

*Viewpoint article:*

## **Disentangling the concepts of global climate change, adaptation, and human mobility: a political-ecological exploration in Vietnam's Mekong Delta**

Mucahid Mustafa Bayrak<sup>1\*</sup>

Danny Marks<sup>2</sup>

Leon T. Hauser<sup>3</sup>

<sup>1</sup> Department of Geography, National Taiwan Normal University, Taipei City, Taiwan, email: [mmbayrak@ntnu.edu.tw](mailto:mmbayrak@ntnu.edu.tw); <https://orcid.org/0000-0001-7699-5575>

<sup>2</sup> School of Law and Government, Dublin City University, Dublin, Ireland, email: [danny.marks@dcu.ie](mailto:danny.marks@dcu.ie); <https://orcid.org/0000-0003-0833-880X>

<sup>3</sup> Institute of Environmental Sciences, Leiden University, Leiden, The Netherlands, email: [l.t.hauser@cml.leidenuniv.nl](mailto:l.t.hauser@cml.leidenuniv.nl); <https://orcid.org/0000-0003-1408-9942>

\* Corresponding author

**Abstract:** The complex relationship between human mobility and global climate change remains contested. In this viewpoint, the themes of human mobility, adaptation and climate change are explored from a political ecology perspective. A framework of political ecology of human mobility in relation to climate change is applied to the context of Vietnam's Mekong Delta (MKD). The Vietnamese government, popular media and academic studies often present the MKD in dystopian ways in which there is sometimes no more place for poor and landless farmers as a direct result of climate change. In 2019 and 2020, the MKD faced one of its most severe droughts in recent history largely tied to upstream hydropower development. In this viewpoint article, we contend that future studies can no longer establish a direct and causal relationship between climate change and human mobility, especially in light of these recent events. The underlying drivers as well as the broader context, which are shaped by political economy, market structures and forces, power relations, government policy, geopolitics, and transboundary water issues deserve a more prominent role in the analysis of human mobility patterns in the MKD and beyond.

**Keywords:** political ecology; human mobility; adaptation regimes; Mekong Delta; climate change; environmental migration.

### **Introduction**

The complex relationship between human mobility and global climate change remains contested (Hugo 2011; Boas et al. 2019). Some scholars estimate that by 2050 between 200 million and 1 billion people will become forced migrants because of climate change (Myers 1993, 2002; Xu et al. 2020). Others critique this direct causal relationship as an oversimplification, arguing that migration is always caused by a multitude of social, political, economic and environmental drivers and factors (Gemenne 2011; Morrissey 2012; Wrathall et al. 2014; Radel et al. 2018). Nevertheless, there is a general consensus in the mainstream literature that climate change affects human mobility patterns (Laczko and Aghazarm 2009; Black et al. 2011a; Afifi et al. 2016; McLeman 2018; Cattaneo et al. 2019; Boas et al. 2019; Lincke and Hinkel 2021).

In this viewpoint, the themes of human mobility, adaptation and global climate change are explored from a political ecology perspective. We argue that the relationship between human mobility and climate change can be better understood by looking at the underlying socioeconomic, historical and political drivers as well as power relations that collectively shape human mobility patterns (Baldwin and Bettini 2017; Paprocki 2018; Radel et al. 2018). Currently, rural households across the Global South, and the poor in particular, are being transformed by governments and academics into mobile (or immobile) agents for adaptation (Natarajan et al. 2019). This neoliberal transformation is problematic because when these households are deemed to have failed to adapt (which is often a top-down judgement), they are simply blamed for their own failure to do so (Watts 2015).

We apply a political ecology framework to the context of human mobility and climate change in Vietnam's Mekong Delta (MKD) by conducting critical bibliometric and discourse analyses. The assumption of a direct relationship between climate change and human mobility in the delta shapes the paradigm used in a majority of academic studies. Similarly, this paradigm has found its way into the rhetoric of the Vietnamese government who asserts that business-as-usual policies and governance will trigger climate-induced out-migration. In contrast, we argue that this direct relationship is too simplistic and environmentally deterministic. Analysing the ways in which climate change affects human mobility patterns needs to also include broader structural determinants, power relations, and micro-level factors that *codetermine* these patterns. Especially given the recent 2019-2020 drought in the MKD, one of the worst droughts in the delta's recent history (Park et al. 2021), we outline in this viewpoint why the relationships between global climate change, adaptation and human mobility as well as the power relationships that shape these concepts—both materially and epistemically—need to be better disentangled (Morrissey 2012; Baldwin and Bettini 2017). Here, we employ the concept of human mobility, instead of environmental migration, as the former more widely encompasses migration, displacement and resettlement (Baldwin and Bettini 2017). 'Environmental migration' is approached here as a (dominant) discourse encapsulating voluntary forms of human mobility in (direct) relation to environmental change.

## **Towards a political ecology framework on human mobility in relation to climate change**

Much of the literature on environmental migration and human mobility is overly deterministic and simplistic. Most studies view the environment as a driver, determinant or trigger causing people to migrate or changing mobility patterns (Baldwin and Bettini 2017). For example, these studies suggest that if peoples' landscapes become unproductive or people face a worsening environment or a hazardous event (such as a flood or drought), they adapt by migrating (e.g., Warner 2010, Black, Kniveton, and Schmidt-Verkerk 2011, Dun 2011, Weinreb, Stecklov, and Arslan 2020). Further, environmental change is seen as external, natural or due to global climate change, and is thus often depoliticized.

A small but burgeoning group of scholars (Morrissey 2012; Wrathall et al. 2014; Baldwin and Bettini 2017; Middleton et al. 2017; Paprocki 2018; Radel et al. 2018; Vigil Diaz Telenti 2019; Natarajan et al. 2019) show that dominant discourses on environmental migration suffer from a "problematic naturalization and a depoliticization of human-environmental relations" (Greiner and Sakdapolrak 2016, p. 154). They instead believe that political ecology is a more useful framework to study human mobility. A political ecology of human mobility emphasises

the role of the political economy and “adds an analysis of structure to an otherwise un-balanced focus on smallholder agency (or lack thereof, with climate instead as deterministic)” (Radel et al. 2018, p. 264). The relationship between climate change and human mobilities needs to be understood foremost as a relation of power (Baldwin and Bettini 2017). Here, we argue that assuming a direct or causal relationship between climate change and migration obscures the broader structural determinants—including agrarian dispossession, government policies, transboundary water issues, geopolitics, historical factors, structural inequality, economic scarcity, and labour relations—political economy, power relations, and micro-level factors (e.g. socioeconomic aspirations, and cultural values) that shape human mobility patterns (Baldwin and Bettini 2017; Natarajan et al. 2019).

A political ecology of human mobility also politicises the environment as a product of unequal social relations across multiple scales, heavily affected by power relations and access or lack thereof to resources, particularly land and water (Robbins 2011). Consequently, certain people move or stay in certain places not accidentally but as a product of political, economic and sociocultural power. Therefore, as political ecology studies on ‘unnatural’ disasters have highlighted, different groups are exposed to differing levels of (environmental) risks (Collins 2010; Marks 2015; Kelman 2020). Mobility patterns are also tied to neoliberalism which shifts the burden of adaptation to the most marginalized, often smallholders farmers or urban slum dwellers (Radel et al. 2018). Further, environmental processes occurring at different scalar levels or in other places can affect different groups’ livelihoods. As an example, dam building in the Mekong serves upstream governments and residents (Marks and Zhang 2019), yet potentially threatens the livelihoods of small-holder rice/aquaculture farmers in the MKD downstream (Betcherman et al. 2019).

Power and vulnerability to climate change is relational (Taylor 2013, 2015). To illustrate their relationality, Taylor (2015) draws on the notion of ‘adverse incorporation’ (Mosse 2007), arguing that vulnerable people are not merely “outcomes of inequalities in market access or public goods” but instead “subordinate groups are incorporated within profoundly unequal power structures” (Taylor 2015, p. 86). Natarajan et al. (2019) also offer a useful concept of climate precarity, drawing on an example from Cambodia. They suggest that precarity is both a product of an unequal, neoliberalised labour market but also captures lived experiences. They further show that migrants cannot necessarily abandon their climate-affected rural livelihoods because of their marginalized positions (cf. Zickgraf 2019). In their case study, smallholder farmers migrated to urban areas to become low-paid, unprotected brick workers and remained in a state of climate precarity.

The political ecology of climate change and human mobility can be analysed at two levels: materially and epistemically. Paprocki (2018) usefully proposes the notion of an adaptation regime which is a “socially and historically specific configuration of power that governs the landscape of possible intervention in the face of climate change” (Paprocki 2018, p. 957). It encompasses development agencies, researchers, media, and science, as well as state actors both nationally and internationally. She explains that the adaptation regime operates through three interrelated processes: (1) imagination: enframing the place as a space of climate change so that the conditions in the place can only be understood in relation to climate change and a future vision for this place is delimited by a looming crisis; (2) experimentation: development interventions conducted in the name of climate adaptation which can accelerate agrarian dispossession and thus human mobility patterns through adversely affecting the

livelihoods of the region's inhabitants; and (3) dispossession which is celebrated as an opportunity for development through its contributing to urban industrial exports and strengthened by the sense of the inevitable climate emergency. She uses this framework to show the ways in which actors within the adaptation regime have framed rural Bangladesh as dystopia and how this framing plus interventions have led to rural communities being dispossessed of their land and pushed to migrate to urban centres. Her article shows how human mobility is not merely determined by the environment but instead by the political economy of a country's developmental regime and production of certain discourses.

We believe that this framework of political ecology of human mobility, and particularly the notion of adaptation regimes, is useful to understand changing mobility patterns in the MKD and the drivers behind these changes. However, since this framework has yet to be applied in the MKD, we seek to address this gap here.

### **Adaptation regimes and human mobility in the Mekong Delta**

The MKD has been one of the most researched deltas in the climate change adaptation literature due to many reasons. First, it is referred to as one of the 'food baskets' of the nation and the world, providing enough food for almost 200 million people globally (Piesse 2019). Secondly, the MKD is characterized by unprecedented urbanization, and increasingly affected by socioenvironmental changes—including drought (Koubi et al. 2016), salinization (Nguyen et al. 2019), land subsidence (Minderhoud et al. 2019), coastal erosion (Marchesiello et al. 2019) and sea-level rise (Hauser et al. 2017; Hauer et al. 2020)—impacting its more than 18 million inhabitants, the majority of whom depend upon smallholder agriculture and aquaculture for their livelihoods (Smajgl et al. 2015; Brown et al. 2018; Nguyen et al. 2019; Tran 2020b; Miller 2020). The MKD is also one of the most human-modified and engineered deltas in the world (Tran 2020b). This includes the development of extensive canal networks, dams, large-scale sea-dykes and sluice systems, and the mechanization of agriculture (Smajgl et al. 2015; Tran et al. 2019). Additionally, the Mekong River and its tributaries have seen an enormous growth of hydropower dams in recent decades, heavily impacting the social and ecological systems in the MKD, including exacerbating droughts and coastal erosion, and reducing freshwater fisheries (Stone 2016; Nguyen et al. 2019; Bussi et al. 2021).

Over the past few decades, scientific and popular media outlets have published an increasing number of dystopian scenarios for the MKD. Headlines such as "*The first climate refugees in Vietnam are starting to emerge*" (Chapman and Tri 2018b) dominate the media landscape. The characterization of these threats is often directly tied to climate change, which together paints an existential crisis for the MKD. The biophysical reality of these testimonies, backed by mounting scientific consensus, has led to urgent calls for adaptation.

The Vietnamese government has taken up and embraced this call for action in a top-down manner (Smajgl et al. 2015; Vo et al. 2019). Climate change and environmental threats, both the biophysical reality as well as its *imagination*, have presented a necessity and justification for decisionmakers to set a new agenda of large-scale reform of the MKD. Simultaneously, climate prognoses have fuelled a general *imagination* among academic studies that climate change currently causes or is intensifying direct out-migration among rural households in the MKD. Climate change is often viewed as an external and abstract phenomenon imposing itself on

societies which, in their turn, need to adapt to it (Ingold 2011; Taylor 2015). This general view prevailed in a bibliometric analysis of 28 peer-reviewed journal articles and book chapters on environmental migration and human mobility in the MKD over the past ten years. We now turn to the two domains (academia and government) to analyse their adaptation regimes of human mobility (Paprocki 2018) in the MKD.

### *Academic studies*

Our bibliometric analysis (Appendix A) shows two trends concerning the *imagination* of human mobility in the MKD. A minority, yet growing amount, of studies no longer solely ascribe changes in the region to climate change, but to broader changes, including land-use challenges, government policy, geopolitical relations, and transboundary water governance issues (Tran 2020b). The studies establish links between (out)migration and failure to adapt to agricultural intensification (Chapman et al. 2017), land-use change and lack of employment opportunities (Tran and James 2017, 2019; Tran 2019), and government policy (Danh and Mushtaq 2011). On the other hand, we found that the majority of the studies (61%) still established a direct relationship between environmental or climate risk and human mobility. Only four studies (14%) (Smajgl et al. 2015; Zickgraf 2019; Betcherman et al. 2019; Khong et al. 2020) explicitly state that they could not find a direct relationship between environmental or climate change and human mobility.

Among studies that assumed a direct relationship between human mobility and climate change, flooding (Warner 2010; Dun 2011), sea-level rise (Hugo 2011), increased rainfall (Afifi et al. 2016), sediment loss (Chapman and Darby 2018) and other climatic stressors (van der Geest et al. 2012) have all been directly associated with increased human mobility in the MKD. Migration is often framed as a risk management strategy (Warner and Afifi 2014), particularly for poorer households who are supposedly unable to implement the necessary technocratic adaptation measures to cope with climate change (van der Geest et al. 2012). While many of these studies argue that other nonenvironmental factors contribute to these households' decisions to migrate, they present migration either as a direct form of climate adaptation or due to a failure to cope with climate change (cf. Radel et al. 2018).

Building upon the *imagination* that climate change is a direct driver of human mobility, the suggested development interventions (*experimentation*) among the studies comprise of three overarching solutions: minimizing out-migration through providing technical and financial support for adaptation to climate-change affected areas (Koubi et al. 2016); creating safe and assisted migration corridors (Hugo 2011; van der Geest et al. 2012); and assisting resettled households to build resilience (Miller and Dun 2019; Miller 2020). These solutions correspond to three groups of households: those who stay, those in transition, and migrants. All three groups should be provided external assistance, and building their resilience is the new mantra (Miller and Dun 2019). Here, attention is paid to whether human mobility is voluntary or forced (or: whether staying is voluntary or forced), the extent to which climate change has been the major cause of migration, and new vulnerabilities in host-regions (Black et al. 2011b). Some scholars also acknowledge the role remittances could play in building the resilience of the communities in regions of origin (Sakdapolrak et al. 2016; Szabo et al. 2018). These studies suggest that development interventions should focus more strongly on the role of remittances in climate change adaptation (cf. Scheffran et al. 2012). Very few studies suggest solutions related to

addressing political economy drivers or broader structural determinants of vulnerability in the MKD. This is therefore an important research gap that future studies need to address.

### *The Vietnamese government*

The Vietnam government's vision of the MKD's future is embodied in the Mekong Delta Plan (MDP) (2013) and Resolution 120 (The Socialist Republic of Vietnam 2017). The MDP is the result of a partnership between the Dutch and Vietnamese governments as a “*vehicle for the translation of knowledge to shape climate change adaptation in the Mekong Delta of Vietnam*” (Weger 2019, p. 183). The vision presented in the MDP seeks a shift away from its traditional emphasis on rice production and food security towards diversification along two axes: (1) high-tech intensive diversified agricultural production simultaneously yielding aquatic products, fruit and rice, and (2) ecological zones (freshwater, brackish water and saltwater), in which aquatic products are the main products. The MDP links outmigration directly to increasing socio-economic disparities between the economies of the MKD and other (urban) regions in Vietnam, with the former being still marked by “smallholder enterprises and/or low value primary agricultural output” (MDP 2013, p.53). Consequently, the MDP attributes outmigration mostly to the practices of ‘outdated’ (pre-reform and past) rice and aquaculture value chains which are deemed ill-equipped to deal with the current and future climate impacts.

Resolution 120 outlines how the Vietnamese government plans to develop a master plan for the MKD. According to this resolution, the master plan needs to focus primarily on the sustainable and climate-resilient development of the Mekong delta. It stresses the need to move away from rice monoculture and towards aquatic products, fruit trees, and rice; implement nature-based solutions to the MKD's natural hydrological dynamics; rehabilitate mangrove forests; restructure the delta's economy as well as labour force; and to diversify agricultural products and enhance product value-chains. While Resolution 120 does not explicitly refer to smallholders, farmers in the MKD are now expected to live with “flood, brackish water and saltwater”. In order to do this, they need be transformed into “highly skilled agricultural workers” (The Socialist Republic of Vietnam 2017).

The Vietnamese government's *imagination* of the MKD can be encapsulated as follows: there is no more room for ‘outdated’ rice monoculture farming in the MKD due to climate change. Farmers should therefore either (1) shift to high-value commodity agriculture (including aquaculture) as a form of climate change adaptation or (2) migrate. While Resolution 120 identifies climate change as the main driver of environmental change, it also mentions hydropower development, and environmental pollution and degradation as additional drivers. On the ground, however, the resolution's implementation thus far has been slow and mixed. Some local governments continue to carry out their own development projects without considering their wide impacts (Tatarski 2021).

In 2019, the Vietnamese government declared a state of emergency in five MKD provinces (Bến Tre, Tiền Giang, Long An, Kiên Giang, and Cà Mau) in response to a prolonged drought and salt water intrusion in the region. Besides climate change being the usual culprit (Tran and Nhat 2020), significant blame was also placed on China's large-scale upstream hydropower development in the Upper Mekong River by Vietnamese (state-aligned) media (e.g., Tran 2020a), government reports (e.g., Vietnam Disaster Management Authority 2020), and international NGO reports (e.g., Basist and Williams 2020). A rhetoric that is backed by findings that demonstrate that during the drought China's 11 upstream mega dams, and the Nuozhadu

dam in particular, have restricted throughflow of sediment, rainfall and snowmelt to the lower MKD—controlling as much as 70 percent of the downstream water in the dry season (Basist and Williams 2020; Beech 2020). Vietnam has multiple times requested China to increase the downstream throughflow of water, but China has thus far refused to comply (Vietnam Disaster Management Authority 2020). China rejected the claim that its dams contributed to the drought downstream, and responded that China too suffered from the drought (Eyler et al. 2020; Keovilignavong et al. 2021). While China has provided rainfall data during the wet season from two of its stations on the Upper Mekong for the past 16 years, the country is reluctant to provide data that covers more stations as well as dry season information (Mekong River Commission 2020). This lack of transparency as a result of skewed power relations on geopolitical level has prevented a meaningful dialogue on the exact causes of the 2019-2020 drought.

In sum, all of the aforementioned examples illustrate that, in addition to climate change and environmental threats, economic restructuring and the lack of Vietnamese sovereignty over the Mekong River are also key drivers shaping the reformed vision for the MKD. In terms of *experimentation* within the MKD, several structural determinants accelerate human mobility patterns and create new vulnerabilities. These factors include: government land-use planning which favours high-tech agriculture and aquaculture instead of subsistence agriculture and fishing; flood control schemes which often cause unequal flood risks, especially for smallholder farmers, among different localities (i.e. relational vulnerability); groundwater extraction and sand mining which contribute to more salinization and subsidence (Minderhoud et al. 2020); and the construction of sea-dykes and sluice systems (Smajgl et al. 2015; Betcherman et al. 2019; Tran 2019). Chapman and Darby (2016) show that the government's decision in An Giang Province to transition towards high dykes and triple rice-cropping mainly benefited land-wealthy farmers, whereas poorer farmers became more indebted after this transition. In addition, various top-down climate change (mal)adaptation programs, such as the Living with Flood program, have displaced or relocated hundreds of thousands of farmers across the MKD (see also Miller, 2020). It is important to note that these factors are not always directly associated with climate adaptation projects, but they directly and indirectly shape human mobility patterns in the delta. A question still lingering is whether the restructuring of the MKD has been a governmental response to climate change or predominantly a strategy to upgrade the delta towards higher value agricultural commodities.

### *Dispossession in the MKD?*

Another remaining question is whether the 2019-2020 drought in the MKD will significantly shape the current imaginations and experimentations among government policy and academia. Could this drought be considered a focusing event, which is defined as “*a sudden, exceptional experience that, because of how it leads to harm or exposes the prospect for great devastation, is perceived as the impetus for policy change*” (Michaels et al. 2006, p. 983)? Or is the 2019-2020 drought merely an anomaly within the broader narrative among government officials, popular media, and academic studies that climate change is causing increased human mobility in the MKD? Further, what evidence of dispossession can be found? Besides those that have been dispossessed as part of the Living with Floods program, how do other government

policies and interventions dispossess smallholder farmers in the MKD? Figure 1 sheds some light on these questions, but answers are far from conclusive.

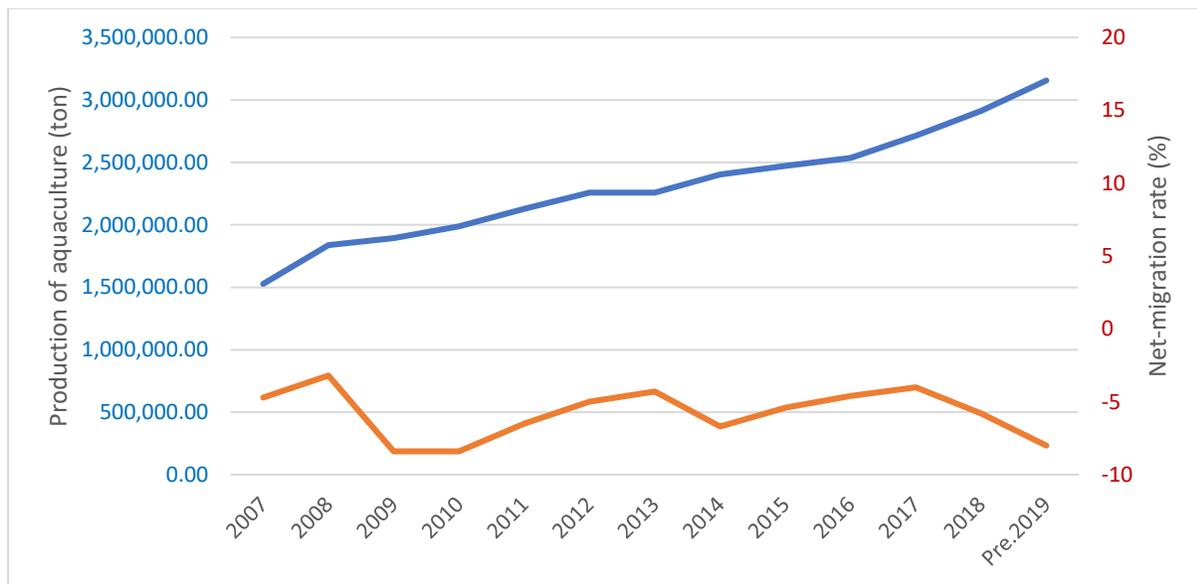


Figure 1: Production of aquaculture (left) and net-migration rate (right) in the MKD (GSO 2019)

Over the past 13 years, aquaculture production in the MKD has more than doubled: from 1.5 million tons in 2007 to 3.2 million tons in 2019 (Figure 1). Concurrently, net-migration rates (in-migration *minus* out-migration) in the MKD have been consistently negative (GSO 2019). It is impossible to establish a *causal relationship* between net-migration (*dispossession*) and agricultural upgrading (*experimentation*) due to a lack of empirical evidence and the problem’s complexity, yet these trends typify the region’s developments. The 2019-2020 drought suggests that it is unclear how these trends will unfold in the future. The government, media, and academia could either continue to simplify and depoliticise the drought or new debates could be triggered about upstream dam development and non-climate related (i.e. political economy) or second-order drivers of environmental change.

In terms of *dispossession*, many landless and poor farmers might have been forced to leave the MKD because there is little place for them in the vision of the Vietnamese government of turning the MKD from the rice basket to the fruit and shrimp basket of the world (cf. Tran 2019). The Vietnamese government is directing smallholders to abandon their rice monoculture farms towards higher-value forms of agriculture so that they can ‘stay in place.’ This capitalist and export-oriented transformation resonates with millions of other smallholder farmers who suddenly “*find themselves tied to markets, and unable to reproduce themselves through agricultural production alone*” (Natarajan et al. 2019, p.903). Eventually this could lead to large-scale agrarian dispossessions in the MKD which could in turn result in “*the death of the peasantry as a foreordained consequence of an impending climate crisis*” (Paprocki 2018, p.957).

## Concluding remarks

The 2019-2020 drought has triggered a blame game on whether China, climate change, or poor government policy is responsible for the drought (Beech 2020; Keovilignavong et al. 2021). At the same time, these trends should be viewed within the broader context of how over the past few decades the Vietnamese government, popular media and academia has *imagined* and *experimented* with climate change and human mobility. The 2019-2020 drought could be a focusing event that shifts the current environmental migration discourse towards acknowledging that there is no direct and causal relationship between climate change and human mobility in the MKD and elsewhere. New research directions could more deeply engage with structural determinants, power relations, transboundary water issues, political economy drivers, and micro-level factors which mediate human mobility patterns within the context of climate or environmental change. More research also needs to be conducted to understand the ways in which adaptation regime and transboundary water practices as well as structural determinants and power relations dispossess smallholder farmers of their lands (Paprocki 2018; Vigil Diaz Telenti 2019). This viewpoint is a first step in developing more scholarship on the political ecology of human mobility in deltaic regions and beyond.

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**Appendix A: Publications on environmental migration and human mobility mentioning the MKD over the past 10 years (2010-2020)\***

	<b>Author(s)</b>	<b>Year</b>	<b>Title</b>	<b>Info</b>	<b>Discourse on environmental migration</b>
1	Warner K	2010	Global environmental change and migration: Governance challenges.	Global Environmental Change 20:402–413.	Environmental degradation, particularly flooding, is a contributing factor to rural out migration and displacement.
2	Warner K, Hamza M, Oliver-Smith A, et al	2010	Climate change, environmental degradation and migration.	Nat Hazards 55:689–715.	Environmental degradation, particularly flooding, is a contributing factor to rural out migration and displacement.
3	Birkmann J	2011	First- and second-order adaptation to natural hazards and extreme events in the context of climate change.	Nat Hazards 58:811–840	Planned migration, government relocation and migration due to sea-level rise.
4	Hugo G	2011	Future demographic change and its interactions with migration and climate change.	Global Environmental Change 21:S21–S33	Migration due to sea-level rise.
5	Danh VT, Mushtaq S	2011	Living with Floods: An Evaluation of the Resettlement Program of the Mekong Delta of Vietnam.	In: Stewart MA, Coclanis PA (eds) Environmental Change and Agricultural Sustainability in the Mekong Delta. Springer Netherlands, Dordrecht, pp 181–204	Resettlement policies as part of Living with Floods program.
6	Dun O	2011	Migration and Displacement Triggered by Floods in the Mekong Delta: Migration and	International Migration 49:e200–e223.	Flooding as a primary cause for migration and displacement.

			displacement in the Mekong Delta.		
7	van der Geest K, Nguyen KV, Nguyen TC	2012	Internal migration in the upper Mekong Delta, Viet Nam: what is the role of climate related stressors?	Asia-Pacific Population Journal 29:25–41.	Migration as an alternative to cope with climatic stressors by poor and landless households.
8	Nguyen KV, James H	2013	Measuring Household Resilience to Floods: A Case Study in the Vietnamese Mekong River Delta.	E&S 18:art13.	Seasonal migration as a way to cope with floods.
9	Reynaud A, Aubert C, Nguyen M-H	2013	Living with Floods: Protective Behaviours and Risk Perception of Vietnamese Households.	Geneva Pap Risk Insur Issues Pract 38:547–579.	Flooding could influence one's decision to migrate (among other options).
10	Bastakoti RC, Gupta J, Babel MS, van Dijk MP	2014	Climate risks and adaptation strategies in the Lower Mekong River basin.	Reg Environ Change 14:207–219.	Migration not mentioned as an climate change adaptation measure in Vietnam, but it is mentioned in the context of Thailand.
11	Warner K, Afifi T	2014	Where the rain falls: Evidence from 8 countries on how vulnerable households use migration to manage the risk of rainfall variability and food insecurity.	Climate and Development 6:1–17.	Migration as a risk management strategy to cope with climate change.
12	Smajgl A, Toan TQ, Nhan DK, et al	2015	Responding to rising sea levels in the Mekong Delta.	Nature Climate Change 5:167–174.	Gradual and linear outmigration process in response to sea-level rise is unlikely.
13	Afifi T, Milan A, Etzold B, et al	2016	Human mobility in response to rainfall variability: opportunities for migration as a successful	Migration and Development 5:254–274.	Migration due to increased rainfall, flooding and other climatic stressors as a form of adaptation.

			adaptation strategy in eight case studies.		
14	Koubi V, Spilker G, Schaffer L, Bernauer T	2016	Environmental Stressors and Migration: Evidence from Vietnam.	World Development 79:197–210.	Perceptions of sudden-onset environmental events increase the livelihood of migration.
15	Collins N, Jones S, Nguyen TH, Stanton P	2017	The contribution of human capital to a holistic response to climate change: learning from and for the Mekong Delta, Vietnam.	Asia Pacific Business Review 23:230–242.	Direct migration due to environmental change and indirect migration due to government policy in response to environmental change
16	Tran T, James H	2017	Transformation of household livelihoods in adapting to the impacts of flood control schemes in the Vietnamese Mekong Delta.	Water Resources and Rural Development 9:67–80.	Migration decisions directly linked to shrinking employment opportunities, and combined impacts of dyke policies and mechanization in agricultural production.
17	Chapman A, Darby S, Tompkins E, et al	2017	Sustainable rice cultivation in the deep flooded zones of the Vietnamese Mekong Delta.	VJSTE 59:34–38.	Migration due to failure to adapt to a triple-cropping system.
18	Szabo S, Adger WN, Matthews Z	2018	Home is where the money goes: migration-related urban-rural integration in delta regions.	Migration and Development 7:163–179.	Environmental risks causing migration as well as the impact of remittances.
19	Chapman AD, Darby SE	2018	Dams and the economic value of sediment in the Vietnamese Mekong Delta.	Ecosystem Services 32:110–111.	Migration due to sediment loss and declining profits.
20	Tran TA	2019	Land use change driven out-migration: Evidence from three flood-prone	Land Use Policy 88:104157.	Migration of rural poor due to land-use change (dyke development) and lack of opportunities.

			communities in the Vietnamese Mekong Delta.		
21	Betcherman G, Haque I, Marschke M	2019	Exploring livelihood transitions in the Mekong delta.	Singapore Journal of Tropical Geography sjtg.12300.	Temporary migration as a risk instrument, but no influence of environmental shocks.
22	Seijger C, Hoang VTM, van Halsema G, et al	2019	Do strategic delta plans get implemented? The case of the Mekong Delta Plan.	Reg Environ Change 19:1131–1145.	Migration due to unsustainable development, sediment loss, salinity intrusion, alternative livelihoods, and reassessment of rice policies (from: policy analysis).
23	Miller F, Dun O	2019	Resettlement and the environment in Vietnam: Implications for climate change adaptation planning.	Asia Pac Viewp 60:132–147.	Planned resettlement and migration influenced by climate risks.
24	Tran T, James H	2019	Changing Livelihood Options as Adaptation: A Comparative Analysis of Three Flood Control Schemes in the Vietnamese Mekong Delta.	In: James H (ed) Population, Development, and the Environment: Challenges to Achieving the Sustainable Development Goals in the Asia Pacific. Springer, Singapore, pp 137–154	Instability in rural employment and the agricultural mechanisation driven by government policies as primary drivers of migration.
25	Zickgraf, C	2019	Keeping People in Place: Political Factors of (Im)mobility and Climate Change	Soc. Sci. 2019, 8(8), 228.	Human mobility caused due to environmental degradation (drought, rainfall variability, riverbank erosion, mudslides, and saline water intrusion), but also political factors can simultaneously promote mobility and immobility.
26	Paik S, Le DTP, Nhu LT, Mills BF	2020	Salt-tolerant rice variety adoption in the Mekong River	PLoS ONE 15:e0229464.	Direct migration due to salinity and inundation

			Delta: Farmer adaptation to sea-level rise.		
27	Miller F	2020	Exploring the consequences of climate-related displacement for just resilience in Vietnam.	Urban Studies 57:1570–1587.	Climate change contributing to migration and forced resettlement.
28	Khong TD, Loch A, Young MD	2020	Perceptions and responses to rising salinity intrusion in the Mekong River Delta: What drives a long-term community-based strategy?	Science of The Total Environment 711:134759	Low intended migration of farm households away from the MKD.

\*Note: this bibliometric research is the result of using the following Boolean search strings in the Scopus database: “Vietnam or Mekong Delta”, “climate or environmental change or flood”, “migration or resilience or relocation or resettlement”, “livelihood and adaptation or transition” from Jan 1<sup>st</sup> 2010 till Dec 31<sup>th</sup> 2020. We selected all the studies which referred to (whether it was the main focus or simply a subsection of the paper) climate/environmental change and migration or human mobility in the Mekong Delta. Additionally, we employed a snowball method from the references among the Scopus studies to add additional peer-reviewed studies which fit the criteria.