**Climate Change and Inequality**

December 12 will mark exactly 7 years since 196 parties adopted the Paris Agreement at COP21 in Paris. To combat climate change and mitigate its effects, the legally binding international treaty set the goal to limit global warming to well below 2°C, preferably to below 1.5°C, in comparison to the pre-industrial levels.[[1]](#footnote-1) According to the Climate Change Performance Index, however, contrary to all the grand pronouncements, the international community of states has taken few measures to prevent "dangerous climate change”. Out of the 60 states monitored, not a single state performs "very well", but instead 75 percent perform "moderately" or "very poorly". By 2030, the states under consideration aim to reduce their emissions by 14 percent. However, to actually achieve the 1.5°C target, a 57 percent reduction would instead be required.[[2]](#footnote-2) One of the biggest problems caused by this inadequate implementation of climate measures and ongoing global warming is the resulting inequality in terms of vulnerability and susceptibility to climate change. The issue of inequality is one of the fundamental problems that the Paris Agreement and the international community are trying to address by providing financial and technological support and capacity-building to countries in need. Nevertheless, actions to address the problem of inequality in the context of climate change are insufficient, and expectations to address these gaps at the recent COP27 were unfortunately not met. In the following part of the project, we will address the issue of inequality across and within countries by analyzing the different areas and measures of inequality and examining some of the potential solutions that we identified.

***What do we mean by inequality***

The notion of inequality in relation to climate change makes up a large part of the discussion on climate justice, which itself is part of the topic of environmental justice.[[3]](#footnote-3) The reason for this is the way the effects of climate change are distributed around the world. As with almost all large-scale impacts or even policies where there are winners and losers from a policy, the impacts of climate change are not uniformly distributed across countries and regions. The key distinction to distributive inequalities of a policy, however, relative to the inequalities of climate change are that in the long run, the effects of climate change will not generate winners if the earth becomes inhabitable. In other words, the negative effects of climate change are more pronounced in some regions of the world than in other regions where the negative effects are felt only slightly, for example. Therefore, the issue of climate change must also be considered from a human rights perspective, as the impacts of climate change are consequently not equitably distributed between rich and poor, women and men, and older and younger generations. This is exactly what the issue of climate justice addresses, which includes the notion of climate change inequality. As said by Mary Robinson, the former President of Ireland and current chair of the Elders, climate justice “insists on a shift from a discourse on greenhouse gases and melting ice caps into a civil rights movement with the people and communities most vulnerable to climate impacts at its heart”.[[4]](#footnote-4)

*Types of Inequality*

The discussion of inequality caused by climate change can be analyzed at different levels and in different areas. Initially, the literature focused on the analysis of inequality with regard to the physical side of climate change, i.e., the impacts of climate change on nature itself.[[5]](#footnote-5) This branch of literature examines the occurrence of unusually extreme weather or climate conditions that can cause severe damage to communities and agricultural and natural ecosystems. For example, the densely populated low-elevation coastal cities of China, accounting for 20 percent of the population and about one-third of the GDP, are severely threatened by rising sea levels, coastal flooding, storm surges, and coastal erosion. Meanwhile, the interior regions are exposed to more frequent and extreme heat waves and droughts reinforcing water security risks that adversely affect agriculture, the main source of income among the rural poor.[[6]](#footnote-6) This example shows that different regions can be affected by different extreme weather events that vary in intensity and frequency. Consequently, climate change that is caused by global and not only regional emissions will unevenly increase the frequency of these extreme weather events and hence result in unequal climate effects, where some regions suffer more than others. In addition to the physical side of inequality, climate change can result in inequality of socioeconomic aspects. This type of inequality is based on three subcategories. The first concentrates on demographic characteristics such as age, gender, race, ethnicity, and religion. The second type is based on inequalities of assets and income and the last subcategory concentrates on inequality of public decision-making (political power) and access to public resources such as publicly financed health, housing, and education.[[7]](#footnote-7) The concept of social inequality due to climate change and its different subcategories are closely interconnected. This implies that climate change impacts have a multidimensional effect on inequality, rather than a linear impact. Therefore, it is especially important to keep these dimensions and subsequent inequalities in mind when discussing the topic of climate change. For example, a temperature increase of more than 2 °C in the US or Europe may not seem to be much of a problem for us, but for people in sub-Saharan Africa, this increase could be devastating.

***Inequality measurement***

Esther Duflo, 2019 Nobel Laureate in Economics, professor of Poverty Alleviation and Development Economics at the Massachusetts Institute of Technology, and co-founder and co-director of the Abdul Latif Jameel Poverty Action Lab, explains that the effects of climate change are not evenly distributed across countries and regions. She points out that most of the responsibility for climate change historically, and even today, lies in the hands of industrialized/developed countries. A very interesting example that she uses to highlight this inequality is that “10 percent of the highest emitters are responsible for 50 percent of the [world] emissions”. Since this example also works in reverse, where “50 percent of the lowest emitters are responsible for [only] 10 percent of total emissions”, it presents the problem of inequality in the emission space in a simple example.[[8]](#footnote-8)

In the context of Esther Duflo’s observation of inequality, the literature has attempted to adjust various measures of distributional inequality to present a clear picture of the inequality in the emission space. For example, an adaptation of the Gini coefficient, which is a widely used and recognized measure of the distributional dispersion of income and wealth, has been brought forward. The article by Teng et al. establishes such a new measure of carbon inequality for historical cumulative emissions per person that is based on the Lorenz curve and the Gini coefficient. Their aim is to present a method that is able to accurately measure inequalities in the emission space for different countries, based on historical emissions of carbon dioxide (CO2). Their new measure called the “carbon Gini index” should hence “provide a general measurement of emission space allocation equality”. To adapt the Gini coefficient to depict the carbon inequality across countries instead of the income inequality, the horizontal axis is showing the population and the vertical axis depicts the emission share. Drawing on historical data, the authors use “CO2 emissions from energy activities” for their measure of emissions as they represent the largest share of world greenhouse gas emissions. Their results show that there is a substantial inequality in the emission space, especially between developed and developing countries. To be more precise, “70% of the world total emission space is allocated unequally” illustrating the large emission gap between countries and hence verifying Esther Duflo’s example. What is interesting about this measure is the significance of the starting point from which historical emissions are aggregated. Changing the starting point for aggregating historical emissions data changes the magnitude of the inequality in such a way that the more recent the starting point, the smaller the inequality. [[9]](#footnote-9) This suggests that the inequality with respect to the emission space has decreased over time. The reason for this reduction can have different origins. On the one hand, countries that are considered high emitters of CO2 from a long-term historical perspective, which are predominantly industrialized countries as identified above, have introduced different techniques and standards to reduce their high emissions. On the other hand, we note that developing countries have increased their emissions since the beginning of their development path and thus also contribute to global emissions to a greater extent. A drastic example is China, which historically has not been the main source of cumulative emissions, but today accounts for 27 percent of annual global CO2 and one-third of global greenhouse gas emissions.[[10]](#footnote-10) The combination of these two effects could be responsible for the reduction in inequality. For this reason, the choice of the starting point of aggregation is fundamental for this type of inequality measure. Now, of course, the question arises as to which starting point should be chosen in order to be able to map inequality correctly in the first instance and to implement adequate measures on the basis of the results. During one of our interviews, we posed this question to Gustavo Torrens, professor of Economics at Indiana University Bloomington and director of the Political Economy Program at the Ostrom Workshop. He explained that it does not really matter how the inequalities of distributions are represented in terms of emissions. There are various measures for representing inequalities in distributions, all of which have advantages and disadvantages. The use of the Gini coefficient as a measure of inequality is in his opinion not a bad approach, as the Gini coefficient is widely used and accepted. Nevertheless, he believes that it is more important to focus on current data as discussions about actions and possible adjustments are happening now. Also, it might be more helpful to focus the arguments on future emissions, but there are major commitment issues.[[11]](#footnote-11)

***Across country inequality***

After looking at measurement methods of inequality in the distribution of the emission space, in this section, we will look at how climate change has unequal effects on individual countries. As identified above, climate change has a physical impact on nature itself that is unequally distributed across countries. The problem lies in the fact that emissions have a global character, meaning “you cannot limit these emissions to a particular part of the earth …, as a consequence this creates a global externality”. The global externality will not affect all countries in a similar way and thus creates unequal effects.[[12]](#footnote-12) Rich consumers and countries are the main culprits of climate change impacts, while the effects of these actions are mostly felt in poor regions due to mainly two reasons. First, these regions are geographically disadvantaged, e.g., they are in places that are already very hot, “where the effects of temperature on productivity and human health are not linear”. This means that small temperature increases have more than linear negative impacts and hence, there are more extreme heats or other extreme weather events in these regions. In other words, a country's geographic location partly determines how hard a country is hit by extreme weather events caused by global emissions. Second, the economic capacity to cope with the negative impacts of climate change is elementary, i.e., the richer a country is, the easier it can find solutions to adapt to climate change. “If it is very warm in Texas you [can] turn [on] the air-conditioning. … If you are working in Punjab [India] and your rice crop is drying and you are trying to work on a construction site it is too hot”. This should show that the mortality costs for the same temperatures are relatively low in developed countries but very high in developing countries.[[13]](#footnote-13)

Considering the above finding that climate change has stronger or weaker negative environmental impacts depending on the region and economic capacity to mitigate them, we also mentioned that there is a socio-economic aspect that is affected by climate change. Therefore, we analyzed the literature that addresses the relationship between climate change and income inequality within a country relative to inequality across countries. In this regard, we refer to the recent findings of Cevik and Jalles, who examine the relationship between a country's climate change vulnerability and resilience on income inequality. Their results show that an increase in climate vulnerability is associated with a higher degree of income inequality. Moreover, they were able to split their country data set into developed and developing countries to contrast how climate change affects income inequality differently across countries. They show that climate change vulnerability has no effect on inequality in industrialized countries. However, in developing countries, the effects were seven times larger and statistically significant.[[14]](#footnote-14) This confirms that the negative effects of climate change not only amplify the physical impacts but also increase socioeconomic inequality between countries, highlighting the importance of the human rights perspective of climate change.

***Within country inequality***

When considering the effects of climate change on inequality within countries, we can use the same analytical approach as when considering inequality between countries. The only difference is that the observational unit is at the regional level. As with the cross-country analysis of the physical impacts of climate change, the geographic location of regions within a country is fundamental. Geographically disadvantaged regions, such as coastal regions prone to flooding or very dry and warm regions that suffer disproportionately from heat waves, will suffer more from the physical impacts caused by climate change than other regions. In addition, regions that are more urbanized than others or have higher levels of economic activity and are therefore more likely to be able to mitigate the negative impacts of climate change through their economic capacities will suffer less from the impacts of climate change.[[15]](#footnote-15)

The literature on cross-country differences and inequality is relatively large, however, not many articles address the within-country inequality aspect of climate change. To better illustrate the effects and relationships at the regional level, we borrow the results identified by S. Nazrul Islam and John Winkel. Their article gives a good overview of the unequal effects of climate change on society and establishes a conceptual framework that helps to understand and study the interconnected relationship. One interesting aspect of this framework is that it not only focuses on the physical effects of climate change but also incorporates the socioeconomic component, which helps to examine the “interlinkages between climate change and within country inequalities”. The authors identify three key channels that intensify the inequality within a society in a way that disadvantaged groups “suffer disproportionately from the adverse effects of climate change, resulting in greater subsequent inequality”. In other words, depending on the initial level of inequality within a society, climate change is able to amplify inequality and hence lead to more subsequent inequality. This is what the authors refer to as a “vicious cycle” that increases inequality dynamically based on the initial levels. The three channels that are responsible for the observed self-feeding effects are “(i) increased exposure of disadvantaged groups to climate hazards, (ii) increased susceptibility to damage caused by climate hazards and (iii) decreased ability to cope with and recover from damage”.[[16]](#footnote-16) Comparing these three channels with Esther Duflo’s reasons why some countries, especially the poor, are more likely to suffer more from the physical effects of climate change, we notice that the reasoning is very similar. This confirms our argument from above that the reasons for inequality are similar when it comes to cross-country and within-country inequality.

***Solving the problem of inequality***

The fundamental question that arises in connection with the problem of inequality is how to ensure that inequality is reduced and that those who are most affected by the effects of climate change are helped. This is one of the central problems that the Paris Agreement addresses and that the international community is trying to solve, so far without great success. When we listened to Esther Duflo's response to this problem and asked Gustavo Torrens what he thought was an appropriate solution, we concluded that economists largely agree on the solution to the problem. “The easiest thing from the point of view from an individual in the poor countries or from the point of view of a poor country itself is to become richer”. Both stress the importance of growth for developing countries to mitigate the effects of climate change that they face. This argument is based on the point stressed above that the richer a country is, the easier it can protect itself from the adverse effects of climate change. This means that growth and hence an increase in economic capacities allows countries to invest in important adaptation measures that are fundamental to reducing the direct effects of climate change. However, and this is also based on mutual agreement, rapid growth is very carbon intensive “so, from the point of view of the world at large, it can be a little bit self-defeating”, since this would lead to an absolute increase in emissions if developed countries try to grow in a “dirty way”.[[17]](#footnote-17) Nevertheless, growth and poverty reduction should still be the key focus of these countries, according to Gustavo Torrens. Even if in the short-run pollution increases from a global perspective, he is optimistic that some local environmental problems will be solved in the particular poor regions as they grow, reducing inequality.[[18]](#footnote-18)

The support of the international community plays an essential role in solving the problem of inequality, even if the solution is for poor countries to grow. In the long run, it is in the interest of all countries to help those countries that are suffering the most to adapt and mitigate. This can be done by funneling more money to developing countries in a committed way. The Paris Agreement tried to establish such a system, however, this has not been very successful. According to Esther Duflo, the reason why this does not succeed lies in the way financial support is used. Since the countries most vulnerable to climate change already suffer from the adverse effects of climate change, they need money primarily for adaptation measures because “people are dying today or are getting sick today and are not able to produce today”. These kinds of spendings for adaptation measures are not seen as a “win-win” situation for the developed countries, meaning they are not energy-efficient investments that both save the planet and make investors rich. As a result, there is less incentive to provide financial assistance to countries to help them adapt to the impacts of climate change, even though both adaptation and mitigation measures are important to alleviate climate change and inequality. Therefore, a combination of private but also public sector investments is needed in a committed way to overcome the problem of “win-win” driven investments.[[19]](#footnote-19)

To solve the problem of increasing environmental pollution due to growth processes in developing countries, the concept of decoupling is an important aspect that society needs to focus on. Depending on the level of technology, it is possible to "advance on four legs" i.e., focus on adaptation, mitigation, energy access, and the development of new clean energy sources. For example, some African countries do not have access to energy which is bad for the people living there, but it is also positive news, as this allows for the possibility of installing energy access that is carbon-free. In industrialized countries that already have an existing energy grid, on the other hand, this is more difficult because the grid would have to be rewired. However, building an efficient and carbon-free, or at least less dirty, power grid requires a lot of capital and the will to invest. This brings us back to the aforementioned problem of “win-win” investments. Furthermore, pollution and climate problems are not perceived as having huge political urgency in developing countries, as the key problems are “for people to make it to the next month”. So, there is a problem with the political will, especially in developed countries, to do something if it is outside the borders.[[20]](#footnote-20)

Through our analysis of the issue of climate justice, we have noticed that inequality is one of the main aspects that makes solving the problem of climate change so difficult. It is not only the inequality created by the global externality in a geographic perspective across or within countries, but also in a temporal perspective where the burden of climate change is not evenly distributed. This divergence between the polluter and the polluted, both geographically and temporally, ensures that not enough measures are implemented by the countries most responsible for climate change as they do not face the consequences of their actions yet. It seems that everything that does not happen within one's own borders or is felt by one's own generation is a problem that does not need to be solved because others bear the consequences. This, we believe, is the main issue that makes climate change a "political problem from hell," as Esther Duflo describes it.[[21]](#footnote-21)

***Connection to “Ministry for the Future”***

Similar to reality, we see that "The Ministry for the Future" also addresses the issue of inequality throughout the book. One of the chapters that we think perfectly illustrates the issues of climate change and inequality and the corresponding international governance is Chapter 6. In this chapter, India describes the devastating effects of the heat wave that struck the country at the emergency meeting of the signatories to the Paris Agreement. India points to the failure of the international community to meet the goals of the agreement, which has led to the disaster caused by climate change. In doing so, they emphasize that India had to bear the cost of inaction in this case. This part clearly emphasizes the above-analyzed problem of inequality. India, which is not a major contributor to climate change, bore the cost of climate change in the form of a deadly heat wave that claimed the lives of thousands of citizens. Delegations from countries present at the emergency meeting nod in agreement as the Indian delegation expresses its concern and calls on all member states to take an active role in reducing emissions and mitigating climate change, but shortly thereafter delegates return to business as usual. We think that this reflects very nicely the reality that we have described in the previous paragraph. The delegates agree with India's concerns, but shortly thereafter they seem to fall back into their usual habits, highlighting the problem of only dealing with problems that are within one's own borders.[[22]](#footnote-22)

***Hopes, expectations, and worries***

We are not very optimistic that the international society will find one key solution to solve the problem of climate change and inequality. Nevertheless, it seems that most countries and politicians are on the lookout for such a “magic antidote” that can reverse the damage already caused and set emissions to zero. We believe that relying on the development of "the one technology" to solve everything is a misguided approach because when climate tipping points are reached if they have not yet been reached, even that technology will not be able to help. However, we are more optimistic than many that the global society is able to solve the issue because we believe that humanity will need a behavior change that is not prohibitively difficult. We already see many steps in the right direction and expect to see a transformation by 2030 that will be one of the biggest steps toward greater environmental awareness. Through discussions in schools and universities and exchanges among people, we can achieve this change and manage to save our planet and not just keep it on life support.

1. United Nations Framework Convention on Climate Change, “The Paris Agreement” (UNFCCC, n.d.), https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement [↑](#footnote-ref-1)
2. Christoph Bals, Jan Burck, Niklas Höhne, Leonardo Nascimento, Thea Uhlich and Jamie Wong, “Monitoring Climate Mitigation Efforts of 60 Countries plus the EU – covering 92% of the Global Greenhouse Gas Emissions” (CCPI Report, 2022) [↑](#footnote-ref-2)
3. S. Nazrul Islam & John Winkel, "Climate Change and Social Inequality" (Working Papers 152, United Nations, Department of Economics and Social Affairs, 2017) [↑](#footnote-ref-3)
4. United Nations Sustainable Development Goals, “Climate Justice” (UN Sustainable Development Goals, n.d.), https://www.un.org/sustainabledevelopment/blog/2019/05/climate-justice/ [↑](#footnote-ref-4)
5. S. Nazrul Islam, ibid., 1 [↑](#footnote-ref-5)
6. World Bank Group, “China Country Climate and Development Report” (CCDR Series, Washington DC, October 2022), 2 [↑](#footnote-ref-6)
7. S. Nazrul Islam, ibid., 2 [↑](#footnote-ref-7)
8. Esther Duflo, interview by David Gelles, 20 September 2022, <https://www.youtube.com/watch?v=GqNWN7F4Z3I> [↑](#footnote-ref-8)
9. Fei Teng, Jiankun He, Xunzhang Pan and Chi Zhang, “Metric of Carbon Equity: Carbon Gini Index Based on Historical Cumulative Emission per Capita” (Advances in Climate Change Research 2 (3), 2011) [↑](#footnote-ref-9)
10. World Bank Group, ibid., 2 [↑](#footnote-ref-10)
11. Gustavo Torrens, interview by Dimitrios Theodoridis, 11 November 2022 [↑](#footnote-ref-11)
12. Ibid. [↑](#footnote-ref-12)
13. Esther Duflo, ibid. [↑](#footnote-ref-13)
14. Serhan Cevik and João Tovar Jalles, “For Whom the Bell Tolls: Climate Change and Inequality” (IMF Working Papers 2022 (103), 2022) [↑](#footnote-ref-14)
15. Gustavo Torrens, ibid. [↑](#footnote-ref-15)
16. S. Nazrul Islam, ibid. [↑](#footnote-ref-16)
17. Esther Duflo, ibid. [↑](#footnote-ref-17)
18. Gustavo Torrens, ibid. [↑](#footnote-ref-18)
19. Esther Duflo, ibid. [↑](#footnote-ref-19)
20. Ibid. [↑](#footnote-ref-20)
21. Ibid. [↑](#footnote-ref-21)
22. Kim Stanley Robinson, “The Ministry for the Future” (Great Britain: Orbit, 2020) [↑](#footnote-ref-22)