2012

Agricultural change, increasing salinisation and migration in the Mekong Delta: insights for potential future climate change impacts?

Olivia V. Dun
University of Wollongong, odun@uow.edu.au

Agricultural change, increasing salinisation and migration in the Mekong Delta: insights for potential future climate change impacts?

Abstract

This chapter focuses on the situation of some households from Nha Phan hamlet in Cai Nuoc District that have become more financially vulnerable as a result of the agricultural and environmental shift and thus have turned to migration as a means of coping. It reveals the complex pathways that link migration choices with changing environmental conditions. It explores how those impacts and choices are linked to human security and how the lessons learned from this study can shed light on climate change-induced migration. The chapter begins with a brief overview of sea-level rise projection for the Vietnamese portion of the Mekong Delta before discussing the switch to shrimp aquaculture in Cai Nuoc District and factors that affected whole-household migration decisions that were discovered during a study of households from that district.

Disciplines

Education | Social and Behavioral Sciences

Publication Details

Dun, O. (2012). Agricultural change, increasing salinisation and migration in the Mekong Delta: insights for potential future climate change impacts?. In L. Elliott (Eds.), Climate Change, Migration and Human Security in Southeast Asia (pp. 84-114). Singapore: S. Rajaratnam School of International Studies, Nanyang Technological University.

AGRICULTURAL CHANGE, INCREASING SALINISATION AND MIGRATION IN THE MEKONG DELTA

INSIGHTS FOR POTENTIAL FUTURE CLIMATE CHANGE IMPACTS?

Olivia Dun

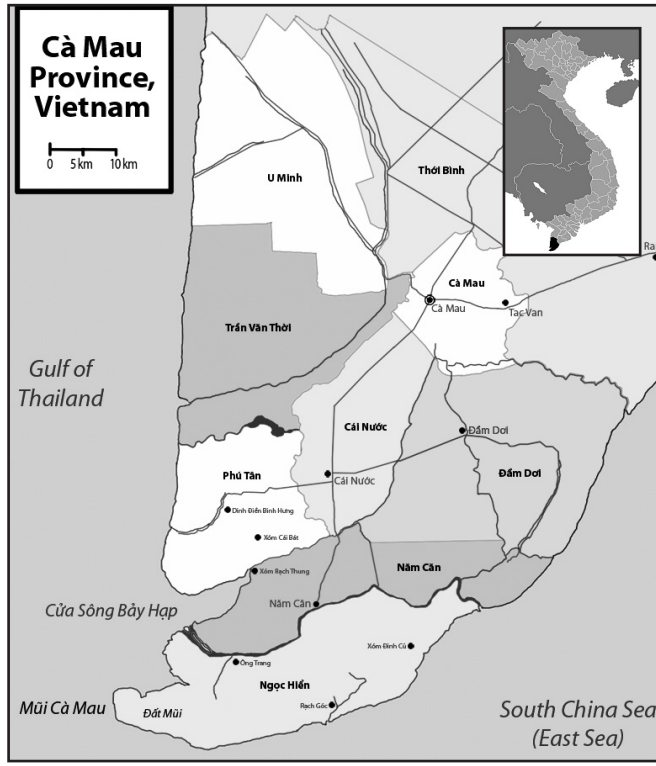
Introduction

The propensity for human insecurity is greater in developing countries, where people are often highly dependent directly on their surrounding natural environment for their immediate livelihood activities, and governments are less able to afford prevention of potential harm caused by environmental changes than in developed countries. Recent studies comparing potential impacts of future sea-level rise on the world's developing countries identified Viet Nam as one of the countries that would be most severely affected, noting in particular, the risks to the Mekong Delta in the south of the country.[1]

Cai Nuoc District, in Ca Mau Province of the Mekong Delta, is naturally prone to salinity intrusion (see Figure 7.1). Since 2000, increasing salinisation of surface water and soils in the district has occurred, largely

1 S. Dasgupta et al., "The Impact of Sea Level Rise on Developing Countries: A Comparative Analysis", *Climatic Change*, Vol. 93, No. 3 (2009), pp. 379–388; Ministry of Natural Resources and Environment (MONRE), *Climate Change, Sea Level Rise Scenarios for Viet Nam* (Hanoi: Ministry of Natural Resources and Environment, 2009).

FIGURE 7.1
Map of Ca Mau Province. Cai Nuoc District is located in the centre of the province.



Source: C. Baer, "Map of Ca Mau Province", Wikipedia (2008), http://en.wikipedia.org/wiki/File:Ca_mau_province_map_-_sm.png (accessed 13 January 2012).

caused by the transformation of coastal area rice fields into salt-water based monoculture shrimp farms. At the household level, these changes have had mixed outcomes on human security, generating some benefits and creating new vulnerabilities.

This chapter focuses on the situation of some households from Nha Phan hamlet in Cai Nuoc District that have become more financially vulnerable as a result of the agricultural and environmental shift and thus have turned to migration as a means of coping. It reveals the complex pathways that link migration choices with changing environmental

conditions. It explores how those impacts and choices are linked to human security and how the lessons learned from this study can shed light on climate change-induced migration. The chapter begins with a brief overview of sea-level rise projection for the Vietnamese portion of the Mekong Delta before discussing the switch to shrimp aquaculture in Cai Nuoc District and factors that affected whole-household migration decisions that were discovered during a study of households from that district.[2]

Sea-level Rise and the Mekong Delta

The Vietnamese Ministry of Natural Resources and Environment (MONRE), with support from the United Nations Country Team (which includes all the United Nations agencies, funds and programmes in Viet Nam), have applied the Intergovernmental Panel on Climate Change's (IPCC's) global climate change scenarios to the national context and identified the potential climate change impacts for Viet Nam.[3] Most relevant for the Mekong Delta is the possibility of a 75-centimetre (cm) rise in sea level by 2100.

A 2007 study[4] found that Viet Nam would be one of the five developing countries most affected by a one-metre rise in sea level,[5] with the deltas of the Mekong and Red rivers facing the most severe threat. As such, in its National Target Programme to Respond to Climate Change,[6] the Vietnamese government's planning is focusing on the possibility for

2 Information about outcomes for households presented in this chapter is based on interviews conducted between May and December 2010 with just over 90 households from Cai Nuoc District (mostly from Nha Phan hamlet).

3 Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)* (Cambridge: Cambridge University Press, 2007); United Nations Viet Nam, "Climate Change Fact Sheet: The Effects of Climate Change in Viet Nam and the UN's Responses", http://www.un.org.vn/en/publications/publications-by-agency/doc_details/217-climate-change-fact-sheet-the-effects-of-climate-change-in-viet-nam-and-the-uns-responses.html (accessed 25 November 2011).

4 Dasgupta et al.,"The Impact of Sea Level Rise on Developing Countries".

5 Based on a comparison of population, gross domestic product, urban extent, agricultural extent, wetlands impacted and land area inundated.

6 The programme was approved by the Vietnamese prime minister in December 2008.

such a rise by 2100.[7] Experts suggest that roughly five per cent of the land area (17,423 square kilometres) in Viet Nam would be inundated by a one-metre rise in sea level if significant measures are not taken in terms of dyke construction and reinforcement or improved drainage.[8] Of this, 82 per cent would be in the Mekong Delta alone,[9] where 37.8 per cent of the land would be inundated.[10] The provinces of Ca Mau, Kien Giang, Hau Giang and Soc Trang would be the most affected areas of both the Mekong Delta and the country as a whole (see Figure 7.1).[11] In Ca Mau, which is the basis of study in this chapter, around 52 per cent of the province would flood, including the districts of Tran Van Thoi, Cai Nuoc, U Minh and Ca Mau City.[12]

Recent Agricultural and Environmental Change in Ca Mau Province

Increasing salinisation in Ca Mau Province has thus far been a function of increased shrimp aquaculture production. Such aquaculture-driven salinisation has facilitated the movement of seawater inland, rather than climate change leading to rising sea levels. Yet in the face of likely future increases in salt-water intrusion in the Mekong Delta provinces as a result of climate change, an exploration of recent increases in salinisation activities in Ca Mau Province provides a useful case study of potential human insecurities and the ways in which communities might respond to these changing environmental conditions.

The Change Towards a Year-Round Saline Water Environment

There was a large-scale change in the land use of Cai Nuoc District, Ca Mau Province in 2000, with an unprecedented shift in the amount of land dedicated to saline-water shrimp monoculture. This reflected a broader trend in Ca Mau Province. From 2000 to 2001, the area dedicated to

7 MONRE, *Climate Change, Sea Level Rise Scenarios for Viet Nam*.
8 United Nations Viet Nam, "Climate Change Fact Sheet".
9 Ibid.
10 MONRE, *Climate Change, Sea Level Rise Scenarios for Viet Nam*.
11 United Nations Viet Nam, "Climate Change Fact Sheet".
12 Ibid.; MONRE, "Global Warming Threatens Ca Mau Province", *Natural Resources and Environment Newspaper*, 2010, http://www.monre.gov.vn/v35/default.aspx?tabid=675&CateID=59&ID=83468&Code=N3LXY83468 (accessed 3 May 2010).

shrimp monoculture in the province doubled, amounting to 42 per cent of all land in Viet Nam dedicated to shrimp aquaculture production.[13] For Cai Nuoc District, this represented a 10-fold increase over the same period. This sudden switch in land use is largely attributed to Vietnamese government Resolution 09/NQ-CP of 2000 which permitted farmers to transform coastal saline rice fields into shrimp farms in order to maintain national target levels for shrimp production.[14] This switch to shrimp monoculture has limited fresh surface-water availability in fields and ponds, which in turn has created more saline soils, mobilised acid-sulphate soils and altered soil and water organisms in shrimp farming areas.[15]

There were mixed feelings among locals about this change towards shrimp monoculture, with some households wanting to raise shrimp while others wished to continue growing rice. The switch to shrimp aquaculture meant that farmers had to convert their rice fields into ponds and allow saline water from common village canals to fill those converted ponds. Farmers keen to raise shrimp broke down sluice gates and dykes that had prevented saline water in rivers from entering common canals, paving the way for increased saline intrusion. They did so despite opposition from other farmers who had not yet harvested their rice and who anticipated crop destruction if saline water came to their fields. Some rice farmers rebuilt gates and dykes but, in the end, were unsuccessful

13 T. N. K. D. Binh et al., "Land Cover Changes Between 1968 and 2003 in Cai Nuoc, Ca Mau Peninsula, Vietnam", *Environment, Development and Sustainability,* Vol. 7, No. 4 (2005), pp. 519–536.

14 Ngo Thi Phuong Lan, "From Rice to Shrimp: Ecological Change and Human Adaptation in the Mekong Delta of Vietnam", in M .A. Stewart & P. A. Coclanis (Eds.), *Environmental Change and Agricultural Sustainability in the Mekong Delta* (New York: Springer, 2011); T. V. Nhuong et al., "Vietnam Shrimp Farming Review", Individual Partner Report for the Project, Policy Research for Sustainable Shrimp Farming in Asia, European Commission INCO-DEV Project PORESSFA No. IC4-200110042, Bac Ninh, Vietnam, CEMARE University of Portsmouth (October 2002).

15 For more details on the changes experienced by Cai Nuoc District in terms of switching to increased shrimp aquaculture, see Binh et al., "Land Cover Changes"; Nguyen T., N. Vromant & L. Hens, "Organic Pollution and Salt Intrusion in Cai Nuoc District, Ca Mau Province, Vietnam", *Water Environment Research,* Vol. 78, No. 7 (2006), pp. 716–723; Nguyen T. et al., "Soil Salinity and Sodicity in a Shrimp Farming Coastal Area of the Mekong Delta, Vietnam", *Environmental Geology,* Vol. 54, No. 8 (2008), pp. 1739–1746.

in preventing saline waters from affecting their land and destroying unharvested crops.

Household Outcomes from Changes: Impact on Livelihoods and Income

The switch to shrimp monoculture in Cai Nuoc District produced mixed human security outcomes. On the one hand, several households benefited from the switch to shrimp because one hectare of shrimp generates an income up to 160 times higher than one hectare of rice.[16] In Nha Phan hamlet, many households were able to upgrade their homes and build new concrete houses whereas primarily subsistence (rice-based) living enabled only basic housing made with plant fibres, leaves and wood. As more money flowed into the hamlet, electricity was introduced and a concrete road was built. Households were able to invest money in modern technologies such as television sets and video compact disc players. Raising shrimp is far less labour-intensive than growing rice. Household members often spoke of this benefit because their work became physically easier and this freed up their ability to seek extra work elsewhere. In this sense, conditions of human security[17] were enhanced, with households able to improve their economic circumstances with flow-on benefits such as securing more robust shelter.

On the other hand, some households became more vulnerable as a result of both the change to shrimp farming and the consequent increasing salinisation of their land. They became more vulnerable overall as their financial debt level increased, which contributed to growing human insecurity. The initial switch to shrimp aquaculture required financial investment to implement the conversion of rice fields to shrimp ponds (machinery, fuel and labour were required to dig up the fields). Government loans became available through state-run banks specifically for this purpose and uptake was widespread. First yields of shrimp commonly

16 Binh et al., "Land Cover Changes".

17 A broad view of human security is taken here, interpreting human security as including dimensions such as security from poverty, food security, and adequate shelter. See Human Security Report Project, "What is Human Security?" (Burnaby, Canada: School for International Studies, Simon Fraser University, 2010), http://www.hsrgroup.org/docs/Publications/miniAtlas/miniAtlas_en_human_security.pdf (accessed 25 November 2011).

resulted in a good harvest and financial success because the pond environment, having recently been converted from a rice field, contained good levels of nutrients and plankton for shrimp to feed on. This initial flush of money and income prompted further conversion of land into shrimp ponds.

However, many households began to experience failure following this initial success. Shrimp disease and attempts to maintain correct pond conditions resulted in households borrowing increasing amounts of money through informal and formal channels.[18] Continued failure to harvest shrimp and consequent inability to repay debt resulted in further financial insecurity for households and informal money-lending groups that relied on loan repayments.[19] Indeed, case studies from Thailand and Indonesia demonstrate that shrimp aquaculture is unsustainable and leads to local poverty and food insecurity.[20]

Human insecurities of the kind described here were then exacerbated through limitations on further changes. This anticipates the kinds of constraints that might also apply in conditions of salt-water intrusion associated with climate change. Few other agriculture or aquaculture options were possible once the change to brackish-water aquaculture and saline conditions had occurred. Higher salinity levels meant that rice could not be grown even for household consumption, unless the entire community agreed to grow rice simultaneously. Previously abundant fruit trees (mangoes, coconuts or bananas) had been reduced in number and were no longer able to yield fruit of suitable quality or substantial quantity because of saline-affected soils. It was possible to raise salt-water crabs or fish, but often these also required high levels of financial investment.

Moreover, shrimp farming itself is vulnerable to climate change effects. A recent study among small-scale shrimp farmers in Ca Mau and Bac Lieu Provinces in the Mekong Delta showed that farmers perceived

18 Shrimp is very sensitive to the pond environment and without the correct conditions (salinity levels, light, oxygen, nutrients and stocking density) can easily die. The risk of disease outbreaks among shrimp populations commonly increases after five to 10 years of operation. See Binh et al., "Land Cover Changes".

19 In some cases, household members fled from the shame or fear of not being able to repay their debts.

20 Environmental Justice Foundation, *Smash and Grab: Conflict, Corruption and Human Rights Abuses in the Shrimp Farming Industry* (London: Environmental Justice Foundation, 2003).

too much rain, high temperatures, canal/river/sea-level rise, as well as irregular weather and storms, as the most serious climate change threats to their shrimp farming activities.[21] These threats, combined with fluctuating international food market prices, indicate further global concerns for already vulnerable local shrimp farmers in Cai Nuoc District. As this discussion shows, environmental change including climate change is not isolated from systems of agriculture and aquaculture nor from the livelihoods dependent upon them.

New Vulnerabilities/Threats to Human Security for Whole Migrating Households

In Nha Phan hamlet, household members with more diverse income sources, such as from a small business (e.g. a grocery shop or motorbike repair workshop), government employment (e.g. work as a teacher or local official) or the service sector (e.g. waitressing), were slightly more resilient than those households dependent solely upon aquaculture and/or agriculture. For others, high household debt levels and a need to find alternative income sources (linked to both changing environmental and economic conditions) were key to household decisions to migrate. Generally, poorer households with small plots of land or landless households struggled to gain or maintain enough financial capital to invest in their shrimp ponds. Mounting debt, an inability to repay that debt from either agricultural or aquaculture activities on their land, and the lack of alternative work in the surrounding rural area prompted some of these households to decide to move to other locations where work was available. The trends of the poor becoming poorer on the one hand and income diversification on the other are not unique to Cai Nuoc District. They reflect a broader trend in Southeast Asia as economic development and investment in agricultural (or aquaculture) intensification are identified as possible pathways out of poverty.[22]

21 N. W. Abery et al., "Vulnerability and Adaptation to Climate Change and Extreme Climatic Events: The Case of Improved Extensive Shrimp Farming in Ca Mau and Bac Lieu Provinces, Vietnam: Analysis of Stakeholder Perceptions", *Aquaclimate Technical Brief*, No. 3 (2011), http://library.enaca.org/emerging_issues/climate_change/vietnam_shrimp_tech_brief_1.pdf (accessed 10 April 2012).

22 J. Rigg, "Land, Farming, Livelihoods, and Poverty: Rethinking the Links in the Rural South", *World Development,* Vol. 34, No. 1 (2006), pp. 180–202.

Two categories of migration were observed in this study: households that only had some members elsewhere, and households where all members moved as a group. This latter group of whole household migrants were among the most vulnerable, facing significant human security challenges. Those challenges are framed here using the five "capitals" that underpin a livelihoods approach analysis.[23] This discussion also outlines a framework that has potential utility for anticipating the human security impacts of environmental change (understood in terms of "capital" losses) and the links between climate change and migration, particularly in situations of likely saline intrusion or progressive (as opposed to sudden) environmental change in rural areas. It also shows how human insecurities become cumulative, and demonstrates the challenges that face communities as well as policymakers in identifying and implementing adaptive and supportive (safety net) human security strategies.

Loss of Natural Capital

The loss of natural assets affected all members of the research hamlet in Cai Nuoc District. For whole migrating households, however, the important consequences of this reduction in natural capital arose primarily through changes in the availability of fresh water and in the composition of soils. Before the switch to shrimp aquaculture, households were able to access fresh (non-saline) water from the canals as well as ponds located in land right next to their houses. They could dig an isolated pond in their land and it would fill with rainwater in the wet season. This water, and that from canals, was used for domestic activities including washing clothes and dishes, and bathing. As canals were filled with saline water and as ponds in household plots (even if filled with rainwater) became saline because of salt seepage from adjacent soils, freshwater resources became rarer and households became highly dependent on groundwater resources, particularly in the dry season. Accessing freshwater therefore came to involve higher costs.

Financial investment in hand-operated groundwater pumps required a loan or support from local religious charities. Ten years after the initial

23 For further discussion about the sustainable livelihoods approach, see I. Scoones, *Sustainable Rural Livelihoods: A Framework for Analysis* (Sussex: Institute of Development Studies, 1998); I. Scoones, "Livelihoods Perspectives and Rural Development", *Journal of Peasant Studies,* Vol. 36, No. 1 (2009), pp. 171–196.

move to shrimp aquaculture, many households were increasingly unable to obtain water using their hand-operated pumps because of the large number of people extracting from shared aquifers. Motorised pumps enabling easier extraction of groundwater were then required. This not only generated additional costs (purchase of fuel and motorised pumps) but also resulted in larger volumes of groundwater use as extraction rates were quicker and more convenient. Those who could not afford to upgrade to a motor pump either spent lengthy amounts of time in the evenings pumping water by hand when neighbours had generally ceased pumping groundwater, or purchased groundwater from wealthier neighbours who had motorised pumps (often at prices higher than the costs incurred by the pump owners in extraction). Households with the ability to purchase several rainwater pots fared better because they were able to store rainwater well into the dry season, but many households could not afford the cost of such large numbers of rainwater pots.

As noted above, soil degradation caused by increasing salinity affected household ability to grow those crops, fruit and vegetables that were intolerant of high salt levels. Some short-cycle vegetables could be grown as their roots only extended into the shallow layers of soil which were not as greatly affected by salt. Soils were further degraded as extracted waste and effluents from shrimp ponds were pumped onto soils bordering the ponds.

Loss of Physical Capital

Prior to a whole household making a decision to migrate, households would often lease out or contract out their land to others in return for a regular income or lump sum respectively. In Viet Nam, contracting out is a common arrangement known as "co".[24] Households often prefer this arrangement as the initial lump sum provides a large amount of money that can be used to pay off some or all of their debt, and then allows them

24 Under a "co" arrangement, one party allows another party to use their land for a fixed period of time, e.g. three years, in exchange for a large lump sum (more than could generally be earned from renting out the land). Once the fixed period of time has lapsed, the original landowner is able to "buy" their land so long as they return the initial lump sum paid. If the fixed time period passes and the original landowner cannot afford to re-purchase their land, the other party can continue using the land until the original owner is able to return the amount owed.

to move elsewhere, work, and re-purchase their land. However, a major problem arises when units of gold instead of cash are exchanged for "co". As the value of gold sometimes more than triples in the period following the initial "co", households have to earn far more money to purchase sufficient gold to buy their land.

Whole-household migrants also faced physical capital losses because of potential damage to their houses and belongings which were locked up and abandoned in their home town. Members of those households worried about damage to property from heavy rain or theft, but they could not return home frequently to check on their property (in many cases houses were made of leaf material) because it was too expensive. Some asked their neighbours to check their houses but knew that generally people did not take as good care of other people's property as their own. Thus, damage increased the amount of money required for any return to their home town.

Loss of Financial Capital

As previously discussed, environmental and agricultural change meant that some households faced such high debt levels that they eventually moved with their whole household to find work. These moves were often perceived as temporary, with households intending to move just for the period of time[25] necessary to earn enough money to pay off their debt with some additional money to return and re-invest in their land (usually to continue raising shrimp). The strategy of moving with all household members was the result of a combination of practical reasons (such as not having other family members available to take care of children) and economic logic (having more members of the household working in the migration destination meant a chance to earn more income).

The movement of whole households has emerged as a new phenomenon in Nha Phan hamlet since around 2005 and is the closest to what might be considered a form of distress migration. Many households had not wanted to move but were grateful for the opportunities to find work and earn an income in the booming manufacturing sector of Viet Nam. Such temporary labour movements were neither forced,

25 Two to four years was common among households interviewed.

nor entirely voluntary, with households often working long hours under risky and unhealthy conditions, compelled to do so by their economic circumstances, lack of alternative livelihood options, inequalities, and environmental limitations in their home location. Such movements of entire households (in addition to the more common partial household migration) under conditions of increasing human insecurity may be an indicator of the type of migration which might emerge as a growing trend in the future as climate change impacts become more pronounced.

Loss of Human Capital

One of the more alarming trends in relation to whole-household migration was the removal of children from a school environment, which contributed to a decline in human capital of the household unit and thereby affected longer term prospects of reaching a state of human security. Households had either removed their children from school because they could not afford the education costs, or needed to take their children out of school because they were migrating. Once at their destination, and depending on the age of the children, the children would either work or stay in the family's rented boarding house room alone or with siblings during the day while their parents worked. Although the children could attend school in their destination area, there was no safe way for them to travel to and from school as parents often worked very long hours and could not collect their children after school. Parents feared for the safety of their children in such unfamiliar destinations as the busy, industrial zones where the majority of migrants from Cai Nuoc District were able to find work, but where they did not know those living around them. Lack of affordable post-school child care arrangements meant that parents were choosing to keep their children out of school.

Whole-household migrants based their decision about where to move primarily on whether they knew someone who had worked, or who was able to help them find work, in a particular destination. In Viet Nam's current stage of development, most unskilled work is in the manufacturing, processing and construction sectors which are clumped in various industrial zones around the country. These are where the majority of whole-household migrants interviewed ended up. Social networks were extremely important in this regard (an issue also addressed in Graeme Hugo's chapter in this monograph); most households did not pick indus-

trial zones randomly. They always went to an industrial zone where they knew at least one other person.

Working in the manufacturing, processing and construction sectors raised new human capital and human security challenges for households. Working household members often worked 12-hour days (with some breaks) for at least six days a week. Income was often based on amount of output, e.g. kilogrammes of cashew nuts shelled or numbers of soft toy parts sewn (which is why household members worked long hours or sought overtime). While households gained new skills, they also faced new health risks, either from exhaustion and dangerous work environments, or living in cramped, poorly ventilated boarding houses with poor hygiene and sanitation conditions. When household members became ill or seriously injured, this affected the ability of the household to earn an income.[26]

Loss of Social Capital

In some cases, a household would move elsewhere for work but would leave the youngest child(ren) with grandparents (if available). Consequently, parents were only able to see their offspring once a year when they had saved enough money to return to their home town for annual celebrations. This has an important effect of changing the composition of rural households, with the more vulnerable elderly and very young living together in the absence of adults of working age, while also taking an emotional toll on parents and children, with parents living away from home for at least three years or, in some cases, even longer. This means that many children grow up not really knowing their parents or forming close bonds with them. This can weaken one of the most significant forms of social capital that exists in a society—the relationship between a parent and a child. In the future, the lack of close bonds between the two could have unforeseen impacts, perhaps in terms of a child's willingness to care and provide financial support for ageing parents. The government may have to play a greater role in the future care of its elderly population than has traditionally been the case.

26 One household reported that all family members often had diarrhoea and this limited their ability to work. In another case, a woman working in the construction sector fell from the first floor of a building and damaged her spine. All the money the household had earned during the previous two years was spent on her treatment in hospital and returning her by taxi to her home town.

Looking at the social structure on a broader scale, growing rice required labour in the rice fields. This generated a significant amount of work between households and particularly for the landless. Less labour required to raise shrimp meant that less work was available in the local area. Additionally, as households faced mounting debt, they were more inclined to rely on their own household members rather than seek external labour. The initial shrimp boom created labour opportunities for pond and house construction. However, increasing debt meant that employment opportunities for labourers declined once the boom was over.

Furthermore, the problem of theft arose during the shrimp harvest period. Household members slept in makeshift shelters next to their ponds to keep watch for thieves. Households that were more successful in raising shrimp were often reluctant to share their secrets with neighbouring households. The overall effect of the switch to shrimp farming has perhaps been increased individualisation, competition and even conflict between neighbours in local areas and less social cohesion.

Conclusion

Agricultural and environmental change in Cai Nuoc District, Ca Mau Province, Viet Nam, has led to greater saline-water intrusion in the area, an issue that anticipates problems associated with climate change. As a result, some households have become more vulnerable in terms of their ability to obtain food and earn a living from their land and surrounding natural environment, as well as in terms of their financial situation, household education level, exposure to health risks, loss of physical assets and general overall ability to escape the traps of poverty. For some of the most vulnerable households, the migration of whole households was perceived as a solution to mounting debt problems arising from their failure to raise shrimp successfully. However, this migration was not a direct consequence of environmental change; rather, environmental change is best understood as a systemic rather than proximate cause.

Migrating to areas of employment potential in the manufacturing, processing and construction sectors, often using connections available through social networks, enabled some of these households to earn a more stable income and pay off some of their debt and entertain the idea of returning home. Other households continued to live under unstable

financial conditions in their migration destination while some others move back and forth between their home and migration destination, preferring to try to survive in their home town, but having to return to their migration destinations when they fail to earn sufficient income. The migration of whole households has also exposed families to new types of vulnerability, particularly in relation to health and education issues. The long-term success of such household migration measures is unclear, as even after returning home, migrants will have to deal with the increased salinity of local water and soils. This will limit opportunities for agricultural and aquaculture production without significant financial investment.

This analysis of migration of entire households using a human security lens has highlighted some of the challenges households face in responding to agricultural and ecological change. It serves to show the cascade of changes that can lead to financial distress and trigger an eventual migration decision following a slower process of environmental change, namely increasing salinisation in the particular agrarian context of the Mekong Delta. Ongoing internal migration, and possibly distress migration, may increasingly emerge in the Mekong Delta as threats and impacts of climate change continue to evolve alongside a plethora of other locally, nationally and regionally induced changes to the Mekong River Delta's water flow regime, salinity levels and agricultural/aquaculture production context.

The author wishes to thank her dedicated research assistant, Ms Cao Thanh Phuong, as well as staff at the College of Environment and Natural Resources of Can Tho University and the Mission for the International Organization for Migration in Viet Nam for their support in conducting this research in Viet Nam. Further thanks go to Professors John Connell and Lorraine Elliott for their detailed comments on earlier versions of this chapter. This research would not have been possible without the generous funding support of the Tempe Mann Travelling Scholarship from the Australian Federation of Graduate Women, an Endeavour Research Fellowship and an Australian Postgraduate Award provided by the Australian Federal Government.

Abbott, C., *An Uncertain Future: Law Enforcement, National Security and Climate Change*, Briefing paper (London: Oxford Research Group, 2008).

Abery, N. W., Minh, T. H., Nguyen, T. P., Jumnongsong, S., Nagothu, U. S., Pham Ba Vu Tung, Nguyen, V. H., & De Silva, S. S., "Vulnerability and Adaptation to Climate Change and Extreme Climatic Events: The Case of Improved Extensive Shrimp Farming in Ca Mau and Bac Lieu Provinces, Vietnam: Analysis of Stakeholder Perceptions", *Aquaclimate Technical Brief*, No. 3 (2011), http://library.enaca.org/emerging_issues/climate_change/vietnam_shrimp_tech_brief_1.pdf (accessed 10 April 2012).

Agriculture and Agri-Food Canada, "Assessment of Climate Change Impacts on Agricultural Land-Use Suitability: Spring Seeded Small Grains on the Prairies", Report (2008), http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1210289174331&lang=eng (accessed 16 April 2012).

Albala-Bertrand, J. M., "Complex Emergencies Versus Natural Disasters: An Analytical Comparison of Causes and Effects", *Oxford Development Studies*, Vol. 28, No. 2 (2000), pp. 187–204.

ASEAN, "ASEAN Agreement on Transboundary Haze Pollution" (2002), http://www.aseansec.org/pdf/agr_haze.pdf (accessed 13 December 2011).

———, "ASEAN Declaration on the Protection and Promotion of the Rights of Migrant Workers (Cebu Declaration)", 12th ASEAN Summit, Cebu, Philippines (2007).

ASEAN Regional Forum (ARF), "Co-chairs' Summary Report of the ARF Defence Officials' Dialogue, Ottawa, Canada, 2 April 2008", Reproduced in *ASEAN Regional Forum Documents Series 2006–2009* (Jakarta: ASEAN Secretariat, 2010).

———, "Report of the ARF Defence Officials' Dialogue, Phuket, Thailand, 18 May 2009", Reproduced in *ASEAN Regional Forum Documents Series 2006–2009* (Jakarta: ASEAN Secretariat, 2010).

Asian Development Bank (ADB), "Policy Options to Support Climate-Induced Migration", Technical Assistance Report (December 2009), http://www2.adb.org/Documents/TARs/REG/43181-REG-TAR.pdf (accessed 1 May 2012).

———, "Climate-Induced Migration: Mitigating Risks, Creating Opportunities" (2011), http://beta.adb.org/themes/climate-change/climate-induced-migration (accessed 31 December 2011).

Baer, C., "Map of Ca Mau Province", *Wikipedia* (2008), http://en.wikipedia.org/wiki/File:Ca_mau_province_map_-_sm.png (accessed 13 January 2012).

Banuri, T., Göran-Mäler, K., Grubb, M., Jacobson, H. K., & Yamin, F., "Equity and Social Considerations", in J. Bruce, H. Lee & E. Haites (Eds.), *Climate Change 1995: Economic and Social Dimensions of Climate Change. Contribution of Working Group III to the Second Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 1995).

Biermann, F., & Boas, I., "Protecting Climate Refugees: The Case for a Global Protocol", *Environment: Science and Policy for Sustainable Development*, Vol. 50, No. 6 (2008), pp. 8–17.

———, "Preparing for a Warmer World: Towards a Global Governance System to Protect Climate Refugees", *Global Environmental Politics*, Vol. 10, No. 1 (2010), pp. 60–88.

Binh, T. N. K. D., Vromant, N., Nguyen T. H., Hens, L., & Boon, E. K., "Land Cover Changes Between 1968 and 2003 in Cai Nuoc, Ca Mau Peninsula, Vietnam", *Environment, Development and Sustainability*, Vol. 7, No. 4 (2005), pp. 519–536.

Black, R., "Environmental Refugees: Myth or Reality?", UNHCR Working Paper No. 34 (Geneva: UNHCR, March 2001).

———, Natali, C., & Skinner, J., "Migration and Inequality", Background paper prepared for *World Development Report 2006: Equity and Development* (New York: UNDP, 2005).

———, Kniveton, D., Skeldon, R., Coppard, D., Murata, A., & Schmidt-Verkerk, K., *Demographics and Climate Change: Future Trends and Their Policy Implications for Migration*, Working Paper T-27 (Brighton: Development Research Centre on Migration, Globalisation and Poverty, 2008).

Bojanowski, A., "UN Embarrassed by Forecast on Climate Refugees", *Spiegel Online* (18 April 2011), http://www.spiegel.de/international/world/0,1518,757713,00.html (accessed 13 December 2011).

Bradshaw, S., *Socio-economic Impacts of Natural Disasters: A Gender Analysis* (Santiago: United Nations Publications, 2004).

Brindal, E., "Asia Pacific: Justice for Climate Refugees", *Alternative Law Journal*, Vol. 32, No. 4 (2007), pp. 240–241.

Brody, A., Demetriades, J., & Esplen, E., *Gender and Climate Change: Mapping the Linkages. A Scoping Study on Knowledge and Gaps* (Sussex: BRIDGE, Institute of Development Studies, University of Sussex, 2008).

Brown, O., "Climate Change and Forced Migration: Observations, Projections and Implications", Occasional Paper (Geneva: UNDP, 2007).

———, "Migration and Climate Change", IOM Migration Research Series No. 31 (Geneva: IOM, 2008).

Campbell, K. M., Guiledge, J., McNeill, J. R., Podesta, J., Ogden, P., Fuerth, I., Woolsey, R. J., Lennon, T. J., Smith, J., Weitz, R., & Mix, D. (Eds.), *The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change* (Washington, D.C.: Center for Strategic and International Studies (CSIS) and Center for a New American Security, 2007).

Center for Strategic and International Studies, "Asia's Response to Climate Change and Natural Disasters: Implications for an Evolving Regional Architecture", A Report of the CSIS Asian Regionalism Initiative (Washington, D.C.: CSIS, 2010), http://csis.org/publication/asia%E2%80%99s-response-climate-change-and-natural-disasters (accessed 13 December 2011).

CENTRA Technology, Inc., & Scitor Corporation, *Southeast Asia: The Impact of Climate Change to 2030: Geopolitical Implications*, CR 2010-02, Conference report (Washington, D.C.: National Intelligence Council, 2010).

Centre de Recherches Interdisciplinaires en Droit de l'Environnement, de l'Aménagement et de l'Urbanisme (CRIDEAU), "Draft Convention on the International Status of Environmentally-Displaced Persons", *Revue de Droit de l'Université de Sherbrooke*, Vol. 39 (2008).

Centre International de Droit Comparé de l'Environnement (CIDCE), "Draft Convention on the International Status of Environmentally Displaced Persons" (May 2010), http://www.cidce.org/ReseauDeplaces/index.htm (accessed 13 December 2011).

Cernea, M., "Understanding and Preventing Impoverishment from Displacement: Reflections on the State of Knowledge", *Journal of Refugee Studies*, Vol. 8, No. 3 (1995), pp. 245–262.

———, "The Risks and Reconstruction Model for Resettling Displaced Populations", *World Development*, Vol. 25, No. 10 (1997), pp. 1569–1587.

———, & McDowell, C., *Risks and Reconstruction: Experiences of Resettlers and Refugees* (Oxford: Berghahn Books, 2000).

Christian Aid, *Human Tide: The Real Migration Crisis* (London: Christian Aid, 2007), http://www.christian-aid.org.uk (accessed 27 June 2010).

Clark, W. A. V., "Social and Political Contexts of Conflict", *Forced Migration Review*, No. 31 (2008), p. 22.

CNA Corporation, *National Security and the Threat of Climate Change* (Alexandria, VA: CNA Corporation, 2007).

Cooper, A. F., & Fues, T., "Do the Asian Drivers Pull their Diplomatic Weight? China, India, and the United Nations", *World Development*, Vol. 36, No. 2 (2008), pp. 293–307.

Cornwall, A., "Revisiting the 'Gender Agenda'", *IDS Bulletin*, Vol. 38, No. 2 (2007), pp. 69–78.

Couldrey, M., & Herson, M. (Eds.), "Climate Change and Displacement", *Forced Migration Review*, No. 31 (2007), pp. 4–80.

Cruz, R. V., Harasawa, H., Lal, M., & Wu, S., "Asia", in M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden & C. E. Hanson (Eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2007).

Dasgupta, S., Laplante, B., Meisner, C., Wheeler, D., & Yan, J., "The Impact of Sea Level Rise on Developing Countries: A Comparative Analysis", *Climatic Change*, Vol. 93, No. 3 (2009), pp. 379–388.

Demetriades, J., & Esplen, E., "The Gender Dimensions of Poverty and Climate Change Adaptation", *IDS Bulletin*, Vol. 39, No. 4 (2008), pp. 24–31.

Diamond, J., *Collapse: How Societies Choose to Fail or Succeed* (New York: Viking Press, 2005).

Dobias, R. J., "ADB's Role in Addressing Climate Change and Migration", Presentation to Climate Change, Migration and Human Security in Southeast Asia Seminar, Singapore (27 May 2011), http://www.rsis.edu.sg/nts/events/docs/Bob_Dobias.pdf (accessed 16 April 2012).

Docherty, B., & Giannini, T., "Confronting a Rising Tide: A Proposal for a Convention on Climate Change Refugees", *Harvard Environmental Law Review*, Vol. 33 (2009), pp. 349–403.

Ducanes, J., & Abella, M., *The Future of International Migration to OECD Countries: Regional Note – China and South East Asia* (Paris: Organisation for Economic Co-operation and Development (OECD), 2009).

Dun, O., *Viet Nam Case Study Report: Linkages between Flooding, Migration and Resettlement* (Environmental Change and Forced Migration Scenarios Project, 2009).

———, "Migration and Displacement Triggered by Floods in the Mekong Delta", *International Migration*, Vol. 49, No. 1 (2011), pp. 200–223.

Dupont, A., "The Strategic Implications of Climate Change", *Survival: Global Politics and Strategy*, Vol. 50, No. 3 (2008), pp. 29–54.

Eakin, H., & Leurs, A. L., "Assessing the Vulnerability of Social-Environmental Systems", *Annual Review of Environmental Resources*, No. 31 (2006), pp. 365–394.

Earth Observatory (EO) of Singapore, Panel discussion at the Conference on Catastrophe and Disaster Management (Singapore, February 2011).

Economy and Environment Program for Southeast Asia (EEPSEA), *Jakarta at the Edge: Will Sea Level Rise Overcome Southeast Asia's Most Vulnerable City?* (Jakarta: EEPSEA, 2010).

Elmhirst, R., "Multi-Local Livelihoods, Natural Resource Management and Gender in Upland Indonesia", in B. P. Resurreccion & R. Elmhirst (Eds.), *Gender and Natural Resource Management. Livelihoods, Mobility and Interventions* (London: Earthscan, 2008), pp. 67–86.

Enarson, E., "Through Women's Eyes: A Gendered Research Agenda for Social Science", *Disasters*, Vol. 22, No. 2 (1998), pp. 157–173.

Environmental Justice Foundation, *Smash and Grab: Conflict, Corruption and Human Rights Abuses in the Shrimp Farming Industry* (London: Environmental Justice Foundation, 2003).

Ewing, J. J., "A Way in the Wilderness: Using Critical Realism to Navigate Environmental Security's Theoretical Terrain", *International Journal of Interdisciplinary Social Sciences*, Vol. 5, No. 7 (2010), pp. 304–316.

Fidler, D., "The Asian Century: Implications for International Law", *Singapore Yearbook of International Law*, Vol. 9 (2005), pp. 19–35.

Fingar, T., "Statement for the Record", National Intelligence Assessment on the National Security Implications of Global Climate Change to 2030 (25 June 2008), http://www.dni.gov/testimonies/20080625_testimony.pdf (accessed 16 April 2012).

Food and Agriculture Organization of the United Nations (FAO), *Food Security and Livelihoods*, Thematic brief (Rome: FAO, n.d.).

Gemenne, F., "Climate Change and Forced Displacement: Towards a Global Environmental Responsibility?" Paper presented at the annual meeting of the International Studies Association, San Diego, California, USA (22 March 2006).

———, "Why the Numbers Don't Add Up: A Review of Estimates and Predictions of People Displaced by Environmental Changes", *Global Environmental Change*, Vol. 21, No. S1 (2011), pp. S41–S49.

———, & Dun, O., "Defining 'Environmental Migration'", *Forced Migration Review*, No. 31 (2008), pp. 10–11.

Ginsburg, T., "Eastphalia as the Perfection of Westphalia", *Indiana Journal of Global Legal Studies*, Vol. 17, No. 1 (2010), pp. 27–45.

Global Humanitarian Forum, *Human Impact Report – The Anatomy of a Silent Crisis* (Geneva: Global Humanitarian Forum, 2009).

Gray, C. L., "Tsunami-Induced Displacement in Sumatra, Indonesia", Paper presented at XXVI IUSSP International Population Conference, Marrakech (27 September – 2 October 2009).

Hajer, M., *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process* (Oxford: Oxford University Press, 1997).

Hartmann, B., "Don't Beat the Climate War Drums", *Climate Chronicle*, No. 2 (9 December 2009), http://popdev.hampshire.edu/sites/popdev/files/uploads/u4/Don_tBeattheClimateWarDrum.pdf (accessed 17 January 2010).

Hathaway, J. C., "A Reconsideration of the Underlying Premise of Refugee Law", *Harvard International Law Journal*, Vol. 31, No. 1 (1990), pp. 129–183.

———, *The Rights of Refugees under International Law* (Cambridge: Cambridge University Press, 2005).

High Representative and the European Commission (HREC), "Climate Change and International Security, Paper to the European Council", S113/08, 14 March 2008.

Hilhorst, D., & Bankoff, G., "Introduction: Mapping Vulnerability", in G. Bankoff, G. Frerks & D. Hilhorst (Eds.), *Mapping Vulnerability: Disasters, Development and People* (pp. 1–9) (London: Earthscan, 2004).

Hodgkinson, D., Burton, T., Anderson, H., & Young, L., "'The Hour When the Ship Comes In': A Convention for Persons Displaced by Climate Change" (2009), http://www.ccdpconvention.com/documents/Hour_When_Ship_Comes_In.pdf (accessed 13 December 2011).

Homer-Dixon, T. F., "On the Threshold: Environmental Changes as Causes of Acute Conflict", *International Security*, Vol. 16, No. 2 (1991), pp. 76–116.

Hugo, G., "Environmental Concerns and International Migration", *International Migration Review*, Vol. 30, No. 1 (1996), pp. 105–131.

Hugo, G. J., "Community and Village Ties, Village Norms and Village Networks in Migration Decision Making", in G. F. DeJong & R. W. Gardner (Eds.), *Migration Decision Making: Multidisciplinary Approaches to Microlevel Studies in Developed and Developing Countries* (pp. 186–224) (New York: Pergamon, 1981).

———, "Migration and Women's Empowerment", in H. B. Presser & G. Sen (Eds.), *Women's Empowerment and Demographic Processes: Moving Beyond Cairo* (pp. 287–317) (Oxford: Oxford University Press, 2000).

———, "The Crisis and International Population Movements in Indonesia", *Asian and Pacific Migration Journal*, Vol. 9, No. 1 (2000), pp. 93–129.

———, "The Impact of the Crisis on Internal Population Movement in Indonesia", *Bulletin of Indonesian Economic Studies*, Vol. 36, No. 2 (2000), pp. 115–138.

———, & Young, S. (Eds.), *Labour Mobility in the Asia-Pacific Region: Dynamics, Issues and a New APEC Agenda* (Singapore: Institute of Southeast Asian Studies, 2008).

———, Bardsley, D. K., Tan, Y., Sharma, V., Williams, M., & Bedford, R., *Climate Change and Migration in the Asia-Pacific Region* (Edward Elgar, forthcoming).

Human Rights Council, "Human Rights and Climate Change", Human Rights Council Resolution 7/23 (2008).

———, "Human Rights and Climate Change", Human Rights Council Resolution 10/4 (2009).

———, "Human Rights and the Environment", Human Rights Council Resolution 16/11 (2011).

Human Security Report Project, "What is Human Security?" (Burnaby, Canada: School for International Studies, Simon Fraser University, 2010), http://www.hsrgroup.org/docs/Publications/miniAtlas/miniAtlas_en_human_security.pdf (accessed 25 November 2011).

Hunter, L. M., & David, E., "Climate Change and Migration: Considering the Gender Dimensions" (submitted to UNESCO for a volume on Migration & Climate, 2009), http://www.colorado.edu/ibs/pubs/pop/pop2009-0013.pdf (accessed 29 June 2010).

Ielemia, A., "A Threat to Our Human Rights: Tuvalu's Perspective on Climate Change", *UN Chronicle*, Vol. 44, No. 18 (2007).

Ikeme, J., "Equity, Environmental Justice and Sustainability: Incomplete Approaches in Climate Change Politics", *Global Environmental Change*, Vol. 13, No. 3 (2003), pp. 195–206.

Institute of Southeast Asian Studies, *Urbanisation in Southeast Asian Countries* (Singapore: ISEAS, 2009).

Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)* (Cambridge: Cambridge University Press, 2007).

———, *Fourth Assessment Report, Climate Change 2007: A Synthesis Report* (Valencia: IPCC Plenary XXVII, 2007).

International Disaster Database, www.emdat.be/ (accessed 23 December 2011).

International Organization for Migration (IOM), "Constitution of the International Organization for Migration" (1953).

———, "Discussion Note: Migration and the Environment", 94th session, MC/INF/288 (1 November 2007).

———, *Climate Change, Environmental Degradation and Migration: Addressing Vulnerabilities and Harnessing Opportunities* (Geneva: IOM and Permanent Mission of Greece, 2009).

———, "Disaster Risk Reduction and Climate Change Adaptation in IOM's Response to Environmental Migration" (Geneva: IOM, 2011), http://publications.iom.int/bookstore/free/DDR_CCA_Infosheet.pdf (accessed 16 April 2012).

Jane's Information Group, "Hostile Environment: Climate Change and Resource Stress Threaten Global Stability", *Jane's Defence Weekly*, Vol. 46, No. 16 (2009), pp. 24–29.

Jasparro, C., & Taylor, J., "Climate Change and Regional Vulnerability to Transnational Security Threats in Southeast Asia", *Geopolitics*, Vol. 13 (2008), pp. 232–256.

Kälin, W., "Conceptualising Climate-Induced Displacement", in J. McAdam (Ed.), *Climate Change and Displacement: Multidisciplinary Perspectives* (Oxford: Hart, 2010).

———, & Künzli, J., *The Law of International Human Rights Protection* (Oxford: Oxford University Press, 2009).

Koh, K.-L., & Robinson, N. A., "Strengthening Sustainable Development in Regional Inter-Governmental Governance: Lessons from the ASEAN Way", *Singapore Journal of International & Comparative Law*, Vol. 6, No. 2 (2002), pp. 640–682.

Kolmannskog, V., "Climate Change, Disaster, Displacement and Migration: Initial Evidence from Africa", UNHCR Working Paper No. 180 (Geneva: UNHCR, December 2009).

———, *Future Floods of Refugees: A Comment on Climate Change, Conflict, and Forced Migration* (Oslo: Norwegian Refugee Council, 2008).

Laczko, F., *Migration, Environment and Climate Change: Assessing the Evidence* (Washington, D.C.: German Marshall Fund, 2010).

Lambrou, Y., & Piana, G., *Gender: The Missing Component of the Response to Climate Change* (Rome: Food and Agriculture Organization of the United Nations, 2006).

Lewis, D., & Mosse, D., "Encountering Order and Disjuncture: Contemporary Anthropological Perspectives on the Organization of Development", *Oxford Development Studies*, Vol. 34, No. 1 (2006), pp. 1–13.

Li, T. M., "Compromising Power: Development, Culture, and Rule in Indonesia", *Cultural Anthropology*, Vol. 14, No. 3 (1999), pp. 295–322.

Maguire, B., & Hagan, P., "Disasters and Communities: Understanding Social Resilience", *Australian Journal of Emergency Management*, Vol. 22, No. 2 (2007), pp. 16–20.

Manalo, E. A., "Results of the 'ASEAN Regional Forum: Security Implications of Climate Change'", Statement to the International Organization for Migration workshop on Climate Change, Environmental Degradation and Migration, Geneva (30 March 2011).

Martin, S. F., *Climate Change, Migration and Adaptation* (Washington, D.C.: The German Marshall Fund of the United States, 2010).

Massey, D., Arrango, J., Hugo, G., Kouasouci, A., Pellegrino, A., & Taylor, J. E., "Theories of International Migration: A Review and Appraisal", *Population and Development Review*, Vol. 19, No. 3 (1993), pp. 431–466.

Mayer, B., "Fraternity, Responsibility and Sustainability: The International Legal Protection of Climate (or Environmental) Migrants at the Crossroads" (2011), http://ssrn.com/abstract=1806760 (accessed 13 December 2011).

———, "Pour en finir avec la notion de 'réfugiés environnementaux': Critique d'une approche individualiste et universaliste des déplacements causés par des changements environnementaux", *McGill International Journal for Sustainable Development Law and Policy*, Vol. 7, No. 1 (2011), pp. 33–60.

———, "The International Legal Challenges of Climate-Induced Migration: Proposal for an International Legal Framework", *Colorado Journal of International Environmental Law and Policy*, Vol. 22, No. 3 (2011), pp. 357–416.

McAdam, J., "Swimming against the Tide: Why a Climate Change Displacement Treaty is Not *the* Answer", *International Journal of Refugee Law*, Vol. 23, No. 1 (2011), pp. 2–27.

———, & Saul, B., "An Insecure Climate for Human Security? Climate-Induced Displacement and International Law", in A. Edwards & C. Ferstman (Eds.), *Human Security and Non-Citizens: Law, Policy and International Affairs* (Cambridge: Cambridge University Press, 2009).

McLeman, R., & Smit, B., "Commentary No. 86: Climate Change, Migration and Security" (Ottawa: Canadian Security Intelligence Service, 2004), http://www.csis-scrs.gc.ca/pblctns/cmmntr/cm86-eng.asp (accessed 29 June 2010).

Ministry of Home Affairs, "SEA for Spatial Planning Serang Municipality Report" (Jakarta, 2009).

Ministry of Natural Resources and Environment (MONRE), *Climate Change, Sea Level Rise Scenarios for Viet Nam* (Hanoi: Ministry of Natural Resources and Environment, 2009).

———, "Global Warming Threatens Ca Mau Province", *Natural Resources and Environment Newspaper*, 2010, http://www.monre.gov.vn/v35/default.aspx?tabid=675&CateID=59&ID=83468&Code=N3LXY83468 (accessed 3 May 2010).

Morton, A., Boncour, P., & Laczko, F., "Human Security Policy Challenges", *Forced Migration Review*, No. 31 (2008), pp. 5–7.

Myers, N., "Environment and Security", *Foreign Policy*, No. 74, Spring (1989), pp. 23–41.

———, *Environmental Refugees: An Emergent Security Issue* (Geneva: International Organization for Migration, 2005).

Naik, A., Stigter, E., & Laczko, F., *Migration, Development and Natural Disasters: Insights from the Indian Ocean Tsunami* (Geneva: International Organization for Migration, 2007).

Native Village of Kivalina v. ExxonMobil Corp. et al., 663 F.Supp.2d 863, 2009 WL 3326113 (2009).

Nelson, V., Meadows, K., Cannon, T., Morton, J., & Martin, A., "Uncertain Predictions, Invisible Impacts, and the Need to Mainstream Gender in Climate Change Adaptation", *Gender and Development*, Vol. 10, No. 2 (2002), pp. 51–59.

Network of Women Ministers and Leaders for Environment, "Recommendations: Network of Women Ministers and Leaders for Environment" (outcome of the meeting of the Network of Women Ministers and Leaders for Environment at the 13th Conference of the Parties to the United Nations Framework Convention on Climate Change in Bali, Indonesia, 11 December 2008), http://www.gendercc.net/fileadmin/inhalte/Dokumente/UNFCCC_conferences/Women_ministers_Bali-Declaration_COP13.pdf (accessed 6 June 2010).

Neumayer, E., & Plumper, T., "The Gendered Nature of Natural Disasters: The Impact of Catastrophic Events on the Gender Gap in Life Expectancy, 1981–2002", *Annals of the Association of American Geographers*, Vol. 97, No. 3 (2007), pp. 551–566.

Newland, K., "Climate Change and Migration Dynamics" (Washington, D.C.: Migration Policy Institute, 2011).

Ngo Thi Phuong Lan, "From Rice to Shrimp: Ecological Change and Human Adaptation in the Mekong Delta of Vietnam", in M. A. Stewart & P. A. Coclanis (Eds.), *Environmental Change and Agricultural Sustainability in the Mekong Delta* (New York: Springer, 2011).

Nguyen, T., Vromant, N., & Hens, L., "Organic Pollution and Salt Intrusion in Cai Nuoc District, Ca Mau Province, Vietnam", *Water Environment Research*, Vol. 78, No. 7 (2006), pp. 716–723.

Nguyen, T., Vromant, N., Nguyen, T. H., & Hens, L., "Soil Salinity and Sodicity in a Shrimp Farming Coastal Area of the Mekong Delta, Vietnam", *Environmental Geology*, Vol. 54, No. 8 (2008), pp. 1739–1746.

Nhuong, T. V., Luu, L. T., Tu, T. Q., Tam, P. M., & Nguyet, T. T. A., "Vietnam Shrimp Farming Review", Individual Partner Report for the Project, Policy Research for Sustainable Shrimp Farming in Asia, European Commission INCO-DEV Project PORESSFA No. IC4-200110042, Bac Ninh, Vietnam, CEMARE University of Portsmouth (October 2002).

Nightingale, A. J., "Warming Up the Climate Change Debate: A Challenge to Policy Based on Adaptation", *Journal of Forest and Livelihood*, Vol. 8, No. 1 (2009), pp. 84–89.

Nordås, R., & Gleditsch, N. P., "Climate Change and Conflict", *Political Geography*, Vol. 26, No. 6 (2007), pp. 627–638.

Nurlambang, T., *Climate Change and Migration Dynamic: A Comparison between Archipelago Developing Country and Continent Developed Country* (Melbourne: Nautilus Institute at Royal Melbourne Institute of Technology, 2008)

O'Hare, G., "Hurricane 07B in the Godavari Delta, Andhra Pradesh, India: Vulnerability, Mitigation and the Spatial Impact", *The Geographical Journal*, Vol. 167, No. 1 (2001), pp. 23–38.

Oberai, A. S., "Land Settlement Policies and Population Redistribution in Developing Countries: Performance, Problems and Prospects", *International Labour Review*, Vol. 125, No. 2 (1986), pp. 141–161.

———, *Land Settlement Policies and Population Redistribution in Developing Countries: Achievements, Problems and Prospects* (New York: Praeger Publishers, 1988), pp. 8–19.

Office of the High Commissioner for Human Rights (OHCHR), "Report of the Office of the United Nations High Commissioner for Human Rights on the Relationship between Climate Change and Human Rights", UN Doc. A/HRC/10/61 (OHCHR, 2009).

Oliver-Smith, A., "Resistance to Resettlement: The Formation and Evolution of Movements", in *Research in Social Movements, Conflicts and Change* (Greenwich, CN: JAI Press, 1994).

———, & Shen, X. (Eds.), "Linking Environmental Change, Migration and Social Vulnerability", SOURCE No. 12/2009 (Bonn: United Nations University Institute for Environment and Human Security and Munich ReFoundation, 2009).

Olson, M. E., "Refugees as a Special Case of Population Redistribution", in L. A. P. Gosling & L. Y. C. Lim (Eds.), *Population Redistribution: Patterns, Policies and Prospects* (pp. 130–152) (New York: United Nations Fund for Population Activities, 1979).

Parry, M. L., Canziani, O. F., & Palutikof, J., "Technical Summary", in M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden & C. E. Hanson (Eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2007).

Peralta, A., "Financing for Climate Change Mitigation and Adaptation in the Philippines: A Pro-Poor and Gender-Sensitive Perspective", in *Gender and Climate Change Finance: A Case Study from the Philippines* (New York: Women's Environment and Development Organization, 2008).

Perch-Nielsen, S., Bättig, M., & Imboden, D., "Exploring the Link between Climate Change and Migration", *Climatic Change*, Vol. 91 (2008), pp. 375–393.

Petersen, W. A., "A General Typology of Migration", *American Sociological Review*, Vol. 23, No. 3 (1958), pp. 256–266.

Piguet, E., "Climate Change and Forced Migration", New Issues in Refugee Research, Research Paper No. 153 (Geneva: United Nations High Commissioner for Refugees, 2008).

Piper, N., "Gender and Migration", Paper prepared for the Policy Analysis and Research Programme of the Global Commission on International Migration (2005), http://www.iom.int/jahia/webdav/site/myjahiasite/shared/shared/mainsite/policy_and_research/gcim/tp/TP10.pdf (accessed 26 March 2012).

Preston, B. L., Suppiah, R., Macadam, I., & Bathols, J., *Climate Change in the Asia/Pacific Region: A Consultancy Report Prepared for the Climate Change and Development Roundtable* (Aspendale: Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2006).

Raleigh, C., Jordan, L., & Salehyan, I., *Assessing the Impact of Climate Change on Migration and Conflict* (Washington, D.C.: Social Development Department, World Bank, 2008).

Ratha, D., "Leveraging Remittances for Development", Paper for the Second Plenary Meeting of the Leading Group on Solidarity Levies to Fund Development (Oslo, 6–7 February 2007).

Reid, A., *Charting the Shape of Early Modern Southeast Asia* (Chiang Mai: Silkworm Books, 1999).

Renaud, F. G., Dun, O., Warner, K., & Bogardi, J., "A Decision Framework for Environmentally Induced Migration", *International Migration*, Vol. 49, No. S1 (2011), pp. e5–e29.

Rerkasem, B., "Climate Change and GMS Agriculture", in K. Rayanakorn (Ed.), *Climate Change Challenges in the Mekong Region* (Chiang Mai: Chiang Mai Press, 2011).

Resurreccion, B. P., "The Gender and Climate Change Debate: More of the Same or New Pathways of Thinking and Doing?", Asia Security Initiative Policy Series Working Paper No. 10 (Singapore: RSIS Centre for Non-Traditional Security (NTS) Studies, 2011).

———, & Sajor, E. E., *The Gender Dimensions of the Adoption of the Systems of Rice Intensification (SRI) in Cambodia* (Oxfam America, 2008).

Reuveny, R., "Climate Change-Induced Migration and Violent Conflict", *Political Geography*, Vol. 26, No. 6 (2007), pp. 656–673.

Richmond, A., "The Environment and Refugees: Theoretical and Policy Issues", Revised version of a paper presented at the meetings of the International Union for the Scientific Study of Population (Montreal, August 1993).

Rigg, J., "Rural-Urban Interactions, Agriculture and Wealth: A Southeast Asian Perspective", *Progress in Human Geography*, Vol. 24, No. 4 (1998), pp. 497–522.

———, "Land, Farming, Livelihoods, and Poverty: Rethinking the Links in the Rural South", *World Development*, Vol. 34, No. 1 (2006), pp. 180–202.

Rimmer, J. R., & Dick, H. W., *The City in Southeast Asia: Patterns, Processes, and Policy* (Singapore: National University of Singapore Press, 2009).

Scoones, I., *Sustainable Rural Livelihoods: A Framework for Analysis* (Sussex: Institute of Development Studies, 1998).

———, "Livelihoods Perspectives and Rural Development", *Journal of Peasant Studies*, Vol. 36, No. 1 (2009), pp. 171–196.

Scott, J. C., *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1998).

Skeldon, R., "Rural-to-Urban Migration and its Implications for Poverty Alleviation", *Asia-Pacific Population Journal*, Vol. 12, No. 1 (1997), pp. 3–16.

Smith, D., & Vivekananda, J., "A Climate of Conflict: The Links between Climate Change, Peace and War" (London: International Alert, 2007).

Stavropoulou, M., "Drowned in Definitions?" *Forced Migration Review*, No. 31 (2008), pp. 11–12.

Stern, N., *The Economics of Climate Change: The Stern Review* (Cambridge: Cambridge University Press, 2007).

Surbakti, I. M., Idroes, I. C., Simarmata, H. A., & Firman, T., "Jakarta City Report: Information Related to Climate Change in Jakarta City", Paper for the Workshop of Climate Change Vulnerability Assessment and Urban Development Planning for Asian Coastal Cities (Nakorn Pathom, Thailand, 20–22 August 2010).

Susandi, A., "Integration of Adaptation Planning across Economic Sectors: Indonesia Experiences", Paper for NWP Technical Workshop on Integration of Approaches to Adaptation Planning (Bangkok, 13 October 2009).

Swain, A., "Environmental Migration and Conflict Dynamics: Focus on Developing Regions", *Third World Quarterly*, Vol. 17, No. 5 (1996), pp. 959–973.

Tacconi, L., Jotzo, F., & Grafton R. Q., "Local Causes, Regional Co-operation and Global Financing for Environmental Problems: The Case of Southeast Asian Haze Pollution", *International Environmental Agreements: Politics, Law and Economics*, Vol. 8, No. 1 (2008), pp. 1–16.

Tacoli, C., "Crisis or Adaptation? Migration and Climate Change in a Context of High Mobility", in J. M. Guzmán, G. Martine, G. McGranahan, D. Schensul & C. Tacoli (Eds.), *Population Dynamics and Climate Change* (pp. 104–118) (London: United Nations Population Fund and International Institute for Environment and Development, 2009), .

Tan, Y., *Resettlement in the Three Gorges Project* (Hong Kong: Hong Kong University Press, 2008).

Tay, S., "The Environment and Southeast Asia: Regionalism, States and Community", in V. R. Savage & M. Tan-Mullins (Eds.), *The Naga Challenged: Southeast Asia in the Winds of Change* (Singapore: Marshall Cavendish Academic, 2005).

———, Patman, R. G., & Mason-Parker, B., "Interdependence, States and Community: Ethical Concerns and Foreign Policy in ASEAN", in D. B. MacDonald (Ed.), *The Ethics of Foreign Policy* (Farnham: Ashgate, 2007).

Terry, D. F., "Remittances as a Development Tool", in D. F. Terry & S. R. Wilson (Eds.), *Beyond Small Change: Making Migrant Remittances Count (*pp. 3–19) (Washington, D.C.: Inter-American Development Bank, 2005).

Terry, G., "No Climate Justice without Gender Justice: An Overview of the Issues", *Gender and Development*, Vol. 17, No. 1 (2009), pp. 5–18.

Thomas, J. A., "International Law in Asia: An Initial Review", *Dalhousie Law Journal*, Vol. 13 (1990), pp. 683–724.

Thuan, N. T. H., "Adaptation to Climate Change in Rice Production in Vietnam Mekong River Delta", in K. Rayanakorn (Ed.), *Climate Change Challenges in the Mekong Region* (Chiang Mai: Chiang Mai Press, 2011).

UK Ministry of Defence, *Global Strategic Trends 2007–2036, 3rd Edition* (Swindon: Ministry of Defence, Development Concepts and Doctrine Centre, 2007).

United Nations, "International Migration and Development: Report of the Secretary-General", Report at the 60th Session of the General Assembly (New York: United Nations, 18 May 2006).

United Nations Department of Economic and Social Affairs, *United Nations Expert Group Meeting on Population Distribution, Urbanization, Internal Migration and Development* (New York: UNDESA Population Division, 2008).

United Nations Development Programme (UNDP), *Human Development Report 2007/2008: Fighting Climate Change: Human Solidarity in a Divided World* (New York: Palgrave Macmillan, 2008).

United Nations Framework Convention on Climate Change (UNFCCC), "Cancun Agreements: Outcome of the Work of the Ad Hoc Working Group on Long-term Cooperative Action Under the Convention" (UNFCCC, 2010).

———, "Decision 1/CP.16 The Cancun Agreements: Outcome of the Work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention", FCCC/CP/2010/7/Add.1 (15 March 2010).

United Nations General Assembly, "Statement by the President of the 62nd Session of the United Nations General Assembly at the Thematic Debate on Climate Change and the Most Vulnerable Countries" (New York, 8 July 2008), http://www.un.org/ga/president/62/statements/ccvulc080708.shtml (accessed 31 December 2011).

United Nations High Commissioner for Refugees (UNHCR), "UNHCR Disappointed at Australian Decision to Reopen Detention Centre for Asylum-Seekers" (2010), http://www.unhcr.org/4bcd99956.html (accessed 13 December 2011).

———, "Statement on the Australia-Malaysia Arrangement" (2011), http://www.unhcr.org/4e2d21c09.html (accessed 13 December 2011).

United Nations Security Council (UNSC), "Debate on the Impact of Climate Change", SC/9000 (New York: Department of Public Information, 2007), http://www.un.-org/News/Press/docs/2007/sc9000.doc.htm (accessed 22 December 2011).

United Nations Viet Nam, "Climate Change Fact Sheet: The Effects of Climate Change in Viet Nam and the UN's Responses", http://www.un.org.vn/en/publications/publications-by-agency/doc_details/217-climate-change-fact-sheet-the-effects-of-climate-change-in-viet-nam-and-the-uns-responses.html (accessed 25 November 2011).

Villarin, J. R. T., Loyzaga, A. Y., & La Viña, A. G. M., "In the Eye of the Perfect Storm: What the Philippines Should Do about Climate Change", Working Paper (Manila: Manila Observatory, 2008).

Walker, B., & Salt, D., *Resilience Thinking: Sustaining Ecosystems and People in a Changing World* (Washington, D.C.: Island Press, 2006).

Wilbanks, T. J., Romero Lankao, P., Bao, M., Berkhout, F., Cairncross, S., Ceron, J.-P., Kapshe, M., Muir-Wood, R., & Zapata-Marti, R., "Industry, Settlement and Society", in M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden & C. E. Hanson (Eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2007).

Williams, A., "Turning the Tide: Recognizing Climate Change Refugees in International Law", *Law & Policy*, Vol. 30, No. 4 (2008), pp. 502–529.

Wisner, B., Blaikie, P., Cannon, T., & Davis, I. *At Risk: Natural Hazards, People's Vulnerability and Disasters, Second Edition* (London: Routledge, 2005).

World Bank, *Resettlement and Development* (Washington, D.C.: World Bank Environment Department, 1994).

———, *Climate Risks and Adaptation in Asian Coastal Megacities: A Synthesis Report* (Washington, D.C.: World Bank, 2010).

World Resources Institute, "Climate Analysis Indicators Tool (CAIT): Data Per Country", 2011, http://cait.wri.org/ (accessed 23 April 2012).

World Wildlife Fund, *Mega-Stress for Mega-Cities: A Climate Vulnerability Ranking of Major Coastal Cities in Asia* (Gland, Switzerland: WWF International, 2008).

Yusof, A. A., & Francisco, H., *Hotspots! Mapping Climate Change Vulnerability in Southeast Asia* (Singapore: Economic and Environment Program for Southeast Asia, 2010).