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Research

Urban resilience building in modern development: a case of Phnom Penh City, Cambodia

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ABSTRACT. Although the process of building urban resilience is increasingly and globally promoted, we consider this concept, and the approaches to achieve it, as particularly challenging for cities in developing countries. We argue that current market-oriented processes of urban upgrading reflect a revival of modernization concepts that, as a consequence, is deepening inequality and limiting adaptive capacities of people to cope with livelihood disruptions resulting from natural disasters and climate change. Efforts in building urban resilience thus become more difficult for marginalized urban dwellers. We explored current climate-related hazards and their impacts on urban livelihoods in selected urban communities in the city of Phnom Penh. We adopted a mixed methods approach, and our key findings revealed limited local government attention to improving infrastructure and a lack of commitment to assist vulnerable urban poor communities to build resilience to natural shocks. Policy recommendations include supporting livelihood improvement programs, addressing land tenure insecurity, and improving basic infrastructure in informal settlements.

Key Words: *adaptation mechanism; climate-related risk; livelihoods; modern development; urban resilience; urban upgrading*

INTRODUCTION

Building urban resilience is on the agenda for urban planners and policy makers in many cities in an era of increasing environmental hazards, urbanization, and rising population density (Coaffee and Lee 2016, Meerow et al. 2016). Although the precise meaning of urban resilience remains unclear, it is commonly viewed as a process of enhancing the capacity of urban systems to resist a wide range of shocks and stresses (Davoudi et al. 2012). Meerow et al. (2016) explain "urban resilience" as an urban system that can maintain or rapidly return to desired functions in the face of a disturbance, adapt to change, and quickly transform social-ecological systems that limit current or future adaptive capacity. We will critically assess the Cambodian government's aims for modern urban development, which seek to build resilient social-ecological systems through enhancing the adaptive capacity of individuals and institutions (National Council for Sustainable Development, Royal Government of Cambodia, Phnom Penh Capital Hall, Global Green Growth Institute, and International Centre for Environmental Management 2016).

Kumar (2015) and Friend et al. (2013) argue that improving understanding of existing urban vulnerabilities enables key stakeholders to formulate efficient and effective responses to catastrophes. This corresponds with the idea of Liao (2012) and Mehmood (2016), who view learning by doing as key for resilience building. In developing countries, some governments seek urban industrialization as a strategy to modernize and strengthen urban capacity (Pickles and Smith 2005, Phillips 2011). As Marsh (2014) argues, this "revival" is seen in processes of enhancing industrialization in developing countries for economic development. Phillips (2011) similarly argues that modernization vigorously influences the agenda of contemporary development that is perceived as a process of social change. Aspects of economic, social, and cultural change and progress are open and flexible for improving levels of wealth and living standards of local people to "catch up" with more developed societies.

We argue that current market-oriented processes of urban upgrading[1] reflect a revival of modernization concepts that, as a consequence, is deepening inequality and limiting adaptive capacities of people to cope with livelihood disruptions resulting from natural disasters and climate change. Efforts to build urban resilience thus become more difficult for marginalized urban dwellers. In the context of Cambodia, some research has explored potential urban disaster risks and coping mechanisms at the community level (Denney 2016, Diepart et al. 2016, Flower et al. 2018). This research is needed to understand adaptation strategies of the urban poor and to what extent their efforts are thwarted by modern development in Phnom Penh. Comprehensive understanding of the extent of risks, vulnerability, and local capacity is important for designing strategies for "disaster risk reduction" (DRR; Desouza and Flanery 2013, Flower et al. 2018). We will analyze urban resilience building in Phnom Penh, focusing on the effectiveness of adaptation strategies and key elements and actors influencing adaptive capacity in urban communities. With Phnom Penh City attempting to modernize to build resilience, we aim to contribute empirical evidence to wider debates on these processes in a developing country context. Research findings will benefit future studies and inform urban planners, policy makers, and development practitioners concerned with urban resilience building.

The revival of modernization theory in contemporary urban development

Urbanization and industrialization are linked as "indisputable" processes of modernization (Bidandi and Williams 2017, Sayan 2017, McGill 2018). Although heavily criticized, the central ideas of modernizing as a staged process, moving from traditional to modern, persist in the literature (Kilminster 2007). Marsh (2014) noted that in modernized urban societies, people often have better "self-flexibility" to anticipate climate threats and adopt measures to mitigate them. In non-Western countries, researchers view "multiple modernities" and justify "new directions" for a

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revitalized modernization, to account for anomalies that could not be explained with the original theory (Jha et al. 2013, Marsh 2014).

Revitalization of modernization concepts is reflected in processes of enhancing industrialization in developing countries for economic development (Marsh 2014). Marsh (2014) also notes that nonmonetized economic sectors, energy consumption, average life expectancy, average education level, and percentage of telephones are used to determine levels of modernization. This justification reflects what Kim (2017) called "alternative modernity," which is viewed as a nonfixed but dynamically emergent phenomenon influenced by current social, cultural, political, and economic contexts. Revitalized modernization is also seen through the process of ecological modernization, criticized as economic "greenwashing," which focuses on improving environmental governance in dealing with environmental issues resulting from contemporary development activities (Inglehart 2014, Lockie 2015). An ecological modernization perspective emphasizes a closed connection between ecology and economic growth and industrial development. It also suggests that social-ecological challenges can be addressed through achieving goals of modern development and environmental improvement by encouraging technological innovation and new forms of economic and market agents (Jänicke 2008, Hobson and Lynch 2018).

From a modernization perspective, urbanization has played a crucial role in transforming economic and social factors (Marsh 2014), but also in creating socio-spatial inequality. The Sustainable Development Goals (SDGs), specifically SDG 11, focus on making cities more inclusive, safe, and resilient (United Nations Human Settlements Programme [UN Habitat] 2016, United Nations 2017). Sustainable urbanization presupposes that the right to development of low-income and middle-income countries can be realized and that the needs of urban poor communities can be fulfilled (UN Habitat 2016). In practice, policies for meeting these objectives often fall short, resulting in a loss of money, time, and effort and frustration toward achieving these goals (Hassan and Lee 2015).

Urban resilience in informal urban settlements

Rapid urbanization presents several cross-sectoral policy challenges, including increased squatter areas, insecure land tenure, insufficient service provision, and environmental degradation (United Nations 2014, Neef and Singer 2015). Jabareen (2015) argues that although many cities have plans to overcome these issues, they have predominantly applied traditional approaches and ignored the predicted threats, uncertainties, and vulnerabilities correlated with climate change. Consequently, lives and livelihoods in urban poor communities, especially informal settlements, are at risk because of limited adaptive capacity (Guild and Matsumoto 2013, Inderberg et al. 2014), exposure to poor environmental quality (Davis 2006, Willis 2011), and ineffective DRR strategies to prepare urban communities to cope with climate change (Birkmann and von Teichman 2010, Flower et al. 2018).

In the case of Cambodia, attempts to build urban resilience can be seen through the Green City Strategic Plan 2016-2025 for transforming Phnom Penh into a clean, green, and sustainable city offering a safe and modern lifestyle to its residents (National Council for Sustainable Development, Royal Government of Cambodia, Phnom Penh Capital Hall, Global Green Growth Institute, and International Centre for Environmental Management 2016). There are three elements to this strategic plan: inclusive growth, social justice, and environmental stability. Various projects have been designed to implement this plan, while improving urban poor livelihoods. Despite this, the vulnerable conditions of poor communities have not improved (Sahmakum Teang Tnaut [STT] 2018, The World Bank 2018). Consequently, peri-urban dwellers remain vulnerable to flooding, pollution, poor wastewater management, fires, landslides, and storm damage (Denney 2016, STT 2016, Flower et al. 2018). Specifically, urban flooding contains contamination from sewage systems and storm-water runoff, which often contains industrial contaminants and other pollutants (Flower and Fortnam 2015). Because the poor cannot compete in the formal property market (Davis 2006), they often opt to settle on unstable hillsides and floodplains or along polluted streams and rivers, which make them susceptible to diseases and natural disasters (STT 2018).

The previous discussion highlights a disconnect between building urban resilience and the pursuit of urban economic modernization, particularly in urban poor communities that are characterized by low adaptive capacity and vulnerability to disasters (Davis 2006, STT 2018). This urban condition seems to diverge from views on urban resilience, as emphasized by Mehmood (2016), who considers it the formulation of immediate responses to disaster as well as long-term adaptation and mitigation strategies in confronting social, environmental, and economic challenges.

Study area

Phnom Penh is the capital city of Cambodia and is located in the floodplain areas on the western bank of the Mekong River. The city is surrounded by ring roads, which are built as dikes to protect it from seasonal floods between June and November. Because of rapid urbanization and integration of peri-urban communes in the last decade, the city's area has nearly doubled. Urban expansion is connected to increasing demand for economic investment, especially in the real estate sector. This sector is expected to help drive economic growth and respond to the housing needs of a population that has increased from 1.13 million in 1998 (Trac 2015) to an estimated 2.4 million by 2020 (Japan International Cooperation Agency 2014).

The 2014 National Housing Policy is aimed at ensuring city dwellers have affordable housing, secure land tenure, and access to basic infrastructure and services; however, the implementation of the policy remains slow and ineffective (The World Bank 2018). This may well relate to limitations in finance and coordination between agencies and departments to ensure desired development outcomes. Phnom Penh has the highest rate of land issues (29 cases in 2013) compared with other provinces of Cambodia (NGO Forum on Cambodia 2014). These land conflicts have interconnected with issues of forced eviction affecting thousands of families that have been removed to peri-urban settlements outside the city center (Mgbako et al. 2010). In fulfilling the ambitions of governments and corporations toward "progress," as explained by Brickell et al. (2017), the new resettlement areas are far removed from the city center, which has disrupted livelihoods and negatively affected the well-being of slum

communities (Connell and Connell 2016). In 2002, about 16,000 people had been displaced from their homes in slum areas as a consequence of the demand for spaces for an "urban revitalization program," announced by the government for rebuilding Phnom Penh as one of Southeast Asia's grandest cities (Olds et al. 2002). These urban upgrading programs displaced hundreds of thousands of families and focused on infrastructure and the development of commercial and modern residential buildings (Brickell 2014, STT 2016).

Forced eviction has been interpreted by affected communities as a sanction from the government and is an ongoing threat facing urban communities (Flower and Fortnam 2015). Forced eviction is a ubiquitous intensification process influenced by neoliberalism (Casolo and Doshi 2013). Critiques of market-oriented neoliberal urban policy making are often ambiguous and less implementable leading to divergence between policy expectations and results (McMichael 2012, Tulumello 2016). As highlighted by Brickell et al. (2017), forced evictions under urban "regeneration" or "beautification" have occurred in many global cities, where the poor are perceived as an "externality" of modern development (McMichael 2012). Although most evicted communities of Phnom Penh have received compensation from the government or investors, it is far below the market value of properties and is insufficient to build adequate housing in the new settlement plots (McFarlane 2012, Connell 2015).

RESEARCH METHOD

To enhance the validity of the study results, we employed a mixed methods approach, which combined both quantitative and qualitative techniques. This method is suitable to enlarge the scope, extend insights, and improve the analytical power of research of complex human phenomena (Sandelowski 2000). We will cover the discussion of case study design, sampling and data collection techniques, and data analysis methods.

Case study design

We concentrated in two Sangkats, or communes, of Phnom Penh: Khmuonh, in Khan Saen Sokh, and Kouk Roka, in Khan Praek Phnov. These locations are appropriate because the two Sangkats are located in outer urban areas where urban upgrading activities are assembled. We chose these areas because they are considered vulnerable as a result of communities having very limited access to basic public services, such as clean water, electricity, or waste management systems; job opportunities; and livelihood resources (McFarlane 2012, Flower and Fortnam 2015, The World Bank 2018). Although both areas are geographically located close to natural lakes and canals, these resources are increasingly contaminated from urban-industrial wastewater.

Both Sangkats consist of a mixture of two kinds of villages. Old established villages are those that have been established since the collapse of the Pol Pot regime in 1979. The newly established urban communities were established in the early 2000s, after rapid urbanization had increased and more city land areas were needed for investments. The residents of these villages were relocated from informal or slum communities in the city center through both voluntarily and forced eviction.

Sampling and data collection methods

Our secondary data concerning topics of urban resilience and modern urban development have been reviewed from journal databases, nongovernmental organizations (NGOs), and government websites. Our primary data were collected from a total of 428 household surveys (Table 1, Fig. 1), where 1 member of each household, i.e., the head of household, was interviewed. The survey participants were selected on a voluntary basis. Closed-ended questionnaires were used for household surveys, and face-to-face interviews were also used for the data collection process. From the questionnaires, respondents were asked to scale (1 = very low to 5 = very high) levels of climate-related risk and its effects on urban communities, level of effectiveness of their adaptive strategies, or level of external support.

Table 1. Research sample size.

No.	Study Areas	Population†	Sample Size	No. of Selected Villages
1	Khmuonh	5719	207	10 out of 13
2	Kouk Roka	2928	221	12 out of 18
	Total		428	22

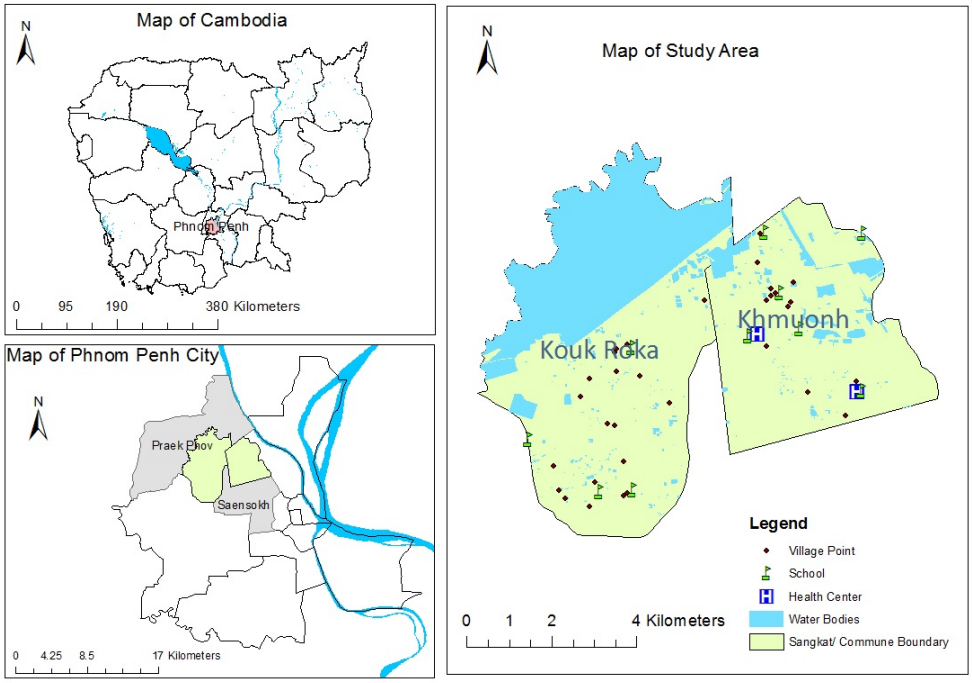
†Sources: Councils of Sangkat Khmuonh (2016), Councils of Sangkat Kouk Roka (2016).

Systematic random sampling, in the probability sampling method, was employed for selecting respondents. Every fifth household of the chosen villages was selected for an interview, with consideration of gender balance and a mixture of different household characteristics. Nine undergraduate (year 4) students were recruited and trained by researchers to implement the questionnaire surveys, in the Khmer language. Because of disorganized settlements in peri-urban or informal communities, some inaccuracies could possibly occur in the process of identifying respondents based on the systematic sampling technique. As a strategy to minimize error, enumerators were trained and closely monitored during the research. The qualitative research was composed of 8 focus group discussions (FGDs; 4 in Khmuonh and 4 in Kouk Roka) with a total of 40 participants, who were selected from the convenience sampling technique. However, the FGD participants needed to be the head of household or the elderly who had been living in the communities for more than 5 years. Twelve key informant interviews (KIIs) were conducted with the representatives of government agencies (4), NGOs (4), academia (2), and the private sector (2) through the snowball sampling method. The FGDs and KIIs were semistructured, allowing for more flexibility to explore particular or unexpected themes raised by the respondents (Corbetta 2003, Walliman 2015).

Data analysis

The quantitative data obtained from the household surveys were processed and analyzed by employing IBM SPSS v.24. Descriptive statistics were used to examine the respondents' socioeconomic characteristics. The Pearson correlation coefficient test was used to observe the connection between level of education and level of income for survey respondents. An independent *t* test was used to discern if there was significant difference in the perception of respondents between both study areas in term of the levels of risk of climate-related hazards and their impacts on urban livelihoods, level of effectiveness of adaptation strategies, and levels of external support for improving urban communities' adaptive

Fig. 1. Study areas.



capacity. The weight average index (WAI) was calculated to measure the participants' responses. WAI was measured on a 5-point scale (very low = 0.00-0.20, low = 0.21-0.40, moderate = 0.41-0.60, high = 0.61-0.80, and very high = 0.81-1.00). This index measured the mean score converted from the questionnaire Likert scale. In the case of a respondent who chose 1 (risk is very low), this answer was equal to a value of 0.20 in WAI, but if the number 5 was selected, then the value was equal to 1.00 in WAI. Also, a chi-square test was used to observe if there was a significant difference in the perception of respondents between both locations in term of types of assistance during the disaster events. Because both study areas are in different Khans with different administrative leadership (governors), it is crucial to examine if communities in both locations have encountered a different level of risks or obtained different adaptive capacities. To execute the tests, a 95% confidence level, i.e., $e = 0.05$, was assumed. Analysis of transcribed qualitative information was facilitated by the use of NVivo (Pro 11), for indexing, sorting, and coding the data, and a thematic analysis tool was applied for structuring the obtained information and selecting quotations for elaboration and justification of quantitative data.

RESULTS AND DISCUSSION

Socioeconomic factors influencing resilience

The survey results indicate that more women (75%) than men participated, because of the latter being away from home for work reasons and women being mainly responsible for household chores and child rearing. The majority of respondents (about 71%) were in the age group between 31 and 60, followed by <31 (about 20%) and >60 (about 9%). Most of them were employed in garment factories and construction firms (41.6%) and casual employment including taxi driving, laundry, cleaning private houses or companies, shoe polishing and sewing, and rubbish collection (22%). About a quarter of respondents were self-employed, and approximately 10% had engaged in formal employment, i.e., with companies, the government, and NGOs. Although nearly 54% of respondents received a primary education and 21% had attended secondary school, about 16% were illiterate. A small percentage had achieved high school (8.2%) and university (1.4%) education. Regarding income levels, about 61% of respondents earned between US$2000 and US$4000 per year, whereas about one-third earned less than US$2000 per year. Only about 8% had annual incomes greater than US$4000. Moreover, a Pearson correlation coefficient test revealed a positive correlation between education and income levels (r = 0.231, P = 0.001).

About 55% of respondents spent between US$2000 and US$4000 per year, whereas about 43% spent less than US$2000 per year, and the rest (2%) spent more than US$4000 per year. These findings indicate that households earning less than US$2000 spent most of their income, with limited opportunity to save their earnings. As part of their survival strategies, about 59% of the respondents had received loans for their families' needs. Interview respondents revealed that despite rapid growth of urban upgrading projects, their incomes had slightly improved. The high increase of inflation causes many poor urban dwellers to spend most of their income. Establishing a small business or having a medical emergency represent more immediate needs for funds from microfinance institutions (MFIs) or local lenders. As suggested by Connell (2015) and Flower and Fortnam (2015),

almost every family relocated to new peri-urban areas has borrowed money from MFIs or private lenders to upgrade their shelters and maintain their livelihood activities.

Among these debtors, only about 19% are able to return the loan on time, whereas the remaining 81% have faced difficulties in returning the debt based on the schedule. This has caused anxiety for the urban poor (Connell 2015), because loans of this nature often lead to crippling debt and the confiscation of household assets. This result aligns with findings in the literature indicating that hardships from increasing indebtedness among urban private households in China (Zheng and Deng 2018) and Spain (Di Feliciantonio 2016) are connected to real estate projects and other forms of neoliberal urbanism. Related to this finding, although the Cambodian government's strategies for DRR have concentrated on addressing specific hazards such as river flooding, the complexities of household indebtedness remain overlooked (Flower and Fortnam 2015). Consequently, the resilience of poor households to potential hazard risks has been restricted by the endemic poverty. The evidence reflects low adaptability of urban dwellers because they are less flexible in using their current capacities to select better options for addressing immediate needs and responding to risks. Moreover, a lack of institutional strategies for enhancing the robustness of urban communities limits the potentials of urban communities to build resilience to disturbances.

Risks of climate-related hazards in urban areas

The independent *t* test results (Table 2) reveal that heat wave has highly affected the communities in both areas. As suggested by FGDs and KII participants, this is because most of the houses in new established villages are condensed with very few trees or vegetation around them. The walls and rooftops of most houses are built from zinc, and the houses' sizes are relatively too small for the kinds of extended families. An FGD participant stated, "My family has lived in the house with the size of 3.8 m x 5, which was provided by the investor or government as a compensation for the relocation and there are 9 members in the family, so we have to live in the narrow space like piglets in the cage [...] during strong sunlight or black out, my family members cannot stay in the house, we need to escape to the nearest trees or shadow."

Although the literature is limited highlighting the negative impacts of heat waves in Phnom Penh, we reveal similar impacts on quality of life, especially for those who have fewer resources to adapt, upgrade, and cope with heat impacts (Jabareen 2015). Moreover, urban areas have become warmer because of higher heat absorption and limited cooling systems associated with urban biodiversity and permeable surfaces (Tyler et al. 2010, The World Bank 2011, UN Habitat 2016). This extreme weather has increased the threat of heatstroke in poor urban communities in developing countries, where access to basic public services, such as safe drinking water and health care, and key livelihood resources, including land, physical infrastructure, or green spaces, is restricted (Yen et al. 2016, Flower et al. 2018).

Floods and windstorms have moderately affected communities in both locations. FGD participants revealed that because their villages are located in flat areas near natural lakes and canals, they are prone to two climate-related risks. Floods had often occurred during heavy rain, and water remained in the communities between a few hours and a week. This corresponds with literature findings highlighting the common impacts of urban flooding, with resulting water contamination from the sewage systems and poor household waste management (Kum et al. 2005, Flower and Fortnam 2015, Denney 2016). FGD participants further contended that because windstorm intensity was fairly strong, the rooftops of some frail houses had been damaged by this risk.

Table 2. Perceptions on the level of climate-related risks affecting urban communities.

Risks	Saen Sokh (N = 207)		Praek Phnov (N = 221)		Overal (N = 428)	
	WAI	OA	WAI	OA	*P* Value	OA
Floods	0.50	M	0.52	M	0.51	M
Heat wave	0.73	H	0.74	H	0.73	H
Strong wind/ storm	0.48	M	0.44	M	0.46	M
Landslide	0.21	L	0.21	L	0.21	L
Thundering	0.32	L	0.31	L	0.31	L
Vector-borne diseases	0.37	L	0.41	M	0.39	L
Fires	0.23	L	0.22	L	0.23*	L

Notes: WAI indicates weight average index measured on a 5-point scale (very low [VL] = 0.00-0.20, low [L] = 0.21-0.40, moderate [M] = 0.41-0.60, high [H] = 0.61-0.80, and very high [VH] = 0.81-1.00). OA indicates overall assessment. Asterisk (*) indicates significance at the 0.05 level.
Source: Nop and Thornton (*unpublished data*, from survey conducted in 2017).

Although the results from Table 2 indicate that vector-borne diseases are a low-level risk, the respondents perceived this differently. Respondents located along canals in newly established communities are highly susceptible to vector-borne diseases. These households have inadequate access to clean, potable water. Poor hygiene and sanitation conditions increase health risk, especially among children who are exposed to this poor living environment on a daily basis. The common health problems occurring in these urban communities include malaria, diarrhea, dengue fever, and respiratory diseases. FGD participants are aware of the health risks associated with "living in poor environmental zones [...] but we have no other choice because we do not have land to settle down." These findings correspond with the argument of Awuah (2018) highlighting that poor housing and environmental conditions, as well as infrastructure and services shortages, remain huge challenges for improving urban communities' adaptive capacity in African cities. The evidence tends to indicate that modern development is complicating community-level adaptation strategies to mitigate risks.

The impacts of climate-related risks on urban livelihoods

The independent *t* test results (Table 3) reveal no significant differences in terms of respondents' perceptions of the level of impacts of climate-related risks on all attributes except "lose land" between both locations. Noticeably, respondents perceive that climate-related risks have moderately (1) damaged their houses and properties, (2) increased health problems, and (3) damaged local infrastructure. For FGD participants, these issues are predominantly caused by both floods and heat waves. FGD participants also highlight that for households on small plots of peri-urban and nonagricultural land, they have very limited access

Table 3. Perceptions on the level of impacts of climate-related risks on urban livelihoods.

Attributes	Saen Sokh (N = 207)		Praek Phnov (N = 221)		Overall (N = 428)	
	WAI	OA	WAI	OA	*P* Value	OA
Lose lives	0.24	L	0.24	L	0.24	L
Lose jobs or businesses	0.39	L	0.40	L	0.39	L
Damage house and other properties	0.46	M	0.44	M	0.45	M
Health problem or diseases	0.53	M	0.52	M	0.53	M
Lose land	0.22	L	0.24	L	0.23*	L
Damage infrastructure	0.53	M	0.51	M	0.52	M
School absence	0.33	L	0.35	L	0.34	L
Damage playground	0.23	L	0.23	L	0.23	L
Damage water sources	0.38	L	0.35	L	0.36	L
Damage crops/ gardens	0.27	L	0.24	L	0.25	L

Notes: WAI indicates weight average index measured on a 5-point scale (very low [VL] = 0.00-0.20, low [L] = 0.21-0.40, moderate [M] = 0.41-0.60, high [H] = 0.61-0.80, and very high [VH] = 0.81-1.00). OA indicates overall assessment. Asterisk (*) indicates significance at the 0.05 level.
Source: Nop and Thornton (*unpublished data*, from survey conducted in 2017).

to parks or playgrounds, which explains why these assets are not significantly affected by climate risks.

In a broad sense, this result is consistent with climate risks and disasters experienced by many ASEAN (Association of Southeast Asian Nations) cities, which have been catastrophic in terms of economic and social destruction and the loss of human life (Friend et al. 2015, Kumar 2015, Sarath Chandran et al. 2017). The increase of climate-related risks has brought about loss of livelihoods and incomes and increased expenditure in health care and property maintenance (STT 2009, Flower and Fortnam 2015). Our findings also reflect studies in environmental change in cases of health effects such as sanitation, infectious diseases, vector-borne diseases, or heatstroke as often encountered by urban poor communities in many Asian cities (Tyler et al. 2010, Flower et al. 2018).

Adaptation mechanisms of urban communities

Table 4 illustrates the respondents' perceptions on the levels of effectiveness of adaptation strategies of urban communities in responding to the risks of climate-related hazards. The independent *t* test results of respondents' perceptions of coping strategies revealed "building higher footpaths/roads" and "upgrading/building higher houses" as two key strategies adopted by communities in both locations. These two strategies are perceived as moderately effective to prevent urban communities from potential risks. FGD participants proclaim that with higher houses, dwellers can protect their household property from flood damage, whereas with higher footpaths or roads, they can still walk and do small business activities during flooding. Urban dwellers have also temporarily moved from homes, constructed dikes, planted more trees, and migrated to other locations. These strategies were only slightly effective because of spatial constraints. There were isolated cases of peri-urban dwellers watering down their rooftops to reduce heat impacts. This result aligns with the findings of Mitchell et al. (2015) and Platt et al. (2016) suggesting that adaptation mechanisms of urban poor communities in many developing countries are usually found to be ineffective because (1) they are located on marginal lands, in term of soil quality and landslide hazards; (2) they have poor-quality materials and engineering for building construction; (3) they have limited access to information to prevent and/or recover quickly from shock and stress; and (4) they have limited capacity to reorganize and recover losses. The evidence reflects low transformability of urban communities because they tend to have limited innovation in designing more effective strategies to cope with risks with the absence of external assistance.

Support in improving urban communities' adaptive capacity

Type of support during disaster risks

Table 5 describes types of support that urban communities in both Khans have received during the exposure to climate-related problems as part of their recovery process. Two-thirds of respondents received increased health-care support from government or NGOs, whereas one-third expressed no increase. The chi-square test result reveals a significant difference (χ^2 = 12.585, df = 1, P = 0.000) in health-care support between both study areas. Similarly, about 61% of respondents claimed to have been included in awareness raising for climate-related issues and problem solving processes. The chi-square test results reveal a significant difference in terms of perception of support between both locations (χ^2 = 9.732, df = 1, P = 0.002). These communities tend to receive less support in other livelihood components such as food, shelter, home reconstruction, rescue and relief, and training on how to cope with risks.

The degree of external support for urban communities

Apart from ad hoc assistance from climate-related events, Table 6 reveals types of support offered to affected communities for livelihood assistance and resilience building. From WAI, communities have received moderate support in five sectors,

Table 4. Perceptions on the level of effectiveness of strategies to cope with climate-related risks in urban communities.

Attributes	Saen Sokh (N = 207)		Praek Phnov (N = 221)		Overall (N = 428)	
	WAI	OA	WAI	OA	*P* Value	OA
Temporarily move out of village	0.30	L	0.30	L	0.30	L
Build higher footpath/roads	0.45	M	0.44	M	0.44	M
Build dikes	0.27	L	0.28	L	0.27	L
Upgrade/build higher houses	0.52	M	0.54	M	0.53	M
Preserve and plant more trees	0.40	L	0.34	L	0.37***	L
Migrate to other areas	0.22	L	0.23	L	0.22	L

Notes: WAI indicates weight average index measured on a 5-point scale (very low [VL] = 0.00-0.20, low [L] = 0.21-0.40, moderate [M] = 0.41-0.60, high [H] = 0.61-0.80, and very high [VH] = 0.81-1.00). OA indicates overall assessment. Asterisks (***) indicate significance at the 0.00 level.
Source: Nop and Thornton (*unpublished data*, from survey conducted in 2017).

Table 5. Perceptions on external support for affected communities.

Attributes		Name of Khan		Total	%	χ^2 Test Result
		Saen Sokh (N = 207)	Praek Phnov (N = 221)			
Food items	No	146	173	319	75	$\chi^2 = 3.381$, df = 1, $P = 0.066$
	Yes	61	48	109	25	
Shelters	No	185	202	387	90	$\chi^2 = 0.509$, df = 1, $P = 0.476$
	Yes	22	19	41	10	
Home reconstruction	No	184	209	393	92	$\chi^2 = 4.594$, df = 1, $P = 0.032$*
	Yes	23	12	35	8	
Health care	No	88	58	146	34	$\chi^2 = 12.585$, df = 1, $P = 0.000$***
	Yes	119	163	282	66	
Rescue and relief	No	197	215	412	96	$\chi^2 = 1.330$, df = 1, $P = 0.249$
	Yes	10	6	16	4	
Awareness raising	No	96	70	166	39	$\chi^2 = 9.732$, df = 1, $P = 0.002$**
	Yes	111	151	262	61	
Trainings on disaster risk reduction	No	176	191	367	86	$\chi^2 = 0.172$, df = 1, $P = 0.679$
	Yes	31	30	61	14	

Note: Asterisks (*, **, and ***) indicate significance at the 0.05, 0.01, and 0.00 levels, respectively.
Source: Nop and Thornton (*unpublished data*, from survey conducted in 2017).

including local infrastructure improvement, water resource management, health-care services, general education for children, and local environmental protection. The independent *t* test results reveal no significant differences between both locations among these attributes, except "water resource management." Support in other sectors (Table 6) has been assessed as "low level."

Interviews reveal that despite the rapid increase of city investment projects during the last decade, the living conditions of urban poor communities remain unchanged because many dwellers remain living in informal and poor settlements, having limited income, and exposed to poor hygiene and sanitation. These results correspond with the World Bank (2018) report suggesting that the needs and challenges of the poor are being neglected in the process of modernizing Phnom Penh City. Respondents further indicate that if all these attributes were to be improved satisfactorily, communities could feel more secured and gain more confidence to swiftly respond and adapt to potential risks by themselves. They note that by having food security, better skills, and the availability of financing to start businesses, community members would be able to consume sufficient calories and build more family savings. Likewise, by upgrading local infrastructure, enhancing the local environment, or improving health-care services, urban dwellers could possibly lead healthier lives and better plan for long-term development of their families and communities.

Our evidence suggests that current climate-related risks moderately affect urban livelihoods, but because of limited mechanisms to minimize impacts, those risks seem to exacerbate the poor living conditions in informal urban areas. As discussed previously, although urban upgrading projects have been established, poor conditions, i.e., unsecured shelters and insufficient basic infrastructure and services, in informal areas have not improved. For instance, ineffective waste management systems exacerbate the effects of floods, causing serious health problems for urban poor communities. This reflects a limited capability of urban communities to cope with the disturbances (Meerow et al. 2016).

Table 6. Perceptions on the level of external support for urban communities in improving their adaptive capacity.

Attributes	Saen Sokh (N = 207)		Praek Phnov (N = 221)		Overall (N = 428)	
	WAI	OA	WAI	OA	*P* Value	OA
Food security	0.33	L	0.30	L	0.31	L
Skills building and development	0.31	L	0.30	L	0.31	L
Financial for income activities	0.28	L	0.27	L	0.27	L
Health-care services	0.59	M	0.59	M	0.59	M
Education for children	0.55	M	0.55	M	0.55	M
Business expansion	0.31	L	0.28	L	0.30*	L
Market for local products	0.33	L	0.33	L	0.33	L
Local infrastructure development	0.58	M	0.58	M	0.58	M
Water resource management	0.61	H	0.53	M	0.57***	M
Environmental protection	0.43	M	0.42	M	0.42	M
Natural resource management	0.34	L	0.34	L	0.34	L
Disaster risk management	0.35	L	0.31	L	0.33***	L
Assistance during high inflation	0.28	L	0.28	L	0.28	L
Technical development	0.25	L	0.24	L	0.24	L

Notes: WAI indicates weight average index measured on a 5-point scale (very low [VL] = 0.00-0.20, low [L] = 0.21-0.40, moderate [M] = 0.41-0.60, high [H] = 0.61-0.80, and very high [VH] = 0.81-1.00). OA indicates overall assessment. Asterisks (* and ***) indicate significance at the 0.05 and 0.00 levels, respectively.
Source: Nop and Thornton (*unpublished data*, from survey conducted in 2017).

Main actors influencing communities' adaptive capacity

The majority of respondents (86%), in both study areas, perceive that community-level adaptive capacity is determined by individual households, with others stating that government agencies (11%) and NGOs (3%) have supported their adaptive strategies. Respondents reveal that during the stage of preparing for and confronting disturbances, individual households have usually relied on their own capacities, unless the villages are under government or NGO project coverage, in which case the target beneficiaries could receive support. The research participants, however, view that the support is insufficient and fragmented and therefore unable to assist the community to improve in the long run. This corresponds with Joseph et al. (2013), who indicate that the adaptive capacity of communities is often formed through livelihood transitions and using available individual and community resources. Many respondents want to see a clear government mechanism for promoting the capacity and security of urban communities through legalizing informal settlements, provision of land certificates, improving basic infrastructure and services, and supporting income generation activities.

The evidence seems to reveal a divergence between the modernization premise and the actual outcomes of contemporary urban development processes. The rapid growth of private investments, especially in construction in Phnom Penh, appears to be influenced by economic models for modern urban development that reflect heavily critiqued ideas rooted in modernization theory and its more contemporary revisions (Inglehart 2014, Marsh 2014). The approach to urban development as influenced by state-driven efforts to modernize (Olds et al. 2002) appears to contradict policy statements for building urban resiliency. Consequently, the capacity of urban communities and state government to cope with shocks and stress remains limited.

CONCLUSION

We explored tensions related to the pursuit of modernizing cities in developing countries for both economic growth and urban resilience building. We found that urban upgrading as an approach to modernize has not improved the lives of the urban poor. Livelihoods remain confronted with the negative impacts of climate change, and, consequently, the urban poor suffer loss of life, property damage, and physical and mental health problems. From our review of the literature, the adaptive capacity of individuals or communities is often expected to be enhanced through modernization. In the city of Phnom Penh, we revealed that attempts by city officials to modernize have contributed to low adaptive capacity in informal settlements. Despite the presence of urban communities' adaptation strategies, these have been assessed by us as having "low effectiveness" because of insufficient household capacity and external support. Our findings identified the practice of loans as a household adaptation strategy in response to the loss of livelihoods and assets. This finding challenges the viewpoints of Jha et al. (2013), Marsh

(2014), and Inglehart (2014) who propose that urban resilience can be strengthened through revitalized modernization concepts, influenced by neoliberalism. This is not to argue that urban upgrading is always negative. On the contrary, strategies that are inclusive of community input should be explored and applied in real practice. To reduce the impacts of climate-related hazards and enhance the adaptive capacity of urban residents, urban development processes should consider the following:

- Supporting urban poor communities with livelihood improvement programs through enhancing knowledge and expanding employment opportunities and market access for urban poor communities.
- Designing DRR programs based on the specific context of urban communities should be integrated into commune/Sangkat investment plans, with active participation by communities and other key stakeholders in program planning, implementation, and monitoring.

The impacts of climate-related risks on human society are increasing, which is a key concern for sustainable urban development planning and policy making. In the context of Cambodia, our findings reflect wider trends of cities attempting to become more resilient cities. Although building urban resilience can be a daunting task, placing vulnerable communities at the center of the decision-making process can be an effective approach for building capacity and localized adaptation strategies.

[1] The main goals of urban upgrading are to provide secure land tenure in illegal and informal areas and to improve basic infrastructure and service delivery (Gulyani and Connors 2002).

Responses to this article can be read online at:
http://www.ecologyandsociety.org/issues/responses.php/10860

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