



Fiddling at the conference of the parties? Peeping into the highs and lows of the post-Kyoto climate change conferences: a review on contexts, decisions and implementation highlights

Harrington Nyirenda¹

Received: 14 October 2021 / Accepted: 25 November 2023
© The Author(s), under exclusive licence to Springer Nature B.V. 2023

Abstract

The Conference of the Parties (COPs) resulted in the development of the Kyoto Protocol and the Paris Agreement to reduce global warming by reducing greenhouse gas (GHG) emissions and deforestation by 2030. Over 25 years of COPs, coherent information is scanty on the status of the GHG emissions and deforestation within the period of the COP meetings especially after the ushering in of the Kyoto Protocol. With less than a decade to reach 2030, there is need for a review to gauge if the 2030 GHG reduction target is on course. This has a bearing on the attainment of the Sustainable Development Goals 1, 13, 14 and 15. A literature-based review was conducted on the status of GHG emissions (prior and during COP meetings) and deforestation covering the COP period. The review reveals that from 1976 to 1995 (prior to COP meetings), the annual GHG emissions were lower (32.44 ± 7 million kiloton) than during the decades (1999–2018) of the COP meetings (38.4 ± 9 million kiloton) ($p=0.0001$). Forest loss and tree cover loss (deforestation) increased by an average of 3.4 and 20.6 million ha per year, respectively. The COPs have resulted in the establishment of the Green Climate Fund, the Adaptation Fund and revamping of the Global Environment Facility on funding and response to proposals, although faced with inconsistent provision of climate finance. As major emitters, developed countries (G20) hold the key to achieving the GHG reduction. Policies that either promote sustainable forestry or reduce the reliance on trees/forests should be implemented.

Keywords Carbon markets · Climate finance · Common time frame · Deforestation · Greenhouse gases · UNFCCC

✉ Harrington Nyirenda
harrynyims@gmail.com

¹ Salima Agricultural Development Division, Ministry of Agriculture, Private Bag 1, Salima, Malawi

1 Introduction

The United Nations held its first conference on environment and climate change from 5 to 16 June, 1972 in Stockholm, Sweden, focussing on Human Environment (UN, 1973). The major output of the summit was the Stockholm Declaration and Action Plan for the Human Environment. The Declaration comprised 26 major principles which placed issues of environmental management as core developmental concerns and opened for dialogue between developed and undeveloped countries. The Action Plan had three components: (1) environmental management activities, (2) global environmental assessment, and (3) measures to support international and national environmental management initiatives. The Stockholm conference established the United Nations Environment Programme (UNEP). It also proposed another summit which was branded the Earth Summit and took place in Rio de Janeiro, Brazil from 3 to 14 June, 1992 (UN, 1973). The Earth Summit had broader focus on development at international and national levels in relation to environmental issues and their trend. The main products of the Earth Summit was the Agenda 21 (a package of actions to tackle negative impacts on the environment caused by unsustainable human interference with the environment), two *legally binding* conventions, the Biological Diversity (BD) and the United Nations Framework Convention on Climate Change (UNFCCC) (UN, 1993). The UNFCCC won signatures from 154 countries in the same year of the Rio Summit. It had three focal areas (Oberthur & Ott, 1999): (1) stability of atmospheric greenhouse gases (GHG), economic prosperity and sustainable food production, (2) reduction of the atmospheric GHG by developed countries, and (3) the birth of Conference of the Parties (COPs). The UNFCCC agreement had provisions for the Conference of the Parties which started in 1995. Since then, Parties meet yearly and it was at COP 3 (1997) in Kyoto, Japan where countries developed the Kyoto Protocol with a focus on: (1) reducing GHG among the protocol members and (2) trading of GHG gas emissions (Grub et al., 1999). The Kyoto Protocol, is arguably a well-known agreement and a forward step in tackling climate change.

Kyoto Protocol was delayed as some countries like the USA refused to ratify yet the country contributed 36% of the 55% of the total GHG emissions from all developed countries as of 1990. The 55% target GHG reduction was reached when Russia ratified the protocol and the protocol officially went into effect on 16 February, 2005, seven years since first negotiations. This means that Kyoto Protocol (with specific country GHG reduction targets) happened to be the first mandate agreed by countries. The protocol is currently ratified by 192 countries with notable exception of the US (UNFCCC, 2020). In 2015, the Parties developed the Paris Agreement in which the countries pledged to reduce GHG emissions (UNFCCC, 2016a). It could be expected that the formulation of these agreements should lead to a reduction of the GHG emissions.

2 Literature review (The need to monitor COP performance regarding GHG emissions)

The problems associated with climate change become worrying because they have effects on the present and future generations and significant impact on the global economy (IPCC, 2014). Mendelsohn et al. (2000) estimated that an increase in warming by 2 °C by 2060 will cause a gross domestic product (GDP) loss of about 0.3% per year. They predicted

that agriculture sector will be the most affected especially in low-income countries. Stern (2006) predicted an increase in temperature of between 2.4 and 5.8 °C by 2100, which will cause a 5% loss to global GDP per year for the next two centuries if no mitigation actions were taken. Of this loss, extreme weather events alone will cause 0.5–1% loss to the GDP per year by the middle of the century. Moreover, lack of mitigation action will double the GHG emissions by 2035 causing a warming of greater than 2 °C. An estimation by the Intergovernmental Panel on Climate Change (IPCC) predicted that an increase of 2 °C will cause an annual loss of 0.2–2% to the global GDP for the next two centuries (IPCC, 2014). It cautioned that if efforts on mitigation delay by 2030, it will be difficult to make a transition to ‘low long-term emission levels’. The World Bank (2014), through its study: Turn Down the Heat: Confronting the New Climate Normal, estimated that a global warming of about 1.5 °C (above pre-industrial period) was trapped in the atmosphere and its manifestation was inevitable. The study warned that if no meaningful actions were taken to cut the current emissions, the warming would reach 2 °C by mid-century and about 4 °C at the end of the century. About 80% of climate change damage will be experienced in the developing countries (Mendelsohn et al., 2006). Most effects of climate change will be felt in the Sub-Saharan Africa (SSA), South East Asia and South Asia (World Bank, 2014). Disastrous cyclones and flooding will dominate in South Asia, leading to limited water supply particularly in the Brahmaputra and Ganges basins. South East Asia will face sea rise which will affect rice production. SSA is predicted to experience prolonged droughts and rainfall shifts resulting in food insecurity.

An increase of 2.4 °C by 2100 will have a positive impact on the market costs for high-latitude countries (Mendelsohn et al., 2006). Although this temperature rise will have positive effects (reduced heating requirement, increased crop yield, reduced winter mortality) in Russia, Canada and Scandinavia, these benefits will be short-lived if the warming progresses beyond 2 °C. (Stern, 2006). These scenarios present a situation that policymakers should consider when making global decisions at COP meetings. The predictions emphasise the need for quick mitigation actions. Consensus holds that limiting GHG emissions and reducing deforestation are the major mitigation measures as outlined in the Kyoto and Paris Agreements.

Several commitments have been made at COP meetings. At COP 3 (1997), developed countries made a pledge to reduce annual emissions by an average of 5.2% by the year 2012 which represented a global reduction of around 29% (Grub et al., 1999). At COP 21, the Parties adopted the Paris Agreement (PA) (UNFCCC, 2016a). The agreement aims at limiting the global warming to below 2 °C, but preferably 1.5 °C compared to the pre-industrial emission levels by reducing GHG emissions at national and global levels. It operates on a 5 year cycle of active actions on climate initiatives, and by 2020, countries were expected to submit their Nationally Determined Contributions (NDCs). The PA provides for finance mobilisation, technology development and advancement and capacity building. It proposes low carbon initiatives/solutions and new carbon markets. Apart from GHG reduction, the other major agreements at COP meetings include reduced deforestation, provision of finance for mitigation and adaptation measures, compensation for the Loss and Damage caused by climate change in developing countries. Despite the agreements made, it has been observed that the biggest threat posed by climate change to economic growth, environment and general livelihoods is lack of formulation and implementation of aggressive, immediate and efficient policies at global level on the above challenges and agreements (Mendelsohn, 2013). This implies that there is lack of immediate, aggressive or efficient agreements because either they are not legally binding or the countries voluntarily choose not to follow. Despite the importance of these COP meetings as a global

platform for climate action, most countries are still crippled with lack of data, limited human capacity, inadequate finance and institutional insufficiency to manage GHG emissions (Tulyasuwan et al., 2012) and deforestation within the period of the COP meetings especially after the ushering in of the Kyoto Protocol. There is need for further analysis on UNFCCC COPs with focus on integral and relational approaches to develop understanding and awareness to achieve future consciousness (Lombardo, 2015) on climate action. Moreover, over two decades have passed with less than a decade to reach 2030, there is need for a review to gauge if the GHG emissions and deforestation were on a downward or upward course (UNFCCC, 2021a). This review therefore, attempts to (1) highlight and link the GHG emissions along the COP period, (2) highlight and link deforestation trend along the COP period and (3) explore other dimensions that may affect the implementation of the COP agreements. The review intends to raise an awareness on the need to focus on climate action and GHG reduction by developed countries. The review acts as a harbinger for urgent climate action by the UNFCCC Parties, national and regional policy makers and will contribute to the timely achievement of other global ambitions such as the Sustainable Development Goals 1 (no poverty), 2 (zero hunger), 13 (climate action), 14 (life below water) and 15 (life on land) (UN, 2015a); and regional agreements like the Agenda 2063 of the African Union which seeks to attain environmentally and climate resilient communities and economies by 2063 (African Union Commission, 2015).

2.1 Approach

This review was accomplished through a desk review of documents to track COP meeting contexts, decisions and implementation. A special focus was placed on GHG emissions, deforestation and financial statuses provided for climate-related actions from the time the Kyoto Protocol was ushered in to around 2020. This was meant to establish if the decisions made at COP meetings (reduce GHG, and deforestation, and increase finance for climate action) were implemented and had impact on these components. The GHG emission analysis focussed on global scale and the top ten GHG emitters since they represent almost 70% of all the global emissions (Friedrich et al., 2020). At global level, a comparison analysis was computed for the GHG emissions two decades (1976–1995) before commencement of the COPs and two decades (1999–2018) of the COP meetings. The decades within the COP meetings started from 1999 to 2018 because the Plan of Action for the implementation of the Kyoto Protocol was completed in 1998 (COP 4) (IISD, 1998). Deforestation focussed at global level and the top ten countries most affected by deforestation. To achieve this, a regression analyses were computed using R Statistical Software version 3.4.2 (R Development Core Team, 2020) for GHG emissions, forest loss and tree cover loss (deforestation) against the COP period using the secondary annual GHG emission data from the following sources:

World Resources Institute (2021a) through the World Bank website. (<https://data.worldbank.org/indicator/EN.ATM.GHGT.KT.CE?locations=JP>). The deforestation data were obtained from the World Resources Institute (2021b) (<https://research.wri.org/gfi/top-ten-lists>). These three components (GHG reduction, deforestation and finance) were chosen because of their importance in the climate change mitigation and adaptation dialogue. Parties have a shared vision to reduce GHG emissions to minimise the global warming and their reduction is an indicator of achievement (UNFCCC, 2021a). Reduced deforestation is an indicator for attaining Strategic Objective 2 (*to improve the conditions of ecosystems*) of the 10 year plan of the United Nations Convention to Combat

Desertification (UNCCD) (UNCCD, 2011) and also as a long-term goal of the UNFCCC for climate change mitigation (UNFCCC, 2021a). Finance availability is an output for the implementation of all the climate action plans (*Finance and technical resources identified and available to support technology development and transfer*) (UNFCCC, 2019a). The other components discussed include attendance at COPs and the period taken by the Parties to take action(s) on agreements. The increase in attendance at COP meetings indicates the popularity or importance institutions/individuals accord these meetings (WMO, 2015). Attendance was analysed by plotting graphs for all the categories of official COP attendees. The period taken by the Parties to take action and finance were systematically checked in official reports of the UNFCCC and the major financial agencies (Adaption Fund (2022), the Green Climate Fund, Global Environmental Facility, the World Bank) since it was difficult to source actual financial data. Based on the observation by Mendelsohn (2013) that lack of aggressive, immediate and efficient policies hamper climate action, this review discusses two components of 'what has worked' and 'what has not worked' based on all the COP meetings.

3 Discussion (synthesis)

3.1 What has worked?

COP summits have drawn both positive and negative reactions from individuals as well as institutions (IISD, 2009). There has been a long period since the start of the COPs especially after the ushering in of the Kyoto Protocol and the Paris Agreement, marked with a number of resolutions (Table 1).

3.1.1 Attendance at COP meetings

The attendance has increased at every next conference from 3969 individuals at COP 1 to 38,457 individuals at COP 26 (UNFCCC, 2021b). The Individuals comprised Parties, observer organisations and the media (Fig. 1). This provides wider opportunity for institutional linkages, networking and collaboration on climate actions (Ingold & Fischer, 2013; Boezeman & Coninck, 2018; ICCA, 2019).

3.1.2 Climate finance and the associated support to developing countries

The Copenhagen Accord in 2009 (COP 15) provided a road map on short-term and medium term on finance mobilisation to the tune of USD30 billion for short term and USD100 billion annually for long-term support to adaptation and mitigation projects (IISD, 2009). The financing of adaptation and mitigation projects by dedicated developed Party countries have ignited hope for climate action. The identified projects and the funding institutions on climate aid are provided in Table 2. These institutions were selected based on their role as major recipient and administrators of climate finance and that some (AF and GCF) were established by COP meetings (Japan Research Institute (2001). A report by the Green Climate Fund (2020) showed an increase in finances to its projects. The institution supported over 100 projects from Asia–Pacific (34%), Africa (24%), Latin America and Eastern Europe. Sixty-seven per cent (50–75 projects) of these projects were from countries very vulnerable to climate change. This represented 61% (USD2.1 billion) of the total finances

Table 1 Summary of the Conference of the Parties (COP) and selected outcomes from 1995–2021

COP	Date	Place/Country	Some Outcomes
COP1	28 March–7 April 1995	Berlin, Germany	Joint implementation of climate action: Protection of global climate for present and future generations of mankind
COP2	8–19 July 1996	Geneva, Switzerland	Geneva Declaration (to adopt legally binding commitments)
COP3	1–10 December 1997	Kyoto, Japan	Kyoto Protocol
COP4	2–14 November 1998	Buenos Aires, Argentina	2-year Plan of Action to devise mechanisms to implement Kyoto Protocol:
COP5	25 October–5 November 1999	Bonn, Germany	Implementation of the programme of work on the biological diversity of inland water ecosystems: National reporting
COP6	13–24 November 2000	The Hague, Netherlands	COP suspended due to disagreements
COP7	29 October–10 November 2001	Marrakech, Morocco	Finalised 2-Year Plan of Action drafted at COP 4; Set the stage for ratification of Kyoto Protocol: Developed the Marrakech Accords: Date for World Summit on Sustainable Development (August–September 2002) to put Kyoto Protocol into force: Established the Adaptation Fund (AF)
COP8	23 October–1 November 2002	New Delhi, India	Delhi Ministerial Declaration (Transfer of technology from developed countries to developing countries to tackle climate change effect; approved the New Delhi work programme on Article 6 of the Convention): 10-year Strategic Plan (reverse land degradation/desertification, halt effects of droughts, rehabilitate degraded ecosystems, capacity building): Increase funding to Global Environment Facility (GEF)
COP9	1–12 December 2003	Milan, Italy	Adaptation Fund to support developing countries adapt to climate change: Reviewed first national reports submitted by 110 non-Annex 1 countries
COP10	6–17 December 2004	Buenos Aires, Argentina	Adopted the Buenos Aires Plan of Action: Commenced discussions on post-Kyoto mechanism on allocation of emission reduction in relation to commitment period of 2012
COP11	28 November–9 December 2005	Montreal, Canada	Kyoto Protocol enter into force: The Montreal Action Plan (extend the life of the Kyoto Protocol beyond 2012)
COP12	6–17 November 2006	Nairobi, Kenya	Financial pledges support to developing countries and Clean Development Mechanism: A five-year plan to support climate change adaptation in developing countries: Formulated procedures and modalities for the AF

Table 1 (continued)

COP	Date	Place/Country	Some Outcomes
COP13	3–17 December 2007	Bali, Indonesia	The 'Bali Road Map' (mitigation of GHG emissions; facilitation of the clean technology transfer; adaptation to climate change effects like droughts, floods etc.; provision of funds for adaptation options/measures; provision of funds to developing countries to end deforestation in tropical rainforest regions): A two-year programme for a period after 2012: Pledge to manage and preserve rainforest in the tropical countries; Launched the AF, Minamata Convention on Mercury
COP14	1–12 December 2008	Poznan, Poland	Finalisation of the AF; Commitments on emission and deforestation reduction: Strategic programme on technology transfer; End deforestation
COP15	7–18 December 2009	Copenhagen, Denmark	Copenhagen Accord (Provision of USD30 billion as short-term solution mitigation and adaptation interventions in developing countries; Provision of USD100,000 billion annually by 2020 as long-term solution mitigation and adaptation interventions in developing countries); Limiting global temperature increase to 2 °C; Called for the establishment of a new Green Climate Fund (GCF)
COP16	28 November–10 December 2010	Cancún, Mexico	Adopted USD100 billion per annum 'GCF', and a 'Climate Technology Centre' and network
COP17	28 November–9 December 2011	Durban, South Africa	Agreed to a start negotiations on a legally binding deal comprising all countries to be adopted in 2015, governing the period post-2020; Adopted a management framework for the GCF
COP18	26 November–7 December 2012	Doha, Qatar	The Doha Climate Gateway: Doha Amendment to the Kyoto Protocol 2013–2020
COP19	11–23 November 2013	Warsaw, Poland	Warsaw International Mechanism for Loss and Damage (aims at establishing approaches that ensures vulnerable developing countries cope and become resilient to unavoidable climate change impacts such as sea level rises, extremes of weather)
COP20	1–12 December 2014	Lima, Peru	Reaffirmations on AF: Multilateral Assessment (MA): International Mechanism on Loss and Damage; Ministerial Declaration on Education and Awareness of Climate Change; The Lima Adaptation Knowledge Initiative, Technology Development and Transfer and the Intended Nationally Determined Contributions (INDCs): Launch of the GCF
COP21	30 November–12 December 2015	Paris, France	Paris Agreement (governing climate change reduction measures from 2020; agreement aims at limiting global warming to below 2 °C, but preferably 1.5 °C compared to the pre-industrial emission levels)

Table 1 (continued)

COP	Date	Place/Country	Some Outcomes
COP22	7–18 November 2016	Marrakech, Morocco	AF maintenance, Facilitative Dialogue 2018; Mid Century Strategies: 2050 Pathway Platform' to be supported by cities, governments, states; Mobilise USD100 billion per year in private and public finance for developing countries by 2020; pledge of USD23 million to help in developing countries in capacity building and technical support assistance through Climate Technology Centre and Network (CTCN); Over USD50 million pledged to developing countries build capacity on issues of transparency; USD1.5 billion pledged by World Bank for Middle East-North Africa through the World Bank Climate Finance; A first review on Warsaw International Mechanism for Loss and Damage related to climate change impacts
COP23	06–17 November 2017	Bonn, Germany	Paris Agreement implementation guidelines: Gender Action Plan (gender-responsive climate action); Agreement on agriculture adaptation: Provision of USD93.3 million to Adaptation Fund; Finalisation of the Local Communities and Indigenous Peoples Platform: Launch of the Ocean Pathway Partnership: Launch of InsuResilience Global Partnership
COP24	03–14 December 2018	Katowice, Poland	Katowice Rulebook for the Paris Agreement (operational interpretation to the Agreement and top-down direction to complement the bottom-up approach of the INDCs)
COP25	2–15 December 2019	Madrid, Spain	Approved 17 National adaptation plans (NAP) submitted by Grenada, Ethiopia, Guatemala, Uruguay, and Saint Vincent and the Grenadines; Endorsed continuation of Adaptation Committee (AC); Provision of funds to implement adaptation programmes in developing countries through Special Climate Change Fund for Least Developed Countries (SCCF-LDC); Inclusion of non-State Actor in supporting capacity building; Birth of a discussion on Climate Finance and Sustainable Cities (CFSC); Adopted the GCF work plan for 2020–2023
COP26	31 October–12 November 2021	Glasgow, Scotland	Climate Finance Delivery Plan: Reaffirmations to meet the USD100 Billion Goal: Reviewed Warsaw International Mechanism to identify best approaches to handle loss and damage: End deforestation

(Source: Japan Research Institute (2001); Muller (2008); UN (2015b); UNFCCC (2008a); Ingram and Irwin (2009); UNFCCC (2009b); Centre for Climate and Energy Solutions (2014); UNFCCC (2015a); UNFCCC (2015b); UNFCCC (2015c); UNFCCC (2016a, 2016b, 2016c); Centre for Climate and Energy Solutions (2016); UNFCCC (2016d), UNFCCC (2016e); UNFCCC (2021a, 2021b) Erbach (2019))

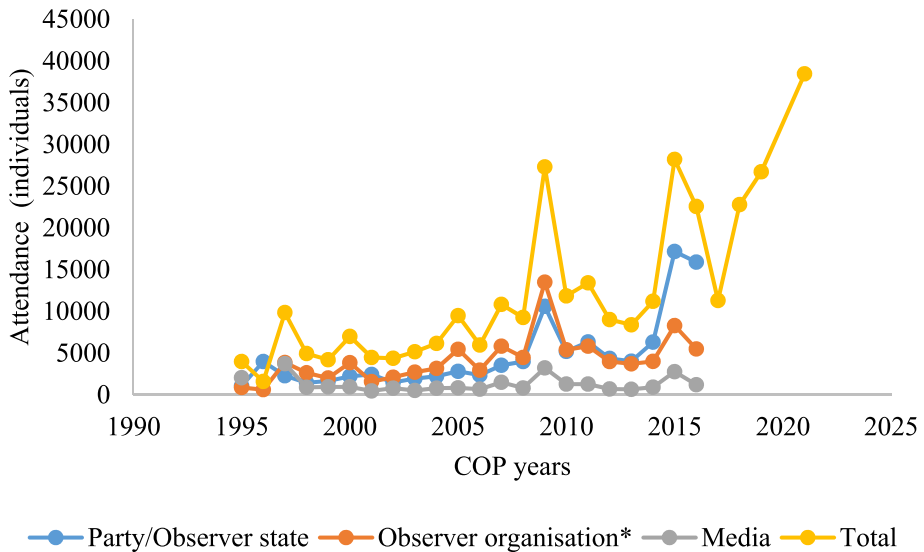


Fig. 1 Attendance at the Conference of the Parties. Data for Parties, observer organisation and media from 2017 (COP 23) were not accessed. Observer organisation* refers to Intergovernmental organisations, Non-governmental organisations and United Nations agencies. (Source: Author computation based on the data from UNFCCC, 2021b)

provided to the projects under implementation. The projects abated 1.2 billion carbon dioxide (CO₂) equivalent, benefitting 408 million individuals on resilience from 2015 to 2020 (Green Climate Fund, 2021). For example, at COP 25, the Green Climate Fund reported to have received USD5.6 billion to support 124 mitigation and adaptation projects in 105 developing countries (Green Climate Fund, 2019). At the conference, 28 countries made a nominal contribution (pledge) of USD9.66 billion plus a notional credit of USD118.5 billion. At the same COP, the GEF reported to have received USD184 million from developed countries, multilateral, bilateral agencies, private sector and civil society organisations to support the Least Developed Countries Fund (LDCF), with Switzerland alone contributing USD3.3 million (Global Environment Facility, 2019). The Parties appealed for more support to increase the purse. The Parties advised GEF to reduce the processing time for the provision of funds to needy countries, i.e. reduce processes in proposal application, review and approval. GEF supported almost 4,000 projects. The majority of the projects were from Asia (30.2%), Africa (26%), and least in the Latin America and the Caribbean (16.4%). Many projects were on renewable energy and energy efficiency. Globally, these climate-related projects in 170 countries led to the adoption of sustainable forest management and sustainable land management (SLM) on 900,000 ha by 400,000 community individuals from 2012 to 2015. A total of 670 million ha were conserved under protected areas. If these ha were a single country, it would be seventh largest in size. Climate aid through GEF and the United Nations Development Programme (UNDP) ‘de-risked’ investment in renewable energy at national and regional levels (UNDP, 2016). This is claimed to have enabled countries scale up investments in wind, solar energy markets, making electricity reliable and affordable by citizens.

Examples of the huge investments in developing countries are given. In Burkina Faso, GEF invested USD11 million on about 20 projects in three broad themes of biodiversity,

Table 2 Projects funded by climate-related finances in the world

Agency	Projects funded	Project scope/context	Amount (USD)	Period	Remarks	Beneficiaries/benefits
GCF	7	National	0.15 billion	2015		
GCF	75	National	3.4 billion	2019		1.2 billion t CO ₂ eq. abated
GCF	122	National	5.18 billion	2019	Approved	
GEF	4800	Regional/national	20.5 billion	1992–2021	USD112 billion in co-financing	900,00 ha conserved
AF	120	Regional/national	838 million	2010–2021		20 million people
WB		Regional	51.5 billion	2011–2015		
WB		National	2 billion	2001–2021	Payment for emission reduction	

GCF Green Climate Fund; GEF Global Environment Facility; AF Adaptation Fund; WB World Bank

Source: World Bank (2015), UNDP (2016); Global Environment Facility (2019); Adaptation Fund (2021), Green Climate Fund (2021), World Bank (2021a), t CO₂ e. = tons carbon dioxide equivalent

land conservation and climate change focussing on community resilience, energy efficiency, modal transportation, climate information and early warning (Global Environment Facility, 2016). The investment supported 17 national and regional projects. A total of seven projects were implemented on protected areas, three on bird conservation, nine on combating desertification (food security, forestry, agriculture) and four on persistent pollutant (POPs) management. A number of GEF Small Grants were reported to have been provided at community level. By 2021 the Adaptation Fund had reached out to 90 countries with climate adaptation aid, 50% of which from the Least Developed Countries (LDCs) and Small Island Developing States (SIDS) (Adaptation Fund, 2019, 2021). In Mozambique, a Landscape Restoration Project along the Zambezi Basin funded by the World Bank is expected to reduce 10 million tons of CO₂ emission by 2024 (World Bank, 2021a). Through similar initiative, the Bank funded USD2 billion to communities for emission reduction in 65 developing countries across the world. From 2011 to 2015, the Bank also funded USD10.3 annually to low-income countries in Africa, South America and East Asia (World Bank, 2015). One important project is on Ecosystem Management at national and inter-country level in the Sahel and West Africa involving Burkina Faso, Benin, Ethiopia, Chad, Mali, Ghana, Mauritania, Nigeria, Niger, Senegal, Sudan and Togo.

The reaffirmation and promise by Brazil at COP 14 (2008) to reduce deforestation by 70% by 2017 appeared to succeed somehow. The country established a National Policy on Climate Change in 2009 to reduce the GHG emission by 80% by 2020 (Silver-Junior et al., 2021). This strengthened the efforts of the Government Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm) from 1996 to 2005. Since the Kyoto Protocol, the country managed to reduce deforestation from 18,000 km² per year in 1996 to 10,129 km² in 2019 in the legal Amazon (Silver-Junior et al., 2021). However, Brazil is registering an increase in deforestation rates in the recent decade (2009–2019) (Fig. 2b). Possibly, logging, ranching and increased land use change from forest to soybean production are responsible for the increase in the recent years (Butler, 2019; Simoes & Hidalgo, 2011). In some cases policy shifts in favour of infrastructure expansion seriously lead to increased deforestation (IPCC, 2007). Other countries that increased forest area from mid-1990s–2020 included Chile, India, China, Russia, Turkey, Morocco, Cuba, Canada, New Zealand, Tunisia, Iceland and Ireland (Ritchie & Roser, 2021). By 2020, globally, 125 out of 154 developing countries were formulating or implementing the National

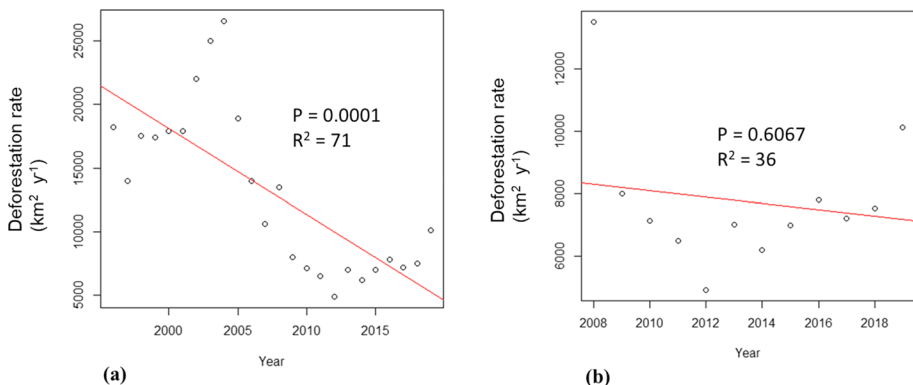


Fig. 2 Trend in deforestation rate in Brazil from 1996 to 2019 (a) and 2008–2019 (b) in the legal Amazon) *Source:* Author computation based on the data from Silver-Junior et al. (2021)

Climate Adaptation Plans (UNFCCC, 2020). Without COP negotiations for financial mobilisation on climate action, these resources would not have been available for the implementation of various projects across the developing Party members.

3.2 What has not worked?

3.2.1 Too long a period before taking action (need for immediate actions)

Pessimists still hold that the ongoing COPs have not achieved the expectations. One observed challenge is that Parties take long to reach an agreement which may provide for unregulated behaviour including those of emissions by the members (Rossati, 2021). For example, Kyoto Protocol remained a mere guide and not a law for many years (1990–2012), during which period some countries were still emitting except the European countries which had made significant reduction in GHG (Grub et al., 1999). According to the Joint Research Centre (2014), the USA and China increased GHG emissions for they had not ratified and not been given reduction targets, respectively. Their emissions overshadowed the reductions achieved by other countries between 1990 and 2009; a period that experienced the GHG increase by 40% (Crippa et al., 2020). Despite contributing 36% of the 55% of the total GHG emissions from all developed countries as of 1990, the USA feared that its 7% emissions limit would jeopardise the economy (Victor, 2001). This is an example of how tough it is to make decisions when a country is faced with situations of choosing between economic growth (at the expense of environment) and climate action.

The Kyoto Protocol's first commitment period ended in 2012 without any significant GHG reduction (Moosmann et al., 2019; UNFCCC, 2012) and a new commitment was agreed at COP 18 to run from 2013 to 2020 through the Doha Amendment (ISSD, 2020). The period under the Kyoto Protocol saw increased GHG emissions and the introduction of the Paris Agreement in 2015 was punctuated by increased emissions too (Fig. 3). This shows ineffectiveness of the COP agreements. Despite the Doha Amendment in 2012, the Kyoto Protocol had not entered into force by early November 2019 due to failure to attain three fourths ratification criteria (UNFCCC, 2008b).

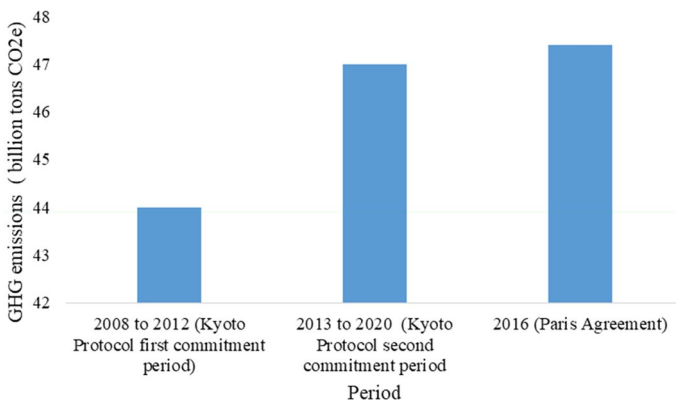


Fig. 3 Trend of greenhouse gas emissions within the period of the Kyoto Protocol and the Paris Agreement (Source: author computation based on the data by Gütschow et al. (2019))

On global stocktake, the Paris Agreement states that there should be a stocktaking once in five year-period (beginning in 2023) to evaluate the progress (Centre for Climate & Energy Solutions, 2016). The stocktaking is expected to lay foundation for the submission of the INDCs by the Parties. At COP 22 (2016), Parties discussed the structure of the stocktake, i.e. duration, inputs, timeline and format and their linkage to other PA provisions. The COP members also tackled other ‘Orphan’ issues. These issues are not yet agreed upon by members. Some are in implementation but members do them differently. The issues included: the possibility of setting uniform timeframe for INDCs (currently Parties have different timeframes); rules regarding adjustment of INDCs by the Parties; and a 2025 financial goal. However, at COP 22, the members did not agree on any of these issues (UNFCCC 2016b). Expectedly, these became agenda at future COPs.

It could also be argued that the implementation modality for the Paris Agreement provides opportunity for laxity in action by the Parties (Slaughter, 2015). Under implementation and compliance, the Paris Agreement provides that there should be a committee of 12 experts which should champion the implementation and compliance in a non-punitive but facilitative manner. On market and non-market mechanisms, the Paris Agreement establishes a non-market approach framework. At COP 22, Parties discussed and explored what elements should encompass this approach. Some examples put forward included feed-in tariffs, reforms on subsidy on fossil fuel (UNFCCC 2016c). However, these conditions do not offer coercive elements for the Parties to follow the PA (Danneman, 2016). At COP 25, the conference agreed that the Paris Committee on Capacity Building had been given a broader task without a focus area. This resulted in extending the period of the committee to November 2024 to allow it to prioritise its activities and report its progress at COP 30 (2024). However, the final terms of reference for the committee were to be agreed at COP 28 (2023). This raises the question of the possibility of the committee to conduct its activities without the agreed terms of reference.

Although the financial assistance and other reaffirmations were pronounced at COP 25, it was believed that most of the major outcomes were not achieved and all the unachieved outcomes were deferred to COP 26 in Glasgow in 2021 (UNFCCC, 2020). Parties failed to agree on the carbon markets. They failed to agree on the common time frame for the implementation of the INDCs. The two proposed implementation periods in 2015 (2020–2025 and 2020–2030) and deferred in 2018 were again deferred to future COPs. If the issues were concluded at COP 25 they could have been aligned to the common time frame for INDCs for 2031–2035 which would have augured with the 5-year operational plan of the Paris Agreement (Dagnet et al., 2019). Although agreed more than five years back, as of November 2019 (prior to the start of COP 25), only 68 low to medium emitting countries expressed determination to strengthen their INDCs (Dagnet et al., 2019). At COP 25, the Parties failed to make concrete agreements on the way forward for the Loss and Damage of the Warsaw International Mechanisms (WIM). The WIM on Loss and Damages would have provided direction on the prevention of loss or damage on valuable assets (land water, heritage sites) and livelihoods due to climate change in developing countries. Even the Secretary General of the United Nations (Antonio Guterres) expressed disappointment over the COP outcomes especially COP 25: *‘I am disappointed with the results of COP25. The international community lost an important opportunity to show increased ambition on mitigation, adaptation and finance to tackle the climate crises. But we must not give up, and I will not give up’* (UNFCCC, 2019b).

3.2.2 More COPs, more GHG emissions

As an indicator of climate change, the increase in warming is accelerated by the increase in the GHG emissions. Since the mid-1990s, the indicator has been on the increase (United States Environmental Protection Agency, 2016). Twenty years after the first COP, carbon dioxide equivalents (CO₂e) were estimated at 47 billion metric tons, representing 43% increase from 1990 (Table 3). This includes all the major GHG (CO₂, methane, nitrous oxide, fluorinated gases). CO₂ alone increased by 51%. These emissions were largely from Pacific and East Asia, Central Asia, Europe and the USA which accounted for 74% of all the world GHG in 2018. For example, from 1997 to 2007, the USA increased the GHG emissions by 7.3% due to economic growth (Feng et al., 2015). The USA rejected to ratify the Kyoto Protocol fearing that its 7% emission reduction target would hamper the economy (Victor, 2001). The carbon footprint of the emerging economies, poor progress made under Kyoto Protocol and the developed nations jointly increased the emission by 7% from 2008 to 2012 (Clark, 2012). In just two decades since the first COP, GHG emissions increased from 32 to 46 million kiloton (FAO, 2020; World Resources Institute, 2021a). The major contributing sectors for the emissions from 1990 to 2010 included heat and electricity production (25%), agriculture and deforestation (24%) (Boden et al., 2017).

The top ten emitters (the USA, China, 27 European countries (EU27), India, Russia, Japan, Brazil, Indonesia, Iran and Canada) contributed 70% of all the GHG emissions (Friedrich et al., 2020). The top three emitters (China, EU27 and the USA) emitted sixteen times the emissions of 100 least emitting countries contributing 42% of the global emissions while the least 100 emitters contributed 4%. A regression analysis showed that from 1999 (two years after the Kyoto Protocol) to 2020, GHG emissions from individual top ten emitters increased or remained significantly high except for the US, EU27 and Japan (Fig. 4). Globally, from 1976 to 1995, the annual GHG emissions were significantly lower (32.44 ± 7 million kiloton) than from 1999 to 2018 (38.4 ± 9 million kiloton) (Fig. 4, Global 1976–1995; 1999–2018). Overall, the duration of COP meetings have not achieved downward course in GHG emissions.

According to the Climate Change Performance Index (CCPI), no country performed or acted in accordance with the 1.5–2 °C reduction target, making the top three ranks to remain vacant since 2005 (Burck et al., 2015). For the CCPI of 2022, Denmark ranked 4th as a 'best performer, followed by Sweden (position 5) and Norway (position 6th). France, a best performer in 2017, shifted to position 17th in 2022 and Sweden maintained 5th position (Burck et al., 2022). Morocco was leading in Africa as best performer, a status (8th globally) maintained since 2017. Few G20 countries (high emitters) registered positive performance like India from 20th in 2017 to 10th in 2022, Brazil from 40th in 2017 to 33 in 2022 although Argentina slumped from 36 to 47th. Most G20 countries performed

Table 3 Percentage of greenhouse gas emission increase within the period of COP meetings

Period	Increase in greenhouse gas emission (%)	Responsible
1990–2009	40	Global
1995–2015	43	Global
2008–2012	7	Developed countries
1997–2007	7.3	The US
2002–2007	13	China

Source: Feng et al. (2015); Shan et al. (2018); Crippa et al. (2020)

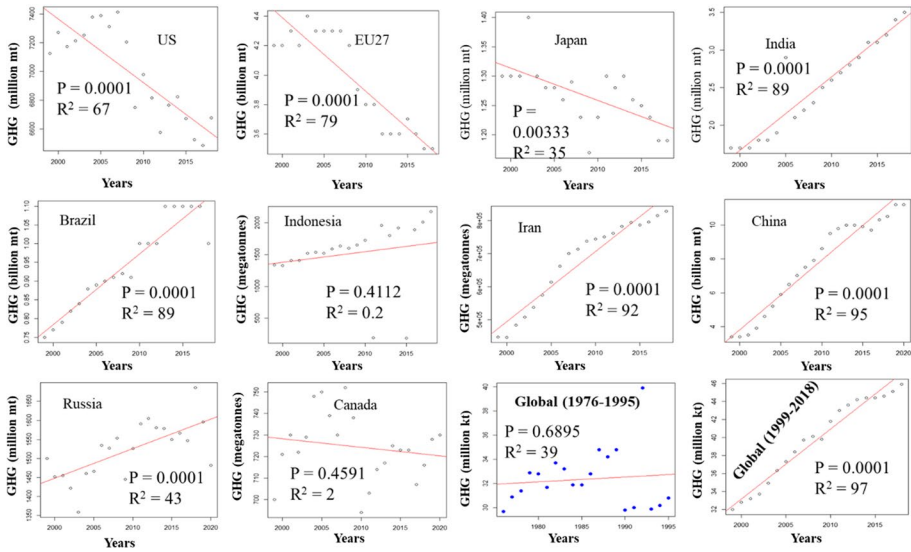


Fig. 4 Greenhouse gas emissions by the top ten emitters from 1999 to 2018 for seven countries and 1999 to 2020 for three countries. (Source: author computation based on data from World Resources Institute (2021a). Note: units for global analysis is kiloton (kt), i.e. 1 kt = 1000 tons

from medium to low rating. Of the top ten GHG, emitters only India featured in the top ten CCPI 2022. This could mean that the top GHG emitters did not invest enough in renewable energy to reduce GHG emissions (Burck et al., 2022). Therefore, COP negotiations for GHG reduction should focus on the high emitting G20 countries to reduce the emissions because they account for over 75% of all emissions (Burck et al., 2017). The least emitting, developing countries should be the recipient of finances for adaptation because they are the worst affected (IPCC, 2021).

Failure to ratify the Paris Agreement by the high emitters such as the US (13% of global emissions) and the oil producing countries of Turkey, Iran, Iraq, Libya, Yemen, Eritrea (4% of global emissions) signal blurred future for climate action (Crippa et al., 2020). This may explain why out of the 13 selected top GHG emitters, 61% have increased emissions from 2009 to 2019 (Fig. 5). It is clear that more COP synods will be held before concrete decisions on cutting emissions are taken by individual countries. For example, at COP 25, Poland reaffirmed to step up efforts to switch to clean energy options (UNFCCC, 2020) as the country is one of the top coal producers in Europe and coal accounts for 80% of the country’s energy source, but no significant steps have been taken on GHG reduction (Garside, 2021). Mexico promised (at COP 14 in 2008) to reduce its GHG by 50% by 2050 but the country registered steady GHG rise especially from 2012 and the trend was projected to increase at least by 2030 (Climate Transparency, 2016). With only 10 developed Party countries reporting on Multilateral Assessment (at COP 25), the transparency on GHG reduction at country may still be questionable. Increase in the use of fossil fuels by developing countries such as members of the BRICS (Brazil, Russia, India, China and South Africa) raises questions for climate action especially on GHG reduction. The global rate of GHG emissions shows that significant GHG reduction was recorded during the global events such as world wars and a year after the 2008 financial downturn (Ritchie & Roser, 2020). Otherwise, the GHG emissions are on a variable annual rise of 2–3% in the more

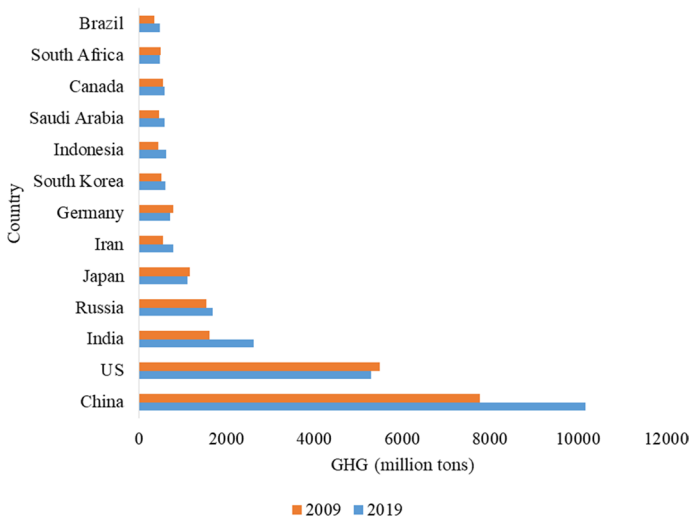


Fig. 5 Greenhouse gas emissions from selected major emitting countries for 2009 and 2019. *Source:* Modified from Tiseo (2021) published in Statista. GHG = greenhouse gas

recent decades but 0.5–2% in the past few years. In 2020 (25 years after COP 1), the global average temperature was 1.2 °C above the pre-industrial baseline, which was a departure from a target of 1.5 °C below the pre-industrial baseline (IPCC, 2021).

In some cases misunderstanding on the level of climate change may pose threat to climate response and negotiations. For example, at COP 14 (2008), there was a disagreement between the scientists on the levels of climate change. About 650 scientists disputed the findings of UN scientists on the degree of climate change and impacts, arguing the situation was exaggerated (Ceglaz et al., 2018; UNFCCC, 2020). Arguments of this nature would leave a mark that there is no common understanding on the extent of climate change and its effects. This may have a bearing on the level of decisions to be made and some questions may be raised; *do we have a worrying situation that deserves urgent attention?* Or *we can still wait?* However, such disagreements are acknowledged and must be resolved with ‘deliberative democracy’, i.e. attain a globally acceptable consensus (Li, 2017), although they still pose huge challenges to command a consensus on climate change action (Oreskes, 2004; Cook et al., 2013; IPCC, 2014).

3.2.3 More COPs, high deforestation

Overall, forest loss and tree cover registered an average annual loss of 3.4 million ha and 20.8 million ha from 2001 to 2020, respectively (Fig. 6). Of the top ten countries highly affected by tree cover loss, Australia, the DRC and Russia registered significant loss within the period (Fig. 7). In 2020 alone, 12.2 million ha of tropical forests were lost of which 4.2 million ha were from humid primary forest which is essential for carbon storage (Weisse & Goldman, 2021). This represented 2.64 Gt of CO₂ emissions, an equivalent of emissions from 570 million cars per year (Minnemeyer et al., 2017). From 2015 to 2020, the global annual deforestation rate was at 10 million ha, and 80 million ha of primary forests have been lost since 1990 (FAO, 2020). The 2015–2020 loss was considered an improvement if compared with the 12 million ha lost from 2010 to 2015

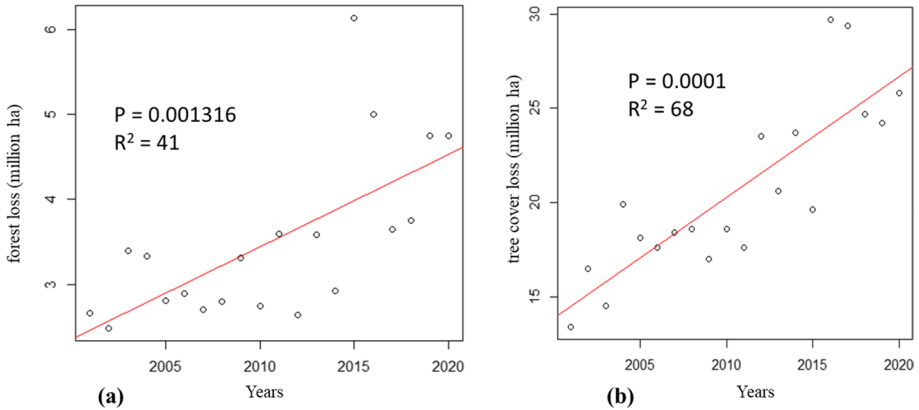


Fig. 6 Trend of global forest loss (a) and tree cover loss (b) from 2001 to 2020. *Source:* author computation based on the data from World Resources Institute (2021b)

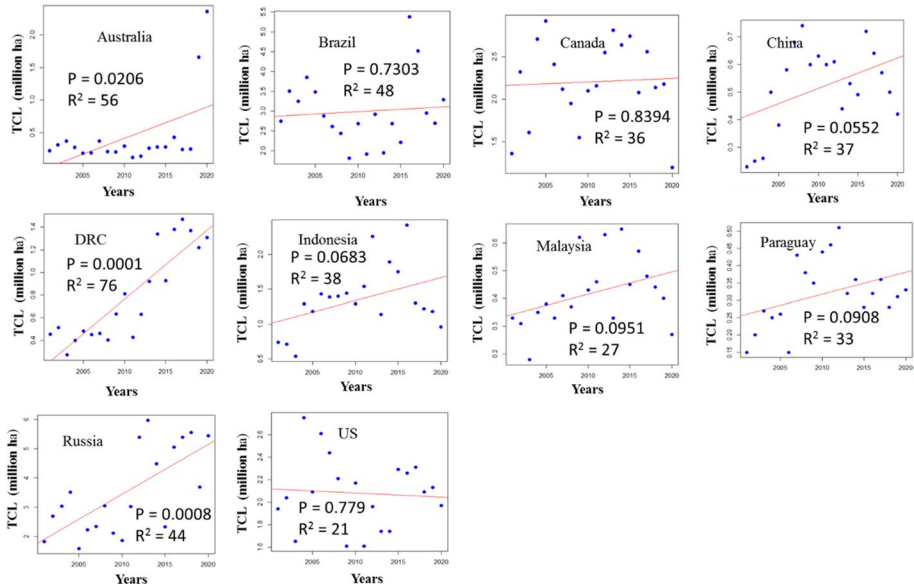


Fig. 7 Tree cover loss (TCL) in the top ten countries from 2001 to 2020 (*Source:* author computation based on data from World Resources Institute (2021b), USA The United States of America)

(FAO, 2020). The deforestation from 2010 to 2014 contributed to the release of 2.6 billion tons of CO₂ per year, representing 6.5% of all the global CO₂ emissions (Ritchie & Roser, 2021). In 2012 (end of the first commitment period of the Kyoto Protocol), all GHG emissions reached 40.2 billion tons. With the current forest loss especially in Africa (3.9 million ha) and South America (2.6 million ha) from 2010 to 2020 (FAO, 2020), the concentration of GHG in the atmosphere may be expected to continue. For example in 2019, the concentration of CO₂ in the atmosphere reached the highest peak in 2 million years and those of nitrous oxide and methane were higher than any other

time in 800,000 years (IPCC, 2021). This is supported by the analysis by Mountford and Bergen (2020) that 2019 and 2020 were the hottest and warmest years, respectively. These phenomena provide the awakening that the focus on climate action should balance the need to replace GHG sinks as efforts to switch to clean technologies are pursued. The quicker we advance on vegetation recovery the better as most approaches already have scientific evidence and have wide spatial and temporal applicability. The increases in deforestations happened despite COP 13 (2007), COP 14 (2008), COP 15 (2009) and COP 26 resolving to end deforestation in developing countries (UNFCCC, 2021a). African countries with primary rainforests experienced massive loss in the past decade (Figs. 8 and 9), which is a sharp contrast to a special emphasis made at COP 13 to reduce deforestation in tropical rainforest regions (UNFCCC 2008b). The most affected countries on forest loss are the Democratic Republic of the Congo, Brazil, Indonesia, Tanzania, Angola, Paraguay, Cambodia, Myanmar, Mozambique and Bolivia (FAO, 2020). Except for Brazil and Indonesia, the rest are low GHG emitters (CAIT, 2020). A question may arise: *why is deforestation on the rise?* There could be no direct answer but it could be assumed that climate mitigation and adaptation options may not have provided adequate alternatives to the problem (Doggart & Meshack, 2017). Globally, 1.6 billion people rely on forests and 13 million are in formal while 45–50 million in informal employment (Arce, 2019). At Africa level, by 2007, unsustainable charcoal business was valued at USD8 billion with 7 million people engaged in the business for livelihoods (African Development Bank, 2018). The business was projected to reach USD12 billion with 12 million people in practice by 2030. This projection should help policy makers and the Parties on decision making for the future sustainability of trees and forest.

There is need to finance programmes that reduce deforestation as mitigation measures. For example, thirteen years ago, Kindermann et al. (2008) estimated that a reduction of 10% in deforestation globally, (from 2005 to 2030) would help avoid the emission of 0.3–0.6 Gt of CO₂ (1 Gt = 1×10^5 g) per year. To achieve this, an investment of about USD0.4–USD1.7 billion per year was required. A 50% reduction in deforestation would save 1.5–2.7 Gt CO₂ per year with an annual financial requirement of

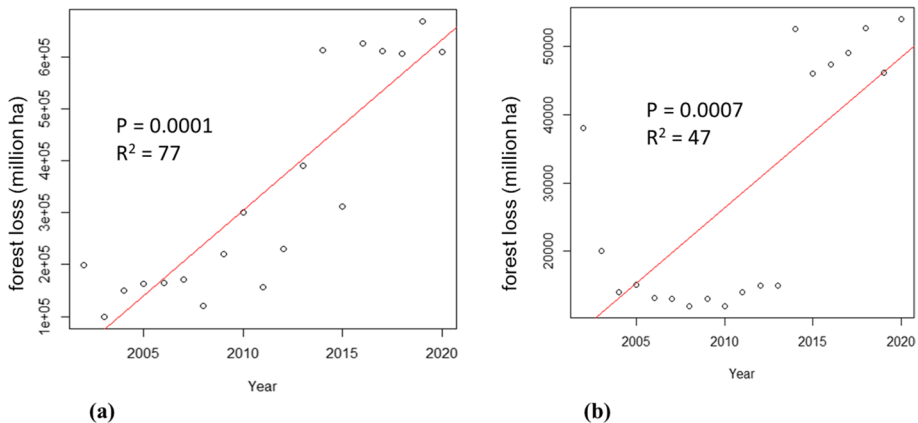


Fig. 8 Primary forest loss from 2001 to 2020 in the Democratic Republic of the Congo (a) and West Africa (b). 2021 Source: author computation based on the data from FAO (2020), World Resources Institute (2021b), Butler (2019)

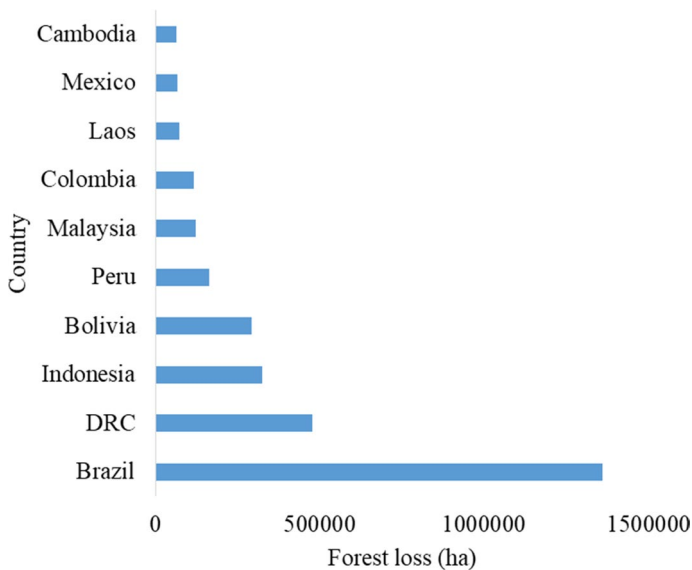


Fig. 9 Countries with the highest loss of primary forest in 2019, Source: Modified from FAO (2020) and Weisse and Goldman (2021). *DRC* the Democratic Republic of the Congo

USD17.2–USD28.0 billion. It can be expected that the current estimates may be higher but this provides a guide for policy direction on the need to meet immediate demands of climate change mitigation and adaptation.

3.2.4 The unrealised financial dream

Although at COP 15 (2009), the Parties agreed to contribute USD100 billion annually as climate aid, and confirmed in the Paris Agreement (2015), this target has never been reached (UNFCCC, 2021a). However, general climate aid has slowly increased from USD700 million in 2000, to USD19 billion in 2010, to USD52 billion in 2016 (OECD, 2019). At COP 25, the conference noted that only Australia, Belgium, Norway, Germany, Switzerland and the Philippines had contributed money to the Standing Committee on Finance (SCF). The financial contribution by developed countries towards climate change action has in some cases been debatable. For example, at COP 22, developed countries reported that they had provided about USD41 billion per year to developing countries but Oxfam in its report *‘The Climate Finance Shadow Report 2016’* stated that the actual finances for climate change actions ranged from USD11–USD21 billion (Oxfam, 2016). Of the USD11–USD21 billion range, only USD4–USD8 billion went to developing countries to tackle climate change impacts, an amount too little for the required climate change adaptation or mitigation actions. Oxfam also argued that only USD8.7 billion of the total finances for climate issues went to the LDCs (48 poorest countries in the world) that greatly lack the capacity to tackle the impacts of climate change yet are very vulnerable. In 2010, the World Bank estimated that USD70–USD100 billion per year would be required to adapt to climate change between 2010 and 2050 based on the 2005 prices (World Bank, 2010). It further reported that 80% of this amount should be invested in towns and cities to facilitate the achievement of a 2 °C temperature drop. Recently, UNEP projected that

adaptation costs only would require USD140-USD300 billion by 2030 and USD280-500 billion annually by 2050 (UNEP, 2016).

The design and development of zero emission technologies for energy generation and other processes still require huge investment in many developing and middle-income countries (Gillingham, 2019; Yang, 2013). More support would be needed. The options are proving to be gradual choices as developed countries fail to make an immediate switch. So far many developed countries peg 2050 as the time, significant switch to zero emission technologies may be fully adopted (European Environmental Agency, 2021a).

4 Other angles that may hinder progress in the implementation of climate actions

Global economic decision makers such as the G8 and G20 countries, International Monetary Fund (IMF), World Trade Organisation (WTO), the World Bank and the United Nations Conference on Trade and Development play crucial roles in shaping the implementation of climate actions in developing countries (<https://www.ecnmy.org/learn/your-world/international-organizations/>). For example, the outcomes of the 33rd G8 summit (support developing countries with benefits from ‘*auction of emission rights*’ increase aid) seem promising but their implementation may not be as straight forward as they appear. Arguably, developed countries inflict financial ‘pain’ on low-income countries’ economies through the Structural Adjustment Programmes (SAPs) championed by IMF and the World Bank, limiting poor countries the freedom to develop country-specific policies (Heidhues & Obare, 2011). SAPs were economic policies advanced by IMF and the World Bank in developing countries to ‘*stimulate the economy to achieve sustained economic growth and development*’ (IMF, 2001). Arguably, SAPs did not consider the institutional weaknesses and social dimensions of development applicable in developing countries (Heidhues & Obare, 2011). The claim by developed countries to support developing countries with increased aid may not be wholly beneficial as aid comes with conditions such as privatisation, market liberalisation, forex de-regulation, higher interest rates, economy de-regulation (avoid subsidies, price control etc.), reduced expenditure on social services which cripple the economies of developing countries (Heidhues & Obare, 2011; Rono, 2002). Not surprising, therefore, that one of the agreements of the 33rd G8 summit was to attach aid to a set of conditions (democracy, human rights, peace, gender equality and freedoms). Most of the low-income countries make losses on international trade as they pay more on licences to developed countries (Love et al., 2009). Low-income countries are trapped in debts despite declarations made at such meetings. No wonder inequalities between nations are higher than those within nations (UNDP, 2015).

Effective climate actions should address actual needs of the local communities. This entails effective use of the climate-related aid provided by the developed countries. The success of climate-related projects remains questionable (Arndt & Tarp, 2017; McCarthy et al., 2012). Climate project activities implemented by governments face higher delays (21%) than those (9%) implemented by the private sector (Green Climate Fund, 2020). Moreover, quality implementation of climate-related projects is also a challenge. Sixteen years ago, the World Bank (2005) observed that only 26% of climate-related projects were recorded to be satisfactory compared to 80% of the projects in the other sectors. This calls for a common understanding on the meaning of ‘*climate aid effectiveness*’ between donors and the recipient countries because climate aid allocation is influenced by

the ‘recipient-country characteristics’ (Bagchi et al., 2016; Betzold & Weiler, 2017; Weiler et al., 2018). Other studies in climate finance distribution show that the finances are not distributed according to the need of the country’s vulnerability status and that adaptation finances do not solve climate-related challenges (Barrett, 2014; Kono and Montinola, 2019). However, if funds were properly channelled to solve the relevant challenges at local community level, people would be able to change their behaviour to reduce the risks of climate change and secure climate justice (Barrett, 2014). Climate justice is ‘an understanding of climate crisis through a human rights lens which places the communities and people most vulnerable to climate impacts as the main focus’ (Barrett, 2013). Since the manifestation of extreme effects, climate change has exacerbated social discomfort among the societies for either immediate or future needs (IPCCC, 2007; WPF, 2020; IPCC, 2021). For example, about 95 million people face food insecurity (acute) and 20 million people are displaced annually due to climate-related disasters (UNHCR 2020). At least 200 million people will migrate in search of better environments by 2050. A total of 132 million people have been squeezed into extreme poverty as a result of climate change (World Bank, 2021b).

For meaningful response from the general global community, the declaration at COP 20 that climate change be integrated in all developmental initiatives including education (Table 1 above), needs appropriate implementation modalities. It is imperative for countries to ensure that their decisions on climate actions positively respond to social equity at national level. Climate change has potential to breed conflicts especially in agriculture dependent (fertile) areas, politically marginalised communities and in underdeveloped regions (Bagozzi et al., 2017; Koubi, 2019). Social unrests in many countries have been caused by inability of governments to deliver in accountability, good governance, corruption, food security and disaster-related causes (Bellemare, 2019; O’driscoll et al., 2020). Avoiding these will prevent social unrest like those of Chile in 2019 which erupted after a policy direction to raise fare for a subway (Gonzalez & Morán, 2020).

5 Conclusions and recommendations

5.1 Role of the COPs and some achievements

Conference of the Parties provide a global platform for unified global action to combat climate change. It is the avenue for collective effort as agreed at COP 1 (IISD, 1995). Significant achievements include the formulation of agreements (Post-Kyoto Conferences and the Paris Agreement) which aim at reducing global warming to below 2 °C through a reduction in GHG emission, technological changes and the provision of GHG sinks (UNFCCC, 2015c; UNFCCC, 2021a). The conferences have resulted in the mobilisation of funds to implement adaptation and mitigation projects especially in developing countries. They have made progress in the establishment/revamping of funding agencies (GEF, GCF, AF), reporting on MA, and formulation of action plans for INDCs. Over 5,000 projects were implemented in developing countries through climate finance. Presentations on MA at COP 25 by the ten developed countries (Austria, Bulgaria, Belgium, Greece, Cyprus, Luxembourg, Kazakhstan, Portugal, New Zealand and Switzerland) and COP 26 (Croatia, Iceland, Kazakhstan, Liechtenstein, Luxembourg, Monaco, Poland, Romania, Slovenia, and the UK) were a source of hope on climate action transparency (UNFCCC, 2021c). MA is a transparent oriented process whereby developed Parties are critically assessed by fellow

Parties on the progress made on emission reduction and the performance of their economy (UNFCCC 2015a). The process was initially meant to assess the countries based on emission reduction targets by 2020. These countries lived up to their promises made at COP 14 (2008) on reducing GHG emissions by 20% by 2020. By 2018, 28 EU Party countries recorded a 2% GHG reduction representing a 23% reduction from the 1990 emission levels (European Environmental Agency, 2021b). This was higher than the initial target of 20% reduction by 2020. Although considered a major emitter, the US managed to reduce the GHG emission by 11% from 2007 to 2013 (Feng et al., 2015). This was due to a decrease in production structure and a switch from the use of coal to natural gas in the production of electricity. However, the economic recession of 2008 also contributed to the decrease.

5.2 Reduce the GHG emissions

A regression analysis showed that GHG emissions increased within the period of COP meetings. At COP 26, it was noted that the increasing GHG emissions have increased the warming by 1.1 °C within the unexpected short period despite the efforts to reduce the emissions (UNFCCC, 2021a). Any additional warming will have serious effects on nature and people (IPCC, 2021). This thwarts the ambition to attain a 2 °C but preferably 1.5 °C reduction in warming in order to minimise the negative impacts of climate change. To achieve the required target, there is need for immediate, deep and rapid sustainable reductions in GHG emissions by developed countries (UNFCCC, 2021a). One notable target is the need to reduce CO₂ by 45% by 2030 and all non-CO₂ emissions such as methane (UNFCCC, 2021a). There is need to phase out coal-based power sources and replace with renewable energy options. High emitting countries should strengthen the energy-climate policies to drive further decarbonisation of the energy system (Feng et al., 2015).

Further, the setting of carbon neutral targets in some countries should be supported with relevant policies. Major carbon neutral targets have been conspicuous in the transport and power sectors (Fischedick et al., 2014). The IAEA (2011) projected that by 2030, zero carbon solutions will reach competitive levels to replace the current carbon-emission options. It estimated a shift in industrial energy use from 42 to 30% on coal/oil and an increase from 20 to 24% in the use of gas from 2008 to 2035, respectively. This is expected to lower the emissions. However, it is argued here that if the global GHG emissions increased and remained high between 1995 and 2021 (throughout the COP period), it may be unlikely to attain a global reduction by 2030 considering the remaining years and the pace at which the Parties implement the COP resolutions. Negotiators at COPs, Parties and non-Parties should be reminded that failure to make significant reduction in GHG emissions by 2030 will mean increased costs to make a significant reduction beyond the year (IPCC, 2014; UNEP 2016).

5.3 Reduce deforestation

Within the COP meetings, there has been an increase in deforestation at global level. There is need to invest in options which will reduce deforestation to increase the CO₂ sinks. Increased forest and vegetation cover and reduced deforestation are the long-term goals of climate change mitigation (IPCC, 2014; UNFCCC, 2021a). A net increase in deforestation since the COP negotiations started, signals a need to reflect on the effectiveness of the agreements at COPs. There is need to formulate policies that lead to either sustainable

forestry or reduce the reliance on forests by rural communities especially in developing countries (Doggart & Meshack, 2017).

5.4 Widen the finance sources

The limited financial resources thwart efforts for adaptation and dealing with the negative effects of climate change in developing countries (UNFCCC, 2021a). There is need to improve the ways of mobilising financial resources by including the private sector whose contributions have remained low as reported by Tall et al. (2021). For example, of the USD23 billion and USD30 billion climate adaptation investments in 2015–2016 and 2017–2018, respectively, only 1.6% was contributed by the private sector. The reliance on developed countries to provide finances has proved ineffective. The increasing effects of climate change may strain the local budgets for developed countries and the countries may be forced to withdraw aid to developing countries (Wade & Jennings, 2010). With the limited financial resources in developing countries, the prolonged frequency of disasters will increase the time of recovery and the economies will remain in constant reconstruction (Hallegatte et al., 2010). However, financial recipient countries should provide annual progress achievements for the climate-related projects under implementation. Developing countries should scale up proposal submission to the funding agencies (AF, GCF, GEF etc.) if more climate activities were to be implemented. As of 1 September 2021, only two projects on Enhanced Direct Access from Belize and Rwanda and six on Innovation Projects from Belize, Bhutan, Vietnam, Somalia, Uganda and a regional one were under review by the AF (Adaptation Fund online).

5.5 Improve collaboration

One important agreement at all the COPs is collaboration (UNFCCC, 2021a). Parties are called to collaborate at various levels to achieve innovations that will enhance climate action. The collaboration could be through joint implementation of climate actions (COP 1 resolution), or financing initiatives on technology advancement, capacity building as suggested at COP 22 through the Marrakech Partnership for Global Climate Action (UNFCCC, 2016f). For inclusivity and responsibility sharing, all actors (Parties, non-Party states, civil society organisations, local communities, indigenous people, youth and children) should be involved. Using a Swedish climate dialogue process, Ingold and Fischer (2013), theorised that stakeholders/actors who share beliefs show higher collaboration than those with different beliefs in climate mitigation actions. They concluded that to achieve climate mitigation, there is need to focus more on shared beliefs among the actors/stakeholders over a long time. Possibly, this theory should be tried at COP negotiations to gauge the beliefs between developed and developing countries. Some COP meetings have been marked with conspicuous divisions between these two sides. For example, at COP 13, developed countries refused a request from developing countries to change some rules of the WTO as they (rules) were deemed unsuitable for profitable trade by developing countries (Love et al., 2009). Another divide was at COP 15, when G77 countries suspended discussions with developed countries alleging non-committed approach by the later (ISSD, 2020). To achieve the shared goals on climate change, all countries should be committed to contribute to achieve the set goals. A collective failure to achieve the GHG emission provisions will have a corresponding collective failure to attain the Sustainable Development Goals 1, 2, 13, 14 and 15. Based on the synthesis, developed countries (G20) hold the key

to achieving the GHG reduction as they contribute over 70% of the emissions. Negotiators at the future COPs should focus on key issues as the climate debate is compounded with social unrest in many countries (Bagozzi et al., 2017; O’driscoll et al., 2020). Arguably, there is also a need to restructure the COP purpose to a more focused and learning platform; a shift from the current set up where COP is viewed as an international multilateral governance and negotiation platform (Wamsler et al., 2020). The current set-up does not provide opportunity for research and development spaces, learning or experimental laboratories, action alliances and prototyping which could ensure inclusivity in decision making resulting into compliance (Kuyer et al., 2018; Wamsler et al., 2020).

Acknowledgements I would like to appreciate the Programme Manager of Salima Agricultural Development Division for providing the opportunity for me to write this paper.

Author contributions HN conceived the review idea and wrote the paper.

Funding This review did not receive any funding.

Data availability Not applicable.

Declarations

Conflict of interest The author has no competing interests to declare that are relevant to the content of this article.

References

- Adaptation Fund (2022). Grants to date: Grants under review. Retrieved January 31, 2022, from <https://www.adaptation-fund.org/apply-funding/enhanced-direct-access-eda-grants/grants-to-date/>.
- Adaptation Fund. (2019a). Adaptation Fund at COP 25. Retrieved August 31, 2021, from <https://www.adaptation-fund.org/adaptation-fund-at-cop25/>.
- Adaptation Fund. (2021). Projects and Programmes. Retrieved August 31, 2021, from <https://www.adaptation-fund.org/projects-programmes/>.
- African Union Commission. (2015). Agenda. (2063) Framework Document, The Africa We Want. Retrieved December 02, 2021, from https://uclgafrica-alga.org/wp-content/uploads/2019/06/INL_Agenda-2063-Technical-Document.pdf.
- African Development Bank. (2018). How forestry contributes to the. African Development Bank’s high 5 priorities: Challenges and opportunities. Retrieved December 21, 2021, from https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/How_Forestry_contributes_to_the_AfDB_High_5_Priorities.pdf.
- Arce, J.J.C. (2019). Forests, inclusive and sustainable economic growth and employment. *United Nations Forum on Forests*. Retrieved 17, December 2021, from <https://www.un.org/esa/forests/wp-content/uploads/2019/04/UNFF14-BkgdStudy-SDG8-March2019.pdf>.
- Arndt, C., & Tarp, F. (2017). Aid, environment and climate change. *Review of Development Economics*. <https://doi.org/10.1111/rode.12291>
- Bagchi, C., Castro, P., & Michaelowa, K. (2016) Donor accountability reconsidered: aid allocation in the age of global public goods. CIS Working Paper No. 87. Zurich, Switzerland: Center for Comparative and International Studies. Retrieved March 12, 2021, from <http://www.css.ethz.ch/en/services/digital-library/publications/publication.html/196672>.
- Bagozzi, B. E., Koren, O., & Mukherjee, B. (2017). Droughts, land appropriation, and rebel violence in the developing world. *Journal of Politics*, 79, 1057–1072.
- Barrett, S. (2013). Local level climate justice? Adaptation finance and vulnerability reduction. *Global Environmental Change*, 23, 1819–1829.
- Barrett, S. (2014). Subnational climate justice? Adaptation finance distribution and climate vulnerability. *World Development*, 58, 130–142.
- Bellemare, M. F. (2015). Rising food prices, food price volatility, and social unrest. *American Journal of Agricultural Economics*, 97, 1–21.

- Betzold, C., & Weiler, F. (2017). Allocation of aid for adaptation to climate change: Do vulnerable countries receive more support? *International Environmental Agreements*, 17, 17–36.
- Boden, T. A., Andres, R. J., & Marland, G. (2017). Global, regional, and national fossil-fuel CO₂ emissions (1751–2014). Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. https://doi.org/10.3334/CDIAC/00001_V2017.
- Boezeman, D., & de Coninck, H. (2018). Improving collaborative knowledge production for climate change mitigation: Lessons from EU Horizon 2020 experiences. *Sustainable Earth*, 1, 6. <https://doi.org/10.1186/s42055-018-0007-0>
- Burck, J., Marlen, F., & Bals, C. (2015). Climate Change Performance Index, Results 2015. Retrieved February 15, 2022, from <https://www.cac.int/sites/default/files/10407.pdf>.
- Burck, J., Marlen, F., & Bals, C. (2017). Climate Change Performance Index, Results 2017. Retrieved February 15, 2022, from <https://ccpi.org/download/the-climate-change-performance-index-2017/>.
- Burck, J., Uhlich, T., Bals, C., Höhne, N., & Nascimento, L. (2022). Climate Change Performance Index, Results 2022. Retrieved January 01, 2022, from <https://ccpi.org/ranking/>.
- Butler, R.A. (2019). Amazon destruction. Retrieved August 26, 2021, from https://rainforests.mongabay.com/amazon/amazon_destruction.html.
- CAIT data: Climate watch. (2020). GHG Emissions. Washington, DC: World Resources Institute. Retrieved January 18, 2022, from <https://data.worldbank.org/indicator/EN.ATM.GHGT.KT.CE?locations=JP>.
- Ceglaz, A., Benestad, R., & Kundzewicz, Z. (2018). Inconvenience versus rationality: Reflections on different faces of climate: contrarianism in Poland and Norway. *Weather, Climate and Society*, 10, 821–836.
- Centre for Climate and Energy Solutions. (2014). Outcomes of the UN Climate Change in Lima: 20th Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 20). Retrieved April 13, 2016, from www.c2es.org/docUploads/cop-20-summary.pdf.
- Centre for Climate and Energy Solutions. (2016). Outcomes of the U.N. Climate Change Conference In Marrakech: 22nd Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 22) November 7–18, 2016. Retrieved February 20, 2022, from <https://www.c2es.org/content/cop-22-marrakech/>
- Clark, D. (2012). Has the Kyoto Protocol made any difference to carbon emissions? Retrieved December 1, 2021, from <https://www.theguardian.com/environment/blog/2012/nov/26/kyoto-protocol-carbon-emissions>.
- Climate Transparency. (2016). Brown to Green: G20 transition to a low carbon economy. Climate Change Performance Index 2016. Retrieved August 19, 2021, from https://www.climate-transparency.org/wp-content/uploads/2016/09/Mexico_Country-Profile.pdf.
- Cook, J., Nuccitelli, D., Green, S. A., Richardson, M., Winkler, B., Painting, R., Way, R., Jacobs, P., & Skuce, A. (2013). Quantifying the consensus on anthropogenic global warming in the scientific literature. *Environmental Research Letters*, 8(2), 024024. <https://doi.org/10.1088/1748-9326/8/2/024024>
- Crippa, M., Guizzardi, D., Muntean, M., Schaaf, E., Solazzo, E., Monforti-Ferrario, F., Olivier, J.G.J. & Vignati, E. (2020). Fossil CO₂ emissions of all world countries-2020 Report, EUR 30358 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-21515-8. doi:<https://doi.org/10.2760/143674>, JRC121460.
- Danneman, M. (2016). The Paris Agreement's compliance mechanism. MSc. Thesis. Stockholm University. Retrieved February 7, 2022, from <http://www.diva-portal.org/smash/get/diva2:1049560/FULLTEXT01.pdf>.
- Dagnet, Y., Waskow, D., Chan, C., Thwaites, J., Levin, K. & Cogswell, N. (2019, November 25). Climate. 4 Priorities for the COP25 Climate Conference in Madrid. World Resources Institute. Retrieved August 13, 2021, from <https://www.wri.org/insights/4-priorities-cop25-climate-conference-madrid>.
- Dogart, N., & Meshack, C. (2017). The marginalization of sustainable charcoal production in the policies of a modernizing African nation. *Frontier in Environmental Science*, 5, 27. <https://doi.org/10.3389/fenvs.2017.00027>
- European Environmental Agency. (2021a). Greenhouse gas emission targets, trends, and Member States MMR projections in the EU, 1990–2050. Retrieved August 23, 2021, from <https://www.eea.europa.eu/data-and-maps/figures/greenhouse-gas-emission-targets-trends-1>.
- European Environmental Agency. (2021b). EEA greenhouse gases-data viewer. Retrieved January 27, 2022, from <https://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer>.
- Erbach, G. (2019). COP24 climate change conference: Outcomes. European Parliamentary Research Service Retrieved February 6, 2022, from [https://www.europarl.europa.eu/RegData/etudes/ATAG/2019/633139/EPRS_ATA\(2019\)633139_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/ATAG/2019/633139/EPRS_ATA(2019)633139_EN.pdf).
- FAO. (2020). Forest Resources Assessment. Retrieved August 24, 2021, from <http://www.fao.org/forest-resources-assessment/2020/en/>.

- Fischedick, M., Roy, J., Abdel-Aziz, A., Acquaye, A., Allwood, J.M., Ceron, J.-P., Geng, Y., Kheshgi, H., Lanza, A., Perczyk, D., Price, L., Santalla, E., Sheinbaum, C. & Tanaka, K. (2014). *Industry: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. In: Edenhofer, O., Pichs-Madruga, R., Sokona, Y., Farahani, E., Kadner, S., Seyboth, K., Adler, A., Baum, I., Brunner, S., Eickemeier, P., Kriemann, B., Savolainen, J., Schlömer, S., von Stechow, C., Zwicker, T. & Minx, J.C., (eds.). Climate Change 2014. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Gütschow, J., Jeffery, L., & Gieseke, R. (2019). The PRIMAP-hist national historical emissions time series (1850–2016) v2.0, 2019. Retrieved February 7, 2022 <https://doi.org/10.5880/PIK.2019.001>.
- Feng, K., Davis, S. J., Sun, L., & Hubacek, K. (2015). Drivers of the US CO₂ emissions 1997–2013. *Nature Communications*, 6, 7714. <https://doi.org/10.1038/ncomms8714>
- Friedrich, J., Ge, M., & Pickens, A. (2020). Climate. World Resources Institute. Retrieved January 27, 2022, from <https://www.wri.org/insights/interactive-chart-shows-changes-worlds-top-10-emitters>.
- Garside, M. (2021, August 02). Chemicals and Resources: Fossil fuels. Statista. Retrieved August 17, 2021, from <https://www.statista.com/statistics/264775/top-10-countries-based-on-hard-coal-production/>.
- Gillingham, K. (2019). Carbon calculus. In G. Bhatt (Ed.), *Finance and development* (pp. 8–11). UK: International Monetary Fund.
- Global Environment Facility. (2016). GEF achievements in Burkina Faso. Retrieved September 1, 2021, from <https://www.thegef.org/news/gef-achievements-burkina-faso>.
- Global Environment Facility. (2019). Report of the Global Environment Facility to the twenty-fifth session of the conference of the parties to the United Nations Framework Convention on Climate Change. Retrieved August 31, 2021, from https://www.thegef.org/sites/default/files/documents/gef_report_unfccc_cop25.pdf.
- Gonzalez, R., & Morán, L. F. C. (2020). The 2019–2020 Chilean protests: A first look at their causes and participants. *International Journal of Sociology*, 50, 227–235.
- Green Climate Fund. (2019). Eighth Report of the Green Climate Fund to the Conference of the Parties to the United Nations Framework Convention on Climate Change. Retrieved August 31, 2021, from <https://www.greenclimate.fund/sites/default/files/event/gcf-b23-10-eighth-report-green-climate-fund-conference-parties-united-nations-framework-convention.pdf>.
- Green Climate Fund. (2020). Annual portfolio performance report 2019. Retrieved August 30, 2021, from <https://www.greenclimate.fund/sites/default/files/document/gcf-b27-inf04.pdf>.
- Green Climate Fund. (2021). Status of the GCF portfolio approved projects and fulfilment of conditions. Retrieved August 30, 2021, from <https://www.greenclimate.fund/sites/default/files/document/gcf-b28-inf09.pdf>.
- Grub, M., Vrolijk, C., & Brack, D. (1999). The Kyoto protocol: A guide and assessment. *Environmental Values*, 10, 556–558.
- Hallegratte, S., Dumas, P., & Hourcade, J.C. (2010). A note on the economic cost of climate change and the rationale to limit it below 2°C. World Bank Policy Research Working Paper 5179. Retrieved August 30, 2021, from <https://deliverypdf.ssrn.com/delivery.php?ID=526026122121114002075079031067002004053019084010061003029004118010040016051013031006009117065083094113040087015067075003027113004028106113000098021107001079016084016070110089107086087090025&EXT=pdf&INDEX=TRUE>
- Heidhues, F., & Obare, G. (2011). Lessons from Structural Adjustment Programmes and their effects in Africa. *Quarterly Journal of International Agriculture*, 50, 55–64.
- IAEA (International Atomic Energy Agency). (2011). World Energy Outlook 2011 Special Report: Are we entering a golden age of gas? International Energy Agency, Paris. Retrieved August 30, 2021, from <https://www.iaea.org/news/iea-special-report-explores-potential-for-golden-age-of-natural-gas>.
- ICCA (International Collaboration for Climate Action). (2019). Heidelberg Outcomes: Collaborative Climate Action lessons, levers, practical examples. Retrieved January 4, 2022, from <https://collaborative-climate-action.org/wp-content/uploads/2019/11/ICCA2019-Heidelberg-Outcomes-English.pdf>.
- IISD (International Institute for Sustainable Development). (1995). Summary report, 28 March–7 April 1995. UNFCCC COP 1. *Earth Negotiations Bulletin*. Retrieved January 08, 2022, from <https://enb.iisd.org/events/unfccc-cop-1/summary-report-28-march-7-april-1995>.
- IISD (International Institute for Sustainable Development). (1998). Report of the fourth conference of the parties to the UN Framework Convention on Climate Change: 2–13 November 1998. *Earth Negotiations Bulletin*, 12, 97. Retrieved February 20, 2022, from <https://enb.iisd.org/events/unfccc-cop-4/summary-report-2-13-november-1998>
- IISD (International Institute for Sustainable Development). (2009). A brief analysis of the Copenhagen Climate Change Conference. An ISSD Commentary. *Earth Negotiations Bulletin*, 12, 459.

- Retrieved February 20, 2022, from https://www.iisd.org/system/files/publications/enb_copen_hagen_commentary.pdf
- ISSD (International Institute for Sustainable Development). (2020). Doha Amendment to Enter into Force. Retrieved February 7, 2022, from <https://sdg.iisd.org/news/doha-amendment-enters-into-force>.
- IMF (International Monetary Fund). (2001). Malawi-Enhanced Structural Adjustment Facility Policy Framework Paper, 1998/99–2000/01. Retrieved February 10, 2022, from <https://www.imf.org/external/np/pfp/malawi/malawi.htm>.
- Ingold, K., & Fischer, M. (2013). Drivers of collaboration to mitigate climate change: An illustration of Swiss climate policy over 15 years. *Global Environmental Change*. <https://doi.org/10.1016/j.gloenvcha.2013.11.021>
- Ingram, K. & Irwin, M. (2009). Poznan Climate Conference 2008. *Sustainable Development Law and Policy* 15: Retrieved October 13, 2021, from <https://heinonline.org/HOL/LandingPage?handle=hein.journals/sdlp9&div=29&id=&page=>.
- IPCC (Intergovernmental Panel on Climate Change). (2007). IPCC Fourth Assessment Report: Climate Change. Retrieved August 23, 2021, from https://archive.ipcc.ch/publications_and_data/ar4/wg3/en/tsts-ts-12-3-implications-of.html.
- IPCC (Intergovernmental Panel on Climate Change). (2014). 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. Geneva Switzerland.
- IPCC, (Intergovernmental Panel on Climate Change). (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. In V Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu & B. Zhou (eds.), *Sixth Assessment Report*. Cambridge University Press. In Press.
- Japan Research Institute. (2001). The "Suspension" of COP6 and its Significance. Retrieved February 6, 2022, from <https://www.jri.co.jp/english/periodical/rim/2001/RIMe200103cop6/>.
- Joint Research Centre. (2014). Carbon dioxide time series 1990–2014 per region/country. Retrieved April 14, 2021, from edgar.jrc.ec.europa.eu/overview.php?v=CO2ts1990-2014.
- Kindermann, G., Obersteiner, M., Sohngen, B., Sathaye, J., Andrasko, K., Rametsteiner, E., Schlamadinger, B., Wunder, S., & Beach, R. (2008). Global cost estimates of reducing carbon emissions through avoided deforestation. *PNAS*, 105, 10302–10307.
- Kono, D.Y. & Montnola, G.R. (2019). Foreign aid and climate change policy: What can('t) the data tell us? WIDER Working Paper 2019/15. United Nations University, World Institute for Development Economics Research.
- Koubi, V. (2019). Climate change and conflicts. *Annual Review of Political Science*, 22, 343–360.
- Kuyper, J. W., Schroeder, H., & Linnér, B. O. (2018). The evolution of the UNFCCC. *Annual Reviews*, 43, 343–368.
- Li, L. (2017). Electoral democracy and deliberative democracy under the chinese constitution. In: Li L (Ed). *Building the rule of Law in China*, pp. 59–83. Retrieved February 10, 2022, from <https://www.sciencedirect.com/book/9780128119303/building-the-rule-of-law-in-china>.
- Lombardo, T. (2015). The future evolution of consciousness. *World Futures Review*, 6, 322–335.
- Love, L, Partick, L, & Ralph, L. (2009). *Protectionism? Tariffs and other barriers to trade*. International Trade: Free Fair and Open? OECD Publishing.
- Minnemeyer, S., Harris, N., & Payne, O. (2017). *Forests: Conserving forests could cut carbon emissions as much as getting rid of every car on earth*. UK: World Resources Institute.
- McCarthy, N., Winters, P., Linares, A.M., & Essam, T. (2012). Indicators to assess the effectiveness of climate change projects. Impact-Evaluation Guidelines Technical Notes No. IDB-TN-398. Retrieved August 31, 2021, from <https://publications.iadb.org/publications/english/document/Indicators-to-Assess-the-Effectiveness-of-Climate-Change-Projects.pdf>.
- Mendelsohn, R., Schlesinger, M., & Williams, L. (2000). Comparing impacts across climate models. *Integrated Assessment*, 1, 37–48.
- Mendelsohn, R., Dinar, A., & Williams, L. (2006). The distributional impact of climate change on rich and poor countries. *Environment and Development Economics*, 11, 1–20.
- Mendelsohn, R. (2013). Climate change and economic growth, commission on growth and development, Working paper no.60.
- Moosmann, L., Urrutia, C., Siemons, A., Cames, M., & Schneider, L. (2019). International Climate Negotiations—Issues at stake in view of the COP 25 UN Climate Change Conference in Madrid, Study for the Committee on the Environment, Public Health and Food Safety of the European Parliament, Policy Department for Economic, Scientific and Quality of Life Policies, European

- Parliament, Luxembourg, 2019. Retrieved December 12, 2022, from <http://www.europarl.europa.eu/supporting-analyses>.
- Mountford, H., & Bergen, M. (2020). Climate resilience. World Resources Institute. Retrieved December 12, 2022, from <https://www.wri.org/insights/6-signs-progress-adoption-paris-agreement>.
- Muller, B. (2008). Bali 2007: On the road again! Oxford energy and environmental comment. Retrieved August 8, 2020, from www.oxfordclimatepolicy.org/publication/documents/comments_0208-2.pdf.
- Oberthur, S., & Ott, H. E. (1999). *The Kyoto Protocol: International Climate Policy for the 21st Century*. Springer-Verlag.
- O'driscoll, O., Bourhrous, A., Maddah, M., & Fazil, S. (2020, October). Protest and state– society relations in the Middle East and North Africa. SIPRI Policy Paper 56. Retrieved August 21, 2021, from <https://www.sipri.org/sites/default/files/2020-10/siprippp56.pdf>.
- OECD. (2019). Climate Change: OECD DAC External Development Finance Statistics. Retrieved January 12, 2021, from <http://www.oecd.org/dac/financing-sustainable-development/development-finance-topics/climate-change.html>.
- Oreskes, N. (2004). The scientific consensus on climate change. *Science*, 306, 1686. <https://doi.org/10.1126/science.1103618>
- Oxfam. (2016). The Climate Finance Shadow Report. Lifting the lid on progress towards the \$100 billion commitment. Retrieved January 12, 2021, from https://www.oxfam.org/sites/www.oxfam.org/files/file_attachments/bp-climate-finance-shadow-report-031116-en.pdf.
- R Development Core Team. (2020). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing.
- Ritchie, H., & Roser, M. (2020, August). CO₂ and Greenhouse Gas Emissions. Our World in Data. Retrieved August 19, 2021, from <https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions>.
- Ritchie, H., & Roser, M. (2021) Forests and Deforestation. Our World in Data. Retrieved January 1, 2021, from <https://ourworldindata.org/forests-and-deforestation>.
- Rono, J. K. (2002). The impact of structural adjustment programmes on Kenyan society. *Journal of Social Development in Africa*, 17, 81–98.
- Rossati, D. (2021). A question of value: on the legality of using Kyoto protocol units under the Paris agreement. *Climate Law*, 11, 298–321. <https://doi.org/10.1163/18786561-11030005>
- Shan, Y., Guan, D., Zheng, H., Ou, J., Li, Y., Meng, J., Mi, Z., Liu, Z., & Zhang, Q. (2018). Data descriptor: China CO₂ emission accounts 1997–2015. *Scientific Data*, 5, 170201. <https://doi.org/10.1038/sdata.2017.201>
- Simoes, A., & Hidalgo, C. (2011). The Economic complexity observatory: An analytical tool for understanding the dynamics of economic development. Workshops at the Twenty-Fifth AAAI Conference on Artificial Intelligence. Retrieved August 22, 2021, from <https://oec.world/en/profile/country/bra/>.
- Silva-Junior, C. H. L., Pessôa, A. C. M., Carvalho, N. S., Reis, J. B. C., Anderson, L. O., & Aragão, L. E. O. C. (2021). The Brazilian Amazon deforestation rate in 2020 is the greatest of the decade. *Nature Ecology and Evolution*, 5, 144–145.
- Slaughter, A.M. (2015). The Paris Approach to Global Governance (December, 28) Project-Syndicate Retrieved February 7, 2022 <https://www.project-syndicate.org/commentary/paris-agreement-model-for-global-governance-by-anne-marie-slaughter-2015-12>.
- Stern, N. (2006). *Review on the economics of climate change, PART II: The impacts of climate change on growth and development*. HM Treasury.
- Tiseo, I. (2021). Chemical and resources. Carbon dioxide gas emissions. Statista. Retrieved August 13, 2021, from <https://www.statista.com/statistics/270499/co2-emissions-in-selected-countries/>.
- Tall, A., Lynagh, S., Blanco, V. C., Bardouille, P., Montoya P.F., Shabahat, E., Stenek V., Stewart, F., Power, S., Paladines, C., Neves, P., & Kerr, L. (2021). Enabling Private Investment in Climate Adaptation and Resilience: Current Status, Barriers to Investment and Blueprint for Action. World Bank, Washington, DC. Retrieved February 14, 2021, from <https://openknowledge.worldbank.org/bitstream/handle/10986/35203/Enabling-Private-Investment-in-Climate-Adaptation-and-Resilience-Current-Status-Barriers-to-Investment-and-Blueprint-for-Action.pdf?sequence=5&isAllowed=y>.
- Tulyasuwan, N., Henry, M., Secrieru, M., Jonckheere, I., & Federici, S. (2012). Issues and challenges for the national system for greenhouse gas inventory in the context of REDD+. *Greenhouse Gas Measurement and Management*, 2, 73–83.
- UN (United Nations). (1973). Report of the United Nations Conference on the Human Environment, Stockholm, 5–16 June 1972. Retrieved August 26, 2021, from <https://undocs.org/en/A/CONF.48/14/Rev.1>.
- UN (United Nations). (1993). United Nations Conference on Environment & Development Rio de Janeiro, Brazil, 3 to 14 June 1992, AGENDA 21. United Nations, New York.

- UN (United Nations). (2015a). Transforming our worlds: The 2030 Agenda for Sustainable Development. Department of Economic Affairs: Sustainable Development. Retrieved January 11, 2022, from <https://sdgs.un.org/2030agenda>.
- UN (United Nations). (2015b). Paris Agreement. Paris, France. Retrieved August 13, 2021, from <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>.
- UNCCD (United Nations Convention to Combat Desertification). (2011). Advice on how best to measure progress on strategic objectives 1, 2 and 3 of The Strategy. Retrieved January 2, 2022, from http://www.ciesin.columbia.edu/repository/entri/docs/cop/UNCCD_COP11_dec22.pdf.
- UNDP (United Nations Development Programme). (2015). Retrieved 13, August 2021, from *Work for human development*. Oxford Publishing Press.
- UNDP (United Nations Development Programme). (2016, August 10). UNDP on 25 Years of GEF: a record of high-impact environmental results. Retrieved September 1, 2021, from <https://www.the-gef.org/news/undp-25-years-gef-record-high-impact-environmental-results>.
- UNEP (United Nations Environment Programme). (2016). The Adaptation Finance Gap Report 2016. Nairobi, Kenya. Retrieved February 14, 2022, from <https://unepdtu.org/wp-content/uploads/2018/10/unep-gap-report-2016-web-6-6-2016.pdf>.
- UNFCCC (United Nations Framework Convention on Climate Change). (2008a, March 14). Report of the Conference of Parties on its Thirteenth Session, held in Bali from 3 to 15 December 2007. Retrieved October 13, 2021, from <https://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf>.
- UNFCCC (United Nations Framework Convention on Climate Change). (2008b). Report of the Conference of Parties serving as the meeting of the Parties to the Kyoto Protocol on its Third Session, held in Bali from 3 to 15 December 2007. Retrieved April 13, 2021.
- UNFCCC (United Nations Framework Convention on Climate Change) (2009a) Report of the Conference of Parties on its Fourteenth Session, held in Poznan from 1 to 12 December 2008. Retrieved October 13, 2021, from <https://unfccc.int/resource/docs/2008/cop14/eng/07a01.pdf>.
- UNFCCC (United Nations Framework Convention on Climate Change). (2009b). Report of the Conference of Parties serving as the meeting of the Parties to the Kyoto Protocol on its Fourth Session, held in Poznan from 1 to 12 December 2008. Retrieved April 12, 2016.
- UNFCCC (United Nations Framework Convention on Climate Change). (2012). Decision 1/CMP.8. Amendment to the Kyoto Protocol pursuant to its Article 3, paragraph 9 (the Doha Amendment), 2012. Retrieved December 12, 2022, from http://www.ciesin.columbia.edu/repository/entri/docs/cop/Kyoto_CMP8_dec01.pdf.
- UNFCCC (United Nations Framework Convention on Climate Change). (2015a). Report of the Conference of Parties on its Twentieth Session, held in Lima from 1 to 14 December 2014. Retrieved October 12, 2021, from <https://unfccc.int/resource/docs/2014/cop20/eng/10a01.pdf>.
- UNFCCC (United Nations Framework Convention on Climate Change). (2015b). Report of the Conference of Parties serving as the meeting of the Parties to the Kyoto Protocol on its Tenth Session, held in Lima from 1 to 14 December 2014. Retrieved October 13, 2021, from <https://unfccc.int/resource/docs/2014/cmp10/eng/09a01.pdf>.
- UNFCCC (United Nations Framework Convention on Climate Change). (2015c). Paris Agreement. Retrieved December 3 2021, from https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf.
- UNFCCC (United Nations Framework Convention on Climate Change). (2016a). Report of the Conference of the Parties on its Twenty-First Session, held in Paris from 30 November to 13 December 2015. Retrieved August 30, 2021, from <https://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf#page=2>.
- UNFCCC (United Nations Framework Convention on Climate Change). (2016b). Report on sources of support for preparation of Intended Nationally Determined Contributions. Retrieved November 30, 2021.
- UNFCCC (United Nations Framework Convention on Climate Change). (2016c). Marrakech action proclamation. Retrieved November 30, 2021 https://unfccc.int/files/paris_agreement/application/pdf/marrakech_partnership_for_global_climate_action.pdf.
- UNFCCC (United Nations Framework Convention on Climate Change). (2016d). Status of credentials of Parties. Report on sources of support for preparation of Intended Nationally Determined Contributions. Retrieved April 14, 2021 <https://unfccc.int/process/the-kyoto-protocol/status-of-ratification>.
- UNFCCC (United Nations Framework Convention on Climate Change). (2016e). Global climate action. Retrieved December 4, 2021.
- UNFCCC (United Nations Framework Convention on Climate Change). (2016f). Marrakech Partnership for Global Climate Action. Retrieved December 2, 2021 https://unfccc.int/files/paris_agreement/application/pdf/marrakech_partnership_for_global_climate_action.pdf.

- UNFCCC. (United Nations Framework Convention on Climate Change) (2019a). Draft monitoring and evaluation of the impacts of the implementation of the mandates of the Technology Executive Committee: Technology Executive Committee Nineteenth meeting. Retrieved January 2, 2022, from https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/fecf05347525429cb21cc66dd9dbc16d/6522dd9d1a2d497a8453a64c0a456172.pdf.
- UNFCCC (United Nations Framework Convention on Climate Change) (2019b, December 15). Statement by the UN Secretary-General António Guterres on the Outcome of COP25 in Madrid. Retrieved February 6, 2022, from <https://unfccc.int/news/statement-by-the-un-secretary-general-antonio-guterres-on-the-outcome-of-cop25#:~:text=%E2%80%9C%20am%20disappointed%20with%20the,1%20will%20not%20give%20up>.
- UNFCCC (United Nations Framework Convention on Climate Change). (2020). Progress in the process to formulate and implement National Adaptation Plans. Retrieved February 11, 2022, from https://unfccc.int/sites/default/files/resource/20201125_CD_2020-Progress-in-NAPs.pdf.
- UNFCCC (United Nations Framework Convention on Climate Change). (2021a). Draft COP decision proposed by the President: DRAFT TEXT on Decision 1/CP.26. Retrieved January 11, 2022, from https://unfccc.int/sites/default/files/resource/Overarching_decision_1-CP-26_0.pdf.
- UNFCCC. (United Nations Framework Convention on Climate Change). (2021b). Statistics on Participation and in-session engagement. Retrieved January 18, 2022, from <https://unfccc.int/process-and-meetings/parties-non-party-stakeholders/non-party-stakeholders/statistics-on-participation-and-in-session-engagement>.
- UNFCCC (United Nations Framework Convention on Climate Change). (2021c). Highlights from Parties' multilateral assessment presentations during COP26 in Glasgow. Retrieved February 11, 2022, from https://unfccc.int/sites/default/files/resource/Highlights_from_Parties_at_the_Multilateral_Assessment_sessions_Nov_21.pdf.
- United States Environmental Protection Agency. (2016). Climate Change Indicators: Global Greenhouse Gas Emissions Retrieved January 21, 2022, from <https://www.epa.gov/climate-indicators/climate-change-indicators-global-greenhouse-gas-emissions>.
- UNHCR (United Nations High Commissioner for Refugees). (2020). Sustainable energy, displacement and climate resilience. Retrieved August 19, 2021, from <https://www.unhcr.org/afr/protection/envir/5f60a3c44/sustainable-energy-displacement-climate-resilience.html>.
- Victor, D. G. (2001). *The collapse of the Kyoto Protocol and the struggle to slow global warming*. Princeton University Press.
- Wade, K., & Jennings, M. (2010). Effect of warming on global economy. Retrieved January 21, 2022, from <https://www.schroders.com/globalassets/digital/insights/pdfs/the-impact-of-climate-change-on-the-global-economy.pdf>.
- Wamsler, C., Schöpke, N., Fraude, C., Stasiak, D., Bruhn, T., Lawrence, M., Schroeder, H., & Mundaca, L. (2020). Enabling new mindsets and transformative skills for negotiating and activating climate action: Lessons from UNFCCC conferences of the parties. *Environmental Science & Policy*, *112*, 227–235.
- Weiler, F., Klöck, C., & Dornan, M. (2018). Vulnerability, good governance, or donor interests? The allocation of aid for climate change adaptation. *World Development*, *104*, 65–77.
- Weisse, M., & Goldman, E. (2021). Forest Pulse: The Latest on the World's Forests. Retrieved August 25, 2021, from <https://research.wri.org/gfr/forest-pulse>.
- WFP (World Food Programme). (2020). R4 Rural resilience initiative. Retrieved August 26, 2021, from <https://www.wfp.org/publications/2020-r4-rural-resilience-initiative-factsheet>.
- WMO (World Meteorological Organization). (2015). Unprecedented attendance by heads of state at COP21. Retrieved February 7, 2022, from <https://public.wmo.int/en/media/news/unprecedented-attendance-heads-of-state-cop21>.
- World Bank. (2005). *Improving the World Bank's development effectiveness: What does evaluation show?* World Bank Operations Evaluation Department.
- World Bank. (2010). Economics of Adaptation to Climate Change: Synthesis Report. Retrieved February 14, 2022, from <http://hdl.handle.net/10986/12750>.
- World Bank. (2014). Turn down the heat: Confronting the new climate normal. Washington, DC: World Bank, License: Creative Commons Attribution—NonCommercial—No Derivatives 3.0 IGO (CC BY-NC-ND 3.0 IGO).
- World Bank. (2015). Finance for Climate Action: A snapshot of the World Bank Group's Climate Work. Retrieved February 8, 2022, from https://www.worldbank.org/content/dam/Worldbank/document/Climate/FinanceClimateAction_Web.pdf.
- World Bank. (2021a). Innovative tools for climate Action. Retrieved January 8, 2022, from <https://www.worldbank.org/en/news/feature/2021/11/03/innovative-tools-for-climate-action>.

- World Bank. (2021b). Climate change overview. Retrieved August 26, 2021, from <https://www.worldbank.org/en/topic/climatechange/overview>.
- World Resources Institute. (2021a). Climate Watch historical GHG emissions. Retrieved January 21, 2022, from https://www.climatewatchdata.org/ghg-emissions?end_year=2018&start_year=1990.
- World Resources Institute. (2021b). Global Forest Review. Retrieved January 21, 2022, from <https://research.wri.org/gfr/top-ten-lists>.
- Yang, M. (2013). Closing the Gap: GEF Experiences in Global Energy Efficiency. Library of Congress Control Number 2012947854, ISBN 978-1-4471-4515-8, ISBN 978-1-4471-4515-5 (eBook), DOI <https://doi.org/10.1007/978-1-4471-4516-5>.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.