Studio: attuazione dell’accordo di Parigi – nuove sfide in vista della COP23

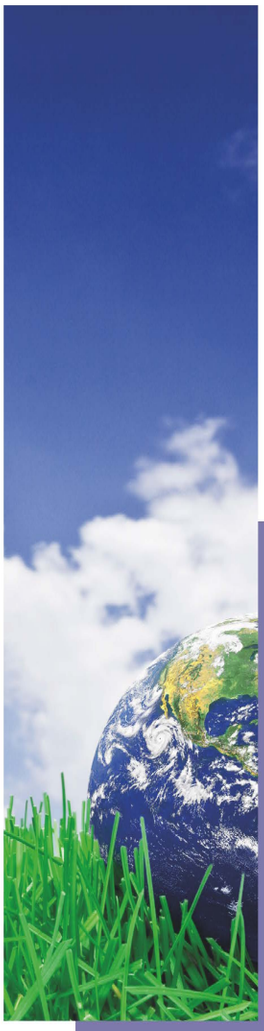
Questo studio riassume gli sviluppi che hanno portato all'adozione dell'accordo di Parigi sul cambiamento climatico nel 2015 e fornisce una panoramica dei suoi contenuti. L'ulteriore processo di attuazione e il ruolo dei principali partiti e di altre parti interessate vengono discusse, nonché gli sviluppi internazionali connessi e le sfide della conferenza sul cambiamento climatico a Bonn nel novembre 2017. **Per ulteriori informazioni e documentazione:**

- Study: Implementing the Paris Agreement – New Challenges in View of the COP 23

European Parliament

DIRECTORATE-GENERAL FOR INTERNAL POLICIES

POLICY DEPARTMENT A
ECONOMIC AND SCIENTIFIC POLICY



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Implementing the Paris Agreement – New Challenges in View of the COP 23 Climate Change Conference

Study for the ENVI Committee

EN

2017

Implementing the Paris Agreement – New Challenges in View of the COP 23 Climate Change Conference

DIRECTORATE GENERAL FOR INTERNAL POLICIES
POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

Implementing the Paris Agreement – New Challenges in View of the COP 23 Climate Change Conference

STUDY

Abstract

This study summarises the developments leading to the adoption of the Paris Agreement on climate change in 2015 and provides an overview of its contents. The further implementation process and the roles of the main Parties and other stakeholders are discussed, as well as related international developments and the challenges of the climate change conference in Bonn in November 2017.

The study was provided by Policy Department A at the request of the Committee on the Environment, Public Health and Food Safety (ENVI).

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CONTENTS

LIST OF ABBREVIATIONS

A4A	Airlines for America
AC	Adaptation Committee
ADP	Ad Hoc Working Group on the Durban Platform for Enhanced Action
AF	Adaptation Fund
AILAC	Independent Alliance of Latin America and the Caribbean (Asociación Independiente de Latinoamérica y el Caribe)
ALBA	Bolivarian Alliance for the Peoples of Our America (Alianza Bolivariana para los Pueblos de Nuestra América)
AOSIS	Alliance of Small Island States
APA	Ad Hoc Working Group on the Paris Agreement
AR5	Fifth Assessment Report of the IPCC
AR6	Sixth Assessment Report of the IPCC
AREI	Africa Renewable Energy Initiative
BASIC	Brazil, South Africa, India and China
BAU	Business As Usual
BINGO	Business and Industry Non-Governmental Organisations
C	Celsius
C40	Network of 40 cities addressing climate change
CAD	Canadian Dollar
CAEP	Committee on Aviation Environmental Protection
CAN	Climate Action Network
CARICOM	Caribbean Community
CCAFS	Climate Change, Agriculture and Food Security
CBDR	Common But Differentiated Responsibilities

CCRIF	Caribbean Catastrophe Risk Insurance Facility
CCS	Carbon Capture and Storage
CDM	Clean Development Mechanism
CDP	Carbon Disclosure Project
CFCs	Chlorofluorocarbons
CfRN	Coalition for Rainforest Nations
CH_4	Methane
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
CO_2	Carbon dioxide
COP	Conference of the Parties
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CPRD	Center for Participatory Research and Development
CTCN	Climate Technology Centre and Network
CVF	Climate Vulnerable Forum
EAG	Environment Advisory Group
EEDI	Energy Efficiency Design Index
EIG	Environmental Integrity Group
ENGO	Environmental Non-Governmental Organisations
EPA	(United States) Environmental Protection Agency
ESD	Effort Sharing Decision
EU	European Union

EU ETS	European Union Emissions Trading Scheme (until 2012); European Union Emissions Trading System (from 2013 onwards)
FAO	Food and Agriculture Organization
FoEI	Friends of the Earth International
FPIC	Free, Prior and Informed Consent
G7	Group of Seven
G20	Group of Twenty
G-77	Group of 77 at the United Nations
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GLADs	Global Aviation Dialogues
GMBM	Global Market-Based Measure
GMTF	Global Market-Based Measure Technical Task Force
Gt	Gigatonnes
GTP	Global Temperature Potential
GWP	Global Warming Potential
HCFCs	Hydrochlorofluorocarbons
HFCs	Hydrofluorocarbons
IAR	International Assessment and Review
IATA	International Air Transport Association
IBRD	International Bank for Reconstruction and Development
ICA	International Consultation and Analysis
ICAO	International Civil Aviation Organization

ICC	International Chamber of Commerce
ICLEI	International Council for Local Environmental Initiatives
ICSA	International Coalition for Sustainable Aviation
ICSID	International Centre for Settlement of Investment Disputes
IDA	International Development Association
IEA	International Energy Agency
IFC	International Finance Corporation
IGO	Inter-Governmental Organisation
IIPFCC	International Indigenous Peoples' Forum on Climate Change
IMF	International Monetary Fund
IMO	International Maritime Organization
INDC	Intended Nationally Determined Contribution
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
IPO	Indigenous Peoples Non-Governmental Organisations
IPR	Intellectual Property Rights
IRENA	International Renewable Energy Agency
ISA	International Solar Alliance
ISWG	Intersessional Working Group (on reduction of greenhouse gas emissions from ships)
ITMO	Internationally Transferred Mitigation Outcome
ITUC	International Trade Union Confederation
JCM	Joint Credit Mechanism
JI	Joint Implementation
LDC	Least Developed Countries

LDCF	Least Developed Countries Fund
LEDS	Low Emission Development Strategy
LEG	Least Developed Countries Expert Group
LGMA	Local Government and Municipal Authorities
LMDC	Like-Minded Developing Countries
LPAA	Lima-Paris Action Agenda
LULUCF	Land Use, Land Use Change and Forestry
MBM	Market-Based Measure
MEF	Major Economies Forum on Energy and Climate
MEPC	Marine Environment Protection Committee
MIGA	Multilateral Investment Guarantee Agency
MoI	Means of Implementation (finance, technology development and transfer, capacity-building)
MOP	Meeting of the Parties to the Montreal Protocol
MOU	Memorandum of Understanding
MRV	Monitoring, Reporting and Verification
Mt	Megatonnes
N_2O	Nitrous oxide
NAMA	Nationally Appropriate Mitigation Action
NAP	National Adaptation Plan
NAZCA	Non-State Actor Zone for Climate Action
NDC	Nationally Determined Contribution
NF_3	Nitrogen trifluoride
NGO	Non-Governmental Organisation
NWP	Nairobi Work Programme

ODA	Official Development Assistance
ODS	Ozone Depleting Substances
OECD	Organisation for Economic Co-operation and Development
PCCB	Paris Committee on Capacity-building
PFCs	Perfluorocarbons
REDD+	Reducing Emissions from Deforestation and Forest Degradation, including the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries
REEEI	Renewable Energy and Energy Efficiency Initiative
RINGO	Research and Independent Non-Governmental Organisations
SB	Subsidiary Bodies
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice
SCCF	Special Climate Change Fund
SCF	Standing Committee on Finance
SDG	Sustainable Development Goal
SEEMP	Ship Energy Efficiency Management Plan
SF_6	Sulphur hexafluoride
SIDS	Small Island Developing States
SR	Special Report (of the IPCC)
SR1.5	Special Report the on the impacts of global warming of 1.5 degrees C above pre-industrial levels and related global greenhouse gas emission pathways
SROCC	Special Report the Ocean and Cryosphere in a Changing Climate

SRCCL	Special Report on desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems
TEC	Technology Executive Committee
TEP	Technical Examination Process
TNA	Technology Needs Assessment
TUNGO	Trade Union Non-Governmental Organisations
UCLG	United Cities and Local Governments
UK	United Kingdom (of Great Britain and Northern Ireland)
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UN-REDD	United Nations Programme on Reducing Emissions from Deforestation and Forest Degradation
USD	United States Dollar
V20	Vulnerable Twenty
WFO	World Farmers Organisation
WIM	Warsaw International Mechanism on Loss and Damage
WMO	World Meteorological Organization
YOUNGO	Youth Non-Governmental Organisations

LIST OF BOXES

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

International climate negotiations and the Paris Agreement

At the climate change conference in Paris in December 2015, an agreement was reached which contains goals and mechanisms for responding to climate change and binding obligations for all Parties. The Paris Agreement is the result of negotiations under the United Nations Framework Convention on Climate Change (UNFCCC) and goes beyond the Kyoto Protocol, which only committed a limited number of Parties to reduce their greenhouse gas emissions.

The Paris Agreement sets a long-term goal of limiting the increase in the global average temperature to well below 2 degrees Celsius © above pre-industrial levels, and of pursuing efforts to limit this temperature increase to 1.5 degrees C. It also includes the goal to increase the ability to adapt to the adverse impacts of climate change and to make finance flows consistent with a pathway towards low greenhouse gas emissions.

In order to achieve these goals, the Paris Agreement requires all Parties to undertake efforts towards reaching global peaking of greenhouse gas emissions as soon as possible and towards achieving a balance between anthropogenic emissions by sources and removals by sinks in the second half of the 21st century. Parties choose the efforts and measures themselves (the so-called Nationally Determined Contributions), but the Paris Agreement provides for a mechanism of assessing progress and increasing global ambition over time by a regular "global stocktake".

In addition to climate change mitigation, the Paris Agreement aims at enhancing adaptive capacity, strengthening resilience and reducing the vulnerability to climate change. The Agreement also acknowledges the importance of addressing loss and damage associated with the adverse effects of climate change. The Agreement contains comprehensive provisions on support to be provided to developing countries, which includes finance, technology development and transfer, and capacity-building. In order to ensure that such support and actions are transparent, the Agreement contains a number of reporting provisions.

The Paris Agreement addresses the period from 2020 onwards. In addition, the Conference of the Parties agreed on specific activities for the period before 2020, including the promotion of and an exchange on mitigation and adaptation actions.

It is important to note that, according to recent studies, the temperature increase by the end of the 21st century will be closer to 3 degrees C given the currently pledged mitigation contributions. Hence, more extensive mitigation efforts are required to bring the world on a path towards the temperature goal of the Paris Agreement.

Entry into force and implementation of the Paris Agreement

The urgent need for action in response to rising global temperatures was emphasised by many governments in the year following the adoption of the Paris Agreement. A large number of Parties ratified the Agreement during the year 2016, including China, the United States, the European Union and many of its Member States. The Agreement entered into force on 4 November 2016.

Shortly thereafter, delegates convened for a climate change conference in Marrakesh to negotiate the details of the Agreement's implementation. These included the contents of the Nationally Determined Contributions, cooperative mechanisms, reporting obligations and the preparation for the global stocktake, including a "facilitative dialogue" scheduled for 2018. Negotiations continued in May 2017 and will be taken up again at the conference in Bonn in November 2017, which will be presided over by the Republic of Fiji.

The role of the main Parties and groups of Parties

The year 2017 saw new challenges emerging when President Donald Trump announced that the United States would withdraw from the Paris Agreement. Although the U.S. withdrawal will not become effective until late in 2020, U.S. mitigation measures and the financial support the United States provides to developing countries will certainly suffer a setback.

China has surpassed the U.S. as the world's largest emitter of greenhouse gases in 2005. It has seen a strong emission growth over the past 15 years, but its CO_2 emissions decreased slightly in 2015. The recent expansion of solar and wind energy will contribute to the achievement of China's goal of reversing its CO_2 emission trend.

After China and the United States, the European Union is the third largest emitter of greenhouse gases. It is currently preparing climate and energy policies which will be needed to meet the Union's climate change mitigation commitments by 2030.

In the climate negotiations, Parties that share similar views often bring forward their positions in a coordinated way. A large number of developing countries are represented by the group of "G-77 and China". On the other hand, the United States sides with developed countries in the so-called Umbrella Group. Other negotiating groups include, *inter alia*, associations of developing countries, regional associations of countries, and the Alliance of Small Island States.

Other stakeholders and groups of countries

Besides the Parties and groups of Parties, other stakeholders play an important role in the run-up to and during climate change conferences, as they present their positions and their support for specific negotiating topics. Among the non-governmental organisations (NGOs), environmental NGOs have been actively voicing their positions from the beginning of the climate change negotiations. Other large groups of NGOs include research/independent NGOs and business and industry NGOs.

Apart from the main negotiating groups, other groups of countries are also of interest as they coordinate their approaches and convey their messages ahead of the climate change conferences. In 2017, climate change was a main issue at the meetings of the Group of Seven (G7) and the Group of Twenty (G20), where the division over climate change issues between the United States and other major economies was exposed.

Furthermore, there are international organisations with close links to climate negotiations, such as the Intergovernmental Panel on Climate Change (IPCC) which has been requested under the Paris Agreement to provide scientific information on future emission pathways, or the International Civil Aviation Organization (ICAO).

Other sectoral agreements and developments

In October 2016, the ICAO assembly adopted a resolution on a Global Market-based Measure, which aims at offsetting the increase in greenhouse gas emissions from international aviation. In the same month, an amendment to the Montreal Protocol was adopted, committing Parties to a stepwise phase-down of hydrofluorocarbons as they are potent greenhouse gases.

Other recent climate-change related developments on the international level include negotiations on mitigation strategies in maritime transport and the adoption of the United Nations Sustainable Development Goals and the Sendai Framework for Disaster Risk Reduction in 2015.

Besides, energy markets and energy policies may impede and/or support the transition to a low-carbon economy in the coming years. Geo-engineering, i.e. large-scale technologies for altering the climate system, are being discussed as an option to alleviate the impacts of climate change in the future.

The challenges of the conference in Bonn

The Paris Agreement specifies the goals and lays down the general procedure for addressing climate change, but the details of its implementation still need to be discussed and agreed by the Parties. The implementation guidelines and modalities, also known as the "Paris rule-book", will be a main focus of the climate change conference in Bonn from 6 to 17 November 2017. At this conference, Parties to the UNFCCC, the Kyoto Protocol and the Paris Agreement will meet, as will subsidiary bodies, to discuss a wide range of technical issues.

Delegates in Bonn will face the challenge of having to find common ground on these issues, bearing in mind that the year 2018 has been set as the deadline for finalising the various guidelines and modalities. Negotiators will have to coordinate a number of negotiation strands and find common ground between diverging interests, amid uncertainties about financing and about the future role of the United States. A substantial amount of work lies ahead for the delegates before they will be able to agree on a comprehensive and balanced outcome.

1. INTRODUCTION

1.1. The Paris Agreement and the climate change conference in Bonn

At the Conference of the Parties (COP) in December 2015 in Paris, an international agreement was reached which is widely seen as a milestone in the global endeavour to respond to climate change. The Paris Agreement constitutes a universal and binding agreement with specific goals for climate change mitigation, adaptation and support.

The Agreement entered into force in November 2016, earlier than many had expected, but its implementation is faced with a number of challenges. The United States, the second largest emitter of greenhouse gases, intends to withdraw from the Paris Agreement. The combined efforts communicated by other Parties are still falling short of reaching the ambitious temperature goal of the Paris Agreement, and gaps are emerging in areas such as support provided to developing countries or the aim to increase ambition before the year 2020.

As far as the international negotiations are concerned, Parties face the difficult task of having to agree on a large number of technical details, in order to ensure an effective implementation of the Paris Agreement. The end of 2018 has been set as a deadline for these negotiations, and considerable progress on those topics will have to be made during the upcoming COP 23 in Bonn in November 2017.

1.2. Aim of the study

This document aims to provide a comprehensive overview of the Paris Agreement, its current state of implementation and its implications for the worldwide response to climate change. It summarises the process that led to the Paris Agreement, the negotiations and events which have taken place since then and the challenges for the upcoming COP in Bonn. This includes an overview of the negotiation strands, the positions of the main stakeholders, and other global developments which are interlinked with climate change action and support.

The present study was commissioned by the European Parliament and is intended for members of the European Parliament delegation to the COP in Bonn. The study also addresses a wider audience by presenting an overview of the Paris Agreement and the current issues at stake in the climate negotiations. It provides concise explanations of the key terms, the negotiation bodies and documents, and it summarises the positions of the main Parties, groups of Parties, as well as governmental and non-governmental stakeholder groups.

1.3. Structure of the document

Chapter 2 of this study provides an overview of the main milestones in the climate negotiations leading to the Paris Agreement. It gives information on key documents such as the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol or the Doha Amendment.

Chapter 3 provides an overview of the contents of the Paris Agreement and an introduction to its main pillars, including mitigation, adaptation and financial, technological and capacity-building support.

The main milestones after the adoption of the Paris Agreement are described in chapter 4. These include its entry into force in November 2016, the climate change conference which took place in Marrakesh shortly thereafter and the negotiations in 2017. This chapter also discusses the state of progress towards the temperature goal of the Paris Agreement and the related challenges.

In chapter 5, information on the main Parties is given. This chapter presents the ten largest emitters of carbon dioxide (CO_2), which include both developed and developing countries. A comprehensive sub-chapter is dedicated to the European Union (EU) and its climate policies.

Like the Member States of the European Union, other Parties present their positions as a group in the climate negotiations, bringing together, for example, small island states or like-minded developing countries. The positions of these groups are laid out in chapter 6.

Besides the Parties to the UNFCCC, other stakeholders voice their positions on climate change in general and on the implementation of the Paris Agreement in particular. These include environmental organisations, industry stakeholders and groups of countries such as the Group of Twenty (G20). Their positions are summarised in chapter 7.

The Paris Agreement does not constitute the only approach to mitigating climate change. In chapter 8, activities and agreements are discussed which aim at limiting greenhouse gas (GHG) emissions in the sectors international aviation, international shipping and fluorinated gases.

Whether climate change will be addressed effectively and the goals of the Paris Agreement will be met will depend on other factors which govern present and future policies, such as energy markets or migration. There are also important links to the implementation of the United Nations Sustainable Development Goals (SDGs) and the Sendai Framework for Disaster Risk Reduction. In chapter 9, a summary of these factors and links is given. Finally, in chapter 10 the main challenges of the upcoming COP in Bonn are summarised and an outlook is given on the work that is expected to be addressed by the international community in 2018 and beyond.

2. A BRIEF HISTORY OF CLIMATE NEGOTIATIONS

This chapter presents an overview of the milestones in the climate negotiations up to the conference in Paris in 2015. These include the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol and the process that led to the adoption of the Paris Agreement. The contents of the Paris Agreement are presented in chapter 3.

2.1. The UNFCCC and the Conference of the Parties

The drafting of an international convention on climate change was initiated at the Toronto Conference in 1988, which can be seen as the starting point of international climate negotiations. At the United Nations (UN) Conference on Environment and Development in Rio de Janeiro in 1992, the United Nations Framework Convention on Climate Change was signed, which sets the framework for negotiating specific agreements, such as the Kyoto Protocol and the Paris Agreement.

Box 1: The United Nations Framework Convention on Climate Change (UNFCCC)

The objective of the United Nations Framework Convention on Climate Change is to achieve "stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (UNFCCC 1992). To this end, the Convention emphasises the common but differentiated responsibilities (CBDR) of the Parties, the principle of taking precautionary measures, and the importance of enabling economic development to proceed in a sustainable manner.

The Convention commits developed country Parties to adopt national policies and take measures on climate change mitigation. These developed country Parties are listed in Annex I to the Convention and include Parties undergoing the process of transition to a market economy. In Annex II to the Convention, Parties are listed that are required to assisting and providing financial support to developing countries.

The Convention also includes matters such as research and systematic observation, education, as well as the establishment of the UNFCCC secretariat, the Conference of the Parties and subsidiary bodies to assist the Conference of the Parties (see Box 2 and Box 3). The Convention was adopted at the United Nations Headquarters in New York in May 1992. It was open for signature at the conference in Rio in June 1992 and additional signatures and ratification by Parties followed. It entered into force on 21 March 1994. Currently, the UNFCCC has 197 Parties (196 countries plus the European Union).

After the Convention had entered into force in 1994, the first Conference of the Parties convened in 1995.

Box 2: The Conference of the Parties (COP)

The Conference of the Parties was established under the UNFCCC as the supreme body of the Convention with the mandate to adopt the decisions necessary to promote its implementation. The first Conference of the Parties (COP 1) met in Berlin in 1995. Since then, such Conferences have taken place annually. The 23rd Conference of the Parties (COP 23) will be hosted in Bonn from 6 to 17 November 2017 (cf. chapter 10.1).

Besides the Conference of the Parties, the UNFCCC has established subsidiary bodies to provide the Conference with scientific and technological advice (SBSTA) and to assess and review the implementation of the Convention (SBI).

Box 3: Subsidiary Bodies under the Convention (SBSTA, SBI)

The Subsidiary Body for Scientific and Technological Advice (SBSTA) was established to provide the Conference of the Parties with information and advice on scientific and technological matters. These included in recent years for example methodological guidance for reducing emissions from deforestation and forest degradation or information on market and non-market mechanisms.

The Subsidiary Body for Implementation (SBI) was established under the UNFCCC to assist the Conference of the Parties in the assessment and review of the effective implementation of the Convention. Its agenda items include, for example, the review of various reports from the Parties or matters related to the mechanisms under the Kyoto Protocol (see chapter 2.2).

The SBSTA and SBI first met in Geneva in 1995. They meet biannually; in recent years during a two-week session in Bonn in May or June and during a one to two-week session in parallel to the COP towards the end of each year. SBSTA and SBI consider agenda items under the Convention, under the Kyoto Protocol (see chapter 2.2) and under the Paris Agreement (see chapter 3).

2.2. The Kyoto Protocol and the Doha Amendment

As provided for in the Convention, a protocol to mitigate climate change was developed and adopted at the Conference of the Parties in Kyoto in December 1997. This Kyoto Protocol set binding targets for limiting or reducing greenhouse gas emissions for the majority of the developed country Parties listed in Annex I to the Convention.

Box 4: The Kyoto Protocol

The Kyoto Protocol (UNFCCC 1997) committed 39 developed country Parties to limiting or reducing their greenhouse gas emissions (expressed as an average of the years 2008 to 2012) relative to the base year (1990 for most Parties). The Protocol requires these Parties to implement climate change mitigation policies and measures, in accordance with their national circumstances. It also requires them to introduce a national system for estimating anthropogenic greenhouse gas emissions and removals. Further, the Protocol regulates the monitoring, reporting and verification (MRV) of these emissions.

Annex A to the Protocol defines the greenhouse gases covered, i.e. carbon dioxide, methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6) and two groups of gases, hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). This Annex also defines the sectors and greenhouse gas source categories for which emissions have to be estimated.

The developed country Parties to which a commitment applies are listed in Annex B to the Protocol. Besides country Parties, they also include the European Union as a separate Party with a reduction commitment of minus 8 %. Of the 39 Parties listed in Annex B, the United States did not ratify the Protocol and Canada withdrew from it in 2011.

The Kyoto Protocol was signed on 11 December 1997. For it to enter into force, it had to be ratified by at least 55 Parties, including Annex I Parties accounting for at least 55 % of Annex I Party emissions in 1990. This requirement was fulfilled in 2004 and the Protocol entered into force on 16 February 2005.

Although the Kyoto Protocol required the relevant Parties to implement domestic policies and measures, it also provided for flexible mechanisms to achieve their commitments. The three

mechanisms are international emissions trading between Annex B Parties, the Clean Development Mechanism (CDM) which allows accounting for emission reduction projects in developing countries, and Joint Implementation (JI) which makes use of emission reduction or the enhancement of greenhouse gas removal by sinks in other Annex B countries.

The more specific rules for implementing the Kyoto Protocol were adopted at the climate change conference in Marrakesh in 2001 (the "Marrakesh Accords"). After the adoption of the Kyoto Protocol in 2005, the first Conference of the Parties serving as the meeting of the Parties (see Box 5) took place in Montreal in November/December 2005.

Box 5: The Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP)

According to the Kyoto Protocol, the Conference of the Parties (see Box 2) also serves as the meeting of the Parties to the Kyoto Protocol. Its mandate is to keep under regular review the implementation of the Protocol and to make related decisions. The "Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol" (CMP) is limited to those Convention Parties that also ratified the Kyoto Protocol. The conference in Montreal in 2005 was the first CMP. Since then, both COPs and CMPs have taken place annually and in parallel, and the conference in Bonn in November 2017 will be convened as CMP 13.

As the commitments under the Kyoto Protocol applied to emissions for the years 2008 to 2012 only, an amendment was developed which governs emission reductions for the years 2013 to 2020. This amendment was agreed upon by the Parties at the Doha COP 18 conference.

Box 6: The Doha Amendment

The Doha Amendment to the Kyoto Protocol (Decision 1/CMP.8) was adopted in December 2012. It defines additional emission reduction commitments for 38 developed country Parties for the period 2013 to 2020. The Parties' emission reduction commitments range between -0.5 % and -24 % compared to the base year (1990 in most cases).

The amendment consists of a new Annex, to replace the former "Annex B" to the Kyoto Protocol and various technical provisions that regulate changes to emission accounting and other areas which became necessary after the introduction of a new commitment period. Besides, an additional greenhouse gas (nitrogen trifluoride, NF_3) has been added to the list of gases covered.

Of the Parties participating in the first commitment period, Japan, New Zealand and the Russian Federation are no longer included as countries with emission reduction commitments. On the other hand, Belarus, Cyprus, Kazakhstan and Malta are now included in the new version of Annex B.

As laid out in Article 20 of the Kyoto Protocol, the Amendment will enter into force once 75 % of the Parties to the Protocol have ratified it. The Doha Amendment has been ratified by 83 Parties as of 21 September 2017 (UNFCCC 2017a) and ratification by more than 60 additional Parties is needed for entry into force.

2.3. Towards a new agreement

The Kyoto Protocol had focused on mitigation actions to be undertaken by a limited number of Parties. Meanwhile emissions, in particular from emerging countries, saw a strong increase during the first decade of the 21st century. Therefore, after the Kyoto Protocol had entered

into force in 2005, international negotiations were aimed at preparing a new, global agreement.

In 2007, the Conference of the Parties in Bali (COP 13) decided "to launch a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action", with the aim of reaching an agreement two years later ("Bali Action Plan", Decision 1/CP.13).

A document in line with the Bali Action Plan was prepared at the Conference of the Parties in Copenhagen in 2009 ("Copenhagen Accord"). This document included a commitment by developed country Parties to mobilise climate finance amounting to USD (United States Dollar) 100 billion per year by 2020, from public and private sources. However, by the end of the COP, Parties did not agree on the Copenhagen Accord but took note of the document only (Decision 2/CP.15).

Although no comprehensive agreement was reached under the Bali Action Plan, Parties at COP 16 in Cancún in 2010 agreed on several important decisions which became to be known as the "Cancún Agreements" (Decision 1/CP.16). The COP recognised that deep cuts in global greenhouse gas emissions were required to limit the increase in the global average temperature below 2 degrees Celsius (C) above pre-industrial levels. The Parties agreed on enhanced action on adaptation and called for nationally appropriate mitigation commitments and actions.

At COP 17 in Durban in 2011, a dedicated body was established to develop a new, broad agreement – the "Ad Hoc Working Group on the Durban Platform for Enhanced Action".

Box 7: The Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP)

The "Ad Hoc Working Group on the Durban Platform for Enhanced Action" (ADP) was a subsidiary body under the Convention which was established at the COP in Durban (Decision 1/CP.17). It started its work in 2012.

The ADP was organised in two workstreams: Workstream 1 was mandated with developing a protocol, another legal instrument or an agreed outcome with legal force under the Convention, applicable to all Parties, to be completed and adopted by the COP in 2015 and to be implemented from 2020 onwards.

Workstream 2 focused on enhancing mitigation ambition before 2020, as the COP in Durban also noted a significant gap between the aggregate effect of the Parties' mitigation pledges by 2020 and emission pathways that would allow keeping the global temperature increase below 2 degrees C or 1.5 degrees C compared to the pre-industrial level.

The ADP met during each COP and subsidiary bodies session from 2012 to 2015, with additional dedicated ADP sessions in 2014 and 2015. With the adoption of the Paris Agreement in 2015, the mandate of the ADP ended. In 2016, work on the implementation of the Paris Agreement was taken over by the Ad Hoc Working Group on the Paris Agreement (APA, cf. chapter 4.2).

The climate change conference in Warsaw in November 2013 marked important progress in the preparation of the new agreement. The COP, in Decision 1/CP.19, requested the ADP to prepare specific elements for a draft negotiating text and to identify, by the next session of the COP, information that Parties need to provide when putting forward their contributions.

The draft negotiating text and the information to be provided by Parties (Intended Nationally Determined Contributions – INDCs, see Box 8) were adopted at the COP in Lima in December 2014 as part of Decision 1/CP.20, the "Lima Call for Climate Action".

Box 8: Intended Nationally Determined Contributions (INDCs)

According to the Lima Call for Climate Action (Decision 1/CP.20), an INDC is a "contribution towards achieving the objective of the Convention as set out in its Article 2", which is a "stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (UNFCCC 1992). It is, in short, the contribution a Party is willing to make to mitigate climate change.

The Lima Call for Climate Action lists the type of information which an INDC may include, "in order to facilitate clarity, transparency and understanding". This information covers quantifiable information on the reference point (including, as appropriate, a base year), time frames for implementation, scope and coverage, planning processes, assumptions and methodological approaches, information on how the Party considers that its INDC is fair and ambitious and how it contributes towards achieving the objective of the Convention. Parties were asked to communicate their INDCs well in advance of COP 21 in Paris.

By December 2015, 187 out of 196 Parties had communicated an INDC (UNFCCC 2017b). These submissions of INDCs were unprecedented in the history of global climate negotiations as – for the first time – Parties responsible for the vast majority of global emissions came forward with specific commitments to curb their emissions. In addition to the submissions of INDCs by the Parties, negotiators met several times during the year 2015 to make progress on the draft agreement text, which was based on the text of the "Lima Call for Climate Action". For more information on the development of the draft text ahead of the Paris conference, see e.g. the report "International Climate Negotiations – On the Road to Paris" (Moosmann et al. 2015).

2.4. The COP in Paris (2015)

The Paris climate change conference started on 30 November 2015 with a Leaders Event, when over 150 heads of state and government voiced their support for an ambitious agreement on climate change – the highest number of leaders ever to attend a UN event in a single day (UNFCCC 2015a). After the ADP had continued its work on the draft agreement text which had been prepared in the course of the year 2015 (see chapter 2.3), COP President Laurent Fabius established the "Comité de Paris" as the negotiation body for the second week. This set-up of the negotiations and the guidance provided by the French Presidency helped resolve a number of differences between the Parties. The main questions which remained open well into the second week of the conference concerned differentiation, i.e. different obligations of developing vs. developed countries, questions on finance and the level of ambition to be prescribed by the agreement (IISD 2015a).

Progress on these issues was made during the last days of the conference when wider coalitions between Parties were formed. In particular, representatives from the European Union and small island states formed the so-called "high ambition coalition" (cf. Box 35), which promoted an ambitious long-term goal and encouraged increasing ambition over time, and which was joined by a large number of Parties at the end of the conference.

On 12 December 2015, after intensive discussions, Laurent Fabius brought the gavel down on the Paris Agreement, confirming the adoption of the first Decision on the agenda of COP 21, perhaps the most significant Decision in the history of the Convention. The contents

of the Paris Agreement are described in the following chapter (chapter 3); for more information on the negotiations in Paris see e.g. the report "Implementing the Paris Agreement – Issues at stake in view of the COP 22 Climate Change Conference" (Moosmann et al. 2016).

3. THE PARIS AGREEMENT AT A GLANCE

The international agreement reached in Paris on 12 December 2015 contains specific goals for responding to climate change, mechanisms to pursue these goals, and binding obligations for all Parties.

The document adopted by the Conference of the Parties is a COP Decision (Decision 1/CP.21), consisting of a Decision text and – in the Annex – the text of the Paris Agreement (UNFCCC 2015b). The Paris Agreement lays down the goals and the general procedure of addressing climate change from 2020 onwards, whereas the COP Decision specifies additional details, and issues that could not be agreed in Paris but for which the Parties agreed that they would continue to elaborate them. The COP Decision also addresses enhanced action prior to 2020.

The Paris Agreement aims to strengthen the global response to the threat of climate change and specifies **long-term goals** regarding global average temperatures, adaptation to climate change and finance flows (Table 1).

Table 1: Long-term goals of the Paris Agreement

Goal	Wording in the Paris Agreement
Temperature goal Article 2.1(a)	Holding the increase in the global average temperature to well below 2 degrees C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 degrees C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change.
Adaptation goal Article 2.1(b)	Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production.
Goal of "low emissions" finance flows Article 2.1(c)	Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

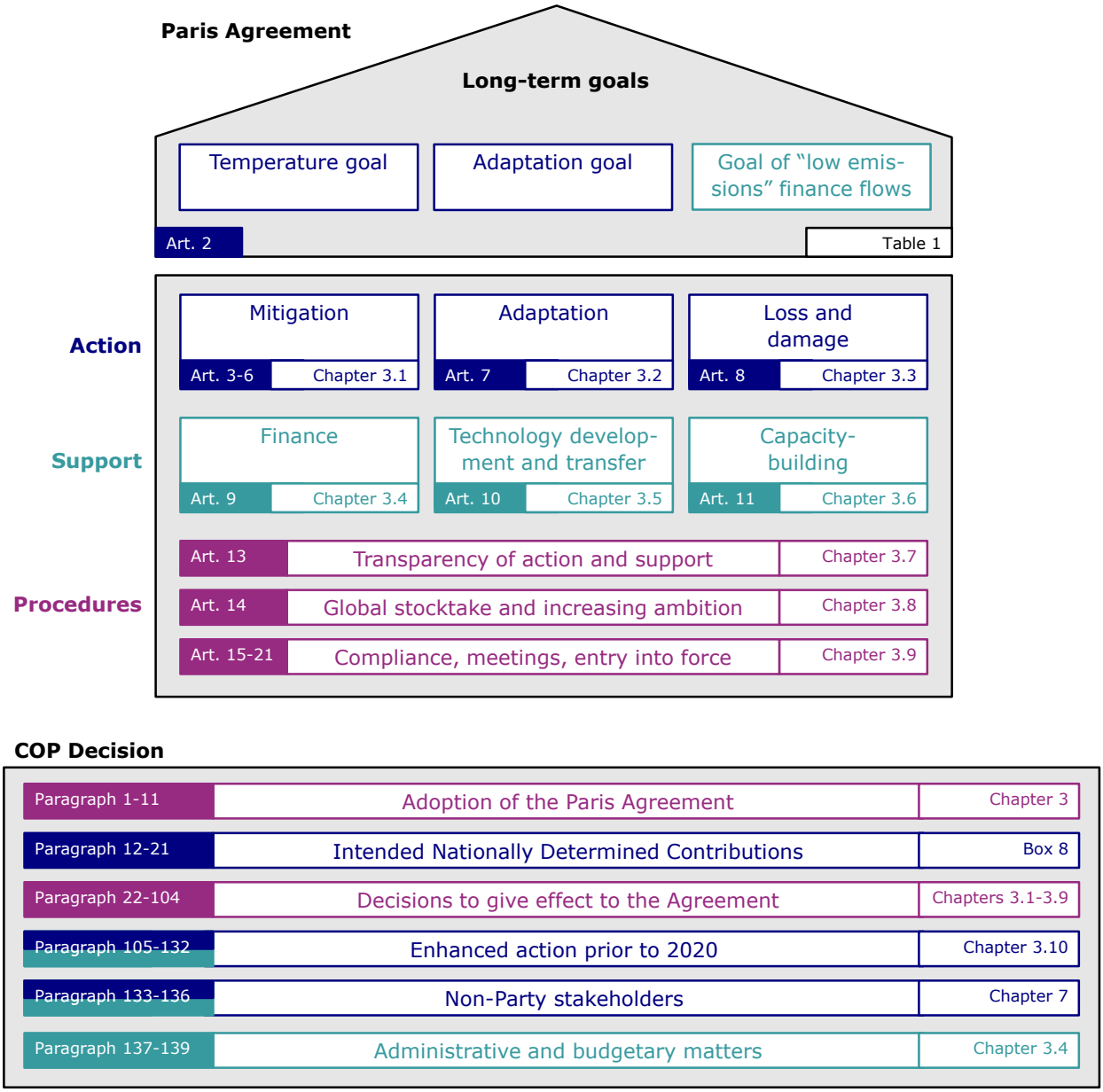
Source: UNFCCC 2015b.

In order to pursue these goals, the Paris Agreement addresses the main cornerstones of international climate action:

- **Mitigation**, i.e. the reduction of greenhouse gas emissions and the enhancement of sinks for greenhouse gases
- **Adaptation**, i.e. the adjustment of natural and human systems in response to climate change
- Averting, minimising and addressing **loss and damage** associated with the effects of climate change

The Agreement also specifies **financial, technological and capacity-building support** (also known as Means of Implementation – MoI). Finally, it lays down procedures for transparency, for a global stocktake and for compliance, as well as for meetings and the entry into force (see Figure 1).

Figure 1: Structure of the Paris Agreement and the accompanying COP Decision



Each main topic is presented in a box, including the corresponding Articles of the Agreement or Paragraphs of the Decision. The table/chapters of the present report where more information can be found are also listed.

Source: UNFCCC 2015b, Decision 1/CP.21, authors' views.

In the following, the key elements of the Paris Agreement are described in more detail (chapters 3.1 to 3.9). Chapter 3.10 covers provisions relating to enhanced action prior to 2020, and chapter 3.11 provides a summary and discussion of the overall Agreement. A tabular overview of the key contents of the Paris Agreement – listed by topic – can be found in Table 10 in Annex 1. Important elements of the accompanying COP Decision are listed in Table 11 in Annex 2.

3.1. Mitigation

The mitigation of climate change – by reducing greenhouse gas emissions and enhancing sinks for greenhouse gases – is inscribed in the United Nations Framework Convention on Climate Change and has been operationalised in the Kyoto Protocol for developed country Parties. The Paris Agreement constitutes a leap forward as it prescribes:

- An ambitious temperature goal (cf. Table 1);
- a long-term emission goal;
- efforts to be undertaken and communicated by all Parties and to be updated periodically.

The **temperature goal** refers to holding the increase in the global average temperature to well below 2 degrees C above pre-industrial levels and to pursue efforts to limit this increase to 1.5 degrees C. The goals of 2 and 1.5 degrees C were introduced in the Cancún Agreements of 2010 (Decision 1/CP.16, cf. chapter 2.3). As summarised in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)), a global temperature increase above 1.5 degrees C and, to a larger extent, above 2 degrees C is associated with impacts on ecosystems, human health, food security and infrastructure, as well as risks of widespread and irreversible impacts (IPCC 2015). However, it is important to note that the IPCC did not recommend any temperature goal because such a recommendation would be policy prescriptive and therefore beyond the mandate of the IPCC.

In order to be able to achieve the temperature goal, the current trend of greenhouse gas emissions needs to be reverted. The **emission goal**, introduced in Article 4 of the Paris Agreement, is twofold. First, Parties aim at reaching global peaking of greenhouse gas emissions as soon as possible. This is especially important because global emissions of greenhouse gases are still increasing and the emissions of many developing countries show clear upward trends.

Secondly, the goal is to achieve a balance between anthropogenic emissions by sources and removals by sinks in the second half of this century. Such a balance, which is also known as "carbon neutrality", will require drastic changes compared to today's situation: All worldwide emissions of greenhouse gases will have to be counterbalanced by carbon sequestration. Carbon neutrality, or having a net zero carbon footprint, refers to achieving net zero carbon emissions by balancing a measured amount of carbon released with an equivalent amount sequestered.

Related to the long-term emission goal, Parties are invited by Decision 1/CP.21 to communicate, by 2020, long-term low emission development strategies (LEDS) with a mid-century timeframe.

Efforts to reach the temperature and emission goals will be shared by all Parties. Article 3 states that all Parties undertake and communicate ambitious efforts, progressing over time. The Paris Agreement points out the common but differentiated responsibilities and capabilities between developing and developed country Parties and it states that developed countries should be taking the lead. However, unlike the Kyoto Protocol, contributions will be required from all Parties.

These contributions are not prescribed for each Party in a top-down approach, but they are prepared, communicated and maintained by the Party itself ("Nationally Determined Contributions" – NDCs, see Box 9). This bottom-up approach can be seen as a response to the failure to reach an agreement with prescribed contributions at the COP in Copenhagen in 2009.

Box 9: Nationally Determined Contributions: From INDC to NDC

187 out of 196 Parties communicated Intended Nationally Determined Contributions (INDCs, cf. Box 8) in 2015. These contributions – as long as they are not updated or replaced – serve as "Nationally Determined Contributions" (NDC) under the Paris Agreement. The NDCs describe the efforts which Parties make to contribute to the global response to climate change. According to Article 3 of the Paris Agreement, such efforts cover the areas of mitigation, adaptation, finance, technology, capacity-building and transparency.

Nationally Determined Contributions have to be updated every five years and have to represent a progression over time. Parties with a time horizon until 2025 in their INDCs have to communicate a new NDC by 2020. Parties with a time horizon until 2030 have to provide an update in 2020. Finally, Parties that have not yet communicated an INDC have to communicate their first NDC at the latest together with their instrument of ratification or accession to the Paris Agreement.

The information to be provided in an NDC is listed in Paragraph 27 of Decision 1/CP.21, but this information is expressed in rather general terms. The Ad Hoc Working Group on the Paris Agreement (APA, cf. chapter 4.2) will develop further guidance. The NDCs will be provided in a public registry; those that have already been communicated, including the INDCs of Parties that have already ratified the Paris Agreement, are available in an interim registry (UNFCCC 2017c).

Periodic updates of NDCs are central to the Agreement because the mitigation contributions communicated ahead of the Paris conference in 2015 are not sufficient to meet the agreed temperature goal (cf. chapter 4.5). For the process of increasing mitigation ambition over time (facilitative dialogue and global stocktake), see chapter 3.8.

In order to achieve their mitigation contributions, Parties may make use of voluntary cooperation. A mechanism will be set up, similar to the Clean Development Mechanism under the Kyoto Protocol (cf. chapter 2.2) which will allow for emission reductions in one country to be counted towards the Nationally Determined Contribution of another country. As laid out in the Agreement, it has to be ensured that this mechanism avoids double counting of contributions and that the mitigation actions covered are sustainable and environmentally sound. The details of such cooperation between Parties will be elaborated by SBSTA, the responsible subsidiary body (cf. Box 3 and chapter 4.3.1).

3.2. Adaptation

All countries will need to adapt to a changing climate in some ways, but the topic of adaptation is especially important for developing countries because of their limited resources and means to adjust. In the Paris Agreement, an adaptation goal is prescribed, which is, according to Article 7 of the Agreement, the goal to

- enhance adaptive capacity;
- strengthen resilience; and
- reduce vulnerability to climate change.

Parties are required to engage in an adaptation planning process and encouraged to report on their adaptation efforts and/or needs. A review of the overall progress made in achieving the global goal on adaptation, and of the adequacy and effectiveness of adaptation support, is part of the global stocktake to be undertaken every five years (see chapter 3.8). Parties

should submit and update periodically an "adaptation communication", which may include adaptation priorities, needs, plans and actions.

Decision 1/CP.21 mandated the Adaptation Committee (AC), the Least Developed Countries Expert Group (LEG) and other bodies with important tasks related to implementation. Specifically, the AC was requested to review, in 2017, the work of adaptation-related institutional arrangements under the Convention and to consider methodologies for adaptation needs.

In addition, the AC and the LEG were requested to develop modalities to recognise the adaptation efforts of developing countries. These two bodies, together with the Standing Committee on Finance and other relevant institutions were asked to develop methodologies and make recommendations on facilitating the mobilisation of support for adaptation in developing countries and on the review – in the course of the global stocktake – of the adequacy and effectiveness of adaptation and of support provided for adaptation.

Originating in the discussion on adaptation, the topic of loss and damage has gained in importance and has become a topic in its own right in recent years. It is now covered by a separate article in the Paris Agreement. Therefore, loss and damage is discussed separately here, in the following section.

3.3. Loss and damage

Loss and damage associated with the adverse effects of climate change is a key concern of the Least Developed Countries (LDC) and of Small Island Developing States (SIDS). Their representatives stress the limited means they have to avert or minimise such loss and damage.

Article 8 of the Paris Agreement states that Parties recognise the importance of averting, minimising and addressing loss and damage associated with the adverse effects of climate change. The fact that this topic is covered by a separate Article is a sign of the acknowledgement of its importance. The Agreement also strengthens the existing Warsaw International Mechanism on Loss and Damage.

Box 10: The Warsaw International Mechanism on Loss and Damage (WIM) and its role under the Paris Agreement

At the COP in Warsaw in 2013, the Warsaw International Mechanism on Loss and Damage (WIM) was established. This mechanism addresses loss and damage associated with impacts of climate change, including extreme events and slow onset events (e.g. sea level rise or land and forest degradation), in developing countries that are particularly vulnerable to adverse effects of climate change. The mechanism aims at:

- Enhancing the knowledge and understanding of comprehensive risk management approaches;
- strengthening the dialogue and coordination among relevant stakeholders; and
- enhancing action and support, including finance, technology and capacity-building.

According to the Paris Agreement, the Warsaw International Mechanism shall be subject to the authority and guidance of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA, see Box 13).

The Paris Agreement also lists examples of areas of cooperation and facilitation, such as early warning systems, emergency preparedness, comprehensive risk assessment and management, risk insurance and resilience.

However, in the accompanying Decision (Decision 1/CP.21), it is specified that the provisions on loss and damage do not involve or provide a basis for any liability or compensation. This

provision reflects the position of the developed countries which oppose the idea of establishing a link, which might entail claims for compensation, between greenhouse gas emissions and climate change induced loss and damage. The COP Decision which contains this provision applies to all Parties, but it may not prevent requests for compensation/liability in the private domain.

3.4. Finance

Mitigation, adaptation and addressing loss and damage require financial resources, and both the Convention and the Paris Agreement foresee that such resources are provided to developing countries.

Under the Convention, the provision of financial resources is the task of a specified number of developed countries. Under the Paris Agreement (Article 9), developed country Parties should still take the lead in mobilising climate finance, but other Parties are encouraged to provide or continue to provide such support. This provision reflects today's situation that emerging countries such as China provide financial support and other emerging countries are seen to be in a position to do so as well.

The provision of finance is also addressed in Article 2 of the Agreement, which specifies the goal of making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development (goal of "low emissions" finance flows, see Table 1).

At the COP in Copenhagen in 2009 (cf. chapter 2.3), it had been agreed that developed countries would mobilise, by the year 2020, climate finance amounting to USD 100 billion per year. The Decision on the Paris Agreement specifies that this amount will be provided annually from 2020 until 2025 and that a new, higher goal will be set for the period thereafter.

Related to financial support, Decision 1/CP.21 contains a section "Administrative and budgetary matters", which points out the urgency of making additional resources available for the implementation of the actions referred to in this Decision.

3.5. Technology development and transfer

Besides financial support, the development and transfer of technology constitutes an important pillar of the support provided to developing countries. Under the Paris Agreement, a technology framework is to be established to strengthen the existing Technology Mechanism under the Convention.

Box 11: The Technology Mechanism under the Convention

The Technology Mechanism was established at the COP in Cancún (cf. chapter 2.3) to help countries develop and transfer the technologies needed to mitigate and adapt to climate change. It consists of two bodies:

- The Technology Executive Committee (TEC), as policy arm, analyses technology policy issues and provides recommendations.
- The Climate Technology Centre and Network (CTCN), as implementation arm, provides technical assistance to developing countries, facilitates access to knowledge on climate technologies and fosters collaboration among stakeholders.

Examples of CTCN activities include technical assistance missions, tutorials and technical workshops.

An outline of the technology framework under the Paris Agreement is given in Decision 1/CP.21. The technology framework should facilitate, *inter alia*, Technology Needs Assessments (TNA), the assessment of technologies that are ready for transfer and the enhancement of enabling environments for the development of socially and environmentally sound technologies. The Subsidiary Body for Scientific and Technological Advice (SBSTA) was mandated with the development of this framework, whereas the Subsidiary Body for Implementation (SBI) will develop the modalities for a periodic assessment of the framework's effectiveness.

3.6. Capacity-building

In addition to financial and technological support, the Paris Agreement aims at further strengthening the capacity of developing countries to respond to climate change. This includes, for example, the implementation of adaptation and mitigation actions, the development, dissemination and deployment of technology and various aspects of education, training and public awareness.

Under the accompanying Decision to the Paris Agreement, a Paris Committee on Capacity building has been established.

Box 12: The Paris Committee on Capacity-building (PCCB) and the 2016-2020 workplan

The aim of the Paris Committee on Capacity-building is to address gaps and needs in the implementation of capacity-building in developing countries. The Committee meets annually during the session of the Subsidiary Body for Implementation and manages and oversees the 2016-2020 workplan which includes, *inter alia*:

- Identification of capacity gaps and needs;
- fostering global, regional, national and sub-national cooperation;
- identifying and collecting good practices.

The PCCB convened for the first time during the subsidiary bodies meeting in Bonn in May 2017 (cf. chapter 4.4.6).

3.7. Transparency of action and support

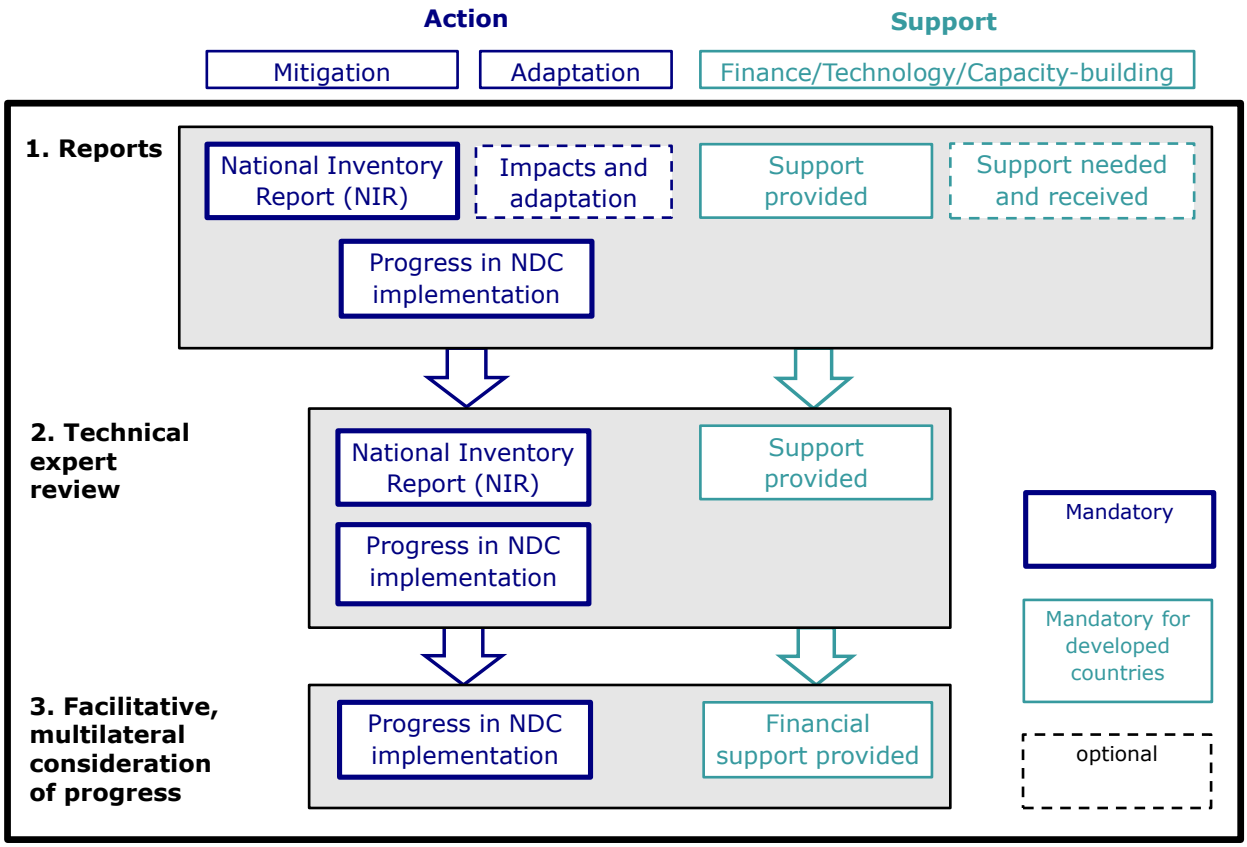
In order to be able to effectively address climate change, the measures taken and the support provided and received need to be made transparent. Transparency has become even more important under the Paris Agreement because actions have to be measured against specific goals (in the areas of mitigation, adaptation and finance) and the implementation of Nationally Determined Contributions has to be assessed in order to be able to improve them over time.

Under the Paris Agreement, a transparency framework is being established, which includes binding provisions for all Parties, though there are less stringent ones for developing countries. The elements of the transparency framework are depicted in Figure 2. They include a national inventory report on greenhouse gas emissions and removals and the necessary information for tracking progress made in implementing and achieving the Nationally Determined Contribution. Information on adaptation and support is also requested, although the only mandatory requirement is to submit a report on the support provided by developed countries.

As can be seen in Figure 2, the national inventory report, the information relating to the Nationally Determined Contribution and the information on the support provided will undergo an expert review. A sub-section of that information will also be subject to a "facilitative,

multilateral consideration of progress", which will most likely be organised as "question and answer" sessions.

Figure 2: Elements of the transparency framework for action and support



Source: UNFCCC 2015b, Baashan and Tyndall 2017, authors' views.

For an overview of the various reporting requirements under the Paris Agreement (as compared to the Convention) see also Figure 8 in chapter 10.2.

3.8. Global stocktake and increasing ambition

As the mitigation contributions which have been communicated by Parties so far are not sufficient to meet the temperature goal of the Agreement (cf. chapter 4.5), the Paris Agreement provides for a cycle of increasing ambition.

The year 2018 constitutes the first important step in this cycle. In that year, the IPCC (cf. chapter 7.3.1) will provide a Special Report (SR) on the impacts of global warming of 1.5 degrees C above pre-industrial levels and related global greenhouse gas emission pathways.

Based on this report, a so-called "facilitative dialogue" will be held in 2018. The facilitative dialogue is based on the Decision accompanying the Paris Agreement and will form the basis for new or updated NDCs (cf. Box 9), to be communicated by Parties by 2020. New NDCs by 2020 are especially important for Parties with a time horizon until 2025 in their INDCs.

The cycle of further increasing ambition under Article 14 of the Paris Agreement will start in 2023, when the first global stocktake will take place: Collective progress towards achieving the purpose of the Paris Agreement and its long-term goals will be assessed in the light of equity and best available science. The outcome of the global stocktake will serve as a basis for Parties to update and enhance their actions and support.

3.9. Compliance, meetings, entry into force

In Articles 15 to 21 of the Paris Agreement, various procedural aspects are laid out. The Agreement enters into force on the 30th day after at least 55 Parties to the Convention accounting in total for at least 55 % of the total global greenhouse gas emissions have deposited their instruments of ratification, acceptance, approval or accession. This condition was fulfilled on 5 October 2016 and the Paris Agreement entered into force on 4 November 2016 (cf. chapter 4.1).

The threshold of 55 % of the total emissions ensured that a number of large emitters ratified the Paris Agreement before it entered into force. On the other hand, this threshold (and the threshold of 55 Parties) helped that the Agreement entered into force swiftly, less than a year after its adoption.

Box 13: The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA)

As laid out in Article 16 of the Agreement, Parties meet in the so-called "Conference of the Parties serving as the meeting of the Parties to the Paris Agreement" (CMA). The meeting is held in conjunction with the annual Conference of the Parties (COP), in the same way as the meetings of the Parties to the Kyoto Protocol have been running in parallel to the COP since 2005.

The mandate of the CMA is to promote and review the implementation of the Paris Agreement. The specific topics which the CMA has to negotiate and decide on are laid out in Decision 1/CP.21 and include, *inter alia*, the type of information to be provided by Parties on their Nationally Determined Contributions, the rules for accounting for greenhouse gas emissions, the modalities for recognising the developing countries' adaptation efforts and the modalities for the global stocktake.

The CMA convened for the first time at the climate change conference in Marrakesh in November 2016 (cf. chapters 4.2 and 4.3).

In order to facilitate implementation of the Paris Agreement and to promote compliance with its provisions, an expert-based committee is to be established (the "compliance committee"). It is to be facilitative in nature and to operate in a non-adversarial and non-punitive manner.

3.10. Enhanced action prior to 2020

The Paris Agreement applies to the post-2020 period. Mitigation until 2020 is governed by the second commitment period under the Kyoto Protocol (cf. chapter 2.2), but due to the limited participation of Parties in mitigation actions under the Kyoto Protocol and in view of increasing emission trends, it is critical that additional efforts are pursued prior to 2020. Therefore, the Decision accompanying the Paris Agreement contains a number of provisions for enhancing mitigation ambition prior to 2020. Specifically, Decision 1/CP.21 provides for:

- Strengthening of the existing **Technical Examination Process (TEP) on mitigation**. This process highlights policies, practices and technologies with high mitigation potential. The current format of technical expert meetings will continue and will be organised by the UNFCCC secretariat with support from the institutions under the Technology Mechanism (cf. Box 11).
- A new **Technical Examination Process on adaptation**. This process is organised jointly by SBI and SBSTA (cf. Box 3) and conducted by the Adaptation Committee. Its

aim is to identify opportunities for strengthening resilience, reducing vulnerabilities and increasing the understanding and implementation of adaptation actions.

- A **high-level event** at each COP from 2016 to 2020, which provides the opportunity for announcing new or strengthened efforts, initiatives and coalitions.
- **High-level champions** to facilitate and scale-up mitigation and adaptation efforts. These positions are currently held by Inia B. Seruiratu, Minister for Agriculture, Rural and Maritime Development and National Disaster Management of Fiji, and by Hakima El Haite, Moroccan Special Envoy for Climate Change. In 2016, the champions set out the "Global Climate Action Agenda", an agenda for cooperative action between governments, cities, businesses, investors and citizens (UNFCCC 2016a).
- The engagement of **non-Party stakeholders** (cf. chapter 7) in the technical examination processes and through the Lima-Paris Action Agenda (LPAA).

Box 14: The Lima-Paris Action Agenda (LPAA)

In order to involve both state and non-state actors in accelerating climate action, the Lima-Paris Action Agenda (LPAA) was initiated in 2014 by the Peruvian and French COP presidencies, the Office of the Secretary-General of the United Nations and the UNFCCC secretariat.

Under this initiative, cities, regions and companies registered their commitments to address climate change in the so-called Non-State Actor Zone for Climate Action (NAZCA) (UNFCCC 2017d). As of 25 September 2017, 77 cooperative initiatives have been registered. In total, over 12 500 commitments are listed, covering 2 508 cities, 209 regions, 2 138 companies and 479 investors.

Non-Party stakeholders are the subject of a dedicated section in Decision 1/CP.21 (Paragraphs 133 to 135). This section welcomes their efforts in addressing and responding to climate change and invites them to scale up their efforts. More information on the role of non-Party stakeholders can be found in chapter 7.

3.11. Summary and discussion

The Paris Agreement can be seen as a milestone in the international endeavour to respond to climate change, as for the first time an agreement was reached which requires all Parties to contribute to achieving ambitious mitigation goals. In this regard, the Agreement delivered more than many had expected ahead of the Paris Conference.

More specifically, all Parties are required to prepare, communicate and maintain Nationally Determined Contributions. This provision constitutes an important difference to the Kyoto Protocol, which prescribed mitigation actions for a limited number of developed country Parties only. In this regard, the Paris Agreement has overcome the differentiation between developing and developed country Parties which originated from Annex I to the Convention of 1992 and does not fully reflect today's realities, as the contributions of developing and emerging countries to global greenhouse gas emissions have already surpassed the share of developed countries.

It is notable that, unlike earlier COP Decisions, the Decision on the Paris Agreement does not mention Annex I to the Convention. What is maintained and remains important is the notion that Parties have "common but differentiated responsibilities" (CBDR). Under the Paris Agreement, differentiation is expressed through flexibilities and different obligations for developing versus developed country Parties to engage in mitigation, adaptation and support, but not in a static distinction between Annex I and non-Annex I Parties.

Although all Parties are required to maintain and enhance their NDCs, there is no legal obligation to meet the targets set in the NDCs. A strict legal obligation was opposed by some developing countries and by countries such as the United States as they would have had difficulties ratifying an agreement with such legal obligations.

It may remain uncertain whether the specific goals stated in the NCDs will be reached, but the Paris Agreement contains a mechanism for responding in case the goals are missed or new scientific findings show that efforts have to be further increased. This mechanism, consisting of the facilitative dialogue in 2018 and the global stocktake from 2023 onwards, still has to prove itself as a suitable mechanism for responding to an accelerating global problem in a dynamic world.

In any case, the contributions communicated by Parties so far would not bring the world on the path towards the goal of limiting the global temperature increase to 2 degrees C or less. The temperature increase estimated in various studies, based on the INDCs communicated during the year 2015 (e.g. UNFCCC 2016b, Rogelj et al. 2016, Carbon Brief 2017), will be closer to 3 degrees C by the end of the 21st century. For further discussion of the progress towards the 2 degrees and 1.5 degrees C goal, see chapter 4.5.

In any case, it seems likely that the willingness to mitigate greenhouse gas emissions is mainly driven by the increasing impacts of climate change as well as by its long-term consequences and the limits of adaptation, especially with respect to natural systems. The most efficient and effective approach to limiting long-term climate change risks is by reducing greenhouse gas emissions now.

4. IMPLEMENTING THE PARIS AGREEMENT

This chapter summarises the events which took place in 2016 and 2017, following the adoption of the Paris Agreement. The Agreement was signed and ratified by a large number of countries during 2016 and entered into force in the same year (chapter 4.1).

The COP 22 in Marrakesh in November 2016 was the first climate change conference after the entry into force of the Agreement (chapter 4.3). In May 2017, the subsidiary bodies meeting in Bonn focused on how to implement the Paris Agreement in detail (chapter 4.4). Other events with close links to the climate negotiations took place throughout the year 2017. Box 15 lists them in chronological order and shows the chapters where they are discussed in more detail.

Box 15: Selected events during 2017

28-31 March: The 45th IPCC plenary meeting takes place in Guadalajara (see chapter 7.3.1)

8-18 May: Parties convene for the subsidiary bodies meeting in Bonn (see chapter 4.4)

22-23 May: The Petersberg Climate Dialogue, held in Berlin, discusses the process in the run-up to COP 23 (see chapter 7.2.1)

26-27 May: G7 leaders convene for the 43rd G7 summit in Taormina (see chapter 7.2.2)

3-7 July: IMO's Marine Environment Protection Committee convenes (see chapter 8.2)

7-8 July: G20 leaders meet for the 12th G20 summit in Hamburg (see chapter 7.2.3)

6-10 September: The 46th IPCC plenary meeting is held in Montreal (see chapter 7.3.1)

6–17 November: The 23rd Conference of the Parties (COP 23) convenes in Bonn (see chapter 10)

20-24 November: The 29th Meeting of the Parties to the Montreal Protocol takes place in Montreal (see chapter 8.3)

12 December: A climate summit, focusing on the mobilisation of financial support, is hosted in Paris (see chapter 7.2.3)

Statements made by Parties during 2017 are discussed under the respective Party section in chapter 5. Important stakeholder meetings are presented under the relevant sections in chapter 7 and other climate-related negotiation events can be found in chapter 8.

Besides the events which took place in 2016 and 2017, the present chapter also discusses progress towards the temperature goal of the Paris Agreement (chapter 4.5).

4.1. Signature, ratification and entry into force

4.1.1. Signature ceremony

Following the adoption of the Paris Agreement on 12 December 2015, a high level signature ceremony took place at the headquarters of the United Nations in New York on 22 April 2016, where 175 Parties (174 countries and the European Union), signed the Agreement. It thereby became the multilateral agreement with the highest number of countries to sign on the first day. From this day on the Agreement was open for signature for one year (IISD 2016a). As of 25 September 2017 there are 195 Parties that have signed the Agreement out of 197 Parties to the Convention. Only Nicaragua and the Syrian Arab Republic, responsible for under 0.1 % and approx. 0.2 % respectively of the total GHG emissions, have not signed the Paris

Agreement yet (UNFCCC 2017e). Nicaragua had been critical of the Paris Agreement because it considered the approach of relying on Nationally Determined Contributions not ambitious enough. However, President Daniel Ortega announced in September 2017 that Nicaragua would join the Paris Agreement (Climate Home 2017a), in solidarity with other developing countries.

4.1.2. Conditions for entering into force

The entry into force and the ratification process of the Agreement depend on domestic legislative and/or constitutional procedures; therefore signing represents a first step only. The Paris Agreement was designed to enter into force 30 days after at least 55 Parties that account for at least 55 % of the global greenhouse gas emissions have deposited their instruments of ratification, acceptance, approval or accession with the Depositary, the Secretary-General of the United Nations (UNFCCC 2015b).

Ratification of a multinational agreement is a formal process that starts at the national level, where countries follow and comply with their own constitutional and legislative procedures in order to establish the legal grounds that represent the country's consent to be bound by the Agreement. Furthermore, ratification leads to a country legally becoming a Party to the Agreement. In some countries it is not compulsory, at national level and within the scope of domestic constitutional law, for the head of state to ratify a treaty; in such a case the instruments of acceptance or approval are used instead. If a country wants to join the Paris Agreement as a party after the one year signature period is over, it will be able to do that by depositing an instrument of accession. In the end acceptance, approval and accession have the same legal implications as ratification (United Nations 2017a; UNFCCC 2017f; Jones and Mace 2016).

4.1.3. Progress of ratification and entry into force

In order to determine the exact moment when the required emission threshold of 55 % of the global greenhouse gas emissions is achieved, a specific compilation report was added as an Annex to the report on the COP in Paris (UNFCCC 2016c). This annex lists the total greenhouse gas emissions of each Party, based on the most recent information submitted to the UNFCCC. According to this calculation, the ten largest emitting countries are responsible for approx. 73 % of the GHG emissions.

During and after the signature ceremony in April 2016, mostly small countries deposited their instrument of ratification. This changed on 3 September 2016, when the world's two largest emitters, China and the United States, deposited their instrument of ratification ahead of the G20 summit (For more information on the G20 see chapter 7.2.3).

On 21 September 2016, a special event was held in New York at the headquarters of the United Nations, where representatives of 31 countries deposited their instruments of ratification. At this event, the first threshold for the entry into force of the Agreement, namely that at least 55 Parties had to ratify the Agreement, was met, and the share of these countries in the global greenhouse gas emissions rose to almost 48 % (United Nations 2016a).

At the beginning of October, additional Parties deposited their instrument of ratification, starting with India on 2 October and including, on 5 October, the European Union as well as seven of its Member States, and Canada. On that day, the second threshold – the emissions threshold – was met, which triggered the entry into force of the Agreement 30 days thereafter, on 4 November 2016.

As of 25 September 2017, 166 Parties accounting for approx. 87 % of the global greenhouse gas emissions have deposited their instrument of ratification, acceptance, approval, or accession (UNFCCC 2017e). For the main Parties and their status of implementation, cf. chapter 5.

4.1.4. Conditions for withdrawal

Article 28 of the Paris Agreement covers the rules for a Party's withdrawal from the Agreement (UNFCCC 2015b). At the earliest, a Party can submit a written notification to the Secretary-General of the United Nations three years after the entry into force of the Paris Agreement for that Party. Withdrawal can then take effect one year after this notification has been received, or at a later date if such a date is specified in the notification. The Party remains a Party to the Paris Agreement and may continue to participate in the negotiations under it and also revoke the withdrawal, until the withdrawal becomes effective (UNFCCC 2017g). On 4 November 2016 the Agreement entered into force, which means that for all the Parties that had joined by this day, the earliest date for a withdrawal from the Paris Agreement to become effective would be 4 November 2020.

On 1 June 2017 the President of the United States announced his intent to withdraw his country from the Paris Agreement. Two months later, in August 2017, the U.S. Department of State sent a communication to the United Nations Secretary-General expressing the USA's intention to withdraw as soon as it is eligible to do so. (For more information on the USA and its position on the Paris Agreement see chapter 5.2).

4.2. Negotiation bodies under the Paris Agreement

As laid out in chapter 3.9, the Paris Agreement established the so-called "Conference of the Parties serving as the meeting of the Parties to the Paris Agreement" (CMA, cf. Box 13). Its mandate is to promote and review the implementation of the Paris Agreement.

In addition, in order to prepare for the implementation of the Paris Agreement, the "Ad Hoc Working Group on the Paris Agreement" (APA) was established by the Decision accompanying the Paris Agreement (Decision 1/CP.21). Table 2 gives an overview of the APA and the CMA.

As the Paris Agreement entered into force at the beginning of November 2016, the first session of the CMA was convened during the COP which took place in Marrakesh later in the same month. During the negotiation of the Paris Agreement, it was expected that the first CMA would convene later and that, consequently, the APA would have more time for fulfilling its mandate. The situation that the APA is still working on the development of relevant guidance and modalities, but has to complete its work in time for the first session of the CMA, was solved by suspending the first session of the CMA and re-opening it in November 2017 as the second part of the first session (CMA 1-2). That CMA session will again be suspended and it was decided at the COP in Marrakesh that the APA would have to finish its work by CMA 1-3 in December 2018 (Decision 1/CP.22).

The first session of the APA in May 2016 was also suspended and re-opened as APA 1-2 in November 2016, and as APA 1-3 in May 2017 (see chapter 4.4, below). Suspension of the APA meeting, rather than closing and re-opening a new session, allows for a more efficient process, without having to discuss and agree on a new agenda at the beginning of each meeting. At the COP in Bonn in November 2017, the fourth part of the first session (APA 1-4) will convene.

Table 2: Overview of the APA and the CMA

	Ad Hoc Working Group on the Paris Agreement (APA)	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA)
Mandate	Oversee the implementation of the work programme resulting from Decision 1/CP.21 (i.e. it develop guidance and modalities).	Review the implementation of the Paris Agreement and promote its effective implementation.
First session	During the first meeting of the subsidiary bodies after the adoption of the Paris Agreement, i.e. during the subsidiary bodies meeting in Bonn, May 2016.	During the first COP session after the entry into force of the Paris Agreement, i.e. during the COP in Marrakesh, November 2016.
Frequency of sessions	Semi-annual, unless otherwise decided by the COP/CMA.	Annual.
Last session	The APA has to complete its work for the CMA's first session. The first session of the CMA has currently been suspended and the APA will complete its work and hold its last session in December 2018.	The CMA will convene as long as the Paris Agreement is in force.
Chairs / President	The APA is chaired by two co-chairs: Sarah Baashan (Saudi Arabia) and Jo Tyndall (New Zealand).	The CMA is presided over by the COP president, i.e. by Fiji Prime Minister Frank Bainimarama at the COP in 2017.
Session at the COP in November 2017	Fourth part of the first session (APA 1-4).	Second part of the first session (CMA 1-2).

Source: UNFCCC 2015b, Decision 1/CP.21, UNFCCC 2017h.

4.3. COP 22 in Marrakesh (2016)

The climate change conference in Marrakesh convened from 7 to 18 November 2016. Under the presidency of Mr. Salaheddine Mezouar, the (then) Moroccan Minister of Foreign Affairs, the 22nd session of the Conference of the Parties (COP), the 12th session of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP, cf. Box 5) and the first session of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA, cf. Box 13 and chapter 4.2) were held.

In addition, the subsidiary bodies SBI and SBSTA (cf. Box 3) held their 45th sessions and the Ad Hoc Working Group on the Paris Agreement (see chapter 4.2) convened the second part of its first session (APA 1-2).

Participation of Party delegates, representatives of agencies, organisations and the media was very high. At approx. 22 000 (IISD 2016b), the number of participants exceeded the number of participants at all previous COPs, except for the conference in Paris in the previous year.

The progress of the negotiations is described for each topic in the following sections. In addition to the negotiations, a number of events took place to demonstrate the international community's commitment to the climate change agenda. Over 70 heads of state and government participated in a high-level event during the second week of the conference, and the "Marrakesh Partnership for Global Climate Action" was launched (El Haite and Tubiana 2016).

This initiative supports collaboration between Parties and non-Party stakeholders to increase climate action in the period 2017 to 2020. Participant's commitments are published on the NAZCA (Non-State Actor Zone for Climate Action) platform (cf. Box 14) and participants are invited to regularly provide information on the progress of their actions. Despite such activities, many developing countries voiced their concerns that, after the entry into force of the Paris Agreement, immediate action in the period before 2020 did not receive the attention needed (TWN 2016a).

In the second week of the conference, the "Marrakesh Action Proclamation for our Climate and Sustainable Development" (UNFCCC 2016d) was read out by the Moroccan Presidency, reaffirming the commitment of the global community to increasing climate action and support and to the implementation of the Paris Agreement.

This proclamation gained further importance in the light of the results of the U.S. presidential elections which coincided with the first week of the conference (for more information on the U.S. elections and their implications see chapter 5.2). Although the prospect of a future U.S. President Trump was an important topic in the corridors of the conference, it did not prevent delegates from pursuing their technical work. The results of these technical negotiations are summarised in the following sections.

4.3.1. Mitigation

As the information to be provided in the Nationally Determined Contributions (NDCs) is not clearly specified in Decision 1/CP.21 (cf. Box 9), the APA's task is to put this information into concrete terms. APA continued its work on guidelines for the "features of NDCs", on how to facilitate clarity, transparency and understanding and on "accounting" (including, e.g., a comparison between pledged emission reductions and actual emission reductions). While China, India and the Arab Group (cf. chapter 6.6) were of the opinion that the guidelines should also include aspects of adaptation and support, the developed country Parties and some developing countries suggested that the guidelines should focus on mitigation.

The issue of a "public registry", i.e. a publicly accessible collection of the documents submitted by Parties, concerns both mitigation and adaptation, because according to the Paris Agreement both the NDCs and the adaptation communications will be recorded in such a registry. The views of Parties diverged widely – whether the two registries should be combined and what the workplan for tackling the overall issue should look like. The SBI (under which the "public registry" negotiations took place) was not able to make progress with the specific modalities of the registry; however, an NDC interim registry is available on the UNFCCC secretariat's website (UNFCCC 2017c).

Besides the topics related to the Paris Agreement, SBSTA discussed one remaining accounting issue from the Kyoto Protocol, namely emissions accounting and accounting for removals through Land Use, Land Use Change and Forestry (LULUCF) under the Clean Development Mechanism.

Box 16: Land Use, Land Use Change and Forestry (LULUCF) and the Clean Development Mechanism

Land use, changes in land use and forestry activities can alter the carbon stock of biomass and soils. As such, these activities may act as sources or sinks of greenhouse gases. In greenhouse gas inventories to be compiled under the UNFCCC, these sources and sinks are reported as a separate sector, "Land Use, Land Use Change and Forestry" (LULUCF), provided that they result from human-induced activities. Under the Kyoto Protocol, Parties account for LULUCF emissions/removals resulting from certain land use activities (e.g. deforestation, forest management and cropland management).

The discussion at the SBSTA session in Marrakesh focused on the types of activities which may be eligible as "removals" under the Clean Development Mechanism (CDM, one of the flexible mechanisms, cf. chapter 2.2). Some developing countries suggested that in addition to reforestation, certain revegetation activities should be eligible.

Even though the introduction of additional LULUCF activities may not be of large significance in the second commitment period of the Kyoto Protocol, it will be important under the Paris Agreement, where all Parties will account for greenhouse gas sources and sinks and – according to Article 6 – will have the option of participating in cooperative mechanisms (cf. chapter 3.1).

Discussions on these future cooperative mechanisms under the Paris Agreement continued at the SBSTA. There were still diverging views on a mechanism for reducing greenhouse gas emissions (which may retain some similarities to the CDM) and on Internationally Transferred Mitigation Outcomes (ITMOs), a more general term for a mechanism that may include activities other than emission reductions/removals. In addition, the Paris Agreement introduced a third option, a framework for non-market approaches.

At the COP in Marrakesh, several Parties suggested that the future cooperative mechanisms should also cover REDD+ activities.

Box 17: The UN-REDD programme and REDD+

The Programme on Reducing Emissions from Deforestation and Forest Degradation (UN-REDD Programme) was established in 2008 by the United Nations' Food and Agriculture Organization (FAO), Development Programme (UNDP) and Environment Programme (UNEP), triggered by a COP Decision of 2007 (Decision 2/CP.13). This programme supports nationally led processes in developing countries and promotes the informed and meaningful involvement of all stakeholders (UN-REDD 2017).

The REDD+ initiative extends this approach as it includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks. Activities in the area of REDD+ are supported by the UN-REDD programme. Under the UNFCCC, these activities are promoted under the Warsaw framework for REDD+, established at COP 19.

4.3.2. Adaptation

The APA was mandated to provide guidelines for the "adaptation communication", which each Party should submit according to Article 7 of the Paris Agreement. The discussions in Marrakesh focused on flexibilities (so as to not create an additional burden for developing countries) and on links to other topics, such as the global stocktake.

Box 18: Issues relating to agriculture

Adaptation to climate change will be a key challenge for farmers in the future, especially in developing countries. Issues related to agriculture have been discussed under the SBSTA agenda since 2012. At the conference in Marrakesh, the group of G-77 and China (cf. chapter 6.1) provided a draft work programme for issues relating to agriculture which focused on adaptation. Developed country Parties pointed out that agriculture also plays a key role in mitigation, as agricultural activities are an important source of greenhouse gases such as CH_4 and N_2O. Although this topic received wide attention during various events at the COP in Marrakesh, Parties were not able to converge to adopt a common position within the time available for negotiations.

4.3.3. Loss and damage

The Warsaw International Mechanism on Loss and Damage (WIM, cf. Box 10) was subject to a review during the Marrakesh conference. In its Decision 4/CP.22, the COP made a number of recommendations for advancing the work of the WIM Executive Committee and decided that a review should be carried out periodically, with the next review scheduled for 2019.

Further, the WIM's five-year workplan was approved and its Executive Committee requested to make various additions to this workplan, including a strategic workstream on the enhancement of action and support for addressing loss and damage, and for work on the implementation of the Paris Agreement.

4.3.4. Finance

The Decision accompanying the Paris Agreement recognises that the Adaptation Fund (see Box 19, below) may serve the Paris Agreement. At the Marrakesh conference, the CMA decided that the Fund should indeed serve as a financial mechanism under the Paris Agreement (Decision 1/CMA.1).

Box 19: Entities involved in climate finance

The financial mechanisms under the Convention are operated by dedicated entities. The Global Environment Facility (GEF) was established in 1991 to provide financing in various areas of environmental protection. The GEF is located in Washington, D.C. and administers, *inter alia*, the Special Climate Change Fund (SCCF) and the Least Developed Countries Fund (LDCF).

The Adaptation Fund (AF) was established in 2001 to finance adaptation projects and programmes in developing country Parties to the Kyoto Protocol.

The Green Climate Fund (GCF) was established in 2010 at the COP in Cancún as operating entity of the financial mechanism under the Convention (Decision 1/CP.16). The fund was made fully operational in 2015, with the GCF secretariat based in Songdo (Republic of Korea). As of 15 September 2017, 43 Parties, including 9 developing countries, pledged a total of USD 10.3 billion to the Green Climate Fund (GCF 2017).

The Standing Committee on Finance (SCF) was established in 2010. It assists the COP in coordinating and mobilising climate-related financing and in measuring, reporting and verifying the financial resources provided.

The COP, in its Decision 1/CP.22, requested the APA to work on the concrete operationalisation of this fund under the Paris Agreement, by addressing its governance structure, institu-

tional arrangements, safeguards and operating modalities. The decisions on the operationalisation of the Adaptation Fund under the Paris Agreement are to be taken by the CMA in 2018.

4.3.5. Technology development and transfer

The SBSTA was mandated by the COP in Paris to prepare the details of the new technology framework under the Paris Agreement (cf. chapter 3.5). At the Marrakesh conference, delegates agreed that the following topics constituted the initial key themes for the technology framework: innovation, implementation, enabling environments and capacity-building, cooperation and stakeholder involvement, and support.

4.3.6. Capacity-building

The SBI elaborated the modalities of the Paris Committee on Capacity-building (PCCB), which had been established through the Decision accompanying the Paris Agreement (cf. chapter 3.6). The PCCB members were elected and entities such as the Green Climate Fund (see Box 19) and the Technology Executive Committee (cf. Box 11) were invited to participate in the meetings of the PCCB. The first focus of the PCCB is on capacity-building activities for the implementation of Nationally Determined Contributions.

Finally, Parties concluded the third comprehensive review of the Convention's framework for capacity-building for developing countries. This framework had been introduced by the COP in Marrakesh in 2001 (cf. chapter 2.2), providing a set of guiding principles and approaches to capacity-building (UNFCCC 2017i).

4.3.7. Transparency of action and support

Under the Paris Agreement, a transparency framework for action and support was established (cf. chapter 3.7). The APA continued its work on determining the modalities, procedures and guidelines for this framework. The transparency framework is a cross-cutting element of the Paris Agreement, which is linked, *inter alia*, to the global stocktake, the "information to be provided in NDCs" (cf. Box 9) and to the "adaptation communication" (see chapter 4.3.2). Hence, the negotiators for the transparency framework need to closely follow and interact with the negotiations on these other topics (Dagnet et al. 2017).

One element of the transparency framework, the so-called "facilitative, multilateral consideration" (cf. Figure 2 in chapter 3.7), is based on two processes already established under the Convention:

First, the so-called "multilateral assessment" focuses on the progress achieved towards the developed countries' emission limitation/reduction targets for 2020. It is organised as question and answer sessions and forms part of the "International Assessment and Review" (IAR) process, which is based on Decision 1/CP.16. During the SBI session in Marrakesh, 24 Parties were subject to the multilateral assessment, including the EU and 19 of its Member States. The focus of the discussions was on mitigation measures and on the quantification of their effects.

Second, the "facilitative sharing of views" discusses information provided by developing countries. It is part of the "International Consultation and Analysis" (ICA) process for countries not included in Annex I to the Convention. In Marrakesh, seven developing countries were subject to this process, which highlighted their experience in the areas of greenhouse gas inventories, projections, policies and measures, but also their need for further support. For an overview of national reports under the Convention and under the Paris Agreement, see Figure 8 in chapter 10.2.

4.3.8. Global stocktake and increasing ambition

The APA continued its work on the details of the facilitative dialogue (scheduled for 2018) and the global stocktake (starting in 2023). Delegates discussed the sources of information to be used for the global stocktake, concepts (e.g. a common understanding of collective progress), and the expected results of the global stocktake.

There is a broad consensus that the Intergovernmental Panel on Climate Change (IPCC) will play a key role in informing the Parties to the Paris Agreement about the latest scientific findings on climate change, which will be the basis for increasing ambition in the context of the global stocktake (cf. also chapter 7.3.1).

4.3.9. Compliance, meetings, entry into force

Discussions on the compliance mechanism according to Article 15 of the Paris Agreement continued. Parties agreed that this mechanism should be facilitative in nature (i.e. less strict than the compliance mechanism under the Kyoto Protocol). However, there were diverging views on the circumstances that would trigger this mechanism, on possible actions under the mechanism and on the composition of the compliance committee.

As the Paris Agreement had already entered into force by the time the Marrakesh conference started, the first session of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA, cf. Box 13) was convened. It decided that the Ad Hoc Working Group on the Paris Agreement (APA) should continue its work until 2018, but should report on its progress to the CMA during the 2017 and 2018 COP sessions. It was agreed that the 2017 COP session would be presided over by Fiji, but held in Bonn (cf. chapter 10.1) and the 2018 COP session would be presided over by and held in Poland (cf. chapter 10.5). At that session, the work programme under the Paris Agreement is to be completed, and the CMA is to consider and adopt the corresponding outcomes (Decision 1/CP.22).

4.4. The meeting of the APA and the subsidiary bodies in Bonn (SB 46, 2017)

From 8 to 18 May 2017, the Ad Hoc Working Group on the Paris Agreement and the subsidiary bodies under the Convention met in Bonn. Approx. 2 000 Party delegates plus non-governmental and media representatives participated in the negotiations under the 46th session of the SBI and SBSTA (cf. Box 3), and the APA convened the third part of its first session (cf. chapter 4.2; IISD 2017a). During this session, the APA continued developing guidance and modalities for the implementation of the Paris Agreement.

Box 20: Modalities and guidelines for the implementation of the Paris Agreement – the "Paris rulebook"

As laid out in chapter 4.3.9, the work programme under the Paris Agreement is to be completed by the end of 2018. The result of the work programme will be a number of CMA decisions specifying the modalities for the implementation on the Paris Agreement, e.g. the rules for cooperative approaches (cf. chapter 3.1), or for the global stocktake (cf. chapter 3.8). In addition, there will be guidelines, e.g. for the reporting of information under the transparency framework (cf. chapter 3.7).

These modalities and guidelines are sometimes referred to as the "Paris rulebook". During the meeting in Bonn in May 2017, Parties converged on an understanding of the structure and elements of the various guidance documents, but a considerable amount of work still lies ahead as details need to be elaborated and agreed before the deadline in December 2018.

Besides the technical aspects of the Paris Agreement, issues under the Convention and the Kyoto Protocol were negotiated under the SBI and SBSTA. In the following sections, the diverse negotiation topics of the Bonn conference are listed, structured once again according to the main topics of the Paris Agreement.

The full agendas of each negotiating body are available on the UNFCCC website (UNFCCC 2017j). A table listing the responsible bodies for each task under Decision 1/CP.21, along with the progress of the negotiations, is provided in the "progress tracker", a document updated regularly by the UNFCCC secretariat (UNFCCC 2017k).

4.4.1. Mitigation

The APA continued its discussion on guidance for features of NDCs, appropriate information in order to facilitate the clarity, transparency and understanding of NDCs, and accounting of Parties' NDCs. As in the discussions in Marrakesh, differences prevailed as to whether the guidance should also address adaptation and support, and how the guidelines should address flexibilities.

Unlike at the COP in Marrakesh, negotiators made progress on the topic of a public registry for NDCs. Parties agreed to focus on the technical aspects of the registry and to work on its functions, structure and design elements.

Both the SBI and SBSTA discussed another mitigation-related topic: the impact of the implementation of response measures (cf. Box 29 in chapter 5.10). During the Bonn conference, a two-day technical expert group meeting was held to address such impacts. Experts from various countries and intergovernmental organisations shared their experiences of economic diversification and transformation, and the transition of the workforce (UNFCCC 2017l).

Following the expert group meeting, negotiations on the work programme and the modalities for the "forum on response measures" (cf. Box 29) progressed slowly. The specific role of the forum under the Paris Agreement still needs to be discussed and agreed on by 2018.

4.4.2. Adaptation

APA continued its work on further guidance in relation to the adaptation communication. Parties agreed that this should cover national circumstances, impacts, vulnerabilities and risk assessment, plans, priorities and actions. However, there were diverging views on the type of information to be provided on the topic of "support for adaptation": The developing countries called for indicative information on the support provided, whereas the developed country Parties were of the opinion that the adaptation communication should focus on information relating to the support needed.

Under the Convention, delegates discussed the Nairobi Work Programme (NWP – a mechanism for the dissemination of information on adaptation policies and practices) and National Adaptation Plans (NAPs, see Box 21).

As far as the Nairobi Work Programme was concerned, the SBSTA welcomed the documents compiled by the UNFCCC Secretariat on health, ecosystems and human settlements, and invited partner organisation to make use of the recommendations listed in these documents.

In addition, a technical expert meeting was held on "integrating climate change adaptation with the Sustainable Development Goals and the Sendai Framework on Disaster Risk Reduction". For more information on the Sustainable Development Goals and the Sendai Framework, see chapter 9.1.

Box 21: National Adaptation Plans (NAPs)

The National Adaptation Plan (NAP) process was established in 2010 under the Cancún Adaptation Framework (Decision 1/CP.16). It supports Parties in preparing and implementing National Adaptation Plans and in integrating adaptation into policies, programmes and activities. Initial guidelines for the formulation of NAPs were adopted at COP 17 in Durban (Decision 5/CP.17), outlining the following elements:

- Laying the groundwork and addressing gaps;
- preparatory elements (e.g. design and development of plans, communication);
- implementation strategies (e.g. strengthening institutional and regulatory frameworks, training and coordination);
- reporting, monitoring and review.

In 2016, the Green Climate Fund (GCF, cf. Box 19) announced plans to provide financial support to developing countries for the preparation of National Adaptation Plans and for running the NAP process (NAP Global Network 2016).

4.4.3. Loss and damage

The topic of loss and damage is addressed by a dedicated article of the Paris Agreement, but there is no specific reporting obligation. Therefore, various negotiation groups discussed whether or not information on loss and damage should be included in:

- the adaptation communication (see chapter 4.4.2)
- the transparency framework (see chapter 4.4.7)
- information provided for the global stocktake (see chapter 4.4.8)

How to address loss and damage under the Paris Agreement is still open. This will have to be decided by 2018.

4.4.4. Finance

As requested by the COP in Marrakesh (cf. chapter 4.3.4), the APA discussed the implementation of the Adaptation Fund under the Paris Agreement, in particular its governance and institutional arrangements, operating modalities and safeguards.

Article 9 of the Paris Agreement requires developed country Parties, *inter alia*, to submit information on support for developing countries provided and mobilised through public interventions. The SBSTA discussed the modalities for the accounting of these financial resources. Various open issues remained, e.g. how to distinguish between climate finance and Official Development Assistance (ODA).

4.4.5. Technology development and transfer

Work on the technology framework under the Paris Agreement continued. As the key themes had been decided in the previous APA session (cf. chapter 4.3.5), Parties now focused on the principles and structure of the framework. As in the other strands of the negotiations, the developing countries referred to the Convention's principle of common but differentiated responsibilities, whereas the developed country Parties put their focus on other principles such as coherence, inclusivity and transparency.

4.4.6. Capacity-building

During the May 2017 session in Bonn, the Paris Committee on Capacity-building (PCCB, cf. Box 12) held its first meeting. It included presentations and discussions on capacity-building for NDCs, with the active participation of observers from civil society (cf. chapter 7.1). The

PCCB adopted its working modalities and procedures, and agreed to continue with its current focus on capacity-building for the implementation of NDCs until 2018.

4.4.7. Transparency of action and support

Under the APA, Parties compiled possible elements of the modalities, procedures and guidelines for the transparency framework. Although the Paris Agreement provides for flexibilities depending on a country's capacities, some developing countries called for a more distinct differentiation between the obligations of developing and developed countries.

As the Transparency Framework includes a wide range of topics (from information on NDCs to financial support) and three different processes (reporting, review and multilateral consideration, cf. Figure 2 in chapter 3.7), there is still a considerable amount of work to be accomplished by delegates before the specifics can be agreed for each of these processes.

As at the COP in Marrakesh, developed country Parties were subject to "multilateral assessment". For this purpose, sessions were convened where questions on their progress towards their emission limitation/reduction targets were posed. These 13 countries included the United States of America, whose delegation provided information on its policies and measures but pointed out that these were currently being reviewed and might not be supported in the future. Shortly after the Bonn Session, President Trump announced his decision to withdraw from the Paris Agreement (cf. chapter 5.2). Nevertheless, the United States retains its role as a negotiator and its reporting obligations as a Party to the Convention.

As in Marrakesh, information provided by developing countries was discussed during a "facilitative sharing of views" session. The ten participating countries included important emitters such as India or Indonesia and – for the first time – a country which qualifies as a "least developed country" (cf. chapter 6.7) – Mauretania.

4.4.8. Global stocktake and increasing ambition

The APA continued its discussion on the global stocktake, focusing on linkages and context, modalities, inputs and outcomes. Several developing countries pointed out the importance of taking equity into account, as well as loss and damage. The Parties largely agreed that the global stocktake should start with a "technical" phase, followed by a separate "political" phase.

4.5. Progress towards the temperature goal of the Paris Agreement

As laid out in chapter 3, the Paris Agreement specifies a temperature goal, an adaptation goal and a goal of finance flows consistent with low emissions and climate-resilient development. Progress towards these goals will be assessed in the global stocktake (cf. chapter 3.8). Among these three goals, the temperature goal stands out for several reasons: It is quantified; progress towards this goal can be assessed quantitatively using measured data and models, and it is subject to a first assessment in 2018, in the course of the facilitative dialogue (cf. chapter 10.5). For these reasons, current progress towards the temperature goal of the Paris Agreement is discussed in more detail in the following.

The Paris Agreement aims to limit the increase in global average temperatures to well below 2 degrees C above pre-industrial levels and, furthermore, to pursue efforts to limit the temperature increase to 1.5 degrees C compared to pre-industrial levels (cf. Table 1).

Over the period 1880 to 2012, the global mean temperature rose by 0.85 degrees C (IPCC 2013). The years 2014, 2015 and 2016 were the warmest years to date in the history of systematic temperature measurement, which began in 1880. Analyses in 2017 by NASA and NOAA show that the global mean temperature has already risen by more than 1 degree C since the late 19th century (NOAA 2017; NASA and NOAA 2017).

Climate change is driven by greenhouse gas emissions and the key source of these emissions is the burning of fossil fuels. Thus, it will be imperative to largely phase out the use of fossil fuels by the middle of this century if the temperature goal of the Paris Agreement is to be achieved.

In this respect, it is important to relate the mitigation actions pledged by the Parties to the resulting total emissions and their effect on global temperature.

4.5.1. Carbon budget

An almost linear relationship is discernible between the cumulative emissions of CO_2 since 1870 and the average global surface temperature increase (IPCC 2015). Because CO_2 has a long lifetime in the atmosphere, most anthropogenic CO_2 which has been emitted up to now and which is contributing to the current CO_2 level will still be in the atmosphere at the end of the 21st century. Therefore, the resulting temperature will depend on the cumulative CO_2 emissions rather than on the timing of those CO_2 emissions.

This linear relationship forms the basis of the carbon budget, which gives the remaining cumulative amount of CO_2 emissions that can be emitted over a certain timeframe in order to stay – with a certain associated probability – on track with respect to a chosen temperature goal.

According to the IPCC, 2 900 Gt of CO_2 emissions can be emitted globally from 1870 onwards, with a 66 % chance to keep the global average temperature increase below 2 degrees C above pre-industrial levels (IPCC 2015). Approx. 2 100 Gt of CO_2 were already emitted in the period until 2016, which leaves around 800 Gt of CO_2 from 2017 onwards. At the current emission rates (approx. 36 Gt of CO_2 in 2016), this budget will be used up in around 20 years' time.

When looking at the 1.5 degrees C goal, the carbon budget is much smaller. To stay – with a 50 % to 66 % probability – within the 1.5 degree C target, the remaining budget is approx. 150 Gt of CO_2, which would mean that it will be used up in around 4 years' time. It has to be noted that there are various choices with regard to the definition, type of model, starting year, temperature goal, probability, etc. to be made when estimating a carbon budget which inevitably lead to uncertainties concerning the outcome of the estimate (Peters 2017). Another recent study, which assumes ambitious emission reductions in non-CO_2 greenhouse gases, estimates the remaining carbon budget to be considerably higher – at 240 Gt of carbon, which corresponds to 880 Gt of CO_2 (Millar et al. 2017). However, this does not change the basic finding that greenhouse gas emissions need to decline drastically to meet the 1.5 degrees C goal.

The carbon budget available for meeting the temperature goal of the Paris Agreement is in stark contrast to the fossil carbon reserves which are known to be available for exploration and combustion worldwide. The estimated fossil material reserves exceed the global carbon budget 4 to 7 times (IPCC 2015; IPCC 2014; Global Carbon Project 2016; Le Quéré et al. 2016; Peters 2017).

4.5.2. NDC pathway

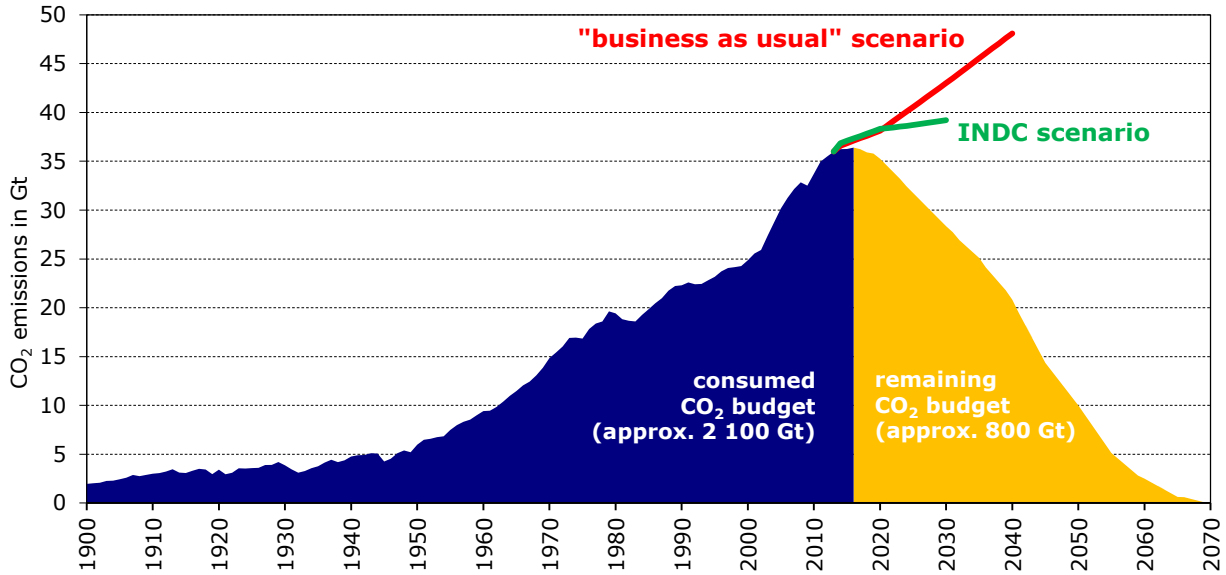
Several analyses have been made to assess the contribution of the current NDCs to meet the temperature goal of the Paris Agreement, assuming that NDCs are implemented as pledged.

According to calculations of Climate Action Tracker (2016), and if governments' unconditional pledges or promises (as of November 2016) were to be implemented, the temperature increase by the year 2100 compared to pre-industrial levels would be limited to approx. 2.8 degree C. This NDC pathway has an over 90 % probability of exceeding the 2 degrees C goal and a chance of approx. 66 % only of staying below 3 degrees C in the period until 2100.

In the absence of mitigation policies the temperature increase by the end of this century would be expected to be between 4.1 degrees C and 4.8 degrees C compared to pre-industrial levels.

According to an analysis of Climate Interactive (2017) based on the national contributions (INDCs, NDCs and long-term strategies) up to April 2017 and on the assumption that no further progress is made in addition to these pledges, these commitments would result in a warming of 3.3 degrees C in 2100. Business as usual would lead to a warming of approx. 4.2 degree C according to this model. Several other studies came to similar conclusions (Carbon Brief 2017).

Figure 3: Development of global CO_2 emissions until 2016, scenarios and carbon budget for staying within the 2 degree C goal



Source: Umweltbundesamt 2017; Global Carbon Project 2016; CDIAC 2016; IEA 2015, IEA 2016a.

Figure 3 combines the development of global CO_2 emissions between 1900 and 2016 with the carbon budget concept and adds two International Energy Agency (IEA) scenarios (Umweltbundesamt 2017). The area below the curve represents the consumed against the remaining CO_2 budget. The depicted curve showing the development of the emissions after 2016 is one of many possible roads to be taken – without overshooting the carbon budget at some point and thereby necessitating a large-scale removal of CO_2 from the atmosphere (for more information on CO_2 removal and geo-engineering see chapter 9.4). In 2016 approx. 36 Gt of CO_2 were emitted by the combustion of fossil fuels and by industrial processes (Global Carbon Project 2016; CDIAC 2016). The "business as usual" scenario builds upon IEA (IEA 2015a; IEA 2016a) calculations based on currently implemented policies. The second scenario is based on submitted INDCs. It further illustrates the need for urgent climate mitigation action.

4.5.3. UNEP emissions gap report

The emissions gap report, published annually by the United Nations Environment Programme (UNEP), shows projections of different scenarios and the resulting emissions gap in 2030 when compared to the 2 degrees C and the 1.5 degrees C goal (UNEP 2016a). Contrary to the data e.g. used in Figure 3 and Table 3, where greenhouse gases other than CO_2 are not included for consistency reasons, UNEP's report is based on calculations which also include other greenhouse gases, like CH_4 or N_2O; the resulting global annual emissions of all gases amount to 52 Gt of CO_2 equivalent for the year 2014. When comparing the INDC pathways with the 2

degree C temperature goal in the year 2030, an emission gap of 12 Gt of CO_2 equivalent for the conditional pledges and 14 Gt of CO_2 equivalent for the unconditional pledges arises. With the 1.5 degree C goal, the gap increases to 15 Gt (and 17 Gt respectively) of CO_2 equivalent in 2030. As a result, UNEP calls for rapid action in its report, and especially for more pre-2020 action (cf. chapter 3.10).

It is important to note that even in the hypothetical case that all fossil fuel emissions were to cease overnight, the anthropogenic greenhouse gases emitted in previous decades would still lead to a further increase in global temperatures in the coming decades due to the inertia of the climate system. Due to past emissions, there would be a "committed warming" of approx. 1.3 degrees C within this century (compared to pre-industrial levels) and a committed warming of approx. 1.5 degrees C in the long term (Mauritsen and Pincus 2017).

All these findings demonstrate that more extensive mitigation efforts than pledged are required to bring the world on a path towards the temperature goal of the Paris Agreement.

5. MAIN PARTIES

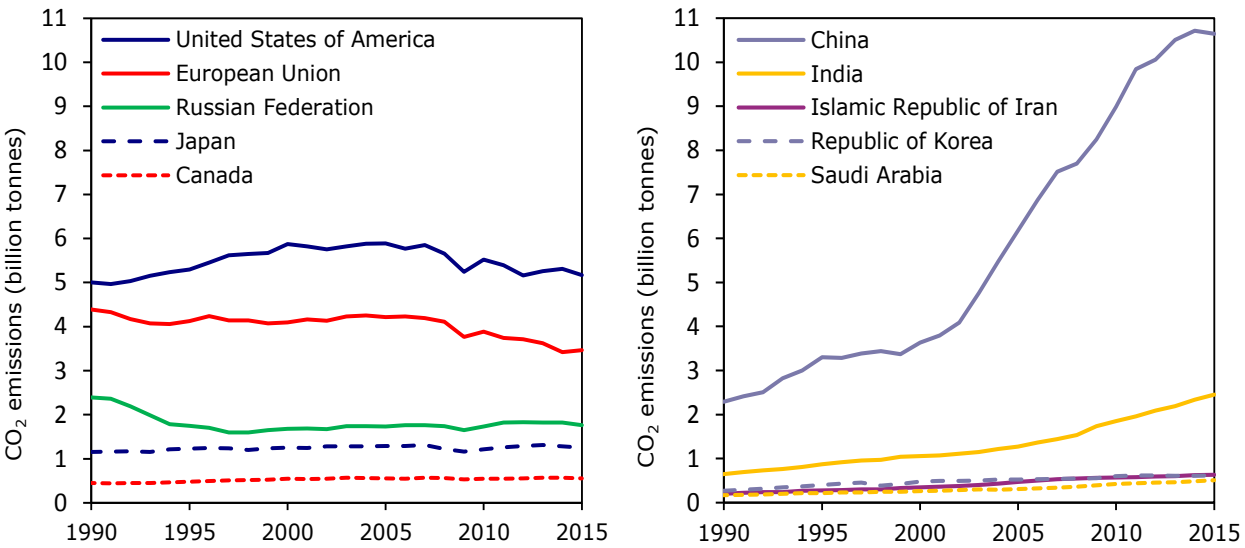
In the UNFCCC negotiations, all countries participate independent of their population size or greenhouse gas emissions. Nevertheless, in view of the goals of the Paris Agreement, it is important to take a closer look at those that make up the largest share of emissions. In the following, information is provided on the ten Parties with the highest CO_2 emission levels (as compiled for the year 2015 by Olivier et al. 2016). Together, they account for approx. 75 % of the global CO_2 emissions. They also include six of the top ten of the world's most populous countries and the top nine countries, ranked according to the Gross Domestic Product (GDP).

In this chapter, the European Union is presented as one Party. Germany is both an EU Member and a Party to the UNFCCC and accounts for the 6th highest CO_2 emissions in 2015. In this chapter, Germany is considered as part of the EU and not presented separately.

Figure 4 presents the development of CO_2 emissions of the ten largest emitters from 1990 to 2015. It has to be noted that not all sources of CO_2 emissions are accounted for here and that greenhouse gases other than CO_2 are not included. Nevertheless, this dataset is used because it constitutes the most recent consistent time series that is comparable across all Parties.

In Annex I to the report on the COP in Paris (UNFCCC 2016c), a compilation of greenhouse gas emissions per Party can be found. However, as stated in that Annex, the information was compiled only for the purpose of determining the threshold of 55 % of the global greenhouse gas emissions for the entry into force of the Paris Agreement. As the data come from a range of reports dating from different years, they do not constitute a consistent dataset for the purpose of comparing the emissions of the main Parties.

Figure 4: CO_2 emissions of Parties to the UNFCCC with largest emissions in 2015



Parties listed on the left are known as developed country Parties. Parties listed on the right are known as developing (emerging) countries. Emissions of the European Union are expressed as the sum of the 28 Member States over the whole time series.

Source: European Commission Joint Research Centre (JRC) / PBL Netherlands Environmental Assessment Agency (2016), http://edgar.jrc.ec.europa.eu/.

Information on other indicators (such as emissions per capita or per GDP) is provided in Table 3. Total greenhouse gas emissions, including other gases, are also shown in this table. The most recent data available for all Parties are from 2013 (WRI 2017a). Again, they may differ

from the figures provided by the Parties in their reports under the UNFCCC but they constitute the most recent information that is comparable across all Parties.

Table 3: Parties to the UNFCCC with largest CO_2 emissions in 2015

Party	CO_2 emissions (million tonnes)	CO_2 emissions (percent of world total)	CO_2 emissions (tonnes per capita)	CO_2 emissions per GDP (kg per 1 000 USD)	Greenhouse gas emissions[1] (million tonnes CO_2 eq.) in 2013
China	10 642	29.5 %	7.7	579	11 735
United States	5 172	14.3 %	16.1	306	6 280
European Union	3 470	9.6 %	6.9	192	4 225
India	2 455	6.8 %	1.9	327	2 909
Russian Federation	1 761	4.9 %	12.3	503	2 199
Japan	1 253	3.5 %	9.9	276	1 353
Islamic Republic of Iran	634	1.8 %	8.0	491	717
Republic of Korea	617	1.7 %	12.3	355	674
Canada	555	1.5 %	15.5	361	738
Saudi Arabia	506	1.4 %	16.0	319	547

[1] Greenhouse gas emissions excluding land use, land use change and forestry (LULUCF) in CO_2 equivalents.
Source: World Resources Institute (2017a), http://cait.wri.org, data derived from several sources.

Source: European Commission Joint Research Centre (JRC) / PBL Netherlands Environmental Assessment Agency (2016), http://edgar.jrc.ec.europa.eu/.

As can be seen from Table 3, per capita CO_2 emissions are highest in the United States of America and China has the highest CO_2 emissions per unit of GDP. Furthermore, China is the largest emitter of CO_2 as well as of total greenhouse gases.

In the following, this chapter provides information for each of the Parties listed above on greenhouse gas emissions, climate policies, and status of implementation of the Paris Agreement.

In chapter 5.11, key information is given on additional Parties which are among the top 15 CO_2 emitters and also play important roles in climate change negotiations (Indonesia, Brazil, Mexico, Australia and South Africa).

5.1. China

The People's Republic of China is with approx. 1.4 billion inhabitants the world's most populous country. It has experienced high economic growth in the last decades and, since 2006, has been the world's largest CO_2 emitter. In recent years, China has made important statements and announcements on climate change, several times in coordination with the United States (e.g. The White House 2015). In September 2016, the presidents of these two countries deposited their instruments of ratification of the Paris Agreement with the United Nations Secretary-General (cf. also chapter 7.2.3).

5.1.1. Emission profile

As can be seen from Table 3, China contributed 29.5 % of the world's total anthropogenic CO_2 emissions in 2015. The CO_2 emissions more than quadrupled from 2.4 Gt (gigatonnes) in 1990 to 10.6 Gt in 2015 (Olivier et al. 2016).

For other greenhouse gases, the most recent detailed inventory is available from China's First Biennial Update Report on Climate Change submitted in December 2016. According to that inventory, CO_2 accounted for approx. 83 % of the total greenhouse gas emissions (expressed in CO_2 equivalents) in 2012, followed by methane with 9.9 %, nitrous oxide with 5.4 % and fluorinated gases with 1.6 % (People's Republic of China 2016).

China is the biggest producer, importer and consumer of coal in the world and is accounting for approx. half of global coal consumption in 2014 (IEA 2015b).

In recent years, after 2011 and until 2014, a slow-down in the annual increase of CO_2 emissions was observed which can be attributed, *inter alia*, to a smaller increase in coal consumption. 2014 saw no growth in coal demand in China and an increase in emissions by only 0.9 % (Olivier et al. 2015). In 2015 a 1.5 % decline in coal consumption was recorded. This was partly offset by increases in consumption of oil as well as natural gas. According to Olivier et al. (2016), China's overall CO_2 emissions decreased by 0.7 % in 2015 compared to 2014. This is the first decline recorded for China after the year 2000 and after the strong (and continued) increase in emissions over the past 15 years.

However, it has to be noted that CO_2 emissions, especially from coal consumption, may be associated with considerable uncertainties, due to uncertainties in emission factors and revisions of statistical data. Korsbakken et al. (2016) found that actual coal consumption was higher in recent years than suggested by preliminary statistical data. In particular, it was found that Chinese total CO_2 emissions from 2000 onwards were higher by approx. 9 % when taking into account revised energy statistics.

5.1.2. Climate policies and status of implementation of the Paris Agreement

A comprehensive overview of China's recent and planned climate policy is given in its First Biennial Update Report on Climate Change (People's Republic of China 2016) submitted to the UNFCCC. China's economy consists of energy-intensive industries and its industrial policy in recent years aimed at transforming and upgrading traditional industries, improving energy efficiency and developing the service industry. However, it has been pointed out that with a strong focus on energy-related CO_2 emissions, emissions of other greenhouse gases such as methane, nitrous oxides or fluorinated gases may be underrepresented in Chinese climate policies and could continue to increase (Climate Action Tracker 2017a).

China's First Biennial Update Report also lays out the mitigation targets and actions of its 13th 5-year plan for the years 2016 – 2020. In the 5-year plan, further economic development is top priority, but at the same time targets have been set for greenhouse gas emissions and energy consumption, as well as goals for increasing the efficiency of the industrial sector and goals for renewable energy. The target for carbon intensity, i.e. CO_2 emissions per unit of

GDP, is an 18 % decrease by the year 2020 from 2015 levels. Regarding its energy policy, the People's Republic of China has set itself the goal to cut energy consumption per unit of GDP by 15 % from 2015 levels by the year 2020. To achieve these objectives, China is aiming to diversify its energy mix, giving more importance to renewables and less to coal. In response to the increasingly important issue of air pollution, specific targets for ambient air quality have been set and emphasis is placed on transportation measures. Furthermore, one of the targets of the 13th five year plan is to increase forest coverage (LSE 2016a; WRI 2016a).

By the end of 2016, China's installed photovoltaic capacity had increased to 77.4 GW, almost double the amount installed in the year 2015. China has thus become the largest producer of solar energy by capacity in the world. Furthermore, it plans to add more than 110 GW of photovoltaic capacity between 2016 and 2020 (People's Republic of China 2017).

In June 2015, China submitted its Intended Nationally Determined Contribution to the UNFCCC secretariat (People's Republic of China 2015). It consists of a summary of enhanced actions (goals) and a wide range of policies and measures, including national and regional actions, enhancement of energy efficiency, low-carbon development, and financial and policy support. Ahead of COP 21, in September 2015, China's President Xi Jinping and U.S. President Barack Obama reaffirmed their mitigation commitments (The White House 2015). In this statement, two additional Chinese initiatives were announced, namely a national emissions trading system planned for 2017 and a "South-South Climate Cooperation Fund" to support other developing countries in combating climate change.

According to its NDC, China is aiming to reach the peak of CO_2 emissions around 2030 and will make best efforts to peak early, to lower its CO_2 emissions per unit of GDP by 60 to 65 % from the level of 2005, to increase the share of non-fossil fuels in primary energy consumption to around 20 % and to increase the forest stock volume by around 4.5 billion cubic metres compared to 2005 (People's Republic of China 2015).

As stated above, China's overall CO_2 emissions decreased between 2014 and 2015. Although this has to be seen in the light of various uncertainties, there is evidence that China may be on track to peak CO_2 emissions considerably earlier than 2030 (Green and Stern 2016; Forbes 2016). The analysis of the Climate Action Tracker also shows that China may be on the way to achieving both its 2020 pledge as well as its 2030 plans. Moreover, under its current policies, China could even overachieve the target levels outlined in its National Determined Contribution (Climate Action Tracker 2017a).

China is an associate member of the G-77 (cf. chapter 6.1) as well as the so called Like Minded Group of Developing Countries (LMDC, cf. chapter 6.3) and puts forward its positions during international climate negotiations through these groups, as well as bilaterally with other key players such as the United States (during the the years of the Obama administration) or the European Union.

The People's Republic of China signed the Paris Agreement in April 2016. In September 2016, China's President Xi Jinping, jointly with U.S. President Barack Obama, deposited the instrument of ratification of the Paris Agreement with United Nations Secretary-General Ban Ki-moon (Reuters 2016a). China was the first large emerging economy to ratify the Paris Agreement and has been a Party to the Agreement since it has entered into force in November 2016.

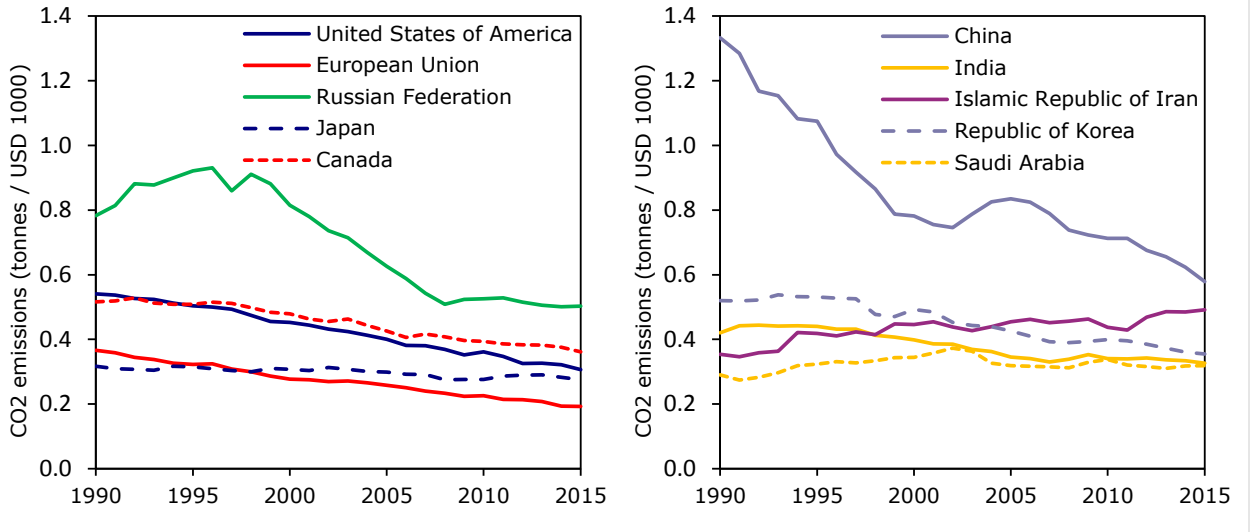
Box 22: CO_2 emissions per unit of GDP

Both in its 2016-2020 five-year plan and its INDC, China included a target to lower its CO_2 emissions per unit of GDP. It is therefore instructive to present more details of this metric for the main Parties discussed in this chapter.

In Figure 5, it can be seen that countries such as China or the Russian Federation have had very high CO_2 emissions per unit of GDP, due to their carbon-intensive industries. Especially China has made important improvements since 1990, but also Russia has made considerable advances. Overall, an alignment of CO_2 emissions per unit of GDP can be observed. For the majority of countries the CO_2 emissions per unit of GDP show a downward trend overall, with no drastic changes over the past few years. Only in Iran and Saudi Arabia did an increase occur between 1990 and 2015. In absolute terms, the rate is lowest in the EU.

It has to be noted that China's CO_2 emissions per unit of GDP have further decreased since 2005, which means that part of the decrease stated in China's INDC has already been achieved and the additional improvement between now and 2030 is correspondingly less strong.

Figure 5: CO_2 emissions per unit of GDP of Parties with largest emissions in 2015



Parties listed on the left are known as developed country Parties. Parties listed on the right are known as developing (emerging) countries.

Source: European Commission Joint Research Centre (JRC) / PBL Netherlands Environmental Assessment Agency (2016), http://edgar.jrc.ec.europa.eu/. Note that the U.S. Dollar is adjusted by purchasing power parity of 2012.

5.2. United States of America

The United States of America is the world's second largest CO_2 emitter and has the highest per capita CO_2 emissions among the main Parties presented in this chapter.

Although the United States was, in September 2016, one of the first developed countries to ratify the Paris Agreement (The White House 2016a), its climate policies took a dramatic turn following the election of Donald Trump as President in November of the same year, and on 1 June 2017, the President announced that the United States would withdraw from the Paris Agreement.

5.2.1. Emission profile

As can be seen in Table 3, the United States contributed, in 2015, 14.3 % of the world's total anthropogenic CO_2 emissions (Olivier et al. 2016). Overall, U.S. greenhouse gas emissions peaked in 2007. After a decrease in the following years, emissions in 2015 were 3 % above the level of 1990. The most recent decrease of 2.6 % between 2014 and 2015 can be explained, *inter alia*, by the substitution of coal by natural gas in the electric power sector. CO_2 accounted for 82.2 % of the total greenhouse gas emissions in 2015, followed by methane with 10.0 %, nitrous oxide with 5.1 % and fluorinated gases with 2.8 % (U.S. Environmental Protection Agency 2017).

5.2.2. Climate policies and status of implementation of the Paris Agreement

Unlike many other countries, the United States addresses greenhouse gases under its air pollution legislation, following a Supreme Court ruling (U.S. Supreme Court 2007) that "greenhouse gases fit well within the […] capacious definition of 'air pollutant' " under the Clean Air Act. CO_2 emissions are sometimes referred to as "carbon pollution".

Following the Supreme Court ruling, the U.S. Environmental Protection Agency (EPA) started regulating greenhouse gas emissions under the Clean Air Act in 2011. The regulations included emission standards for light-duty vehicles, corporate average fuel economy standards, and a permitting programme for stationary sources.

This regulation on stationary sources was extended by the "Clean Power Plan" in 2015 (Climate Policy Observer 2015). This plan included state-by-state CO_2 emission goals for power plants; states were provided with several options for implementing state-wide plans to meet these goals. The Clean Power Plan constituted the centrepiece of the United States' Intended Nationally Determined Contribution (INDC), which had been communicated in March 2015 (United States of America 2015). This document, which still has the status of the United States' Nationally Determined Contribution (NDC) under the Paris Agreement, envisaged a reduction of greenhouse gas emissions by 2025 by 26 to 28 % compared to 2005 levels.

However, in March 2017, President Trump revoked several climate-related policies and ordered the EPA to review the "Clean Power Plan" and to suspend, revise or rescind its rules (The White House 2017a).

Box 23: Social cost of carbon in regulatory impact analysis

The regulations which President Trump ordered to be reviewed and revoked in March 2017 include the estimate of the "social cost of carbon, nitrous oxide and methane for regulatory impact analysis". The "social cost of carbon" approach had been introduced by the Obama administration and takes into account long-term costs of climate change (The White House 2016b), resulting in approx. USD 40 per tonne of CO_2 emitted. The Trump administration, by contrast, will return to regulations of 2003 (The White House 2017a) which will result in much lower costs of carbon in cost-benefit analyses of new regulations, *inter alia* because impacts of GHG emissions will only be considered for the U.S. and not abroad.
This approach can be seen as another aspect of the shift in White House policies from a global and long-term perspective to a strictly domestic and shorter-term focus. However, it was also pointed out that the relevant government agencies will face difficulties in revising their cost estimates consistently, and that these revised estimates will be prone to court challenges (Revkin 2017).

On 1 June 2017, President Trump announced that the United States would withdraw from the Paris Agreement (The White House 2017b). The President also declared that the United States would suspend implementation of its NDC and would terminate payments to the Green

Climate Fund (cf. Box 19). In his statement, President Trump mentioned his willingness to negotiate a re-entry into the Paris Agreement or to negotiate a new agreement. However, it was made clear by an important number of representatives from other Parties that they would not engage in such an approach. For example, the leaders of Germany, France and Italy, in a joint statement, confirmed their view that the Paris Agreement cannot be renegotiated and reaffirmed their commitment to implement it (Reuters 2017a).

Box 24: Timeline for the U.S. withdrawal from the Paris Agreement

As laid out in chapter 4.1.4, there is a three-year period between the entry into force of the Paris Agreement and the start of a Party's withdrawal procedure. Despite the President's announcement, the withdrawal procedure will start on 4 November 2019 at the earliest, with a notification to the United Nations Secretary-General. If such a notification is given on that date, withdrawal will be effective one year later, on 4 December 2020, which happens to be one day after the next U.S. presidential election.

The intention to withdraw was reiterated by a communication submitted by the U.S. Department of State to the United Nations on 4 August 2017 (U.S. Department of State 2017). In this letter the United States expressed its intention to withdraw from the Agreement unless it "identifies suitable terms for reengagement". This language represents a departure from previous language on "renegotiating" the Paris Agreement and is interpreted by some observers as an opening that may in fact allow the United States to remain in the Agreement after all (Climate Home 2017b).

The Department of State also announced that the U.S. would continue to participate in climate negotiations, including the upcoming Conference of the Parties in November 2017 and, in particular, the negotiations on the guidance/modalities for implementing the Paris Agreement (cf. chapter 10.3).

Despite the change of course in national climate policies, numerous U.S. cities, states and businesses have pledged to continue ambitious climate action (Climate Policy Observer 2017a). For example, over 200 mayors, nine states and a large number of business leaders declared, in an open letter with the message "We are still in" (World Wildlife Fund 2017), that they would continue to support climate action to meet the goals of the Paris Agreement. The governors of California, New York and Washington formed the "U.S. Climate Alliance" and committed to achieve or exceed the targets of the Clean Power Plan on a state level (Office of Governor Edmund G. Brown Jr. 2017a). Kuramochi et al. (2017) analysed committed and proposed mitigation actions from 22 states, 54 cities and 250 companies. They found that in 2025, these actions would lead to emission reductions of 430 to 540 Mt CO_2 equivalent (5 to 8 % of overall greenhouse gas emissions) compared to the national policy scenario.

The overall effect of the changes in U.S. policies is difficult to quantify, as it depends on the exact date when the previously planned policies will be suspended, and as they may partly be replaced by similar policies on the state level. According to recent studies (Höhne et al. 2017, Galik et al. 2017), U.S. emissions would remain around current levels throughout the 2020s and clearly miss the goal stated in the NDC. This emissions gap would be due, *inter alia*, to less stringent energy efficiency and methane emissions standards.

However, besides national and state policies, market forces will also shape the development of U.S. emissions in the future. Although the Clean Power Plan will not be implemented as planned, emissions from power plants are projected to decrease due to the abundance and price advantage of natural gas in North America (compared to coal). A recent projection estimates that GHG emissions from the U.S. power sector will decrease by 30 % by 2030,

compared to 2005, even without related federal policy, thereby coming close to the original target of the Clean Power Plan (Bloomberg New Energy Finance 2017).

Finally, it is worth mentioning that while the United States announced that it would cease implementation of its NDC, no such announcement was made in relation to its emissions goal under the Copenhagen Accord, which was communicated following the 2009 climate change conference (cf. chapter 2.3) and foresees an emissions reduction of 17 % compared to 2005 by 2020.

5.3. European Union

The European Union is the only group of countries which is a Party to the UNFCCC. The EU as well as its Member States committed to reducing their greenhouse gas emissions jointly under the Kyoto Protocol. For the second commitment period under the Kyoto Protocol, which was laid down in the Doha Amendment (cf. Box 6), all current Member States (plus Iceland) agreed to further reduce their greenhouse gas emissions in the period 2013-2020. The Intended Nationally Determined Contribution which was submitted in 2015 also applies to all current Member States combined.

The European Union and seven of its Member States deposited their instruments of ratification for the Paris Agreement on 5 October 2016. As of 25 September 2017 all EU Member States had ratified the Paris Agreement with the exception of the Czech Republic.

5.3.1. Emission profile

As can be seen in Table 3, the European Union contributed 9.6 % of the world's total anthropogenic CO_2 emissions in 2015 (Olivier et al. 2016). In recent years, the EU has seen a steady decline of greenhouse gas emissions due to the implementation of various European and national regulations e.g. in the field of energy efficiency and renewable energy use. There are also two distinct phases of steeper greenhouse gas emission reductions since 1990: at the beginning of the 1990s due to, *inter alia*, an economic restructuring of the Eastern European economies and from 2008 onwards in the aftermath of the economic crisis.

The total greenhouse gas emission reduction of the 28 EU Member States from 1990 to 2015 was -23.7 % excluding LULUCF (EEA 2017). Consequently, the EU will most probably overachieve its emission reduction target of minus 20 % until 2020 as foreseen in the second commitment period under the Kyoto Protocol. Since 1990, emissions have declined in all main sectors but transport (including international transport) and refrigeration and air conditioning.

Between 2014 and 2015 the EU's total GHG emissions increased (by 0.5 %) for the first time since 2010, accompanied by an increase in GDP by 2.2 % which was the largest increase since the start of the economic crisis in 2008. The rise in emissions in 2015 was mainly triggered by a higher heating demand, in particular from households, as a consequence of colder winter conditions in Europe and an increase in road transportation. In 2015, CO_2 emissions amounted to approx. 81 % of the total greenhouse gas emissions, followed by methane and nitrous oxide with 11 % and 6 % of the total emissions respectively (EEA 2017).

5.3.2. Climate policies and status of implementation of the Paris Agreement

EU climate policies can be roughly divided into four phases:

Table 4: Overview of EU climate policies

Policies	Time period
Policies and measures for the first Kyoto commitment period, including the EU Emissions Trading Scheme (EU ETS)	2008-2012
The 2020 climate and energy package to meet the target of the second Kyoto commitment period, including the EU Emissions Trading System and national emission reduction targets.	2013-2020
The 2030 Climate and Energy Policy Framework, which forms the basis for the EU's Nationally Determined Contribution (NDC).	2021-2030
A long-term strategy for a low-carbon economy, as laid out in the 2050 low-carbon economy and the energy roadmap.	2031-2050

Source: Decisions, Directives and Commission Communications as outlined in the text below.

The EU Climate and Energy package (adopted in 2009) includes targets to reduce EU greenhouse gas emissions by at least 20 % by 2020 compared to 1990; to increase the share of renewable sources in energy consumption to 20 % by 2020 and to reduce the total primary energy consumption by 20 % by 2020, compared to a business as usual baseline (known as the "20-20-20 targets").

In order to meet these targets, the EU Emissions Trading System (ETS), including a single EU-wide emissions cap, was introduced as well as the EU Effort Sharing Decision (ESD, Decision No 406/2009/EC), setting binding annual targets for Member States at national level for 2013 to 2020. The latter is relevant for sectors not covered by the EU ETS (housing, services, agriculture, waste and transport, excluding aviation as well as industrial sources not covered by the ETS). In addition, Member States were assigned binding national targets under the Renewable Energy Directive (Directive 2009/28/EC). These policies are complemented by EU-wide and national measures addressing areas such as energy efficiency, low carbon technologies and transport.

For the time period beyond 2020, in its Climate and Energy Policy Framework (European Commission 2014, Council of the European Union 2014) the EU is committed to a target of an at least 40 % domestic reduction of greenhouse gas emissions by 2030 compared to 1990, a renewable energy target of at least 27 % of final energy consumption and a 27 % target for improving energy efficiency (known as the "40-27-27 targets"). The energy efficiency target will be reviewed in 2020 having in mind a 30 % target.

The 40 % reduction of greenhouse gas emissions is the centrepiece of the European Union's NDC. In 2016 and 2017, work within the EU focused on substantiating the Climate and Energy Policy Framework, i.e. on drafting and negotiating the legislation for achieving the 40 % emission reduction (see Box 25 and Box 26).

Box 25: The European Commission's "Low-carbon economy" package

In July 2016, the European Commission presented a package of measures to accelerate the transition to a low-carbon economy. The package consists of a proposal for a Regulation on the Member States' binding annual greenhouse gas emission reductions (European Commission 2016a), a proposal for a regulation on including the LULUCF sector (cf. Box 16) into the 2030 climate and energy framework (European Commission 2016b) and a Commission Communication on "A European Strategy for Low-Emission Mobility" (European Commission 2016c).

The two legislative proposals address in particular the period from 2021 to 2030 and are part of the implementation of the Climate and Energy Policy Framework (Council of the European Union 2014), the European Union's INDC (European Union 2015) and, hence, the EU's commitment under the Paris Agreement.

The overall GHG emission reduction target of -40 % in 2030 compared to 1990 translates into a -43 % reduction in the sectors covered by the EU ETS and a -30 % reduction to be achieved by the EU Member States, both compared to 2005 levels. The various Member States are allocated different targets, depending mainly on their relative wealth. The resulting Regulation will be known as the "Effort Sharing Regulation", similar to the "Effort Sharing Decision" for 2013-2020 (mentioned above).

On 14 June 2017, the European Parliament agreed its position on the Effort Sharing Regulation, and the Council is expected to adopt its position during the Estonian Presidency, enabling the start of trilogue negotiations. The proposal for the LULUCF regulation was discussed in the Committees of the European Parliament in the first half of 2017 and is awaiting first reading in Parliament.

As far as the EU ETS is concerned, the European Council has reached a common position on the EU ETS post 2020 at the Environment Council held on 28 February 2017. Interinstitutional negotiations between the Parliament, the Council and the Commission started with a first trilogue on 4 April 2017.

Box 26: The European Commission's "Clean energy for all Europeans" package

In November 2016, the European Commission presented a package of measures to accompany the low-carbon economy agenda and to keep the European Union competitive in future energy markets (European Commission 2016d). The package consists of legislative proposals covering energy efficiency, renewable energy, design of the electricity market, security of electricity supply and governance rules for the Energy Union. In addition, the Commission proposed a new Ecodesign Working Plan and a strategy for connected and automated mobility.

The package also includes a Communication on accelerating clean energy innovation and a legislative proposal to further improve the energy performance of buildings. The package provides measures to encourage public and private investment, while also promoting EU industrial competitiveness and mitigating related impacts on society. Finally, the Commission seeks to accelerate clean energy innovation and to help non-EU countries achieve their policy goals.

An overview of the proposals, including background information and factsheets, can be found on the European Commission's website (European Commission 2016e).

With regard to the EU's long-term climate strategy, the European Commission has adopted policy documents to promote the discussion on the long-term framework of climate and energy policies in Europe. These include a roadmap on moving towards a competitive low carbon economy in 2050 (European Commission 2011a), an energy roadmap 2050 (European Commission 2011b) a White Paper on competitive and efficient transport systems (European Commission 2011c) and a bioeconomy strategy (European Commission 2012). The roadmap on the low carbon economy suggests that by 2050 the EU should reduce its greenhouse gas emissions by 80 % compared to 1990 levels.

Box 27: Implications of the United Kingdom's plan to leave the European Union ("Brexit") for international climate change policies

In June 2016, voters in the United Kingdom (UK) voted to leave the European Union. Withdrawal from the EU will become effective within two years after the United Kingdom's government notifies the European Council; this notification was received by the European Union on 29 March 2017. The exit from the European Union ("Brexit") has a wide range of implications for the EU's and the UK's international relations and obligations, including those related to climate change. It was pointed out that the UK's paper on its proposed foreign policy relationship with the EU, which was published in September 2017 (Government of the United Kingdom 2017), does not include climate-change related issues (Climate Home 2017c). However, the following aspects will need to be addressed in the course of the Brexit negotiations and beyond:

- **Obligations under the Paris Agreement**: As the European Union ratified the Paris Agreement before "Brexit" will become effective, the commitments as described in its NDC apply to the remaining EU Member States plus the UK. It is currently open what kind of arrangement the United Kingdom and the European Union will choose to ensure that the commitments are fulfilled; one option is that the UK will decide to adhere to those parts of the EU legislation which are related to the European Union's international commitments in the area of climate change.
- Under the Paris Agreement, the European Union plus the United Kingdom are invited to communicate a **long-term low greenhouse gas emission development strategy** (LEDS). The deadline, according to Decision 1/CP.21, is 2020, which will be after the UK's withdrawal from the EU has become effective. Again, the EU and UK may decide to communicate a common LEDS.
- **Updating of the Effort Sharing Regulation**: In the draft Effort Sharing Regulation for 2021-2030 (see Box 25) the United Kingdom has an above-average emission reduction target. If the UK does not take part in the reduction effort, this will have to be compensated by other Member States (Carbon Brief 2016a). However, the Effort Sharing Regulation may be finalised before the UK's withdrawal becomes effective, and the UK may adhere to its provisions.
- **European Union Emissions Trading System** (EU ETS): After leaving the European Union, the United Kingdom will not be required to participate in the EU ETS. However, it may decide to be part of it, in a similar way as Iceland, Liechtenstein and Norway which are currently part of the EU ETS.
- The United Kingdom, its **research institutes and business organisations** play a leading role in international climate change action, support and science. It is expected that UK institutes and organisations will continue to play an important role in the future, and the United Kingdom may emerge as a separate actor in international climate negotiations.

On 5 October 2016, ambassadors from the EU and seven of its Member States deposited their instrument of ratification of the Paris Agreement with the UN Secretary-General (United Nations 2016b). With the deposition of these instruments of ratification, the second threshold for entry into force of the Paris Agreement was surpassed (cf. chapter 4.1.3). The Member States which had already completed their national ratification procedures on that day were Austria, France, Germany, Hungary, Malta, Portugal and Slovakia. By 25 September 2017 all EU Member States had ratified the Paris Agreement with the exception of the Czech Republic.

At a European Council meeting on 22-23 June 2017 (European Council 2017), EU leaders reiterated their commitment to climate action and support and emphasised that the Paris Agreement would remain the cornerstone. This statement has to be seen in light of the announcement, earlier that month, by President Trump, of the USA's intended withdrawal from the Paris Agreement and the USA's intention to renegotiate it (cf. chapter 5.2). The Council emphasised in its conclusions that the Paris Agreement could not be renegotiated.

This position – and the importance of forming alliances with other major economies – was reconfirmed when Canada, China and the European Union hosted a ministerial meeting on climate change in Montreal in September 2017 (Environment and Climate Change Canada 2017a).

5.4. India

India, currently the fourth largest CO_2 emitting Party, contributes 6.8 % of the world's CO_2 emissions. The reasons for this high ranking position are India's population size (second most populous country) and the expanding industry and service sector – partly affected by international outsourcing – driving the national consumption of energy and other resources. Per capita emissions, however, are much lower than those of most developed countries and China (Olivier et al. 2016).

5.4.1. Emission profile

As shown in Table 3, India contributed, in 2015, 6.8 % of the world's total anthropogenic CO_2 emissions. According to India's First Biennial Update Report, CO_2 accounted for approx. 74 % of total greenhouse gas emissions in 2010, followed by methane with 19 % and nitrous oxide with 5 % (Government of India 2015).

The Indian economy has been growing rapidly since the 1990s, especially energy-intensive sectors such as power generation, steel, cement, refineries, chemicals, fertilisers and transport with low energy efficiency standards (Government of India 2012). From 2014 to 2015, India's CO_2 emissions increased by 4.9 % (average growth rate of 6.8 % for the 2006-2015 period). Coal consumption accounted for approx. 58 % of India's total primary energy consumption and coal consumption increased by 4.8 % from 2014 to 2015. In 2014 India became the second largest coal consumer, after China (Shearer et al. 2016). Production as well as imports of coal and coke increased remarkably and are expected to further increase according to the 12th Five-Year Plan 2012-2017 (Olivier et al. 2015).

On the other hand, the Indian Ministry for Energy has set a target for increasing its installed capacities for renewable energy from approx. 57 gigawatts in 2017 to 175 gigawatts in 2022, with most of the increase coming from an expansion of solar energy. Data released by the Ministry of New and Renewable Energy show that in 2017 India has so far reached a share of renewable energy of 17.5 % in its total installed capacity (Economic Times 2017).

5.4.2. Climate policies and status of implementation of the Paris Agreement

In 2008 India launched a National Action Plan on Climate Change, outlining so-called "national missions" including a national mission for renewable energy (Government of India 2008). In this area India has implemented two major renewable energy-related policies: the

"Strategic Plan for New and Renewable Energy" (2011) and the "National Solar Mission" (2010), containing targets for solar energy. The "Strategic Plan for New and Renewable Energy" was developed in view of the economic growth and the enormous demand for electricity as well as the high dependence on fossil fuel imports (Government of India 2011).

According to its NDC India is committed to reducing the emission intensity of its GDP by 33 to 35 % by 2030 compared to 2005. It aims at achieving an installed cumulative electric power capacity from non-fossil fuel based energy resources of 40 % by 2030 and at creating an additional carbon sink by increasing forest and tree cover (India 2015).

India's draft National Electricity Plan of 2016 (Government of India 2016) aims primarily at a reliable access to electricity but also includes measures for GHG mitigation. If the draft Electricity Plan is implemented, India will achieve its non-fossil capacity target as specified in its NDC (40 % by 2030) before 2022, and will reach 57 % by 2027. It has been pointed out that the actions undertaken under the current policies may already surpass India's NDC commitment (Climate Action Tracker 2017b).

In the climate negotiations, India holds the view that the focus of providing finance should remain with developed countries and that public sources, rather than private investment, should be the main contributor to finance. India also called for financial support for research and development. Similar to China, India sees the importance of addressing intellectual property rights (IPR) in the context of technology transfer.

Box 28: The International Solar Alliance (ISA)

At the COP in Paris the International Solar Alliance (ISA) was launched jointly by India and France involving more than 120 countries (IISD 2015b). In April 2016, ISA also entered into a partnership with the United Nations Development Programme (UNDP). ISA is aiming for easier finance for the solar projects of member countries (Economic Times 2016).

At the beginning of October 2016, India ratified the Paris Agreement and the instrument of ratification was deposited with the United Nations Secretary-General on 2 October 2016 (United Nations 2016b).

5.5. Russian Federation

The Russian Federation is a leading producer of natural gas and oil, although in 2010, it was overtaken by the United States as the world's largest gas producer (Olivier et al. 2014). Its greenhouse gas emissions declined considerably at the beginning of the 1990s due to the closure of heavy industries after the collapse of the Soviet Union.

As a consequence of the decline in emissions since 1990, the Russian Federation over-achieved its emission commitment for 2008-2012 under the Kyoto Protocol. However, for the second commitment period under the Kyoto Protocol, the Russian Federation did not commit itself to a quantitative target (Decision 1/CMP.8).

5.5.1. Emission profile

The Russian Federation is the fifth largest emitter of CO_2, contributing 4.9 % of the global total anthropogenic CO_2 emissions in 2015 (see Table 3; Olivier et al. 2016). According to the most recent inventory data submitted for 2015, CO_2 accounted for approx. 63 % of the total greenhouse gas emissions, methane for 33 % and nitrous oxide for 3 % (Russian Federation 2017).

After a historical low in 1998, CO_2 emissions have been increasing steadily, with the exception of a decrease in 2008 and 2009 in the wake of the global financial crisis. In the years 2013,

2014 and 2015 emissions declined again by 1.9 %, 1.5 % and 3.5 % respectively (Olivier et al. 2016). In 2014, emission reductions were *inter alia* caused by a decreasing consumption of coal (Analytical Center for the Government of the Russian Federation 2015). The large emission reduction in 2015 seems to be linked to the 3.7 % decrease in GDP in that year (Olivier et al. 2016).

5.5.2. Climate policies and status of implementation of the Paris Agreement

Policies and measures to mitigate climate change include legislative and regulatory acts to fulfil national commitments under the UNFCCC, as well as targeted measures and national programmes (Russian Federation 2014). Russia's climate policy has a clear focus on energy, setting energy intensity targets to be achieved in the period until 2020. Under the "Energy saving and energy efficiency improvement programme until 2020", Russia has committed to reducing energy intensity per GDP by 40 % in 2020 compared to 2007 levels.

This approach requires technological improvements and the elimination of non-economic risks and barriers, e.g. in the areas of energy efficiency, public transport, fuel economy, gas transportation and timber biomass (Kokorin and Korppoo 2014). Furthermore, environmental legislation exists for an improved recovery of petroleum gas and with regard to the technical requirements for oil companies (Climate Action Tracker 2017c).

In climate negotiations, the Russian Federation puts forward its position as part of the Umbrella Group (cf. chapter 6.2). In its INDC, the Russian Federation stated that "limiting anthropogenic greenhouse gases by 25 to 30 % compared to 1990 levels by the year 2030 might be a long-term indicator", subject to unlimited and full use of forest sinks. No use of international market mechanisms is planned.

It has to be noted that the Russian Federation already has legally binding instruments in place to achieve at least a 25 % emission reduction ten years earlier, i.e. by 2020. The INDC would therefore not commit the Russian Federation to additional emission reductions from 2020 to 2030. As greenhouse gas emissions currently are still significantly below 1990 levels, the INDC in fact constitutes an increase in emissions between the current levels and 2030 (Carbon Brief 2015).

The Paris Agreement was signed by the Russian Federation on 22 April 2016. However, in May 2016, Oleg Shamanov, Russia's climate negotiator, told Reuters that for Russia it was crucial to know the rules for the implementation of the Paris Agreement before joining it (Reuters 2016b). Furthermore, Presidential Decree No. 2344/2016 requires several studies of the impacts of ratification on the economy and these studies have to be available before the actual ratification of the Agreement takes place. According to the timeline outlined in the decree, ratification will not take place before 2019, when it can form part of a presidential decree approving the 2030 emission reduction target (Climate Policy Observer 2017b).

5.6. Japan

Japan contributed, in 2015, 3.5 % of the world's total anthropogenic CO_2 emissions and was thus the sixth largest emitter of CO_2 (see Table 3). Japan currently has a population of approx. 126 million and, ranked by population, is the 11th most populated country in the world.

5.6.1. Emission profile

Japan possesses very limited domestic energy resources and is therefore a major importer of natural gas, coal and oil. For this reason, Japan has only been able to meet less than 9 % of its primary energy demand domestically since 2012 in comparison to approximately 20 % before the shutdown of the nuclear power stations (Olivier et al. 2015).

Japan's CO_2 emissions show a gradual increase after 1990, interrupted by the global economic crisis from 2008 to 2011. After a strong post-crisis increase back to previous levels and a decrease in the last two years, total emissions were 8.2 % higher in 2015 compared to 1990 levels (Olivier et al. 2016).

According to the latest GHG inventory of Japan, the main driving factor for the recent CO_2 emissions decrease can be attributed to electricity power generation in the energy industries sector (Japan 2017). The share of non-fossil fuels in total primary energy consumption, which amounts to approx. 8 %, has seen an increase due to the restarting of nuclear power plants and increases in various forms of renewable energy. Oil and natural gas consumption declined and only coal consumption increased slightly in 2015 (Olivier et al. 2016).

With respect to the overall greenhouse gas emissions, CO_2 accounted for 92.5 % of Japan's total emissions in 2015, followed by methane with 2.4 % and nitrous oxide with 1.6 % (Japan 2017).

5.6.2. Climate policies and status of implementation of the Paris Agreement

Japan's energy policy in recent years was shaped by the aftermath of the Fukushima nuclear accident. In 2011, all nuclear power plants were taken off the grid, strict energy conservation measures were imposed and gas and coal fired power generation was increased. However, in 2014, nuclear power was included in Japan's Basic Energy Plan and the use of nuclear energy is planned to be resumed as a baseload power source (Olivier et al. 2015).

The Basic Energy Plan decided by the Cabinet Council in 2014 includes a re-evaluation of coal as energy source and gives coal a much more important role in baseload power generation than up until now. Currently there are plans for 49 coal plants at various development stages. These plans are, *inter alia*, fraught with certain economic risks as well as carrying risks for Japans future climate obligations (Caldecott et al. 2016).

Japan introduced a Joint Credit Mechanism (JCM) to help spread Japanese technologies in climate change mitigation worldwide, in particular in Asia (Japan 2015a). It has to be noted that this mechanism was established independently of the Clean Development Mechanism under the Kyoto Protocol. Japan intends to use credits originating from this mechanism to help meet its future emission targets.

Japan participated in the first commitment period of the Kyoto Protocol, but is not committed to a target in the second commitment period (Decision 1/CMP.8).

In its Intended Nationally Determined Contribution Japan presented an emission reduction target of 26 % below 2013 emission levels by 2030, which corresponds to an 18 % reduction below 1990 levels. Japan plans to achieve this mainly through a decrease of energy-related CO_2 emissions, based on energy efficiency measures and a shift from fossil fuels to renewable and nuclear power generation. In addition, Japan expects that measures in the LULUCF sector and credits from its Joint Credit Mechanism will contribute to achieving the target (Japan 2015b). During climate negotiations, Japan is working actively together with other members of the Umbrella Group (cf. chapter 6.2) as well as representing its interests bilaterally.

Japan signed the Paris Agreement in April 2016 and deposited the instrument of acceptance in November 2016, and the Agreement entered into force for Japan in December 2016.

In May 2016, following the adoption of the Paris Agreement, a "plan for global warming countermeasures" was formulated and approved by the Japanese Cabinet. The plan entails a midterm target, in line with Japan's NDC, of a 26 % emissions reduction by 2030 (compared to 2013 levels) and a long-term goal of reducing greenhouse gas emissions by 80 % by 2050. Achieving this goal will require, *inter alia,* a strong focus on research and development as well as the dissemination of innovative technologies, a reduction of energy demand and the

de-carbonisation of energy supply. Furthermore, it will include the introduction of large-scale carbon pricing (Takashina 2017; Ministry of the Environment Japan 2017).

5.7. Islamic Republic of Iran

The Islamic Republic of Iran was the seventh largest emitter of CO_2 in 2015 (see Table 3). It has appeared on the list of the top ten emitters worldwide for the first time in 2014 because emission estimates were revised upwards considerably by Olivier et al. (2015) based on the latest available energy statistics. The country has a population of approx. 81 million and is the seventeenth most populous country in the world.

5.7.1. Emission profile

The Islamic Republic of Iran has the second largest oil reserves in the world and is a major producer of oil. Furthermore, it is the fourth largest gas producer with the second largest gas reserves in the world (LSE 2016b). As a consequence, the energy sector is responsible for more than 90 % of its greenhouse gas emissions (Islamic Republic of Iran 2015a). In 2010, 99 % of primary energy supply in the Islamic Republic of Iran came from its own oil and gas resources (Islamic Republic of Iran 2015b).

CO_2 emissions more than tripled in the period 1990 to 2015. In the year 2015 the Islamic Republic of Iran emitted 634 million tonnes of CO_2 and thus had a share of 1.8 % of the world's total anthropogenic CO_2 emissions (cf. Table 2) (Olivier et al. 2016).

In the business as usual (BAU) scenario provided in Iran's INDC, it is anticipated that the energy sector will grow 4.7 % each year until 2030, which would result in a steep increase of greenhouse gas emissions from approx. 700 million tonnes of CO_2 equivalent in 2010 to over 1700 million tonnes in the year 2030 (Islamic Republic of Iran 2015b).

5.7.2. Climate policies and status of implementation of the Paris Agreement

In this context, with Iran's energy system based on fossil fuels, the Iranian government concentrates on mitigation policies in the energy sector when it comes to addressing climate change (LSE 2016b). The Islamic Republic of Iran sees it as imperative to move to a more diverse energy supply mix (Islamic Republic of Iran 2015b).

The last national five year development plan 2010-2015 set a 30 % energy intensity reduction target. The Islamic Republic claims in its INDC that the international sanctions which were in place in these years prevented it from reaching this target and that energy intensity actually increased in recent years (Islamic Republic of Iran 2015a). Data from the time period after lifting the international sanctions are as yet not available and although energy intensity may decrease again after the lifting of the sanctions at the beginning of 2016, overall greenhouse gas emissions are expected to increase considerably due to the rebound in fossil fuel extraction and transport.

So far combating climate change has been envisioned in the Islamic Republic of Iran within the broader goal of sustainable development (LSE 2016b). According to its INDC (Islamic Republic of Iran 2015a), an official national climate change action plan is currently being developed.

Like other important oil producing countries, the Islamic Republic of Iran submitted its INDC shortly before the Paris conference in November 2015. Its INDC contains plans for a 4 % decrease in the national annual emissions by the year 2030 (compared to a business as usual scenario) as an unconditional mitigation action. Apart from that it is stated that subject to the termination of sanctions and appropriate support, Iran could use its mitigation potential and achieve a further reduction of greenhouse gas emission by up to 8 % compared to the BAU scenario (Islamic Republic of Iran 2015a).

Unlike e.g. Saudi Arabia (see chapter 5.10), the Islamic Republic of Iran has committed itself to a quantified reduction of emissions compared to the BAU scenario. However, it is important to note that this reduction is small compared to the projected increase in emissions and that overall greenhouse gas emissions are likely to more than double by 2030. In this regard, it will be interesting to see whether the Islamic Republic of Iran will be able to follow the encouragement of Article 4.4 of the Paris Agreement, which is – for developing country Parties – to move towards economy-wide emission reductions or limitation targets over time.

The Islamic Republic of Iran is a member of the G-77 (cf. chapter 6.1) as well as the Like Minded Group of Developing Countries (cf. chapter 6.3).

In April 2016 the Islamic Republic of Iran signed the Paris Agreement. The Iranian Cabinet of Ministers ratified the Paris Agreement in July 2016, sending it to the Majles, the unicameral legislative body, for consent to ratification (WRI 2016b). However, as of 25 September 2017 the Islamic Republic of Iran has not deposited its instrument of ratification with the Secretary-General of the United Nations.

5.8. Republic of Korea

The Republic of Korea contributed, in 2015, 1.7 % of the world's total anthropogenic CO_2 emissions and is thus the eighth largest emitter of CO_2 (see Table 3). Ranked by population, the Republic of Korea is with approx. 51 million people the 27th most populous country in the world.

5.8.1. Emission profile

In 2012, 87.2 % of greenhouse gas emissions were caused by the energy sector, coming mainly from fossil fuel combustion (Republic of Korea 2014). The share of CO_2 in total greenhouse gas emissions was 90.9 % in 2012, followed by methane with 4.3 %, nitrous oxide with 2.1 %, HFCs with 1.3 %, SF_6 with 1.1 %, and PFCs with 0.3 %.

The Republic of Korea's natural resources are very limited and as a result it is one of the top five importers of coal and liquid natural gas. Its economy is very susceptible to changes in the energy markets. Consequently, the Republic of Korea plans to enlarge its nuclear power capacity in the future (Eschborn 2015).

Despite the growing importance of renewable energy sources, greenhouse gas emissions are increasing. This is due to the growth of energy-intensive industries (e.g. chemical and primary metal industry) and the related use of coal and gaseous fuels.

Coal consumption in the Republic of Korea has increased by a factor of 3.5 since 1990, thus doubling its share in the global coal consumption from 1.1 % to 2.2 % in the year 2015. Coal combustion was responsible for approx. 50 % Korea's total fossil-fuel combustion CO_2 emissions in 2013 (Olivier et al. 2016).

Between the years 1990 and 2012 greenhouse gas emissions rose by 133 % (Republic of Korea 2014). Nevertheless, partial decoupling of emissions from GDP has been achieved since the Asian financial crisis in 1997. The 1998-2007 manufacturing output doubled while emissions rose by one third, which shows that energy efficiency has improved and a step towards shifting away from energy intensive activities has taken place (OECD 2012).

5.8.2. Climate policies and status of implementation of the Paris Agreement

In 1998 a Special Committee on Climate Change was founded, which drafted the Comprehensive Action Plans for Climate Change to promote strategies related to the environment, industry and international cooperation. "Low Carbon, Green Growth" was established as a national vision (Republic of Korea 2012).

The Republic of Korea joined forces with other countries in the Environmental Integrity Group (EIG, cf. chapter 6.10) and is actively working together with them to represent and advance its interests.

The Republic of Korea has implemented a Green Growth Strategy, a comprehensive policy package targeting all policy areas including climate change. One of its key policies is a cap and trade scheme introduced in January 2015 (Climate Action Tracker 2017d). This emissions trading scheme covers over 500 of the country's largest emitters, which together account for approx. 68 % of the national GHG emissions (ICAP 2017a).

In its INDC, submitted ahead of COP 21, the Republic of Korea committed itself to reducing its greenhouse gas emissions by 37 % compared to a business as usual scenario (which assumes a steady growth in emissions) by 2030. It plans, *inter alia,* to use carbon credits from international market mechanisms to achieve this target (Republic of Korea 2015). This approach was criticised for lacking ambition because, due to the use of market mechanisms, domestic reductions may be significantly lower and their level cannot be predicted as they depend on the further development of the business as usual scenario (Climate Action Tracker 2017d).

The Republic of Korea signed the Paris Agreement in April 2016 and ratified it in November 2016. The Republic of Korea became a Party to the Agreement in December 2016.

In the same month, the government of the Republic of Korea released its "1st Climate Change Response Basic Plan (2017-2030)". This plan sets out the medium and long-term strategies and action plans until the year 2030. Part of this plan is a "National Roadmap for Greenhouse Gas Reductions by 2030" and specific targets for each of the economic sectors (ICAP 2017b; The Hankyoreh 2016). In relation to Korea's business as usual forecast of approx. 850 Mt CO_2 equivalent in the year 2030, it requires an emissions reduction of over 300 Mt CO_2 equivalents. The roadmap allocates 70 % of the planned reductions by 2030 to domestic sectors. The energy, industry and building sectors and the new energy industries (consisting mainly of carbon capture technologies as well as electric vehicles) are expected to deliver the largest reductions. The remaining 30 % of Korea's 2030 target shall be met through use of international offsets. However, these offsets depend on further conditions and developments. They would be contingent on conditions such as the finalisation of the international negotiations about the new cooperative mechanism under the Paris Agreement (cf. chapter 3.1), a sufficiently developed market and an agreed fund-raising measure.

5.9. Canada

Canada is the second largest country in the world by surface area, with a population of approx. 36 million citizens. Canada was the ninth largest emitter of CO_2 in 2015, with a share of 1.5 % in global CO_2 emissions (see Table 3; Olivier et al. 2016).

5.9.1. Emission profile

Since 1990, Canada's greenhouse gas emissions have shown an increasing trend, driven primarily by an increase in emissions from the fossil fuel industries and transport. Canada (as well as the United States, China and Argentina) produces shale gas and shale oil on an industrial scale (Olivier et al. 2015).

In 2015, carbon dioxide contributed 79 % of Canada's total greenhouse gas emissions, mainly as a result of the combustion of fossil fuels. Methane, largely from fugitive sources in oil and natural gas systems, accounted for 14 % and N_2O for 5 % of the total emissions. In 1995, greenhouse gas emissions started to be decoupled from economic growth. This shift can be attributed to increases in efficiency, the modernisation of industrial processes, and structural changes in the economy. In the last few years however, emissions intensity seems to have followed a stabilising trend (Environment and Climate Change Canada 2017b).

5.9.2. Climate policies and status of implementation of the Paris Agreement

Canada's climate change plan aims at regulating greenhouse gas emissions on a sectoral level. Federal, provincial as well as territorial governments have adopted action plans to address climate change and investments in clean energy technology and other non-regulatory measures shall help reduce emissions in the longer term (Canada 2014).

In December 2011, Canada notified the Secretary-General of the United Nations that it was going to withdraw from the Kyoto Protocol. Withdrawal became effective in December 2012.

However, after the election in October 2015 and with the newly elected Prime Minister Justin Trudeau the course of Canada's climate and energy policy changed. This became visible during the COP in Paris, e.g. with Mr Trudeau's assertive speech during the Leaders Event (UNFCCC 2015c). Nevertheless, Canada's NDC still represents the less ambitious position of the previous government.

In its Intended Nationally Determined Contribution, Canada has committed itself to reducing its greenhouse gas emissions by 30 % below 2005 levels by 2030. International mechanisms may be used to achieve this target (Canada 2015). The INDC, prepared under the previous government, was criticised for lacking ambition, *inter alia* because it constitutes a modest emission reduction below 1990 levels only (Climate Action Tracker 2017e). It has to be noted that forest sinks are expected to play an important role and therefore the actual pledged emission reduction excluding land use, land use change and forestry will be even smaller.

In June 2016 Canada, the United States and Mexico forged a North American Climate, Clean Energy and Environment Partnership, which aimed at generating 50 % of its power from "clean energy" (which includes renewable and nuclear energy as well as carbon capture and storage) by 2025. Currently, the three countries combined are generating 37 % of their electricity from "clean energy", and more than 80 % of the total amount of electricity used is consumed by the United States. Furthermore, the Partnership targeted a cut in methane emissions by 40-45 % to be achieved by 2025 (The White House 2016c, 2016d, Wade 2016). With the changes in the climate policies in the United States, however, the future of this Partnership became unclear.

In December 2016, the "Pan-Canadian Framework on Clean Growth and Climate Change" – an overarching strategy paper for GHG emissions reductions – was announced. It contains measures on the federal and province level, including an approach for carbon pricing and the plan to phase out traditional coal plants (Climate Action Tracker 2017e). More precisely, Canada plans to charge a minimum of CAD 10 (Canadian Dollar) per tonne on carbon pollution from 2018, which is to be increased by CAD 10 a year, reaching CAD 50 in 2022. According to the Climate Action Tracker, Canada may achieve its 2030 NDC target (including LULUCF credits) if the planned Pan-Canadian Framework policies are implemented.

It should be noted that Saskatchewan and Manitoba, two of the ten Canadian provinces, have not yet signed the "Pan-Canadian Framework on Clean Growth and Climate Change". They need to sign before the end of 2017 to receive their share of designated funding (National Observer 2017).

Canada signed the Paris Agreement in April 2016. The instrument of ratification was deposited by Canada on the same day the European Union deposited its instrument of ratification – on 5 October 2016 (United Nations 2016b). Canada engages with the Umbrella Group (cf. chapter 6.2) to join forces with other like-minded countries and to advance its own national interests.

5.10. Saudi Arabia

In 2015 Saudi Arabia, which currently has a population of approx. 33 million, was the tenth largest emitter of CO_2, with a contribution of 506 million tonnes CO_2 (1.4 % of the world's

total anthropogenic CO_2 emissions) (see Table 3; Olivier et al. 2016). Saudi Arabia is the world's second largest oil producer. The oil industry constitutes the backbone of the Saudi Arabian economy; its oil export proceeds cover 90 % of the total government revenues (Climate Action Tracker 2017f).

5.10.1. Emission profile

According to the 2010 GHG emission inventory of Saudi Arabia, recently reported in its Third National Communication, CO_2 is responsible for the largest share of emissions. CH_4 emissions are provided in mass units only, which would amount to 0.4 % of emissions. If converted using global warming potentials, the share of CH_4 in total emissions would be higher. The energy sector is responsible for 89.7 % of the total CO_2 emissions, followed by the industrial processes sector, which is well behind with 10.1 % and the agriculture sector with 0.2 % (Saudi Arabia 2016a).

The combustion of oil products was responsible for approx. 70 % and the combustion of natural gas for the remaining 30 % of Saudi Arabia's total fossil-fuel combustion CO_2 emissions in 2013. Coal is not used as a fuel in Saudi Arabia due to the abundance of oil and natural gas reserves (Olivier et al. 2016).

CO_2 emissions in Saudi Arabia increased on average by 5.2 % per year over the past ten years and tripled between 1990 and 2015. The annual per capita emissions are, at 16 tonnes CO_2 per person, among the highest of all countries (both the developed and developing countries) (Olivier et al. 2016).

Aridity and extreme heat are characteristic of most parts of Saudi Arabia (Saudi Arabia 2016a). Average warming in Saudi Arabia in 2040 is projected to be higher than the global average and in the event of 3 to 4 degree C of global warming by the end of the century, approx. 75 % of the country is expected to suffer from excessive aridity (Saudi Arabia 2011).

5.10.2. Climate policies and status of implementation of the Paris Agreement

As the world's second largest oil producer and exporter, Saudi Arabia will be affected by the mitigation policies of countries importing fossil fuels, as they may lead to a decreasing demand for oil in the future (for more information on "response measures", see Box 29). Hence, Saudi Arabia always has been a proponent of addressing the issue of response measures under the UNFCCC. However, Saudi Arabia faces additional challenges, including a rapid increase in domestic consumption of fossil fuels and youth unemployment. For this reason, Saudi Arabia is nowadays placing more emphasis on economic diversification, a topic which it has been raising in the UNFCCC negotiations.

Saudi Arabia's INDC, submitted shortly before the Paris climate change conference in 2015, lays out plans for such diversification, e.g. in the areas of energy efficiency and renewable energies, which are expected – in the terminology of the INDC – to create "mitigation co-benefits". Likewise, adaptation measures, such as water management and urban planning, are listed which are also expected to create mitigation co-benefits (Saudi Arabia 2015). Saudi Arabia seeks to decrease its annual emissions by up to 130 Mt CO_2 equivalent in 2030 in comparison to a not further defined business as usual scenario. Thus its envisioned emissions pathway towards 2030 remains uncertain. According to calculations performed by the Climate Action Tracker, emissions in 2030 would be in the range of 840 to 1042 Mt CO_2 equivalent, corresponding to an increase by 350 to 450 % compared to 1990 levels (Climate Action Tracker 2017f).

In 2016 Saudi Arabia announced wide-ranging plans, the so called "Saudi Vision 2030", to move away from oil, deploy renewables and diversify its economy in the coming decades (Saudi Arabia 2016b). In April 2016, the then Deputy Crown Prince Muhammad bin Salman

announced an initial public offering of a stake in Saudi Aramco, the national oil company, and investment in a wide range of non-oil industries (Climate Home 2016a).

Saudi Arabia signed and ratified the Paris Agreement in November 2016. It entered into force for Saudi Arabia in December 2016. During the climate negotiations, Saudi Arabia voices its views prominently, often speaking for the Arab group (cf. chapter 6.6). For example, Saudi Arabia opposed the inclusion of terms such as "decarbonisation" and "carbon neutrality" in the Paris Agreement (IISD 2015b).

Early in the year 2017, the minister of energy and mineral resources, Khalid al-Falih, spoke about up to USD 50 billion investments over the next ten years in "clean energy", including significant investments in nuclear energy. Saudi Arabia plans to source 10 % of its power from renewable energy by the year 2023 and 30 % of its power from non-fossil sources by 2030. Saudi Arabia launched a renewable energy tender programme in 2017, in which 700 MW of wind and solar power projects are scheduled for the first year and domestic and international companies can bid for projects (Climate Home 2017d; Bloomberg 2017a).

Box 29: Impact of the implementation of response measures

Measures in response to climate change have various economic and social side-effects. For example, a shift away from fossil fuels affects the economy of oil-exporting countries.
The COP in Paris initiated a work programme in this area (Decision 11/CP.21), which currently addresses economic diversification and transformation, as well as a just transition of the workforce, and the creation of decent work and quality jobs. Decision 11/CP.21 also strengthened the "forum on the impact of the implementation of response measures" (UNFCCC 2017m), which has been meeting regularly since 2011.
The impacts of the implementation of response measures are also mentioned in Article 4, paragraph 15 of the Paris Agreement – Parties shall take into consideration the concerns of Parties whose economies are most affected by these impacts – and the Decision accompanying the Paris Agreement specifies that the above-mentioned forum shall serve the Agreement.

The fact that this topic has been considered both under the Convention and under the Paris Agreement can be seen as a comprehensive, though rather unspecific response to a concern most prominently voiced by Saudi Arabia.

5.11. Other Parties

In 2015 **Indonesia** was the eleventh largest emitter of CO_2 with a share of 1.4 % of the world's total anthropogenic CO_2 emissions. The CO_2 emissions have tripled since 1990 (Olivier et al. 2016). Indonesia currently has a population of approx. 263 million inhabitants, which makes it the fourth most populated country in the world.

According to Indonesia's 2012 national GHG inventory, the main sector contributing to the greenhouse gas emissions is Land Use, Land Use Change and Forestry (LULUCF) including peat fire related emissions (48 %), followed by energy (35 %), which together account for approx. 83 % of Indonesia's emissions (Indonesia 2016a). It is important to note that the emissions of LULUCF and peat fires are not included in the national total. If these emissions were to be taken into account, the emissions of Indonesia would almost be twice as high.

Indonesia's final energy consumption has been growing, in line with the country's economic and population growth, with fossil fuels as the dominant energy source (Indonesia 2011). Loss of annual forest cover has increased over the last decade, with an acceleration of the trend in recent years. Emissions from deforestation as well as coal combustion are expected to grow rapidly in the period up to 2030 (Climate Action Tracker 2017g).

In its INDC Indonesia committed to an unconditional reduction of greenhouse gas emissions compared to the business-as-usual scenario of 26 % by 2020 and 29 % by 2030. This reduction will be met without the use of international market mechanisms. With support provided through international cooperation, Indonesia expects to be able to increase its contribution up to 41 % (Indonesia 2015).

Indonesia signed the Paris Agreement in April 2016, ratified it in October 2016 and became a Party to it in November 2016.

It is one of a few Parties only that submitted a separate "First NDC" as an update to its INDC. In this "First NDC", submitted in November 2016, Indonesia envisions going beyond its pledged emission reductions as specified in the INDC after 2020, but the emission reductions for 2030 remain unchanged from those communicated in its INDC (Indonesia 2016b).

Brazil ranks twelfth in the list of largest emitters of CO_2. In 2015 Brazil had a share of 1.3 % of the world's total anthropogenic CO_2 emissions. CO_2 emissions have increased by 120 % since 1990 (Olivier et al. 2016). Brazil is, with approx. 211 million inhabitants, the fifth most populous country in the world, as well as the fifth largest country in the world by surface area.

In 2010, CO_2 emissions contributed approx. 58 % of the total greenhouse gas emissions (expressed in CO_2 equivalents according to the IPCC's Second Assessment Report, see Box 30), followed by methane with 27 % and N_2O with 14 % (Brazil 2016).

The largest share of Brazil's net CO_2 emissions originates from land-use change, especially the conversion of forests to cropland and pasture. Due to the high share of renewable energy in the energy matrix, the share of CO_2 emissions from fossil fuel use is relatively small in Brazil.

More than 41 % of Brazil's energy supply comes from renewable energy sources such as water, biomass (in particular ethanol), wind and solar energy. Hydroelectric power plants are responsible for approx. 79 % of the electricity generated (Brazil 2017). With approx. 9 % of global hydropower capacity, Brazil ranks second after China with a 28 % share (REN21 2017).

Box 30: Metrics for comparing the effects of greenhouse gases

In its Second Biennial Update Report (Brazil 2017), Brazil reported its greenhouse gas emissions without converting them to CO_2 equivalent. For countries emitting a high share of greenhouse gases other than CO_2, it is relevant how the impact of these gases on the climate system is compared to the impact of CO_2. In its Third National Communication (Brazil 2016), Brazil showed that its total greenhouse gas emissions would be lower if the effect of other greenhouse gases were converted using a Global Temperature Potential (GTP) approach, as opposed to a Global Warming Potential (GWP) approach, which is based on the overall warming effect of a gas over a given time period.

This is because methane, which is a relatively short-lived gas, plays a smaller role when looking at its effect on the global temperature at a certain point in time in the future, rather than over a given time period. Hence, Brazil's methane emissions would be less relevant when using a GTP approach, its emissions in CO_2 equivalents would be lower and its CO_2 emission reductions would stand out more prominently.

It has been pointed out that the GTP may be better suited to target-based policies, including policies related to the 2 degrees C goal, and common metrics for calculating the CO_2 equivalence of greenhouse gases are the subject of current negotiations on accounting for the Parties' Nationally Determined Contributions (cf. chapter 10.2).

In its National Policy on Climate Change launched in 2009 and its National Plan on Climate Change, Brazil aims at both reducing greenhouse gas emissions and strengthening removals by sinks. These plans have been elaborated in a participative process, involving representatives of academia, the scientific community, economic sectors and civil society organisations.

Brazil has addressed all main emitting sectors, but the focus of actions taken has been on forestry laws that help protect native forest. This includes the National Forest Code and the Action Plans for Deforestation Prevention and Control (Climate Action Tracker 2017h).

According to its INDC, which later became its NDC, submitted in September 2015, Brazil intends to commit itself to the following goals (Brazil 2015):

- reduce greenhouse gas emissions by 37 % below 2005 levels by 2025;
- increase this reduction of emissions to 43 % below 2005 levels by 2030 (indicative goal);

It has to be noted that, unlike other major developing countries, Brazil commits to a substantial absolute reduction of greenhouse gas emissions relative to the base year of 2005. In its INDC, Brazil also points out the importance of adaptation and of the complimentary role of South-South cooperation.

In climate negotiations, Brazil puts forward its position as member of the group of G-77 and China (cf. chapter 6.1). Brazil has been generally cautions about weakening the differentiation between developing and developed countries and pointed out the importance of financial support from developed countries.

The Paris Agreement was signed by Brazil in April 2016; it deposited its instrument of ratification with the UN Secretary-General in September 2016. Hence, Brazil has been a Party to the Agreement since its entering into force in November 2016.

Mexico is with approx. 130 million inhabitants the tenth most populous country in the world and was the thirteenth largest emitter of CO_2 in 2015 with a share of 1.3 % of the world's total anthropogenic CO_2 emissions. There was an increase in Mexico's CO_2 emissions by 63 % between 1990 and 2015 (Olivier et al. 2016).

Mexico, besides the Republic of Korea, is the only developing (emerging) country in the Environmental Integrity Group (cf. chapter 6.10). In its INDC submitted in March 2015, Mexico committed itself to an unconditional emission reduction of 25 % compared to business as usual by 2030 (Mexico 2015).

Mexico signed the Paris Agreement in April 2016. The instrument of ratification was deposited with the United Nations Secretary-General in September 2016 and Mexico has been a Party to the Agreement since November 2016.

Australia, with its approx. 25 million inhabitants, is the sixth largest country in the world by surface area. It was the fourteenth largest CO_2 emitter in 2015 and had a share of 1.2 % of the world's total anthropogenic CO_2 emissions. There was a 60 % increase in Australia's CO_2 emissions between 1990 and 2015. Australia's CO_2 emissions per capita, at 18.6 tonnes per year, are the highest among the members of the Organisation for Economic Co-operation and Development (OECD). The reason for this mainly lies in the fact that Australia heavily relies on coal in its power generation (Olivier et al. 2016). With a share of 78.7 % the energy sector was the largest greenhouse gas emissions source in 2015 (Australia 2017).

Australia submitted its INDC in August 2015. It is committed to reducing greenhouse gas emissions by 26 to 28 % below 2005 levels by 2030 (Australia 2015). It has to be noted that this would constitute a modest emission reduction (minus 0.5 %) compared to 1990 levels because emissions in 2005 were considerably higher and Australia intends to account for removals from LULUCF activities.

Australia signed the Paris Agreement in April 2016; it deposited its instrument of ratification with the UN Secretary-General in November 2016. The Agreement entered into force for Australia in December 2016.

South Africa is Africa's largest greenhouse gas emitter and was the fifteenth largest CO_2 emitter in 2015 worldwide with a share of 1.2 % of the world's total anthropogenic CO_2 emissions. There was an increase in South Africa's CO_2 emissions by 48 % between 1990 and 2015. The per capita emissions remained unchanged in the same time period (Olivier et al. 2016). South Africa has approx. 55 million inhabitants.

Unlike many other developing countries, South Africa's greenhouse gas emissions arise largely from the energy sector (75.1 % in the year 2010). The energy intensity of South Africa's economy is mainly due to the importance of mining and minerals processing and to a coal-intensive energy system (South Africa 2014).

In its approach to tackle climate change, South Africa has focused mainly on the development of market-based mitigation mechanisms and on the promotion of renewable energy and energy efficiency (LSE 2015).

South Africa submitted its INDC in September 2015. It prominently proposes an adaptation component, with six goals for the period 2020 to 2030 and a support component. On mitigation, South Africa's commitment takes the form of a "peak, plateau and decline" trajectory. For emissions in 2025 and 2030, a wide range is given (approx. 400 to 600 million tonnes of CO_2 equivalent) (South Africa 2015).

South Africa signed the Paris Agreement in April 2016. The instrument of ratification was deposited with the United Nations Secretary-General in November 2016 and South Africa became a Party to the Agreement in December 2016.

6. GROUPS OF PARTIES

In the negotiations under the UNFCCC, Parties that share similar national circumstances or similar views often bring forward their positions in a coordinated way. Over the years, a number of groups have been established. These groups meet regularly during COPs and subsidiary body sessions to coordinate their positions, appoint negotiators for specific negotiation topics and adopt a common position in the statements prepared in the plenary, which are presented by one member "on behalf of the group".

In the following, a brief overview is given for each of these groups, including the group members and common characteristics. The groups' positions on international climate policies and on the implementation of the Paris Agreement are summarised. A list of the member countries of each group can be found in Annex 3.

During climate negotiations, the Coalition for Rainforest Nations (CfRN) also meets and contributes statements. This group is not presented here because it focuses on specific aspects such as REDD+ and the member countries of CfRN are part of other groups as well. Similarly, "Small Island Developing States" (SIDS) are a recognised group under the United Nations, but are not described here because in UNFCCC negotiations, the interests of these states are largely represented by the Alliance of Small Island States (AOSIS, see chapter 6.4).

The EU and its Member States coordinate their position in a way that is somewhat similar to other groups of Parties. Representatives of the EU and its Member States meet regularly before and during conferences and subsidiary body sessions. They appoint negotiators, and statements are made on behalf of the EU and its Member States. The position of the EU is presented in chapter 5.3.

Besides the groups of countries presented here, there are other groups and regular meetings of countries (such as the Group of Twenty) which are not directly related to climate negotiations. Nevertheless, the positions of their members and the statements made at such meetings have a high political importance and may affect the general direction of climate negotiations. Such groups and meetings are presented in chapter 7.2.

6.1. Group of G-77 and China

The "Group of 77 at the United Nations" (G-77) was founded in 1964 by 77 developing country signatories, in the course of the first United Nations Conference on Trade and Development. Since then, the group has grown to 134 ordinary member countries. The aim of G-77 is to "provide the means for the countries of the South to articulate and promote their collective economic interests and enhance their joint negotiating capacity on all major international economic issues within the United Nations system, and promote South-South cooperation for development" (G-77 2017). In 2017, the Republic of Ecuador acts as presiding country of the G-77.

The Peoples' Republic of China is not a full member of the G-77, but a "special invitee" and associate member (Masters 2014). Hence, the group taking a position in UNFCCC climate negotiations is known as "G-77 and China".

G-77 and China represent a large number of countries with diverse levels of development and diverging views. Many of its members are also affiliated with other groups (see chapters 6.3 to 6.9). Nevertheless, G-77 and China can be characterised through the following common position that it adopts on international climate policies:

The group emphasises the Convention's principle of "common but differentiated responsibilities and respective capabilities": It points out the particular responsibility of the developed countries due to their historically higher emissions and their larger financial, technological

and institutional capacities. Consequently, the G-77 and China see that mitigation commitments must be a priority for developed country Parties.

Concerning adaptation, the group focuses on the challenges that its members are facing in adapting to a changing climate and calls for support from the developed countries for loss and damage. G-77 and China see financial support, technology transfer and capacity-building as important pillars of the international response to climate change.

At the APA 1-3 closing meeting on 18 May 2017 (cf. chapter 4.4), the G-77 and China stressed the importance of the Adaptation Fund serving the Paris Agreement, and the importance of setting a new collective quantified finance goal (IISD 2017a).

Box 31: The BASIC Group

The BASIC countries (Brazil, South Africa, India and China) played an important role in the preparation of the Copenhagen Accord in 2009 (see chapter 2.3). They continue to hold ministerial meetings on climate change – most recently in April 2017 in Beijing – but have been less active as a negotiating group because they have also been represented by the "G-77 and China" group. In a joint statement at the end of the 24th BASIC Ministerial Meeting on Climate Change, ministers reiterated their governments' commitment to the global efforts against climate change and urged all signatories to maintain their support to the Paris Agreement (Republic of South Africa 2017).

6.2. Umbrella Group

The Umbrella Group comprises a loose coalition of most Annex I Parties outside the EU and its Member States. It is composed of Australia, Canada, Japan, New Zealand, Kazakhstan, Norway, the Russian Federation, Ukraine and the United States, although it is not a group with formal membership such as the G-77. There are also three observer Parties to the Umbrella group: Belarus, Israel and Switzerland (Climate Policy Observer 2016).

Most members of this group did not commit themselves to quantified emission limitation or reduction commitments in the second commitment period under the Kyoto Protocol (Decision 1/CMP.8). However, Australia, Kazakhstan, Norway and Ukraine made a commitment. Despite their differences over current mitigation ambition, the members share a number of common positions.

Members of the Umbrella Group are characterised by historically high per-capita greenhouse gas emissions, although most of them have reduced their emissions in recent years. Some have been overtaken by developing countries in overall or per-capita greenhouse gas emissions. Consequently, they argued in the negotiations leading to the Paris Agreement that a strict distinction between developed country Parties and developing countries does not represent the situation as it is today. They emphasise the importance of mitigation not only in developed, but also in developing countries, and they point out the importance of a level playing field, i.e. common rules for all major emitters.

The Umbrella group is critical about issues which may require financial support, i.e. commitments/mechanisms in the areas of adaptation, loss and damage, finance, technology transfer and capacity-building. Umbrella Group members do not oppose such mechanisms, but they aim at limiting the effort needed to introduce and run these mechanisms. The group is in favour of increasing the transparency of these mechanisms, whereas they oppose additional efforts to increase transparency in areas such as the review of greenhouse gas emission inventories.

For the Umbrella Group it is important that the Paris Agreement encourages developing countries to enhance their mitigation efforts and also provide support if they are in a position to

do so. At the same time, they have accepted the outcome that developed countries should continue to take the lead in climate change action and support.

At the APA 1-3 closing meeting on 18 May 2017 Australia, for the Umbrella Group, viewed transparency on mitigation action as important for an understanding of collective and individual progress and recognised the global stocktake as a central element for driving collective ambition (IISD 2017a). Members of the Umbrella group also expressed concern at the pace of some discussions, including those on cooperative mechanisms.

6.3. Like-Minded Developing Countries (LMDC)

The group of Like-Minded Developing Countries comprises Asian countries including China, India and Indonesia as well as countries from Northern Africa, the Middle East and Latin America. On many topics, its views are similar to those of the G-77 and China, but more pronounced.

Like the G-77 and China, the LMDC emphasise the particular responsibility of developed countries due to their historically high emissions and, in this light, aim at retaining the distinction between developed and developing countries, similar to the distinction between Annex I and non-Annex I countries in the Convention. The group advocates financial support for developing countries, including support for loss and damage.

As the group includes oil-exporting countries that will be affected by a future decrease in fossil fuel use, it also points out the importance of reducing the impact of the implementation of response measures (cf. Box 29).

Throughout the negotiations on the Paris Agreement, the LMDC stressed that loss and damage should play an important part in the new agreement. Their efforts have, *inter alia*, led to loss and damage being included as a separate Article of the Paris Agreement, reflecting the international community's growing understanding of the issue.

After the adoption of the Paris Agreement, the LMDC also stressed the importance of historical responsibility and differing capabilities in the implementation of the Paris Agreement (IISD 2017a).

Box 32: The Climate Vulnerable Forum (CVF) and the Vulnerable Twenty (V20) group

Several LMDC members that are especially vulnerable to climate change founded the Climate Vulnerable Forum (CVF) in 2009 (CVF 2015a). Though the forum did not actively participate as a group in the climate negotiations, it adopted various declarations and presented its activities in the run-up to and during recent COPs.

In October 2015, the finance ministers of twenty CVF member countries founded the Vulnerable Twenty (V20) group. They announced a series of actions to promote investment in climate resilience and low emissions development. At the start of the COP in Paris, the heads of state and senior representatives of the CVF member countries called for an ambitious mitigation goal and focus on adaptation and loss and damage in the "Manila-Paris Declaration" (CVF 2015b).

The V20 conducts a dialogue with the G20 (cf. chapter 7.2.3) and urges G20 countries to deliver their long-term low-emissions development strategies before 2020, and to include ambitious climate action. In its recent communiqué, the V20 reiterates that investing in climate action is critical for inclusive development and economic growth (V20 2017).

6.4. Alliance of Small Island States (AOSIS)

The Alliance of Small Island States brings together small islands and low-lying coastal countries and sees itself as their voice in the negotiations within the United Nations system (AOSIS 2017). The alliance has 44 members and observers.

The key concern of AOSIS members is their vulnerability to the adverse effects of global climate change, such as sea level rise and changes in weather patterns. Hence, the group called for ambitious mitigation action, including increasing pre-2020 mitigation efforts and aiming at limiting the global temperature increase to 1.5 degrees C (Waqa 2014).

The mentioning of a long-term goal of 1.5 degrees C in the Paris Agreement can be seen as a success for AOSIS and the role of its members in the "high ambition coalition" during the negotiations (cf. chapter 2.4 and Box 35). Nevertheless, after the adoption of the Paris Agreement, AOSIS stressed the importance of fulfilling the commitments made with a time horizon of 2020. In particular, AOSIS sees the rapid ratification of the Doha Amendment as a crucial next step, together with the scaling up of climate finance, especially for the implementation of adaptation actions, to USD 100 billion (TWN 2016b).

Besides the ambitious temperature goal, the introduction of a separate Article on loss and damage in the Paris Agreement is recognised as a great achievement. AOSIS stresses the importance of strengthening the Warsaw International Mechanism on Loss and Damage (WIM, cf. Box 10) (AOSIS 2016).

At the APA 1-3 closing meeting on 18 May 2017 AOSIS found that progress was "mixed" across thematic areas and asked that lost time be made up with a spirit of urgency. Concerning cooperative approaches, AOSIS emphasised that market mechanisms could help achieve ambition, but must not erode environmental integrity (IISD 2017a).

Box 33: Caribbean Community (CARICOM)

The Caribbean Community (CARICOM) comprises a group of twenty countries: fifteen Member States and five Associate Members, located between the Bahamas in the Caribbean and Suriname in South America. CARICOM consists of developing countries and most of its members and associates (except for Belize, Guyana and Suriname) are island states (CARICOM 2017).

A number of Caribbean countries have been severely affected by a sequence of hurricanes in September 2017. CARICOM member states have launched a close cooperation through an intergovernmental disaster management agency and the Caribbean Catastrophe Risk Insurance Facility (CCRIF), the world's first multi-country risk pool, which makes payments based on the measured intensity of extreme weather events (The Economist 2017). For more information on managing the risks of natural disasters on UN level, see Box 41 in chapter 9.1.

It has been shown that the projected future warming of the atmosphere above the Atlantic may result in more intense hurricanes – both in terms of wind speed and in terms of precipitation – due to a higher water vapour content of the warming atmosphere (e.g. Lackmann 2015). Due to the region's exposedness to natural disasters, CARICOM negotiators play a very active role in climate change conferences. They stress that the global community needs to rapidly reduce greenhouse gas emissions, and strive to limit temperature rise below 1.5 degrees C above pre-industrial levels (CARICOM 2016).

6.5. African Group

The African Group has become increasingly visible in climate negotiations in recent years, laying out its positions regularly in the plenaries of the ADP and the COP. The African Group emphasises the principle of common but differentiated responsibilities and respective capabilities. It aims at parity between mitigation, adaptation and enhancing support, while referring to the increased burden that adaptation and loss and damage place upon developing countries.

The African Group particularly stresses the responsibilities of developed country Parties in the area of climate finance and technology transfer.

These positions of the African Group have found their way into the Paris Agreement, as it contains comprehensive provisions on adaptation, on financing for developing countries with differentiated responsibilities and new provisions for technology transfer and capacity-building (UNDP 2015).

Box 34: The Africa Renewable Energy Initiative (AREI)

The Africa Renewable Energy Initiative (AREI) was launched at the Paris Conference in 2015 with the overall goal to produce clean and affordable energy for the electrification of the African continent. The AREI aims at supporting the installation of large-scale renewable energy capacity in Africa by 2020. The plan is to raise at least USD 5 billion, from bilateral, multilateral and other sources, including the Green Climate Fund (GCF) between 2016 and 2020, in order to leverage a further USD 15 billion in other investments. The initiative is led by the African Union's Commission, the African Group, the African Development Bank, the UN Environment Program (UNEP) and the International Renewable Energy Agency (IRENA) (UNFCCC 2016e).

6.6. Arab Group

The League of Arab States was founded in 1945 by Egypt, Iraq, Lebanon, Saudi Arabia, Syria, Transjordan (Jordan from 1946/49) and Yemen as a regional organisation of Arab countries. The negotiation group now comprises 22 member states. The Arab Group considers its economies as particularly vulnerable, as many Arab countries lie in arid or semi-arid regions which will be prone to further drought or desertification in the future. Some of the Arab economies are also highly dependent on the production, processing and export of fossil fuels and therefore emphasise the importance of addressing the adverse effects of response measures (cf. Box 29) (Arab Group 2017).

At the APA 1-3 closing meeting on 18 May 2017 the Arab Group stressed the need to preserve the balance between the various elements of the Paris Agreement and complete the negotiations on additional matters under the APA. The group referred to the linkages between the adaptation communication, the transparency framework and the global stocktake, as well as to finance, capacity-building, technology transfer and response measures (IISD 2017a).

6.7. Least Developed Countries (LDC)

Under the United Nations, countries are classified as "least developed" according to defined criteria for per capita income, human assets and economic vulnerability. Currently 47 countries are classified as LDC (UNCTAD 2017). These countries form a distinct group in the climate negotiations under the UNFCCC.

The key issues for LDCs that have emerged over the past few years are adaptation and, in particular, loss and damage. The LDC group points out their lack of resources to adapt to the effects of climate change and to compensate loss and damage. Consequently, the group calls for financial support, technology transfer and capacity-building in these areas. The group

opposes an increase in transparency in some areas as this may make it more burdensome to raise support. As the greenhouse gas emissions of LDCs are comparably small, they expect mitigation efforts to come from developed countries.

At COP 22 in Marrakesh the LDCs announced the launch of their Renewable Energy and Energy Efficiency Initiative (REEEI) for Sustainable Development. REEEI aims at scaling up the provision of renewable energy to LDCs while promoting energy efficiency; recognising the crucial role that energy plays in rural development, industrialisation and the provision of services. REEEI will be a key element of the Global Partnership on Renewable Energy and Energy Efficiency, also launched in Marrakesh (LDC 2016).

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

The Bolivarian Alliance for the Peoples of Our America consists of four South/Central American countries (Bolivia, Ecuador, Venezuela and Nicaragua) and seven Caribbean countries, including Cuba. It is an intergovernmental organisation which, *inter alia*, acts as a negotiating group on climate change issues.

Like other developing country groups, ALBA calls for ambitious mitigation action by developed country Parties and for finance and technology transfer.

In the negotiations on the Paris Agreement, ALBA countries stressed the importance of including non-market approaches as one of the options of international cooperation on mitigation (cf. chapter 3.1). The preamble to the Paris Agreement was drafted by a working group led by a Venezuelan representative and it contains references to concepts such as "Mother Earth" and "climate justice", which had been put forward by Bolivia.

Non-market mechanisms and links to the 2030 Agenda for Sustainable Development (cf. chapter 9.1) continue to be important topics for ALBA countries in the implementation of the Paris Agreement (IISD 2016c).

At the APA 1-3 and SBSTA 46 closing meetings on 18 May 2017 the ALBA noted the need to find the correct balance between the multiple agenda items, and the pillars of mitigation, adaptation, finance and capacity-building. The group further stressed the need to recognise the particular capabilities of the different countries and invited proposals for innovative non-market cooperative approaches under Article 6 of the Paris Agreement (IISD 2017a).

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

The Independent Alliance of Latin America and the Caribbean brings together four South American (Chile, Colombia, Paraguay and Peru) and four Central American countries (Costa Rica, Guatemala, Honduras and Panama). The group was established as a formal negotiating group in the course of the COP in Doha in 2012.

Unlike ALBA and other developing country groups, AILAC has been in favour of global climate goals from the start, rather than a strict distinction between developed and developing countries. On adaptation, AILAC supported the introduction of a global goal for adaptation in the Paris Agreement, along with collective and individual adaptation commitments, support and institutional arrangements (Mexico and AILAC 2014).

Concerning mitigation, AILAC holds the view that pre-2020 ambition efforts should be supported by enhanced finance, technology transfer and capacity-building from developed countries.

At the APA 1-3 closing meeting on 18 May 2017 AILAC emphasised the need to make further progress with work on the global stocktake, and the relevance of the 2018 facilitative dialogue (IISD 2017a).

6.10. Environmental Integrity Group (EIG)

The Environmental Integrity Group comprises two large developing (emerging) countries (Mexico and the Republic of Korea) and three small developed countries (Liechtenstein, Monaco and Switzerland) that are neither part of the European Union nor of the Umbrella Group.

Their approach to climate policies can be characterised as more ambitious in several ways than the approach of other comparable Parties. Concerning mitigation, Liechtenstein, Monaco and Switzerland are committed to emission reductions in the second commitment period under the Kyoto Protocol and to further ambitious emission reductions in their NDCs. In areas such as loss and damage, diverse views exist within the group. Against this background, and despite the differences within the group, EIG can play an important role in the negotiations, bringing together different views and engaging in the search for a compromise (Climate Home 2015).

As an example of the EIG members' collaboration between developed and developing countries, Mexico joined the United States and Canada in the "North American Climate, Clean Energy and Environment Partnership" (cf. chapter 5.9.2). Liechtenstein, Monaco and Switzerland may not be able to reach the mitigation goals stated in their INDCs through domestic action only and intend to make use of international cooperation.

At the SBSTA 46 closing meeting in Bonn on 18 May 2017 the EIG called for a strong role of the IPCC and the scientific community in the facilitative dialogue and the global stocktake. They further stressed the need for substantial progress to be achieved on technical issues for cooperative approaches under Article 6 of the Paris Agreement, including the participation of observers (IISD 2017a).

Box 35: The "high ambition coalition"

The "high ambition coalition" is a loose coalition representing more than 100 developed and developing countries that pushed at COP 21 for the inclusion of an ambitious long-term goal in the Paris Agreement and for the introduction of a five-year cycle which came to be known as the "global stocktake". The coalition started out as an initiative launched by the Marshall Islands and the European Union and consists of mostly Caribbean, Pacific and African countries. Notable exceptions include major developing countries such as China and India.

In 2016 the "high ambition coalition", including representatives from the U.S. and Canada, played an important role in reaching an agreement to phase out potent greenhouse gases known as hydrofluorocarbons (HFCs) under the Montreal Protocol (Track 0 2016, see chapter 8.3).

6.11. Conclusions on the positions of groups

The last two negotiating groups mentioned above and the "high ambition coalition" are examples of a development observed in recent years which has led to a less strict division between "developing" or "developed" countries. In the Paris Agreement, it was possible to bridge all relevant divides between the groups, and the Agreement does not refer to the Convention's distinction between "Annex I Parties" and "non-Annex I Parties". Nevertheless, the concept of "common but differentiated responsibilities and capabilities" remains valid, and the various groups will continue to put forward their diverging positions in the negotiations.

In the following table, a summary is given of the main negotiating topics and of those groups that put their focus primarily on these topics.

Table 5: Main negotiation topics and groups focusing on these topics

Topic	Group focusing on the topic
Ambitious mitigation action – limiting the global temperature increase to 1.5 degrees	AOSIS, LDC, African Group, ALBA
Adaptation goal and communication	G-77 and China, LMDC, African Group, AILAC, Arab Group
Loss and damage	G-77 and China, LMDC, African Group, AOSIS, ALBA
Scaled-up climate finance	G-77 and China, African group, LMDC, LDC, AOSIS, AILAC, Arab Group
Technology development and transfer	G-77 and China, African group, LDC, AILAC
Capacity-building	African group, LDC, AILAC
Transparency of action and support	AOSIS, Umbrella Group (for transparency of support), EIG

Source: IISD 2015b, IISD 2017a, authors' views.

7. OTHER STAKEHOLDERS

Besides the Parties to the Convention (196 countries plus the European Union), delegates from observer states and from observer organisations attend meetings under the UNFCCC. Currently, there is one observer state only – the Holy See. The observer organisations include:

- United Nations units and bodies established by the UN, such as the United Nations Environment Programme (UNEP) or the Intergovernmental Panel on Climate Change (IPCC)
- Inter-governmental organisations (IGOs), such as the International Energy Agency (IEA) or the Organisation for Economic Co-operation and Development (OECD)
- Non-governmental organisations (NGOs)

At COP 22 in Marrakesh, participation of these organisations reached new heights in COP history with over 2 100 admitted observer organisations. After a record high of over 28 000 participants at COP 21 in Paris, approx. 22 600 participants attended the Marrakesh conference. In 2016 roughly 5 500 participants from observer organisations were registered, as well as 15 900 participants from the Parties and 1 200 media representatives (UNFCCC 2017n).

In the following, an overview is given of those observer organisations and stakeholders that figure most prominently in the current discussions on climate change, *inter alia* because they adopted clear positions on the implementation of the Paris Agreement and climate change action or because support is at the core of their work. For the purpose of this report, these stakeholders are divided into three groups:

- NGOs and local government organisations (see chapter 7.1)
- Groups of countries (see chapter 7.2)
- International organisations (see chapter 7.3)

The aims of each of these stakeholders are presented in the following, along with their position on international climate policies, and, as far as available, on the implementation of the Paris Agreement.

7.1. NGOs and local government organisations

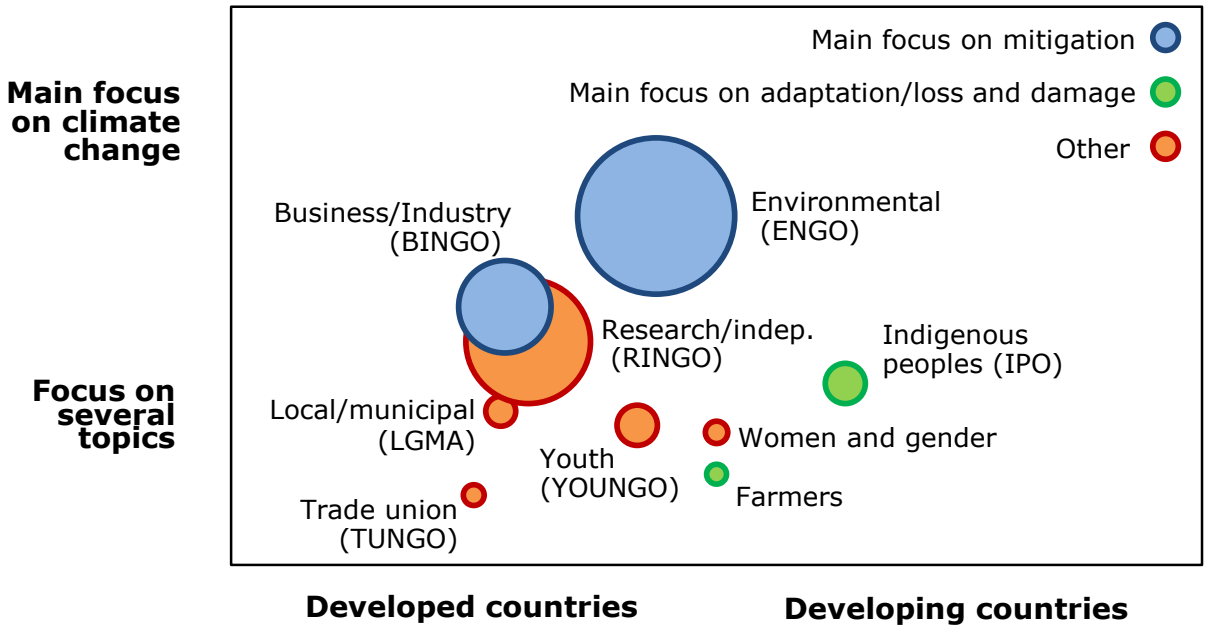
Non-governmental organisations actively participate in climate change conferences, through side events, exhibits and press releases. NGOs form the largest group among the observer organisations – a total of more than 2 000 such organisations are currently admitted as observers under the UNFCCC.

On UNFCCC level, all organisations except intergovernmental organisations are often referred to as "NGOs" or "civil society", although they also include local government and municipal authorities (LGMA). In this chapter, these local/municipal authorities are also described alongside with NGOs, as their role is indeed separate from the role of national governments and intergovernmental organisations and closer to NGOs.

Most representatives of the civil society are affiliated to one of nine constituencies (see Figure 6), which act as focal points in the climate negotiation process and in the interaction with the UNFCCC secretariat. Accredited observer status and affiliation to a constituency allow for contributing statements in plenary sessions and written submissions on negotiation topics as well as the organisation of side events.

In the following, these nine constituencies and their positions on international climate negotiations and policies are introduced.

Figure 6: NGO and local government organisation constituencies



The size (area) of the circles is proportional to the number of organisations registered under the constituency.

Source: Number of NGOs and country affiliations: List of admitted NGOs (UNFCCC 2016f). The division between developed and developing countries is based on the GDP per capita (World Bank Group 2016a). Country affiliation is based on where the head office is situated; organisations may be active in and represent both developed countries and developing countries. The main focus of work of the constituencies has been determined on the basis of the authors' views.

7.1.1. Environmental non-governmental organisations (ENGO)

Almost 700 organisations are registered as ENGOs under the UNFCCC; which makes ENGO the largest constituency. In the following, three of the most active ENGOs in the process are presented.

The Climate Action Network (CAN) is a network of over 1 100 NGOs in more than 120 countries worldwide, which works to promote governmental as well as individual action to limit anthropogenic climate change to ecologically sustainable levels (CAN 2017). The CAN established regional network hubs that coordinate these efforts around the world. One regional network is CAN Europe with almost 140 member organisations in more than 30 European countries (CAN Europe 2017). CAN and its member organisations are visible and outspoken participants of climate change conferences. Civil society mobilisation is an important focus for CAN's work.

Friends of the Earth International (FoEI) is a grassroots environmental network representing more than 2 million members and supporters in 75 different countries. FoEI mobilises and supports campaigns on today's most urgent environmental and social issues and seeks to change the perception of the public, the media and policy makers through policy analysis and promote solutions that will help to create environmentally sustainable and socially just societies (FoEI 2017). One of FoEI's main concerns is climate justice, taking into account the developed countries' historically high greenhouse gas emission levels and the right of communities to choose their own sustainable energy sources.

Greenpeace International is a global campaigning organisation, consisting of Greenpeace International based in Amsterdam and 26 national and regional offices around the world, with a presence in over 55 countries. Their aim is to change attitudes and behaviour, to protect and conserve the environment and to promote peace (Greenpeace International 2017). As

regards the Paris conference and its outcome, Greenpeace International acknowledges the successful completion of a global agreement and the ambitious temperature goal, but points out that huge efforts are needed to reach this goal (Greenpeace International 2015).

7.1.2. Research and independent non-governmental organisations (RINGO)

Research and independent non-governmental organisations (RINGO) are organisations engaged in independent research and analysis, in order to develop sound strategies to address both the causes and consequences of global climate change. Making up approx. 25 % of the 2 000 admitted NGOs, it is the second largest constituency. The RINGO Steering Committee is composed of representatives from research institutes in the area of climate change, such as the International Institute for Sustainable Development, the University of Zurich or Wageningen University. RINGO representatives play an active part in climate change conferences, e.g. by organising side events to address a wide range of topics (RINGOs 2017).

7.1.3. Business and industry non-governmental organisations (BINGO)

The International Chamber of Commerce (ICC) coordinates activities of Business and Industry Non-Governmental organisations (BINGO) related to the UNFCCC process. The aim of the ICC and its Commission on Environment and Energy is to help businesses meet the challenges associated with climate change (ICC 2017). The Carbon Disclosure Project (CDP) is an example of an NGO in the business and industry constituency, which operates a global disclosure system for investors, companies, cities and regions to manage their policies and risks related to climate change (CDP 2017).

Companies play a key role in the development and promotion of low-emission technologies and lifestyles. For examples of climate action initiatives of businesses, see the Non-State Actor Zone for Climate Action (NAZCA) under the Lima-Paris Action Agenda (LPAA, cf. Box 14). Links between energy markets and climate change are laid out in chapter 9.2, and potential conflicts between the interests of business NGOs and the objectives of the Paris Agreement are discussed in chapter .

7.1.4. Youth non-governmental organisations (YOUNGO)

During UNFCCC conferences, young people are given the opportunity to attend plenary sessions, to meet with officials and organise side events, exhibits or interviews. Their constituency (Youth non-governmental organisations, YOUNGO) regularly addresses plenaries and makes submissions (UNFCCC 2017o).

7.1.5. Indigenous peoples non-governmental organisations (IPO)

Indigenous peoples organisations are united in the International Indigenous Peoples' Forum on Climate Change (IIPFCC). At climate change conferences, IIPFCC representatives voice the concerns of indigenous peoples in areas such as climate change impacts, adaptation, mitigation, finance, recognition of indigenous peoples rights and traditional knowledge, and Free, Prior and Informed Consent (FPIC) (IIPFCC 2017).

7.1.6. Local government and municipal authorities (LGMA)

The constituency of local government and municipal authorities is coordinated by "ICLEI – Local Governments for Sustainability" (ICLEI 2017a); ICLEI stands for "International Council for Local Environmental Initiatives". Both the local and the regional level play an important role in complementing national mitigation and adaptation actions. The Compact of States and Regions is an initiative for providing information on efforts to address climate change on state level and on the level of regional governments. Governments with existing greenhouse gas

reduction targets can join the Compact by reporting a public commitment to reduce greenhouse gas emissions and a region-wide greenhouse gas inventory, which has to be updated annually (ICLEI 2017b).

In 2015, ahead of COP 21, the "Subnational Global Climate Leadership Memorandum of Understanding" ("Under 2 MoU") was initiated. It requires its signatories to reduce their greenhouse gas emissions by 80 to 95 %, or to limit them to 2 tonnes CO_2 equivalent per capita, by 2050 (Under 2 MOU 2017). Besides the entities on the subnational level, there are also some countries that have endorsed the coalition. As of September 2017, 187 jurisdictions representing 1.2 billion people and 39 % of global GDP have signed or endorsed this Memorandum of Understanding (Office of Governor Edmund G. Brown Jr. 2017b).

On city level, the "C40 Cities Climate Leadership group" is a network of megacities collaborating in the areas of climate change mitigation and climate-related risk reduction (C40 2017). Under the leadership of C40, of ICLEI and of the United Cities and Local Governments (UCLG), the Compact of Mayors was launched in 2014. The aim of the Compact of Mayors is, *inter alia*, to demonstrate the cities' commitment to ambitious global climate action and to accelerate collaborative and sustainable local action (Compact of Mayors 2017).

Another example is the Covenant of Mayors for Climate and Energy, under which more than 6 600 local and regional authorities across the European Union have committed themselves to meeting and exceeding the EU's greenhouse gas reduction target by increasing energy efficiency and developing renewable energy sources. The current target year is 2030 and the Covenant integrates both mitigation and adaptation actions (Covenant of Mayors 2017).

In June 2016, the European Covenant of Mayors and the Compact of Mayors formed a coalition. The aim of this initiative, "the Global Covenant of Mayors for Climate and Energy", is to facilitate collaboration between cities worldwide. It provides a common platform for relevant data on the cities' energy and climate actions which allows for comparison of the cities' achievements to those of other cities, and makes them publicly available. As at 25 September 2017 it comprises approx. 7 500 cities representing almost 700 million people worldwide (Global Covenant of Mayors 2017).

Many of these initiatives on the urban and local level have been registered on the UNFCCC's NAZCA platform (UNFCCC 2017d) which was launched in 2014 under the Lima-Paris Action Agenda (cf. Box 14 in chapter 3.10).

7.1.7. Women and gender non-governmental organisations

The women and gender constituency comprises 16 women's and environmental civil society organisations working to ensure that women's perspectives are embedded in the processes and results under the UNFCCC (WGC 2017). The topic "gender and climate change" has been on the agenda of climate change conferences since 2013, with discussions under the SBI (cf. Box 3) and in-session workshops.

7.1.8. Trade union non-governmental organisations (TUNGO)

The International Trade Union Confederation (ITUC) works with its affiliates to include the labour movement on the climate agenda by focusing, *inter alia*, on emission reduction targets and differentiated responsibilities, and on developing a comprehensive strategy for a "just transition" for workers and communities to a low-carbon economy (ITUC 2017).

7.1.9. Farmers non-governmental organisations

In UNFCCC negotiations, the farmers' constituency has been represented by varying organisations, most recently by the World Farmers Organisation (WFO). Initiatives such as the Climate Change, Agriculture and Food Security (CCAFS) programme work on strengthening

the role of agriculture in areas such as technology transfer or Nationally Appropriate Mitigation Actions (NAMAs). NAMAs were established in the Bali Action Plan (Decision 1/CP.13) to reduce greenhouse gas emissions in developing countries. They are prepared under national governmental initiatives.

The discussion of climate measures in the agricultural sector was initiated at COP 17, followed by workshops and reports within the SBSTA (cf. Box 18). The CCAFS initiative is actively contributing to this process, with input on issues such as early warning systems, the risks and vulnerability of agricultural systems and adaptation measures (Dinesh et al. 2016).

7.2. Groups of countries

Besides the organisations described above, other groups of countries exist which regularly voice their position on climate change. In this section, groups of countries and high-level dialogues are described.

Besides national governments, actors on the sub-national level (regions or cities) form groups and make their voice heard. In UNFCCC negotiations, representatives of such entities are classified under 'civil society'. They are presented in chapter 7.1.6, above.

7.2.1. Petersberg Climate Dialogue

The Petersberg Climate Dialogue is an informal meeting of ministers, chaired by Germany and the president of the upcoming COP, which has been taking place annually since 2010, when it was initiated at Petersberg near Bonn. It has since then provided an opportunity for Parties to exchange experiences about international climate policies in support of the UNFCCC negotiating process (BMUB 2017a).

In 2016 Germany announced an initiative to support developing countries with the implementation of their NDCs, by offering guidance in their institutional and political landscape, on their sectoral approaches as well as on financing and transparency. This "NDC Partnership" aims at accomplishing better harmonisation between various donor programmes and at combining existing climate and development goals.

At the eighth Petersberg Climate Dialogue in Berlin, Ministers and representatives from 35 countries met from 22 to 23 May 2017. The main outcomes of the meeting are summarised in the co-chairs' conclusions (BMUB 2017b; IISD 2017b). The main issues discussed were, *inter alia*, how to push forward climate action in the context of domestic as well as international challenges, and the importance of the development of long term low-emission strategies. Furthermore, the domestic implementation of NDCs, adaptation to climate change and the tasks ahead of COP 23 were discussed. Participants reaffirmed their commitment to the Paris Agreement and its implementation. The USA reserved its position on the co-chairs' document and its contents, because it was in the process of reviewing its climate change related policies (for more information on the USA and its position towards the Paris Agreement see chapter 5.2).

7.2.2. The Group of Seven (G7)

The Group of Seven (G7) consists of the major developed countries France, Germany, Italy, Japan, the United Kingdom, the United States and Canada. The European Union also participates in G7 meetings, which are held as annual summits to discuss international political and economic issues. At the end of summits a communiqué, which is politically binding on all G7 members, about the issues and decisions taken at the summit is adopted and released (Council of the European Union 2017b).

Climate change was a main topic at the G7 summit in 2015 in Germany. The G7 heads of state affirmed their strong determination to adopt an ambitious agreement at the climate

change conference in Paris later that year, while also naming the 2 degrees C goal as well as making mitigation commitments. Furthermore, the G7 underlined their commitment to climate finance and declared that a decarbonisation of the global economy was required over the course of the 21st century (G7 2015).

At the 42nd G7 summit in 2016 in Japan the G7 leaders announced their intent to take over the leadership in efforts towards an early entry into force of the Paris Agreement. Moreover, they committed themselves to the development and communication of long-term low greenhouse gas emission development strategies well before 2020. The G7 also stated that the need to focus on emissions from international aviation was crucial (G7 2016).

The issues put forward for debate also included energy and its central role in the decarbonisation of the global economy. In this context the G7 renewed their commitment to eliminate inefficient fossil fuel subsidies and encouraged all countries to follow suit by the year 2025. This commitment was criticised for its lack of ambition and NGOs have urged the large countries to phase out subsidies for fossil fuels by 2020 (The Washington Post 2016).

At the 43rd G7 summit from 26 to 27 May 2017 in Taormina, Italy the G7 leaders, except the USA, reaffirmed in their communiqué (G7 2017) their commitment to implementing the Paris Agreement swiftly, as stated at the G7 summit in 2016. Instead of the usual consensus statement, the communiqué noted that the United States of America was still in the process of considering its position on the Agreement and was not in a position to join the consensus (for more information on the USA and its new position towards the Paris Agreement see chapter 5.2).

This marked the first time that the USA stood apart from the consensus on climate change related issues released in the final communiqué on G7 level. Apart from that, the summit focused on issues like the global economy, foreign policy, the migration crisis as well as on reducing inequalities (Climate Home 2017e; Council of the European Union 2017c).

On 11 and 12 June 2017 the Environment Ministers' Meeting of the G7 countries took place in Bologna. The G7 environment ministers and the European Commissioners responsible for the environment and climate issues reaffirmed their commitment to the implementation of the 2030 Agenda for Sustainable Development, but only six of the seven ministers signed the sections in the communiqué on the Paris Agreement and on multilateral development banks. The reason for the United States not to sign these sections was the "recent announcement to withdraw and immediately cease implementation of the Paris Agreement and associated financial commitments." Apart from that, the ministers adopted a five-year "Bologna Roadmap", which outlines the next steps for pushing resource efficiency forward through, *inter alia*, resource efficiency indicators, the assessment of potential greenhouse gas reductions of resource efficiency policies, as well as action on food waste, plastics and green public procurement (G7 Environment Ministers 2017; IISD 2017c).

7.2.3. The Group of Twenty (G20)

In the decades since the founding of the G7, the share of this group in the GDP and in greenhouse gas emissions has decreased worldwide, and the share of the large emerging countries has increased in many respects. Hence, the Group of Twenty (G20), which comprises 19 major developed and emerging countries plus the European Union, has been playing an increasingly important role. In addition to the members of the G7, Argentina, Australia, Brazil, China, India, Indonesia, the Republic of Korea, Mexico, the Russian Federation, Saudi Arabia, South Africa and Turkey are members of the G20. The group was founded in 1999 and has been meeting regularly since 2008. Its aim is to enable high-level discussions of policy issues, to strengthen policy coordination as well as to promote international financial stability.

In September 2016, one day before the G20 summit, China's President Xi Jinping and U.S. President Barack Obama deposited their instruments of ratification for the Paris Agreement with United Nations Secretary-General Ban Ki-moon (The White House 2016a). This initiative was of exceptional significance for the process towards the entry into force of the Paris Agreement: The two largest emitters of greenhouse gases took the lead among the large economies in the ratification of the Agreement, calling for others to follow suit and causing a substantial leap upwards in the share of emissions covered by the ratifying Parties – which was then just 16 % short of the threshold of the 55 % required for the Agreement to enter into force.

At the end of the 2016 summit the G20 leaders reiterated their commitment to providing strong and effective support for action to address climate change. They committed themselves to completing their respective domestic procedures so that they would be able to join the Paris Agreement as soon as their national procedures allowed them to do so (G20 2016). As of 25 September 2017 all G20 countries except the Russian Federation and Turkey have ratified the Paris Agreement.

At the 12th G20 summit from 7 to 8 July 2017 in Hamburg, the G20 leaders discussed – apart from global economic growth, international trade and financial markets, traditionally at the centre of the discussions – a wide range of topics, amongst others climate change, fighting terrorism, digitalisation, a partnership with Africa, the multilateral 2030 Agenda as well as pandemics and antimicrobial resistance. After the announcement that the USA would withdraw from the Paris Agreement, the USA did not support climate change related topics in the joint G20 leaders´ declaration. The other 19 countries declared the Paris Agreement to be irreversible and reasserted their commitment. In this context, the remaining 19 countries adopted the "G20 Hamburg Climate and Energy Action Plan for Growth", in which they outlined their intentions to collaborate closely, *inter alia*, on the transformation of energy systems, climate resilience & adaptation and on the alignment of finance flows (G20 2017a; G20 2017b; G20 2017c).

On the sidelines of the G20 summit the French President Emmanuel Macron announced that a climate summit focusing on the mobilisation of financial support will be held in Paris on 12 December 2017, marking the two-year anniversary of the adoption of the Paris Agreement (Politico 2017, IISD 2017d).

7.2.4. The Major Economies Forum on Energy and Climate (MEF)

Besides the G20, an overlapping group of countries was founded in 2009 with a special focus on climate change – the Major Economies Forum on Energy and Climate (MEF). The MEF has 17 permanent participating economies and its aims are to

- "facilitate a candid dialogue among major developed and developing economies,
- help generate the political leadership necessary to achieve a successful outcome at the annual UN climate negotiations, and
- advance the exploration of concrete initiatives and joint ventures that increase the supply of clean energy while cutting greenhouse gas emissions" (MEF 2016a).

The MEF was founded under an initiative of the Obama administration. As the Trump administration is revising its climate change policies fundamentally, no MEF activities are currently planned.

7.3. International organisations

7.3.1. Intergovernmental Panel on Climate Change (IPCC)

The Intergovernmental Panel on Climate Change (IPCC) is a scientific body established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988 to provide a scientific view on the current state of knowledge of climate change and its potential environmental and socio-economic impacts (IPCC 2017a). As an intergovernmental body, it is open to 195 member countries of the United Nations and the WMO. The Panel itself consists of representatives appointed by governments and holds plenary sessions usually once or twice a year.

The IPCC follows the aim to review and assess the most recent scientific information relevant to the understanding of climate change, but does not conduct its own research. Thousands of scientists from all over the world contribute to the work of the IPCC on a voluntary basis. Ensuring an objective and complete assessment of current information is an essential part of the IPCC process.

One of the main IPCC activities is the preparation of comprehensive Assessment Reports which compile state-of-the-art scientific knowledge to provide a basis for discussions on adaptation and mitigation solutions under the UNFCCC. The assessment is aligned along three topics respectively shared among three Working Groups.

Table 6: IPCC Working Groups

Group	Topics assessed
Working Group I	Physical science aspects of the climate system and climate change
Working Group II	Vulnerability of socio-economic and natural systems to climate change, consequences of climate change, and options for adaptation
Working Group III	Options for mitigating climate change

Source: IPCC (2017a; 2017b).

Since its inception in 1988 the IPCC has prepared five multivolume Assessment Reports. The **Fifth Assessment Report** (AR5) was released first in September 2013, with the complete version of the Synthesis Report published in March 2015 (IPCC 2015). Key findings of the Synthesis Report are that the human influence on the climate system is clear, that continued emissions of greenhouse gases will cause further warming and long-lasting changes to all components of the climate system, and that adaptation and mitigation are complementary strategies for reducing and managing the risks of climate change. Over 830 scientists from over 80 countries were selected to form the author teams producing the AR5. They, in turn, drew on the work of over 1 000 contributing authors and over 1 000 expert reviewers. AR5 was based on the assessment of over 30 000 scientific papers.

The IPCC is currently in its **sixth assessment cycle** (which started in the year 2016), during which three Working Group contributions to the Sixth Assessment Report (AR6) are expected to be released throughout the year 2021, and a Synthesis Report to be completed in 2022 (IPCC 2017c; IPCC 2017d). These reports will constitute a key input to the first global stocktake under the Paris Agreement (cf. chapter 3.8) which will take place in the year 2023. The IPCC also produces Special Reports on specific topics and Methodology Reports which mainly provide practical guidelines for the preparation of greenhouse gas inventories. Four of these

reports are planned to be produced during the sixth cycle; three special and one methodological report. From 1 to 5 May 2017 the scoping meeting for the AR6 took place in Addis Ababa. In September 2017 at its 46th session (IISD 2017e), the panel approved the draft chapter outlines for the three Working Group reports that, together with the synthesis report, will make up the Sixth Assessment Report.

In the Decision on the Paris Agreement (Decision 1/CP.21) the IPCC was invited to provide a **Special Report (SR1.5)** on the "impacts of global warming of 1.5 degrees C above pre-industrial levels and related global greenhouse gas emission pathways". This report will form the scientific basis for the facilitative dialogue in 2018 (cf. chapter 3.8). The 1.5 degrees C Special Report will integrate knowledge and perspectives from all three IPCC Working Groups (cf. Table 6). The IPCC strives to make this report relevant for policymakers and at the same time easily understandable for a non-scientific audience. The scoping meeting for this Special Report was held in August 2016 (IISD 2016d). At the IPCC's 44th meeting the outline was approved (IPCC 2017e). The report will *inter alia* contain chapters on mitigation pathways compatible with 1.5 degrees C in the context of sustainable development, impacts of a global temperature increase of 1.5 degrees C on natural and human systems, strengthening and implementing the global response to the threat of climate change and sustainable development, poverty eradication and the reduction of inequalities. A first draft report was distributed for review by experts at the end of July 2017. The approval of the report is planned for September 2018 at the 48th IPCC meeting (IISD 2016e).

Two other Special Reports are currently under preparation, one about the Ocean and Cryosphere in a Changing Climate **(SROCC)** and the second one on Climate Change and Land **(SRCCL)** and, more specifically, on "desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems". It is planned that these two reports will be finalised in September 2019 (IPCC 2017c). The outlines of both SROCC and SRCCL were discussed and approved at the 45th IPCC meeting (IPCC 2017f; IPCC 2017g). The SROCC will *inter alia* contain chapters on High Mountain Areas, Polar Regions, Sea Level Rise and Implications for Low Lying Islands, Coasts and Communities and Changing Ocean, Marine Ecosystems and Dependent Communities. The SRCCL on the other hand will *inter alia* contain chapters on Land–Climate interactions, Desertification, Land Degradation, Food Security and interlinkages between these phenomena. Once the author teams have been selected, they will meet several times over the course of three years to work on their respective special reports (IISD 2017f).

In May 2019 a **methodology report** entitled "2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories" is expected to be published. Such guidelines are to be used by Parties to prepare their greenhouse gas emission inventories. The scoping meeting for this methodological report was held in August 2016 and the outline was approved in October 2016 at the 44th IPCC meeting. The report will consist of a revision of specific sections of the 2006 National Greenhouse Gas Inventory Guidelines, in the form of an update, an elaboration, or new guidance. This report will be important for tracking progress under the Paris Agreement, as its methods are intended to be used by Parties for preparing their national emission inventories. Changes in these methods, and changes to emission factors used by countries to calculate their emissions can have impacts on their reported GHG emissions (IPCC 2017h; IISD 2016e).

The IPCC usually holds two **meetings** per year, where the numerous tasks and activities of the Panel are discussed and decided. These sessions typically bring together around 300 participants from over 100 countries.

An important topic of the **43rd IPCC meeting** in 2016 (and of other IPCC meetings in the past) was how to place a stronger focus on regional aspects in the AR6, without preparing a Special Report solely on this topic. It is a long-standing goal of the IPCC to increase the

participation of scientists from developing countries while also including areas which are currently underrepresented with regard to the availability of scientific literature (IISD 2016f). Furthermore, the IPCC decided to prepare a Special Report on cities within the seventh Assessment Report cycle.

Box 36: Alignment of the cycles of the IPCC and the global stocktake

Strategic planning and possibilities for better **alignment of the work of the IPCC with that of the UNFCCC**, especially of the Paris Agreement's global stocktake cycle (cf. chapter 3.8) with the Assessment Report cycles, was also discussed at the 43rd IPCC meeting. The IPCC secretariat was asked to draw up possible suggestions on how this could be achieved and to submit its proposals on this issue in 2017 when the rules of procedure were to be reviewed. During its 45th session the secretariat said it was preparing its proposals for consideration at the 46th meeting (IISD 2016f; IISD 2016e; IISD 2017f).

The **44th session** was held in October 2016 in Bangkok. Besides the decisions on the outlines of the SR1.5 as well as of the methodology report, strategic planning and procedural matters were important topics. Arrangements were made *inter alia* on the IPCC Trust Fund programme and budget, the Expert Meeting on Mitigation, Sustainability and Climate Stabilisation Scenarios, and the future of the Task Group on Data and Scenario Support for Impact and Climate Analysis (IISD 2016e).

In March 2017 the **45th IPCC plenary meeting** took place in Guadalajara. While the panel discussed and decided on a multitude of topics and issues, the outlines of the SROCC and SRCCL were at the heart of this meeting. Apart from that, decisions were made on the budgets for the years 2017 through to 2020 and on resource mobilisation.

Additionally, it was decided to create an Ad Hoc Task Group on Financial Stability. The finance focus can be explained by a decline in contributions to the IPCC since 2008 both in terms of the amount of funds and the number of funders, and the uncertainty triggered by announcements of the Trump Administration to cut funding for international climate processes. The USA currently is the biggest national contributor to the IPCC and its contribution in 2016 was six times higher than the second highest contribution (for more information on the USA and its changed position on climate action and support see chapter 5.2). The strategic planning schedule of the AR6 and the IPCC carbon footprint were also on the agenda (IISD 2017f).

The Panel is continually working on improving the **communication and outreach strategy** of its Assessment Reports, a topic which has appeared regularly on the agenda of the last IPCC meetings.

The **46th IPCC plenary meeting** was held in Montreal from 6 to 10 September 2017 (IISD 2017e; IPCC 2017i). Apart from the approved outlines for the three Working Group contributions to the 6th Assessment Report, the IPCC's budget was an important item on the agenda of the meeting, where various funding options were discussed and the mandate of the Ad Hoc Task Group on Financial Stability was extended. Furthermore, the IPCC agreed to establish a task group for better alignment of the IPCC cycles and the global stocktake under the UNFCCC.

7.3.2. International Civil Aviation Organization (ICAO)

The International Civil Aviation Organization (ICAO), founded in 1944, is a specialised agency of the United Nations based in Montreal. Currently the ICAO has 191 Member States. Its objective is to serve as the global forum of states for international civil aviation. It develops international standards and recommends practices in the area of aviation (ICAO 2017a).

The ICAO's permanent body, the Council, is composed of 36 Member State representatives elected by the Assembly every three years. It is split into three "parts" (or clusters): firstly, states of chief importance in air transport; secondly, states which make the largest contribution to the provision of facilities for international civil air navigation; and thirdly, states that ensure geographic representation in the Council (ICAO 2017b).

After the adoption of the Paris Agreement in December 2015, the ICAO pointed out that the fact that greenhouse gas emissions from international aviation were not included in the Agreement would reinforce confidence in ICAO's own achievements in combating climate change (ICAO 2017c). ICAO's 2016 Environmental Report (ICAO 2017d) gives an overview of available mitigation options, including aircraft technology, operational improvement, market-based measures and alternative fuels, as well as discussing climate change adaptation and resilience in the context of the aviation industry. The Global Market-based Mechanism adopted at the 39th ICAO assembly in October 2016, but also the projected large emission increase in the aviation sector, is discussed in chapter 8.1.

7.3.3. International Maritime Organization (IMO)

The International Maritime Organization (IMO), founded in 1948, is a United Nations' specialised agency based in London. It is responsible for setting standards for safety, security and environmental performance in international shipping. As of 2017 the IMO has 172 Member States and three Associate Members (IMO 2017a).

The Marine Environment Protection Committee (MEPC) is IMO's senior technical body on marine pollution related matters. It is supported by various sub-committees, such as the Sub-Committee on Pollution Prevention and Response (IMO 2017b). Besides the requirements related to water and air pollutants, IMO has recently adopted energy efficiency standards for new ships and mandatory operational measures to reduce emissions from existing ships (IMO 2017c).

It has to be noted that, unlike ICAO, the IMO has up to now not come forward with concrete proposals such as market-based measures (MBM). New calls for bold measures in the shipping sector come from the climate-vulnerable Marshall Islands, which operate the world's second largest shipping registry after Panama and other Pacific countries together with some European countries (see Box 39 in chapter 8.2).

Further developments with regard to the IMO and international shipping are presented in chapter 8.2.

7.3.4. The World Bank Group

The World Bank Group is one of the agencies managing projects under the Global Environment Facility (GEF, cf. Box 19) and in recent years has become an outspoken stakeholder in the international discussion on climate change.

The World Bank Group, established in 1944, comprises five international organisations: the International Bank for Reconstruction and Development (IBRD), the International Development Association (IDA), the International Finance Corporation (IFC), the Multilateral Investment Guarantee Agency (MIGA) and the International Centre for Settlement of Investment Disputes (ICSID). Two entities thereof, the IBRD and IDA, jointly form the organisation which is generally referred to as "the World Bank". It is headquartered in Washington, D.C. and has an observer status at the United Nations. The World Bank operates as international financial institution, whose main function is to provide loans to developing countries. The World Bank is owned by the governments of the 189 member countries, which have the decision-making power within the organisations (World Bank Group 2017a, 2017b, 2017c, United Nations 2015a).

In 2013, the World Bank Group set itself two goals: to end extreme poverty by decreasing the number of people living on less than USD 1.25 per day to 3 % and to promote prosperity by supporting the income growth of the lowest 40 % in each country, both to be achieved by 2030. In the year 2015 the World Bank Group spent USD 65.6 billion in total on credits, capital investments, grants, technical assistance and guarantees for countries and businesses worldwide (World Bank Group 2016b).

In the course of the 2015 annual meeting of the World Bank Group and the International Monetary Fund (IMF), the Group pledged to increase the share of climate-related finance in the group's overall funding from 21 to 28 % by the year 2020 (World Bank Group 2015).

In 2016 a new Climate Change Action Plan was approved (World Bank Group 2016c). According to the World Bank Group, impacts of climate change could mean that an additional 100 million people will live in poverty by the year 2030. Therefore, one of the key aspects of the plan is to integrate climate change across the whole operations of the Group. Other priorities within the Climate Change Action Plan are to help developing countries to implement their NDCs, shape national investment plans as well as to leverage the resources of the private sector. The new plan reaffirms the World Bank Group's announcement from 2015 to increase its climate related investments to potentially up to USD 29 billion per year, leveraged co-financing already taken into account, by the year 2020.

After almost four years of work, the Board of the World Bank Group adopted a new environmental and social framework in 2016 in order to streamline its work and increase the outcome of its development efforts. The aim is to improve and expand the level of protection for people and the environment under future investment projects. The framework of the guidelines is expected to come into effect in the year 2018 (World Bank Group 2017d). The World Bank Group's previous safeguards had little to do with climate change. By contrast, the new framework establishes requirements for assessing the greenhouse gas emissions of each project as well as the potential impact of climate change on the project's success (WRI 2016c). The World Bank Group is currently setting up the so-called "Invest4Climate" platform, which aims at bringing together national governments and investors and at facilitating climate-related investments in developing countries (World Bank Group 2017e).

The World Bank Group has published many reports on a range of topics related to climate change, such as the impacts of climate change on poverty (Hallegatte et al. 2015) or carbon taxes (World Bank Group 2017f). The Group also hosts a "Climate Change Knowledge Portal" (World Bank Group 2017g) with adaptation and mitigation data sources and tools.

8. OTHER SECTORAL AGREEMENTS

The Paris Agreement requires all Parties to contribute to reaching its ambitious temperature and emission goals. However, two sectors are not directly covered by the Agreement – international aviation and international maritime transport. As both sectors contribute a considerable share to global greenhouse gas emissions, action in these areas is critical, in particular for reaching the long-term goal of achieving a balance between emissions by sources and removals by sinks (cf. chapter 3.1). The UN bodies governing these sectors are the International Civil Aviation Organization (ICAO, cf. chapter 7.3.2) and the International Maritime Organization (IMO, cf. chapter 7.3.3).

In addition, in October 2016, an agreement was reached under the Montreal Protocol on the phasing down of certain fluorinated gases, which increasingly contribute to global greenhouse gas emissions. The following sections 8.1 to 8.3 give an overview of the negotiations and agreements on international aviation, international maritime transport and fluorinated gases.

It should be noted that comprehensive policies and measures already exist on the European level in these sectors (see Table 7).

Table 7: Main policies and measures on the EU level, relating to international transport and fluorinated gases

Sector	Main policies and measures
International aviation (see chapter 8.1)	From 2012 onwards, aviation has been covered by the EU Emissions Trading System (ETS, Directive 2009/29/EC). This includes all flights within the European Economic Area (EEA). However, for flights to and from other countries the ETS has been suspended from 2013 onwards (Decision No 377/2013/EU).
International shipping (see chapter 8.2)	As a step towards a global market-based mechanism, a Regulation was adopted on the monitoring, reporting and verification (MRV) of CO_2 emissions from maritime transport (Regulation (EU) 2015/757). Large ships (over 5 000 gross tonnes) calling at EU ports are required to collect and later publish verified annual CO_2 emission data and other relevant information.
Fluorinated gases (see chapter 8.3)	A Regulation (Regulation (EU) No 517/2014) is in place which, *inter alia*, limits and gradually reduces the placing on the market of hydrofluorocarbons (HFCs) by 79 % (to be achieved by 2030).

Source: Directive, Decision and Regulations as referenced above.

8.1. International aviation

Between 1990 and 2014, CO_2 emissions from international aviation increased by approx. 95 % (IEA 2016b) and in 2012 international aviation had a 1.3 % share in the global CO_2 emissions (Cames et al. 2015). If domestic emissions are included, aviation accounts for more than 2 % of global CO_2 emissions. What is even more important is that emissions from international aviation are projected to increase from approx. 450 megatonnes (Mt) in 2010 to approx. 1 800 Mt in 2050 (ICAO 2013), even when taking technological and operational improvements into account. Such a continued increase is in strong disagreement with the goals of the Paris Agreement – which aim for global peaking of greenhouse gas emissions as soon as possible and for achieving a balance between anthropogenic emissions by sources and removals by sinks in the second half of the century. Therefore, measures to mitigate

greenhouse gas emissions from international aviation have been called for, and the European Parliament is one of the proponents of such measures (European Parliament 2015).

The International Civil Aviation Organization (cf. chapter 7.3.2) decided in 2001 that an emissions trading system (ETS) would be the most appropriate instrument to address greenhouse gas emissions from international aviation. In the following years little progress had been made until 2010 when ICAO, at its 37th Assembly, agreed on a global aspirational goal of carbon neutral growth by 2020 (ICAO 2010).

In 2013, ICAO finally established a working group for the development of a Global Market-Based Measure (GMBM) to reach this goal. The inclusion of aviation in the EU Emissions Trading System (EU ETS) in 2012 and other ETSs established for domestic aviation in South Korea, New Zealand and possibly China in the near future have doubtlessly pushed this development (ICSA 2016a).

In March 2014 the ICAO Council established the Environment Advisory Group (EAG) responsible for overseeing the development of the GMBM. In technical and analytical aspects the EAG was supported by the Global MBM Technical Task Force (GMTF) of the ICAO Committee on Aviation Environmental Protection (CAEP). The ICAO installed the Global Aviation Dialogues (GLADs) bringing together all states and stakeholders in a forum for information and exchange of ideas and thus also reaching out to states that are not directly active in the ICAO (ICAO 2016a). The second round of GLADs took place in March and April 2016. At five venues across the ICAO regions the draft assembly resolution text was presented to states and stakeholders and opportunities for feedback were provided.

Besides these activities, a proposal was finalised for the first binding fuel efficiency and emission reduction standards for new aircraft and presented at the tenth meeting of ICAO's Committee for Environmental Protection in February 2016. The standards for new aircraft will be effective in 2028. On average a 4 % reduction in cruise fuel consumption compared to aircraft delivered in 2015 will be required (ICCT 2016).

Box 37: The International Coalition for Sustainable Aviation (ICSA)

In 1998 a group of national and international environmental NGOs established the International Coalition for Sustainable Aviation (ICSA), functioning as official observers at the ICAO (ICSA 2016b).

In July 2016 ICSA released a progress report on the ICAO GMBM (ICSA 2016c). In the report the most recent draft Assembly Resolution text of the global MBM was checked against a checklist for an "effective Plan to Cut Aviation Global Warming Pollution". The ICSA's checklist outlined what a measure with a high degree of environmental integrity should contain. This included, *inter alia*, a cap at 2020 levels, regular reviews to align aviation with the Paris Agreement temperature goals, transparent accounting and governance.

Box 38: ICAO's Global Market-based Measure (GMBM) to control CO_2 emissions from international aviation

On 6 October 2016, the ICAO assembly adopted a resolution on a Global Market-based Measure (GMBM; ICAO 2016b). From 2021 onwards, countries voluntarily participate in a pilot phase of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). This scheme addresses any annual increase in total CO_2 emissions from international aviation (i.e. flights that depart in one country and arrive in a different country) above the 2020 levels. After a voluntary first phase from 2021 to 2026, the scheme will apply worldwide from 2027 onwards, with exceptions for least developed countries, small island developing states, landlocked developing countries and states with very low levels of international aviation activity. Seventy countries, including 18 out of the 20 largest aviation nations and accounting for at least 80 % of the anticipated increase of greenhouse gas emissions from international aviation activity, will participate from 2021 onwards (European Commission 2016g, Green Air online 2017).

All aircraft operators in participating countries have to offset a share of their emissions in a given year, which equals the aviation sector's total emission growth rate between 2020 and the given year. Offsets are carried out by purchasing emissions units (corresponding to emission reductions in other sectors), which have to fulfil the criteria agreed upon by the ICAO's Committee on Aviation Environmental Protection.

The agreement reached at the 39th ICAO assembly constitutes an important step in addressing greenhouse gas emissions from international aviation, but it was criticised for the late start of the mandatory phase and for lacking a link to the long-term goals of the Paris Agreement (Climate Home 2016b). The measure adopted by ICAO does not include reduction targets, but only requires the offsetting of emissions above the level of 2020. This measure therefore lacks an aspect which is central to the Paris Agreement, the reduction of emissions and subsequent balancing of all global emissions by sources and removals by sinks in the long term.

The Obama administration committed the United States to CORSIA when it was adopted in autumn 2016. The Trump administration is currently reviewing the ICAO aviation emission agreement and the decision as to whether the U.S. will remain committed to CORSIA is still pending (Airportwatch 2017). Meanwhile, the International Air Transportation Association (IATA) and the U.S. airlines trade body Airlines for America (A4A) have reinforced their support for CORSIA and the latter has also signalled the commitment of its members to participate in the scheme from the start (Green Air online 2017).

8.2. International shipping

Between 1990 and 2014, emissions from international maritime transport increased by approx. 69 % (IEA 2016b). In 2012 international shipping had a 2.2 % share in the global CO_2 emissions (IMO 2014). In 2011, the IMO adopted two efficiency measures to deal with GHG emissions: The Energy Efficiency Design Index (EEDI) sets mandatory energy efficiency standards for ships built after 2013, while the Ship Energy Efficiency Management Plan (SEEMP) is an approach for monitoring and optimising ship efficiency performance (IMO 2017c).

Even when taking these measures into account, CO_2 emission from international shipping are still projected to be six times higher in 2050 compared to 1990 levels, due to the expected economic growth (IMO 2014, Cames et al. 2015).

During the 69th session of the IMO's Marine Environment Protection Committee (MEPC) in April 2016, mandatory requirements for ships above 5 000 gross tonnage were approved, as they account for approximately 85 % of the CO_2 emissions from international shipping (IMO 2017c). For these ships, consumption data will have to be recorded and reported for each type of fuel they use together with additional data e.g. on proxies for transport undertaken. The mandatory data collected as a first step will be analysed in a second step. IMO intends to use these data for a policy debate to assess the need for additional measures to address greenhouse gas emissions and energy efficiency in the field of international shipping (IMO 2016a).

The mandatory data collection requirements for fuel consumption by ships have been formally adopted at the 70th MEPC meeting in October 2016 in London (IMO 2016b). Furthermore, a roadmap was agreed for developing an initial (but comprehensive) "IMO strategy on the reduction of GHG emissions from ships" (2017 through to 2023), which is expected to be adopted in 2018 (IMO 2016c, European Commission 2016h).

In June 2017, during the first meeting of the Intersessional Working Group on the Reduction of GHG Emissions from Ships (ISWG 1), a draft outline for the IMO strategy on emission reduction was elaborated. In July 2017, at MEPC 71, IMO agreed on a draft outline for the strategy and also adopted guidelines for the verification of ship fuel consumption data that are needed to implement energy efficiency measures for ships (IISD 2017g). Further details will be discussed at the second intersessional meeting (ISWG 2), which is scheduled for 23-27 October 2017 (after the present study's completion date).

According to IMO, the second intersessional meeting will further develop the structure and identify core elements of the draft initial IMO strategy on the reduction of GHG emissions from ships. Finalisation of this strategy, including the submission of a report to MEPC 72 (9-13 April 2018), has been scheduled for the third intersessional meeting (ISWG-GHG 3, 3-6 April 2018) (IMO 2017d).

Box 39: The "high ambition coalition for shipping" group

The "high ambition coalition for shipping" was formed by small island states, mainly from the Pacific, and several EU countries, including the Marshall Islands, Tuvalu, Tonga, Kiribati, Antigua, Germany, the Netherlands, Belgium, France, Sweden and Denmark. The group was formed following the third Pacific Regional Transport and Energy Ministers meeting (Climate Home 2017f).

The group's aim is to ensure a high level ambition in the IMO strategy on the reduction of GHG emissions in line with the calls of Pacific leaders to limit the global temperature rise to 1.5 degrees C (SLOCAT 2017).

8.3. Fluorinated gases

The Montreal Protocol on Substances that Deplete the Ozone Layer (UNEP 1987) is an international treaty, adopted in 1987, which sets the framework for phasing out the production and consumption of ozone depleting substances (ODS). These substances include, among others, chlorofluorocarbons (CFCs), for which the global phase-out was completed in 2016, and hydrochlorofluorocarbons (HCFCs), for which production and consumption have been frozen and total phase-out is scheduled for 2020 for developed countries and 2030 for developing countries.

Another group of chemicals, the hydrofluorocarbons (HFCs), have partly replaced these ozone depleting substances, e.g. in refrigeration and air conditioning. HFCs, a sub-group of fluorinated gases, do not deplete the ozone layer, but they are potent greenhouse gases. As they have similar uses as the substances regulated under the Montreal Protocol, an amendment to the Protocol was proposed to address the phase-down of HFCs.

At the 27th Meeting of the Parties to the Montreal Protocol in Dubai in November 2015, the Parties agreed on working towards an amendment addressing the phase-down of HFCs, with a view to adopting this amendment at an extraordinary meeting in 2016 (IISD 2015c). During the year 2016, delegates met several times to work on a phase-down schedule, taking into account flexibilities for developing countries and for countries with high ambient temperatures, where the replacement of HFCs is technically more challenging (IISD 2016g; IISD 2016h).

On 15 October 2016, at the 28th Meeting of the Parties to the Montreal Protocol (MOP 28), which took place in Kigali (Rwanda), delegates adopted an amendment to the Protocol, which commits all Parties to a stepwise phase-down of the use of HFCs (IISD 2016i).

Box 40: The Kigali Amendment to the Montreal Protocol

The Kigali Amendment to the Montreal Protocol requires all Parties to reduce the use of HFCs according to a defined schedule. For developed countries, reduction of use starts in 2019 (in 2020 in some cases). For developing countries, the level of use is frozen in 2024 and reduced from 2029 onwards. A number of countries in the Middle East and South Asia are given more time for the freeze and reduction (until 2028 and 2032, respectively). Overall, developed countries will reduce the use of HFCs by 85 % by 2036; developing countries' reductions amount to 80-85 % by the late 2040s.

The consolidated text of the Montreal Protocol, including the Kigali Amendment, is available on the website of the UNEP Ozone Secretariat (UNEP 2016b). Article 2J of the amended Protocol regulates the phase-down; the list of controlled HFCs can be found in Annex F. An overview of the phase-down schedule in tabular format is provided, e.g., on the UNEP Ozone Secretariat website (UNEP 2017a).

The Kigali Amendment will enter into force on 1 January 2019, provided that it is ratified by at least 20 Parties to the Montreal Protocol. As at 25 September 2017, 9 Parties have ratified the Amendment (UNEP 2017b).

The adoption of the Kigali Amendment was widely seen as an important milestone in climate change mitigation (Climate Home 2016c). As the use of refrigerants is projected to increase substantially over the coming decades, a timely, worldwide phase-down of HFCs can avoid up to 0.5 degrees C of global warming by the end of the 21st century (Xu et al. 2013).

However, the length of time given to the various groups of countries for their phase-down is substantial, and some countries will not start phasing down until 2029. The time periods for developed countries are shorter, but still less ambitious than proposed by the European Union and compared to the EU's own phase-down plan under its fluorinated gases Regulation (see Table 7, above).

In July 2017, Parties to the Montreal Protocol discussed issues relating to the implementation of the Kigali Amendment, at the 39th meeting of the Open-Ended Working Group to the Montreal Protocol. These issues included data reporting, destruction technologies for HFCs, safety standards for flammable alternatives to HFCs and energy efficiency (IISD 2017h). These issues will be taken up again at the 29th Meeting of the Parties (MOP 29) in Montreal from 20 to 24 November 2017.

9. OTHER DEVELOPMENTS

Climate action and support are affected by a variety of external factors. In the following, important global developments are discussed which are closely interlinked with climate change and the climate negotiation process. The following developments are covered:

- The UN Sustainable Development Goals and the Sendai Framework for Disaster Risk Reduction, which were adopted in the same year as the Paris Agreement and show a number of links and parallels (see chapter 9.1).
- Energy markets and energy policies, which will impede and/or support the transition to a low-carbon economy in the future (see chapter 9.2).
- The European refugee crises which has diverted attention from climate change issues, but which also shows links to climate change mitigation and adaptation (see chapter 9.3).
- Recent calls for geo-engineering methods to supplement climate change mitigation actions (see chapter 9.4).

9.1. UN Sustainable Development Goals (SDGs)

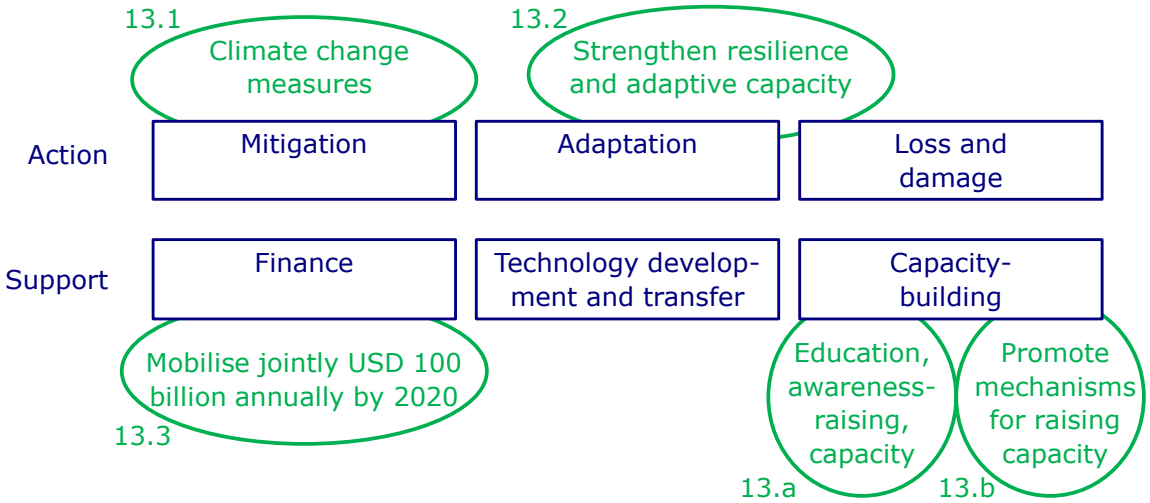
In 2015, the UN General Assembly adopted the "2030 Agenda for Sustainable Development" (United Nations 2015b), a plan for action that seeks to build on the Millennium Development Goals (United Nations 2017b) and is relevant for all countries, not just for the developing countries. It consists of 17 Sustainable Development Goals (SDGs), each with a set of specific targets, adding up to a total of 169 targets.

One of the SDGs is to "take urgent action to combat climate change and its impact". The 2030 Agenda for Sustainable Development acknowledges that the UNFCCC is the primary international, intergovernmental forum for negotiating the global response to climate change. Nevertheless, the SDG is an important signal that "climate action" (as this goal is known in short) has a place of its own on the 2030 Agenda.

This chapter gives an overview of the close links between the goals and topics covered under the UNFCCC (including the Paris Agreement) and the Sustainable Development Goals. First, the links to the specific targets under the "climate action" SDG are discussed, then additional links to other SDGs are pointed out.

Under the "climate action" SDG, the 2030 Agenda lists five targets. The links between these targets and the topics of climate action and support (as introduced in chapter 3, Figure 1) are shown in Figure 7.

Figure 7: Links between the specific targets under the Sustainable Development Goal "climate action" and climate change action and support



Source: United Nations 2015b; authors' views.

The five targets (which are numbered 13.1-3 and 13.a-b in the 2030 Agenda and are depicted as bubbles in the figure) fit well into the structure of climate change action and support (shown as squares) which evolved under the UNFCCC and can be found in the Paris Agreement. There is a specific mitigation and a specific adaptation target; the latter also addresses aspects which – in Article 8 of the Paris Agreement – are associated with averting loss and damage, namely the issue of resilience to climate-related hazards.

One of the targets is the very specific commitment given by developed country Parties under the UNFCCC to mobilise jointly USD 100 billion of climate finance a year by 2020. This target emerged during the last session of the "UN General Assembly Open Working Group on Sustainable Development Goals" in 2014 (IISD 2014). During that session, other quantitative targets (such as a temperature goal) were discussed but not agreed, and the USD 100 billion target remained in place, possibly because developed country Parties had already committed themselves to it earlier under the UNFCCC.

Finally, the "climate action" SDG includes two targets relating to education and capacity-building; target 13.b specifically addresses least developed countries and small island developing states.

Besides the "climate action" goal (13), several other SDGs are related to climate change action and support and may reinforce the UNFCCC and the Paris Agreement **mitigation** goals. They include

- affordable and clean energy (goal 7),
- sustainable cities and communities (11),
- responsible consumption and production (12) and
- industry, innovation and infrastructure (9).

Goal 9 may generate conflicts with mitigation efforts if developments of industry, innovation and infrastructure lead to higher emissions of greenhouse gases; or if mitigation actions make it harder for countries to industrialise or improve their infrastructure (cf. Box 29 – "impacts of response measures" in chapter 5.10). However, it is important to note that the

focus of goal 9 is on reliable, sustainable and resilient infrastructure and on sustainable industrialisation (United Nations 2015b). Finally, mitigation efforts help in the pursuit of goals 14 and 15, the protection of life below water and on land.

A number of goals can help reinforce **adaptation** efforts and possibly minimise **loss and damage**:

- industry, innovation and infrastructure (9),
- sustainable cities and communities (11) and
- no poverty (1).

Communities which successfully adapt to climate change may find it easier to pursue the goals (2) zero hunger and (5) gender equality – the latter because women in developing countries are often more vulnerable to climate change (UNEP 2011). Finally, the goal (4) quality education can be seen as a prerequisite for successful capacity-building.

For each of the Sustainable Development Goals, the "SGD Knowledge Hub" (IISD 2017i) provides a collection of articles, policy briefs and information on events.

While the Sustainable Development Goals and the Paris Agreement were negotiated and adopted, another important process at UN level came to an end in the same year: the Sendai Framework for Disaster Risk Reduction.

Box 41: Sendai Framework for Disaster Risk Reduction

In 2015, the "Sendai Framework for Disaster Risk Reduction 2015-2030" (United Nations 2015c) was adopted at the Third UN World Conference on Disaster Risk Reduction in Sendai, Japan. The Framework introduces seven targets, with the aim to achieve "a substantial reduction of disaster risk and losses of lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries".

This goal is to be achieved through four priorities for action, i.e. understanding disaster risk, strengthening disaster risk governance to manage disaster risk, investing in disaster risk reduction for resilience, and enhancing disaster preparedness for effective response.

The framework acknowledges that many disasters are exacerbated by climate change and that climate change is one of the underlying drivers for disaster risk. It states that addressing climate change represents an opportunity to reduce disaster risk in a meaningful and coherent manner, but it also respects the mandate of the UNFCCC in this area.

The four priorities of the Sendai Framework are linked to climate change action. **Understanding disaster risk** and **strengthening disaster risk governance** in order to manage such risks can be seen as an integral part of adaptation to a changing climate. **Investing in disaster risk reduction** for resilience (priority 3), **enhancing disaster preparedness** for effective response and embedding the "build back better" principle into recovery, rehabilitation and reconstruction (priority 4) are also a part of adaptation and a way of addressing climate change induced loss and damage.

As a significant number of disasters result from extreme weather events that are becoming more severe as a result of climate change, it is unlikely that the goals under the Sendai Framework will be met without appropriate climate change risk management. One of the national goals for adaptation could be to help avoid that extreme weather events become disasters. Disasters resulting from extreme weather events should thus become one of the entry points for enhanced adaptation action.

The SDG progress cannot be quantified and monitored as closely as e.g. the commitments of the Parties as stated in their Nationally Determined Contributions (cf. Box 9 in chapter 3.1). Nevertheless, the "2030 Agenda for Sustainable Development" foresees a follow-up and review framework which is intended to be voluntary and participatory in nature, but also effective and transparent (United Nations 2015b).

To conclude, the Sustainable Development Goals are closely linked to the topics and goals of the Paris Agreement. This, by itself, is not surprising. The message is rather that the goals crucially depend on (and mainly reinforce) each other: Climate change will make it harder to fulfil the Sustainable Development Goals; mitigation and adaptation efforts will be needed to fulfil the SDGs, and many of the SDGs will support effective mitigation and adaptation.

Looking at the long term developments, the findings of the IPCC's 5th Assessment Report suggest that it will be more challenging in the years after 2030 to meet the Sustainable Development Goals as the temperature increase will continue beyond that time horizon and climate change risks are going to increase throughout the 21st century.

9.2. Energy markets and policies

Various energy sources are associated with different carbon intensities, i.e. CO_2 emissions per unit of energy. The various forms of coal have the highest carbon intensity, followed by liquid fossil fuels and natural gas. Non-fuel renewable energy generation is associated with CO_2 emissions from the production, maintenance and disposal of equipment, but not from energy production itself. However, biomass for energy purposes (heat and power generation, biofuels) needs to be produced in a sustainable manner; otherwise, the overall greenhouse gas emissions associated with biomass (including its production) might be similar to those of fossil fuels.

Due to different carbon intensities, the ability of the global community to meet the goals of the Paris Agreement will depend on the mix of energy sources in the future, a mix which will be shaped by energy markets and their developments, which in turn will be affected by the decisions of policy makers, operators, investors and consumers.

During the second half of 2014, crude oil prices decreased sharply and since 2015 their levels have been around half their previous highs (Bloomberg 2017b). This has had widespread effects on other energy sources which have become less competitive. On the other hand, the share of oil in global energy investments declined considerably between 2014 and 2016, whereas investment in renewable electricity generation decreased only slightly and large new capacities based on renewables were created during that period (IEA 2017a).

In 2015, renewable energy sources (biomass, hydro, solar, wind and geothermal) accounted for approx. 14 % of the global primary energy production (IEA 2016c), a share which has been increasing in recent years. The year 2016 saw the largest annual increase ever in renewable power generating capacity (REN21 2017). Wind and solar projects have been subsidised by specific schemes in many countries, but are becoming more competitive, despite the recent drop in fossil fuel prices. In the medium to long term, renewable energy sources are expected to be highly competitive and wind and solar are projected to account for almost half of the global installed capacity and a third of global electricity generation by 2040 (Bloomberg New Energy Finance 2017).

As regards fossil fuels, natural gas has the lowest carbon intensity and has therefore been named a "transitional fuel" on the path toward low-emission power generation. Gas turbines can adjust their output more quickly than other thermal power generators and therefore play an important role in balancing the intermittent supply from renewable energy sources – unless large-scale electricity transmission and/or storage capacity is available. However, unabated combustion of natural gas – which releases CO_2 from a fossil source – is not in line

with the long-term goal of the Paris Agreement which is to "achieve a balance between anthropogenic emissions by sources and removals by sinks in the second half of the century" (cf. chapter 3.1).

The increased availability of natural gas and the low oil price lead to a reduced use of coal for electricity generation in the United States (cf. chapter 5.2) but to an increased consumption elsewhere. Coal is still an important energy source in European countries such as Poland. The use of coal in China may be reaching its peak (cf. chapter 5.1), due to (amongst others) strict air pollution policies, but is projected to increase considerably in other Asian countries such as India (Bloomberg New Energy Finance 2017).

Despite their negative effects on climate change – and often on local and regional air quality – fossil fuels are still heavily subsidised in many parts of the world. Estimates by the IEA indicate that fossil-fuel consumption subsidies worldwide amounted to USD 493 billion in 2014, outweighing the subsidies for renewable energy sources by considerable amounts. According to an IMF study (IMF 2015), energy subsidies amount to over USD 5 trillion, or 6.5 % of global GDP. This estimate also includes the negative external effects on human health and on the environment which are not internalised in the energy prices in many countries, as most countries tend to set energy taxes below levels that reflect the environmental damage associated with energy consumption.

Nuclear power does not emit greenhouse gases during energy generation. In 2014, nuclear energy accounted for 4.8 % of global primary energy production and this share is not expected to change considerably in the coming years (IEA 2017b). Many nuclear power plants will be decommissioned in the coming years and it is not expected that this technology will be competitive and technically feasible on a large scale in regions where the projected growth rate in energy demand is the highest, such as India or Southeast Asia.

In order to reach a balance between anthropogenic emissions by sources and removals by sinks in the second half of the century (cf. chapter 4.5), Carbon Capture and Storage (CCS) may be used to combat CO_2 emissions from power generation (see also chapter 9.4). Over the past year, the first CCS project in the iron and steel industry opened in Abu Dhabi and a large CCS system became operational at a coal-fired power plant in Texas, capturing up to 1.4 Mt CO_2 per year (IEA 2017b).

Besides power generation, road transport is an important source of CO_2 emissions which is projected to increase worldwide. In 2016, over 750 000 electric cars were sold, raising the total number of electric cars on the road to 2 million (IEA 2017b). Vehicle-to-grid also offers a promising system in which plug-in electric vehicles communicate with the power grid to sell demand-response services, either by returning electricity to the grid or by throttling their charging rate.

In July 2017, the United Kingdom announced plans to ban the introduction of new petrol and diesel cars from 2040, following a similar announcement by France (The Guardian 2017). Norway requires all new cars to be either electric or plug-in hybrid already from 2025.

Box 42: Fossil fuel reserves and power generating capacities as stranded assets

Energy markets and investments, while producing an effect on the progress of climate change mitigation, are – on the other hand – influenced by climate policy. For an emission pathway in line with the goals of the Paris Agreement, the amount of fossil fuels combusted needs to be reduced considerably in the coming decades. Provided that Parties continue their commitment and adjust their Nationally Determined Contributions accordingly, a large share of the known reserves of fossil fuels will have to remain in the ground. Using a precautionary approach, it has been estimated that only 20 % of the indicated fossil fuel reserves can be combusted by 2050 for an emission pathway in line with the 2 degrees C goal (Carbon Tracker 2013).

Therefore it has been pointed out that fossil fuel companies and their investors are faced with risks which had previously been undervalued and that their fossil fuel reserves may turn into stranded assets (Fulton et al. 2015).

Besides the fossil fuel reserves, power plants constitute large assets with a lifetime of several decades. Profound changes in the fuel mix within a timeframe until 2030 and 2050 will affect the owners and operators of a number of fossil fuel power plants. In Europe, no investments in new-built coal-fired power plants are planned after 2020 (Eurelectric 2017), but a further extension of the lifetime of current power plants may lead to overcapacities of fossil fuel power plants by 2030 (EEA 2016), which would not be in line with the EU's decarbonisation efforts as laid out in the energy roadmap for 2050 (cf. chapter 5.3).

To conclude, low-carbon and renewable energy sources look set to become widely available in the medium to long term, whereas energy production based on fossil fuels may face considerable cost disadvantages and financial risks. However, it is important to note that market forces alone are not expected to lead to decarbonisation in line with the ambitious goals of the Paris Agreement (Bloomberg New Energy Finance 2017). Additional actions by policy makers will be essential to support and accelerate the decarbonisation of the world's energy supply.

9.3. Refugee crisis and migration

In Europe, the refugee crisis has been one of the main political challenges over the past couple of years. It has been a dominating issue which has diverted attention from other topics such as climate change. It has been argued that drought and water scarcity, amongst other problems, may have been a contributing factor to the start of the conflict in Syria (UNCCD 2016). On a general note, current crises need to be considered as well as long-term developments, as climate change and its impacts can (if too little action is taken against it) increase various forms of migration.

Climate change has large-scale impacts on ecosystems, which will have effects on habitability worldwide. Adaptation to these changes will not be possible in some areas. For example, the projected rise of the sea level by about one metre within this century is a severe threat to low lying island states, which are on an average only about two metres above the sea level, leaving only a limited area for relocation within the island (Tong 2016). Temperature increases and water scarcity may also contribute to migration from regions such as the Middle East or Northern Africa.

Similarly, climate-induced loss and damage can lead to displacement and migration. An overview of the links between climate change, environmental degradation and migration is provided in a European Commission Staff Working Paper (European Commission 2013). The

IPCC's Fifth Assessment Report (IPCC 2015) states that climate change is projected to increase the displacement of people, but it also notes that exposure and vulnerability are influenced by a wide range of factors, rendering quantitative assessments of future trends very difficult.

Climate change has already become one of the drivers for large-scale displacement as it contributes to natural disasters such as desertification, droughts, floods, and powerful storms. In 2016, approx. 24 million people were displaced by natural disasters and weather-related hazards, in particular storms (IDMC 2017). The highest numbers of displacements by disaster were recorded in China, India and the Philippines; small island states were affected disproportionately (taking the population size into account) (IDMC 2017).

It has been pointed out that it is especially difficult to quantify the number of people displaced by climate change because it is a "threat multiplier" – it intensifies the potential for other drivers of forced migration such as conflict (Ferrie 2017). Most of the displacement takes place within countries; people driven across national borders by climate change related events are not considered refugees under the 1951 Refugee Convention. The Center for Participatory Research and Development (CPRD) released a policy paper in 2015 with arguments in favour of a "new legal Protocol under the UNFCCC" to address climate-induced displacement and migration. The main elements of the proposed Protocol on climate-induced migrants are listed below (Shamsuddoha 2015):

- Addressing causes of displacement and migration;
- relocation within the country;
- ensuring economic well-being of the trapped and most vulnerable groups;
- ensuring human rights-based protection for the climate migrants;
- provision of cross border (ex-situ) adaptation;
- entire community migration.

The International Organization for Migration (IOM) also calls for more consideration of migration in the climate change negotiations (Climate Home 2014). Climate change, as well as its adverse consequences for livelihoods, public health, food security, and water availability, will have a major impact on human mobility, and is likely to substantially increase its scale. The IOM points out that both the slow climate processes such as sea level rise and desertification resulting in food insecurity, and the sudden climate events such as storms and flooding are already substantially influencing population movements.

9.4. Emerging topics – geo-engineering

As laid out in chapter 4.5, more extensive mitigation efforts are required to bring the world on a path towards the temperature goal of the Paris Agreement. Depending on the efforts actually taken, and in order to counterbalance any emissions still occurring in the second half of the century, it will be necessary to remove from the atmosphere some of the CO_2 that has already been emitted.

Removal of CO_2 from the atmosphere happens naturally by plants; this CO_2 sink can be enhanced by afforestation and by other land uses that increase the carbon pools in the soil. However, it is important that once the carbon is stored in wood products or in soils, it is not released at a later time.

In order to remove CO_2 from the atmosphere on a larger scale, **geo-engineering** methods are being discussed, i.e. "methods and technologies operating on a large scale that aim to deliberately alter the climate system in order to alleviate the impacts of climate change" (IPCC 2015).

Geo-engineering methods that capture CO_2 are known as **Carbon Dioxide Removal (CDR)** or "negative emission technologies". The basic approach is Carbon Capture and Storage

(CCS), in which CO_2 is separated from industrial and energy-related sources, transported to a storage location and isolated from the atmosphere in the long term (IPCC 2005, see also chapter 9.2).

"Bioenergy with carbon capture and storage" (BECCS) is an extension of this approach. Vegetation is used to remove CO_2 from the atmosphere, the resulting biomass is combusted for energy use and the generated CO_2 is captured and stored.

Other approaches to capturing CO_2 include enhanced weathering, mineralisation of CO_2 in basaltic rock, the burning of biomass to produce char, which is added to soils and retains carbon for long periods of time, or direct capture of CO_2 from the atmosphere, using adsorption. Injecting nutrients into the ocean to stimulate the uptake of CO_2 by algae has also been suggested (Carbon Brief 2016b).

However, such "negative emission technologies" are associated with a number of problems. Besides the high costs of implementation, the storage of large amounts of CO_2 is associated with risks of leakages. A large-scale transition to land use for biomass production would involve competition over land use, including agriculture, and some techniques are associated with negative effects on land or ocean ecosystems (IPCC 2015).

Since it is still open whether it will be technically and economically feasible to achieve CO_2 removal on the required scale in the second half of the century, research has been conducted into other geo-engineering techniques, in particular into altering the temperature balance of the atmosphere. **Solar Radiation Management (SRM**) aims at reducing the radiation captured by the earth's surface and atmosphere, thus counterbalancing the increased greenhouse effect of anthropogenic greenhouse gases.

Solar radiation management techniques such as the injection of aerosols into the atmosphere do not only affect the radiation balance. They may also affect atmospheric chemistry and rain patterns. In addition, such techniques do not address the root causes of climate change and other negative effects of high atmospheric CO_2 concentrations would persist, including ocean acidification and changes to ecosystems (IPCC 2015).

The main difference between CO_2 removal and solar radiation management is that the latter has to be done continuously and over time periods of centuries to millennia. If solar radiation management ceases as a result of economic or political crises, the result would be a rapid increase in global temperatures, due to the greenhouse gases still being in the atmosphere. Hence, reliable CO_2 removal would be less risky – but the aforementioned risks would still be there. If geo-engineering technologies are not deployed at the levels assumed or if they are unsuccessful, the world would be locked into a high-temperature pathway (Anderson and Peters 2016). The most effective approach is to prevent greenhouse gas emissions in the first place.

It can be expected that CO_2 removal and other geo-engineering methods will be important topics of the discussions in 2018 and thereafter, when the IPCC's special report on 1.5 degrees C is completed (cf. chapter 7.3.1). This is because earlier research has suggested that even the trajectories towards an increase of 2 degrees C will require ambitious actions, including a removal of CO_2 on a large scale (IPCC 2015).

10. OUTLOOK: COP 23 AND BEYOND

10.1. The conference in Bonn

From 6 to 17 November 2017, the 23rd session of the Conference of the Parties (COP 23) will convene in Bonn. The conference will also serve as the 13th meeting of the Parties to the Kyoto Protocol (CMP 13) and as the second part of the first meeting of the Parties to the Paris Agreement (CMA 1-2, cf. Box 13 and chapter 4.2).

The COP presidency rotates annually. In 2017, the COP will be presided over for the first time by a small island state – Fiji. Its Prime Minister Frank Bainimarama will act as COP president.

In addition, the following subsidiary bodies will meet in Bonn:

- The Ad Hoc Working Group on the Paris Agreement (APA, cf. chapter 4.2), which will convene for the fourth part of its first session (APA 1-4).
- The Subsidiary Body for Implementation and the Subsidiary Body for Scientific and Technological Advice (cf. Box 3), which will hold their 47th meeting, known as SBI 47 and SBSTA 47.

The APA, SBI and SBSTA will convene from 6 to 15 November. The results of their negotiations, such as draft decisions, will be forwarded to the COP for further negotiations and for adoption. Topics related to the Kyoto Protocol (such as matters relating to the Clean Development Mechanism, cf. chapter 2.2) will be forwarded to the CMP. Topics related to the implementation of the Paris Agreement will be forwarded to the CMA. The COP, CMP and CMA will have their closing sessions on 17 November 2017.

An overview schedule of the conference is available from the UNFCCC secretariat (UNFCCC 2017p) and links to detailed agendas, background documents and lists of events are available from the UNFCCC's main conference webpage (UNFCCC 2017h). Additional information on the conference and its events is available on the website of the Republic of Fiji (COP 23 Presidency Secretariat 2017).

Box 43: Events besides the negotiations at COP 23

During the COP, Parties and other participating stakeholders (NGOs, international organisations etc.) are given the opportunity to hold side events. These include presentations and discussions on a wide range of topics related to climate change. In addition, the COP presidency hosts events under the "Marrakesh Partnership for Global Climate Action" (cf. chapter 4.3). Information on the various events will become available before the start of the conference at the UNFCCC secretariat's events webpage (UNFCCC 2017q) and in the overview schedule (UNFCCC 2017p).

Parties and stakeholders will also display exhibits on the conference grounds. A list of exhibits is available on the same COP 23 webpage. For an overview of the various stakeholders, see chapter 7.

Live webstreams and recordings of many events are available on the "UNFCCC Climate Change Studio" YouTube channel (UNFCCC 2017r).

10.2. Negotiating topics at COP 23

The focus of the negotiations in Bonn will be on the technical implementation of the Paris Agreement, i.e. on guidance and the modalities for the various topics covered by the Agreement. The main topics on the APA agenda (APA 2017) include:

- The information to be contained in Nationally Determined Contributions (cf. Box 9)
- The type of information to be contained in the adaptation communication (cf. chapter 3.2)
- Modalities, procedures and guidelines for the transparency framework (cf. chapter 3.7)
- Modalities for the global stocktake (cf. chapter 3.8)
- Modalities for the committee to promote compliance (cf. chapter 3.9)

In addition, SBSTA will discuss the implementation of cooperative mechanisms under Article 6 of the Paris Agreement (cf. chapter 3.1) and the modalities for the accounting of financial resources under Article 9 (cf. chapter 3.4).

SBI has put the following items related to the implementation of the Paris Agreement on its agenda: common time frames for Nationally Determined Contributions (as the current NDCs differ in their time horizons/time frames) and the modalities and procedures for the NDC and adaptation registries (cf. chapter 4.4.1). The forum on response measures serving the Paris Agreement will be negotiated jointly under SBI/SBSTA.

As the work programme for the technical implementation of the Paris Agreement is scheduled to be completed within one year after COP 23, i.e. by COP 24 in December 2018 (cf. chapter 4.2), it will be important for negotiators to agree on the main elements and – as far as possible – draft texts for the decisions to be adopted as the "Paris rulebook" (cf. Box 20). The situation is somewhat similar to the negotiations at COP 20 in Lima in 2014 (cf. chapter 2.3), from which a draft text emerged which was completed and adopted in the form of the Paris Agreement one year later.

The progress of the negotiations relating to the Paris Agreement is summarised in the so-called "progress tracker", a document updated regularly by the UNFCCC secretariat (UNFCCC 2017k).

Besides, the SBI and SBSTA will discuss a wide range of topics under the Convention, covering the areas of mitigation, adaptation, loss and damage, finance, technology and capacity-building. The SBI and SBSTA agendas are available on the UNFCCC's main conference webpage (UNFCCC 2017h).

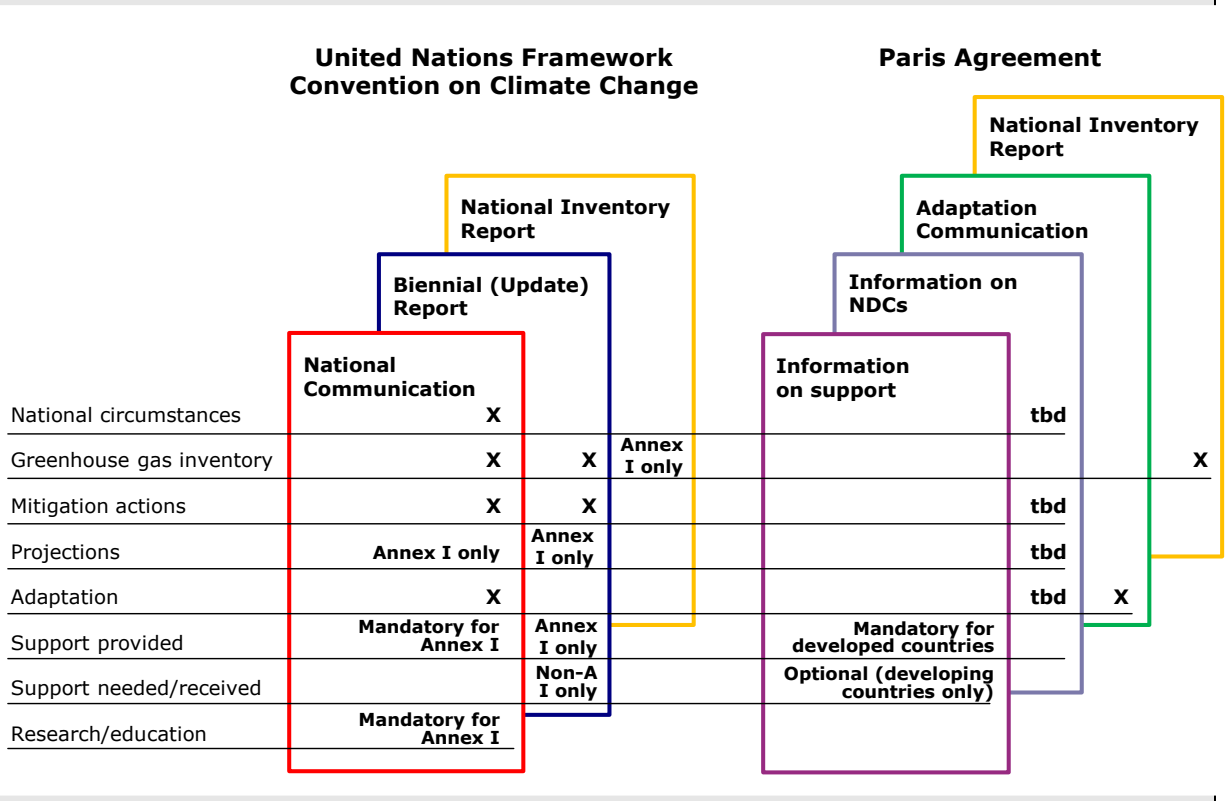
As in previous climate change conferences, the SBI will hold a "multilateral assessment" for developed countries and a "facilitative sharing of views" for developing countries (cf. chapter 4.3.6). These sessions, which are open to all COP participants and provided as webstreams (UNFCCC 2017r), will provide insights into the various Parties' national circumstances and their efforts in responding to climate change. The multilateral assessment and the facilitative sharing of views will be based on the information submitted in the Parties' Biennial (Update) Reports. An overview of the various reporting obligations can be found in Box 44.

Box 44: Reports to be provided under the Convention and under the Paris Agreement

Under the UNFCCC, all Parties are required to submit National Communications, which give an overview of the Parties' national circumstances, greenhouse gas emissions, policies/measures, adaptation efforts and other climate-related topics (Figure 8). Developed country Parties submit National Communications every four years and from 2014 onwards, they are also required to submit Biennial Reports, which allow for a more regular update of information. Developing country Parties provide so-called Biennial Update Reports; the requirements for these reports are less detailed.

In order to increase transparency, some of these reporting requirements are to be extended under the Paris Agreement (cf. chapter 3.7). Figure 8 gives an overview of the reporting obligations under the Convention and under the Paris Agreement.

Figure 8: Topics covered by national reports under the Convention and under the Paris Agreement



tbd … details to be decided (negotiated under the APA).

Under the Convention, "Biennial Reports" are requested from Annex I country Parties; "Biennial Update Reports" are requested from non-Annex I countries.

Source: Decisions 4/CP.5, 2/CP.17 (Annex I) and 24/CP.19 for Annex I country Parties; Decisions 17/CP.8 and 2/CP.17 (Annex III) for non-Annex I countries; Article 13 of the Paris Agreement (UNFCCC 2015b), authors' views.

Submitted national reports are available at the UNFCCC website (UNFCCC 2017s). The next deadline for the submission of National Communications and Biennial Reports is 1 January 2018. The developed country Parties, including the EU, are expected to submit their reports in December 2017; some may already submit them at or before COP 23. These reports provide up-to date information on climate action and on the support provided by these countries. Due to the limited resources available, most developing countries do not adhere to the same deadlines. Information obtained from the most recent national reports was used as input for the overview of the main Parties in chapter 5.

10.3. The challenges of the COP 23 negotiations

The technical implementation of the Paris Agreement creates a number of challenges for the negotiators. Some of them are listed in the table below.

Table 8: Challenges of the COP 23 negotiations

Challenge	Status	Risks / opportunities / success factors
Time constraints (cf. chapter 4.2)	The Paris work programme ("Paris rulebook") has to be completed by December 2018. Divergent views exist and time for negotiations is limited.	There is a risk that Parties may not find an agreement on all modalities and elements of the guidelines. Negotiations need to be guided in an efficient way and Parties need to actively find common grounds.
Cross-cutting issues (cf. chapter 4.4)	There are overlaps between agenda items, e.g. between the information on NDCs, the transparency framework and the global stocktake.	Slow progress in one negotiation strand may jeopardise progress with others. Coordination between the negotiating strands and sequencing will be crucial.
Balance (cf. chapter 3.11)	Some developing countries see an unbalanced focus on mitigation rather than on other topics such as adaptation and support.	Perceived imbalance may slow down the whole negotiation process. Both a balanced plan of negotiation time and flexibility on the part of the negotiators are required.
Bifurcation (cf. chapter 3.11)	Some developing countries aim at a clear separation of the requirements for developing versus developed country Parties.	There is a risk that the obligations for developing countries may be watered down and may not be in line with their capabilities. To reduce this risk, developed countries interact with progressive emerging countries.
Role of U.S. negotiators (cf. chapter 5.2)	The Unites States is currently a Party to the Convention and to the Paris Agreement. Although it intends to withdraw from the Paris Agreement, the U.S. delegation continues to participate in the negotiations.	A Party with fundamentally different positions may slow down the overall negotiations. Based on experience gained at the subsidiary bodies meeting in Bonn in May 2016 and on an announcement made by the U.S. Department of State (cf. chapter 5.2), it can be expected that the U.S. delegation will focus its involvement on the more technical issues of the Paris Agreement.

Challenge	Status	Risks / opportunities / success factors
Inclusion of non-Party stakeholders (cf. below)	The inclusion of non-Party stakeholders is an important factor for implementing the Paris Agreement. However, there are discussions about potential conflicts of interest (e.g. among business NGOs).	This topic will continue to be discussed but it is not expected to affect the technical negotiations on modalities under the Paris Agreement.

Non-Party stakeholders such as NGOs or local governments play a key role in climate action and support, as laid out in chapter 7. They are addressed in the Decision accompanying the Paris Agreement (cf. chapter 3.1) and they are invited to actively contribute to pre-2020 activities such as the "technical examination process" and the Lima-Paris Action Agenda (cf. chapter 3.10).

At the SBI session in Bonn in May 2017, the SBI held a workshop on opportunities to further enhance the effective engagement of non-Party stakeholders. In particular, the role of stakeholders in enhancing the ambition of NDCs and national adaptation plans was discussed. However, concerns were voiced by representatives from developing countries that some stakeholders' interests may be in conflict with the objectives of the Convention (IISD 2017a). It has been pointed out that large corporations – and the business organisations representing them – can exert an important influence on climate policy. Using a "carbon policy footprint" approach, as an example, InfluenceMap depicts 50 of the most influential corporations – some of them supporting and some opposing the goals of the Paris Agreement (InfluenceMap 2017).

On the other hand, NGOs pointed out that there is a lack of transparency on the part of the Parties because – at some negotiating sessions – observers, including the non-Party stakeholders, are not allowed to participate. These include some informal contact group meetings, where draft conclusions are prepared on the various topics negotiated under the subsidiary bodies. Hence, although the importance of non-Party stakeholders in the response to climate change is widely acknowledged, diverging views exist on what their role is at climate change conferences.

10.4. Additional challenges facing the implementation of the Paris Agreement

The future implementation of the Paris Agreement is faced by additional challenges, some of which have emerged very recently (Table 9).

Table 9: Additional challenges facing the implementation of the Paris Agreement

Topic	Status	Risks / opportunities
Announcement by the U.S. to withdraw from the Paris Agreement (cf. chapter 5.2)	On 1 June 2017, President Trump announced the withdrawal from the Paris Agreement. The withdrawal will become effective on 4 November 2020 at the earliest.	With the U.S. withdrawal, there is a risk that other Parties decrease their ambition as they are not willing to take on a higher burden. In addition, developing countries and international organisations such as the IPCC are affected by a decrease in financial support. So far, other main Parties reaffirmed their commitments (see e.g. chapter 7.2.3) and may use the opportunity to take over leadership.
Reluctance by some Parties to ratify the Agreement (cf. chapter 4.1)	As of 25 September 2017, 31 Parties have not yet ratified the Paris Agreement, including the Russian Federation, Iran and Turkey.	If large emitters such as the Russian Federation or Iran do not share the efforts under the Paris Agreement, it will be harder for the remaining Parties to fulfil its goals. However, a large majority of the emissions (approx. 87 %) is currently covered by countries that have ratified the Agreement.
Emission gap (cf. chapter 4.5)	The combined efforts in the Parties' NDCs fall short of reaching the temperature goal of the Paris Agreement.	Further delays in emission reductions will reduce the options of meeting the temperature goal. The facilitative dialogue in 2018 (cf. chapter 10.5) will be an important opportunity to increase ambition.
New scientific findings (cf. chapter 4.5)	Knowledge on climate change and the emission gap evolve based on new scientific findings.	It will be important that, during the facilitative dialogue (cf. chapter 10.5) and the global stocktake, these new findings will help Parties and stakeholders in making the case for increased ambition.
Energy markets (cf. chapter 9.2)	An overall low level of energy prices poses a barrier for the spread of renewable energy.	The spread of renewable energy may slow down and may rely on subsidies in many cases. Low energy prices may also help drive out some fossil fuels, such as coal in the United States.
Finance (cf. below)	Financial support to developing countries remains below expectations, in particular after the U.S. announced to cut its contributions.	A lack of support may curtail mitigation efforts in developing countries and reduce their capabilities to adapt to climate change, increase resilience and address loss and damage.

Financial support to developing countries suffered a major setback in June 2017 when President Donald Trump announced that the United States would stop contributing to the Green Climate Fund (The White House 2017b; cf. chapter 5.2). The United States had contributed

to the Green Climate Fund (GCF, cf. Box 19) under the Obama administration. Unless it delivers the remaining funds of its pledge, the GCF will be roughly 20 % short of the total amount of approx. USD 10 billion pledged so far (Climate Home 2017g).

In addition, President Trump announced that the United States would stop its payments to the Intergovernmental Panel on Climate Change (IPCC). These payments amounted to 45 % of the IPCC's total funds in 2016. Hence, the IPCC's financial situation was a major topic at its 46th session in September 2017 (cf. chapter 7.3.1). At this session, the European Union and a number of other developed countries announced their intention to increase their financial contributions and their support for the IPCC Trust Fund (IISD 2017e). Donald Trump also announced that the United States would stop funding the UNFCCC secretariat, but the 2018 U.S. budget is still being discussed in Congress. In September 2017, the Senate appropriations committee approved a spending bill which includes funding for the UNFCCC and the IPCC in the 2018 budget (Reuters 2017b).

10.5. Beyond COP 23 – Work in 2018 and beyond

The year 2018 will mark an important milestone in the implementation of the Paris Agreement, for two reasons. First, as decided by the CMA at its first session in Marrakesh in 2016 (cf. chapter 4.3.9) the modalities and guidelines for the implementation of the Paris Agreement – the "Paris rulebook" are to be finalised and adopted at the end of that year. Second, the facilitative dialogue (cf. chapter 3.8) will take place, where Parties will take stock of their efforts in relation to the long-term goal of the Paris Agreement. This facilitative dialogue will serve as a key input to Parties for updating their NDCs.

In order to advance on the "Paris rulebook", the APA, together with the SBSTA and SBI, will convene in Bonn from 30 April to 10 May 2018.

In September 2018, the IPCC will present its Special Report) on the impacts of a global warming of 1.5 degrees C above pre-industrial levels and related global greenhouse gas emission pathways (cf. chapter 7.3.1). This report will be used as a key input to the facilitative dialogue.

This facilitative dialogue will be held during the 24th session of the Conference of the Parties (COP 24), which will convene in Katowice (Poland) from 3 to 14 December 2018. Besides the facilitative dialogue, it is expected that the APA will complete the work programme for the implementation of the Paris Agreement and that its results will be adopted by the CMA. The work of the negotiators will not end there, as some details, such as reporting tables, may be finalised later.

A main challenge for Parties after 2018 will be to update their NDCs. This will be especially important because (as shown in chapter 4.5), global efforts are currently not sufficient to meet the goals of the Paris Agreement. More ambitious climate action and support will be needed to meet the expectations placed on the international community and the goals stipulated in the Paris Agreement.

REFERENCES

- Airportwatch, *Trump administration considering whether to remain in ICAO aviation emissions agreement, CORSIA*, 2017, available at: http://www.airportwatch.org.uk/2017/06/trump-administration-considering-whether-to-remain-in-icao-aviation-emissions-agreement-corsia/, last accessed on 25 September 2017.
- Analytical Center for the Government of the Russian Federation, *Russian Energy – 2014*, 2015, available at: http://ac.gov.ru/files/publication/a/6490.pdf, last accessed on 25 September 2017.
- Anderson, K., Peters, G., 'The trouble with negative emissions', *Science*, 354, 6309, p. 182-183, doi:10.1126/science.aah4567, 2016, available at: http://science.sciencemag.org/content/354/6309/182, last accessed on 25 September 2017.
- AOSIS – Alliance of Small Island States, *AOSIS SBI Statement. UNFCCC Climate Change Conference. May 2016. Bonn, Germany*, 2016, available at: http://aosis.org/wp-content/uploads/2016/05/AOSIS-SBI-Statement_FINAL1.pdf, last accessed on 25 September 2017.
- AOSIS – Alliance of Small Island States, *About AOSIS*, 2017, available at: http://aosis.org/about/, last accessed on 25 September 2017.
- APA – Ad Hoc Working Group on the Paris Agreement, *Agenda of the Ad Hoc Working Group on the Paris Agreement at its first session,* 2017, available at: http://unfccc.int/resource/docs/2017/apa/eng/03.pdf , last accessed on 25 September 2017.
- Arab Group, *Submission to the Adaptation Committee by the Kingdom of Saudi Arabia on behalf of the Arab Group*, 2017, available at: http://www4.unfccc.int/Submissions/Lists/OSPSubmissionUpload/102_287_131292261609851439-AC%20submission%20by%20KSA%20on%20behalf%20of%20Arab%20Group.pdf, last accessed on 25 September 2017.
- Australia, *Australia's Intended Nationally Determined Contribution to an new Climate Change Agreem*ent, 2015, available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Australia/1/Australias%20Intended%20Nationally%20Determined%20Contribution%20to%20a%20new%20Climate%20Change%20Agreement%20-%20August%202015.pdf, last accessed on 25 September 2017.
- Australia, *National Inventory Report 2015 Volume 1,* 2017, available at: http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/aus-2017-nir-16jun17.zip, last accessed on 25 September 2017.
- Baashan, S. and Tyndall, J., *Reflections note on the second part of the first session of the Ad Hoc Working Group on the Paris Agreement*, 2017, APA.2017.1.InformalNote, available at: http://unfccc.int/resource/docs/2017/apa/eng/1infnot.pdf, last accessed on 25 September 2017.
- Bloomberg, *Saudis Seek Bids for First Utility-Scale Plant for Wind Power*, 2017a, available at: https://www.bloomberg.com/amp/news/articles/2017-07-16/saudi-arabia-starts-bidding-process-for-400-megawatt-wind-plant, last accessed on 25 September 2017.
- Bloomberg, *Bloomberg Markets – Energy*, 2017b, available at: http://www.bloomberg.com/energy, last accessed on 25 September 2017.
- Bloomberg New Energy Finance, *New Energy Outlook 2017 – Executive Summary*, 2017, available at: https://about.bnef.com/new-energy-outlook/ last accessed on 25 September 2017.

- BMUB – Federal Ministry of the Environment, Nature Conservation, Building and Nuclear Safety, *Petersberg Climate Dialogue VII "Making the Paris Agreement a reality"*, 2017a, available at: http://www.bmub.bund.de/en/topics/climate-energy/climate/international-climate-policy/petersberg-climate-dialogue/, last accessed on 25 September 2017.
- BMUB – Federal Ministry of the Environment, Nature Conservation, Building and Nuclear Safety, *Final Co-chairs' conclusions Petersberg Climate Dialogue VIII – Working together on solutions*, 2017b, available at: http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Klimaschutz/pcd_viii_chairs_conclusions_bf.pdf, last accessed on 25 September 2017.
- Brazil, *Intended Nationally Determined Contribution*, 2015, available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Brazil/1/BRAZIL%20iNDC%20english%20FINAL.pdf, last accessed on 25 September 2017.
- Brazil, *Third National Communication of Brazil to the United Nations Framework Convention on Climate Change*, 2016, available at: http://unfccc.int/resource/docs/natc/branc3v3.pdf, last accessed on 25 September 2017.
- Brazil, *Second Biennial Update Report of Brazil, 2017,* available at: http://unfccc.int/files/national_reports/non-annex_i_parties/biennial_update_reports/application/pdf/bur2-ing-02032017_final.pdf, last accessed on 25 September 2017.
- C40, *About C40*, 2017, available at: http://www.c40.org/about, last accessed on 25 September 2017.
- Caldecott, B., Dericks, G., Tulloch, D.J., Kruitwagen, L., Kok, I., *Stranded Assets and Thermal Coal in Japan: An analysis of environment-related risk exposure,* Smith School of Enterprise and the Environment, University of Oxford, 2016, available at: http://www.smithschool.ox.ac.uk/research-programmes/stranded-assets/satc-japan.pdf, last accessed on 25 September 2017.
- Cames, M., Graichen, J., Siemons, A., Cook, V., *Emission Reduction Targets for International Aviation and Shipping*, Study for the ENVI Committee, 2015, European Parliament Directorate General for Internal Policies, Policy Department A: Economic and Scientific Policy, Brussels, available at: http://www.europarl.europa.eu/RegData/etudes/STUD/2015/569964/IPOL_STU(2015)569964_EN.pdf, last accessed on 25 September 2017.
- CAN – Climate Action Network, *About CAN*, 2017, available at: http://www.climatenetwork.org/about/about-can, last accessed on 25 September 2017.
- CAN Europe – Climate Action Network Europe, *About CAN Europe*, 2017, available at: http://www.caneurope.org/about-us/learn-about-us, last accessed on 25 September 2017.
- Canada, *Canada's Sixth National Report on Climate Change. Actions to meet commitments under the United Nations Framework Convention on Climate Change,* 2014, available at: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/nc6_can_resubmission_english.pdf, last accessed on 25 September 2017.
- Canada, *Canada's INDC submission to the UNFCCC*, 2015, available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Canada/1/INDC%20-%20Canada%20-%20English.pdf, last accessed on 25 September 2017.
- Carbon Brief, *Ambiguous Russian climate pledge mystifies many*, 2015, available at: https://www.carbonbrief.org/ambiguous-russian-climate-pledge-mystifies-many, last accessed on 25 September 2017.

- *the EU would increase climate targets for others*, 2016a, available at: https://www.carbonbrief.org/analysis-how-uk-leaving-the-eu-would-increase-climate-targets-for-others, last accessed on 25 September 2017.
- Carbon Brief, *Explainer: 10 ways 'negative emissions' could slow climate change*, 2016b, available at: https://www.carbonbrief.org/explainer-10-ways-negative-emissions-could-slow-climate-change, last accessed on 25 September 2017.
- Carbon Brief, Analysis: *Meeting Paris pledges would prevent at least 1C of global warming*, 2017, available at: https://www.carbonbrief.org/analysis-meeting-paris-pledges-would-prevent-at-least-one-celsius-global-warming, last accessed on 25 September 2017.
- Carbon Tracker, *Unburnable Carbon 2013: Wasted capital and stranded assets*, 2013, available at: http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/PB-unburnable-carbon-2013-wasted-capital-stranded-assets.pdf, last accessed on 25 September 2017.
- CARICOM – Caribbean Community, *CARICOM eyes positive outcomes from Morocco Climate Change meeting – Report*, 2016, available at: http://caricom.org/media-center/communications/news-from-the-community/caricom-eyes-positive-outcomes-from-morocco-climate-change-meeting-report, last accessed on 25 September 2017.
- CARICOM – Caribbean Community, *Who we are*, available at: http://caricom.org/about-caricom/who-we-are, 2017, last accessed on 25 September 2017.
- CDIAC - Carbon Dioxide Information Analysis Center, *Fossil-Fuel CO2 Emissions*, 2016, available at: http://cdiac.ornl.gov/trends/emis/meth_reg.html, last accessed on 25 September 2017.
- CDP – Carbon Disclosure Project, *About us*, 2017, available at: https://www.cdp.net/en/info/about-us, last accessed on 25 September 2017.
- Cervini, R., Liden, R., Neumann J.E., Strzepak, K.M., *Enhancing the Climate Resilience of Africa's Infrastructure*, 2016, A copublication of the Agence Française de Développement and the World Bank, The World Bank, Washington, DC, available at: http://documents.worldbank.org/curated/en/857671468179354431/pdf/96040-REPLACEMENT-FILE-PUBLIC-all-other-metadata-correct.pdf, last accessed on 25 September 2017.
- Climate Action Tracker, *Effect of current pledges and policies on global temperature*, 2016, available at: http://climateactiontracker.org/global.html, last accessed on 25 September 2017.
- Climate Action Tracker, *China*, 2017a, available at: http://climateactiontracker.org/countries/china.html, last accessed on 25 September 2017.
- Climate Action Tracker, *India*, 2017b, available at: http://climateactiontracker.org/countries/india.html, last accessed on 25 September 2017.
- Climate Action Tracker, *Russian Federation*, 2017c, available at: http://climateactiontracker.org/countries/russianfederation.html, last accessed on 25 September 2017.
- Climate Action Tracker, *South Korea*, 2017d, available at: http://climateactiontracker.org/countries/southkorea.html, last accessed on 25 September 2017.
- Climate Action Tracker, *Canada*, 2017e, available at: http://climateactiontracker.org/countries/canada.html, last accessed on 25 September 2017.
- Climate Action Tracker, *Saudi Arabia*, 2017f, available at: http://climateactiontracker.org/countries/saudiarabia/2017.html, last accessed on 25 September 2017.

- Climate Action Tracker, *Indonesia*, 2017g, available at: http://climateaction-tracker.org/countries/indonesia.html, last accessed on 25 September 2017.
- Climate Action Tracker, *Brazil*, 2017h, available at: http://climateactiontracker.org/countries/brazil.html, last accessed on 25 September 2017.
- Climate Home, *EU-backed study to explore climate and migration links*, 2014, available at: http://www.climatechangenews.com/2014/12/30/eu-backed-study-to-explore-climate-and-migration-links/, last accessed on 25 September 2017.
- Climate Policy Observer, *Obama unveils ambitious plan to cut emissions from power plants*, 2015, available at: http://climateobserver.org/obama-unveils-ambitious-plan-to-cut-emissions-from-power-plants/, last accessed on 25 September 2017.
- Climate Home, *Meet the unlikely climate allies bridging divides in UN talks,* 2015, available at: http://www.climatechangenews.com/2015/01/20/meet-the-unlikely-climate-allies-bridging-divides-in-un-talks/, last accessed on 25 September 2017.
- Climate Home, *Saudi Arabia, Germany to ratify UN climate deal in 2016*, 2016a, available at: http://www.climatechangenews.com/2016/07/05/saudi-arabia-germany-to-ratify-un-climate-deal-in-2016/, last accessed on 25 September 2017.
- Climate Home, *Reaction: Aviation climate deal agreed in Montreal*, 2016b, available at: http://www.climatechangenews.com/2016/10/06/reaction-aviation-climate-deal-agreed-in-montreal/, last accessed on 25 September 2017.
- Climate Home, *UN agrees historic deal to cut HFC greenhouse gases*, 2016c, available at: http://www.climatechangenews.com/2016/10/15/un-agrees-historic-deal-to-cut-hfc-greenhouse-gases/, last accessed on 25 September 2017.
- Climate Home, *Nicaragua to join Paris climate deal in solidarity with 'first victims'*, 2017a, available at: http://www.climatechangenews.com/2017/09/21/nicaragua-join-paris-climate-deal-solidarity-first-victims/, last accessed on 25 September 2017.
- Climate Home, *Trump lays groundwork for staying in Paris Agreement,* 2017b, available at: http://www.climatechangenews.com/2017/08/11/trump-lays-groundwork-staying-inside-paris-agreement/, last accessed on 25 September 2017.
- Climate Home, *UK omits climate change from post-Brexit foreign policy plan,* 2017c, available at: http://www.climatechangenews.com/2017/09/12/uk-omits-climate-post-brexit-foreign-policy-plan/, last accessed on 25 September 2017.
- Climate Home, Saudi $50 billion clean power plan close to launch, 2017d, available at: http://www.climatechangenews.com/2017/01/16/saudi-50-billion-clean-power-plan-close-to-launch/, last accessed on 25 September 2017.
- Climate Home, *G7 split as leaders issue climate statement without US*, 2017e, available at: http://www.climatechangenews.com/2017/05/27/trump-takes-us-brink-climate-isolation-g7/, last accessed on 25 September 2017.
- Climate Home, *Pacific islands are on a collision course with the shipping industry*, 2017f, available at: http://www.climatechangenews.com/2017/05/15/pacific-islands-collision-course-shipping-industry/, last accessed on 25 September 2017.
- Climate Home, *Trump budget: US to stop funding UN climate process*, 2017g, available at: http://www.climatechangenews.com/2017/03/16/trump-budget-us-stop-funding-un-climate-process/, last accessed on 25 September 2017.

- Climate Interactive, *Climate Scoreboard – UN Climate Pledge Analysis*, 2017, available at: https://www.climateinteractive.org/programs/scoreboard/, last accessed on 25 September 2017.
- Climate Policy Observer, Umbrella Group, 2016, available at: http://climateobserver.org/country-profiles/umbrella-group/, last accessed on 25 September 2017.
- Climate Policy Observer, *U.S. subnational entities and businesses ready to take over climate leadership,* 2017a, available at: http://climateobserver.org/u-s-subnational-entities-businesses-ready-take-climate-leadership/, last accessed on 25 September 2017.
- Climate Policy Observer, *Russian Federation*, 2017b, available at: http://climateobserver.org/country-profiles/russian-federation/, last accessed on 25 September 2017.
- Compact of Mayors, *About*, 2017, available at: https://www.compactofmayors.org/history/, last accessed on 25 September 2017.
- COP 23 Presidency Secretariat, *COP23 Fiji – UN Climate Change Conference*, 2017, available at: https://cop23.com.fj/, last accessed on 25 September 2017.
- Council of the European Union, *2030 Climate and Energy Policy Framework, Conclusions,* 2014, available at: http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/145397.pdf, last accessed on 25 September 2017.
- Council of the European Union, *EU leaders commit to swiftly and fully implement Paris climate deal*, 2017a, available at: https://ec.europa.eu/clima/news/eu-leaders-commit-swiftly-and-fully-implement-paris-climate-deal_en, last accessed on 25 September 2017.
- Council of the European Union, *Background*, *G7 summit, Taormina, Italy, 26-27 May 2017*, 2017b, available at: http://www.consilium.europa.eu/en/meetings/international-summit/2017/05/170524-G7-background-REV2_pdf(2)/, last accessed on 25 September 2017.
- Council of the European Union, *G7 summit in Taormina, Italy, 26-27/05/2017*, 2017c, available at: http://www.consilium.europa.eu/en/meetings/international-summit/2017/05/26-27/http://www.consilium.europa.eu/en/meetings/international-summit/2017/05/170524-G7-background-REV2_pdf(2)/, last accessed on 25 September 2017.
- Covenant of Mayors, *The Covenant of Mayors*, 2017, available at: http://www.covenantofmayors.eu/about/covenant-of-mayors_en.html, last accessed on 25 September 2017.
- CVF - Climate *Vulnerable Forum, Vulnerable Twenty Group Founded*, 2015a, available at: http://www.thecvf.org/vulnerable-twenty-group-founded/, last accessed on 25 September 2017.
- CVF - Climate *Vulnerable Forum, The Manila-Paris Declaration*, 2015b, available at: http://www.thecvf.org/the-manila-paris-declaration/, last accessed on 25 September 2017.
- Dagnet, Y., Rocha, M.T., Fei, T., Elliott, C. and Krnjaic, M., *Mapping the Linkages between the Transparency Framework and Other Provisions of the Paris Agreement*, 2017, Working Paper. Washington, DC: Project for Advancing Climate Action Transparency (PACT), https://www.wri.org/sites/default/files/mapping-linkages-between-transparency-framework-other-provisions-paris-agreement.pdf, last accessed on 25 September 2017.

- Decision 1/CMA.1 adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement, *Matters relating to the implementation of the Paris Agreement,* 2017, FCCC/PA/CMA/2016/3/Add.1, available at: http://unfccc.int/resource/docs/2016/cma1/eng/03a01.pdf, last accessed on 25 September 2017.
- Decision 1/CMP.8 adopted by the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, *Amendment to the Kyoto Protocol pursuant to its Article 3, paragraph 9 (The Doha Amendment),* FCCC/KP/CMP/2012/13/Add.1, 2013, p.2, available at: http://unfccc.int/resource/docs/2012/cmp8/eng/13a01.pdf, last accessed on 25 September 2017.
- Decision 4/CP.5 adopted by the Conference of the Parties, *Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications, Annex,* FCCC/CP/1997/7, 2000, p.80, available at: http://unfccc.int/resource/docs/cop5/07.pdf, last accessed on 25 September 2017.
- Decision 17/CP.8 adopted by the Conference of the Parties, *Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention*, FCCC/CP/2002/7/Add.2, 2011, p.2, available at: http://unfccc.int/resource/docs/cop8/07a02.pdf, last accessed on 25 September 2017.
- Decision 1/CP.13 adopted by the Conference of the Parties, *Bali Action Plan*, FCCC/CP/2007/6/Add.1, 2011, p.3, available at: http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf, last accessed on 25 September 2017.
- Decision 2/CP.13 adopted by the Conference of the Parties, *Reducing emissions from deforestation in developing countries: approaches to stimulate action*, FCCC/CP/2007/6/Add.1, 2011, p.8, available at: http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf, last accessed on 25 September 2017.
- Decision 2/CP.15 adopted by the Conference of the Parties, *Copenhagen Accord*, FCCC/CP/2009/11/Add.1, 2010, p.4, available at: http://unfccc.int/resource/docs/2009/cop15/eng/11a01.pdf, last accessed on 25 September 2017.
- Decision 1/CP.16 adopted by the Conference of the Parties, *The Cancun Agreements, Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention*, FCCC/CP/2010/7/Add.1, 2011, p.3, available at: http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf, last accessed on 25 September 2017.
- Decision 1/CP.17 adopted by the Conference of the Parties, *Establishment of an Ad Hoc Working Group on the Durban Platform for Enhanced Action,* FCCC/CP/2011/9/Add.1, 2012, p.2, available at: http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf, last accessed on 25 September 2017.
- Decision 2/CP.17 adopted by the Conference of the Parties, *Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention, Annex I (UNFCCC biennial reporting guidelines for developed country Parties) and Annex III (UNFCCC biennial reporting guidelines for Parties not included in Annex I to the Convention),* FCCC/CP/2011/9/Add.1, 2012, p.31 and 39, available at: http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf, last accessed on 25 September 2017.
- Decision 5/CP.17 adopted by the Conference of the Parties, *National Adaptation Plans,* FCCC/CP/2011/9/Add.1, 2012, p.80, available at: http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf, last accessed on 25 September 2017.

- Decision 1/CP.19 adopted by the Conference of the Parties, *Further advancing the Durban Platform*, FCCC/CP/2013/10/Add.1, 2014, available at: http://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf, last accessed on 25 September 2017.
- Decision 24/CP.19 adopted by the Conference of the Parties, *Revision of the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention,* FCCC/CP/2013/10/Add.3, 2014, available at: http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf, last accessed on 25 September 2017.
- Decision 1/CP.20 adopted by the Conference of the Parties, *Lima Call for Climate Action*, FCCC/CP/2014/10/Add.1, 2015, p.3, available at: http://unfccc.int/resource/docs/2014/cop20/eng/10a01.pdf, last accessed on 25 September 2017.
- Decision 1/CP.21 adopted by the Conference of the Parties, *Adoption of the Paris Agreement*, FCCC/CP/2015/10/Add.1, 2016, p.3, available at: http://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf, last accessed on 25 September 2017.
- Decision 11/CP.21 adopted by the Conference of the Parties, *Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015, Decisions adopted by the Conference of the Parties, Forum and work programme on the impact of the implementation of response measures,* FCCC/CP/2015/10/Add.2, 2016, p.25 available at: http://unfccc.int/resource/docs/2015/cop21/eng/10a02.pdf, last accessed on 25 September 2017.
- Decision 1/CP.22 adopted by the Conference of the Parties, *Preparations for the entry into force 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*, FCCC/CP/2016/10/Add.1, 2017, p.3, available at: http://unfccc.int/resource/docs/2016/cop22/eng/10a01.pdf, last accessed on 25 September 2017.
- Decision 4/CP.22 adopted by the Conference of the Parties, *Review of the Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts*, FCCC/CP/2016/10/Add.1, 2017, p.10, available at: http://unfccc.int/resource/docs/2016/cop22/eng/10a01.pdf, last accessed on 25 September 2017.
- Decision No 377/2013/EU *of the European Parliament and of the Council of 24 April 2013 derogating temporarily from Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community*, OJ L 113/1, 25.4.2013, p. 1-4, available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013D0377&from=EN, last accessed on 25 September 2017.
- *Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020,* OJ L 140, 5.6.2009, p.136-148, available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009D0406, last accessed on 25 September 2017.
- Dinesh, D., Vermeulen, S., Bacudo, I., Martinez-Baron, D., Castro-Nunez, A., Hedger, M., Huyer, S., Iversen, P., Laure, A., Loboguerrero Rodriguez, AM., Martius, C., Neufeldt, H., Nyasimi, M., Richards, M., Wollenberg, L., *Options for agriculture at Marrakech climate talks: messages for SBSTA 45 agriculture negotiators*, CCAFS Report No. 16, Copenhagen, 2016, available at: http://www.cifor.org/publications/pdf_files/Papers/CCAFS_Report.pdf, last accessed on 25 September 2017.

- *Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC*, OJ L 140, 5.6.2009, p. 16-62, available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0028, last accessed on 25 September 2017.
- Directive 2009/29/EC *of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community*, OJ L 140, 5.6.2009, p. 63-87, available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0029, last accessed on 25 September 2017.
- Economic Times, *International Solar Alliance gathers steam, summit in New Delhi next year*, 2016, available at: http://economictimes.indiatimes.com/industry/energy/power/international-solar-alliance-gathers-steam-summit-in-new-delhi-next-year/articleshow/52393073.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst, last accessed on 25 September 2017.
- Economic Times, *India's renewable energy capacity crosses 57 GW*, 2017, available at: http://energy.economictimes.indiatimes.com/news/renewable/indias-renewable-energy-capacity-crosses-57-gw/59137130, last accessed on 25 September 2017.
- EEA – European Environment Agency, *Transforming the EU power sector: avoiding a carbon lock-in*, 2016, EEA Report No 22/2016, available at: http://www.eea.europa.eu/publications/transforming-the-eu-power-sector/, last accessed on 25 September 2017.
- EEA – European Environment Agency, *Annual European Union greenhouse gas inventory 1990-2015 and inventory report 2017, Submission to the UNFCCC Secretariat*, 2017, EEA Report 2017, available at: http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/euc-2017-nir-06jun17.zip, last accessed on 25 September 2017.
- El Haite, H. and Tubiana, L., *Marrakech Partnership for Global Climate Action*, 2016, available at: http://unfccc.int/files/paris_agreement/application/pdf/marrakech_partnership_for_global_climate_action.pdf, last accessed on 25 September 2017.
- Environment and Climate Change Canada, *Ministerial meeting on climate action co-chairs summary*, 2017a, available at: https://www.canada.ca/en/environment-climate-change/news/2017/09/ministerial_meetingonclimateaction.html, last accessed on 25 September 2017.
- Environment and Climate Change Canada, *National Inventory Report 1990-2015. Greenhouse Gas Sources and Sinks in Canada. Canada's Submission to the United Nations Framework Convention on Climate Change. Part 1.* 2017b, Available at: http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/can-2017-nir-13apr17.zip, last accessed on 25 September 2017.
- Eschborn, N., 'Environmental Policy in South Korea – Editorial', *KAS Journal on Contemporary Korean Affairs*, 2015, p.5, available at: http://www.kas.de/wf/doc/17802-1442-1-30.pdf, last accessed on 25 September 2017.
- EURELECTRIC, *European electricity sector gears up for the energy transition*, EURELECTRIC Union of the Electricity Industry, 2017, available at: http://www.eurelectric.org/media/318381/2017-04-05-eurelectric-press-release-on-energy-transition-statement-launch-of-cep-papers-embargo-9-am-542017.pdf, last accessed on 25 September 2017.

- European Commission, *Communication from the Commission to the European Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Roadmap for moving to a competitive low carbon economy in 2050*, COM(2011) 112 final, 2011a, available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011DC0112, last accessed on 25 September 2017.
- European Commission, *Communication from the Commission to the European Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Energy roadmap 2050*, COM(2011) 885 final, 2011b, available at: http://eur-lex.europa.eu/legal-content/EN/ALL/;ELX_SESSIONID=pXNYJKSFbLwdq5JBWQ9CvYWyJxD9RF4mnS3ctywT2xXmFYhlnlW1!-868768807?uri=CELEX:52011DC0885, last accessed on 25 September 2017.
- European Commission, *White Paper - Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system*, COM(2011) 144 final, 2011c, available at: http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52011DC0144, last accessed on 25 September 2017.
- European Commission, *Innovating for Sustainable Growth – A Bioeconomy Strategy for Europe*, Directorate-General for Research and Innovation, 2012, available at: http://bookshop.europa.eu/en/innovating-for-sustainable-growth-pbKI3212262/, last accessed on 25 September 2017.
- European Commission, *Climate change, environmental degradation, and migration*, 2013, Commission Staff Working Document, SWD(2013) 138 final, available at: https://ec.europa.eu/clima/sites/clima/files/adaptation/what/docs/swd_2013_138_en.pdf, last accessed on 25 September 2017.
- European Commission, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A policy framework for climate and energy in the period from 2020 to 2030*, COM(2014) 15 final, 2014, available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014DC0015, last accessed on 25 September 2017.
- European Commission, *Proposal for a* regulation of the European Parliament and of the Council *on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 for a resilient Energy Union and to meet commitments under the Paris Agreement and amending Regulation No 525/2013 of the European Parliament and the Council on a mechanism for monitoring and reporting greenhouse gas emissions and other information relevant to climate change*, COM(2016) 482 final, 2016a, available at: http://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-482-EN-F1-1.PDF, last accessed on 25 September 2017.
- European Commission, *Proposal for a regulation of the European Parliament and of the Council on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry into the 2030 climate and energy framework and amending Regulation No 525/2013 of the European Parliament and the Council on a mechanism for monitoring and reporting greenhouse gas emissions and other information relevant to climate change*, COM(2016) 479 final, 2016b, available at: http://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-479-EN-F1-1.PDF, last accessed on 25 September 2017.
- European Commission, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – A European Strategy for Low-Emission Mobility*, COM(2016) 501 final, 2016c,

available at: https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-501-EN-F1-1.PDF, last accessed on 25 September 2017.

- European Commission, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank – Clean Energy For All Europeans,* COM(2016) 860 final, 2016d, available at: http://eur-lex.europa.eu/resource.html?uri=cellar:fa6ea15b-b7b0-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF, last accessed on 25 September 2017.
- European Commission, *Commission proposes new rules for consumer centred clean energy transition*, 2016e, available at http://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition, last accessed on 25 September 2017.
- European Commission, *EU Covenant of Mayors and Compact of Mayors launch largest global coalition of cities committed to fighting climate change*, 2016f, available at: http://europa.eu/rapid/press-release_IP-16-2247_en.htm, last accessed on 25 September 2017.
- European Commission, *Press statement on landmark international agreement to curb aviation emissions*, 2016g, available at: https://ec.europa.eu/commission/2014-2019/bulc/announcements/press-statement-landmark-international-agreement-curb-aviation-0_en, last accessed on 25 September 2017.
- European Commission, *70th session of the Marine Environment Protection Committee (MEPC 70) at the International Maritime Organization (IMO)*, 2016h, available at: https://ec.europa.eu/transport/media/media-corner/70th-session-marine-environment-protection-committee-mepc-70-international_en, last accessed on 25 September 2017.
- European Parliament, *Towards a new international climate agreement in Paris*, P8_TA(2015)0359, 2015, available at: http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P8-TA-2015-0359+0+DOC+PDF+V0//EN, last accessed on 25 September 2017.
- European Union, *Intended Nationally Determined Contribution of the EU and its Member States,* Submission by Latvia and the European Commission on behalf of the European Union and its Member States, 2015, available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Latvia/1/LV-03-06-EU%20INDC.pdf, last accessed on 25 September 2017.
- Ferrie, J., *Climate change and mass migration: a growing threat to global security*, 2017, available at: https://www.irinnews.org/analysis/2017/01/19/climate-change-and-mass-migration-growing-threat-global-security, last accessed on 25 September 2017.
- FoEI – Friends of the Earth International, *About FoEI,* 2017, available at: http://www.foei.org/about-foei, last accessed on 25 September 2017.
- Forbes, *Climate Expert Says China Is A Decade Ahead Of Schedule On Reducing CO_2 Emissions*, 2016, available at: http://www.forbes.com/sites/jillbaker/2016/07/20/good-news-from-china-coal-has-peaked-and-emissions-will-begin-falling-after-2020-2022/#75331f335259, last accessed on 25 September 2017.
- Fulton, M., Cleveland, S., Schuwerk, R., Weber, C., *Carbon Asset Risk: From Rhetoric to Action*, 2015, available at: http://www.carbontracker.org/wp-content/uploads/2015/10/car_action_FINAL101415.pdf, last accessed on 25 September 2017.

- G7 – The Group of Seven, *Leaders' Declaration, G7 Summit. 7-8 June 2015,* 2015, available at: https://sustainabledevelopment.un.org/content/documents/7320LEADERS%20STATEMENT_FINAL_CLEAN.pdf, last accessed on 25 September 2017.
- G7 – The Group of Seven, *G7 Ise-Shima Leaders' Declaration. G7 Ise-Shima Summit, 26-27 May 2016,* 2016, available at: http://www.mofa.go.jp/files/000160266.pdf, last accessed on 25 September 2017.
- G7 – The Group of Seven, *G7 Taormina Leaders' Communiqué*, 2017, available at: http://www.consilium.europa.eu/en/meetings/international-summit/2017/05/g7-taormina-leaders-communique_pdf/, last accessed on 25 September 2017.
- G7 Environment Ministers – The Group of Seven Environment Ministers, *G7 Bologna Environment Ministers' Meeting, Bologna, Italy, 11-12 June 2017, Communiqué*, 2017, available at: http://www.g7italy.it/sites/default/files/documents/Comunicu%C3%A9%20G7%20Environment%20-%20Bologna_0.pdf, last accessed on 25 September 2017.
- G20 – The Group of Twenty, *G20 Leader's Communique Hangzhou Summit*, 2016, available at: http://europa.eu/rapid/press-release_STATEMENT-16-2967_en.htm, last accessed on 25 September 2017.
- G20 – The Group of Twenty, *G20 Leaders´ Declaration Shaping an interconnected world*, 2017a, available at: http://www.consilium.europa.eu/en/meetings/international-summit/2017/07/G20-Hamburg-leaders--communiqu%C3%A9_pdf/, last accessed on 25 September 2017.
- G20 – The Group of Twenty, *The outcomes of the G20 summit. Tangible progress made*, 2017b, available at: https://www.g20.org/Content/EN/Artikel/2017/07_en/2017-07-10-erfolge-g20-hamburg_en.html, last accessed on 25 September 2017.
- G20 – The Group of Twenty, *G20 Hamburg Climate and Energy Action Plan for Growth*, 2017c, available at: https://www.g20.org/Content/DE/_Anlagen/G7_G20/2017-g20-climate-and-energy-en.pdf?__blob=publicationFile&v=6, last accessed on 25 September 2017.
- G-77 – Group of 77, *About Group of 77,* 2017, available at: http://www.g77.org/doc/, last accessed on 25 September 2017.
- Galik, C.S., Decarolis, J.S., Fell, H., 'Evaluating the US Mid-Century Strategy for Deep Decarbonization amidst early century uncertainty', *Climate Policy,* 17, doi:10.1080/14693062.2017.1340257, 2017, available at: http://www.tandfonline.com/doi/full/10.1080/14693062.2017.1340257, last accessed on 25 September 2017.
- GCF - Green Climate Fund, *Status of Pledges and Contributions made to the Green Climate Fund*, 2017, available at: https://www.greenclimate.fund/documents/20182/24868/Status_of_Pledges.pdf, last accessed on 25 September 2017.
- Global Carbon Project, *Carbon Budget 2016*, 2016, available at: http://www.globalcarbonproject.org/carbonbudget/index.htm, last accessed on 25 September 2017.
- Global Covenant of Mayors, *About the Global Covenant of Mayors for Climate & Energy*, 2017, available at: http://www.globalcovenantofmayors.org/about/, last accessed on 25 September 2017.
- Government of India, *National Action Plan on Climate Change*, 2008, available at: http://www.moef.nic.in/sites/default/files/Pg01-52_2.pdf, last accessed on 25 September 2017.

- Government of India – Ministry of New and Renewable Energy, *Strategic Plan for new and renewable energy sector for the period 2011-2017*, 2011, available at: http://mnre.gov.in/file-manager/UserFiles/strategic_plan_mnre_2011_17.pdf, last accessed on 25 September 2017.
- Government of India – Ministry of Environment & Forests, *India – Second National Communication to the United Nations Framework Convention on Climate Change*. New Delhi, 2012, available at: http://unfccc.int/resource/docs/natc/indnc2.pdf, last accessed on 25 September 2017.
- Government of India – Ministry of Environment, Forest and Climate Change, *First Biennial Update Report to the United Nations Framework Convention on Climate Change*, 2015, available at: http://unfccc.int/files/national_reports/non-annex_i_parties/biennial_update_reports/application/pdf/indbur1.pdf, last accessed on 25 September 2017.
- Government of India, *Draft National Electricity Plan (Volume 1)*, 2016, available at: http://www.cea.nic.in/reports/committee/nep/nep_dec.pdf, last accessed on 25 September 2017.
- Government of the United Kingdom, *Foreign policy, defence and development – A future partnership paper*, 2017, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/643924/Foreign_policy__defence_and_development_paper.pdf, last accessed on 25 September 2017.
- Green, F. and Stern, N., 'China's changing economy: implications for its carbon dioxide emissions', *Climate Policy*, 1-15, DOI:10.1080/14693062.2016.1156515, 2016, available at: http://www.tandfonline.com/doi/full/10.1080/14693062.2016.1156515, last accessed on 25 September 2017.
- Green Air Online, *ICAO and airlines reinforce support for CORSIA*, 2017, available at: http://www.greenaironline.com/news.php?viewStory=2376, last accessed on 25 September 2017.
- GCF - Green Climate Fund, *Status of Pledges and Contributions made to the Green Climate Fund*, 2017, available at: https://www.greenclimate.fund/documents/20182/24868/Status_of_Pledges.pdf/eef538d3-2987-4659-8c7c-5566ed6afd19, last accessed on 25 September 2017.
- Greenpeace International, *Kumi Naidoo reacts to conclusion of COP21*, 2015, available at: http://www.greenpeace.org/international/en/press/releases/2015/kumi-naidoo-conclusion-cop21-climate/, last accessed on 25 September 2017.
- Greenpeace International, *About Greenpeace*, 2017, available at: http://www.greenpeace.org/international/en/about/, last accessed on 25 September 2017.
- Hallegatte, S., Mangalore, M., Bonzanigo, L., Fay, M., Kane, T., Narloch, U., Rozenberg, J., Treguer, D. and Vogt-Schilb, A., 'Shock-Waves: Managing the Impacts of Climate Change on Poverty', *Climate Change and Development Series*, The World Bank, Washington, DC, doi: 10.1596/978-1-4648-0673-5, 2015, available at. https://openknowledge.worldbank.org/bitstream/handle/10986/22787/9781464806735.pdf, last accessed on 25 September 2017.
- Höhne, N., Luna, L., Fekete, H., Sterl, S., Hare, B., Cantzler, J., Parra, P., Sferrra, F., Ancygier, A., Deng, Y., M., G., *Action by China and India slows emissions growth, President Trump's policies likely to cause US emissions to flatte*n, 2017, available at: http://climateactiontracker.org/assets/publications/briefing_papers/CAT_2017-05-15_Briefing_India-China-USA.pdf, last accessed on 25 September 2017.

- ICAO – International Civil Aviation Organization, *Resolutions adopted at the 37th session of the Assembly,* Provisional Edition, p. 55, 2010, available at: http://www.icao.int/Meetings/AMC/Assembly37/Documents/ProvisionalEdition/a37_res_prov_en.pdf, last accessed on 25 September 2017.
- ICAO – International Civil Aviation Organization, *Present and Future Trends in Aircraft Noise and Emissions*, A38-WP/26, 2013, available at: http://www.icao.int/Meetings/a38/Documents/WP/wp026_en.pdf, last accessed on 25 September 2017.
- ICAO – International Civil Aviation Organization, *2016 Global Aviation Dialogues (GLADs),* 2016a, available at: http://www.icao.int/meetings/GLADs-2016/Pages/default.aspx, last accessed on 25 September 2017.
- ICAO – International Civil Aviation Organization, *Climate Change: Global Market-based Measure (MBM),* 2016b, available at: http://www.icao.int/environmental-protection/Pages/market-based-measures.aspx, last accessed on 25 September 2017.
- ICAO – International Civil Aviation Organization, *About ICAO*, 2017a, available at: http://www.icao.int/about-icao/Pages/default.aspx, last accessed on 25 September 2017.
- ICAO – International Civil Aviation Organization ICAO, *Council States 2014-2016*, 2017b, available at: http://www.icao.int/about-icao/Pages/council-states-2014-2016.aspx, last accessed on 25 September 2017.
- ICAO – International Civil Aviation Organization, *1.6. Why were international aviation emissions not included in the Paris Agreement at COP 21?*, 2017c, available at: http://www.icao.int/Meetings/HLM-MBM/Lists/FAQ/DispForm.aspx?ID=8, last accessed on 25 September 2017.
- ICAO – International Civil Aviation Organization, *2016 Environmental Report,* 2017d, available at: http://www.icao.int/environmental-protection/Documents/ICAO%20Environmental%20Report%202016.pdf, last accessed on 25 September 2017.
- ICAP - International Carbon Action Partnership, *Korea Emissions Trading Scheme*, 2017a, available at: https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems[]=47, last accessed on 25 September 2017.
- ICAP - International Carbon Action Partnership, *South Korea releases 2030 climate roadmap*, 2017b, available at: https://icapcarbonaction.com/zh/news-archive/416-south-korea-releases-2030-climate-roadmaphttps://icapcarbonaction.com/fr/news-archive/416-south-korea-releases-2030-climate-roadmap, last accessed on 25 September 2017.
- ICC – International Chamber of Commerce, *ICC Perspective On The 2015 UN Climate Agreement And International Climate Change Policy*, 2017, available at: https://iccwbo.org/publication/icc-perspective-on-the-2015-un-climate-agreement-and-international-climate-change-policy/, last accessed on 25 September 2017.
- ICCT – The International Council on Clean Transportation, *International Civil Aviation Organization CO_2 standard for new aircraft*, 2016, available at: http://www.theicct.org/icao-proposed-co2-standard-update-201602, last accessed on 25 September 2017.
- ICLEI - Local Governments for Sustainability, *About ICLEI*, 2017a, available at: http://www.iclei-europe.org/about-iclei/, last accessed on 25 September 2017.

- ICLEI - Local Governments for Sustainability, *Compact of States and Regions*, 2017b, available at: http://www.iclei.org/activities/agendas/low-carbon-city/compactstatesregions.html, last accessed on 25 September 2017.
- ICSA – International Coalition for Sustainable Aviation, *Global Market-based Measure*, 2016a, available at: http://icsa-aviation.org/issues/cutting-climate-pollution/global-market-based-measure/, last accessed on 25 September 2017.
- ICSA – International Coalition for Sustainable Aviation, *About ICSA*, 2016b, available at: http://icsa-aviation.org/icsa-aviation-about-us/, last accessed on 25 September 2017.
- ICSA – International Coalition for Sustainable Aviation, *ICSA's Progress Report on the ICAO MBM*, 2016c, available at: http://icsa-aviation.org/wp-content/uploads/2016/07/ICSA-Progress-Report-on-ICAO-MBM_8-June-2016_final1.pdf, last accessed on 25 September 2017.
- IDMC – Internal Displacement Monitoring *Centre, Global Report on Internal Displacement*, 2017, available at: http://www.internal-displacement.org/global-report/grid2017/, last accessed on 25 September 2017.
- IEA – International Energy Agency, *Energy and Climate Change World Energy Outlook Special Report*, 2015a, available at: https://www.iea.org/publications/freepublications/publication/WEO2015SpecialReportonEnergyandClimateChange.pdf, last accessed on 25 September 2017.
- IEA - International Energy Agency, *Coal Medium-Term Market Report 2015 - Market Analysis and Forecasts to 2020 – Factsheet*, 2015b, available at: http://www.iea.org/media/news/2015/press/151218_MTCMR15_Factsheet.pdf, last accessed on 25 September 2017.
- IEA – International Energy Agency, *World Energy Outlook*, 2016a, available at: https://www.iea.org/newsroom/news/2016/november/world-energy-outlook-2016.html, last accessed on 25 September 2017.
- IEA – International Energy Agency, *CO_2 emissions from fuel combustion,* 2016b, available at: https://www.iea.org/publications/freepublications/publication/CO2EmissionsfromFuelCombustion_Highlights_2016.pdf, last accessed on 25 September 2017.
- IEA – International Energy Agency, *Key World Energy Statistics 2016*, 2016c, available at: https://www.iea.org/publications/freepublications/publication/KeyWorld2016.pdf, last accessed on 25 September 2017.
- IEA – International Energy Agency, *World Energy Investment 2017*, 2017a, available at: http://www.iea.org/bookshop/759-World_Energy_Investment_2017, last accessed on 25 September 2017.
- IEA – International Energy Agency, *Tracking Clean Energy Progress 2017*, 2017b, available at: http://www.iea.org/publications/freepublications/publication/TrackingCleanEnergyProgress2017.pdf, last accessed on 25 September 2017.
- IIPFCC, *About the International Indigenous Peoples' Forum on Climate Change*, 2017, available at: http://www.iipfcc.org/who-are-we/, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *Summary of the Thirteenth Session of the UN General Assembly Open Working Group on Sustainable Development Goals: 14-19 July 2014,* 2014, available at: http://www.iisd.ca/download/pdf/enb3213e.pdf, last accessed on 25 September 2017.

- IISD – International Institute for Sustainable Development, *Paris Highlights: Wednesday, 9 December 2015*, Vol. 12 No. 661, 2015a, available at: http://www.iisd.ca/download/pdf/enb12661e.pdf, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *Summary of the Paris Climate Change Conference: 29 November – 13 December 2015*, Vol. 12 No. 662, 2015b, available at: http://www.iisd.ca/download/pdf/enb12663e.pdf, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *Summary of the Twenty-Seventh Meeting of the Parties to the Montreal Protocol,* Vol. 19, No. 115, 2015c, available at: http://enb.iisd.org/vol19/enb19115e.html, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *High-Level Signature Ceremony for the Paris Agreement on Climate Change*, 2016a, available at: http://www.iisd.ca/climate/cop21/signing-ceremony/, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *Summary of the Marrakech Climate Change Conference: 7-19 November 2016*, Vol. 12 No. 689, 2016b, available at: http://enb.iisd.org/download/pdf/enb12689e.pdf, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *Summary of the Bonn Climate Change Conference: 16-26 May 2016*, Vol. 12 No. 676, 2016c, available at: http://www.iisd.ca/download/pdf/enb12676e.pdf, last accessed on 25 September 2017.
- IISD - International Institute for Sustainable Development, *Draft Outline for IPCC Special Report on Impacts of 1.5°C Warming Agreed*, 2016d, available at: http://climate-l.iisd.org/news/draft-outline-for-ipcc-special-report-on-impacts-of-1-5c-warming-agreed/, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *Summary of the 44th Session of the Intergovernmental Panel on Climate Change: 17-21 October 2016*, Vol. 12 No. 677, 2016e, available at: http://enb.iisd.org/download/pdf/enb12677e.pdf, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *Summary of the 43rd Session of the Intergovernmental Panel on Climate Change: 11-13 April 2016*, Vol. 12 No. 664, 2016f, available at: http://www.iisd.ca/download/pdf/enb12664e.pdf, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *Summary of the thirty-seventh meeting of the open-ended working group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer*, Vol. 19, No. 116, 2016g, available at: http://www.iisd.ca/download/pdf/enb19116e.pdf, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *Summary of the Montreal Protocol Meetings in Vienna: 15-23 July 2016*, Vol. 19, No. 125, 2016h, available at: http://www.iisd.ca/download/pdf/enb19125e.pdf, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *Summary of the twenty-eigth meeting of the Parties to the Montreal Protocol: 10-14 October 2016*, Vol. 19, No. 131, 2016i, available at: http://enb.iisd.org/download/pdf/enb19131e.pdf, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *Summary of the Bonn Climate Change Conference: 8-18 May 2017*, Vol. 12 No. 701, 2017a, available at: http://enb.iisd.org/download/pdf/enb12701e.pdf, last accessed on 25 September 2017.

- IISD – International Institute for Sustainable Development, *Petersberg Climate Dialogue Focuses on Solutions*, 2017b, available at: http://sdg.iisd.org/news/petersberg-climate-dialogue-focuses-on-solutions/, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *G7 Environment Ministers Reaffirm Commitment to 2030 Agenda*, 2017c, available at: http://sdg.iisd.org/news/g7-environment-ministers-reaffirm-commitment-to-2030-agenda/, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *Climate Summit – 12 December 2017*, available at: http://sdg.iisd.org/events/climate-summit/, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *Summary of the 46th Session of the Intergovernmental Panel on Climate Change: 6-10 September 2017*, Vol. 12 No. 702, 2017e, available at: http://enb.iisd.org/download/pdf/enb12702e.pdf, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *Summary of the 45th Session of the Intergovernmental Panel on Climate Change: 28-31 March 2017*, Vol. 12 No. 690, 2017f, available at: http://enb.iisd.org/download/pdf/enb12690e.pdf, last accessed on 25 September 2017.
- IISD - International Institute for Sustainable Development, *IMO Environment Committee Advances Work on Shipping Emissions*, 2017g, available at: http://sdg.iisd.org/news/imo-environment-committee-advances-work-on-shipping-emissions/, last accessed on 7 August 2017.
- IISD – International Institute for Sustainable Development, *Summary of the 39th meeting of the Open-Ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer: 10-14 July 2017*, Vol. 19, No. 132, 2017h, available at: http://enb.iisd.org/download/pdf/enb19132e.pdf, last accessed on 25 September 2017.
- IISD – International Institute for Sustainable Development, *SDG Knowledge Hub*, 2017i, available at: http://sdg.iisd.org/, last accessed on 25 September 2017.
- IMF – International Monetary Fund, *How Large Are Global Energy Subsidies?*, IMF Working Paper, 2015, available at: https://www.imf.org/external/pubs/ft/wp/2015/wp15105.pdf, last accessed on 25 September 2017.
- IMO – International Maritime Organization, *Third IMO Greenhouse Gas Study 2014*, 2014, available at: http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf, last accessed on 25 September 2017.
- IMO – International Maritime Organization, *IMO takes further action on climate change,* 2016a, available at: http://www.imo.org/en/MediaCentre/PressBriefings/Pages/11-data-collection-.aspx, last accessed on 25 September 2017.
- IMO – International Maritime Organization, Marine Environment Protection Committee (MEPC), 70th session, 24-28 October 2016, 2016b, available at: http://www.imo.org/en/MediaCentre/MeetingSummaries/MEPC/Pages/MEPC-70th-session.aspx, last accessed on 25 September 2017.
- IMO – International Maritime Organization, Press briefing on new requirements for international shipping, October 2016, 2016c, available at: http://www.imo.org/en/MediaCentre/PressBriefings/Pages/28-MEPC-data-collection--.aspx, last accessed on 25 September 2017.

- IMO – International Maritime Organization, *Introduction to IMO,* 2017a, available at: http://www.imo.org/en/About/Pages/Default.aspx, last accessed on 25 September 2017.
- IMO – International Maritime Organization, *Marine Environment*, 2017b, http://www.imo.org/en/OurWork/Environment/Pages/Default.aspx, last accessed on 25 September 2017.
- IMO – International Maritime Organization, *Energy Efficiency Measures*, 2017c, available at: http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Technical-and-Operational-Measures.aspx, last accessed on 25 September 2017.
- IMO – International Maritime Organization, *Marine Environment Protection Committee (MEPC), 71st session, 3-7 July 2017*, 2017d, available at: http://www.imo.org/en/MediaCentre/MeetingSummaries/MEPC/Pages/MEPC-71.aspx, last accessed on 25 September 2017.
- India, *India's intended nationally determined contribution: Working towards climate justice*, 2015, available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/India/1/INDIA%20INDC%20TO%20UNFCCC.pdf, last accessed on 25 September 2017.
- Indonesia, *Indonesia Second National Communication under the United Nations Framework Convention on Climate Change (UNFCCC),* 2011, Ministry of Environment, Jakarta, available at: http://unfccc.int/resource/docs/natc/indonc2.pdf, last accessed on 25 September 2017.
- Indonesia, *Intended Nationally Determined Contribution*, 2015, available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Indonesia/1/INDC_REPUBLIC%20OF%20INDONESIA.pdf, last accessed on 25 September 2017.
- Indonesia, *First Biennial Update Report*, 2016a, available at: http://unfccc.int/files/national_reports/non-annex_i_parties/biennial_update_reports/application/pdf/idnbur1.pdf, last accessed on 25 September 2017.
- Indonesia, *First Nationally Determined Contribution*, Republic of Indonesia, 2016b, available at: http://www4.unfccc.int/ndcregistry/PublishedDocuments/Indonesia%20First/First%20NDC%20Indonesia_submitted%20to%20UNFCCC%20Set_November%20%202016.pdf, last accessed on 25 September 2017.
- InfluenceMap, *Corporate Carbon Policy Footprint,* 2017, available at: https://influencemap.org/site/data/000/299/CPF_Report_Aug_2017.pdf, last accessed on 25 September 2017.
- IPCC - Intergovernmental Panel on Climate Change, *Carbon Dioxide Capture and Storage,* 2005, available at: https://www.ipcc.ch/pdf/special-reports/srccs/srccs_wholereport.pdf, last accessed on 25 September 2017.
- IPCC - Intergovernmental Panel on Climate Change, *Climate Change 2013 – the Physical Science Basis, Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Technical Summary*, 2013, available at: https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_TS_FINAL.pdf, last accessed on 25 September 2017.
- IPCC - Intergovernmental Panel on Climate Change, *Mitigation of Climate Change, Working Group III Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, *Technical Summary,* 2014, available at: https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_technical-summary.pdf, last accessed on 25 September 2017.

- IPCC – Intergovernmental Panel on Climate Change, *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, 2015, available at: http://www.ipcc.ch/report/ar5/syr/, last accessed on 25 September 2017.
- IPCC – Intergovernmental Panel on Climate Change, Organization, 2017a, available at: http://www.ipcc.ch/organization/organization.shtml, last accessed on 25 September 2017.
- IPCC – Intergovernmental Panel on Climate Change, *Working Groups / Task Force*, 2017b, available at: http://www.ipcc.ch/working_groups/working_groups.shtml, last accessed on 25 September 2017.
- IPCC – Intergovernmental Panel on Climate Change, *The IPCC and the Sixth Assessment cycle*, 2017c, available at: https://www.ipcc.ch/pdf/ar6_material/AC6_brochure_en.pdf, last accessed on 25 September 2017.
- IPCC – Intergovernmental Panel on Climate Change, *Activities*, 2017d, available at: https://www.ipcc.ch/activities/activities.shtml, last accessed on 25 September 2017.
- IPCC – Intergovernmental Panel on Climate Change, *Decision IPCC/XLIV-4. Sixth Assessment Report (AR6) Products, Outline of the Special Report on 1.5°C,* 2017e, available at: https://www.ipcc.ch/meetings/session44/l2_adopted_outline_sr15.pdf, last accessed on 25 September 2017.
- IPCC – Intergovernmental Panel on Climate Change, *Sixth Assessment Report (AR6) Products, Decision and Outline of the Special Report on climate change and oceans and the cryosphere*, 2017f, available at: https://www.ipcc.ch/meetings/session45/Decision_Outline_SR_Oceans.pdf, last accessed on 25 September 2017.
- IPCC – Intergovernmental Panel on Climate Change, *Decision IPCC/XLIV-5. Sixth Assessment Report (AR6) Products, Decision and Outline of the Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes interrestrial ecosystems*, 2017g, available at: https://www.ipcc.ch/meetings/session45/Decision_Outline_SR_LandUse.pdf, last accessed on 25 September 2017.
- IPCC – Intergovernmental Panel on Climate Change, *Decision IPCC/XLIV-5. Sixth Assessment Report (AR6) Products, Outline of the Methodology Report(s) to refine the 2006 Guidelines for National Greenhouse Gas Inventories*, 2017h, available at: https://www.ipcc.ch/meetings/session44/l3_adopted_outline_methodology_report_guideline.pdf, last accessed on 25 September 2017.
- IPCC – Intergovernmental Panel on Climate Change, *IPCC-46. Montreal, Canada, 6-10 September 2017*, 2017i, available at: https://www.ipcc.ch/scripts/_session_template.php?page=_46ipcc.htm, last accessed on 25 September 2017.
- Islamic Republic of Iran, *Intended Nationally Determined Contribution*, 2015a, available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Iran/1/INDC%20Iran%20Final%20Text.pdf, on 25 September 2017.
- Islamic Republic of Iran, *Iran's Third National Communication to UNFCCC Chapter 3: National GHGs Mitigation Policies – Energy*, 2015b, available at: http://en.climate-change.ir/my_doc/climatechange/Climate%20Change%20in%20Iran/TNC/English/Mitigation%20Report_Energy_English.pdf, last accessed on 25 September 2017.

- ITUC – International Trade Union Confederation, *Issues: Climate change*, 2017, available at: http://www.ituc-csi.org/climate-change?lang=en, last accessed on 25 September 2017.
- Japan, *Japan's Second Biennial Report under the United Nations Framework Convention on Climate Change,* 2015a, The Government of Japan, available at: http://unfccc.int/files/national_reports/biennial_reports_and_iar/submitted_biennial_reports/application/pdf/japan_br2_revised.pdf, last accessed on 25 September 2017.
- Japan, *Submission of Japan's Intended Nationally Determined Contribution (INDC)*, 2015b, available at: http://www4.unfccc.int/Submissions/INDC/Published%20Documents/Japan/1/20150717_Japan's%20INDC.pdf, last accessed on 25 September 2017.
- Japan – Ministry of the Environment, *National Greenhouse Gas Inventory Report of Japan*, 2017, available at: http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/jpn-2017-nir-13apr17.zip, last accessed on 25 September 2017.
- Jones, D., Mace, M.J., *The Paris Agreement: Practical and strategic considerations related to signature and entry into force*, 2016, available at: http://climateanalytics.org/files/paris_agreement_signature_and_eif_final-1.pdf, last accessed on 25 September 2017.
- Kokorin, A. and Korppoo, A., *Russia's Greenhouse Gas Target 2020 – Projections, Trends and Risks*, 2014, Friedrich Ebert Stiftung, available at: http://library.fes.de/pdf-files/id-moe/10632.pdf, last accessed on 25 September 2017.
- Korsbakken, J. I., Peters, G. P. and Andrew, R. M., 'Uncertainties around reductions in China's coal use and CO_2 emissions', *Nature Climate Change*, doi:10.1038/nclimate2963, 2016, available at: http://www.nature.com/nclimate/journal/v6/n7/full/nclimate2963.html, last accessed on 25 September 2017.
- Kuramochi, T., Höhne, N., Sterl, S., Lütkehermöller, K., Seghers, J.-C., *States, cities and businesses leading the way: a first look at decentralized climate commitments in the US*, New Climate Institute, 2017, available at: https://newclimate.org/2017/09/13/states-cities-and-businesses-leading-the-way-a-first-look-at-decentralized-climate-commitments-in-the-us/, last accessed on 25 September 2017.
- Lackmann, G.M., 'Hurricane Sandy before 1990 and after 2100', *Bulletin of the American Meteorological Society*, doi:10.1175/BAMS-D-14-00123.1, 2015, available at: http://journals.ametsoc.org/doi/10.1175/BAMS-D-14-00123.1, last accessed on 25 September 2017.
- LDC - Least Developed Countries, *Press Release: Strengthening Global Action on Renewable Energy at COP22*, 2016, available at: https://ldcclimate.wordpress.com/2016/05/26/press-release-strengthening-global-action-on-renewable-energy-at-cop22/, last accessed on 6 October 2016.
- Le Quéré, C., Moriarty, R., Andrew, R. M., Canadell, J. G., Sitch, S., Korsbakken, J. I., Peters, G. P., Manning, A. C., Boden, T. A., Tans, P. P., Houghton, R. A., Keeling, R., Alin, S., Andrews, O. D., Anthoni, P., Barbero, L., Bopp, L., Chevallier, F., Chini, L. P., Ciais, P., Currie, K., Delire, C., Doney, S. C., Friedlingstein, P., Gkritzalis, T., Harris, I., Hauck, J., Haverd, V., Hoppema, M., Klein Goldewijk, K., Jain, A. K., Kato, E., Körtzinger, A., Landschützer, P., Lefèvre, N., Lenton, A., Lienert, S., Lombardozzi, D., Melton, J. R., Metzl, N., Millero, F., Monteiro, P. M. S., Munro, D. R., Nabel, J. E. M. S., Nakaoka, S., O'Brien, K., Olsen, A., Omar, A. M., Ono, T., Pierrot, D., Poulter, B., Rödenbeck, C., Salisbury, J., Schuster, U., Schwinger, J., Séférian, R., Skjelvan, I., Stocker, B. D., Sutton, A.

J., Takahashi, T., Tian, H., Tilbrook, B. van der Laan-Luijkx, I. T., van der Werf, G. R., Viovy, N., Walker, A. P., Wiltshire, A. J., Zaehle, S., '*Global Carbon Budget 2016'*, Earth Syst. Sci. Data, 8, 605–649, 2016, available at: https://www.earth-syst-sci-data.net/8/605/2016/essd-8-605-2016.pdf, last accessed on 25 September 2017.

- LSE – London School of Economics and Political Science, *The Global Climate Legislation Study, Country Profiles – South Africa*, 2015, available at: http://www.lse.ac.uk/GranthamInstitute/country-profiles/south-africa/, last accessed on 25 September 2017.
- LSE – London School of Economics and Political Science, *The Global Climate Legislation Database - 13th Five-Year Plan*, 2016a, available at: http://www.lse.ac.uk/GranthamInstitute/law/13th-five-year-plan/, last accessed on 25 September 2017.
- LSE – London School of Economics and Political Science, *The Global Climate Legislation Study, Country Profiles – Iran*, 2016b, available at: http://www.lse.ac.uk/GranthamInstitute/country-profiles/iran/, last accessed on 25 September 2017.
- Masters, L., *The G77 and China in the climate change negotiations: a leaky umbrella?*, 2014, Institute for Global Dialogue, available at: http://www.igd.org.za/jdownloads/Global%20Insight/project_35_policy_brief_111_final_final.pdf, last accessed on 25 September 2017.
- Mauritsen, T., Pincus, R., 'Committed warming inferred from observations*'*, *Nature Climate Change*, 7, 652-655, doi:10.1038/nclimate3357, 2017, available at: http://www.nature.com/nclimate/journal/v7/n9/full/nclimate3357.html, last accessed on 25 September 2017.
- McDermott, T.K.J., *Investing in Disaster Risk Management in an Uncertain Climate*, 2016, Policy Research Working Paper 7631, The World Bank, Washington, DC, available at: http://documents.worldbank.org/curated/en/638091467986362765/pdf/WPS7631.pdf, last accessed on 25 September 2017.
- MEF - Major Economies Forum, *About the Major Economies Forum*, 2016, available at: http://www.majoreconomiesforum.org/about.html, last accessed on 25 September 2017.
- Mexico, *Intended Nationally Determined Contribution*, 2015, available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Mexico/1/MEXICO%20INDC%2003.30.2015.pdf, last accessed on 25 September 2017.
- Mexico and AILAC – Independent Alliance of Latin America and the Caribbean, *Mexico joint submission with the Independent Association of Latin America and the Caribbean (AILAC), 2014*, available at: http://www4.unfccc.int/submissions/Lists/OSPSubmissionUpload/39_99_130581311840849856-Adaptation%20Submission%20AILAC-Mexico%20vf.pdf, last accessed on 25 September 2017.
- Millar, R.J., Fuglestvedt, J.S., Friedlingstein, P., Rogelj, J., Grubb, M.J., Matthews, H.D., Skeie, R.B., Forster, P.M., Frame, D.J. and Allen, M.R., 'Emission budgets and pathways consistent with limiting warming to 1.5°C', *Nature Geoscience*, Advance online publication, doi:10.1038/ngeo3031, 2017, available at: http://www.nature.com/ngeo/journal/vaop/ncurrent/full/ngeo3031.html, last accessed on 25 September 2017.
- Ministry of the Environment Japan, Greening of Whole Tax System and Carbon Tax in Japan, 2017, available at: http://www.env.go.jp/en/policy/tax/20170130_greening.pdf, last accessed on 14 August 2017.
- Moosmann, L., Pazdernik, K., Prutsch, A. and Radunsky, K., *International Climate Negotiations – On the Road to Paris*, Study for the ENVI Committee, 2015, European Parliament Directorate General for Internal Policies, Policy Department A: Economic and Sci-

entific Policy, Brussels, available at: http://www.europarl.europa.eu/RegData/etudes/STUD/2015/569970/IPOL_STU(2015)569970_EN.pdf, last accessed on 25 September 2017.

- Moosmann, L., Neier, H., Mandl, N. and Radunsky, K., *Implementing the Paris Agreement – Issues at stake in view of the COP 22 Climate Change Conference in Marrakesh,* Study for the ENVI Committee, 2016, European Parliament Directorate General for International Policies, Policy Department A: Economic and Scientific Policy, Brussels, available at: http://www.europarl.europa.eu/RegData/etudes/STUD/2016/587319/IPOL_STU(2016)587319_EN.pdf, last accessed on 25 September 2017.
- NAP Global Network, *Green Climate Fund to Boost Support for National Adaptation Plans*, 2016, available at: http://napglobalnetwork.org/2016/10/green-climate-fund-boost-support-national-adaptation-plans/, last accessed on 25 September 2017.
- NASA – National Aeronautics and Space Administration & NOAA – National Oceanic and Atmospheric Administration, *NASA, NOAA Data Show 2016 Warmest Year on Record Globally*, 2017, available at: https://www.nasa.gov/press-release/nasa-noaa-data-show-2016-warmest-year-on-record-globally, last accessed on 25 September 2017.
- National Observer*, 'Only fair': McKenna on excluding Saskatchewan, Manitoba from $2B carbon fund,* 2017, available at: http://www.nationalobserver.com/2017/06/15/news/only-fair-mckenna-excluding-saskatchewan-manitoba-2b-carbon-fund, last accessed on 25 September 2017.
- NOAA – National Oceanic and Atmospheric Administration, *2016 marks three consecutive years of record warmth for the globe*, 2017, available at: http://www.noaa.gov/stories/2016-marks-three-consecutive-years-of-record-warmth-for-globe, last accessed on 25 September 2017.
- OECD – Organisation for Economic Cooperation and Development, *OECD Economic Surveys: Korea 2012*, 2012, available at: http://www.oecd-ilibrary.org/economics/oecd-economic-surveys-korea-2012_eco_surveys-kor-2012-en;jsessionid=15rsm1plg9255.x-oecd-live-02, last accessed on 25 September 2017.
- Office of Governor Edmund G. Brown Jr., *CA Governor Brown, NY Governor Cuomo and WA governor Inslee announce formation of U.S. Climate Alliance*, 2017a, available at: https://www.gov.ca.gov/news.php?id=19818, last accessed on 25 September 2017.
- Office of Governor Edmund G. Brown Jr., *Governor Brown welcomes new members to Under2 Coalition*, 2017b, available at: https://www.gov.ca.gov/news.php?id=19956, last accessed on 25 September 2017.
- Olivier, J.G.J., Janssens-Maenhout G., Muntean, M. and Peters J.A.H.W., *Trends in global CO_2 emissions: 2014 Report*, JRC report 93171 / PBL report 1490, PBL Netherlands Environmental Assessment Agency, The Hague, 2014, available at: http://edgar.jrc.ec.europa.eu/news_docs/jrc-2014-trends-in-global-co2-emissions-2014-report-93171.pdf, last accessed on 25 September 2017.
- Olivier, J.G.J., Janssens-Maenhout, G., Muntean, M. and Peters J.A.H.W., *Trends in global CO_2 emissions: 2015 Report*, JRC report 98184 / PBL report 1803, PBL Netherlands Environmental Assessment Agency, The Hague, 2015, available at: http://edgar.jrc.ec.europa.eu/news_docs/jrc-2015-trends-in-global-co2-emissions-2015-report-98184.pdf, last accessed on 25 September 2017.
- Olivier, J.G.J., Janssens-Maenhout, G., Muntean, M. and Peters, J.A.H.W., *Trends in global CO_2 emissions: 2016 Report*, JRC report 103428 / PBL report 2315, PBL Netherlands

Environmental Assessment Agency, The Hague, 2016, available at: http://edgar.jrc.ec.europa.eu/news_docs/jrc-2016-trends-in-global-co2-emissions-2016-report-103425.pdf, last accessed on 25 September 2017.

- People's Republic of China, *Enhanced actions on climate change: China's intended nationally determined contributions*, 2015, available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/China/1/China's%20INDC%20-%20on%2030%20June%202015.pdf, last accessed on 25 September 2017.
- People's Republic of China, *The People's Republic of China First Biennial Update Report on Climate Change*, 2016, available at: http://unfccc.int/files/national_reports/non-annex_i_parties/biennial_update_reports/application/pdf/pr_china-_bur-chinese+en.pdf, last accessed on 25 September 2017.
- People's Republic of China, *China tops the world in installed photovoltaic capacity*, 2017, available at: http://english.gov.cn/news/top_news/2017/02/07/content_281475561436579.htm, last accessed on 25 September 2017.
- Peters, G., *How much carbon dioxide can we emit?*, 2017, available at: http://www.cicero.uio.no/en/posts/climate-news/how-much-carbon-dioxide-can-we-emit, last accessed on 25 September 2017.
- Politico, *Macron plans December climate summit*, 2017, available at: http://www.politico.eu/article/macron-plans-december-climate-summit/, last accessed on 25 September 2017.
- Regulation (EU) No 517/2014 *of the European Parliament and of the Council of 16 April 2014 on fluorinated gases and repealing Regulation (EC) No 842/2006*, 2014, OJ L 150, p.195-230, available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0517&from=EN, last accessed on 25 September 2017.
- Regulation (EU) 2015/757 *of the European Parliament and of the Council of 29 April 2015 on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport, and amending Directive 2009/16/EC*, 2015, OJ L 123, p. 55-75, available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015R0757&from=EN, last accessed on 25 September 2017.
- REN21 – Energy Policy Network for the 21st Century, *Renewables 2017 – Global Status Report*, 2017, available at: http://www.ren21.net/status-of-renewables/global-status-report/, last accessed on 25 September 2017.
- Republic of Korea, *Korea's Third National Communication under the United Nations Framework Convention in Climate Change*, 2012, Ministry of Environment, available at: http://unfccc.int/resource/docs/natc/kornc3.pdf, last accessed on 25 September 2017.
- Republic of Korea, *First Biennial Update Report of the Republic of Korea*, 2014, Greenhouse Gas Inventory & Research Center of Korea, available at: http://unfccc.int/resource/docs/natc/rkorbur1.pdf, last accessed on 25 September 2017.
- Republic of Korea, *Submission by the Republic of Korea: Intended Nationally Determined Contribution,* 2015, available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Republic%20of%20Korea/1/INDC%20Submission%20by%20the%20Republic%20of%20Korea%20on%20June%2030.pdf, last accessed on 25 September 2017.

- Republic of South Africa, *Joint statement issued at the conclusion of the 24th BASIC Ministerial Meeting on Climate Change*, 2017, available at: https://www.environment.gov.za/mediarelease/jointstatementon24thbasicministerialmeetingonclimatechange, last accessed on 25 September 2017.
- Reuters, *U.S., China ratify Paris climate agreement*, 2016a, available at: http://www.reuters.com/article/us-china-climatechange-idUSKCN11901W?il=0, last accessed on 25 September 2017.
- Reuters, *Russia at odds with Chinese, U.S. push for fast approval of climate pact*, 2016b, available at: http://www.reuters.com/article/us-climatechange-russia-idUSKCN0YG1VR, last accessed on 25 September 2017.
- Reuters, *France, Italy, Germany defend Paris Accord, say cannot be renegotiated*, 2017a, available at: http://www.reuters.com/article/us-usa-climatechange-eu-idUSKBN18S6GN, last accessed on 25 September 2017.
- Reuters, *Defying Trump, Senate panel approves funding for U.N. climate body*, 2017b, available at: https://www.reuters.com/article/us-usa-congress-climatechange/defying-trump-senate-panel-approves-funding-for-u-n-climate-body-idUSKCN1BJ1LA, last accessed on 25 September 2017.
- Revkin, A., *Failure to Set Cost of Carbon Hampers Trump's Effort to Expand Use of Fossil Fuels*, 2017, available at: https://www.propublica.org/article/failure-to-set-cost-of-carbon-hampers-trumps-effort-to-expand-use-of-fossil-fuels, last accessed on 25 September 2017.
- RINGOs, *About*, 2017, available at: https://ringosnet.wordpress.com/about/, last accessed on 25 September 2017.
- Rogelj, J., den Elzen, M., Höhne, N., Fransen, T., Fekete, H., Winkler, H., Schaeffer, R., Sha, F., Riahi, K. and Meinshausen, M., 'Paris Agreement climate proposals need a boost to keep warming well below 2 °C', *Nature*, 534, 631–639 doi:10.1038/nature18307, 2016, available at: http://www.nature.com/nature/journal/v534/n7609/abs/nature18307.html#author-information, last accessed on 25 September 2017.
- Russian Federation, *First Biennial Report of the Russian Federation,* 2014, Federal Service for Hydrometeorology and Environmental Monitoring, available at: http://unfccc.int/files/national_reports/biennial_reports_and_iar/submitted_biennial_reports/application/pdf/1br_rus_unoffical_translation_eng.pdf, last accessed on 25 September 2017.
- Russian Federation, *National Inventory of the Russian Federation for the years 1990-2015.* 2017, available at: http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/rus-2017-nir-25jul17.zip, last accessed on 25 September 2017.
- Saudi Arabia, *Second National Communication of the Kingdom of Saudi Arabia*, 2011, available at: http://unfccc.int/resource/docs/natc/saunc2.pdf, last accessed on 25 September 2017.
- Saudi Arabia, *The Intended Nationally Determined Contribution of the Kingdom of Saudi Arabia under the UNFCCC*, 2015, available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Saudi%20Arabia/1/KSA-INDCs%20English.pdf, last accessed on 25 September 2017.
- Saudi Arabia, *Third National Communication of the Kingdom of Saudi Arabia*, 2016a, available at: http://unfccc.int/files/national_reports/non-annex_i_natcom/application/zip/saudi_arabia_nc3_22_dec_2016.zip, last accessed on 25 September 2017.

- Saudi Arabia, *Saudi Vision 2030*, 2016b, available at: http://vision2030.gov.sa/en, last accessed on 25 September 2017.
- Wade, L, 'North American energy deal places focus on Mexico', *Science*, DOI: 10.1126/science.aaf5831, 2016, available at: http://www.sciencemag.org/news/2016/07/north-american-energy-deal-places-focus-mexico, last accessed on 25 September 2017.
- Shamsuddoha, Md., *Climate-Induced Displacement and Migration: Policy Gaps and Policy Alternative*, 2015, Center for Participatory Research and Development, available at: https://unfccc.int/files/adaptation/groups_committees/loss_and_damage_executive_committee/application/pdf/briefing_paper_climate_induced_displacement_and_migration.pdf, last accessed on 25 September 2017.
- Shearer C., Ghio, N., Myllyvirta, L., Yu, A. and Nac, T.: *Boom and Bust 2016. Tracking the global coal plant pipeline,* CoalSwarm, Greenpeace, and Sierra Club, 2016, available at: http://sierraclub.org/sites/www.sierraclub.org/files/uploads-wysiwig/final%20boom%20and%20bust%202017%20%283-27-16%29.pdf, last accessed on 25 September 2017.
- SLOCAT – Partnership on Sustainable, Low Carbon Transport Foundation, *Pacific leads High Ambition Coalition for Shipping emission reduction*, 2017, available at: http://www.slocat.net/news/1830, last accessed on 25 September 2017.
- South Africa, *South Africa's 1st Biennial Update Report*, 2014, available at: http://unfccc.int/resource/docs/natc/zafbur1.pdf, last accessed on 25 September 2017.
- South Africa, *Intended Nationally Determined Contribution (INDC)*, 2015, available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/South%20Africa/1/South%20Africa.pdf, last accessed on 25 September 2017.
- Takashina, J., *Japan's Global Warming Countermeasures*, 2017, available at: http://www.eu-japan.eu/sites/default/files/presentations/docs/takashina_en.pdf, last accessed on 25 September 2017.
- The Economist, *The Caribbean's pioneering form of disaster insurance*, 2017, available at: https://www.economist.com/news/americas/21729003-too-little-not-too-late-caribbeans-pioneering-form-disaster-insurance, last accessed on 25 September 2017.
- The Guardian, *Britain to ban sale of all diesel and petrol cars and vans from 2040*, 2017, available at: https://www.theguardian.com/politics/2017/jul/25/britain-to-ban-sale-of-all-diesel-and-petrol-cars-and-vans-from-2040, last accessed on 25 September 2017.
- The Hankyoreh, *Greenhouse gas reductions announced, a major step back from last year,* 2016, available at: http://english.hani.co.kr/arti/english_edition/e_national/773646.html, last accessed on 25 September 2017.
- The Washington Post, *Richest nations fail to agree on deadline to phase out fossil fuel subsidies*, 2016, available at: https://www.washingtonpost.com/world/richest-nations-fail-to-agree-on-deadline-to-phase-out-fossil-fuel-subsidies/2016/07/01/7db563fb-42f0-46c8-bea4-2fcfc0f48c69_story.html, last accessed on 25 September 2017.
- The White House, *U.S.-China Joint Presidential Statement on Climate Change*, 2015, available at: https://www.whitehouse.gov/the-press-office/2015/09/25/us-china-joint-presidential-statement-climate-change, last accessed on 25 September 2017.
- The White House, *U.S.-China Climate Change Cooperation Outcomes*, 2016a, available at: https://www.whitehouse.gov/the-press-office/2016/09/03/fact-sheet-us-china-cooperation-climate-change, last accessed on 25 September 2017.

- The White House, *Strengthening Tools to Account for Damages from Greenhouse Gas Emissions in Regulatory Analysis*, 2016b, available at: https://obamawhitehouse.archives.gov/blog/2016/08/26/strengthening-tools-account-damages-greenhouse-gas-emissions-regulatory-analysis, last accessed on 25 September 2017.
- The White House, *U.S.-Canada Joint Statement on Climate, Energy, and Arctic Leadership*, 2016c, available at: https://www.whitehouse.gov/the-press-office/2016/03/10/us-canada-joint-statement-climate-energy-and-arctic-leadership, last accessed on 25 September 2017.
- The White House, *Leaders' Statement on a North American Climate, Clean Energy, and Environment Partnership*, 2016d, available at: https://www.whitehouse.gov/the-press-office/2016/06/29/leaders-statement-north-american-climate-clean-energy-and-environment, last accessed on 25 September 2017.
- The White House, *Presidential Executive Order on Promoting Energy Independence and Economic Growth*, 2017a, available at: https://www.whitehouse.gov/the-press-office/2017/03/28/presidential-executive-order-promoting-energy-independence-and-economi-1, last accessed on 25 September 2017.
- The White House, *Statement by President Trump on the Paris Climate Accord*, 2017b, available at: https://www.whitehouse.gov/the-press-office/2017/06/01/statement-president-trump-paris-climate-accord, last accessed on 25 September 2017.
- Tong, A., *Migration is the "brutal reality" of climate change*, 2016, available at: http://www.climatechangenews.com/2016/06/21/anote-tong-migration-is-the-brutal-reality-of-climate-change/, last accessed on 25 September 2017.
- Track 0, *High Ambition Coalition help reach ambitious deal on HFCs in Kigali*, 2016, available at: http://track0.org/2016/10/high-ambition-coalition-help-reach-ambitious-deal-on-hfcs-in-kigali/, last accessed on 25 September 2017.
- TWN – Third World Network, *Climate talks close with developing countries calling for strong pre-2020 action*, 2016a, available at: https://twnetwork.org/climate-change/climate-talks-close-developing-countries-calling-strong-pre-2020-action, last accessed on 25 September 2017.
- TWN – Third World Network, *SBSTA: Developing countries disappointed over opposition to references to UNFCCC*, 2016b, available at: http://twnetwork.org/climate-change/sbsta-developing-countries-disappointed-over-opposition-references-unfccc, last accessed on 25 September 2017.
- Umweltbundesamt – Environment Agency Austria, *Klimaschutzbericht 2017, REP-0622*, 2017, available at: http://www.umweltbundesamt.at/fileadmin/site/publikationen/REP0622.pdf, last accessed on 25 September 2017.
- UNCCD – United Nations Convention to Combat Desertification, *Drought, Food Security, Migration and Climate: Implications for Policy and Conflict*, 2016, available at: http://www.unccd.int/en/media-center/MediaNews/Pages/highlightdetail.aspx?HighlightID=469, last accessed on 25 September 2017.
- UNCTAD – United Nations Conference on Trade and Development, *UN list of Least Developed Countries*, 2017, available at: http://unctad.org/en/pages/aldc/Least%20Developed%20Countries/UN-list-of-Least-Developed-Countries.aspx, last accessed on 25 September 2017.
- Under 2 MOU - Subnational Global Climate Leadership Memorandum of Understanding, *Background on the Under2,* 2017, available at: http://under2mou.org/background/, last accessed on 25 September 2017.

- UNDP, *What does the COP21 Paris Agreement mean for Africa?*, 2015, available at: http://www.africa.undp.org/content/rba/en/home/ourperspective/ourperspectivearticles/2015/12/17/what-does-the-cop21-paris-agreement-mean-for-africa-.html, last accessed on 25 September 2017.
- UNEP – United Nations Environment Programme, *Montreal Protocol on Substances that Deplete the Ozone Layer*, 1987, available at: http://ozone.unep.org/en/handbook-montreal-protocol-substances-deplete-ozone-layer/5, last accessed on 25 September 2017.
- UNEP – United Nations Environment Programme, *Women at the frontline of climate change: Gender risks and hopes, A rapid Response Assessment*, 2011, available at: http://www.grida.no/publications/198, last accessed on 25 September 2017.
- UNEP – United Nations Environment Programme, *The Emissions Gap Report 2016*, 2016a, available at: http://uneplive.unep.org/theme/index/13#egr, last accessed on 25 September 2017.
- UNEP – United Nations Environment Programme, *The Montreal Protocol on Substances that Deplete the Ozone Layer (consolidated text)*, 2016b, available at: http://ozone.unep.org/sites/ozone/files/pdfs/Consolidated-Montreal-Protocol-November-2016.pdf, last accessed on 25 September 2017.
- UNEP – United Nations Environment Programme, *Frequently asked questions relating to the Kigali Amendment to the Montreal Protocol*, 2017a, available at: http://ozone.unep.org/sites/ozone/files/pdfs/FAQs_Kigali_Amendment.pdf, last accessed on 25 September 2017.
- UNEP – United Nations Environment Programme, *Ozone Secretariat – In Focus*, 2017b, available at: http://ozone.unep.org/en/focus, last accessed on 25 September 2017.
- UNFCCC, *United Nations Framework Convention on Climate Change,* New York, 1992, available at: http://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf, last accessed on 25 September 2017.
- UNFCCC, *Kyoto Protocol to the United Nations Framework Convention on Climate Change,* Kyoto, 1997, available at: http://unfccc.int/resource/docs/convkp/kpeng.pdf, last accessed on 25 September 2017.
- UNFCCC, *Leaders Event and High Level Segment*, 2015a, available at: http://newsroom.unfccc.int/cop21parisinformationhub/cop-21cmp-11-information-hub-leaders-and-high-level-segment/, last accessed on 25 September 2017.
- UNFCCC, *Paris Agreement*, 2015b, available at: http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf, last accessed on 25 September 2017.
- UNFCCC, *Statements made during the Leaders Event at the Paris Climate Change Conference – COP 21 / CMP 11*, 2015c, available at: http://unfccc.int/meetings/paris_nov_2015/items/9331.php, last accessed on 25 September 2017.
- UNFCCC, *Global Climate Action Agenda – Climate Champions Release Detailed Roadmap,* 2016a, available at: http://newsroom.unfccc.int/climate-action/global-climate-action-agenda/#Roadmap, last accessed on 25 September 2017.
- UNFCCC, *Aggregate effect of the intended nationally determined contributions: an update*, 2016b, available at: http://unfccc.int/resource/docs/2016/cop22/eng/02.pdf, last accessed on 25 September 2017.
- UNFCCC, *Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015, Annex I*, FCCC/CP/2015/10, p. 30, 2016c,

available at: http://unfccc.int/resource/docs/2015/cop21/eng/10.pdf, last accessed on 25 September 2017.

- UNFCCC, *Marrakech Action Proclamation for our Climate and Sustainable Development*, 2016d, available at: http://unfccc.int/files/meetings/marrakech_nov_2016/application/pdf/marrakech_action_proclamation.pdf, last accessed on 25 September 2017.
- UNFCCC, *Africa Renewable Energy Initiative Increasing Renewable Energy Capacity*, 2016e, available at: http://newsroom.unfccc.int/lpaa/renewable-energy/africa-renewable-energy-initiative-increasing-renewable-energy-capacity-on-the-african-continent/, last accessed on 25 September 2017.
- UNFCCC, *Admitted NGO*, 2016f, available at: http://unfccc.int/parties_and_observers/ngo/items/9411.php, last accessed on 25 September 2017.
- UNFCCC, *Status of the Doha Amendment*, 2017a, available at: http://unfccc.int/kyoto_protocol/doha_amendment/items/7362.php, last accessed on 25 September 2017.
- UNFCCC, *INDCs as communicated by Parties*, 2017b, available at: http://www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx, last accessed on 25 September 2017.
- UNFCCC, *NDC Registry (interim)*, 2017c, available at: http://www4.unfccc.int/ndcregistry/pages/All.aspx, last accessed on 25 September 2017.
- UNFCCC, *NAZCA – accelerating climate action*, 2017d, available at: http://climateaction.unfccc.int/, last accessed on 25 September 2017.
- UNFCCC, *Paris Agreement – Status of Ratification*, 2017e, available at: http://unfccc.int/paris_agreement/items/9444.php, last accessed on 25 September 2017.
- *UNFCCC*, *Entry into force of the Paris Agreement: legal requirements and implications*, 2017f, available at: http://unfccc.int/files/paris_agreement/application/pdf/entry_into_force_of_pa.pdf, last accessed on 25 September 2017.
- UNFCCC, *On the Possibility to Withdraw from the Paris Agreement: A Short Overview*, 2017g, available at: http://newsroom.unfccc.int/paris-agreement/on-the-possibility-to-withdraw-from-the-paris-agreement-a-short-overview/, last accessed on 25 September 2017.
- UNFCCC, *UN Climate Change Conference – November 2017,* 2017h, available at: http://unfccc.int/meetings/bonn_nov_2017/meeting/10084.php, last accessed on 25 September 2017.
- UNFCCC, *Capacity-building: Frameworks,* 2017i, available at: http://unfccc.int/cooperation_and_support/capacity_building/items/7203.php, last accessed on 25 September 2017.
- UNFCCC, *Bonn Climate Change Conference, May 2017,* 2017j, available at: http://unfccc.int/meetings/bonn_may_2017/meeting/10076.php, last accessed on 25 September 2017.
- UNFCCC, *Progress tracker – Work programme resulting from the relevant requests contained in decision 1/CP.21,* 2017k, available at: http://unfccc.int/paris_agreement/items/9485.php, last accessed on 25 September 2017.
- UNFCCC, *First ad hoc Technical Expert Group on the impact of the implementation of response measures*, 2017l, available at: http://unfccc.int/cooperation_support/response_measures/items/10142.php, last accessed on 25 September 2017.

- UNFCCC, *Forum on the impact of the implementation of response measures*, 2017m, available at: http://unfccc.int/cooperation_support/response_measures/items/7418.php, last accessed on 25 September 2017.
- UNFCCC, *Statistics about observer organizations in the UNFCCC process*, 2017n, available at: http://unfccc.int/parties_and_observers/observer_organizations/items/9545.php, last accessed on 25 September 2017.
- UNFCCC, *YOUNGO (UNFCCC observer constituency of youth non-governmental organisations)*, 2017o, available at: https://unfccc.int/cc_inet/cc_inet/youth_portal/items/6795.php, last accessed on 25 September 2017.
- UNFCCC, *UN Climate Change Conference 6-17 November 2017 – Overview Schedule*, 2017p, available at: http://unfccc.int/files/meetings/bonn_nov_2017/application/pdf/os_nov2017.pdf, last accessed on 25 September 2017.
- UNFCCC, *COP23 Official Side Events and Exhibits,* 2017q, available at: http://newsroom.unfccc.int/cop-23-bonn/cop23-official-side-events-and-exhibits/, last accessed on 25 September 2017.
- UNFCCC, *UNFCCC Climate Change Studio*, 2017r, available at: https://www.youtube.com/channel/UCSbUPgmmKUTzRmspKM9DpuQ, last accessed on 25 September 2017.
- UNFCCC, *National Reports*, 2017s, available at: http://unfccc.int/national_reports/items/1408.php, last accessed on 25 September 2017.
- United Nations, *The World Bank Group and the United Nations – Working Together for Development*, 2015a, available at: http://www.un.org/esa/ffd/ffd3/wp-content/uploads/sites/2/WBG-UN-Brochure.pdf, last accessed on 25 September 2017.
- United Nations, *Transforming our world: the 2030 Agenda for Sustainable Development*, Resolution adopted by the General Assembly on 25 September 2015, 2015b, available at: http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/70/1, last accessed on 25 September 2017.
- United Nations, *Sendai Framework for Disaster Risk Reduction 2015-2030*, 2015c, available at: http://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf, last accessed on 25 September 2017.
- United Nations, *Paris Climate Agreement Moves Closer to Entry into Force in 2016*, 2016a, available at: http://www.un.org/sustainabledevelopment/blog/2016/09/paris-climate-agreement-moves-closer-to-entry-into-force-in-2016/, last accessed on 25 September 2017.
- United Nations, *With 'unstoppable' momentum, Paris climate pact set for early November entry into force – UN chief*, 2016b, available at: http://www.un.org/apps/news/story.asp?NewsID=55219#.V_dI72zyldg, last accessed on 25 September 2017.
- United Nations, Glossary of terms relating to Treaty actions, 2017a, available at: https://treaties.un.org/Pages/Overview.aspx?path=overview/glossary/page1_en.xml, last accessed on 25 September 2017.
- United Nations, *Millennium Development Goals and Beyond 2015*, 2017b, available at: https://www.un.org/millenniumgoals/bkgd.shtml, last accessed on 25 September 2017.
- United States of America, *Intended Nationally Determined Contribution,* 2015, available at: http://www4.unfccc.int/submissions/INDC/Published%20Docu-

ments/United%20States%20of%20America/1/U.S.%20Cover%20Note%20INDC%20and%20Accompanying%20Information.pdf, last accessed on 25 September 2017.

- UN-REDD, *About the UN-REDD Programme*, 2017, available at: http://www.un-redd.org/, last accessed on 25 September 2017.
- U.S. Department of State, *Communication Regarding Intent To Withdraw From Paris Agreement*, 2017, available at: https://www.state.gov/r/pa/prs/ps/2017/08/273050.htm, last accessed on 25 September 2017.
- U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014*, EPA 430-P-17-001, 2017, available at: http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/usa-2017-nir-14apr17.zip, last accessed on 25 September 2017.
- U.S. Supreme Court, Massachusetts et al. v. Environmental Protection Agency et al. 2007, available at: https://supreme.justia.com/cases/federal/us/549/497/, last accessed on 25 September 2017.
- V20, *V20 economies announce new climate finance initiatives*, 2017, available at: http://www.v-20.org/v20-economies-announce-new-climate-finance-initiatives/, last accessed on 25 September 2017.
- Waqa, D., *AOSIS High Level Statement Delivered at COP 20 in Lima*, 2014, available at: http://aosis.org/aosishigh-level-statement-delivered-at-cop-20-in-lima/, last accessed on 25 September 2017.
- WGC – Women and Gender Constituency, *Our background*, 2017, available at: http://womengenderclimate.org/our-background/, last accessed on 25 September 2017.
- World Bank Group, *World Bank Group Pledges One-Third Increase in Climate Financing*, 2015, available at: http://www.worldbank.org/en/news/press-release/2015/10/09/world-bank-group-pledges-one-third-increase-climate-financing, last accessed on 25 September 2017.
- World Bank Group, *GDP per capita, PPP (current international $)*, 2016a, available at: http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD, last accessed on 25 September 2017.
- World Bank Group, *The World Bank Group A to Z*, 2016b, available at: https://openknowledge.worldbank.org/handle/10986/22548, last accessed on 25 September 2017.
- World Bank Group, *World Bank Group Climate Change Action Plan*, 2016c, available at: http://pubdocs.worldbank.org/en/677331460056382875/WBG-Climate-Change-Action-Plan-public-version.pdf, last accessed on 25 September 2017.
- World Bank Group, *About the World Bank*, 2017a, available at: http://www.worldbank.org/en/about, last accessed on 25 September 2017.
- World Bank Group, *What We Do*, 2017b, available at: http://www.worldbank.org/en/about/what-we-do, last accessed on 25 September 2017.
- World Bank Group, *Organization*, 2017c, available at: http://www.worldbank.org/en/about/leadership, last accessed on 25 September 2017.

- World Bank Group, *World Bank Board Approves New Environmental and Social Framework*, 2017d, available at: http://www.worldbank.org/en/news/press-release/2016/08/04/world-bank-board-approves-new-environmental-and-social-framework, last accessed on 25 September 2017.
- World Bank Group, *Heads of UN and World Bank Announce Initiative to Ramp up Finance for Climate Action*, 2017e, available at: http://www.worldbank.org/en/news/press-release/2017/09/20/heads-of-un-and-world-bank-announce-initiative-to-ramp-up-finance-for-climate-action?CID=CCG_TT_climatechange_EN_EXT, last accessed on 25 September 2017.
- World Bank Group, *Carbon Tax Guide: A Handbook for Policy Makers*, 2017f, available at: https://openknowledge.worldbank.org/handle/10986/26300, last accessed on 25 September 2017.
- World Bank Group, *Climate Change Knowledge Portal*, 2017g, available at: http://sdwebx.worldbank.org/climateportal/, last accessed on 25 September 2017.
- WRI – World Resource Institute, *5 Questions: What Does China's New Five-Year Plan Mean for Climate Action?*, 2016a, available at: http://www.wri.org/blog/2016/03/5-questions-what-does-chinas-new-five-year-plan-mean-climate-action, last accessed on 25 September 2017.
- WRI – World Resource Institute, *Paris Agreement: Getting Closer to "Entering into Force" this Year*, 2016b, available at: http://www.wri.org/blog/2016/07/paris-agreement-getting-closer-entering-force-year, last accessed on 25 September 2017.
- WRI – World Resource Institute, *The World Bank Just Overhauled its Safeguards for the First Time in 30 Years*, 2016c, available at: http://www.wri.org/blog/2016/08/world-bank-just-overhauled-its-safeguards-first-time-30-years, last accessed on 25 September 2017.
- WRI – World Resources Institute, *CAIT Climate Data Explorer*, 2017a, available at: http://cait.wri.org/, last accessed on 25 September 2017.
- World Wildlife Fund, *We are still in*, 2017, available at: http://wearestillin.com/, last accessed on 25 September 2017.
- Xu, Y., Zaelke, D., Velders, G. J. M. and Ramanathan, V., 'The Role of mitigation 21st century climate change', Atmos. Chem. Phys., 13, 6083-6089, doi:10.6194/acp-13-6083-2013, 2013, available at: https://www.atmos-chem-phys.net/13/6083/2013/, last accessed on 25 September 2017.

INDEX

Pages where terms/concepts are described in detail are marked in **bold**.

ANNEX 1: CONTENTS OF THE PARIS AGREEMENT

Table 10: Key contents of the Paris Agreement by topic

Topic	Key contents
Long-term goals (for more information, see chapter 3)	Holding the increase in the global average temperature to well below 2 degrees C above pre-industrial levels and to pursue efforts to limit this increase to 1.5 degrees C. Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development. Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development (Article 2).
Mitigation (see chapter 3.1)	All Parties undertake and communicate ambitious efforts, progressing over time ("Nationally Determined Contributions", Article 3). Parties aim at achieving the long-term temperature goal by reaching global peaking of greenhouse gas emissions as soon as possible and achieving a balance between anthropogenic emissions by sources and removals by sinks in the second half of the century (Article 4). The Agreement provides for voluntary cooperation between Parties to fulfil their Nationally Determined Contributions (Article 6).
Adaptation (See chapter 3.2)	A global goal for adaptation is established. It includes the enhancement of adaptive capacity, the strengthening of resilience and the reduction of vulnerability to climate change. Each Party shall, as appropriate, engage in adaptation planning and in the implementation of actions (Article 7).
Loss and damage (See chapter 3.3)	Parties recognise the importance of averting, minimising and addressing loss and damage associated with the adverse effects of climate change. The existing Warsaw International Mechanism for Loss and Damage is strengthened and will continue to operate under the Paris Agreement (Article 8).
Finance (see chapter 3.4)	Developed country Parties shall provide financial resources to assist developing country Parties in mitigation and adaptation. Other Parties are encouraged to provide such support voluntarily (Article 9).
Technology development and transfer (see chapter 3.5)	A technology framework is established to support the existing technology mechanism under the Convention. It aims at promoting and facilitating technology development and transfer (Article 10).

Topic	Key contents
Capacity-building (see chapter 3.6)	The capacity and ability of developing country Parties to take effective action should be enhanced. Such capacity-building should be country driven and progress shall be regularly communicated. Developed country Parties should enhance their support and capacity-building activities shall be enhanced through appropriate institutional arrangements (Article 11).
Transparency of action and support (see chapter 3.7)	In order to build mutual trust and confidence and to promote effective implementation, a transparency framework is established. It builds on the experiences of the transparency arrangements under the Convention, such as National Communications, but also introduces national inventory reports and reviews for all Parties (Article 13).
Global stocktake and increasing ambition (see chapter 3.8)	Collective progress towards achieving the purpose and the long-term goals of the Paris Agreement is assessed every five years, starting in 2023. The outcome of this stocktake shall inform Parities in enhancing national actions and international cooperation (Article 14).
Compliance, meetings, entry into force (see chapters 3.9 and 4.1)	An expert-based committee will be established to facilitate implementation of the Agreement and to promote compliance with its provisions (Article 15). The Conference of the Parties under the Convention serves as the meeting of the Parties to the Paris Agreement (CMA) (Article 16). The Agreement is open for signature and subject to ratification, acceptance or approval by Parties to the UNFCCC. It is open for signature for one year starting on 22 April 2016. Thereafter, it is open for accession (Article 20). The Paris Agreement enters into force on the 30th day after the date on which at least 55 Parties accounting in total for at least 55 % of the global greenhouse gas emissions have deposited their instrument of ratification (Article 21).

Source: UNFCCC 2015e.

ANNEX 2: ELEMENTS OF THE DECISION ACCOMPANYING THE PARIS AGREEMENT

Table 11: Important elements of Decision 1/CP.21

Topic	Key contents
Adoption of the Paris Agreement (see chapter 3)	The Conference of the Parties adopts the Paris Agreement, which is presented as an Annex to the Decision (Paragraph 1).
Ad Hoc Working Group on the Paris Agreement (see chapter 4.2)	The Ad Hoc Working Group on the Paris Agreement (APA) is established, which shall prepare for the entry into force of the Agreement (Paragraphs 7 to 11).
Intended Nationally Determined Contributions (see Box 8)	The contributions which were communicated by Parties ahead of the Paris conference are welcomed, but it is noted with concern that much greater efforts will be required to meet the temperature goals of the Paris Agreement (Paragraphs 12 and 17).
Facilitative dialogue in 2018 (see chapter 3.8)	In 2018, a facilitative dialogue is convened to take stock of the collective efforts of Parties towards the long-term goals of the Agreement (Paragraph 20).
Long-term low emission development strategies (see chapter 3.1)	Parties are invited to communicate, by 2020, mid-century long-term low greenhouse gas emission development strategies (Paragraph 35).
Loss and damage (see chapter 3.3)	The provisions on loss and damage do not involve or provide a basis for any liability or compensation (Paragraph 51).
Finance (see chapter 3.4)	Developed country Parties intend to collectively mobilise USD 100 billion climate finance per year from 2020 to 2025. Afterwards, a new goal shall be set from a floor of USD 100 billion (Paragraph 53).
Paris Committee on Capacity-building (see chapter 3.6)	The Paris Committee on Capacity-building is established. Its aim is to address gaps and needs in implementing capacity-building in developing country Parties. Its aim is also to further enhance capacity-building efforts (Paragraph 71).

Topic	Key contents
Enhanced action prior to 2020 (see chapter 3.10)	The existing technical examination process on mitigation is strengthened. This process highlights policies, practices and technologies with a high mitigation potential, using the format of technical expert meetings (Paragraph 109). The engagement of non-Party stakeholders is pointed out and encouraged (Paragraphs 117 to 119). A high-level event at each COP from 2016 to 2020 provides an opportunity for announcing new or strengthened efforts, initiatives and coalitions (Paragraph 120). High-level champions are appointed to facilitate and scale up current mitigation and adaptation efforts (Paragraph 121). A technical examination process on adaptation is launched for the period 2016 to 2020 (Paragraphs 124 to 132).
Non-Party stakeholders (see chapters 3.10 and 7)	Non-Party stakeholders, including those of civil society, the private sector, financial institutions, cities and other sub-national authorities are invited to scale up their mitigation and adaptation efforts (Paragraph 134).

Source: Decision 1/CP.21.

ANNEX 3: GROUPS OF COUNTRIES AND THEIR MEMBERS

Table 12: Overview of the Parties' affiliation to groups

Group (cf. chapter 6) / Party	African group	AILAC	ALBA	AOSIS	Arab group	BASIC	EIG	European Union	G-77 and China	LDC	LMDC	Umbrella group
Afghanistan									x	x		
Albania												
Algeria	x				x				x		x	
Andorra												
Angola	x								x	x		
Antigua and Barbuda			x	x					x			
Argentina									x			
Armenia												
Australia (cf. chapter 5.11)												x
Austria								x				
Azerbaijan												
Bahamas				x					x			
Bahrain					x				x			
Bangladesh									x	x	x	
Barbados				x					x			
Belarus												o
Belgium								x				
Belize				x					x			
Benin	x								x	x		
Bhutan									x	x		
Bolivia (Plurinational State of)			x						x		x	
Bosnia and Herzegovina									x			
Botswana	x								x			
Brazil (cf. chapter 5.11)						x			x			

Party \ Group (cf. chapter 6)	African group	AILAC	ALBA	AOSIS	Arab group	BASIC	EIG	European Union	G-77 and China	LDC	LMDC	Umbrella group
Brunei Darussalam									x			
Bulgaria								x				
Burkina Faso	x								x	x		
Burundi	x								x	x		
Cabo Verde	x			x					x			
Cambodia									x	x		
Cameroon	x								x			
Canada (cf. chapter 5.9)												x
Central African Republic	x								x	x		
Chad	x								x	x		
Chile		x							x			
China (cf. chapter 5.1)						x			x		x	
Colombia		x							x			
Comoros	x			x	x				x	x		
Congo	x								x			
Cook Islands				x								
Costa Rica		x							x			
Côte d'Ivoire	x								x			
Croatia								x				
Cuba			x	x					x		x	
Cyprus								x				
Czech Republic								x				
Democratic People's Republic of Korea									x			
Democratic Republic of the Congo	x								x	x		
Denmark								x				

Group (cf. chapter 6) / Party	African group	AILAC	ALBA	AOSIS	Arab group	BASIC	EIG	European Union	G-77 and China	LDC	LMDC	Umbrella group
Djibouti	x				x				x	x		
Dominica			x	x					x			
Dominican Republic				x					x			
Ecuador			x						x		x	
Egypt	x				x				x		x	
El Salvador									x		x	
Equatorial Guinea	x								x			
Eritrea	x								x	x		
Estonia								x				
Ethiopia	x								x	x		
European Union (cf. chapter 5.3)								x				
Fiji				x					x			
Finland								x				
France								x				
Gabon	x								x			
Gambia	x								x	x		
Georgia												
Germany								x				
Ghana	x								x			
Greece								x				
Grenada			x	x					x			
Guatemala		x							x			
Guinea	x								x	x		
Guinea-Bissau	x			x					x	x		
Guyana				x					x			
Haiti				x					x	x		
Honduras		x							x			

Party / Group (cf. chapter 6)	African group	AILAC	ALBA	AOSIS	Arab group	BASIC	EIG	European Union	G-77 and China	LDC	LMDC	Umbrella group
Hungary								x				
Iceland												
India (cf. chapter 5.4)						x			x		x	
Indonesia (cf. chapter 5.11)									x		x	
Iran (Islamic Republic of) (cf. chapter 5.7)									x		x	
Iraq					x				x		x	
Ireland								x				
Israel												o
Italy								x				
Jamaica				x					x			
Japan (cf. chapter 5.6)												x
Jordan					x				x		x	
Kazakhstan												x
Kenya	x								x			
Kiribati				x					x	x		
Kuwait					x				x		x	
Kyrgyzstan												
Lao People's Democratic Republic									x	x		
Latvia								x				
Lebanon					x				x			
Lesotho	x								x	x		
Liberia	x								x	x		
Libya	x				x				x			
Liechtenstein							x					
Lithuania								x				

Party / Group (cf. chapter 6)	African group	AILAC	ALBA	AOSIS	Arab group	BASIC	EIG	European Union	G-77 and China	LDC	LMDC	Umbrella group
Luxembourg								x				
Madagascar	x								x	x		
Malawi	x								x	x		
Malaysia									x		x	
Maldives				x					x			
Mali	x								x	x	x	
Malta								x				
Marshall Islands				x					x			
Mauritania	x				x				x	x		
Mauritius	x			x					x			
Mexico (cf. chapter 5.11)							x					
Micronesia (Federated States of)				x					x			
Monaco							x					
Mongolia									x			
Montenegro												
Morocco	x				x				x			
Mozambique	x								x	x		
Myanmar									x	x		
Namibia	x								x			
Nauru				x					x			
Nepal									x	x		
Netherlands								x				
New Zealand												x
Nicaragua			x						x		x	
Niger	x								x	x		
Nigeria	x								x			
Niue				x								

Party \ Group (cf. chapter 6)	African group	AILAC	ALBA	AOSIS	Arab group	BASIC	EIG	European Union	G-77 and China	LDC	LMDC	Umbrella group
Norway												x
Oman					x				x			
Pakistan									x		x	
Palau				x								
Panama		x							x			
Papua New Guinea				x					x			
Paraguay		x							x			
Peru		x							x			
Philippines									x			
Poland								x				
Portugal								x				
Qatar					x				x			
Republic of Korea (cf. chapter 5.8)							x					
Republic of Moldova												
Romania								x				
Russian Federation (cf. chapter 5.5)												x
Rwanda	x								x	x		
Saint Kitts and Nevis			x	x					x			
Saint Lucia			x	x					x			
Saint Vincent and the Grenadines			x	x					x			
Samoa				x					x			
San Marino												
Sao Tome and Principe	x			x					x	x		
Saudi Arabia (cf. chapter 5.10)					x				x		x	
Senegal	x								x	x		

Party / Group (cf. chapter 6)	African group	AILAC	ALBA	AOSIS	Arab group	BASIC	EIG	European Union	G-77 and China	LDC	LMDC	Umbrella group
Serbia												
Seychelles	x			x					x			
Sierra Leone	x								x	x		
Singapore				x					x			
Slovakia								x				
Slovenia								x				
Solomon Islands				x					x	x		
Somalia	x				x				x	x		
South Africa (cf. chapter 5.11)	x					x			x			
South Sudan	x								x	x		
Spain								x				
Sri Lanka									x		x	
State of Palestine					x				x			
Sudan	x				x				x	x	x	
Suriname				x					x			
Swaziland	x								x			
Sweden								x				
Switzerland							x					o
Syrian Arab Republic					x				x		x	
Tajikistan									x			
Thailand									x			
The Former Yugoslav Republic of Macedonia												
Timor-Leste				x					x	x		
Togo	x								x	x		
Tonga				x					x			
Trinidad and Tobago				x					x			
Tunisia	x				x				x			

Party \ Group (cf. chapter 6)	African group	AILAC	ALBA	AOSIS	Arab group	BASIC	EIG	European Union	G-77 and China	LDC	LMDC	Umbrella group
Turkey												
Turkmenistan									x			
Tuvalu				x						x		
Uganda	x								x	x		
Ukraine												x
United Arab Emirates					x				x			
United Kingdom of Great Britain and Northern Ireland								x				
United Republic of Tanzania	x								x	x		
United States of America (cf. chapter 5.2)												x
Uruguay									x			
Uzbekistan												
Vanuatu				x					x	x		
Venezuela (Bolivarian Republic of)			x						x		x	
Viet Nam									x		x	
Yemen					x				x	x		
Zambia	x								x	x		
Zimbabwe	x								x			

Note: o … observer
The 15 largest emitters of CO_2 in 2015 are marked in bold.

Source:
UNFCCC Party Groupings, http://unfccc.int/parties_and_observers/parties/negotiating_groups/items/2714.php
United Nations Regional Groups of Member States, http://www.un.org/depts/DGACM/RegionalGroups.shtml
UNCTAD list of Least Developed Countries, http://unctad.org/en/pages/aldc/Least%20Developed%20Countries/UN-list-of-Least-Developed-Countries.aspx
Climate Policy Observer – Umbrella Group, http://climateobserver.org/country-profiles/umbrella-group/.

NOTES

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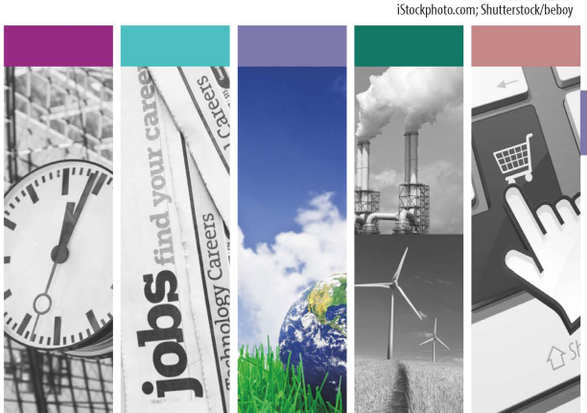

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