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Climate-induced population displacements in a 4°C+ world

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Massive population displacements are now regularly forecast as one of the most dramatic possible consequences of climate change. Current forecasts and projections show that regions that would be affected by such population movements are low-lying islands, coastal and delta regions, as well as sub-Saharan Africa. Such estimates, however, are usually based on a 2°C temperature rise. In the event of a 4°C+ warming, not only is it likely that climate-induced population movements will be more considerable, but their patterns could also be significantly different as people might react differently to temperature changes that would represent a threat to their very survival. This paper puts forward the hypothesis that a greater temperature change would not only affect the magnitude of the associated population movements, but also—and above all—the characteristics of these movements, and therefore the policy responses that can address them. The paper outlines the policy evolutions that climate-induced displacements in a 4°C+ world would require.

Keywords: migration; displacement; climate change; mobility; adaptation

1. Introduction

Massive population displacements are regularly forecast as one of the most dramatic possible consequences of climate change. In recent years, the concept of climate-induced migration has gained considerable currency, and 'climate refugees' are now a common feature in discourse on the human impact of climate change [1,2]. Works on this topic are rooted in an essentialist perspective which assumes that migration is a logical by-product of climate change. Most forecasts and estimations adopt a deterministic approach based on the number of people living in regions that will be affected by sea-level rise, and conclude that about 150–200 million people could be displaced by 2050 as a result of climate change [3–5]. Such forecasts, however, triggered wide controversy among the scholarly community, and were often criticized for being too environmentally deterministic and not sufficiently rooted in empirical evidence [6,7]. Indeed, such forecasts took little account of vulnerability patterns and demographic trends, and did not factor in the development of possible adaptation strategies.

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This paper contends that the nature and extent of migration flows associated with the impacts of climate change depend not only on these impacts, but also on a wide range of other factors, such as cultural, economic or political conditions. This paper argues that the policy responses that will be implemented to deal with these flows will be particularly important in that regard. Migration policies, so far, have poorly accounted for environmental drivers of migration, but the policy debate on adaptation is increasingly considering that migration could be a way for populations to cope with environmental degradation, rather than being seen as a failure to adapt [8–10]. The planning of future adaptation policies that would address migration, however, is contingent upon predictions and forecasts of future population movements. Current forecasts and projections show that the regions that would be most affected by such population movements are low-lying islands, coastal and delta regions, as well as sub-Saharan Africa [5,11]. Such estimates, however, are usually based on a 2°C temperature rise. In the event of a 4°C+ average temperature rise, this paper argues that the very nature of these migrations, rather than just their magnitude, would change and would therefore call for different policy responses. It puts forward the hypothesis that a greater temperature change would not only affect the magnitude of associated population movements, but also—and more importantly—the characteristics of these movements, and therefore the policy responses that can address them.

Section 2 reviews the different impacts of climate change that could trigger population displacements. Such impacts typically include sea-level rise, droughts and land degradation, as well as extreme weather events. Predictions and forecasts of population displacements related to these impacts, however, are marred by a double uncertainty, which concerns both the local impacts of climate change and the way people will respond to these changes. Despite these uncertainties, §3 attempts to examine how a temperature rise of 4°C+ could affect population displacements. Using past empirical evidence, the section suggests that people might migrate very differently in a 4°C+ world than in a 2°C world. Three expected changes in particular are highlighted, in a way that rebuts the deterministic perspective that dominates discourse on 'environmental migration'. Finally, §§4 and 5 outline the policy implications of this rebuttal and elaborate on some proposals for policy developments that could address the changing nature of climate-induced displacements in a 4°C+ world.

2. The impacts of climate change on migration

Climate change will affect societies through an extensive range of impacts. The prediction of such impacts, however, remains marred by uncertainties, especially at the regional and local levels [12,13]. Uncertainties are even greater when one needs to factor in the wide range of possible human reactions to these impacts. Empirical studies remain scarce [6], and experimentation is impossible, as is often the case in social sciences. Thus an assessment of the impacts of climate change on migration is, by nature, a daunting task. It nevertheless appears possible to identify three types of impacts that seem most likely to have an effect on migration patterns, although these effects are not certain [11,14].

(*a*) *Extreme weather events*

Extreme weather events include heat waves, tropical cyclones, droughts and flooding. The latest IPCC report predicts, by the end of this century, a '*very likely* increase in hot extremes, heat waves and heavy precipitation', a '*likely* increase in tropical cyclone activity', with 'less confidence in the decrease of tropical cyclones', as well as '*very likely* precipitation increases in high latitudes and *likely* decreases in most subtropical land regions' [15]. In addition, it is expected that annual run-off and precipitation will increase in high latitudes, whereas water resources will decrease in mid-latitudes and in the tropics, as well as in arid regions. The IPCC notes that both the increase in droughts and tropical cyclone activity present a potential for population migration [16].

The latter claim, however, can be disputed, as the impacts of extreme weather events on migration flows are diverse and sometimes controversial. Disasters can indeed result in highly diverse patterns of migration. For example, it is widely thought that disasters are more likely to induce temporary migration, allowing people to return home once the danger is gone. As a result of this assumption, people forced to flee to another country because of a disaster were often granted temporary protection status: for example, a temporary protection status in the USA was granted to the people of Montserrat displaced by a volcanic eruption in 1997, and to the people of Honduras and Nicaragua displaced by Hurricane Mitch in 1998. The experience of Hurricane Katrina, however, showed that people displaced by natural disasters were not always able to go home, as a significant proportion of the population of New Orleans has still not returned, and seems unlikely to do so in the future [17]. It is now increasingly acknowledged that disasters result in both temporary and permanent migration, as well as in both proactive and reactive migration.

It is likely that an increase in extreme weather events will result in an increase in the number of natural disasters [18]. This would reinforce the upward trend in the occurrence of disasters, identified since the start of their systematic recording in the early twentieth century [19]. Until now, this upward trend has been primarily explained by the increased vulnerability of the affected populations. A disaster occurs when natural risk meets vulnerability [20]: if the number of natural risks increases with a temperature rise, the number of disasters will consequently increase unless the vulnerability of populations can be reduced. Unless robust adaptation strategies are implemented, there is no sign that vulnerability might decrease in a near future. In a 4°C+ world, however, the main driver of natural disasters might shift from an increase in vulnerability to an increase in the number and severity of natural events. In addition, the characteristics of these events themselves might change, as different hazards could combine with each other in an unprecedented setting. This could affect both the location of disasters and the design and implementation of disaster-reduction policies.

(*b*) *Sea-level rise*

The most obvious consequence of climate change with regard to environmental migration is probably the sea-level rise. Though sea-level rise will not be uniform across the globe, most studies agree that the rise will be about 1 m by the end of the century [21,22]. The IPCC notes that

> Many millions more people are projected to be flooded every year due to sea-level rise by the 2080s. Those densely-populated and low-lying areas where adaptive capacity is relatively low, and which already face other challenges such as tropical storms or local coastal subsidence, are especially at risk. The numbers affected will be largest in the mega-deltas of Asia and Africa while small islands are especially vulnerable. Intergovermental Panel on climate change [23].

Unlike extreme weather events, sea-level rise is more predictable if longer term, and populations at risk can be more easily identified, thus facilitating the implementation of adaptation plans. Given that coastal and delta areas are usually very densely populated, the potential for large numbers of migrants is particularly high [24,25].

The projection of a 1 m sea-level rise is usually based on a 2°C average temperature increase. In a world with a 4°C+ temperature increase, sea-level rise would be higher, especially with the increased probability of the deglaciation of the Greenland and West Antarctic ice sheets [26]. Sea-level rise would also induce greater coastal erosion, as well as bigger storm surges. The El Niño-Southern Oscillation could also be affected, magnifying the differences in local sea-level rises. It is especially important to understand and forecast local sea-level rises, as the migration potential associated with this rise depends on the local rather than the average sea-level rise. In that regard, a 4°C+ temperature increase would not only increase the average sea-level rise, but also—and probably more importantly—the uncertainties associated with the migration potential. For example, population retreat from the coasts might be increasingly considered as an alternative to migration.

(*c*) *Water stress*

Water stress will be caused by a series of cumulative factors: droughts, salt water intrusion owing to sea-level rise, and also the melting of mountain glaciers in the long run. The IPCC forecasts that 'freshwater availability in Central, South, East and southeast Asia, particularly in large river basins, is projected to decrease due to climate change which, along with population growth and increasing demand arising from higher standards of living, could adversely affect more than a billion people by the 2050s' [23]. The water supplies stored in glaciers and snow cover are also expected to decline, reducing freshwater availability in regions supplied by melt-water from mountain ranges. The situation is expected to be most difficult in Africa, where an estimated 75 million to 250 million people will be at risk of water stress owing to climate change by 2020. Given that this water stress will be associated with higher demand, especially in big cities, water-related problems are very likely to be exacerbated [27].

The effects of water stress on migration patterns remain heavily contested: some authors argue that droughts and desertification are a major push factor for migration [28,29],[1] while others contend that people affected by droughts

[1]Hammer [28] argues that one million people were displaced as a result of the 1985 drought in Niger, and that 'hundreds of thousands of people from rural Sahel regions are displaced every year as a consequence of environmental change and desertification'; Leighton [29] makes a similar case for Northeast Brazil.

have a choice between different coping strategies, including migration, and note that international migration actually decreases during these periods [6]. In a recent review of empirical case studies conducted in Africa, Jonsson asserts that 'environmental stressors such as droughts do not necessarily lead to migration' [30]. In any case, the nexus between drought and migration is not straightforward and depends on a wide range of factors [31]. Findings from the EACH-FOR project,[2] for example, confirm that water stress can affect migration patterns in different directions: Van der Geest [32] found that contemporary North–South migration in Ghana was environmentally motivated, but decreased during the worst droughts; Afifi [33] also identified droughts as an important push factor that influences both internal and international migration in Niger.

Here again, a larger temperature increase towards 4°C would further exacerbate problems of water stress, and would also increase uncertainties: the impact of aggravated water stress on human mobility remains unclear and poorly documented. According to the case and the wider context, it could result in different mobility patterns, with an increase in some regions and a decrease in others. In the Sahel, Jonsson observes that 'whether and how people migrate in response to environmental change depends largely upon the role that mobility already plays in their lives and livelihoods' [30]. Q2

The impacts of climate change in a 4°C+ world are difficult to translate into migration forecasts: increased temperatures might have different effects on migration flows, and it is impossible to conduct experimentation in this field to adjust the forecasts.

Historically, migration models have done a very poor job of accounting for environmental factors in the migration decision [34], and it is only recently that migration research has started to consider environmental changes as possible migration drivers. Hence, it is not possible to refer to explanatory models in order to predict the nature and the extent of the migratory movements that could be associated with climate change impacts.

We are thus faced with a double level of uncertainty: the first level deals with uncertainties related to climate impacts on local and regional scales; whereas the second level concerns the way humans will react to environmental changes. Such uncertainties are even greater in the event where the average global temperature would rise by 4°C and beyond. The first level of uncertainty can be reduced with more precise climate models, but the second level cannot yet be reduced because current migration models do not account for environmental drivers. The only tool we have at our disposal is to look at how environmental changes have affected migration behaviours in the past. This does not imply that humans will react in the same way to future environmental changes: these changes will be accompanied by other social, cultural and economic changes and transformations that will also influence migration behaviours. Past empirical evidence is not especially helpful in predicting future migration flows, but can nevertheless be used to show some trends that are likely to occur under a 4°C+ global warming.

[2]EACH-FOR stands for Environmental Change and Forced Migration Scenarios, an empirical research project funded by the European Commission between 2007 and 2009. See http://www.each-for.eu for more details.

3. Implications for a 4°C+ world

Given that the uncertainties associated with a 2°C temperature rise, an assessment of climate-induced displacements in a 4°C+ world is a very tricky task. Though empirical evidence cannot predict future population displacements, it suggests that in a 4°C+ world, people might move in a very different way than in a 2°C world: the very nature of the displacements might be affected more than just their magnitude. Three changes in particular can be expected.

As shown in §2, a 4°C+ world could result in increased environmental pressure on migration. Empirical research shows that mobility is often one possible option among different coping strategies to deal with environmental disruption. Over the years, people have developed traditional mobility patterns that allow them to cope with environmental changes, especially when these changes affect agricultural yields or livestock herds. For some people, mobility is an integral part of their livelihood, which allows them to increase, diversify or secure their incomes. Such traditional coping strategies are jeopardized by increased environmental pressure owing to climate change [35,36]. As environmental disruptions would be exacerbated with a 4°C+ temperature increase, mobility might become a less-viable coping strategy.

For example, Van der Geest [36] observes that traditional nomadic patterns, which were used by pastoralists to cope with droughts, have been modified owing to rapidly changing environmental and socio-economic conditions. A similar phenomenon is observed in Bangladesh, where the traditional movement of people from *char* to *char*[3] is disrupted by flash floods that are more violent and frequent than they used to be [37]. Thus, it appears that if the impacts of climate change become more severe, they could disrupt traditional patterns of mobility and people might need to leave their usual place of residence. Migration options would become more limited. In that case, it is expected that the movement would most likely be a long-term or permanent migration instead of a temporary displacement—a trend that has been observed by the EACH-FOR project in different countries of southeast Asia and sub-Saharan Africa (most notably Ghana, Vietnam and Bangladesh). In Vietnam, for example, rice farmers usually undertake seasonal labour migration to urban centres during the flooding season, in order to increase and diversify their incomes. Successive floods, however, leading to the destruction of crops, have prompted farmers to migrate permanently in search of a new livelihood [38,39].

Permanent dislocation affects the ability of migrants to cope and adapt in the destination region, but might also affect the rights and protection they are entitled to, especially in the case of forced migration abroad, as no international protection regime exists for those displaced by environmental changes. Though the distinction between forced and voluntary migration is increasingly blurred [40] and probably no longer fit to describe the realities of contemporary migration, it remains a defining element of migration policies and law.

Climate change is expected to further blur this distinction, as environmental changes not only threaten the lives of people, but also their livelihoods [41]. Hence, people moving as a result of climate change impacts might do so both because their life is at risk and because they can no longer sustain their

[3]A char is a temporary sandy island that forms in the bed of a river.

household. In a 4°C+ world, where environmental pressure to migrate could be higher, traditional patterns of mobility might be deeply affected: an increasing number of people could be deprived of the choice to leave or to stay and feel *forced to move*.

However, not everyone moves when confronted with environmental changes. Another consequence of a temperature rise of 4°C+ might be, paradoxically and in some cases, a decrease in the number of people on the move. Numerous studies show that migration flows tend to decrease when environmental crises peak. This is especially true in the case of droughts, as people tend to allocate their income primarily to meet their household's basic needs rather than to moving [6,36]. People will move only if they have the resources that allow them to do so: this includes financial resources—moving is a costly process—but also access to social networks facilitating mobility. Furthermore, empirical evidence shows that the most vulnerable are often unable to move when faced with an environmental crisis. For example, prior to Hurricane Katrina, about 60 000 people were unable to leave the city of New Orleans: evacuation required money for food, gas and lodging, and many poor families were unable to afford the expense. Furthermore, the hurricane struck at the end of the month: many of the poorest residents were awaiting paychecks, leaving even fewer resources available for their evacuation [42].

If vulnerability and poverty increase in some regions, as has been the case in recent decades,[4] one might expect that the number of people who would find themselves unable to move in the event of an environmental crisis would also be on the rise. An increasing number of people might thus find themselves *forced to stay*.

Finally, climate change-induced migration in a 4°C+ world is not expected to become more international, as often assumed. Apart from some specific cases of migration from small island states, discussed in §4, movements are expected to remain confined within the borders of states affected by the impacts of climate change, unless significant policy changes occur. No empirical evidence suggests that the distance of migration increases in relation to the magnitude of environmental disruption. Empirical findings from the EACH-FOR project reveal that the overwhelming majority of migration flows observed in relation to environmental changes are internal movements, often over very short distances [38].

Furthermore, international migration requires considerable financial resources for the migrants: unless significant financial transfers are made or developing countries undergo rapid economic development, these resources are unlikely to be available. In addition, policy developments with regard to international migration since the late 1970s point towards a restriction of international mobility, rather than an opening of borders. This trend is observed in both the North and the South, as exemplified by the recent building of a security barrier at the border between India and Bangladesh [37]. The barrier is supposed to protect India against intrusion by Islamist militants from Bangladesh, as well as smuggling and illegal immigration. Bangladesh also ranks among the countries that are

[4]Research dealing with the increase in natural disasters over the past few decades suggests that the key driving force behind this rise is the increased vulnerability of populations, rather than a higher number of natural hazards [24].

the most vulnerable to climate change impacts. In the event of climate-induced displacements from Bangladesh, the barrier would also, most likely, serve as a deterrent to prevent these migrants from entering India.

In a nutshell, the effects of a 4°C+ temperature rise on migration flows remain difficult to assess. The linkages between environmental changes and mobility cannot be explained through a linear, deterministic relationship, though many discourses on this issue remain rooted in an essentialist perspective. Empirical research has shown that responses to environmental changes vary according to a wide set of factors and are context-specific: this makes it difficult—if not impossible—to design a general predictive model of climate-induced displacement. Furthermore, a global warming of 4°C+ will bring unprecedented changes, which will make them difficult to compare with changes experienced by populations in the past. These changes will also, most likely, be accompanied by other changes and transformations of societies. These economic, cultural, technological or political changes might translate into opportunities or constraints for migration, and are in any case expected to affect mobility patterns. We should not assume, however, that climate change impacts will simply act as 'push' factors of migration. Migration theories have widely rebutted the 'push and pull' model as unfit to account for contemporary migration, and have shown the complex and nonlinear processes governing migration dynamics [43–45]. Climate change will most probably be an increasingly important element of these migration dynamics, but should not be considered independently of other changes and variables, as is too often the case in deterministic arguments linking climate change and migration in a direct, causal relationship.

So far, no migration theory has properly accounted for the effects of climate change, let alone a 4°C+ warming. Yet, some likely trends can be identified through a comparative assessment of empirical evidence. Traditional patterns of mobility could be disrupted, and an increasing number of migrants might feel deprived of a choice in their migration decision. At the same time, some people, especially the most vulnerable, might find themselves unable to move, lacking the resources to do so. Population movements associated with climate change impacts are expected to take place mostly at the internal domestic level, over short distances, and eventually on a permanent basis. Overall, it appears that the most significant impact of a 4°C+ warming on migration would be to reduce populations' ability to move on their own terms, as many people would no longer have the choice to stay or to leave when confronted with environmental changes. This ability, or 'right to choose', however, will be highly dependent upon the policy responses that will be designed to address climate-induced displacements.

4. Policy implications

Historically, migration policies have often neglected environmental factors as drivers of migration. Environmental policies, on the other hand, have usually considered migration as a humanitarian issue resulting from natural disasters or other environmental disruptions [46]. Current debates on future policy developments tend to rely on the deterministic assumptions outlined in §2: migration is considered as a dramatic and unavoidable consequence of climate

change impacts, with little account of people's agency and ability to respond. As a result, most policy discussions revolve around issues of protection and security rather than of governance and mobility.

As no international regime exists to assist those displaced by climate change, many policy proposals have recommended that a new convention or treaty be drafted to fill in this gap in international law [47,48]. Most of the debates have focused on the international status that could be granted to the displaced, with many authors lamenting that the 1951 Geneva Convention Relating to the Status of Refugees does not apply to those displaced by environmental events [47,49]. An international status, however, would be inapplicable in most cases of climate-induced displacements, as these are primarily internal movements, beyond the reach of an international status. Despite this fact, various legislative proposals have been made in different parliaments, including those of Australia and Belgium, with the aim of establishing an international status for 'climate change refugees'. Overall, the issue remains framed in either a security agenda or a humanitarian one.

As described earlier, in a 4°C+ world, the adaptive capacities of many regions are likely to be overwhelmed by the impacts of climate change. Policy responses would therefore be crucial to enhance the migration options of those affected by the impacts. Yet, it appears that the current policy directions and development proposals remain rooted in a deterministic and international perspective, and take little account of empirical evidence. These policies would therefore be inadequate in the face of the greater and different migratory pressures in a 4°C+ world. In particular, this paper contends that policies should be more focused on assisting migration, both internal and cross-border, rather than on its limitation. In order to achieve this goal, we would need different policy agendas.

(*a*) *Fostering the right to mobility*

As adaptation strategies will be a key element of the fight against climate change in a 4°C+ world, policy responses would need, in particular, to promote the right to mobility, as migration can be an efficient adaptation strategy and traditional patterns of mobility in relation to environmental changes will most probably be deeply disrupted. Migration, in many cases, would need to be encouraged rather than avoided. Migration would have to become a core element of the affected populations' adaptive capacity, rather than a symptom of adaptation failure. This would also imply that the current security agenda be replaced by an adaptation agenda with regard to mobility. From a policy viewpoint, fostering the right to mobility with regard to climate change impacts means two things. First, barriers to migration remain considerable in many parts of the world, including at the internal level. These barriers would need to be lifted for migration to unleash its full potential as an adaptation strategy. Second, the most vulnerable often lack the resources to migrate. As environmental crises will become more frequent and more severe, it is likely that households' resources will not be available for migration, but would be used instead to meet the households' primary needs. Transfers of resources will therefore be needed in order to foster the right to mobility for the most vulnerable. The financial burden of migration could be met through adaptation

funding, provided this funding includes a provision for migration. In a 4°C+ world, if the most vulnerable are not enabled to move to safer places, they will find themselves directly at risk of climate change impacts with tragic humanitarian implications.

In that regard, the issue of proactive displacements is not an easy one. Some governments, such as those of China and Mozambique, have started displacing their populations in anticipation of climate change impacts. These populations need to be provided with adequate compensation, and human rights, including the right to choose one's destination, should be a policy priority. In any case, people should not be displaced against their will, and education and information about climate change impacts need to be improved.

(*b*) *Adaptation in the destination regions*

Adaptation remains largely envisioned as a way to prevent displacement in the regions of origin. Adaptation will also be needed, however, in the regions of destination. These regions will be faced with additional influxes of population. They will therefore need to adapt to both climate change impacts and higher demographic pressures, especially if they are already highly populated. If adaptation policies are not also directed at destination regions, these regions might find themselves unable to meet the needs of their populations. Normal emergency humanitarian aid will be insufficient to meet these requirements, as migrants will also need to be provided with jobs, housing, schools, etc. After Hurricane Katrina, the city of Houston welcomed an estimated 150 000–200 000 displaced residents from Louisiana. They were provided with emergency supplies and housing, as the authorities of Houston expected them to return home within a couple of weeks. It took several months, however, before residents could return to New Orleans, and many decided to resettle in Houston and in the region. The city of Houston, however, experienced a surge in crime, drug use and racism as a result of its inability to provide many of the displaced with jobs and long-term housing.

The humanitarian agenda will therefore need to shift towards a development agenda, as population movements are expected to become increasingly long-term and permanent displacements. Migrants should not be considered as resourceless victims, but should be empowered in order to develop their adaptive capacities once in the destination region. The current deterministic perspective, however, continues to envision them as 'refugees', a label that could hinder their resilience and resourcefulness, ultimately impeding their resettlement in the destination region.

(*c*) *Protection and assistance*

As noted earlier, those displaced by climate change are not entitled to any kind of international protection or assistance. No international organization or UN agency has a mandate to deal with environmental displacement, though both the United Nations High Commissioner for Refugees (UNHCR) and the International Organization for Migration (IOM) now intervene regularly in situations of natural disasters to provide humanitarian assistance to the displaced. As forced migration worldwide would most probably increase as a result of a 4°C+ temperature increase, adequate mechanisms of protection and assistance will be needed to

assist those forcibly displaced. Such mechanisms are already required today—the need for them would only be further reinforced in a 4°C+ world—as discussed by other authors [47,50].

(*d*) *Statelessness*

Statelessness, defined by the UNHCR as the condition of a person not considered as a national by any state under the operation of its law, could also become an important policy issue in a 4°C+ world. It is understood that low-lying small island states are especially vulnerable to the effects of climate change, and to sea-level rise and extreme weather events in particular. The sea-level rise that will be induced by a 4°C+ temperature change is expected to make some island states uninhabitable, and their governments might then have no other option than to organize the resettlement of their population abroad [51]. There are currently 38 small island states that have acquired full independence. Among them, the existence of at least six states, representing about one million people, would be directly at risk in the case of a temperature rise of 4°C+ degrees: Bahamas, Kiribati, Maldives, Marshall Islands, Nauru and Tuvalu. These island states are all of very low elevation, with a highest point situated below 100 m above sea level.[5] Though adaptation strategies in low-lying island states are usually limited and costly, they are not necessarily doomed to fail and one should not jump too quickly to describing islanders as stateless citizens in the making. Indeed, such rhetoric might just jeopardize the adaptation efforts of these countries [52].

In the event of 4°C+ world, in some cases migration of the whole population might become the only viable option. It should be carefully planned and organized, with the interests of the migrants as paramount, at both the individual and collective levels. In particular, their political rights, citizenship and collective identity should be preserved. Some authors have pointed out that the migrants would in this case fall under the 1961 Convention for the Reduction of Statelessness, and could avail themselves of the Convention's protection. An alternative view is that these migrants should not be considered as stateless citizens, and that these states continue to exist, even uninhabited. The continued existence of these states is a guarantee that the citizenship and political rights of their people be maintained—if they were to disappear as independent states, the irony would be that the very states that disappear into the sea because of climate change would also lose their seat at the UN table of negotiations. Furthermore, even in the case where the islands disappear, territorial waters would continue to exist and could provide an anchor for these states' political existence. This would probably also imply reconceptualizing the notion of citizenship.

5. Conclusion

As Danish physicist Niels Bohr famously put it, 'prediction is very difficult, especially about the future'. A 4°C+ world would bring unprecedented changes to the environment, likely to affect human mobility in different ways. How human societies could respond to these changes is highly uncertain, and will depend on a

[5]Maldives, 2 m above sea level; Tuvalu, 5 m; Marshall Islands, 10 m; Bahamas, 63 m; Nauru, 71 m and Kiribati, 81 m.

wide set of factors, with many of them not relating to environmental conditions. Despite the lack of explanatory theoretical models, or possibly because of it, the assessment of how a 4°C+ world would affect migration patterns remains dominated by an essentialist, deterministic perspective. This view sees climate-induced displacement conceptualized as a failure of adaptation, a humanitarian catastrophe in the making. In this paper, I show how and why such deterministic assumptions do not match current empirical evidence, and how policy may be out of touch with the reality of future migration movements. The relationship between environmental changes and migration is highly complex and depends upon many variables and specific contexts. It cannot be reduced to a direct causal relationship. Thus, the impacts associated with a 4°C+ warming might not only affect the magnitude of the induced population movements, but also, and above all, their very nature.

Among the factors that will also influence the nature and magnitude of migration flows, policy is especially important. For now, discussions on future policy developments in this regard remain rooted in a deterministic perspective, unlikely to provide an adequate policy framework to address climate-induced displacements in a warmer world. Both migration and adaptation policies would need to evolve significantly, and move away from the security and humanitarian agendas they are currently framed in. Climate-induced migration should not only be addressed within the framework of climate change, but also within the discussions on the global governance of migration. In many cases, migration does not have to be envisioned as a humanitarian catastrophe, but can also be a solution to environmental disruption, which would allow people to relocate in safer areas and to cope better with climate change impacts.

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