

Migrations and environmental transformations in the anthropocene: a heuristic typology

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Introduction

Migrations due to environmental reasons have been known in human history for a long time. Despite that evidence, only recently have academics, and particularly migration studies, start to pay attention to environment as a driving force and a cause for migration. This trend in academic interest is associated with a new phenomenon: climate change processes due to anthropogenic reasons. In fact, climate change processes introduce new elements, drawing a line between past and future environmental transformations (ET). Some authors (Crutzen 2002, Zalasiewicz *et al.* 2011) have already proposed to establish a difference between those two moments, saying that we have already crossed an epoch-scale boundary from the Holocene (around 12.000 years ago) to the Anthropocene, in which major transformations in ecosystems have taken place due to human activity. Although not considered as relevant by migration theory, environmental causes for migration in the Holocene were common (e.g. ice ages, hurricanes and floods, drought and heart quakes, etc.). They still are in the Anthropocene. But, now, in the top of ‘classic’ natural causes, one has to add new ET that are triggered by human activity, bringing new kinds of responsibilities and accountability. Being an analytical proposition, this article derives from a conference paper (Costa, 2011a) that intends to assess and discuss some central aspects of the debate around migration, environment and climate change and to propose for discussion a heuristic typology along with a line of time, space, causality and accountability. We will propose four main types of environmental transformations (natural, human, interactive and climatic), thus allowing to clarify classification of different kinds of migrations according to different ET (the proposal is further developed below). Identifying different kinds of ET impacts on migrations will also allow assessing different levels of causality and accountability (economic and political). In the first part of this article, a brief historical assessment of the concept of ER will be done, allowing us, at the same time, to clarify some aspects of the debate. As we know, the ‘refugees’ designation has started a debate around political and legal implications of forced migration due to environmental reasons (Lopez 2006). Therefore, a word on that relation and the need for a ‘political ecology of climate adaptation’ (Shearer, 2012) will also be addressed. In the second part, we will advance some clarification on the relevance of environment and climate change in migration theories. Although environmental degradation and climate change impacts can be and really are several times connected, there isn’t yet a clear and unequivocal scientific relation established between climate change and environmental impacts (about IPCC strategies to deal with quantitative levels of uncertainty in prediction and introduce qualitatively calibrated levels of confidence’, to overcome such limitations, see IPCC 2007:120); this limitation is externalized also to the assessment of the interrelation between climate change processes and migration dynamics. Therefore, new research tools and approaches are needed to distinguish between those that move because of natural or human causes (environmental migrants) from those that move due to changes in global climate system unequivocally connected to anthropogenic climate change (e.g. environmental refugees). In the third part, by using the idea of ET as a causal factor for migration, we propose a heuristic typology with four categories, allowing establishing ET as a

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relevant causal effect for the emergence of new types of environmental migrants (EM). Finally, we will sum up the issues, conclude, and give some indications concerning the operationalization of the typology.

1. The debate of environmental migrants

Since the decade of 1970 that the alarm concerning Environmental Refugees (ER) has been set by the hand of the photographer and environmental activist Lester Brown (1970), and later on in the 1980s by the hand of a professor and consultant to the United Nations, El-Hinnawi (1985). But it was the book 'Environmental Exodus: An Emergent Crisis in the Global Arena' by the experts on refugees, Norman Myers and Jennifer Kent (1995), that has become a milestone in the 'institutionalization' of the idea of ER. Myers and Kent primarily aimed at 'putting numbers in the category' to provide empirical support to a kind of migrations that had no studies to underpin it. One of the objectives of their work was to draw attention to the existence of a group of refugees who are not eligible by the United Nations (UN) in the same way as political refugees are. According to them, ER were increasing and organizations that were in the field had already identified large numbers of ER, but no particular rights were given to them. The scientific community reacted some approving and others disregarding the study, becoming divided between two opposing perspectives. Astri Suhrke (1993) designates them as 'maximalist' - more related to the UN and the issues of refugees and the security -, and 'minimalist' - related to studies of migration (about the debate between maximalists and minimalists, see Morrissey, 2012). That is, on the one hand, there are those who "see the changes in the environment as a contextual variable that may contribute to migration, but warn of the difficulty in drawing firm conclusions, due to lack of knowledge about these processes", and on the other hand, those who consider that 'environmental degradation has displaced millions of people and still generate more threat' (Suhrke 1993:4). Indeed, eager to give expression to the category and the drama of ER, Myers and Kent included in the new category all sorts of movements of people resulting from all kinds of environmental forcing factors (environmental degradation, natural disasters, manmade disasters, mismanagement of land use, etc.), adding to those the impacts of greenhouse gases emissions on environment - which lead to an overwhelming number of migrants. In fact, the numbers are impressive. The authors further note that in considering the possible effects of climate change and the consequent rise of average sea levels and flooding of many coastal areas, these numbers may increase and threaten to shift to some 200 million people by the year 2050 (Myers 2005). Recently, the Stern report (2006) also stated that the climate change may be responsible for 200 million ER. Others, like the Christian Aid, talk about billions that can be displaced by climate change and other ET, like dams and other development projects (in Brown 2008). But, as the Foresight final project report underlines 'most recent estimates of the numbers of environmental/climate migrants have at their roots just one or two early publications' (Foresight, 2011:28), namely the figures of 1988 Jacobson's publication (10 million ER) and 1995 Myers and Kent's publication (150 million by 2050). Subsequent works by other authors base their assumption on those previous figures and estimations, without further empirical estimations (Foresight, 2011). Generally, these figures and estimates were criticized as speculative and created a backlash in the scientific community, particularly among scholars of migration which in fact helped to reframe the issue of ER. This can also be appreciated in IPCC reports. For example, the 1990 IPCC report used the term 'Environmental Refugee' in its First Assessment Report (IPCC, FAR 1990), saying that 'Even a modest rise in global sea-levels could produce tens of millions of such refugees' (IPCC, FAR 1990:5-10), but, in 1994, the Second Assessment Report (SAR) changed from ER to 'ecological refugees' (IPCC, SAR 1996:34) reframing the use of the concept of ER, and in the 2001 Third Assessment Report of IPCC they didn't use either of those terms. Nevertheless, they still connect the prospected sea level rise with that mass migration phenomenon, making a clear distinction between impacts that we are now feeling in environment and those projected for the future. In fact, the 2007 IPCC Four Assessment Report states that the Earth will warm between 1.8 and 4 degrees Celsius by the end of the century, which will result in, among other weather events, rising sea level up to 58 cm and the flooding of coastal areas and several small islands (IPCC, AR4 2007). Africa is among the most vulnerable continents. Drought, intense tropical cyclone activity, increasing incidence of extreme high sea level (excluding tsunamis) (IPCC, AR4 2007:13), and prospected sea level rise will be part of the ET affecting human activity and patterns of settlement. Nevertheless, some authors (Webster 2002; Reilly 2007) find the IPCC

report relatively vague, particularly in what concerns the impacts of global warming in agriculture, namely in terms of agro-climatic ability of the lands and the consequent effects of delocalization of cultures (Pinto 2004; Reilly 2007) and, therefore, of people. If, on the one hand, some authors establish a direct causal link between human-induced climate change and migratory flows (El-Hinnawi 1985; Myers 1995, 2005; Stern 2006); others (the minimalists) are more sceptic some considering that climate change doesn't have a clear anthropogenic nature and that global warming shouldn't be seen as a central push factor for migration because no direct causal link leading to increased migratory can undoubtedly be established. Richard Black (2001) and Stephen Castles (2002) are amongst those that consider incorrect the use of the term ER criticizing the direct connection that it underlines in relation to environment as a main cause for migration. According to Richard Black "while environmental factors do play a part in forced migration, they are always closely linked to a range of other political and economic factors, so that focusing on the environmental factors in isolation does not help in understanding specific situations of population displacement" (in Castles 2002:1). They also call attention to the fuzziness of the concept of ER. Global institutions, such as the United Nations University (UNU-EHS), acknowledging the fuzziness of the concept, underline the need to address the problem of ER. Renaud, an officer at the UNU-EHS and head of the Section on Environmental Assessment and Resource Vulnerability, stated that "no one can disagree that there is a need to address these issues more scientifically and systematically, and that the fuzziness of the environmental refugee concept as it stands now, as well as the difficulty in estimating the number of people concerned or identifying migration routes should not be a reason not to act and move forward with adequate policies" (Renaud et al 2007:16). In this line of thought, other authors emphasize the need to further research the relation between climate and migration. Oil Brown (2008) underlines that, since the 90's, "the greatest single impact of climate change could be on human migrations – with millions of people displaced by shoreline erosion, coastal flooding and agricultural disruption" (Brown 2008:9). Dominic Kniveton, Kerstin Schmidt-Verkerk Christopher Smith and Richard Black (2008) acknowledge that the relation between migrations and climate change must be studied and propose a very interesting set of methodologies allowing more interdisciplinary empirical studies, in order to better understand the way environment affects migrations (Kniveton et al. 2008). Later on, Graeme Hugo (2008) explores the interrelationships between migration, environment and development and, despite the 'conceptual fuzziness' of the concept of environmental refugee (Hugo 2008:46), calls attention to the causal association between environment and migration and to the need for a more substantial and cross-disciplinary research. In the same line, Richard Black, in a collective multidisciplinary report (Foresight 2011), points to the some uncertainties and methodological difficulties when dealing with EM or establishing environmental causality as an independent driver but, nevertheless, pointing to the need of political attention to the link between environmental change and migration.

The debate around ER and EM crosses political and academic institutions and opens new avenues for research. The need for more accurate information has become an important concern in several academic areas, as we can see in projects such as EACH-FOR, from the Six Framework Program from European Commission, which aims at a twofold objective: a) to 'discover and describe the causes of forced migration in relation to environmental degradation/change and their association with other social, political and economic phenomena in Europe and in the main countries of migration origin'; and b) to 'provide plausible future scenarios of environmentally-induced forced migration' (see online website, available at: <http://www.each-for.eu/index.php?module=main>). It is in the context of this debate that we propose an heuristic typology believing that it can be of assistance to facilitate going further allowing assessing, in one hand, different kinds of ET and connected type of migration and, in the other hand, levels of causality and accountability (economic and political), both in the present and in the future environmental conditions.

2. Political implications of environmental refugees and the precautionary principle

From the moment ER debates entered the law studies the idea that they must have the right to the status of a refugee under the United Nations framework has become a subject in political-legal and international law (see Lopez 2006). The goal of creating an institutional

framework for these "new refugees" was not met, and indeed was affected, due to confusion and weak statistical support generated by the classification of ER. Stephen Castles correctly refers that the alarmism and the fuzziness of ER quantifications don't favour a productive discussion on the question of the relationship between environment and migration, saying that 'the global forecasts and the associations of common sense don't contribute to a better understanding of these phenomena' (Castles 2005:163). Instead, they introduce more confusion and could affect the situation of political refugee's framework. In a reaction to the debate of ER, the UNHCR stated clear what they think about the designation:

'The phrase 'refugee' is a legal term. A person who has been determined a refugee will have satisfied the criteria under the 1951 Refugee Convention, the 1969 OAU Convention, or UNHCR's mandate. For this reason, a reference to an 'economic refugee' is not a reference to a recognized term under international law, neither are 'climate refugee' or 'environmental refugee'. While often used, particularly in the media, it would be incorrect to give the words a legal meaning that has not been endorsed by the legal community.' (UNHCR 2009a:8)

The UNHCR also considers that ER definition could have impacts on a renegotiation of the 1951 Refugee Convention because it 'could potentially undermine the international legal regime for the protection of refugees and, thereby, contribute to the 'lowering of protection standards' (UNHCR 2009a:9) for 'traditional' refugees. But, even recognizing that 'there are indeed certain groups of migrants' that are in need of assistance, the UNHCR clearly assumes that 'while environmental factors can contribute to prompting cross-border movements, they are not grounds, in and of themselves, for the grant of refugee status under international refugee law' (idem). However, it is said that, although the tentative to bring those persons affected by environmental reasons into the UN framework is behind the emergence of the concept, the Convention of Refugees of 1951 'was not drafted with those persons in mind' (Lopez 2006:387).

We believe that there are three fundamental aspects that must be of concern. The first one has to do with accountability. The Convention of Refugees of 1951 doesn't consider environment directly as a forcing factor leading to persecution; and being persecuted is a condition to have the status of a refugee. In the case of ER, the persecutor is, so to say, Nature itself and we can't hold it directly accountable. But, in other cases, such as human man made environmental disasters (e.g. nuclear or chemical pollution, or the construction of dams) the responsible factors can be clearly identified and there is the possibility of them having direct accountability. But, again, this is not so (at least not yet) in what regards climate change impacts in environment. Future developments showing unequivocal relation between climate change and migration will most probably change that scenario. The crucial factor of accountability for climate change and the scientific proof of an unequivocal connection between ET and climate change will be essential to determine accountability and change the framework within which the question of ER is being seen. Somehow, the Kyoto Protocol and the Clean Development Mechanism and, in a way, also the Millennium Development Goals are first generation instruments to deal with global responsibility. In fact, the idea behind the Clean Development Mechanism is to bring accountability to emissions of GHG. It deals with justice and human rights, which is behind the 'traditional refugees' status issue. But now the challenges are not about war and political persecution. Instead, they are about acceleration of global climate change, accountability and global or national justice.

A second aspect that should be considered in this new framework is the question of borders - only international flows can be considered. To get to have the refugee's status one has to cross a national border. UNHCR uses the internal displaced persons (IDP) to internal migrations (Lopez 2006:377). So, in a situation of migration due to environmental reasons (mostly internal flows) the responsibility, 'premised upon new forms of inter-State cooperation, international solidarity and responsibility-sharing' (UNHCR, 2009a:2), is mainly of the national state itself. But, the UNHCR also calls attention to 'the phenomenon of statelessness' (UNHCR, 2009a:2). In fact, what if a country ceases to exist because of climate change, unequivocally attributed to the rise of sea level that permanently affects livelihood, as for example is expected to be the case of little islands such as Tuvalu or the Maldives and Alaska natives in Kivalina (Shearer, 2012)? In these cases, no national assistance can be provided and we will face a new kind of 'wicked problem' (see Rittel and Webber, 1973) that demand for innovative ecological

policies. Bronen and Chapin (2013) work also goes in that line. They advance the idea of ‘climigration’, i.e. the need for a political framework of ‘effective adaptation strategy to climate change’ to respond to future climate refugees situations (Bronen and Chapin, 2013:5). As up to now we live in a world of borders, national and international migrations result from that international disposition of States. These new situations will also have implications in the units that are considered. The ‘persecuted’ ones will cease to be only individuals but instead collective groups, as will be the case of low land islands be they a country (e.g. Maldives) or an island within a nation (see Shearer, 2012 for the case of collective groups in Kivalina Island, in Alaska). As a matter of fact, the ‘traditional’ framework for refugees is centred on the individual. In the case of ER, it is not the individual but the country that is ‘persecuted’ and the responsibility for that persecution is not of one single entity. Those countries where people must flee because of climate change will have no national support because they will lose their territory, they will become ‘stateless’. We thus consider that, in the case of future ER, it is not the individuals that are ‘persecuted’ but, instead, collective groups are; and the responsibility for such a persecution is not from one single entity. So, in order to deal with future migratory configurations, we will have to consider the ‘phenomenon of statelessness’ (UNHCR 2009a:2), and probably not only from the point of view of adaptation measures (as it seems to be the focal point of a UNHCR note released in 2009 with the title ‘Climate change and statelessness: An overview’) but mostly by developing new political responses (on the need for new political-institutional frameworks, see Bronen and Chapin, 2013 and Shearer, 2012).

Third aspect, as stated by Renaud et al (2007), is the precautionary principle it is a condition we must bear in mind concerning the ‘simultaneous though iterative approach’ of the nexus science-policy-action (Renaud et al 2007:29). These new environmental conditions pose new challenges to policy making. New times demand for new political solutions at national and international levels. Much probably, instead of trying to adapt the framework of the Convention of Refugees to new kinds of refugees such as ER, a new framework must be developed having in mind the ‘precautionary principle’. Several decades have already gone by since the problem of ER was brought up for the first time. Now it is time to prevent the impacts of climate change on migratory dynamics because we have the information to do so, and if we don’t, then the responsibility will be of those who had the information to stop the ‘persecution’ and didn’t do anything with it. Christine Shearer (2012), within her case study of Kivalina, in Alaska, suggested that a new political ecology must be developed in order to find the right solutions to this kind of ‘wicked problems’, such as those of collective groups affected by climate change. Mitigation policies to reduce the risk of climate change are needed but one must go further developing adaptation policies that can ‘better capture the political, economic, and social factors that can create barriers to climate change adaptation assistance’ (Shearer, 2012:174). Because of the ‘lack of comprehensive policies for displacement and relocation, and restriction of adaptation assistance at the international level’ (Shearer, 2012:180), populations in risk can become trapped within political uncertainty (in the same subject, for a larger set of low-land Alaskan communities, see also Bronen and Chapin, 2013). Facing this new kind of challenges demands developing (national and international) new political-institutional capabilities (see Costa, 2013) that can efficiently respond and avoid eminent human disaster. This is precisely at the bottom of what is called the precautionary principle.

3. Migrations, environment and climate change: causality relations

There are several theories about the ‘determinants’ of migration. The economic dimension as a cause of migration has been the most considered one. Even if Ravenstein (1885) has considered environment as relevant for migrations, migrations theory has focused exclusively on economic determinants of migration. The neoclassical economics of macro demand and supply of labor, the micro rational actors, the new economics of labor migration, and the segmented labor market theories are examples of that trend (Massey et al, 1993, 1998). Later on, inspired by the work of Wallerstein (1974), theories about migration started to consider sociological and historical factors as cause of migratory flows (Portes and Walton 1981, Castles et al 1989). Institutional theories and cumulative causation theories led to new approaches with social, economic and political concerns. Amongst others, world system theories and theories of social capital networks of immigrants have gained expression focusing not only the causes that trigger migration but also the factors (e.g. globalization) that contribute to

perpetuate them (Massey et al 1993, 1998, Portes 1998). Migration system theories stand as an effort to integrate several theoretical contributions and constitute an important advance of previous theories (Massey et al 1993, 1998). Although having laid the foundations for an integrated approach to migration theory, Massey and his colleagues, consider that there are still methodological and theoretical limitations (Massey et al 1998). As stated by several authors, global theories that include the diversity of situations of migration are considered illusory and it is, in fact, more appropriate to consider the existence of an integrated set of middle-range theories (Portes 1997, Castles 2005, 2010, King et al 2008). As argued by Stephen Castles (2010), general theories of migration are 'neither possible nor desirable' 'in part because the dynamics of change are so intense and rapid in producing social transformations that we are at constant need of new 'forms of inquiry that start from a situation of rapid and generalized changes' [in order to] (...) facilitate discussion of the complexity, interconnectedness, variability, contextuality and multi-level mediations of global change' (Castles 2010:2). Actually, the argument that Massey and his colleagues use to propose the need to a step forward in theory building for migration studies, i.e., the changes in global conditions that influence migration dynamics in different periods (the pre-industrial, industrial and post-industrial eras), must now be considered concerning climate change impacts in global humanity; not only because they affect environmental conditions, but also because climate change issues impinges social, economic and political dimensions of life, thus becoming a very important factor in future world develop.

Climate change (along with globalization) is one of the most important factors of change of this century, introducing more complexity to reality and posing both important cross-cut political, environmental, social, economic and challenges. Environment has always been a 'pull and push factor', attracting or forcing populations into great displacements. Besides, droughts, floods and extreme weather events have always existed and had impacts on people's settlement, but, in the current setting, with problems of population growth, sustainability and the prospected changes in climate system, migration issues do gain a new position under the spotlight. Although migrations are considered a multi causal phenomenon, with economic, political and cultural drives being the most important ones, in this article, we argue that we must also integrate ET, present and projected, as relevant drives for the emergence of new types of migratory dynamics. As stated above, there are several weaknesses in migration theories. For example, as Russell King notes, there are limitations regarding the way they deal with the issue of internal and external flows (King et al 2008). According to the author, those theories do not conveniently consider the issue of internal migrants, focusing on immigration which involves cross-border flows and leave out the internal flows that often imply longer trips, with problems of integration of different cultures, as well as problems in terms of labour markets (see King et al 2008). Stephen Castles also addresses the same limitation, saying that 'internal migrations often have little interchange with those working on international migration' and the same goes to studies on forced migration, asylum and refugees (see Castles, 2010:6). Richard Black pointed out that very failure, specifically mentioning that the impact of climatic events on the population tends to originate internal and non-international flows, thus being difficult to be perceived by others than UN organizations and NGOs on the ground (Black 2001). Transnational dynamics brought by globalization also pose challenges to migration theories. As Hein De Haas (2008) put it, the 'clear-cut dichotomies of 'origin' and 'destination' and categories such as 'permanent', 'temporary' and 'return' migration are increasingly difficult to sustain in a world in which the lives of migrants are increasingly characterized by circulation and simultaneous commitment to two or more societies' (De Haas 2008:38). Similarly, theories on migration do not properly insert the issue of EM, which results from new processes of environmental transformations. In fact, excluding the alarmist nature of certain projections, Stephen Castles (as well as Richard Black) does not fail to mention that research on 'forced migration (and even on migration in general) needs to pay more attention to environmental factors' and that 'we must consider them as part of a broader processes of social transformation' (Castles 2005:169). We fully subscribe this assumption and consider that ET (both natural and human-made) must be integrated in migration theories because they have an impact on livelihood, fostering new social transformation relevant to migration studies.

Concerning recent migration studies on the relation between migration and environment, it is commonly said that the economic, political, socio-cultural and environmental dimensions interact in a complex way, which makes it difficult to isolate environment as an effective and

predominant cause of migration flows (Black 2001, Castles 2005, Massey 2007). There is, definitely, great confusion in the ascription of the environmental factors that trigger migratory flows and such is due to the fact that it is difficult to isolate the environment (in reality, other drives too) as a triggering element and, as we have seen, economic, cultural and social frameworks dominate within migratory studies. Indeed, in a great part of the works, environment as a triggering factor for migrations is both assumed as due to natural causes (e.g. earthquakes, tsunamis, volcanoes.) and as a result of environmental degradation and pollution, depletion of natural resources, drought and desertification, water stress, the construction of major works (e.g. dams), environmental disasters (e.g. Chernobyl) and, to this list of 'environmental causes', projected impacts of climate change are also added. Such a profusion and mix of environmental causes complicates the analysis of frameworks, and does not contribute to help clarify the debate around new types of migrants such as environment migrants. Usually, the environment is seen as an indirect cause of migrations. Human intervention often puts at stake basic resources (e.g. water) which will later constrain local sustainability and economic and social development, generating disruptions in food and agricultural production, and affecting the quality of life. In these cases, the triggering factor of migrations is assumed as an economic one, but in its basis there are environmental changes. The perception of the causes of migrations, both by the migrants themselves and the by researchers, is thus dependent on the ability to perceive the complex interactions there exist between environment, economy, culture, politics and society. The question lies in knowing how to determine, along with others factors, the degree of causality of environmental factors in migration flows? The existence of interactions between environment and other dimensions is unambiguous and, in most cases, environment is difficult to be perceived as the main cause. Therefore, one of the questions is getting to know whether it is possible to isolate environmental factors as a relevant cause of migration and to see to what degree it conditions migration dynamics.

As empirical evidence of EM is difficult to assess and frontiers amongst categories are blurred, new approaches are being developed namely by looking back to past empirical evidence of climate conditions and their relation to migrations. In a recent research, the Project CLIMIGRA has given an important step in that direction testing working hypotheses and new methodological approaches. We hypothesize that the reason for the so-called *Avieiros*, to flee from VL in the first quartile of the 20th century, was related to particularly adverse climate conditions that affected the community's capacity to develop his fishing and subsistence agricultural activities. To test this hypothesis, CLIMIGRA multidisciplinary and multilevel project crosses historical empirical data about climatic conditions (series that exists since the middle of 19th century) with land use information for the same period (e.g. Portuguese Geographical Institute, Geographical Society of Lisbon, Hydrographical Institute, and archives from the Ministry of Agriculture, among others) and migratory flows (e.g. ethnographic studies about migratory communities and Portuguese Census since the middle of 19th century), allowing us to (1) identify specific periods of time where there were significant variations in demographic behavior (inflexions in 'normal' population growth – as was the case in our case study); (2) identify economic activities and land use for specific periods of time in each case and; (3) cross this information with past climate data on precipitation, temperature, wind, waves and humidity in a 'reconstructed' past climate georeferenced map. This research, so far, seems to reinforce (at least it cannot be refused, which is a very important achievement) our hypothesis because main migratory flow of *Avieiros* is correlated to the wettest decade in the region. Nevertheless, this working hypothesis needs further development, namely to frame temporal limits of local resilience. This research allowed us to put another question: How many consecutive years of bad weather are necessary for local communities to increase the propensity to migrate? In our case study, the persistence of seven consecutive years with adverse weather conditions is being considered as a sufficient forcing factor to migrate. In fact, the seven consecutive years (1924 to 1930) with high values of annual precipitation in the river *Lis* basin apparently had a strong influence on the migration decision, as the correlation with the decrease of the Census curve between 1920 and 1930 shows (Costa, 2011b and Amorim, 2013). We looked at economic impacts as an 'externality' of particular climate and economic conditions in selected communities that, by affecting agriculture, harvesting and fishing, transforms climate push factors into economic push factors, those being the most visible ones. This historical approaches allowed us to 'isolate' economic variables because in great part of the country there

were no second and third sectors (industry and services) between the middle of 19th and 20th centuries that could serve as a buffer for these communities, retaining people in second and third job markets reducing propensity to migrate (as is common in third countries economies in other parts of the world –see Costa, 2011b and Amorim, 2013). Defining levels of causality for the different categories of EM will also allow to integrate and articulate our analytical framework and heuristic typology with other theoretical frameworks and methodologies already proposed by other authors, such as the Agent-Based Modeling proposal (see Kniveton, 2008) in order to enrich future projection about the relation between climate change, land use and migration. We trust that by using this kinds of approaches, we believe that it is possible to empirically assess how different environmental transformations produces different kinds of EM along a timeline and assess different levels of causality and accountability relevant to policy-making.

4. Environmental transformations as drives for migration: a heuristic typology

To understand the extent to which ET are relevant to the study of migration we propose an analytical framework to study the relation between environment, climate change and migration. In our exploratory typology, we define different kinds of ET and, by using a chronological line, we argue that different levels of causality and accountability arise as anthropogenic climate change process accelerates and becomes more accurate and unequivocal. Before describing the typology some presuppositions are needed. We consider that, although there is more and more relevant scientific information about the process of climate change, linking the greenhouse effect to the increase and frequency of extreme weather events (e.g. hurricanes, floods, droughts, etc.), there is still no scientific support that allows us to state that those phenomena are unequivocally attributable to the process of climate change and that they are a direct result of GHG's increase. Only when the impacts of climate change definitively and permanently prevent the populations from having essential livelihood conditions (e.g. the case of small islands stateless persons), and a clear link between climate change and human responsibility is established, will it be possible to support the existence of ER and specify accountability. Meanwhile, the principle of precaution must be taken into consideration.

We are aware of the limitations of our approach but we prefer to consider the extreme situation of statelessness because that way it is possible to have a clear and unequivocal possibility to attribute moral responsibility and accountability. This will be an irreversible situation and no mitigation or adaptation measures can be suggested. That way, our proposal establishes the relevance of considering the ER as a form of migration that will occur in the future and which, therefore, will require a political response (outside or within the framework of the UN). For the propose of this work, we defined EM as those people who, for reasons related to natural (e.g. droughts and floods, earthquakes, volcanoes, tsunamis, typhoons) and human-made ET (e.g. pollution, environmental degradation, forced displacement due to major works such as dams) found in migration, both internal and external, a way of responding to those threats. For the same propose, we defined ER as those people who have moved to other countries, due to the fact that their country became completely and irreversibly affected by ET unequivocally connected to anthropogenic changes in climate system. We propose to establish a differentiation between past and future impacts (mixing the two time scales creates confusions in quantifications, as we have seen above). Actually, there is climate inertia; what we are now measuring corresponds to the past effects of climate. We consider that the issue of ER is intrinsically related to the issue of projections, i.e., of what supposedly may happen to the climate in the future and, therefore, a clear definition of ER suffers from the same levels of uncertainty as those associated with the research on climate change. As stated above, somehow, we assist to a dialectic process similar to that of climate change antagonism between 'believers and scepticals', i.e., people who believe that climate change is in fact happening and those that are scepticals about that fact (Evans and Steve, 2007). But even if we consider that there are no ER so far, we can still say that there are people who have been more or less affected by environment, be they of natural causes or due to human activity. Therefore, we consider it pertinent to establish the category of EM as the type of migration that is happening in the present due to ET not directly connected to climate change processes. When the impacts of climate change accelerate and unequivocally produce statelessness persons (the case of low land islands) we must admit the emergence of a new category of migrants, the ER. ER will become

those who will be affected as a collectively entity. Important policy questions will arise from that assumption that need further debate, namely when producing new legal responses within the framework of the UN.

Another aspect that hardens the study of the relationship between environment and climate change has got to do with spatial scales. The natural and human-made environmental transformations tend to have local impacts. On the other hand, the processes related to climate change tend to have global impacts, such as the changing patterns of global temperature and the rise of the average sea level. Although there is an immense complexity between environment, climate change and migration, it is our intention to propose for discussion the following experimental typology that considers the interrelation of referred aspects in order to make it easy to test operationalization (see Table 1).

We are aware of the fact that important interactions occur in the Earth System as a whole. But given the complexity of that system, we chose to consider four structural kinds of ET: Natural Environmental Transformations (NET), Human Environmental Transformations (HET), Interactive Environmental Transformations (IET), and Climatic Environmental Transformations (CET). The next table shows the different types of ET and migrants types and flows associated.

Table 1

Typology of Environmental Migrantes

<i>Environmental Transformations Timeline:</i>	Past				Future
<i>Spacial Impacts:</i>	Local				Global
Environmental Transformations	Natural Environmental Transformations (NET)	Human Environmental Transformations (HTE)	Interactive Environmental Transformations (IET)	Climate Environmental Transformations (CET)	
Types of flows					
Internal/National	Environmental Migrants (EM)	Environmental Migrants (EM)	Environmental Migrants (EM)	no internal migrations	
External/International	Environmental Migrants (EM)	Environmental Migrants (EM)	Environmental Migrants (EM)	Environmental Refugees (ER)	
<i>Environmental causality:</i>	Less				More
<i>Accountability:</i>	Local/National				Global/International

Let us specify our categories. Natural Environmental Transformations are natural phenomena that occur in the Earth system, particularly those relating to the sub-systems of the geosphere, hydrosphere and atmosphere, respectively earthquakes, floods and droughts, among other natural phenomena not directly attributable to human activity. The impacts are local ones. In these cases there is not a responsibility attributable to an entity other than Nature; and the states are responsible for the negative impacts on populations and may have external help. In these cases, the flows are characterized by being mostly internal (EM) and short time lasting, and they may generate circular pattern flows, more or less extended in time. Resilience strategies can and are often adopted. African countries where people live in flood riverbeds are a good example. They can be pressure factors for external migration generating environmental immigrants, particularly if associated with other interaction factors (economic, political, social, etc.). It is difficult (but not impossible) to measure the main reason for the move, seeing that, in most cases, the environmental reasons are converted into economic problems, this being commonly perceived as the main factor (see Costa, 2011b and Amorim, 2013).

Human Environmental Transformations are environmental phenomena that derive from human activity and that fall within the sub-biosphere system. They relate to human interventions that cause significant changes in the environment due to soil occupation (construction of dams, chemical or nuclear contamination, among others) and which originate migration flows. In these cases there is a responsibility directly attributable to an entity. There may exist external support 'negotiated' on a case-by-case basis. Their impacts are mainly local. In some cases resilience strategies are part of adaptation measures. The flows are characterized by being mainly internal and tending to be permanent if the environment is inevitably affected, as in the case of dam construction (e.g. China-Three Gorges Dam) or radioactive contamination (e.g. Chernobyl, Ukraine) and chemicals (e.g. Bhopal, India). There may occur situations of environmental remediation to renew the habitability of the place.

A third kind is Interactive Environmental Transformations. The more you can clearly understand the cause of the phenomena as being from impacts of climate change process, the easier it is to determine primary causality to factors. Their underlying causes are harder to see clearly. Their impacts can only be assessed on a case-by-case basis, through studies on their respective places (e.g. the case of Kivalina Island - Shearer, 2012). There are interactions between global changes due to intensification of climate change process and local conditions (e.g. sea level rise). The types of flows are identical to the previous ones (i.e. they generate internal EM and at a less extend and, in a case-by-case situations, international migrations). Accountability other than national one can be considered only when unequivocal relation to climate change can be established through scientific studies. Impacts are not permanent and the types of flows vary according to the adaptation capability, as well as to the resilience in the place, region or country. We can admit a new climate migration type connected to those IET if they can be unequivocally connected to climate change processes, but we prefer not to do it in this first approach, therefore, we consider that IET tend to generate the same types of migrants as NET. Nevertheless, case-by-case situation can become of relevance. In fact, there are already some situations where, even if there is no scientific certainty, a relation between climate change and environmental transformations can be assumed, as for example is the case of Tuvalu Islands, where, the rise of sea level is already affecting some people. This situation as led to new political circumstances. According to Aurelie Lopez (2006), the Prime Minister of Tuvalu Islands has requested, from both Australia and New Zealand, ER status for the citizens. New Zealand has responded to the plea by 'allowing seventy-five Tuvaluans to relocate annually to their country' (Lopez 2006:372), making them the first international political response to climate change concerns. Nevertheless, we consider that this category is the fuzziest one of our proposal, needing to be tested and confronted with further empirical research.

A fourth kind of ET concerns the issue of climate change and the need to consider the precautionary principle. We designate these transformations as Climate Environmental Transformations (CET). They characteristically affect climate in a global way. The most extreme example is the rise of sea level. This fourth type depends on time function. The verification of statelessness people (flood of low land islands) due to a clear link between global warming and environmental impacts will mark the point from which this category should be fully taken into consideration. The verification of this type of ET will also mark the point from which the concept of ER will come to have a significant empirical support, in fact, in this case, they will become ER and only international flows can be possible (see Table 1). The impacts are global and accountability can be historically and politically attributed.

The debate around ER is part of that process and, along scientific research about the impacts of climate change in the environment, it is necessary to study the human and political implications of those impacts. Research on the relation between environment, climate change and migrations is paving its way and, we hope this paper can be of some contribution to support legal responses within or outside of UN framework.

5. Conclusion and further steps

In this paper, we argued that migration studies need to pay attention to relations between people's movement and different kinds of ET. Considering that analytical frameworks and typologies are approximate tools to explore the phenomena, we have constructed a heuristic typology based on the idea of different ET (natural, human, interactive and climatic) as a way to

distinguish between different causal relations and political implications of environmental migrations. We have stated that two kinds of migrants can be considered, EM and ER. First, we propose to consider EM (internal and external) as those already affected by present natural and human environmental transformations (NET and HET). In these cases impacts are mainly local and political implications and accountability belongs to State and specific entities. Both of them produce mostly internal migrations and causality is diffuse particularly in the case of international migrations. Secondly, we propose to think about ER as those who, although not empirically verifiable yet, in some decades, will be affected by changes in environment due to climate change processes caused by human GHG emissions. In this case, changes tend to affect definitively livelihoods and originate ER. We have used the extreme case of 'climatic statelessness persons' in order to show the precautionary principle relevance.

A note is needed concerning our third category, the IET. In this case, it is necessary to have better scientific support to establish the relations between climate change and migrations. As we have said, this is the most difficult category to support empirically because of climate inertia and the blurred relations between environment and climate change. The levels of scientific support can vary depending on the evolution of climatic science and the establishment of unequivocal scientific prove. In fact, a well-supported theoretical and empirical grounding is needed because, otherwise, quantifications can always be challenged and devalued. We believe that empirical confrontation will allow to go forward testing this category.

To test our proposal, quantitative and qualitative cluster analysis within migrant's communities must be done in order to quantify and define levels of causality, both for internal and international migrations. We propose to integrate our analytical framework and heuristic typology in theoretical and methodological frameworks, as is the case of our historical study about early 20th century Portuguese fisherman that flee from Vieira de Leiria to River Tagus basin in Lisbon (see Costa et al., 2011b and Amorim et al. 2013) and also in other kind of studies such as Agent-Based Modeling (Kniveton et al 2008). We trust that it is possible to assess empirically how different ET produces different kinds of EM and assess different levels of causality and accountability, but, in order to go further, new empirical research is needed to adjust our empirical proposal and contribute to come up with new relevant proposals to inform policy-making.

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Abstract (American- English)

The debate around 'environmental refugees' and climate change is high on the academic and political agendas, even though no causal link between climate change and human migrations has yet been unequivocally established. In this article we establish a differentiation between RA and MA and consider that, even if there aren't 'environmental refugees' (ER) at this moment, it is argued that environment transformations (ET) have already caused several environmental migrants (EM); a fact that has not been sufficiently taken into consideration in migration studies. We suggest a new analytical framework based on the idea of ET. The paper intends to propose a heuristic typology grounded on a classification of ET, allowing making a distinction between different types of environmental migrations according to different forcing factors (natural, human, interactive and climatic). Three factors are considered in the formulation of the typology: ET are identified along a timeline; spatial impacts of different ET (from local to global) are taken into consideration; levels of environmental causality and related accountability are framed. The case of low land islands is used to assert that the Refugees Convention of 1951 is not tailored to deal with this new challenges and that acceleration and intensification of climate change processes makes the 'precautionary principle' more compulsory to the definition of a political and legal framework at national and international level to deal with the high probability of the emergence of RA unambiguously related to the ET resulting from climate change.

Key-words:

Environmental migrants and refugees, environmental transformations, climate change and a policy making.

Resumo (Portuguese)

O debate em torno da temática dos "refugiados ambientais" e das mudanças climáticas está no topo da agenda académica e política, mesmo apesar do nexos de causalidade entre as mudanças climáticas e as migrações humanas tenha ainda sido inequivocamente estabelecido. Neste artigo estabelecemos uma diferenciação entre RA e MA. Considerarmos não haver, ainda, evidências empíricas inequívocas da existência de "refugiados ambientais" (RA) e argumenta-se que as transformações ambientais (TA) já terão dado origem a outro tipo de migrantes, os migrantes ambientais (MA), facto que não foi suficientemente tido em consideração nos estudos sobre as migrações. Este trabalho tem a intenção de propor uma tipologia heurística baseada em uma classificação de TA, permitindo fazer uma distinção entre os diferentes tipos de migrações ambientais de acordo com diversos factores e forçamentos (naturais, humanos, interactivos e climáticos). Três factores são considerados na formulação da tipologia: as TA são identificadas ao longo de uma linha do tempo; são considerados os diferentes impactos espaciais de diferentes tipos de TA (do local ao global); e são introduzidos níveis de causalidade ambiental e responsabilidade relacionada. Afirma-se que a Convenção de Refugiados de 1951 não está adaptada para lidar com os novos tipos de RA e que a aceleração e intensificação dos processos de mudanças climáticas faz com que o princípio da precaução deva ser tido em consideração na definição de uma política ecológica de âmbito nacional e internacional para lidar com a elevada probabilidade do surgimento de RA inequivocamente relacionados com as TA resultantes das alterações climáticas.

Palavras-chave:

Migrantes e refugiados ambientais, transformações ambientais, mudanças climáticas e elaboração de políticas.

Résumé

If the paper is accepted, can I have help translating to French?

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