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Climate Finance in the 21st Century – A Systematic Literature Review

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Abstract and Policy Implications

The aim of this essay is to give a systematic review of the literature. Climate change is omnipresent and manifests itself in a steady increase in global warming. This trend was triggered as a reaction to increasing emissions in the course of industrialization. Climate finance is generally understood to be the provision of public, private, and alternative sources of finance that represent measures to mitigate and adapt to climate change. Significant commitments to support developing countries by developed countries have been manifested in the UNFCCC climate framework and the Paris Climate Agreement. Funding from public and private sources increased to a total of \$540 billion in 2019. Whether multilateral or bilateral, the largest share is provided in the form of loans to the target countries.

1. Introduction

In view of the almost unstoppable globalization and the associated increase in greenhouse gases, a rethink is required within our society. Regarding that problem, one of the most modern and promising solution is the so called climate finance.

The United Nations describes climate finance that it “refers to local, national or transnational financing- drawn from public, private and alternative source of financing- that seeks to support mitigation and adaption actions that will address climate change” (United Nations, 2021).

Data collectors and aggregators often use different definitions for the climate finance but with more or less similar elements. Even the United Nations Framework Convention on Climate Change (UNFCCC) does not contain a systematic definition of climate finance. Because of that definitional issue a definition resulting from the literature can be framed as: “Climate finance aims at reducing emissions and enhancing sinks of greenhouse gases and aims at reducing vulnerability of, and maintaining and increasing the resilience of, human and ecological systems to negative climate change impacts.” (UNFCCC, 2014)

Integral part of the international climate policy is the financial support from industrialized countries for climate protection and adaption to climate change in developing countries. In this context, financial support originally referred to channels of development cooperation or multilateral climate funds to promote measures for the mitigation or avoidance of greenhouse

gases, for example through the conversion of energy systems or climate-friendly development and adaptation to climatic changes (Kowalzig, 2021).

Milestones in climate finance have been the United Nations Convention, the Kyoto Protocol, and the Paris Agreement, which are binding under international law and call for precisely financial support from parties with more financial resources for those that are less equipped and more vulnerable. This fundamental idea was enshrined in the 1992 Convention, which enshrined the principle of "common but differentiated responsibilities and respective capabilities". This is the first time that it has been recognized and manifested that countries' capacities, and therefore their contribution to addressing climate change varies widely. The Paris Agreement reaffirms these commitments by developed countries and encourages other parties to also make voluntary contributions (United Nations, 2021). As a result of the Paris Agreement, climate finance is now often understood in a broader sense. This seems necessary as climate finance consists of several components. These include the instruments, the source of financing, the flows of financing and whether climate change migration is the major or minor element. Against the backdrop of Article 2.1 of the Paris Climate Agreement, which aims to keep the rise in average global temperature to well below 2 °C above pre-industrial levels and preferably to 1.5 °C, climate finance fundamentally aims to provide financial resources for implementing the transition to a sustainable low-carbon and climate-resilient economy (Waldén, 2021).

2. Review of the Literature

2.1 Climate Finance Goals

Due to advancing climate change and its associated impacts, developing countries will find it very difficult to make progress in their development. So, as can inevitably be seen, climate protection and development policy are very much interdependent. In order to adapt to these negative barriers of climate change and to achieve climate protection goals, a strong international community of states is needed (BMZ, 2019).

To achieve the stated goal of climate resilience and decarbonization in the 21st century, all must launch ambitious programs to reduce greenhouse gas emissions and adapt to the consequences of climate change. Specifically, this means moving to low-carbon lifestyles and economies and making societies more resilient to the impacts of climate change. To achieve this goal, the industrialized countries had already committed in Copenhagen in 2009 to mobilize \$100 billion annually from public and private sources for climate protection and adaptation in developing countries from 2020 (BMZ, 2019).

In the course of the Paris Climate Conference in 2015, it was agreed to provide \$ 100 billion annually until 2025 initially and then to set a new international climate financing target. To

address the realities accordingly, this is to be above \$100 billion and adapted to the needs and priorities of developing countries. The funding will be secured through public and private, bilateral, and multilateral, and alternative funding sources (European Commission, 2021).

Parties have made significant progress in recent years in scaling up their climate finance ambition, which is evident from the OECD's latest progress report. For example, funding provided by developed countries for climate action in developing countries reached \$78.9 billion in 2018 compared to \$71.2 billion in 2017, and the 2018 biennial assessment by the UNFCCC Standing Committee on Finance showed that governments are on track to meet the targets by the end of 2020. It should be noted that measuring progress toward the \$100 billion target is a highly subjective endeavor. The assessment largely depends on how climate finance is defined. However, in the absence of such a definition, it seems inevitable that not all Parties will use the same approaches or methodologies to measure their contribution. These different approaches can lead to inconsistency in the data (Adams, 2020).

2.2 Challenges and Needs

Climate change is omnipresent and manifests itself in a steady increase in global warming. This trend was triggered as a reaction to increasing emissions in the course of industrialisation. The human influence on the climate could already be detected at the beginning of the twentieth century, but at that time as well as in the following decades its extent was wrongly estimated and underestimated. Initial studies in this regard focused in particular on the apparently positive effect of the tendency towards a (slight) increase in average annual temperature (Beuermann 2013). From today's perspective, this initial assessment seems more than paradoxical, given the existential challenges that climate change poses for current and future generations. The consequences are far-reaching, extreme weather conditions exemplary: hurricanes, the increase in the extent and number of floods due to melting polar ice caps, or even the spread of deserts hostile to living space are growing to become the greatest challenges facing humanity (Greenpeace UK 2021).

Economic impact: According to one of the most popular studies of recent years, the expected future economic costs of an increase in average annual temperatures, if emissions are not reduced, could amount to an economic loss of at least five percent (tending towards G7 countries) and up to twenty percent (tending towards developing countries) of the respective Gross Domestic Product (GDP). This estimate was made in the Stern Review (The Economics of Climate Change) by the former Chief Economist of the World Bank and now Head of the British Government's Economics Department, Professor (LSE) Sir Nicholas Stern, in a scenario-based model calculation in 2006 (Stern 2007). Researchers in a recent study by the Mercator Research Institute for Global Commons and Climate Change in Berlin and the Potsdam Institute for Climate Impact Research arrive at a similar order of magnitude, according

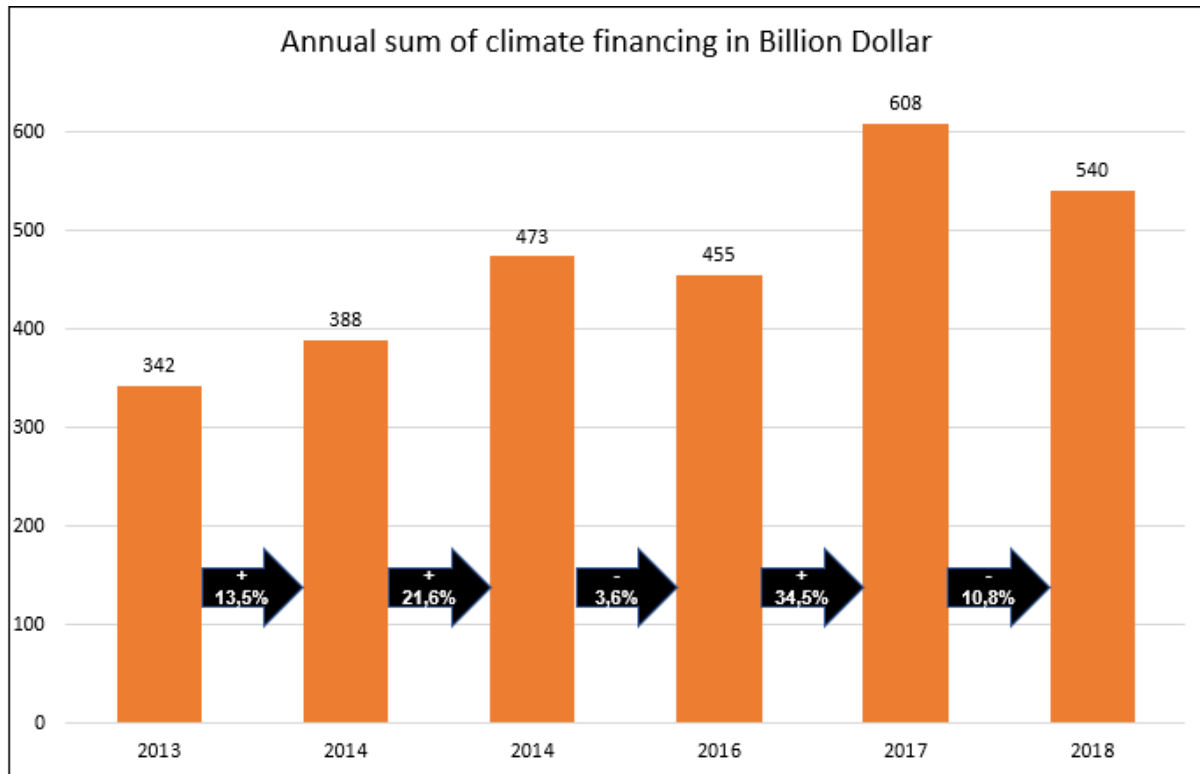
to which an increase in annual temperature of 3 to 4 degrees by 2100, instead of the target of 1.5 to 2 degrees set out in the Paris Climate Agreement, can be assumed on the basis of current developments in emissions. As a result, a range of costs between 7 and 14 per cent of GDP is to be expected (Kalkuhl and Wenz 2020). This range is also confirmed by a recent study by Swiss Re, one of the world's largest reinsurers, in its recent publication "The economics of climate change" (separate to the Stern Review). According to this study, the global annual loss in terms of GDP would amount to about ten percent by the middle of the century. Within the G7 countries, an average loss of 8.5 percent of their respective annual economic output is to be expected (Swiss Re 2021). According to the aid organisation Oxfam, the G7 countries would thus be more than twice as heavily burdened as compared to the current Corona situation, which caused an average GDP decline of 4.2 percent (Oxfam Germany 2021). Researchers agree that the longer we do not act, the higher the economic costs of the future will be (United Nations 2020).

Need for climate finance: In view of the extreme costs for the environment, society and the economy, the sum of \$100 billion per year until 2025 agreed at the UN climate summit in Copenhagen in 2009 for financial aid to adapt to and reduce climate change in developing countries seems relatively low. The United Nations estimates that the developing countries alone will need between \$140 and \$300 billion annually by 2030 and between \$280 and \$500 billion by 2050 to adapt to climate change if the climate targets are met, i.e. an average increase of 1.5 degrees to a maximum of 2 degrees Celsius by 2100. According to the UN, developing countries already need about \$70 billion per year just for adaptation, for example in agriculture and infrastructure (United Nations 2021). According to OECD estimates, global investments in infrastructure amounting to \$6.9 trillion per year from 2016 to 2030 are necessary to achieve the climate goals, i.e. measures to reduce greenhouse gases. According to the OECD, sustainable changes are particularly important in the energy, transport, building and water infrastructure sectors. These sectors emit over 60 per cent of total greenhouse gas emissions (OECD 2017). The goal for all countries must therefore be to achieve a future climate-neutral environment and thus limit the damage. For example, the European Union wants to achieve a reduction in greenhouse gas emissions of at least 55% by 2030 compared to 1990. And to be the first continent to achieve complete climate neutrality by 2050 (European Commission 2021). At the upcoming UN Climate Change Conference in Glasgow at the end of 2021 (COP26), new, ambitious climate targets are to be presented by the countries (Kowalzig 2021).

2.3 Financing Instruments

This chapter takes a closer look at individual financing components of climate finance. A distinction is made there between the public and private sectors. The amount increased by \$198 billion from \$342 billion in 2013 to \$540 billion in 2018 .This represents an increase of 57% (Macquarie et al. 2020) .The following figure shows the development of contributions to absolute and in relation to the previous year.

Figure 1: Development of climate financing



Source: Own representation based on (Macquarie et al. 2020, p. 7)

2.3.1 Public Finance

2.3.1.1 Multilateral Climate Finance Instruments

The word multilateral describes a situation in which several contracting parties are involved. (duden.de, 2021) In the context of climate finance, this means that various contractual partners/investors provide money to developing countries via multilateral instruments.

Money is collected through funds and other multilateral programs and then transferred to the recipients. The supervision of these institutions is the responsibility of different organizations, which can be divided into three different categories

1. Capital managed by organizations that are not subjected to the UNFCCC mechanism.
For example development banks
2. Funds managed by organizations subject to the UNFCCC mechanism.
3. Regional organizations (Heinrich Böll Stiftung, 2019)

The multilateral development banks (MDBs) provide the largest contribution to the multilateral financing. They contributed an average of \$57 billion to climate finance in 2017/2018. This is the third largest single component of the total contribution of \$574 billion, after national DFIs (public source) and collaborations (private source). Multilateral funds are also a type of multilateral financing (Macquarie et al. 2020).

In 2019, MDBs contributed \$61.6 billion, which is an increase of 44% from \$43 billion in 2015. The largest contributors are the following three banks. (African Development Bank (AfDB) et al. 2020):

1. European Investment Bank (EIB) → \$21.6 billion
2. World Bank Group (WBG) → \$18.8 billion
3. Asian Development Bank (ADB) → \$7.1 billion

While most of the ADB's and WBG's funding goes to low- and middle-income economies, the EIB's funds are used almost exclusively for high-income economies. The following table shows the distribution of the funds used with the corresponding percentage share.

Table 1: Breakdown of MDBs' financial resources

Bank	Intended use in \$million	
	Low- and middle-income economies	High-income economies
EIB	3,6 (8,67%)	18 (89,55%)
WBG	18,4 (44,33%)	0,4 (1,99%)
ADB	7,1 (17,1%)	0 (0%)
Rest	12,4 (29,9%)	1,7 (8,46%)
Total	41,5 (100%)	20,1 (100%)

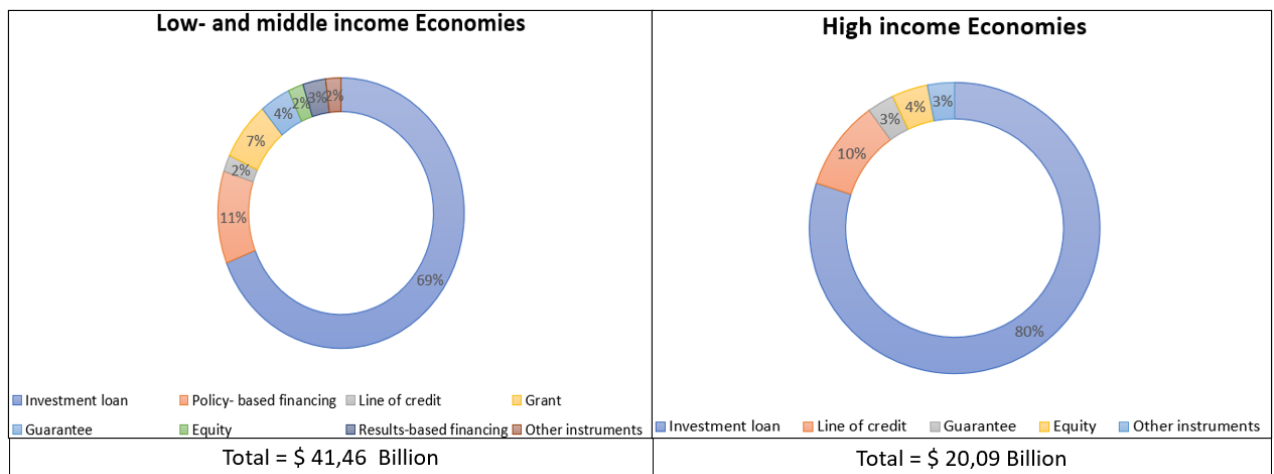
Source: Own representation based on (African Development Bank (AfDB) et al. 2020, p. 11)

As mentioned above, multilateral funds are also a source of funding. These contributed over \$3 billion over the years 2017/2018 (Macquarie et al. 2020). Well-known funds include the Least Developed Countries Fund and the Green Climate Fund (GCF) (Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung). The GCF is the world's largest fund for combating climate change. The committed value for GCF projects is \$8.4 billion, of which \$5.8 billion has already been implemented (Green Climate Fund).

Regional organizations include, for example, the Caribbean Catastrophe Risk Insurance Facility and the Africa Risk Capacity. These are insurances on a state level that take over in the event of catastrophes. The Africa Risk Capacity is managed by the African Union, for example.. (africanriskcapacity.org)

But which financing instruments are used by the organizers to provide the funds ? Here’s a graphic that provides a good overview.

Figure 2: Development of climate financing

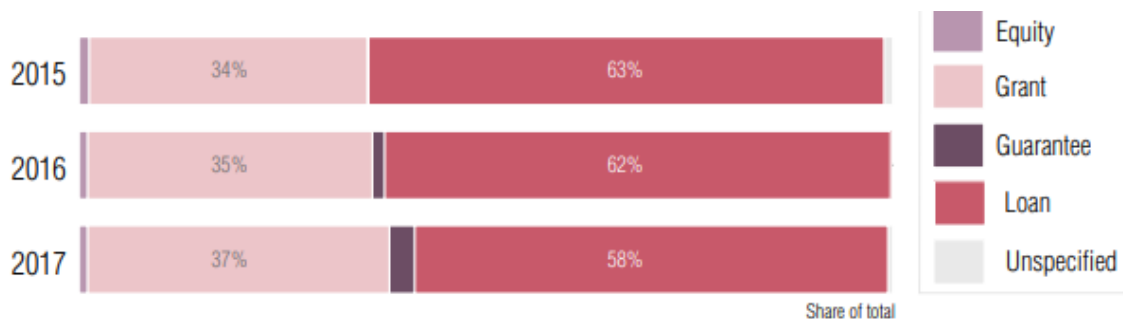


Source: Own representation based on (African Development Bank (AfDB) et al. 2020, p. 14)

2.3.1.2 Bilateral Climate Finance Instruments

Bilateral climate finance describes the financing of measures between two specific countries, for example Germany and India. Such financing is usually already managed by existing state institutions. In Germany, there are three companies active in bilateral cooperation: KfW, GIZ and BMZ. (UNFCCC, 2016) In Germany, bilateral funds represent by far the largest share of financing. In the period 2017 - 2019, 82% of climate finance was transacted through bilateral channels.. (Kowalzig, 2021, S. 8) Loans and grants represented the largest share of instruments, at 43.7% and 43.4% respectively. (Kowalzig, 2021) At the international level, the situation is not necessarily different, according to a study by the OECD, 58% of all bilateral measures in 2017 were loans followed by grants at 37%. Therefore, loans are the most important instrument in the bilateral sector. (OECD, 2018)

Figure 3: Bilateral financing Instruments



Source: OECD, 2018, p. 15

2.3.2 Private Sector

The private sector contribution to climate finance totaled \$280 billion in 2018 and \$268 billion in 2017. Compared to the public sector, this is 8% lower on average (Macquarie et al. 2020).

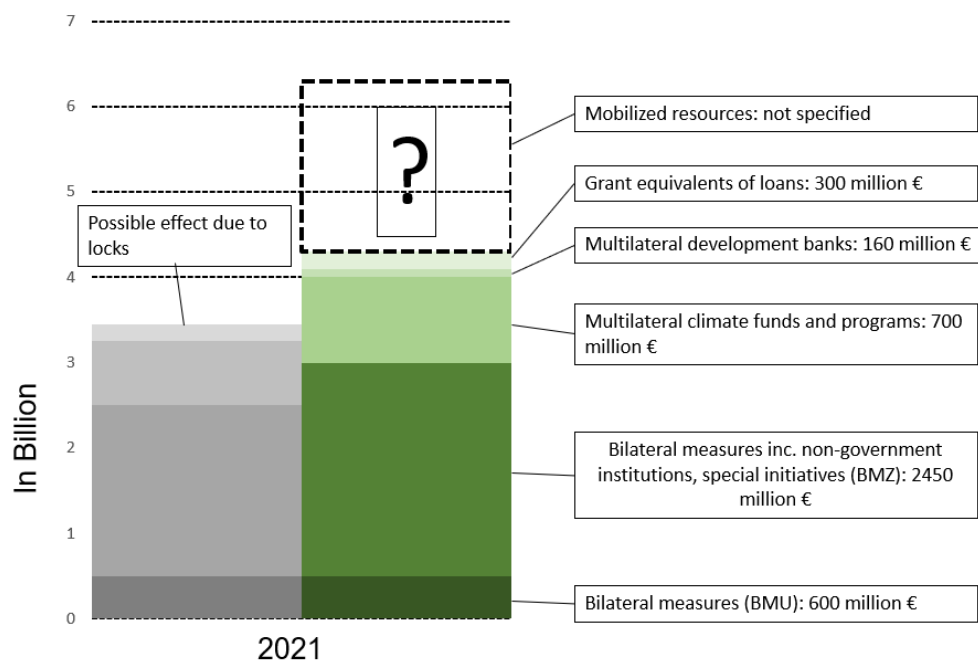
The main reasons for private investors to participate in climate finance include government intervention, but also high growth potential in developing countries (OECD, 2016). The highest share of private financing is provided by companies with 60% followed by households with 19%. These funds are used almost exclusively in the form of equity or loans for adaptation in the respective countries (Macquarie et al. 2020). The private sector is seen as the largest untapped pool for climate finance. In the future, it is seen as having the potential to grow from a billion to a trillion amount. (Independent expert group on climate finance 2020). A far-reaching criticism is that the funds from the private sector are provided mainly for commercial profit-making purposes. Accordingly, this contribution should not be added to the achievement of the 100 billion target (Kowalzig Jan, 2021).

3. Finding and Results

With regard to climate finance in Germany, the main channel is the German government, which provides budget funds to the BMZ and the BMU. In addition, KfW and DEG are increasingly providing amounts in the form of loans or share capital, which are mobilized via own funds or the capital market. Another channel for providing funds for climate financing is increasingly provided by private actors.

According to the German government's current planning figures, 4 billion euros will be made available for climate financing in the 2021 reporting year. As can inevitably be seen in the figure below, a large part of this will be provided in the form of bilateral measures. However, the gray areas should also be noted and not neglected, as they show the potential impact of blockages in bilateral cooperation titles. A large part of climate finance is mobilized from these titles, which could have a significant impact on the amount of funds provided. In the worst case, these could drop by an estimated 400 million euros. Another obstacle to providing funding is that the federal government has not provided an increase for development cooperation. Since climate finance is also part of development finance in Germany, there will be no significant increase in the current scenarios (Kowalzig, 2021).

Figure 4: Climate financing in Germany 2021



Source: Own representation based on (Kowalzig Jan, 2020 p. 7)

The biggest problem with German climate finance is that the vast majority (57.2%) is channelled into mitigation. However, only 19.8% of the funds are channelled into adaptation to climate change. The main reason is that loans can be better used for the energy sector, for example, than for adaptation to climate change. Around 20% represent cross-cutting measures, which are often environmental and biodiversity protection projects and thus tend to have little climate relevance. Overall, an increasing balance between adaptation and mitigation by donor countries is needed to address the climate finance mismatch.

In line with the 'polluter pays' principle, industrialised countries have agreed under the Paris Climate Agreement to provide finance to developing countries for climate change mitigation and adaptation. This section examines the actual distribution of annual climate finance. As mentioned above, the United Nations estimates the annual needs of developing countries for adaptation to climate change alone at around 70 billion US dollars per year, with a sharp increase to \$140 to \$300 billion per year by 2030 and \$280 to \$500 billion per year by 2050, assuming that the Paris climate targets can be met, i.e. an average annual temperature increase of 1.5 to a maximum of 2 degrees Celsius by 2100 (United Nations 2021).

According to calculations by the aid organisation Oxfam, climate financing totalled 71.2 billion US dollars in 2017. Of this, only 15.1 billion US dollars flowed into the area of adaptation. In percentage terms, this corresponds to a distribution of approximately 80 % for the area of greenhouse gas emissions and only 20 % for the area of adaptation (Oxfam Germany 2021). This distribution was also maintained almost identically in the following year 2018. According to the OECD report, a total of \$79 billion was disbursed to developing countries for climate

financing. About \$16 billion of this went to adaptation measures, which corresponds to a relative share of about 21 percent and thus remained almost identical to the previous year (source). According to the results of a study by the aid organisation CARE International, the actual amount is lower. In particular, due to misreporting, i.e. the incorrect labelling as an adaptation measure, the funds actually made available for adaptation measures, amounting to \$10 billion, could be lower than reported and thus comprise a relative share of only around 7.6 percent in 2018. (CARE Climate Change 2021). The financing needs of developing countries are therefore immense. The aid organisation Oxfam calls for a significant increase in climate financing, especially for adaptation measures, for example to protect crops threatened by climate change or to protect against extreme weather events (Oxfam Germany 2021). According to current calculations by Oxfam, the adaptation measures for the 48 least developed countries range from \$2.4 to \$3.4 billion per year, which corresponds to approximately three US dollars per inhabitant and year, i.e. less than \$0,01 per capita and day (Oxfam Germany 2019).

Consequently, funds for projects to reduce emissions in developing countries are significantly higher than for adapting agriculture to climate change, for example. Globally, the OECD estimates that investments of \$96.6 trillion in energy, transport, building and water infrastructure will be necessary by 2030 to achieve the climate targets (OECD 2017).

4. Summary and Conclusion

In the course of this research, it was discovered that in multilateral as well as in bilateral climate finance, loans are the most popular instrument. Kenya, for example, in its 2021 report "The Landscape of Climate Finance in Kenya", states that 79% of climate finance is provided in the form of debt. (The Landscape of Climate Finance in Kenya, 2021). This current situation is now viewed critically, as such climate finance could lead to over-indebtedness and further jeopardise the economic growth of these countries. Moreover, the true value of climate finance is estimated to be two-thirds less when repayments and interest rates are taken into account. The picture is further clouded, if one believes a report by Oxfam that some loans are issued at market interest rates (Ratcliff, 2020). Given the historical responsibility of industrialized countries and the slowly increasing attention to this problem, we expect the share of grants to increase in the future.

With the COP26 summit to be held on 01.11-12.11.2021, the new negotiations will begin regarding the renewal of the climate finance target after 2025. From the perspective of revising the measures to achieve the goals of the Paris Agreement and the UN Framework Convention on Climate Change, one of the key negotiation points will be the provision of funds to poorer countries in line with their needs regarding mitigation and adaptation measures. Renewing the targets seems sensible, as many critics believe the \$100 billion target is too low. They argue, for example, that in developing countries, the cost of climate change adaptation alone could grow to \$520-790 billion per year by 2050. Consequential economic damages from climate change could reach a total of \$1.2-1.8 trillion per year in developing countries in 2050, despite these investments. For greenhouse gas reductions and energy system transformation, the International Energy Agency (IEA) estimates that annual global investments in renewable energy and energy efficiency would need to increase to \$1.8 trillion by 2030 (Kowalzig, 2021). The need to increase the targets for the upcoming climate conference in Glasgow can also be justified by the fact that funds for adaptation measures in developing countries in particular only account for about 20 percent of total climate financing. Expressed in absolute figures, this is a sum of \$16 billion in 2018 in relation to the total of \$79 billion disbursed. According to United Nations estimates, the actual funds needed for climate adaptation alone already amount to about \$70 billion, which represents an even more extreme financing need. According to calculations by the aid organisation Oxfam, the least developed countries in particular regularly have less than \$0.01 per inhabitant and day available for adaptation measures. As the "Great Lockdown" and the accompanying decline in GHG emissions in Q2 2020 has shown, a different emissions pathway is possible. It is imperative that the post-COVID economic recovery be matched with a transition to a low-carbon global economy. In the context of the upcoming COP26, there is now a unique opportunity to lead the global economy in a direction that will achieve the goal of a carbon-neutral world by 2050.

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