



MODULE 1

CLIMATE CHANGE SCIENCE AND POLICY

Regional Training on Climate Finance in Southeast Asian countries

OUTLINE

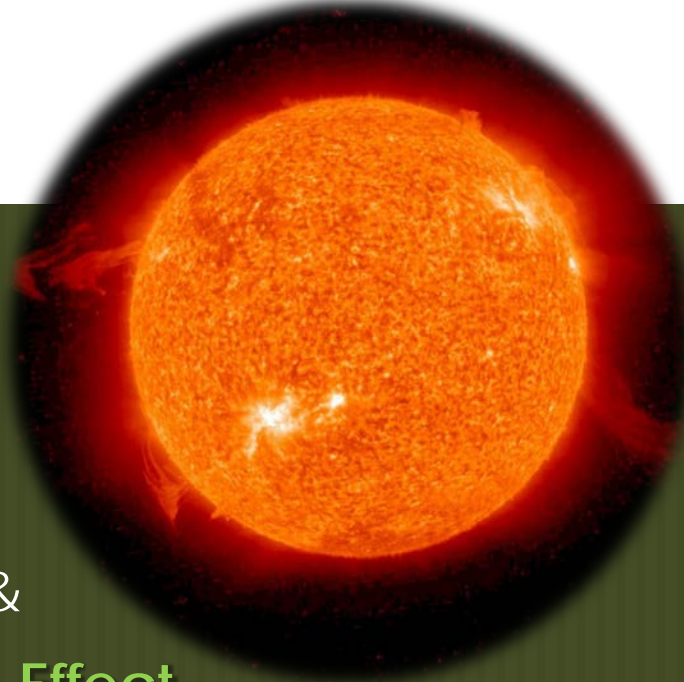
- 1) Climate Change science and the 2°C Target
- 2) International Climate Negotiations
- 3) Climate Finance negotiations under the UNFCCC process



CLIMATE CHANGE SCIENCE AND THE 2°C TARGET

Section 1

A SIMPLE CLIMATE SCIENCE PRIMER

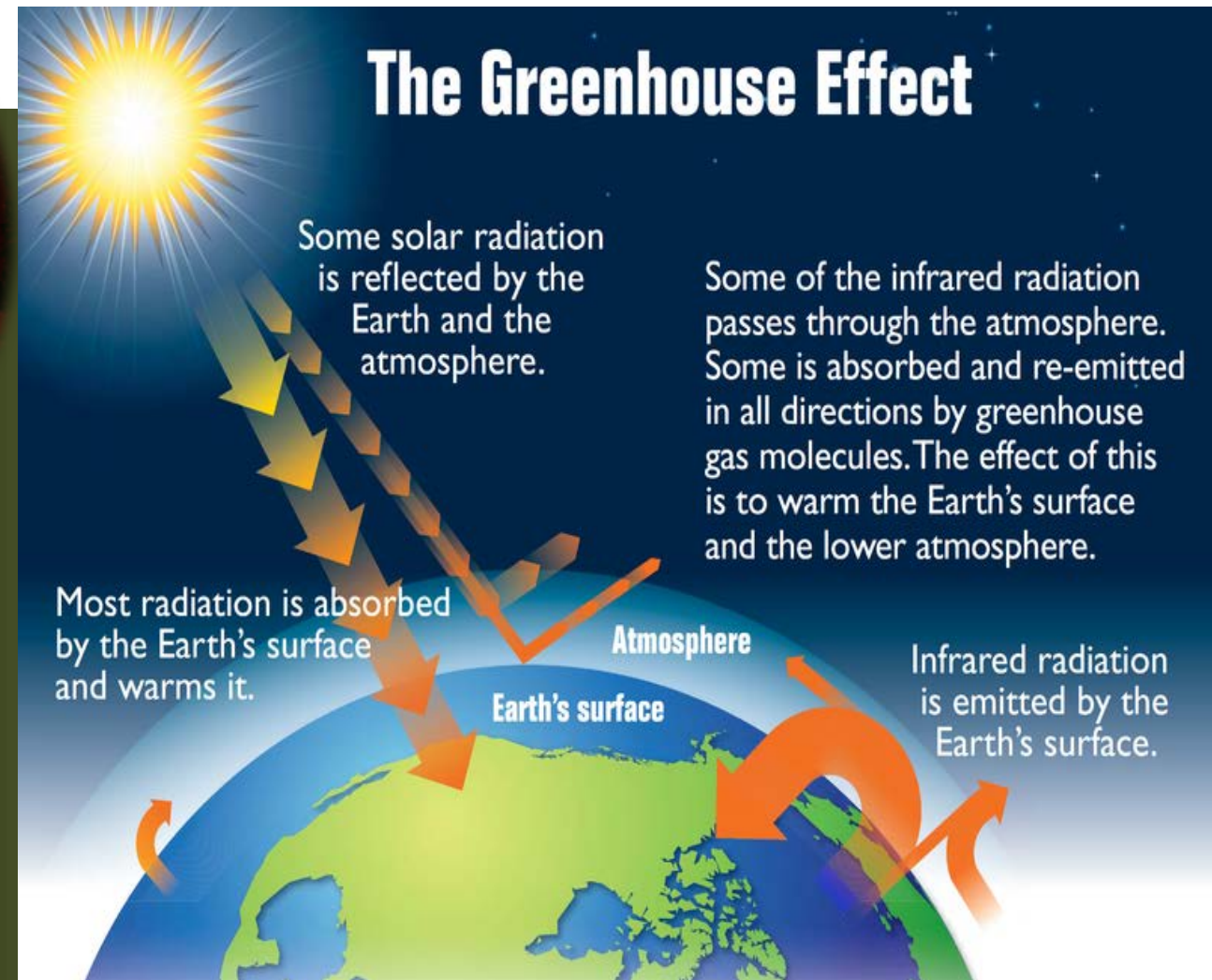


It all starts with

1) Solar Radiation &

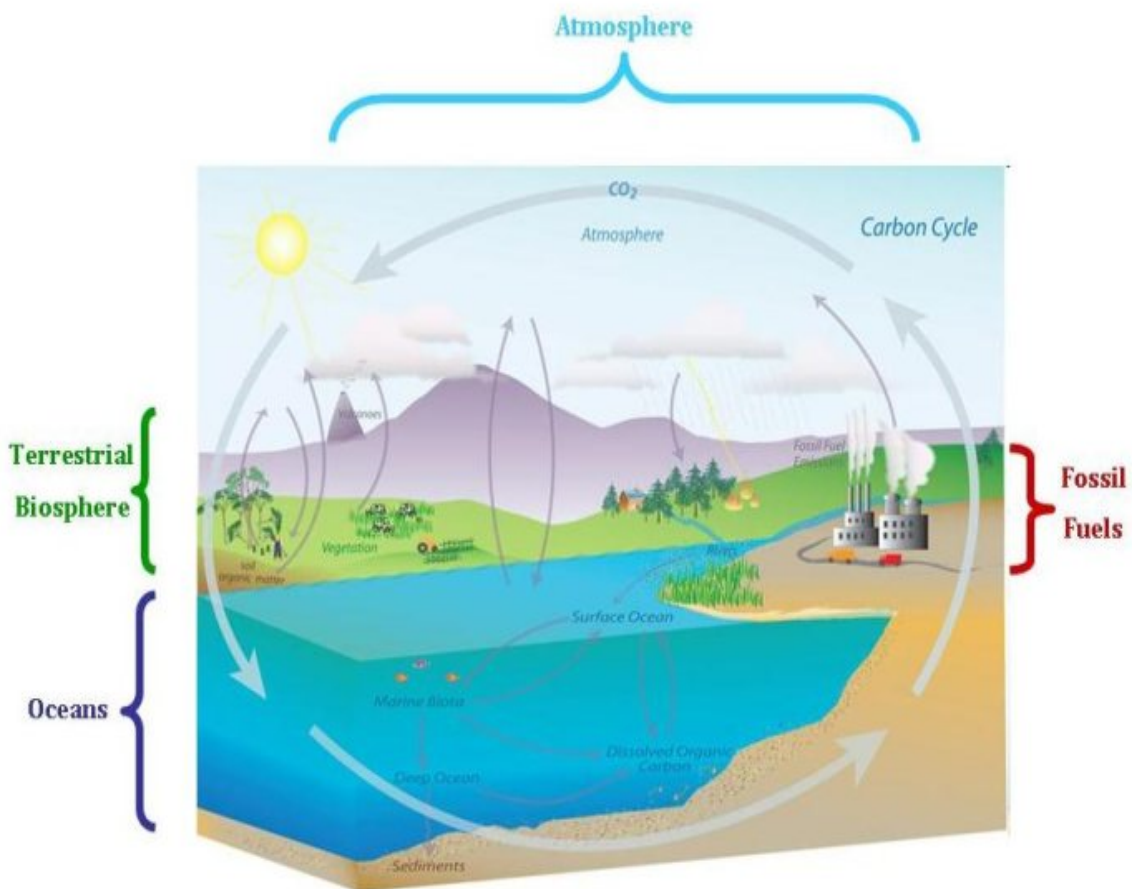
2) The Greenhouse Effect

- The **Earth's atmosphere** is comprised of several gases, especially nitrogen (N₂), oxygen (O₂), and argon (Ar) *accounting for 99.8% of the atmospheric gases.
- The atmosphere also includes small amounts of **Greenhouse Gases** (Water vapour (H₂O), Carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O), Ozone (O₃), and Chlorofluorocarbons (CFCs)) that **absorb and emit radiation** within the thermal infrared range

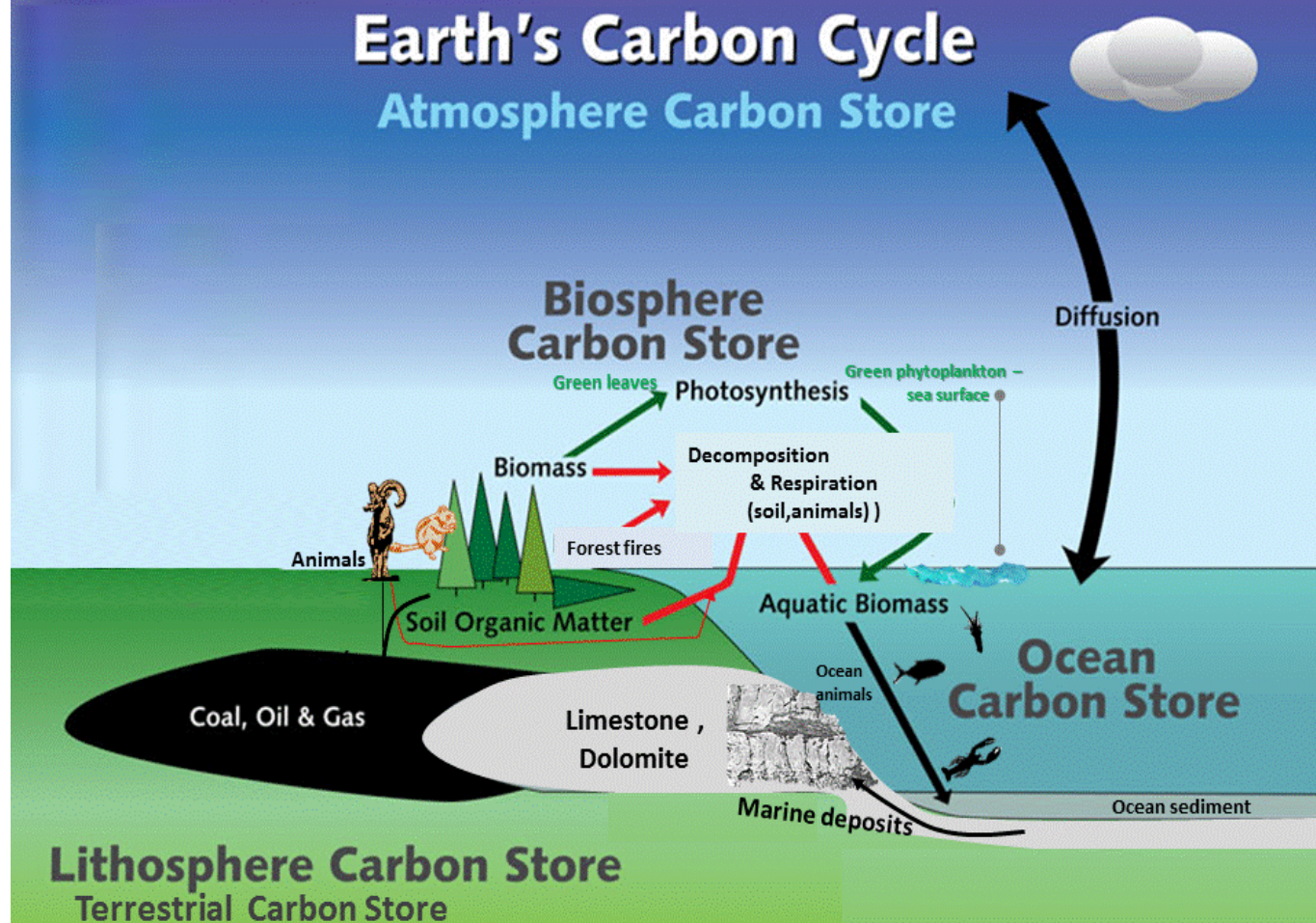


THE EARTH'S CARBON CYCLE

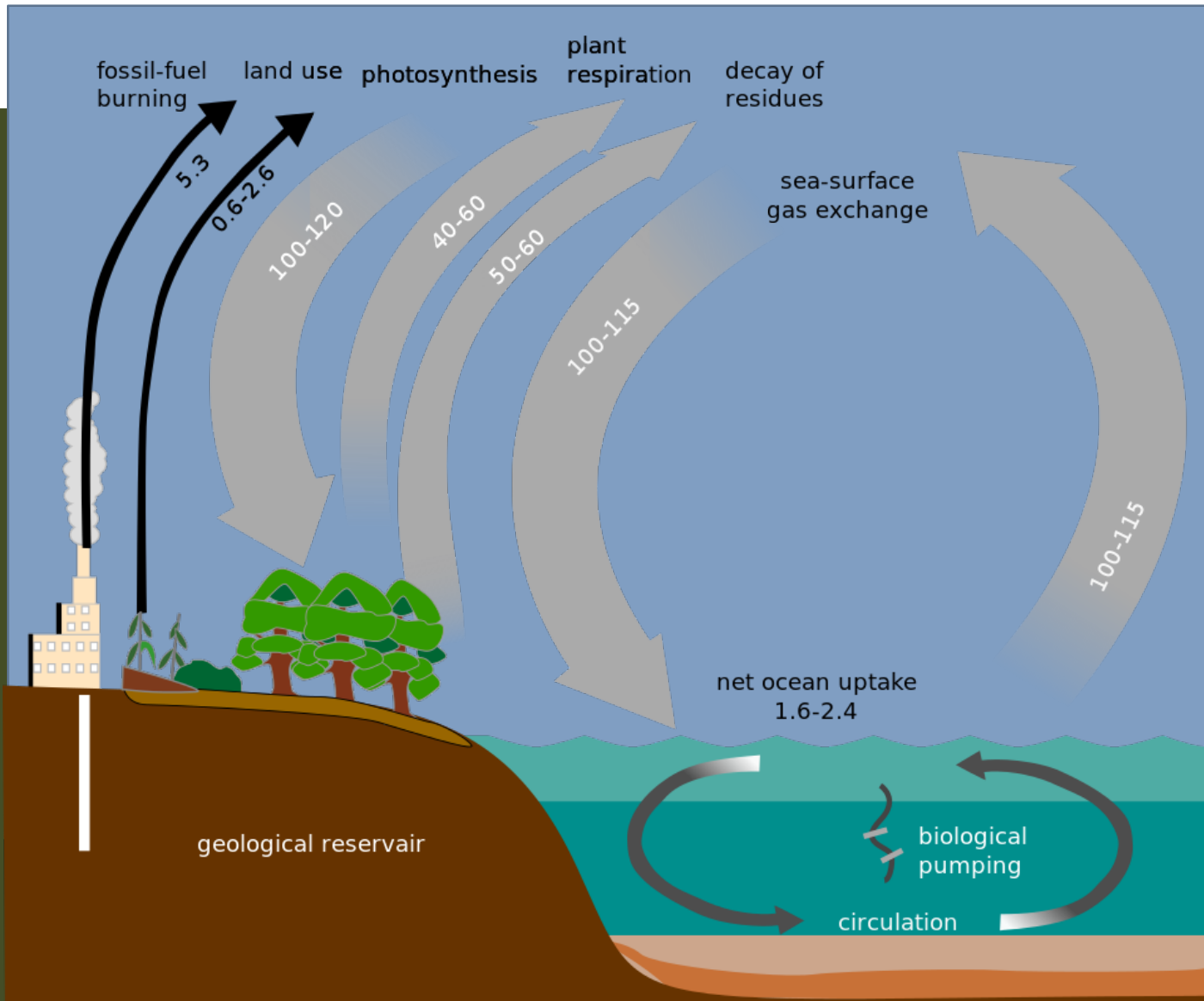
The Carbon Cycle



Earth's Carbon Cycle
Atmosphere Carbon Store



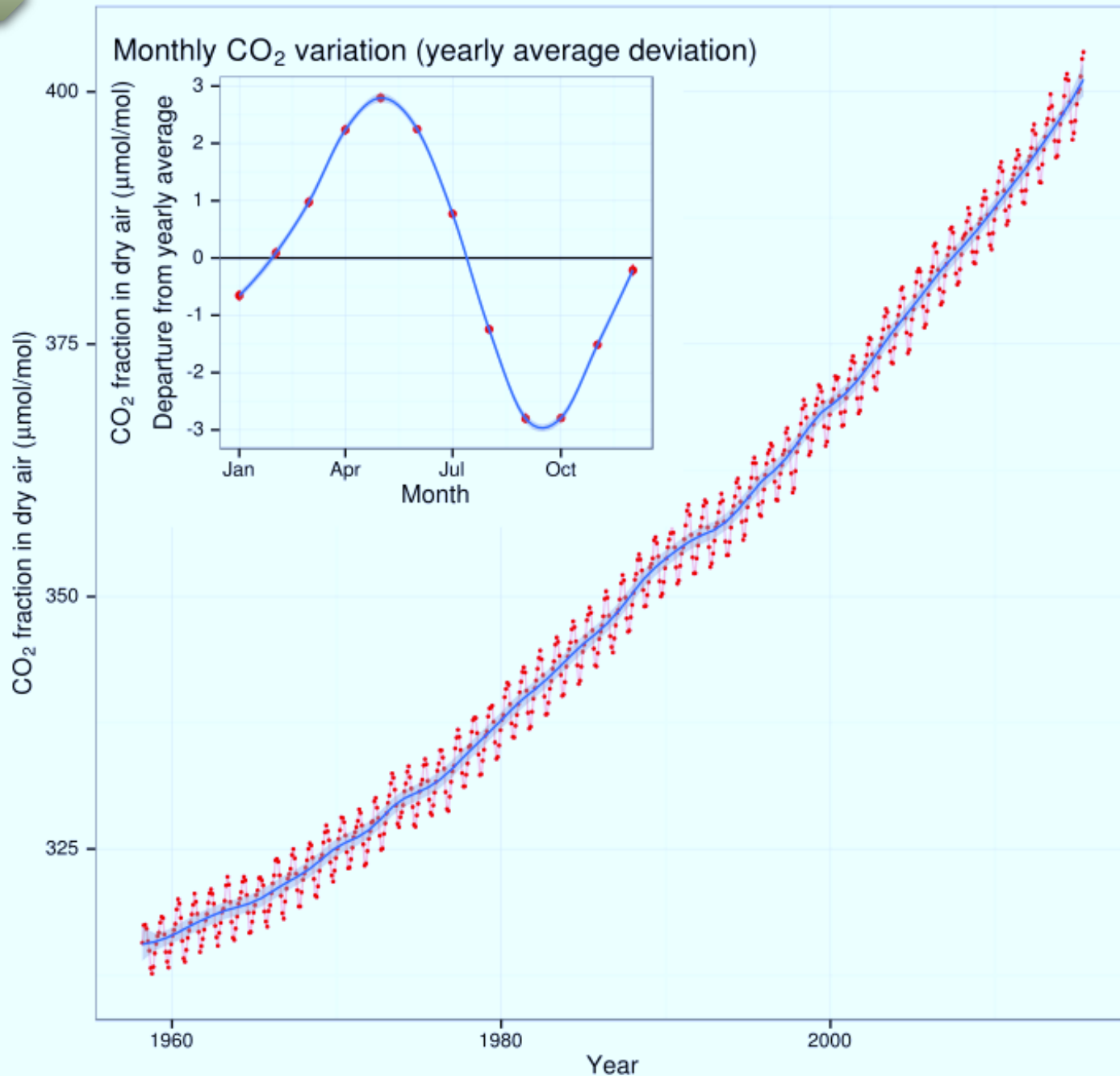
HUMAN DISRUPTION OF THE CARBON CYCLE



Atmospheric CO ₂ Account		10 ¹⁵ grams of carbon per year*
Date	Origin	Balance
annual	Biosphere	- 2
annual	Ocean	- 3
annual	Fossil Fuel Burning	+ 8
annual	Deforestation	+ 1
Annually Reported Atmospheric Balance		+ 4

* These numbers are approximate and are for the whole globe

- The natural carbon cycle achieves a state of **dynamic balance**, i.e. *absorbing and emitting an equal amount over time*.
- Human greenhouse gas (GHG) emissions are disrupting this balance, and atmospheric carbon concentrations are steadily increasing.
- Human activities are responsible for the release of over 30 GigaTons (Gt) of CO₂ (or ~9 Gt of Carbon) every year.
 - From: IPCC WGI Fourth Assessment Report

Mauna Loa monthly mean CO₂ concentration 1958-2015

ATMOSPHERIC CO₂ CONCENTRATIONS

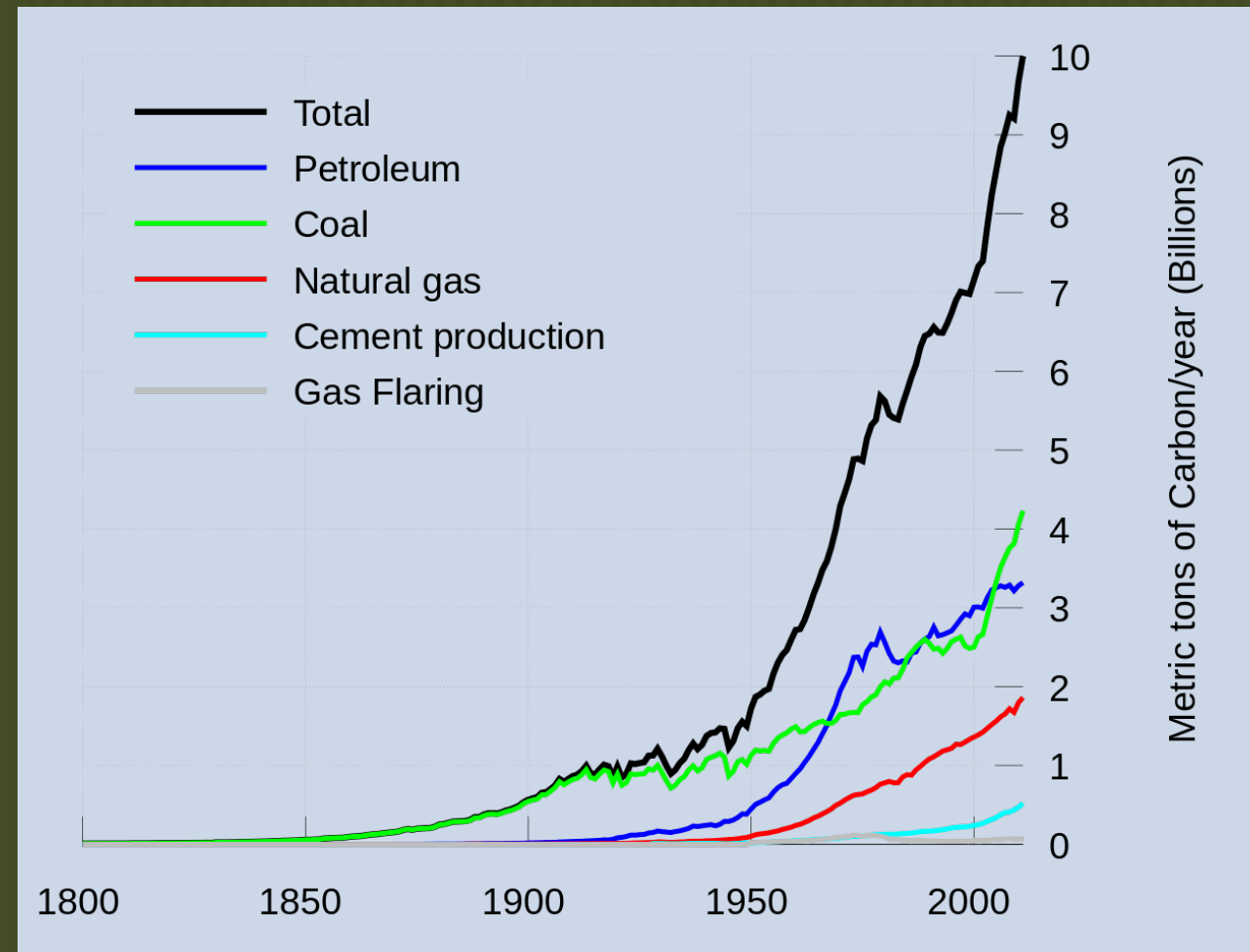
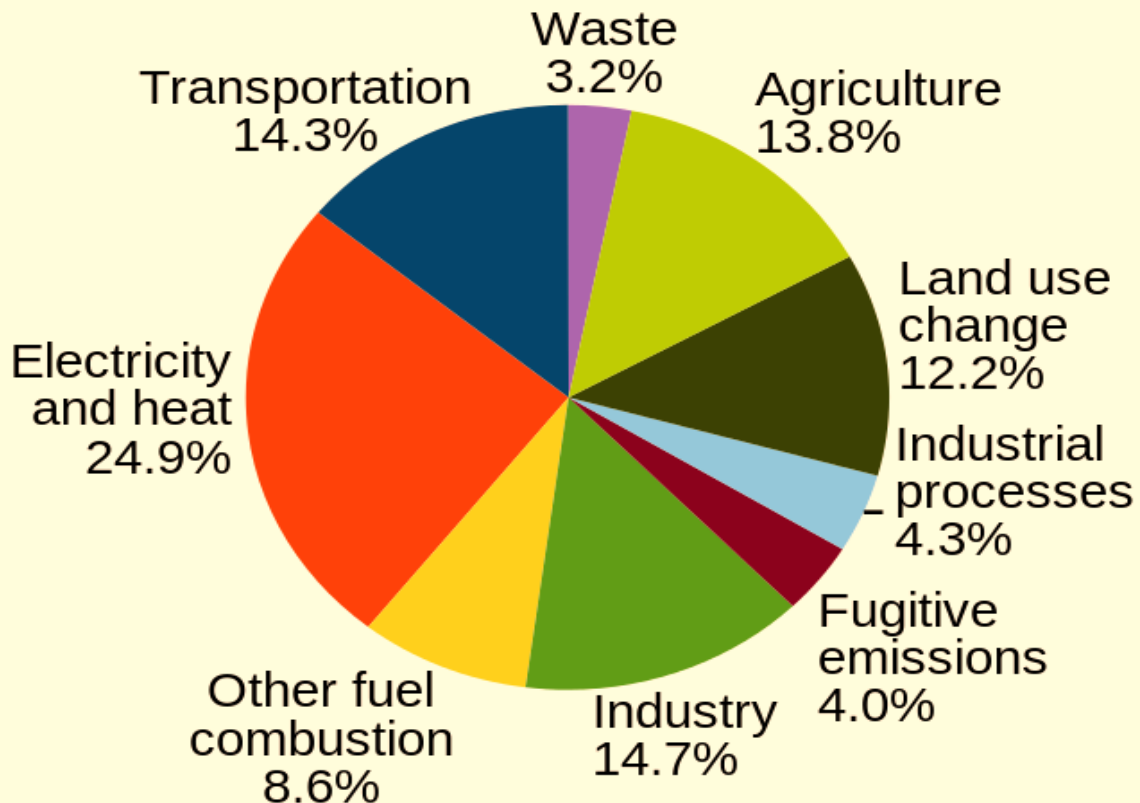
From the start of the Industrial Revolution (1760) to now, atmospheric CO₂ concentrations increased from 280 ppm to 400 ppm.

"Mauna Loa CO₂ monthly mean concentration" by Delorme - Own work. Data from Dr. Pieter Tans, NOAA/ESRL and Dr. Ralph Keeling, Scripps Institution of Oceanography.

Licensed under CC BY-SA 4.0 via Wikimedia Commons - https://commons.wikimedia.org/wiki/File:Mauna_Loa_CO2_monthly_mean_concentration.svg#/media/File:Mauna_Loa_CO2_monthly_mean_concentration.svg

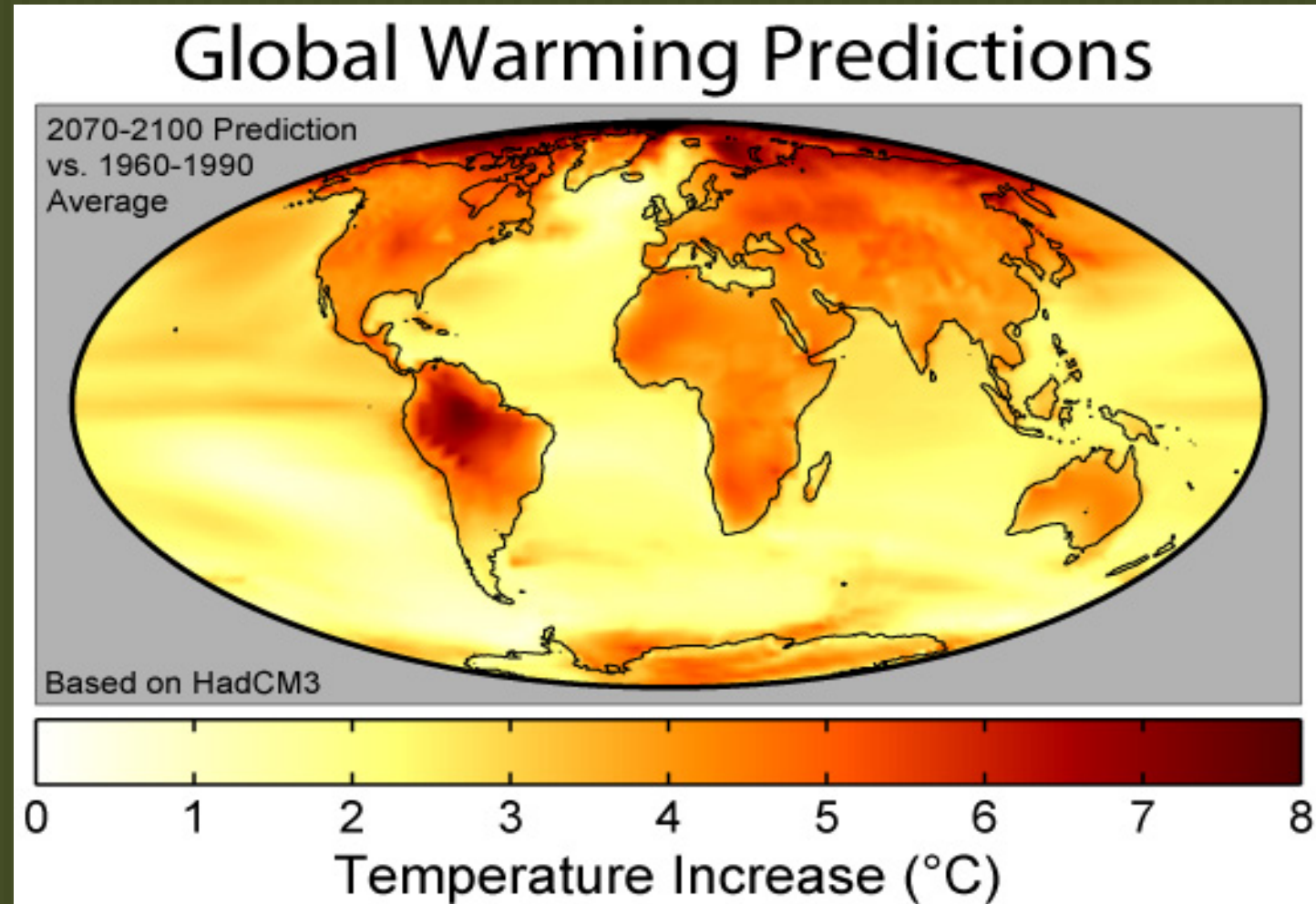
HUMAN CAUSES OF GREENHOUSE GAS EMISSIONS

Annual world greenhouse gas emissions, in 2005, by sector



MORE GREENHOUSE GAS MEANS MORE GREENHOUSE EFFECT AND GLOBAL WARMING

- Based on the Hadley Centre HadCM3 climate model and the IS92a ("business as usual") projections, an average change of 3.0°C is predicted for global surface temperatures.
- This model is towards the low end of the Intergovernmental Panel on Climate Change's 1.4-5.8°C predicted climate change from 1990 to 2100



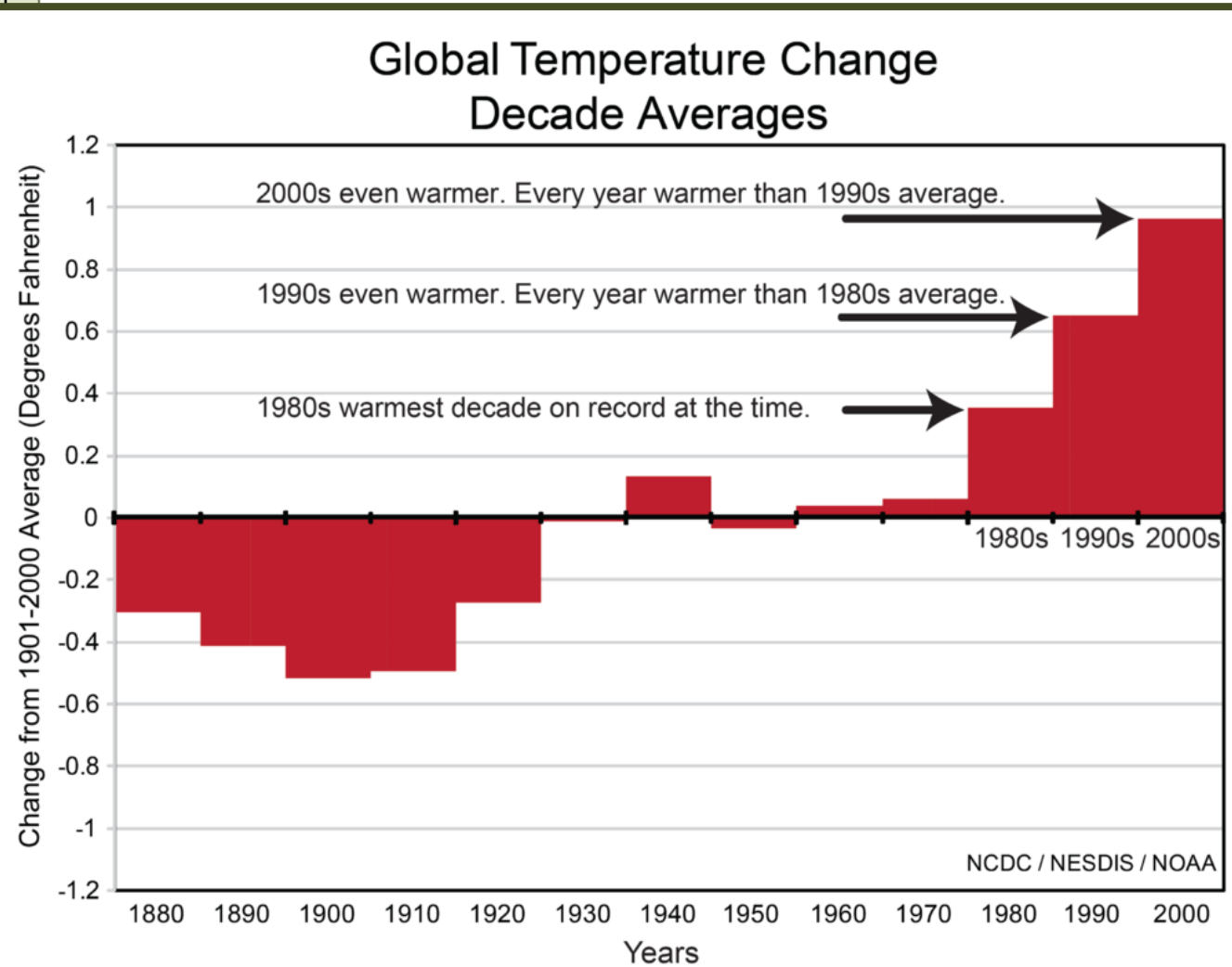
Global Land–Ocean Temperature Index



"Global Temperature Anomaly" by NASA Goddard Institute for Space Studies - <http://data.giss.nasa.gov/gistemp/graphs/>.

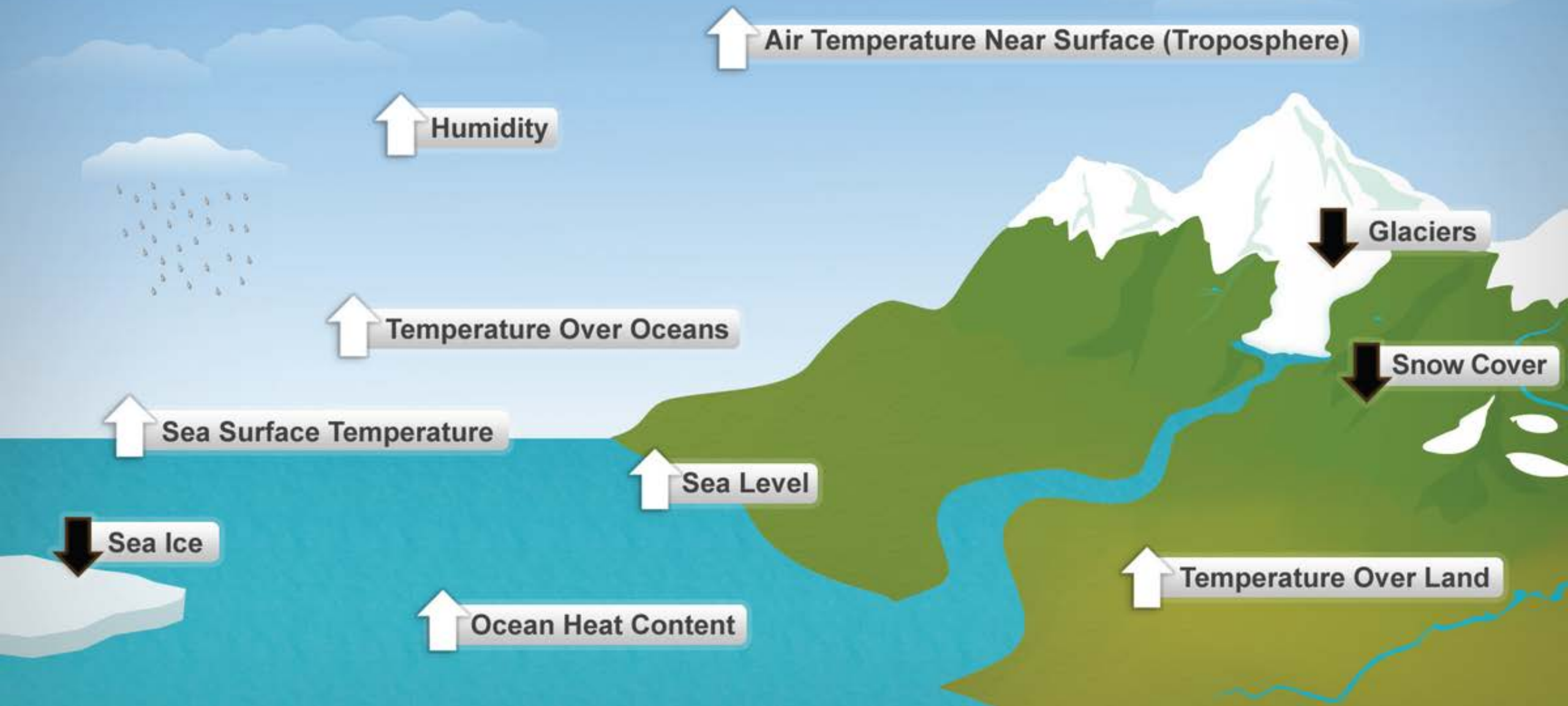
Licensed under Public Domain via Wikimedia Commons - https://commons.wikimedia.org/wiki/File:Global_Temperature_Anomaly.svg#/media/File:Global_Temperature_Anomaly.svg

Global Temperature Change



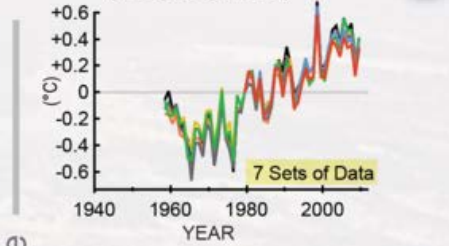
NOAA (July 2010), *State of the Climate in 2009*, as appearing in the July 2010 issue (Vol. 91) of the *Bulletin of the American Meteorological Society (BAMS)*. Supplemental and Summary Materials: Report at a Glance: Highlights, US National Oceanic and Atmospheric Administration (NOAA): National Climatic Data Center, <http://www.ncdc.noaa.gov/bams-state-of-the-climate/2009.php>, p.5.

Ten Indicators of a Warming World

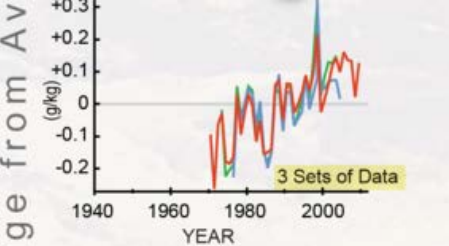


These indicators all increase in a warming world

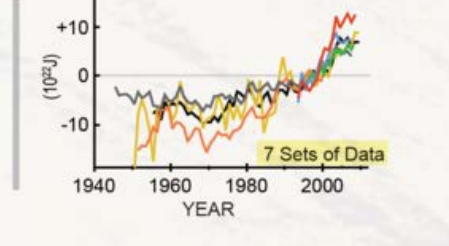
Air Temperature Near Surface (Troposphere) ↑



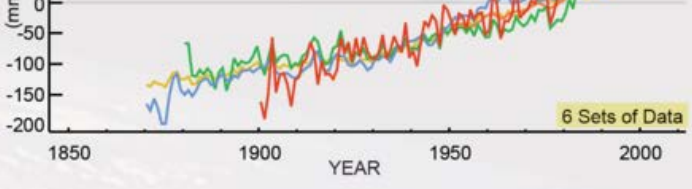
Specific Humidity ↑



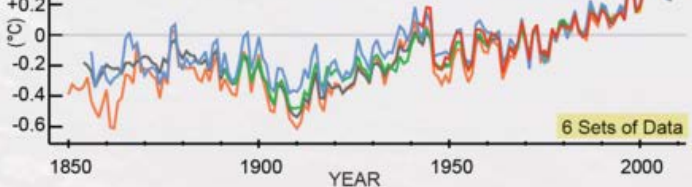
Ocean Heat Content ↑



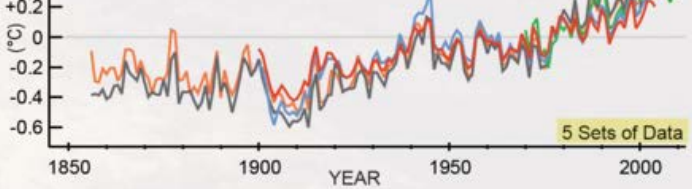
Sea Level ↑



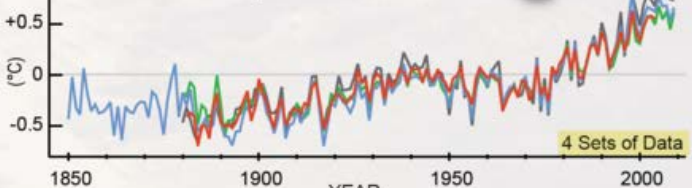
Sea-Surface Temperature ↑



Temperature Over Oceans ↑

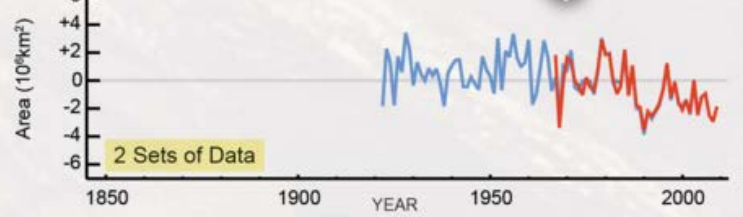


Land Surface Air Temperature Over Land ↑

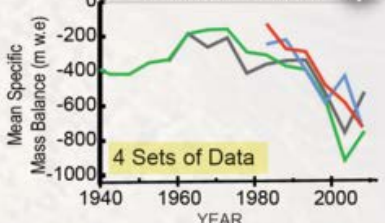


These indicators all decrease in a warming world

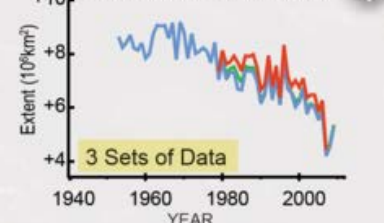
Snow Cover ↓
(March-April, Northern Hemisphere)



Glaciers ↓
(Glacier Mass Balance)



Sea-Ice ↓
(September Arctic Sea-Ice Extent)

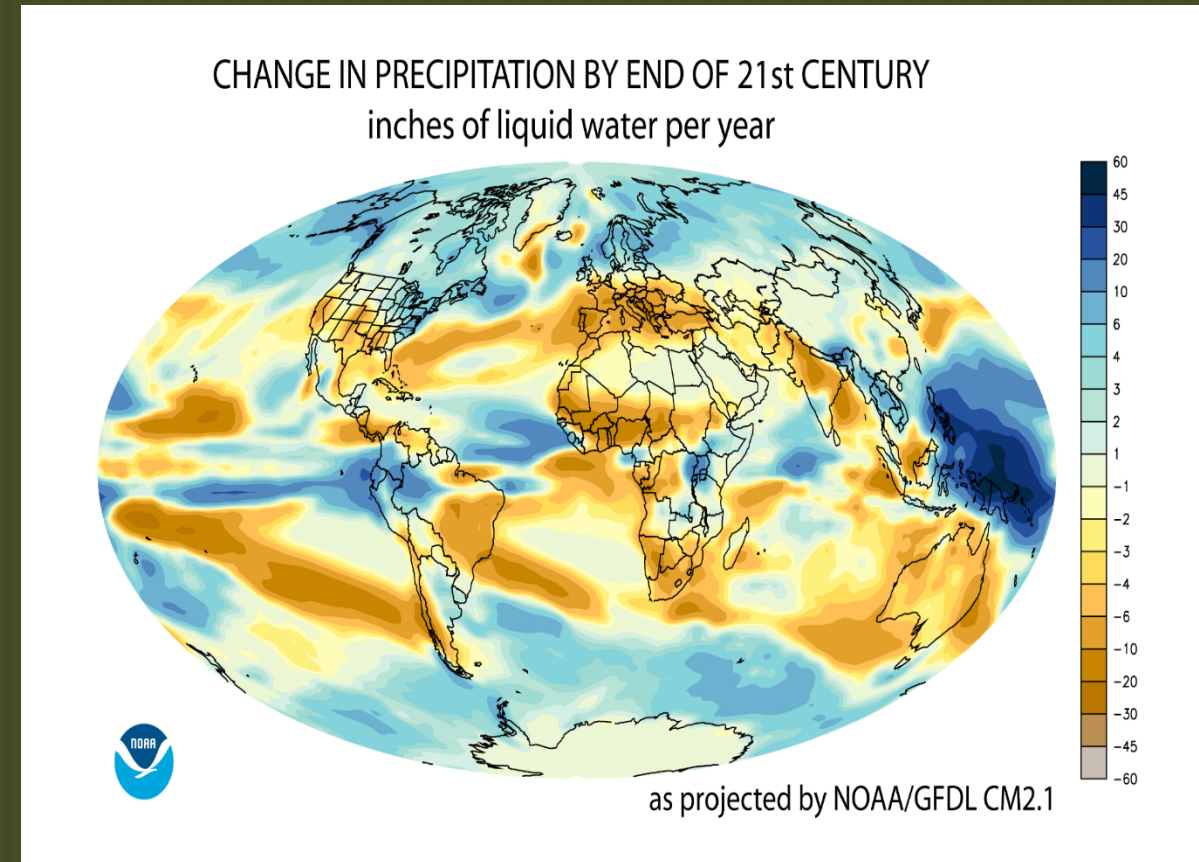


THE 2°C MAXIMUM WARMING TARGET

- Governments have agreed to limit CO₂ emissions to halt climatic warming to a maximum of 2°C.
 - But will this be achieved, and will this be enough?
 - The answers are not certain, but the scientific signals are that we are still moving ever closer to a critical tipping point.
- Major Concerns include:
 - The 2°C maximum is already too much.
 - Current trends, unless immediately changed, will take us well past the 2°C maximum .
 - The required actions to meet this target have yet to be enacted.

SAFE ATMOSPHERIC CO₂ CONCENTRATION?

- Currently atmospheric CO₂ concentrations are at 400 ppm and **increasing at ~3 ppm/year**.
- The warming effects of carbon dioxide emissions persist in the atmosphere for ~1,000 years.
- **2°C = 450 ppm** → we are not so sure, a 50/50 chance & **at current rates we would reach this by ~2030**
- The most stringent calls suggest that we have already passed a safe operating limit, and should aim to decrease to 350 ppm and a 1.5°C warming



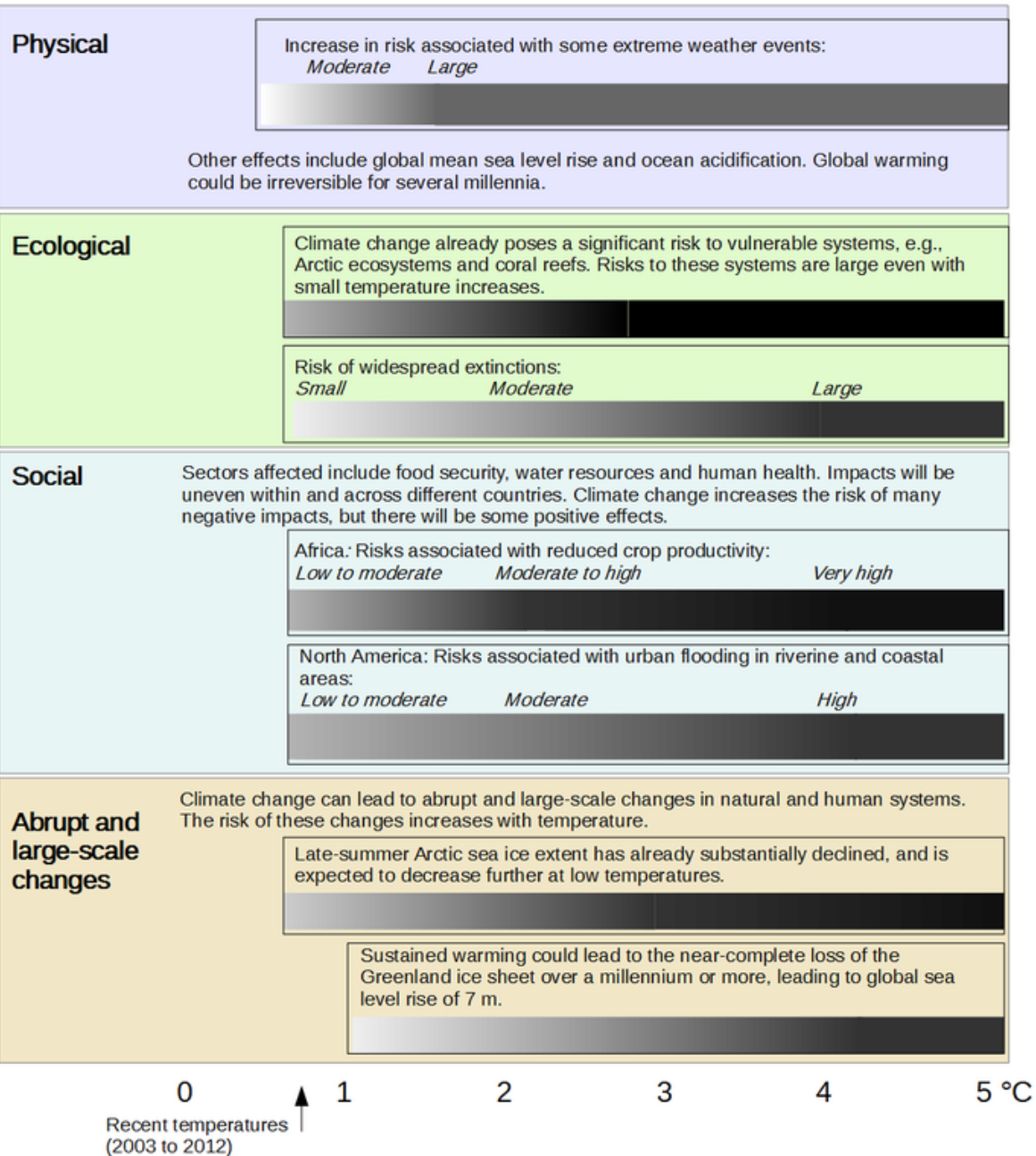
NOAA Geophysical Fluid Dynamics Laboratory (GFDL)

https://en.wikipedia.org/wiki/Effects_of_global_warming#/media/File:Projected_change_in_annual_average_precipitation_for_the_21st_century_based_on_the_SRES_A1B_emissions_scenario_and_simulated_by_the_GFDL_CM2.1_model.png

Increase in global mean temperature, relative to pre-industrial levels

0 1 2 3 4 5 6 7 8 9 °F

CLIMATE CHANGE IMPACTS & RISKS



- The impacts of climate change include increased temperatures, increases and decreases in precipitation, sea level rise, intensification of extreme weather events, etc.
- These impacts result in numerous geographically specific risks, such as flooding, reductions in crop productivity, shortages in fresh water supply, sea inundation, etc.
- The more vulnerable communities are, the more likely it is that these risks will result in extreme disasters.

KEY FINDINGS FROM IPCC AR5 WGIII *MITIGATION OF CLIMATE CHANGE*

- To remain below the 2°C maximum warming target, total anthropogenic Carbon emissions must be limited to **790 GtC**
- From 1870 to 2011, human activities have led to the release of **515 GtC**, i.e. consuming 65% of this total Carbon Budget.
- There is only a **275 GtC** Budget remaining if we are to limit warming to below 2°C
- At the current rate, we will have spent the remaining Carbon Budget by 2050

AMBITIOUS MITIGATION IS AFFORDABLE

- While AR5 WGII stresses the importance of taking strategic adaptation measures to reduce the risks people will face from climate change, WGIII stresses the importance and value of concerted mitigation efforts.
- Ambitious Mitigation efforts would lead to Economic growth reduced by ~ 0.06%
- The estimated costs do not account for the benefits of reduced climate change
- While, unmitigated climate change would create increasing risks to economic growth and potentially create far more negative impacts on growth and development.

MITIGATION MEASURES

- More efficient use of energy
- Greater use of low-carbon and no-carbon energy
 - Many of these technologies exist today
- Improved carbon sinks
 - Reduced deforestation and improved forest management and planting of new forests
 - Bio-energy with carbon capture and storage
- Lifestyle and behavioural changes



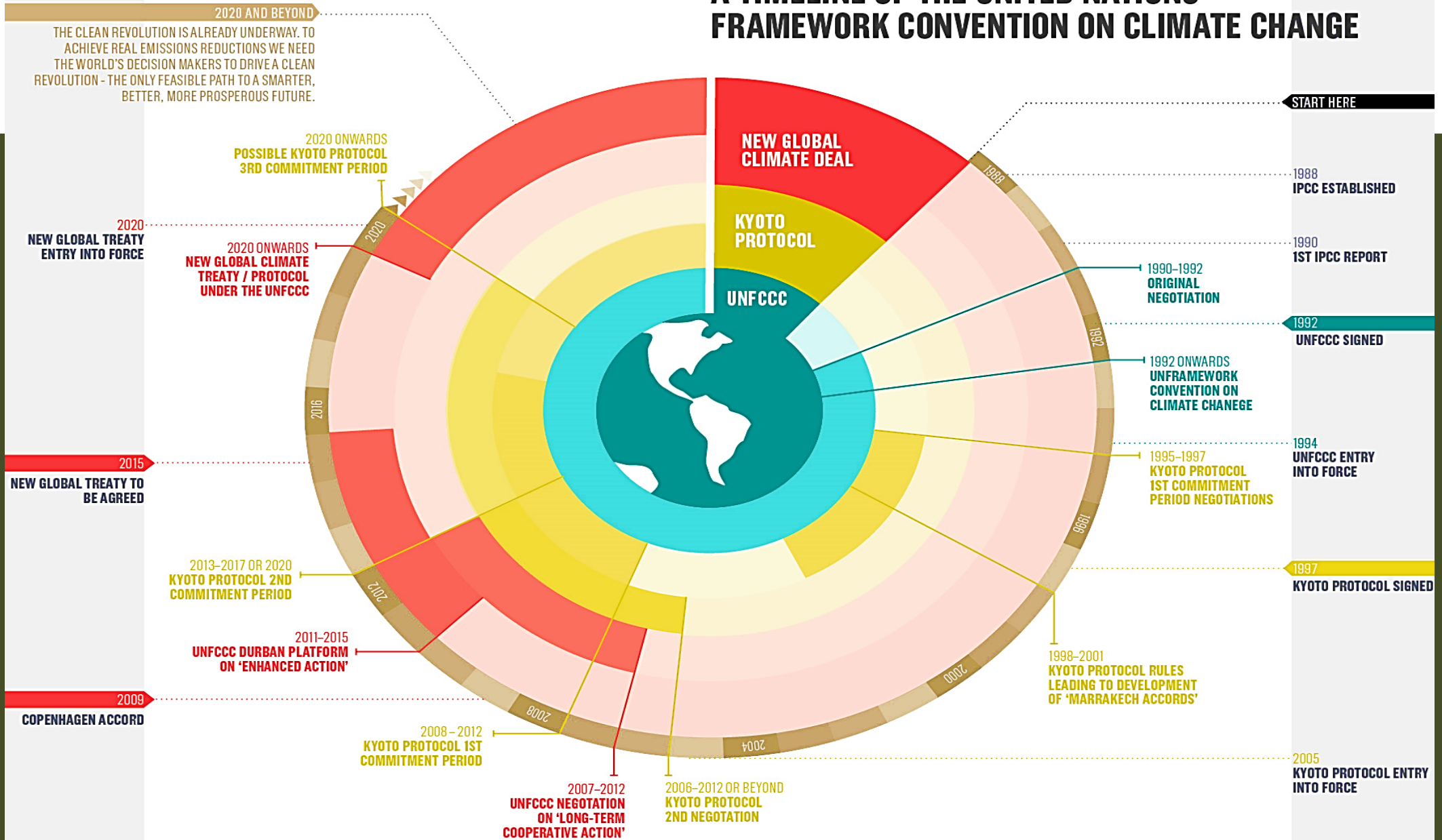
INTERNATIONAL CLIMATE NEGOTIATIONS

Section 2

CLIMATE NEGOTIATIONS TIMELINE

- **1988** – The Intergovernmental Panel on Climate Change (IPCC) is established
- **1990** – The 1st IPCC Assessment Report is launched
- **1992** – The United Nations Framework Convention on Climate Change (UNFCCC) is ratified by 154 nations
 - With the objective is to "stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" . UNFCCC Article 2
- **1994** – UNFCCC enters into force
- **1995** – The 2nd IPCC Assessment Report is launched
- **1997** – Kyoto Protocol is adopted at the 3rd Conference of Parties (COP)
 - This includes legally binding emissions reduction targets for developed countries.
 - First Commitment Period – 2008-2012
 - Second Commitment Period – 2012-2020
 - Kyoto Protocol also establishes flexibility mechanisms including: International Emissions Trading (IET), the Clean Development Mechanism (CDM), and Joint Implementation (JI)
- **2001** – The 3rd IPCC Assessment Report is launched
- **2005** – At COP 11, the Kyoto Protocol enters into force & the *Reducing emissions from deforestation and forest degradation (REDD)* mechanism is introduced
- **2007** – The 4th IPCC Assessment Report is launched
- **2007** – COP 13 adopts the Bali Road Map towards finalizing a binding agreement at COP 15
 - The Bali Action Plan strengthens efforts for both Mitigation and Adaptation among both developed and developing countries with the launch of: the **Adaptation Fund**, the Nationally Appropriate Mitigation Action (**NAMA**) process, and the National Adaptation Programme of Actions (**NAPA**) process
- **2009** – COP 15 is not able to achieve a new binding agreement, and instead produces the non-binding Copenhagen Accord
- **2010** – COP 16 produces the Cancun Agreements in which parties agree limit future global warming below the **2°C target** & to establish the **Green Climate Fund**
- **2014** – The 5th IPCC Assessment Report is launched
- **2015** – COP 21 adopts the Paris Agreement (by 195 member states) with countries making Nationally Determined Contributions (NDCs) to GHG reductions

UNDERSTANDING THE UNFCCC NEGOTIATIONS A TIMELINE OF THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE



TOP DOWN PERIOD: 1992-2006

(COPs 1-12)

- One of the first efforts under the UNFCCC was to establish National Greenhouse Gas Inventories to track emissions and removals.
- Discussions at COP 1 and 2 led countries to agree that stabilizing at 1990 levels was not enough, and further reductions below 1990 levels were required.
- COP 3 and the Kyoto Protocol (1997) provides the first legally binding emission reduction targets for developed countries (i.e. Annex 1 countries)
- COP 7 and the Marrakech Accords (2001) lays out the rules for meeting the targets set out in the Kyoto Protocol, such as operational rules on Carbon Trading and CDM as well as the compliance regime
- COP 15 (2005), Kyoto Protocol enters into force and the parties agree to extend the protocol beyond 2012 with the aim for deeper emission cuts
 - COP meetings also now include the Meeting of Parties to the Kyoto Protocol, and the Kyoto
- COP 16 (2006) receives criticism for the disconnect between the political process and the scientific imperative, but it also achieves strong improvements for supporting developing countries, CDM and a five-year plan of work on adaptation

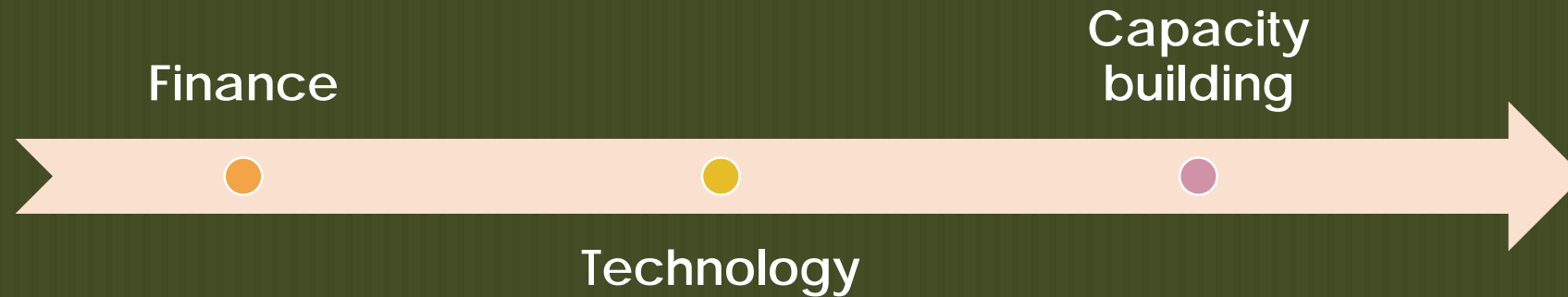
AFTER BALI (COP 13 – 2007): A MORE BOTTOM UP APPROACH

- COP 13 began negotiations on the successor to the Kyoto Protocol, and set out to agree on a road-map, timetable and concrete steps for future negotiations towards reaching an agreement in 2009
- The Bali Road Map set out a two year negotiating process aimed towards finalizing an agreement in Copenhagen at COP 15 – that would strengthen an approach for cooperative actions and include ample opportunities for feedback/inputs from parties.
- The Bali Road Map also defined a set of building blocks for the new agreement: cutting emissions, mitigation, forests, adaptation, technology development and transfer, and finance.
- Neither COP 15 (in Copenhagen) or COP 16 (in Cancun) were able to realize this new agreement for a successor to the Kyoto Protocol, and from COP 17 “The Durban Platform” began a new round of negotiations towards a new agreement finally realised at COP 21 (in Paris, 2015)
- However, the Bali Road Map did lead to the development/advancement of a range of support mechanisms for developing countries on both mitigation and adaptation

THE BALI ACTION PLAN

1 (b) (ii):

- Nationally Appropriate Mitigation Actions (NAMAs) by developing Parties
- In the context of sustainable development,
- Supported and enabled by:

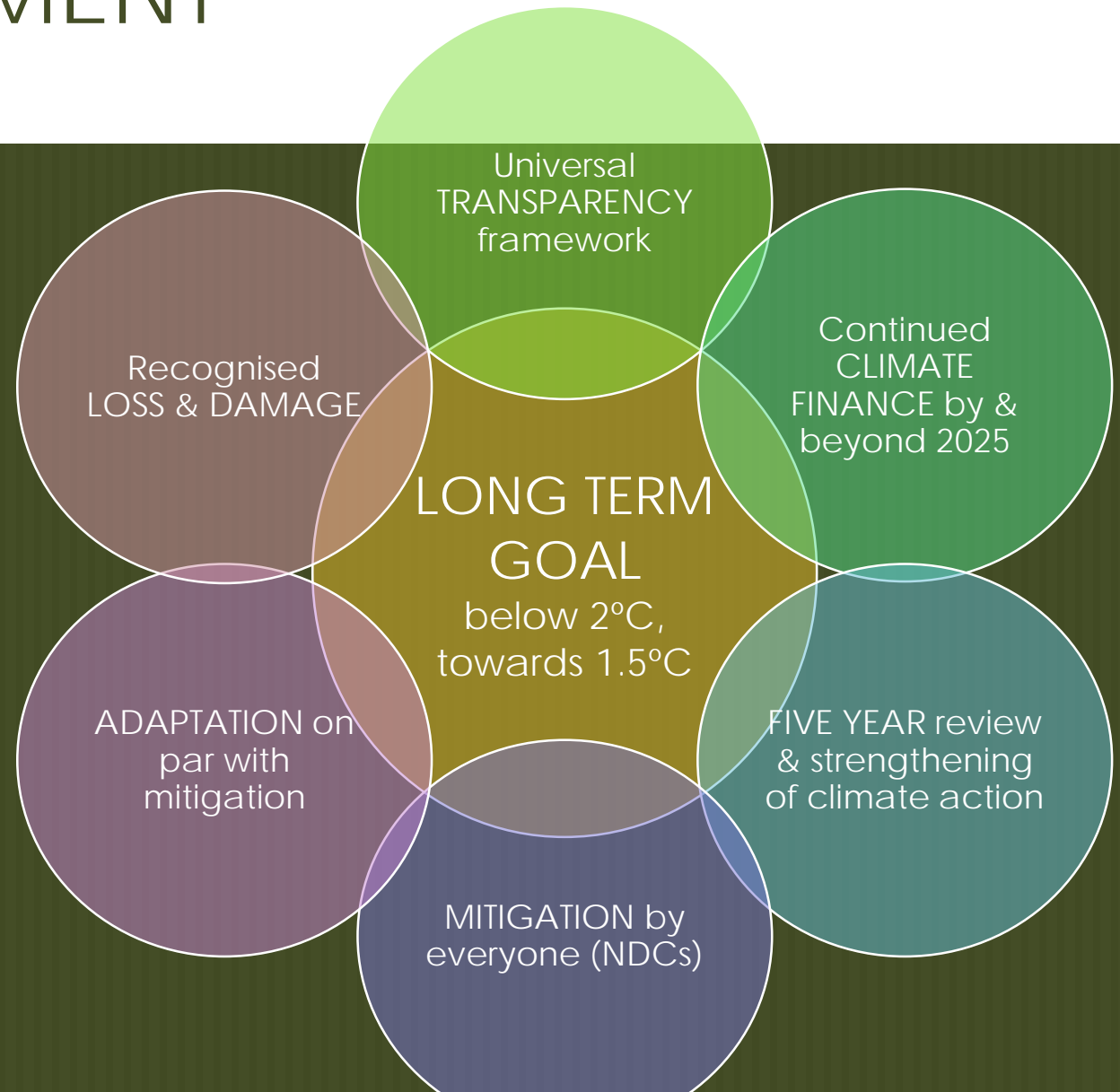


- In a Measurable, Reportable and Verifiable manner (MRV)

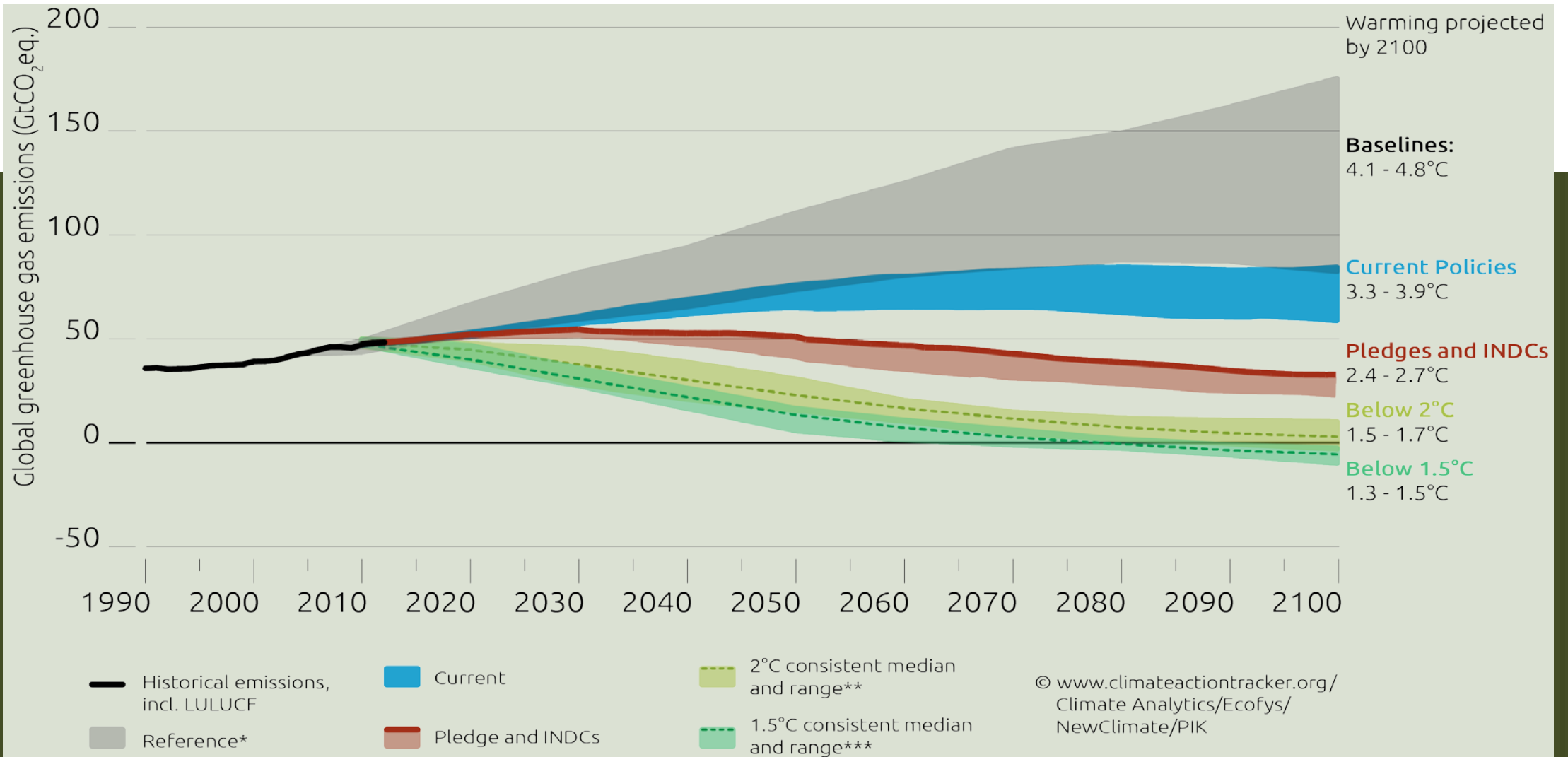
THE PARIS AGREEMENT

Article 2:

- a) Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;
- b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production;
- c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.



TRACKING THE NATIONALLY DETERMINED CONTRIBUTIONS



- * 5%-95% percentile of AR5 WGIII scenarios in concentration category 7, containing 64% of the baseline scenarios assessed by the IPCC
- ** Greater than 66% chance of staying within 2°C in 2100. Median and 10th to 90th percentile range. Pathway range excludes delayed action scenarios and any that deviate more than 5% from historic emissions in 2010.
- *** Greater than or equal to 50% chance of staying below 1.5°C in 2100. Median and 10th to 90th percentile range. Pathway range excludes delayed action scenarios and any that deviate more than 5% from historic emissions in 2010.



CLIMATE FINANCE NEGOTIATIONS UNDER THE UNFCCC PROCESS

Section 3

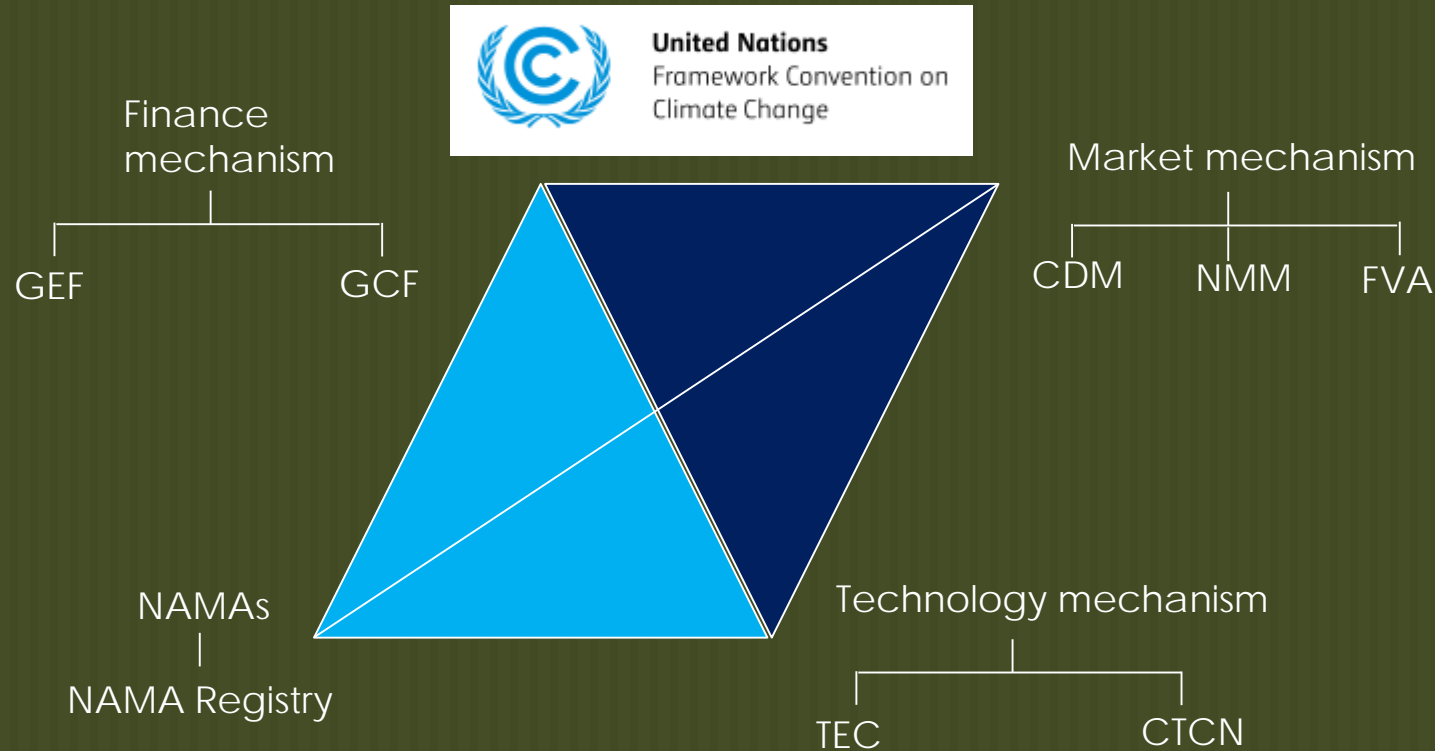
HISTORY OF CLIMATE FINANCE NEGOTIATIONS *(PART 1)*

- COP 3 (Kyoto, 1997): Establishes the first flexibility mechanisms including the [Clean Development Mechanism \(CDM\)](#)
- COP 7 (Marrakech, 2001): Agreed to establish three funds: 1) climate change fund to support climate measures, 2) fund to support National Adaptation Programs of Action for least-developed countries, and 3) a Kyoto Protocol adaptation fund supported by a CDM levy – *(these points agreed at the resumed COP 6 negotiations in Bonn, but finalised at COP 7)*
- COP 9 (Milan, 2003): Parties finalise agreement on the use of the [Adaptation Fund](#) for supporting adaptation efforts in developing countries, but also for capacity building through technology transfer.
 - *However the fund was not officially launched until 2007, and funding allocation began in 2010.*
 - *Between 2010-2015, the fund has committed US\$331 million in 54 countries*
- COP 11 (Montreal, 2005): Introduces the [Reducing emissions from deforestation and forest degradation \(REDD\)](#) mechanism as a new flexibility mechanism
- COP 12 (Nairobi, 2006): The procedures and modalities for the Adaptation Fund are agreed

HISTORY OF CLIMATE FINANCE NEGOTIATIONS *(PART 2)*

- COP 13 (Bali, 2007): The Bali Road Map identifies finance as a key pillar of the future climate agreement, and establishes a set of guiding principles for climate finance:
 - 1) To improve access to predictable and sustainable financial resources; 2) To provide positive incentives; 3) To establish innovative means of funding for adaptation; 4) To Incentivise adaptation actions on the basis of sustainable development policies; 5) To mobilize climate-friendly funding and investment choses; and 6) To provide financial and technical support for capacity-building in the assessment of costs of adaptation in developing countries, to aid in determining their financial needs.
- COP 16 and the Cancun Agreements (2010): Developed countries commit to mobilizing USD 100 Billion per year by 2020 to address the needs of developing countries for meaningful mitigation actions and to establish the **Green Climate Fund**
 - The Standing Committee on Climate Finance was established as part of the UNFCCC
- COP 17 (Durban, 2011): Adopts a Management Framework for the Green Climate Fund
- *At present, around USD 10.2 Billion has been committed to the Green Climate Fund by 42 national governments, and an additional USD 18.4 Million from regional and municipal governments*
- COP 21 (Paris, 2015): Aims to align the existing financial flows with the over

MEANS OF IMPLEMENTATION: AN INTERDEPENDENT MIX OF FINANCE, TECHNOLOGY, CAPACITY BUILDING AND MARKET MECHANISMS



- Current discussion takes place separately under each mechanism.
- No entity is officially tasked to create synergies among various mechanisms.

CLIMATE FINANCE FLOWS

(USD BILLION AND ANNUALIZED)

- From 2010-2012, Global climate finance in all countries ranged from USD 340 to USD 650 billion per year
- Between 38-53% of this funding was directed to the Asia-Pacific region
- In 2014, public funding for climate finance accounted for 38% of the total (i.e. USD 148 billion), while private funding accounted for 62% (i.e. USD 243 billion)
 - Private funding was primarily invested into renewable energies

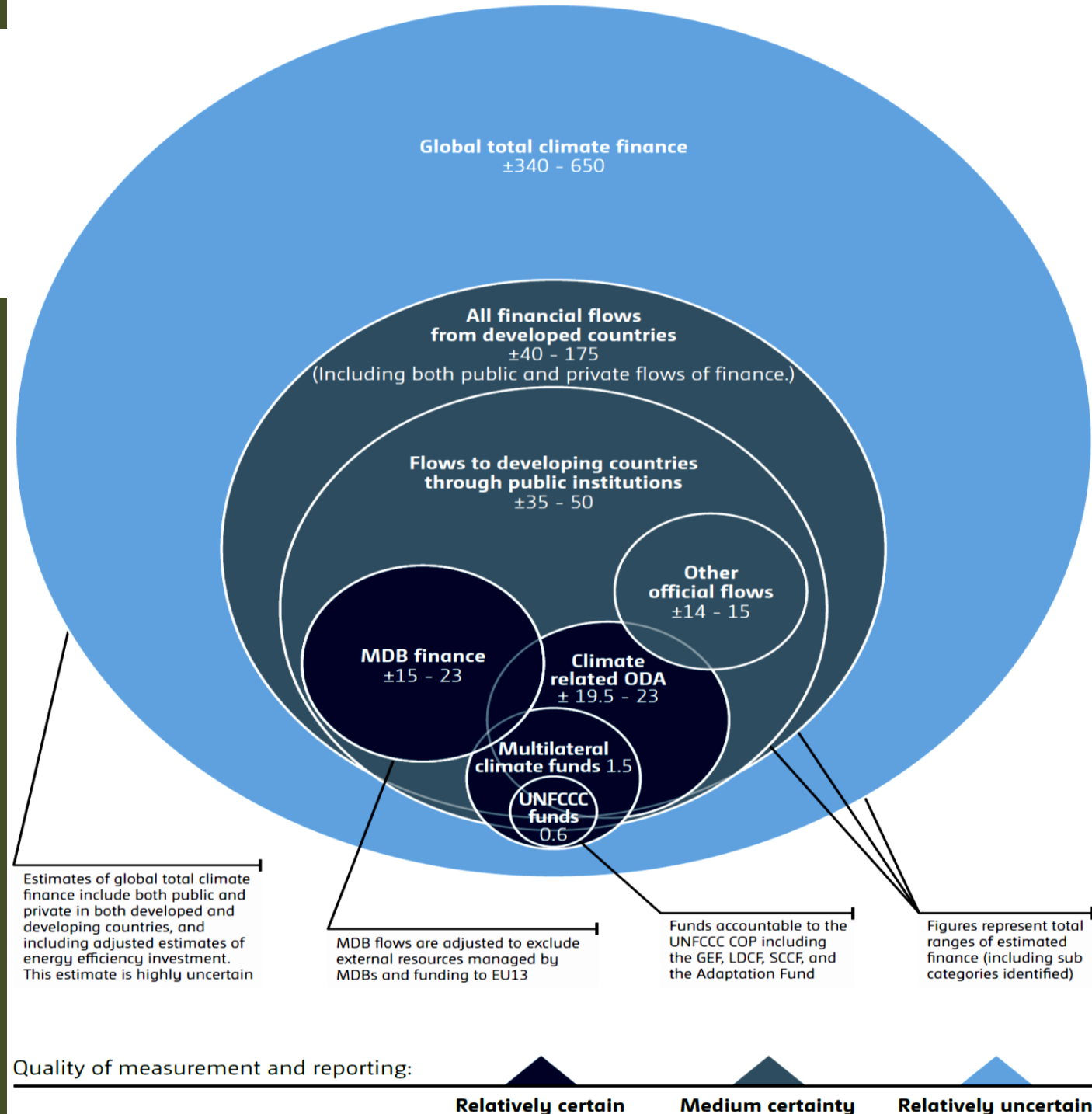


Figure 2. The Global Landscape of Climate Finance 2015

GLOBAL LANDSCAPE OF CLIMATE FINANCE 2015

Landscape of Climate Finance 2015 illustrates climate finance flows along their life cycle for the latest year available, mostly 2014, in USD billions

USD 391 BN TOTAL

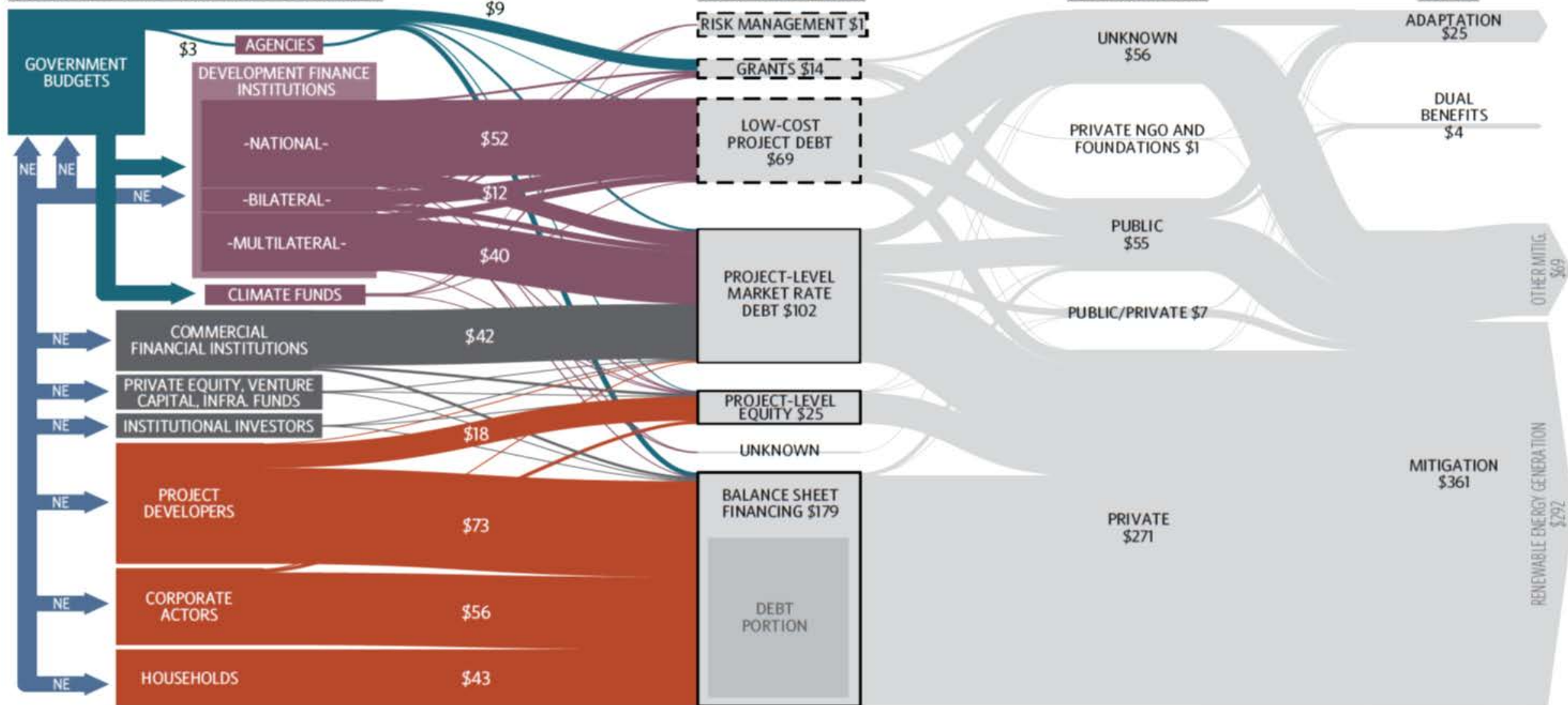


SOURCES AND INTERMEDIARIES

INSTRUMENTS

RECIPIENTS

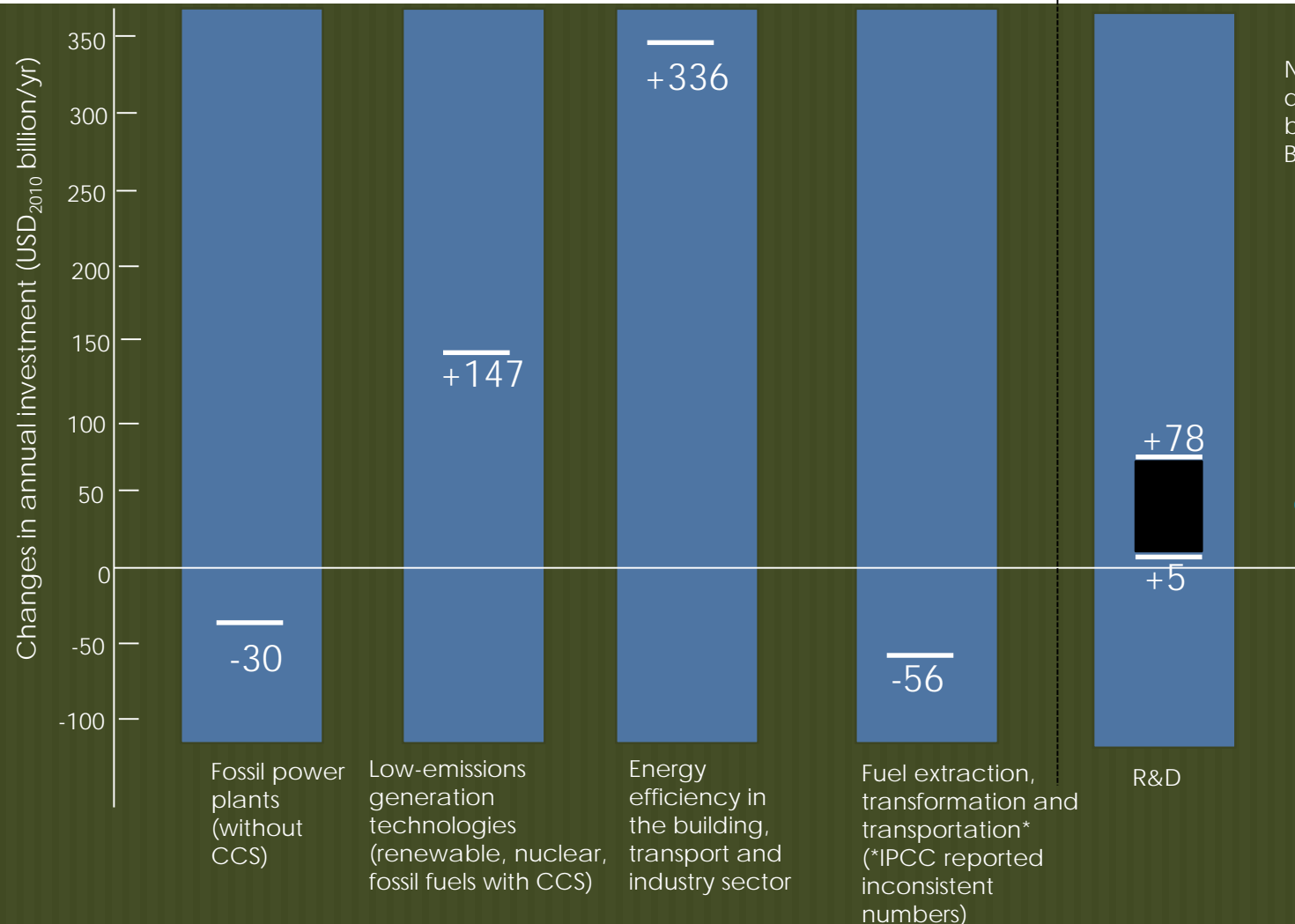
USES



KEY

- PUBLIC MONEY
- PRIVATE MONEY
- PUBLIC FINANCIAL INTERMEDIARIES
- PRIVATE FINANCIAL INTERMEDIARIES
- CAPITAL INVESTMENT
- CAPITAL INVESTMENT AND INCREMENTAL COSTS
- FINANCE FOR INVESTORS & LENDERS
- NE: NOT ESTIMATED

USD 400 BILLION PER YEAR ADDITIONAL INVESTMENT WILL BE REQUIRED BY 2030 TO STAY BELOW 2°C



Note: Additional investment is defined as the difference between policy scenarios and BAU.

Key Message:
Changing investment pattern is equally important as scaling up climate finance.

Thank You for your kind attention!

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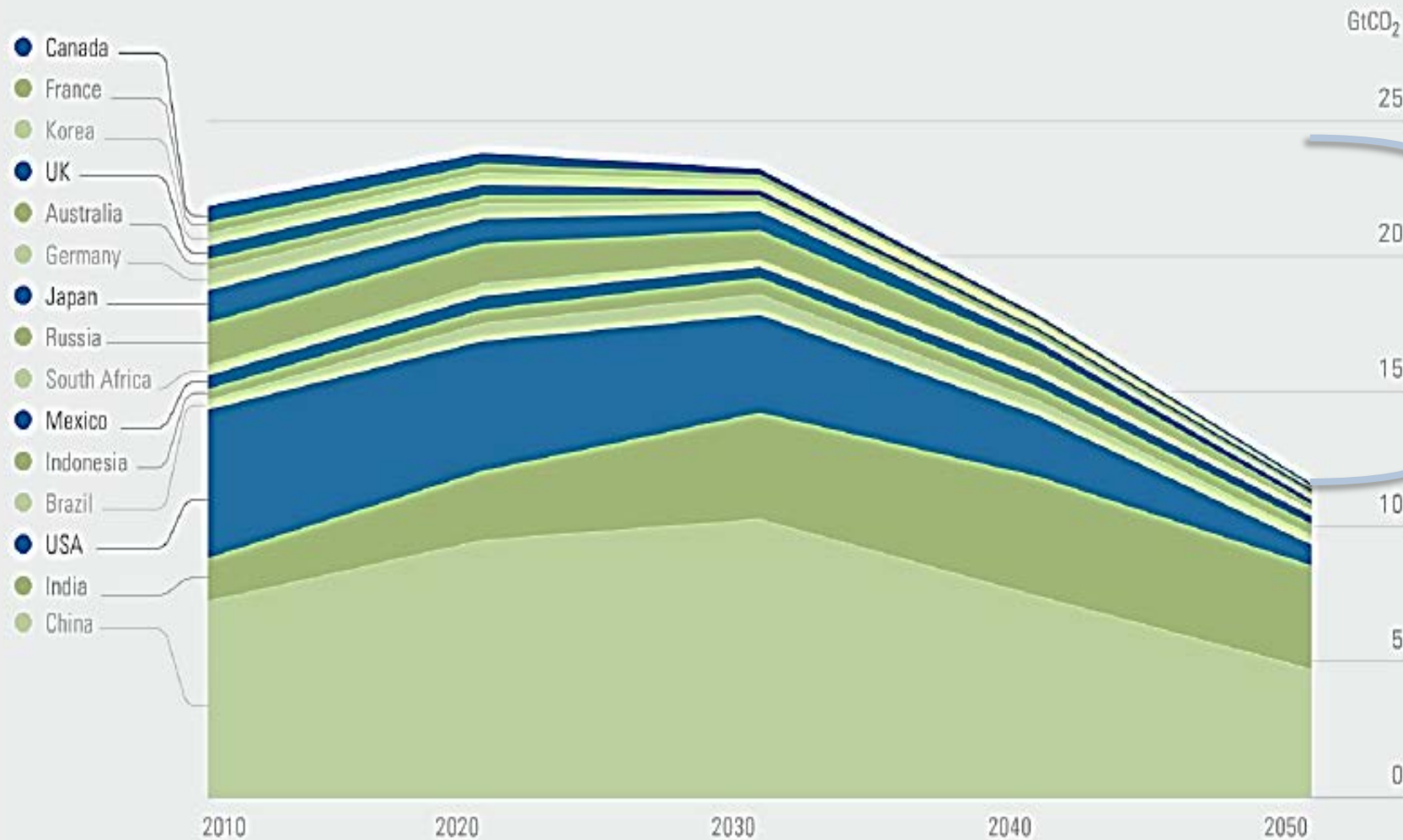
THE IMPERATIVE FOR ACTION

"We are allowing ourselves to travel a uniquely dangerous path, and we are doing so without an appreciation for the consequences that lie ahead." - Jean-Pierre Gattuso

"This is a moral moment. This is not ultimately about any scientific debate or political dialogue. Ultimately it is about who we are as human beings. It is about our capacity to transcend our own limitations. To rise to this new occasion. To see with our hearts, as well as our heads, the unprecedented response that is now called for. To disenthral ourselves, to shed the illusions that have been our accomplices in ignoring the warnings that were clearly given, and hearing the ones that are clearly given now." - Al Gore

THE URGENCY OF NOW

Figure 6.3. Energy-related CO₂ emissions reduction trajectories in the 15 DDPs



Required reductions to limit global warming to 2°C target maximum