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WOMEN'S ADAPTIVE CAPACITY FOR LOCAL CLIMATE RESILIENCE IN CAMBODIA'S FOUR AGROECOLOGICAL ZONES

Introduction

Cambodia is among the three countries most vulnerable to climate change in Asia and the 10 most vulnerable worldwide (UNDP 2013 and Kreft et al. 2013). In part this is due to inadequate financial, technical and institutional capacity in building climate resilience, the dependence of the majority of its population on climate-sensitive livelihood sectors notably fisheries and agriculture, their limited awareness of climate change issues, and lagging integration of climate change adaptation into long-term planning (UNDP 2013). Climate change impacts are expected to amplify and compound existing development challenges in Cambodia (Solar 2010). Climate projections show that Cambodia can expect higher temperatures, more frequent and intense flooding and drought and extreme storms, and temporal changes in rainfall patterns (MOE and UNDP 2011). These direct effects can eventually lead to indirect impacts such as water scarcities, crop losses, inundation of low-lying land, and epidemics of infectious human and animal diseases.

Knowledge and information about climate change and adaptation responses in Cambodia is generally lacking (Va 2015). The top-down nature of information flows leaves most climate information concentrated at the national level and largely unavailable to stakeholders at local and subnational



Participants in a focus group discussion contributed ideas on how to build their adaptive capacity and resilience to climate change. Preah Vihear, July 2018

levels. Similarly, local knowledge and expertise does not flow upwards, let alone get integrated into decision and policy making. Further, the complex nature of scientific and technical information means that much of the climate information that is available is largely inaccessible to the general public. This means that local people's sources of knowledge about changes in the environment are their own experiences and local knowledge, perhaps supplemented with sporadic training provided by outsiders. Other constraints shaping climate change awareness are insufficient budget allocation

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at the subnational level and limited localisation and applicability of climate data due to a lack of downscaled climate modelling (Sam and Ouch 2014).

Climate change commonly affects women disproportionately. Because women are the primary carers within the household and shoulder the burden of domestic work such as securing adequate food, water and fuel, climate change makes their daily life even more difficult (UN Women 2009). The pivotal role of women in supporting their households and communities means that the potential to mitigate and build local resilience to climate change is lost when women are neither heard nor have the right kinds of spaces to contribute their knowledge and experience (UNFCCC 2010). In Cambodia, rural women are expected to suffer the most because of their dependence on highly climate-sensitive sectors, particularly agriculture, fishing, livestock and forestry (NCCC 2013). Yet not all rural women, who in 2014 constituted 47 percent of Cambodia's total agricultural workforce, are aware and informed about their vulnerability to climate change, not to mention what they can do to prepare for and protect their livelihoods from major risks (NIS 2015).

Clearly, increasing women's participation in leadership and decision making at local and community levels is vital for building the long-term resilience of vulnerable communities to the impacts of climate change. Yet women's equal political participation and their access to information, education and financial support that would help them manage climate-related risks remain limited due to the lack of specific mechanisms facilitating women's participation in development and their equal access to resources (Nang et al. 2014). Traditional cultural attitudes assign women lower status in the socioeconomic hierarchy; for instance, they are not expected to take part in public affairs. Such social and cultural barriers to women's fuller representation and participation in public and political life discourage women from building the self-confidence and self-esteem they need to voice their concerns and solve their problems. Constraints of time and place also limit women's participation in community development planning, strategy and policy development. Therefore, despite a gradual increase in women's representation, men continue to dominate decision making and leadership positions (Moul 2013).

This paper draws on a two-year participatory research project conducted by CDRI with support from the United Nations Democracy Fund to assess local women's awareness of climate change and their capacity to respond to climate change impacts (Nong, Chhaing and Sorn forthcoming). The aim of the study was to identify the problems met by women adapting to climate change in rural areas and the constraints limiting their ability to access reliable information on climate change and adaptation measures.

Analytical framework

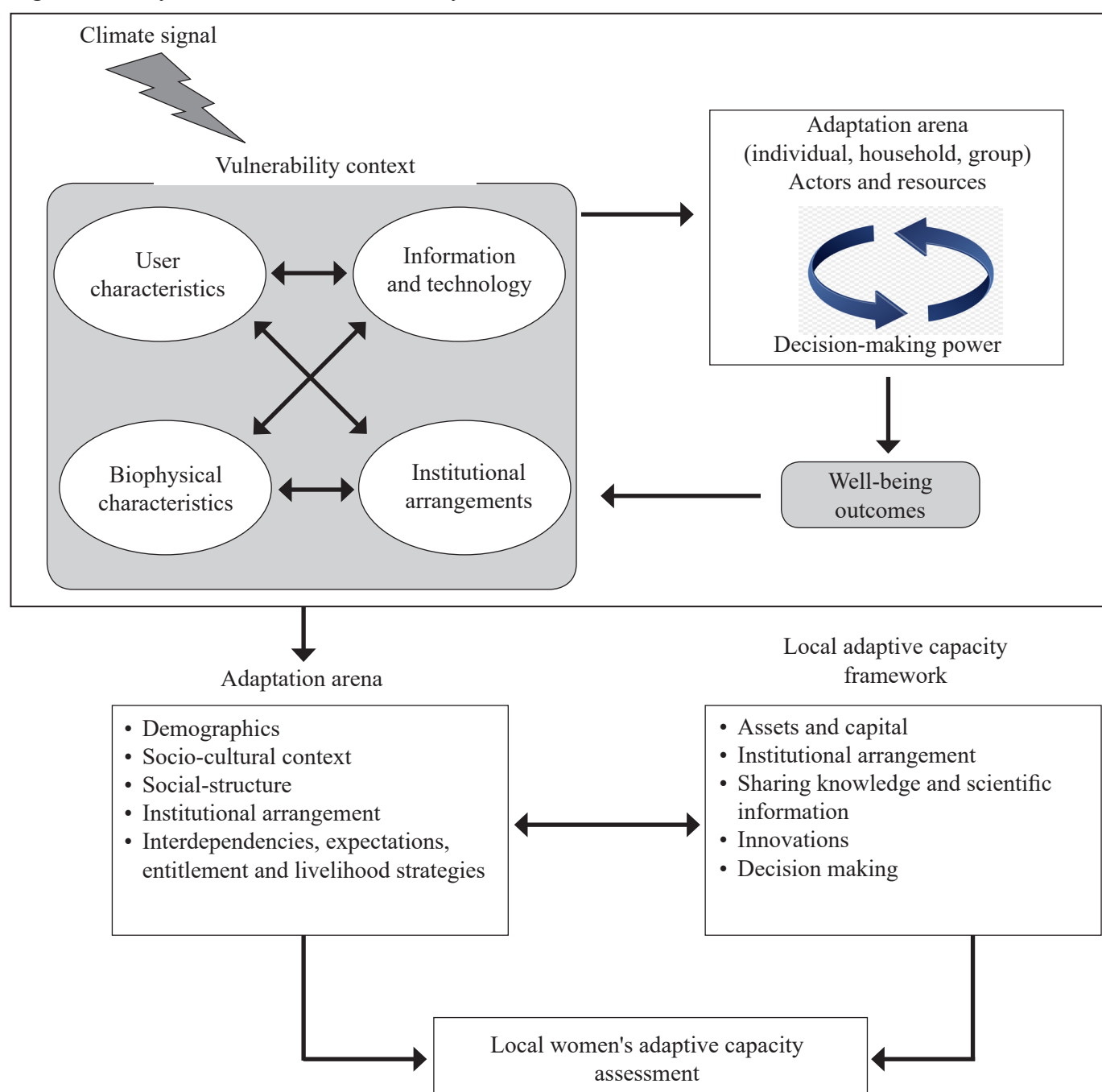
The study follows the framework for analysing rural women's capacity in the arena of climate change mitigation and adaptation developed by Behrman, Bryan and Goh (2014) and the local adaptive capacity (LAC) framework of Jones (2011). The LAC framework, depicted in Figure 1, represents a shift from a sole focus on livelihood assets or capitals (human, social, natural, physical and financial) to include capabilities at the local level by paying more attention to the dynamism of local adaptive capacity. In the words of Jones (2011, 2), it seeks to recognise "what a community does that enables it to adapt such as fostering innovation; promoting forward looking flexible governance; and re-defining maladaptive norms, behaviours and institutions" as key coping strategies.

Research method

The study used both quantitative and qualitative research approaches. A household knowledge, attitudes and practice (KAP) survey on climate change was conducted in November 2017. It was administered to the household head or the principal adult¹ decision maker (312 females and 89 males) in 401 households in 43 villages across 10 communes in four provinces. Battambang, Preah Vihear, Prey Veng and Kampot provinces representing the Tonle Sap, Plateau and Mountain, Plains, and Coastal areas, respectively, were selected because they are consistently ranked among those most vulnerable to climate change. Information was also collected from 19 key informant interviews (KIIs) with local women, local authorities, provincial line department officials and local NGO representatives, and 16 focus group discussions (FGDs) – two female-only

¹ Adult is defined as age 16 years and above.

Figure 1: Analytical framework of the study



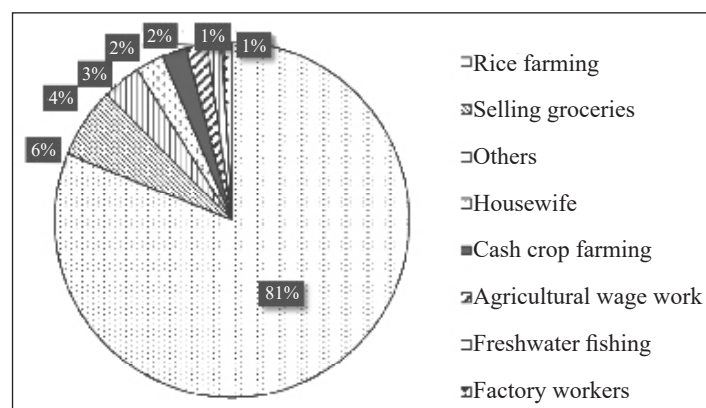
Sources: Behrman, Bryan and Goh 2014; Jones 2011

Table 1: Age profile of survey respondents (percent)

Respondents	16–24	25–39	40–54	55+	Average
Female (n=312)	6.09	30.77	33.01	30.13	45.17
Male (n=89)	1.12	25.84	39.33	33.71	45.55
Total (n=401)	4.99	29.68	34.41	30.92	46.81

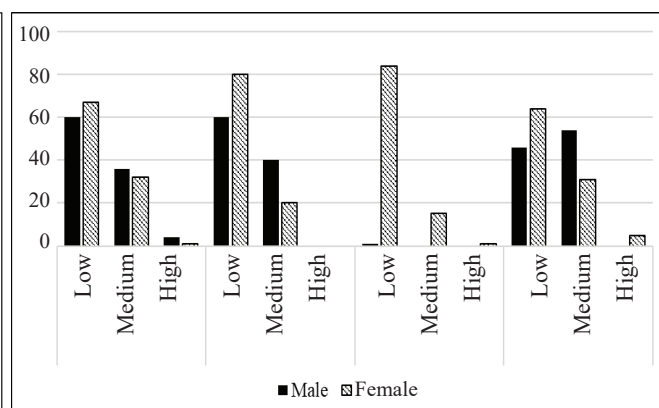
Source: KAP survey, November 2017

Figure 2: Main occupation of female respondents (percent)



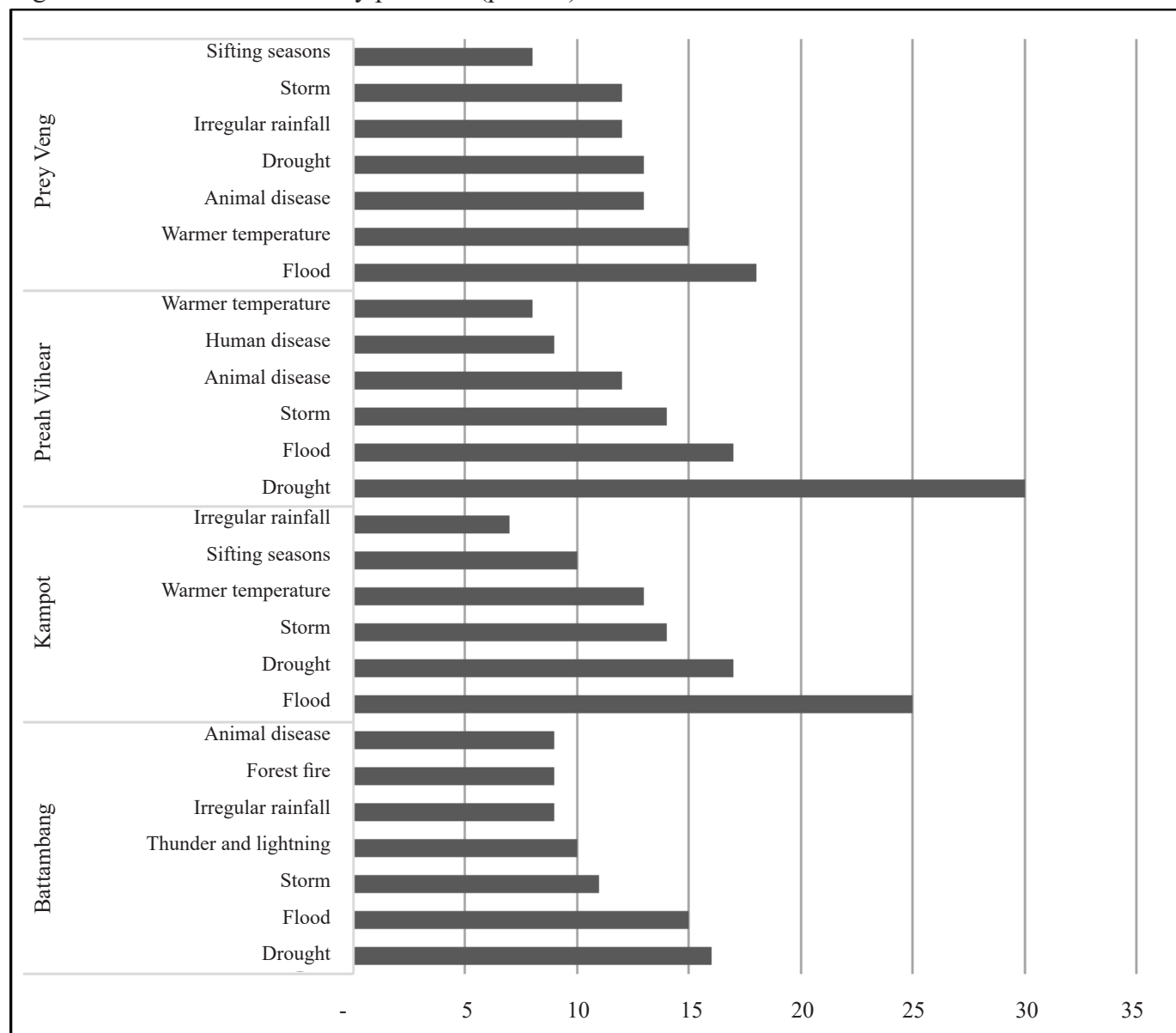
Source: KAP survey, November 2017

Figure 3: Education level of respondents (percent), by gender



Source: KAP survey November 2017

Figure 4: Disaster occurrence by province (percent)



Source: KAP survey, November 2017

and two male-only FGDs in each province. The KIIs and FGDs were conducted in June 2018.

The findings

Characteristics of survey respondents

Respondents were categorised by age into four groups, as shown in Table 1. The largest proportion of respondents (34.41 percent) fall into the 40–54 age group. There is little difference between the average age of female and male respondents. Figure 2 shows female respondents' main occupations, which for the majority (81 percent) is rice farming.

For education level, the study used standardised categories; these are expressed as low (no education, primary), medium (lower secondary, upper secondary, basic vocational training), and high (university education, specialised vocational training).² As Figure 3 shows, in three of the four provinces (except Preah Vihear), more female than male respondents have a low-level education; conversely, more male than female respondents have a medium-level education. None of the male respondents in Preah Vihear province have a medium- or high-level education, and none of the respondents in Kampot have a high-level education.

Exposure to climate hazards

Respondents in the four provinces are affected differently by natural disasters. Those in Kampot and Prey Veng are most affected by flooding and those in Preah Vihear by drought. Droughts and floods are the most frequent and extreme events local people have to deal with, followed by windstorms, warmer temperatures and shifting seasons.

Knowledge of climate change, its meaning, causes and effects

Understanding the meaning of climate change

The KAP survey results shown in Figure 5 indicate that female and male respondents (71 percent vs 70 percent) are equally familiar with the phrase “climate change”. Roughly half of them (50 percent female vs 47 percent male) have not heard of the

phrase “global warming”, and only 25 percent of female and 39 percent of male respondents have heard of it. A minority of respondents are uncertain or neutral about these scientific terms.

A KII with a disaster risk management committee (DRMC) representative in Kampot confirmed our survey findings. According to him, not all local people, women and men alike, know what the term climate change means. Roughly half of the people in his commune are aware of climate change issues such as changes in the growing season and rainfall patterns.

In my view, people in my commune understand a lot about how climate change affects their lives, especially since we provided various kinds of information through training courses, leaflets and booklets to raise awareness about climate change impacts and adaptation. The level of understanding about climate change varies from region to region. For instance, 50 percent of people who live in project intervention areas have a comprehensive understanding of climate change issues.

Male, DRMC representative, August 2018

Unsurprisingly, therefore, few local people use the terms climate change and global warming. Instead, they talk about extreme weather – too cold or too hot, too much or too little or heavier rainfall, prolonged dry spells and stronger storms, as relayed by two NGO workers:

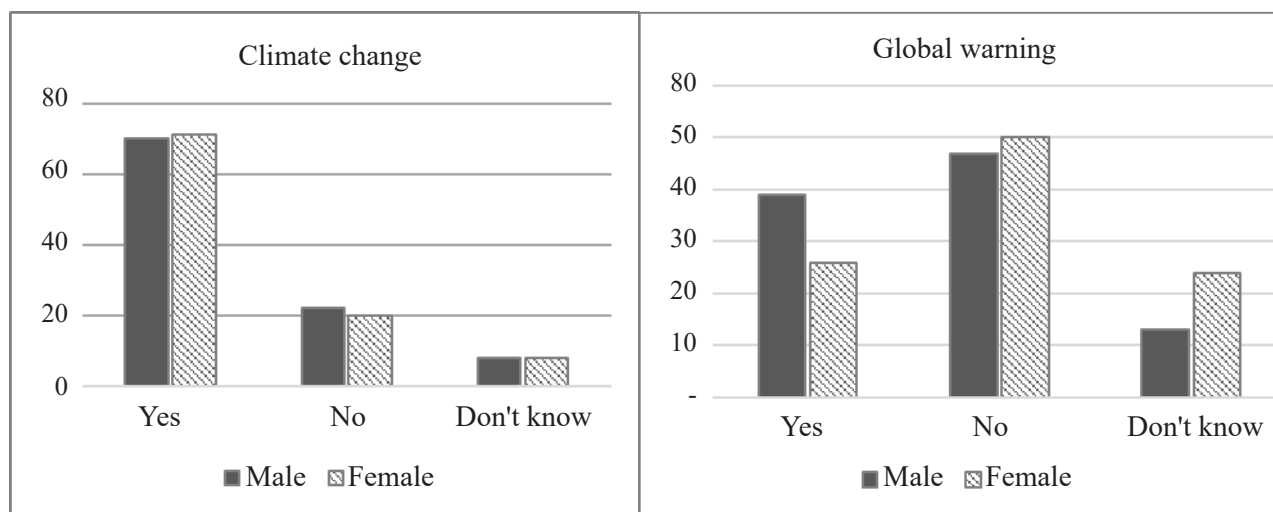
...when talking [with local people] about climate change, I start by talking about the climate hazards in their villages like warmer or colder temperatures, too much rainfall or other weather issues, so they can understand [what I am saying]. Then, I explain the causes and effects of climate change. I definitely always use simple words or phrases to communicate with them. In my experience, compared to elders, young people are more aware of climate change because they learn about it through social media.

Female, local NGO representative,
August 2018

A few villagers understand the phrase climate change in that it has affected their lives. However, most of them think the problems occur naturally. They don't think they stem

² The standardised categories are based on the International Standard Classification of Education from UNESCO (1999). Only completed education and training were taken into account. Incomplete training and educational attainments were coded to the next lower level.

Figure 5: Respondents having heard the phrases climate change or global warming (percent), by gender



Source: KAP survey, November 2017

from climate change, let alone associate them with human activity. In their experience, intense rainfall and prolonged dry season happen more frequently and the growing season has changed rapidly.

Male, local NGO representative,
August 2018

Understanding the causes and effects of climate change

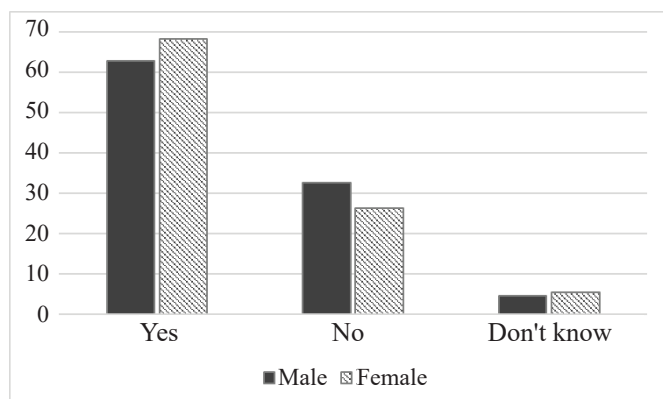
Nearly half the respondents linked the causes of natural disasters with the impact of unsustainable and illegal logging and consequent deforestation and forest degradation, which is known to disrupt natural weather patterns, alter microclimatic conditions and impair ecosystem functions, and lead to increased weather variability. Thirteen percent of female respondents recognised that natural disasters result from natural processes

and a few blamed human activities such as the burning of rubbish, wood and fossil fuels, the construction of too many buildings, and population growth.

Female and male respondents alike said they worry about climate-related health issues. They perceived that climate change creates challenges to agriculture, making it harder to grow rice and other crops and causing water scarcities. They were also aware of some indirect effects such as forest loss, uneven distribution of the impacts of natural disasters such as prolonged drought and extreme temperatures, declining agricultural productivity, and the risk of falling into poverty.

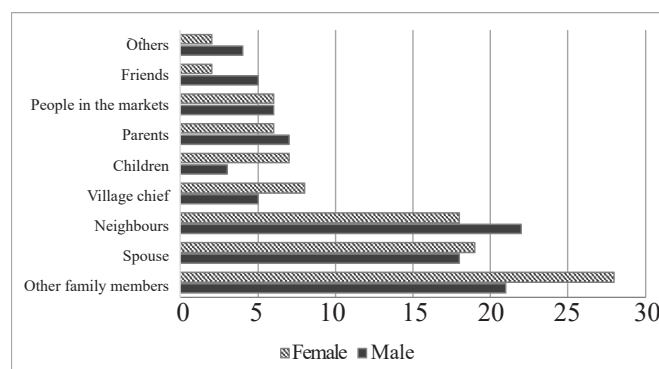
In my experience of working with local communities, people do not really understand what the phrase climate change means and not many people have heard about climate change. They never care or think about where

Figure 6: Discussing climate change issues (percent), by gender



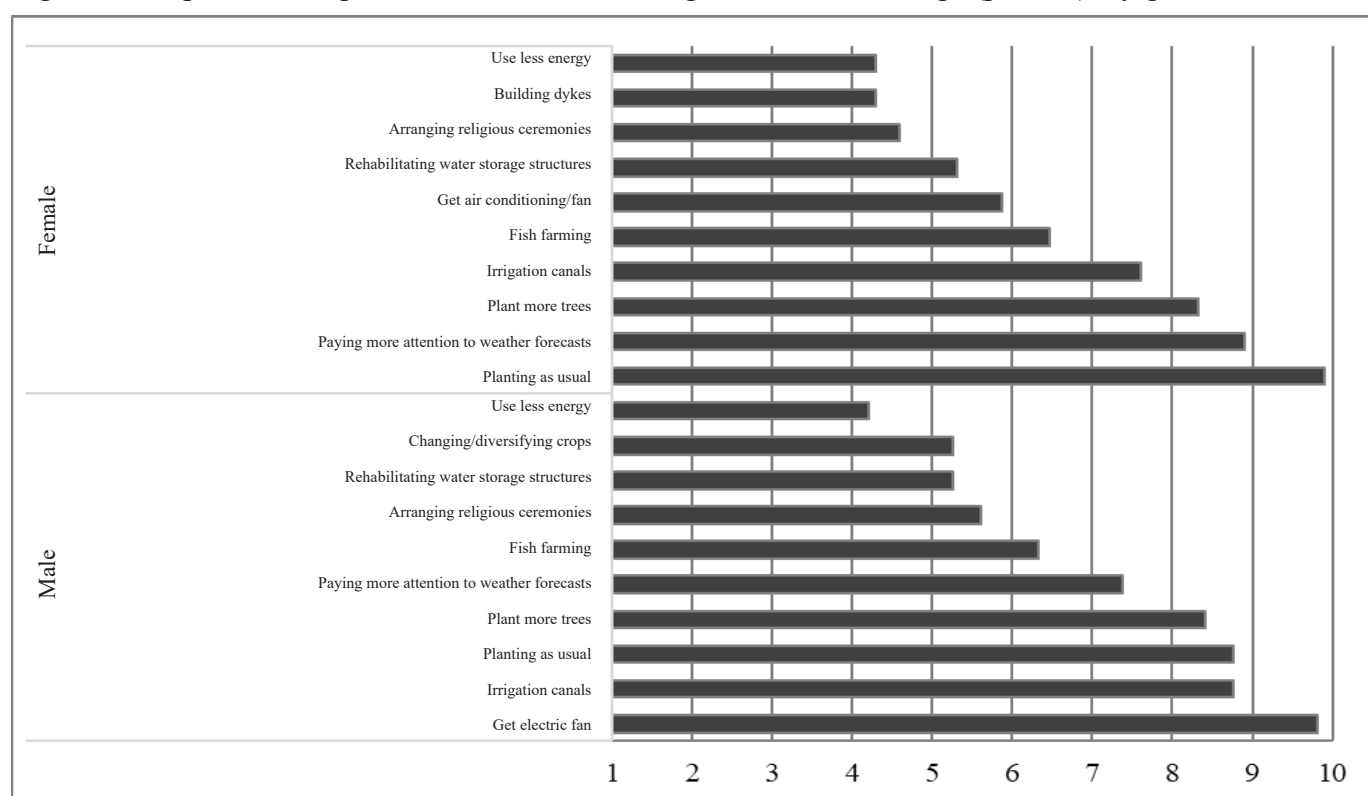
Source: KAP survey 2017

Figure 7: Persons with whom respondents have discussed climate change issues (percent), by gender



Source: KAP survey, November 2017

Figure 8: Respondents' top three solutions for dealing with climate change (percent), by gender



Note: Data represents the proportion of respondents selecting each solution among their top three choices

Source: KAP survey, November 2017

that hazard comes from – if they are hot, they just turn on the electric fan. All information about problems and issues related to climate change has to meet the needs of people especially at the community level.

Female, local NGO representative, 2018

Sources of knowledge on climate change

The KAP survey revealed that 45 percent of men and 46 percent of women learn how to cope with changes in the weather through their daily practices and experiences and those of their friends and neighbours. As Figures 6 and 7 show, 68 percent of the female respondents claiming to be aware of climate change have discussed the issue with their family, husbands, neighbours and local authorities such as village heads or commune chiefs. Twenty-six percent of them have not discussed the issue at all. Respondents have received little “outside” knowledge such as through training workshops on climate change. For instance, only 22 percent of male and 26 percent of female respondents had participated in training run by local NGOs.

Adaptation strategies to climate change

Climate adaptation initiatives can be planned or autonomous. Planned adaptation refers to a continuous strategy that enables people to sustain both their livelihoods and the environmental resources they rely on. Such initiatives usually involve effective resource use and planning, and focus on finding alternative livelihood options. Autonomous adaptation refers to short-term, reactive and immediate responses oriented towards survival, usually motivated by crisis – often as a result of environmental resource degradation – and prompted by a lack of alternatives (JCCI 2012).

In the KAP survey, only 22 percent of the respondents reported having adopted planned adaptation options, whereas 78 percent had adopted autonomous adaptation strategies. As Figure 8 shows, the most common practices reported by female respondents are planting crops as usual, paying more attention to weather forecasts, planting more trees and repairing irrigation structures. Information from the KIIs suggests that some villagers have changed the types of crops they grow and started to choose varieties that are more heat tolerant. Moreover, to adapt to the flooding risk

in their villages, they have stored food supplies, materials and other property in safe spots and made plans to evacuate their livestock to higher land.

I have shared and explained information to [villagers] to help them understand climate change. Some villagers responded by planting different kinds of crops. Moreover, they use seed varieties that are resilient to climate change which they get through commune authorities. They have also adapted to the flooding risk in their village. Before a flood happens, some villagers prepare food, materials and property, take their livestock to a safe spot on higher land, and so on.

Male, commune councillor, 2018

Others seemed reluctant to invest in disaster-risk preparedness and were going about their lives and livelihoods in the usual way, growing the same crops in the usual way and getting an electric fan or air-conditioner to cope with hot weather. Discussants in the women-only focus group in Preah Vihear stressed how in order for them to build their adaptive capacity and resilience to climate change, canals and ponds need to be rehabilitated and the lake deepened so they can store water for agriculture and domestic use. They also called on the Agricultural District Office to extend animal vaccination services and obtain drought-tolerant crop seeds, and requested that volunteer medical staff be placed in their villages to teach them about healthcare.

Discussion

The study participants mostly rely on “inside” knowledge and receive some “outside” knowledge and information about climate change through the media. A few have participated in formal training organised by local NGOs (Nang et al. 2014). Young women are more able than older women to access climate-related information through social media and the internet. However, local women generally find it hard to access climate-related information, affecting their ability to adapt to change quickly enough. Other important challenges are time constraints, limited resources and low commitment. Besides, women are rarely involved in public forums, workshops, farmer field schools and field visits, and farmer associations. Although the impacts of climate change affect women more than men, the

results of the KAP survey and VAR suggest that local people are not aware of gender differences in vulnerability to climate change, let alone the potential implications of gender-differentiated and generation-differentiated impacts.

Conclusion and recommendations

The study demonstrates that a community’s vulnerability and resilience to climate change vary depending on the agroecological zone in which it is located. People living in Prey Veng and Preah Vihear provinces are more susceptible to drought, higher temperatures and irregular rainfall, whereas those in Battambang and Kampot provinces are more susceptible to increased floods followed by drought, storms, and infectious human and livestock diseases. Most local women have heard of “climate change” but are less familiar with the term “global warming”. Their awareness of the causes and impacts of climate change therefore lags behind national efforts to build local climate resilience. Some local women are able to respond to climate change adequately and cope with natural disasters by paying more attention to weather forecasts and maintaining irrigation canals and water structures. Others do not know how to prepare for predicted climate hazards, resorting to religious ceremonies, moving to live elsewhere, or getting an air-conditioner or electric fan.

Support for women to build their adaptive capacity to climate change should include the following actions.

- Raise awareness about climate change in the most vulnerable communities specific to the agroecological zone they are located in. This can be done through participatory action research coupled with tailored capacity building.
- Engage women at commune level in participatory action research to document best practices and available tools for building resilience to climate impacts on women’s livelihoods. These include climate-smart agriculture, water resource management, access to finance, income diversification, and information about climate change adaptation and disaster risk reduction.
- Strengthen local governance by improving women’s engagement and participation in the mainstreaming of women’s knowledge and practices into climate change adaptation planning and initiatives in commune development plans.

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Effectiveness of Community Forestry for Forest Conservation in Cambodia

Introduction

Community forestry (CF) is a natural resource management system which is maintained by local community members at the village and community level. It is considered a successful means for achieving positive social-ecological outcomes, reconciling biodiversity and carbon conservation, local knowledge and livelihood needs (Bowler et al. 2012). Further, CF is reportedly more effective than protected area management for forest conservation (Ellis and Porter-Bolland 2008; Porter-Bolland et al. 2012). As a form of self-governed decentralised forest management, CF is a complex, nested, social-ecological system. Even so, it has been claimed that participatory forest monitoring under CF is cheaper than under private and state management because it is more expensive to hire forest officials from the city to monitor isolated forests (Ostrom 2007).

With 77 percent of Cambodia's total population of 16.25 million living in rural areas, forests play an important role in rural household livelihoods and are of special cultural and spiritual significance to many, especially in traditional communities. Forest cover has decreased substantially over the past five decades, from 13,227,100 ha or 73.04 percent of the total land area in 1965 to 8,742,401 ha or 48.14 percent in 2016 (FA 2011; MOE 2018). To keep large tracts of forest intact and improve local livelihoods, the Cambodian government has laid down several policies and strategies. The 2002 Forest Law sets out the framework for the management, use, development and conservation of forests, which are managed by the Forestry Administration (FA) under the auspices of the Ministry of Forestry, Agriculture and Fisheries. CF is one of the six major programs of National Forestry Program 2010–29, and has been implemented since the 1990s with the cooperation of local non-government organisations (NGOs), international organisations and development

partners. By 2017, there were 580 CF sites in 21 provinces with a combined forest area of 470,970 ha (FA 2017). The FA plans to increase the number of CF sites to 1,000 by 2029, quadrupling the land area under CF to 2 million ha (FA 2015).

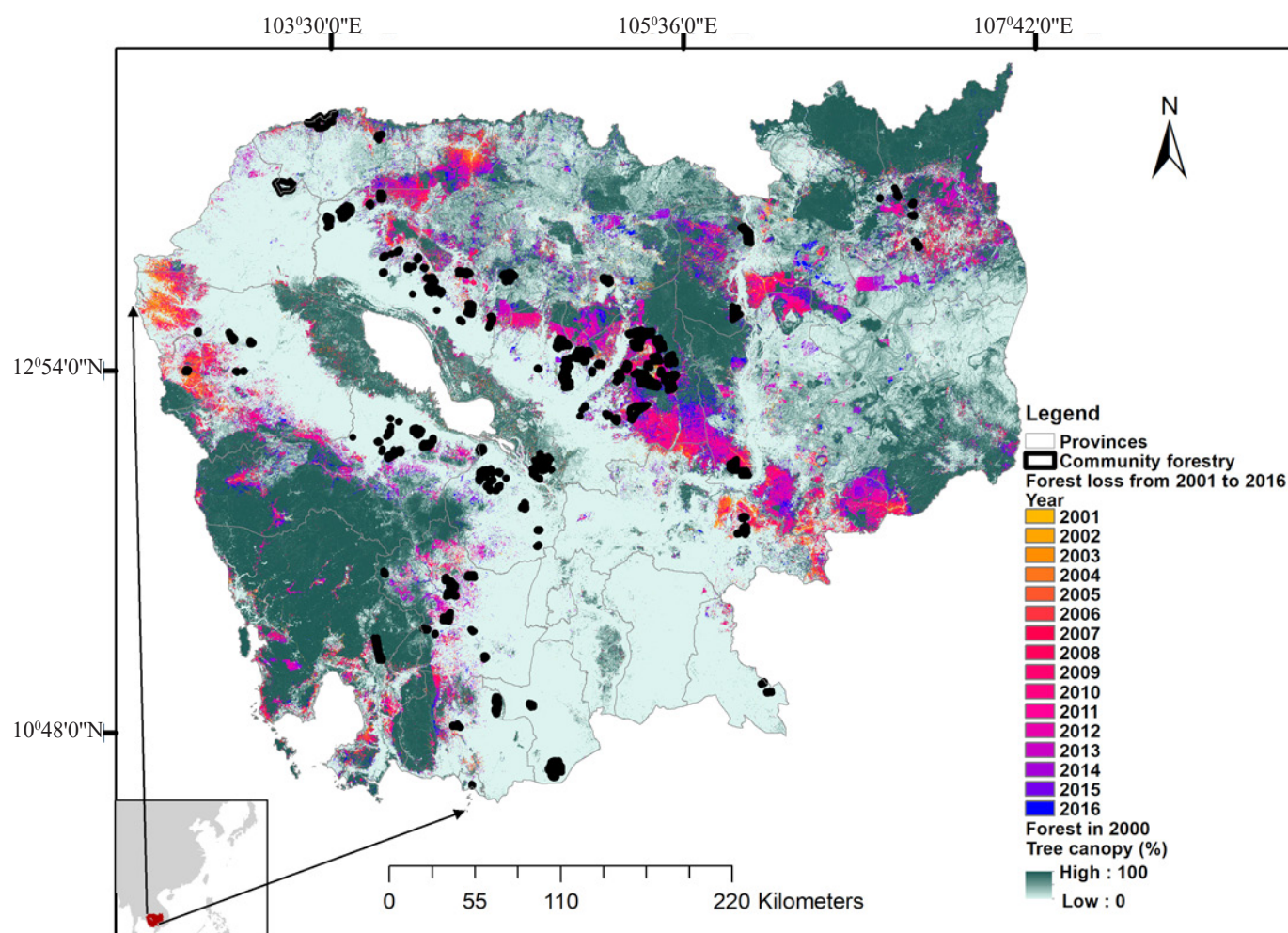
So far there have been studies on CF in Cambodia (Persson and Prowse 2017), but there have been no county-scale studies on the effectiveness of CF. Moreover, these studies, as well as many similar works on CF in other developing countries, have inevitably relied on small datasets derived from a few case studies, the results of which are not strong enough to help decision makers plan better policies for natural resource management (Nagendra 2007). This research will contribute to filling that knowledge gap. This article draws on the author's PhD thesis (Lonn 2018), which used a country-scale dataset on 197 community forests, established between 1994 and 2005, to compare and measure change in forest cover between 2005 and 2016.

Methods

CF site selection and characteristics

Due to incomplete or missing data, only 197 (out of 580) CF sites, covering a total of 121,701.51 ha across 19 provinces, were selected for study (Figure 1). These CF sites are located mainly to the north and south of the Tonle Sap Lake. Elevations range from 0 metres to 589 metres above sea level and slope gradients range from 0 percent to 50 percent. Annual rainfall in these areas is 1000 mm to 2600 mm (NIS 2012). The main forest types are semi-evergreen, evergreen and deciduous, and the condition of the forests in CF sites is generally degraded but being restored and regenerated. The major tree species are Beng (*Azelia xylocarpa* (Kurz) Craib), Thnong (*Pterocarpus pedatus* Pierre), Kokoh (*Sindora cochinchinensis* H. Baill), Phcheuk (*Shorea obtusa* Wallich ex Blume), Sokram (*Xylia dolabriformis* Benth) and Tbaeng (*Dipterocarpus obtusifolius* Teyjsm ex Miq.). The common wildlife found in community forests includes wild boar, rabbits, deer, wild chickens, snakes, peacocks and monkeys (FA 2010).

Figure 1: Location of the 197 selected CF sites showing tree canopy in 2000 and forest loss from 2001 to 2016



Source: Forest loss and tree canopy data is from Hansen et al. 2013

Data

Following Davis et al. (2015), tree canopy of 30 percent and above is considered forest. Forest loss between 2005 and 2016 was calculated based on tree cover data for the year 2000 from a global forest change study using medium (30 m by 30 m) spatial resolution satellite images (Hansen et al. 2013). Spatial resolution is measured in pixel size: 1 pixel equals 30 metres. A 30 m by 30 m resolution represents an area of 900 m² and is therefore accurate enough for assessing tree cover in Cambodia's CF sites. Statistics on CF and information on the boundaries of CF sites come from the FA (2015). Information on country, district and village boundaries is from census and map layer data 2008 (NIS 2010), and on road networks (main roads and subroads) from the Ministry of Public Works and Transport and Japan International Cooperation Agency (2003). Terrain

data on elevation and slope is from the ASTER Global Digital Elevation Model.¹

Estimation of forest cover change

The study used a covariate-matching method to estimate forest cover outcomes within the CF sites (treatment) and their buffer zones (control), defined as a 10 km perimeter around the CF boundaries. In our study, we focus on two sets of factors: biophysical – slope and elevation of the CF sites; and socioeconomic – distances from the CF sites to the nearest roads and markets (i.e. district centres), CF villages and CF boundaries. These characteristics can influence the likelihood of deforestation. We therefore reduce bias by matching the distributions of confounding covariates inside and outside the CF sites.

¹ ASTER stands for Advanced Spaceborne Thermal Emission and Reflection Radiometer.

Table 1: Estimated deforestation in and around CF sites

Location	Total area (ha)	Total forest area in 2005 (ha)	Total forest area in 2016 (ha)	Deforestation between 2005 and 2016	
				(ha)	(%)
Inside CF	121,701.51	78,697.35	60,359.40	18,337.95	23.30
Outside CF	1,302,064.74	517,194.99	325,527.39	191,667.6	37.06

Table 2: Average treatment effect on treated (ATT) for deforestation

	Deforestation
Estimate	-0.115 ***
Standard error	0.002
Rosenbaum test	1.75

Note: *** statistically significant at the 1 percent level ($p < 0.01$).

Covariate matching is a five-step process. First, we calculate the average treatment effect on the treated (ATT), which is the difference in average deforestation outcomes between the treated areas (i.e. the CF sites) and control areas (the CF buffer zones). In so doing we randomly select 10 percent of all pixels classified as forest in 2005, giving sample sizes of 77,955 pixels inside CF sites and 1,005,088 pixels outside CF sites. We then use nearest-neighbour matching, based on the Mahalanobis distance classification. Matching was performed in R version 3.4.3 (R Core Team 2017). Finally, we check the robustness of the ATT estimates to hidden bias using the Rosenbaum bounds approach, which indicates the required level of unobserved heterogeneity needed to make a statistically significant ATT non-significant (Rosenbaum 2002). We set the significance level at 5 percent ($p < 0.05$).

Results

The CF sites and their buffer zones have similar socioeconomic characteristics, particularly the distances to CF villages and the nearest markets, but different biophysical characteristics. The mean elevation of areas in the CF buffer zones is higher than that of areas within the CF sites (Appendix Tables A1 and A2).

Table 1 presents estimated forest areas in 2005 and 2016. The data indicates that total forest loss in the selected CF sites amounted to 18,337.95 ha

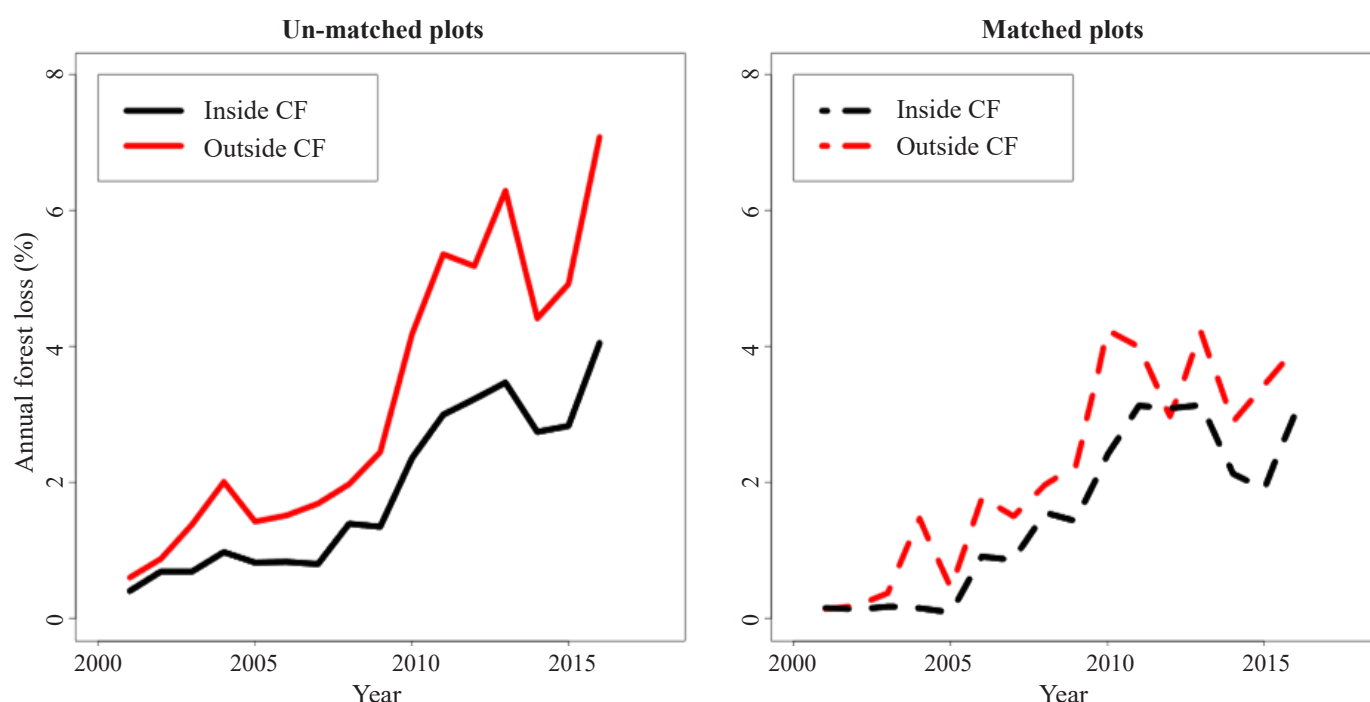
or 23.30 percent of total forest cover, compared to 191,667.6 ha or 37.06 percent in the CF buffer zones. The covariate matching results in Table 2 indicate that the deforestation rate in the CF sites from 2005 to 2016 was 11 percent lower than that in the CF buffer zones.

Analysis of matched and nonmatched data indicates that mean annual forest loss in the CF sites is lower than in the CF buffer zones (Figure 2). Importantly, the rate of deforestation seems to have shot up since 2010, implying continuous and increasing deforestation both in and around the CF sites. The matching result is statistically significant at the 1 percent ($p=0.01$) level. Rosenbaum bounds sensitivity analysis to check for hidden bias shows that our matching results for deforestation are robust up to a factor of 1.75 (Table 2). In other words, the results would remain significant at the 5 percent level even if the covariate of unobserved bias caused the odds ratio of deforestation to differ between areas inside and outside the CF areas by factors as large as 1.75. These values are similar to those obtained in other studies on forest change using similar methods (e.g. Rasolofoson et al. 2015; Miranda et al. 2016).

Discussion

This study builds on a growing body of research to find out on whether or not CF is an effective means of forest conservation, especially in developing countries. As such, it is the first country-scale

Figure 2: Annual forest loss inside and outside CF sites with and without matching



study of CF in Cambodia. An important finding is that CF is effective in reducing deforestation: over the 11 years from 2005 to 2016, the annual mean deforestation rate in CF areas was 11 percent lower than in non-CF areas. This reflects the results of a similar study in the Peruvian Amazon, which found that protected areas reduced deforestation by 8 percent between 2000 and 2005 (Miranda et al. 2016). Conversely, a national-scale study over 11 years (2000–2010) in Madagascar found no evidence that CF reduces deforestation (Rasolofoson et al. 2015). While we can safely conclude from the current study that CF inhibits deforestation in Cambodia, the rate of deforestation in CF areas across the country is nonetheless increasing.

Even though CF is a form of decentralised forest management, it is hard to evaluate its effectiveness because of the different types of CF management practices and strategies, ranging from commercial use, forest conservation and protection to timber production (Rasolofoson et al. 2015). Evaluation should therefore be done among the same types of CF (Lund et al. 2009). Some effective CF initiatives receive ongoing support such as through payments for ecosystem services under the Direct Payment for Conservation project (Rasolofoson et al. 2015), whereas less successful CF communities no

longer have financial support or incentives from NGOs. However, the current study does not intend to generalise the findings to every CF initiative in Cambodia as some are inevitably more successful than others due to different contexts within a complex social-ecological system (see, for example, Pagdee et al. 2006; Ostrom 2007).

Conclusion

After over two decades of implementing the community forestry program across Cambodia, policymakers need to know whether or not it promotes forest conservation as intended, rather than uncritically expanding the existing program. In this study, we used a country-scale dataset to evaluate the effectiveness of CF as a way to reduce deforestation. The results show that the rate of deforestation in CF areas is 11 percent lower than in nearby non-CF areas. However, deforestation appears to be increasing in CF and non-CF areas alike. These important findings provide high quality information for policymakers to highlight and address the current rate of deforestation in Cambodia. Managing and updating the Forestry Administration's dataset on CF and making it accessible for further research are key for improving CF systems in Cambodia.

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Appendices

Table A1: Summary statistics for the matching analysis of deforestation

Variables	Unit	Inside CF		Outside CF		Mean difference
		Mean	STD	Mean	STD	
Deforestation	binary (1 or 0) ^a	0.244	0.430	0.337	0.473	0.093 ***
Distance to road	metre	4,589.078	3,595.877	5,145.447	3,712.662	556.369 ***
Distance to market	metre	19,993.460	10,344.990	20,123.610	10,059.390	130.150 ***
Distance to village	metre	4,437.458	3,191.149	4,998.165	3,191.149	560.707 ***
Distance to CF boundary	metre	530.050	436.761	7,488.091	3,294.483	6,958.041 ***
Slope	degree	4.126	4.426	4.058	4.418	-0.068 ***
Elevation	metre	87.123	69.572	115.874	149.352	28.751 ***

Notes: *** p < 0.01; a variable takes on value of 1 for deforestation and 0 for others; STD = standard deviation.

Table A2: Covariate balance for the matching analysis of deforestation

Variables (Unit)		Mean			Median eQQ diff ¹	Max eQQ diff*	Mean eCDF diff**
		Inside CF	Outside CF	eQQ diff ^a			
Distance to road (m)	Before						
	Matching	4,589.10	5,137.90	591.41	636.34	1,840.70	0.05
	After						
	Matching	4,589.10	4,537.60	291.32	173.97	3,209.20	0.02
Distance to village (m)	Before						
	Matching	19,993.00	20,166.00	915.81	1014.20	5,188.40	0.02
	After						
	Matching	19,993.00	19,782.00	475.25	322.00	2,425.00	0.01
Distance to market (m)	Before						
	Matching	4,437.50	4,985.40	720.27	452.19	4,689.10	0.06
	After						
	Matching	4,437.50	4,359.90	147.00	61.53	2,474.90	0.01
Distance to CF boundary (m)	Before						
	Matching	530.05	7,455.40	6,925.30	7085.70	14,709.00	0.57
	After						
	Matching	530.05	1,335.70	805.64	707.49	4,498.20	0.34
Slope (degree)	Before						
	Matching	87.12	115.88	32.62	5.00	876.00	0.02
	After						
	Matching	87.12	81.56	6.27	3.00	70.00	0.01
Elevation (m)	Before						
	Matching	4.13	4.04	0.11	0.00	12.00	0.00
	After						
	Matching	4.13	4.00	0.13	0.00	2.00	0.00

Note: * Mean, Median and Max eQQ diff indicate the mean, median and maximum differences in the empirical quantile-quantile treatment plots (i.e. inside CF sites) and control plots (i.e. outside CF sites); ** Mean eCDF diff indicates the mean difference in the cumulative distribution functions.

Economy Watch—External Environment

This section presents economic indicators of major world economies and economies in Southeast Asia during the second quarter of 2018.

Indonesia's real GDP growth was 5.3 percent year-on-year, 0.2 percentage point higher than in the previous quarter. This growth was largely driven by the service sector, corporate profits, and transportation-warehousing.

Growth in Malaysia was 4.5 percent, compared to 5.4 percent in the previous quarter, mainly contributed by the expansion of private consumption of food and beverages, restaurants and hotels, as well as communication services.

Singapore's growth cooled to 3.9 percent from 4.4 percent in the previous quarter, amidst the uncertainties arising from trade tensions between the United States and several major countries.

Thailand's economy expanded by 4.6 percent over the 12 months, 0.2 percentage point lower than in the preceding quarter, driven mainly by the expansion in manufacturing. Industrial production growth in this quarter amounted to 3.2 year on year, driven by stronger export growth.

Vietnam's growth was 6.8 percent, compared to 7.4 percent in the previous quarter, driven by booming exports and large inflows of foreign direct investment, against the backdrop of the global trade tensions. Being largely dependent on global trade, Vietnam is reinforcing its monitoring of international market situations to be better able to mitigate any unfavorable effects.

China's growth was 6.7 percent after stabilising at 6.8 percent during the last three consecutive quarters. This growth was not yet affected by the tariff increase by the US, whose impacts were estimated to emerge in the second half of 2018. Meanwhile, China's international trade expanded by 7.9 percent during the first two quarters of 2018. As the country's imports rose 11.5 percent, its trade surplus dropped 26.7 percent.

Hong Kong's growth was 3.5 percent, down from the preceding quarter's 4.7 percent. Taiwan's growth was 3.3 percent in this quarter, up on 3.0 percent in the previous quarter.

South Korea's growth stood at 2.9 percent, up slightly on the 2.8 percent in the previous quarter. Domestic demands eased while exports remained healthy in the face of the global trade friction.

Since the last quarter in 2017, Japan's economy continued easing to 1.0 percent, compared to 1.1 percent in the previous quarter. Its private consumption, constituting about 60 percent of GDP, was the major backer to growth in this quarter, growing 0.7 percent. However, recent contention with the United States over Japan's trade policy raised concerns of impact to future growth. Japan preferred multilateral trade agreements over bilateral ones.

Real growth in the eurozone continued its decreasing trend to 2.2 percent, from 2.5 percent in the previous quarter.

Growth in the United States was 2.9 percent year-on-year, driven by personal consumption expenditure (PCE), non-residential fixed investment, exports, federal government spending, and state and local government spending.

World inflation and exchange rates

All Asian and ASEAN countries had inflation: Cambodia 2.7 percent, Indonesia 3.2 percent, Malaysia 1.3 percent, Singapore 0.4 percent, Thailand 1.3 percent and Vietnam 3.8 percent. Inflation in China was 1.8 percent, Hong Kong 2.1 percent, South Korea 1.5 percent and Taiwan 1.6 percent. Inflation in the eurozone was 1.7 percent, Japan 0.6 percent and the United States 2.7 percent.

In this quarter, the USD-KHR exchange rate was KHR4,047.0/USD, the riel depreciating by 0.9 percent from a quarter earlier. The Thai baht depreciated by 1.1 percent from the preceding quarter to THB31.9/USD, while the Vietnamese dong appreciated by 1.2 percent to VND22,483.9/USD. The Chinese yuan depreciated by 0.2 percent to CYN6.4/USD, and the Japanese yen depreciated by 0.7 percent to JPY109.1/USD.

Commodity prices in world markets

Prices of most major commodities in world markets rose this quarter, compared to the previous quarter; only those of palm oil, rubber, and rice dropped. The price of palm oil declined by 4.5 percent to USD601.0/tonne, of rubber by 4.7 percent to USD1,433.3/tonne, and of rice by 1.8 percent to USD451.0/tonne.

The price of maize rose 5.8 percent to USD173.3/tonne, and of soybeans by 2.2 percent to USD435.6/tonne. The price of crude oil increased by 11.2 percent to USD71.9/barrel, of gasoline by 11.3 percent to US cents 53.3/litre and of diesel by 9.1 percent to US cents 55.6/litre.

Table 1: Real GDP growth of selected trading partners, 2011–18 (percentage increase over previous year)

	2011	2012	2013	2014	2015	2016	2017				2018	
							Q1	Q2	Q3	Q4	Q1	Q2
Selected ASEAN countries												
Cambodia	6.1	7.3	7.4	7.1	-	-	-	-	-	-	-	-
Indonesia	6.5	6.3	5.8	5.2	4.8	5.0	5.0	5.2	5.1	5.2	5.1	5.3
Malaysia	4.9	5.4	4.6	6.0	4.9	4.3	5.6	5.8	6.2	5.9	5.4	4.5
Singapore	4.7	1.3	3.8	3.0	2.0	2.0	2.7	2.9	5.2	4.3	4.4	3.9
Thailand	0.0	6.7	2.8	1.6	2.8	3.2	3.3	3.7	4.3	4.0	4.8	4.6
Vietnam	6.1	5.2	5.4	5.9	6.6	6.1	5.1	6.2	7.5	7.7	7.4	6.8
Selected other Asian countries												
China	9.3	7.7	7.7	7.3	7.0	6.7	6.9	6.9	6.8	6.8	6.8	6.7
Hong Kong	4.9	2.9	3.0	2.3	2.3	1.7	4.3		3.6	3.4	4.7	3.5
South Korea	3.6	2.1	2.8	3.4	2.6	2.6	2.8	2.7	3.6	2.9	2.8	2.9
Taiwan	4.2	1.2	2.2	3.5	0.6	1.2	2.6	2.1	3.1	3.3	3.0	3.3
Selected industrial countries												
Euro-12	1.6	-0.5	0.1	0.7	1.3	1.6	1.7	2.1	2.5	2.8	2.5	2.2
Japan	-0.8	1.7	1.7	0.6	0.3	0.9	1.6	2.0	1.7	2.0	1.1	1.0
United States	1.8	2.1	1.8	2.4	2.3	1.6	2.1	2.1	2.3	2.6	2.8	2.9

Sources: International Monetary Fund, *Economist* and countries' statistics offices

Table 2: Inflation rate of selected trading partners, 2011–18 (percentage price increase over previous year—period averages)

	2011	2012	2013	2014	2015	2016	2017				2018	
							Q1	Q2	Q3	Q4	Q1	Q2
Selected ASEAN countries												
Cambodia	5.5	3.0	3.0	3.9	1.2	3.0	4.2	2.7	2.5	2.3	2.2	2.7
Indonesia	5.4	4.3	7.0	6.4	6.4	3.5	3.6	4.1	3.8	3.4	3.3	3.2
Malaysia	3.2	1.7	2.1	3.2	2.1	2.1	4.3	4.0	3.7	1.3	1.8	1.3
Singapore	5.2	4.6	2.3	1.0	-0.5	-0.8	0.7	0.8	0.5	0.2	0.2	0.4
Thailand	3.8	3.0	2.2	1.9	-0.9	0.2	1.1	0.2	0.5	0.8	0.6	1.3
Vietnam	18.6	9.3	6.6	4.8	0.6	2.7	5.0	0.8	2.8	2.7	2.8	3.8
Selected other Asian countries												
China	5.4	2.7	2.6	2.0	1.4	2.0	1.4	1.4	1.6	2.2	2.2	1.8
Hong Kong	5.3	4.1	4.0	4.4	3.1	2.5	1.0	2.4	1.8	2.4	2.4	2.1
South Korea	4.4	2.1	1.1	1.3	0.7	0.8	2.0	2.0	2.3	1.2	1.2	1.5
Taiwan	1.4	1.9	0.8	1.5	0.6	1.4	0.8	0.6	0.8	1.6	1.6	1.6
Selected industrial countries												
Euro-12	2.7	2.5	1.4	0.4	0.0	0.3	1.8	1.2	1.4	1.3	1.3	1.7
Japan	0.1	-0.03	0.4	2.8	0.9	-0.1	0.2	0.3	1.1	1.3	1.3	0.6
United States	3.2	2.1	1.5	1.6	0.0	1.2	2.5	1.9	1.9	2.2	2.2	2.7

Sources: International Monetary Fund, *Economist* and National Institute of Statistics

Table 3: Exchange rates against US dollar of selected trading partners, 2011–18 (period averages)

	2011	2012	2013	2014	2015	2016	2017				2018	
							Q1	Q2	Q3	Q4	Q1	Q2
Selected ASEAN countries												
Cambodia (riel)	4063.6	4037.8	4027.2	4037.6	4060.4	4053.6	4015.8	4048.2	4087.8	4036.4	4012.4	4047.0
Indonesia (rupiah)	8748.0	9363.0	10,419.2	11,850.2	13394.8	13338.3	13344.7	13312.8	13327.0	13534.8	13576.1	13944.6
Malaysia (ringgit)	3.1	3.1	3.1	3.3	3.9	4.1	4.4	4.3	4.3	4.2	3.9	3.9
Singapore (S\$)	1.3	1.2	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3
Thailand (baht)	30.5	31.1	30.7	32.5	34.2	35.3	35.1	34.3	33.4	32.9	31.6	31.9
Vietnam (dong)	20574.3	20856.9	20990.3	21138.2	21917.7	22507.5	22429.1	22704.3	22732.8	22717.5	22749.5	22483.9
Selected other Asian countries												
China (yuan)	6.5	6.3	6.1	6.2	6.3	6.6	6.9	6.9	6.7	6.6	6.4	6.4
Hong Kong (HK\$)	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
South Korea (won)	1108.6	1126.6	1095.0	1053.6	1131.9	1161.0	1152.4	1129.9	1132.8	1107.0	1072.0	1079.0
Taiwan (NT\$)	29.4	29.6	29.7	30.3	31.8	32.3	31.1	30.3	30.3	30.1	29.3	29.8
Selected industrial countries												
Euro-12 (euro)	0.7	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8
Japan (yen)	79.9	79.8	97.6	105.9	121.0	108.8	113.7	111.1	110.9	112.9	108.4	109.1

Sources: International Monetary Fund, *Economist* and National Bank of Cambodia

Table 4: Selected commodity prices on world market, 2011–18 (period averages)

	2011	2012	2013	2014	2015	2016	2017				2018	
							Q1	Q2	Q3	Q4	Q1	Q2
Maize (US No. 2)—USA (USD/tonne)	291.7	298.4	259.4	192.9	169.8	159.2	160.6	157.7	148.1	148.8	163.7	173.3
Palm oil—north-west Europe (USD/tonne)	1125.4	999.3	856.9	821.4	622.7	643.6	773.0	696.3	706.3	703.0	673.7	601.0
Rubber SMR 5 (USD/tonne)	4630.6	3200.7	2575.3	1755.6	1392.7	1416.1	2147.7	1568.1	1551.7	1466.0	1504.0	1433.3
Rice (Thai 100% B)—Bangkok (USD/tonne)	558.5	594.8	533.8	434.9	395.5	406.7	537.0	431.0	411.7	422.3	459.3	451.0
Soybeans (US No.1)—USA (USD/tonne)	540.7	591.4	538.4	491.8	390.4	405.7	419.1	385.7	395.3	399.7	418.3	435.6
Crude oil—OPEC spot (USD/barrel)	106.2	109.5	105.9	96.2	49.6	40.7	52.0	47.9	52.8	59.4	64.7	71.9
Gasoline—US Gulf Coast (cents/litre)	71.9	74.6	71.2	65.6	41.0	35.2	41.0	40.3	44.4	45.0	47.9	53.3
Diesel (low sulphur No.2)—US Gulf Coast (cents/litre)	75.7	80.7	78.4	71.5	41.7	34.8	41.4	39.0	45.2	48.2	51.0	55.6

Sources: Food and Agriculture Organisation and US Energy Information Administration

Economy Watch—Domestic Performance

Main economic activities

In the second quarter of 2018, total fixed asset investment approvals shot up to USD2,380.0 m from USD469.3 m in the previous quarter, representing a year-on-year increase of 44.0 percent.

Investment approvals in agriculture amounted to USD30.4 m compared to USD99.5 m in the previous quarter. Total industrial investment approvals were USD193.4 m, compared to USD259.6 m in the previous quarter. Investments in the garment sector were valued at USD31.4 m, less than the previous quarter of USD53.2 m. Investments in electronic assembly totalled USD90.9 m, accounting for 3.8 percent of total investments. Total investments in services amounted to USD2,156.2 m in this quarter, constituted the largest share (90.6 percent) in the total, of which USD106.6 m went to hotels and tourism.

Total international tourist arrivals expanded to 1,290,407 in this quarter, an 11.3 percent increase from the same quarter last year, but a 24.6 percent drop in tourist arrivals from the previous quarter due to seasonal weather factors. Chinese tourists accounted for the largest proportion of the total arrivals, 425,823 arrivals in this quarter, followed by tourists from Vietnam (199,859), Thailand (76,149), the United States (54,594), South Korea (48,544), Malaysia (41,002), Japan (38,684), the United Kingdom (33,685), and France (29,347).

Total exports were USD3,000.2 m, an increase of 5.8 percent from the previous quarter. Year on year, they rose 17.3 percent. Garment exports, the largest share (74.7 percent) of total exports, increased by 7.1 percent to USD2,240.6 m from the previous quarter, a rise of 19.6 percent year on year. Exports to the EU took the largest share of the total garment exports, accounting for 35.9 percent, followed by the United States (25.6 percent), Japan (7.4 percent), the UK (9.1 percent) and ASEAN (1.5 percent), and the rest of the world (20.5 percent). Exports of electronic components amounted to USD90.9 m, 19.4 percent up on the previous quarter and accounting for 3.0 percent of the total exports. Exports of automotive parts increased to USD13.1 m from USD11.9 m in the previous quarter.

Agricultural exports expanded by 15.2 percent year on year to USD166.0 m. Nonetheless, they shrank by

19.4 percent from the previous quarter, which was dragged by the drop in the exports of fish by 88.9 percent, of rice by 32.7 percent, and of rubber by 30.3 percent. Exports of rice, the largest proportion, constituted 43.3 percent of total agricultural exports, followed by rubber (22.0 percent), wood (20.5 percent), others (14.2 percent) and fish (0.1 percent).

Total imports increased by 5.9 percent from a quarter earlier, and were 24.0 percent lower than in the previous year, at USD4,496.0 m. Imports of gasoline were valued at USD60.8 m, diesel fuel USD116.9 m, construction materials USD138.7 m and other imports USD4,179.7 m.

Public finance

Total government revenue in the quarter was KHR5059.5 bn, 16.5 percent more than a quarter earlier, and 23.6 percent more than in the same quarter of the previous year. Current revenue was KHR5014.0 bn, 15.8 percent more than the previous quarter. Tax revenue was KHR4417.6 bn, 10.8 percent more than in the previous quarter, while non-tax revenue was KHR596.5 bn, 74.1 percent more than in the preceding quarter.

Total expenditure was KHR4,226.2 bn, 17.7 percent more than a quarter earlier, and 9.0 percent more than in the same quarter of the previous year. Capital expenditure was KHR1,037.6 bn, 26.4 percent more than the previous quarter. Current expenditure was KHR3,188.5 bn, 15.1 percent more than a quarter earlier.

Inflation and foreign exchange rates

The overall consumer price index (CPI) in Phnom Penh in the second quarter of 2018 was 2.7 percent, compared to 2.3 percent in the previous quarter. Prices of food and non-alcoholic beverages rose by 2.9 percent. Transport prices rose by 3.9 percent year on year.

Compared to the previous quarter, the riel depreciated by 0.9 percent against the US dollar, to KHR4,047.0 per US dollar and by 0.6 percent against the Vietnamese dong to KHR17.9 per 100 dong. However, the riel appreciated by 0.2 percent against the Thai baht to KHR127.4 per baht.

The price of gold declined 1.7 percent to USD 157.6/chi. The price of diesel fuel increased 6.4 percent to KHR3,915.7/litre. The price of gasoline rose by 5.3 percent from the previous quarter, to KHR4,120.3/litre.

Poverty situation

This section describes the situation of vulnerable workers and garment workers based on a survey of 320 vulnerable workers and 120 garment workers in August 2018.

Compared to the same month last year, porters' earnings rose by 3.0 percent to KHR15,889 per day. Eighty percent of these workers migrated alone to Phnom Penh or Siem Reap for work; 20.0 percent migrated with family members. They mostly spent on food (75.2 percent of total spending), rent (15.6 percent), healthcare (1.2 percent) and other expenses (7.9 percent). Since they started working as porters, their families have been better off, reported by 77.5 percent of respondents, while 17.5 percent said that their families' livelihoods have remained the same, and 5.0 percent said their families were worse off.

Earnings of small vegetable vendors increased to KHR20,141 per day, 2.5 percent higher year on year. They came from Kandal (27.5 percent), Svay Rieng (27.5 percent), Prey Veng (15 percent), Kampong Speu (15 percent), Takeo (10 percent), and Kampot (2.5 percent) provinces, and Phnom Penh (2.5 percent). Twenty-two-point five percent had no agricultural land, 32.5 percent had less than 0.5 hectares, 30 percent had between 0.5 and 1 hectares, 35.0 percent had between 1 and less than 2 hectares, and 2 percent had between 2 and less than 3 hectares. Ninety-five-point five percent of the respondents were the main income earners in their families. Thirty percent indicated that they were in debt while the rest said they had no debt.

Scavengers' earnings rose by 13.0 percent from a year earlier, to KHR13,288 per day. Compared to the previous three months, 90 percent of respondents noted that the number of scavengers rose. However, the sources of rubbish increased according to 77.5 percent of respondents and its price also rose, reported by about 42.5 percent of them. Eighty-seven and a half percent of the scavengers interviewed were the family breadwinners. On average, scavengers worked 10.9 hours per day and 30 days per month. Normally, they spent mostly on food (69.3 percent of their total spending), rent (15.0 percent), healthcare (2.2 percent) and other expenses (13.5 percent).

The daily earnings of waiters decreased by 2.3 percent compared to the same month last year, to KHR7,945 per day. On average they have worked as waiters for 4 years. They worked on average 11.4 hours per day and 30 days per month. They

spent 76.8 percent of their total spending on food, 9.5 percent on healthcare and 13.7 percent on other spending. All of them were provided lodging by their employer, so they did not spend their money on rent.

Ricefield workers' earnings were KHR8,427 per day, a 3.2 percent decrease year on year. Thirty-seven and a half percent of those interviewed were the main earners for their families. Their income had decreased compared to the previous quarter, 57.5 percent said. Sixty-two-point five percent stated that their income could partially support their families, while the rest said it could not. Sixty-five percent were in debt; the average interest rate on their borrowing was 1.5 percent per month.

Daily earnings of unskilled construction workers remained almost the same as a year earlier at KHR17,539 per day. Compared to the previous three months, the number of unskilled construction workers expanded, reported by 77.5 percent of them, amid an increase in construction activities based on 92.5 percent of workers' answers. Sixty percent of these workers migrated alone for work and 40 percent migrated with family members. They worked 9.6 hours per day and 23 days per month on average. They spent 76 percent of their total spending on food, 11.1 percent on rent, 0.6 percent on health and 12.2 percent on other items. Their income could only partially support their families, 95 percent of them said.

Garment workers' daily wages increased by 7.1 percent from a year earlier, to KHR15,316. Sixty-one percent of them were between 18 to 30 years old. Generally, they had worked in the factory for about 4.2 years. Five percent of them had no education, 66.7 percent had primary education, 22.5 percent had secondary education, and 6 percent had high school education. Fifty-one and a half percent of them said they received training in the factories, 5.8 received training at private training houses, 1.6 percent trained by themselves, while 40.1 percent said they had no skills. Asked whether their wage could support their family, 10 percent said that it could not, 70 percent said it could partially, and 20 percent said it could. Sixty-seven and a half percent were optimistic about the future of their factory, 11.7 percent said that it would not be so good, 8.3 percent said that it would be the same, and the rest did not know.

Table 1: Private investment projects approved, 2011–2018

	2011	2012	2013	2014	2015	2016	2017				2018	
							Q1	Q2	Q3	Q4	Q1	Q2
	Fixed Assets (USD m)											
Agriculture	725.0	531.6	930.5	56.5	169.8	117.1	8.0	54.9	-	-	99.5	30.4
Industry	2860.1	829.3	3257.0	1002.5	1014.7	1436.4	115.6	265.7	486.6	114.3	259.6	193.4
<i>Garments</i>	393.9	497.0	324.1	393.5	225.2	380.7	54.0	22.0	78.88	56.3	53.2	31.4
<i>Electronics</i>	-	-	-	-	-	-	-	73.9	82.2	96.9	76.2	90.9
<i>Automotive</i>	-	-	-	-	-	-	-	-	-	-	-	-
Services	3425.4	916.6	140.7	622.6	2734.4	1664.3	7.8	1332.0	2518.8	-	110.2	2156.2
<i>Hotels and tourism</i>	2850.9	691.5	106.0	446.9	98.6	1366.9	3.6	237.2	2518.8	-	75.2	106.6
Total	7010.42	2278.0	4328.0	1583.9	3918.9	3217.7	131.4	1652.6	3005.4	114.3	469.3	2380.0
	Percentage change from previous quarter											
Total	-	-	-	-	-	-	-74.1	1158.0	81.9	-96.2	310.5	407.2
	Percentage change from previous year											
Total	209	90.1	63.4	147.4	-67.5	-	90.1	98.8	214.5	-77.5	257.2	44.0

Note: Figures include expansion project approvals. Source: Cambodian Investment Board

Table 2: Value of construction project approvals in Phnom Penh, 2009–15

	2009	2010	2011	2012	2013	2014				2015		
						Q1	Q2	Q3	Q4	Q1	Q2	Q3
						USD m						
Villas, houses and flats	-	220.1	405.1	547.3	658.9	133.6	84.0	33.1	20.4	122.3	-	637.6
Other	-	217.8	199.9	463.6	859.6	190.0	141.7	105.6	11.7	49.8	-	252.6
Total	-	489.8	605.0	1010.9	1518.5	323.6	225.7	138.7	32.1	172.0	-	897.4
Percentage change from previous quarter												
Total	-	-	-	-	-	34.3	-30.2	-38.5	-77.8	437.3	-	-
Percentage change from previous year												
Total	-60.5	11.0	23.5	67.1	28.1	8.0	-9.2	-64.2	-86.7	-46.8	-	-

Source: Department of Cadastre and Geography of Phnom Penh municipality

Table 3: Foreign visitor arrivals, 2011–2018

	2011	2012	2013	2014	2015	2016	2017				2018	
							Q1	Q2	Q3	Q4	Q1	Q2
	Thousands											
China	247.2	333.9	463.1	560.3	694.7	830.0	273.0	362.0	206.4	369.4	505.94	425.82
Vietnam	614.1	763.1	854.1	905.8	987.8	959.7	203.4	267.3	122.8	241.9	186.76	199.86
Korea	342.8	411.5	435.0	424.4	395.3	357.2	127.7	87.7	41.1	88.6	126.06	48.54
Thailand	116.8	201.4	221.3	279.5	349.9	398.1	95.9	99.5	47.5	152.1	83.71	76.15
US	154.0	173.1	185.0	191.4	217.5	238.7	80.1	76.2	29.2	71.1	79.07	54.59
Japan	161.8	179.3	206.9	215.8	193.3	191.6	60.2	51.4	35.3	56.4	59.01	38.68
France	117.4	121.2	131.5	141.1	145.7	150.3	54.0	43.2	21.5	47.7	56.56	29.35
UK	104.1	110.2	123.9	133.3	154.3	159.5	54.6	48.2	20.6	47.7	51.16	33.69
Malaysia	102.9	116.8	130.7	144.4	149.4	152.8	37.8	53.4	31.8	56.4	44.85	41.00
By air	1480.4	1722.1	2017.7	2273.5	2476.0	1995.5	921.4	684.3	777.7	929.3	1157.6 ^a	8464.9
By land or water	1401.4	1862.2	2192.5	2229.3	2299.2	2331.4	581.5	475.5	472.3	760.1	553.6 ^a	443.9
Total	2881.8	3584.3	4210.2	4502.8	4775.2	4980.4	1502.9	1159.8	1250.1	1689.4	1711.3 ^a	1290.4
	Percentage change from previous quarter											
Total	-	-	-	-	-	-	-0.03	-22.8	7.3	35.1	1.3 ^a	-24.6
	Percentage change from previous year											
Total	20.1	24.4	17.5	7.0	6.1	4.3	11.9	3.9	22.7	12.4	13.9 ^a	11.3

Source: Ministry of Tourism. Note: a) These are corrections for our mistakes in the figures appearing in our previous publication. Wrong figures of By air was 2308.7, By land or water was 1138.0, and Total was 3446.7.

Table 4: Exports and imports, 2011–2018*

	2011	2012	2013	2014	2015	2016	2017				2018	
							Q1	Q2	Q3	Q4	Q1	Q2
	USD m											
Total exports	4929.5	6106.4	6982.4	8106.0	9256.4	10043.3	2290.7	2558.4	3098.3	2825.6	2834.6	3000.2
Garments	4259.6	5015.4	5386.1	5960.5	6827.0	7308.0	1856.3	1874.1	2290.3	1999.6	2092.1	2240.6
<i>To US</i>	2055.3	2143.3	2075.2	1963.6	2009.4	1831.5	452.3	426.0	570.8	474.7	538.4	573.9
<i>To EU</i>	1322.2	1716.9	1969.6	2403.7	2903.9	2928.7	583.0	693.3	787.9	718.1	670.1	805.2
<i>To ASEAN</i>	17.6	39.4	60.2	83.3	103.4	98.4	24.2	29.0	24.2	29.6	28.6	32.7
<i>To Japan</i>	147.0	188.6	278.7	383.1	524.2	655.5	196.2	136.7	204.8	163.6	224.7	165.2
<i>To UK</i>	-	-	-	-	-	439.8	214.2	201.6	267.0	221.2	219.5	203.9
<i>To rest of the world</i>	717.5	927.2	1002.9	1126.8	1286.3	1354.2	386.4	387.6	435.7	392.5	410.9	459.7
Electronics	-	-	-	-	-	-	127.1	73.9	82.17	96.87	76.2	90.9
Automotive	-	-	-	-	-	-	1.8	6.89	1.14	1.76	11.9	13.1
Agriculture	362.1	376.7	554.5	624.4	548.8	534.1	201.0	144.2	175.4	185.9	205.9	166.0
<i>Rubber</i>	197.6	176.6	175.2	153.9	165.4	165.3	66.1	65.2	71.7	70.5	52.4	36.5
<i>Wood</i>	48.8	36.8	73.6	132.0	46.3	47.2	11.7	28.9	24.6	35.3	30.0	34.0
<i>Fish</i>	3.1	2.0	1.2	0.8	0.5	0.6	0.2	0.1	0.1	0.2	1.0	0.1
<i>Rice</i>	106.6	146.4	262.3	248.5	315.3	300.8	83.1	35.0	66.5	70.5	106.7	71.8
<i>Other agriculture</i>	6.0	14.9	42.4	89.1	21.3	20.2	39.9	15.0	12.4	9.4	15.8	23.6
Others	307.9	714.4	1088.2	1520.1	1880.2	2201.2	104.5	459.3	549.3	541.5	448.6	489.6
Total imports	6375.9	8593.3	8639.4	10,295.4	11,494.5	15013.4	3173.5	5914.4	4303.3	3424.2	4244.5	4496.0
Gasoline	294.4	308.0	306.4	334.7	377.3	384.8	75.1	57.5	58.3	65.8	64.9	60.8
Diesel	447	559.5	569.1	602.3	607.8	709.1	146.4	111.1	113.3	102.2	102.0	116.9
Construction materials	48.1	66.1	80.8	117.6	164.4	253.2	55.6	90.3	89.6	68.8	100.7	138.7
Other	5586.4	7659.1	7682.6	9240.7	10345.1	13666.3	2896.4	5655.5	4042.2	3187.5	3976.9	4179.7
Trade balance	-1446.4	-1341.6	-1610.9	-2184.3	-2238.1	-4470.0	-641.9	-3287.6	-1205.0	-598.7	-1409.9	-1495.9
	Percentage change from previous quarter											
Total garment exports	-	-	-	-	-	-	5.6	1.0	22.2	-12.7	4.6	7.1
Total exports	-	-	-	-	-	-	-6.7	14.7	17.9	-8.8	0.3	5.8
Total imports	-	-	-	-	-	-	3.0	86.4	-27.2	-20.4	24.0	5.9

	Percentage change from previous year											
Total garment exports	32.1	17.7	7.4	10.7	14.5	7.0	5.5	9.1	10.5	13.7	12.7	19.6
Total exports	35.8	16.1	-	-	14.2	8.5	-4.1	10.2	10.0	15.1	23.7	14.2
Total imports	22.8	19.7	21.4	19.2	11.7	30.6	14.2	-3.6	42.6	11.1	33.8	-24.0

* Import data includes tax-exempt imports. Sources: Department of Trade Preference Systems, MOC and Customs and Excise Department, MEF (website)

Table 5: National budget operations on cash basis, 2011–2018 (billion riels)

	2011	2012	2013	2014	2015	2016	2017				2018	
							Q1	Q2	Q3	Q4	Q1	Q2
Total revenue	6251.4	7691.9	8255.2	10543.4	11879.9	14201.5	4261.9	4093.6	3870.8	4307.2	4341.4	5059.5
Current revenue	6179.3	7443.8	8233.2	10359.4	11759.0	14088.7	3261.9	4071.5	3839.2	4278.5	4328.5	5014.0
Tax revenue	5277.5	6334.8	7198.1	8995.2	10502.4	12196.5	3905.8	3580.5	3318.4	3500.0	3985.9	4417.6
Domestic tax	4071.6	5002.8	5728.1	7226.5	8591.7	10185.8	2450.0	3107.5	2844.0	2928.3	3470.6	3845.2
Taxes on international trade	1205.9	1331.7	1470.0	1822.7	1910.7	2010.7	455.8	473.1	474.4	471.8	515.3	572.4
Non-tax revenue	901.8	1118.2	1035.2	1310.3	1256.6	1892.2	356.2	490.9	520.9	778.5	342.7	596.5
Property income	63.8	143.0	84.0	88.5	77.3	116.0	17.4	35.8	39.1	34.9	7.7	130.5
Sale of goods and services	588.7	667.4	750.3	871.2	1047.1	1248.3	272.1	360.3	347.3	537.0	323.8	375.6
Other non-tax revenue	249.3	298.8	200.8	350.5	132.2	528.0	66.6	94.8	134.7	206.5	11.1	87.4
Capital revenue	72.1	247.9	73.4	184.0	121.0	113.4	0.0	22.1	31.5	28.7	12.9	45.4
Total expenditure	9032.4	9660.9	12,535.7	13306.5	13849.5	13775.4	3090.9	3878.4	4420.9	5591.9	3591.4	4226.2
Capital expenditure	3546.9	3628.3	5567.5	5590.7	5290.3	3785.3	859.0	1096.0	1202.1	1785.9	821.2	1037.6
Current expenditure	5341.2	6188.4	6968.3	7715.8	8544.6	9990.1	2231.9	2782.4	3218.7	3806.0	2770.3	3188.5
Wages	2170.6	2486.6	2997.3	3755.5	4271.9	5381.7	1567.6	1515.7	1739.3	1820.2	1760.3	1911.1
Subsidies and social assistance	1518.8	1586.8	1563.0	1627.0	1742.9	1774.9	312.9	635.2	617.0	749.6	469.9	621.1
Other current expenditure	1651.8	2115.1	2408.0	2333.4	2529.8	2833.5	664.3	1266.7	1479.5	1983.8	1010.0	1277.4
Overall balance	-2781.0	-1969.0	-4280.6	-2763.1	-1969.6	426.1	1171.1	215.2	-550.1	-1284.8	750.0	833.3
Foreign financing	2379.2	2457.8	4326.2	3972.1	3729.4	1878.9	598.5	960.8	640.6	894.1	402.0	593.6
Domestic financing	-2061.7	-332.9	824.4	-1428.7	-2034.9	-1858.7	-352.8	-339.1	88.8	82.9	9.4	0.0

Source: MEF website

Table 6: Consumer price index, exchange rates and gold prices (period averages), 2011–2018

	2011	2012	2013	2014	2015	2016	2017				2018	
							Q1	Q2	Q3	Q4	Q1	Q2
	Consumer price index (percentage change from previous year)											
Phnom Penh – All Items	5.4	2.3	3.0	3.9	1.2	3.0	4.2	2.7	2.5	2.2	2.3	2.7
- Food & non-alcoholic beverages	6.5	2.5	3.9	4.9	4.0	5.6	6.0	3.1	2.7	1.9	1.9	2.9
- Transportation	7.1	3.3	-0.6	-1.0	-9.2	-7.0	4.1	4.3	3.8	4.1	3.1	3.9
Exchange rates, gold and oil prices (Phnom Penh market rates)												
Riels per US dollar	4063.6	4039.2	4036.2	4060.4	4060.4	4053.7	4015.8	4048.2	4089.5	4036.4	4012.4	4047.0
Riels per Thai baht	133.2	130.0	124.9	119.4	119.4	115.5	114.9	118.8	122.8	123.402	127.7	127.4
Riels per 100 Vietnamese dong	19.7	19.4	19.1	18.7	18.7	18.2	17.8	17.9	18.1	17.9	17.8	17.9
Gold (US dollars per chi)	184.5	200.9	175.9	152.3	140.6	151.2	145.5	150.9	154.1	155.5	160.3	157.6
Diesel (riels/litre)	4761.2	4941.2	4852.1	4934.1	3771.3	3004.0	3391.6	3310.4	3369.0	3472.4	3679	3915.7
Gasoline (riels/litre)	5044.5	5312.7	5083.3	5155.7	3951.7	3336.8	3697.0	3625.2	3722.0	3819.7	3914	4120.3

Sources: NIS, NBC and CDRI

Table 7: Monetary survey, 2011–2018 (end of period)

	2011	2012	2013	2014	2015	2016	2017				2018	
							Q1	Q2	Q3	Q4	Q1	Q2
	Billion riels											
Net foreign assets	17893.9	18154.5	21260.1	26699.7	26665.5	31814.5	36490.5	40285.4	43301.5	42575.3	46707.0	49421.9
Net domestic assets	5760.8	10437.4	11508.3	15859.8	22157.6	25802.3	24057.0	24985.6	26440.4	28743.5	28457.0	29926.1
Net claims on government	-2123.1	-2486.4	-2794.9	-4359.1	-6428.8	-8148.5	-9818.9	-10128.0	-10347.7	-11066.5	-12381.1	-12887.7
Credit to private sector	17552.8	23536.6	27608.8	36244.6	46071	56458.8	57385.9	61189.9	63492.6	66922.6	68686.5	72464.2
Total liquidity	23654.7	28591.9	32768.4	42559.5	48823.1	57616.6	60547.4	65271.0	69741.9	71318.9	75164.0	79348.0
Money	3956.2	4045.7	4878.2	6308.4	6741.4	7273	7524.7	8186.1	8925.0	9428.4	9578.5	9553.9
Quasi-money	19698.5	18154.5	21260.1	26699.7	42081.7	50343.8	53022.7	57084.8	60816.9	61890.4	65585.5	69794.1
	Percentage change from previous year											
Total liquidity	17.8	20.9	14.6	29.9	14.7	18.0	19.0	19.7	22.1	23.8	24.1	21.6
Money	16.9	2.3	20.6	29.3	6.9	7.9	12.2	19.1	19.6	29.6	27.3	16.7
Quasi-money	17.9	44.6	13.6	30.0	16.1	19.6	20.0	19.8	22.5	22.9	23.7	22.3

Source: National Bank of Cambodia

Table 8. Real Average Daily Earnings of Vulnerable Workers (base November 2000)

	Daily earnings (riels)									Percentage change from previous year		
			2017				2018			2018		
	2015	2016	Feb	May	Aug	Nov	Feb	May	Aug	Feb	May	August
Cyclo drivers	12405	11516	11092	10916	10804	10362	11042	11285	10267	-0.4	3.4	-5.0
Porters	15631	14318	15171	14625	15423	14549	15123	14915	15889	-0.3	2.0	3.0
Small vegetable sellers	15867	17177	18411	13980	19655	16015	18343	20999	20141	-0.4	50.2	2.5
Scavengers	12344	10297	11478	12428	11754	10703	10664	13931	13288	-7.1	12.1	13.0
Waitresses*	8436	7989	7905	8141	8135	8190	8226	8077	7945	4.1	14.1	-2.3
Rice-field workers	8745	8088	8332	7049	8708	8132	8774	8486	8427	5.3	6.6	-3.2
Garment workers		13688	14889	12910	14299	14275	15268	14605	15316	2.5	3.9	7.1
Motorcycle taxi drivers	14455	14509	14770	13888	14370	13895	14901	14429	15293	0.9	-0.8	6.4
Unskilled construction workers	15349	17365	16664	14796	17533	20371	18082	15771	17539	8.5	20.4	0.0
Skilled construction workers	18624		21716	21924	23014	24951	25578	25025	23276	17.8	13.1	1.1

* Waitresses' earnings do not include meals and accommodation provided by shop owners. Surveys on the revenue of waitresses, rice-field workers, garment workers, motorcycle taxi drivers and construction workers began in February 2000. Source: CDRI. November 2015 data not available.

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24 August, CDRI, Phnom Penh

Mid-year meeting of CDRI's board of directors. The Chairman HE Dr Mey Kalyan, on behalf of the board, expressed his appreciation to CDRI staff for their hard work, enthusiasm and commitment towards achieving CDRI's mission – to generate high quality, influential and impactful knowledge through policy research and capacity development to contribute to Cambodia's prosperity.

30 August, Phnom Penh

Institute of Technology of Cambodia hosts Seminar on Industry 4.0 and Cybersecurity. The threefold aim of this seminar was to identify ways to support Cambodia's ambitious vision to become a upper-middle-income country by 2030 through embracing the new digital economy; to raise awareness among engineers and researchers about educational needs for Industry 4.0 and its implications for cybersecurity; and to facilitate interactions and build partnerships between engineers, scientists and CDRI researchers.

3 September, Phnom Penh

UNDP hosts high-level policy seminar on Industry 4.0 in Cambodia. The seminar was sponsored by the United Nations in Cambodia, the International Labour Organization (ILO), the United Nations Industrial Development Organization (UNIDO) and UNDP Cambodia. The agenda covered three themes: opportunities and challenges – insights from UNIDO global and ILO regional studies on the impacts of Industry 4.0; how Industry 4.0 technologies are affecting the global textile and garments industry; and digital leaders in business and manufacturing industry. CDRI's executive director participated in the panel on "Policymakers and Development Partners".

14 September, Phnom Penh

Inception Workshop: The Contribution of Vocational Skills Development to Inclusive Industrial Growth and Transformation. Organised by CDRI, the workshop brought together 40 delegates from ministries, the private sector and TVET schools. The purpose of this workshop was

to present the research project and seek support and cooperation for its implementation from national and local stakeholders, and regional partners.

RESEARCH UPDATE**Agriculture**

Five projects were implemented this quarter. *Testing Innovative Mechanisms for Agricultural Extension in Cambodia*, funded by the International Food Policy Research Institute, is almost finished. We plan to organise a dissemination workshop in December. Data analysis and report writing for the Sida-funded project *On-farm Food Safety in Horticulture in Cambodia: The Case of Vegetable Farming* has been delayed because resources were diverted to a new short-term consultancy project, *MALIS (Improving Food Security and Market Linkages for Smallholders in Oddar Meanchey and Preah Vihear) Impact Evaluation*. Commissioned by the Food and Agriculture Organization, the aim of this evaluation is to assess the real impact of, and identify lessons learned from the MALIS project. Fieldwork for a quarterly *Agriculture Technology Newsletter*, being developed with technical support from Swisscontact Cambodia, was conducted as planned and the team are in the throes of data analysis. The concept note for the Sida-funded project *Mango Value Chain Analysis* was finalised. In line with Industrial Development Policy 2015–25, the study aims to map out mango value chains in Cambodia with an emphasis on the relationships between value chain actors, and their entrepreneurship.

Economics

The inception workshop for the project *Contribution of Vocational Skills Development (VSD) to Inclusive Industrial Growth and Transformation: An Analysis of Critical Factors in Cambodia* was successfully held in September. Its purpose was to inform and engage relevant stakeholders, especially manufacturing firms in the three selected sectors, vocational skills training institutes, the Ministry of Labour and Vocational Training, and local and international organisations working on VSD programs. The team is now preparing for fieldwork, which

will be conducted over four months starting in October.

Our economists presented new research findings at various workshops and conferences, including the *ADB-Asian Think Tank Development Forum 2018* at Australian National University, Canberra, Australia, on 22–23 August; the *8th Asia Research Forum* organised by the Division of International Trade, Institute of World Economics and Politics, Chinese Academy of Social Sciences, in Beijing, China, on 3 September; and a workshop on *Labour Market Reform* organised by the Centre for Economic and Social Development in Myanmar on 18–21 September. The team also participated in a training course on Non-Tariff Measures: Economic Assessment and Policy Options for Development, organised by UNCTAD-ARTNeT in Bangkok, Thailand, on 3–6 July.

Education

Data collection for *Social Entrepreneurship and Innovation in Higher Education*, a Sida-funded project, was performed in September. The project on the *Nature and Practice of Internship in Cambodia*, funded by the Swiss Agency for Development and Cooperation (SDC) is in the data analysis and report writing phase. *Higher Education Typology*, a project funded by Australia's Department of Foreign Affairs and Trade, is at the preparatory stage of data collection.

The Public-Private Partnership Forum, which receives funding from SDC, was held on 7 August at Phnom Penh Hotel. The theme was “Partnerships for Work-Based Learning: Experiences and Possibilities”. Its purpose was to share experiences of exposure visits to China, South Korea and Switzerland, and to provide a platform for discussion among policymakers, practitioners, development partners, researchers and scholars.

A senior education researcher served as a panellist at Asia in Motion: Geographies and Genealogies, an international conference organised by the Association for Asian Studies and Ashoka University in New Delhi, India, on 5–8 July; and attended a thinktank meeting in Hainan province, China, on 26–28 September, with its theme being “the Construction of Hainan Free Trade Zone/Port and Economic and Culture Cooperation and Exchanges between China and

ASEAN Countries”

The team organised a third writing workshop on 11–16 August in Kep province to provide a space for researchers to focus on their research papers. The unit also organised the third intern forum on 30 August to give interns the opportunity to practice presentation skills by presenting the findings of the projects they have been engaged in.

Environment

The project team undertaking participatory action research for *Empowering Women on Climate Resilience in Cambodia*, a two-year project funded by the United Nations Democracy Fund, completed 10 vulnerability reduction assessments (VRAs), one in each target commune across four provinces. With the aim of developing local capacity to integrate climate change adaptation into commune planning, the team also delivered training and coaching on VRA tools and proposal writing to about 80 local women leaders. NGO partners then assisted women network members to prepare several community-based adaptation proposals to apply for small initiative grants from the project.

The Sida-funded *Climate Change Adaptation and Disaster Risk Reduction* project is making good progress. The draft report is being revised based on comments from an external consultant and project team members. Work started on a related project called *Human Response to Environmental Change in the Lower Mekong River Basin*. The project team is getting ready to conduct a survey in Phnom Penh of migrant workers from riparian flooded villages. However, because the timing of our fieldwork clashed with the national election, data collection on sedimentation in flood-prone villages has been postponed until 2019.

The multi-country project *Contract Farming in the Mekong-Lancang Region* is on track. Having finalised the research proposals, the four country research teams are preparing for fieldwork. Finally, for the project *Impact of climate Change Programs in Cambodia: Vulnerability, Poverty, Gender, and Human Rights*, the unit has formed a steering committee, which comprises eminent representatives from the Ministry of Environment, Ministry of Rural Development and UNDP Cambodia.

CDRI Update

MAJOR EVENTS

Between August and September 2018, CDRI organised two workshops and a forum, and researchers and senior managers participated in various events.

2 July, Phnom Penh

Visit by Luke Arnold, new Deputy Chief of Mission, Australian Embassy in Cambodia. Senior managers and education researchers briefed Luke Arnold on the progress of CDRI's education research program funded by Australia's Department of Foreign Affairs and Trade (DFAT). He expressed his satisfaction with the program's implementation and discussed support for future research. On behalf of DFAT, he assured CDRI of the embassy's continuing support.

12 July, Phnom Penh

Validation Workshop: Medical Professionalism at the University of Health Sciences (UHS). The purpose of the workshop was to present and discuss the dataset and results of a survey to assess the perceptions and understanding of medical ethics among students and lecturers at UHS. The event was attended by the senior leadership team of the Faculty of Medicine, other faculty members and curriculum experts. Discussion focused on how to improve the teaching of medical ethics and the

assessment of professionalism among medical students within the existing medical curriculum.

7 August, Phnom Penh

CDRI hosts national Public-Private Partnership (PEP) Forum. The forum was the first of a series of three to be organised annually under a 3.5-year project on TVET. The agenda covered two themes: experiences from exposure visits to learn about TVET systems in China, South Korea and Switzerland; and insights from research studies on PPP in TVET, internships and apprenticeships in Cambodia. The forum was attended by 180 delegates from ministries, private sector, universities, VET schools and international development partners. It was a unique opportunity for participants to engage in productive interactions and networking.

16 August, Phnom Penh

Meeting at the National Secretariat of Cambodia on Mekong-Lancang Cooperation. Organised by the Ministry of Foreign Affairs and International Cooperation, the purpose of the meeting was to brief stakeholders from various ministries and research institutes about the concept and implementation of the Mekong-Lancang Cooperation Fund. Technical and administrative dimensions of the funding and expected outcomes were clarified.

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