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GENDER AND CLIMATE CHANGE: EVIDENCE FROM COASTAL AREAS IN THAILAND

KEYS TO PREPARE THAI BUSINESSES FOR THE AGE OF A LOW-CARBONECONOMY: DATA AND FINANCING

TDRI

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GENDER AND CLIMATE CHANGE: EVIDENCE FROM COASTAL AREAS IN THAILAND*

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ABSTRACT

It is widely known that climate change is not gender neutral, and that women and girls tend to suffer more than males from climate-related disasters, such as floods, storms, droughts, and rising temperatures. Several gender-related factors, such as lack of access to information and early warning, the role of caregivers for family members, including children and the elderly, as well as the lack of opportunity to learn such basic survival skills as swimming and climbing, can be linked to the low survival rate of women during disasters. For example, the rate of casualties among women in the 2006 Pangandaran earthquake in Indonesia and the tsunami in that country as well as Sri Lanka was three times higher than that of men.

In this article, how climate change impacts the lives of women and men is studied using a questionnaire survey in four coastal provinces along the Gulf of Thailand, namely Phetchaburi, Rayong, Surat Thani, and Songkhla. The data from 834 samples show that women in such areas tend to be more vulnerable to climate change than men. Compared with men, a higher percentage of women do not receive education and are unemployed. About twice as many women than men in the four coastal provinces reported experiencing heat stress, diarrhea, heatstroke, and dengue fever. Moreover, a higher proportion of women had never participated in the policy decision-making process on climate-related issues, such as drought and sea level rise.

Keywords: gender, climate change, coastal areas, Thailand

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1. INTRODUCTION

Several research investigations and studies concluded that climate change has different impacts on women and men. According to UN Women (2022), climate change is a "threat multiplier" which escalates social, economic, and political tension in areas with existing gender inequalities. Women tend to have less access to natural resources as well as some essential public services, such as education and healthcare, all of which make them more vulnerable when disasters strike. In many countries, more women than men are reported to suffer more from climate-related disasters, such as floods, storms, droughts, and rising temperatures.

Several gender-related factors, such as the lack of access to information and disaster warning, the role of caregivers for family members, including children and the elderly, as well as the lack of opportunity to learn such basic survival skills as swimming and climbing, can be linked to the low survival rate of women during disasters. Neumayer and Plümper (2007) studied data from 141 countries and found that women tended to have a higher rate of death from natural disasters than men; for example, the rate of casualties among women in the 2006 Pangandaran earthquake in Indonesia and the resulting tsunami in that country as well as Sri Lanka was three times higher than that of men.

Thailand ranked ninth on the Global Climate Risk Index 2021, developed by Germanwatch, on countries most affected by "extreme weather events" between 2010 and 2019, with a financial loss valued at more than US$ 7.7 billion – the highest among the top 10 most affected countries. Thailand has been a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) since

1994 and its Kyoto Protocol since 2002. Thailand first introduced its national strategy to manage climate change in 2008; this was followed by many policies and measures, particularly the Climate Change Master Plan (2015-2050). These measures suggest awareness among policy-makers that climate change is one of Thailand's critical risks that has to be dealt with promptly and properly.

Nevertheless, after reviewing 10 policies and measures related to climate change in Thailand, it was found that only the Ministry of Public Health's Action Plan on Climate Change: Public Health Sector Phase I (2021-2030) has a few gender-responsive climate adaptation or mitigation measures, while others hardly acknowledge the linkage between climate change and gender inequality. In a similar vein, among the six reviewed national policies relating to gender and women's empowerment, none mentions the disproportionate impacts of climate change on women and girls, let alone any action to address such a challenge. This indicates a gap in linkage between gender issues and climate change among policy-makers in Thailand.

The gap might be partly driven by the lack of evidence in Thailand that climate change is not gender neutral, and that women and girls tend to suffer more from climate-related disasters, such as floods, storms, droughts, and rising temperatures. Moreover, of Thailand's 77 provinces, there are only 23 provinces with coastal areas. It is possible that the aggregated national data might overshadow the actual degree of vulnerability to climate change among women who reside in coastal provinces where the impacts of climate change are more manifest than in other areas of the country. Previous studies found that Thailand's coastal provinces have experienced littoral erosion and are more at risk of natural disasters as a result of climate change, which has led to uncertainty with regard to the residents' livelihoods (Surachai 2011; TEI 2022).

Therefore, this article is aimed at examining how climate change affects the lives of women and men differently in four coastal provinces of Thailand, namely Phetchaburi, Rayong, Surat Thani, and Songkhla. The ultimate goal is to provide additional evidence about the linkage between gender inequality and climate change in Thailand in order to support policy-makers in the design and delivery of a more gender-responsive climate adaptation and mitigation policy. The article is divided into four sections: introduction, methodology, findings, and conclusion.

2. METHODOLOGY

2.1 Data collection

The data were collected through a questionnaire survey distributed among residents who were no less than 18 years of age (i.e., considered adults according to Thai law) in the four previously mentioned coastal provinces. The period of data collection ran from July 13, 2022 to August 30, 2022, and in total, 953 responses were received. Of these, we screened out 119 who did not complete the survey, and those who gave contradictory answers. In the end, we used a total of 834 responses to generate our findings.

2.2 Analytical framework

The analytical framework of this article is based on the Sustainable Livelihood Framework developed by Parikh (2007) and FAO (2012). It examines five dimensions of sustenance,

as shown in Figure 1. First is Basic livelihood, which includes individual characteristics (highest educational attainment, religion, and marital status), and household characteristics (sex of the head of household, education level of the head of household, household size, and type of accommodation). The second dimension is Work and income, which also investigated at the individual level (main occupation, income level, and access to financial services) and household level (breadwinner, household income, and debt).

The third dimension is Health, which investigated climate-related diseases, access to health insurance, and life satisfaction. The fourth dimension is Access to information and public services, which examined access to information about disaster and climate change, as well as satisfaction with the government's responses. The fifth dimension is Participation, which looked into awareness and adaptability regarding climate change, and participation in climate-related policy.

3. FINDINGS

3.1 Characteristics of respondents

The characteristics of our 834 samples are shown in Table 1. They include area of residence, gender (rather than sex alone), age, religion, marital status, occupation, and highest educational attainment.

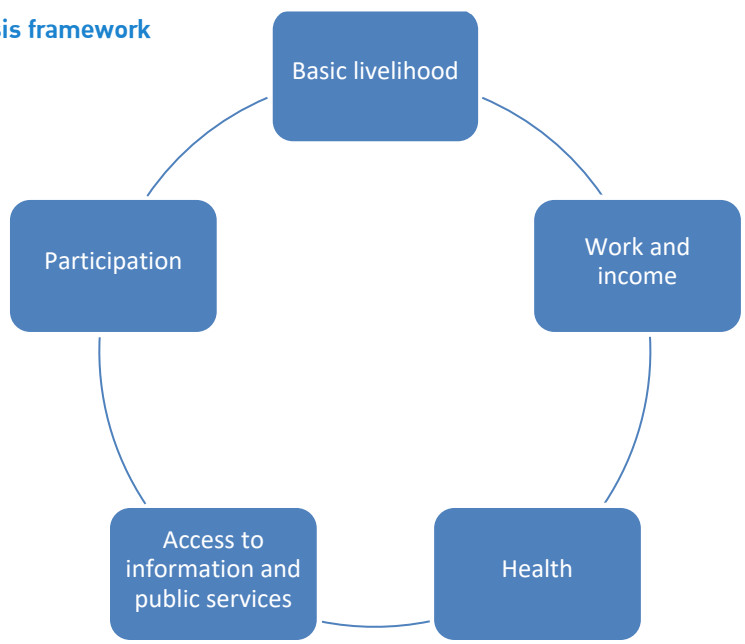
3.1.1 Area of residence

The proportions of our samples in each studied area do not differ much, with Rayong having the largest sample size (27.7% of the total, or 231 samples), followed by Phetchaburi (27.5%; 229), Songkhla (23.1%; 193), and Surat Thani (21.7%; 181).

3.1.2 Gender

More than half of our respondents identified themselves as women (56.7%; 473 samples), followed by men (42.9%; 358). There were two respondents who chose "other" in terms of gender, and another respondent who preferred not to answer.

Figure 1: Livelihood analysis framework



Source: Adapted from Parikh (2007) and FAO (2012).

3.1.3 Age

The average age of our respondents was 45 years, with the youngest being 18 years of age, and the oldest, 91. The largest proportion of our samples were those between 40 and 49 years of age (20.4%; 170 respondents), followed by 50-59 years (19.8%; 165), 20-29 years (19.3%; 161), 30-39 years (18.7%; 161), 60-69 years (11.5%; 96), 70-79 years (5.5%; 46), under 20 years (2.6%; 22), 80-89 years (1.8%; 15), and 90 years or older (0.4%; 3).

3.1.4 Religion

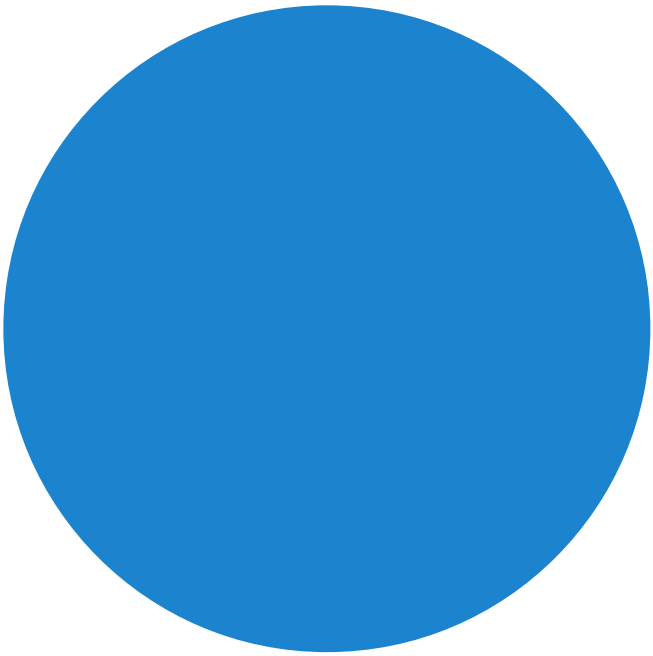
About 96 percent of our samples reported that they affiliated themselves with Buddhism (795 respondents); around 4 percent, Islam (36 respondents); 0.2 percent, Christian (2 respondents); and 0.1 percent, no religious belief (1 respondent).

3.1.5 Marital status

Approximately one-third of our respondents were single (36.5%; 304 respondents), and another third stated that they were legally married (35.7%; 298). Those who were living together with partners accounted for 15.3 percent (128 respondents), while those who were widows accounted for 6.7 percent (56 respondents). There were 30 respondents (3.6%) who were separated, and 18 respondents (2.2%) were divorced.

3.1.6 Occupation

In the case where a respondent had more than one occupation, she/he was asked to choose the occupation to which the person allocated the most time within one week. Our samples comprised those who owned trade/business (24.6%; 205 respondents), followed by those who were hirelings in general (22.9%; 191), working in agriculture/husbandry/fisheries (12.1%; 101), students (8%; 67), officers in government agencies (7.2%; 60),



employees in private businesses (7.2%; 60), freelancers (5.8%; 48), unemployed (3.7%; 31), housewife/househusband (2.4%; 20), hirelings in factories (2.3%; 19), household/family business (2.2%; 18), hawkers (1.1%; 9), retired government officers (0.5%; 4), and digital platform workers (0.1%; 1).

3.1.7 Highest educational attainment

For almost one-third of our respondents, the highest educational attainment was: elementary school level (30.1%; 251 respondents), followed by bachelor's degree (22.8%; 190), high school (17.5%; 146), vocational diploma (13.1%; 109), junior high school (10.9%; 91), no education or below elementary level (4.7%; 39), master's degree (0.6%; 5), doctoral degree (0.2%; 2), and non-formal education (0.1%; 1).

Table 1: Characteristics of respondents (n=834)

Characteristics	Percentage	No.
Area		
Phetchaburi	27.5	229
Rayong	27.7	231
Songkhla	23.1	193
Surat Thani	21.7	181
Sex/gender		
Male	42.9	358
Female	56.7	473
Other	0.2	2
Prefer not to say	0.1	1
Age (years)		
below 20	2.6	22
20-29	19.3	161
30-39	18.7	156
40-49	20.4	170
50-59	19.8	165
60-69	11.5	96
70-79	5.5	46
80-89	1.8	15
90 and older	0.4	3
Average = 44.65 (SD = 16.38)		
min = 18; max = 91		
Religion		
Buddhism	95.3	795
Christianity	0.2	2
Islam	4.3	36
No religion	0.1	1
Marital status		
Single (never married)	36.5	304
Legally married	35.7	298
Living with a partner	15.3	128
Widowed	6.7	56
Divorced	2.2	18
Separated	3.6	30
Occupation		
Unemployed	3.7	31
Officer in government agency	7.2	60
Employee in private business	7.2	60
Hireling in general	22.9	191
Hireling in factory	2.3	19
Freelance	5.8	48
Agriculture/husbandry/fisheries	12.1	101
Owned trade/business	24.6	205
Household/family business	2.2	18
Hawker	1.1	9
Housewife/househusband	2.4	20
Student	8.0	67
Retired government officer	0.5	4
Digital platform worker	0.1	1
Highest education		
No education/below elementary level	4.7	39
Elementary	30.1	251
Junior high school	10.9	91
High school	17.5	146
Vocational	13.1	109
Bachelor's degree	22.8	190
Master's degree	0.6	5
Doctoral degree	0.2	2
Non-formal education/home schooling	0.1	1

3.2 Livelihood in coastal areas of Thailand

Our findings in this section can be divided into five dimensions of livelihood according to the framework analysis as follows.

3.2.1 Basic livelihood

This dimension can be further divided into two levels, individual and household.

A. Individual level

This includes educational attainment, religion, and marital status.

Highest educational attainment

Previous studies suggested that women tended to have less access to education compared with men, which hinders them from obtaining the knowledge and skills necessary for climate change adaptation or mitigation. Table 2 shows that for more than one-third of the male respondents the highest educational attainment was at the elementary level (38.1%), which is higher than that of women (28.3%). One interesting note is that the proportion of women with a bachelor's degree is markedly higher than that of men (24.1% compared with 14.7%). However, it may not be concluded that women in coastal areas do not have challenges in accessing education. Among the female respondents, those who received no education or had less than an elementary education account for a higher percentage than men, at 5.3 percent and 3.9 percent respectively.

Religion

The majority of respondents were Buddhists, with indistinct differences between men and women. Table 3 shows that more than 95 percent of men and women respondents identified themselves as Buddhists; and about 4 percent, Muslim; all those who reported to be Christian were women.

Marital status

Table 4 shows that more than one-third of the female respondents were single (39.7%), while more than one-third of the males were legally married (39.1%). It should be noted that more women than men tended to be in a marital status that indicated that they were alone (single, widowed, divorced).

Table 2: Percentage of respondents, by education and their sex/gender

Highest education attainment	Sex/gender			
	Male	Female	Other	Average for all
No education/below elementary level	4.1	5.7	-	5.0
Elementary	38.1	28.6	-	32.7
Junior high school	11.1	11.8	-	11.5
High school	19.9	14.2	66.7	16.9
Vocational school	11.7	13.9	-	12.9
Bachelor's degree	14.7	24.1	33.3	19.9
Master's degree	-	1.2	-	0.7
Doctoral degree	0.3	0.2	-	0.3
Non-formal education/home schooling	-	0.2	-	0.1

Note: This table does not include those who were students.

Table 3: Percentage of respondents, by religion and their sex/gender

Religion	Sex/gender			
	Male	Female	Other	Average of all
Buddhism	95.3	95.3	100.0	95.3
Christianity	-	0.4	-	0.2
Islam	4.5	4.2	-	4.3
No religion	0.3	-	-	0.1

Table 4: Percentage of respondents, by marital status and their sex/gender

Marital status	Sex/gender			
	Male	Female	Other	Average of all
Single (never married)	31.8	39.7	66.7	36.5
Legally married	39.1	33.2	33.3	35.7
Living with a partner	17.9	13.5	-	15.3
Widowed	5.9	7.4	-	6.7
Divorced	1.4	2.7	-	2.2
Separated	3.9	3.4	-	3.6

B. Household level

This includes sex or gender preference of the head of household, education level of the head of household, household size, and type of accommodation.

Sex/gender of the head of household

About 67 percent of all respondents reported having men as head of their households, as shown in Table 5. This is distinctly higher than the national average at 59.8 percent, according to the 2020 Household Socio-Economic Survey undertaken by the National Statistical Office. This might be partly explained by the fact that many residents along the coastal provinces are in the fisheries sector, which is traditionally male-dominated. It also reaffirms the patriarchal values and gender roles in Thai society.

Education level of the head of household

Table 6 shows that more than one-third of the heads of household completed primary education (38.6%), with the proportion of the head household who were men being higher than women (41.5% and 33.5% respectively). One interesting note is that the

Table 5: Percentage of the head of household, by their sex/gender

Head of household	Percentage
Male	66.8
Female	32.3
Other	0.1
Prefer not to say	0.8

Table 6: Percentage of education level of the head of household, by their sex/gender

Highest educational attainment	Sex/gender of head of the household			
	Male	Female	Other	Average of all
No education/less than elementary level	3.1	10.8	12.5	5.6
Elementary	41.5	33.5	12.5	38.6
Junior high school	13.3	9.7	-	12.0
High school	18.5	13.8	12.5	16.9
Vocational school	9.7	11.9	37.5	10.7
Bachelor's degree	13.8	17.8	12.5	15.1
Master's degree	0.2	2.2	-	0.8
Doctoral degree	-	0.4	12.5	0.2
Non-formal education/home schooling	-	-	-	-

Table 7: Percentage of household size, by sex/gender of the head of household

Household size	Sex/gender of head of the household			
	Male	Female	Other	Average of all
1 Person	18.0	25.7	-	20.3
2 Persons	40.6	37.9	12.5	39.4
3-4 Persons	34.8	30.5	75.0	33.8
5 Persons or more	6.6	5.9	12.5	6.5
Average	2.53	2.34	3.25	2.48
Minimum	1	1	2	1
Maximum	10	7	5	10

proportion of women heads of household who had a bachelor's degree is 4 percent higher than that of men (17.8% and 13.8% respectively). However, the proportion of women heads of household who had no education or less than an elementary level of education is about 7 percent higher than that of men (10.8% and 3.1% respectively). The results suggest that the households with heads who had no or a low level of education are probably more vulnerable to climate change than others. This is in line with the findings of Balikoowa et al. (2019), who found that women tended to have less access to educational opportunity than men, and were less likely to act as the head of household.

Household size

Table 7 shows that the average household size of our samples was three members, with the smallest size being a one-person household, and the largest, 10 persons. The largest proportion of our samples were households with two members (39.4%), followed by three to four persons (33.8%), one-person (20.3%), and five persons or more (6.5%). Within the households with more than two members, the proportion of male heads of household was larger than that of women. Among the one-person households, however, women acted as the head of the household more than men (25.7% and 18.0% respectively). This finding can be linked to marital status, as women had a higher proportion who were single, widowed, and divorced than men.

Table 8: Percentage of dependents, by sex/gender of the head of household

Household members, by age	Sex/gender of head of the household			
	Male	Female	Other	Average of all
Under 15 years	5.2	5.2	15.4	5.4
15-59 years	77.2	72.0	76.9	75.6
60 years and older	17.5	22.7	7.7	19.0

Table 9: Percentage of type accommodation, by sex/gender of head of the household

Type of accommodation	Sex/gender of head of the household			
	Male	Female	Other	Average of all
Detached house	82.9	79.2	87.5	81.8
Tenement/commercial building	12.0	14.5	12.5	12.8
Semi-detached house	2.2	1.1	-	1.8
Apartment/flat/condominium	1.3	2.6	-	1.7
Room in house	1.3	2.6	-	1.7
Temporary shelter	0.4	-	-	0.2

Dependents

Table 8 shows that households with women as heads tended to have more elderly members (i.e., persons who are 60 years of age and older) than households with men as heads, which tended to have more working-age household members. This is in line with the findings of Neumayer and Plümper (2007), who suggested that women tend to be more vulnerable when disasters strike, as they have to take care of family members who have movement restrictions, such as the elderly.

Type of accommodation

The majority of respondents resided in a detached house (81.8%), followed by tenement/commercial building (12.8%), semi-detached house (1.8%), a unit in an apartment/flat/condominium (1.7%), and temporary shelter (0.2%), as shown in Table 9. Households with men as heads tended to live in detached and semi-detached houses, which suggested the availability of a large space. On the contrary, households with women as heads tended to live in smaller-sized accommodations, such as a tenement/commercial building, apartment/flat/condominium, or a room in a house. This might be explained by the size of the household, which suggests that more women tended to be in one-person households.

3.2.2 Work and income

This dimension can be divided into two levels, individual and household.

A. Individual level

This includes main occupation, income level, and access to financial service.

Main occupation

Table 10 shows that almost one-fourth of women reported their main occupation as owned trade/business (29.4%), which is distinctly higher than that of men (17.9%). We found a large difference (about 15%) between men and women in

Table 10: Percentage of respondents, by main occupation and their sex/gender

Main occupation	Sex/gender			
	Male	Female	Other	Average of all
Unemployed	3.4	4.0	-	3.7
Officer in government agency	9.2	5.5	33.3	7.2
Employee in private business	6.4	7.8	-	7.2
Hireling in general	25.1	21.4	-	22.9
Hireling in factory	2.8	1.9	-	2.3
Freelance	4.7	6.6	-	5.8
Agriculture/husbandry/fisheries	20.9	5.5	-	12.1
Owned trade/business	17.9	29.4	66.7	24.6
Household/family business	2.2	2.1	-	2.2
Hawker	1.1	1.1	-	1.1
Housewife/househusband	0.8	3.6	-	2.4
Student	4.7	10.6	-	8.0
Retired government officer	0.6	0.4	-	0.5
Digital platform worker	-	0.2	-	0.1

Table 11: Percentage of respondents, by income level and their sex/gender

Income level (baht)	2022				2019			
	Sex/gender				Sex/gender			
	Male	Female	Other	Average of all	Male	Female	Other	Average of all
No income	4.2	3.8	-	4.0	5.6	4.4	-	4.9
Less than 5,000	6.1	6.8	-	6.5	4.7	7.6	-	6.4
5,000 – 9,999	22.1	24.3	-	23.3	18.2	22.6	-	20.6
10,000 – 19,999	46.4	44.0	66.7	45.1	47.2	43.3	66.7	45.1
20,000 – 29,999	10.3	11.4	33.3	11.0	10.1	11.2	-	10.7
30,000 – 39,999	5.6	4.9	-	5.2	7.0	5.3	-	6.0
40,000 – 49,999	2.5	2.1	-	2.3	2.2	1.5	-	1.8
50,000 and higher	2.8	2.7	-	2.8	5.0	4.0	33.3	4.6
Average	15,767.60	15,675.86	16,666.67	15,718.80	17,336.87	22,568.82	26,333.33	20,336.51
Minimum	0	0	12,000	0	0	0	12,000	0
Maximum	400,000	300,000	25,000	400,000	350,000	3,000,000	50,000	3,000,000

agriculture, husbandry, and fisheries – in which there was a higher proportion of men than women (20.9% and 5.5% respectively). Furthermore, the share of women who were unemployed was slightly higher than that of men (4.0% and 3.4% respectively). Considering that fisheries tended to be the main economic sector along coastal areas, such a low level of female participation indicates critical gender inequality. Less employment opportunity for women might lead to women becoming more vulnerable to climate change (Denton 2002; Chalita 2014; CODI 2019).

Income level

The average monthly income of our respondents in 2022 was 15,719 baht (around US$ 413), with the lowest having no income, and the highest, 400,000 baht (about US$ 10,528), as shown in Table 11. The average income in 2022 decreased by around 5,000 baht (about US$ 132) from the year 2019, which was before the COVID-19 pandemic started. The average income of women respondents decreased from about 22,569 (about US$ 594) in 2019 to about 15,676 (about US$ 413) in 2022,

which is a markedly larger drop compared with that of men. This suggests that women in the four studied areas were affected more negatively than men by the COVID-19 pandemic in terms of income. An explanation might be because more women tended to be in trade/business, and thus suffered negative impacts due to the lockdown and movement restriction measures, while men tended to concentrate in the agriculture/husbandry/fisheries sector, which experience less disruption.

Access to financial services

Table 12 shows that the majority (85.6%) of our respondents had at least one bank account, with 82.1 percent being men and 88.2 percent women. While the percentage is considered quite high for an upper-middle income country, it is still lower than the national average which is 95.58 percent.[1] Table 13 further shows that savings accounts were the most common type of bank account among our samples (97.9%), with not much difference between men and women.

Table 14 shows that only about 13 percent of our respondents were using loan services from a commercial bank, with the percentage of women being slightly higher than that of men (13.5% and 11.2% respectively). This might be explained by our finding that women tended to own a trade/business and thus might need such services for their business operations. It should be noted that we did not collect

[1] *World Bank, 2021, "Account ownership at a financial institution or with a mobile-money-service provider (% of population ages 15+) – Thailand," https://data.worldbank.org/indicator/FX.OWN.TOTL.ZS?locations=TH (accessed on September 29, 2022). Note that the difference might be due to the World Bank's larger population coverage (15 years and older) than that of the present study (18 years and older).*

Table 12: Percentage of respondents with at least one bank account, by their sex/gender

Type of bank account	Sex/gender			
	Male	Female	Other	Average of all
Savings account	99.3	96.9	100.0	97.9
Current account	0.0	0.9	-	0.6
Fixed deposit account	0.7	2.1	-	1.5

Table 13: Percentage of respondents with at least one bank account, by type of account and their sex/gender

Type of bank account	Sex/gender			
	Male	Female	Other	Average of all
Savings account	99.3	96.9	100.0	97.9
Current account	0.0	0.9	-	0.6
Fixed deposit account	0.7	2.1	-	1.5

Table 14: Percentage of respondents using loan services from a commercial bank, by their sex/gender

Using loan services from a commercial bank	Sex/gender			
	Male	Female	Other	Average of all
Not using	88.8	86.5	66.7	87.4
Using	11.2	13.5	33.3	12.6

data on the demand to access loans. Hence, those who were not using loan services might not have had a need for such services.

B. Household level

Breadwinner

More than half of the respondents reported that they were also the breadwinner of their households (52.1%), followed by their spouse (17.0%), and their parents or parents-in-law (11.9%), as shown in Table 15. The respondents who were the breadwinners tend to be in households with women as heads of households more than men (62.5% and 47.6% respectively). This can be linked back to our finding that women tended to be in one-person households and thus also acted as the breadwinner.

Household income and debt

The average monthly household income of our respondents was 34,772 baht (US$ 918) in 2022, with about a 2,000 baht decrease from that of 2019, which is in accordance with the pattern of individual income, as shown in Table 16. The drop in both individual and household incomes might be due to the COVID-19 pandemic. Households with men as the head had higher average household income than those with women as the head in 2022 and 2019. This might be explained by our previous finding that households with men as the heads tended to have more members, particularly working-age members (i.e., 15-59 years old).

Table 17 shows that almost one-fifth of the households in our survey had debts. Among those who were in debt, the average amount of the debt was 293,345 baht (US$ 7,748), with the lowest amount being 5,000 baht (US$ 132), and the highest, 4 million baht (about US$ 105,625) (see Table 18). While higher percentage of women respondents had debts, men had a higher average amount of debt than women.

Table 15: Percentage of breadwinners, by sex/gender of the head of household

Breadwinner	Head of the household, by sex/gender			
	Male	Female	Other	Average of all
All household members	6.8	7.4	-	6.9
Respondents	47.6	62.5	38.5	52.1
Spouse (legally married)	22.4	4.3	30.8	17.0
Partner (living together)	5.6	3.1	7.7	4.8
Son/Daughter	3.3	4.3	-	3.6
Son/Daughter-in-law	0.4	0.3	-	0.4
Father-Mother/Father-Mother-in-law	12.1	11.5	7.7	11.9
Siblings	1.4	5.0	15.4	2.7
Grandparents	0.1	-	-	0.1
Relatives	0.1	0.5	-	0.6

Table 16: Percentage of household income, by sex/gender of head of the household

Household income (baht)	2022				2019			
	Sex/gender of head of the household				Sex/gender of head of the household			
	Male	Female	Other	Average of all	Male	Female	Other	Average of all
No income	0.4	0.4	-	0.4	1.3	0.7	-	1.1
Less than 5,000	2.0	3.0	-	2.3	2.2	2.6	-	2.3
5,000 – 9,999	7.7	10.8	-	8.6	5.7	13.0	-	8.0
10,000 – 19,999	27.3	31.6	37.5	28.8	28.5	29.7	37.5	29.0
20,000 – 29,999	22.1	21.6	37.5	22.1	19.2	24.2	37.5	21.0
30,000 – 39,999	18.9	16.4	12.5	18.0	17.6	10.8	12.5	15.3
40,000 – 49,999	7.4	4.8	-	6.5	6.6	4.8	-	6.0
50,000 and higher	14.4	11.5	12.5	13.4	18.9	14.1	12.5	17.3
Average	35,923.21	32,569.89	28,625.00	34,771.62	40,403.16	28,543.68	27,125.00	36,540.93
Minimum	0	0	12,000	0	0	0	12,000	0
Maximum	1,000,000	700,000	90,000	1,000,000	3,000,000	380,000	75,000	3,000,000

Table 17: Percentage having debts, by sex/gender of head of the household

Having debts	Sex/gender of head of the household			
	Male	Female	Other	Average of all
No debts	80.8	79.6	62.5	80.2
Have debts	19.2	20.4	37.5	19.8

Table 18: Percentage of household debt level, by sex/gender of the head of household

Debt level (baht)	Sex/gender of head of the household			
	Male	Female	Other	Average of all
Less than 10,000	0.9	1.8	-	1.2
10,000 – 49,999	19.6	29.1	-	22.4
50,000 – 99,999	25.2	18.2	33.3	23.0
100,000 – 499,999	38.3	36.4	33.3	37.6
500,000 – 999,999	7.5	5.5	-	6.7
1,000,000 and higher	8.4	9.1	33.3	9.1
Average	284,496.33	266,200.00	1,106,666.67	293,345.45
Minimum	5,000	5,000	50,000	5,000
Maximum	4,000,000	3,000,000	3,000,000	4,000,000

3.2.3 Health

Climate-related diseases

Table 19 shows that the top four climate-related diseases experienced by our respondents were heat stress (9.8%), diarrhea (8%), dengue fever (6.4%), and heatstroke (3.6%). Women comprised a higher proportion of those who ever experienced any of those four diseases than men. Moreover, among the women who experienced heat stress and heat stroke, 60 percent of them did not receive any medical treatment.

Access to health insurance

Table 20 shows that the majority of respondents were covered under the universal health care scheme (79.5%), followed by social security (27%), and private health insurance (18.3%). Among those who had universal health coverage, a slightly higher proportion were men than women (80.7% and 78.6% respectively). A higher proportion of women had social security than men (30.4% and 22.1% respectively).

Life satisfaction

Table 21 shows that the average level of life satisfaction among our respondents was 7, with the lowest level at zero, and the highest level at 10. Almost half of the respondents (45.1%) were most satisfied with life and about one-third (32.4%) were fairly satisfied with life. Among those who were highly satisfied with life, the proportion was higher among women than men. This finding is rather interesting because, while more women than men reported experiencing physical health issues, their mental health (as partly reflected by their satisfaction in life) seems to not differ much from that of men.

Table 19: Percentage of respondents who ever had a climate-related disease, by their sex/gender

Climate-related diseases	Ever had climate-related disease				Ever had medical treatment			
	Sex/gender				Sex/gender			
	Male	Female	Other	Average of all	Male	Female	Other	Average of all
Heat stress	7.0	12.1	-	9.8	36.0	40.4	-	39.0
Malnutrition	0.6	0.6	-	0.6	50.0	100.0	-	80.0
Heatstroke	2.8	4.2	-	3.6	10.0	40.0	-	30.0
Diarrhea	6.4	9.3	-	8.0	47.8	75.6	-	66.2
Leptospirosis	-	0.2	-	0.1	-	-	-	-
Malaria	-	0.2	-	0.1	-	100.0	-	100.0
Dengue Fever	3.6	8.5	-	6.4	100.0	90.0	-	92.5

Table 20: Percentage of respondents, by type of health insurance and their sex/gender

Type of health insurance	Sex/gender			
	Male	Female	Other	Average of all
Universal health coverage	80.7	78.6	66.7	79.5
Social security	22.1	30.4	66.7	27.0
Civil servant or pensioner	6.7	4.0	-	5.2
Public enterprise	0.3	1.7	-	1.1
Independent government agency	0.6	1.9	-	1.3
Local government organization	0.8	3.0	-	2.0
Private health insurance	16.5	19.5	66.7	18.3
Welfare provided by employer	6.4	5.1	33.3	5.8
Others	0.3	0.4	-	0.4

Table 21: Percentage of life satisfaction among respondents, by their sex/gender

Life satisfaction	Sex/gender			
	Male	Female	Other	Average of all
Unsatisfied (0)	0.6	-	-	0.2
Very least satisfied (1-2)	0.3	0.4	-	0.4
Least satisfied (3-4)	1.7	2.3	33.3	2.2
Fairly satisfied (5-6)	31.8	32.8	33.3	32.4
Most satisfied (7-8)	48.6	42.7	-	45.1
Highly satisfied (9-10)	17.0	21.8	33.3	19.8
Average	7.06	7.13	6.00	7.09
Minimum	0	1	4	0
Maximum	10	10	9	10

3.2.4 Access to information and public services

Access to information about disasters and climate change

Table 22 shows that the majority of respondents received information regarding forecasts of drought, flood, and extreme events, as well as forecasts of the start of the rainy season (70.4% and 86.5% respectively). However, only one-third of the respondents had ever received information about short-term weather forecasts (one week in advance), and only 14.4 percent ever received long-term forecast (one year in advance). While more women than men received weather forecasts in general, the share of women who received information about extreme events was smaller than that of men.

Regarding the sources of information, the majority of our respondents received information about disasters and climate change from television, neighbors, and family members (84.1%, 71.8%, and 71.5% respectively), as shown in Table 23.

Satisfaction with the government's responses to disasters

More than half of the respondents were satisfied with the government's responses to disasters in terms of surveillance, warning, prevention, emergency response and mitigation during disasters, and recovery and assistance after the disasters (Table 24). The patterns are similar to that of the survey on opinions about disasters and the environment undertaken by the National Statistical Office in 2013. However, it is important to note that the other half of the samples were least satisfied or unsatisfied with the government's responses.

Table 22: Percentage of respondents who received information about disasters and climate change, by type of information and their sex/gender

Type of information	Sex/gender			
	Male	Female	Other	Average of all
Forecast of drought, flood, and extreme events	71.2	69.6	100.0	70.4
Forecast of the start of rainy season	84.9	87.5	100.0	86.5
Seasonal weather forecast	56.7	63.4	66.7	60.6
Short-term weather forecast (one week in advance)	34.9	35.7	33.3	35.4
Long-term weather forecast (one year in advance)	13.7	14.8	33.3	14.4

Table 23: Percentage of respondents who received information about disasters and climate change, by source of information and their sex/gender

Source of information	Sex/gender			
	Male	Female	Other	Average of all
Government/public enterprise agency	32.1	39.1	33.3	36.1
Private agency	12.6	19.7	33.3	16.7
NGOs	6.7	8.9	-	7.9
Community or village leaders, Community or village meetings	53.9	55.6	-	54.7
Family members	70.4	72.3	66.7	71.5
Neighbors	71.8	72.1	33.3	71.8
Television	84.6	83.7	66.7	84.1
Radio	41.1	38.5	33.3	39.6
Amplifier in community or village	47.8	45.2	66.7	46.4
Schools or teachers	11.2	13.5	-	12.5
Cell phone (SMS)	12.0	20.1	33.3	16.7
Internet	47.5	58.8	100.0	54.1
Traditional forecasters/indigenous knowledge/own knowledge	42.7	42.1	33.3	42.3

Table 24: Percentage of respondents, by satisfaction with the government's responses to disasters

Government's responses	Level of satisfaction				
	Unsatisfied	Least satisfied	Fairly satisfied	Most satisfied	Not sure/ no opinion
Surveillance	14.4	24.3	43.9	13.8	3.6
Warning	14.4	23.3	45.4	13.3	3.6
Prevention	14.4	23.4	46.5	12.2	3.5
Emergency response and mitigation during disaster	15.2	26.4	42.8	11.9	3.7
Recovery and assistance after disaster	16.3	24.5	44.5	10.9	3.8

3.2.5 Participation

Awareness of and adaptation to climate change

Table 25 shows that the majority of our respondents had participated in activities that indicated awareness of and adaptation to climate change. When considering the difference between men and women, we found only a 1-2 percent difference in each activity among men and women. Not littering in public spaces had the highest participation rate, which might be because anti-littering campaigns have been conducted for longer periods compared with other activities. Furthermore, unlike most of the activities described under this activity which have no penalty if not practiced, littering in public spaces is an offence that can result in a fine, or imprisonment, or both. Another interesting note is that, despite carrying a heavier penalty compared with littering, the burning of waste has a lower participation rate than recycling waste, for which there is no penalty, even though anti-burning campaigns have been

Table 25: Percentage of respondents who participate in activities or practice climate change awareness and adaptability activity, by their sex/gender

Participation/practice under each activity	Sex/gender			
	Male	Female	Other	Average of all
Plant trees	83.2	84.4	66.7	83.8
Conserve energy	83.0	83.9	33.3	83.3
Understand and study about the harm of pollution	77.9	75.3	66.7	76.4
Use renewable energy	80.2	78.0	33.3	78.8
Not litter in public space	89.1	90.9	100.0	90.2
Avoid burning waste or agricultural burning	82.4	85.4	66.7	84.1
Reduce the use of chemicals in agriculture	80.7	79.0	66.7	79.7
Recycle waste	86.6	88.2	66.7	87.4
Participate in environmental conservation-related activities	83.8	85.2	66.7	84.5

Table 26: Percentage of respondents who never participated in climate-related policy decision-making, by sex/gender

Government's responses	Sex/gender			
	Male	Female	Other	Average of all
Storm surge	69.5	76.9	100.0	73.9
Tidal surge	75.7	80.5	100.0	78.5
Flash floods from heavy rain	75.2	80.1	100.0	78.1
Drought	80.7	86.7	100.0	84.2
Rising sea temperature	82.1	85.8	100.0	84.3

conducted for decades. This might suggest that legal sanctions combined with long-term and continuous awareness-raising campaigns would be the most effective policy to respond to climate change.

Participation in climate-related policy

Overall, more than two-thirds of our respondents had never participated in any climate-related policy decision-making process. The types of disaster-related activity in which the respondents participated the least at the policy decision-making level was on drought and rising sea temperatures (see Table 26). It is clear that a higher proportion of women had never participated in the policy decision-making process on every issue. This reaffirms the findings of other studies that women tend to have less policy access as compared with men (Terry, 2009; World Bank Group, 2016).

4. CONCLUSION

The findings of our surveys of 834 respondents in the four coastal provinces of Phetchaburi, Rayong, Surat Thani, and Songkhla can be summarized as follows. First, the proportion of women with no education is higher than that of men. While the percentage of women with a bachelor's degree is also higher than that of men, this might not be interpreted as a positive sign.

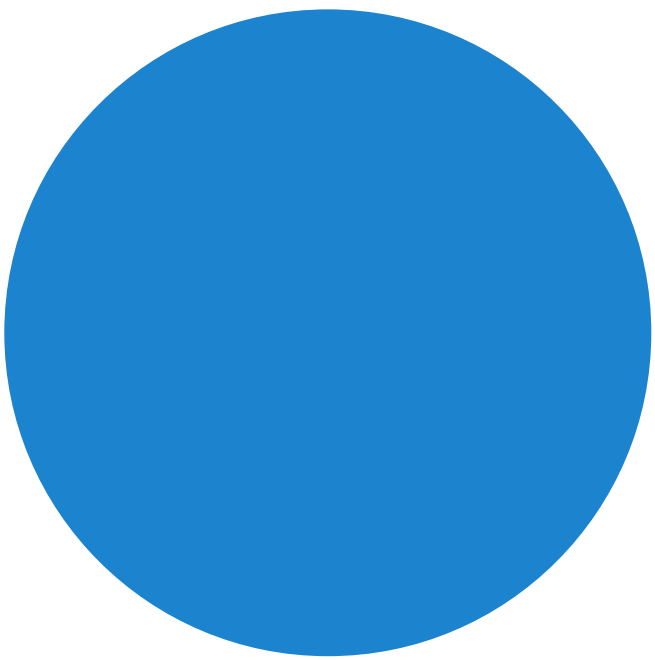
Continuing into university may indicate a loss of opportunity, or access, to join the labor market and earn income, suggesting possible gender discrimination in employment. Our study also found that women tend to be unemployed more than men.

Second, our study also indicates that more women than men tend to live alone. This is linked to marital status that women tend to be single, widowed, divorced, as well as the household characteristics which showed that more women than men are living in one-person households. This might become an issue as more than 70 percent of our respondents reported learning information about climate change from family members. The government must become more active in raising awareness and communicating in ways that can reach out to individuals, such as by text, letter, or email.

Third, households with women as heads tend to have more elderly members, while households with men as heads tend to have members who are of working-age. Households with men as heads also have a higher average income that those with women as heads. This implies that women-led households might have fewer resources to adapt to or mitigate the impacts of climate change.

Fourth, women more than men experienced climate-related diseases, such as heat stress, heat stroke, and dengue fever. Moreover, almost two-thirds of women who had experienced heat stress and heat stroke did not receive any medical treatment. However, women respondents tend to be more satisfied with their lives as compared with men.

Fifth, the share of women who receive information about extreme events is smaller than that of men. This reaffirms our previous findings that the government must invest more effort in communicating and reaching out to women. Providing women with more access to the policy decision-making process is also crucial, as our study suggests that women still have less engagement compared with men. The combination between long-term and continuous awareness-raising campaigns and legal sanctions seems to be the most effective response.



REFERENCES

Balikoowa, K., G. Nabanoga, D. M. Tumusiime, and M. S. Mbogga. 2019. "Gender differentiated vulnerability to climate change in Eastern Uganda." *Climate and Development*, 11(10): 839-849. https://doi.org/10.1080/17565529.2019.1580555

Chalita Buntuwong. 2014. "Coastal Communities in Ao Phang Nga and Their Changing Economic Lives." *Journal of Sociology and Anthropology*, 33(1): 45-80.

Community Organizations Development Institute (CODI). 2019, June 21. From coastal resources to local economy: Case study of Tambon Hat Chao Samran (in Thai). https://ref.codi.or.th/public-relations/news/17009-2019-06-21-09-16-22

Denton, F. 2002. "Climate Change Vulnerability, Impacts, and Adaptation: Why Does Gender Matter?" *Gender and Development*, 10(2): 10–20. http://www.jstor.org/stable/4030569

Food and Agriculture Organization of the United Nations (FAO). 2012. Training guide on gender and climate change research in agriculture and food security for rural development. https://www.fao.org/documents/card/en/c/4ca6d155-3ecb-586e-a3cc-53d179a48bd1/

Germanwatch. 2021, January 25. Global climate risk index 2021: Who Suffers Most from Extreme Weather Events? Weather-related Loss Events in 2019 and 2000 to 2019. https://www.germanwatch.org/en/19777

Intergovernmental Panel on Climate Change (IPCC). 2022. Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. https://www.ipcc.ch/ report/sixth-assessment-report-working-group-ii/

Neumayer, E., and T. Plümper. 2007. "The gendered nature of natural disasters: The impact of catastrophic events on the gender gap in life expectancy, 1981–2002." *Annals of the Association of American Geographers,* 97(3): 551-566. https://doi.org/10.1111/j.1467-8306.2007.00563.x

Parikh, J. 2007. Gender and climate change: Framework for analysis, policy & action. Integrated Research and Action for Development. https://www.undp.org/ india/publications/gender-and-climate-change-framework-analysis-policy-action-0

Surachai Khlaithong. 2011. A Study of the Impact of Coastal Erosion Problems on the Fishing Community of Ban Chai Talay in Tambon Phanthaisongkhro, Muang District, Samut Sakhon Province (Master's Thesis, in Thai). Nakhon Pathom: Silpakorn University.

Terry, G. 2009. "No climate justice without gender justice: an overview of the issues. *Gender and Development*, 17(1): 5–18. http://www.jstor.org/stable/27809203

Thailand Environment Institute (TEI). 2022, March 28. Urban communities: Vulnerability to climate change. https://www.tei.or.th/th/blog_detail.php?blog_id=103

UN Women. 2022, February 28. Explainer: How gender inequality and climate change are interconnected. https://www.unwomen.org/en/news-stories/explainer/2022/02/explainer-how-gender-inequality-and-climate-change-are-interconnected

Vatcheva, K. P., Lee, M., McCormick, J. B., & Rahbar, M. H. 2016. Multicollinearity in regression analyses conducted in epidemiologic studies. *Epidemiology* (Sunnyvale), 6(2). https://doi.org/10.4172/2161-1165.100022

World Bank Group. 2016. World Bank Group Gender Strategy (FY16-23): Gender Equality, Poverty Reduction and Inclusive Growth. https://openknowledge.worldbank.org /handle/10986/23425

World Health Organization [WHO]. 2022, June 3. Why mental health is a priority for action on climate change. https://www.who.int/news/item/03-06-2022-why-mental-health-is-a-priority-for-action-on-climate-change

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KEYS TO PREPARE THAI BUSINESSES FOR THE AGE OF A LOW-CARBON ECONOMY: DATA AND FINANCING*

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1. INTRODUCTION

Climate change has become one of the most significant global challenges for the global community, and has become one of the most significant risks for businesses. This is evident from the results of Global Risks Perception Survey (GRPS) in the Global Risks Report 2023 published by the World Economic Forum[1] highlighting the failure of climate change adaptation and mitigation efforts as two of the top 10 global risks, both in the short term (over the next 2 years) and the long term (over the next 10 years).

As climate change has been given great attention by various stakeholders around the world, private sector organizations have been facing pressure to address the climate crisis. The pressure comes from global targets and commitments, including a significant one associated with the 21st Session of the Conference of the Parties (COP21) of the United Nations Framework Convention on Climate Change (UNFCCC), which led to the adoption of the Paris Agreement in 2015. In the Paris Agreement, 195 parties agreed to collectively hold the global temperature increase this century to well below 2°C compared with pre-industrial levels, and pursue efforts to limit that increase even further to no more than 1.5°C above pre-industrial levels. During COP26 in 2021, Thailand officially pledged to achieve a net zero greenhouse gas emissions target by 2065. This national commitment cascades a number of environmental implications for Thai businesses, prompting several organizations to set net zero goals and adopt a climate action plan.

In addition to the pressure resulting from such a commitment, international trade regulations, such as the Carbon Border Adjustment Mechanism (CBAM) of the European Union, local regulations, investors, trade partners, consumers and other stakeholders have pressured private sector organizations to pay great attention to climate action. Inevitably, organizations need data related to greenhouse gas emissions and financing sources in order to tackle climate change and transition toward a low-carbon economy, as well as to respond to their stakeholders' pressures.

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[1] *World Economic Forum, The Global Risks Report 2023: 18th Edition, Insight Report, accessed on November 9, 2023; available from https://www3.weforum.org/docs/WEF_Global_Risks_Report_2023.pdf.*

This article is aimed at highlighting the importance of greenhouse gas (GHG) emission data and financing sources as the key elements needed by businesses to transition to a low-carbon economy.

2. IMPORTANCE OF GREENHOUSE GAS EMISSION DATA

Around the world, there have been increasing regulatory requirements and standards on GHG emission disclosures. Also, GHG emission data play a significant role in informing organizations of their business activities and potentially the hotspots where they can reduce GHG emissions. This section illustrates the existing and emerging regulations and standards, both at the local and international levels, affecting the need for more and better GHG emission data. This is followed by a discussion on the readiness of large Thai businesses concerning the availability of GHG emission data; the organizational benefits of the data; and challenges in GHG emission data management, and how to overcome such challenges.

2.1 Regulations and standards influencing the disclosure of greenhouse gas emission data

In Thailand, the Securities and Exchange Commission (SEC) has consolidated the disclosures format of annual information statements (Form 56-1) and annual reports (Form 56-1) into One Report, or Form 56-1 One Report. The One Report, which became effective from the financial period ending on December 31, 2021, was used for filing from January 1, 2022 onwards, elevated the sustainability disclosures of listed companies. The required disclosures include GHG Scope 1 and Scope 2 emissions.[2] However, currently the requirement of GHG emission data under this form adopts a comply-or-explain reporting approach.[3]

In addition to the local disclosure requirement, international criteria and standards may pose additional challenges for Thai companies. Among other such disclosure standards, the International Sustainability Standards Board (ISSB) on June 26, 2023 issued its first two International Financial Reporting Standards (IFRS): Sustainability Disclosure Standards IFRS S1 and IFRS S2. IFRS S1 General Requirements for Disclosure of Sustainability-related Financial Information is a general principle for organizations to disclose financial information related to sustainability, covering the opportunities and risks related to the organization's sustainability; IFRS S2 Climate-related Disclosures provides criteria for companies to disclose information about opportunities and risks related to climate change.

The International Organization of Securities Commissions (IOSCO) also supports these standards, encouraging its 130 member countries to consider using these standards for disclosure. This endorsement has sent a strong signal to jurisdictions around the world that these standards could fit the purpose of capital market use; however, enforcement depends on the regulatory bodies of each country.

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[2] *There are three scopes as defined in the Greenhouse Gas Protocol of the International Sustainability Standards Board. They provide a means to categorize the different kinds of emissions that a company creates in its own operations and in its wider value chain. They will be discussed in more detail in section 2.2.*

[3] *SEC, "[คู่มือจัดทำแบบแสดงรายการข้อมูลประจำปี/รายงานประจำปี แบบ 56-1 One Report แบบ 69-1]," assessed on November 13, 2023; available from https://publish.sec.or.th/nrs/8619s.pdf.*

Besides the international disclosure standards, other international regulations also raise the importance of GHG emission data. One example is the previously mentioned CBAM regulation, introduced on October 1, 2023, which will have implications for Thai exporters to provide GHG emissions connected with products in particular sectors, including steel and iron, cement, electricity, aluminum, fertilizers and hydrogen.

The European Union also has enacted other regulations that will potentially have impacts on organizations in Thailand. Those include Corporate Sustainability Reporting Directive (CSRD) mandating large organizations to disclose the impacts of corporate activities on the environment and society; and the Corporate Sustainability Due Diligence Directive (CSDDD), which is still in the legislative proposal stage, which would require large companies to conduct and report on supply chain due diligence both within and outside the borders of their country in order to foster environmental and human rights considerations within the companies' operations and governance. These regulations and standards could exert pressure on Thai companies to prepare and disclose their GHG emissions.

2.2 Readiness of the Thai companies concerning greenhouse gas emission data

Due to the increasing need for GHG emission data, this section leads to a discussion on the readiness of Thai companies. In this context, the disclosure of GHG emissions of listed companies in the SET100 index could be used as an example to gauge the readiness of large Thai corporations.

Before delving into the discission on readiness, it is worth noting that GHG emissions can be categorized into three scopes.

Scope 1 includes **direct GHG emissions** from the organization, such as from organizational vehicles, fuel combustion, and the use of air-conditioning refrigerants.

Scope 2 includes **indirect GHG emissions** associated with the purchase of electricity, heat, steam or cooling used within the organization.

Scope 3 encompasses other **indirect GHG emissions** from the value chain. The Corporate Value Chain (Scope 3) Accounting and Reporting Standard under the Greenhouse Gas Protocol identifies 15 categories covering activities throughout the value chain. These include upstream activities, such as purchased goods and services, transportation and distribution, as well as downstream activities, such as use of sold products, end-of-life treatment of sold products, investments, and leased assets.[4]

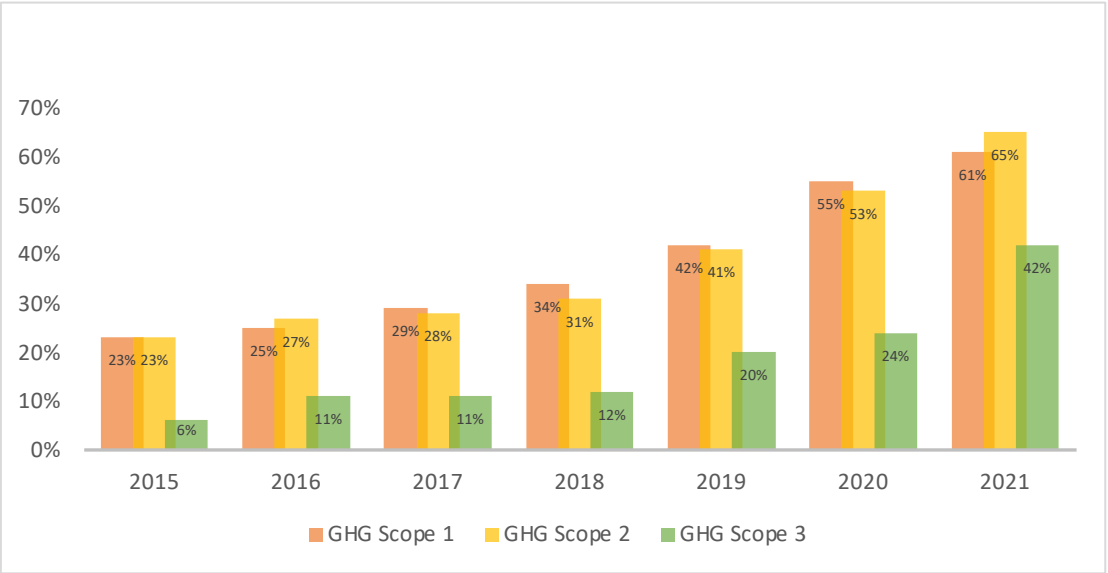
As mentioned previously, for listed companies, GHG emissions Scope 1 and Scope 2 are core-level metrics; they are required to be included in the 56-1 One Report (i.e., Comply or Explain Approach), while Scope 3 is a recommended-level metric as stated in the Stock Exchange of Thailand (SET)[5] Sustainability Reporting Guide.

According to data compiled by TDRI from the corporate disclosures of companies listed in

[4] *Greenhouse Gas Protocol, "Corporate Value Chain Accounting and Reporting Standard," accessed on November 9, 2023; available from https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf.*

[5] *SET, "[คู่มือการรายงานความยั่งยืนสำหรับบริษัทจดทะเบียน]," assessed on November 13, 2023; available from https://setsustainability.com/download/nqcywd36j9tmk5x.*

Figure 1: The disclosure of GHG data, by sample group companies



*Source: TDRI. 2023, "Exploring Thai listed companies' corporate sustainability reporting and the stakeholder involvement in corporate materiality analysis [*โครงการสำรวจศักยภาพการจัดทำรายงานความยั่งยืน และการมีส่วนร่วมของผู้มีส่วนได้ส่วนเสียในการกำหนดประเด็นความยั่งยืนที่มีนัยสำคัญของบริษัทจดทะเบียนในประเทศไทย*]."*

the SET100 index during the period 2015-2021,[6] the dataset shows an increasing quantity in GHG emissions of all three scopes. In 2021, the percentage of companies disclosing GHG emissions Scope 1, Scope 2, and Scope 3, were 61 percent, 65 percent, and 42 percent, respectively (Figure 1). It is anticipated that the disclosure of Scope 1 and Scope 2 data will see a gradual rise over time, driven by the SEC 56-1 One Report requirements.[7]

The disclosure of GHG Scope 3 data tends to be lower compared with that of Scope 1 and Scope 2. This is because of the complexity and challenges in collecting and measuring Scope 3 data. Despite such challenges, understanding Scope 3 emissions is crucial as they are normally the largest scope of GHG emissions.

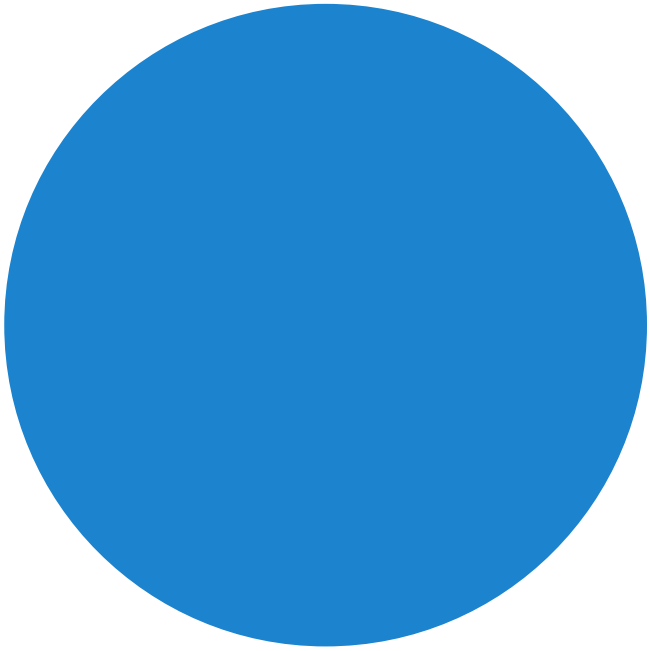
Different businesses could prioritize categories of GHG Scope 3 differently depending on their business activities. For companies operating in the manufacturing sector, their focus could be on the categories of Scope 3 that are related to procuring and production activities. For example, Fortune Parts Industry Public Company Limited (FPI), listed on the Market for Alternative Investment (MAI), considers Scope 3 Category 1 Purchased Goods and Services as being among the key categories of its GHG Scope 3. Information from FPI Sustainability Report 2022 shows that Scope 3 emissions accounted

[6] *TDRI, "Exploring Thai listed companies' corporate sustainability reporting and the stakeholder involvement in corporate materiality analysis [โครงการสำรวจศักยภาพการจัดทำรายงานความยั่งยืน และการมีส่วนร่วมของผู้มีส่วนได้ส่วนเสียในการกำหนดประเด็นความยั่งยืนที่มีนัยสำคัญของบริษัทจดทะเบียนในประเทศไทย]," CMRI, accessed on November 9, 2023; available from https://www.cmri.or.th/uploads/images/CMRI_Publication/16921722831-%20Final%20Report_ESG%20Report_JUN2023.pdf15.*

[7] *Ibid.*

for 57 percent of the company's total emissions.[8] This means that, if a company would like to reduce its Scope 3, it needs to procure lower carbon-intensive materials, such as materials with a higher content of recycled plastics.

Financial institutions, unlike manufacturing companies, need to focus on Scope 3 Category 15 Investments, which include emissions associated with their portfolios of loans and investments. As stated in the Kasikornbank Public Company Limited (KBANK) Sustainability Report 2022, Scope 3 emissions, specifically those under Category 15, constitute the largest Scope 3 emissions for financial institutions.[9] In addition to GHG emission data, Thai companies have been increasingly focusing on setting GHG-related targets, such as carbon neutral and net zero targets.[10] Observing the disclosures of those listed companies throughout a seven-year period reveals some issues related to its target-setting practices, and disclosure of such targets. Those include ambiguity of the target information, postponing the pre-set targets, unclear communication regarding the base year related to the target, and lack of a concrete plan to achieve such a target.



However, some companies use GHG emissions data to set clear goals, targets, and progress-monitoring plans. For instance, Bangchak Corporation Public Company Limited (BCP) has set a net zero target with a plan called "BCP 316 NET," covering four key directions to achieve the target. Those includes the following:[11]

(1) B: Breakthrough Performance – 30 percent of GHG emissions will be reduced from enhanced efficiency

(2) C: Conserving Nature and Society – 10 percent of GHG emissions will be reduced from carbon sequestration from the forest and marine ecosystems

(3) P: Proactive Business Growth and Transition – 60 percent of GHG emissions will be reduced from transitioning to renewable energy,

8 *Fortune Parts Industry PCL, "Sustainability Report 2022 [รายงานการพัฒนาเพื่อความยั่งยืน ประจำปี 2565]," assessed on November 9, 2023; available from https://www.fpiautoparts.com/sd_report_th/.*

9 *Kasikornbank Public Company Limited, "Sustainability Report 2022 [รายงานการพัฒนาเพื่อความยั่งยืน 2565]," assessed on November 9, 2023; available from https://www.kasikornbank.com/th/sustainable-development/Report.*

10 *TDRI, "Exploring Thai listed companies' corporate sustainability reporting and the stakeholder involvement in corporate materiality analysis [โครงการสำรวจศักยภาพการจัดทำรายงานความยั่งยืน และการมีส่วนร่วมของผู้มีส่วนได้ส่วนเสียในการกำหนดประเด็นความยั่งยืนที่มีนัยสำคัญของบริษัทจดทะเบียนในประเทศไทย]," CMRI, accessed on November 9, 2023; available from https://www.cmri.or.th/uploads/images/CMRI_Publication/16921722831-%20Final%20Report_ESG%20Report_JUN2023.pdf15.*

11 *Bangchak Corporation Public Company Limited, "Integrated Sustainability Report 2022 [รายงานการพัฒนาเพื่อความยั่งยืนแบบบูรณาการ ประจำปี 2565]," assessed on November 9, 2023; available from https://www.bangchak.co.th/storage/document/sd-report/sd2022-th.pdf.*

increasing the proportion of revenue from green businesses, and investing in green technologies

(4) NET: Net Zero – Creating an ecosystem to support the journey toward the net zero emission target.

2.3 The use of greenhouse gas emission data for corporate decision-making

Despite being used to respond to regulations and pressures, GHG emission data can be integrated into corporate strategy and decision-making processes. The decisions include decisions on enhancing energy efficiency, investing in renewable energy, developing products and services, expanding market base, and strengthening corporate resilience.

The BCP case can also be used as an example of a company that leverages GHG emission data to create business opportunities and manage risks. Beyond using the data in setting targets, the company also uses the information for investment decisions concerning renewable energy, energy efficiency projects, and carbon capture and storage initiatives. The company incorporates GHG emission data into financial management and resource allocation. This means that their accounting department is also responsible for integrating GHG emission data to be used with financial data. Additionally, their finance department needs to understand GHG emissions in order to seek funding sources and new financial instruments to support their GHG reduction projects.

Home Product Center Public Company Limited (HMPRO) is another example of a company that utilizes GHG data together with financial and operational information to reduce long-term operating costs by investing in low-carbon technologies. Those include investment in solar rooftop installation across 18 branches nationwide, resulting in an estimated reduction in the annual cost of electricity of approximately 13 million baht.[12] Also, the company used the GHG emission data and transportation costs to make decisions concerning replacement of their transport vehicles with electric-powered vehicles. In 2023, the company has already transitioned 10 vehicles, and by 2035, it plans to convert to 100 percent electric-powered vehicles. Such replacement is estimated to reduce its transportation costs by 21 percent per year, along with a reduction of approximately 16 tCO2e per vehicle per year.[13]

Moreover, several companies leverage GHG emission data in their marketing efforts by linking GHG emission data with their products to inform and attract consumers. For example, Mitr Phol Sugar Corporation Limited included sustainability rankings information and GHG emission data on the labels of their sugar products. Apple Computer Inc. attached a carbon neutrality claim to its Apple Watch Series 9.[14]

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[12] *The abbreviation tCO2e means the amount of greenhouse gas emitted during a given period, measured in metric tons of carbon dioxide (CO2) equivalent. Source of the data: Alternative Energy Institute of Thailand Foundation, "[GUNKUL ลุยติดตั้ง "โซลาร์รูฟท็อป" โฮมโปรฯ18 สาขา ขนาด 8.29 MW ช่วยลดค่าไฟ 13 ล้านต่อปี]," assessed on November 10, 2023; available from https://aeitfthai.org/solar-move/10972.html.*

[13] *Thairath Online, "[โฮมโปร ปรับรถขนสินค้าเป็นรถยนต์ไฟฟ้า 100% คาดช่วยลดต้นทุนขนส่ง 21%]," assessed on November 10, 2023; available from https://www.thairath.co.th/news/auto/evcar/2726125.*

[14] *Taida Nando, "Apple's First Carbon Neutral Products: Greenwashing or Genuine Sustainability?" Impakter, accessed on November 10, 2023; available from https://impakter.com/apples-first-carbon-neutral-products-greenwashing-or-genuine-sustainability/.*

2.4 Challenges in greenhouse gas emission data management and how to overcome the challenges

Challenge 1: Unclear goals and targets

As mentioned above, GHG emission data are also used for setting goals and targets. However, the goals and targets of some companies are still unclear and ambiguous.

Overcoming the challenge: setting clear, scientific, ambitious goals

Goals and targets related to GHG reduction should be set at the organizational level – to be a guiding compass for management and operational actions. Steering corporate-level GHG reduction initiatives requires such goals to be clear and translatable into concrete actions. The characteristics of good-quality targets could include the following: (a) the targets should be ambitious enough for transitioning toward a low-carbon economy; (b) the targets and milestones should be clear; and (c) the targets and progress should be disclosed appropriately. Some companies have set climate-related targets in accordance with the Science-Based Targets (SBTs).[15] About 30 companies in Thailand use SBTs so that their targets are reviewed and certified by the Science-Based Targets Initiative (SBTi), with scientific criteria to assess whether the proposed targets are aligned with a net zero transition.

[15] *Ambitious Corporate Climate Action," Science Based Targets, accessed on November 16, 2023; available from https://sciencebasedtargets.org/.*

Challenge 2: Lack of integration of greenhouse gas emission data with the corporate database

As GHG emission data are one of the keys for transitioning toward a low-carbon economy, businesses could utilize such data, together with other types of data, to make informed decisions. However, some companies do not have a proper and integrative database for this purpose. This could be due to the cost of data collection and database development.

Overcoming the challenge: digitizing and integrating greenhouse gas emission data

It is paramount that companies collect and understand their GHG emissions so that they can use them for decision-making. Recently, the SET developed and deployed its "ESG Data Platform" for listed Thai companies. This platform enables companies to store, report, and manage their ESG data, including GHG emission data. This will also benefit users, such as investors, who can directly view the data – reducing redundancy of producing reports for investors. For non-listed companies, technology solutions developed by private sector developers, such as cWallet, Gideon One, and MekhaV, can be used as emission calculation and data dashboard tools to integrate emission calculations with accounting.

Companies can also develop internal databases, which are essential for formulating, monitoring and evaluating GHG reduction actions. Such databases require digitization and integration of GHG emission data. Different companies would have diverse levels of digitization and integration depending on their resources and organizational needs. These could range from storing the data in spreadsheet software, such as Microsoft Excel; or integrating the data into their enterprise resource planning (ERP) systems. Using spreadsheets may pose difficulties in data-sharing and real-time updates, while the integration of GHG emission data into ERP facilitates data collection and storage more comprehensively. A complete dataset is key to make data usable for further corporate planning.

The cost of GHG emissions data collection and calculations is another challenge, especially for smaller firms. This could be overcome by using a shared GHG emission calculation tool that can be accessed in a low-cost manner. An example is a tool provided by the Carbon Market Club, a network of about 300 companies joining to prepare businesses for new challenges and opportunities related to the low-carbon transition; it has developed a cost-friendly tool for "Carbon Footprint Tracking for Organization (CFO)" with free-trial period. The software is based on ISO14064, an internationally recognized standard for quantification and reporting of GHG emissions.

Challenge 3: Lack of greenhouse gas emission data from supply chains

GHG Scope 3, or GHG emissions in supply chains, is crucial for companies in order to identify their emission hotspots. However, there are still some challenges in calculating and collecting GHG Scope 3 data, especially for companies having multiple suppliers that might lack understanding and resources to collect data on their GHG emissions. Moreover, those suppliers may not be willing to share the data due to concerns about the companies' confidentiality, or due to difficulties posed by language barriers.

Overcoming the challenge: collaboration for data-sharing and capacity-building

To gather the necessary data, it is important for companies to engage and collaborate with their suppliers. One good example of such engagement and collaboration is the "Unilever Climate Programme." With more than 54,000 suppliers around the world, Unilever engages with about 300 of its suppliers under the program to help them measure, collect and report their GHG emissions, as well as formulate decarbonization plans and actions to reduce GHG emissions by 50 percent by 2030.

Challenge 4: Unclear claim related to greenhouse gas reduction

Many companies communicate their GHG reduction efforts and information via many channels, including attaching such information to their products or services. Companies must be careful with external communications, especially with regard to consumer protection. With increasing awareness among the public about climate actions, some companies globally could face the risk of "greenwashing" in their marketing campaigns, i.e., overly or falsely advertising their climate-related targets, such as carbon neutrality in sourcing and production. This could lead not only to reputational risk, but also to legal risks. To illustrate, the European Union recently passed its "Directive on Empowering Consumers for the Green Transition," which is to be enforced in 2025, banning carbon neutrality claims. At the same time, the United Kingdom is soon to enforce its "Digital Markets, Competition and Consumers Bill," which similarly bans over-advertisement of environmental aspects, building on its consumer protection laws. In the United Kingdom, the Competition and Markets Authority will be able to impose a large fine on violators – up to 10 percent of its annual revenue.

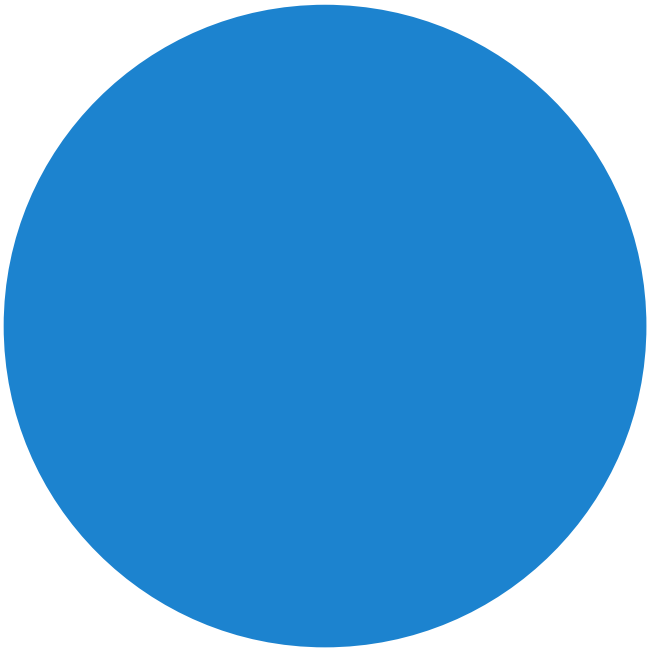
Overcoming the challenge: providing supporting data for any claims and communications

With these regulatory trends, businesses must manage the risks by (a) ensuring unambiguous, evidence-based communication; (b) assuring the quality of data governance in collection, inspection, and presentation; (c) setting up internal communication for common understanding and knowledge management; and (d) being ready to provide statements and supporting evidence in case the business is suspected or accused of greenwashing.

3. FINANCING OPPORTUNITIES FOR GREEN AND TRANSITION ACTIVITIES

In the previous section, GHG emission data is discussed as one of the keys elements to prepare businesses for a low-carbon economy. Financing is another key element that will be covered in this article. Transitioning to a low-carbon economy requires capital for transforming business operations and for investing in greener technologies. The Intergovernmental Panel on Climate Change (IPCC)[16] estimates that climate actions necessary to limit the global temperature increase to no more than 1.5°C above pre-industrial levels would require

[16] *IPCC, Global Warming of 1.5°C: IPCC Special Report on Impacts of Global Warming of 1.5°C above Pre-Industrial Levels in Context of Strengthening Response to Climate Change, Sustainable Development, and Efforts to Eradicate Poverty, 1st ed. (Cambridge University Press, 2022); available from https://doi.org/10.1017/9781009157940.*



more than US$ 2.4 trillion in investments between 2016 and 2035 to transform the energy sector alone. Recently, there has been an increase in financing opportunities for green and transition activities. Businesses must have green projects and have supporting data ready to grasp the opportunities.

3.1 Role of investors and financial institutions for transitioning toward a low-carbon economy

The financing gap mentioned above leads to increasing financial instruments for transition finance both from financial institutions and investors. Financial institutions are increasingly providing more transition financing opportunities in several forms, while reducing financing supports for non-green business activities. For example, KBANK financed green businesses valued at more than 20 billion baht in the first half of 2023, while announcing its plan to cease financial support for new coal power plants and reduce its support for existing coal power plants to zero by 2030.

Meanwhile, investors are showing interest in businesses that take action in the area of sustainability. In 2020, BlackRock[17] published the results of a survey of 395 institutional investors' responses on their top drivers for sustainable investing (Figure 2). The top three responses were: (a) "It's the right thing to do;" (b) "Better risk-adjusted performance;" and (c) "To mitigate investment risk." These top three drivers can be groups, as they want to be good corporate citizens and manage their investment risks. The latter group has a crucial implication for investors' decision-making, which will be discussed later. From a global perspective, asset owners, investment managers and service providers have increasingly signed the United Nations Principles for Responsible Investment, which allow the signatories to provide voluntary commitments to sustainable investment principles.[18] This resulted in assets under management of those signatories worth a cumulative US$ 120 trillion in 2021 (Figure 3).

3.2 The rise of green taxonomies

Financing the transition toward a low-carbon economy needs clear guidelines on how to consider a certain project as green or low-carbon. A number of green taxonomies have been developed and adopted

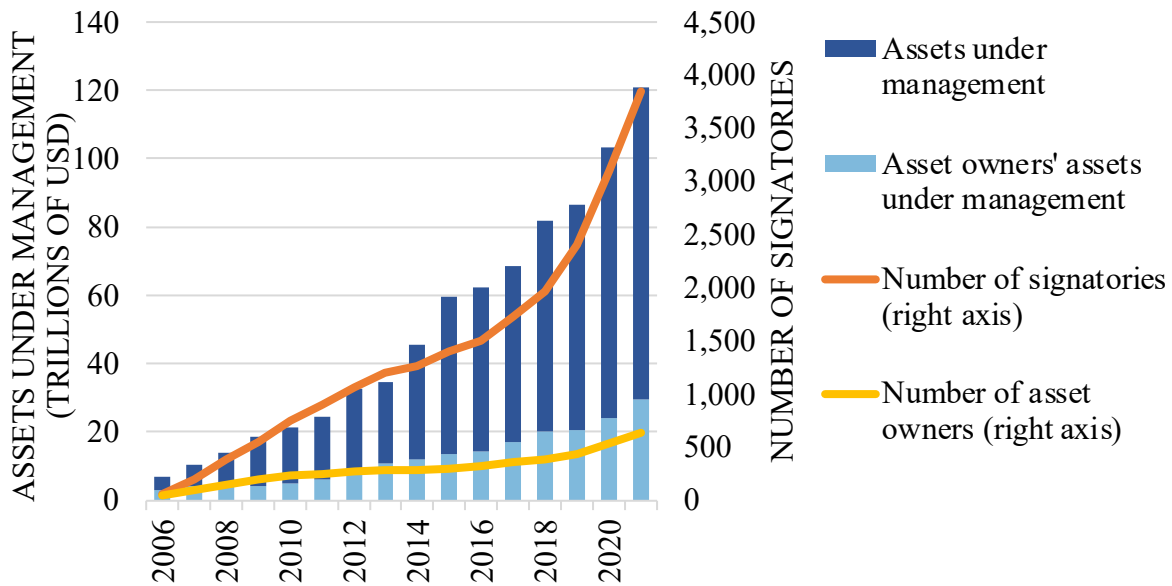
[17] *BlackRock, 2020, "2020 Global Sustainable Investing Survey," available from https://www.blackrock.com/corporate/about-us/blackrock-sustainability-survey; and Dividend.com, 2020; "6 Takeaways from BlackRock's 2020 ESG Survey," available from https://www.dividend.com/esg-channel/takeaways-from-blackrock-2020-esg-survey/Dividend.com.*

[18] *Principles for Responsible Investment, "Climate Data and Net Zero: Closing the Gap on Investors' Data Needs," (PRI, September 4, 2023), accessed on November 16, 2023; available from https://www.unpri.org/driving-meaningful-data/climate-data-and-net-zero-closing-the-gap-on-investors-data-needs/11698.article.*

Figure 2: "What are the top three drivers of your adoption of sustainable investing?" in the 2020 Global Sustainable Investing Survey of BlackRock

Source: BlackRock, 2020, "2020 Global Sustainable Investing Survey;" and "6 Takeaways from BlackRock's 2020 ESG Survey."

Figure 3: Signatories to the United Nations Principles for Responsible Investment and value of assets under management



Source: United Nations Principles for Responsible Investment, 2021, "About the PRI," PRI, accessed on November 16, 2023; available from https://www.unpri.org/about-us/about-the-pri.

in many jurisdictions around the world, starting with the European Union and its mandatory EU Taxonomy. A green taxonomy is usually a set of scientific criteria used to assess the true greenness of business activities in target sectors, and consequently could help prevent greenwashing activities. Taxonomies of some jurisdictions could cover several environmental objectives, such as climate change mitigation and climate change adaptation.

In Thailand, the Bank of Thailand (BOT) and the SEC developed and published "Thailand Taxonomy" (Phase 1) in June 2023. As a localized taxonomy, it is aimed at guiding the private and financial sectors on realistic actions in the context of the Thai economy and technical capabilities. This first phase is focused on climate change mitigation as the environmental objective, and includes two sectors – energy and transportation, which are among the most GHG-intensive sectors with the highest potential for mitigation. The criteria of the taxonomy are laid out with technical, quantitative figures, distinguishing business activities with a "traffic light" system. (Table 1) Financial institutions can utilize the taxonomy for assessment of portfolios, business proposals, and products and services development. Investors can objectively understand the authenticity of green activities to make investment decisions, while companies can make clear business plans and investment decisions, along with objective climate-oriented reporting for financial institutions and investors.

With the financial sector and investors becoming more ready to assess the greenness of

Table 1: Overview of Thailand Taxonomy criteria

Category	Summarized definition	Summarized examples of criteria	
		Energy sector: solar power	**Transport sector: freight by road**
Red	Substantially contributing to the goal of climate change mitigation	Any solar power generation	Zero CO_2 emissions, and vehicles not used for transporting fossil fuels
Amber	Facilitating significant emission reductions in the transition period, but should be phased out by a sunset date	-	Use of top 15% truck models available on the Thai market with the least GHG emissions
Green	Not compatible with net zero trajectory; should be phased out completely	Solar power to support fossil fuel power generation	Options not in the green or amber categories

Source: Bank of Thailand, 2023, "Thailand Taxonomy Phase 1;" available from https://www.bot.or.th/content/dam/bot/financial-innovation/sustainable-finance/green/Thailand_Taxonomy_Phase1_Jun2023_EN.pdf.

business activities, there are several emerging financial instruments to provide financing supports for the transition. Equity finance is indeed still one of the options for businesses to access financial supports, with investors likely to consider investing in businesses that are climate-friendly and those that develop means to provide solutions for other businesses to reduce emissions or manage emission-related data. Sustainability-related and green funds can help companies attract investors specifically interested in sustainable investment. Debt financing provides even more opportunities through a set of diverse financial instruments, namely labeled bonds and loans. Such labeling can be divided into two main groups: use of proceeds instruments and sustainability-linked instruments.

In recent years, two main groups of products have been produced in Thailand: those that specifically support GHG mitigation and those that support more broadly the sustainability of organizations.

Under the first group are instruments, the proceeds of which are to be used to support certain projects; they include green loans, green bonds, and sustainability bonds. Transition bonds comprise another type whereby the use of the proceeds instrument is aimed at providing support for transition activities, or "amber activities" under the traffic light approach of some taxonomies. The second group comprises an instrument in which the proceeds are not bound to certain projects but are aimed at supporting the organizational-level climate actions while providing more flexibility for organizations that do not have particular green projects. These instruments include sustainability-linked bonds (SLBs) and sustainability-linked loans (SLLs).

Table 2: Examples of sustainability-linked bond and sustainability-linked loan products issued for Thai businesses

Company	Thai Union[a]	Siam Cement Group Packaging (SCGP)[b]	Minor International[c]
Financial institution	Krungsri	Krungsri	20 Banks in Thailand and Asia
Year and maturity	2021 (7)	2021 (4)	2023
Amount	5 billion baht	5 billion baht	500 million euros (approx. 20 billion baht)
Financial product	Sustainability-linked bonds	Sustainability-linked loans	Sustainability-linked loans
Sustainability Performance Targets (SPTs)	(1) Being included in the Dow Jones Sustainability Index (DJSI) Emerging Markets and ranking in the top 10 companies for the DJSI Food Products Industry Index (2) Reducing Thai Union's Scope 1 and Scope 2 carbon emissions from manufacturing operations by 4% annually (carbon intensity) from a 2019 baseline (3) Increasing the percentage of tuna purchased from vessels equipped with electronic monitoring and/or human observers from a 71% baseline in 2021 to 100% in 2025	(1) Reducing GHG emissions (2) Managing water resources by reducing water from external sources (3) Increasing the sales portion of eco-friendly goods and services with an SCGP green choice label	(1) Reducing both Scope 1 and Scope 2 GHG emission intensity of its Minor hotels (2) Water withdrawal intensity of its Minor hotels
Conditions	0.02%, 0.04%, 0.04% of interest change for each STP, respectively (negative if target achieved, and positive if not)	Interest rate decreased if targets achieved, and increased if not	

Notes:

[a] *ShareInvestor Thailand, "Thai Union Group Public Company Limited," accessed on November 16, 2023; available from https://investor.thaiunion.com/sustainable.html.*

[b] *Bangkok Post Public Company Limited, "SCGP Takes out B5bn Sustainability-Linked Krungsri Loan," Bangkok Post, accessed on November 16, 2023; available from https://www.bangkokpost.com/business/general/2189307/scgp-takes-out-b5bn-sustainability-linked-krungsri-loan.*

[c] *Minor International. 19 September 2023. "Mint completed Thailand's first sustainability-linked syndicated loan in tourism and leisure sector," press release; available from https://mint.listedcompany.com/newsroom/20230919-mint-news1-en.pdf.*

3.3 Sustainability-linked instruments to promote the transition to a low-carbon economy

As SLBs and SLLs provide organizations with more flexibility, proceeds from SLB and financing from SLLs are not project-specific. Their function to promote decarbonization lies in binding interest rates with actual achievements of organizational efforts toward pre-set Sustainability Performance Targets (SPTs), usually including a GHG reduction target. As shown in Table 2, interest rates are increased when the issuer/lender fails to achieve the targets, thus applying pressure and incentivizing implementation of the commitments.

This is where, as mentioned previously, investment risk management plays an important role in allowing these financial instruments to function. For sustainable investments, especially for climate-related ones, there may be a "green premium," or as it is known popularly by the coined term, "greenium."[19] Investors perceive that more sustainable or climate-friendly companies have less long-term risk with respect to regulatory trends and ability to access capital. Such companies are also likely to have lower costs, hence more viable business models, even though they may initially require capital investment to transform and prepare their businesses in the short run. With lower perceived risk, investors are willing to receive a lower return. The Thai Bond Market Association published an analysis of the Thai bond market in August 2023, concluding that 0.06-0.07 percent of the green premium for sustainability-related or ESG bonds is found in the Thai bond market.[20] This implies that bond investors can accept a 0.06-0.07 percent lower return for ESG bonds compared with non-ESG bonds. Green premiums create potential momentum for companies willing to seize the opportunity to attract investors at a lower cost of capital and use the capital to prepare their businesses for moving toward a low-carbon economy.

As shown in the case of SLBs and SLLs, incentives can be well aligned. Companies gain access to capital, bound with commitments to fulfil the SPTs. If they achieve their targets, they become more sustainable as organizations and as businesses. Then, financial institutions and investors would be willing to have their returns reduced. In turn, companies would enjoy lower costs of capital.

However, opportunities and the incentive alignment mechanism of SLBs and SLLs are not without flaws. The mechanism described above would function as a driver toward GHG mitigation if, and only if, the businesses, financial institutions, and investors have no moral hazard. On the side of financial institutions and investors (lenders), moral hazard occurs when they realize that they would in fact benefit from the companies (borrowers) failing to achieve sustainability.

On the company side, recent cases, such as the case of Chanel,[21] raise concerns of a haunting

[19] *Allegra Pietsch and Dilyara Salakhova, "Pricing of Green Bonds: Drivers and Dynamics of the Greenium," ECB Working Paper Series, no. 2728 (2022).*

[20] *ThaiBMA, "Green Premium ในตราสารหนี้กลุ่มความยั่งยืน (ESG Bond) ของไทย [Green Premium in Thai ESG Bonds]," Thai Bond Market Association, August 17, 2023; available from https://www.thaibma.or.th/EN/Investors/Individual/Blog/2023/170823.aspx.*

[21] *Priscilla Azevedo Rocha, Akshat Rathi, and Todd Gillespie, "Empty ESG Pledges Ensure Bonds Benefit Companies, Not the Planet," Bloomberg, October 4, 2022; available from https://www.bloomberg.com/news/features/2022-10-04/greenwashing-enters-a-22-trillion-debt-market-derailing-climate-goals.*

problem in climate finance – greenwashing. The pre-determined SPTs themselves are targets of greenwashing and exploiting lower interest rates. Companies can set unambitious targets that they know they can surely achieve, or even targets that they have already achieved but have not yet reported. Such companies can then benefit from capital at a lower cost (lower interest rates), and exploit the proceeds in other company activities – even unsustainable ones, thanks to the proceeds not being bound to specific projects. Even if the targets are green, it is possible to circumvent hard work by choosing some minor areas in the business to lower emissions, while doing nothing with the majority of the operations where a large volume of brown activities occur.

To ensure SLBs and SLLs are utilized correctly and minimize associated reputational risks, companies must set SPTs that are truly related to the environmental impact of the company, and are ambitious, urgent, and have not already been achieved. Financial institutions as lenders and underwriters must involve experts to scrutinize proposed targets and the company's objectives; and make efforts to determine penalties and rewards that prevent greenwashing and stimulate genuine climate actions. At the same time, companies must rigorously and adequately disclose data on the progression of the SPTs to ensure transparency.

4. CONCLUDING REMARKS

Readiness revolves around data and evidence-based planning

To ensure readiness and opportunities, and overcome challenges to a low-carbon economy transition, all comes back to data and evidence-based planning. Companies must prepare a GHG emission data ecosystem by assigning responsibilities, setting boundaries for data collection, identifying GHG sources of their business operations, including Scope 1, Scope 2 and Scope 3, and keeping up to date with data reporting and disclosure regulations and standards. At the same time, companies must utilize GHG emission data to develop their businesses, in other words to plan business strategies and investments, to report data to financial institutions and investors in order to gain access to financial support, and to improve products that meet customers' demands and can be marketed.

Financial institutions and investors, as virtually inseparable drivers of the private sector, must collect and analyze GHG emission data of businesses in their portfolios. The first priority could be the GHG-intensive sectors, then expanded to other types of businesses. There, the Thailand Taxonomy can be used as objective criteria for screening and classifying assets and activities. With comprehensive insight of the portfolios, clear goals and policies for GHG reduction and sustainable investment can be developed. Financial institutions and investors can then implement their plans by creating financial products linked to GHG reduction, along with conditions of issuance with GHG targets as one of the key indicators to promote sustainable development.

In short, start with goals, change challenges into opportunities, and ride on with the momentum of a transitioning economy

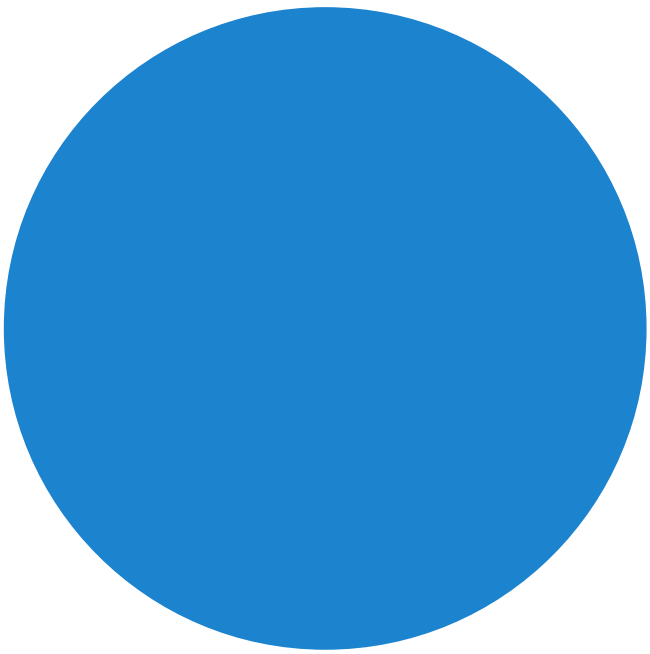
As discussed previously, businesses have been facing pressure from all directions. Businesses need to seek a way to turn such pressure into business opportunities: turning risk management into creation of long-term resilience, turning reporting burdens into gaining real insight into operations and supply chains linked to room for improvement, and turning the cost of compliance into competitive advantage. Businesses have the greatest opportunity to ride on the momentum along with other businesses, financial institutions, and investors utilizing cooperative relationships toward the common goal of a rapid and stable transition.

Indeed, the private sector alone cannot propel this ambitious change. It is quite clear that the private sector itself is at the center of driving the economy and society toward the low-carbon age. It is possible to accomplish and reap abundant opportunities. Additional support to close the gaps and enhance an ecosystem that facilitates the transition, including policy packages, incentives, data, and frameworks, are in the hands of public sector. However, it is critical that all sectors cooperate and fulfil their roles in preventing and not engaging in greenwashing. Otherwise, our climate actions will be in vain – without any improvement toward achieving our common goal.

BIBLIOGRAPHY

International Financial Reporting Standards (IFRS). "IFRS S1 General Requirements for Disclosure of Sustainability-related Financial Information." Accessed November 13, 2023. https://www.ifrs.org/issued-standards/ifrs-sustainability-standards-navigator/ifrs-s1-general-requirements/.

สิรีฒร ศิวิลัย. "ISSB กับกติกาสากลด้านความยั่งยืน.... ที่ผู้มีส่วนร่วมในตลาดทุนทั่วโลกรอคอย." SEC. Accessed November 9, 2023, https://www.sec.or.th/TH/Template3/Articles/2566/300866.pdf.



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