Linking migration, climate and social protection in Brazilian semiarid: case studies of Submédio São Francisco and Seridó Potiguar

Conectando migração, clima e proteção social no semiárido brasileiro: estudos de caso do Submédio São Francisco e Seridó Potiguar

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doi:10.18472/SustDeb.v11n2.2020.31293

Received: 01/05/2020
Accepted: 10/08/2020

ARTICLE - VARIA

ABSTRACT

Over the known history of Brazilian sertões migration has been recorded as a human response to drought episodes. Social protection policies beginning around 2003 had dramatically diminished poverty rates and, within this context, migration changed compared to other periods, becoming more heterogeneous and diffuse. The article aims to explore the link between drought, migration and social protection in the Brazilian semiarid region based upon the analysis and conceptual discussion about two case studies: Submédio São Francisco and Seridó Potiguar. In contrast with the past, actual migration holds an indirect relation to climate. Public policy softened the impacts of the climate over livelihoods and changed the coping strategies. In this sense, mobility outside the semi-arid was not a strategy to survive. Yet, the role of the state in the preceding decades and the region's historical path – inseparable from its climate – drew persistent migration flows that still reverberate in present dynamics.

Keywords: Population mobility. Drought. Cash transfer. Brazilian semi-arid Northeast.

RESUMO

Ao longo da história dos sertões, a migração foi registrada como resposta humana a episódios de seca. Políticas de proteção social iniciadas nos anos 2003 diminuíram drasticamente as taxas de pobreza, ao passo que a migração mudou comparada a outros períodos, tornando-se mais heterogênea e difusa.

O artigo visa explorar o nexo entre secas, migrações e proteção social na região, baseado na análise e discussão conceitual em torno de dois estudos de caso: o Submédio São Francisco e o Seridó Potiguar. Em contraste com o passado, a migração do presente tem uma relação indireta com o clima. Políticas públicas moderaram os impactos do clima sobre os meios de vida e estratégias. Portanto, deixar o semiárido não seria mais uma estratégia de sobrevivência. Ainda assim, o papel do estado nas décadas anteriores e a trajetória histórica da região – inseparável do clima – desenhou fluxos migratórios persistentes que ainda reverberam no presente.

Palavras-chave: Mobilidade populacional. Secas. Transferência de renda. Semiárido nordestino.

1 INTRODUCTION

Migration, as a specific type of population mobility, has been historically associated with drought episodes in the Brazilian semiarid region. Over centuries, the population movement toward coastal cities or to the southern part of country was a subsistence and even survival strategy to avoid famine, diseases and the collapse of agricultural systems during periods of severe droughts.

The context underlying those drought episodes relates to the irregular rain regime, which is characteristic of the region's climate, combined with poor socioeconomic conditions. Brazilian semiarid is located mostly in Northeast Brazil and corresponds to approximately 11% of Brazilian territory. This area is delimited by its physical characteristics, notably its inter-annual rain variability, low water availability and rains concentrated in three to five months a year. Besides scarce rains, it is common the occurrence of drought episodes a year or a couple of years with precipitation way below average (MARENGO et al., 2011). Those aspects are especially problematic for rainfed agriculture, which is a persistent and relevant activity in Brazilian semiarid.

In addition, the semiarid region has held a large share of the poorest Brazilian population. Since colonization and for centuries that followed, land concentration shaped social and economic dynamics. Most of the population established a relation of dependence (and even subservience) with a local elite, in which they would use and produce in a landlord's lands, giving part of production as payment. This system was reinforced by climate, as land owners would provide means for survival – usually benefiting from dams built by federal government – to those kept under their influence. As result, during periods of droughts thousands of people would not have access to water or food (as their subsistence production collapsed), facing death or being forced to flee (ARAÚJO, 2000; BURSZTYN, 2008; CHACON, 2007).

During the 20th century, this dynamic shifted due to a more direct – and top-down – State action, as well as economic modernization processes. Investment in relief measures, such as cash transfer programs, as cash-for-work programs and water trucks progressively diminished famine, mortality and migration, thus increasing the resilience and adaptation capacity of the population living in the semi-arid. Still, centuries of inequality in the access to resources along with focalized and fragment development policies implemented mostly during military regime (1960's to 1980's) resulted in high and persistent poverty rates.

The last drought episode (2011-2017) was one of the longest and harshest ever registered in the region in terms of rain scarcity and irregularity, but it took place in a different social scenario. Between 2012 and 2015, the Ministry of Integration estimated a loss of 6 billion dollars in the agricultural sector, and the Federal Government declared state of emergency in 1,100 of the 1,794 municipalities in Brazilian semiarid (MARENGO; CUNHA; ALVES, 2016). Nevertheless, and in contrast with past contexts, the rate of poor people in the region dropped from 80% in 1991 to 41% in 2010, due largely to wide investment in cash transfer programs and advancements in social protection policies. Still reflecting social improvement, human development index (HDI) raised from 0,291 to 0,591 in the same period. Given this background, the human impact associated with the six years of low raining did not reflect past scenarios of disaster and increasing migration or population circulation (for example, seasonal or temporary mobility) that for so long characterized the long periods of rain scarcity.

This contrast between past and present raises questions about what elements mediate the link between migration and climate, more specifically droughts episodes. Furthermore, Brazilian semiarid recent history points to the role of social protection and cash transfer programs in modifying this relation. Human impacts related to droughts in the region throughout the last decades provide a picture of a changing social, economic and political scenario – which includes new and more heterogenic migration patterns – exposed to a known phenomenon.

This article explores the connections between climate, migration and social protection through the specificities of *Brazilian semiarid*. We ground this discussion based upon two case studies within the region: *Submédio São Francisco* (*Pernambuco* and *Bahia* states) and *Seridó Potiguar* (state of *Rio Grande do Norte*). The first section discusses the extant literature on the effects of drought on migration as well as the role social protection programs affecting this relationship. The second section brings the study cases on the Submédio São Francisco and Seridó region, followed by concluding remarks in the last section.

2 THE ASSOCIATION BETWEEN DROUGHTS AND SOCIAL PROTECTION PROGRAMS ON MIGRATION IN BRAZILIAN SEMIARID

Since the colonial occupation in Brazil, drought episodes and their effects have been registered as part of Brazilian semiarid social landscape. Missionaries in 16th century reported indigenous people fleeing to coastal regions due to the lack of rains, and settlers recorded massive loss of cattle in 17th century (MARENGO et al., 2011). One of the most dramatic episodes took place in 1877, during a three-years drought episode which killed around 500 thousand people and raised nationwide public commotion (NELSON; FINAN, 2009b).

Population mobility was associated with the drought episodes from the first written registers, as illustrated by the 16th missionary notes. In the 18th century, though, population in the semiarid grew significantly, and migration during famine outbreaks due to droughts became massive (CAMPOS, 2014). Gomes (2001) states that until the 20th century "the human disaster dimension was strictly associated with migration; facing famine and lack of water to even drink, those who did not die in '*sertão*' fled to another place". Even in the early 20th century, the number of migrants fleeing drought were so expressive that the Brazilian government created 'concentration camps' allegedly to assist population, in order to keep the "*retirantes*" from arriving in the cities of the coast. In 1932, the biggest camp in *Ceará* state contained 60 thousand people (NEVES, 1995).

Given this historical background, climate factors are commonly pointed in the literature as the root of migration flows originating in the region. Population displacement was one of the few survival strategies available to the poorest population when their survival capacity deteriorated (OJIMA; COSTA; CALIXTA, 2014). Nonetheless, different conceptual frameworks on environment and migration might provide a sight about different patterns associating population and the droughts in semiarid regions.

The debate about environmental migration gained momentum in the decade of 1980 due largely to the rising debate about the consequences of climate change on vulnerable populations. El-Hinnawi (1985), Jacobson (1988) and Myers (2002), among other authors, established and spread the term "environmental refugee" to name forced migratory movement provoked by environmental disturbances that undermine life conditions in a given place. In this context, pressures over natural resources where livelihoods were fragile would result directly in population displacements (CASTLES, 2002). Myers (2002) estimated 25 million environmental refugees worldwide in 1995 from out-migration from areas prone to environmental stress. Similarly, Rigaud et al. (2018) more recently calculated 143 million climate migrants fleeing slow-onset events within developing countries by 2050.

Following this debate, migration driven by droughts has been discussed as a "common sense" assumption (CASTLES, 2002; MORRISSEY, 2012). As Morrissey (2012) points out, migration is frequently understood by proponents of the environmental refugee concept as "an inevitable outcome of vulnerability" (p. 43).

In this sense, out-migration in Brazilian semiarid could be understood as a "natural" consequence of the impacts of the lack of rains over agricultural production, water availability, food security and possible social tensions arriving from this resource stress (such as famine outbreaks).

However, droughts are usually not the sole cause of mobility as adaptation strategy (WARNER ET AL., 2011). Several studies (BARBIERI, 2011; BLACK et al., 2011; CATTANEO et al., 2019; HUGO, 1996; KACZAN; ORGILL-MEYER, 2019; MCGREGOR, 1994; WARNER, 2010) discuss the high complexity in the association between climate and migration. First, migration in many cases is not so straightforwardly derived from livelihood conditions – on the contrary, it can be constrained by multiple factors such as institutions and social relations (see, e.g., BLACK ET AL., 2011).

In a review of empirical evidence, Kaczan and Orgill-Meyer (2019) highlight the role of income, land tenure and gender in the relationship between weather and migration. In addition, the human consequences that would lead to migration (e.g. food and water scarcity) might not themselves derivate from environmental crisis. Sen (1983), for instance, argues that famine outbreaks during drought episodes in the African Sahel were due to a failure of individual entitlements – related to a broader social and political framework – rather than environmental conditions to food production. Some studies even conclude that the poorest and more vulnerable households cannot afford migrating during an environmental crisis (e.g. MCNAMARA et al., 2018; MUELLER et al., 2020). Overall, several authors have discussed migration (and other types of population mobility as well) as an adaptation strategy to droughts as highly contextual and dependent on factors in multiple dimensions (BLACK et al., 2011; ADGER and ADAMS, 2013).

Some conceptual frameworks analyzing the association between environmental factors and migration highlight the complexity of this link and draw attention to the multiple factors involved. According to Morrissey (2012), a main question regarding studies in the field is to clarify the "relationship between environmental and non-environmental variables in shaping mobility imperatives and decisions, in communities experiencing environmental stress". Along these lines, Hugo (1996) discussed a model of environmentally driven migration in which "precipitating events" might trigger population movement under "predisposing conditions". However, these conditions do not directly provoke migration; instead, they affect the constraints and facilitators to migration, as well as they might be modified by policy responses.

Similarly, Black et al. (2011) argue that the migration-environment nexus must be analyzed in multiple dimensions and levels. The conceptual framework suggested by the authors defines categories that encompass factors related to the wider context in which a person or group is inserted and that influences the decision to migrate; for example, due to employment opportunities (economic), existing conflicts (political) and land productivity (environmental). Likewise, individual characteristics (e.g. wealth, education, sex and personal preferences) and meso-level characteristics (e.g. social networks and institutions) may facilitate or undermine the decision to migrate or to stay (BLACK et al., 2011). Given these multiple levels, environmental change impacts this chain by modifying directly or indirectly macro conditions in environmental, political, economic, social and demographic spheres (BLACK et al., 2011). It is implicit in this discussion the impossibility to separate economic from environmental motivations to move (LILLEOR and VAN DEN BROECK, 2011), as well as the highly contextual, diverse factors affecting the relationship between migration and droughts (LEIGHTON, 2011)

Since frameworks like those proposed by Hugo (1996) and Black et al. (2011) assume that multiple drivers play a role in limiting or favoring the decision to migrate, the idea of "forced migration" itself is softened. Under this perspective, voluntary and forced movement are seen as ends of a continuum (with "completely voluntary" movement in one side, and "completely forced" movement in the other). The range of alternatives available to the individual, household or community posits them in this gradient – the movement is closer to a displacement whether migration is necessary to survival. The degree of willingness – a "subjective dimension" – and the elements of the underlying context in scenarios of environmental change might be bridged through the concept of vulnerability (degree in

which a group is susceptible to suffer impacts from an environmental change and unable to cope with it, mediated by the adaptive capacity this group presents) (BARBIERI, 2011).

In order to analyze Brazilian semiarid as a study case, we review the literature to identify on the plethora of (complex) factors addressing the region's socioeconomic, institutional and political background. Nelson and Finan (2009) point out that climate hazards is always present in Brazilian semiarid environment, but only in certain situations – determined by non-environmental factors – it results in human disasters (including high mortality) and/or people fleeing the region. In this sense, drought episodes exist primarily as a socio-environmentally driven phenomenon. On one hand, the region historically presents high levels of poverty and low access to basic services and assets. On the other hand, choices regarding politics and public policy towards the region also shaped the relationship between the population and their local climate.

Chacon (2007) synthesizes the questions underlying drought episodes in Brazilian semiarid in four points: a) land ownership structure; b) socioeconomic and productive structure; c) household disaggregation; and d) relationship between population and politics. Regarding the first, land uneven distribution is lasting. From colonial times, land was distributed among a restrict elite that raised and reinforced political and economic power by regulating population access to resources. From the productive perspective (b), rainfall agriculture was one of the cornerstones of the production in Brazilian semiarid until 20th century, mainly to the self-consumption of the most dispossessed population. It is still a central activity among small farmers and is highly sensitive to climate.

Chacon (2007) also draws attention to the fragilities derived from the departure of family members to other regions (c): migration itself makes population more sensible to the effects of drought. Finally, policies had been historically used by some groups in exchange to political "loyalty", in a pattern named "*clientelismo*" (d). Thus, public policies were seen by the majority of population as a *gift* rather than a *right*. Although this path changed with advancements in the overall development of the region, much of these relations to policy and to politics remain a barrier to more effective and lasting coping strategies.

The relevance of observing multiple factors affecting migration flows is even more evident considering the changes in recent scenarios in the region. After mid-20th century and more intensely in 21th century, migration patterns shifted from massive movements towards the coast and the wealthier region of Southeast (cities like *São Paulo*) to more diffuse and heterogeneous movements to smaller cities and other areas within semiarid region, including return migration and circular mobility (BURSZTYN; CHACON, 2013; FUSCO; OJIMA, 2014; OJIMA, 2014; ALMEIDA, 2018).

At the same time, the socioeconomic scenario was also transformed. From the 1960s to the 1980s, Brazil faced an intense process of urbanization (PRIORI et al., 2012). During 1960s and 1970s, the Northeast region was target for policies oriented to the construction of development poles (such as priority areas to foster modernized agriculture stablished in *São Francisco* valley and dry lands of *Seridó* and other regions) (ARAÚJO, 2000; BURSZTYN, 2008). In the 2000, federal social protection policies were significantly expanded, involving federal expenditure in social assistance increased almost fivefold between 2002 and 2015, what caused poverty in the region to drop (ARAÚJO, 2013).

In general, migration (as well as other forms of population mobility such as commuting and seasonal mobility) seem to have transited along the continuum forced-voluntary movement: if massive flows of people fleeing characterized Brazilian semiarid in the past, the heterogeneous contemporary movements are closer to a choice of strategy than in the previous periods. This shift is related to the changes in social, economic and political landscape, as rain scarcity was not only constant through time but also is likely increasing due to climate changes (MARENGO et al., 2011).

Along these lines, Ojima, Costa and Calixta (2014) observed statistically a smaller association between migration and drought occurrence than between migration and social protection benefits, since people receiving cash transfers or social insurances were less likely to migrate. Similarly, Correia and

Barbieri (2019) observed the role of social protection programs in the mobility patterns and the coping mechanisms facing environmental hazards.

Evidences like those indicate that social protection is nowadays an important factor underlying population movement in the region. It is, thus, necessary to qualify this relation, particularly in terms of understanding how social protection alter the relation among population and climate events and how population vulnerabilities and fragilities still historically persist and respond to climate variations.

A nationwide system of social protection began to be structured in Brazil after the decade of 1980, following the process of redemocratization and an international trend towards the adoption of public policies focused on poverty reduction in a scenario of economic crisis (DRAIBE, 2005). Social protection was stablished as a right in the Brazilian Constitution of 1988. Despite the legal framework, social protection measures – mainly those framed as social assistance – were systematically implemented only in the decade of 2000 (VAITSMAN; ANDRADE; FARIAS, 2009). Policies such as wide-ranging cash transfer programs and rising minimum wage took effect mainly in the poorest regions, as is the case of the Brazilian semiarid.

Social protection is frequently defined as those policies aiming to reduce vulnerability and risks of groups facing poverty and exclusion (DEVEREUX; SABATES-WHEELER, 2004; KOZEL; FALLAVIER; BADIANI, 2008; OIT, 2014). This aim comprises two facets: shocks and structural conditions (BLANK; HANDA, 2008; DEVEREUX, 2016). On one hand, social protection protects a person or household from an isolated disturbance (e.g., economic, environmental or political) that could cause immediate and profound impacts on its means of living. On the other hand, social protection reduces vulnerabilities resulted from social exclusion and chronical poverty.

Devereux and Sabates-Wheeler (2004) proposed four categories of social protection measures according to their interaction with shocks and structural conditions: a) protective measures; b) preventive measures; c) promotive measures; d) transformative measures. Protective measures (a) aligns with the concept of *safety net measures*, which alleviate specific deprivations and avoid deeper impacts of disturbances. Preventive measures (b) seek to avoid rising deprivation, allowing individual or groups to cope with livelihood shocks (social insurances are included in this category). Promotive and transformative measures, in turn, aim to bring these population groups out of their current condition by enhancing capabilities (c) or modifying social structures (d). These measures are related to broader development policies and social justice.

Social protection in rural areas – and more specifically, protective measures – is closely linked to food security. In these contexts, disturbance (of environmental or economic order) affect directly production and thus production for self-consumption and income also used to acquire food. Kanbur (2015) highlights not only how shocks could generate food insecurity, but how some strategies adopted by household could deepen its long-term condition. Short-term measures, as temporary mobility, selling animals or restricting production variety, might undermine possibilities of future development. Protective measures such as cash and food transfers avoid immediate food insecurity and prevent poverty traps. In this sense, rain scarcity impact over rainfed agriculture in the Brazilian semiarid might affect self-consume, income and husbandry costs among poor rural population.

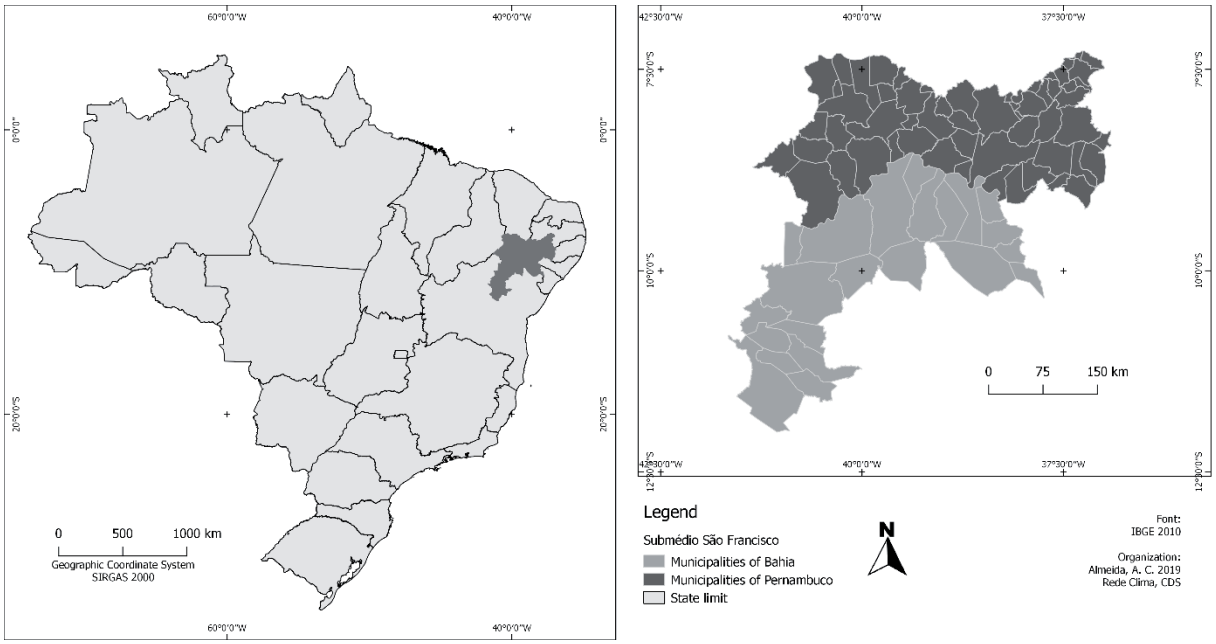
Thus, the effects of climate over migration might be modified by social protection measures in its two facets of action: by softening the impact of shocks over the livelihoods (AGRAWAL; PERRIN, 2009; TANLE, 2015) and by changing the poverty situation underlying the decision to migrate. Therefore, the concepts of *strategy* and *vulnerabilities* bridge migration, climate and social protection. People might migrate in order to improve their livelihood, to avoid life conditions to deteriorate, or even to survive in the face of oscillations in climate and other circumstances (economic, political, social). This motivation puts them within the spectrum of forced and voluntary movement. Social protection policies can modify the necessity to migrate as well as to provide and to change the alternatives available to the household strategies, thus reducing vulnerabilities. These policies can potentially shift migration from displacement-like patterns towards voluntary strategies.

3 STUDY CASES: DROUGHTS AND MIGRATION IN THE BRAZILIAN SEMI-ARID

We describe below two case studies which unveils the linkages between migration and droughts, and how social protection programs may affect it. We analyze data from two case studies collected in 2017, both financed by Brazilian Research Network for Climate Change (*Rede CLIMA – Rede Brasileira de Pesquisa em Mudanças Climáticas*). The first case – Submédio São Francisco – address the relation between migration, droughts and social protection through a temporal perspective apprehended by indicators and the memory and perception of local actors. The Seridó study case discuss the question through the results of a survey of the perception of the drought effects and its impacts over household strategies. Thus, the cases present an investigation of the link between migration, climate and social protection through different methodologies, as the first case emphasizes the qualitative analysis while the second focuses on quantitative results.

3.1 THE SUBMÉDIO SÃO FRANCISCO

The *Submédio São Francisco* is a sub-basin of São Francisco river basin, the largest river crossing Brazilian semiarid area. *Submédio* is a 110.000km² area entirely within the Brazilian semiarid climate zone. Mean rainfall regime varies from 350 to 850 mm a year. It is a plural space, where family (rainfed) agriculture is, to date, a significant activity to a large share of the population and coexists with large public irrigation projects, oriented to agroindustrial and high-value production.



Map 1 | Study area of the Submédio São Francisco case.

Source: elaborated by the authors

This area comprises ninety-three municipalities partially or entirely within the sub-basin. Data supporting the case discussion was obtained from official statistic (e.g., censuses) and semi-structured interviews undertaken in 2017 with 41 community leaders and civil society entities members[1] within the integrative research project on Socio-Environmental Security (*"PI-SSA" – Projeto Integrativo de Segurança Socioambiental*), financed by *Rede CLIMA*. The questionnaire was comprised of open-ended questions about the recent drought, and broader observed changes and responses in multiple dimensions of daily life (e.g. mobility, water access, food security, income, health, family relations).

The study case investigates through the narratives of the interviewees and the temporal evolution of indicators the directs effects of drought, the changes caused by social protection measures and the migration paths. The changes in these three dimensions are compared to discuss the link between them.

As for the rest of the Brazilian semiarid, *Submédio* is characterized by irregular rainfall and faced one of the longest drought in the period 2012 - 2017. This drought illustrates the direct impacts of the lack of rain. Interviewees related that it prejudiced crops and in some cases even made agriculture unfeasible. Some interviewees mentioned that they have not harvested for the past seven or eight years. Even though the area is crossed by a large perennial stream – the São Francisco river – many farmers near to the riverbank are equally affected by the rain scarcity. As drought brings river level low (especially in the dam reservoirs constructed along São Francisco, where water volume reached 4% of capacity), riverside communities get more distant from the stream and frequently do not have adequate pumping technology or access to any technology at all. Public irrigation projects settlers, in contrast, where not affected. Farmers reported drought would not "reach" the irrigated perimeter and they would not lack water unless São Francisco river dried completely.

In this sense, the lack of rain has a direct effect over production of food crops – the main production of small farmers in the region are manioc, beans and corn – that would serve to self-consumption, income and cattle feeding. Moreover, rains below average also hinder fishery and extractive activities, such as the gathering of *umbu* (*Spondias tuberosa*) fruits that generate income mainly to women in the region. Thus, drought impacted income received as well as household budget.

Although rains were reported as having direct effects, the case study analyzed the socioeconomic path in the region as well, following the conceptual frameworks discussed in the previous section. The aim is to establish a connection with migration patterns. During the decade of 2000, economic resources available to the poorest *Submédi*o population improved: the percentage of people living in poverty dropped from 64% to 44%, and the mean income of the poorest fifth increased 78% from 2000 to 2010. The reduction of poverty reflects mainly the higher investment in social insurances and cash transfers and growth of public administration sector, as agricultural grew less than other sectors and production value of small farming products stagnated in the decade.

At the same time, 51% of the households in *Submédio* were benefited by *Programa Bolsa Família*, the main federal cash transfer policy, aimed to reach families with children (390,000 beneficiaries in the ninety-three municipalities within the *Submédio* sub-basin, receiving a mean of R$ 103 per month, according to Social Development Ministry – MDS data). By 2010, only 57.5% of the mean household income was from labor, indicating the relevance of social programs in the domestic finances. Regarding socioeconomic indicators, it is evident the contrast between two municipalities (*Petrolina* and *Juazeiro*) that were target of the development policy of irrigation sites construction and agricultural modernization during the 1970s and the other municipalities of the region. The poverty rates are significantly lower than the rest of the region (20% of population living in poverty in 2010) and a mean of 80% of the household income came from labor in this region – indicating social programs are less significant to household budget in those municipalities.

Interviews with community leaders (part of the groups interviewed) show that income from rural activities is rarely sufficient to sustain the household. Households frequently hold a range of activities, including temporary and informal jobs in other agricultural establishment or in urban centers. Still, most interviewees, especially the elderly, related changes in the life conditions in the past two decades. Some of them associated this shift to public policy; social insurance (rural retirement pension), cash transfer (*Programa Bolsa Família*), policies of public purchase (*Programa de Aquisição de Alimentos*) and the construction of rain collecting cisterns (*Programa 1 Milhão de Cisternas*).

Thus, life conditions in *Submédio* seem to have improved in recent years and led the region to avoid past scenarios of human disasters, even when rains are more scarce than usual. Some interviewees report that life quality in rural areas and small villages of *Submédio* is now "viable". In other words, vulnerabilities where

reduce, increasing alternatives available. This improvement is associated to protective and preventive-like measures (namely cash transfer programs) as evidenced by the relative lack of labor opportunities and low income coming from productive activities. Moreover, there remains socioeconomic inequality of *Submédio* in relation to other Brazilian regions and the sub-space of *Petrolina* and *Juazeiro* (shaped by past development policy decisions), so the gap might indicate that structural conditions still were not fully addressed. Along with this, migration as a strategy facing the region's context also shifted.

Submédio, following Brazilian semiarid historic pattern, presents high rates of migration and negative net migration. The low net migration rate in the region was persistent among past decades: the net migratory rate (net migration in relation to total population) was -2,49 in the 1991 census, compared to -3,49 in 2010 – it means the region continued to lose population over this time. Even though, migration flows changed in the recent past in the area. In-migration in urban areas decreased between the decades of 1980 and 1990, while rural exodus became less intense among adult population during the 2000s, according to national demographic censuses. Destination places became more diffuse along time as well. *São Paulo* metropolitan area is the region that receives most of the migrants from *Submédio*, but its relative importance decreased along time in face of other less populated areas (in mid-1990, 20% of the migrants would go to *São Paulo*, compared to 10% in 2000s). Similarly, the relevance of *Petrolina* and *Juazeiro* as attraction poles to the rest of the region diminished compared to other areas near *Submédio* (as other municipalities in *Bahia* and *Pernambuco* semiarid). Moreover, the data available does not express more heterogeneous movements, as circular mobility arrangements and short-term migration that might have increased in the region as well.

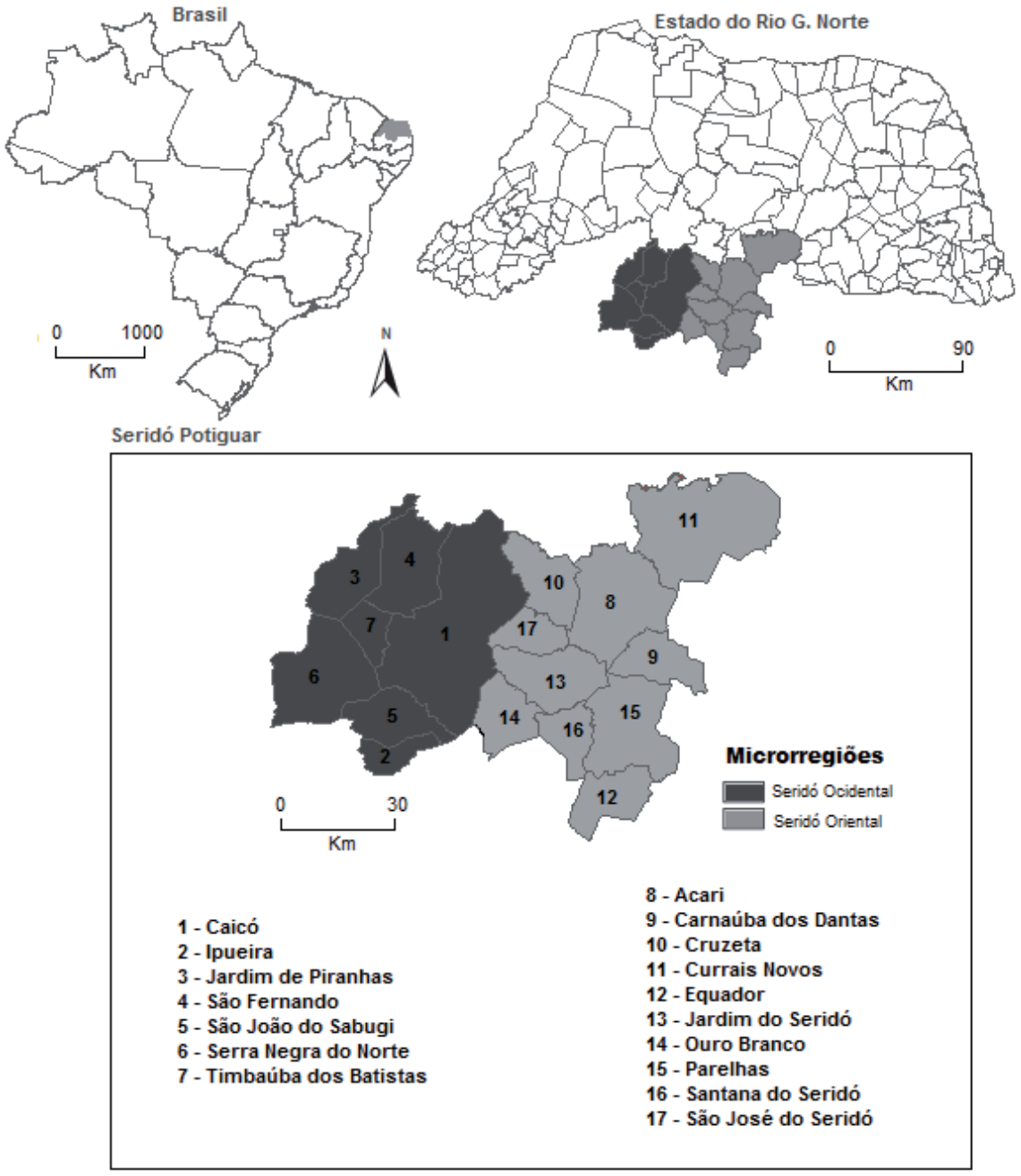
The meaning and purpose of the movements also changed, according to the perception of local actors. Older community leaders reported a contrast in their statements between migration in the past and today. Past movements are recalled as a change for the whole family, in which all or a few members would migrate to assure the survival of the group. In opposition, they highlight that actual migration is frequently a strategy by young members of the household for an urban way of life, associated with their devaluated perception of the region. In this sense, young people migrate seeking economic opportunities and social mobility despite the needs of the household.

It is noteworthy that most of the interviewees do not associate present migratory movements to the environment, as they remark improvements in living conditions in the region, mainly following social protection policies intensification. Nevertheless, the lack of income opportunities, especially during the prolonged drought (less agricultural production and less job options in larger farms) was also highlighted. This, by its turn, is mediated by non-environmental factors: some actors within the region do not "feel the drought" (as some interviewees state) for having access to water and resources (as pumping technology and rural technical assistance).

In sum, migration characteristics in *Submédio* followed the path suggested in the first section, as they have become closer to an alternative than a displacement. This shift might be associated to the protection of livelihoods in face of shocks (direct drought impacts). Even when production was not enough to guarantee income and food due to the lack of rains, the income provided by cash transfers programs and pensions allowed a food security scenario and dynamism in local economy. Policies that potentially foster structural changes by providing productive alternatives and deepening capabilities (we could associate with Devereux and Sabates-Wheeler's (2004) transformative and promotive measures) are existent – for instance, programs to spread accessible social technologies – but still not as widespread as social protection protective measures. Thus, improvement in life conditions have brought migration closer to a choice, but it faces a double threat: as environmental change could raise stresses, this new profile of the movements might depend on the continuity of the protective measures, since they are only effective while benefits are delivered.

3.2 THE SERIDÓ POTIGUAR

The Seridó Potiguar region involves 17 municipalities and 216,508 inhabitants (85% urban). The mean temperature is 28.6oC, with 23.2oC minimum and 35.4oC maximum on average. Rain regimes are irregular with low precipitation (mean 41.3 mm in 2007). As for the most non-irrigated semi-arid, natural soil fertility is low soil. The region is heavily dependent on agriculture and cash transfer programs, and water supply relies on few rivers and dams. Nonetheless, the Seridó, as in most parts of the contemporary Brazil, presents strong urban – rural articulations, with households diversifying livelihoods through both direct engagement in rural production or indirect linkages (e.g., agro-industries, services etc), urban employment (especially in the informal sector) and high dependence on cash-transfer programs.



Map 2 | Study area of the Seridó Potiguar case, Rio Grande do Norte

Source: CORREA (2018), data from IBGE, Malha Municipal Digital (2010).

In 2017, with financing from *Rede CLIMA*, it was implemented the first statistically representative household survey (n=1,064) in the Brazil´s semi-arid, during one of worse periods of droughts in history of the semi-arid. The survey collected questions about socioeconomic, environmental and demographic issues, with a particular focus on vulnerability and adaptation to droughts. The survey used a three-stage probabilistic sample: municipalities (1st), urban sectors (2nd), households (3rd). In 2019 we implemented a follow up of 600 households from the 2017 sample.

The main purpose of the survey was to understand how population perceptions about droughts affect mobility as an adaptation strategy in the Brazilian semi-arid. Related to this, it was investigated how migration and temporary mobility (vis-à-vis immobility) is an effective strategy to reduce vulnerability for slow onset events (at least for this study case). The justification for this focus is that there are scanty evidences in the literature about the role of distinct types of mobility in adaptation strategies (types, timing, spatial range, residency status).

Barbieri et al. (2019) analyzed the linkages between mobility, droughts and social protection programs through bivariate descriptive analysis with significance tests, multiple multinomial regression using Probit Heckman selection models. Two main conclusions were reached. The first refers to understanding how distinct categories of mobility (migration, commuting, immobility) differ as adaptation strategies to droughts. The authors found that while higher exposition and experience with droughts decreases migration, it increases other types of mobility, especially commuting. Furthermore, migration is more likely in events not strictly related to droughts; in particular, it is more influenced by pre-existing socioenvironmental conditions, while commuting is more likely when experiences with droughts increase, acting as an immediate livelihood adaptation to droughts. Finally, the authors found that men are more mobile than women, and more likely than women to adopt migration vis-a-vis commuting.

The second conclusion refers to understanding how cash transfer programs (Bolsa Familia, rural retirement pensions etc) affect perceptions about droughts and adaptation strategies in terms of mobility. The authors found households with commuters (and not migrants) are always less likely to diversify livelihoods in terms of cash transfers (compared to households with migrants and no commuters), independent of perception about droughts. Households receiving social benefits are negatively associated with commuting (0.62 the odds of having a commuter compared to a non-mover) and are positively associated with migration (34% higher probability of having a migrant compared to non-movers, and 108% higher probability of having a migrant compared to commuters). Nonetheless, if a household receive cash transfers, there is a change in the level of mobility probabilities by age and perception about severity of droughts: each additional increase in one standard deviation of age increases the odds of migration in 3% compared to non–movers, or migrants compared to commuters.

4 CONCLUSIONS

The study case on the *Submédio São Francisco* illustrates how migration patterns are modified along with changing socioeconomic scenario. Among rural communities, the meaning around migration shifted from a survival measure to a search for economic opportunities social protection programs became an important component of household survival strategies, assuring basic needs and income during extreme events. This change corroborates the discussion in first section: the intensification of social protection policies in the region reduced poverty and protected households from direct climate impacts. Before this protection, migration might not decline (as it did not in Submédio) but rather approximate to the voluntary end of the continuum. On the other hand, the study case on the Seridó Potiguar shows the importance of understanding that perceptions about droughts may define, contingent on household characteristics and if they receive cash transfers or not, distinct mobility strategies, particularly in terms of migration and commuting.

The two case studies cases point to the relevance of protective measures as cash transfer in changing the socioeconomic scenario of Brazilian semiarid, and maintaining migration as an alternative strategy

rather than a survival necessity. Social protection programs that foster alternative and sustainable livelihoods as well the reduction of power inequalities and resource distribution are still not as widespread as pensions and transfers. Protective measures are able to protect households while the benefits are delivered and assure food security in the short-run. Thus, adaptive strategies face a challenge as the uncertain political-institutional scenario might undermine the social protection effects. As the cases evidenced migration is highly sensitive to the socioeconomic context, migration paths that recently became similar to voluntary choices could regress to displacement-like movements.

NOTES

1 | 16 interviewees from "Fundos de Pasto" (traditional agricultural communities); 9 from indigenous communities, 5 from associations of irrigated agriculture, 7 from other agricultural communities,4 from related civil society organizations.

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