

**It is Not Just the Climate That is Changing: Climate-Adaptive Development in Koh
Kong, Cambodia**

by

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Executive Summary

Developing countries must concurrently develop while also adapting to climate change; if not, the challenges of poverty alleviation are likely exacerbated. One response has been an emergence of literature emphasizing various approaches that address climate adaptation and development. There are approaches that focus on: climate-specific impacts, addressing underlying vulnerability of households or the resiliency of systems. Taken separately, these approaches have significant weaknesses, but a combined assessment of general and climate specific capacities at system and household scales, the adaptive development capacities framework, is promising. This framework is captured in a matrix that illustrates the presence of these capacities and thereby provides a basis for considering the relative importance and the interaction of climate-specific and general capacities at multiple scales. The framework has the potential to provide a nuanced, yet clear understanding of the extent that climate-adaptive development is occurring. This is important because there is a weak understanding of the interaction and relative importance of adaptive development capacities at multiple scales in developing countries. This thesis research sets out to operationalize the adaptive development framework (Eakin, Lemos and Nelson 2014) (when the research began, this framework had not yet been operationalized).

This qualitative research project addresses this gap by focusing on coastal Cambodia. Cambodia is actively pursuing economic development through a range of policies, including developing a series of Special Economic Zones. For example, my case focuses on a Special Economic Zone (SEZ) located near the Thai border (between the border and a secondary coastal city, known as Koh Kong town) that began employing thousands of workers in 2012. At the same-time, Cambodia has ambitious climate adaptation policies, that include a coastal focus. Since the climate-adaptation and development effects of the SEZ, specifically its employment, are unknown, this case provides a strong setting for testing the adaptive development capacities framework. In this way, the SEZ is a window into better understanding the presence and interaction of adaptive development capacities across household and system scales.

This thesis begins by introducing the research topic, research questions and adaptive development framework. The research methods are clearly detailed, before turning to an understanding of climate change within the context of broader environmental change in Koh Kong. Fisheries decline, coastal erosion and drinking water shortages are being driven by a series of drivers including off-shore fishing, sand-mining, mangrove loss, and urban growth in the coastal area, and these drivers are being exacerbated by the increasing effects of climate change in Koh Kong. Climate change risks include sea-level rise, increasing drought and more extreme and frequent storms.

Turning to the adaptive development capacity of systems, this research uncovered no climate-specific capacities in Koh Kong's industrial, urban and migration systems. Most problematically, the city is being developed without consideration of the climate change risks posed by sea-level rise and increased drought. This has already led to seasonal piped water shortages as the water demand pressures of factories, population growth, along with prolonged dry seasons, leads to insufficient water. The uneven quality of

urban systems, and the variation in climate exposure, means that the residential location of households contributes to varying degrees of household adaptive development capacity. Although these systems lack climate-specific capacity, there is a high level of development capacity in the industrial system due to relatively high and predictable wages and a good working environment in this particular SEZ, in comparison to elsewhere in Cambodia.

Linked to the strength of the SEZ as an employer, households – particularly those with females between 18-25 –are able to temporarily diversify or compliment their livelihoods from climate-exposed fisheries and farming towards the higher and more predictable wages of SEZ employment where there is minimal climate exposure. This means that although the Koh Kong's systems lack specific climate adaptive capacity, households are able to use their agency to move towards a greater degree of adaptive development. However, not all households are able to achieve the same degree of climate adaptive capacity, and the timing of such adaptive capacity is very specific (the SEZ only hires women between 18-25). While local fishing households are optimally placed to take advantage of the proximity of the SEZ and their surplus female labour, migrant farming households face the higher costs of migration and greater female labour opportunity costs. Looking within households, the very high rate of female employment at the SEZ means that adaptive development is uneven across households.

While the strengthening of household adaptive development capacity through time-sensitive SEZ employment is encouraging, in the long-term, the lack of adaptive capacity in Koh Kong's systems could significantly limit or undermine these gains. Of concern is the pressure that industrialization, urban growth and migration are placing on Koh Kong's urban water system, land-use practices and planning processes that are not able to address current environmental concerns, nor climate change risks. This creates the conditions for emerging vulnerabilities, and demonstrates the limits of household adaptive development capacity. These findings demonstrate the value of the adaptive development framework in articulating the forms and scales of capacity needed for adaptive development.

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Chapter 1: Introduction

The impacts of climate change are increasingly threatening the well-being of people and the poverty reduction successes and ambitions of developing countries. (Agrawal and Lemos 2015; Denton et al. 2014; Hallegatte et al. 2015). Without climate change adaptation, poverty will increase (Hallegatte et al. 2015). At the same time, adaptation alone is insufficient; poverty must concurrently be eradicated. Finding a way to successfully adapt and develop under climate change is a key challenge facing all developing countries, including in Southeast Asia where broader environmental change such as deforestation, fisheries decline and agricultural land degradation continues to occur simultaneously with climate change (Hijioka et al. 2014). Environmental change, including increasing climate risks, is partially a result of, and interacts with, rapid industrialization and urbanization. Therefore, development that is adaptive to environmental change, especially climate change, is increasingly important.

In response, governments are developing policies, climate-finance is mobilizing, and households are acting. However, our understanding of how adaptation and development can simultaneously be achieved is weak. This lack of understanding is problematic when considering countries such as Cambodia. Cambodia's poverty reduction success is fragile, with millions of people remaining poor (The World Bank 2014) and Cambodia faces high climate vulnerability (Yusuf, Francisco 2009) even as industrialization is a key driver of Cambodia's development (Hill and Menon 2014; The World Bank 2014). This combination makes achieving adaptive development imperative in Cambodia.

In climate-vulnerable coastal Cambodia's Koh Kong province, a Special Economic Zone (SEZ) was designed in 2006, but only in 2012 did large factories open. Built a couple of kilometers from the Thai border, the SEZ is designed to regionally integrate Thai and Cambodian economies, and to spur economic development in Cambodia's less industrialized provinces. The SEZ provides a window into how development is being done in the face of climate change, and if this form of development is climate-adaptive.

This research seeks to answer three research questions in order to assess adaptive development in Koh Kong:

1. How is the environment, including the climate, changing in Koh Kong? How is this change affecting Koh Kong's systems and households?
2. How are Koh Kong's systems changing and to what extent do these systems have general and climate-specific development capacities?
3. How are SEZ employed households differentiated within Koh Kong systems and to what extent do they have general and climate-specific development capacities?

Chapter Two focuses on the evolution of conceptualizing adaptation and development and the state of knowledge in the Cambodian context in terms of adaptation and development. This is followed by Chapter Three, a methodology chapter that describes

the qualitative research process. Chapter 4 is a 3-part chapter that presents the research findings, with Chapter 5 discussing the findings reaching some conclusions.

More specifically, part 1 of Chapter 4 examines how the environment, including the climate, is changing in Koh Kong; thereby providing the basis for assessing adaptive capacity to climate change. Changes to fisheries, coast-lines and to fresh-water resources are assessed. Part 2 (of Chapter 4) is an examination of three systems that enable three corresponding processes to occur. Eakin, Lemos and Nelson (2014) encourage researchers to use the adaptive development framework contextually and to be flexible in determining the boundaries of systems. The industrial system that enables industrialization and the SEZ is the starting point, or window, into considering if Koh Kong's development is climate-adaptive. The urban system that supports urbanization encompasses the broader systems that affect and have been affected by industrial development in Koh Kong. The migration system that exists to enable migration concerns the movement of people, which is an essential part of industrialization and urbanization. These three systems in Koh Kong are evolving processes that are interacting with one another and affect all interviewees.

Part 3 of Chapter 4 is an examination of how households have their own adaptive development capacities and have differentiated capacities even when they exist under the same systems. Four sets of capacity differentiation and areas of agency are analyzed: livelihoods, mobility, gender, and residence location. Livelihoods is selected because, although all research participants work or worked at the SEZ, they have migrated from, or they currently live within, households where the familial or parental livelihood is fishing or farming. Mobility is selected because of the prominence of migrants and multi-local livelihoods across all interviewees. Gender is selected because women make-up the majority of employees at the SEZ, while men are seldom employed. The location of residence is the final attribute analyzed because, although all employees live near or within the Koh Kong municipality, there are varying levels of adaptive development due to housing location.

Chapter 5 is a discussion and conclusion that summarize the findings using the adaptive development capacities framework that guided the research. Households and systems are mapped on to the heuristic matrix and conclusions are drawn about the state of adaptive development in Koh Kong. Following this, the value of the framework is reflected upon. Finally, the theoretical and practical implications of the findings are briefly presented.

Chapter 2: Literature Review

Climate Adaptation and Development

Climate change exacerbates poverty and threatens to reverse the poverty reduction success of developing countries (IPCC 2014; Hallegatte et al. 2015). The poor are already negatively affected by climate shocks and stresses such as floods, droughts and storms. Climate increases the intensity, frequency and changes the types of climate-related impacts, such as floods and droughts, on the ecological and socio-economic systems that poor households depend upon. This reduces food security, decreases human health, and increases losses to homes, assets and lives (IPCC 2014; Hallegatte et al. 2015). The uncertainty of climate change and the variety of development trajectories that may occur mean that it is difficult to assess to what extent climate change will impact poverty. Therefore, it is estimated that between 3 to 122 million people will become poor because of climate change, while poverty will deepen for many of those who are already poor (Hallegatte et al. 2015). It is clear though that to achieve poverty reduction under climate change, adaptation must occur.

Despite this clarity, the relationship between adaptation and development has been practiced and conceptualized in various, often competing, ways (Figure 1). McGray et al.'s (2007) review of adaptation projects pointed to a continuum of approaches with climate impact focused adaptation on one end, and underlying vulnerability focused adaptation on the other end. Climate impact approaches take adaptive action on specific climate change risks and do not consider wider vulnerability or pre-existing climatic variation as necessary for adaptation. This is the approach of most climate finance where the additionality of climate change risks is funding criteria (Ayers and Huq 2009; McGray et al. 2007). In a systematic review of the conceptualization of adaptation and development, Sherman et al. (2016) finds no literature supporting this stand-alone approach to adaptation. That review shows that adaptation and development are always conceptualized as distinct, yet integrated goals. Even so, this integrated approach can still take the form of impact-based adaptation through technocratic risk management (Chevallier 2010; Hoffmaister and Roman 2012). This manifests itself in practice as 'climate screening' and 'climate proofing' development from climate risks by taking measures to protect development from climate hazards. To do this, climate predictions are made and mitigative actions taken to existing development plans and projects. This is considered a 'mainstreaming minimum' (Ayers et al. 2014) or 'adaptation plus development' (Ayers and Dodman 2010; Sherman et al. 2016).

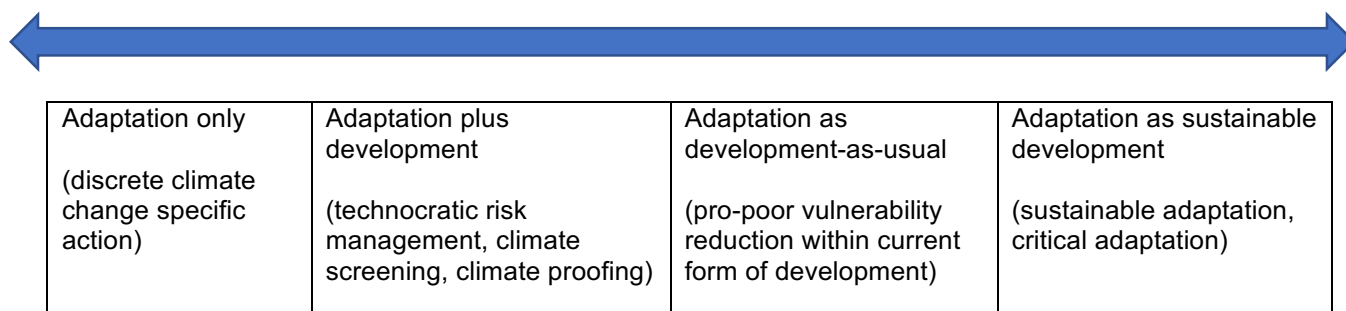


Figure 1: Adaptation and development continuum based on McGary et al. (2007) and Sherman et al. (2016).

The literature is highly critical of these impact-focused approaches to climate adaptation (Sherman et al. 2016). Pointing to the multi-dimensional socio-economic causes of climate vulnerability (IPCC 2014; Tucker et al. 2015; Räsänen et al. 2016) adaptation requires a focus on underlying vulnerability through improvements to general development. This is framed in two major ways: adaptation as ‘development-as-usual’ and adaptation as ‘sustainable development’.

Adaptation as ‘development-as-usual’ or ‘pro-poor vulnerability reduction’ views poverty reduction through current dominant forms of development as adequate and necessary for adaptation (Ayers and Dodman 2010; Lemos et al. 2013; Sherman et al. 2016). The basis of adaptation is through human, political economic development that increases incomes and shifts economies away from natural-resource livelihoods with high-climate exposure towards industrial activity (Bowen et al. 2013; Fankhauser and McDermott 2014; Hallegatte et al. 2015). This is the strategy of the ‘climate informed development’ approach of the World Bank which argues that pro-poor economic growth will substantially reduce vulnerability (Hallegatte et al. 2015). There is an emphasis on ‘no-regret’ adaptation that views the best way to adapt is by targeting existing adaptation deficits to normal climate variability (Shipper and Pelling 2006; Wilby and Dessai 2010). Evidently, this makes the line between adaptation and development difficult to define (Ayers and Huq 2013).

In response to the assumption that ‘development-as-usual’ can lead to sustained poverty reduction and long-term adaptation, the ‘sustainable adaptation’ approach argues that, to reach those goals, development must fundamentally change—it must become socially equitable and environmentally sustainable (Brown 2011; Eriksen et al. 2011; Sherman et al. 2016). Current development patterns can make people more vulnerable to climate change even while poverty is being reduced (Cannon and Müller-Mahn 2010; Rigg and Oven 2015). In the long term there is a risk of maladaptation where adaptation and development increase or fail to address climate risks (Brown 2011; Dilling et al. 2015), possibly leading to societal collapse (Brooks, Grist, and Brown 2009). Furthermore, for the root cause of climate change to be addressed mitigation is required. The goal is adaptation, development and mitigation—a ‘triple win’ or ‘climate compatible development’ (Mitchell and Maxwell 2010; Suckall, Stringer, and Tompkins 2015; Thornton and Comberti 2017). For these reasons, adaptation requires the

transformation, not the continuation, of current development processes (Pelling, O'Brien, and Matyas 2015).

Development and adaptation has been primarily conceptualized through vulnerability thinking. However, there is a concern that current conceptualizations do not take into account the system dynamics of the interaction of development and adaptation over temporal and spatial scales (Dilling et al. 2015; Tucker et al. 2015). Adaptation should engage with systems thinking so that it is understood as an iterative and emergent process and not a goal (Berbés-Blázquez et al. 2017; Dilling et al. 2015; Eriksen et al. 2011). This is critical because risk landscapes change as urbanization, migration and industrialization occur alongside adaptive actions. Furthermore, new risks can emerge from the feedback effects of adaptive actions themselves (Dilling et al. 2015; Tucker et al. 2015). This weakness of vulnerability approaches has contributed to the rise of climate resilience, including urban climate resilience.

Urban climate resilience research has proliferated (Meerow, Newell, and Stults 2016) and action is being taken, especially in Asia (Archer and Dodman 2015; Bahadur and Tanner 2014; R. Friend et al. 2014). Urban climate resilience is understood as a property of socio-ecological systems, which are complex adaptive systems (da Silva, Kernaghan, and Luque 2012; Tyler and Moench 2012). Urban households have relatively high dependence on systems than is the case in rural areas where there is greater dependence livelihoods (Friend and Thinphanga 2016). Urban climate change adaptation not applied from a systems perspective can actually harm climate change resilience because 'predict and prevent' and 'no regret' approaches fail to acknowledge the interaction of complex urban systems with climate change (Tyler and Moench 2012). Urban climate resilience powerfully articulates urban systems as complex, uncertain and evolving. However, there are also limitations to resilience approaches.

Resilience is a neutral, technical characteristic of a system. It is not normative. It is not pro-poor. Whose resilience to what is not specified. This is important because cities are not only complex systems, they are politically and socially contested systems whose normative direction is not self-evident (Archer and Dodman 2015; Bahadur and Tanner 2014; Shi et al. 2016). Therefore, resilience approaches need to integrate poverty reduction. If not, climate resilience can be achieved without any reductions to poverty, or even with an increase in poverty (Béné et al. 2014; da Silva, Kernaghan, and Luque 2012; Friend and Moench 2013). There is an increasing realization that there are tradeoffs between the resilience of systems and poverty reduction, and tradeoffs between people (Béné et al. 2014; Chelleri et al. 2015). Furthermore, when various policy approaches to climate resilience are contrasted, it is approaches that address poverty that have the greatest traction in the governments of developing countries (Dupuis and Knoepfel 2013). Yet, an overview of resilience measurement frameworks found that poverty is weakly accounted for in most frameworks (Lisa et al. 2015). Research should more closely analyze how the uneven distribution of existing development capacities affects urban resilience (Shi et al. 2016), because underlying vulnerability significantly affects climate resilience (Cannon and Müller-Mahn 2010; Friend and Moench 2013). For resilience to engage poverty and vulnerability, there

should be a greater assessment of households' agency via their autonomous adaptation and their livelihoods (Béné et al. 2014; Tanner et al. 2014).

Weaknesses in current conceptual approaches based on vulnerability and resilience, mean that adaptive capacity is being drawn upon (Eakin, Lemos, and Nelson 2014; Engle 2011; Lemos et al. 2013). Adaptive capacity is the ability of system or household to do adaptation—the “process of adjustment to actual or expected climate and its effects” (IPCC 2014, 5). Adaptive capacity influences the ultimate potential for successful adaptation. Both resilience and vulnerability include adaptive capacity in their theories, albeit in distinct ways. When most powerfully articulated and assessed adaptive capacity draws upon both resilience and vulnerability (Engle 2011). Resilience frameworks considers adaptive capacity to be a characteristic of social-ecological systems (Béné et al. 2014), and vulnerability frameworks considers adaptive capacity as one of its three components (the others are exposure and sensitivity). For resilience, adaptive capacity can be understood as the defining capacity of a system's ability to move towards a desirable state. For vulnerability, adaptive capacity is the human ability to modulate exposure and sensitivity. A vulnerability approach leads to actor-centric analysis of adaptive capacity in contrast to resilience which assesses processes, interactions and feedbacks at various temporal and spatial scales (Engle 2011).

Building off this conceptualization of adaptive capacity and the continuum of approaches to adaptation and development, Lemos et al. (2013) argue that there are two forms of capacity that contribute to adaptive capacity: climate-specific and generic. Although the conceptualization of adaptation and development has shifted towards generic capacities that address underlying vulnerability, approaches to adaptation and development are not mutually exclusive (Sherman et al. 2016). In fact, a combination of approaches is necessary (Eakin, Lemos, and Nelson 2014; Lemos et al. 2013).

Eakin, Lemos and Nelson (2014) nudge this thinking on adaptive capacity towards a development orientation by understanding 'generic capacity' not only as contributing to adaptation, but to development goals. They provide a 'capacities matrix' (Figure 2) that aids in visualizing the relationship between these two capacities that are required in order to achieve development and adaptation—termed 'adaptive development' or 'sustainable adaptation' (although it does not refer to Brown's (2011) understanding of 'sustainable adaptation'). The matrix has four quadrants that describe four adaptive development states that systems or households can be in. Although the ideal is 'sustainable adaptation', systems and people can end in 'poverty-traps' where low capacity to climate risks and low general development capacities re-enforce each other. A state of 'safety first', where climate resilience is high, but human development is low is possible, as is a 'safe development paradox' where development capacities are high, but the ability to address climate change risks are low (Eakin, Lemos, and Nelson 2014).

High generic capacity	'safe-development paradox'	'sustainable adaptation' (referred as 'adaptive development' elsewhere)
Low generic capacity	'poverty-trap'	'safety first'
	Low specific capacity: risk management	High specific capacity: risk management

Figure 2: Capacities Matrix for Adaptive Development (based on Eakin, Lemos and Nelson 2014).

Responding to the importance of adaptation at multiple scales (Adger, Arnell, and Tompkins 2005; Eriksen et al. 2011; Tucker et al. 2015), adaptive development capacities are differentiated between individual/household and system organizational levels of society (Eakin, Lemos, and Nelson 2014) (Figure 3). This framing allows for autonomous household adaptive capacity to be assessed against the adaptive capacity of systems that are beyond the direct influence of households.

	Individual/Household Level	System Level
Generic capacities		
Specific capacities		

Figure 3: Capacities across organizational levels (Eakin, Lemos and Nelson 2014)

While Cannon and Muller-Mahn (2010) first suggest 'adaptive development', and Eakin, Lemos and Nelson (2014) conceptualize it through 'adaptive capacities' and 'sustainable development', it is Agrawal and Lemos (2015) that most extensively describe and define 'adaptive development'. Adaptive development "aims to refocus both adaptation (by highlighting the importance of growth, equity and sustainability) and development (by emphasizing risk mitigation)" (Agrawal and Lemos 2015, 186). For adaptive development to occur, generic and climate-specific capacities at multiple scales must be deliberately and concurrently built (Eakin, Lemos, and Nelson 2014). The matrices enable an assessment of what differentiates development that is adaptive to climate change from other forms of development. Although the goal of adaptive development is conceptually clear, adaptation and development have not been well integrated, nor has 'adaptive development' been achieved (Sherman et al. 2016; Eakin, Lemos, and Nelson 2014). Only recently has the framework been empirically applied (Lemos et al. 2016). The presence, relative importance and interaction (synergies, negative feedbacks and trade-offs) of generic and climate-specific capacities at household and system scales is poorly understood and requires further empirical study (Agrawal and Lemos 2015; Ayers and Dodman 2010; Eakin, Lemos, and Nelson 2014; Lemos et al. 2013; Denton et al. 2014). Cambodia provides a strong setting for contributing to this adaptive development research gap.

Cambodia

Cambodia is ranked 143rd/188 countries on the Human Development Index and is considered a 'least developed country' (Jahan 2016). A fifth of Cambodians live below the national poverty line (The World Bank Group 2014), while a multi-dimensional poverty line considers 33% of the population in poverty (Oxford Poverty and Human Development Initiative 2015). Poverty has reduced from 53.2% in 2004 to 20.5% in 2011 (The World Bank Group 2014). The World Bank Group (2014) asked: "where did all the poor go?" and they found out "not very far!" (xvi); a \$0.30 reduction in income per day per person in Cambodia would double the poverty rate. One possible shock to these gains is climate change. Cambodia is ranked 13th in a global climate risk index (Kreft et al 2016). When vulnerability is considered, Cambodia scores 131st/180 countries, the second lowest ranking in Southeast Asia region (University of Notre Dame 2016). Relative to its neighbors, Cambodia's high vulnerability is not due to its exposure or sensitivity (its scores low on these metrics), but due to its low adaptive capacity (Yusuf, Francisco 2009).

In response to poverty and climate change, Cambodia has become one of the most ambitious countries in terms of policy for achieving development and adaptation (Bowen et al. 2013; Käkönen et al. 2014). The key climate change policy is the Cambodian Climate Change Strategic Plan (CCCSP) 2014-2023. A guiding principle of the CCCSP is to "ensure that national development priorities can be achieved under a changing climate" (Royal Government of Cambodia 2013, 3). The CCCSP argues that "response efforts to address climate change cannot be separated from economic development and poverty alleviation, which are vital in a transition towards...climate-resilient development" (Royal Government of Cambodia 2013 ii). This has influenced the National Strategic Development Plan (NSDP) 2014-2018 (Royal Government of Cambodia 2014), and it provides general strategic direction for the Sectoral Climate Change Strategic Plans (SCCSPs). Climate-finance backs these policy initiatives for mainstreaming adaptation into policy and planning, and supports specific climate adaptation projects, especially in rural and coastal areas (Am et al 2013).

Cambodia's adaptation policy is designed to strengthen development strategies; one of the most prominent being industrialization through Special Economic Zones (SEZs) (Royal Government of Cambodia 2015a, Warr and Menon 2015). SEZs are an increasingly common industrialization tool being applied by governments globally and within Cambodia. SEZs are specific areas within countries where business rules are more economically liberal and more administratively effective than outside the specific zone (Farole and Akinci 2011). In 2015 there were thirteen operational SEZs in Cambodia (Council for the Development of Cambodia 2017).

The social and economic impacts of SEZs are ambiguous and vary between countries and between SEZs within countries. China has successfully generated economic growth and reduced poverty through SEZs, which has led many countries, such as Cambodia, to adopt SEZs as a key industrial policy intervention (Farole and Akinci 2011; Moberg 2015). Elsewhere the impacts are negligible or negative. This is due to

the failure of SEZs to attract any firms, the relocation of firms within countries to SEZs or weak domestic economy linkages to the SEZs (Farole and Akinci 2011; Moberg 2015). Wages are typically higher in SEZ factories than in non-SEZ counterparts and employees typically increase their wages in comparison to their previous employment (Cirera, Lakshman, and Spratt 2013; Farole 2011). SEZ firms have a similar rate of unionization as non-SEZ firms (Cirera, Lakshman, and Spratt 2013). The evidence of SEZ success is less certain than the degree of SEZ implementation suggests (Farole and Akinci 2011). However, the Asian Development Bank sees Cambodian SEZs positively by pointing out the 68,000 jobs that otherwise would have not existed (Warr and Menon 2015). More broadly, industrialization is a key factor in the dramatic reduction of poverty in Cambodia (The World Bank Group 2014). In Cambodia, this has included 700,000 garment laborers (Deth and Bultmann 2016) that are 85% female (The World Bank Group 2014) which has made a significant contribution to poverty reduction by reducing urban poverty, providing minimum wage labour for rural households, and contributing remittances to rural households (The World Bank Group 2014).

One of the priority industrialization areas is Koh Kong Province where there is a SEZ with 7,200 employees across five firms: Camko Motor (Hyundai vehicles; South-Korean owned), MIKASA Sports (sports balls; Japanese owned), Yazaki Cambodia Products (automotive parts; Japanese owned), KKN Apparel (Adidas/Nike clothing; Taiwanese owned) and Hana Microelectronics Group (phone parts; Thai owned). The SEZ is the result of Cambodian industrial policy to de-centralize factory growth and the 'Thailand-plus one' strategy that firms took after the floods in Bangkok in 2011 to diversify away from Bangkok and to take advantage of Cambodia's lower wages (Kuroiwa 2016). Furthermore, the SEZ is strategically positioned on the Greater Mekong Sub-region corridor of economic development.

The SEZ is also located in climate vulnerable coastal Koh Kong (Ministry of Environment 2015), near to Koh Kong municipality and the Thai-Cambodia border. SEZs have been shown to be critical drivers of urbanization and the cause of emergent vulnerabilities for people (such as increased housing costs, flooding risks, water shortages) (Ortega, Aciego, and Hermida 2015). The most recent statistics show that Koh Kong municipality, although an urban area, is urbanizing slowly (0.9%) with a population of 26,737 people in 2011 (Ministry of Environment 2013). Drought has occurred in Koh Kong municipality (Lambert 2015), and the coastline is particularly vulnerable to climate change (Fuchs, Conran, and Louis 2011; Ministry of Environment 2015). The Climate Change Action Plan for the Ministry of Land Management, Urbanization and Construction states that Koh Kong is to develop a Master Plan that mainstreams climate change (Royal Government of Cambodia 2015).

Linking urbanization and industrialization is the migration of people from rural areas to factories in urban areas. Despite the migration of people to cities, urbanization rates are limited by the circularity of migration in Cambodia. In 2008, 3.5 million (26.5% of the population) Cambodians were internal migrants (Royal Government of Cambodia 2009), many of which return to their area of origin after working in cities or other rural areas

(Oudry, Pak, and Chea 2016; Parsons 2016, The World Bank Group 2014). This circular migration contributes to the high rate of multi-local households and livelihoods in Cambodia (Marschke 2016; Parsons 2016; Peou 2016). Although the development advantages of migration are viewed positively due to remittance and improved incomes (Rigg and Oven 2015; Tacoli 2009; Roth and Tiberti 2016), the climate adaptive impact of it is difficult to assess because climate change is one among multiple drivers of migration (Black et al. 2011; Sakdapolrak et al. 2016; Etzold and Mallick 2016). There are resilience costs to multi-local livelihoods (Bylander 2015; Rigg and Oven 2015;), but migration is increasingly viewed positively as an adaptive strategy for rural, climate-exposed households (Black et al. 2011; Etzold and Mallick 2016; Foresight 2011). However, there are concerns about emergent vulnerabilities in urban areas linked to migration (Foresight 2011, Schade et al. 2016).

Besides the recent focus on migration and adaptation in Cambodia (Bylander 2015, 2016; Oudry, Pak, and Chea 2016), research related to adaptive development has focused on governance in relation to health (Bowen et al. 2013), agriculture and water (Dany, Taplin, et al. 2016), policy narratives (Käkönen et al. 2014), and the gap between research and climate policy (Dany, Bajracharya, et al. 2016). Studies on a possible policy-practice mismatch are needed because there is little evidence that the mainstreaming of climate adaptation into policy is changing how development is practiced. Research on adaptation has occurred in rural areas (Sok and Yu 2015; Marschke and Berkes 2006), but only recently has there been a focus on climate change adaptation by assessing perceived self-efficacy for climate change adaptation in coastal Cambodia (Ung et al. 2015) and contrasting self-reported barriers to adaptation in urban and rural areas of Cambodia (Armah et al. 2017). Cambodia has limited research on adaptive development in practice, and no research on industrial development and adaptation specifically. The processes of migration of employees to the SEZ, the industrialization of the economy, and the urbanization of Koh Kong municipality, all within the context of climate change risks and a government that is pursuing adaptive development, means that Cambodia is a strong setting for applying the adaptive development framework.

Chapter 3: Research Methodology

This research applies qualitative methodologies to enable a descriptive, nuanced study of adaptive development, taking into account environmental change, households and industrial systems (i.e., water and waste management) in the context of SEZ development near a coastal secondary city. Semi-structured interviews are appropriate for addressing the complexity of climate change adaptation (Fisher et al. 2015). Semi-structured interviews allowed for insight into generic and climate-specific capacities across scales. In addition to conducting semi-structured interviews, newspaper articles, grey literature including policy documents and NGO reports, and maps related to climate change impacts and adaptation were reviewed.

This research was funded by, and contributes to, the Urban Climate Change Resilience in Southeast Asia (UCRSEA) Partnership project conducted in partnership with Canadian and Southeast Asian institutions. The UCRSEA project selected, among other cities in the region, two Cambodian cities as the focus of urban climate change adaptation research. This research was conducted in Koh Kong, Cambodia (map in Figure 4). Ethics approval was received from the Research Ethics Board of the University of Ottawa in August 2016.

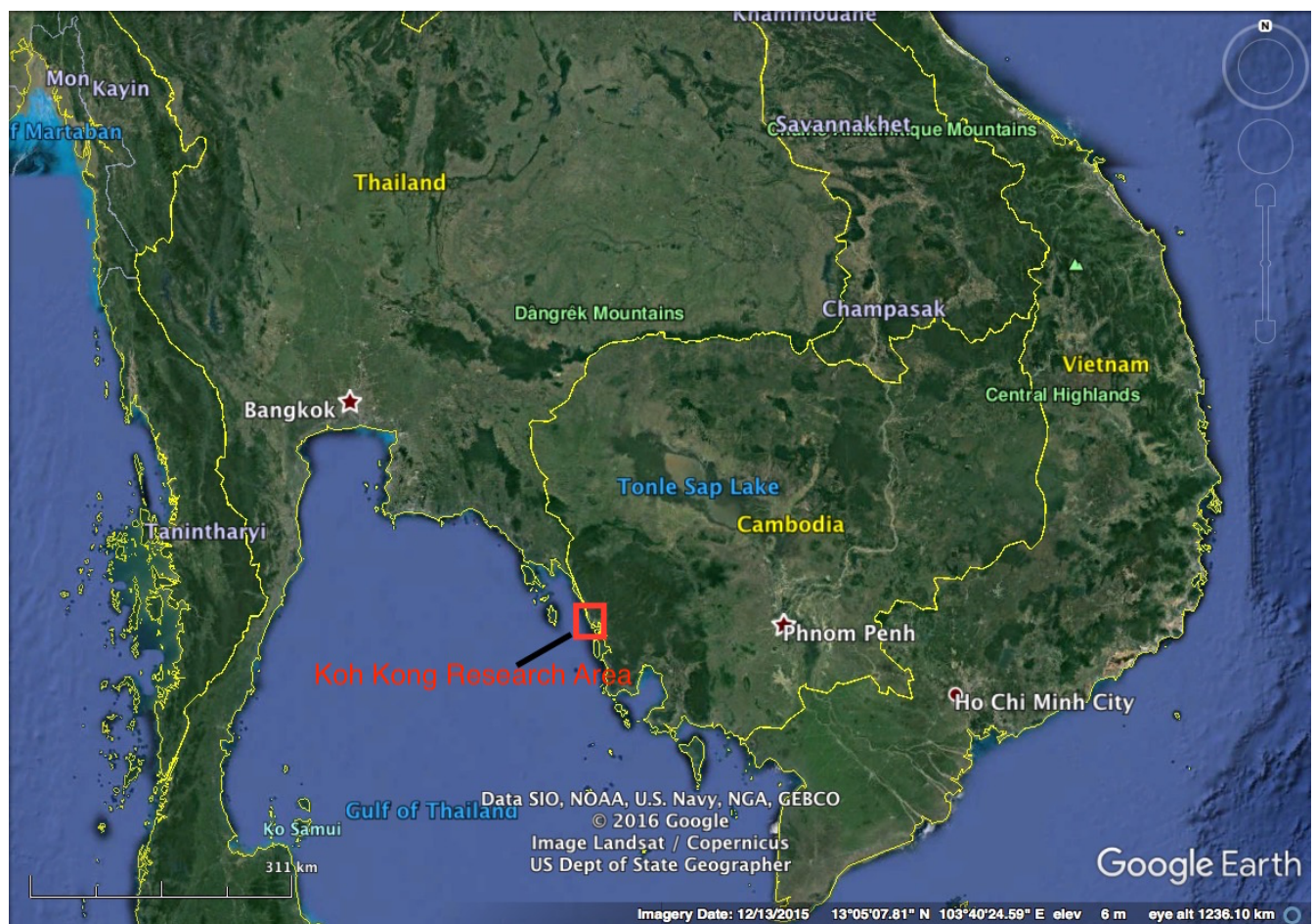


Figure 4: Cambodia with research area marked.

The semi-structured interviews are organized as: (a) interviews with current or former SEZ employees, and (b) interviews with key informants: government officials, SEZ managers and non-government organization staff. All interviews were transcribed immediately during the interview. In all SEZ employee interviews and in most government official interviews a translator's assistance was necessary. A translator was selected based on a recommendation of the thesis supervisor and a PhD student.

The questionnaires used in the interview were designed prior to the interviews. In the case of the key informants, the questionnaire was developed to suit the position and organization of the interviewee. In the case of the SEZ employees, the questionnaire (see Appendix B) was developed to understand their employment experience at the SEZ, various aspects of adaptive capacity, and the employee's interaction with various systems (governance, migration, urban).

A total of 35 current SEZ employees were interviewed over a three-month period in September to December 2016. Interviews averaged 40 minutes in length. Interviewee selection occurred through snow-ball sampling. The initial interviewee contacts were made by contacting SEZ employees that were previously interviewed by the thesis supervisor for other purposes. To increase the number and variety of contacts, a visit was made to employee housing located near the SEZ. If SEZ employees were interested their phone contact information was shared and they were called later to set-up an interview. There were additional efforts made to ensure that men were interviewed in sufficient numbers (a challenge given that approximately 90% of employees are female) so that the findings could be analyzed according to gender. The interviews were mostly conducted at the residence of the employee and in some cases in a public park.

To reflect a variety of experiences, SEZ employees living within 3 distinct geographic residential locations were targeted (see map in Figure 5). Since the research project is focused on climate change adaptation, the importance of differing geography and the unique relationship to urbanization and livelihood changes across the 3 areas gave analytical richness. The three residential areas are: Koh Kong municipality, Bak Khlang village, and the area within 2km of the SEZ. At least 10 interviews were conducted in each area. "Koh Kong" from this point forward (unless otherwise specified) refers not to the province nor the municipality, but to these three residential areas where interviews were conducted.



Figure 5: Koh Kong research area with three areas of focus, plus Koh Sralao, and Thai border marked

Due to importance of migration, the availability of time and the contacts that the thesis supervisor has in Koh Sralao, additional research was conducted with SEZ-employed households in the village of Koh Sralao. Koh Sralao is a 23 km boat ride from Koh Kong municipality. The research found only 8 households (out of approximately 300 households) with a child working at the SEZ and interviews were conducted with 7 of these households. Many of the interviews in Bak Khlang included responses from parents because they were nearby and wanted to, or at times could more accurately, answer questions. Furthermore, this research interviewed 4 former SEZ employees.

Category	Number
<i>SEZ employee interviews, by employment status:</i>	
Current employees	35
Former employees	4
<i>SEZ employees interviews, by gender:</i>	
Female	33
Male	6
<i>SEZ employees interviews, by village location:</i>	
Living in Koh Kong town, provincial capital in commuting distance to SEZ	14
Living in Bak Khleng, a fishing village in commuting distance to the SEZ	14
Living in 2 km radius of SEZ	11
<i>SEZ Family Member only interviews, by village location:</i>	
Living in Koh Sralao, a 45 minute boat ride from Koh Kong town	7
Living in 2 km radius of SEZ	1
Total SEZ employee & family member interviews:	47
<i>Key informant interview, by institution:</i>	
Government	8
Civil Society	2
Special Economic Zone manager	1
International organizations	3
Total Key Informant Interviews	14

Figure 6: Summary of SEZ Employee Interviews

Semi-structured interviews with key informants were conducted with 14 people through 10 interviews for approximately 1 hour between October 2016 and December 2016. A list of relevant key informants was created and interviews were requested by phone or e-mail. At least one official was interviewed from each of the following government ministry: the Ministry of Industry and Handicrafts, the Ministry of Environment and the Ministry of Land Management, Urbanization and Construction. A full list of the civil society, government and SEZ key informants is in Appendix A.

The interviews were transcribed and the data was analyzed through Nvivo software. First, the transcripts of each research participant were classified as “key informant” or “employee & family member” interviews. Employee and family members were assigned a set of attributes. These attributes included gender, residential location, familial livelihood and mobility. Secondly, the interview text was coded with nodes. These nodes are thematic and based on the analytical framework and the specific context of the research (see Appendix C for nodes and attributes used). Lastly, the nodes were analyzed, themes identified, and matrix coding conducted.

Chapter 4: Findings

The findings chapter is organized in three parts; one for each research question (Figure 7). These findings are guided by the adaptive development matrix that considers adaptive development at multiple scales. The first part inquires about environmental change in Koh Kong, with an emphasis on climate change. This section provides the setting, which enables an understanding of what adaptation needs to be built for. The second part, examines three systems, and their adaptive development capacities. During the course of interviews and subsequent analysis, these systems emerged as three of the most relevant systems for this research to focus on. Lastly, the third part, assesses the adaptive development capacity of households, and how that capacity is differentiated. These areas of capacity at the household level emerged in the data analysis as the most relevant and insightful aspects of adaptive development at the household level.

PART 1: Environmental and Climate Change <u>Question:</u> How is the environment, including the climate, changing in Koh Kong? How is this change affecting Koh Kong's systems and households? a. Fisheries b. Coastline & Mangroves c. Drought & Flooding		
General development capacities	PART 2: System Level <u>Question:</u> Are Koh Kong's systems changing and to what extent do these systems have general and climate-specific development capacities? a. Industrial System: Infrastructure & Employee Policy/Practice b. Urban System: Water Supply, Housing & Flooding, Urban Planning & Flooding c. Migration System: Housing & Land, Governance	PART 3: Household Level <u>Question:</u> How are SEZ employed households differentiated within Koh Kong systems and to what extent do they have general and climate-specific development capacities? a. Livelihoods (Fisheries and Agriculture): Drivers, SEZ Strategy, Outcomes b. Mobility (Local and Migrants): Drivers, Outcomes c. Gender: Women, Men d. Housing Location: Koh Kong Municipality, Bak Khlang and SEZ Area
Climate-specific capacities		

Figure 7: Findings Outline

Findings Part 1: Environmental and Climate Change

The three aspects of the environment that the people and systems of Koh Kong interacted with the most significantly are: fisheries, the coastline, and drought and flood. Peoples' experiences of environmental and climate change are presented alongside some findings that the literature contains.

Fisheries

Fisheries decline in Koh Kong is consistently experienced by households in Koh Kong, many of which are fishers who depend on it as a primary livelihood activity. The saltwater fisheries occur in mangroves where clams are collected, and in open water where fish and crabs are caught. Most households keep some of the catch for personal consumption, while the remainder is sold to varying extents depending on the socio-economic status of the household. There has been a degradation of the fisheries ecosystem due to multiple causes. The literature is clear that there are socio-economic pressures, such as over-fishing and pollution, and climate change impacts, that interact with each other, that are leading to declining fisheries globally (Osterblom et al. 2017, Portner et al. 2014). Climate change affects ocean currents, acidification and temperatures that in turn will impact fisheries (Béné et al. 2016; Portner et al. 2014). There is limited evidence on climate change already altering fisheries, although impacts are beginning to emerge (Portner et al. 2014; Savo, Morton, and Lepofsky 2017). Fisheries in tropical areas are expected to decline due to climate change (Portner et al. 2014), with Cambodia of particular concern due to its high dependence on fisheries and current vulnerability due to over-exploitation of stocks (Barange et al. 2014). The literature is clear that on-going declines are attributable to a variety of human actions with climate change playing an increasingly damaging influence on fisheries in the tropics in the future.

This is consistent with interviewed households that attributed declining fisheries to over-fishing and sand-mining, with minimal attribution to climatic change. When climate change is considered a driver of change it is related to warming ocean temperatures. Crab populations are specifically pointed-out as declining due to increasingly warm ocean temperatures. Likewise, key informants in the Ministry in the Environment argue that warming ocean temperatures are damaging the ability of fish and crabs to successfully spawn.

Most households in Koh Kong attribute the decline in the marine environment to over-fishing (and illegal fishing), and sand-mining. In Bak Khlang, large fishing boats from Thailand are considered the cause of declining fisheries, including crabs. Based on 20 years of fishing, a father of an employee described how the ocean around Bak Khlang has changed. He said that:

“I have been a fisherman for 20 years. This year, the crab substantially declined. The government let the Thai boat, the big boat with modern fishing equipment. That is what destroys the crab” (Employee 27’s father).

In nearly all cases over-fishing is blamed on large Thai boats and their modern fishing equipment, with some households noting the increasing numbers of local fishers as the problem. The emphasis on Thai boats means that households see the Cambodian government as allowing the fisheries to decline.

Sand dredging is often cited as a reason for declining fisheries. This is especially the case in the area near Koh Sralao where, without hesitation, all households claimed that sand dredging is the cause of the deteriorating fisheries. Sand dredging has been on-going since 2006 in the Koh Kong area, although there is an indication that it has slowed-down recently. Sand dredging in Koh Sralao demonstrates that industrial activity, referred to as ‘development’ by some, can dramatically harm fisheries. Fishers in Koh Sralao did not cite climatic change as a reason for fisheries change.

Households in Koh Kong presented climate change as a marginal or irrelevant influence on declining marine ecosystem quality. However, in one case, a young employee from Bak Khlang argued that climate change is only one pressure among others impacting the ocean. She articulated a multiple-stressor change occurring in the ecosystem around her home:

“The sea natural resources are declining. If I compare [fishing now] to other years, it is declining. It is because of the sand dredging companies. They destroy the house for the crabs and for the fish. Some problems are caused by climate change. Like the water. The heat is too hot for the crab to lay its eggs” (Employee 8).

This perspective is in-line with a Ministry of Environment official who argued that declining fisheries in Koh Kong are due to a combination of sand dredging, over-fishing and climate change.

The overall effect of this is reduced income for fisheries households, except for the wealthiest who invest in large boats, better equipment and more labour. For those, their situation is seen to be stable or improving. A father in Koh Sralao explained the impact on his family’s life:

“The situation of the fishing now, it is difficult to earn income to support the family. The crab and fish is declining. It is because of the sand dredging and they let the big boat with modern equipment destroy the sea products. I can earn 1-2 kg a day, compared to 5-6 yrs ago, it was 10 kg per day” (Family Member 2).

Although the price of crab has tripled, the larger comparative drop in catches, means that fisheries income has declined from \$5-8 a day down to \$3-4 for households with a relatively small boat. Reduced fish and crab populations are being attributed most

strongly to over-fishing (including illegal fishing) and sand-mining, with some linkages to climate change by locals. However, the decline of fisheries, no matter the cause, is reflective of the conditions that climate change will likely have on Koh Kong in the future. Therefore it provides an appropriate case for assessing adaptive development capacities.

Coastline

The Koh Kong coastline, with its mangroves and estuaries, is changing—although the causes of that change is uncertain and its effects varied. Mangroves have a history of change in the area, but households attribute that change to the direct action taken by locals as opposed to climate change. In the 1990s mangroves were severely damaged by charcoal production, but due to the actions of local households and the government, mangroves have been restored in many areas. Currently mangrove loss is clearest in Bak Khlang and in some areas in Koh Kong municipality. In Bak Khlang mangrove loss is driven by people cutting down the mangrove for construction material in the absence of legal enforcement. Some mangrove loss is reported in Koh Sralao due to people from outside of the village cutting down trees, but also coastal erosion. It is claimed that sand-mining leads to the collapse of mangrove trees by undermining the sea-floor.

Mangrove loss impacts the livelihoods of fishers and their houses. Mangroves are described as the “house” of clams, fish and crabs, leading to the loss of fishery catches and associated income. Furthermore, mangrove loss has made homes in Bak Khlang less safe. For one resident in Bak Khlang, the interaction of mangrove loss and changes in the climate were observed:

“It [the environment] changed in Bak Khlang. There were a lot of trees here, and the rain was regular and no storm. They cut down all the tress, and the weather changed. Now, the rain is very very heavy. The speed of the wind is too strong....The reason is because of the destroyed mangrove.” (Employee 21)

Beyond the impact on houses, and livelihoods, mangrove loss leads to the erosion of land. However, the extent that coastal erosion is due to mangrove loss is contested. Coastal erosion has occurred on the only road connecting the SEZ and Koh Kong municipality to Bak Khlang. The shoreline has been eroded by over 100 meters, requiring the road to be rerouted (Ministry of Environment 2016). The Department of Public Works and Transport built a stone masonry wall along 638 meters of the shore. Additionally, local businesses have constructed a further 150 meters of a wood wall. Despite claims in a climate resilience project report (Ministry of Environment 2016) that the wall is a best practice in climate change adaptation, the wall is crumbling and erosion continues. The inclusion of this wall as a case of climate change adaptation in this report suggests that sea-level rise or climate-related changes to storm and wind patterns is the cause. However, satellite imagery (Figure 8, 9), along with the accounts of people in Bak Khlang, show that extensive mangrove loss has occurred along the road over the past 16 years.

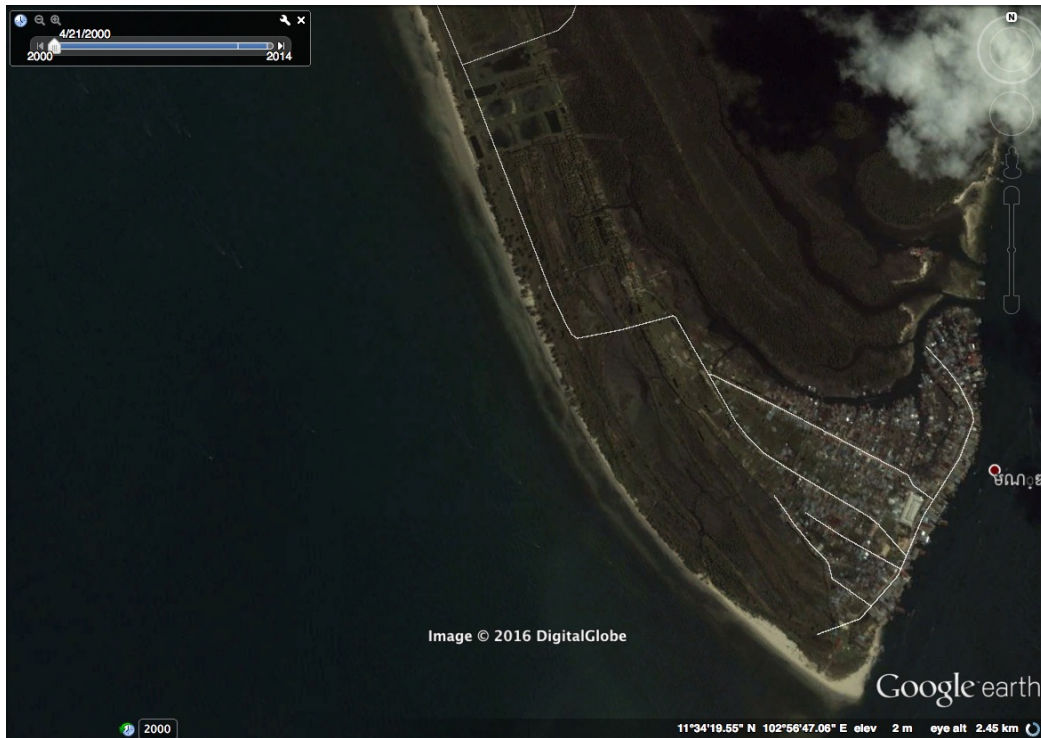


Figure 8: Image taken in April 2000



Figure 9: Image taken January 2017



Figure 10: Sea-wall along road to Bak Khlang

Sea-level rise will seriously impact Koh Kong as the sea-level is expected to rise by 10cm by 2025 and 40 to 60cm by 2100 (PPCR 2014). A 1 meter rise in sea-level will permanently flood 44km² of Koh Kong Province (PPCR 2014), including 30.8 hectares of homes in Bak Khlang commune (Ministry of Environment 2015) and 56% of Koh Kong municipality (PPCR 2014) (Figure 10). Flooding associated with sea-level rise or storm surges is at greatest risk during November when the highest tides occur. Given the time-scales involved, and the multiple-drivers of coastal change, it is understandable that sea-level rise is not observed by households. The concern about sea-level rise associated with climate change was only voiced by key informants. An official from the Ministry of Land Management, Urban Planning and Construction argued that sea-level rise is not yet a problem, but it will become a challenge for Koh Kong municipality. The larger concern in rural Koh Kong province, less so in the research area itself, is salt-water intrusion into agricultural land. For these reasons, a climate change project implementer argued that sea-level rise is the primary climate change concern in Koh Kong province. Although sea-level rise is a major climate risk facing Koh Kong, for now, the major coastline change is the loss of mangroves and associated erosion of the shoreline.

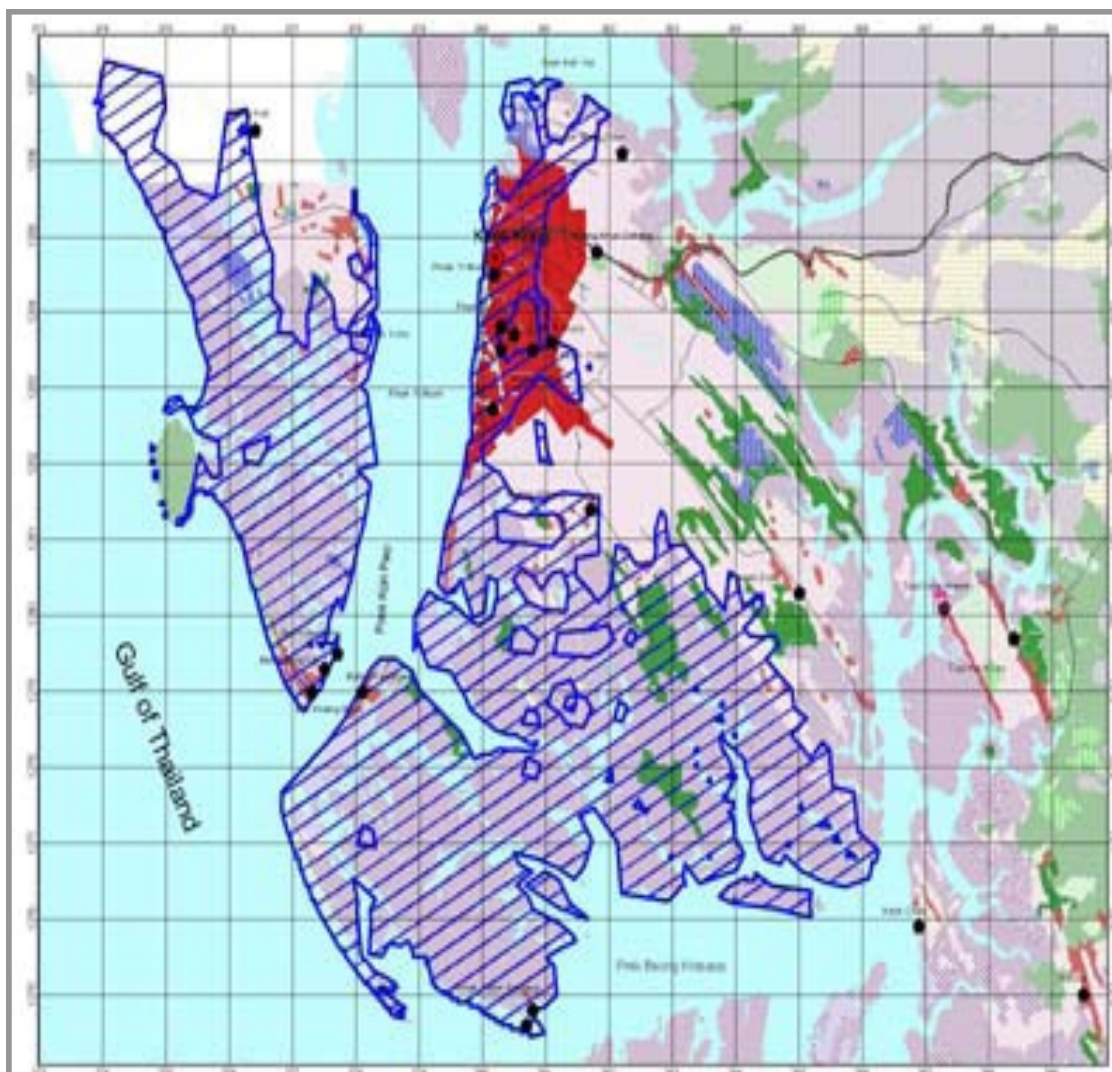


Figure 10: A map showing the effect of 1-meter sea-level rise on Koh Kong. Blue lined area is future sea-level rise. Red is settlement areas. (Ministry of Environment 2009)

Drought & Floods

Temperatures in Cambodia have risen by 0.8C since 1960, with a projected increase of up to 4.3C by 2090 (Thoeun 2015), along with an increased likelihood of heatwaves (PPCR 2014). Although rainfall patterns have not changed in Cambodia (Thoeun 2015), it is anticipated that there will be increased numbers of long-term droughts (PPCR 2014). Combined with increased evaporation rates due to temperature changes, drought is expected to have the most significant impact on Koh Kong in the next 20 years (PPCR 2014). Greater tidal and storm extremes are likely to cause floods (PPCR 2014). Increased storms and increased drought conditions have been observed by Koh Kong residents (PPCR 2014) and are reflected in interviews.

People in Koh Kong are widely in agreement that rain-fall has changed. Rain-fall is less predictable and the dry season has been abnormally long as the start of the rainy

season is often being delayed from April to July. The unpredictability of rain-fall was noted by employees who, when asked about changes, responded:

“Yes, of course [there are changes]...before, five to ten years ago, there was regular rain and storms. Before you could guess if the month would have rain” (Employee 25).

The lack of predictability and increased intensity of storms is a re-occurring theme. An employee in Koh Kong described:

“Now there are more storms, they are irregular storms. When I was young, this month has a storm. For now, you can’t predict it. Recently, it is very strong. It can take your roof. Before, it was strong, but it wasn’t so strong” (Employee 8).

This change in rain-fall has led to re-occurring droughts in Koh Kong that have severely affected the water supply system. Many, although not all, people in Koh Kong reported water shortages between April and July 2016. Drought contributed to water shortages in 2013 and in 2014 as well. These water cuts occurred 4-5 times a month, and often lasted for one or two days. However, there were also times when the water was cut for a week at a time. Households described the effect of the water shortage as inconvenient, but not disruptive or very costly. These re-current droughts and their impact on water supply is the reason that key informants in the government consistently named drought as the most urgent environmental concern in Koh Kong. The cause of water shortages is not only being attributed to changes in rainfall, but to the increased water demand of the SEZ and population growth. It is not a coincidence that urban activity and reduced access to water occurred at the same time. This relationship will be further explored in Part 2 on systems.

Changes to rain-fall and run-off have not led to severe flooding, although the risk is there in the future. In Koh Kong, flooding can happen in three ways: sea-level rise, an overflowing river and localized rain-fall the exceeds the ability of the water drainage system. Flooding is occasionally reported in Koh Kong when there is minor flooding in after heavy rain-fall. The market in Koh Kong was reportedly flooded in the previous year, yet only one person said this. As of now, flooding in Koh Kong is brief and not severe, although on-going coastal development and climate change risks mean that vulnerability to flooding is dynamic.

Conclusions

The decline of fisheries and increased drought are two of the most problematic ecosystem changes in Koh Kong. Marine resource change, driven by a combination of over-fishing, sand-mining and climate change, is leading to decreasingly productive fisheries for households. This significantly impacts Koh Kong because fishing is the single most common livelihood activity for households in Koh Kong. Drought has repeatedly impacted the piped water supply system in Koh Kong, and thereby, negatively affects all those who depend on it. As of now, household are more harmed

by fisheries decline than drought. Both the water shortage and the decline in marine resources are driven by multiple factors, of which climate change is only one. The uncertainty around the extent that climate change is influencing these changes does not take away from the ability of these environmental shocks and stresses to represent the type of impacts that development needs be adaptive to when climate change increases.

Findings Part 2: Systems

Industrial System

The industrial system, and the process of industrialization, is the starting point for understanding adaptive development in Koh Kong. Prior to the arrival of manufacturing firms to the Koh Kong SEZ, there was no significant low-wage industrial employment in Koh Kong. In 2006, the Koh Kong SEZ was established on 336 hectares on land between Koh Kong municipality and the Thailand-Cambodia border. The SEZ is owned by the LYP group whose politically influential president, Ly Yong Phat, is a billionaire Cambodian businessman and a Senator for the Cambodia People's Party. The first factory to open in the SEZ was Camko in 2008, where there are 30 employees currently building car parts for Hyundai. KKN and Yazaki opened their factories in 2012. KKN manufactures sportswear and currently employees 4000 people. Yazaki manufactures car wiring and currently employees 3000 people. In 2013, Mikasa, a sports ball manufacturer, opened a factory and employs 100 people. Lastly, Hana, a micro-electronics manufacturer, arrived in 2015 and has 70 employees. This means that there are 5 firms that employ approximately 7200 employees. KKN is currently constructing a new factory, and they will be hiring 1000-2000 new employees when it becomes operational. Koh Kong, in the span of 4 years, has gone from 30 to over 7000 manufacturing jobs.

Industrial System: Infrastructure

The industrialization of Koh Kong is a part of the larger Cambodia industrial system. The development of SEZs in border regions, like Koh Kong, is logistically strategic and contributes to de-centralizing economic growth away from Phnom Penh. However, the success of the SEZ is disputed. The SEZ management itself doesn't view the SEZ as attracting the expected number of factories. SEZ management team said that "yes, we have been successful, but not much. Because we start in 2006 and until now, 10 years already, we have just 5 companies" (Key Informant 6). Most of the SEZ land remains available for lease, while another SEZ a few kilometers away has been formally established, but there has been no progress made beyond its approval. The success of the SEZ is the industrial jobs that it provides where there were previously none. Therefore, government officials expressed unequivocal enthusiasm for the changes that the SEZ has brought. One government official explained that:

"the reason for the SEZ was that the government wanted to improve the economy of Koh Kong. Before the zone, the town was quiet. People had no job. Now days, men and women, all of them work there. It reduced the unemployment" (Key Informant 7).

The industrial system, although it is creating jobs in Koh Kong, it is not catalyzing additional industrial activity in Koh Kong. All factory supplies are imported from Thailand. SEZ and government officials argue that the broader economic benefits of the SEZ are the construction and ownership of employee residences. Furthermore, the

economic stimulus of increased wages and an increased population is also noted. The SEZ de-centralizes industrial development in Cambodia even if the extent of its success is not as great or as quickly achieved as expected.

Regional integration is also driving SEZ development in Koh Kong with the SEZ 3 kilometers from the Thailand-Cambodia border. The relatively low-wages of Cambodia provide an incentive for firms to operate in Cambodia, often producing components of a larger product. Another incentive listed in the SEZ promotion booklet is that “we are free from natural disaster.” This SEZ marketing is targeted at firms in Thailand that were affected by the Bangkok floods in 2011. The SEZ management confirmed that these floods were a reason that factories are re-locating to Koh Kong; adding that “we told them that we don’t have floods here” (Key Informant 6). As of now, that statement is correct.

The SEZ is situated at approximately 9 meters above sea-level, with the back of the SEZ (currently vacant) bordering a mangrove area (according to satellite images). An environmental impact assessment was conducted when the SEZ was established, and government officials stated that there were no environmental issues that were unmitigated. Government officials are impressed by the waste management system of the SEZ that sees the chemical waste trucked out of Koh Kong by a private company. Although there are no current environmental or climate concerns affecting the SEZ, the future is less certain, as is the ability of the SEZ to adapt. The effect of sea-level rise is difficult to assess without a specific assessment of that risk. Sea-level rise maps for the area show potential impacts near the SEZ. Additionally, an expanded SEZ would increase water demands in what is an already stressed water system in Koh Kong. Although it appears that the SEZ is unaffected by climate change, the urbanization system analysis will demonstrate otherwise when the dynamics of urbanization, especially the water system, are considered.

Industrial System: Employee Policy & Practice

Beyond infrastructure, SEZ employee policies and practices have adaptive development implications. Interviews revealed six areas of policy and practice to consider: wages, the work environment, contracts, unions, skills development and benefits.

The SEZ pays wages that are governed by the labour law that sets a minimum wage for manufacturing. The first minimum wage was set in 1997, shortly after the first non-government union was established, and has since increased 8 times. These findings were collected before the most recent increase in the minimum wage. The minimum wage in 2016 was \$140 USD per month before over-time hours are considered. When allowances are included, the total wage rises to \$157 USD. While manufacturing has a minimum wage, other economic sectors, such as restaurants and construction, do not.

The factories at the Koh Kong SEZ follow the minimum wage law. Nearly all employees reported working over-time frequently, and therefore their wages are reported as being higher than the minimum wage. Generally, employees earn between \$210 USD and

\$250 USD a month. Lower wages, that are still in-line with the labour law, are paid by Hana because of the lack of over-time labour. Minimum wages have risen over time in Cambodia. Employees with previous factory employment outside of the SEZ reported considerably lower wages. Factories in Phnom Penh and Sihanoukville paid their employees \$130 USD including overtime within the past few years. SEZ employees who did not work in another factory often heard about higher wages in Koh Kong and choose Koh Kong for that reason. It is difficult to verify and be certain of the cause of these wage discrepancies. Although wages have increased over time and the details of the labour law would require closer scrutiny, the wage gap between the Koh Kong SEZ and other factories in Cambodia points towards varying degrees of compliance to wage laws in Cambodia. The SEZ is revealed as a positive outlier throughout these interviews. The Koh Kong SEZ management agrees with this assessment arguing that “when Yazaki came, the standard went up, and that is why all of the factories are better” (Key Informant 6). Yazaki is Japanese owned, and a union leader in Cambodia stated that, broadly speaking, Japanese factories follow the law while other factories are less likely to do so. A government official said that the financial incentives offered to the companies allowed employees to be paid more than elsewhere in Cambodia. However, the factories are simply following the law and paying the minimum wage. It is interesting to note that employees state that a fair wage would be between \$250 USD and \$300 USD.

The second area of industrial practice is the working environment. Overall, employees are satisfied with the physical work environment of the factories. The job is viewed as easy—easy when it is compared against the physically demanding work of farming and clam collecting. Likewise, the cleanliness of the factory is a consistent observation by employees. An employee explained that:

“The working condition is good. There is a place for fresh wind, some buildings have air-con. There are bathrooms and everything clean. It is better than Phnom Penh. I used to work in Phnom Penh for two months. I worked across from the national airport. There was no fresh air there. The buildings, there were not enough windows. There was a no sanitation with the food, just dirty food from the street” (Employee 8).

It became apparent that the SEZ is abnormally clean for a Cambodian factory. Additionally, the uniforms are a source of pride and dignity as workers want to be seen wearing their uniforms. Another positive for employees at Yazaki is the free rice they receive for their meals, although they have pay for side dishes. However, SEZ work is also described by some employees as restrictive and boring. Working 10 hour shifts, sometimes at night, for six days a week made some exhausted and led them to desire to leave. Nearly every employee reports working over-time regularly, but typically not every day. Most employees said that they are not forced to work over-time, but some employees said they are forced to when productivity targets require it. Being able to take a day-off due to sickness is also difficult for some employees. Employees most frequently complain about the language that superiors use to blame and place pressure on them. Employees described others losing their jobs when they did not obey.

The third industrial policy and practice is employee contracts. The use of contracts between the employers and employees is mandated by law, but a source of confusion between the SEZ and its employees. The SEZ management stated that all employees sign contracts. Meanwhile, every employee, except one, denied signing a contract. The one employee that had signed a contract started working in 2012 when the factory opened. She received a contract at the time, but said that contracts are no longer used. This causes problems when employees are supposed to gain seniority bonuses. Rather than a contract, people are told that if they worked well they can work for a long time. However, employees do not fear that their employment will suddenly be terminated. There are no disruptions in employment. SEZ employment is reliable.

The fourth industrial policy and practice are unions. After contradictory accounts of the presence and function of a union at the SEZ, it is evident that there are no unions. Many workers don't know of a union. At the same time, there are a significant number of employees that describe a union where employees became representatives for workers' problems to the employer. What these employees are describing is an internal complaints system set-up by the employer. Nevertheless, no employees reported using this complaint system. The SEZ management was emphatic in their denial of, and pleasure in, not having a union at the SEZ. Their reason for no unions being present at the SEZ is their long distance from Phnom Penh and Sihanoukville where unions are prolific, although not universal. A Cambodian union representative (not working at the SEZ) argued that SEZs have higher security measures that make it more difficult for unions to form.

The fifth industrial practice is skills development. Skills development at the SEZ is limited to learning the specific skill that garment or wire manufacturing requires. People see limited value in these skills beyond the SEZ employment as they are not transferable to fishing, farming or towards business.

The final policy and practice is employee benefits. There are several benefits for employees. First, every employee receives a bank account when they begin working at the SEZ that is used to pay employees. For nearly all employees this is their first bank account. Some employees see little benefit of a bank account, while others express the advantages of easily saving money. Second, their workplace health insurance covers the health costs incurred due to work, such as fainting. There are medical staff and a pharmacy in the SEZ that provides services at no cost to employees. Some employees described coverage for non-workplace and child health issues. Third, there is no child-care provided for the children of employees. A union representative in Cambodia explained that the law stipulates that child-care be provided at factories. The SEZ management admits that child-care is law, but that it is not implemented at the SEZ. All children of employees remained with family members during the day. For some employees, their children remained with family members in another province of Cambodia. For several hundred Yazaki employees, they live in housing provided to employees at no cost.

Policy & Practice Area	Finding
Wages	Follows minimum wage law. Relative to Cambodian counterparts, the Koh Kong SEZ pays higher wages.
Work Environment	Relatively easier than farming and fishing, but exhausting for some. Relatively clean and safe compared to other factories. Most common complaint is verbal treatment by supervisors.
Contracts	SEZ says contracts are used, but employees disagree.
Unions	No unions. Only an internal complaints system.
Skills Development	Limited to sewing and basic manual labour.
Benefits	Bank accounts, health care provided for employment related issues. No child-care despite the law.

Figure 11: Summary of Industrial Employee Policies and Practice

Industrial System: Conclusions

The industrial system has changed dramatically in Koh Kong with the de-centralization of Cambodian industrialization and regional integration driving the creation of the Koh Kong SEZ. Although the SEZ has not created spin-off industries or been fully developed, Koh Kong industrial system has 5 factories providing employment for 7200 people. From the perspective of employee policy and practice, the SEZ is a case of positive deviance in the industrial system of Cambodia with its improved wages and work conditions, even if there remains a need to improve unions, benefits and contracts. The climate-exposure of the SEZ infrastructure appears low, but there are unknowns. The current factories are well-situated on a raised area above the ocean and mangroves, but given it is likely that urbanization intensifies around the SEZ, and with climate risks present, there is no indication of a capacity to adapt to this evolving climate vulnerability landscape.

Urban System

Koh Kong is designated as an urban area (a municipality), but by regional or national standards it resembles a town more than a city. It is representative of the many provincial capitals in Cambodia where 20,000-30,000 people reside in an economy built on government services and small business. However, for Koh Kong municipality there is a nearby SEZ that has recently increased the population and changed its economic character. Krong Khemarak Phoumin is the official name of the municipality (which also makes it a district), that is commonly referred to simply as Koh Kong (here it is specified as Koh Kong municipality). The municipality is made up of 3 communes: Smach Mean Chey, Stueng Veng, and Dang Tong which cover an area many times larger than the actual settlement area of the municipality (see Figure 4). The area is made up of significant mangroves, rice fields, forested mountains as well as a part of Peam Krasob Wildlife Sanctuary. The settled area of the municipality is within a few meters of high-

tide. Importantly, the city limits exclude the SEZ that is in neighboring Mondul Seima district where Bak Khlang village is also located.



Figure 4: The administrative boundaries of Koh Kong municipality.

Koh Kong municipality is insufficient when considering urbanization for two reasons. First, population growth and industrialization are occurring outside the municipal boundary as much as inside of it. In fact, the SEZ area has transformed the most in the past 4 years, yet it is outside of the municipality. Second, a distinguishing feature of urban areas is a greater dependency on physical infrastructure systems than rural areas, yet both areas inside and outside of the municipality show a strong degree of dependence on natural resource livelihoods, and both areas depend on shared urban infrastructure systems such as the piped water system.

With this understanding of urban boundaries in Koh Kong, urbanization is occurring, albeit below expectations. This is partially because the SEZ has not been fully developed and firms have mostly hired local employees. With 70% of SEZ employees coming from within Koh Kong Province, most of which are from an area within 10km from the SEZ, there has not been strong population growth. The population has grown mostly because of migrants who stay for 1-2 years (on average) in Koh Kong before leaving. Therefore, new rental housing has been built and new businesses have opened, but migrants are not investing in land or housing themselves. Hence, urbanization is slow (Figure 12, 13, 14).

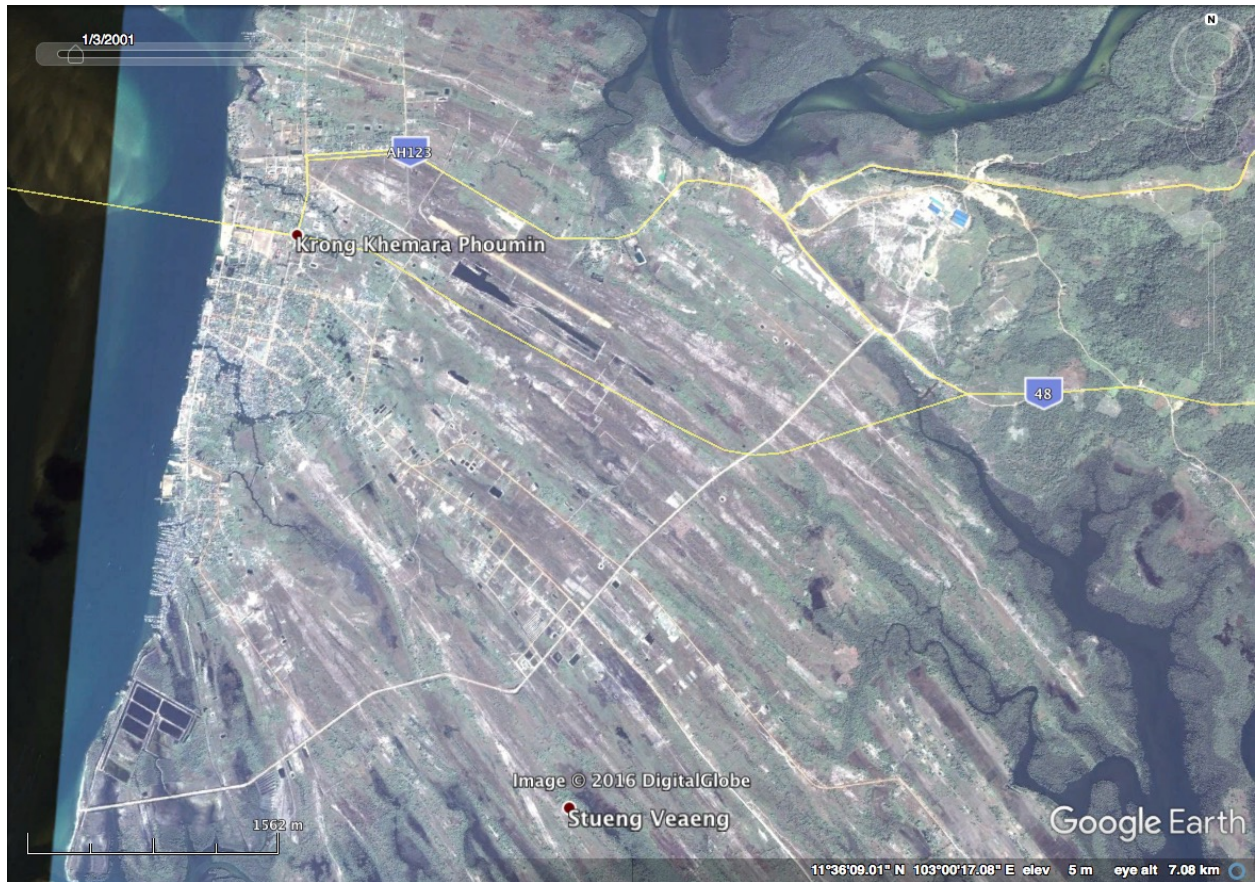


Figure 12: Koh Kong Municipality in January 2001.



Figure 12: Koh Kong Municipality in December 2012. (Time of SEZ factories opening.)



Figure 13: Koh Kong Municipality on January 2017. Annotated with: new reservoir, Dong Tung village, cleared land, back-filled mangrove area.

Urban System: Water Supply

Water is accessed in Koh Kong through: water pipes, natural sources such as ponds, wells and roof run-off, and bottled water. The latter is the only source that does not require treatment by the consumer. The water supply system refers to the piped water because it is a physical system as opposed to an individual well or vendor. However, four out of the thirteen people interviewed in Koh Kong municipality do not have access to piped water. This research focuses on the piped water system, which in hindsight, highlights the shortcomings of shifting attention towards water systems as opposed to water access.

The piped water system is privately owned and operated by the LYP Group, the same company that operates the SEZ. There are three reservoirs: one large reservoir (with a capacity for 1,100,000 m³) that is adjacent to the SEZ, and two small reservoirs elsewhere. One of these reservoirs is designed to be used only in the dry season in case of a water shortage. Starting in 2013, there was not sufficient water supply to meet demand in Koh Kong. In 2014, the government realized that this would be a recurrent problem as water was once again cut. In 2015, construction on a new reservoir began on a mountainside at the north-east edge of the municipality. Most

recently in 2016, there was insufficient water supply during the prolonged dry season. The failure of the piped water system to provide water through the dry season, and especially during the 2016 drought, was emphasized by all government officials. In contradiction to this adaptive failure, a climate change mainstreaming project report (Ministry of Environment 2016) stated that the presence of water in one of the reservoirs during drought means that the water supply system is a best practice in climate change adaptation. In an interview with the author of the report, the author was aware that there were water cuts affecting Koh Kong after hearing about it inadvertently in a field visit to village of Peam Krasob. The reason for presenting the water reservoir as an adaptive best practice is unclear, as political pressure or the focus on systems as opposed to people's experience may have led to that conclusion.

People in Koh Kong experienced water cuts during the months of April, May and June. These water cuts occurred 4-5 times a month, and often lasted for one or two days. However, there were also times when the water was cut for a week at a time. People were sometimes informed of upcoming water cuts, but at other times there was no warning. Government officials stated that they provided funds for people to buy water, and told people not to waste water. Interviews with employees show that people responded to the water cuts by buying water from local businesses. The cost of water from the pipes is 0.4 USD a cubic meter, although people in rental housing pay a flat rate of \$10-\$15 for water and electricity which inflates the value of their actual water usage. Buying water from a business costs \$1 USD for 10 liters, costing \$10 a month for drinking needs. The government is optimistic about the water situation in 2018 because the new reservoir is slated to be operational, multiplying the capacity of the system by five. This didn't stop one governmental official from being cautious about future water supply security because increased pressures of population growth and drought. It is important to note that many people are already purchasing drinking water from the market rather than boiling the piped water. However, market water purchases increased when water cuts occurred. Despite the limitations of the piped water system, the system never collapsed as locals trucked water to neighborhoods and stores sold water. As of now, water cuts are inconvenient, but not devastating. Interestingly, people who did not receive piped water and used a well or pond instead did not experience water shortages. This demonstrates the importance of the water system beyond physical pipes.

The water supply shortage is attributed not only to drought, but increased demand driven by the SEZ and a growing population. Population growth due to migrants, along with increased businesses, including tourism, have increased pressure on the water system. However, it is not a coincidence that water shortages became a problem shortly after factories started to open at the SEZ in 2012. The factories have contributed to the water shortages and have felt the effects of it as acknowledged on public posters from KKN asking residents to conserve water so that there is enough. Yet, while every household in the municipality and in Bak Khlang experienced water cuts to their piped water, the SEZ never had a water shortage. The SEZ management responded to a question about the adequacy of the water supply saying:

“It is enough. Actually, it is nearly not enough. [...] For the factory, it is okay, we have a schedule. There is a problem in Koh Kong town. It is all the same system” (Key Informant 6).

The reason for this is likely due to the political economy of Koh Kong. The SEZ and the water supply system are owned and operated by the same company—the LYP Group. The LYP group also has special border privileges for the casino it owns near the border, it owns a fisheries port, and built and operates the toll-bridge connecting the Mondul Seima district (where the SEZ is) to Koh Kong municipality. In an interview with another researcher participating in the UCRSEA project, a government official candidly described the political economy of Koh Kong:

“You know in Koh Kong’s territory, tycoon Ly Yong Phat is the biggest [most powerful] person. No one dare to reject his project even the provincial governor [...] Ly Yong Phat kicked out even his cousin [previous Provincial Governor] [...] If he wanted to do any project in Koh Kong, he will do it. Many government officials dare not reject Ly Yong Phat’s goal, even if they found the [negative] impact from their study of Yong Phat project.” (Asif 2016, 6)

This political economy is noticed by employees; two of which reasoned water cuts to their homes are because “the company (LYP Group) keeps the water for the factory and industry” (Employee 21) and that the “company saves it for the others” (Employee 32). Under the pressure of drought, this political economy shows the uneven distribution of the effects of water system failure under climate change in urbanizing areas. It demonstrates how increasing droughts, urbanization and industrialization combine in Koh Kong to create water shortages that would otherwise not exist.

Urban System: Housing & Flooding

The adaptive development capacity of housing to address flooding risks in Koh Kong shows some strengths in the short-term, but long-term weaknesses. Currently, the water drainage system in Koh Kong has the capacity to avoid severe flooding caused by rain or ocean waves by effectively draining most water away (with some pooling occurring after storms). However, the capacity of the water drainage system and houses to adapt to climate change risks posed by increased rain-fall extremes and sea-level rise is concerning.

There are two building approaches in Koh Kong: houses of fishers that are traditionally built over the ocean (approximately 1 meter above high-tide), and houses built on back-filled low-lying land. In the case of traditional houses built over the ocean, currently there rarely flooding is from ocean waves, although the future sea-level rise does create long-term risks. In the second case of houses built on back-filled land, there is greater immediate adaptive development concern. The construction of these buildings occurs by filling wet-lands and mangroves with soil and then erecting a small concrete wall around the outer edge of the property. This displaces the water that was there. Depending on the drainage, this displaced water may have no other option but to flood

adjacent buildings or roads. Rental housing for SEZ employees is often built in this manner. These units are not dirty or crowded as is the case in some urban contexts, and there is not flooding occurring—yet. As the settled area in Koh Kong grows, there are emerging cases of localized flooding being caused by urban expansion. This has been the case for an employee living in Koh Kong municipality. He and his family explained that:

“It is getting worse, because people are filling up the lake to build the house. It [the need for employment at the SEZ] is because our family owes money to the micro-finance. I have help them earn income to pay the bank. The reason for the loan is for buying a tuk-tuk, and we bought land that needed dirt to fill-in the flooded area. The location [of the house], before it was low, and it had to be filled up or else it would will up with water. Now the problem has come again because someone else filled-up an area” (Employee 32).

This case demonstrates how increased financial resources are needed for households to avoid current flooding. This is a unique case among employees, but it will likely happen more frequently if there is more intense rain-fall coinciding with continued poorly planned development. It is the development of land and housing by back-filling mangroves at sea-level that shows the least adaptive capacity.

In Bak Khlang most homes are built above the water, but there is a part of the village that is built on land that is no more than 1 meter above sea-level. Here, the construction of single room rental housing is being built by back-filling water, possibly in anticipation of the opening of the new KKN factory. Given the current problems with coastal erosion (the crumbling sea-wall) and mangrove loss, the ability of these homes to adapt to changes to storms and sea-level rise is weak. Likewise, in Koh Kong municipality there are large areas of land for sale, including land that is for sale in a (former) mangrove. Almost all the land being developed by KK Property remains vacant as land developers are hoping to take advantage of any significant urban growth in Koh Kong. In one particularly concerning case, land near the open estuary and in a mangrove, was purchased by the company “KK Property” from local people and subsequently developed by filling in the water and removing the trees (Figure 14).

This construction in mangroves, although it can be considered urban development, not only causes ecological harm to mangroves and the livelihoods that depend on them, but it is not climate adaptive. There are no specific actions being taken or abilities being developed to ensure that these developments in Koh Kong do not go under water in the future due to flooding risks posed by sea-level rise and extreme rain-fall. Government officials interviewed are aware of the sea-level rise risks facing Koh Kong, but they see the ability to adapt to it differently. While the Ministry of Environment is asking fishing households to increase the space between the sea and the floor of the house, the Ministry of Land Management, Urban Planning and Construction said that the city will need to be re-located to higher ground in the future. A highly-knowledgeable senior official said that there is no plan to deal with sea-level rise. Therefore, the climate

adaptive capacity of houses to deal with flooding and sea-level rise is low, despite the well-built rental housing and lack of current flooding in Koh Kong.



Figure 14: KK Property selling land they developed in a mangrove.

Urban System: Land-Use Planning and Flooding

Land-use planning in Koh Kong has a history of periodic environmental and climate policy considerations which have not led to climate adaptive urban land use planning or practice. In 2002, a Koh Kong Provincial Physical Framework was released with various socio-economic scenarios and their implications outlined (Ministry of Environment 2002). The preferred scenario was manufacturing and its anticipated urbanization affects were outlined. The industrialization vision became reality when the SEZ opened. However, the vision for urbanization and environmental management has not turned out as government documents had intended. That report stated that Koh Kong municipality would grow from 23,000 in 1998 to 40,000 in 2005 and Mondul Seima district (where the SEZ is located) was supposed to have its urban population grow from 0 in 1998 to 20,000 in 2005. Fifteen years after the report was written, urbanization has yet to reach this scale. That report foresaw significant land requirements for industrialization and urbanization, and therefore proposed maintaining all paddy rice growing areas and protecting mangroves. Fifteen years later, and with slow urbanization, mangroves have been destroyed and the water system is inadequate.

Once again, in 2013, a report by the Ministry of Environment argued that urban growth would occur in Koh Kong, and that in turn, this could lead to distressed urban services and increased environmental problems. It argues that the “sustainable management of the coastal urban environment, therefore, is one of the major challenges for the years to come” (Ministry of Environment 2013, 82). In 2014, a Ministry of Environment report saw minimal progress integrating climate change into municipal land use master plans and in most commune development plans. In its recommendations, the report sees the need for SEZs to integrate climate change into their land use planning. In 2015, the Climate Change Action Plan for the Ministry for Land Management, Urban Planning and Construction called for Koh Kong to do a climate vulnerability assessment and integrate climate change adaptation into the master plan and municipal development.

The policy of environmental and climate change integration into urban planning contrasts with the current process of urban land management that is ad hoc, fragmented, and uninformed by climate change. The lack of an approved urban masterplan for Koh Kong municipality means that all areas, inside and outside the municipality build without an overall plan. There are rules, such as no building in mangroves, but the implementation of rules is weak as the recent land development in mangroves demonstrates. This unplanned urban growth is occurring as an Urban Master Plan 14 years in the making remains unapproved. It began in 2002 when the directors of all line ministries met to initiate the Master Plan. That same year community consultations and analysis took place, leading to a report based on the findings. A draft Master Plan was then created and made public, setting out a strategy for the municipality. Residents responded with significant levels of concerns related to relocation. The Master Plan has not moved beyond this point because the complaints and issues around compensation must be settled. Once resolved, the updated Master Plan will be presented to the public for comment, complaints can once again be filed, a Master Plan may eventually be approved. That appears unlikely because the remainder of the process and the implementation of the Master Plan requires money that the municipality does not have.

The implementation of the draft Master Plan in its current form would dramatically change Koh Kong. There would be a network of highways, additional bridges, and a re-developed shore-line on the estuary. The plan shows the development of extensive mangrove areas, including the area that is currently being developed by KK Property in Figure 14. There are significant concerns by households about the draft Master Plan with adaptive development implications. The relocation of residents along roadways, the central market, and the shoreline of Dong Tung commune are the primary concerns. The proposed relocation of Dong Tung commune’s fishing households has climate adaptive consequences. These households do not have land title, although the government says that their historical habitation of the land means that the land will not simply be taken from them. The reason that the government would like to relocate them and re-develop the shore-line is for tourist and environmental reasons. What exactly this re-development would look like, and what the specific reasons are for it are difficult to know. However, recent coastal re-development in Koh Kong has built up a wall along the coast, with a park filling in the space between the roadway and the wall. It is

possible that a similar space is desired where Dong Tung fishing households are now. The extent that this decreases flooding risks is unknown. It would certainly change, and easily damage, the fishing livelihoods Dong Tung households.

This plan lacks the inclusion of climate change risks, reflecting the state of climate change policy and practice of Cambodia in general. The climate change adaptation policy ambitions of Cambodia are sweeping in scale and depth, with no level of government or line ministry being untouched. Despite this, the implementation of policies in Cambodia remains a distant reality. None of Koh Kong provincial ministries are applying these climate change adaptation policies. The lack of implementation is related to the short time between policy creation and the time of research, the lack of financing and varying levels of political interest. A provincial government official gave his opinion on the prospects of climate change policy at the provincial and municipal level. He said that:

“For climate change, there is a new plan created by the [national] department of the environment. Nobody [in Koh Kong] knows it well. Nobody has the knowledge of the climate change yet. The government doesn't have a strategy for the climate change yet in Koh Kong town. It is just a concept of the environment ministry. I don't think it will become a reality. It needs money. It needs cooperation from the different levels of the government” (Key Informant 7).

Urban climate governance also suffers from the lack of participation of residents in governance in general. SEZ employee participation in urban governance is weak and their satisfaction with it low. No employee participated in any government meeting, including land use planning, because employees either are migrants who do not participate in urban governance or they are locals who are disinterested in formal government and NGO meetings. While local employees know of government meetings with the community, meetings by government or NGOs were understood to be for “the old people. The young people are working and going out. The old people have a chance to join. It is a waste of time for us” (Employee 25). The extent of household participation in the Master Plan process is unknown. It was 10-15 years ago when consultations happened, and employees were typically 10-13 years old at that time. This underscores a critical weakness of adaptive governance in Koh Kong: a Master Plan developed fifteen years ago is being hopelessly pushed as if Koh Kong has not changed, and neither has, or will, its environment and climate.

Urban System: Other

Although water supply, housing, and land-use planning have strong implications for adaptive development, there are other critical components Koh Kong's urban system that this research does not focus on, but merit a comment. Solid waste management in Koh Kong, initiated in 2013, is a recent service provided by the government that is only available for households on truck-accessible roads in Koh Kong municipality. Households living in the densely populated shoreline are excluded from this waste collection coverage as is Mondul Siema district. This means that the new rental units

for employees surrounding the SEZ are dumping their solid waste behind their houses. In Bak Khlang, solid waste is dumped into the ocean below houses. Despite attempts by NGOs and the commune government to end this practice, waste continues to be thrown into the ocean. This is partly because there no viable solution for people.

Despite the water, flooding and urban planning concerns, employees enjoy living in Koh Kong. Koh Kong offers better electricity and better health care access for most migrant SEZ employees than where they migrated from. For many migrants, Koh Kong offers improved social life and amenities because “everything is modern here. It is close to the market, and everything is up-to-date. Like using a phone” (Employee 3). The local beaches and resort provide leisure activities for the employees. In sum, Koh Kong is overwhelming viewed as a pleasant place to live.

Urban System: Conclusion

Urbanization is a slow process that, along with industrialization and drought, is already demonstrating the challenge of adaptive development in Koh Kong. Developmentally, Koh Kong’s strengths are its reliable housing, functional water drainage, and an ability to find solutions to the insufficiency of the piped water system. At the same time, the stalling masterplan process, absence of coordinated land-use, and the inadequacies of the piped water system are areas that require strengthening regardless of climate change. When climate change risks are considered, the specific adaptive capacity of housing, land-use planning and, most critically to date, the water supply system, show that Koh Kong may be urbanizing, but it is not urbanizing adaptively.

Migration System

The SEZ and its effect on migration is the latest iteration of change in Koh Kong’s migration system. There is a long history of migration in Koh Kong, as there is in all of Cambodia. Some of this is due to the Khmer Rouge’s practices where people were required to move from urban to rural areas by government policy and force. In the 1990’s many people came to settle into coastal Koh Kong to take advantage of the natural resources of the area. In subsequent years, the flow of migration has primarily been away from Koh Kong to Thailand and Phnom Penh where wage labour is pursued. Now, the SEZ draws migrants to Koh Kong, and some locals no longer migrate because the SEZ is nearby. Factories actively advertised and recruited workers at first in a fear that remote Koh Kong would not have enough labour. The migration system shifts enable the industrial system to grow in Koh Kong and are the main driver of modest urbanization.

Migration can be understood as a system in two ways, only one of which is consistent with the assessment of the urban and industrial systems. First, migrants participate in a migration system made up of components and interactions that are beyond their household’s control or agency. One aspect of the migration system is housing, land access and associated service provision. The second aspect is migration governance and policy. This is consistent with the organizational characteristics of the urban and

industrial systems. Secondly, migrants participate in a system of components and interactions that occur at the household level. Here, households have adaptive capacities that are determined by individual and families, rather than collective and government-led action. These interactions are covered in Part 3.

Migration System: Housing

The migration system has adequate rental housing for migrants, but land access and house ownership are areas of concern. Migrants increased the housing demands on Koh Kong, and the private sector responded when locals in Koh Kong rented out rooms in their homes, while those with more capital built rental housing. Rental housing is typically a long building with multiple, rentable, single rooms that are accessible from the outside of the building. There are sufficient units available for migrants and they are always serviced with piped water and electricity. However, with thousands of migrants becoming new water users in Koh Kong, along with other pressures, the water system has become insufficient for Koh Kong. Migrant housing needs also places pressure on land-use, albeit not as dramatically as it was anticipated. The large areas of land for sale in Koh Kong attests to the anticipation of property owners for a large migration influx that has yet to happen. Land-use change is highest around the SEZ where recent rental housing is the densest, but rental housing has been built low-lying areas where the climate risks are higher.

There are two reasons for the nearly universal use of rental housing by migrants: multi-local livelihoods and the cost of urban land. Multi-local livelihoods mean that people are living in Koh Kong temporarily as they circulate around Cambodia or the region. This discourages investment into land and housing. In one only case did a migrant buy a house in Koh Kong. In that case, the migrant moved to Koh Kong in 2008 with her sister and worked in restaurants and small-business, with her sister eventually working at the SEZ. Their length of time in Koh Kong demonstrates that some migrants do stay and eventually own a house. The second reason for the propensity for migrants to rent is the cost of land and housing. A 5-meter by 20-meter plot of land in Koh Kong's mangrove is selling for \$1000. More accessible and better serviced land was selling starting at \$3500 for a similar sized plot. These are prohibitive costs for migrants who are often sending remittances to their family members. For migrants, land in their hometowns is cheaper, or it is provided through family members. It is common for migrants to aspire to save to buy land or build a house in their hometown.

The adaptive development implications of the challenges of buying land and a house in Koh Kong are difficult to assess. In general, migration holds the capacity for migrants to shift the climate exposure of their house when they are migrating to Koh Kong. The comparative adaptive capacity of migrant housing to the former/other houses of migrants is relevant, yet it is not reported as an adaptive capacity that is being used or impacted in any way by employees. Migrants do not report their house structure being affected by floods or storms in either their previous housing locations or in Koh Kong. The capacity for migrants to live in quality housing is evident in the few complaints migrants had about housing, yet limited by the inaccessibility of purchasing urban land.

Migration System: Governance

The governance of internal migration is an important component of the migration system that is underdeveloped in Koh Kong, and in Cambodia more broadly. Migrants to Koh Kong experienced government as disappointing and distant. While local employees knew of government meetings with the community, migrants never knew about any government meetings or initiatives because migrants are viewed by the government as the responsibility of their rental property owners. As one migrant described, “the relationship is separate between me and the government and the commune chief”. (Employee 18). Migrants, like locals, are dissatisfied with the quality of governance, sometimes expressing support for stronger government investment in their areas of origin. The lack of government interaction with migrants is mirrored by a lack of migration policy.

There is no migration department in Cambodia. Neither is there a migration policy, though it does appear as a topic in other policies. In Koh Kong, government and non-government assessments of climate change vulnerability and adaptation rarely consider migration in their reports. When it is briefly considered, migration is viewed as a negative response to climate change. The nearly exclusive focus of these assessments is on local vulnerabilities and local responses to climate change. These assessments and government policies do not consider the adaptive development capacity of multi-local living. Interviews with key informants confirmed the view of officials to see migration as a demonstration of low adaptive capacity, but officials, when pushed, demonstrated a more positive view of migration when considering livelihood diversification. There is a large gap between the prevalence of migration and its importance to adaptive development, and the responsiveness of government and non-government organizations to migration.

Migration System: Conclusion

The migration system has few active structures and processes that are not determined by household capacity. There can be a migration system beyond the household level with possibilities for policies and approaches that guide remittance, recruitment and migratory labour towards certain climate adaptive purposes. Whereas the industrial and the urban systems of Koh Kong exist at an organizational level that is beyond the household, the migration system is almost entirely mediated through households. It is to households that the assessment of adaptive development capacities now turns.

Findings Part 3: Households

The adaptive development capacities of the industrial, urban and migration systems have differentiated effects across households in Koh Kong; households are not equally affected by the systems that they live within in Koh Kong. Furthermore, household adaptive development capacities are not completely dependent on the adaptive capacity of the systems that they exist in. There are adaptive development capacities that households hold and use which do not exist at the systems level in Koh Kong. Households have agency; they are not passive.

Household capacities, and their differentiated interaction with systems, are evident in Koh Kong's households through their: livelihoods, mobility, gender dynamics and residential location. The industrial system has corresponding livelihood differentiation and household-level livelihood agency. The migration system has corresponding mobility differentiation between local employees and migrants, and agency demonstrated through multi-local livelihoods. SEZ employment is gendered, therefore men and women influence the adaptive development capacities of households differently. Lastly, the urban system has residential location differentiation between the three areas of Koh Kong.

Employee Stories

The stories of employees and their households navigating system change are a reminder of the importance of people in the pursuit of adaptive development. Their stories taken as a whole, not separated into their parts, bring to the fore the lives that intertwine with systems. These stories are selected because they are representative of the most common narratives among interviewees. Here are four of them¹.

Chan's Story

Chan's home in Bak Khleng is perched over an estuary and connected to a thin strip of eroding land. Her father and older brother go out nearly every day in the dry season to set their crab traps and catch fish. When they do go out, they earn around \$3 a day, before the costs of gasoline and equipment are factored in. Her father complains about the trouble they have catching enough fish. The prices for fish are higher, but the catches are much lower than they used to be. While they took out a loan to afford a larger boat that can take them further from shore, they find large Thai fishing boats there. They see their government failing to protect their fisheries. It doesn't help that the storms and rain are increasingly unpredictable. The habitat around their home has lost most of the mangroves that once protected its shore and the ocean floor is lined with the garbage of their homes. Chan's neighbor next door is not fishing any more. They left to work at a shrimp farm in Thailand, but Chan's family have stayed. The risks of migrating to Thailand are too great for them, and four years ago they invested in fishing when they took a loan to buy a new boat. Fishing provides them with enough for

¹ These stories are a compilation of the interview findings and are not a reflection of any one interviewee.

their basic needs, but the debt repayment is challenging. Due to this situation, Chan dropped out of school, stayed in Bak Khlang and peeled crabs for her family and wealthier neighbors. Previously, they have paid-off loans by taking out other loans and by sending older siblings to work in a Phnom Penh factory. However, it was costly for them to live in Phnom Penh and the factory didn't pay or treat them well. Eventually, those siblings got married and the remittance stopped flowing to Chan's parents.

In 2012, Yazaki went to her village and advertised the opening of their first factory at the nearby SEZ. She was quickly hired and found the work exhausting, but also empowering. She gave her family nearly all of her \$220 monthly income so that they could meet their daily needs, pay-off their loans, and buy water whenever the water stopped flowing in their pipes. Importantly, the income from the SEZ meant that the lender would stop getting angry at her parents. Furthermore, her parents didn't need to worry about having enough money during the increasingly unpredictable rainy season. She kept some of her income for herself, buying an iPhone and new clothing. In late 2015, Chan got married to a neighboring fisherman who had inherited a small boat from his parents. The SEZ income helped them secure a loan, which allowed them to build their own house in Bak Khlang. Chan continued to work at the SEZ for nearly a year longer until they had their first child. Chan no longer works at the SEZ because she is taking care of her son. This has led a large drop in income for the family. Her husband earns enough to pay for the basic costs of living in Bak Khlang, but it is not enough to upgrade their small boat without a loan or Chan returning to work at a factory again. The problem is that the SEZ will not hire her again. Chan is 27. She needs to be under 25 to be re-hired by Yazaki.

Seng's Story

For Seng, after growing-up working with her parents in the rice fields of Kampot, leaving for Phnom Penh and working in a garment factory was always appealing. Farming in Kampot is physically demanding and dirty work. The family's income put them near the poverty line and periodic, but increasingly frequent droughts, put them into episodes of desperation. Debt was taken on to recover and Seng's brothers left to work in Phnom Penh's construction boom. When Seng was 18, she left for Phnom Penh to join her sister and brother there. She sent money back to her parents so that they could purchase fertilizer and pay-off debt. Although the family benefited from this remittance, she worked up to 14 hours a day and wasn't paid overtime. This made the migration barely worthwhile. During this time, she met and married her husband who also had migrated to work in construction. They moved back to Kampot province together, to support her aging parents, and return to farming. However, they did not own enough land within their family to provide sufficient income, so they looked for another opportunity.

Upon hearing of the better wages that the Koh Kong SEZ offered, they left for Koh Kong. Seng was hired to sew at KKN and her husband found construction work nearby. She earns a consistent \$220 a month, and he earns \$120 a month. They rent out a room in the rental housing units across from the SEZ where the water is reliable, the

electricity available, and the market nearby. They enjoy the beauty of the coastline and amenities of a small city. They have not experienced any floods or water shortages in Koh Kong. As a married couple, they send less remittance than if they were single. However, the recent drought that affected Kampot province meant that her parents harvested half the normal yield, only ½ a ton. In response, they sent money to their parents to help them buy food and pay-off their debt while they await the next rainy season. Seng and her husband are saving money to build a house and buy more land in Kampot. When they save enough, they plan to leave the SEZ job and Koh Kong to start a small business near her parents' home in Kampot. They know that working at the SEZ is not ideal in the long-term: the hours are long, the schedule inflexible, and their family and home far away in Kampot.

Phal's Story

Phal's husband left her and their two-year old son 2 years ago. He left because of the large loan repayments that Phal was paying her parents who had contracted \$8000 of debt that they had signed for on behalf of a family friend. That family friend left, leaving Phal's parents with a burden that their livelihood of farming alone could not bear. With her husband gone, Phal and her son moved in with her parents, and continued to farm in Sre Ambel, an agricultural region of Koh Kong province. In June 2016, drought had taken hold, delayed planting and withered crops. In response, many people left to find income elsewhere due to the lack of local alternatives. For her too, remaining there was not a viable option.

She heard from a relative in Koh Kong that the factories were hiring, left Sre Ambel (but left her child with her parents), and within one week found work at Yazaki in the SEZ. She knows that she will return to Sre Ambel one day, although she is not sure exactly when. The pressures of debt repayment and the costs of the drought means that she has to remit \$170 a month out of her salary of \$220. It means that she doesn't live with other migrants in their rental housing, but in the back room of a house that isn't connected to the piped water of Koh Kong. There is some flooding around the house during rain storms, but it is only an inconvenience at this point. She is lonely, and deeply misses her son and parents. Two months ago, by remitting money, she re-planted her field by hiring laborers even though she is away. She is disappointed that the government does not improve the irrigation system to help farmers. She plans to work until her household's financial situation improves enough to allow her to move back to farming and being with her family. It is possible that by next planting season she could move back. For Phal, that day cannot come quick enough.

Oung's Story

In the mangroves of Koh Sralao on Koh Kong's coast, Oung and her family have seen their mangroves diminished by charcoal production, and then restored through collaborative efforts with the government and their community. Despite this, Oung's family see the fisheries in decline. The ocean temperatures are increasing and affecting the crabs, and the storm patterns are changing affecting boat navigation. However, it is

the sand-mining over the past 10 years that Oung's family points to as the reason for decreasing ocean resources. Fisheries decline has fueled an exit from Koh Sralao. Her neighbors have left fishing for the factories of Sihanoukville and Thailand. Koh Sralao is only accessible by boat and the local options for an alternative income are few. In her teen years, Oung found collecting clams in the mangroves and peeling crabs necessary, but dirty, and unrewarding work. She heard about the jewelry, shopping, and independence of living in a city and earning a minimum wage. Her brother applied to work at the SEZ, but to his discouragement, he has not been hired. He remains helping his father fish. As a female, Oung had a better chance.

So, when she was 18, the earliest she could be hired, she left to go work at the SEZ in nearby Koh Kong. While others left for Sihanoukville, the 30-minute boat ride to the SEZ means that her parents can send seafood to her, and she can visit her family when they are sick. Oung enjoys working at the SEZ and has become a supervisor over other employees, despite her only having a primary education. She rents a house with a few young women from Koh Sralao in Koh Kong municipality. The water is cut off at times, but it is cheaper and more reliable than the water in Koh Sralao. She sends money back to her parents, around \$100 a month, to help them pay-off the debt that they took on for their new house. She would give more, but costs of living away from her family limit what she can send back. Her mother wants the family to improve their fishing equipment, but Oung prefers to see the money spent on a new kitchen. She hopes that her current rental house is the step before she buys her own house in Koh Kong. The precarious nature of a fishing livelihood and the lack of modern amenities in Koh Sralao make a return to Koh Sralao unappealing. Yet, the prospect of marrying a fisherman from there and moving back to Koh Sralao, make it quite possible she will return.

Livelihoods

The livelihoods of households come into focus in this research particularly sharply because the SEZ (and the industrial livelihood that it offers) is the research window into adaptive development in Koh Kong. Fourteen SEZ employees interviewed came from households where the main familial livelihood is agriculture, while twenty-two came from households where the main familial livelihood is fishing. For three employees, the familial livelihood is neither fishing or nor agriculture. The differentiation among, and agency of, agricultural and fishing livelihoods is assessed by considering: the drivers of SEZ employment, the SEZ strategy, and the outcomes of SEZ employment.

Livelihoods—Drivers: Financial

The most common reason for starting to work at the SEZ is poverty, or, as employees prefer to express, "their family situation." For many households, agriculture and fishing-centered livelihoods generate a limited income that is sufficient for affording food and basic needs, but improvements to their house, transportation, or fishing and farming equipment is very limited. With these limitations of fishing and farming, employees see the opportunity that the SEZ offers. In a few cases, employees are driven by financial distress. Their discontent when working at the SEZ and separation from their young

children, but persistence in working at the SEZ revealed strong financial challenges being placed on those households. These women are pushed into SEZ employment.

In both opportunistic and more desperate households, debt re-payment is a major driver of SEZ employment. For those in crisis, it is the over-bearing weight of debt repayment that leads employee parents to send them to the SEZ. In fishing households, debt is the most quickly identified reason for working at the SEZ. In Koh Sralao, approximately 90% of households have debt. Nearly all households were asked about debt, and only one household did not have any. Households have loans from \$1000 up to \$10,000 with interest rates of 2 or 3% for loans from micro-finance institutions and 10% from informal lenders. A mother of a young male employee under the pressure to repay explained her situation:

“I don’t want him to work in the factory. I feel bad that he stopped the studies. My situation is that I need someone to earn the income. Because of the livelihood, with the food [business], I wake up and cook food. I try to do many things to save money, but I need to pay the bank” (Employee 32’s mother).

Fishing households trace the motivation for debt to the need to purchase fishing equipment and improve housing. For agricultural households, it is used mainly for housing. In more distressed cases, it is the debt of another household that the family contracted that drives them towards SEZ employment. A widowed mother describes the reason for her daughter’s SEZ employment:

“We borrowed because we want to run a business, but the business is not good. I borrowed also for another family, but they escaped away. So I have to pay all the money for that family. The situation is getting worse and not better” (Employee 26).

Employees foresee the end of their SEZ employment occurring when debt is re-paid. Weak financial capital, especially debt, is a consistent driver of SEZ employment. However, there are deeper reasons for weak financial capital in fishing and agriculture livelihoods.

Livelihoods—Drivers: Environment & Climate

The financial struggle of households is heavily influenced by changes to the natural capital of the fishing and farming activities of households. Part one of the findings section, “Environmental and Climate Change”, outlined the environmental changes that household livelihoods are experiencing in Koh Kong. These environmental changes limit the adaptive development capacity of household to sustain fishing and farming livelihoods. The extent to which natural resource changes influence households to seek SEZ employment is differentiated between fisheries and agriculture.

For fisheries, the degradation of the marine eco-system is the root cause of economic struggle. Fisheries decline over the past 5-10 years was reported by all households.

Although debt was the first stated reason for SEZ employment, the reason for debt is tied to the ability of households to catch enough. That has become more difficult because of over-fishing, sand mining and climate change. The impacts of this on fisheries households were described in part one.

Whereas the decline in marine resources is the principle environmental driver of fisheries households to seek SEZ employment, for agricultural households the environmental driver is drought and limited land availability. Unlike fishing, environmental change in agricultural households is not occurring in Koh Kong, but in the agricultural regions of Cambodia. An El-Nino driven drought caused problems for farmers across Cambodia. The reliance on rain-fed agriculture means that farmers are very sensitive to changes in rain-fall timing and quantity. Farmers “depend on the sky”; making the decreasing reliability of rain-fall highly problematic. A farmer from Kampot province explained that “at my house in Kampot, they have no water. There was no rain yet. This month, farmers should plant rice, but this month they could not” (Employee 7). The drought of 2016 destroyed crops, delayed planting and in-turn increased the rate of people shifting to off-farm labour. Although not all agricultural households identified drought as a reason for SEZ employment, many did. After farming for five years in Kampot, an employee left with her husband because the drought was too severe this year. While the previous year was not an ideal harvest, with 1 ton of rice, the most recent year only yielded a ½ ton. The drought along with the weight of debt, pushed some agricultural households into a crisis. These were the most distressed employees interviewed.

The extent of environmental change, beyond climate change, as a driver of SEZ employment is important to note. The lack of land for farming is a frequent driver to work at the factory. Households with ½ to 1 hectare of land either find it insufficient to farm, and depending on the size of the household, there is excess labour for other economic activities. A climate finance donor, when pushed to discuss the role of climate change in broader environmental change in Cambodia, pointedly said:

“If we talk more generally, there is a mix of climate change, bad natural resource management, and poor design and planning of development. [...] There is development that is not well organized, this can be another cause of disaster. [...] We have to think of this, and not just blame the climate change” (Key Informant 4).

Climate change is one of multiple drivers of natural resource degradation that is pushing people away from fishing or farming and drawing them towards the promises of industrial employment.

Livelihoods—Drivers: Social

There are also social drivers to SEZ employment. Employees don’t explicitly express this, but there is an underlying tension between the cultural value of remaining rural and staying near parents, and the desire to be independent, ‘modern’, and meet new

people. Young adults at the SEZ, although they experience natural resource and economic pressures by staying in fishing and farming, also desire to leave physically demanding work for more respectable work. In the words of an employee “I like the sanitary environment. The good uniform, the people look at us from the outside and we look nice” (Employee 6). Tied to the social advantages of the type of employment is the advantages of urban life. Employees enjoy how ‘modern’ Koh Kong is with its beaches, shops and other amenities. Having a source of income, even if large portions are given to family members, gives greater financial freedom to employees to buy smartphones, and use social media. In Koh Sralao, working at the SEZ, requires moving away from parents—but only 20 kilometers away. Despite the relatively close distance, there is reluctance to return, even on holiday weekends. After collectively considering the social reasons for working at the SEZ, a group of people on Koh Sralao stated that young women “don’t want to come back and do hard work. They live well there. They have nice skin there. They don’t want to work in the ocean.” (FM 2) There are strong social undertones to the explicitly stated financial and environmental reasons for SEZ employment.

Livelihoods—SEZ Strategy: Social & Labour Capital

Driven towards the SEZ, employees use their social and labour capital to work at the SEZ. Social capital is instrumental in finding SEZ employment. Family members and relatives inform each other about the SEZ’s demand for labour and the relatively good working conditions and wages at the SEZ when compared to other factories in Cambodia. An employee describes the way she found the SEZ:

“My sister called me to come here then....my sister who calls me to come. It is because my sister moved to work here, then we can help each other if there are issues. She works at KKN too” (Employee 18).

The lack of a social network in a city affects the likelihood of employees to take on work there. For example, employees in Koh Sralao that have family members in Sihanoukville, but not in nearby Koh Kong, prefer to work in Sihanoukville and live with family members.

The SEZ is a relatively new destination for Cambodian household labour that is seeking a livelihood that is less dependent on environmentally vulnerable fishing and farming. This labour is seasonal and gendered. For fisheries, there is a surplus of labour in the rainy season when fishing slows down. Fishing is a male dominated activity as men go out on boats and go fishing. Women peel crabs and fix nets, but their ability to work is not fully realized in fisheries households. The labour capital of these households finds a strong match in the demand of the SEZ for year-round female labour. Conversely, agricultural households have surplus labour in the dry season. Agricultural labour is not as gender skewed as fisheries, with less surplus labour. Nevertheless, females from agricultural households use their labour in their household SEZ strategy. For poorly educated households, their human capital matches the SEZ’s lack of education requirements.

Livelihoods—SEZ Strategy: Temporarily Industrialize

Taking their social and labour capital, households industrialize their livelihood. They go to the SEZ, and after a week or two, become hired by a factory. The industrialization of their livelihoods takes different forms, partially dependent on their familial livelihood. For fishing households, employees are predominantly single women who, due to their relationship status, remain closely tied to their family. They are typically situated in a family that has a father, often a son, fishing. Other female siblings, if they are old enough to work at factories, will contribute via work at a factory. SEZ employees contribute by diversifying the livelihood strategies of fishing households. However, this diversification does not become a permanent diversion away from fishing. Once married, despite the desire to own a small-business, employees frequently return to a fishing-centered livelihood where their husband fishes and the wife provides support. The reason for this return to male-dominated fishing, besides gender reasons, is tied to the quality of livelihoods that can still be derived from fishing. Despite the decline in fisheries resources, fishing in coastal Koh Kong remains, relative to livelihoods elsewhere in Cambodia, a viable livelihood to be centered on. An environment ministry official said that the environment is better in Koh Kong than elsewhere in Cambodia. He argued that “the reason that people don’t work at the factory for a long time in Koh Kong is that the natural resources are still good in Koh Kong, they can go fishing” (Key Informant 3). Currently, the quality of fisheries means that fishing households use the SEZ to temporarily diversify their livelihood rather than more permanently shift away from it.

Agricultural households show more variation in how they industrialize. Although this research was unable to interview employees of an agricultural background who exited the SEZ, the findings suggest that natural resources are more constrained for farmers than fishers. This makes it more likely for employees of an agricultural background to go beyond diversifying and attempt to use the SEZ in a broader strategy to more strongly shift away from agriculture. The higher rates of married employees coming from agricultural backgrounds suggests that agriculture is less tenable than fishing. The most distressed employees came from agricultural households where drought, debt and land size made farming untenable. A Ministry of Environment official confirmed the relatively high natural resource constraints faced by agricultural households compared to coastal Koh Kong.

Despite the differences between agricultural households and fishing households, both households end up viewing and using SEZ employment as a temporary rather than a long-term, permanent livelihood strategy. The average length of time working at the SEZ at the time of the interview was 1.5 years. Former employees that were interviewed had worked for up to 2 years. The SEZ opened 5 years prior to the interviews, yet only 4 people had worked there for 4 or more years. Not only is the SEZ short-term work, it is typically a one-off event. In only two cases did an employee work at the SEZ, leave, and then return to SEZ employment.

The temporality of SEZ employment is related to gender and multi-local livelihoods (discussed in upcoming sections) and the completion of livelihood goals such as debt repayment. In a few cases employment temporality is tied to the seasonality of agriculture. Some employees know coming to the SEZ that they will leave once the planting season begins. In nearly all cases, there is a strong desire to use the SEZ as a temporary strategy towards the longer-term goal of owning a business such as a hair salon, phone shop or clothing store. This is expressed succinctly by a young aspirational man:

“I want to work in the factory. I wanted to do this before I got the job. I don’t want to farm again. I plan to work here, as long as I can. When I go back, I can build a house and run a business” (Employee 1).

Employees rarely return to work at the SEZ, although the two cases of it occurring show that financial failure can drive a return to the SEZ. Critically though, the possibility of returning to the SEZ is limited by age.

One of the strongest reasons for the temporality of SEZ employment is the age-limit on hiring. At Yazaki the limit is 25-years-old, and the preference at KKN is for employees younger than 27-year-old. Employees who leave, have children, and then consider returning to work, know that their age limits their ability to return. Parents of employees repeatedly complain about their inability to get hired. A mother of an employee explained that “if the factory needs women, if they need old women, they would go. All of the women would go if the factory let them” (Employee 23). For households with a family member between the age of 18-27 the SEZ is a possible strategy. For the rest, a return is not possible.

Livelihoods—Outcome: Financial Capital

A clear and consistent outcome of SEZ employment is the higher and more predictable minimum wage income of SEZ employees. Employees are almost exclusively young females that were previously doing household tasks, and assisting in fishing or farming to varying extents. The income generated by fishing and farming is difficult to measure, since those activities provide food and non-monetary benefits. However, employees always express that the income from the SEZ is higher than if they were fishing or farming. For fishers, the surplus labour of women meant that income gains were greater than for farmers who do not have the labour surplus of fishers. Income from fishing ranged \$50 USD to \$100 USD a month, while the SEZ paid \$220 USD a month. With few exceptions, every person strived to work at the SEZ when their circumstances allowed for it to happen. Former employees that no longer received SEZ wages see large decreases in their financial capital after they leave. For instance, household wages for a married couple where the husband is fishing drop from \$300 USD to \$75 USD a month when the wife stops working at the SEZ. On the other hand, married couples saved up to \$200 USD a month when working at the SEZ. SEZ income helps “relieve the tension. When you have a job, you don’t need to worry about

the money to buy something in the future” (Employee 1). The SEZ improves household financial capital with few exceptions.

There are three cases where financial capital is higher elsewhere. First, for wealthy households, a combination of other avenues for higher income and their social status mean that SEZ employment is not sought after. Secondly, for fishers who under certain conditions, and at optimal times of the year, can earn up to \$50 in a day from fishing. Thirdly, for migrants who spend larger portions of their income on living costs. Migrant households generally experience income gains, but those gains come with large costs and trade-offs that can become overbearing.

Beyond increased financial capital, is a more predictable and consistent income than the uncertainty and seasonality of fishing, farming or running a business. SEZ employment provides a “stable job” that has so far been insulated from shocks, unlike fishing or farming. The SEZ also provides consistent employment, as opposed to the seasonality of fisheries and agricultural labour. Although seasonality is expected, it requires households to save up for the off-season, and it means there is excess labour at times of the year. In most cases, SEZ employment is a multi-year endeavor that removes the seasonality from their labour. This is described by an employee who said that:

“A farmer can’t work all months a year. Just like 3 months a year. The rest of the time I am free. It is not stable work. I want to work in the factory because it is a stable job and I get higher pay” (Employee 36).

The higher wages and more predictable, consistent income lead employees and their households to worry less about their financial capital. The increased financial capital didn’t necessary translate into increased spending though. Debt repayment was a major target of SEZ wages.

When debt was the predominant driver for households, nearly all SEZ income went towards paying off debt. It eased the pressure on less predictable sources of income within households. An employee described the role of SEZ income:

“It really helps. Even if I can’t have a lot. If I can have a salary, I pay my father to pay the debt. I send \$130-\$140 a month. At the beginning, almost \$200 back to pay the bank. It will take 17 more months to pay back” (Employee 14).

SEZ employment not only helps respond to household debt, it also helps households access more loans. Asked how long his son would continue to work at the SEZ, a father responded:

“We have \$8000 loan for building the house. We have been paying it off for 3 years, and will pay it off for 2 more years. Before the work at the SEZ, we did not take much loans, but now we do. If you have more family members working at

the factory, then you can take more loans out. The bank will let you do that then” (Employee 8’s father).

Although predominantly used to pay-off debt, SEZ employment also leads to an increased ability to take on debt. Debt and SEZ employment are closely tied together, and their exact relationship to one another is unclear. In any case, there are undoubtable gains to financial capital when fishing and farming are the other options. However, the role that this financial capital plays in increasing the climate adaptive capacity of households is not evident.

Livelihoods—Outcome: Physical Capital

Increased financial capital changes the physical capital of households. One employee described the higher income as “a key in my hand. I can get what I want. Not expensive things, just normal things. I can now open it” (Employee 37). For many, this means being able to purchase their basic household needs without worry. With his wife and himself both working at the SEZ, an employee described purchasing with confidence:

“I have a good salary with my wife. Including my wife’s salary, I can buy things. Not all in one month, but slowly over time. I didn’t buy things yet, I keep it in the bank. I only buy rice and food. If I want to buy something, I can buy it” (Employee 1).

The SEZ also allows people to go beyond meeting their basic needs to buying smartphones, jewelry and improving their houses. The linking of debt to housing, and the use of wages for debt repayment makes housing investment attributable to the SEZ. Most clearly, a household of three children, and no parents, who all work at the SEZ, collectively saved up to build a larger and stronger house. Employees partially attribute the increasingly taller, expensive and better furnished houses in Bak Khleng and Koh Kong to SEZ employment.

Fishing households, when not improving their house, spend SEZ income on fishing equipment. Debt is linked to fishing equipment, with one case in particular making a very clear link. The only male fisherman interviewed left his job at KKN because he felt “bored with work. [...] I wanted to change, to be a fisherman” (Employee 31). He went crab fishing in his very small boat, but found the crab catches insufficient for his family. Additionally, as the only one in the boat, he felt “bored” and alone. He realizes that fishing, under the right circumstances, could lead up to higher income than the SEZ, but that was the case for only a few months of the year. Furthermore, the SEZ is more comfortable. He returned to work at KKN, and is paying off debt and saving for a larger boat. Some fishing households are hesitant to spend wages on fishing gear because “no one is an expert at fishing” (Employee 8) or that there is not enough money for fishing equipment. They are often fishing labourers or they do not see the benefits of a greater investment in fishing. Employees with an agricultural background had a different relationship to changes in physical capital, partially because they are more likely to be migrants. Their multi-local livelihoods and the outcomes of that will be explored later.

Livelihoods—Outcome: Climate-Exposure

Although there is no evidence that increases to financial and physical capital are changing the climate-specific capacities of fishing and farming livelihoods, climate-adaptive capacity is being built-up through the SEZ strategy. Climate-specific capacity is developed through reducing the exposure of livelihoods to climate change by diversifying and shifting livelihoods away from climate-exposed agriculture and fisheries to the SEZ. There is some climate change exposure and sensitivity at the SEZ. But unlike fishing and farming, it is low. For farming households, the SEZ allows for households to diversify their livelihood strategies away from drought exposure to the SEZ. Under drought, households working at the SEZ have their income maintained or increased. For fishing, the SEZ strategy allows households to reduce their exposure to environmental change in the fisheries, including climate change. When the employee is working at the SEZ, the SEZ can be highly effective way of modulating livelihood climate exposure and sensitivity.

Despite the focus on rural adaptation in Koh Kong province, a Ministry of Environment official concurred, saying that “the factory in Koh Kong is important. In the future, having jobs like the jobs at the factory will allow people to adapt to resource changes and climate change” (Key Informant 3). There are few adaptive options for fishers in Koh Kong if they do not diversify away from fisheries. Yet, it is critical to note that, although there are long-term effects of this diversification into factory work, its benefits are limited by the temporality of SEZ employment. A fisher in their sixties without a child working at the SEZ cannot shift livelihood exposure to climate change through SEZ employment. The temporary adaptive capacity gains are a larger concern for agricultural households which face greater climate exposure to their livelihoods than fishers. They have a greater need for livelihoods that are more permanently diversified or shifted away from climate-exposed natural resource systems. For the moment that households are SEZ employed, the SEZ dramatically reduces the climate vulnerability of livelihoods to climate change.

Livelihoods: Conclusion

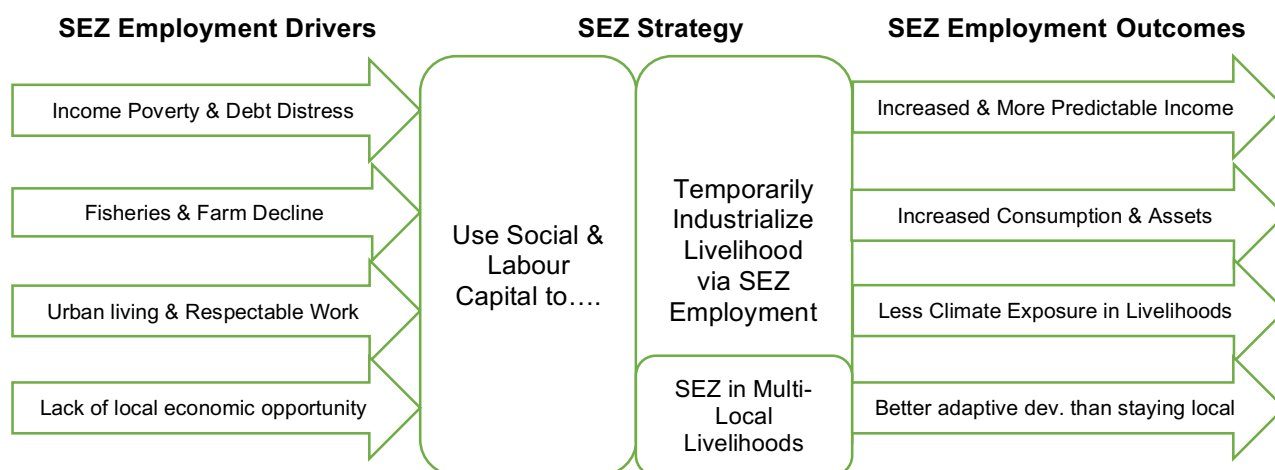


Figure 15: Summary of Livelihood and Mobility Findings

Households have strong adaptive development capacities when they use the SEZ employment as a livelihood strategy. The SEZ strategy allows for increased and more consistent income in response to financial and natural resource constraints, and social aspirations, especially fishing households. For agricultural households, drought and limited land availability drive can severely undermine their livelihood making SEZ employment a critical adaptive move, although they tend to give up household labour that would otherwise be farming in favor of the SEZ. For fishing households, multiple forces including climate change are degrading fisheries, making the SEZ a highly valuable adaptive response, especially considering the lower trade-offs for fisheries households that send females to the SEZ. However, the adaptive development capacities of the SEZ strategy are not available always to all households. Only households with young adults, mainly women, aged 18-27 can have increased adaptive development capacities due to the SEZ. For the rest, a SEZ strategy has nothing to offer them.

Mobility

The diversification and shifting of livelihood strategies requires household mobility in many instances. This creates a situation where households not only have diversified livelihood activities, but households also have livelihood activities across multiple locations. They have multi-local livelihoods. There were 19 migrant employees interviewed, and 15 employees that considered Bak Khlang or Koh Kong municipality their hometown. Despite the division of migrant and local employees, at a household level, multi-local livelihoods occurred even in local employee households as other household members sometimes migrate. It is now common for households to have people engaging in livelihood activities with a large and diverse footprint. This makes the adaptive development capacity of multi-local livelihoods relevant for everyone. Mobility differentiation is assessed from the perspective of multi-local livelihood as a livelihood strategy that has drivers and adaptive development outcomes.

Mobility—Drivers

The main driver that determines the extent of multi-local livelihoods is the spatial spread of economic development. The SEZ changed the spatial footprint of economic opportunity, which in turn changed the spatial spread of their livelihoods. In Koh Kong, young women are less likely to migrate because the opening of the SEZ increased the diversity and quality of local livelihood options for them. This means that young women no longer go elsewhere in Cambodia or to Thailand to work in factories. However, Koh Kong households continue to be multi-local in many cases. For example, young adults who left for Thailand before the SEZ opened do not return to the SEZ. Another common case is when adults, sometimes entire families, leave for Thailand because they are too old to work at the SEZ.

Employees who are engaging in multi-local livelihoods themselves do so because their area of origin does not allow for a successful livelihood. When the local economic opportunities are not sufficient and impacted by climate change, migrating to the SEZ enables a higher and more predictable income than could otherwise be achieved in the migrant's area of origin. A frequent example is the drought and land constrained farmers of Kampot province that have limited local livelihood options when climate shocks occur. Likewise, natural resource stress in Koh Sralao interacts with local options in a similar manner. A fisherman explained that:

“the number of resources are declining here. Many people will migrate to other provinces or to Thailand. They cannot stay here without income. They cannot supply their everyday needs. They must migrate, to Koh Kong, to Thailand and to Poipet” (Family Member 6).

The lack of local economic opportunity is instrumental in causing multi-local livelihoods. Migrants emphasize the lack of factories in the regions where they originate from. Therefore, the prospect of a factory opening in provinces where there currently are none excites migrant SEZ employees. The spatial dimensions of multi-local livelihoods can be reduced, or multi-local livelihoods can stop being used, when local livelihood conditions improve. In Koh Sralao, multi-local livelihoods remain the case, but the distance between the industrial wage labour at the village is greatly reduced by the presence of the SEZ. Beyond economic reasons for multi-local livelihoods, multi-local living is also driven by social ambitions such as meeting new people, experiencing urban life, or leaving a harmful family situation.

Mobility—Outcomes

For local employees at the SEZ, reducing the spatial spread of livelihood activities has been beneficial. Young women who would have migrated to factory work elsewhere are avoiding the costs and risks of migration, while more households are doing industrial labour because factory work is more accessible. Koh Kong households can be diversified in their livelihood activities without being diversified in location. There are additional livelihood and social benefits when employees on their time-off assist their family's small business activities or help peel crabs. For those with children, they can see them every day, along with the rest of their family. The close SEZ proximity is unanimously viewed positively.

For migrants, the results of engaging in multi-local livelihoods are costly, but necessary. Renting housing reduces the economic benefits of migrating to the SEZ because monthly rent costs \$40-50 USD. The costs of food rise as migrants cannot depend on their own food production. The demands that remittance places on the employee impacts their quality of life. The housing of one of these high-remitters is a partially-walled back room of a simple home over a wetland for \$25 USD a month. Supporting a multi-local livelihood weighs down on migrants. A migrant from Koh Sralao explained that:

“I don’t like living here. The room is not large enough for living. The difference between here and my hometown is that there are not many close friends and neighbors. The food here is not the same. In my hometown, there are lots of crabs and fish. Here, if you buy lots of food, you don’t save money. There is no place for visiting here. I try to buy cheap vegetables and rice. I try to buy cheap. My purpose is to save money and give it to my home.” (Employee 15)

The costs of migration on the migrant means that the temporality of SEZ employment is different for migrants than locals. It was described that:

“For local people, I don’t see many people stop working. For the people from the province, they can’t save money, and the parents call them back. For Bak Khlang [local village] I haven’t seen one worker stop.” (Employee 30)

This turn-over of migrant employees is a source of dissatisfaction for SEZ management that struggle to retain a consistent work-force.

The multi-local livelihoods of employees have four variations. One means of maintaining the multi-local livelihood is to remit money to family members who continue to farm or fish. Remittance allows for daily needs to be met, and frequently it enables the purchasing of larger assets such as a house, boat or agricultural equipment. Remittance increases when shocks and stresses deepen in the area of origin. Employees increased remittance sending during the most recent drought that hit their parents in their hometown. SEZ employment means that employees do not typically return to assist with fishing and farming. A father and his neighbors in Koh Sralao described that:

“I can’t find anyone who stopped [working at the SEZ temporarily] and came back here. When the dry season comes, for other jobs like construction, maid, restaurant, those workers come back. But for the SEZ, they do not come back during the dry season” (Family Member 2).

The fear of not being re-hired by the SEZ and the social benefits of migration are reasons that employees do not return to their families often.

The second multi-local livelihood dynamic is to leave seasonally to the SEZ, though this occurred in only two cases. In their cases, employees left their fields for the SEZ to respond to drought and debt stress by working at the SEZ until the next planting season. The third strategy is to hire laborers to farm in the absence of family members. In both cases, the absence of the employee may have a negative effect on climate change adaptation. This was suggested by a climate change project implementer in Koh Kong province who argued that the lack of water irrigation system maintenance and repairs in agricultural areas of Koh Kong Province is partially attributed to migrants leaving to work elsewhere. This not only affects the economic productivity of the area, but in years of drought, it hinders the ability of agricultural areas to adapt to climate change. The final form of multi-local livelihoods are the migrants who are married and

have limited remittance sending. They typically maintain the desire and ability to return to their hometown in the future, though they dream of returning as businesspeople, not as farmers.

Generally, multi-local livelihoods allow for diversification away from locations where the livelihood options are limited and exposed to climate change. It appears that without the migration, remaining in drought stricken rural agricultural Cambodia would have more likely led to coping rather than adaptation. Unless the spatial distribution of industrial livelihoods changes, or fishing and farming can become more prosperous and climate-resilient, multi-local livelihoods that include the SEZ will continue to enable a more climate adaptive and prosperous livelihood.

Lastly, a comment about the social results of migration. Being independent, enjoying urban amenities, and meeting new people are experiences that migration offers. Even in Bak Khlang, an employee desired to leave to experience life elsewhere in Cambodia despite the presence of relatively good factory nearby. The migrants that left Koh Sralao for Koh Kong have a 30-minute boat ride between their parents' home and their rental housing, yet prefer to remain in Koh Kong even on holidays. At the same time, migration and multi-local livelihoods are not ideal for many employees. They would prefer, or they feel obligated, to remain near to their family. Migrants who are lonely and separated from their children reveal the social costs of migration that co-exist alongside with social benefits that others experience.

Mobility—Conclusion

Both migrant and locally-employed households see increased and more predictable income from the SEZ, although the costs of migration limited these benefits for multi-local households. Yet, migration allows households to more successfully respond to financial stress, climate shocks, environmental degradation on their livelihoods than would otherwise be the case if they remain in their area of origin where there are limited livelihood options that can lead to adaptive development. Migration opens-up adaptive development possibilities, though doubts remain as to the long-term adaptive capacity impact of multi-local livelihoods.

Gender: Men and Women

The role of gender in achieving adaptive development capacities for households is highly relevant when considering the gender dimension of SEZ employment. It is estimated that over 90% of SEZ employees are female. The SEZ management explained that women are better at sewing and more passive in the work place. In Bak Khlang, except for wealthier households, all single young women are working at the SEZ. For Bak Khlang that means these young women would return to their parents' home every day. In Koh Sralao all single young women have migrated, including to the SEZ. Since the benefits of the SEZ are shared within households it is less meaningful to compare adaptive development capacities between genders and better to see the

gendered dimensions of achieving adaptive development capacity for a household. Therefore, gender is not mapped onto the adaptive capacities matrix in Figure 16.

The most advantageous female contributions to adaptive development via SEZ employment is in fisheries households. Here, young women have limited ways to significantly contribute to economic productivity. Young women in fishing households see themselves, and are seen by their parents, as being without work. As an employee expressed, working at the SEZ “is better than staying there [in the fishing village] and doing nothing” (Employee 15). On the most positive side of the spectrum, women see their ability to significantly improve the household livelihood and earn their own income. They no longer need to rely on their husband, or parents, to provide an income based on seasonal work. The SEZ is also a clean and proper job. Collectively, this makes many women “excited to go to work” (Employee 12). In contrast, some fathers and employees see this differently. For them, it is the household’s lack of capacity to otherwise improve their economic condition that forces parents to send their daughters to work at an exhausting SEZ job. Although the satisfaction with SEZ work is not uniform, the role that women played in diversifying agricultural and fishing livelihoods is significant. In the face of climate change, this ability is essential.

For women, marriage and child-care often result in the end of their SEZ employment. This is seen most clearly with employees from Koh Sralao and Bak Khlang where marriage leads to employees ending their work if their husbands can provide enough income for the household from fishing. Women described being requested to stay at home even without children. There is no indication that the small business aspirations of these former SEZ employees becomes a reality though. They often return to doing household chores, peeling crabs and caring for children. Nevertheless, circumstances can require married women to work at the SEZ if the husband is unable to provide enough income. After being married for three and a half years, an employee from Koh Sralao went to the SEZ because:

“he [her husband] could not earn much income. So I decided to come work. The reason is the natural resource decline. It is because of the sand dredging. You can’t work all the seasons. You have to work in the dry season and save to spend in the rainy season.” (Employee 34)

Most alarmingly, are mothers, including widows, that went to work at the SEZ leaving behind children in other regions of Cambodia. Interestingly, it is a widow with children from Bak Khlang that impressively became a supervisor at the SEZ with a primary level education. Although some employees were married and/or had children, marriage and children does make SEZ employment significantly less likely.

Men are rarely hired by the SEZ despite their desire to be employed there because the SEZ management considers men too difficult to control and more likely to demand changes from their employer. Most male siblings of female employees wish to work at the SEZ. This desire fluctuates depending on the time of year and their fishing capacity. The dry season is marked by the ability for some to earn more per day than at the SEZ,

but that depends on having fishing equipment and enough labour. The lack of fishing equipment, and the seasonality of fishing attracts men towards the SEZ. The consistency and the rate of the wage at the SEZ means that women earned at least \$70 more per month than husbands who also do wage-labour. The gendered nature of SEZ employment means that women are likely to earn a larger annual wage than their male siblings or husbands, and have a greater capacity to enable livelihood diversification away from climate exposed fishing and farming.

Household Residential Location: Koh Kong municipality, Bak Khlang, and the SEZ Area

The residential location of households in the urban system impacts their adaptive development capacities. There are three ways that the location of people's residence differentiates adaptive development capacities: water access, the climate exposure of an area, and urban governance. Let us now turn to the distinctive capacities of each area: Koh Kong municipality, the SEZ area, and Bak Khlang.

Households in Koh Kong municipality have a weak water supply system, a municipal government that is not planning for climate change, and live in areas that lack the adaptive capacity needed to deal with climate change risks. Despite having a municipal government, water access in Koh Kong municipality is the worst of the three areas. Koh Kong municipality is the only area where some employees rely on ponds and wells—a more common means of water access in rural areas in Cambodia. Furthermore, the adaptive capacity of houses to sea-level rise and future flooding risks are weak, which is notable given the climate risks of the low-lying municipality. The municipal government does not have plans or strategies in place to adapt to climate change, despite being the only area to have a municipal government with an urban master plan process. There is little evidence that this form of governance is leading to more adaptive development capacity for the people living there. There is the potential that people in Koh Kong municipality can benefit from a more planned and responsive local government, yet that remains a unrealized.

Despite being a village outside of the municipality, all households interviewed in Bak Khlang have piped water. They experience water cuts during the dry season with the same regularity of the municipality. Additionally, NGOs provided water filters that allow some households to avoid boiling water. Bak Khlang's exposure to sea-level rise, storm surges, and flooding is high. Problematically, its corresponding adaptive capacity to deal with this risk is limited. The low-lying land of the village, without action, will flood in coming years. To date, action to limit erosion and flooding has been insufficient as barriers crumble into the incoming waves. On a more positive note, although storms have taken off the roofs of some homes, the building quality is improving in Bak Khlang, partially due to increased financial capital from the SEZ. In terms of governance, there is no municipal government or master plan process.

The 2km radius around the SEZ is the third residential area where employees live. No employees experienced water cuts here to their piped water (while Bak Khlang and the municipality did). The rental houses here are built close to the SEZ and are on top of a

gentle sloping hill above the mangrove and the ocean. The climate exposure of people here is low. However, the area is rapidly changing with large areas for sale and being cleared for larger developments. Some of these areas go up to the edge of the mangroves. For an area that has absorbed the most intense urbanization, it is problematic that the SEZ area is not a part of the municipal master plan nor is it being developed with the integration of climate change risks. In the future, when this area grows, the need for adaptive capacity may become more apparent. Currently, Bak Khleng and Koh Kong municipality face the largest adaptive capacity deficit due to larger climate exposure and sensitivity than the SEZ area.

Chapter 5: Discussion & Conclusion

The adaptive development matrix for Koh Kong (Figure 16) highlights several key conclusions on the presence of adaptive development capacities. A challenge that arises when using the matrix is the parameters of what constitutes high and low capacity. This research used the Cambodian context to determine what are high levels of development capacities. The relatively high wages and good work conditions of the SEZ in the Cambodian context, lead to the conclusion that the industrial system and livelihoods had high generic capacity. Likewise, when considering the urban adaptive capacity that is being built elsewhere in Cambodia (and the region), climate-specific capacity of the urban system in Koh Kong is disappointing.

For households, livelihood and mobility characteristics were combined into the most common types of households (local fishing, migrant fishing and migrant farming). Separating mobility from livelihoods is impractical and not reflective of household realities where these characteristics interact to shape the adaptive capacity of the household. These households were placed to reflect the greater degree of climate specific capacity at the household level than at the system level. In terms of generic capacity, the high capacity reflects the relatively high quality of factory work that the SEZ offers. Taking this contextual approach, over-time these parameters should change as expectations for development and adaptation rise. However, it is unclear when the quest for fully adaptive development is realized.

First, it illustrates that at a system-level, generic capacity varies tremendously between the strength of the industrial system (due to its relatively high wages and good working conditions), the moderately developed urban system, and the nearly absent migration system. Despite the variation in generic capacity, climate-specific capacity is absent across all systems. It is most critically exposed in the water system that faltered under the combined pressure of drought, increased SEZ use and population growth.

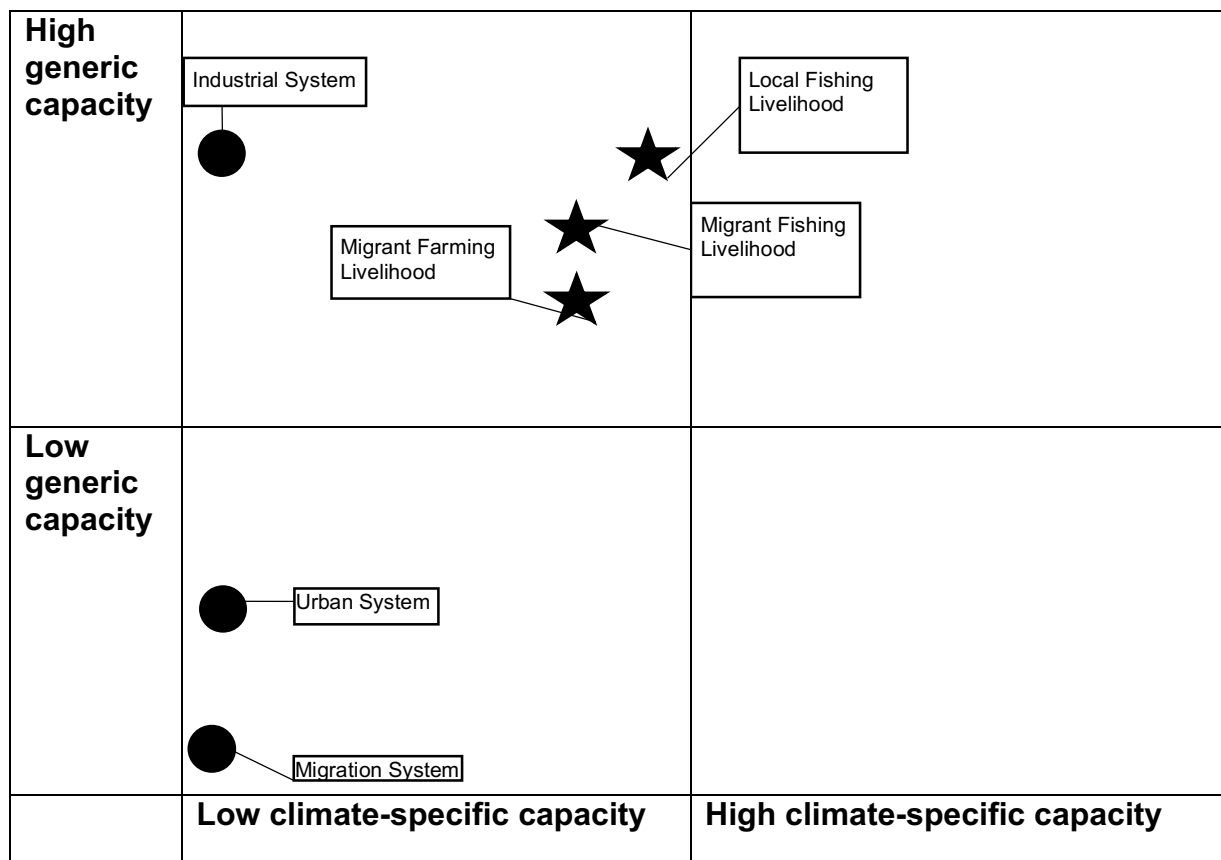


Figure 16: Koh Kong Adaptive Development Matrix

Second, the matrix points to increased, more predictable income for households with an SEZ employee and reduced livelihood climate exposure for all households, though there are differences across livelihood portfolios and mobility profiles. Local fishing households optimally take advantage of their surplus female labour and opportunity that the industrial system that enables households to diversify and reduce the climate-exposure of their livelihood. In contrast, migrant farmers incur comparatively reduced capacities due to the costs of migration, lost agricultural labour, and the possible long-term adaptive consequences of multi-local livelihoods, although they benefit from increased income and diversification away from climate-exposed agriculture. Critically, these adaptive development benefits to households are limited by the temporality of SEZ employment.

Third, perhaps most strikingly, is the contrast between the high capacities of SEZ-employed households and the low capacities of the urban and migration systems. Households have relatively strong adaptive development capacities by using livelihood strategies that allow them to respond to climate change's impacts on fishing and agriculture, even when urban and migration systems are underdeveloped and unresponsive to climate change. This highlights the importance of household agency to re-organize livelihood strategies and locations in influencing climate adaptive development.

Even though households have unique capacities, they are not fully independent of systems. Most positively, the transformation of the industrial system in Koh Kong has enabled local fishers to achieve higher adaptive development capacities than they would otherwise be able to. More negatively, the piped water supply has already failed to reliably and equitably provide water to households and the lack of land-use planning places households at increasing risk to climate change. In a worse-case scenario, greater industrialization and drought conditions may lead to severe water cuts to households and their employers, the SEZ. If SEZ employment is disrupted, and fisheries and farming remain unviable sole livelihoods, costly thresholds could be hit. Likewise, for land-use planning and flooding there may come a point when unplanned development in high risks areas leads to detrimental impacts on households and other urban systems. Under increasing climate change impacts, the low climate specific capacity of Koh Kong's systems over the long-term could seriously undermine the development gains of systems and households as industry and the city grow unaware of the increasing risks of climate change. Who bears the costs of weak adaptive development, and at what point systems and household are unable to re-organize and adapt, are critical questions.

This research shows that although increased adaptive development for households is possible while they work at the SEZ (with some long-term benefits), achieving more sustained improvements to adaptive development capacities is challenging. It is challenging enough for climate change risks to influence the current state of development in Koh Kong. Compounding the challenge is that, even without climate change, environmental change, urban growth, industrial development and increased migration will likely create further vulnerabilities. While donors and the Cambodian government spend money on building dykes for anticipated sea-level rise and water storage tanks for drought in Koh Kong's coastal villages, the livelihoods of these people is dramatically impacted not by climate change, but by recent sand-dredging. In the end, a village's specific climate risks are managed, but the viability of a livelihood, even living there, is greatly reduced. This highlights the extraordinary challenge of building adaptive capacity to long-term risks, while doing so in a manner that is aware of the tremendous change that will occur before those specific risks are even realized. One only needs to look back at the past 50 years of Cambodian history to consider the change that may occur in the next 50 years. Given the time-scales involved in development and vulnerability changes, it is difficult to assess what forms of development are compatible with climate change without more longitudinal research of households and systems.

This is the first empirical study using the adaptive capacities framework at a household and system level. This research demonstrates that the adaptive development capacities approach is an insightful and practical research framework. It uniquely captures the multiple scales and types of capacity that are collectively required for adaptive development. The approach successfully takes the complexity of adaptive development and simplifies it by visualizing it in a matrix. This framing lends itself to the needs of practitioners and policy-makers who can assess at what scale and to which form of capacity (generic vs. climate-specific) action is required, as well as what the

possible synergies, trade-offs, and negative feedbacks may be. Future research could consider using the matrix to show changes in generic and climate-specific capacities over time by illustrating trajectories of capacity development over time.

These research findings provide critical reflection of other climate adaptation frameworks, such as urban climate resilience. There is an assumption in urban climate resilience that to understand the adaptive capacity of a city's people, it is sufficient to assess the city's systems. This is partially rooted in the view that unlike rural areas, the adaptive capacity of urban households is primarily influenced by hard infrastructure systems (water, drainage, transportation), rather than household agency and their livelihoods. While acknowledging that Koh Kong is not a large urban area that is typically the focus of urban adaptation, these findings demonstrate that livelihoods and related systems (i.e. the industrial system) have a strong influence on the adaptive capacity and the development of people in cities. If this research only studied urban infrastructure and governance the conclusion would be that Koh Kong's systems, and thereby its people, have no climate specific capacity. By including household level livelihoods, and the related industrial system, it is observed that the most significant impact of climate change in Koh Kong is not on systems, but on people's fishing livelihoods. This shifts attention to assessing the adaptive capacity of households, especially household livelihoods. In this light, SEZ employment is a critical builder of adaptive capacity. Viewed this way, urban climate resilience in Koh Kong is more successfully being built than would otherwise be concluded under an urban climate resilience framework.

The inclusion of household scale and livelihoods in this research leads to the realization that many people temporarily move to Koh Kong as a part of, and a phase in, multi-local livelihoods. The blending of the 'rural' and the 'urban', seen in the multi-local and diversified livelihoods of households, points to the artificial distinction that is made in urban resilience studies between urban system resilience and rural adaptation. There are adaptive development implications of this continuous movement in and out of cities that are missed by urban climate resilience because it is bounded by its location-based (urban only) assessment of climate adaptive capacity. This research provides a possible solution by considering, alongside and interacting with urban systems, migration as a system, as it has been viewed in the literature (Bakewell 2014; de Haas 2010; Parsons, Lawreniuk, and Pilgrim 2014). Greater engagement with continuous and circular migration and shifting and evolving livelihoods requires assessing adaptive development across longer time-scales and in multiple locations.

Practically, in response to the adaptive development challenge in perpetually changing coastal Cambodia, governance that is adaptive, not just to climate change, but to all change, in its pursuit of development is crucial. Therefore, the failure of formal municipal planning processes and the lack of consideration of environmental and climate change in urban development is concerning. The integration of emerging climatic and non-climatic vulnerabilities into more informal processes that are not bound to municipal limits, but inclusive of the entire urbanizing area, are needed.

To decide on what systems, neighborhoods, or household demographic to focus adaptive development efforts on, the adaptive capacity matrix requires additional knowledge about where there are the greatest climate specific capacity needs. In other words, where climate exposure and sensitivity is greatest. In Koh Kong the immediate need is not in the industrial system or in the residential area nearby, but in the water system and in land-use planning. Attention should be specifically paid to the Master Plan that, if implemented, would transform the urban space of Koh Kong, and in turn alter the vulnerability landscape and adaptive development capacity of its systems and households. For such a critical process, it is unfortunately difficult to access information about it. Finally, in terms of migration, the possibilities of a migration system orientated towards adaptive ends is uncertain as policies are only beginning to be discussed (Oudry, Pak, and Chea 2016; Etzold and Mallick 2016).

The temporality of SEZ employment inhibits more sustained and higher levels of adaptive development capacity for households. Even if adaptive capacity is improved in rural areas, the development benefits of wage-labour and the limitations of adaptation, means that livelihoods that provide more permanent access to livelihoods other than farming and fishing at all stages of life would enhance adaptive development. Ideally, these diversified livelihoods are available locally, so that no one is forced to migrate. Interestingly, it is men who are excluded from the relatively high quality of labour at the SEZ and tend to work in less regulated labour markets where access to adaptive development capacities are possibly lower. Although this research finds reason to be positive about adaptive development in Koh Kong, there are significant challenges for households and systems, of all types, to be capable of adaptive development.

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Appendix A: Summary of Key Informant Interviews

Organization	Number of People Interviewed
Koh Kong Special Economic Zone (Management)	1
Free Trade Union	1
Asian Development Bank	2
International Centre for Environmental Management	1
Cambodia NGO Forum	1
Ministry of Interior	1
Ministry of Land Management, Urbanization and Construction	1
Ministry of Environment	2
Ministry of Industry and Handicrafts	3
Commune Chief	1

Appendix B: Sample Questionnaire for Semi-Structured Interview with Special Economic Zone Employees

Interview #:

Date:

Name:

Age:

Gender:

Location of house:

1. What do you do at your job in the SEZ?
2. When did you start to work at the SEZ?
 - a. When did you start to live in Koh Kong?
 - b. What were you doing before the job at the SEZ?
3. What are the working conditions like at your job?
 - a. How much are you paid?
 - b. What is a fair wage?
 - c. Is there a union?
 - d. Have you heard of workers being fired without a reason or without warning?
 - e. Did you sign a contract?
4. Do you like your job at the SEZ? Why?
5. Do you have access to:
 - i. Drinking water?
 - ii. Electricity?
 - iii. A bank account?
 - iv. Health care?
 - b. What services do you have access to that you did not have access to before living here?
6. Do you like living in Koh Kong?
7. Why did you come to live in Koh Kong and work at the SEZ? **OR** How has Koh Kong/Bak Khleng changed in the past years?
8. In the past years, have you experienced droughts, floods or extreme heat?
9. Are changes in the environment affecting your decision to live in Koh Kong and work at the SEZ?

10. How does having a job at the SEZ affect your ability to have the financial resources and belongings that you and your family need? Give an example.
11. How does having a job at the SEZ affect your ability to plan for and react to the unexpected events and shocks in your life? Give an example. Any failures?
12. Learning:
 - a. Did you have to learn anything in order to do your job?
 - b. Is there anything that you want to learn about?
 - c. Have you learned anything about dealing with floods and droughts or climate change?
13. What do you think about the work of the government here?
14. Do you think that it is good for lots of women to work at the factory and not stay at home and work?
15. How long do you think you will work at the SEZ?
 - a. What will you do after working at the SEZ?

Appendix C: Nvivo Coding Tables

Nodes used to organize and analyze data.	
Node Category	Node Folder
Climate Change Impacts	<ul style="list-style-type: none"> a. Droughts b. Floods c. Land temperature d. Ocean temperature e. Rain-fall change f. Sea-level rise g. Storms
Drivers of Employment	<ul style="list-style-type: none"> a. Climate b. Debt c. Economic d. Natural resources e. Social
Gender	<ul style="list-style-type: none"> a. Female empowerment b. Female futures c. Male exclusion
Industrial Livelihood	<ul style="list-style-type: none"> a. Debt repayment b. Temporary work c. Future plans d. Increased assets & savings e. Limited benefits f. Predictable & consistent income g. Responding to shocks
Industrialization & SEZ	<ul style="list-style-type: none"> a. Benefits (training, health, banking, child-care) b. De-centralized and regional integration c. General change & situation d. SEZ water & environment e. Unions & contracts f. Wages g. Work environment
Migration	<ul style="list-style-type: none"> a. Avoiding migration b. Circular & temporary migration c. General change & situation d. Remittance & rural relations
Urbanization	<ul style="list-style-type: none"> a. Flooding b. General change and situation c. Governance general d. Housing e. Services (electric, waste, banking, health)

	<ul style="list-style-type: none"> f. Social g. Urban land-use and planning h. Water supply
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Attributes used to organize and analyze data. These attributes apply to all interviews expect for the key informants.	
Attribute Category	Attribute Options
Age	
Employer	<ul style="list-style-type: none"> a. Yazaki b. KKN c. Hanna d. Other factory
Familial Livelihood	<ul style="list-style-type: none"> a. Agriculture b. Fishing c. Other
Gender	<ul style="list-style-type: none"> a. Male b. Female
Length of SEZ Employment	
Link to Koh Sralao	<ul style="list-style-type: none"> a. Yes b. No
Location of Residence	<ul style="list-style-type: none"> a. Koh Kong b. SEZ Area c. Bak Khlang d. Koh Sralao
Relationship Status	<ul style="list-style-type: none"> a. Single b. Married c. Married with Children d. Widow
Relationship to Employee	<ul style="list-style-type: none"> a. Father b. Mother c. Parents d. Sibling
Status of Employment	<ul style="list-style-type: none"> a. Current b. Former c. Other Factory
Status of Mobility	<ul style="list-style-type: none"> a. Local b. Migrant

Appendix D: Additional Images

Taken from a hill over-looking the SEZ. In the distance, and across the estuary, is Koh Kong municipality. Water on bottom right is main water reservoir.



Entrance of the SEZ.



Rental housing directly across from the SEZ entrance.



Koh Kong municipality with apartments in the back and fishing households in the front.