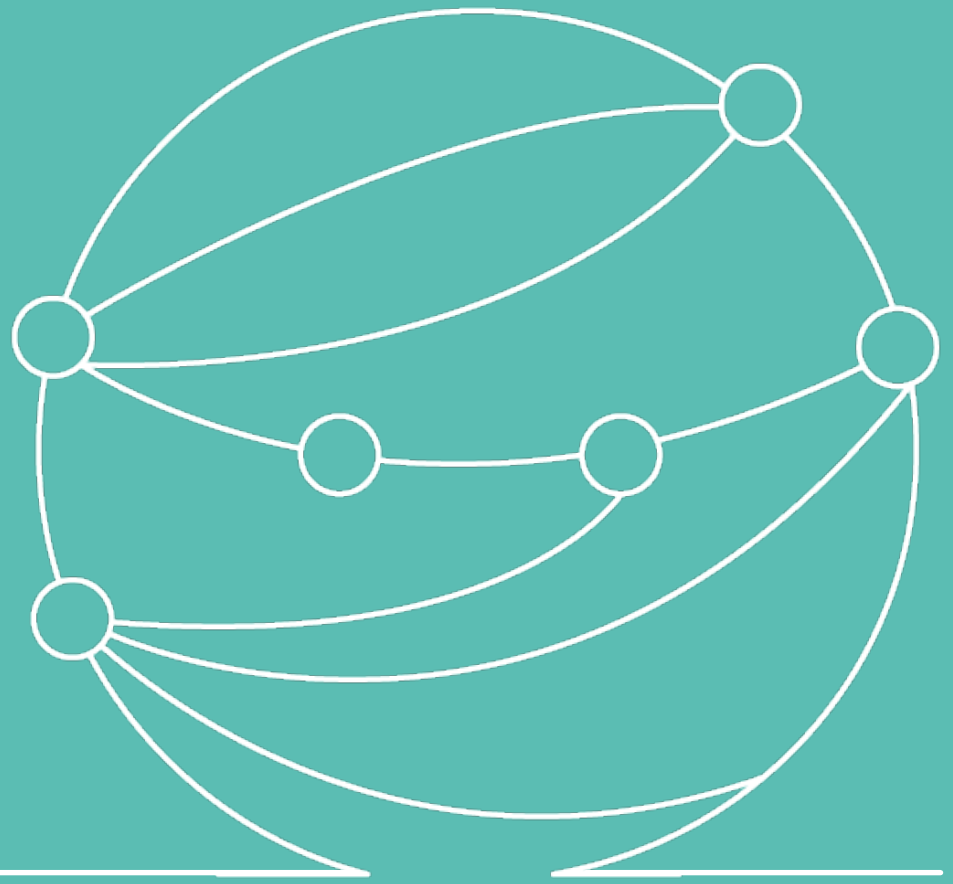

Total Annual Anthropogenic GHG Emissions by Groups of Gases 1970-2010
GHG Emissions [GtCO2eq/yr]
+1.3%/yr
1970-2000
+2.2%/yr
2000-2010
27 Gt
33 Gt
38 Gt
40 Gt
49 Gt
0.44%
0.67%
0.81%
1.3%
7.9%
7.9%
7.4%
6.9%
19%
18%
18%
16%
17%
15%
16%
13%
55%
58%
59%
62%
2.0%
6.2%
16%
11%
65%
Gas
F-Gases
N2O
CH4
CO2 FOLU
CO2 Fossil Fuel and Industrial Processes
0
10
20
30
40
50
1970
1975
1980
1985
1990
1995
2000
2005
2010
2010

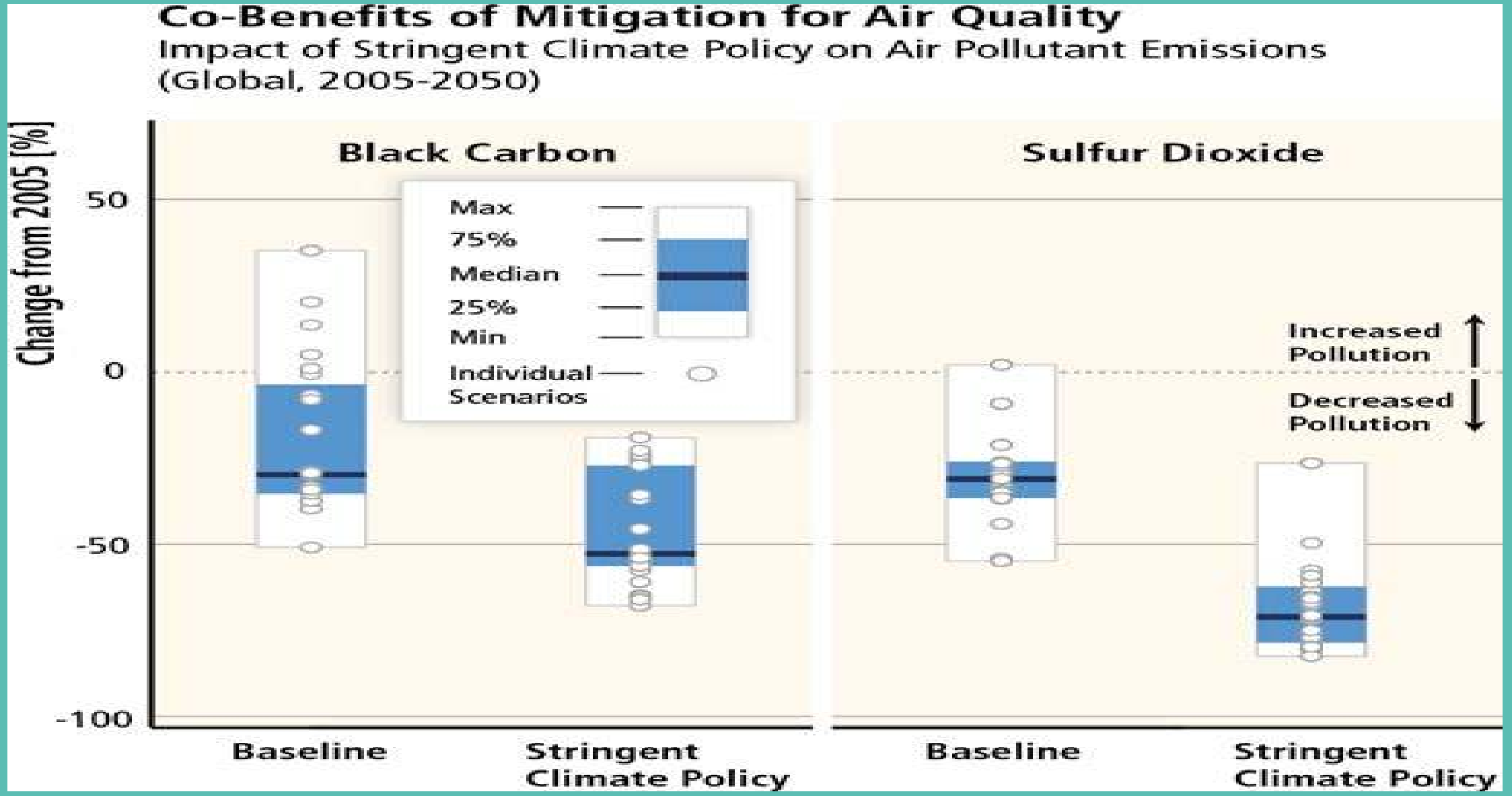
Benefits of Mitigation

The benefits of mitigation

- **Primary:** reducing GHG emissions = reducing global climate change

- **Co-benefits:** other benefits explicitly incorporated into the creation of GHG mitigation policies include reductions in local and regional air pollution
- As the world proceeds with the implementation of the Paris Agreement on climate change, a focus on the multiple benefits of mitigation can motivate a more ambitious approach to reducing greenhouse gas emissions.




Co-Benefits of Mitigation for Air Quality
Impact of Stringent Climate Policy on Air Pollutant Emissions
(Global, 2005-2050)
Change from 2005 [%]
50
0
-50
-100
Black Carbon
Sulfur Dioxide
Max
75%
Median
25%
Min
Individual Scenarios
Increased Pollution
Decreased Pollution
Baseline
Stringent Climate Policy
Baseline
Stringent Climate Policy

Co-Benefits of mitigation action: environmental, economic and social benefits

-Conservation of biodiversity and ecosystems
-Improved water and air quality
-Restoration of degraded land

-Employment creation
-Energy security
-New economic opportunities
-Potential cost savings

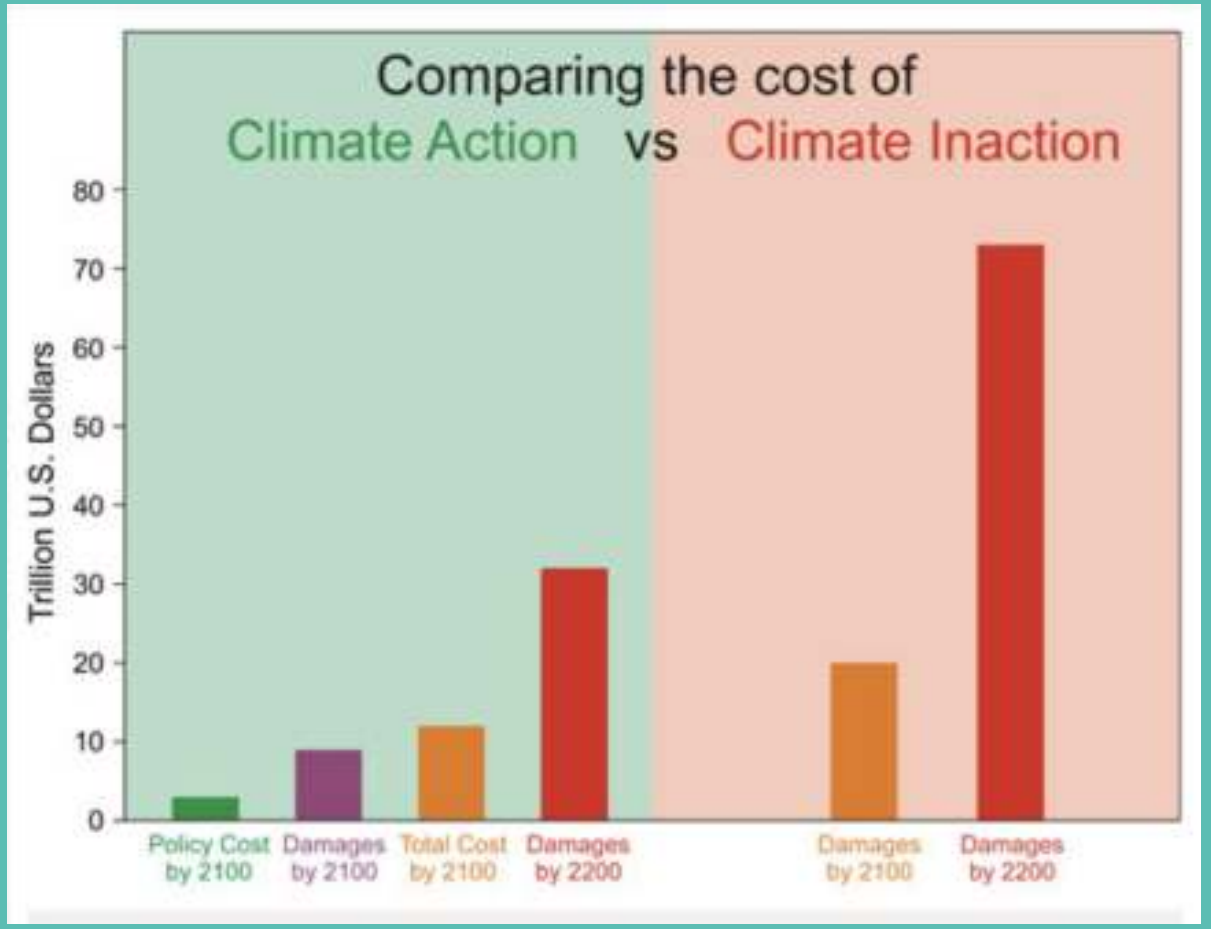
-Access to better services
-Health benefits
-Lifestyle benefits

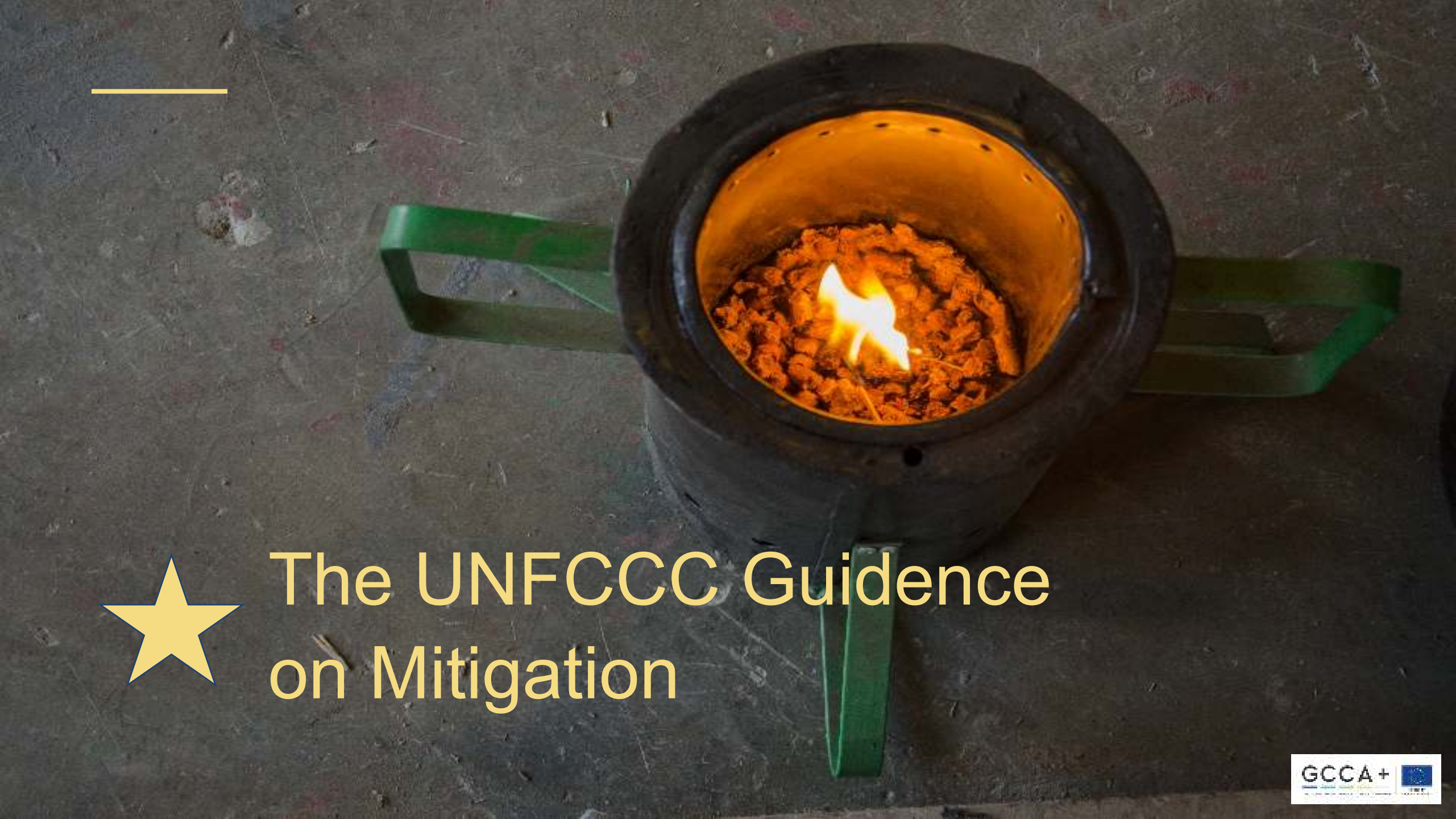
The cost of inaction

Mitigation action is several times less costly than trying to adapt to climate change in the future

Costs related to damages in the long term exceed by far present costs but this is a difficult message to communicate politically

Concerns about costs often ignore the other benefits of action (health, environment, …)



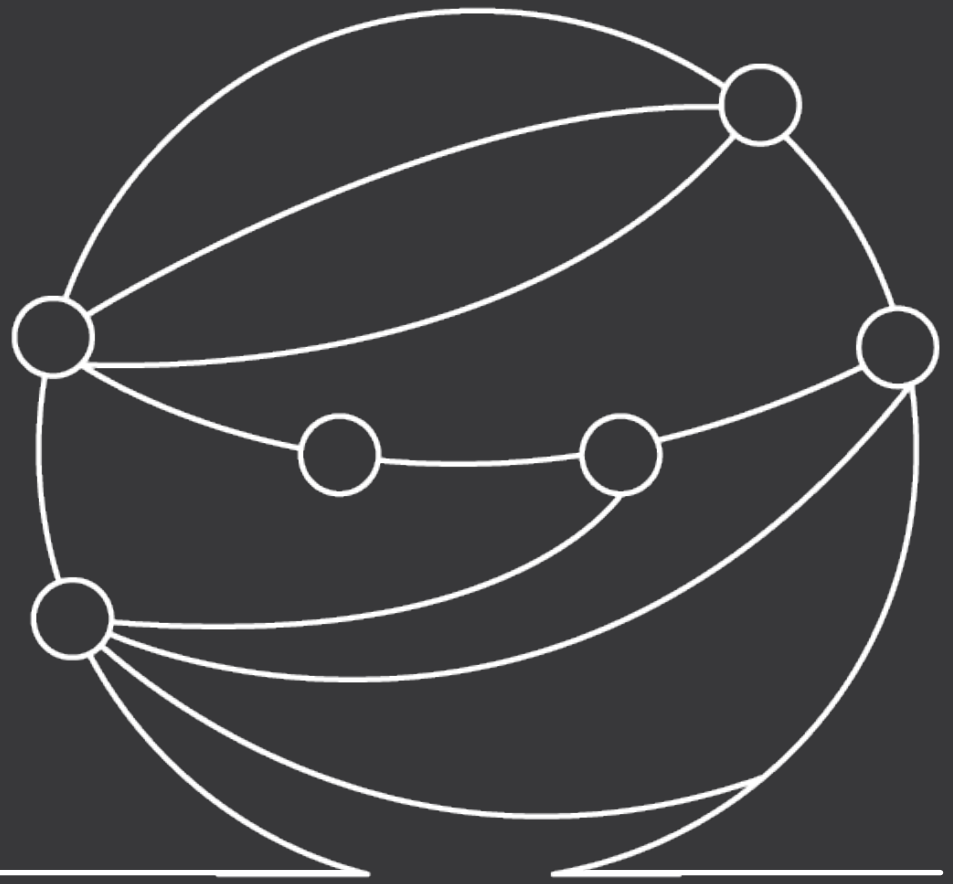


The UNFCCC Guidence on Mitigation

The long road from Rio to Paris, Passing through Kyoto, Durban, Bali…. A long path already traced

In 1997, the Conference of Parties (COP) was held in Kyoto in Japan, during which the "Kyoto Protocol", the first document with legally binding obligations for limiting and reducing was adopted. The period of applicability was set for the years 2008 to 2012 (1st commitment period) and 2013 to 2020 (2nd commitment period).

In order to be able to maintain the international climate protection process after 2020, a new climate agreement was required as less than 16% of global emissions were subject to Kyoto Protocol limitations. This new agreement was reached in 2015 at the COP in Paris as the "Paris Agreement", which, for the first time, included a specific target for limiting global warming at a level of at least 2°C below the pre-industrial level of 1750.



UNFCCC Reporting Commitments

Article 4, p.1, and Article 12, p.1, of the convention provide for each Party to report to the COP:

- information on its emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol (greenhouse gas inventories);
- national or, where appropriate, regional programmes containing measures to mitigate, and to facilitate adequate adaptation to climate change (general description of steps taken or envisaged by the Party to implement the Convention);
- any other information that the Party considers relevant to the achievement of the objective of the Convention.

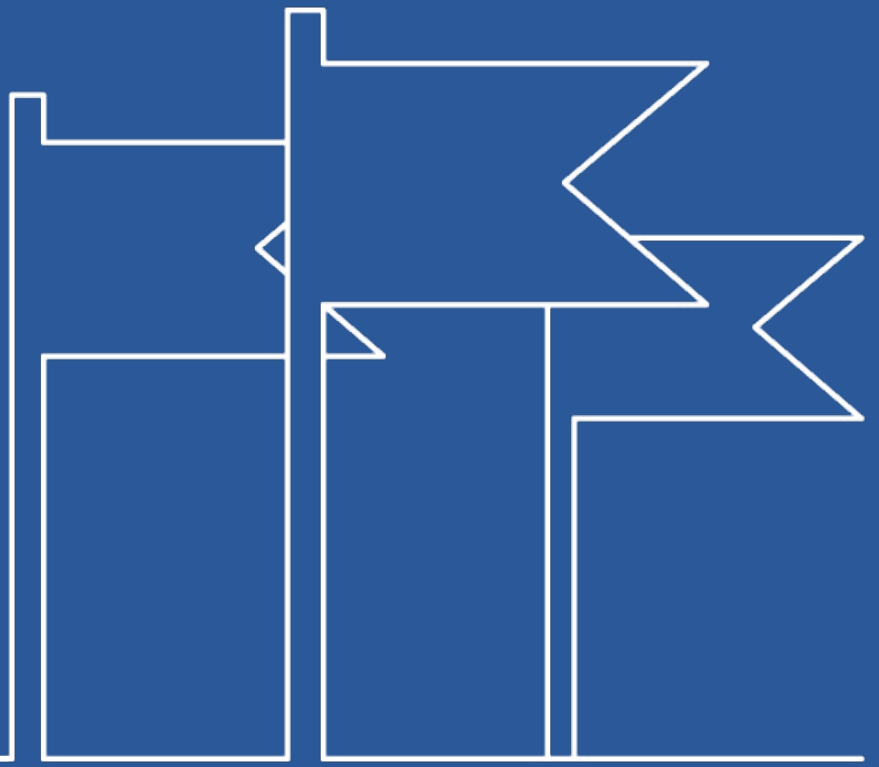
The Enhanced Transparency Framework agreed in Katowice, 2018, builds on these reporting requirements and sets specific parametres for rerporting every two years from 2023.

Sectoral Approaches to Mitigation

From general actions to sectors affected by mitigation

The seven sectors identified by the IPCCC 2014 fifth assessment report with high mitigation potential are :

1) Energy
2) Transport
3) Buildings
4) Industry
5) Agriculture
6) Forestry
7) Waste Management



Sectors with High Mitigation Potential

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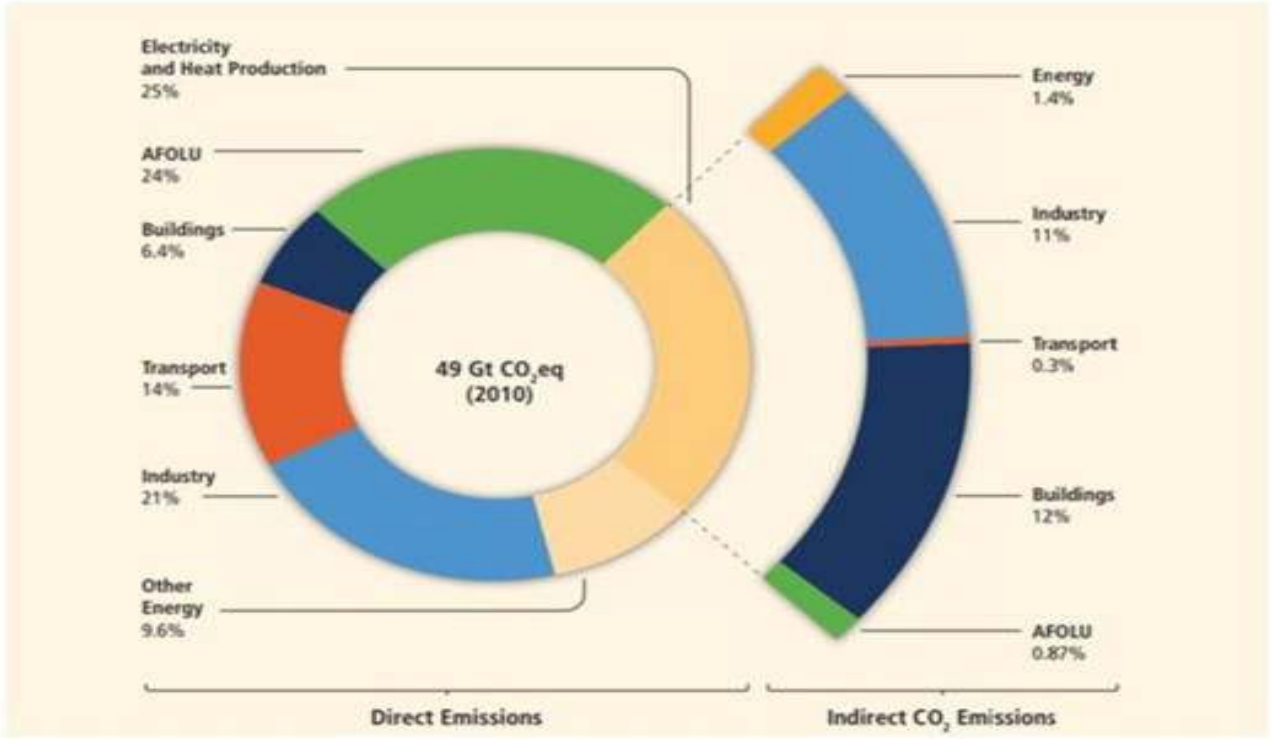


Source: IPCC (2014). Fifth Assessment Report

Some possible Mitigation options per sector

ENERGY:
Use of renewable heat and power (e.g. Hydropower, solar, wind, geothermal and bioenergy)
Improved supply and distribution efficiency
Carbon Capture Storage (CCS)
Combined heat and power

Some possible Mitigation options per sector

TRANSPORT

More fuel efficient vehicles
Use of alternative energy sources (biofuels, cleaner diesel etc.)
Better land-use and transport planning
Shift from individual transport to public transport system
More efficient driving practices
Non-motorized transport (cycling, walking)
Carbon market solution to promote the reduction of CO2 emissions

Some possible Mitigation options per sector

BUILDING:

- Efficient lighting and day lighting
- More efficient electrical appliances and heating and cooling devices
- Improved insulation
- Integrated design of buildings including technologies such as intelligent metering providing feedback and control
- Solar photovoltaic systems integrated in building
- Heat/cooling district system in buildings

Some possible Mitigation options per sector

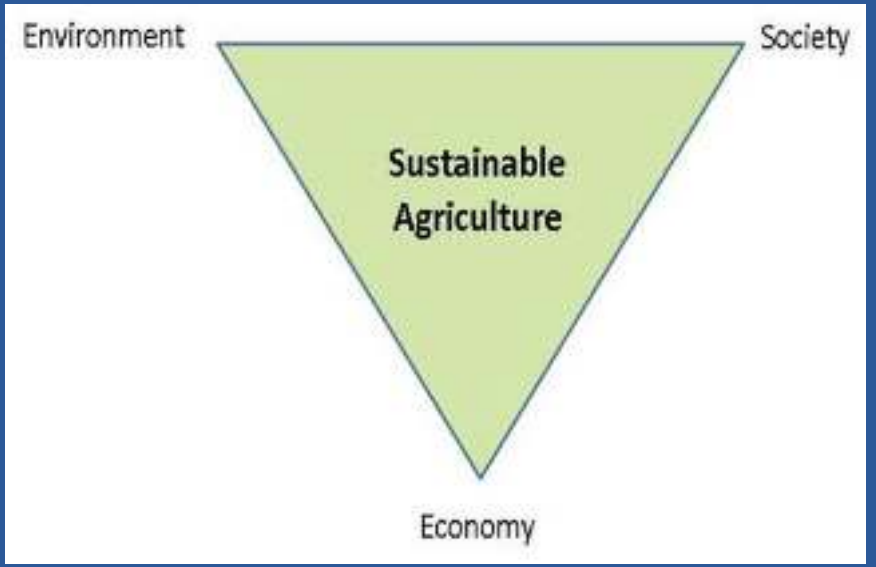
INDUSTRY:

- Process-specific technologies that improve efficiency and reduce emissions
- Material recycling and substitution
- Heat and power recovery/cogeneration
- Control of greenhouse gas emissions
- R&D
- Carbon trading/taxes and similar solutions

Some possible Mitigation options per sector

AGRICULTURE:

- Manure and livestock management to reduce CH4 emissions
- Improved fertilizer application techniques to reduce N2O emissions
- Improved crop and grazing land management to increase soil carbon storage
- Restoration of cultivated peaty soils and degraded lands
- Agroforestry practices
- Reducing food wastage



Some possible Mitigation options per sector

FORESTRY:

- Reduced deforestation
- Afforestation/reforestation (increasing forest cover)
- Forest management
- Tress species improvement to increase biomass productivity and carbon sequestration (wood for energy)

Some possible Mitigation options per sector

WASTE:

- Landfill methane recovery
- Waste incineration with energy recovery
- Composting or organic waste
- Controlled wastewater treatment
- Recycling and waste minimization
- Biocovers and biofilters to optimize CH4 oxidation

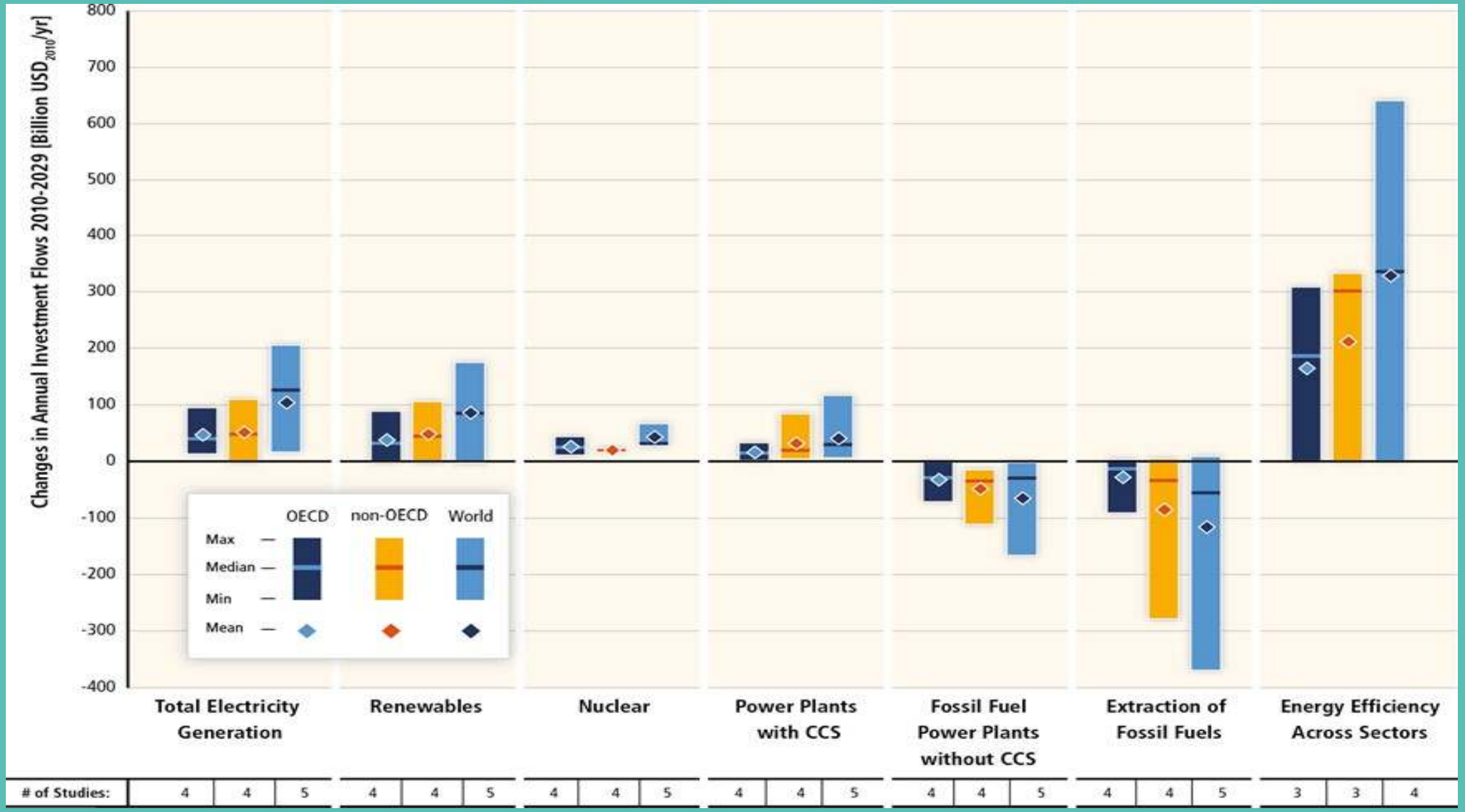
Mitigation Measures

Achieving least cost implementation through International Cooperation

How international cooperation can inform the design of mitigation measures to lower implementation costs (1)

The UNFCCC has played and should continue to play an essential role in instigating and coordinating a global response to climate change. However, in the face of continuing difficulty in stabilizing the global climate at safe levels, it is argued here that the UNFCCC is by no means alone in addressing this challenge and that wider international cooperation is possible in a way that complements the international climate negotiations.

Indeed, **Substantial reductions in emissions would require large changes in global and domestic investment patterns**


Changes in Annual Investment Flows 2010-2029 [Billion USD2010/yr]
800
700
600
500
400
300
200
100
0
-100
-200
-300
-400
OECD
non-OECD
World
Max
Median
Min
Mean
Total Electricity Generation
Renewables
Nuclear
Power Plants with CCS
Fossil Fuel Power Plants without CCS
Extraction of Fossil Fuels
Energy Efficiency Across Sectors
# of Studies:
4 4 5 4 4 5 4 4 5 4 4 5 4 4 5 4 4 5 3 3 4

How international cooperation can inform the design of mitigation measures to lower implementation costs (2)

The literature identifies many options for achieving reductions of global GHG emissions at the international level through cooperation. It also suggests that successful agreements are environmentally effective, cost-effective, incorporate distributional considerations and equity, and are institutionally feasible (high agreement, much evidence)

- Greater cooperative efforts to reduce emissions will help to reduce global costs for achieving a given level of mitigation, or will improve environmental effectiveness
- Improving, and expanding the scope of, market mechanisms (such as International Emissions Trading, Joint implementation and Clean Development Mechanism(CDM)) could reduce overall mitigation costs

How international cooperation can inform the design of mitigation measures to lower implementation costs (3)

Efforts to address climate change can include diverse elements such as emissions targets; sectoral, local, sub-national and regional actions; RD&D programmes; adopting common policies; implementing development oriented actions; or expanding financing instruments. These elements can be implemented in an integrated fashion, but comparing the efforts made by different countries quantitatively would be complex and resource intensive

Actions that could be taken by participating countries can be differentiated both in terms of when such action is undertaken, who participates and what the action will be. Actions can be binding or non-binding, include fixed or dynamic targets, and participation can be static or vary over time

CURRENT CONTEXT OF EXISTING MECHANISMS TO SUPPORT IMPLEMENTATION OF CLIMATE CHANGE (1)
KYOTO PROTOCOL

Clean Development Mechanism (CDM)

Joint Implementation (JI)

International Emissions Trading (IET)

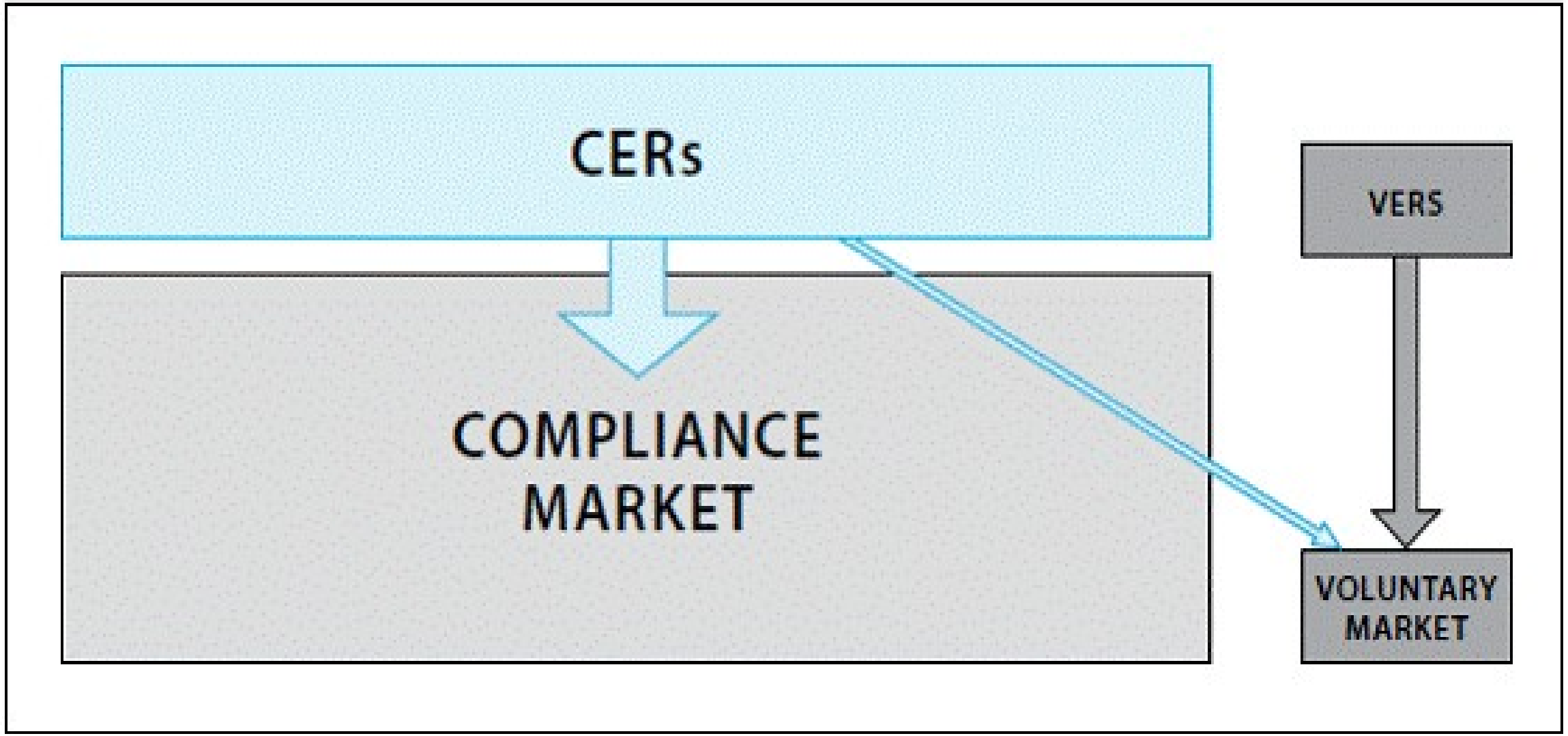
CURRENT CONTEXT OF EXISTING MECHANISMS TO SUPPORT IMPLEMENTATION OF CLIMATE CHANGE (2)
'Flexibility' Mechanisms in the Post-Paris World

CURRENT CONTEXT OF EXISTING MECHANISMS TO SUPPORT IMPLEMENTATION OF CLIMATE CHANGE (3)

VOLUNTARY OFFSET SCHEMES outside the KP

There are currently several ap-and-trade compliance emes that operate or are planned to operate ependently of the Kyoto otocol. All of these also incorporate an offset component to their program

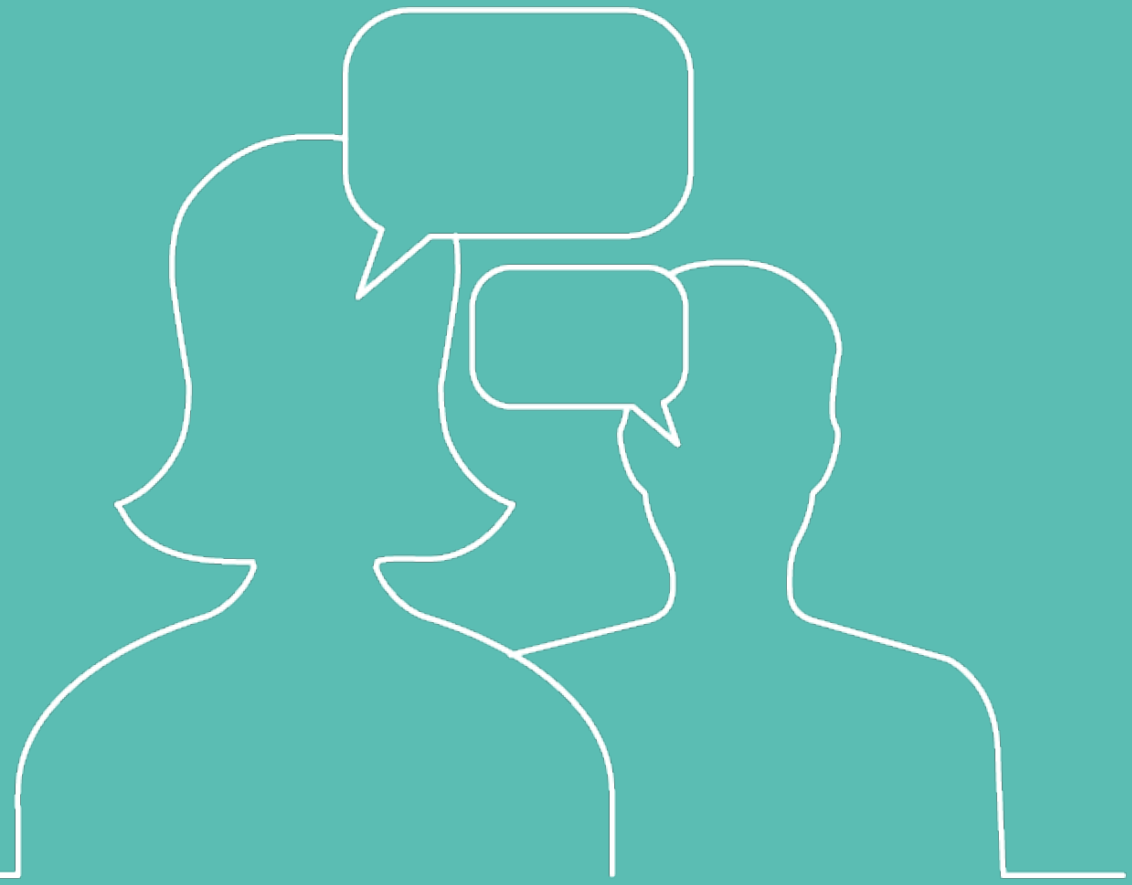
CHART 1: ***Carbon Offsets in the Compliance and in the Voluntary Market***



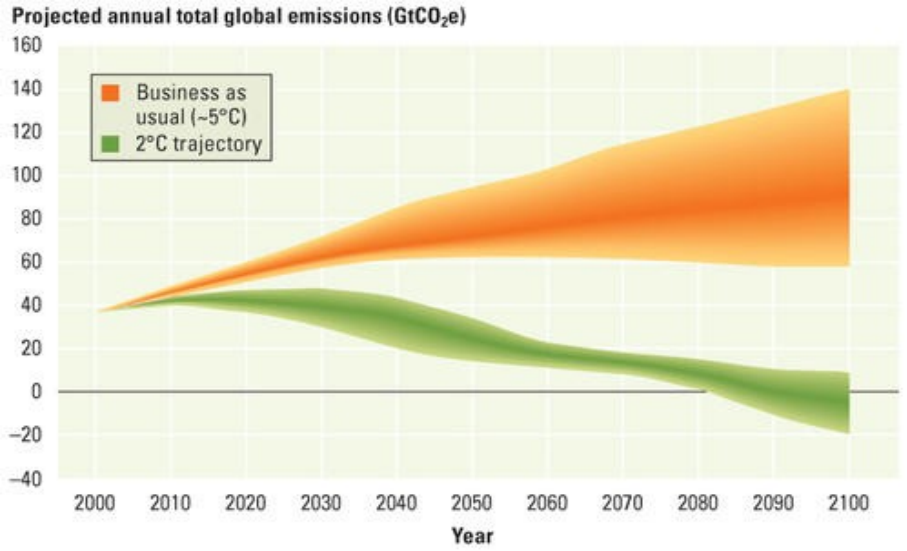
Are funding mechanisms capable to cope with the challenges posed by climate change mitigation?

- In the case of mitigation, large scale investment are required to significantly reduce emissions and despite the “constellation of different climate funds” something incisive is still to be found.

- Banking…and Green Bank may play a critical role in the decarbonisation process of the society…close to the climate funds. Mitigation actions are clear but financial mechanisms to address such priorities should be strongly supported through climate finance (see the Climate Finance Module).



Conclusions: which path forward?



”The EU is committed to the Paris Agreement and is implementing ambitious policies. In their conclusions, environment ministers recall the progress made in recent months by the EU on **legislation which delivers on its commitments to reduce greenhouse gas emissions.**

These include the new EU 2030 renewable energy target of 32%, the new energy efficiency target of 32.5%, the reform of the EU emission trading system, the emission reduction targets in sectors falling outside the scope of ETS and the integration of land use, land use change and forestry (LULUCF) in the EU's climate and energy framework.

Low-emissions and climate resilient growth is possible: The EU is continuing successfully to decouple economic growth from emissions. Between 1990 and 2016, the EU's GDP grew by 53% while total emissions fell by 22.4%. The EU's share of global greenhouse gas emissions fell from an estimated 17.3% in 1990 to 9.9% in 2012.”

EU Council conclusions 09/10/2018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