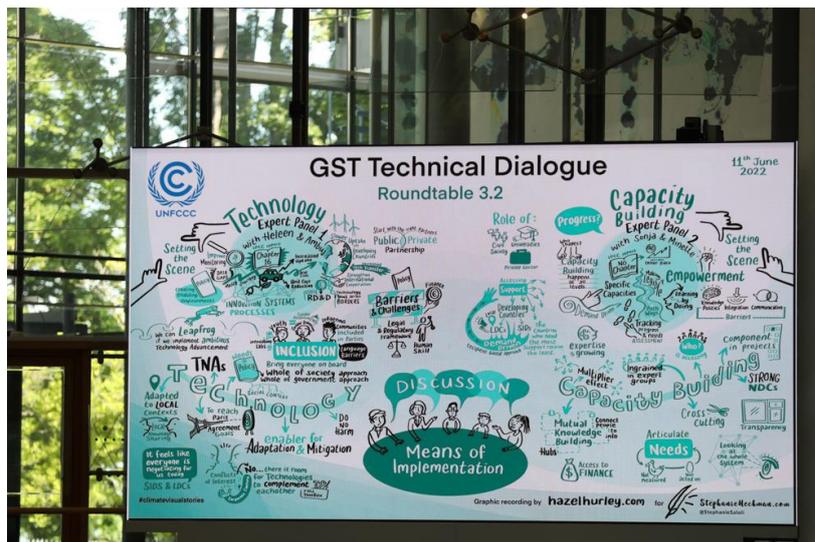


The COP27 Climate Change Conference

Status of climate negotiations and issues at stake



Policy Department for Economic, Scientific and Quality of Life Policies
Directorate-General for Internal Policies

Authors: Lorenz MOOSMANN, Anne SIEMONS, Felix FALLASCH,
Lambert SCHNEIDER, Cristina URRUTIA, Nora WISSNER, Roman MENDELEVITCH,
Hauke HERMANN, Sean HEALY, Dietram OPPELT, Stefanie HEINEMANN
PE 733.989 - October 2022



The COP27 Climate Change Conference

Status of climate negotiations and issues at stake

Abstract

This study provides an overview of the status of international climate negotiations and issues at stake at the COP27 Climate Change Conference that will take place in Sharm El-Sheikh (Egypt) from 6 to 18 November 2022. It also addresses the current implementation of the Paris Agreement, the stakeholders in the negotiations and the climate policies of key Parties.

This document was provided by the Policy Department for Economic, Scientific and Quality of Life Policies at the request of the Committee on the Environment, Public Health and Food Safety (ENVI).

This document was requested by the European Parliament's Committee on the Environment, Public Health and Food Safety (ENVI).

AUTHORS

Lorenz MOOSMANN, Anne SIEMONS, Felix FALLASCH, Lambert SCHNEIDER, Cristina URRUTIA, Nora WISSNER, Roman MENDELEVITCH, Hauke HERMANN, Sean HEALY, Öko-Institut e.V.
Dietram OPPELT, Stefanie HEINEMANN, HEAT GmbH

ADMINISTRATOR RESPONSIBLE

Georgios AMANATIDIS

EDITORIAL ASSISTANT

Catherine NAAS

LINGUISTIC VERSIONS

Original: EN

ABOUT THE EDITOR

Policy departments provide in-house and external expertise to support EP committees and other parliamentary bodies in shaping legislation and exercising democratic scrutiny over EU internal policies.

To contact the Policy Department or to subscribe for email alert updates, please write to:

Policy Department for Economic, Scientific and Quality of Life Policies

European Parliament

L-2929 - Luxembourg

Email: Poldep-Economy-Science@ep.europa.eu

Manuscript completed: September 2022

Date of publication: October 2022

© European Union, 2022

This document is available on the internet at:

<http://www.europarl.europa.eu/supporting-analyses>

DISCLAIMER AND COPYRIGHT

The opinions expressed in this document are the sole responsibility of the authors and do not necessarily represent the official position of the European Parliament.

Reproduction and translation for non-commercial purposes are authorised, provided the source is acknowledged and the European Parliament is given prior notice and sent a copy.

For citation purposes, the study should be referenced as: MOOSMANN et. al., *The COP27 Climate Change Conference: status of climate negotiations and issues at stake*. Study for the Committee on the Environment, Public Health and Food Safety, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg, 2022.

© Cover image by Kiara Worth (IISD)

CONTENTS

LIST OF ABBREVIATIONS	6
LIST OF BOXES	12
LIST OF FIGURES	12
LIST OF TABLES	12
EXECUTIVE SUMMARY	13
1. INTRODUCTION	15
2. THE INTERNATIONAL FRAMEWORK FOR ADDRESSING CLIMATE CHANGE	16
2.1. The United Nations Framework Convention on Climate Change	16
2.2. The Kyoto Protocol	17
2.3. The Paris Agreement	17
2.3.1. Negotiation history	17
2.3.2. Signature, ratification and entry into force	18
2.3.3. The goals of the Paris Agreement	19
2.3.4. Overview of the main topics of the Paris Agreement	20
2.4. The Sixth Assessment Report of the IPCC	23
2.5. Sectoral agreements outside the UNFCCC	25
2.5.1. International aviation	25
2.5.2. International maritime transport	28
2.5.3. Addressing fluorinated gases under the Montreal Protocol	30
3. IMPLEMENTATION OF THE PARIS AGREEMENT (COP24-26) AND ISSUES AT STAKE AT COP27	33
3.1. Mitigation	33
3.1.1. Outcomes of COP24/CMA1 Part 3	34
3.1.2. Outcomes of COP25/CMA2	34
3.1.3. Outcomes of COP26/CMA3	35
3.1.4. Issues at stake at COP27	37
3.2. Voluntary cooperation under Article 6 of the Paris Agreement	38
3.2.1. Outcomes of COP24-26	38
3.2.2. Issues at stake at COP27	40
3.3. Adaptation	41
3.3.1. Outcomes of COP24-26	41
3.3.2. Issues at stake at COP27	42
3.4. Loss and damage	43
3.4.1. Outcomes of COP24-26	43

3.4.2. Issues at stake at COP27	44
3.5. Support	44
3.5.1. Finance	44
3.5.2. Technology development and transfer	46
3.5.3. Capacity building	47
3.6. Transparency and compliance	48
3.6.1. Outcomes of COP24-26	48
3.6.2. Issues at stake at COP27	50
3.7. The global stocktake	50
3.7.1. Procedure of the global stocktake	50
3.7.2. The technical phase of the global stocktake	51
3.7.3. The political phase of the global stocktake	52
3.8. Other topics in the negotiations	52
3.8.1. Koronivia joint work on agriculture	53
3.8.2. Impacts of the implementation of response measures	53
3.8.3. Research and systematic observation	53
3.8.4. Action for climate empowerment	54
3.8.5. The local communities and indigenous peoples' platform	55
3.8.6. The gender action plan	55
3.8.7. International aviation and maritime transport	55
4. STAKEHOLDERS IN THE NEGOTIATIONS	57
4.1. Groups of Parties	57
4.1.1. Umbrella Group	57
4.1.2. Environmental Integrity Group	58
4.1.3. Independent Alliance of Latin America and the Caribbean (AILAC)	59
4.1.4. Alliance of Small Island States (AOSIS)	59
4.1.5. Least Developed Countries (LDCs)	59
4.1.6. African Group of Negotiators (AGN)	59
4.1.7. Group of Argentina, Brazil and Uruguay (ABU)	60
4.1.8. Bolivarian Alliance for the Peoples of Our America (ALBA)	60
4.1.9. Like-Minded Developing Countries (LMDC)	60
4.1.10. Arab Group	60
4.1.11. Group of G-77 and China	60
4.1.12. European Union	61
4.2. Observers	61
4.2.1. Civil society	62
4.2.2. Local and regional governments	65

4.2.3. International organisations	66
4.2.4. UN bodies and inter-governmental organisations	66
5. CLIMATE POLICIES OF MAIN PARTIES	68
5.1. Argentina	70
5.2. Australia	71
5.3. Brazil	72
5.4. Canada	73
5.5. China	74
5.6. Egypt (COP Presidency)	75
5.7. European Union	76
5.8. India	78
5.9. Indonesia	79
5.10. Japan	80
5.11. Mexico	81
5.12. Republic of Korea	82
5.13. Russian Federation	83
5.14. Saudi Arabia	84
5.15. South Africa	85
5.16. Turkey	86
5.17. United Kingdom	87
5.18. United States	87
6. RECENT DEVELOPMENTS AND THEIR IMPACTS ON THE NEGOTIATIONS AND ON CLIMATE ACTION	89
6.1. The Russian Federation's war on Ukraine	89
6.1.1. Impacts on energy prices and energy security	89
6.1.2. Impacts on the transformation of energy systems/decarbonisation in Europe	91
6.1.3. Impacts on commodities and agriculture	92
6.1.4. Impacts on the global economy and on global greenhouse gas emissions	93
6.1.5. Impacts on the international climate negotiations	94
6.2. The COVID-19 pandemic	95
7. OUTLOOK	97
REFERENCES	98

LIST OF ABBREVIATIONS

ABU	Group of Argentina, Brazil and Uruguay
AC	Adaptation Committee
ACE	Action for Climate Empowerment
ADCOM	Adaptation Communication
AILAC	Independent Alliance of Latin America and the Caribbean (Asociación Independiente de Latinoamérica y el Caribe)
AFOLU	Agriculture, Forestry and Other Land Use
AGN	African Group of Negotiators
ALBA	Bolivarian Alliance for the Peoples of our America (Alianza Bolivariana para los Pueblos de Nuestra América)
AOSIS	Alliance of Small Island States
AR6	Sixth Assessment Report (of the Intergovernmental Panel on Climate Change)
ATAG	Air Transport Action Group
BAU	Business As Usual
BINGO	Business and Industry NGOs
bn	Billion
BTR	Biennial Transparency Report
CAN	Climate Action Network
CBAM	Carbon Border Adjustment Mechanism
CBDR/RC	Common but Differentiated Responsibilities and Respective Capabilities
CDM	Clean Development Mechanism
CII	Carbon Intensity Indicator

CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO₂	Carbon Dioxide
CO₂eq	Carbon Dioxide Equivalent
COP	Conference of the Parties
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
COVID-19	Coronavirus Disease 2019
COY	Conference of the Youth
CTCN	Climate Technology Centre and Network
DCS	Data Collection System
ECONGO	Education and Capacity Building and Outreach NGOs
EEDI	Energy Efficiency Design Index
EEXI	Energy Efficiency Existing Ship Index
EIG	Environmental Integrity Group
ENGO	Environmental NGOs
ETF	Enhanced Transparency Framework
ETS	Emissions Trading System
EU	European Union
EUA	European Union Allowance (under the European Emissions Trading System)
EJ	Exajoule
ExMOP	Extraordinary Meeting of the Parties
F-gas	Fluorinated Gas

FAO	Food and Agriculture Organization
FBOs	Faith Based Organisations
FMCP	Facilitative, Multilateral Consideration of Progress
FoLU	Forestry and Other Land Use
FSRU	Floating Storage and Regasification Unit
FWG	Facilitative Working Group
G7	Group of Seven
G20	Group of Twenty
G-77	Group of 77 at the United Nations
GAP	Gender Action Plan
GCF	Green Climate Fund
GCoM	Global Covenant of Mayors for Energy and Climate Change
GEF	Global Environment Facility
GGA	Global Goal on Adaptation
GHG	Greenhouse Gas
GlaSS	Glasgow-Sharm-el-Sheikh work programme on the global goal on adaptation
GLDFLU	Glasgow Leaders' Declaration on Forests and Land Use
GMP	Global Methane Pledge
GST	Global Stocktake
Gt	Gigatons
GWP	Global Warming Potential
HFCs	Hydrofluorocarbons
ICAO	International Civil Aviation Organization
ICC	International Chamber of Commerce

ICLEI	International Council for Local Environmental Initiatives
iCTU	Information to facilitate Clarity, Transparency and Understanding
IDDI	Industrial Deep Decarbonisation Initiative
IGO	Intergovernmental Organisation
IMO	International Maritime Organization
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPO	Indigenous Peoples Organizations
IRA	Inflation Reduction Act
ITMO	Internationally Transferred Mitigation Outcome
ITUC	International Trade Union Confederation
JI	Joint Implementation
KCI	Katowice Committee of Experts on the Impacts of the Implementation of Response Measures
KJWA	Koronivia Joint Work on Agriculture
kWh	Kilowatt hour
LCIPP	Local Communities and Indigenous Peoples Platform
LDC	Least Developed Countries
LEG	Least Developed Countries Expert Group
LGMA	Local Government and Municipal Authorities
LMDC	Like-Minded Developing Countries
LNG	Liquid Natural Gas
LPG	Liquefied Petroleum Gas
LTF	Long-term Finance

LTS	Long-term Strategy
LULUCF	Land Use, Land Use Change and Forestry
MEPC	Marine Environmental Protection Committee
Mha	Million Hectares
MOP	Meeting of the Parties (to the Montreal Protocol)
MPGs	Modalities, Procedures and Guidelines (for the transparency framework for action and support)
Mt	Megatons
MWh	Megawatt Hour
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
NGO	Non-Governmental Organisation
ODS	Ozone Depleting Substances
OECD	Organisation for Economic Co-operation and Development
OEWG	Open-Ended Working Group
PAWP	Paris Agreement Work Programme
PCCB	Paris Committee on Capacity-Building
ppm	Parts per Million
RACHP	Refrigeration, Air Conditioning and Heat Pump
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RINGO	Research and Independent Non-Governmental Organisations
SB	Subsidiary Body
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice

SCF	Standing Committee on Finance
SDG	Sustainable Development Goal
SED2	Second Structured Expert Dialogue
SEEMP	Ship Energy Efficiency Management Plan
SIDS	Small Island Developing States
TEAP	Technology and Economic Assessment Panel
TEC	Technology Executive Committee
TF	Technology Framework
TM	Technology Mechanism
TUNGO	Trade Union Non-Governmental Organisations
TWh	Terawatt hour
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UG	Umbrella Group
UN	United Nations
UK	United Kingdom
US	United States
USD	United States Dollar
WGC	Women and Gender Constituency
WIM	Warsaw International Mechanism (for loss and damage)
YOUNGO	Youth Non-Governmental Organisations

LIST OF BOXES

Box 1:	The Doha Amendment	17
Box 2:	Industry organisations and initiatives	64

LIST OF FIGURES

Figure 1:	The Conference of the Parties and related bodies	16
Figure 2:	Status of signature and ratification of the Paris Agreement	19
Figure 3:	Goals of the Paris Agreement	19
Figure 4:	Topics addressed by the Paris Agreement	20
Figure 5:	Global GHG emissions of modelled pathways, and projected emissions	25
Figure 6:	Historic and future development of CO ₂ emissions from international aviation	26
Figure 7:	Historic and projected CO ₂ emissions from international maritime transport	29
Figure 8:	Depiction of common time frames of NDCs following decision 6/CMA.3	36
Figure 9:	Elements of Article 13 of the Paris Agreement and the related chapters of the MPGs (2018) and elements of the transparency guidance (2021)	49
Figure 10:	Parties to the UNFCCC, and group affiliations	58
Figure 11:	Breakdown of admitted NGOs per constituency	62
Figure 12:	Historical development and futures for natural gas, electricity and European Union Allowances (EUA) prices in Central-Western Europe	90

LIST OF TABLES

Table 1:	Contributions of the IPCC working groups to the Sixth Assessment Report	24
Table 2:	Workshops scheduled in 2022 under Glasgow-Sharm-el-Sheikh work programme on the global goal on adaptation	43
Table 3:	NDCs communicated by G20 members by the end of September 2022	68
Table 4:	Long-term strategies communicated by G20 members by the end of September 2022	70
Table 5:	Current natural gas use and projections for 2050 in net zero CO ₂ emissions scenarios	92

EXECUTIVE SUMMARY

Climate change poses a serious threat to peoples' livelihoods and to ecosystems across the globe. Addressing climate change requires concerted action at the international level. Under the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, Parties meet regularly to advance the international framework for addressing climate change, including the mitigation of climate change, the adaptation to a changing climate, and the support given to developing countries. The upcoming 27th Conference of the Parties (COP27) will take place in Sharm El-Sheikh (Egypt) from 6 to 18 November 2022.

The international framework for addressing climate change

The UNFCCC constitutes the overarching framework for addressing climate change. Under this framework, the Kyoto Protocol was adopted in 1997, which established greenhouse gas emission targets for developed countries only and did not prevent global emissions from increasing substantially in the last two decades. In 2015, the Paris Agreement was adopted, which commits all its Parties to ambitious mitigation and adaptation actions.

The Paris Agreement addresses the mitigation of climate change, including through carbon markets, the adaptation to climate change, loss and damage associated with its adverse effects, and support given to developing countries. The main instruments for increasing climate action are the nationally determined contributions (NDCs) which Parties have to communicate regularly, and the global stocktake, a process for assessing collective progress towards the goals of the Paris Agreement.

The goals of the Paris Agreement aim at (1) limiting the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit this increase to 1.5°C; (2) increasing the ability to adapt to the adverse impacts of climate change and to foster climate resilience; and (3) making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

Greenhouse gas emissions from international aviation and international maritime transport are also addressed by specialised United Nations agencies. These sectors are characterised by strong emission increases in recent decades, and instruments for effectively mitigating these emissions are currently not in place. The emissions of hydrofluorocarbons (HFCs), which also increased strongly in recent years, are also addressed by the Kigali Amendment to the Montreal Protocol.

Implementation of the Paris Agreement

In the years following the adoption of the Paris Agreement, Parties negotiated the rules for its implementation. At the climate change conference in Katowice in 2018, major decisions related to mitigation, adaptation, support and accountability were adopted. At COP26 in Glasgow in 2021, these decisions were complemented by the rules for international carbon markets and by guidance for transparency.

The current focus of the climate negotiation is on the implementation of the Paris Agreement, which includes a work programme to increase mitigation ambition, the framing of the global goal on adaptation and the provision of support to developing countries.

At COP27, the technical phase of the first global stocktake is underway. As a key input to this process, the Intergovernmental Panel on Climate Change (IPCC) published its Sixth Assessment Report, which compiles the latest available science on current and future climate change, on the challenges of adaptation, and on options for mitigation.

Stakeholders in the negotiations

In the international negotiation process, Parties are organised in groups of Parties with common interests or national circumstances. The most important negotiation groups include the group of G-77 and China, an association of developing countries, and the Umbrella Group, which represents many developed countries. The European Union also acts as a negotiating group.

Beside Parties, non-governmental organisations, intergovernmental organisations and United Nations specialised agencies attend the climate change conferences. They play a critical role by providing expert input and making the case for the urgency of climate action.

Climate policies of main Parties

In order to keep the temperature goal of the Paris Agreement within reach, substantial reductions of greenhouse gas emissions are required in the years ahead. Large economies, such as the members of the G20, have a particular responsibility because they account for the majority of global emissions. While all G20 members have announced and implemented mitigation actions in recent years, the targets of most NDCs are not in line with the goal of limiting the global temperature increase to 1.5°C. Several G20 members communicated long-term strategies which include an objective of climate neutrality by mid-century. This objective requires a deep transformation of their economies and energy systems in the years to come.

Recent developments affecting the negotiations and climate action

The Russian Federation's war on Ukraine brought, among many other impacts, insecurity to energy markets and supply chains, threatening food security, and it impacts the transition to low-emission energy systems. In many countries, coal will replace gas as a fuel in the short term, leading to higher greenhouse gas emissions. But many economies, in particular the European Union, aim at making their energy systems more sustainable and less dependent on fossil fuel imports from Russia.

The COVID-19 pandemic affected climate change negotiations in the past 2.5 years. Large in-person meetings started being held again from November 2021. Virtual or hybrid meetings were held successfully in many cases. The multiple lockdowns during 2020 resulted in a modest reduction of global greenhouse gas emissions of approx. 5% that year, but in 2021 these emissions again reached a record high. This indicates that the COVID-19 pandemic did not lead to sustained emission reductions. Comprehensive actions are urgently needed to mitigate greenhouse gas emissions and respond to the growing impacts of climate change.

1. INTRODUCTION

Climate change poses a serious threat to peoples' livelihoods and to ecosystems across the globe. It is among several current crises which require concerted efforts and collaboration at the international level. Climate action may not be as high on the political agenda in many countries due to the COVID-19 pandemic and due to the economic and energy insecurity as a consequence of the Russian Federation's war on Ukraine. However, each of these recent crises reveal the vulnerability of societies to new and emerging threats, and the need for international collaboration to address them.

The response to climate change at the international level is coordinated under the United Nations Framework Convention on Climate Change (UNFCCC). Each year, delegates from over 190 countries meet at the Conference of the Parties (COP) to discuss and to promote the mitigation of climate change, the adaptation to a changing climate, and the support given to developing countries. The 27th Conference of the Parties (COP27) will take place in Sharm El-Sheikh (Egypt) from 6 to 18 November 2022.

This study provides an overview of the issues at stake at COP27. It is delivered to the European Parliament's delegation to COP27, but is also intended for a wider audience – for readers who would like to gain an overview of the international climate negotiations and of the climate policies of the world's large economies.

The study is structured as follows: Chapter 2 introduces the international framework for addressing climate change, i.e. the UNFCCC, the Kyoto Protocol and the Paris Agreement. This chapter also summarises the key findings from the Intergovernmental Panel on Climate Change (IPCC)'s Sixth Assessment report, and it provides information on sectoral agreements to address climate change outside the UNFCCC.

Chapter 3 describes the key developments at recent climate change conferences and the related issues at stake at the upcoming COP27.

The stakeholders of the negotiation, i.e. groups of Parties, non-governmental and international organisations, are introduced in chapter 4. For the main Parties, their climate policies and their commitments under the Paris Agreement are described in chapter 5. This information is provided for each member of the Group of 20 (G20), meaning it encompasses all main economies and the main emitters of greenhouse gases.

Recent developments that have an impact on the climate negotiations and on climate action, namely the Russian Federation's war on Ukraine and the COVID-19 pandemic, are addressed in chapter 6. Chapter 7 provides an outlook on developments expected in 2023 and beyond.

Chapters 2.1 to 2.3 and 4 constitute an update of chapters 2.1 to 2.3 and 4 of the study 'The COP26 Climate Change Conference – Status of climate negotiations and issues at stake' (Moosmann et al. 2021).

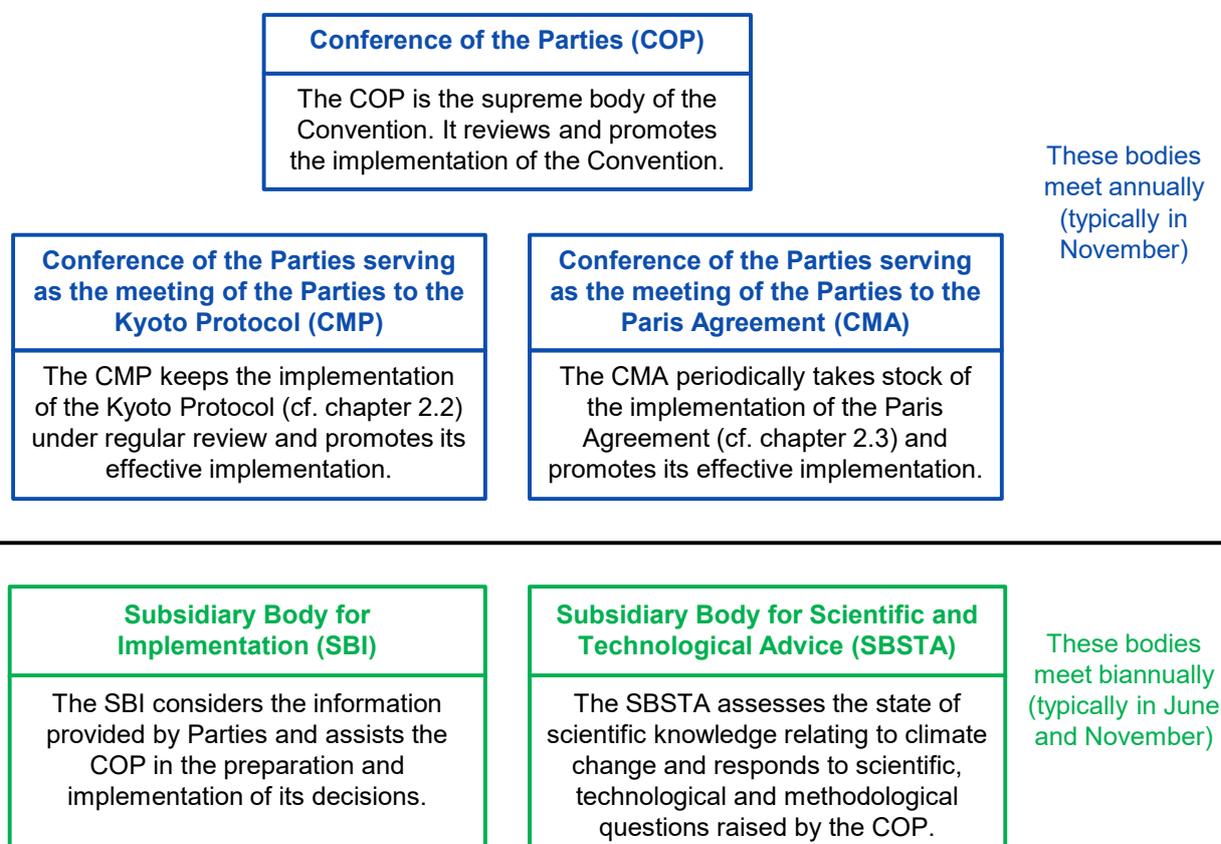
2. THE INTERNATIONAL FRAMEWORK FOR ADDRESSING CLIMATE CHANGE

2.1. The United Nations Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change (UNFCCC 1992) was adopted at the UN Conference on Environment and Development in Rio de Janeiro in 1992. The objective of the UNFCCC is to stabilise the concentrations of greenhouse gases (GHG) in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Parties to the Convention commit to implementing measures to mitigate climate change and to facilitating adequate adaptation to its effects.

Following the 1992 Rio conference, most countries signed and ratified the Convention. Currently it has 198 Parties. The newest Party is the Holy See, which accessed the Convention on 6 July 2022 (United Nations 2022b). After the entry into force of the Convention in 1994, its first Conference of the Parties (COP) convened in 1995. From 1995 onwards, climate change conferences took place annually, with the exception of 2020, when the conference was postponed due to the COVID-19 pandemic. Besides the COP, there are other bodies under the Convention, as depicted in Figure 1.

Figure 1: The Conference of the Parties and related bodies



Source: UNFCCC (1992), (UNFCCC 1998), (UNFCCC 2015b), authors' own illustration.

2.2. The Kyoto Protocol

In order to support the achievement of its objectives, the UNFCCC provides for the adoption of protocols. Following the entry into force of the Convention, the Kyoto Protocol was adopted by the Conference of the Parties in Kyoto in 1997 (UNFCCC 1998).

The Kyoto Protocol required developed country Parties to limit or reduce their greenhouse gas emissions. The reductions or limitations agreed for the first commitment period (2008-2012) were slightly below the emissions levels of 1990 in most cases, and for some countries they constituted an increase compared to that year. The largest emitter at the time of the adoption of the Kyoto Protocol, the United States of America, did not ratify the protocol, and another important emitter, Canada, withdrew from it in 2011. The remaining Parties to the Kyoto Protocol fulfilled their obligations in the Protocol's first commitment period.

The Kyoto Protocol allows countries to achieve their emission reductions or limitations using three carbon market mechanisms: Under the Clean Development Mechanism (CDM), developed countries are allowed to use certified emission reductions from mitigation projects in developing countries to achieve their commitments. Under Joint Implementation (JI), developed countries can acquire emission reduction units resulting from projects in other developed countries. Moreover, developed countries can transfer parts of their assigned emission budgets to other developed countries.

Box 1: The Doha Amendment

As the first commitment period of the Kyoto Protocol ended in 2012, Parties agreed on a second commitment period at the Climate Change Conference in Doha in 2012. The Doha Amendment to the Kyoto Protocol (UNFCCC 2012) committed a restricted number of developed country Parties to limiting or reducing their emissions in the period from 2013 to 2020. Since large emitters such as the Russian Federation or Japan did not assume a commitment for this period, emission reductions under the Doha Amendment are mainly achieved through the commitment of the European Union to decrease its greenhouse gas emissions by 20% compared to 1990 (European Commission 2022).

The final greenhouse gas inventory data for 2020 is currently under review. Information submitted in Parties' National Inventory Reports suggests that most Parties achieved their emission reduction commitments for the period 2013 to 2020. Parties that did not achieve their commitments domestically may make use of the carbon market mechanisms under the Kyoto Protocol to fulfil their commitments.

2.3. The Paris Agreement

2.3.1. Negotiation history

At the beginning of the 21st century, greenhouse gas emissions from emerging countries, most notably from China, increased rapidly. As the commitments under the Kyoto Protocol covered a limited number of developed countries only, the international community prepared a successor to the Kyoto Protocol, which would include mitigation commitments by a larger group of countries. The first major attempt ended in a failure at COP15 in Copenhagen in 2009, where Parties only 'took note' of a document that laid out principles for voluntary contributions in the period up to 2020.

The subsequent negotiations focused on an agreement that would allow Parties to determine their contributions in a bottom-up approach while having legal force and requiring all Parties to contribute to its mitigation goals.

The negotiations on this agreement came to an end in 2015, the same year that the Sustainable Development Goals (SDGs) and the Sendai Framework for Disaster Risk Reduction were adopted. The decisive conference, COP21 in Paris in December of that year, was preceded by announcements by many countries on contributing to climate change mitigation – the Intended Nationally Determined Contributions (INDCs). Despite the positive momentum that preceded the conference, negotiators still had to resolve a number of key issues, such as how to find a balance between ambitious action and the needs of developing countries, and how to enshrine increased ambition over time in the agreement.

Guided by the French COP presidency, Parties agreed on 12 December 2015 to adopt the Paris Agreement. This was the first global agreement requiring climate change mitigation and adaptation action from all Parties (UNFCCC 2015b). While each Party determines the extent of its action (the bottom-up approach of the nationally determined contributions), the Paris Agreement also contains universal legal obligations that apply to all Parties, thus establishing a shared, rules-based system (top-down approach).

The Paris Agreement is included in the annex of COP decision 1/CP.21 (UNFCCC 2015a). This decision adopted the Paris Agreement and laid out additional details, including technical work to be completed in order to make the Paris Agreement fully operational. This technical work, the ‘Paris Agreement Work Programme’ (PAWP), constituted the main focus of climate negotiations from 2016 onwards.

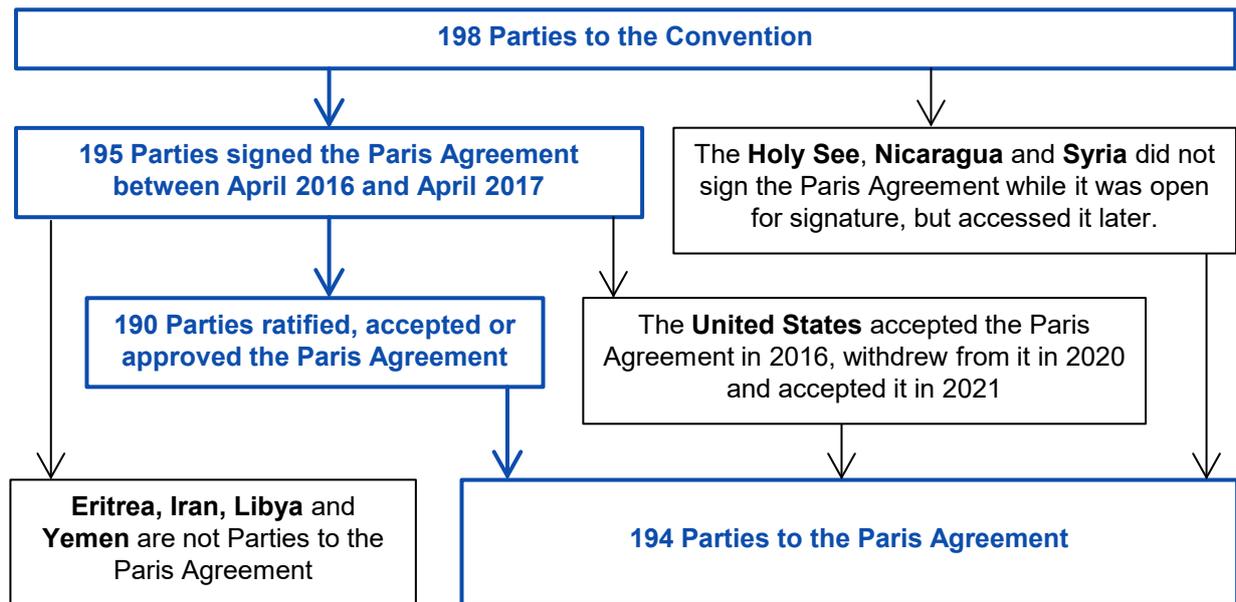
2.3.2. Signature, ratification and entry into force

After its adoption, the Paris Agreement was open for signature for one year, starting in April 2016. 195 of the then 197 Parties to the Convention signed the Paris Agreement during that period. What is more important than the signing is the actual ratification, which legally binds Parties to the Agreement. In this step, countries deposit instruments of ratification with the UN Secretary General. Depending on their legislative procedures, some countries deposit instruments of acceptance or approval rather than ratification, and Parties that did not sign the agreement while it was open for signature have the possibility of accessing it.

Progress in ratification was more rapid than many had expected, with the pivotal moment coming in September 2016 when U.S. President Barack Obama and China’s President Xi Jinping delivered their instrument of acceptance/ratification to the UN Secretary General. Other large emitters, such as India and the European Union, deposited their instrument of ratification in October 2016. Having been ratified by over 55 Parties, which accounted for more than 55 % of global greenhouse gas emissions, the requirements for entry into force of the Paris Agreement were met, and it entered into force on 4 November 2016.

Figure 2 provides an overview of the status of signature and ratification of the Paris Agreement. At the time of writing this study, there are four Parties which have signed the agreement but not ratified it. The United States accepted the Paris Agreement in 2016, withdrew from it in 2020 and accepted it again in 2021. The Holy See deposited its instrument of accession on 4 September 2022 (United Nations 2022c). It is a Party to the Paris Agreement from 4 October 2022 onwards.

Figure 2: Status of signature and ratification of the Paris Agreement

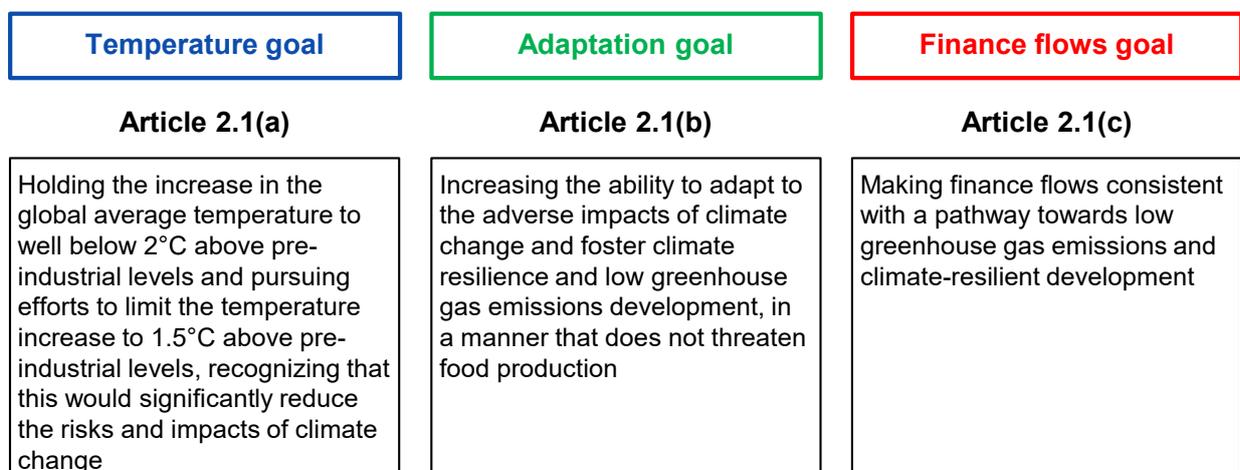


Source: United Nations (2022c), authors' own illustration.

2.3.3. The goals of the Paris Agreement

The Paris Agreement is guided by three goals, which are laid out in Article 2 of the Agreement (Figure 3). The temperature goal aims to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit this increase to 1.5°C. The adaptation goal aims to increase the ability to adapt to the adverse impacts of climate change and to foster climate resilience and low greenhouse gas emissions development. Finally, the 'finance flows' goal aims to make finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

Figure 3: Goals of the Paris Agreement



Source: UNFCCC (2015b).

The 'finance flows' goal needs to be distinguished from the '100 billion dollar' goal, a commitment by developed country Parties, first made at the COP in Copenhagen in 2009, to mobilise climate finance amounting to USD 100 billion per year by 2020, from public and private sources. The '100 billion dollar'

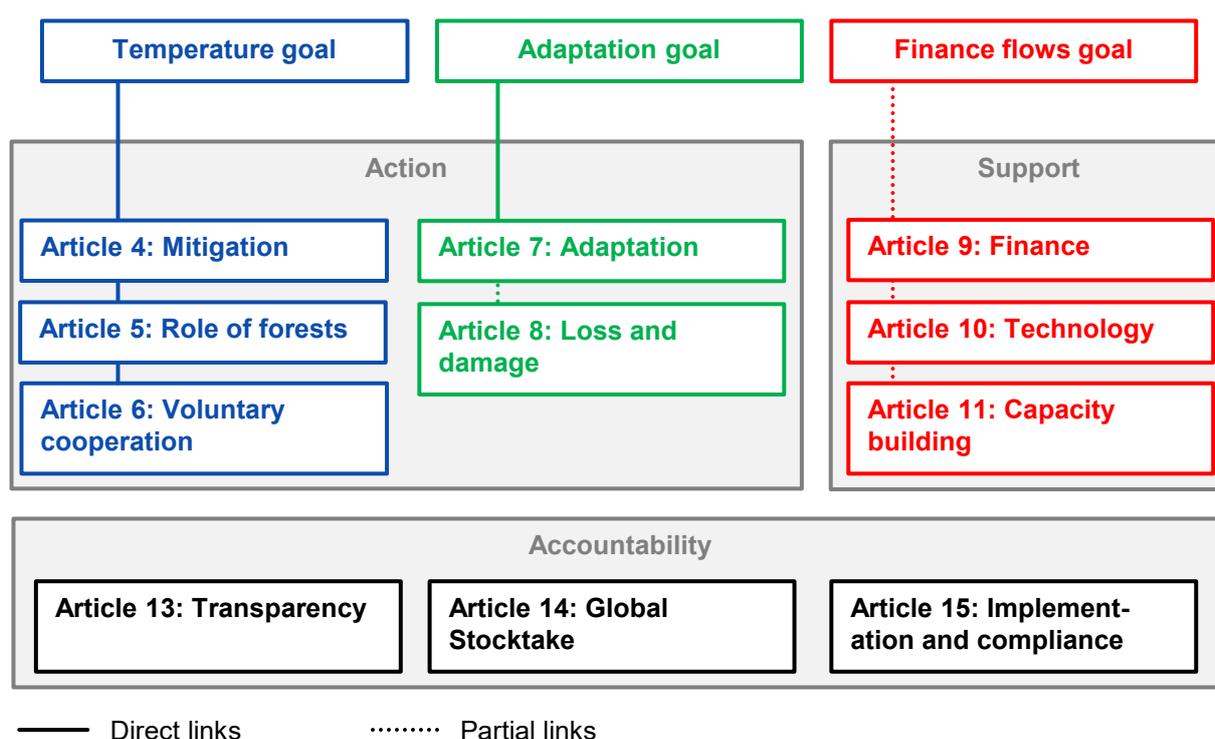
goal was reiterated in the decision on the Paris Agreement (UNFCCC 2015a), and it was decided that it shall apply from 2020 to 2025 and a new global goal shall be set from a floor of USD 100 billion per year, which is to apply thereafter.

It should also be noted that the ‘finance flows’ goal is broader than the concept of financial support addressed in Article 9 of the Paris Agreement (cf. chapter 2.3.4 below). While Article 9 addresses financial support to developing countries, the ‘finance flows’ goal aims also to address finance flows within countries, e.g. the distribution of subsidies or private investments.

2.3.4. Overview of the main topics of the Paris Agreement

The Paris Agreement addresses a wide range of topics, from mitigation to adaptation and support, as depicted in Figure 4. In the following, an overview of the topics of the Paris agreement is provided.

Figure 4: Topics addressed by the Paris Agreement



Source: UNFCCC (2015b); figure based on Moosmann et al. (2016) and UNFCCC (2022g).

Note: Loss and damage is partially linked to the adaptation goal, because increasing resilience helps to avert and minimise loss and damage. Financial, technology and capacity building support are partially linked to the ‘finance flows’ goal, because this goal is broader and goes beyond the topic of support provided to developing countries.

Mitigation

Mitigation, i.e. the reduction of greenhouse gas emissions and the enhancement of sinks of greenhouse gases, is a cornerstone of the response to climate change. The Paris Agreement, in Article 4, sets out the emissions goal, according to which Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, and to achieve a balance between anthropogenic emissions by sources and removals by sinks of GHGs in the second half of this century. The main instrument for reaching the emissions goal is the NDC, which each Party has to communicate every five years; successive NDCs represent a progression beyond the Parties’ prevailing NDCs. Developed countries should establish economy-wide absolute emission reduction targets in their NDCs. Developing countries may also

establish other forms of targets (e.g. for renewable energy or for some sectors only) but are encouraged to move, over time, towards economy-wide emission reduction or limitation targets.

In addition to their NDCs, Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies. Decision 1/CP.21 invited Parties to communicate such strategies with a mid-century time horizon by 2020.

Besides the reduction of emissions, the uptake of carbon dioxide from the atmosphere will have to play an important role in achieving the temperature goal of the Paris Agreement (IPCC 2022b). Article 5 of the Paris Agreement states that Parties should take action to conserve and enhance sinks and reservoirs of greenhouse gases, including forests.

As Parties may choose to cooperate in their mitigation actions, including through international carbon market mechanisms, the Paris Agreement addresses such voluntary cooperation with a similar approach as that taken in the Kyoto Protocol. Article 6 provides a framework for using mitigation outcomes achieved in other countries to meet a Party's NDC. This article also establishes a new carbon crediting mechanism under international oversight and a framework for countries to engage in non-market approaches.

Adaptation and loss and damage

As human influence has already warmed the atmosphere and changes in the climate system have already occurred (IPCC 2021b), adaptation to climate change is needed as a complementary approach to mitigation. It has become more relevant with the passing of time and failure of the international community to address the mitigation of greenhouse gas emissions adequately. Article 7 of the Paris Agreement establishes a global goal on adaptation; its pillars are the enhancement of adaptive capacity, the strengthening of resilience and the reduction of vulnerability to climate change.

Adaptation to climate change is a central political and practical priority for developing countries since they are more vulnerable than developed countries and possess fewer adaptive capacities. In this regard, the Paris Agreement recognises the importance of giving support, of international cooperation and of taking into account the needs of developing countries.

The Paris Agreement requires each Party to engage, as appropriate, in an adaptation planning process and in the implementation of adaptation actions. Each Party should report on these actions in an adaptation communication, which is to be submitted and updated periodically.

Despite adaptation efforts, the adverse impacts of climate change cause loss and damage, such as the loss of low-lying land as a result of sea level rise or the damage to property and infrastructure as a result of extreme weather events. Like adaptation, this topic is of special importance to developing countries, particularly Small Island Developing States (SIDS) and Least Developed Countries (LDC) whose capacity to avert, minimise or address loss and damage is limited.

Article 8 of the Paris Agreement addresses loss and damage. It lists areas of cooperation, inter alia on early warning systems, emergency preparedness, risk assessment and management, and resilience of communities, livelihoods and ecosystems. The Warsaw International Mechanism (WIM) on Loss and Damage, established by the COP in Warsaw in 2013, is subject to the authority and guidance of the CMA.

Support (finance, technology and capacity building)

Mitigation and adaptation actions require, among other things, financial resources, technologies and skills. As has already been the case under the Convention, the Paris Agreement requires developed

country Parties to provide financial, technology and capacity building support provided to developing countries.

The Paris Agreement extends the group of countries providing financial support: While the Convention, in its Annex II, lists a limited number of developed country Parties that are required to provide financial support, the Paris Agreement, under Article 9, requires all developed country Parties and encourages others (e.g. emerging countries) to do so. For the distribution of funds to developing countries, the Financial Mechanism was established under the Convention, and this mechanism also serves under the Paris Agreement. The main entities operating under the Financial Mechanism are the Global Environment Facility (GEF) and the Green Climate Fund (GCF).

Besides *providing* financial resources, developing country Parties should continue to take the lead in *mobilising* climate finance from a wide variety of sources. As decided at the COP in Paris, developed countries intend to continue their existing goal of mobilising USD 100 billion annually from 2020 through 2025 and to set a new collective quantified goal for the time period after 2025, from the floor of USD 100 billion per year.

Besides financial support, the Paris Agreement notes the importance of the development and transfer of mitigation and adaptation technologies. Under Article 10, it establishes the Technology Framework (TF). This framework should facilitate, inter alia, technology needs assessments, the provision of enhanced financial and technical support, the assessment of technologies that are ready for transfer, and the enhancement of enabling environments for technology development and transfer.

These activities are supported by the Technology Mechanism (TM), which had been established under the Convention. This mechanism consists of the Technology Executive Committee (TEC), which analyses policy issues and provides recommendations, and the Climate Technology Centre and Network (CTCN), which provides technical assistance, creates access to knowledge and fosters collaboration.

As another aspect of support, Article 11 of the Paris Agreement addresses capacity building. Its aim is to enhance the capacity and ability of developing countries to take effective climate action. The COP in Paris established the Paris Committee on Capacity-building (PCCB), with the aim of addressing capacity building gaps and needs and enhancing capacity-building efforts.

Transparency, implementation and compliance

In order to be able to track the overall progress towards the goals of the Paris Agreement, the Parties' efforts need to be transparent. Article 13 of the Paris Agreement establishes an Enhanced Transparency Framework (ETF) for action and support. This transparency framework comprises the three layers of biennial reporting, technical expert review and facilitative, multilateral consideration of progress.

According to Article 13 of the Paris Agreement, each Party shall regularly provide a national inventory of anthropogenic greenhouse gas emissions and removals and information necessary to track progress made in implementing and achieving its NDC. Each Party should also provide information related to climate change impacts and adaptation.

The information to be provided on support differs between developed and developing countries: Developed country Parties *shall* provide information on financial, technology transfer and capacity-building support provided. Other Parties (e.g. emerging countries) that provide support *should* provide such information. Finally, developing country Parties *should* provide information on support *needed* and *received*.

Information on the national inventory, on tracking of progress and on support provided will undergo a technical expert review. Part of that information will be discussed in the Facilitative, Multilateral Consideration of Progress (FMCP) – a question-and-answer session organised under the Subsidiary Body for Implementation (SBI).

Building upon reporting and review practices established under the Convention, the enhanced transparency framework introduces new reporting elements and requires, for the first time, that all Parties provide relevant information, thereby ending the differentiation in reporting requirements between Annex I and non-Annex I Parties under the Convention and the Kyoto Protocol. However, exceptions exist for SIDS and LDCs and some flexibility is granted to those developing countries that need it in the light of their capacities.

The Parties' implementation of and compliance with the provisions of the Paris Agreement will be examined by a committee. Article 15 of the Paris Agreement established this committee, which will be expert-based and facilitative in nature and shall pay particular attention to the respective national capabilities and circumstances of Parties.

The ambition cycle and the global stocktake

As Parties are only at the beginning of their path towards achieving the goals of the Paris Agreement, the ambition cycle constitutes a critical overarching feature of the Agreement. The ambition cycle is not explicitly stated or defined in the Paris Agreement; it refers to the overall architecture and functioning of the Paris Agreement that results from the interplay of the different individual and collective obligations it contains.

Each Party is required to undertake ambitious efforts to strengthen the global response to climate change. These efforts are communicated in the Parties' NDCs. As these NDCs vary in their scope and ambition, the Paris Agreement stipulates that Parties' contributions have to represent a progression over time, and it introduces a mechanism of taking stock and increasing ambition. In the global stocktake (GST), the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA) assesses the collective progress towards achieving the goals of the agreement. The aim of the global stocktake is to inform Parties in updating and enhancing their NDCs. The first global stocktake is currently underway and will be completed in 2023. The Talanoa Dialogue, which was conducted in 2018, already contained elements of such a stocktake.

The global stocktake consists of three phases: information collection for a technical assessment, technical assessment of collective progress, and consideration of outputs. Following the first global stocktake, countries need to communicate NDCs in 2025. Both the global stocktake and the communication of NDCs take place every five years, thereby enhancing climate action over time.

2.4. The Sixth Assessment Report of the IPCC

The IPCC plays a key role in informing the global community on the status of climate change and on options to address it. Its reports summarise and synthesise scientific findings from thousands of research articles. While all chapters of the reports and the technical summaries undergo a rigorous review process, the IPCC's 'summaries for policymakers' are not solely produced by researchers but are discussed and agreed among government representatives. Hence, the summaries for policymakers represent a consensus among governments. The clear language in the most recent IPCC summaries for policymakers indicates that there is a high level of consensus on the extent of current climate change and on its impacts.

Between August 2021 and April 2022, the IPCC published the main components of its Sixth Assessment Report (AR6). Table 1 provides an overview of the contributions of IPCC Working Groups (WG) I, II and III, which address the physical science basis, adaptation, and mitigation, respectively.

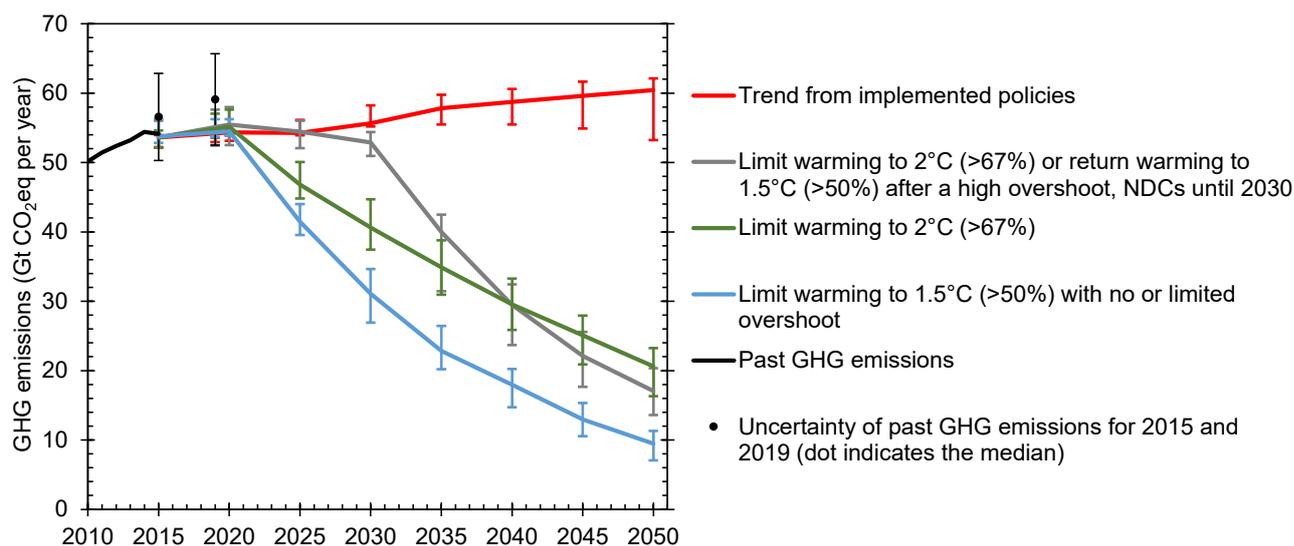
Table 1: Contributions of the IPCC working groups to the Sixth Assessment Report

WG	Contribution	Release date	Selected key messages
I	The Physical Science Basis	9 Aug 2021	<p>It is unequivocal that human influence has warmed the atmosphere, ocean and land, making extreme climate events more frequent and severe.</p> <p>Global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO₂ and other GHG emissions can be achieved in the decades ahead.</p>
II	Impacts, Adaptation and Vulnerability	28 Feb 2022	<p>Climate change is already extensively affecting every region in the world with a warming of 1.1°C.</p> <p>Financial, governance, institutional and policy constraints hinder improvement of current adaptation levels, in particular in vulnerable countries.</p> <p>Climate resilient development is already challenging at current global warming levels. The prospects will become further limited if warming exceeds 1.5°C and may not be possible if warming exceeds 2°C.</p>
III	Mitigation of Climate Change	4 Apr 2022	<p>In 2010-2019 average annual global greenhouse gas emissions were at their highest levels in human history (though the rate of growth has slowed).</p> <p>Without immediate and deep emissions reductions across all sectors, limiting global warming to 1.5°C is beyond reach.</p> <p>There are mitigation options available to at least halve GHG emissions by 2030.</p>

Source: IPCC (2021b), IPCC (2022a), IPCC (2022b); <https://www.ipcc.ch/reports/?rp=ar6>.

The key message of the WG III report – that without immediate and deep emission reductions across all sectors limiting global warming to 1.5°C is beyond reach – is supported by modelled pathways. Figure 5 shows the development of global GHG emissions in various pathways that limit global warming to 1.5°C or 2°C. Pathways without a high temperature overshoot require substantial emission reduction between 2020 and 2030. No such emission reductions will be achieved if current policy continues, as indicated by the red line in the figure.

Figure 5: Global GHG emissions of modelled pathways, and projected emissions



Source: Kriegler et al. (2022), Data for Figure SPM.4 – Summary for Policymakers of the Working Group III Contribution to the IPCC Sixth Assessment Report, <https://ipcc-browser.ipcc-data.org/browser/dataset?id=3878>.

Against the backdrop of this figure, it is important to note the message of the WG III report that there are mitigation options available to at least halve GHG emissions by 2030. These options are addressed in detail in the various chapters of the report. It will be critical that countries explore and implement such options as soon as possible.

As the final product of the AR6 cycle, the Synthesis Report is scheduled to be launched in late 2022 or early 2023 to inform the final phase of the global stocktake.

2.5. Sectoral agreements outside the UNFCCC

Under the Paris Agreement, the vast majority of anthropogenic greenhouse gas emissions are included in the scope of NDCs. However, most NDCs do not include greenhouse gas emissions from international aviation or international maritime transport. The mitigation of emissions from these sectors is addressed by organisations outside the UNFCCC process – the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO).

In the following sections 2.5.1 and 2, the climate change mitigation activities of these organisations are described. Such activities are particularly important because international aviation and shipping saw large increases in greenhouse gas emissions over the past decades.

Another sector which saw important increases of emissions in recent decades is the use of hydrofluorocarbons. These gases were introduced from 1990 onwards to replace ozone-depleting substances (ODS) which were phased out under the Montreal Protocol. An amendment to this protocol now addresses the phase-down of HFCs, as described in section 2.5.3.

2.5.1. International aviation

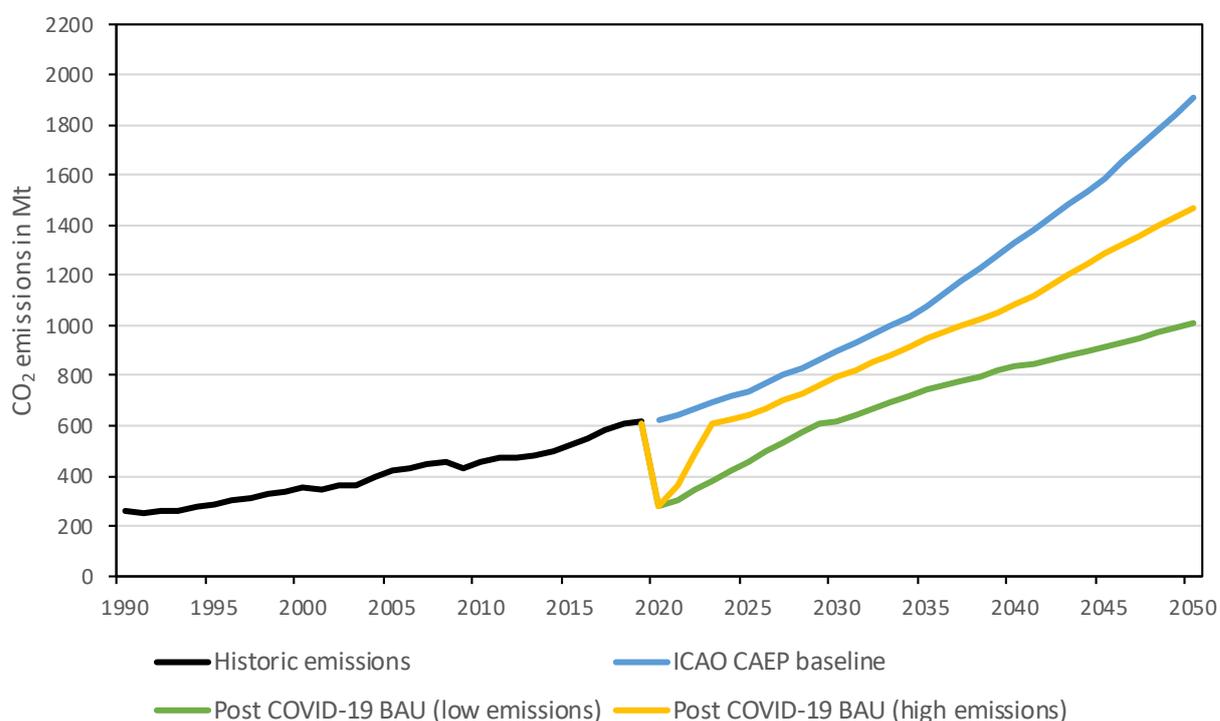
CO₂ emissions from global aviation accounted for approx. 2.4% of annual global CO₂ emissions in recent years (Lee et al. 2021). Due to the growth of the sector, the CO₂ emissions from aviation have been on the rise for the past decades. Between the years 2013 and 2019, CO₂ emissions from aviation increased globally by approx. 29% (Graver et al. 2020). To date, aviation's contribution to human-induced global warming is considered to be 4% - most of this cumulative impact due to emissions since

1990 (Klöwer et al. 2021). However, the actual contribution of aviation to global warming is much larger. This is because, in addition to direct greenhouse gas emissions, aviation has other harmful effects on the climate through cloud formation and other chemical processes (non-CO₂ effects). The impact of these non-CO₂ effects is estimated to be about three times the effect of CO₂ emissions alone (Lee et al. 2020).

The major part of aviation emissions can be attributed to international aviation. In 2019, CO₂ emissions from international aviation amounted to 618 million tonnes of CO₂ (OECD 2022b). If international aviation were a country, it would rank in tenth place in a list of countries with the highest CO₂ emissions worldwide in 2019 (excluding emissions from the land sector) (Gütschow et al. 2021).

Figure 6 shows the historic development of CO₂ emissions from international aviation between 1990 and 2019 based on top-down data from the International Energy Agency on fuel sales (OECD 2022b). It also shows different scenarios for the future development of CO₂ emissions from international aviation. All scenarios predict a significant growth in aviation emissions until 2050.

Figure 6: Historic and future development of CO₂ emissions from international aviation



Source: Authors' own compilation based on ICAO (2019), Climate Action Tracker (2022f), OECD (2022b).

Note: The blue line shows a business-as-usual (BAU) scenario from ICAO. The green and yellow lines show business as usual (BAU) projections for international aviation considering the impact of the COVID-19 pandemic from Climate Action Tracker (2022f).

The COVID-19 pandemic led to an unexpected and significant decrease in air transport and respective emissions in 2020. As an example, GHG emissions from domestic and international aviation in the EU (including the United Kingdom) decreased from approx. 186 Mt CO₂eq in 2019 to approx. 79 Mt CO₂eq in 2020 (EEA 2022).

However, the sector is already recovering from the drop in air passenger numbers. In the long term, the reduction of aviation emissions due to the COVID-19 pandemic is considered to be small because it is expected that air transport will normalise after a few years and that air travel and emissions will, in any case, more than double up to 2050 (ATAG 2020; Klöwer et al. 2021).

This sector needs to drastically reduce emissions in the face of future growth projections to be compatible with the goals of the Paris Agreement. Gains in energy efficiency will only play a small part in the necessary emission reductions (Graver et al. 2020; ICAO 2022). The use of sustainable aviation fuels (SAF) and other propulsion technologies (like electric aircrafts) will be the main lever to reduce emissions up to 2050 (ICAO 2022; Klöwer et al. 2021). However, the production of SAF and novel technologies requires time to be scaled up. It therefore remains highly challenging to achieve climate neutrality in the aviation sector by 2050 (Leipold et al. 2021).

Policy instruments to mitigate emissions from international aviation

ICAO has set a goal of carbon-neutral growth after 2020 (ICAO 2016). To reduce emissions, ICAO foresees a basket of measures consisting of technical and operational measures to increase fuel efficiency, the use of SAF, and the purchase of carbon offsets.

In 2016, ICAO adopted a global scheme – the Carbon Offset and Reduction Scheme for International Aviation (CORSIA). The scheme aims to compensate for any CO₂ emissions above a baseline of the average CO₂ emissions of 2019 and 2020. CORSIA has a timeline from 2021 to 2035 divided into three phases. During the pilot phase from 2021 to 2023, the baseline was changed to 2019 in response to the decline in 2020 emissions due to the COVID-19 pandemic. This scheme only covers flights on international routes between participating countries. CORSIA has been criticised for a number of shortcomings, such as the lack of ambition of its goal of ‘carbon-neutral growth,’ the coverage of CO₂ emissions only, the limited participation in the voluntary phase, the quality of the eligible carbon credits, the choice of the high baseline (2019 emission levels) and its weaknesses in terms of ensuring compliance and enforceability (ICF Consulting et al. 2020; Broekhoff et al. 2020; Siemons et al. 2021).

In 2022, a review of CORSIA is underway to consider ‘improvements that would support the purpose of the Paris Agreement, in particular its long-term goals’ (ICAO 2016, p. 6). Schneider and Wissner (2021) suggest that the review should trigger a broader discussion on aligning CORSIA and ICAO’s ambition with the Paris Agreement, for example, by increasing CORSIA’s ambition with a new trajectory (like net zero emissions by 2035), and by addressing non-CO₂ effects and improving the quality of carbon credits eligible under the scheme.

Additionally, other ICAO technical bodies are pursuing climate change mitigation measures under several other workstreams: the use of SAF in the Fuels Task Group (FTG) of the Committee on Aviation Environmental Protection (CAEP) and the consideration of the adoption of a long-term aspirational goal (LTAG). CAEP recently published a feasibility report on the LTAG (ICAO 2022). The report modelled different emission trajectories until 2050 – whereby all scenarios exclude out-of-sector measures (e.g. offsetting) and result in remaining emissions between 200 and 950 MtCO₂ in 2050. The report also suggests including intermediate steps/emissions goals. It is now up to the ICAO Council to proceed based on the findings of the CAEP report.

In face of CORSIA’s drawbacks and ICAO’s lack of ambition, some stakeholders are therefore calling on the EU to use its own climate policy instruments to address international aviation. The EU Emissions Trading System (EU ETS) currently only covers intra-European flights and not – as originally planned – all outbound and inbound flights. The sector has received 85% of its emission allowances through free allocation in the past. In July 2021, the European Commission published legislative proposals that target the aviation sector as part of its Fit-for-55 package (cf. section 5.7). The package foresees a

revision of the EU ETS for aviation which includes the phase-out of free allocation by 2027, an increase of the linear reduction factor which caps emissions from aviation from the current factor of 2.2% to 4.2% annually from 2024 onwards, and a proposal on the geographical scope of the ETS versus CORSIA. All flights between countries of the European Economic Area and to the UK and Switzerland will be subject to the EU ETS. Flights to/from and between third countries participating in CORSIA will be subject to CORSIA. If a flight occurs to/from a third country not participating in CORSIA, the flight is subject to the EU ETS. However, the proposal by the European Commission does not address non-CO₂ effects of aviation either. EU institutions are currently in the process of negotiating the legislation for the enhanced EU ETS.

2.5.2. International maritime transport

In 2018, maritime transport contributed approx. 2.9% to global greenhouse gas emissions (IMO 2020). Over 90% of emissions from maritime transport are CO₂ emissions and international maritime transport represents the major share of emissions (IMO 2020). With 740 MtCO₂ emitted in 2019 international maritime transport would be ranked the 7th largest emitter of CO₂ globally (Gütschow et al. 2021). In the EU, emissions from international maritime transport amounted to 3.9% of its overall emissions in 2019 (EEA 2021). Although there have been improvements in energy efficiency in recent years, the rate of carbon intensity reduction has decreased since 2015 (IMO 2020). Future growth of emissions is expected because the demand for maritime transport is highly dependent on economic growth. The disruption of supply chains due to the COVID-19 pandemic or the obstruction of the Suez Canal by the Ever Given vessel have highlighted the importance of maritime transport for the global economy.

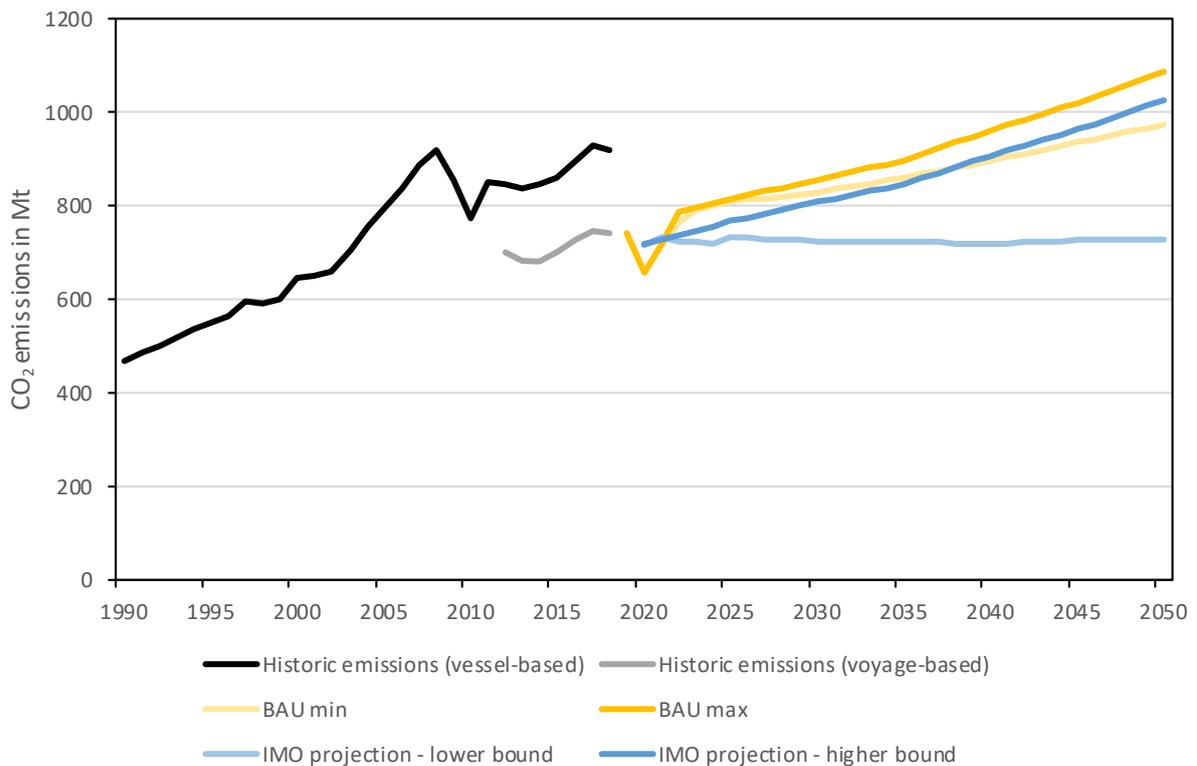
Figure 7 provides an overview of the CO₂ emissions development to date and a range of emission projections up to 2050. On average, annual emissions from international maritime transport have increased in recent decades. The business-as-usual (BAU) scenarios all lead to an increase in emissions in 2050 compared to today with a wide range of projected emissions in 2050 (represented by the lower and upper bounds in Figure 7). International maritime transport is expected to be less impacted by the COVID-19 pandemic than aviation (ClimateAction Tracker 2021).

Policy instruments to mitigate emissions from maritime transport

Like for aviation, emission reductions in maritime transport can be achieved through energy efficiency measures (operational or technical) and mainly through the switch to post-fossil fuels and the electrification of short-sea shipping (DNV GL 2019).

On the international level, the Initial Greenhouse Gas Strategy, adopted by the IMO in 2018, is the main framework for climate policy (IMO 2018). The strategy includes the long-term goal 'to peak greenhouse gas emissions from international shipping as soon as possible and to reduce the total annual greenhouse gas emissions by at least 50 % by 2050 compared to 2008 whilst pursuing efforts towards phasing them out'. Also, the IMO Member States set a goal of reducing the average carbon intensity (CO₂ emissions per transport work) by at least 40% by 2030, and 70% by 2050, compared to 2008 (IMO 2018). A revision of the GHG strategy is foreseen for 2023. At the recent meeting of the Marine Environmental Protection Committee (MEPC78) a majority of IMO Member States supported a higher ambition of the strategy with achieving zero GHG emissions by or no later than 2050 (Shaw and Smith 2022). This is based on several submissions to the last MEPCs which encompass different zero or net zero GHG emissions targets for 2050 as well as interim targets. A conclusion of this matter was postponed to MEPC80 in 2023.

Figure 7: Historic and projected CO₂ emissions from international maritime transport



Source: Authors' own compilation based on Climate Action Tracker (2021), IMO (2009), IMO (2015), IMO (2020).

Note: Historic emissions are based on bottom-up data from the IMO of the activity of the global fleet. The latest IMO greenhouse gas study IMO (2020) refines the methodology by using a voyage-based approach compared to the previous vessel-based approach which decreases the share of international maritime transport of the total maritime transport. Projections are based on business-as-usual data from the IMO and an analysis of the impact of COVID-19 from Climate Action Tracker (2021).

The IMO's Greenhouse Gas Strategy includes 20 candidate measures to mitigate greenhouse gas emissions from the sector, including technical measures to increase energy efficiency and the deployment of synthetic alternative fuels (IMO 2018). While it is planned that short-term measures will be agreed by 2023, mid- and long-term measures are expected to be agreed by or beyond 2030. In recent years, IMO has adopted several policies targeting the energy efficiency of ships (Lloyd's Register 2020):

- the Energy Efficiency Design Index (EEDI) sets compulsory energy efficiency standards for new ships built after 2013;
- the Ship Energy Efficiency Management Plan (SEEMP) requires ships to develop a plan to monitor and possibly improve their energy efficiency;
- the Energy Efficiency Index for Existing Ships (EEXI) requires every operator to improve the technical energy efficiency of existing ships. The energy efficiency level of those ships needs to improve to levels comparable to a new ship of the same type and deadweight in correspondence with the applicable EEDI; and
- the Carbon Intensity Indicator (CII) regulates operational carbon intensity by requiring a linear reduction of in-service carbon intensity of a ship (of 5 000 Gt or larger) between 2023 and 2030.

Analogous to the EU monitoring, reporting and verification system of CO₂ emissions from maritime transport, the IMO has set up the Data Collection System (DCS) which requires ships to collect and report data on fuel consumption from 2019 onwards and report it to their flag state.

At MEPC78 in June 2022 and during the intersessional meetings earlier in 2022 (ISWG-GHG11 and 12), there was a growing consensus that a basket of mid-term measures will be necessary to achieve the targets of the IMO GHG Strategy (Shaw and Smith 2022). In the period of 2007 to 2010, the IMO discussed market-based policies to address greenhouse gas emissions from international maritime transport. After 10 years, the thread was picked up again by a new proposal to establish an International Maritime Research Board Fund with a contribution of merely USD 2 per tonne of fuel (approx. EUR 0.60 per tonne of CO₂) to finance research and development (ICS et al. 2019). Other proposals for a market-based measure are a levy of USD 100 per tonne of CO₂ by the Marshall and Solomon Islands, an emissions cap and trade system proposed by Norway, and a 'feebate' (fee and rebate) system proposed by Japan. Further, a GHG emission fuel standard is also being discussed. There was no conclusion on mid-term measures at MEPC78 and the proposals will be further considered with a conclusion at MEPC80 at the earliest.

At the international level, stringent policy instruments are thus still lacking and will take time to implement. Based on a proposal released by the European Commission in July 2021, the European Union is now working on legislation for including maritime transport in the existing EU ETS and for establishing GHG intensity reduction targets based on the Fuel EU Maritime Initiative (EC 2021b; EC 2021c). According to the proposal for amending the EU ETS, maritime transport would be included in the current EU ETS from 2023 onwards, with auctioning of allowances and a three-year phase-in lasting until 2026 (EC 2021b). The proposal also covers international transport by including 50% of emissions from voyages to or from EEA ports. While the ETS would be implemented before any international market-based measure, compliance with any measure from the IMO side will need to be anticipated or checked during reviews of the legislation. The proposed Fuel EU Maritime Initiative will set a limit to the GHG intensity of energy used onboard a ship. This limit would decrease over time from 2 % below the reference value in 2025 to 75 % below the reference value in 2050 (EC 2021c). The Initiative is supposed to incentivise the use of low-carbon or post-fossil fuels. Both proposals represent a big step forward in reducing emissions from maritime transport but have also been partially criticised and still have to undergo the EU inter-institutional negotiations.

2.5.3. Addressing fluorinated gases under the Montreal Protocol

The Montreal Protocol primarily addresses the phase-out of ozone-depleting substances. Most ozone-depleting substances are also GHGs. With the adoption of the Kigali Amendment in 2016 the scope of the Montreal Protocol was extended to cover Hydrofluorocarbons (HFCs), which are not ODSs but GHGs. The Kigali Amendment puts the consumption of HFCs under a binding reduction control regime, where non-compliance by the Parties may lead to financial penalties and, worst case, to trade sanctions. The Montreal Protocol's effectiveness results from its binding nature and sanction regime. As of August 2022, 138 countries have ratified the Kigali Amendment. The Kigali Amendment came into force on 1 January 2019, meeting the criteria of 20 ratifying Parties. Among the major HFCs consumers, the USA and Brazil have not yet deposited the instrument of ratification of the Kigali Amendment. However, on 21 September 2022 the U.S. Senate gave advice and consent to its ratification (The White House 2022). Brazil moved the ratification of the Kigali Amendment through the Senate in July 2022 and the ratification bill is now awaiting presidential signature (EPBR 2022).

The European Union ratified the Kigali Amendment on 27 September 2018. The EU is now progressing with the implementation of an ambitious HFC phase-down strategy with the proposed revision of the

F-gas Regulation (EU) No 517/2014 published on 5 April 2022 (EC 2022d). The revision is currently subject to consultation with the European Parliament and the Council and expected for a final decision at the beginning of 2023.

While the climate impacts of F-gases are addressed through the EU F-gas regulation, other environmental and health concerns related to the use of F-gases are not sufficiently addressed under the F-gas Regulation. Five European countries are working together on a restriction proposal under the Regulation concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (EC 2022d) targeting Per- and Polyfluoroalkyl Substances (PFAS). Some F-gases used as refrigerants are PFAS. The restriction proposal will be submitted in January 2023 with a decision to be expected in 2025¹. In California, a bill on the sale and distribution of HFCs, passed the Senate, regulating the transition to ultra-low or no GWP refrigerants by 2035².

In the Sixth Assessment Report of the IPCC, the impact of the Kigali Amendment on global average temperatures against national HFCs regulations was updated to up to +0.04-0.08°C in 2050 and +0.1-0.3°C in 2100 (IPCC 2021a), with additional GHG mitigation potential resulting from improved efficiencies in refrigeration and air conditioning equipment during the transition to non-HFC refrigerants (IPCC 2021a).

Due to the Covid-19 pandemic, in-person meetings under the Montreal Protocol and its funding mechanism, the Multilateral Fund, were initially paused and resumed in July 2022 with the 5th Extraordinary Meeting of the Parties (ExMOP-5) and the 44th Open-Ended Working Group (OEWG). During these meetings, the Parties advanced on the following main topics:

- **Replenishment.** Adoption of the 2021-2023 triennium budget with USD 540 million with replenishment of USD 475 million and a roll-over of unused funds of USD 65 million from the triennium 2018-2020 (IISD 2022b). An additional amount of USD 246 million of remaining funds from the triennium 2018-2020 will be reserved for the period after 2023.
- **Compliance and monitoring.** Incidences of illegal production and trade raised the request by some Parties for independent satellite-based global atmospheric and ground-level data monitoring, complementing reported country data, to improve effective implementation. So far, Parties have reached no consensus on a decision.
- **Provisions and funding of energy efficiency under the Kigali Amendment.** With the Kigali Amendment, the Parties have agreed – with the phase-down of HFC production and use – to maintain or improve energy efficiency for refrigeration, air conditioning and heat pump (RACHP) equipment. Most HFC refrigerants are used in RACHP equipment. The Technology and Economic Assessment Panel (TEAP), which provides technical information about available alternatives, has concluded with the transition to low GWP HFC alternatives, the energy efficiencies can improve in all RACHP subsectors (Technology and Economic Assessment Panel 2022). The GHG savings potential will accumulate with the projected growth of RACHP equipment, e.g. the projected tripling of installed room air conditioners by 2050 (UNEP 2022). TEAP also concludes that there is an obligation by equipment exporters to avoid dumping old and new energy-inefficient RACHP equipment and to support developing countries to prevent importing such equipment. TEAP request the close institutional collaboration of national ozone offices, energy and climate departments on cooling plans and integrated programmes

¹ The universal PFAS restriction proposal and F-gases, <https://www.environmentagency.no/news/2022/the-universal-pfas-restriction-proposal-and-f-gases/>.

² SB-1206 Hydrofluorocarbon gases: sale or distribution, https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=2021202205B1206.

addressing both the energy efficiency and the GWP of refrigerants of appliances. Discussion on the provision for energy efficiency provisions under the Kigali Amendment is progressing with the potential of a formal decision in the upcoming Meeting of the Parties (MOP). The remaining barriers to including energy efficiency provisions in the funded HFC phase-down include clarification on the access, the affordability to energy-efficient equipment controlled by few global industry players, the dumping of energy inefficient equipment, adoption of minimum efficiency standards, subsidised electricity tariffs, adoption of safety standards for efficient equipment with flammable refrigerants and adequately trained technicians, installation and maintenance (IISD 2021b).

It can be expected that many of the open points will be decided upon at the 34th MOP to be held between 31 October and 4 November 2022 in Montreal. With the agreed funding levels, the established compliance regime of the Montreal Protocol, the extended scope on climate, it can be expected that the Montreal Protocol with its Kigali Amendment will make a significant impact on progress on climate action.

3. IMPLEMENTATION OF THE PARIS AGREEMENT (COP24-26) AND ISSUES AT STAKE AT COP27

After the Paris Agreement was adopted in 2015, the details of its implementation were negotiated and agreed among Parties over the last six years or so. These include, for instance, the information to be provided as part of NDCs, the detailed reporting obligation of countries, or the procedures for the global stocktake. Most of this work, the 'Paris Agreement Work Programme,' was completed at COP24 in 2018, and the remainder was further discussed and finally agreed at COP26 in 2021.

Some of the topics addressed at COP24 to COP26 require follow-up work, such as the elaboration of reporting provisions under Article 6. Parties also initiated new processes to complement the existing frameworks, such as a work programme on increasing ambition to complement the global stocktake. These topics will be discussed at the upcoming COP27 in Sharm El-Sheikh, together with regular agenda items under the Convention, such as research and systematic observation and many other topics.

In this chapter, the implementation of the Paris Agreement will be summarised for each of the main topics introduced in section 2.3.4 i.e. mitigation; voluntary cooperation under Article 6 of the Paris Agreement; adaptation; loss and damage; support; transparency and compliance; and the global stocktake. For each of these topics, the outcomes of COP24 to 26 will be summarised, followed by an overview of the issues at stake at the upcoming COP27 in Sharm El-Sheikh.

Following the presentation of these main topics of the Paris Agreement in sections 3.1 to 3.7, an overview of other negotiation topics under the Convention will be presented in section 3.8.

3.1. Mitigation

Article 4 of the Paris Agreement lays out mitigation obligations for Parties. These include the obligation to prepare and maintain a NDC and to communicate a NDC every five years, as well as to accompany each NDC with 'information to facilitate clarity, transparency and understanding' (iCTU). Decision 1/CP.21 provided initial guidance on accounting and iCTU, but the development of further guidance was mandated as part of the Paris Agreement Work Programme. The Paris Agreement also gave the mandate to Parties to consider 'common time frames for nationally determined contributions'. This was necessary because the first NDCs submitted by Parties had diverse time frames. Most began in 2021 as this was the expected date of the entry into force of the Paris Agreement, and ended in either 2025 or 2030. Hence, these NDCs (or intended NDCs at the time) had a time frame of five or ten years and were communicated five years in advance. According to Article 4, each 'successive NDC will represent progression' compared to the current and NDC and correspond to the 'highest possible ambition' of a Party.

Article 4 also established that NDCs must be recorded in a 'public registry maintained by the secretariat,' but the details of this registry were to be negotiated in the following years. The discussions were shaped by diverging views on how to accommodate in this registry the adaptation components that some Parties included in their NDCs.

Other components of Article 4 are the indication that Parties may adjust their NDCs when aiming to increase ambition and that developing country Parties will receive support for the implementation of Article 4.

3.1.1. Outcomes of COP24/CMA1 Part 3

At COP24 in Katowice, the third part of the first CMA session was convened, which saw the completion of key mandates of the Paris Agreement Work Programme on mitigation with the adoption of decision 4/CMA.1. The decision outlines the details of the information Parties must provide when communicating their NDCs and completes the guidance for accounting for the emissions and removals corresponding to the NDCs. According to the decision, Parties shall apply guidance on ICTU and accounting for their second and subsequent NDCs and are encouraged to do so earlier. Parties also agreed on the modalities and procedures for the public registry for NDCs and gave a mandate to the UNFCCC Secretariat to develop a prototype of this platform for storing and accessing all NDCs (decision 5/CMA.1). They also agreed to assess this prototype at the next session. Discussion on common time frames for NDCs also continued and Parties agreed that common time frames will apply from 2031. However, they did not specify the duration of common time frames.

Addressing the need for increased climate ambition, decision 1/CP.24 reiterated the call for Parties to provide long-term strategies and new or updated NDCs by 2020. The decision also included an emphasis on the need for enhanced pre-2020 ambition and called for the entry into force of the Doha Amendment to the Kyoto Protocol. The conference also took place in light of the IPCC Special Report on Global Warming of 1.5°C (IPCC 2018). The report sheds a light on the expected impacts of 1.5°C global heating above pre-industrial levels and the characteristics of different pathways for reducing GHG emissions for limiting the temperature increase to 1.5°C. It also includes a chapter outlining actions for drawing GHG emissions down to zero by 2050 and addresses interactions of climate action and sustainable development, describing how the prospects of sustainable development are impacted by 1.5°C and 2°C global heating.

During COP24, the Global Climate Action Agenda and the Marrakesh Partnership included events on human settlements, transport, industry, oceans and coastal zones, and land use. The Polish COP presidency also initiated the 'Silesia Declaration on Solidarity and Just Transition,' which was endorsed by leaders at the Leaders' Summit during the COP and is noted in decision 1/CP.24 (UNFCCC 2018a). The declaration focuses on the need to ensure that the transition towards zero emissions provides 'decent work and quality jobs'. The official link for accessing the declaration is now defunct.

3.1.2. Outcomes of COP25/CMA2

At COP25/CMA2 discussions continued in relation to common time frames for NDCs and the NDC registry. However, these discussions concluded without result. No other specific items related to NDCs or the mitigation sections of the Paris Agreement were on the agenda. Important discussions related to mitigation action took place under the agenda items on Article 6 (markets) and transparency, namely work on the reporting tables for tracking progress of NDCs. Negotiations under both agenda items concluded without results. Decision 1/CMA.2, titled 'Chile Madrid Time for Action' contains the call for Parties to close the ambition gap between current NDCs and the emissions pathway needed to limit the global temperature increase to well below 2°C or 1.5°C and reiterates the call for submitting mid-century long-term low greenhouse gas emission development strategies.

The Chilean Presidency of COP25 placed a special focus on the issue of oceans and climate change, coining the conference as a 'blue COP'. The Action Agenda continued with the practice of hosting thematic events, including on energy, industry, and agriculture. In decision 1/CP.25 Parties agreed to extend the Marrakesh Partnership for Global Climate Action until 2025.

In 2019 the IPCC published two special reports, the first on 'Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems' (IPCC 2019b) and the second on 'the Ocean and Cryosphere in a Changing Climate' (IPCC

2019c). The Subsidiary Body for Scientific and Technological Advice (SBSTA) and the IPCC convened a special event on the reports and decision 1/CP.24 invites Parties to use the information of the reports in their discussions under the UNFCCC.

3.1.3. Outcomes of COP26/CMA3

COP26/CMA3 put a spotlight on mitigation ambition. On the one hand, this was because 2020 was supposed to be the year when new and updated NDCs were to be provided and on the other hand, it was because it took place in light of the findings of the Sixth Assessment Report of the IPCC.

In its summary for policymakers, IPCC Working Group I on the physical science basis of climate change noted that warming of the atmosphere, ocean and land is unequivocally linked to human influence and that each of the last four decades has been successively warmer than any decade that preceded it since 1850. Every 'inhabited region' of the planet is currently experiencing the impacts of climate change, be it in the form of temperature extremes, heavy precipitation or drought. WG I also noted that the science for attributing human influence to extreme events, such as heatwaves, strong precipitation and drought has improved since the last assessment cycle. It highlighted that 'deep reductions in CO₂ and other greenhouse gases' must occur in the decades ahead, otherwise the global temperature increase will not stay below the 1.5°C or 2°C limit. AR6 of the IPCC compared modelling of five emission scenarios with varying levels of cumulative CO₂ emissions, ranging from very low to very high. This comparison showed that the proportion of CO₂ emissions that can be taken up by land and oceans decreases with higher CO₂ emissions. Another important finding was that keeping the temperature limit established by the Paris Agreement will not only require net-zero CO₂ emissions but also limiting CH₄, N₂O and other GHG emissions. In the 'Glasgow Climate Pact,' the COP welcomed the IPCC WG I contribution and expressed 'alarm and utmost concern' at the observed global warming of 1.1°C (decision 1/CP.26).

In the 'Glasgow Climate Pact,' the COP and the CMA (decision 1/CMA.3) strengthened the framework for mitigation by:

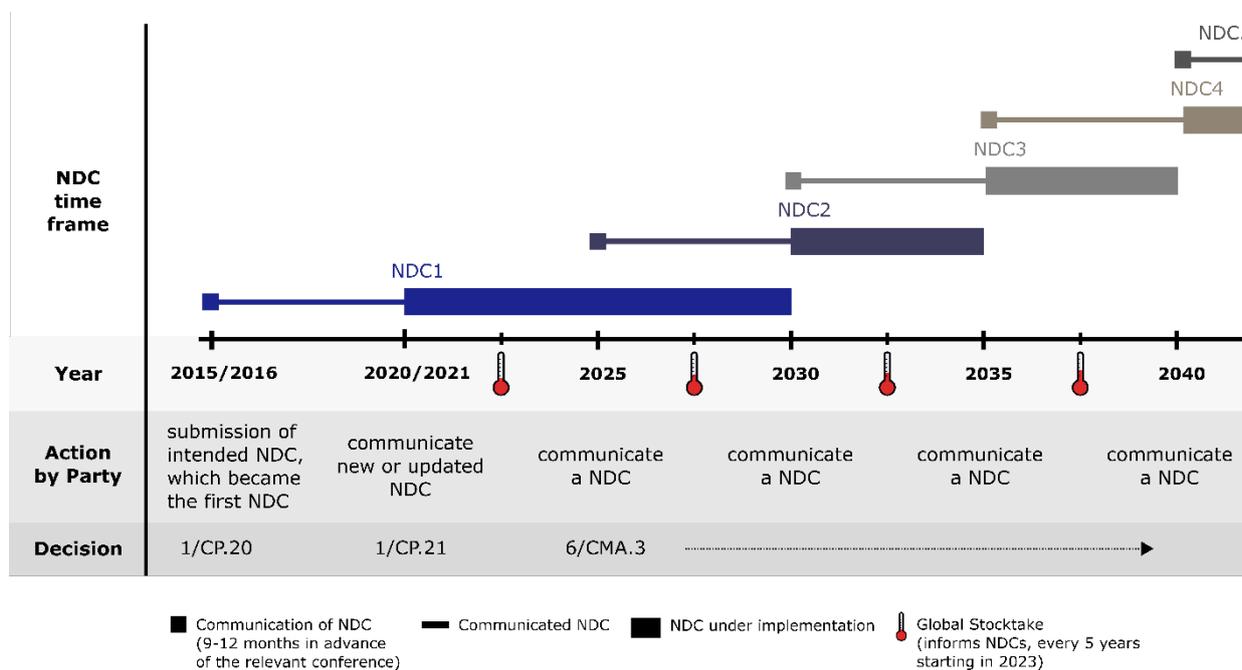
- Resolving to pursue efforts to hold the 1.5°C temperature limit;
- for the first time stating a concrete figure for a reduction of CO₂ emissions (-45% by 2030 compared to 2010);
- emphasising the importance of reaching net-zero CO₂ emissions around 2050;
- stressing the importance of action in the years up to 2030;
- explicitly addressing the need for deep reduction in other GHG emissions, specifically calling on Parties to reduce CH₄ emissions;
- for the first time explicitly addressing coal and fossil fuels by stating the need for a phase-down of unabated coal power generation and a phase-out of inefficient fossil fuel subsidies.

The CMA further established a 'work programme to urgently scale up ambition and mitigation' up to 2030 and asked the subsidiary bodies to propose a decision on the work programme until its next session. This work programme is to complement the global stocktake. The CMA also called on Parties to revise their NDCs and strengthen their 2030 targets by the end of 2022. It also called for Parties to present or update their long-term low greenhouse gas emission development strategies. The UNFCCC Secretariat will prepare an annual synthesis report on NDCs and on the long-term strategies. High-level ministerial round tables on pre-2030 ambition will take place annually, starting with CMA4 in 2022.

As for the outstanding issues of the Paris Agreement Work Programme, the CMA adopted the prototype of the NDC registry prepared by the Secretariat (decision 20/CMA.3). As of June 2022, the NDC registry is accessible online and all submitted NDCs are accessible via the registry³. Past NDCs can be accessed by setting the search filter to ‘archived’.

Parties also reached agreement on common time frames for NDCs (decision 6/CMA.3, (UNFCCC 2021c)). The decision encourages Parties to communicate NDCs with end dates in 2035 and 2040 and to communicate them in 2025 and 2030 respectively, as well as to do so ‘every five years thereafter’. Although this is only an encouragement, it must be understood in light of the obligations of the Paris Agreement. Parties ‘shall’ communicate NDCs every five years and progression in ambition is expected with each subsequent NDC. The decision notably does not make a distinction anymore between new and updated NDCs, it just calls for the communication of ‘a NDC’. This may create some ambiguity on when a NDC is new, but the NDC registry will help clarify this question, as it archives past NDCs and records version numbers of NDCs. Figure XX shows the exemplary time frames of NDCs considering decision 6/CMA.3. Note that as of last year, most NDCs and all G20 countries’ NDCs end in 2030 and that thus the application of common time frames should not pose specific challenges to Parties. Whether the time frame for NDCs is now ten or five years is a matter of interpretation. One can say that starting in 2025, NDC will last ten years (IISD 2021) or that a new NDC is communicated five years in advance and lasts five years (e.g. communication in 2025, implementation from 2030 to 2035). Figure 8 does not depict up-dates of NDCs outside the five-year rhythm stated in the Paris Agreement, but they are possible at any time with a view to enhancing NDC ambition.

Figure 8: Depiction of common time frames of NDCs following decision 6/CMA.3



Source: (UNFCCC 2014; 2015a; 2021c), authors’ own illustration.

The Glasgow climate change conference also served as a platform for launching several initiatives, declarations and announcements on climate action. Notably these include:

³ NDC Registry, <https://unfccc.int/NDCREG>.

- the Glasgow Leaders' Declaration on Forest and Land Use, where 145 countries committed 'to halt and reverse forest loss and land degradation by 2030' and the Global Forest Finance pledge of USD 12 billion of public climate finance from 2021 to 2025;
- the Global Methane Pledge, where 90 countries pledged to reduce global methane emissions by at least 30 percent from 2020 levels by 2030;
- the COP26 Declaration on Accelerating the Transition to 100% Zero Emission Cars and Vans, where governments and non-state actors including car manufacturers, committed to working towards 100% zero emission vehicle sales by 2035 at the latest in leading markets, and by 2040 globally;
- the Just Energy Transition Partnership with South Africa, which aims to accelerate decarbonisation of South Africa with support from the EU, the US and the UK; and
- The Global Coal to Clean Power Transition Statement, which states the aim to rapidly scale up technologies and policies to achieve a transition away from unabated coal power generation in the decade after 2030.

3.1.4. Issues at stake at COP27

Designing the work programme to scale up mitigation and ambition will be one of the key tasks for CMA4. Conclusions of the subsidiary bodies in June 2022 did not capture substantive progress. Parties agreed to share their views in submissions by 30 September and to convene in a pre-session workshop. An informal note by the co-facilitators captures the issues for which agreement is required (UNFCCC 2022b). These include the objective of the work programme, its outcomes, the thematic areas it will address (scope), the inputs it will rely on, the working modalities and its institutional arrangements. Parties have so far proposed to use thematic areas aligned with the work of the IPCC, especially the themes addressed in the AR6 contribution of WG III, elements mentioned in the Glasgow Climate Pact (decision 1/CMA.3) such as the transition to low-emission energy systems, the alignment of NDCs with long term strategies, an equitable access to the remaining carbon budget, sustainable lifestyles, etc. The challenge will lay in determining meaningful discussion areas that complement the global stocktake and can feed into the annual ministerial round tables on pre-2030 ambition. Ideally the work programme and the ministerial meeting should take into account the latest synthesis reports prepared by the UNFCCC Secretariat on NDCs and long-term strategies. As the CMA notes, alignment between NDCs and long-term strategies is important and according to the IPCC, it is necessary for ensuring we remain on emissions pathways that are in line with the temperature limits of the Paris Agreement. So far only 50 Parties have submitted long-term strategies.

Another issue that may elicit controversial discussions is how to address the role of negative emissions. The AR6 of the IPCC showed that in any of the analysed emissions pathways, holding the 1.5°C temperature limit will require some form of drawing CO₂ from the atmosphere. Thus Parties may address these issues and diverging views on the role of natural sinks vs. carbon capture and storage, carbon capture and utilisation and geo-engineering may come into the forefront. Regarding modalities, questions such as the frequency of meetings and the participation of non-Party stakeholders are under discussion.

Other important aspects of COP27 in the area of mitigation will be capturing meaningful outcomes of the ministerial roundtables that help to address the current ambition gap in NDCs and under the Climate Action Agenda to provide a follow-up on the initiatives announced in Glasgow.

3.2. Voluntary cooperation under Article 6 of the Paris Agreement

3.2.1. Outcomes of COP24-26

After six years of negotiations, the adoption of rules for international carbon markets under Article 6 was a major achievement of COP26 in Glasgow. The new rules allow countries to engage in international emissions trading under Article 6.2. At the same time, detailed rules for a new international carbon crediting mechanisms were agreed under Article 6.4. In July 2022, the new Supervisory Body of this mechanism met for the first time. And lastly, a framework for using non-market-based approaches was established under Article 6.8, an approach requested by Parties that are in general against the use of markets. The analysis below focuses on Article 6.2 and Article 6.4.

Article 6.2 – A framework to engage in international carbon markets and account for transfers

A key achievement from Glasgow is the adoption of comprehensive accounting rules for the international transfer of carbon market units. Under the accounting framework adopted under Article 6.2, two countries engaging in the transfer of carbon market units must apply 'corresponding adjustments' to account for 'internationally transferred mitigation outcomes' (ITMOs): the country selling ITMOs (i.e. emission reductions or removals achieved in this country) makes an addition to its emission level, and the country acquiring ITMOs makes a subtraction. Both countries then compare the adjusted balance with their target level to assess whether they have achieved their target. This approach ensures that only the buyer country can use transferred emission reductions, and thus avoids 'double counting'.

The framework adopted in Glasgow requires all countries to account for ITMOs, without exemptions. For a long time, Brazil, supported by some other countries of the group of like-minded developing countries (cf. section 4.1.9), had requested for exemptions from such accounting for the emission reductions generated under the Article 6.4 mechanism. This would have led to double counting, meaning that both the seller and buyer could use the same emission reduction to achieve their NDCs. This issue was a major roadblock for achieving consensus at COP24 in Katowice and COP25 in Madrid. It was resolved in Glasgow by creating two types of carbon credits under the Article 6.4 mechanism: one that is authorized by host countries and backed by corresponding adjustments and one that is not. The decision also clarifies that only units backed by corresponding adjustments can be used to achieve NDCs or for international compliance purposes such as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) under ICAO (cf. section 2.5.1). Carbon credits without corresponding adjustments could be used for other purposes, such as in domestic emissions trading systems.

This decision brought an ongoing debate in the voluntary carbon market into the negotiations, namely whether non-authorized carbon credits can be used for offsetting claims in voluntary markets. Several governments, most vocally Switzerland, tried to introduce language in the decision text that would regulate what claims can be made in respect to non-authorized units. However, no consensus could be achieved on this matter, as many considered this matter as outside the scope of Article 6.

Article 6.2 also requires countries to apply corresponding adjustments regardless of whether the emission reductions are covered by the NDC of the seller country. If emission reductions are not covered by the NDC (e.g. in case of methane emission reductions in a country whose NDC only covers carbon dioxide), double counting would not occur and, hence, corresponding adjustments would theoretically not be necessary to avoid double counting. Exemptions from corresponding adjustments could, however, have created perverse incentives for countries not to expand the coverage of their NDCs, or define it very 'creatively,' in order to forego accounting.

Another key challenge for using carbon market approaches is that most countries have targets for one single year only (e.g. 2030), rather than a multi-year year period, while carbon market approaches typically involve multi-year compliance periods. The agreed rules allow countries to apply two different approaches to account for single-year targets: countries can either adopt multi-year trajectories for accounting purposes or they use 'averaging,' by accounting in the target year for the average amount of ITMOs sold or acquired over a multi-year period. Both approaches bear risks for environmental integrity. While the rules require that emissions shall not increase across trading partners, the approach of averaging can effectively lead to increased emissions, including when the emission reductions are used under CORSIA (Siemons and Schneider 2022).

The rules from Glasgow also prescribe that accounting must always be conducted in greenhouse gas emission metrics, expressed in tons of CO₂ equivalent. While the rules provide flexibility to also use other metrics, such as hectares of land afforested, countries still need to quantify the impact in a greenhouse gas emissions balance.

Finally, the accounting rules prohibit any carry-over of carbon market units from one NDC period to the next period. This prevents that countries may generate large amounts of carbon market units which are not backed by actual emission reductions, and then carry them forward to achieve future climate targets, as observed under the Kyoto Protocol (Schneider 2021).

Article 6.4 – A new international carbon crediting mechanism

Under Article 6.4, comprehensive rules for a new carbon crediting mechanism under the supervision of a UN body were established. This new mechanism is commonly considered as a successor to the Clean Development Mechanism (CDM) but has more stringent rules. For example, the mechanism establishes new principles for demonstrating that the mitigation activities are additional, meaning that they would not be implemented anyway. In contrast to the CDM, the mechanism also requires the application of robust environmental and social safeguards and establishes a grievance mechanism to appeal decisions.

A further advancement compared to the CDM is that the mechanism does not purely aim to offset emissions in one place by emissions in another place. Rather, the achieved emission reductions should be shared between the seller country and the buyer country, next to a small proportion of 2% that accrues to the atmosphere, referred to as overall mitigation in global emissions (OMGE).

In addition, 5% of the carbon credits must be transferred to the Adaptation Fund. A key demand from many developing countries was to apply the same percentages to international transfers of other types of carbon units under Article 6.2. This would ensure a level playing field among carbon crediting approaches. Developed countries opposed this idea as it could, for example, make the linking of emissions trading systems more difficult, and the principle is referred to under Article 6.4 but not Article 6.2 of the Paris Agreement. In Glasgow, countries agreed to "strongly encourage" contributions to adaptation and implementation of OMGE when using cooperative approaches under Article 6.2.

Finally, countries agreed on a transition of the CDM to the Paris Agreement. Existing CDM projects can only issue certified emission reductions (CERs) under the Kyoto Protocol for emission reductions that occurred by the end of 2020. However, CDM projects can – under certain conditions – be transitioned to the new Article 6.4 mechanism and continue to issue carbon credits for emission reductions occurring from 2021 onwards. In addition, a limited amount of CERs issued under the Kyoto Protocol – about 300 million units according to a detailed model developed by NewClimate Institute and Oeko-Institute (Fearnough et al. 2021) – can be directly used to achieve NDCs after 2020.

This agreement ensures some continuity in UN approaches towards carbon crediting, particularly for existing CDM projects, but also bears risks for environmental integrity. The use of CERs to achieve NDCs could directly undermine climate ambition because these emission reductions were achieved in the past, regardless of the decision to allow their use under the Paris Agreement. Similarly, the transition of CDM projects could pose risks because many CDM projects are likely to continue operation, regardless of whether they can transition to the Paris Agreement. If countries authorise these projects to sell carbon credits internationally, they give away emission reductions that would anyway occur, which could undermine their ability to achieve their NDCs or adopt more ambitious climate targets. Whether these risks materialise depends on how host countries authorise CDM projects for transition.

Phasing out the CDM

With the adoption of rules for Article 6 and the possibility of a transition of CDM projects to the new Article 6.4 mechanism, Parties also agreed to phase out the CDM. The decisions in Glasgow clarify that no CERs can be issued for emission reductions occurring after 2020. The temporary measures, which allow the CDM Executive Board to handle new requests for registration or issuance of CERs, will remain operational until the new Supervisory Body of the Article 6.4 mechanism has set up the possibility of receiving such requests.

3.2.2. Issues at stake at COP27

While countries adopted comprehensive rules for Article 6 at COP26 in Glasgow, a number of issues could not be resolved and were deferred to a work programme. This includes many technical aspects to fully operationalise the Article 6 rules, but also a few more political issues that were not finalised in Glasgow. In total, this includes 14 items that are now being discussed under the SBSTA. Key elements include:

- The possibility of simplified rules for LDCs or SIDS;
- Whether 'emissions avoidance' and 'conservation enhancements' should be eligible under Article 6 (these concepts are not yet further defined);
- How the approaches to account for single year targets could be further operationalised and integrity ensured;
- How countries should report relevant information (e.g. what templates should be used);
- How the necessary infrastructure to engage in Article 6, such as registries and international databases, should be established;
- How the information reported by countries should be internationally reviewed;
- How the share of proceeds for adaptation and OMGE should be implemented in practice;
- How countries make national arrangements to participate in Article 6;
- How the transition of CDM activities to the Article 6.4 mechanism should be operationalised;
- How the use of CERs towards achieving NDCs should be implemented; and
- How the registry of the Article 6.4 mechanism should be implemented.

Many of these matters may not yet be finalised at COP27 as some of the aspects are technically complex. A possible outcome is a decision or negotiation document that addresses initial elements or principles, with further elements left for work that may be completed next year.

3.3. Adaptation

Many countries around the world are already experiencing the adverse effects of climate change in the form of an increased frequency and intensity of extreme weather events such as droughts, floods, heat waves and rising sea levels. Increasing resilience of societies by adapting to climate change therefore is a key development priority, especially for those countries that are most vulnerable to climate change. The architecture of the Paris Agreement reflects this by striking a careful balance between adaptation and mitigation issues. Adaptation is reflected in the Agreement's objectives that stipulate that the global response to climate change also includes 'increasing the ability to adapt to the adverse effects of climate change and foster climate resilience.'⁴ With Article 7 of the Paris Agreement, Parties further established a 'global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change'.⁵

Parties further agreed to voluntarily submit and update periodically an adaptation communication (ADCOM), which may include countries' priorities, implementation and support needs as well as plans and actions.

The Paris Agreement in Article 7.6 recognizes that support for and international cooperation on adaptation is an important aspect for building resilience against the adverse effects of climate change. In this context, Article 9.4 states that the provision of scaled-up financial resources should aim to achieve a balance between resources for adaptation and mitigation.

3.3.1. Outcomes of COP24-26

At COP24 in Katowice, Parties agreed on guidelines for the ADCOM. Countries have flexibility to submit an ADCOM as a standalone document or in conjunction with another document such as the National Adaptation Plan (NAP), the Nationally Determined Contribution (NDC) or the National Communication. The guidelines adopted at COP24 apply, however, regardless of the format chosen for submitting the ADCOM and provide optional elements that countries can choose to report on. These include information on national circumstances, support needs as well as status updates on the implementation of adaptation actions and plans (UNFCCC 2018d).

At COP24 Parties further decided that the Adaptation Fund shall serve the Paris Agreement. The Fund has been established in 2001 to finance concrete adaptation projects and programmes in developing countries Party to the Kyoto Protocol, with a focus on those that are particularly vulnerable to the adverse effects of climate change⁶. With the Kyoto Protocol's second commitment period ending in 2020, it was important to anchor the Fund within the architecture of the Paris Agreement. The Fund is an important institution for developing countries and has successfully established the direct access modality that enables countries to access funding through national institutions thus strengthening country ownership in adaptation.

At COP26 Parties agreed to establish a public registry for adaptation communications on the UNFCCC website. The registry was established in addition to the NDC registry, where nationally determined contributions communicated by Parties are recorded. The question of whether one registry or two separate registries will be created was a contentious issue at COP26, with the EU supporting the creation of two separate registries to better reflect the different nature between the two documents.

⁴ See Article 2.1 (b) of the Paris Agreement.

⁵ See Article 7.1 of the Paris Agreement.

⁶ See <https://unfccc.int/Adaptation-Fund>

The registry was made operational in 2022 as a simple collection of all submitted adaptation communications⁷.

Another key outcome of COP26 was the call on developed countries to at least double their collective provision of adaptation finance from 2019 levels by 2025 to achieve a better balance between resources for adaptation and mitigation. In 2019 – the latest data currently available for estimates on climate finance flows – developed countries had mobilised approx. USD 80 billion in climate finance, of which approx. USD 20 billion had been for adaptation. Compared to 2018 levels, adaptation finance grew, however, by 20% in 2019 (OECD 2021a) (see section 3.5.1 for key outcomes on finance at COP26).

COP26 also agreed on rules, modalities and procedures for the new market-based mechanism established by Article 6.4 of the Paris Agreement, which stipulate that a share of proceeds from the sales of Article 6.4 units will be allocated to the Adaptation Fund. Such a share of proceeds already applied under the Kyoto Protocol's Clean Development Mechanism (CDM) and has been an important revenue source in the early years of the Fund. While under the CDM, the share of proceeds was set at 2%, Parties agreed that under the Article 6.4 mechanism it will amount to 5% of the revenues.

Several countries at COP26 made new pledges to the Adaptation Fund and the Least Developed Countries Fund (LDCF). The Adaptation Fund received a record of pledged contributions of USD 356 million in Glasgow, of which USD 116.4 million (EUR 100 million) were pledged by the EU Commission⁸. At COP26, the US and Canada also made pledges to the Adaptation Fund for the first time. Further, the LDCF received new pledges of about USD 600 million.

An emerging key issue at COP26 were discussions on the operationalisation of the global goal on adaptation (GGA). Parties discussed how to make progress towards this goal and how such progress can be measured. To broaden the technical base for further discussions on this goal, Parties agreed to establish the 'Glasgow-Sharm-el-Sheikh work programme on the global goal on adaptation (GlaSS),' which will be one of the main issues at stake at COP27 (see next section for more details).

3.3.2. Issues at stake at COP27

The GlaSS was launched during a high-level meeting on 16-17 May 2022 in the Maldives. It is carried out jointly by the SBI and SBSTA with contributions from the current and incoming Presidencies of the COP, the Adaptation Committee (AC), Working Group II of the IPCC and others. It will run for two years with a draft decision for consideration and adoption by the CMA expected for COP28 in 2023.

Each year there will be four workshops under the GlaSS with two being held virtually and two in conjunction with the meetings of the subsidiary bodies. In May 2022, an informal virtual event took place to reflect on submissions by Parties and observers on their expectations and the organisation of work. During the meeting of the subsidiary bodies in June 2022, an IPCC event was conducted on the contributions of Working Group II to the Sixth Assessment Report. In addition, the first workshop of 2022 took place; it focused on enhancing the understanding of the global goal on adaptation and reviewing progress towards it. Further dates and themes for the remaining workshops are shown in Table 2.

⁷ Adaptation Communications Registry, <https://unfccc.int/ACR>.

⁸ USD equivalent, using conversion rates applying at the time of the pledge.

Table 2: Workshops scheduled in 2022 under Glasgow-Sharm-el-Sheikh work programme on the global goal on adaptation

	Theme	Dates
First Workshop	Enhancing understanding of the GGA and reviewing progress towards it	8-9 June 2022
Second Workshop	Enhancing adaptation action and support	30-31 August 2022
Third Workshop	Methodologies, indicators, data and metrics, monitoring and evaluation	17-18 October 2022
Fourth Workshop	Communicating and reporting on adaptation priorities	5 November 2022

As an input to these workshops, the UNFCCC Secretariat prepared a compilation and synthesis of indicators, approaches, targets and metrics that could be relevant for reviewing overall progress made in achieving the GGA (UNFCCC 2022c).

At COP 27, Parties will need to take stock of the progress achieved so far under the GlASS and set directions for further work on the global goal on adaptation.

Adaptation is a key priority for the incoming COP presidency who would like to use the conference to deliver an enhanced global agenda for action on adaptation⁹.

3.4. Loss and damage

The Paris Agreement recognizes the importance of ‘averting, minimizing and addressing’ loss and damage. As depicted in Figure 4 in section 2.3.4, the topic of loss and damage was introduced under the Paris Agreement as a separate article and an additional pillar of climate action.

The issue has been a long-standing concern for most vulnerable countries, in particular SIDS and LDCs who have championed it in the UNFCCC for many years. With the Warsaw International Mechanism for Loss and Damage (WIM), Parties in 2013 established a body mandated to strengthen dialogues among stakeholders and to enhance action on loss and damage by mobilizing experts and sharing knowledge. A key request of developing countries since the establishment of the WIM has been the creation of a mechanism that provides funding to countries for managing loss and damage.

One of the main reasons that developed country Parties have been reluctant to agree on a funding mechanism for loss and damage is the concern that the provision of compensation for loss and damage could be construed as an acceptance of legal liability for climate-related damages. One particular concern is that such an admission might trigger litigation and compensation claims on a major scale (WRI 2022).

3.4.1. Outcomes of COP24-26

In response to calls from developing countries for more tangible action on loss and damage, Parties at COP25 agreed to establish the Santiago Network on loss and damage, which should act as a catalyst to

⁹ Egypt goals and vision, <https://cop27.eg/#/vision#goals>.

provide technical assistance through relevant bodies supporting the minimisation of loss and damage at the local, national, and regional level (UNFCCC 2019a).

At COP26, developing countries called for the establishment of a Loss and Damage Facility as a new fund with a dedicated mandate to address loss and damage. Such a proposal was not acceptable for developed countries and instead COP26 established the two-year 'Glasgow Dialogue' to discuss arrangements for funding of activities to avert, minimize and address loss and damage. Parties also agreed to operationalise the Santiago Network (UNFCCC 2021a).

Setting a precedent, the Scottish government pledged GBP 2 million for loss and damage at COP26, followed by the government of Wallonia (EUR 1 million) and a group of philanthropic organisations (EUR 3 million). This is the first time that regional governments have committed financial resources that are directly earmarked for loss and damage (Climate Home News 2021).

3.4.2. Issues at stake at COP27

Progress on the Glasgow Dialogue will be a key issue for COP27. In their closing statements at COP26, the G77 and China as well as the Alliance of Small Island States (AOSIS) highlighted that their expectation is that the Dialogue will result in the establishment of a Loss and Damage facility at COP27. An important aspect of the discussion will be to identify ways of providing support for loss and damage while at the same time avoiding the admission of liability.

It can be expected that the issue of loss and damage will have a high political significance at COP27. Civil society groups at the meeting of the subsidiary bodies in June 2022 have been very vocal in demanding solidarity with countries most vulnerable to climate change (Climate Home News 2022b). Further, the Alliance of Small Island States (AOSIS) is pressing for loss and damage finance to become an official agenda item at COP27 and has convened regional workshops among its member states to work on elaborating potential elements of a loss and damage finance facility (AOSIS 2022b).

3.5. Support

3.5.1. Finance

The provision of climate finance continues to be a key topic in the UNFCCC negotiations. Already in 2009, developed country Parties committed to jointly mobilising USD 100 billion per year by 2020 to address the needs of developing countries in fighting climate change. This goal was confirmed in 2015 when adopting the Paris Agreement, together with an agreement to set a new climate finance goal by 2025 which should go beyond the mobilisation of USD 100 billion per year¹⁰.

At COP24 in Katowice, Parties agreed that developed countries will submit biennial communications on expected levels of climate finance from 2020 onwards to enhance the predictability and clarity of climate finance in line with Article 9.5 of the Paris Agreement. This information will be summarised in compilation and synthesis reports and additionally, high-level ministerial dialogues on climate finance will take place every two years. The first biennial Article 9.5 communications from Parties were available at COP26 in Glasgow. It was also decided at COP24, that from 2020 onwards, the Standing Committee on Finance (SCF) will consider to what extent climate finance flows are mainstreamed with the Paris Agreement in its biennial assessment and overview of climate finance¹¹.

¹⁰ Climate finance, <https://unfccc.int/topics/climate-finance/the-big-picture/introduction-to-climate-finance>.

¹¹ Katowice climate package, <https://unfccc.int/process-and-meetings/the-paris-agreement/katowice-climate-package#eq-4>.

Negotiations at COP26 were framed by the failure to meet the USD 100 billion goal for 2020 which was acknowledged by developed country Parties. Ahead of the conference, the COP presidency had released a 'delivery plan,' setting out how the goal would be reached by 2023¹². The plan was accompanied by a technical note by the OECD that developed the underlying scenarios (OECD 2021b). Achieving the USD 100 billion goal will remain an important aspect of building trust among Parties. With the next high-level political moment in the international negotiations being the first global stocktake (GST) in 2023 (see section 3.7) and the subsequent revision of NDCs in 2025 it would be an important signal to meet the goal ahead of the GST in 2023 in line with the 'Climate Finance Delivery Plan'. The SCF was asked to prepare a report in 2022 on progress towards achieving the USD 100 billion goal. This report is expected to be available soon after the 29th meeting of the SCF (29 September to 1 October 2022) and will be considered at COP27.

At COP26, the deliberations on a new collective quantified goal for the period beyond 2025 were initiated and Parties decided to set such a goal in 2024. At the conference, the importance of adaptation finance was also emphasised. In the final decisions, the CMA urged developed country Parties to at least double their collective provision of climate finance for adaptation to developing country Parties from 2019 levels by 2025 (UNFCCC 2021a). Views between some groups of developing countries and developed countries diverged regarding the nature of the process to set a new target and to what extent a decision from Glasgow should specify the content of the negotiations. Additionally, due to disagreement on the agenda item on long-term finance (LTF), it was decided at COP26 that the LTF agenda item under the COP would be extended until 2027. However, this agenda item duplicates discussions under the CMA in relation to the expected levels of climate finance under Article 9.5 of the Paris Agreement.

The SCF also presented its first assessment report on developing countries' financial needs for implementing the Paris Agreement at COP26. According to available cost estimates reported by developing countries, more than USD 8.9 trillion are needed up to 2030. However, due to a lack of information by a number of countries as well as a lack of data, tools and capacity for assessing adaptation needs, this amount is considered to be significantly underestimated (SCF 2021).

Additionally, the Glasgow Climate Pact explicitly calls for 'accelerating efforts towards the phasedown of unabated coal power and phase-out of inefficient fossil fuel subsidies' (UNFCCC 2021a). Also, several developed countries specifically agreed for the first time to provide finance to support South Africa in the transition to clean energy, including a focus on just transition (EC 2021a).

At COP26, it was also decided that 5% of proceeds under the mechanism established under Article 6.4 of the Paris Agreement will go into the Adaptation Fund to support developing country Parties that are particularly vulnerable to the effects of climate change, in the agreement on the rules, modalities and procedures for this mechanism (see section 3.2)¹³. Furthermore, the reporting tables for reporting on support in the Biennial Reports that will be submitted to the UNFCCC from 2024 onwards (see section 3.6) were agreed at COP26¹⁴.

To date, developed country Parties have fallen short of reaching the goal of mobilising USD 100 billion climate finance annually. According to the SCF's 4th Biennial Assessment, developed countries reported an annual average of public support of USD 48.7 billion for 2017 and 2018. They provided another USD

¹² Climate finance delivery plan, <https://ukcop26.org/wp-content/uploads/2021/10/Climate-Finance-Delivery-Plan-1.pdf>.

¹³ Glasgow climate pact, <https://unfccc.int/process-and-meetings/the-paris-agreement/the-glasgow-climate-pact/cop26-outcomes-finance-for-climate-adaptation#eq-4>.

¹⁴ As Annex III of the 'guidance for operationalizing the modalities, procedures and guidelines for the enhanced transparency framework,' see decision 5/CMA.3, <https://unfccc.int/documents/460951>.

25 billion through multilateral development banks and USD 2.7 billion through multilateral climate change funds (UNFCCC Standing Committee on Finance 2021). While final data on 2020 flows will be available only as of next year, the OECD estimated that climate finance provided and mobilised amounted to USD 80.4 billion in 2019 and 83.3 billion in 2020, leaving a gap of about USD 16 billion that could not be closed (OECD 2022a)¹⁵. Climate finance by the EU has steadily increased since 2013. In 2020, EUR 23.4 billion was committed by the EU, its Member States and the EIB to support developing countries in their efforts towards mitigation of and adaptation to global warming¹⁶.

However, a clear definition of what should count as climate finance remains absent (Shishlov and Censkowsky 2022). Civil society actors as well as governments from recipient countries have repeatedly criticised the EU and other donor countries for over-estimating their contributions, particularly including non-concessional loans at face value (e.g. INKA consult 2021; INKA consult and CARE 2021; Oxfam 2020; Government of India 2016; CAN 2021). Also, countries use different approaches for determining the climate objectives of flows and whether financial means are 'new and additional' (Roberts et al. 2021; Mitchell et al. 2021). In decision 4/CP.26, the COP merely requests the SCF to continue its work on the definition of climate finance¹⁷.

The majority of available support goes to mitigation activities (OECD 2022a) while only 20-25% of committed concessional finance is supporting adaptation activities (UNFCCC Standing Committee on Finance 2021). This contradicts the aim stated in the Paris Agreement that an equal balance should be achieved between mitigation and adaptation finance (Article 9.4). Nevertheless, record pledges of USD 356 million to the Adaptation Fund were made at COP26, of which the EU and its Member States will provide 75%. Financing for loss and damage has so far been omitted from climate finance provisions or related agreements under the UNFCCC. It emerged as a key issue of discussion at COP26, but only resulted in the promise of some small-scale funding to support the Santiago Network on Loss and Damage set up at COP25 under the WIM. As mentioned in section 3.4, above, developed countries objected the establishment of a separate Glasgow Facility on Loss and Damage Finance, which a large number of developing countries had called for (IISD 2021a).

The UNFCCC Climate Finance Data Portal presents information on financial resources that have been made available by developed to developing country Parties¹⁸. An interactive web portal to facilitate access to the information reported in the Biennial Reports will be available from December 2025 onwards.

As explained in section 2.3.3, the 'finance flows' goal of the Paris Agreement is related to the topic of financial support, but it is broader as it also includes finance flows within countries and among developed countries. In order to effectively mitigate climate change, it will be critical to align global finance flows with low GHG emission development. At COP27 in Sharm El-Sheikh, this topic will be discussed for the first time under a specific CMA agenda item named 'Matters relating to Article 2, paragraph 1(c), of the Paris Agreement'.

3.5.2. Technology development and transfer

The Technology Mechanism (TM) under the Convention is composed of two bodies, the Technology Executive Committee (TEC) and the Climate Technology Centre and Network (CTCN). The TM was

¹⁵ These figures include bilateral public climate finance, multilateral public climate finance, climate-related officially supported export credits as well as private finance mobilised by bilateral and multilateral public finance (OECD 2022a).

¹⁶ Council approves 2020 climate finance figure, <https://www.consilium.europa.eu/en/press/press-releases/2021/10/29/council-approves-2020-climate-finance-figure/>.

¹⁷ Long-term climate finance (LTF), <https://unfccc.int/topics/climate-finance/workstreams/long-term-climate-finance-ltf>.

¹⁸ UNFCCC Climate Finance Data Portal, <https://unfccc.int/climatefinance?home>.

established in 2010 under the COP; the Paris Agreement established the Technology Framework (TF) through Article 10.4 to provide ‘overarching guidance’ to the Technology Mechanism. The TM and the TF have the objective to support the transformational changes envisioned by the Paris Agreement through addressing the following key themes: innovation, implementation, enabling environment and capacity-building, collaboration and stakeholder engagement and support. The Paris Agreement stipulated that developing countries will be supported (Article 10.6) on cooperative action on technology development and transfer and that the financial mechanism of the Convention will support the thematic area ‘innovation’ related to cooperative action (Moosmann et al. 2021).

COP26 confirmed the importance of the Technology Mechanism in the cover decision of the Glasgow Climate Pact (UNFCCC 2021a), calling for the implementation of mitigation and adaptation action, including accelerating, encouraging, and enabling innovation, and the importance of predictable, sustainable, and adequate funding from diverse sources for the Technology Mechanism’. Parties also called for further cooperation of the GEF and GCF with the TEC and CTCN. In further detail, Parties agreed on the Memorandum of Understanding with the United Nations Environment Programme (UNEP) to host the CTCN for an additional period of five years¹⁹, to increase the number of Advisory Board seats to allow for additional Parties and Observers²⁰, and to initiate the first periodic assessment of the Technology Mechanism which also serves as an input to the global stocktake²¹.

With COP26, the Parties concluded the Paris Rulebook and fully entered into the phase of implementation of the Paris Agreement (Minas 2021). With the conclusion of the Rulebook the processes under the COP and Paris Agreement (CMA) are now fully aligned. The Technology Process was mandated by CMA to seek close collaboration between the two bodies of the Technology Mechanism, the TEC and the CTCN. Following the guidance, TEC and CTCN established a joint task force between TEC and CTCN, are carrying out joint activities (along separate activities specific to the mandates for each body), are holding joint sessions, and seek synergies and consistency on the design of their future work programmes. TEC and CTCN are currently drafting their new five-year work programmes, which will be aligned for the period 2023-2027. The work programmes are discussed prior to COP27 and their endorsement will be sought at the COP. Key elements covered in the draft work programmes include the focus on enablers (such as innovation, digital solutions, collaboration, and the methodological linkages of Technology Need Assessments, roadmaps and NDCs) and systems (including low carbon buildings and industry, the agriculture-water-energy nexus, mobility, and energy systems) (CTCN 2022; TEC 2022).

3.5.3. Capacity building

Article 11 of the Paris Agreement strengthens the role of capacity building with a focus on the least developed and Small Island Development States (SIDS). To further promote capacity building in developing countries at COP 21 in 2015 the Paris Committee on Capacity-building (PCCB) was established with the aim of addressing capacity building gaps and needs and enhancing capacity-building efforts, the capacity for implementing NDCs, reporting capacities, the mainstreaming of climate consideration into national planning and budgeting and addressing institutional capacity gaps required for the implementation of the Paris Agreement, gender mainstreaming, and local and indigenous capacities. To help enhance the systematic approach of countries on capacity building, the

¹⁹ Second review of the Climate Technology Centre and Network, <https://unfccc.int/documents/310492>.

²⁰ Review of the constitution of the advisory board of CTCN, <https://unfccc.int/documents/310486>.

²¹ First periodic assessment referred to in paragraph 69 of decision 1/CP.21, <https://unfccc.int/documents/310507>.

PCCB issued the 'PCCB Toolkit to assess capacity building gaps'²². In its synthesis report to the global stocktake (PCCB 2022) the PCCB reported on its progress on enhancing capacity building in developing countries, through information sharing, the development of the toolkit, the establishment of the Capacity Building Hub²³ as a series of information sharing conferences and the PCCB Network²⁴.

The Glasgow Climate Pact (UNFCCC 2021a) stressed the need for capacity building in developing countries in the areas of mitigation and adaptation, and to implement approaches to averting, minimising and addressing loss and damage associated with the adverse effects of climate change, and, for Global Environment Facility to facilitate improved access to the capacity-building Initiative for transparency.

3.6. Transparency and compliance

Work on the enhanced transparency framework constituted an important part of the Paris Agreement Work programme. Delegates had to elaborate the detailed information which Parties have to report in order to allow for the tracking of progress towards the goals of the Paris Agreement. The information to be reported and the rules for reviewing this information were agreed at COP24 in 2018, while detailed reporting tables and outlines were finalised at COP26 in 2021. Now that the reporting provisions have been finalised, Parties are preparing for the first reporting round under the enhanced transparency framework, and the first biennial transparency reports (BTRs) are due in 2024.

3.6.1. Outcomes of COP24-26

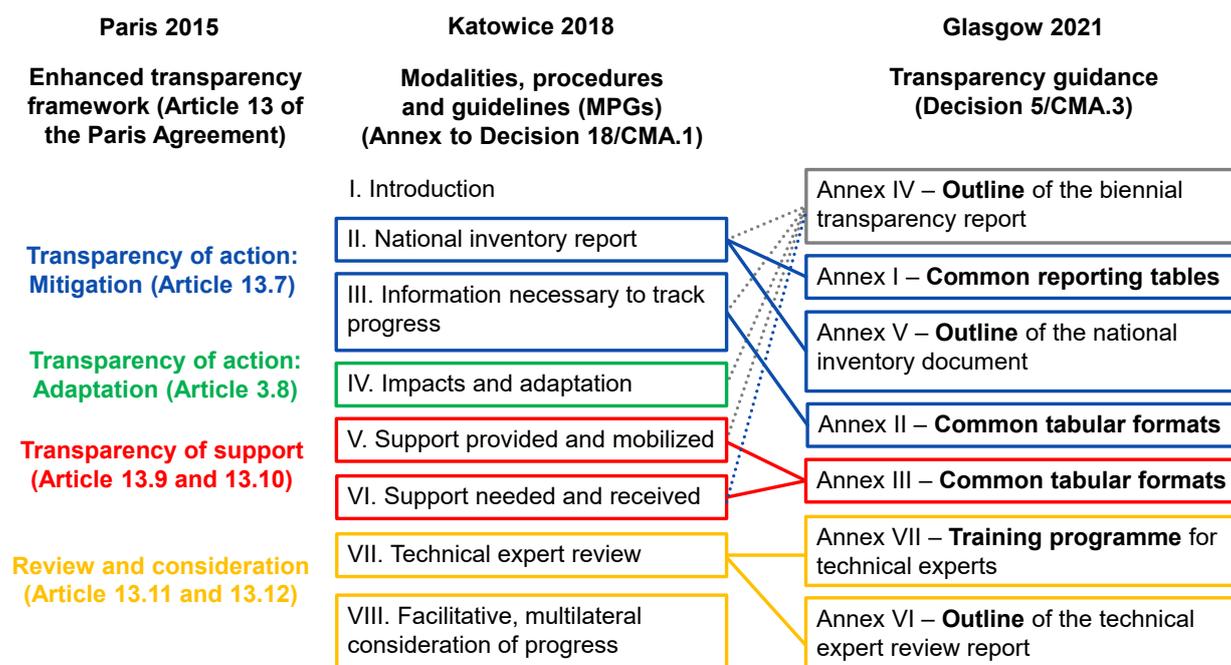
While Article 13 of the Paris Agreement specifies the general set-up of the transparency framework, the detailed information to be reported, and the rules for reporting and review were elaborated in the years following the adoption of the Paris Agreement. At COP24 in Katowice in 2018, the CMA adopted the 'modalities, procedures and guidelines (MPGs) for the transparency framework' (UNFCCC 2018b). A comprehensive annex to this CMA decision details the information to be reported and how it is reviewed and considered. Figure 9 lists the eight chapters of the MPGs and how they are related to Article 13 of the Paris Agreement.

²² Capacity-building: Portal, <https://unfccc.int/topics/capacity-building/resources/capacity-building-portal>.

²³ Capacity-building Hub, <https://unfccc.int/capacity-building-hub>.

²⁴ PCCB Network, <https://unfccc.int/pccb-network>.

Figure 9: Elements of Article 13 of the Paris Agreement and the related chapters of the MPGs (2018) and elements of the transparency guidance (2021)



Source: Based on Moosmann and Herold (2022).

Chapters II to VI of the MPGs specify the information to be provided in Biennial Transparency Reports, which are to be submitted by Parties for the first time by the end of 2024. The information to be reported covers national inventories of greenhouse gas emissions and removals, information necessary to track progress in implementing and achieving NDCs, information on impact and adaptation, and various topics related to support given to developing countries. Chapters VII and VIII of the MPGs specify the modalities of the technical expert review and the facilitative, multilateral consideration of progress.

Figure 9 also depicts the elements of the additional guidance adopted at COP26 in Glasgow in 2021: The ‘Guidance for operationalizing the MPGs for the enhanced transparency framework’ (UNFCCC 2021b) contains outlines for the BTR, for the national inventory report and for the technical expert review report. It also contains various tables for the reporting of greenhouse gas inventories, information necessary to track progress and information on support. These outlines and tables will facilitate transparent and comparable reporting – and hence the provision of climate change related information to all Parties and stakeholders.

Besides transparency under Article 13, compliance under Article 15 is an important element of accountability under the Paris Agreement. The key outcome relating to Article 15 was agreed at COP24 in Katowice: The ‘Modalities and procedures for the effective operation of the committee to facilitate implementation and promote compliance’ (UNFCCC 2018c) sets out the:

- Arrangements for the Committee to facilitate implementation and promote compliance;
- How the Committee will consider issues related to a Party’s implementation of or compliance with the provisions of the Paris Agreement; and
- the measures to be taken by the Committee.

The Article 15 Committee consists of 12 members with recognized competence in relevant fields to be elected by the CMA. It has met regularly since 2020. Additional information on the Committee, including its meeting reports, can be found at the Committee's website²⁵.

3.6.2. Issues at stake at COP27

Now that the rules for reporting and review under the Paris Agreement have been finalised, Parties are busy preparing for the first reporting cycle. The reporting of the requested information, including detailed greenhouse gas inventories, constitutes a challenge for developing countries, and support, including capacity building, will be crucial. At COP27, an item is on the CMA agenda which addresses the 'provision of financial and technical support to developing country Parties for reporting and capacity-building'. Under this agenda item, delegates will consider the support for reporting which is provided by entities such as the Global Environment Facility (GEF).

Under the Paris Agreement, information related to mitigation and support is subject to review, while no review of information related to climate change impacts and adaptation is foreseen. As climate change impacts and the adaptation to a changing climate are of particular importance to developing countries, several of them initiated a discussion of a voluntary review of such information. Under SBSTA agenda item 15, Parties will discuss in Sharm El-Sheik various options for such voluntary reviews. These could contribute, inter alia, to improved reporting and to the recognition of adaptation efforts. Given that the topic of adaptation is one of the priorities of the Egyptian COP Presidency, this agenda item is expected to draw quite some interest.

Finally, under SBI agenda items 3 and 4 and SBSTA agenda item 14, delegates will discuss the reporting and review provisions under the Convention and how to arrange a transition towards the transparency framework under the Paris Agreement. The challenge will be to make the reporting and review process as efficient as possible, while ensuring that all information will be available in a timely and transparent manner.

3.7. The global stocktake

The Paris Agreement combines global collective goals to address climate change with national contributions towards these goals (NDCs) set individually by the participating countries. To address the challenge that the individual contributions might not suffice in order to reach the collective goals, the global stocktake was established by the Paris Agreement as a mechanism to take stock of collective progress in reaching the goals. It aims to inform Parties on updating and enhancing their NDCs and shall take place every five years, shortly before new or updated NDCs are to be submitted to the UNFCCC. It mainly covers three topics: mitigation of greenhouse gases, adaptation to climate change, and means of implementation and support. The first global stocktake has started in 2021 and will continue until 2023.

3.7.1. Procedure of the global stocktake

At COP24 in 2018, Parties decided upon the modalities of the global stocktake and the information sources that it will be based upon (decision 19/CMA.1). It was confirmed at COP24 that the global stocktake will consist of three phases: (i) information collection for technical assessment, (ii) technical assessment of collective progress, and (iii) consideration of outputs²⁶.

²⁵ Paris Agreement Implementation and Compliance Committee (PAICC), <https://unfccc.int/process-and-meetings/bodies/constituted-bodies/paris-agreement-implementation-and-compliance-committee-paicc>

²⁶ Global Stocktake, <https://unfccc.int/topics/global-stocktake/global-stocktake>.

Information that is to be used as input to the global stocktake should be submitted at least three months before their consideration in the technical assessment. Such input should comprise information about the state of greenhouse gas emissions, mitigation measures by Parties, the aggregated impact of NDCs, adaptation efforts, support provided, specific obstacles and challenges for developing countries, possibilities to enhance international cooperation on mitigation and adaptation, options for enhancing the provision of support as well as considerations of equity (decision 19/CMA.1 paragraph 36).

Specific information sources include reports and notes of Parties to the UNFCCC, reports by the IPCC, SBSTA and SBI or other relevant bodies in the context of the UNFCCC and Paris Agreement, reports by other UN organisations, regional groups or institutions as well as submissions of Parties and other stakeholders (decision 19/CMA.1 paragraph 37). The UNFCCC Secretariat is tasked to prepare four synthesis reports on 1) the state of greenhouse gas emissions and measures to mitigate them; 2) the state of adaptation efforts; 3) the aggregate impact of NDCs and 4) support provided (decision 19/CMA.1, paragraph 23).

The SBI and SBSTA Chairs ('SB Chairs') are mandated to develop guiding questions for all components of the global stocktake. The focus of the global stocktake lies on aggregate progress towards implementing the goals of the Paris Agreement and not on individual contributions (paragraph 14). All inputs to the global stocktake are provided on the GST Information Portal²⁷ (decision 19/CMA.1 paragraph 21).

3.7.2. The technical phase of the global stocktake

The technical phase of the global stocktake consists of two components – information collection and preparation, and technical assessment. The information collection and preparation component of the first global stocktake started in 2021 after a call for inputs sent out in mid-2021. The SB Chairs prepared a non-paper for this phase to outline the process and present their guiding questions²⁸. So far, a number of inputs to the global stocktake have been collected on the Information Portal, including the various synthesis reports by the UNFCCC Secretariat mentioned in the section above. The information collection and preparation phase will continue until mid-2023. Inputs can be submitted up to six months before the third phase of the global stocktake, the political consideration of outputs. At COP26, it was emphasised that the lists on types of information and sources of information that should feed into the global stocktake were non-exhaustive. Additionally, developing country Parties underlined that non-party stakeholders, particularly from developing countries should be asked to provide input to the GST and that support needs to be provided to enable their participation (IISD 2021a).

The second component of the global stocktake (technical assessment) started in spring 2022. The SB Chairs released guiding questions for this phase in February 2022²⁹ as well as an information note on the first meeting of the technical dialogue in May 2022³⁰. In line with the modalities agreed at COP24, the technical dialogue is implemented through a focused exchange of views, information and ideas in in-session roundtables, workshops or other activities (decision 19/CMA.1, paragraph 6).

At the 56th session of the Subsidiary Bodies (SBs) in June 2022, the first meeting of the technical dialogue took place. It comprised an opening and a closing plenary session, three interactive

²⁷ Global Stocktake information portal, <https://unfccc.int/topics/global-stocktake/information-portal>.

²⁸ Non-paper on preparing for GST1, https://unfccc.int/sites/default/files/resource/REV_Non-paper_on_Preparing_for_GST1_forSBs_15Sept.pdf.

²⁹ Draft guiding questions, https://unfccc.int/sites/default/files/resource/Draft%20GST1_TA%20Guiding%20Questions.pdf.

³⁰ Technical Dialogue information note, https://unfccc.int/sites/default/files/resource/GST_Technical_Dialogue_Information_Note.pdf.

roundtables and a world café format with exchanges in a more informal setting³¹. Two similar meetings of the technical dialogue will take place during the 57th meeting of the SBs at COP27 in November 2022 and during the 58th sessions of the SBs in June 2023.

The technical assessment phase runs in parallel to the information collection and preparation phase of the global stocktake as these two components will interact if, for example, new information sources are published (particularly IPCC reports) or if Parties meeting during the technical assessment request additional information³².

3.7.3. The political phase of the global stocktake

The third component of the global stocktake, the consideration of outputs, constitutes the political phase and will take place during COP28 in November 2023. During this political phase, the implications of the findings of the technical assessment for updating and enhancing Parties' efforts to tackle climate change will be addressed. This phase will consist of high-level events where these findings and implications will be presented and discussed (decision 19/CMA.1 paragraph 33). These meetings shall serve to identify opportunities and challenges in enhancing action and support, to identify possible measures and good practices for international cooperation as well as to summarise key political messages, including recommendations for strengthening action and enhancing support. Such conclusions shall be referenced in a CMA decision or declaration (decision 19/CMA.1 paragraph 34).

The first global stocktake will thus be concluded about two years before Parties are to submit their NDCs in 2025.

The organisation of the first global stocktake will be decisive for the implementation of future iterations of the process and the extent to which the global stocktake will be able to fulfil its function of enhancing ambition of countries' efforts to tackle climate change. In addition, the COP presidency and the moderation of the political assessment of the GST outcomes will play an important role in this regard (Jeffery et al. 2021). Domestic factors such as political will, financial, institutional, technical or human capacity as well as external support will also be important for the impact of COP guidance on domestic decision-making processes (Charles et al. 2021).

It remains to be seen to what extent the global stocktake will be able to generate sufficient public attention in order to put political decision-makers at domestic level into spotlight. Research organisations have proposed to support the process by anonymised information on contributions by individual countries through performance distributions that makes a comparison of domestic progress with global or regional progress possible (Jeffery and Nascimento 2022). Additionally, a consortium of civil society actors has formed the Independent global stocktake (iGST) as a network to support the formal global stocktake process through complementary research, exchange and spreading the messages of the formal process to relevant authorities and the wider public³³.

3.8. Other topics in the negotiations

Besides the implementation of the Paris Agreement, negotiations at the COP address a number of other topics under the Convention and under the Kyoto Protocol. The following sections provide an overview of these topics.

³¹ Technical Dialogue, <https://unfccc.int/topics/global-stocktake/components-of-the-gst/technical-dialogues-of-the-first-global-stocktake/technical-dialogue-11-td11-of-the-first-global-stocktake#eq-4>.

³² Components of the Global Stocktake, <https://unfccc.int/topics/global-stocktake/components-of-the-global-stocktake>.

³³ Independent Global Stocktake, <https://www.climateworks.org/independent-global-stocktake/>.

3.8.1. Koronivia joint work on agriculture

Agriculture is relevant for both mitigation and adaptation. In order to discuss how to mitigate emissions from agricultural activities while addressing the vulnerability of the sector to climate change, COP23 launched the Koronivia Joint Work on Agriculture (KJWA). The work programme was named after the Koronivia Research Station, the agricultural research station of Fiji, which presided over COP23. According to the agreed roadmap, six thematic workshops and expert meetings have taken place. These addressed a number of agriculture-related issues, taking into consideration the vulnerability of agriculture to climate change and addressing food security (UNFCCC 2017c; Moosmann et al. 2021).

At COP26, conflict lines persisted with regard to the proposal by developed countries to include mitigation in the report on outcomes of the KJWA. This was opposed by several developing countries (IISD 2021a) as it is perceived to conflict with prioritising food security and adaptation. The issue of whether to include language on 'reducing total livestock numbers' in reports on workshops held under the KJWA has also been particularly controversial in the past (Moosmann et al. 2021). Negotiations on the outcomes of the KJWA continued in June 2022 with disagreement on the contents of outstanding workshop reports as well as a report on outcomes of the KJWA to the COP (IISD 2022a). Discussions on these issues and future topics to be considered will continue at COP27³⁴. Developing countries continuously emphasised the need for support for adaptation and mitigation in the agricultural sector.

3.8.2. Impacts of the implementation of response measures

One mitigation-related aspect which has been discussed under the Convention since it began and is also addressed under the Paris Agreement is the impacts of the implementation of response measures. Whenever measures in response to climate change are taken, e.g. the reduction of fossil fuel consumption, they may have impacts on other economic sectors and other countries. The oil-producing countries, in particular Saudi Arabia, point out the importance of addressing these impacts and of acknowledging and supporting related activities, such as economic diversification in countries relying on fossil fuel production (Moosmann et al. 2021).

A forum on the implementation of response measures is in place under the Convention since 2012 which is operational under the Paris Agreement since 2018. It is supported by the Katowice Committee of Experts on the Impacts of the Implementation of Response Measures (KCI) comprised of 14 members. A workplan for six years was adopted for the forum in 2019. At COP26, the KCI reported on progress towards completion of its workplan. A joint decision by the COP, the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP) and CMA adopted recommendations regarding exploring approaches to inform the development of NDCs (activity one of the workplan) and requested the Secretariat to organise a regional workshop on facilitating modelling and assessing the impacts of response measures (activity three of the workplan). In June 2022, the mid-term review of the work plan was initiated; discussions on this will continue at COP27. In the SB conclusions, the KCI is requested to prepare a synthesis report on the work of the forum as an input to the global stocktake (IISD 2022a).

3.8.3. Research and systematic observation

Under the SBSTA heading 'research and systematic observation,' Parties discuss inter alia the work of the IPCC, research-related mandated events like the SBSTA special event on IPCC Working Group III (which took place during the 56th SB sessions in 2022) and activities of the Global Climate Observing

³⁴ Workstreams – Agriculture, <https://unfccc.int/topics/land-use/workstreams/agriculture>.

System or the World Meteorological Organisation. At COP26, the 'Earth Information Day' took place again, providing a platform for exchanging information on the state of the global climate system and developments in systematic observation³⁵.

Even though there is general acknowledgement of the importance of climate science and its relevance for the negotiations, Parties repeatedly disagree on the language to be used with regard to scientific work in the conclusions. At COP26, some countries opposed, for example, the inclusion of a sentence encouraging Parties to use the information provided by scientific bodies to inform their actions under the Convention and the Paris Agreement. Similarly, Parties wanted to remove an expression of appreciation for the work by the IPCC's working groups on the Sixth Assessment Report (AR6). Eventually, Parties agreed on 'noting the relevance' of the reports by scientific bodies to actions under the Convention and the Paris Agreement and expressed 'appreciation and gratitude to the IPCC and the scientific community' and stated they were looking forward to their continued work on the AR6. However, Working Groups II and III, which were in the process of finalising their key contributions to the AR6 on adaptation and mitigation respectively were not mentioned in the SBSTA conclusions (IISD 2021a).

Another negotiation item related to science and research is the scope of the next periodic review of the long-term global goal under the Convention and of overall progress towards achieving it. At COP26, informal consultations on this item took place in which key inputs to and the process of the review were discussed. Developing country Parties argued for also reviewing progress towards the provision of means of implementation; overall, conclusions were of little substance (IISD 2021a). A second structured expert dialogue (SED2) discussed this item at SBSTA 56. The item should be closed at COP27 so that it can inform the Global stocktake (see section 3.7). For COP27, a summary report on the structured expert dialogues and a synthesis report of the second periodic review will be prepared (IISD 2022a).

At SBSTA 56, latest findings from climate research were also discussed at the 14th meeting of the 'Research Dialogue'³⁶.

3.8.4. Action for climate empowerment

The field of education, training, public awareness, public participation and public access to information constitutes another important aspect of the response to climate change. This topic is enshrined in Article 6 of the Convention and in Article 12 of the Paris Agreement (Moosmann et al. 2021). Education-related topics are discussed in annual dialogues under the 'Action for Climate Empowerment' (ACE) programme (UNFCCC 2019b).

At COP26, the review of the Doha work programme on Article 6 of the Convention was concluded. It is now titled 'Glasgow work programme on Action for Climate Empowerment' with a ten-year mandate. Annual dialogues under this work programme will be held and an action plan with a focus on immediate actions should be developed and proposed for adoption at COP27. Several developed and developing countries expressed concern that references to human rights, Indigenous Peoples' rights, gender responsiveness and intergenerational equity were removed from the work programme in an intransparent and non-inclusive process (IISD 2021a).

In 2022, the Action for Climate Empowerment Hub was launched. It will be located at the UNFCCC Secretariat in Bonn and provide support to governments and other stakeholders in order to better

³⁵ Earth Information Day 2021, <https://unfccc.int/event/earth-information-day-2021>.

³⁶ 14th Meeting of the Research Dialogue, <https://unfccc.int/event/fourteenth-meeting-of-the-research-dialogue>.

engage the public, particularly youth, in climate action³⁷. As part of the annual Global Youth Video Competition, youth around the world showcase their actions to tackle climate change via a platform hosted by the UNFCCC³⁸.

3.8.5. The local communities and indigenous peoples' platform

The 'Local Communities and Indigenous Peoples Platform' (LCIPP) was established in 2017 at COP23. Its aim is to strengthen the knowledge, technologies, practices, and efforts of local communities and indigenous peoples related to addressing and responding to climate change (UNFCCC 2017a). In 2021, a web portal³⁹ was created to spread the work of the platform and the work of the Facilitative Working Group, comprised of representatives from Parties and indigenous peoples' organisations (Moosmann et al. 2021). At COP26, a three-year workplan for the platform developed by a Facilitative Working Group (FWG) was adopted together with the decision to continue the work by the FWG to support the participation of Indigenous Peoples and local communities in the negotiations (IISD 2021a). In particular, respect of the rights of indigenous peoples' and their involvement is crucial in preserving tropical forests and reducing deforestation (FAO 2021).

3.8.6. The gender action plan

In many countries, women are more exposed to the impacts of climate change than men, while they have not been equally involved in addressing its causes and impacts. To advance gender balance and the mainstreaming of a gender perspective in the implementation of the Convention, the Lima work programme on gender was established in 2014 (COP20) and the first gender action plan (GAP) was agreed at COP23 (UNFCCC 2017b; Moosmann et al. 2021). The work programme encompasses a number of dialogues, reports and workshops in five priority areas (enhancing knowledge, enhancing the participation of women, mainstreaming of gender considerations, gender-responsive implementation of the Convention and the Paris Agreement and monitoring and reporting of the work programme) (Moosmann et al. 2021). At SB156 in June 2022, the intermediate review of the plan was initiated which shall be completed at COP27 (IISD 2022a).

Women continue to be underrepresented in-person at UNFCCC meetings. At COP26, about 37% of all Party delegates were women; they accounted for only 29% of the total speaking time. In the UNFCCC-constituted bodies, the representation of women varies between 10% on the CDM Executive Board and the Technology Executive Committee (TEC) and 81% on the Adaptation Committee (AC) (UNFCCC 2022d).

3.8.7. International aviation and maritime transport

Emissions from international aviation and maritime transport and policies to address them are discussed in three areas under the UNFCCC.

Firstly, ICAO and IMO have been reporting on their work addressing emissions from the use of bunker fuels under SBSTA since COP1 in 1995. Based on the reports of these international bodies, Parties typically comment on the efforts made under ICAO and IMO. However, Parties have not been able to agree on draft conclusions on IMO and ICAO reports since 2018.

Secondly, any efforts under ICAO and IMO are implicitly part of the global stocktake. Decision 19/CMA.1 states that events outside the UNFCCC (such as events organised by ICAO and IMO) can contribute to

³⁷ ACE Hub, <https://unfccc.int/ace-hub>.

³⁸ Global youth video competition, <https://unfccc.int/topics/education-and-outreach/events--meetings/global-youth-video-competition>.

³⁹ Local Communities and Indigenous Peoples Platform Web Portal, <https://lcipp.unfccc.int/>.

the global stocktake. The decision also includes the consideration of outputs which enhance international cooperation for climate action (such as actions under ICAO and IMO). It will thus be important that ICAO and IMO contribute to the first global stocktake and submit relevant documents with details on their ambitions and measures taken.

Thirdly, offsets used for ICAO's CORSIA and the issue of double counting (cf. section 2.5.1) are relevant for the rules under Article 6. Such rules were adopted at COP26, as described in section 3.2.

The first topic of (ICAO and IMO reports on emissions from international aviation and maritime transport) was deferred at COP26 in 2021 and thus not discussed. In June 2022, negotiations on the matter resumed at SBSTA56. After about 4 years of reaching no conclusions, Parties agreed on procedural conclusions. From the perspective of negotiations, this means progress has been made, even though the conclusions were purely procedural, stating that matters of emissions from fuel used in aviation and maritime transport were considered and that considerations will continue at SBSTA57.

To date, the EU has called on IMO and ICAO to ensure that international aviation and maritime transport make a fair contribution towards achieving the goals of the Paris Agreement and to continue reporting on their progress. Particularly, the EU position encourages the adoption of an ambitious long-term emission reduction target at ICAO and the implementation of further mitigation measures at IMO.

4. STAKEHOLDERS IN THE NEGOTIATIONS

4.1. Groups of Parties

The five United Nations regional groups (African States; Asia-Pacific States; Eastern European States; Latin American and the Caribbean States; and Western European and other States) play a role in appointing representatives to various bodies, and the COP presidency rotates between them. Additionally, in the negotiations under the UNFCCC there are groups formed by shared interest instead of the geographical location. These approx. 10 groups of Parties regularly coordinate their positions. The 'G-77 and China' generally coordinates its positions in UN processes. Other UNFCCC negotiations groups have a regional focus, such as the African Group of Negotiators or the group of Argentina, Brazil and Uruguay. Although there is some fluctuation and groups are not active at the same level at each conference, we can distinguish between the following groups, as depicted in Figure 10 and discussed below.

As far as the influence of the various negotiating groups is concerned, it is important to note that all COP, CMP and CMA decisions and all conclusions of subsidiary bodies are made unanimously. Hence, every single Party can influence the outcome of the negotiations. Nevertheless, the larger groups have an advantage because they have a sufficient number of experts available in their delegations to cover all topics in-depth and to reach out to delegates from other groups to discuss and find compromises.

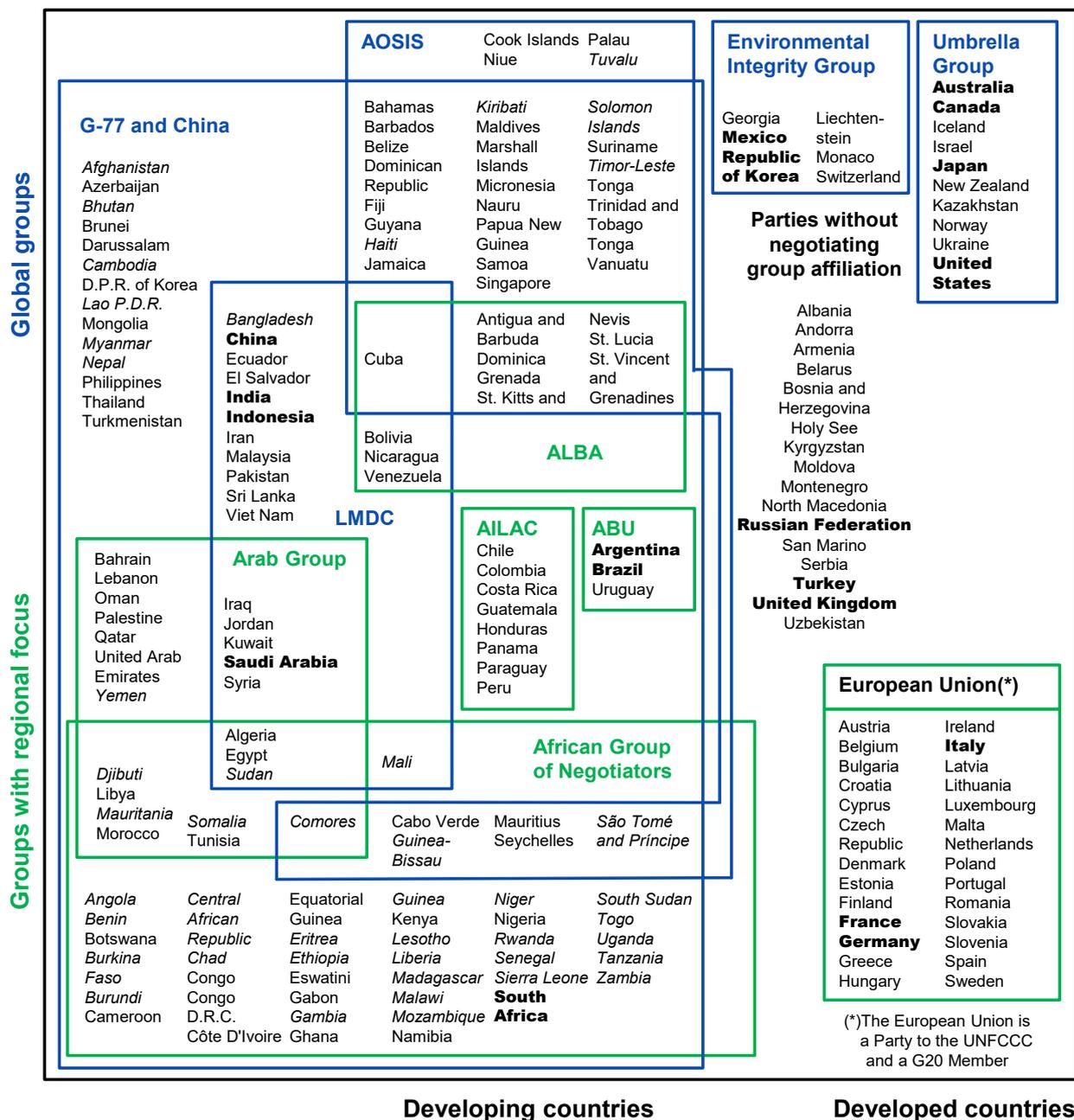
4.1.1. Umbrella Group

The Umbrella Group is a coalition of developed countries comprising Australia, Belarus, Canada, Iceland, Israel, Japan, New Zealand, Kazakhstan, Norway, Ukraine and the US (UNFCCC 2022f). Most of its members have high per-capita greenhouse gas emissions. Hence, some of the members of this group are cautious about ambitious mitigation actions and the group generally calls for developing countries to contribute to mitigation action.

In the negotiations, members of the Umbrella Group aim at overcoming the differentiation between developed and developing countries which was introduced in the Convention. In general, the group calls for high standards of transparency in reporting, both for developed and developing country Parties.

As of March 2022, following the invasion of Ukraine by the Russian Federation, the Umbrella Group has stopped coordinating with the Russian Federation and Belarus (Climate Home News 2022e).

Figure 10: Parties to the UNFCCC, and group affiliations



Source: AGN (2022), AOSIS (2022a), G-77 (2022), UNFCCC (2022f), Moosmann et al. (2021).

Note: Members of the Group of Twenty (G20) are shown in bold. Members of the Group of Least Developed Countries (LDC) are shown in italics.

4.1.2. Environmental Integrity Group

The Environmental Integrity Group (EIG) consists of three small developed countries (Liechtenstein, Monaco and Switzerland) and three developing/emerging countries (Mexico, Republic of Korea and Georgia). Members of the EIG call for ambitious mitigation action, including from developing countries, and they are proponents of transparent reporting.

The majority of EIG members plan to make use of voluntary cooperation under Article 6 of the Paris Agreement to achieve their NDCs. The group therefore shows a strong interest in the current

negotiations on Article 6 and calls for high transparency standards and the promotion of environmental integrity in the cooperative approaches and the mechanism under Article 6.

4.1.3. Independent Alliance of Latin America and the Caribbean (AILAC)

The Independent Alliance of Latin America and the Caribbean (Asociación Independiente de Latinoamérica y el Caribe – AILAC) comprises Chile, Colombia, Costa Rica, Guatemala, Honduras, Panama, Paraguay and Peru (AILAC 2022).

AILAC aims at bridging divides between developing and developed countries. Its members call for ambitious mitigation action, not only from developed, but also from developing countries. AILAC also supports an effective transparency framework for all countries. Like other groups of developing countries, AILAC also points out the importance of adaptation action and of financial, technological and capacity building support.

4.1.4. Alliance of Small Island States (AOSIS)

The Alliance of Small Island States (AOSIS) comprises 39 small island and low-lying coastal developing states (AOSIS 2022a). Most SIDS are AOSIS members. Specifically, AOSIS comprises all SIDS which are UN Member States except Bahrain and, in addition, two SIDS which are not UN Member States but Parties to the UNFCCC, namely the Cook Islands and Niue. As these countries and territories are affected disproportionately by rising sea levels and by extreme weather events, AOSIS is a proponent of ambitious mitigation action. In the negotiations for the Paris Agreement, the introduction of the 1.5°C goal constituted one of the achievements of AOSIS.

In current negotiations, the group calls for high levels of transparency and environmental integrity, while being mindful about the limited capacities available to developing countries. Consisting of mostly low-income and small countries, the group calls for support, e.g. financial support and capacity building in the area of adaptation.

However, as the possibilities to adapt to effects such as global sea level rise is limited for low-lying islands and coastal areas, members of AOSIS also show high interest in the topic of loss and damage associated with the impacts of climate change.

4.1.5. Least Developed Countries (LDCs)

The Least Developed Countries (LDCs) are a group of 46 low-income countries; the affiliation to this group follows specific criteria and is reviewed regularly by the Committee for Development under the United Nations Economic and Social Council (UN Economic Analysis & Policy Division 2022).

Similarly to AOSIS countries, the LDCs have limited capacity to respond to the impact of climate change. In the negotiations, the group stresses the importance of adaptation action and of addressing loss and damage. LDCs are also vocal in the negotiations on support for developing countries.

4.1.6. African Group of Negotiators (AGN)

The African Group of Negotiators (AGN) comprises all 54 African countries (AGN 2022). Like other groups of developing countries, the AGN points out the challenges faced by their members in adapting to the adverse impacts of climate change. Hence, the AGN calls for giving the same level of importance in the negotiations to adaptation as to mitigation. In addition, the AGN points out the limited capacities available in African countries and calls for financial, technological and capacity building support. Within the AGN, South Africa is an important country that supports high transparency standards.

4.1.7. Group of Argentina, Brazil and Uruguay (ABU)

The group of Argentina, Brazil and Uruguay (ABU) comprises three important agricultural producers. For these countries, it is important to recognise the specific role of agriculture in mitigation and adaptation. As agricultural activities lead to the emission of specific greenhouse gases (methane and nitrous oxides) besides carbon dioxide, ABU is active in the discussion on global warming potentials (GWPs) of various greenhouse gases.

Another area in which ABU (mostly Brazil) is vocal is the discussion on Article 6 of the Paris Agreement. Brazil has been very active in the Clean Development Mechanism under the Kyoto Protocol.

4.1.8. Bolivarian Alliance for the Peoples of Our America (ALBA)

The Bolivarian Alliance for the Peoples of Our America (Alianza Bolivariana para los Pueblos de Nuestra América – ALBA) is an association of ten Latin American and Caribbean countries with socialist/social democratic governments. Although the group is less active at present, it has played a prominent role in supporting the interests of indigenous peoples in the climate negotiations.

The group was also a proponent of introducing concepts such as ‘climate justice’ in the Paris Agreement and supports the development of non-market approaches to cooperation between Parties.

4.1.9. Like-Minded Developing Countries (LMDC)

The group of Like-Minded Developing Countries (LMDC) comprises 24 developing countries (Algeria, Bangladesh, Bolivia, China, Cuba, Ecuador, Egypt, El Salvador, India, Indonesia, Iran, Iraq, Jordan, Kuwait, Malaysia, Mali, Nicaragua, Pakistan, Saudi Arabia, Sri Lanka, Sudan, Syria, Venezuela and Vietnam). This group insists on the importance of the principle of common but differentiated responsibilities and calls foremost for ambitious action and support from the part of developed countries. The group stresses the historical responsibility of developed countries, as they have been responsible for the majority of greenhouse gas emissions over the past decades.

The LMDCs point out the importance of taking into account sustainable development and poverty eradication when addressing climate change. The topic of loss and damage is also on the group’s agenda.

4.1.10. Arab Group

The Arab Group comprises 22 Parties from the Arab Peninsula and Northern Africa. As some of them are important oil and gas producers, the Arab Group pays particular attention to possible impacts of mitigation measures (such as a shift away from fossil fuels) on their economies. The topic of ‘impacts of the implementation of response measures’ is a regular item on the agenda at climate change negotiations (cf. section 3.8.2). The Arab Group and other oil producing countries point out the challenges of diversifying their economies in response to mitigation actions; Saudi Arabia is the most vocal member of the group. The Group was successful in including the concept of ‘mitigation co-benefits of adaptation actions’ into Article 4 of the Paris Agreement.

4.1.11. Group of G-77 and China

In addition to being a member of one of the groups introduced above, most developing countries are members of the ‘G-77 and China’ group. The ‘Group of 77 at the United Nations’ (G-77) was founded by 77 developing countries at the United Nations Conference on Trade and Development in 1967 (G-77 2022). Since then, the group has grown to 134 members, and in climate change negotiations, China associates itself with the group. Hence, the G-77 and China group is the largest group of Parties at UNFCCC negotiations.

Like other groups of developing countries, the G-77 and China emphasise the common but differentiated responsibilities and respective capabilities (CBDR/RC) in the Convention. Representatives of the group point out that developed countries are responsible for a large share of historical emissions and should take the lead in climate change mitigation.

Another focus of G-77 and China is the call for support to developing countries. On specific technical topics, however, there are diverse views among the members of G-77 and China. On such topics, G-77 and China holds a general position, while other groups of developing countries bring forward more nuanced positions.

4.1.12. European Union

Among the groups of Parties, the European Union constitutes a special case. The EU is a Party to the UNFCCC and to the Paris Agreement, and the same is true for each of its Member States. Delegates from the EU and its Member States coordinate their position throughout the year and prepare shared positions before each negotiating session. For each agenda item negotiated at a climate change conference, a representative (from a Member State or from the European Commission) is selected who negotiates on behalf of the EU and its Member States. Member States do not speak for themselves in the negotiations.

The focus of the EU in the negotiations is on increasing mitigation ambition. The EU also acknowledges the importance of support for developing countries and points out the related efforts by the EU and its Member States. It calls for transparent reporting on both action and support. Although the EU does not intend to participate in voluntary cooperation under Article 6 of the Paris Agreement, it is a proponent of strict and transparent rules for such cooperation in order to preserve the environmental integrity of such approaches.

4.2. Observers

Observers play a critical role in the implementation of the Paris Agreement with their leadership and contribution towards increasing mitigation and adaptation efforts. The outgoing UNFCCC Executive Secretary, Patricia Espinosa, highlighted their critical role at the June 2022 Bonn Session on the global stocktake: 'The leadership and contributions of non-state actors has become more and more important every year, as the world must redouble its efforts on implementation. . . . [Non-state actors are] helping to foster a much needed solutions oriented conversation about how to address the impacts we are already seeing from increasing climate disasters.'⁴⁰

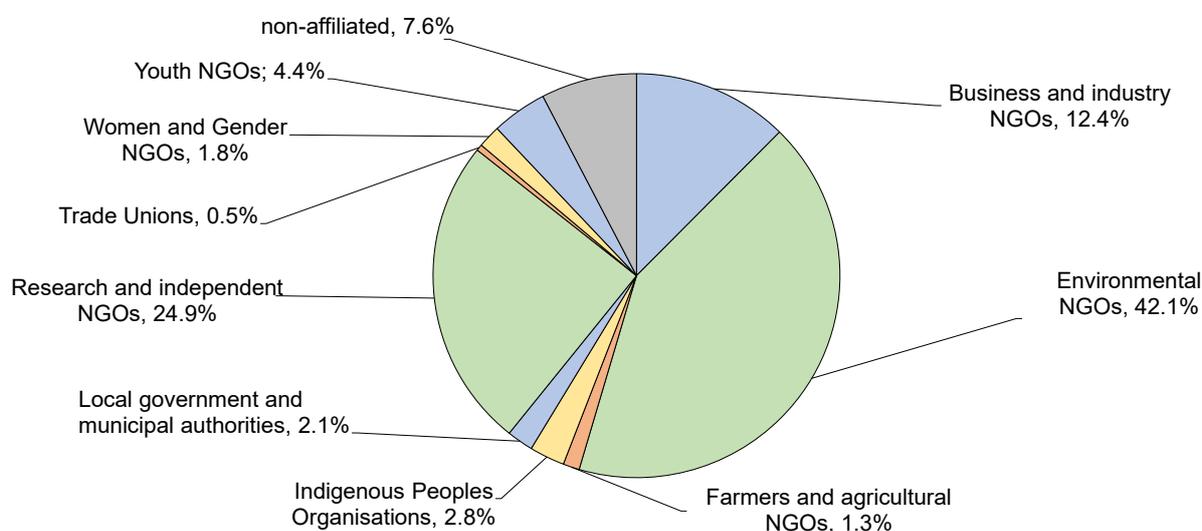
In the UNFCCC process, observer organisations comprise different types of actors: The United Nations System and its Specialised Agencies, intergovernmental organisations (IGOs) and non-governmental organisations (NGOs). IGOs and NGOs need to be granted observer status by the UNFCCC Secretariat. Thereafter, they can register delegates on behalf of their organisation. As of November 2021, 2,902 NGOs and 145 IGOs are registered as observer organisations to the UNFCCC. They cover a broad variety of topics, interests and types of organisations (UNFCCC 2022e). The number of observer organisations has been steadily growing since COP1 and reached a new record with 520 new admissions for COP26 (UNFCCC 2022e).

NGOs in the UNFCCC process organise themselves in constituencies in which they are clustered according to common interests or perspectives. They mirror the 9 'Major Groups' which were established in the Agenda 21 and re-confirmed by the Rio+20 summit: business and industry NGOs

⁴⁰ Taking stock: Bonn Climate Conference opens, <https://climatechampions.unfccc.int/bonn-climate-conference-opens/>.

(BINGO), environmental NGOs (ENGO), farmers and agricultural NGOs (Farmers), indigenous peoples organisations (IPO), local government and municipal authorities (LGMA), research and independent NGOs (RINGO), trade union NGOs (TUNGO), women and gender constituency (WGC), youth NGOs (YOUNGO). In addition, faith-based organisations (FBOs), education and capacity building and outreach NGOs (ECONGO) and parliamentarians are recognised as informal NGO groups by the Secretariat since 2016. Figure 11 shows the breakdown of admitted NGOs per constituency.

Figure 11: Breakdown of admitted NGOs per constituency



Source: (UNFCCC 2022e).

In the following, we describe the activities of the various observer organisations. We distinguish between (a) civil society, (b) local and regional governments (although they are also a 'NGO constituency' under the UNFCCC), and (c) international organisations.

4.2.1. Civil society

The current list of admitted NGOs (UNFCCC 2022a) denotes more than 1200 organisations as part of the constituency of environmental NGOs (ENGO). The most prominent voice representing environmental NGOs in the international climate negotiations is the Climate Action Network (CAN)⁴¹. It is a worldwide network of over 1800 civil society organisations in more than 130 countries, which consists of numerous regional and national networks. During the UNFCCC negotiation sessions, CAN publishes the well-known daily 'Eco' Newsletters which provide an NGO perspective on the negotiation process. Furthermore, CAN awards the daily 'Fossil of the Day' which is given to countries or stakeholders in the negotiations which it regards as obstructing progress or acting unsustainably. CAN also coordinates advocacy and communications of civil society groups at the Intergovernmental Panel on Climate Change (IPCC), the Green Climate Fund (GCF), the Group of Seven (G7) and the G20 as well as the World Bank, the International Monetary Fund meetings and other diplomatic fora. CAN is organised in regional and national nodes as well as in thematic working groups covering the main topics of the negotiations.

The group of youth NGOs (YOUNGO) covers more than 120 admitted NGOs. They elect two focal points (one for the Global North and one for the Global South) to coordinate communication with the UNFCCC

⁴¹ Climate Action Network, <https://climatenetwork.org/>

Secretariat. In the days preceding COPs, the youth NGOs organise conferences of the youth (COY) as a forum for exchange and establishing common strategies. During UNFCCC sessions, YOUNGO provides a space, called Spokes Council where youth can learn about the process, network with other youth and collaborate⁴².

More than 80 indigenous peoples' NGOs are included in the constituency of indigenous peoples' organisations. Through the International Indigenous Peoples Forum on Climate Change,⁴³ they elaborate common strategies for the UNFCCC process. The Local Communities and Indigenous Peoples Platform (LCIPP, cf. chapter 3.8.5) has been established under the UNFCCC framework as a basis for strengthening the knowledge, technologies, practices and efforts of local communities and indigenous peoples related to addressing and responding to climate change, to facilitate the exchange of experience and sharing of best practices and lessons learned on mitigation and adaptation and to enhance the engagement of local communities and indigenous peoples in the UNFCCC.

More than 50 NGOs are listed as part of the constituency of women and gender NGOs. The constituency is a platform for exchange of NGOs working on gender issues in the context of climate change and to promote the rights of women as they are particularly affected by the adverse impacts of climate change. A Gender Action Plan seeking to advance women's full, equal and meaningful participation and to promote gender-responsive climate policy and the mainstreaming of a gender perspective in the implementation of the Convention was adopted by the COP in 2017, was enhanced in 2019 and is currently being reviewed again as an outcome of COP26 (cf. chapter 3.8.6).

Research and independent NGOs (RINGO) comprise organisations engaged in independent research and analysis in order to develop sound strategies to address the causes and consequences of global climate change. More than 720 organisations belong to the RINGO constituency under the UNFCCC. RINGO representatives play an active part in climate change conferences, e.g. by organising side events to address a wide range of topics, and are considered strong in providing ideas and expertise, evaluating consequences, and proposing solutions (Nasiritousi et al. 2016).

Activities by the more than 350 business and industry NGOs under the BINGO constituency are coordinated by the International Chamber of Commerce (ICC) which undertakes efforts to help businesses take climate action. In 2019, the Chambers Climate Coalition was launched, providing a platform for chambers to demonstrate their commitment to an effective global response to climate change⁴⁴.

⁴² YOUNGO, <http://www.youngo.uno/>.

⁴³ Indigenous Peoples Forum on Climate Change, <http://www.iipfcc.org/>.

⁴⁴ Chambers Climate Coalition, <https://www.chambers4climate.iccwbo.org/>.

Box 2: Industry organisations and initiatives

The cover decision of COP26, the Glasgow Climate Pact (UNFCCC 2021a) recognizes the importance of non-state actors for enhancing the ambition. With the need to step up efforts on mitigation, there is an increasing need for transformative change in many industrial sectors. The commitments from a critical mass of actors in each sector is required for the consistent transformation of sectors towards a zero-emission pathway and increased resilience. The concept of this critical mass of front running actors to promote the change at the required scope and pace is behind the '2030 Breakthroughs', a campaign under the UNFCCC to rally leadership and support from businesses, cities, regions and investors to help achieve the goals of the Paris Agreement (UNFCCC 2022a).

The transition of the industry sector to zero-emission plays an important role with the industry sector accounting for process emissions as well as 23% of all energy related emissions (IEA 2022a). In fast developing countries, such as India, the industry sector is a major driver for growing emissions (IEA 2021).

Several state and non-state actor initiatives are now addressing the role of the industry sector for transforming zero emissions pathways. Important initiatives include:

- Industrial Deep Decarbonisation Initiative (IDDI) (www.unido.org/IDDI). The IDDI targets low emission production and product standards for Green Public Procurement. The IDDI is coordinated through the Clean Energy Ministerial with UNIDO as secretariat and UK, Canada, Germany and India as initial members.
- The First Mover Coalition (<https://www.weforum.org/first-movers-coalition>) under the leadership of the US promotes industrial low emission technologies with a focus on aluminium, aviation, chemicals, concrete, shipping, steel, trucking and innovative carbon removal technologies. India, Denmark, Italy, Japan, Norway, Singapore, Sweden and the United Kingdom have joined the US as government partners to create early markets for clean technologies.
- Mission Possible Partnerships is an alliance of mostly private actors focused on decarbonisation of the concrete/cement, aluminium, chemicals, steel, aviation, shipping and trucking sectors industries (<https://missionpossiblepartnership.org>).
- LeadIT which was established at the United Nations Climate Action Summit in 2019. This group aims to foster public-private collaboration supported by technical expertise sharing to accelerate the decarbonisation of industry (<https://www.industrytransition.org>).

The convergence on zero or low-carbon emission industrial standards is increasingly becoming an important imperative in the context of free trade with the emergence of the 'climate club' concept as a group of countries promoting an ambitious level playing field and low carbon emission standards (G7 2022).

The International Trade Union Confederation (ITUC) as the umbrella organisation for trade unions, lists climate justice and industrial transformation as one of its central priorities. Its aim is to implement global climate action 'on the basis of just transition principles and plans: national and

industry/enterprise plans that protect and create new jobs by investing in the necessary industrial transformation⁴⁵. 16 NGOs are listed as part of the trade unions' constituency under the UNFCCC.

The farmers' constituency comprises more than 30 NGOs. In 2017, COP23 initiated the Koronivia Joint Work on Agriculture (KJWA) which requests the SBSTA and SBI to jointly address issues related to agriculture (cf. chapter 3.8.1). In the view of the Food and Agriculture Organization (FAO), this work is an 'important step forward in the negotiations on agriculture with the UNFCCC and emphasises the importance of agriculture and food security in the climate change agenda. By mainstreaming agriculture into the UNFCCC process, the KJWA can drive transformation in the agricultural sector and address synergies and trade-offs between adaptation, mitigation and agricultural productivity' (FAO 2019). The farmers' constituency as well as a number of individual NGOs with a stake in agriculture have regularly expressed their views in submissions on topics discussed under the KJWA.

4.2.2. Local and regional governments

The constituency of local government and municipal authorities (LGMA) is coordinated by 'ICLEI – Local Governments for Sustainability'. ICLEI (International Council for Local Environmental Initiatives) is a global network of more than 2,500 local and regional governments committed to sustainable urban development, active in more than 125 countries.⁴⁶ In the UNFCCC negotiations, ICLEI aims to ensure that the needs, interests and priorities of local and regional governments are represented and taken up in official decisions. At the same time, it engages in spreading information on developments at the international level and peer exchange through their networks to the local and regional level⁴⁷. ICLEI launched a Climate Neutrality Framework in 2020, aiming to accelerate climate action by local and regional governments,⁴⁸ followed by the Malmö Commitment, which outlines ICLEI's commitment and strategic vision 2021-2027 regarding the progress on sustainable urban development worldwide. Concrete actions of ICLEI local and regional governments are outlined in the Malmö Action Plan 2021–2024 (ICLEI 2021).

Another important initiative from cities is the Global Covenant of Mayors for Climate and Energy (GCoM). It is the largest alliance for city climate leadership and covers over 11,500 cities and local governments from 142 countries, representing more than 1 billion people. With a secretariat based in Brussels, GCoM has also established regional/national covenants, which serve as local chapters of the global alliance. The three main initiatives of the GCoM are: 1) data4cities initiative – an initiative to collect data on cities' climate action and implement common ways of reporting among cities; 2) invest4cities initiative: a platform to facilitate and mobilise cities' access to climate finance and technical assistance for critical investment in urban climate change mitigation and resilience projects, and 3) innovate4cities initiative: a research and innovation initiative to identify specific data, information and technology priorities and drive investment in these areas⁴⁹. The GCoM brings together the EU's Covenant of Mayors⁵⁰ and the former Compact of Mayors.

The world's megacities have joined forces in the network C40, connecting 97 of the world's largest cities to take bold climate action and representing more than 700 million citizens⁵¹. Through networks

⁴⁵ International Trade Union Confederation – Climate justice and industrial transformation <https://www.ituc-csi.org/dimate-justice-and-industrial?lang=en>.

⁴⁶ ICLEI – Local Governments for Sustainability, <https://iclei.org/>.

⁴⁷ ICLEI – Our approach, https://iclei.org/en/our_approach.html.

⁴⁸ The ICLEI Climate Neutrality Framework, https://iclei.org/en/climate_neutrality.html.

⁴⁹ Global Covenant of Mayors – Our initiatives, <https://www.globalcovenantofmayors.org/our-initiatives-new/>.

⁵⁰ Covenant of Mayors, <https://www.covenantofmayors.eu/>.

⁵¹ About C40, <https://www.c40.org/about>.

on central climate-related topics, city practitioners exchange experiences about successes and challenges of implementing climate action. The Cities and Climate Change Initiative by UN-Habitat supports and connects cities in emerging and developing countries to share experiences on addressing climate change⁵².

Additionally, local and regional actors have launched sub-national initiatives on climate change such as initiatives of US state governments that join forces in the US Climate Alliance founded in 2017. Under this alliance, which represents 54% of the US population, states pursue common initiatives aimed at collaborating in combating climate change through, for example, enhancing carbon sinks, reducing hydrofluorocarbons, energy efficiency standards and international cooperation, including with Mexico and Canada⁵³.

4.2.3. International organisations

The UNFCCC provides that representatives of the United Nations system may be represented as observers at the negotiations (UNFCCC 1992).

The IPCC is one of these UN organisations and as a scientific body plays a prominent role in the UNFCCC negotiations. It assesses the scientific, technical and socio-economic information relevant for understanding the risk of human-induced climate change. The IPCC's work covers physical scientific aspects of the climate system and climate change, the vulnerability of socio-economic and natural systems to climate change as well as options for mitigating climate change. It produces general assessment reports (every five to seven years) as well as special reports and technical papers on specific issues, often upon the request of the COP or the SBSTA, which then find entrance into COP decisions.

The IPCC is currently in its sixth assessment cycle, in which it is producing the Sixth Assessment Report (AR6) comprising contributions from each of the three Working Groups on the physical science basis; impacts, adaptation and vulnerability; and mitigation of climate change as well as synthesis report on climate change. It summarises the state of scientific knowledge on the drivers of climate change, its impact and how mitigation and adaptation can reduce the risks related to climate change. Section 24 provides more information on the AR6.

AR6 has been a major input to the global stocktake process under the UNFCCC. The AR6 Synthesis Report is scheduled to be launched in late 2022 or early 2023 to inform the 2023 global stocktake. Moreover, the IPCC has developed guidelines for national greenhouse gas inventories which are used by all Parties to prepare national reports on their greenhouse gas emissions (IPCC 2006; 2019a).

4.2.4. UN bodies and inter-governmental organisations

The International Civil Aviation Organisation (ICAO) and the International Maritime Organisation (IMO) are two other UN organisations with close links to the UNFCCC negotiations. Apart from making submissions to the UNFCCC process, they report under SBSTA on their activities (see section 3.8.7) and ICAO's CORSIA scheme for emissions offsetting plays a role in the negotiations on cooperative approaches under Article 6 (see section 3.2).

In addition, intergovernmental organisations (IGOs) outside the UN system may be admitted by the COP as observers to the UNFCCC. 145 IGOs have observer status, including a great variety of organisations, e.g. the Secretariat of the Pacific Community, the Permanent Secretariat of the Alpine

⁵² UN Habitat Cities and Climate Change Initiative, <https://unhabitat.org/programme/cities-and-climate-change-initiative>.

⁵³ United States Climate Alliance, <https://www.usclimatealliance.org/>.

Convention, the Islamic or the European Investment Bank or the Gas Exporting Countries Forum (UNFCCC 2022a).

Like other observer organisations, representatives from international organisations may participate in sessions open to observers, make submissions, make statements at high-level segment sessions, organise side events and present their work in the exhibition area.

5. CLIMATE POLICIES OF MAIN PARTIES

To achieve the goals of the Paris Agreement, it is crucial that Parties not only make pledges for climate action at international level but also put in place robust domestic policies and measures, to ensure that they fulfil their pledges. Large economies are of particular importance because they account for the majority of global GHG emissions. The members of the Group of 20 (G20) accounted for almost 80% of global GHG emissions in 2019 (Gütschow et al. 2021).

In this chapter, the climate policies of each G20 member are summarised. The policies of the G20 members Germany, France and Italy are not presented separately. Instead, the climate policies of the European Union are presented, which are implemented at the level of the EU and its Member States, including Germany, France and Italy.

Each G20 member recently communicated a new NDC or updated its current NDC under the Paris Agreement, and many members also communicated long-term strategies. The EU communicated the NDC and its long-term strategy for all its Member States and thus covers Germany, France and Italy. Table 3 provides an overview of the NDCs communicated by the G20 members.

Table 3: NDCs communicated by G20 members by the end of September 2022

Member	NDC submitted	Date	Increased mitigation ambition	Type of mitigation target(s)
Argentina	Updated 2 nd NDC	2/11/2022	Yes	Economy-wide emissions cap
Australia	Updated NDC	16/6/2022	Yes	Economy-wide emissions reduction target
Brazil	Updated NDC	7/4/2022	No	Economy-wide emissions reduction target Note: The baseline is higher than in the first NDC
Canada	Updated NDC	12/7/2021	Yes	Economy-wide emissions reduction target
China	Updated NDC	28/10/2021	Yes	CO ₂ emissions peaking target; economy-wide CO ₂ emissions intensity target; specific targets for non-fossil energy share, forest stock volume and installed wind and solar power capacity
European Union	Updated NDC	18/12/2020	Yes	Economy-wide emissions reduction target
India	Updated NDC	26/8/2022	Yes	Emissions intensity target; target for the installed capacity of non-fossil fuel based power generation; increase of carbon sink
Indonesia	Updated NDC	22/7/2021	No	Economy-wide emissions target compared to a business-as-usual scenario Note: Targets unchanged from first NDC
Japan	Updated NDC	22/10/2021	Yes	Economy-wide emissions reduction target

Member	NDC submitted	Date	Increased mitigation ambition	Type of mitigation target(s)
Mexico	Updated NDC	30/12/2020	No	Economy-wide emissions target compared to a business-as-usual scenario Note: The baseline is higher than in the first NDC
Republic of Korea	Updated NDC	23/12/2021	Yes	Economy-wide emissions reduction target
Russian Federation	First NDC	25/11/2020	No	Economy-wide emissions reduction target Note: Target within the range already provided in the intended NDC
Saudi Arabia	Updated NDC	23/10/2021	Yes	Emissions target compared to a business-as-usual; target for the renewable energy share Note: The business-as-usual scenario is not specified
South Africa	Updated NDC	27/9/2021	Yes	Economy-wide emissions reduction target
Turkey	First NDC	11/10/2021	No	Emissions target compared to a business-as-usual scenario Note: Targets unchanged from intended NDC
United Kingdom	Updated NDC	12/12/2020	Yes	Economy-wide emissions reduction target
United States	First NDC	22/4/2021	Yes	Economy-wide emissions reduction target

Source: NDC registry, <https://unfccc.int/NDCREG>; Climatewatch, <https://www.climatewatchdata.org/2020-ndc-tracker>

Note: The Russian Federation, Turkey and the United States joined the Paris Agreement only recently. Their current NDCs are technically 'first NDCs'. Here their mitigation ambition is compared to the ambition of the intended NDCs submitted in 2015.

It can be seen in Table 3 that several G20 members did not increase their mitigation ambition in their most recent NDC. More information on each G20 member's NDC is provided under the respective country section further below in this chapter.

Table 4 list the long-term strategies communicated by the G20 members under the Paris Agreement.

Table 4: Long-term strategies communicated by G20 members by the end of September 2022

Member	Date	Climate neutrality goal	Description of goal
Argentina	No long-term strategy communicated under the Paris Agreement		
Australia	10/11/2021	Yes	Net-zero emissions by 2050
Brazil	No long-term strategy communicated under the Paris Agreement		
Canada	17/11/2016	No	80% emissions reduction by 2050 compared to 2005
China	28/10/2021	(Yes)	Carbon neutrality before 2060 (not all GHGs covered)
European Union	6/3/2020	Yes	Climate neutrality by 2050
India	No long-term strategy communicated under the Paris Agreement		
Indonesia	22/7/2021	No	Emissions of 540 Mt CO ₂ eq by 2050
Japan	29/10/2021	Yes	Carbon neutrality by 2050, reducing GHGs to net-zero
Mexico	16/11/2016	No	50% emissions reduction by 2050 compared to 2000
Republic of Korea	30/12/2020	(Yes)	Carbon neutrality by 2050 (not all GHGs covered)
Russian Federation	5/9/2022	Yes	Balance of emissions and removals no later than 2060
Saudi Arabia	No long-term strategy communicated under the Paris Agreement		
South Africa	23/9/2020	No	Emissions of 212 to 428 Mt CO ₂ eq by 2050
Turkey	No long-term strategy communicated under the Paris Agreement		
United Kingdom	19/10/2021	Yes	Net-zero emissions by 2050
United States	1/11/2021	Yes	Net-zero emissions by 2050

Source: Communication of long-term strategies, <https://unfccc.int/process/the-paris-agreement/long-term-strategies>; Climatewatch, <https://www.climatewatchdata.org/its-explore>

Table 4 shows that several G20 members have not yet communicated long-term strategies. Some of them announced long-term goals independently of a long-term strategy submission under the Paris Agreement. Such announcements are addressed in the respective country sections below.

In this chapter, the G20 members presented in alphabetical order. Egypt, which plays an important role due to the presidency of COP27, is also included, although it is not a G20 member.

5.1. Argentina

In Argentina's economy, agriculture plays a key role. Within the UNFCCC negotiations, Argentina, along with Uruguay, Brazil and most recently Paraguay, insists upon the relevance of agriculture for global

food security and that measures need to be taken in that regard to adjust to the pursuit of the Paris Agreement goals (Mecopress 2021). The extent to which fossil fuel reserves such as the recent discovery of recoverable hydrocarbons in the Vaca Muerta formation (Lallana et al. 2021) continue to be exploited in Argentina is politically sensitive with environmental groups highlighting the incompatibility of such energy policies in favour of fossil fuels with the achievement of the country's efforts to reduce GHG emissions.

Total net emissions for the year 2018 were estimated in the most recent national inventory report by Argentina to be 366 MtCO₂e. The majority of the emissions originate from the energy sector (51%) followed by the AFOLU sector (39%) with the remaining net emissions from industry (6%) and waste (4%) (Argentina 2022).

Argentina has pledged to limit total net GHG emissions to 349 MtCO₂e by 2030 and to present a long-term low-emission development strategy with the aim of achieving climate neutrality by 2050. Given that over half of the total net emissions originate from the energy sector, a transition away from fossil fuel will be necessary if domestic policies are to be aligned with the goals of the Paris Agreement and therefore several policies have been implemented in order to incentivise a more diversified supply of energy. For example, the Renewable Energy Law aims to encourage the development of renewable electricity generation. The law establishes renewable energy targets and mandates a 20% share of renewables (including hydropower plants smaller than 50 MW) in electricity consumption by the end of 2025. Argentina have also implemented a carbon tax covering most liquid fuels sold in Argentina, based on a price of 10 USD/tCO₂eq, which however decreased to 5 USD/tCO₂eq after updating in November 2019. In general the Argentinian government has been criticised for the lack of investment in renewables compared to fossil fuels. Indeed, the Argentinian national government assigned 90 times more money to fossil fuels programs than renewable energy projects in 2020 (Climate Tracker 2021).

The Argentinian agricultural sector must also play a considerable role to achieve the country's emissions reduction targets since it represents 37% of national annual GHG emissions (Argentina 2022). Argentina's export-dependent economy could face significant risks as climate-progressive countries and economic unions consider introducing stricter environmental requirements and taxation schemes for emissions-intensive trade commodities.

The Native Forests Law aims at controlling the reduction of native forest surface, aiming at achieving net-zero change in forest areas. The law sets minimum budgets to be spent on forest protection, established a capacity building scheme and requirements for provinces to comprehensively monitor and track forest areas. It also establishes the National Fund for Enriching and Conserving Native Forests that disburses funds to provinces that protect native forests. However, to date, the Native Forest Law has only been partially implemented, and only a small amount of the available budget spent (Climate Action Tracker 2022a).

The government of Argentina submitted its second NDC in December 2020, and an update to this NDC in October 2021. It sets the absolute, economy-wide and unconditional goal of limiting greenhouse gas emissions to 349 Mt CO₂eq in 2030 including LULUCF (Argentina 2021).

Argentina is currently developing a long-term low emissions development strategy towards 2030 and beyond, but the government has not yet adopted an emissions target for 2050.

5.2. Australia

Climate action has been a very contested policy area over the last few decades in Australia resulting in many reversals in key policy as governments have changed over time. The volatile nature of policy

making on this issue has been reflected by the country adopting positions within the UNFCCC negotiations that havenot always been viewed as constructive (Burck et al. 2019).

Australia's total net greenhouse gas emissions were 488 MtCO₂eq in 2020. The energy sector was the largest source of greenhouse gas emissions in 2020 comprising 85.2% (416 Mt CO₂eq) of total net emissions. Agriculture emissions made up 13.9% (68 Mt CO₂eq) of total net emissions in 2020. Industrial processes and product use made up 6.7% (33 Mt CO₂eq), and the waste sector contributed 2.4% (12 Mt CO₂eq) of total net emissions in 2020 (Australia 2022c).

In September 2022, Australia's parliament enshrined in law the government's a target of reducing GHG emissions by 43% below 2005 levels by 2030 (Climate Home News 2022a). The recently elected Labour government has promised to turn Australia into a 'renewable energy superpower' and to put an end to the 'climate wars' that have impacted a succession of governments in Australia over the last few decades. A key pledge of the new government will be to increase the share of renewable energy in the national electricity market to 82% by 2030 (Energy Tracker Asia 2022). Investments are expected in transmission and storage infrastructure to help balance the grid as the deployment of renewables increases. The newly elected government aims to introduce a strengthened safeguard mechanism that sets a carbon emissions cap on the biggest polluters (Energy Tracker Asia 2022). However, progress towards achieving net-zero carbon emissions by 2050 will be severely tested by the new administration's policy towards the use of coal. Indeed, during the recent election campaign, the Labour party avoided promising a phase out of the use of fossil fuels or coal mining in the near future and several party members even suggested that the country would keep mining coal as long as there was market demand (Energy Tracker Asia 2022).

Australia submitted a stronger NDC target to the UNFCCC in June 2022 (Australia 2022b). The new target is a 43% reduction of greenhouse gas emissions by 2030 below 2005 levels, including LULUCF. Analysis of the effect of the NDC on likely fossil fuel and industrial GHG emissions is made difficult by the fact that the NDC target includes LULUCF emissions, which have been substantial in the past and fluctuate significantly. The Climate Action Tracker rates Australia's NDC target as 'almost sufficient' when compared to the level of reductions needed within its borders.

Australia submitted a long-term strategy on 29 October 2021. The long-term strategy sets the goal of achieving carbon neutrality by 2050 (Australia 2022a). Australia included the target to achieve net zero by 2050 in its updated NDCs in October 2021 and June 2022.

5.3. Brazil

Although Brazil engaged on international emission reduction initiatives and pledges at COP26, domestic climate action saw major setbacks during the Bolsonaro government. General elections are scheduled for October 2022, and it will be critical for the incoming government to revisit national climate policies, most urgently addressing the progressing deforestation and carbon intense agriculture policies.

Brazil – Latin America's largest economy – is the seventh largest emitter of greenhouse gases worldwide (Gütschow et al. 2021), with total emissions of 1 452 Mt CO₂eq⁵⁴ in 2019. The AFOLU sector is Brazil's primary emitting sector, representing approx. 62% of total net emissions. The energy sector is the second largest emitting sector, with 31%. Taking the cumulative amount of carbon dioxide emitted since the start of the industrial revolution (including carbon emissions from land use and

⁵⁴ Climatewatch Data Explorer, <https://www.climatewatchdata.org/data-explorer/>.

forestry) into account, Brazil appears in fourth place in the ranking of most significant contributors to cumulative CO₂ emissions from 1850 to 2021.⁵⁵

According to the NGO network 'Systema de Estimativa de Emissões de Gases de Efeito Estufa', Brazil's greenhouse gas emissions increased by 9.5% in 2020 and hit their highest level since 2009⁵⁶. Since 2001, Brazil has lost approx. 12% of its total tree cover, of which 46% were primary forests. Commodity-driven related deforestation accounted for two-thirds of the deforestation and increased during the most recent years. The increase in deforestation activities is a result of the policies encouraging agriculture and mining activities, particularly in the Cerrado savannas and Amazonas regions (Agência Brasil 2021). The IPCC listed the Amazon forest dieback as a significant global tipping point, with the likelihood of its occurrence highly dependent on human related deforestation. If current deforestation trends continue, the Amazon rainforest could turn into a net emitter with a massive loss of biodiversity (Lenton et al. 2019).

The agriculture sector is the second largest source of emissions with 504 Mt CO₂eq (2019), where over 90% of the emissions are related to cattle ranching, i.e. methane emissions resulting from cattle digestion, cattle-related manure used as fertilizer and the use of synthetic fertilizers. The energy sector has 451 Mt CO₂eq (2019) emissions. Key energy subsectors with their shares are transport (47%), industry power consumption (14%), fuel production (14%), electricity generation (12%) and buildings (8%) (Brazilian Climate Observatory 2021). Brazil produces 85% of its electricity from renewable energy sources with hydropower contributing 64%, followed by wind and solar. Brazil's electricity mix is one of the least carbon-intensive in the world (Agência Brasil 2022). Brazil targets expanding its non-hydropower renewable share from wind, solar and biomass to 28-33% by 2030 (EPE 2016). At COP26, Brazil attempted to show a change in attitude towards combating climate change and committed to the Global Methane Pledge (GMP) and the Glasgow Leaders' Declaration on Forests and Land Use (GLDFLU). The GMP targets methane emissions reductions of 30% from 2020 to 2030, and the GLDFLU signatories commit to halt and reverse forest loss and land degradation by 2030. Brazil announced halting illegal deforestation by 2028, restoring and reforesting 18 Mha and recovering 30 Mha of degraded pastureland by 2030⁵⁷.

Brazil's updated NDC of March 2022 (Brazil 2022) contains GHG emission reductions of 37% in 2025 and by 50% in 2030 compared to 2005, with the long-term objective of reaching climate neutrality in 2050. The updated NDC is based on a 2005 baseline level which has been revised upwards, effectively allowing up to 81 MtCO₂eq higher emissions in 2030 than Brazil's first submitted NDC. This lowering of ambitions contradicts the ratcheting up mechanism agreed under the Paris Agreement. Also, the updated NDC does not incorporate Brazil's commitments on ending deforestation, recovery of degraded pastures and reducing methane emissions as per the GMP (Unterstell and Martins 2022). So far Brazil has not implemented robust domestic measures and policies backing up its NDC commitments. Overall, Brazil's updated NDC, its actions and policies are not in line with the goals of the Paris Agreement.

5.4. Canada

Canada has at times had a strained relationship with the UNFCCC process and even officially withdrew from the Kyoto Protocol after experiencing difficulties with complying with its obligations. The country is however signed up to the Paris Agreement and has set more ambitious targets for 2030 and beyond.

⁵⁵ Carbon Brief (2021), Which countries are historically responsible for climate change, <https://www.carbonbrief.org/analysis-which-countries-are-historically-responsible-for-climate-change/>.

⁵⁶ Brazil gross GHG emissions according to SEEG, NGO GHG Reporting Coalition https://plataforma.seeg.eco.br/total_emission.

⁵⁷ Tracking Latin America's Progress on Climate Action, <https://www.wri.org/insights/tracking-progress-climate-latin-america>.

Based on the country's previous track record, there are doubts amongst critics about whether these new commitments will be achieved. Indeed, at the heart of this uncertainty lie future decisions on the further exploitation of the oil sands that would offset a lot of the more positive environmental action undertaken by Canada in recent years.

In 2020, GHG emissions (excluding LULUCF) were 672 Mt CO₂ eq. Carbon dioxide accounted for 535 Mt (80% of total emissions). Methane emissions in 2020 amounted for 92 Mt or 14%, and nitrous oxide emissions accounted for 33 Mt (4.9%) of Canada's total emissions. The energy sector accounted for 540 Mt, or 80%, of total GHG emissions (Canada 2022).

The Pan-Canadian Framework on Clean Growth and Climate is an overarching strategy for reducing emissions, which was published by the Canadian government in December 2016. The strategy set a 2030 target of a 30 % GHG emission reduction below 2005 levels and led to the introduction of national carbon pricing and a coal phaseout as well as plans for clean fuel standards covering all fossil fuels, the implementation of efficiency measures for both buildings and transportation and regulations to reduce methane emissions from the oil and gas sector⁵⁸. However, the Climate Action Tracker reports that the country continues to expand its pipeline capacity for fossil fuels despite the fact that modelling from their own energy regulator shows that the additional capacity exceeds available supply (Climate Action Tracker 2022b).

In July 2021, Canada submitted its updated NDC, where it increased its emission reduction target from a 30 % reduction below 2005 levels by 2030 to at least 40-45 %. The Climate Action Tracker assess the ambition of this NDC to be 'almost sufficient' (Climate Action Tracker 2022b).

Canada submitted a long-term strategy on 17 November 2016 (Canada 2016). Canada subsequently passed the Canadian Net-Zero Emissions Accountability Act in June 2021. This act enshrines its 2050 net zero target into law and also requires the setting of intermediary targets at five-year intervals (2030, 2035, 2040, 2045) at least a decade in advance of each target, and the requirement to develop emissions reduction plans for these targets (Climate Action Tracker 2022b).

5.5. China

China is currently the largest annual emitter of CO₂ emissions; nevertheless the country has been a forceful advocate for the principle of 'common but differentiated responsibilities' in the UNFCCC negotiations (refer to Article 3.1 of the Convention) noting that several other Parties have significantly higher cumulative emissions since the start of the industrial revolution and this greater level of responsibility for the climate emergency should be reflected by greater obligations.

According to the most recent greenhouse gas inventory submitted by China under the UNFCCC, total national emissions excluding LULUCF amounted to approx. 12.3 Gt CO₂eq in 2014 (China 2019). Methane emissions amounted to 1,125 Mt CO₂eq and nitrous oxide emissions to 610 Mt CO₂eq. Emissions of fluorinated gases in 2014 amounted to 214 Mt CO₂eq for HFCs, 16 Mt CO₂eq for PFCs and 61 Mt CO₂eq for SF₆. Energy and industrial processes accounted for 78% and 14 % respectively of the overall total emissions in 2014 (without LULUCF) (China 2019).

Over the 14th Five-year Plan period between 2021 and 2025, China intends to 'strictly control coal consumption' and will be more ambitious in the 15th Five-year Plan between 2026 and 2030 when the country 'will phase down coal consumption'. With regards to the deployment of renewables in the country, the 14th Five-year Plan pledges that 39 % of electricity will be generated from renewable

⁵⁸ The Carbon Brief Profile: Canada, <https://www.carbonbrief.org/the-carbon-brief-profile-canada/>.

resources in 2025 (Climate Action Tracker 2022c). It is envisaged that China's national ETS, which started operation in 2021 for the power sector, will be an important policy measure to achieve China's targets to peak emissions by 2030 and furthermore achieve carbon neutrality by 2060⁵⁹. However, China's annual output of coal reached its highest ever level in 2021 and the country plans to add an additional 30 GW of coal in 2022 (Climate Action Tracker 2022c).

China's updated NDC, which was submitted on 28 October 2021, contains the following five targets:

- peaking CO₂ emissions before 2030 and achieve carbon neutrality before 2060;
- lower carbon intensity by over 65 % in 2030 from the 2005 level;
- share of non-fossil fuels in primary energy consumption to around 25 % in 2030;
- increase forest stock volume by 6 billion cubic meters in 2030 from the 2005 level; and
- increase the installed capacity of wind and solar power to over 1,200 GW by 2030.

An assessment of the country's policies by the Climate Action Tracker shows that China is expected to achieve the new NDC targets without a substantial increase in implementing mitigation policy and therefore they still deem China's rating (Climate Action Tracker 2022c) for its NDC targets as 'Highly Insufficient' (Climate Action Tracker 2022c).

China submitted a long-term strategy on 28 of October 2021 (China 2021). The long-term strategy sets the goal of achieving carbon neutrality by 2060.

5.6. Egypt (COP Presidency)

Egypt is not a member of the G20. Its total greenhouse gas emissions are lower than those of each G20 member (Gütschow et al. 2021). However, Egypt is included in this chapter because it plays a key role at COP27 as its host and presidency.

Egypt is the first African country to host a COP since 2016, when Morocco hosted COP22 in Marrakesh. Egypt is highly vulnerable to the impacts of climate change particularly due to water scarcity in the Nile delta and a resulting decreasing crop productivity (Global Alliance for the Future of Food 2022; Government of Egypt 2022). Additionally, Egypt imported more than 60% of wheat consumed from abroad with high shares coming from the Russian Federation and Ukraine so that the country is hit hard by the current import disruptions resulting from the Russian Federation's invasion of Ukraine (IFPRI 2022).

It has been a political priority to expand the country's natural gas production, resulting in Egypt's current position as the second-largest producer of natural gas in Africa. The key role of gas has also shaped its climate policy. For example, Egypt's national Climate Change Strategy envisages the use of compressed natural gas for vehicles, the expansion of its domestic natural gas network and using gas in the shipping sector (Elgendy 2022). Over the past years, Egypt has emphasised adaptation and the need for financial support from developing countries in international climate debates (Koumassi et al. 2022).

The COP presidency has attracted international attention to Egypt's climate policy and is likely to have spurred recent national policy developments to tackle climate change. Ahead of the conference, Egypt has signed several agreements related to renewable energy (Prengaman 2022). Egypt has also submitted an updated NDC to the UNFCCC in June 2022. The updated NDC includes additional mitigation and adaptation actions and establishes quantified emission targets compared to BAU for

⁵⁹ China national ETS, <https://icap.carbonaction.com/en/ets/china-national-ets/>.

three sectors (electricity, oil and gas as well as transport, representing about 43% of total emissions in 2015) by 2030. It does not set an overall mitigation target though (Government of Egypt 2022).

Currently, Egypt's climate change policy consists of various sectoral legislation. The 2030 low emissions development strategy adopted in 2019 outlines Egypt's main mitigation policies. Renewable energy targets are set in Egypt's Integrated Sustainable Energy Strategy to 2035 (ISES 2035). In May 2022, the 2050 National Climate Change Strategy was published. This strategy does not set an overall emission reduction goal or a net zero target either though (Climate Action Tracker 2022d). The National Council for Climate Change (NCCC) is an inter-ministerial committee and constitutes the central entity responsible for coordinating climate change policy development and implementation (Koumassi et al. 2022).

The Egyptian Foreign Affairs Minister Sameh Shoukry, who will also preside the conference, has stated that the main focus of COP27 is to "raise ambition" and prevent "backsliding or backtracking on commitments and pledges" (El Wardany et al. 2022). On the conference website, the Egyptian presidency also emphasises the COP's focus on implementation.⁶⁰ At the same time, Egypt has repeatedly emphasised climate finance and adaptation as the main priorities for COP27, putting less emphasis on enhancing mitigation (Elgendy 2022; AI Monitor 2021).

In the context of COP27, the Egyptian Presidency is launching flagship initiatives, including its Food and Agriculture For Sustainable Transformation Initiative, presented at SB56 in 2022. This initiative aims to increase climate finance to agriculture and food systems with the view to enhancing climate action.⁶¹

Human Rights Watch pointed to human rights violations by Egypt in the past related to curtailing the right to free speech and peaceful assembly and warned that the country might use its role as COP27 host to mask its poor record on human rights (AI Monitor 2021).

5.7. European Union

The European Union is a Party to the UNFCCC and the Paris Agreement, and so are its Member States. The NDC communicated by the EU covers all Member States, and its target has to be achieved by all Member States collectively. Legislation has been put in place to help achieve the EU target; Member States implement this legislation and as well as additional, national policies. After the withdrawal of the UK in 2020, the EU consists of 27 Member States.

Total GHG emissions (excluding LULUCF) of the 27 EU Member States amounted to approx. 3.3 Gt CO₂eq in 2020. The energy sector is the most important emission source (75% of total emissions), followed by the agriculture and 'industrial processes and product use' sectors (12% and 10%, respectively). The LULUCF sector constitutes a net sink of approx. 220 Mt CO₂eq. Total GHG emissions (excluding LULUCF) of the 27 EU Member States were 32% lower in 2020 compared to 1990. However, the reduced economic activity caused by the COVID-19 pandemic in 2020 played an important role; GHG emissions decreased by approx. 8.5% between 2019 and 2020 alone (EEA 2022).

In December 2020, the EU communicated an updated NDC, which included an increase of its 2030 GHG emissions reduction target from -40% to -55%, compared to 1990. At EU level, this NDC is translated into legislation under the '2030 Climate and Energy Framework'. Following the NDC update, several cross-cutting policies are currently in the process of being adjusted to align with the NDC's higher level of ambition.

⁶⁰ COP27 Sharm El-Sheik, Egypt 2022, <https://cop27.eg/>.

⁶¹ City talk, <https://talkofthecities.iclei.org/sustainable-food-systems-to-have-strong-presence-at-cop27-in-egypt/>.

- The ETS Directive is currently under revision, to ensure that the EU ETS can contribute substantially to the more ambitious 2030 target. The proposal by the European Commission⁶², which forms the basis for the negotiations between the European Parliament and Council, foresees a steeper emissions reduction by 2030 (i.e. increasing from 43% to a 61% reduction below 2005 levels), a further strengthening of the market stability reserve, reduction of free allocation, and the inclusion of emissions from shipping in the EU ETS.
- For the period up to 2030, the Effort Sharing Regulation was adopted in 2018. It specified that sectors of the economy not covered by the EU ETS must reduce emissions by 30% by 2030 compared to 2005 as their contribution to the overall target. The regulation continued to recognise the different capacities of Member States to take action by differentiating targets according to GDP per capita across Member States. The Effort Sharing Regulation is also under revision currently. The emissions reduction target for 2030 compared to 2005 is proposed to increase to 40%⁶³.

To achieve the ambitious targets set, the European Commission proposed the following additional legislation:

- Proposal for an amendment of the Energy Efficiency Directive⁶⁴, which includes a higher target for reducing primary (39%) and final (36%) energy consumption by 2030, up from the current target of 32.5% (for both primary and final consumption).
- Proposal for an amendment to the Renewable Energy Directive⁶⁵, which states that Member States shall collectively ensure that the share of energy from renewable sources in the Union's gross final consumption of energy in 2030 is at least 40%;
- Proposal for a Directive on the taxation of energy products and electricity⁶⁶, which includes a revision so that fossil fuels used as fuel for intra-EU air transport, maritime transport and fishing should no longer be fully exempt from energy taxation in the EU.

In December 2021, additional proposals were put forward which included a number of legislative and policy proposals focusing on gas and hydrogen⁶⁷, methane emissions⁶⁸ and buildings⁶⁹ to enable the EU to meet its new 2030 target.

In light of the invasion of Ukraine by the Russian Federation, it has been necessary for the EU to even more rapidly switch to renewable energy sources and increase energy efficiency than was originally envisaged, due to the disruption to global energy markets. In May 2022 the European Commission

⁶² Proposal for a Directive amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union, COM(2021)551 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0551>.

⁶³ Proposal for a Regulation amending Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement, COM(2021) 555 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0555>.

⁶⁴ Proposal for a Directive on energy efficiency (recast), COM(2021) 558 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0558>.

⁶⁵ Proposal for a Directive amending Directive (EU) 2018/2001 [...] as regards the promotion of energy from renewable sources, COM(2021) 557 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0557>.

⁶⁶ Proposal for a Council Directive restructuring the Union framework for the taxation of energy products and electricity (recast), COM(2021) 563 final, <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52021PC0563>.

⁶⁷ Proposal for a Directive on common rules for the internal markets in renewable and natural gases and in hydrogen, COM(2021) 803 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0803>.

⁶⁸ Proposal for a Regulation on methane emissions reduction in the energy sector, COM(2021) 805 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2021%3A805%3AFIN&qid=1639665806476>.

⁶⁹ Proposal for a Directive on the energy performance of buildings (recast), COM(2021) 802 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0802&qid=1641802763889>.

presented its REPowerEU Plan which proposed increasing the share of renewables in final energy consumption to 45% (EC 2022e) in 2030. It was also proposed by to increase the energy efficiency target from 9% to 13% compared to the 2020 reference scenario.⁷⁰

The EU submitted a long-term strategy in March 2020 (European Council 2020). The long-term strategy sets the goal of achieving carbon neutrality by 2050.

5.8. India

India will take over the G20 presidency from Indonesia in 2023. The updated NDC India submitted in August 2022 before COP27 can be considered a step into the right direction, but, more leadership, both internationally and domestically, will be required from an India-chairing G20 to allow the world to move towards achieving the targets under the Paris Agreement.

India's total emissions in 2019 are estimated to be 3.36 GtCO₂eq 76% of these emissions result from fossil fuel use in the energy sector, 21% from agriculture and 5% from the industrial processes sector⁷¹. The emissions in the energy sector grew at an annual average of 3.6% during the last ten years and this sector is the main contributor to India's rising emissions. The power generation subsector remains the single most significant contributor to India's emissions, with 46% of total energy GHG emissions. GHG emissions from the other energy subsectors are industry with 30%, transport with 13% and buildings at 6% (IEA 2021). Over the last 20 years, the energy demand growth resulted from industries with about 140 Mtoe (million tonnes oil equivalent), transport with 75 Mtoe and buildings with 60 Mtoe. As the Indian economy recovers, the emissions from fossil fuel use in the energy sector for 2021 rose to 2.7 Gt CO₂, which is a 4% increase compared to 2019^{72,73}. India's total power generation continues to be dominated by fossil fuels, with a 63% share. Non-nuclear renewables had a share of 23% in 2019 (Ministry of Power 2020).

India submitted its updated NDC in August 2022 (India 2022). The updated NDC constitutes a progression from the previous NDC, with increased ambition on reducing emission intensity of GDP by 2030 compared to 2005, from 30% to 45% and a share of renewable power installed capacity by 2030, reaching 50% versus 40% in the first NDC.

The updated NDC targets are in line with the announcements of India at COP26, where Prime Minister Narendra Modi committed to net zero emissions by 2070 and 2030 mitigation efforts, including 500 GW renewable energy generation capacity and emission reductions of 1 bn t CO₂eq by 2030 (IISD 2021a; Carbon Copy 2022). India's Prime Minister Modi stressed the need to match finance with ambition and urged developed countries to provide USD 1 trillion of climate finance with a tracking system tracing the payment of financial commitments (IISD 2021a). India's NDC mitigation and adaptation efforts are subject to the provision of transfer of technology and low-cost international financing, including through the GCF. According to the Notre Dame GAIN index, India is the G20 country with the highest vulnerability to climate change and among the countries with the lowest readiness to respond to climate risks⁷⁴.

⁷⁰ Energy Efficiency Targets, https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-targets_en/.

⁷¹ Climatewatch Data Explorer, <https://www.climatewatchdata.org/data-explorer/>.

⁷² Global Carbon Budget 2021, https://www.globalcarbonproject.org/global/images/carbonbudget/Infographic_Emissions2021.pdf.

⁷³ Climate Scorecard, <https://www.climatescorecard.org/2020/12/india-has-seen-greenhouse-gas-emissions-increase-by-a-staggering-335-since-1990/>.

⁷⁴ Notre Dame Global Adaptation Initiative Country Index, <https://gain.nd.edu/our-work/country-index/>.

However, the NDC might not reach the highest possible ambition as requested in Article 4 of the Paris Agreement. For example, the 2030 NDC targets are below the economic optimal 2030 energy mix, which India's Central Electricity Authority assessed in 2020 as 64% non-fossil fuel based by 2030 (Ministry of Power 2020). India's life-cycle costs for renewable energy are significantly below fossil fuels, suggesting an economic gain through a faster transition towards renewable energy. The electrification of fossil fuel based energy systems and the accelerated transition to renewable energy are essential for the peaking and declining of emissions in the most GHG emitting sectors, mainly industry, transport and buildings. However, India continues to invest strongly into its fossil fuel infrastructure, with additional investments in coal-based power generation (IEA 2021). Structural and regulatory barriers, including financial debts of power companies, net metering limits, delays and cancellation of power purchase agreements slow the growth of renewable energy investments and installations.

To lower future industry sector emissions, India set up a Green Hydrogen and Green Ammonia policy targeting 5 million tons of green hydrogen by 2030 for the oil refining, fertiliser and steel subsectors. In the transport sector, India aims at electric vehicle sales, accounting for 30% of private cars, 70% of commercial vehicles, and 80% of two and three-wheelers by the year 2030⁷⁵. In its NDC, India committed to investing in forests, creating carbon sinks equivalent to 2.5-3 bn t CO₂ (India 2022). According to the World Research Institute's Global Forest Watch platform, India had a 5% decline in tree cover in the last 20 years and it has not signed the global pledge to halt deforestation⁷⁶.

During COP26 in November 2021, India resisted efforts for a global coal phase-out under the Glasgow Climate Pact. To date, it remains unclear if India generates and receives the climate financing needed to fund the decarbonisation and implements and enforces its policies consistently throughout the country.

5.9. Indonesia

Under the presidency of Indonesia for the G20, Indonesia set the sustainable energy transition as a critical priority for itself and the G20⁷⁷. A coordinated and accelerated effort of the G20 countries on peaking and declining emissions will be very significant for reaching the climate targets under the Paris Agreement. With growing emissions from the coal sector and being the biggest global coal exporter, Indonesia's future coal policy has a significant international climate impact. A collaboration between Indonesia and donor countries for financing the energy transition under a Just Energy Transition Partnership (cf. section 5.15) can be a critical success factor⁷⁸.

Indonesia's emissions amounted to 1,9 Gt CO₂eq in 2019. The sector with the largest contribution to overall emissions is the forest sector, with net emissions of 957 Mt CO₂eq and a share of 49% of total emissions. Emissions in the forest sector grew on average by about 5% per year in the last ten years⁷⁹. Since 2001 Indonesia has lost 28.6 Mha of forest, which includes 9.95 Mha of humid primary forest. Both forest and primary forest losses have continuously declined since 2017⁸⁰. Other significant GHG emitting sectors are the energy sector with 650 Mt CO₂eq (2019) and a 33% share, agriculture (9%), the waste (7%) and the industrial processes sector (2%).

⁷⁵ Financing India's transition to electric vehicles, <https://www.ceew.in/cef/solutions-factory/publications/financing-india-transition-to-electric-vehicles>.

⁷⁶ Global Forest Watch, <https://globalforestwatch.org/dashboards/country/IND>.

⁷⁷ Indonesia's G20 Presidency, <https://g20.org/g20-presidency-of-indonesia/>.

⁷⁸ Implementation of the Just Energy Transition Partnership in South Africa, <https://www.germanwatch.org/sites/default/files/g7-g20-track-2-just-energy-africa-policy-brief-rev-1-met-1.pdf>

⁷⁹ Climatewatch Data Explorer, <https://www.climatewatchdata.org/data-explorer/>.

⁸⁰ Global Forest Watch, <https://globalforestwatch.org/>.

Indonesia submitted its first NDC in November 2016 with a target of 2030 emissions reductions of 29% below BAU and 41% reductions with international support (Indonesia 2016). Before COP26 Indonesia updated its NDC in July 2021. Indonesia left the 2030 targets for GHG emissions reductions unchanged and added a 2030 forestry sector commitment on 2 Mha peat lands restoration and rehabilitation of degraded land of 12 Mha. Climate action in Indonesia is underlined with a legal framework through the 'Decree No. 168 of 2022 on Indonesia's Forestry and Other Land Use (FoLU) Net Sink 2020 for climate change control'.

Indonesia also enhanced its ambition on a comprehensive adaptation framework, including sectoral and regional adaptation policies and measures. According to the GAIN (Global Adaptation INitiative) Index of the University of Notre Dame, Indonesia belongs to the G20 countries with the highest vulnerability to climate change and to the countries with the lowest readiness to mitigate climate risks⁸¹. Along with the updated NDC, Indonesia submitted its Long-term Strategy (LTS) in July 2021. The LTS also indicates that Indonesia will peak its national GHG emissions in 2030, with the forest and land use sectors becoming net emissions sinks as opposed to their historical role as sources and reaching economy-wide net zero emissions by 2060 or sooner (Indonesia 2021).

With its forest climate policy framework, Indonesia can turn its sectoral forestry emissions into a low carbon or carbon negative pathway⁸². However, the government of Indonesia is still pursuing a 35 GW coal power programme and Fast Track Programme adding another 7 GW coal power capacity. On the positive side, the state-owned power generation company PT Perusahaan Listrik announced that it will not build any more new coal power plants after 2023. At COP26, Indonesia voluntarily signed onto the Global Coal to Clean Power Transition Statement, pledging a coal phase-out by 2040 subject to sufficient international financing⁸³. An energy transition partnership with international donors can provide the required international financing at affordable conditions. Such international collaboration needs to be supplemented by national policies ending fossil fuel subsidies and investments of the domestic state-owned industry into the fossil fuel infrastructure. Indonesia needs to implement or strengthen the implementation of low carbon policy instruments. Essential instruments include carbon pricing, guarantees for renewable power purchase agreements, incentives for the electrification and decarbonisation of industry and transport, and green public procurement of low carbon construction projects^{84, 85}.

5.10. Japan

Japan sits within the Umbrella Group at the international climate negotiations. The ambition of the country in the UNFCCC negotiations has sometimes been criticised especially with regards to its continuation of the use of coal in electricity generation after nuclear power was scaled down following the Fukushima nuclear power plant disaster.⁸⁶

According to the most recent greenhouse gas inventory submitted by Japan under the UNFCCC, total GHG emissions (excluding LULUCF) amounted to approx. 1.2 Gt CO₂eq in 2020 (Japan 2022). The energy sector (excluding indirect CO₂) accounted for 86.5 % of total GHG emissions in 2020, followed by the IPPU sector (excluding indirect CO₂) with 8.8 % of total GHG emissions in 2020 and the

⁸¹ Notre Dame Global Adaptation Initiative Country Index, <https://gain.nd.edu/our-work/country-index/>.

⁸² IEA, Indonesia, <https://www.iea.org/countries/indonesia>.

⁸³ Global coal to clean power transition statement, <https://ukcop26.org/global-coal-to-clean-power-transition-statement/>.

⁸⁴ IRENA, <https://irena.org/events/2022/Jul/2nd-Partners-in-Energy-Transitions/>.

⁸⁵ Achieving a just energy transition in Indonesia, <https://www.iisd.org/system/files/2022-07/achieving-just-transition-indonesia.pdf>.

⁸⁶ IAEA, <https://www.iaea.org/newscenter/news/nuclear-power-10-years-after-fukushima-the-long-road-back/>.

agricultural sector with 2.8 % of total GHG emissions in 2020. Removals by the LULUCF sector were equivalent to 4.5 % of total GHG emissions in 2020 (Japan 2022).

Japan's climate policy takes place under its Act on Promotion of Global Warming Countermeasures, which commits the state, local governments and companies to develop emission reduction plans. The most recent state plan clarifies the country's NDC pathway.⁸⁷

Japan approved a new Basic Energy Plan in October 2021, which revised the 2030 electricity mix target to the following:

- 36-38% renewable electricity;
- 20-22% nuclear;
- 20% gas; and
- 19% coal.

The continuation of coal within the electricity mix is however not aligned with the level of ambition necessary to achieve the objectives of the Paris Agreement. Japan has introduced effective policies for energy efficiency in transport, industry and buildings. An amendment to the Energy Conservation Act, which is a longstanding policy implemented in Japan, was enforced in 2019 that established a new certification system that allows for an inter-business initiative to enhance systemic energy savings. An upstream environmental tax per tonne of CO₂ has been implemented in Japan since 2016. However, the tax is set at a relatively low level (Climate Action Tracker 2022g).

Japan submitted an updated NDC to the UNFCCC on 22 October 2021, which was improved to a 46 % reduction below 2013 levels by 2030. According to the Climate Action Tracker, this updated target is assessed as 'almost sufficient' when compared to modelled domestic emission pathways (Climate Action Tracker 2022g).

Japan submitted a long-term strategy on 29 October 2021. It sets the goal of achieving carbon neutrality by 2050 (Japan 2021).

5.11. Mexico

Under previous governments, Mexico has played an important role in global climate negotiations and was one of the first nations to introduce climate change legislation. Indeed, despite its status as a non-Annex I country under the UNFCCC, Mexico was one of the first countries to adopt a voluntary mitigation target in 2008 and the first developing country to submit its intended NDC in the lead up to the Paris Agreement in 2015. However, progress on climate change policies have stalled, and even gone into reverse, as the current government led by President Lopez Obrador prioritizes investment in the state-run fossil fuel sector and dismantles policies to support renewables.

According to the most recent greenhouse gas inventory submitted by Mexico under the UNFCCC, total national emissions amounted to 727 Mt CO₂eq in 2019 while net emissions amounted to 535 Mt CO₂eq (Mexico 2022). Emissions primarily come from the Energy sector (64%), followed by the Agriculture, Forestry and Other Land Use (AFOLU) sector (19%), the Industrial sector (10%), and the Waste sector (7%). The main greenhouse gas is carbon dioxide (67%), followed by methane (24%), and nitrous oxide (6%), with the rest being F-gases (HFC, PFC, NF₃, and SF₆) (Mexico 2022).

The climate policies implemented in Mexico have regressed in recent years following the prioritisation of the use of fossil fuels under the discourse of energy sovereignty and republican austerity advocated by the government of President Lopez Obrador. Several high-profile policies to support renewable

⁸⁷ The Carbon Brief Profile: Japan, <https://www.carbonbrief.org/carbon-brief-profile-japan/>.

energy have been rolled back or reformed. For example, the Mexican government cancelled the long-term electricity auctions that had encouraged an increase in renewable energy for electricity production in Mexico over three years. Furthermore, the decision of a previous government to retire the oldest fossil fuels power plants was overturned. More recently, most of the 'climate change mitigation and adaptation' budget in 2021 and 2022 was allocated to fossil gas transport infrastructure. Construction is also underway for an additional refinery and the government continues to subsidise the use of fossil fuels in the transport sector. The national policies of Mexico under the current government are at risk of locking in high carbon technologies (Climate Action Tracker 2022h).

In 2020, Mexico submitted an updated NDC which was subsequently revoked in October 2021 following a successful lawsuit from civil society that argued that the updated NDC was less ambitious than the previous NDC and therefore contrary to both the Paris Agreement and Mexican law. The updated NDC repeated the same percentage reduction as in the previous submission (i.e. unconditionally reduce 22% of emissions from BAU and reduce by 36% conditional on international support), however the updated baseline was less transparent, removed the peak year for emissions in 2026 and resulted in higher emissions (Climate Action Tracker 2022h).

Mexico submitted a long-term strategy on 16 November 2016 (Mexico 2016). The long-term strategy that was recently reinstated sets a reduction target of 50 % of national GHG emissions by 2050 below emission levels in 2000.

5.12. Republic of Korea

The Republic of Korea, like Mexico, is part of the Environmental Integrity Group (cf. section 4.1.2), which is a diverse group of countries that work together during the UNFCCC negotiations to advocate progressive climate policies and aim to bridge the gap between emerging and developed economies.⁸⁸

According to the most recent greenhouse gas inventory submitted by the Republic of Korea under the UNFCCC, CO₂ emissions (without LULUCF) amounted to 728 Mt CO₂eq in 2018 (Republic of Korea 2022). Methane emissions amounted to 28 Mt CO₂eq and nitrous oxide emissions to 14 Mt CO₂eq. Emissions of fluorinated gases in 2018 amounted to 9 Mt CO₂eq for HFCs, 3 Mt CO₂eq for PFCs and 8 Mt CO₂eq for SF₆. Energy and industrial processes accounted for 87% and 8% respectively of the overall total emissions in 2018 (without LULUCF) (Republic of Korea 2022).

The Korea Emissions Trading Scheme is one of the country's main cross-sectoral policy instruments that has been implemented since 2015. In the third trading period between 2021 and 2025, a 4% reduction in emissions is expected, along with an expansion in the coverage of national GHG emissions from 68% to 73.5%, a further increase in auction shares, and a tightening of benchmarks for coal-fired power generation (Climate Action Tracker 2022k).

The Republic of Korea still heavily relies upon fossil fuels for electricity generation (67% share in 2020) and has come under criticism for its energy policy regarding future plans for coal power.⁸⁹ Indeed, the electricity mix outlined for 2030 in the Ninth Electricity Plan still includes a 30% share from coal power and the Climate Action Tracker deem this to not be aligned with the Paris Agreement that requires a much faster phase out of coal.

Although the share of renewables in the energy sector has increased, it remains small at around 6% and is considerably lower than in the EU, Japan, and the US. The Ninth Electricity Plan envisages that the country may achieve a 21% share of electricity generation from renewables by 2030 (Climate Action

⁸⁸ The Carbon Brief Profile: South Korea, <https://www.carbonbrief.org/the-carbon-brief-profile-south-korea/>.

⁸⁹ Ibid.

Tracker 2022k) through the implementation of various policies to increase the share of new and renewable energy such as the Renewable Portfolio Standard.

According to the Climate Action Tracker, implemented policies are currently rated as 'highly insufficient' and are estimated to result in an emissions level (excluding LULUCF) of 649 to 691 Mt CO₂eq in 2030 (-3 % to 3 % relative to 2020 levels, or 106% to 120% above 1990 levels) depending on the eventual impact of the COVID-19 crisis (Climate Action Tracker 2022k).

The Republic of Korea announced a stronger NDC target in October 2021 – a 40% reduction in emissions compared to 2018 levels, including emissions reductions from LULUCF and international credits (Republic of Korea 2021). This target was submitted to the UNFCCC in December 2021.

The Republic of Korea submitted a long-term strategy on 30 August 2020 (Republic of Korea 2020). The long-term strategy involves reaching carbon neutrality by 2050 and includes the following five key elements for the green transition:

- expanding the use of clean power and hydrogen across all sectors;
- improving energy efficiency to a significant level;
- commercial deployment of carbon removal and other future technologies;
- scaling up the circular economy to improve industrial sustainability; and
- enhancing carbon sinks.

5.13. Russian Federation

The Russian economy is strongly dependent on the exploitation of energy-intensive industries and fossil fuels. The Russian Federation has been at best a passive player in the UNFCCC negotiations in previous years, however the country did announce a net zero target for 2060 as part of a wider climate framework in November 2021. The Russian Federation's war on Ukraine and its wider implications are addressed in a separate section of the report (Section 6.1).

According to the most recent greenhouse gas inventory submitted by the Russian Federation under the UNFCCC, total net GHG emissions amounted to approx. 1.5 Gt CO₂eq in 2020 (Russian Federation 2022a). Carbon dioxide emissions amounted to approx. 1 Gt CO₂eq in 2020, methane emissions to 321 Mt CO₂eq and nitrous oxide emissions to 100 Mt CO₂eq (Russian Federation 2022a).

The Russian Federation adopted a climate bill In June 2021, which was less ambitious than the legislation originally proposed as it does not enforce emission quotas or impose penalties on large GHG emitters and only requires companies to report their emissions from 2023 onwards. Beyond 2024, no targets have been set for renewable energy generation in the country and it is unlikely to meet the existing target of generating 4.5% of electricity generation from renewables (excluding hydropower). Furthermore, mandatory energy efficiency standards were abolished in 2020 for new buildings and action in the transport sector remains limited (Climate Action Tracker 2022i).

As a consequence of the economic impact of the country's decision to invade Ukraine, it is very likely that plans to decarbonise are more difficult to pursue with policy makers under pressure to reduce the stringency of environmental regulations to support domestic businesses from the sanctions applied by the West. Indeed, there have been reports recently that energy companies have been lobbying to relax GHG emission reporting and verification (Climate Home News 2022c).

The Russian Federation submitted an NDC on 25 November 2020, which includes a 2030 domestic emissions reduction target of a 30 % reduction below 1990 levels (Russian Federation 2020). Climate Action Tracker assess this target as being 'highly insufficient' when compared with modelled domestic

emissions pathways (Climate Action Tracker 2022i). Indeed, compared to the most recent BAU projections for 2030 it is unlikely that the NDC target will result in an actual cut in 2030 emissions (Climate Action Tracker 2022i).

The Russian Federation submitted a long-term strategy on 5 September 2022. The long-term strategy sets the goal of achieving carbon neutrality by 2060 (Russian Federation 2022b).

5.14. Saudi Arabia

Saudi Arabia is a key oil and gas producer and the world's largest oil exporter (IEA 2022c). The transition towards a global low-carbon economy, with decreasing demand for oil and gas, will massively affect Saudi Arabia's economy. Hence, Saudi Arabia is a very active player in the climate negotiations, pointing out the social and economic consequences of climate change mitigation measures on countries whose economies focus on fossil fuel production.

Saudi Arabia also plays a vocal role in the IPCC. As an example, the Summary for Policymakers of the Working Group III contribution to the IPCC's Sixth Assessment Report (IPCC 2022b), which was discussed and agreed by all participating governments in April 2022, contains language which is more favourable to carbon capture and storage than the IPCC's technical summary would suggest. This language was brought in by Saudi Arabia, which sees carbon capture and storage as a viable option to reduce emissions from large-scale fossil-based sources (Climate Home News 2022d).

According to the most recent greenhouse gas inventory submitted by Saudi Arabia under the UNFCCC, CO₂ emissions (without LULUCF) amount to 603 Mt CO₂eq (Saudi Arabia 2022a). Methane emissions amount to 41 Mt CO₂eq and nitrous oxide emissions to 12 Mt CO₂eq. Emissions of fluorinated gases are not reported by Saudi Arabia. Due to its dominating fossil fuel industry, fugitive emissions from fuels constitute an important source of methane emissions.

The 'Saudi Vision 2030' is the Kingdom's main development agenda, with the aim to diversify the economy and limit the reliance on fossil fuels as the main revenue source (Saudi Arabia 2022a). Under the 'Saudi Green Initiative,' Saudi Arabia pursues goals in reducing greenhouse gas emissions, planting trees and protecting land and sea areas (Saudi Arabia 2022c). This initiative was complemented by a 'Middle East Green Initiative' in 2022, which focuses on a 'circular carbon economy' and established a regional centre for carbon capture, utilization and storage (Saudi Arabia 2022a).

The 'circular carbon economy' is seen as a way of continuing the use of fossil fuels, while reducing net emissions of greenhouse gases through natural sinks and through carbon capture and storage. Besides the circular carbon economy, Saudi Arabia pursues initiatives in the areas of energy efficiency, renewable energy, and hydrogen production using renewable energy sources. It also set up the legal and institutional framework for introducing nuclear power generation (Bélaïd and Al-Sarihi 2022).

Saudi Arabia was among several Parties that communicated an updated NDC shortly before the start of the Glasgow climate change conference in October 2021. In this NDC, Saudi Arabia commits to reducing, avoiding, and removing GHG emissions amounting to 278 Mt CO₂eq by 2030 compared to a not further specified baseline (Saudi Arabia 2022d). The NDC provides general information on baselines for the period 2020 to 2030, but it does not specify the emissions level relative to which GHG emissions will be reduced. Hence, it is not possible to quantify the actual emissions level resulting from Saudi Arabia's emissions target in 2030. In addition to the emissions target, Saudi Arabia aims at reaching around 50 % of renewable energy sources in the electricity sector by 2030.

Saudi Arabia did not communicate a long-term strategy under the Paris Agreement. However, in October 2021 Crown Prince Mohammed bin Salman announced the aim to reach 'net zero' by 2060

(Saudi Arabia 2022b). Saudi Arabia did not yet specify whether CO₂ or all greenhouse gases are included in this goal, and what the role of natural sinks will be in reaching it.

5.15. South Africa

At COP26 South Africa entered into a ground-breaking Just Energy Transition Partnership with France, Germany, the UK and the US, along with the European Union. The partnership targets the mobilisation of 8.5 billion USD for its first phase of implementation to help decarbonise South Africa's energy system (EC 2021a). The partnership provides a role model on international collaboration on domestic climate action with international donor financing. The energy transition is critical for lowering GHG emissions in South Africa.

South Africa's GHG emissions reached 562 MtCO₂eq in 2019, which corresponds to a 9% increase since 2009⁹⁰. The energy sector is the largest contributor to the emission growth, with a share of over 80% of the increase. Emissions are also increasing in the waste and industrial process and waste sectors. In 2017, energy contributed 80.1%, IPPU 6.3%, AFOLU 9.5% and waste 4.1%.⁹¹ South Africa has the highest carbon intensity among G20 countries and CO₂ emissions per capita are amongst the highest in the developing world due to South Africa's strong reliance on coal for electricity generation and heavy emissions from the transport sector (South Africa 2021c). In 2017, electricity generation continued to be one of the main sources of greenhouse gas emissions in the energy sector accounting for 60.7% of energy-related emissions, followed by transport (13.3%) manufacturing industries and construction (7.0%) (South Africa 2021b).

South Africa updated its NDC in September 2021 with conditional/unconditional emission reductions of 398/510 MtCO₂eq by 2025 and 350/420 MtCO₂eq by 2030 (South Africa 2021a). Compared to the first NDC South Africa increased its ambition relative to the upper band with reductions of 17% (2025) and 32% (2030). The updated NDC includes South Africa's first adaptation communication in line with Article 7 of the Paris Agreement to help enable support for key sectors that are affected by the impacts of climate change, including human settlements, agriculture, water and energy. The NDC states the goal 'to access significantly higher levels of climate finance during the periods of implementation of the first NDC, with a view to achieving a floor of USD 8 billion per year by 2030. These resources will be equally distributed balanced between adaptation and mitigation, in line with Article 9.4 of the Paris Agreement' (South Africa 2021a).

The NDC is supported by policy instruments, including the Integrated Resource Plan, the Green Transport Strategy and a carbon tax.

The Integrated Resource Plan (Department of Mineral Resources and Energy South Africa 2019) sets the transformation of the electricity supply sector from coal to renewable energies. The plan aims to build 25 GW of new renewable capacity until 2030 and to decommission over 35 GW of coal generation capacity by 2050. 42 GW of coal power capacity are currently in operation. However, the plan also allocates an additional 1.5 GW to new coal-fired power station capacity (Ireland and Burton 2018). According to an analysis by the Climate Action Tracker (2022j) the share of renewables in total electricity generation would need to reach a minimum of 45% by 2030, 85% by 2040, and 98% by 2050 to be compatible with the Paris Agreement. Existing plans aim to reach a third of total electricity generation by renewables in 2030. Renewable energy in South Africa's power sector currently accounts for approximately 8% of the power mix (Climate Transparency 2021).

⁹⁰ Climatewatch Data Explorer, <https://www.climatewatchdata.org/data-explorer/>.

⁹¹ Ibid.

To address the significant contribution of transport to national GHG emissions, South Africa launched its Green Transport Strategy 2018-2050 (Department of Transport South Africa 2018), which sets a target of a 5% reduction of transport emissions by 2050, shifting 30% of freight transport from road to rail, and 20% of passenger transport from private cars to public transport and eco-mobility transport within seven years of implementation.

South Africa adopted a carbon tax in February 2019 covering fossil fuel combustion emissions, industrial processes and fugitive emissions such as those from coal mining.

The updated NDC is not yet aligned to ensure reaching carbon neutrality by 2050. However, South Africa commits to the vision of climate neutrality by 2050 in its Low Emissions Development Strategy (South Africa 2020) and the Presidential Climate Change Coordinating Commission⁹² is currently developing a net-zero roadmap, which will be in line with South Africa's commitments on climate mitigation and adaptation, as well with the principles of a just transition.

5.16. Turkey

Among G20 members, Turkey was the last country to ratify the Paris Agreement. Turkey's instrument of ratification was deposited with the UN Secretary General on 11 October 2021. One reason for the late ratification is Turkey's special position under the UNFCCC: In the Convention, Turkey is listed in Annex I together with developed countries and is not eligible to receive support. However, Turkey sees itself as a developing/emerging country. In fact, when the instrument of ratification was deposited, Turkey declared it 'will implement the Paris Agreement as a developing country' (United Nations (2022c)).

According to the most recent greenhouse gas inventory submitted by Turkey under the UNFCCC, CO₂ emissions (without LULUCF) amount to 524 Mt CO₂eq in 2020 (Turkey 2022). Methane emissions amount to 64 Mt CO₂eq and nitrous oxide emissions to 40 Mt CO₂eq. Emissions of fluorinated gases are relatively smaller with HFCs accounting for 6 Mt CO₂eq with only negligible emissions reported for PFCs and SF₆. The energy sector accounted for around 70% of the overall total emissions in 2020 (without LULUCF).

The National Climate Change Strategy (2010-2023), National Climate Change Action Plan (2011-2023) and the 10th Development Plan (2014-2018) provide the basis for most of Turkey's climate change policies. The 11th Development Plan was subsequently published in 2019 prioritising energy security over decarbonisation efforts (Climate Action Tracker 2022). This focus on energy security has continued the country's reliance upon fossil fuels with the Ministry of Energy and Natural Resources announcing tenders for coal mines promoting domestic lignite in 2019 and in the same year started construction on the 1.3 GW Hunutlu thermal power plant. In addition, a slowdown in wind power installations (7.4 GW at the end of 2019) may put the achievement of the country's energy capacity goals of 20 GW by 2023 at risk. According to the Climate Action Tracker, 'aside from the Energy Efficiency Action Plan and renewable energy auctions, Turkey has made little progress on climate action implementation' (Climate Action Tracker 2022).

When Turkey ratified the Paris Agreement in 2021, it submitted its 2015 intended NDC as its NDC, with the aim of unconditionally reducing GHG emissions including LULUCF in 2030 by 21% below a BAU projection. The NDC submission included a reference BAU projection of emissions in 2030 of 1,175 Mt CO₂eq including LULUCF and a target emission level of 929 Mt CO₂eq including LULUCF. As this

⁹² Presidential Climate Commission, <https://www.climatecommission.org.za/>.

target constitutes a strong increase in emissions compared to current levels, the ambition of the NDC is deemed 'critically insufficient' by the Climate Action Tracker (Climate Action Tracker 2022l).

In September 2021, a net zero target was set for the year 2053, however, few details are publicly available (Climate Action Tracker 2022l).

5.17. United Kingdom

The United Kingdom has taken on a leading role in the UNFCCC negotiations having hosted the previous COP 26 and setting an ambitious net-zero emissions target for 2050.

According to the most recent greenhouse gas inventory submitted by the United Kingdom under the UNFCCC, CO₂ emissions (without LULUCF) amounted to 327 Mt CO₂eq in 2020 (United Kingdom 2022). Methane emissions amounted to approx. 47 Mt CO₂eq and nitrous oxide emissions to 19 Mt CO₂eq. Emissions of fluorinated gases in 2020 amounted to 12 Mt CO₂eq for HFCs, 0.2 Mt CO₂eq for PFCs and 0.4 Mt CO₂eq for SF₆. Energy and industrial processes accounted for 76 % and 9 % respectively of the overall total net emissions in 2020 (United Kingdom 2022).

Following the passage of the Climate Change Act in 2008, the UK has achieved a 37% reduction in their GHG emissions and the Act has provided the foundation for the setting of complementary climate action including the establishment of a UK ETS post Brexit and a projected phasing out of coal-fired power plants by 2023. The legislation was subsequently updated in 2019 to align with the setting of a net-zero 2050 emissions target (the ambition of the 2050 target in the previous legislation was for an 80% reduction below 1990 GHG emission levels). Although the UK government has set ambitious policies on climate change mitigation, the impact of many of the new measures announced in the 'Ten Point Plan for a Green Industrial Revolution' have not yet been fully quantified, resulting in a high level of uncertainty whether they will enable sufficient progress towards the net-zero 2050 emissions target (Climate Action Tracker 2022m).

After leaving the European Union, the UK was required to submit its own NDC that included the 2030 target of a 68% reduction in GHG emissions below 1990 levels. This target, if achieved, is also aligned with a pathway towards achieving the UK's 2050 net-zero target. However, the Climate Action Tracker assessed the current policies either announced or implemented to be 'insufficient' to achieve the emission reduction necessary to meet the 2030 target and therefore more action is required to deliver the ambitious target set CAT.

The UK submitted a long-term strategy on 19 October 2021 (United Kingdom 2021). The long-term strategy sets the goal of achieving net-zero emissions by 2050.

5.18. United States

With the start of the Biden administration, the climate policies of the US have been significantly reversed after the country previously withdrew from the Paris Agreement under the Trump administration. It is expected that the US will now once again be a more collaborative Party within the UNFCCC negotiations and the country has shown a willingness to lead with more ambition on climate action and a pledge to decarbonise their economy.

According to the most recent greenhouse gas inventory submitted by the US under the UNFCCC, total national emissions excluding LULUCF amounted to approx. 5.2 Gt CO₂eq in 2020 (United States of America 2022). Carbon dioxide emissions amounted to approx. 4.7 Gt CO₂eq in 2020. Methane emissions amounted to 650 Mt CO₂eq and nitrous oxide emissions to 426 Mt CO₂eq. The net total for LULUCF emissions in 2020 amounted to 759 Mt CO₂eq (United States of America 2022).

The Inflation Reduction Act (IRA) was signed into law by President Biden on 16 August 2022 to help set the emissions of the US on a trajectory towards meeting its climate commitment to reduce GHG emissions by 50 % below 2005 levels by 2030. The IRA is designed to encourage investment in clean energy through tax incentives, grants, and other funding mechanisms. However, the IRA is less comprehensive than the legislation which was proposed by the Biden administration in 2021 but failed to pass the Senate. Additional policies will be required even with the implementation of the IRA in order to reach the US target for 2030 of 50-52 % below 2005 levels. The Biden administration have also acted quickly to reverse several key decisions of the Trump presidency such as re-establishing stricter fuel economy and GHG emissions standards for passenger vehicles. A bill has also been enacted by the Biden administration to phase down the use of HFCs over the next 15 years (Climate Action Tracker 2022n).

The US has submitted an NDC with a target to reduce emissions by 50-52 % below 2005 levels by 2030 (including LULUCF). The target is economy wide and applies to all GHGs. The Climate Action Tracker have assessed this NDC target for 2030 as 'almost sufficient' as the domestic target could become consistent with the Paris Agreement's 1.5°C temperature limit with moderate improvements (Climate Action Tracker 2022n).

The US also submitted a long-term strategy to the UNFCCC in November 2021, committing to net zero emissions by 2050 at the latest (United States of America 2021).

6. RECENT DEVELOPMENTS AND THEIR IMPACTS ON THE NEGOTIATIONS AND ON CLIMATE ACTION

6.1. The Russian Federation's war on Ukraine

The invasion of Ukraine by the Russian Federation, which started in February 2022, has huge impacts not only on Ukraine, but also on the global political order and on economic relationships. In this section, we focus on impacts which are related to climate policies, in particular the changes in global energy supplies as a consequence of the war and of sanctions imposed on the Russian Federation⁹³. We discuss impacts on energy prices and energy security, importance of resilience and diversification of energy supply, impacts on the transformation of energy systems and we provide a qualitative assessment of possible effects on greenhouse gas emissions.

6.1.1. Impacts on energy prices and energy security

The Russian Federation is a key supplier of fossil fuels to international markets: around 20% of natural gas and coal, and around 10% of crude oil in global export volumes came from Russia in 2020 (World Bank Group 2022). The EU is particularly dependent on fossil fuel supply from the Russian Federation. In 2021, the EU imported more than 40% of its total gas consumption, 27% of oil imports and 46% of coal imports from Russia.⁹⁴ In the months before the invasion, natural gas supply volumes to Central Europe were reduced compared to previous years, and natural gas storages were not filled to the same levels as in previous years, which has spurred increases in natural gas and electricity prices⁹⁵ since the autumn 2021. After lockdowns due to the COVID-19 pandemic in 2020, the economic recovery in 2021 led to a strong increase in coal demand, in particular by large importers such as India and China, which induced coal prices to increase in 2021. After the Russian Federation's invasion in February 2022, these market trends escalated and decreased natural gas supplies brought about price increases for natural gas. Figure 12 shows the wholesale price development for natural gas deliveries in Central Western Europe, coal delivered to Western European ports, electricity in the Central European electricity market and CO₂ allowances from the EU ETS. Mainly as a consequence of reduced gas supply from the Russian Federation, prices for natural gas have multiplied. In the last 10 years, natural gas traded slightly above 20 EUR per MWh HHV (Euro per mega-watt hour – higher heating value) and prices stayed at that level until beginning of 2021. Since then, they have reached price levels over 100 EUR/MWh in summer 2022. In order to compensate for reduced natural gas-fired electricity generation, coal-fired generation has increased – along with a continued increase in coal demand in India and the prospect of an embargo on coal from the Russian Federation (see paragraph on sanctions further below) – driving coal prices even further. Between mid-2021 and mid-2022, coal price in Europe have more than 10-fold. With strong increases in cost for the main price-setting generation technology in the electricity market, electricity prices in the EU have also increased considerably. Forward contracts show decreasing natural gas, coal and power prices in the years ahead. However, the era of low fossil fuel prices seems to be over, with all prices staying clearly above the level observed before the war.

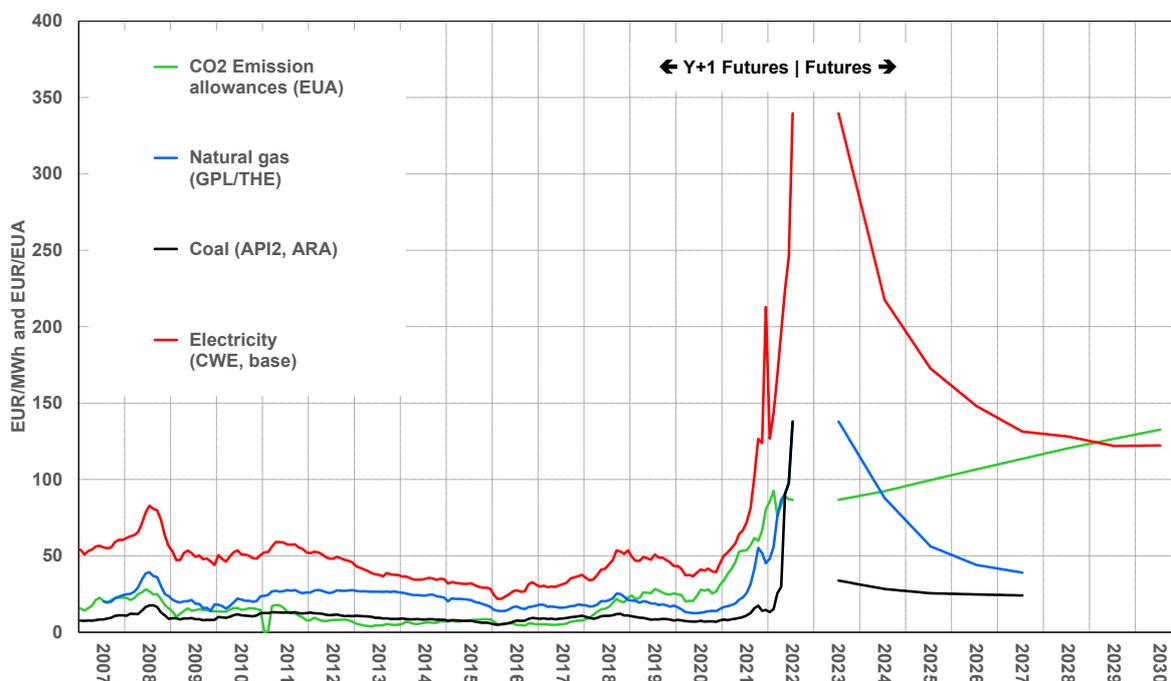
⁹³ See <https://www.consilium.europa.eu/en/policies/sanctions/restrictive-measures-against-russia-over-ukraine/sanctions-against-russia-explained/> for an overview and explanation of sanctions imposed against Russia by the EU.

⁹⁴ In focus: Reducing the EU's dependence on imported fossil fuels, https://ec.europa.eu/info/news/focus-reducing-eus-dependence-imported-fossil-fuels-2022-apr-20_en.

⁹⁵ In the marginal cost-based electricity market, which is in place in the European electricity system, the marginal supply sets the price that is then received by all supply for the respective supply period. Natural gas-fired electricity supply is often the marginal supply technology; hence electricity prices also increase if natural gas supply costs go up.

The price for CO₂ allowances stayed below 30 EUR⁹⁶/tCO₂eq until end of 2020. Since then, it has increased to levels above 90 EUR/tCO₂eq in winter 2021/2022. Futures indicate a further moderate increase to levels of around 100 EUR/tCO₂eq in 2025 and 130 EUR/tCO₂eq for 2030. Along with the European Union’s Fit-for-55 Package, the increase of the natural gas price is an important driver for the allowance price. A fuel switch from natural gas to more carbon-intensive fossil fuels (such as fuel oil in heating and coal in power generation) leads to an increase in demand for allowances in installations covered by the EU ETS and hence to higher prices.

Figure 12: Historical development and futures for natural gas, electricity and European Union Allowances (EUA) prices in Central-Western Europe



Source: Authors’ own figure, based on data from European Energy Exchange (EEX) and Intercontinental Currency Exchange (ICE).

Note: Futures based on data from July 2022.

As part of the sanctions imposed as a reaction to the Russian Federation’s war on Ukraine, several countries imposed bans on fossil fuel imports from Russia. The U.S. and Canada banned all fossil fuel imports from Russia. By end of 2022, crude oil and oil products from Russia will also be banned in the UK. After difficult negotiations, the EU has also agreed on bans for coal, crude oil and numerous oil products. Starting in August 2022, coal and other solid products cannot be imported from Russia to the EU. A ban on crude oil will come in effect by December 2022. While there is an exemption for pipeline-bound imports, Germany and Poland include the import of pipeline-bound oil in their sanctions portfolio. These restrictions will cover nearly 90% of Russian oil imports to Europe by the end of the year 2022 (Council of the EU and the European Council 2022).⁹⁷ While preparing these sanctions, EU countries had already been working on reducing imports.

⁹⁶ All prices in this paragraph refer to nominal values.

⁹⁷ A full timeline of the sanctions can be found here: <https://www.piie.com/blogs/realtime-economic-issues-watch/russias-war-ukraine-sanctions-timeline>

The sanctions imposed by the EU and other countries are to some extent made up by increased imports of other countries, making use of spare volumes. With buying 18% of Russia's exports in May 2022, India became a significant importer. It is important to note that significant shares are re-exported again as refined products to destinations also including Europe and the US (Myllyvirta et al. 2022). Similarly, Saudi Arabia has increased its crude oil imports from Russia after the invasion. They are used to a domestic oil-fired electricity supply, while domestic production is freed up for exports (Krauss 2022). This seaborne trade relies on tanker capacities. Potential future physical shortage of tanker capacity or the agreed extensions of sanctions to insuring ships carrying Russian oil could significantly diminish Russian capacity to export oil (Myllyvirta et al. 2022). China is another beneficiary of reduced deliveries to the EU. However, east-bound export capacities for fossil fuel are limited and already running at high-capacity utilisation rates. Therefore, another substantial increase in imports would require either very long and costly shipments from Russia's Baltic Sea and Black Sea, or new infrastructure that would take years to build (Myllyvirta 2022).

The EU is addressing the issue of security of supply in terms of fossil fuel supply by reducing consumption, increasing capacities of alternative sourcing routes from international markets and activating new trade partners (EC 2022e). With the uncertain future of Russian natural gas supply, the concepts of resilience of the energy system and diversification of energy supply are nevertheless becoming key factors in energy planning. It is important to increase the resilience and the diversification of pipeline-bound energy supply (natural gas and oil). This challenge is particularly large for natural gas. Resilience always has a supply side and a demand side. On the supply side, several Member States in the EU have increased or are increasing their liquefied natural gas (LNG) import capacity (Finland, Netherlands, Germany), e.g. by chartering floating LNG storage and regasification unit (FSRU) terminals.

On the demand side, a wide variety of measures are being taken. These range from increased use of coal and oil power plants that replace production from natural gas power plants in the power sector, a fuel switch from natural gas to fuel oil or LPG (liquefied petroleum gas) within one installation, or reducing demand for fossil fuels. Demand reductions can be achieved by reduced heating or a change in supply chain (sourcing of final products instead of production in the EU of, for example, ammonia).

In the long term, the roll out of renewable energies in the EU as pursued by the policies under the EU's 2030 climate and energy framework and the REPowerEU Plan is the most important measure for increasing the resilience of the European energy supply.

The challenge about increasing the resilience and diversification of the energy supply is that a lock-in into a carbon-intensive infrastructure should be avoided:

- Extending the life of old coal fired power plants for a few years does not constitute a lock-in, but scrapping coal phase-out plans altogether would be problematic.
- Chartering flexible FSRU terminals for a decade in order to be able to import more LNG does not constitute a lock-in, but the signature of very long LNG-supply contracts or investments into new fossil gas fields does.

While there might be a new incentive to invest into additional fossil fuel production infrastructure, it will not be compatible with a 1.5° world (Trout et al. 2022).

6.1.2. Impacts on the transformation of energy systems/decarbonisation in Europe

Many countries in Europe and world-wide planned on using natural gas as a bridging technology until fossil fuels can be replaced completely by renewables. Such plans need to be revisited now that the supply of gas from the Russian Federation may cease as a consequence of political conflict or sanctions.

In the past fossil gas was considered a bridging technology, providing flexible generation in the power sector until the roll out of renewable energies have been achieved. For the future this role will be discussed. To increase the security of supply, it is not necessary to completely abandon the use of natural gas. In some cases, it is sufficient that natural gas can be substituted when necessary. Bivalent plants that can use different fuels will become more important (fuel oil and LPG can replace fossil gas).

While natural gas still plays a key role in net zero scenarios, its central contribution is mainly in the horizon until 2030. As shown in Table 5 natural gas supply was projected to decrease by only 10 EJ (Exajoule) between 2020 and 2030. Given the fact that many countries have been planning on substituting coal-fired power generation by increasing natural gas-fired generation and ramping up natural gas-based blue hydrogen production, the increase is overcompensated by a decrease in demand from other sectors like from energy efficiency in the building sector. After 2030, total demand is projected to decrease substantially, arriving at about half (61-72 EJ) in 2050. At the same time the share of natural gas dedicated for blue hydrogen (i.e. hydrogen production based on natural gas combined with carbon capture and storage) in total supply is projected to increase. With respect to natural gas, the lack of Russian natural gas supply to international markets would not pose a long-term threat to the transition of energy systems.

Table 5: Current natural gas use and projections for 2050 in net zero CO₂ emissions scenarios

Gaseous energy carrier	Unit	2020	IEA NZE			IRENA 1.5°
			2030	2040	2050	2050
Natural gas supply (excl. natural gas liquids)	[EJ/yr]	139	129	75	61	72
Hydrogen	[EJ/yr]	11			63	74
Blue hydrogen	[EJ/yr]	<1			24	24
Green hydrogen	[EJ/yr]	<1			39	50
Biogas	[EJ/yr]	2	5	10	14	15
Total gaseous energy carriers ¹	[EJ/yr]	139			113	136

Notes: ¹Total gaseous energy carriers is the sum of natural gas, green hydrogen and biogas.

Source: Own table adapted from Gielen and Bazilian (2021).

While the war has put resilience and supply security as top priority for policy making, it also added political arguments to support energy transitions towards reducing import-based fossil fuel dependence. At the same time, inflation and economic uncertainty as well as shortages in material supplies and interrupted/out of balance supply chains increase financing cost for transformation technology and may delay implementation. This is particularly true for those innovations that were supposed to be driven without governmental financial support. Those elements of the transformation that do rely on public support schemes can in turn benefit from the window of opportunity that is created with adding resilience and security of supply as arguments in favour of clean energy transition policies. This is for example true in the chemicals and iron and steelmaking sectors.

6.1.3. Impacts on commodities and agriculture

The Russian Federation is not only a key supplier of fossil fuels to international markets, but also an important player on the international market for metals and minerals (including aluminium, palladium, platinum, fertilizers and pig iron, with shares in global exports ranging between 10% and 30% in 2020) and for agricultural products (including wheat, barley, edible oils, with shares in global exports ranging

between 5% and 20% in 2020). Ukraine is also an important player on the international market for pig iron (around 20% of global export volumes in 2020) and for agricultural products (World Bank Group 2022). It is the world's largest producer of sunflower seed as well as a key exporter of wheat, rapeseed, barley, vegetable oil, and maize (Gay et al. 2022). Given this, the various disruptions caused by the war in Ukraine are also affecting global food supply and various supply chains. In the following, we focus on agricultural products and related markets.

The reduction in exports from Ukraine and the Russian Federation, and rising energy and fertiliser prices are putting pressure on international agricultural product markets, and putting global food security at risk (Gay et al. 2022). Prices for agricultural products have been on the rise since mid-2020 and the trend has been aggravated since the war began. The increase was driven by several factors including a recovery in demand after the COVID-19 pandemic, bad weather conditions and rising input costs, in particular for energy and fertilisers. The war has added to the growing stress on agricultural supply chains (IEA 2022b).

Fertilisers are based on ammonia produced from natural gas (4% of global natural gas consumption) as the key input, partly converted to urea, the most common nitrogen fertiliser product used globally. Natural gas often accounts for 70% to 80% of the operating costs of producing ammonia and urea, resulting in close correlation of prices. In recent months, nitrogen fertiliser plants have announced temporary closures, citing spiralling natural gas costs as the cause. Ammonia production in the Russian Federation is mostly exported. It accounts for around 15% of global exports in 2020 in terms of volumes, while other major producers like the EU, the US and India are also major importers and production in China largely balances domestic demand (IEA 2022b; Guénette et al. 2022). In terms of urea, India imports around 30%, and Brazil close to 100%. If total quantities are small, many African countries also import very high shares of their urea consumption. These regions are most severely affected by rising prices and lack of supply. Countries such as Egypt, Turkey and other grain-importing countries in Africa and the Middle East have only a limited possibility of expanding their domestic production (van Meijl et al. 2022). If farmers respond by using less fertiliser, this could have a negative impact on crop yields for the next harvest. This could also undermine attempts to increase domestic supply as a reaction to high international prices. Wheat and vegetable oil crops are currently affected the most, with African countries bearing the major share of the impacts this summer. If the tense situation with fertiliser supply persists into the next planting season, rice will be the next major crop to come under pressure, affecting billions more people in Asia and the Americas (IEA 2022b according to; United Nations 2022a).

Climate and environmental protection goals for agricultural practices could be undermined as a reaction to the war's impact on supply and demand for agricultural products and the commodity price surge. As an example, the EU allows derogation 'from conditions relating to the greening payment, including the use of plant protection products, for claim year 2022 as regards land lying fallow which has been declared to meet the crop diversification or ecological focus area requirements [...]' (EC 2022a).

6.1.4. Impacts on the global economy and on global greenhouse gas emissions

On the macro-economic scale, the war has introduced an economic crisis in the Russian Federation and Ukraine as well as globally. In OECD projections (OECD Publishing 2022) almost all countries show slower growth than foreseen in projections before the war. For OECD countries, the projection for 2023 is 2 percentage points lower. In terms of greenhouse gas emissions, the current crisis has different effects that partly level each other out. On the one hand, there will be an emissions increase because natural gas will be replaced with other, more emission-intensive fossil fuels. On the other hand, the

high prices for energy partly lead to direct and indirect reduction in demand for natural gas (e.g. due to lower levels of gas-consuming industrial activities like ammonia production and higher imports or due to less use of fertilisers, one of the main ammonia-derived products). Energy savings and renewable energy programs as a reaction to reduced natural gas and crude oil supply will also lower emissions. As discussed above, fuel prices are projected to stay high for the next couple of years, which gives a price signal for spurring investment in climate change mitigation technologies and induce behaviour change.

A first quantification of the different, partly countervailing effects on the global scale might be available with the upcoming edition of the World Energy Outlook⁹⁸ in October 2022. For the EU, the REPowerEU Plan (EC 2022e) aims to incorporate the various effects on global energy markets, supply chains and induced consumer behaviours. The actions in the REPowerEU Plan cover energy savings, diversification of energy supplies, and accelerated roll-out of renewable energy to replace fossil fuels in all sectors. They cover a dedicated EU Solar Strategy (EC 2022b) to double solar photovoltaic capacity by 2025 and install 600 GW by 2030, and a Biomethane Action Plan (EC 2022c) aiming at producing 35 billion cubic metres by 2030.

The modelling accompanying the plan calculates a reduction of 67% in gross gas-fired electricity generation compared to the previous Fit-for-55 plan, and around 8 GW less installed gas-fired capacity for the EU in 2030. At the same time, coal-fired electricity supply increases by 105 TWh in 2030. Generation from nuclear also increased by 45 TWh due to maintenance of capacities in Belgium and France. Final energy consumption is assumed to be 4.6% lower than in the previous proposal due to higher prices, dedicated policies and consumer awareness. Additional investments in renewable electricity supply capacities and lower energy demand increase the total share of renewable energy in 2030 to 45% (compared to 40% in the Fit-for-55 proposals). In the residential and services sectors, natural gas use decreases substantially, mainly via electrification, heat pumps and bio-methane transported in the existing gas network. Fossil fuel imports from the Russian Federation are also reduced through significant use of hydrogen in hard-to-abate transport sectors (EC 2022c). All together these measures are projected to increase the EU's emission reduction compared to 1990 levels to 57-58% with the REPowerEU Plan (Climate Action Tracker 2022e).

6.1.5. Impacts on the international climate negotiations

The Russian Federation's war on Ukraine also complicates diplomatic relationships and events at international level, including COP27. In particular, it can be expected that the war will be addressed in the opening plenary of the COP. This has already been the case in the opening plenary of the Subsidiary Bodies meeting in Bonn in June 2022, when the EU, the Umbrella Group and the Environmental Integrity Group condemned the war and voiced their support for Ukraine. When the Russian Federation took the floor to justify its invasion of Ukraine, delegates of many Parties left the plenary⁹⁹. However, the technical negotiations at the SB meeting in June 2022 were not affected, and delegates focused on the specific topics in their interventions without addressing the war.

In the negotiations, most large developed countries outside the EU are members of the Umbrella Group (cf. section 4.1.1). The Russian Federation, Belarus and Ukraine have been members of the Umbrella Group for many years. In March 2022, an Australian official announced that members of the Umbrella Group were no longer coordinating with Russia and Belarus (Climate Home News 2022e). However, this has limited practical impact on the negotiations because traditionally the Umbrella Group has

⁹⁸ Publication announced for 13 October 2022; <https://www.iea.org/data-and-statistics/data-product/world-energy-outlook-2022>.

⁹⁹ A recording of the joint opening plenary meeting of SBSTA and SBI is available at https://unfccc-events.azureedge.net/SB56_85105/agenda.

coordinated less than other groups. In general, there is no coordinated Umbrella Group position and several members of the group speak for their country rather than for the whole group.

Beyond the climate negotiations, the Russian Federation's war on Ukraine contributes to a fragmentation of the international community. While many countries express their strong support for Ukraine, some countries, including most notably China, ties to the Russian Federation. Such a fragmentation can make it more difficult to achieve broad support for international initiatives and to organise a coordinated response to climate change.

6.2. The COVID-19 pandemic

Climate action in general, and the international climate negotiations in particular, were severely affected by the COVID-19 pandemic over the past 2.5 years. As far as the negotiations were concerned, the subsidiary bodies meetings planned for June 2020 and June 2021 were not convened in Bonn, and the COP26, which had originally been scheduled for November 2020, was postponed by one year.

COP26 in November 2021 was the first large in-person climate negotiating meeting after the start of the pandemic, and it was convened successfully, with several precautions in place such as daily testing and physical distancing rules. The same was true for the subsidiary bodies meeting in June 2022 in Bonn.

Surprisingly, despite the ongoing pandemic, the number of participants at COP26 exceeded the number of participants of every previous COP – with more than 38 000 badges issued in Glasgow (UNFCCC 2021d). On one hand, this can be seen as an indication of the growing importance of climate action. On the other hand, such large numbers of participants pose challenges to physical distancing and logistics, and they generate considerable amounts of GHG emissions through participants' travel. In fact, it became evident during the COVID-19 pandemic that many events can be conducted in a virtual or hybrid format, and physical attendance may not be necessary in all cases. While in-person meetings and negotiations will continue to remain important in the years ahead, the pandemic has shown that climate action can be discussed and promoted without holding physical meetings.

As far as the effects of the pandemic on greenhouse gas emissions are concerned, the lockdowns in 2020 and the associated decrease in economic activity led to lower emissions in that year. However, an analysis of global CO₂ emissions from energy combustion and industrial processes showed that – after a decrease of approx. 5 % in 2020 – these emissions increased by 6% in 2021, reaching a new all-time high (IEA 2022a). Hence, the pandemic led to a temporary decrease only, but not to a reversal of the increasing emissions trend.

In order to promote a change in the emissions trend, structural changes in the economies are needed. While large public funds were directed to the economic recovery after the start of the COVID-19 pandemic, it was found that many of them, such as subsidies for households or support for businesses, still focused on fossil fuels. An analysis of the COVID-19 responses of 38 major economies and eight multilateral banks found that in the period 2020 to 2021, 41 % of quantified measures, or USD 515 bn, supported fossil fuel-intensive sectors while only 38 % supported clean energy¹⁰⁰. A separate analysis, which distinguishes between 'environmentally positive', 'environmentally negative' and 'mixed' spending, registered a total of USD 478 bn of 'mixed/negative' spending by April 2022¹⁰¹. With energy systems and economies in a fragile state due to the COVID-19 pandemic and the Russian Federation's

¹⁰⁰ Energy policy tracker, Global recovery analysis, <https://www.energypolicytracker.org/2020-21-global-recovery-analysis/>.

¹⁰¹ OECD, Key findings from the April 2022 update of the OECD Green Recovery Database, <https://www.energypolicytracker.org/2020-21-global-recovery-analysis/>.

war on Ukraine, the transformation to sustainable energy systems has become more pressing yet more difficult to achieve from month to month.

7. OUTLOOK

COP27, hosted by a Member of the African Group of Negotiators, will shed light on the issues of particular importance to developing countries, namely adaptation, loss and damage, and finance. In addition, it can be expected that COP27 will raise urgent calls for more ambitious mitigation action, resulting from the discussions under the mitigation work programme and the global stocktake.

Even if the progress at COP27 is perceived to be incremental, it will be critical for national governments to use its outcomes to implement concrete mitigation and adaptation actions and to direct finance flows towards climate neutral and climate-resilient development. As an example, the mitigation work programme provides an opportunity to explore and commit to new and scaled-up mitigation actions. Civil society, including businesses and local and regional governments also play a key part in urgently needed climate action.

The synthesis report of the IPCC's Sixth Assessment Report, which is expected to be completed after COP27, will once again highlight of a changing climate, but also options for mitigating climate change and adapting to it.

This report will be one of the key inputs to the political phase of the global stocktake, which will be one of the central events taking place at the following COP28 in November 2023. The rotating COP presidency in that year will be assumed by a member of the group of Asia-Pacific States. Already in Glasgow the COP26 accepted the offer by the United Arab Emirates to host this conference, and it will be held in Dubai (Emirates News Agency 2022).

As both Egypt and the United Arab Emirates are members of the Arab Group and Group of G-77 and China, it can be expected that the COP28 presidency will have some similar priorities as its predecessor, such as the adaptation to climate change. However, the focus of COP28 will mainly be shaped by the outcome of this year's COP and by climate-change related developments and events during the coming year.

REFERENCES

- Agência Brasil, 2021, *Deforestation in Amazon up 21.9% in 12 months*, 2021. Online available at <https://agenciabrasil.ebc.com.br/en/geral/noticia/2021-11/deforestation-amazon-219-12-months>.
- Agência Brasil, 2022, *Brazil registers growth in wind and solar energy generation*. Online available at <https://agenciabrasil.ebc.com.br/en/economia/noticia/2022-02/brazil-registers-growth-in-wind-and-solar-energy-generation>.
- AGN, 2022, *About the AGN*. Online available at <https://africangroupofnegotiators.org/about-the-agn/>.
- AILAC, 2022, *About AILAC*. Online available at <http://ailac.org/en/sobre/>.
- AI Monitor, 2021, *Egypt gears up to host next climate summit*. Online available at <https://www.ai-monitor.com/originals/2021/11/egypt-gears-host-next-climate-summit>.
- AOSIS, 2022a, *About us*. Online available at <https://www.aosis.org/about/member-states/>.
- AOSIS, 2022b, *SIDS climate negotiators chart way forward for climate at AOSIS regional workshops*. Online available at <https://www.aosis.org/aosis-pushes-progress-on-loss-and-damage-finance-facility/>.
- Argentina, 2021, *Actualización de la meta de emisiones netas de Argentina als 2030*, 2021. Online available at <https://unfccc.int/documents/497046>.
- Argentina, 2022, *Cuarto informe bienal de actualización de la República Argentina*, 2022. Online available at <https://unfccc.int/documents/419772>.
- ATAG, 2020, *Waypoint 2050: Balancing growth in connectivity with a comprehensive global air transport response to the climate emergency*, 2020. Online available at <https://aviationbenefits.org/environmental-efficiency/climate-action/waypoint-2050/>.
- Australia, 2022a, *Australia's long-term emissions reduction plan*, 2022. Online available at https://unfccc.int/sites/default/files/resource/Australias_LTS_WEB.pdf.
- Australia, 2022b, *Australia's Nationally Determined Contribution*, Communication 2022, 2022. Online available at <https://unfccc.int/documents/510662>.
- Australia, 2022c, *National Inventory Report 2020*, 2022. Online available at <https://unfccc.int/documents/478957>.
- Bélaïd, F., Al-Sarihi, A., 2022, *Energy Transition in Saudi Arabia: Key Initiatives and Challenges*, 17th IAEE European Energy Conference, 2022. Online available at https://www.researchgate.net/publication/357568996_Energy_Transition_in_Saudi_Arabia_Key_Initiatives_and_Challenges.
- Brazil, 2022, *Nationally Determined Contribution (NDC)*, 2022. Online available at <https://unfccc.int/sites/default/files/NDC/2022-06/Updated%20-%20First%20NDC%20-%20%20FINAL%20-%20PDF.pdf>.
- Brazilian Climate Observatory, 2021, *Análise das emissões brasileiras de e suas implicações para as metasclimáticas do Brasil 1970 – 2020*, 2021. Online available at https://www.oc.eco.br/wp-content/uploads/2021/10/OC_03_relatorio_2021_FINAL.pdf.
- Broekhoff, D., Schneider, L. et al., 2020, *Options for Improving the Emission Unit Eligibility Criteria under the Carbon Offsetting and Reduction Scheme for International Aviation*. Berlin: German Emissions Trading Authority (DEHSt) at the German Environment Agency. Online available at https://www.dehst.de/SharedDocs/downloads/EN/project-mechanisms/discussion-papers/improving-unit-eligibility.pdf;jsessionid=0CE24D49AA25A3B7D53B0FA233846736.1_cid292?_blob=publicationFile&v=2.
- Burck, J., Hagen, U. et al., 2019, *Climate Change Performance Index 2019*, 2019. Online available at <https://ccpi.org/download/the-climate-change-performance-index-2019/>.

- CAN - Climate Action Network, 2021, *The EU's climate finance. World's largest contributor needs to set the direction of travel*. Online available at <https://caneurope.org/the-eus-climate-finance-worlds-largest-contributor-needs-to-set-the-direction-of-travel/>.
- Canada, 2016, *Canada's mid-century long-term low-greenhouse gas development strategy*, 2016. Online available at <https://unfccc.int/sites/default/files/resource/Canada's%20Mid-Century%20Long-Term%20Low-GHG%20Strategy.pdf>.
- Canada, 2022, *National Inventory Report 1990-2020: Greenhouse gas sources and sinks in Canada*, 2022. Online available at <https://unfccc.int/documents/461919>.
- Carbon Copy, 2022, *Cabinet approves India's NDC update; 5 things you need to know*, 2022. Online available at <https://carboncopy.info/cabinet-approves-indias-ndc-update-5-things-you-need-to-know/>.
- Charles, L., Thomas, S. et al., 2021, *Using the Global Stocktake to improve national climate policy ambition and implementation*, Summary of key findings. Climate Analytics, 2021. Online available at <https://climateanalytics.org/publications/2021/using-the-global-stocktake-to-improve-national-climate-policy-ambition-and-implementation/>.
- China, 2019, *The People's Republic of China Second Biennial Update Report on Climate Change*, 2019. Online available at <https://unfccc.int/documents/197666>.
- China, 2021, *China's Mid-Century Long-Term Low Greenhouse Gas Emission Development Strategy*, 2021. Online available at <https://unfccc.int/sites/default/files/resource/China%E2%80%99s%20Mid-Century%20Long-Term%20Low%20Greenhouse%20Gas%20Emission%20Development%20Strategy.pdf>.
- Climate Action Tracker, 2021, *International Shipping/Aviation Assessment*, August 2021 Update, 2021. Online available at <https://climateactiontracker.org/sectors/aviation/>.
- Climate Action Tracker, 2022a, *Argentina - Policies & Action*. Online available at <https://climateactiontracker.org/countries/argentina/policies-action/>.
- Climate Action Tracker, 2022b, *Canada - Targets*. Online available at <https://climateactiontracker.org/countries/canada/targets/>.
- Climate Action Tracker, 2022c, *China - Country summary*. Online available at <https://climateactiontracker.org/countries/china/>.
- Climate Action Tracker, 2022d, *Egypt*, 3 Jun 2022. Online available at <https://climateactiontracker.org/countries/egypt/>.
- Climate Action Tracker, 2022e, *EU*. Online available at <https://climateactiontracker.org/countries/eu/>.
- Climate Action Tracker, 2022f, *International Shipping/Aviation Assessment*, May 2022 Release, 2022. Online available at <https://climateactiontracker.org/sectors/>.
- Climate Action Tracker, 2022g, *Japan - Policies & Action*, 2022. Online available at <https://climateactiontracker.org/countries/japan/policies-action/>.
- Climate Action Tracker, 2022h, *Mexico - Country Profile*, 2022. Online available at <https://climateactiontracker.org/countries/mexico/>.
- Climate Action Tracker, 2022i, *Russian Federation - Country summary*, 2022. Online available at <https://climateactiontracker.org/countries/russian-federation/>.
- Climate Action Tracker, 2022j, *South Africa*, 2022. Online available at <https://climateactiontracker.org/countries/south-africa/policies-action/>.

- Climate Action Tracker, 2022k, *South Korea - Policies & Action*, 2022. Online available at <https://climateactiontracker.org/countries/south-korea/policies-action/>.
- Climate Action Tracker, 2022l, *Turkey*, 2022. Online available at <https://climateactiontracker.org/countries/turkey/>.
- Climate Action Tracker, 2022m, *United Kingdom - Policies & action*, 2022. Online available at <https://climateactiontracker.org/countries/uk/policies-action/>.
- Climate Action Tracker, 2022n, *USA - Country summary*, 2022. Online available at <https://climateactiontracker.org/countries/usa/>.
- Climate Home News, 2021, *Scotland breaks loss and damage "taboo", raising hopes others will follow*. Online available at <https://www.climatechangenews.com/2021/11/03/scotland-breaks-loss-damage-taboo-raising-hopes-others-will-follow/>.
- Climate Home News, 2022a, *Australia passes climate law targeting 43% emissions cuts by 2030*. Online available at <https://www.climatechangenews.com/2022/09/08/australia-passes-climate-law-targeting-43-emissions-cuts-by-2030/>.
- Climate Home News, 2022b, *EU blocks bespoke fund for climate victims as rich nations moot alternatives*. Online available at <https://www.climatechangenews.com/2022/06/17/eu-blocks-bespoke-fund-for-climate-victims-as-rich-nations-moot-alternatives/>.
- Climate Home News, 2022c, *Russian climate action and research is collateral damage in Putin's war on Ukraine*, 2022. Online available at <https://www.climatechangenews.com/2022/05/26/russian-climate-action-and-research-is-collateral-damage-in-putins-war-on-ukraine/>.
- Climate Home News, 2022d, *Saudi Arabia dilutes fossil fuel phase out language with techno fixes in IPCC report*, 2022. Online available at <https://www.climatechangenews.com/2022/04/04/saudi-arabia-dilutes-fossil-fuel-phase-out-language-with-techno-fixes-in-ipcc-report/>.
- Climate Home News, 2022e, *UN climate change negotiating bloc ejects Russia, condemning its invasion of Ukraine*. Online available at <https://www.climatechangenews.com/2022/03/10/un-climate-change-negotiating-bloc-rejects-russia-condemning-its-invasion-of-ukraine/>.
- Climate Tracker, 2021, *Despite green pledges, Argentina's renewables stall while fossil fuels expand*. Online available at <https://climatetracker.org/green-pledges-argentina-renewables-energy-fossil-fuels/>.
- Climate Transparency, 2021, *South Africa*, 2021. Online available at <https://www.climate-transparency.org/wp-content/uploads/2021/10/CT2021SouthAfrica.pdf>.
- Council of the EU and the European Council, 2022, *EU sanctions against Russia explained*, Council of the EU and the European Council. Online available at <https://www.consilium.europa.eu/en/policies/sanctions/restrictive-measures-against-russia-over-ukraine/sanctions-against-russia-explained/>.
- CTCN - Climate Technology Centre & Network, 2022, *Programme of Work 2023-2027*, 2022. Online available at https://www.ctc-n.org/sites/www.ctc-n.org/files/AB.2022.20.16.1%20CTCN%20Programme%20of%20Work%202023-2027%20DRAFT_0.pdf.
- Department of Mineral Resources and Energy South Africa, 2019, *Integrated Resource Plan 2019*, 2019. Online available at <http://www.energy.gov.za/IRP/2019/IRP-2019.pdf>.
- Department of Transport South Africa, 2018, *Green Transport Strategy for South Africa: (2018-2050)*, 2018. Online available at https://www.transport.gov.za/documents/11623/89294/Green_Transport_Strategy_2018_2050_onlineversion.pdf/71e19f1d-259e-4c55-9b27-30db418f105a.
- DNV GL, 2019, *Maritime Forecast to 2050*, Energy Transition Outlook 2019, 2019. Online available at <https://eto.dnv.com/2019/Maritime/forecast>.

- EC - European Commission, 2021a, *France, Germany, UK, US and EU launch ground-breaking International Just Energy Transition Partnership with South Africa*, 2021. Online available at https://ec.europa.eu/commission/presscorner/detail/en/IP_21_5768.
- EC - European Commission, 2021b, *Proposal for a Directive of the European parliament and the council, amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union, Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and Regulation (EU) 2015/757 (COM(2021) 551 final)*, 2021. Online available at https://ec.europa.eu/info/sites/default/files/revision-eu-ets_with-annex_en_0.pdf.
- EC - European Commission, 2021c, *Proposal for a Regulation of the European Parliament and of the Council on the use of renewable and low-carbon fuels in maritime transport and amending Directive 2009/16/EC*, COM(2021) 562 final, 2021. Online available at https://ec.europa.eu/info/sites/default/files/fueleu_maritime - green european maritime space.pdf.
- EC - European Commission, 2022a, *Commission Implementing Decision (EU) 2022/484 of 23 March 2022 providing for derogations from Regulation (EU) No 1307/2013 of the European Parliament and of the Council and from Commission Delegated Regulation (EU) No 639/2014 as regards the implementation of certain conditions relating to the greening payment for claim year 2022*, (notified under document C(2022) 1875), 2022. Online available at http://data.europa.eu/eli/dec_impl/2022/484/oj.
- EC - European Commission, 2022b, *EU Solar Energy Strategy*. {SWD(2022) 148 final}, European Commission. Online available at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A221%3AFIN&qid=1653034500503>.
- EC - European Commission, 2022c, *Implementing the REPOWER EU Action Plan: Investment needs, hydrogen accelerator and achieving the Bio-Methane Targets*, Accompanying the document to SWD(2022) 230 final, 2022. Online available at https://energy.ec.europa.eu/system/files/2022-05/SWD_2022_230_1_EN_autre_document_travail_service_part1_v3.pdf.
- EC - European Commission, 2022d, *Proposal for a Regulation of the European Parliament and of the Council on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) No 517/2014*, COM(2022) 150 final, 2022. Online available at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022SC0097>.
- EC - European Commission, 2022e, *REPowerEU Plan*, SWD(2022) 230 final, 2022. Online available at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A230%3AFIN&qid=1653033742483>.
- EEA - European Environment Agency, 2021, *Annual European Union greenhouse gas inventory 1990–2019 and inventory report 2021*, Submission to the UNFCCC Secretariat. 15 April 2021, 2021. Online available at <https://unfccc.int/documents/273463>.
- EEA - European Environment Agency, 2022, *Annual European Union greenhouse gas inventory 1990–2020 and inventory report 2022*, Submission to the UNFCCC Secretariat, 2022. Online available at <https://unfccc.int/documents/461931>.
- El Wardany, S., Lombrana, L. M., et al., 2022, *Egypt to Fight Against Backslide of Climate Goals at COP27*, Bloomberg. Online available at <https://www.bloomberg.com/news/articles/2022-07-31/egypt-aims-to-raise-ambitions-at-climate-talks-despite-energy-crisis#xj4y7vzkg>.
- Elgendy, K., 2022, *COP27: Navigating a difficult road to Sharm El-Sheikh*, Chatham House. Online available at <https://www.chathamhouse.org/2022/07/cop27-navigating-difficult-road-sharm-el-sheikh>.

- Emirates News Agency, 2022, *UAE President announces COP28 Climate Summit to be hosted at Dubai Expo City, 2022*. Online available at <http://wam.ae/en/details/1395303059702>.
- Energy Tracker Asia, 2022, *Labour Climate Change Policy 2022 in Australia – Ambitious, but Facing Lots of Challenges, last updated on* <https://energytracker.asia/labour-climate-policy-in-australia/>.
- EPBR, 2022, *Senado aprova ratificação brasileira à Emenda de Kigali*. Online available at <https://epbr.com.br/senado-aprova-ratificacao-brasileira-a-emenda-de-kigali/>.
- EPE - Energy Research Office, 2016, *The Brazilian Commitment to Combating Climate Change: Energy Production and Use, 2016*. Online available at <https://www.epe.gov.br/sites-en/publicacoes-dados-abertos/publicacoes/PublicacoesArquivos/publicacao-181/NT%20COP%2021%20-English.pdf>.
- European Council, 2020, *Long-term low greenhouse gas emission development strategy of the European Union and its Member States*, Submission to the UNFCCC on behalf of the European Union and its Member States (6612/20). Brussels, 2020. Online available at <https://unfccc.int/documents/210328>.
- FAO, 2019, *FAO&the Koronivia Joint Work on Agriculture*, Food and Agricultural Organisation. Online available at <http://www.fao.org/climate-change/our-work/what-we-do/koronivia/en/>.
- FAO, 2021, *New report shows Indigenous and Tribal Peoples 'best guardians' of forests, 2021*. Online available at <https://www.fao.org/news/story/en/item/1391139/icode/>.
- Fearnough, H., Schneider, L. et al., 2021, *Analysis of options for determining OMGE, SOP and Transition within Article 6*, Implications of policy decisions for international crediting under the Paris Agreement. Climate Analytics, NewClimate Institute, Oeko-Institut, 2021. Online available at <https://www.oeko.de/en/publications/p-details/analysis-of-options-for-determining-omge-sop-and-transition-within-article-6>.
- G-77, 2022, *About the Group of 77*. Online available at <https://www.g77.org/doc/>.
- Gay, H., Frezal, C. et al., 2022, *The impacts and policy implications of Russia's aggression against Ukraine on agricultural markets*. OECD, 2022. Online available at <https://read.oecd.org/10.1787/0030a4cd-en?format=pdf>.
- Gielen, D., Bazilian, M., 2021, *Critically exploring the future of gaseous energy carriers*. In: *Energy Research & Social Science* (79), p. 102185. Online available at <https://doi.org/10.1016/j.erss.2021.102185>.
- Global Alliance for the Future of Food, 2022, *Untapped opportunities for climate action: An assessment of food systems in Nationally Determined Contributions. Country Assessment Egypt, 2022*. Online available at https://futureoffood.org/wp-content/uploads/2022/03/GA_NDC_CountryAssessments-11-Egypt_EN.pdf.
- Government of Egypt, 2022, *Egypt's first updated Nationally Determined Contribution, 2022*. Online available at <https://unfccc.int/sites/default/files/NDC/2022-07/Egypt%20Updated%20NDC.pdf.pdf>.
- Government of India, 2016, *Climate change finance, analysis of a recent OECD report: some credible facts needed* (Discussion Paper), 2016. Online available at https://dea.gov.in/sites/default/files/ClimateChangeOEFDRReport_0.pdf.
- Graver, B., Rutherford, D. et al., 2020, *CO2 emissions from commercial aviation. 2013, 2018, and 2019*. ICCT, 2020. Online available at <https://theicct.org/sites/default/files/publications/CO2-commercial-aviation-oct2020.pdf>.
- Guénette, J. D., Kenworthy, P. et al., 2022, *Implications of the War in Ukraine for the Global Economy* (Equitable growth, finance, and institutions policy note, EFI Policy Note 3). World Bank Group.

Washington D.C., 2022. Online available at <https://openknowledge.worldbank.org/handle/10986/37372>.

- Gütschow, J., Günther, A. et al., 2021, *The PRIMAP-hist national historical emissions time series (1750-2019) v2.3*. zenodo, 2021. Online available at <https://zenodo.org/record/5175154#.YUMLQJ0zZpl>.
- ICAO - International Civil Aviation Organization, 2022, *Report on the feasibility of a long-term aspirational goal (LTAG) for international civil aviation CO2 emission reductions*, ICAO committee on aviation environmental protection, 2022. Online available at <https://www.icao.int/environmental-protection/LTAG/Pages/LTAGreport.aspx>.
- ICAO - International Civil Aviation Organization, 2016, *Resolution A39-3: Consolidated statement of continuing ICAO policies and practices related to environmental protection – Global Market-based Measure (MBM) scheme*. Montreal, Oct 2016. Online available at http://www.icao.int/environmental-protection/Documents/Resolution_A39_3.pdf.
- ICAO - International Civil Aviation Organization, 2019, *Global Environmental Trends, Present and Future Aircraft Noise And Emissions*, 2019. Online available at https://www.icao.int/Meetings/a40/Documents/WP/wp_054_en.pdf.
- ICF Consulting, Air Transportation Analytics et al., 2020, *Assessment of ICAO's global market-based measure (CORSA) pursuant to Article 28b and for studying cost passthrough pursuant to Article 3d of the EU ETS Directive*. European Commission (ed.). Brussels, 2020.
- ICLEI, 2021, *ICLEI in the urban area*, 2021. Online available at <https://iclei.org/publication/iclei-in-the-urban-era/>.
- ICS, BIMCO et al., 2019, *Proposal to establish an International Maritime Research and Development Board (IMRB)*, MEPC 75/5/4 - Reduction of GHG emissions from ships (MEPC 75/7/4). International Maritime Organization. London, 2019.
- IEA - International Energy Agency, 2021, *India Energy Outlook 2021*, World Energy Outlook Special Report, 2021. Online available at https://iea.blob.core.windows.net/assets/1de6d91e-e23f-4e02-b1fb-51fdd6283b22/India_Energy_Outlook_2021.pdf.
- IEA - International Energy Agency, 2022a, *Global Energy Review: CO2 Emissions in 2021*, 2022. Online available at <https://www.iea.org/reports/global-energy-review-co2-emissions-in-2021-2>.
- IEA - International Energy Agency, 2022b, *How the energy crisis is exacerbating the food crisis*. In collaboration with Levi, P. and Molnar, G. et al., International Energy Agency. Online available at <https://www.iea.org/commentaries/how-the-energy-crisis-is-exacerbating-the-food-crisis>.
- IEA, 2022c, *Data and Statistics*. Online available at <https://www.iea.org/data-and-statistics/data-tables>.
- IFPRI, 2022, *Climate-resilience Policies and Investments for Egypt's Agriculture Sector: Sustaining Productivity and Food Security*. Online available at <http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/134588/filename/134802.pdf>.
- IISD, 2021a, *Glasgow Climate Change Conference Summary report 31 October - 12 November 2021*, 2021. Online available at <https://enb.iisd.org/glasgow-climate-change-conference-cop26/summary-report>.
- IISD, 2021b, *Summary report of the Combined 12th Meeting of the Conference of the Parties to the Vienna Convention (Part II) and 33rd Meeting of the Parties to the Montreal Protocol*, 2021. Online available at <https://enb.iisd.org/Montreal-Protocol-Ozone-MOP33-Vienna-Convention-COP12-summary>.
- IISD, 2022a, *Bonn Climate Change Conference June 2022 - Summary report 6-16 June 2022*. IISD, 2022. Online available at <https://enb.iisd.org/bonn-climate-change-conference-sbi56-sbsta56-summary>.

- IISD, 2022b, *Summary report of the 44th Meeting of the Open-ended Working Group of the Parties to the Montreal Protocol (OEWG-44) and 5th Extraordinary Meeting of the Parties to the Montreal Protocol (ExMOP-5)*, 2022. Online available at <https://enb.iisd.org/montreal-protocol-ozone-oewg-44-extraordinary-meeting-parties-exmop-5-summary>.
- IMO - International Maritime Organization, 2015, *Third IMO Greenhouse Gas Study 2014*. In collaboration with Smith, t. W. P.; Jalkanen, J. P. et al. London, 2015.
- IMO - International Maritime Organization, 2020, *Fourth IMO GHG Study 2020, Reduction of GHG Emissions from Ships (MEPC 75/7/15)*. London, 2020. Online available at <https://docs.imo.org/Shared/Download.aspx?did=125134>.
- IMO, 2009, *Second IMO GHG Study 2009*, Update of the 2000 IMO GHG Study. Final report covering Phase 1 and Phase 2 (MEPC 59/INF.10). IMO, 2009. Online available at <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/SecondIMOGHGStudy2009.pdf>.
- IMO, 2018, *Adoption of the initial IMO strategy on reduction of GHG emissions from ships and existing IMO activity related to reducing GHG emissions in the shipping sector*, Note by the International Maritime Organization to the UNFCCC Talanoa Dialogue - Resolution MEPC.304(72), 13 Apr 2018. Online available at https://unfccc.int/sites/default/files/resource/250_IMO%20submission_Talanoa%20Dialogue_April%202018.pdf.
- India, 2022, *India's Updated First Nationally Determined Contribution Under Paris Agreement*, 2022. Online available at <https://unfccc.int/sites/default/files/NDC/2022-08/India%20Updated%20First%20Nationally%20Determined%20Contrib.pdf>.
- Indonesia, 2016, *Intended Nationally Determined Contribution*, 2016. Online available at https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Indonesia/1/INDC_REPUBLIC%20OF%20INDONESIA.pdf.
- Indonesia, 2021, *Long-Term Strategy for Low Carbon and Climate Resilience 2050*, 2021. Online available at https://unfccc.int/sites/default/files/resource/Indonesia_LTS-LCCR_2021.pdf.
- INKA consult, 2021, *Setting the standard: Climate finance from EU and EFTA Member States*. ACT Alliance EU (ed.), 2021. Online available at https://actalliance.eu/wp-content/uploads/2021/01/ACT-Alliance_EU_SettingTheStandard.pdf.
- INKA consult, CARE, 2021, *Climate adaptation finance: Fact or fiction?*. CARE (ed.), 2021. Online available at https://www.care-international.org/files/files/CARE_Climate_Adaptation_Finance_Fact_or_Fiction.pdf.
- IPCC, 2006, *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). IGES, Japan., 2006. Online available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.
- IPCC, 2018, *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change*. Cambridge: Cambridge University Press. Online available at <https://www.ipcc.ch/sr15/>.
- IPCC, 2019a, *2019 Refinement to the 2006 Guidelines for National Greenhouse Gas Inventories*. IPCC, 2019. Online available at <https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/>.

- IPCC, 2019b, *Climate change and land. Summary for policy makers*, An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. IPCC, 2019. Online available at <https://www.ipcc.ch/report/srccl/>.
- IPCC, 2019c, *Special report on the ocean and cryosphere in a changing climate*. IPCC, 2019. Online available at <https://www.ipcc.ch/srocc/home/>.
- IPCC, 2021a, *Short-Lived Climate Forcers*, Chapter 6 of Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, 2021. Online available at https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter06.pdf.
- IPCC, 2021b, *Summary for Policymakers* (Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change). Masson-Delmotte, V.; Zhai, P.; Pirani, A.; Connors, S. L.; Péan, C.; Berger, S. et al. (ed.). Cambridge and New York, 2021. Online available at https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf.
- IPCC, 2022a, *Summary for Policymakers* (Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change). Cambridge and New York, 2022. Online available at https://report.ipcc.ch/ar6wg2/pdf/IPCC_AR6_WGII_SummaryForPolicymakers.pdf.
- IPCC, 2022b, *Summary for Policymakers* (Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change). Cambridge and New York, 2022. Online available at https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf.
- Ireland, G., Burton, J., 2018, *An assessment of new coal plants in South Africa's electricity future*, 2018. Online available at thegreentimes.co.za/wp-content/uploads/2018/06/Assessment-of-South-Africa-coal-plants.pdf.
- Japan, 2021, *The Long-Term Strategy under the Paris Agreement*, 2021. Online available at https://unfccc.int/sites/default/files/resource/Japan_LTS2021.pdf.
- Japan, 2022, *National Greenhouse Gas Inventory Report of Japan*, 2022. Online available at <https://unfccc.int/documents/461933>.
- Jeffery, L., Nascimento, L., 2022, *Introducing performance distributions to visualise collective progress towards mitigation goals of the Paris Agreement*. NewClimate Institute, 2022. Online available at https://newclimate.org/sites/default/files/2022-06/NewClimate_Introducing%20performance%20distributions%20to%20visualise%20%20collective%20progress%20towards%20mitigation%20goals%20of%20the%20Paris%20Agreement_2Pager_June22.pdf.
- Jeffery, L., Siemons, A. et al., 2021, *The Challenges of Assessing "Collective Progress": Design Options for an effective Global Stocktake process under the UNFCCC* (Climate Change, 28/2021). NewClimate Institute; Oeko-Institut; Wuppertal Institut. UBA (ed.). Dessau-Roßlau, 2021. Online available at <https://www.umweltbundesamt.de/publikationen/the-challenges-of-assessing-collective-progress>.
- Klöwer, M., Allen, M. R. et al., 2021, *Quantifying aviation's contribution to global warming*. In: *Environ. Res. Lett.* 16 (10), p. 104027. DOI: 10.1088/1748-9326/ac286e. Online available at <https://iopscience.iop.org/article/10.1088/1748-9326/ac286e>.

- Koumassi, K. A., Tovivo, K. et al., 2022, *Egypt Climate Governance*, An assessment of the government's ability and readiness to transform Egypt into a zero emissions society. Climate Action Tracker, 2022. Online available at <https://climateactiontracker.org/publications/climate-governance-in-egypt/>.
- Krauss, C. (2022) *Ostracized by the West, Russia Finds a Partner in Saudi Arabia*. In: *The New York Times*, 2022. Online available at <https://www.nytimes.com/2022/09/14/business/energy-environment/russia-saudi-oil-putin-mbs.html>, last accessed on 14 Sep 2022.
- Kriegler, E., Krey, V., et al., 2022, *Data for Figure SPM.4 - Summary for Policymakers of the Working Group III Contribution to the IPCC Sixth Assessment Report*, 10.48490/ys3e-mq98, MetadataWorks, last updated on <https://ipcc-browser.ipcc-data.org/browser/dataset?id=3878>.
- Lallana, F., Bravo, G. et al., 2021, *Exploring deep decarbonization pathways for Argentina*. In: *Energy Strategy Reviews* 36, p. 100670. Online available at <https://www.sciencedirect.com/science/article/pii/S2211467X21000560>.
- Lee, D. S., Fahey, D. W. et al., 2020, *The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018*. *Atmospheric Environment*, 117834. DOI: 10.1016/J.ATMOENV.2020.117834.
- Lee, D. S., Fahey, D. W. et al., 2021, *The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018*. *Atmospheric Environment* 244, p. 117834. DOI: 10.1016/J.ATMOENV.2020.117834.
- Leipold, A., Aptsiauri, G. et al., 2021, *DEPA 2050: Development pathways for aviation up to 2050*. DLR, 2021. Online available at https://www.dlr.de/fw/Portaldata/42/Resources/dokumente/aktuelles/DEPA2050_StudyReport.pdf.
- Lenton, T. M., Rockström, J. et al., 2019, *Climate tipping points — too risky to bet against*. In: *Nature* 575 (7784), pp. 592–595. DOI: 10.1038/d41586-019-03595-0. Online available at <https://www.nature.com/articles/d41586-019-03595-0>.
- Lloyd's Register, 2020, *Summary Report - IMO Marine Environment Protection Committee Seventy-Fifth Session (MEPC 75)*, Briefin Note. Lloyd's Register, 2020.
- Mercopress, 2021, *Mercosur agrees on a negotiating group to deal with climate change*. Online available at <https://en.mercopress.com/2021/11/13/mercosur-agrees-on-a-negotiating-group-to-deal-with-climate-change>.
- Mexico, 2016, *Mexico's Climate Change Mid-Century Strategy*, 2016. Online available at https://unfccc.int/files/focus/long-term_strategies/application/pdf/mexico_mcs_final_cop22nov16_red.pdf.
- Mexico, 2022, *Inventario nacional de emisiones de gases y compuestos de efecto invernadero 1990-2019*, 2022. Online available at <https://unfccc.int/documents/512232>.
- Minas, S., 2021, *Parties step up Paris implementation in COP26 technology decisions*. Online available at <http://cilj.co.uk/2021/12/29/parties-step-up-paris-implementation-in-cop26-technology-decisions/>.
- Ministry of Power, 2020, *Report on optimal generation capacity mix for 2029-2030*, 2020. Online available at https://cea.nic.in/old/reports/others/planning/irp/Optimal_mix_report_2029-30_FINAL.pdf.
- Mitchell, I., Ritchie, E. et al., 2021, *Is Climate Finance Towards \$100 Billion "New and Additional"?* (CGD Policy Paper 205). Center for Global Development, 2021. Online available at <https://www.cgdev.org/publication/climate-finance-towards-100-billion-new-and-additional>.
- Moosmann, L., Herold, A., 2022, *Understanding the Transparency Guidance*, Oeko-Institut Working Paper 7/2021, updated version, March 2022. Berlin, 2022. Online available at <https://www.oeko.de/fileadmin/oekodoc/WP-Transparency-Guidance.pdf>.
- Moosmann, L., Neier, H. et al., 2016, *Implementing the Paris Agreement - Issues at Stake in View of the COP 22 Climate Change Conference in Marrakesh*. Study for the ENVI Committee. European Parliament, Policy

- Department for Economic and Scientific Policy. Brussels, 2016. Online available at [http://www.europarl.europa.eu/RegData/etudes/STUD/2016/587319/IPOL_STU\(2016\)587319_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2016/587319/IPOL_STU(2016)587319_EN.pdf).
- Moosmann, L., Siemons, A. et al., 2021, *The COP26 Climate Change Conference- Status of climate negotiations and issues at stake*, Study for the committee on the Environment, Public Health and Food Safety, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament. Luxembourg, 2021. Online available at [https://www.europarl.europa.eu/RegData/etudes/STUD/2021/695459/IPOL_STU\(2021\)695459_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2021/695459/IPOL_STU(2021)695459_EN.pdf).
 - Myllyvirta, L., 2022, *Russia's fossil fuel exports continue to contract in June, media reporting exaggerates China and India imports*, 14 Jul 2022. Online available at <https://energyandcleanair.org/russias-fossil-fuel-exports-june-2022>.
 - Myllyvirta, L., Thieriot, H. et al., 2022, *Financing Putin's war: Fossil fuel imports from Russia in the first 100 days of the invasion*. Research on Energy and Clean Air, 2022. Online available at https://energyandcleanair.org/wp/wp-content/uploads/2022/06/Financing-Putins-war-100-days_20220613.pdf.
 - Nasiritousi, N., Hjerpe, M. et al., 2016, *The roles of non-state actors in climate change governance: understanding agency through governance profiles*. In: *International Environmental Agreements: Politics, Law and Economics* 16, pp. 109–126. Online available at <https://link.springer.com/article/10.1007/s10784-014-9243-8>.
 - OECD Publishing (ed.), 2022, *OECD Economic Outlook*, June 2022 (2022. edition) (OECD Economic Outlook, 111). OECD. Paris, 2022. Online available at <https://doi.org/10.1787/62d0ca31-en>.
 - OECD, 2021a, *Climate Finance Provided and Mobilised by Developed Countries: Aggregate Trends Updated with 2019 Data* (Climate Finance and the USD 100 Billion Goal). Paris: OECD Publishing.
 - OECD, 2021b, *Forward-looking Scenarios of Climate Finance Provided and Mobilised by Developed Countries in 2021-2025, Technical Note* (Climate Finance and the USD 100 Billion Goal). Paris: OECD Publishing.
 - OECD, 2022a, *Aggregate trends of climate finance provided and mobilised by developed countries in 2013-2020*, 2022. Online available at <https://www.oecd.org/development/statement-by-the-oecd-secretary-general-on-climate-finance-trends-to-2020.htm>.
 - OECD, 2022b, *IEA CO2 Emissions from Fuel Combustion Statistics*, 2022. Online available at https://www.oecd-ilibrary.org/energy/data/iea-co2-emissions-from-fuel-combustion-statistics-greenhouse-gas-emissions-from-energy/ghg-emissions-from-fuel-combustion-summary_445ec5dd-en.
 - Oxfam, 2020, *Climate finance shadow report 2020: Assessing progress towards the \$100 billion commitment*, 2020. Online available at <https://oxfamilibrary.openrepository.com/bitstream/handle/10546/621066/bp-climate-finance-shadow-report-2020-201020-en.pdf>.
 - PCCB - Paris Committee on Capacity-building, 2022, *Synthesis report for the technical assessment component of the first global stocktake*, 2022. Online available at https://unfccc.int/sites/default/files/resource/PCCB_SR_GST.pdf.
 - Prengaman, P., 2022, *Egypt promises to allow protest, push pledges as COP27 host*. AP News (ed.). Online available at <https://apnews.com/article/climate-politics-africa-sameh-shoukry-ef68f280f3fadcb337f673ee55a2762>.
 - Republic of Korea, 2020, *2050 Carbon Neutral Strategy of the Republic of Korea*, 2020. Online available at https://unfccc.int/sites/default/files/resource/LTS1_RKorea.pdf.
 - Republic of Korea, 2021, *The Republic of Korea's Enhanced Update of its First Nationally Determined*

- Contribution*, 2021. Online available at <https://unfccc.int/documents/497641>.
- Republic of Korea, 2022, *Fourth Biennial Update Report of the Republic of Korea*, 2022. Online available at <https://unfccc.int/documents/418616>.
 - Roberts, J. T., Weikmans, R. et al., 2021, *Rebooting a failed promise of climate finance*. In: *Nat. Clim. Chang.* 11 (3), pp. 180–182. DOI: 10.1038/s41558-021-00990-2.
 - Russian Federation, 2020, *Nationally Determined Contribution of the Russian Federation*, 2020. Online available at <https://unfccc.int/documents/497862>.
 - Russian Federation, 2022a, *2022 National Inventory Report (NIR)*, 2022. Online available at <https://unfccc.int/documents/461970>.
 - Russian Federation, 2022b, *Strategy of socio-economic development of the Russian Federation with low greenhouse gas emissions until 2050*, 2022. Online available at <https://unfccc.int/sites/default/files/resource/Strategy%20of%20Socio-Economic%20Development%20of%20the%20Russian%20Federation%20with%20Low%20GHG%20Emissions%20EN.pdf>.
 - Saudi Arabia, 2022a, *Fourth National Communication (NC4) - Kingdom of Saudi Arabia*, 2022. Online available at <https://unfccc.int/documents/461529>.
 - Saudi Arabia, 2022b, *Reducing emissions*. Online available at <https://www.saudigreeninitiative.org/targets/reducing-emissions/>.
 - Saudi Arabia, 2022c, *The Middle East Green Initiative is a catalyst for action*. Online available at <https://www.saudigreeninitiative.org/about-middle-east-green-initiative/>.
 - Saudi Arabia, 2022d, *Updated First Nationally Determined Contribution*, 2022. Online available at <https://unfccc.int/sites/default/files/resource/202203111154--KSA%20NDC%202021.pdf>.
 - SCF - UNFCCC Standing Committee on Finance, 2021, *First report on the determination of the needs of developing country Parties related to implementing the Convention and the Paris Agreement*, 2021. Online available at https://unfccc.int/sites/default/files/resource/54307_2%20-%20UNFCCC%20First%20NDR%20technical%20report%20-%20web%20%28004%29.pdf.
 - Schneider, L., 2021, *COP26 in Glasgow delivered rules for international carbon markets – how good or bad are they?* Online available at <https://blog.oeko.de/glasgow-delivered-rules-for-international-carbon-markets-how-good-or-bad-are-they-cop26/>.
 - Schneider, L., Wissner, N., 2021, *Fit for purpose? Key issues for the first review of CORSIA*. Oeko-Institut, 2021. Online available at <https://www.oeko.de/fileadmin/oekodoc/Key-issues-for-first-review-of-CORSIA.pdf>.
 - Shaw, A., Smith, T., 2022, *An overview of the discussions from IMO MEPC 78*. UMAS, 2022. Online available at <https://www.u-mas.co.uk/wp-content/uploads/2022/06/MEPC-78-overview-UMAS.pdf>.
 - Shishlov, I., Censkowsky, P., 2022, *Definitions and accounting of climate finance: between divergence and constructive ambiguity*. In: *Climate Policy* 22 (6), pp. 798–816. DOI: 10.1080/14693062.2022.2080634.
 - Siemons, A., Schneider, L. et al., 2021, *Options for regulating the climate impacts of aviation*. Oeko-Institut. Stiftung Klimaneutralität (ed.), 2021. Online available at <https://www.oeko.de/fileadmin/oekodoc/Options-for-regulating-the-climate-impacts-of-aviation.pdf>.
 - Siemons, A., Schneider, L., 2022, *Averaging or multi-year accounting?, Environmental integrity implications for using international carbon markets in the context of single-year targets*. In: *Climate Policy*. DOI: 10.1080/14693062.2021.2013154. Online available at <https://www.tandfonline.com/doi/pdf/10.1080/14693062.2021.2013154>.

- South Africa, 2020, *South Africa's Low-Emission Development Strategy 2050*, 2020. Online available at <https://unfccc.int/sites/default/files/resource/South%20Africa%27s%20Low%20Emission%20Development%20Strategy.pdf>.
- South Africa, 2021a, *First Nationally Determined Contribution under the Paris Agreement*, Updated September 2021, 2021. Online available at <https://unfccc.int/sites/default/files/NDC/2022-06/South%20Africa%20updated%20first%20NDC%20September%202021.pdf>.
- South Africa, 2021b, *National GHG Inventory Report South Africa 2017*, 2021. Online available at <https://unfccc.int/documents/307107>.
- South Africa, 2021c, *South Africa's 4th Biennial Update Report to the United Nations Framework Convention on Climate Change*, 2021. Online available at <https://unfccc.int/documents/307104>.
- TEC - Technology Executive Committee, 2022, *Draft workplan of the Technology Executive Committee for 2023-2027*, TEC/2022/25/16, 2022. Online available at https://unfccc.int/ttclear/misc/StaticFiles/gnwoerk_static/tn_meetings/246612ac8e984e629effd94ca790e430/a1dc752aea104070a92c4cfa02db6e05.pdf.
- Technology and Economic Assessment Panel, 2022, *Report of the Technology and Economic Assessment Panel: Volume 3: Decision XXXIII/5 - Continued provision of information on energy-efficient and low-global-warming-potential technologies*, 2022. Online available at <https://ozone.unep.org/system/files/documents/TEAP-EETF-report-may-2022.pdf>.
- The White House, 2022, *U.S. Ratification of the Kigali Amendment*, 2022. Online available at <https://www.state.gov/u-s-ratification-of-the-kigali-amendment/>.
- Trout, K., Muttitt, G. et al., 2022, *Existing fossil fuel extraction would warm the world beyond 1.5 °C*. In: *Environ. Res. Lett.* 17 (6), p. 64010. DOI: 10.1088/1748-9326/ac6228. Online available at <https://iopscience.iop.org/article/10.1088/1748-9326/ac6228>.
- Turkey, 2022, *Turkish Greenhouse Gas Inventory 1990-2020*, 2022. Online available at <https://unfccc.int/documents/461926>.
- UN Economic Analysis & Policy Division, 2022, *Least Developed Countries (LDCs)*. Online available at <https://www.un.org/development/desa/dpad/least-developed-country-category.html>.
- UNEP, 2022, *The Importance of Energy Efficiency in the Refrigeration, Air-conditioning and Heat Pump Sectors*, Briefing note A, 2022. Online available at https://ozone.unep.org/sites/default/files/2019-08/briefingnote-a_importance-of-energy-efficiency-in-the-refrigeration-air-conditioning-and-heat-pump-sectors.pdf.
- UNFCCC Standing Committee on Finance, 2021, *Fourth (2020) Biennial Assessment and overview of climate finance flows*. SCF, 2021. Online available at https://unfccc.int/sites/default/files/resource/54307_1%20-%20UNFCCC%20BA%202020%20-%20Report%20-%20V4.pdf.
- UNFCCC, 1992, *United Nations Framework Convention on Climate Change (UNFCCC)*. Online available at http://unfccc.int/files/essential_background/convention/background/application/pdf/convention_text_with_annexes_english_for_posting.pdf.
- UNFCCC, 1998, *Kyoto Protocol to the United Nations Framework Convention on Climate Change*. UNFCCC, 1998. Online available at <http://unfccc.int/resource/docs/convkp/kpeng.pdf>.
- UNFCCC, 2014, *Decision 1/CP.20: Lima call for climate action*, FCCC/CP/2014/10/Add.1, 2014. Online available at <https://unfccc.int/documents/8611>.
- UNFCCC, 2015a, *Decision 1/CP.21: Adoption of the Paris Agreement* (FCCC/CP/2015/10/Add.1). Online available at <https://unfccc.int/documents/9097>.

- UNFCCC, 2015b, *Paris Agreement*, 2015. Online available at http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf.
- UNFCCC, 2017a, *Decision 2/CP.23 - Local communities and indigenous peoples platform*, FCCC/CP/2017/11/Add.1, p. 11, 2017. Online available at <https://unfccc.int/documents/65126>.
- UNFCCC, 2017b, *Decision 3/CP.23 - Establishment of a gender action plan*, FCCC/CP/2017/11/Add.1, 2017. Online available at <https://unfccc.int/documents/65126>.
- UNFCCC, 2017c, *Decision 4/CP.23 - Koronivia joint work on agriculture*, FCCC/CP/2017/11/Add.1, p. 19, 2017. Online available at <https://unfccc.int/documents/65126>.
- UNFCCC, 2018a, *Decision 1/CP.24: Preparations for the implementation of the Paris Agreement and the first session of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement*. Source of information: FCCC/CP/2018/10/Add.1, p.2. Online available at <https://unfccc.int/documents/193360>.
- UNFCCC, 2018b, *Decision 18/CMA.1: Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement*. Source of information: FCCC/PA/CMA/2018/3/Add.2, p.13. Online available at <https://unfccc.int/documents/193408>.
- UNFCCC, 2018c, *Decision 20/CMA.1 Modalities and procedures for the effective operation of the committee to facilitate implementation and promote compliance referred to in Article 15, paragraph 2, of the Paris Agreement*. Online available at https://unfccc.int/sites/default/files/resource/cma2018_3_add2%20final_advance.pdf.
- UNFCCC, 2018d, *Decision 9/CMA.1 : Further guidance in relation to the adaptation communication, including, inter alia, as a component of nationally determined contributions, referred to in Article 7, paragraphs 10 and 11, of the Paris Agreement*. Source of information: FCCC/PA/CMA/2018/3/Add.1, p.23. Online available at <https://unfccc.int/documents/193407>.
- UNFCCC, 2019a, *Decision 2/CMA.2, Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts and its 2019 review*. Online available at <https://unfccc.int/documents/210477>.
- UNFCCC, 2019b, *What is education and outreach?* Online available at <https://unfccc.int/topics/education-and-outreach/the-big-picture/what-is-education-and-outreach>.
- UNFCCC, 2021a, *Decision 1/CMA.3, Glasgow Climate Pact*. Online available at <https://unfccc.int/documents/460950>.
- UNFCCC, 2021b, *Decision 5/CMA.3: Guidance for operationalizing the modalities, procedures and guidelines for the enhanced transparency framework referred to in Article 13 of the Paris Agreement*, FCCC/PA/CMA/2021/10/Add.2, 2021. Online available at <https://unfccc.int/documents/460951>.
- UNFCCC, 2021c, *Decision 6/CMA.3: Common time frames for nationally determined contributions referred to in Article 4, paragraph 10, of the Paris Agreement*, FCCC/PA/CMA/2018/3/Add.1, 2021. Online available at <https://unfccc.int/documents/460952>.
- UNFCCC, 2021d, *List of participants*, FCCC/CP/2021/INF.3, 2021. Online available at <https://unfccc.int/documents/323052>.
- UNFCCC, 2022a, *Admitted NGOs*. Online available at <https://unfccc.int/process-and-meetings/parties-non-party-stakeholders/non-party-stakeholders/admitted-ngos#eq-2>.
- UNFCCC, 2022b, *Co-facilitators' informal note on SBSTA/SBI agenda item 6 - Matters relating to the work programme for urgently scaling up mitigation ambition and implementation referred to in paragraph 27 of decision 1/CMA.3*, IN.SBI56.i6_SBSTA56.i6.2, 2022. Online available at <https://unfccc.int>

[/documents/510584.](#)

- UNFCCC, 2022c, *Compilation and synthesis of indicators, approaches and metrics for reviewing overall progress in achieving the global goal on adaptation*, 2022. Online available at <https://unfccc.int/documents/613843>.
- UNFCCC, 2022d, *Gender composition and progress on implementation*, 2022. Online available at <https://unfccc.int/documents/611303>.
- UNFCCC, 2022e, *Non-Party Stakeholders - Statistics*. Online available at <https://unfccc.int/process-and-meetings/parties-non-party-stakeholders/non-party-stakeholders/statistics>.
- UNFCCC, 2022f, *Party groupings*. Online available at <https://unfccc.int/process-and-meetings/parties-non-party-stakeholders/parties/party-groupings>, last updated on 2022.
- UNFCCC, 2022g, *Reference Manual for the Enhanced Transparency Framework under the Paris Agreement*, 2022. Online available at <https://unfccc.int/sites/default/files/resource/ETFReferenceManual.pdf>.
- United Kingdom, 2021, *Net Zero Strategy: Build Back Greener*, 2021. Online available at <https://unfccc.int/sites/default/files/resource/UK%20Net%20Zero%20Strategy%20-%20Build%20Back%20Greener.pdf>.
- United Kingdom, 2022, *UK Greenhouse Gas Inventory, 1990 to 2020*, 2022. Online available at <https://unfccc.int/documents/461922>.
- United Nations, 2022a, *Global impact of the war in Ukraine Billions of people face the greatest cost-of-living crisis in a generation* (UN Global Crisis Response Group on Food, Energy, and Finance, Brief No. 2), 2022. Online available at <https://bit.ly/GCRG-Brief-02>.
- United Nations, 2022b, *Status of Treaties - 7. United Nations Framework Convention on Climate Change*. Online available at https://treaties.un.org/Pages/ViewDetailsIII.aspx?src=IND&mtdsg_no=XXVII-7&chapter=27&Temp=mtdsg3&clang=en.
- United Nations, 2022c, *Status of Treaties - 7.d Paris Agreement*, 2022. Online available at https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-7-d&chapter=27&clang=en.
- United States of America, 2021, *The Long-Term Strategy of the United States*, 2021. Online available at <https://unfccc.int/documents/308100>.
- United States of America, 2022, *Inventory of U.S. Greenhouse Gas Emissions and Sinks*, 2022. Online available at <https://unfccc.int/documents/461948>.
- Unterstell, N., Martins, N., 2022, *NDC: Analysis of the 2022 update submitted by the Government of Brazil*, 2022. Online available at https://www.politicapointeiro.org/wp-content/uploads/2022/04/Brazils-NDC-2022-analysis_V0.pdf.
- van Meijl, H., Bartelings, H. et al., 2022, *Impacts of the conflict in Ukraine on global food security*. In: 97894644. DOI: 10.18174/570589. Online available at <https://research.wur.nl/en/publications/impacts-of-the-conflict-in-ukraine-on-global-food-security>.
- World Bank Group, 2022, *Commodity Markets Outlook: The Impact of the War in Ukraine on Commodity Markets*. World Bank. Washington D.C., 2022. Online available at <https://openknowledge.worldbank.org/handle/10986/37223>.
- WRI, 2022, *What Is "Loss and Damage" from Climate Change? 6 Key Questions, Answered*, World Resources Institute. Online available at <https://www.wri.org/insights/loss-damage-climate-change>.

This study provides an overview of the status of international climate negotiations and issues at stake at the COP27 Climate Change Conference that will take place in Sharm El-Sheikh (Egypt) from 6 to 18 November 2022. It also addresses the current implementation of the Paris Agreement, the stakeholders in the negotiations and the climate policies of key Parties.

This document was provided by the Policy Department for Economic, Scientific and Quality of Life Policies at the request of the Committee on the Environment, Public Health and Food Safety (ENVI).

PE 733.989
IP/A/ENVI/2022-6

Print ISBN 978-92-846-9796-0 | doi: 10.2861/93866 | QA-04-22-067-EN-C
PDF ISBN 978-92-846-9795-3 | doi: 10.2861/742165 | QA-04-22-067-EN-N