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WHITE PAPER

DISASTER RISKS, CLIMATE CHANGE, AND RESPONSES OF VIETNAMESE BUSINESSES

Hà Nội, 2017

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The Vietnam Chamber of Commerce and Industry (VCCI) is a national organization representing the business community, employers, and business associations of all economic sectors in Vietnam. The purpose of the VCCI is to protect and assist business enterprises, to contribute to the socioeconomic development of the country, and to promote economic, commercial, and technological cooperation between Vietnam and the rest of the world based on equality and mutual benefit.

The Asia Foundation

The Asia Foundation is a nonprofit, international development organization committed to improving lives across a dynamic and developing Asia. Informed by six decades of experience, and with a network of offices in 18 Asian countries, The Asia Foundation supports programs that strengthen governance, expand economic opportunity, empower women, increase environmental resilience, and promote regional cooperation.

WHITE PAPER

VIETNAMESE BUSINESS RESPONSES TO CLIMATE CHANGE AND DISASTER RISKS

Besides the negative impacts, climate change may also bring business opportunities!

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ABBREVIATIONS

CED	*Centre for Education and Development*
COP	*Conference of the Parties under the framework of The United Nations Climate Change Conference*
FES	*Forest Environmental Services*
GHG	*Greenhouse gas*
HCMC	*Ho Chi Minh City*
IFC	*International Finance Corporation*
IKLU	*Initiative for Climate and Environmental Protection (Initiative für Klima und Umweltschutz)*
IMHEN	*Institute of Meteorology, Hydrology, and the Environment*
IPCC	*Intergovernmental Panel on Climate Change*
KGGTF	*Korea Green Growth Trust Fund*
MARD	*Ministry of Agriculture and Rural Development*
NEDO	*New energy and industrial technology development organization*
NTP-RCC	*Payments for Environmental Services National Target Program to Respond to Climate Change*
PFES	*Payments for Forest Environmental Services*
REDD+	*Reducing emissions from deforestation and forest degradation*
USD	*United States dollars*
UN	*United Nations*
UNDP	*United Nations Development Program*
UNFCCC	*United Nations Framework Convention on Climate Change*
VCCI	*Vietnam Chamber of Commerce and Industry*
VCIC	*Vietnam Climate Innovation Centre*
VND	*Vietnamese dong*
WB	*World Bank*
WHO	*World Health Organization*

FOREWORD

This paper represents a joint effort of the Vietnam Chamber of Commerce and Industry and The Asia Foundation to raise awareness, stimulate discussion, and improve preparedness among Vietnamese businesses for the risks—and the opportunities—posed by climate change and natural disasters.

Part one explores the potential impacts of climate change and natural disasters on Vietnamese businesses and the economy, including the risks, threats, and opportunities for various economic sectors, and how these factors are reflected in the evolution of Vietnamese policies and perceptions. Part two considers how businesses can respond to climate change, and the opportunities for business in efforts to mitigate climate change. Part three makes the case that government agencies, donors, and other stakeholders should continue to support businesses in tackling the climate change threat.

This white paper was prepared by researchers Pham Tien Dzung, Le Duy Binh, Nguyen Thuy Nhi, and Truong Duc Trong of Economica Vietnam, with the assistance of experts from the Legal Department of the Vietnam Chamber of Commerce and Industry Dau Anh Tuan, Pham Ngoc Thach, and Bui Linh Chi. The research group received technical assistance, including editing and revisions, from Dr. Michael DiGregorio, Nguyen Tri Thanh and Le Quang Trung of The Asia Foundation, and additional contributions from other local and international experts.

The authors hope this white paper will encourage businesses in Vietnam to become active participants in their nation's response to climate change. While the authors have made their best efforts in the development of this report, mistakes are unavoidable, and we invite our readers' comments and suggestions for improvement.

Thank you!

Hanoi, June 2017

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PART 1

DISASTER RISKS AND CLIMATE CHANGE: IMPACTS ON VIETNAMESE BUSINESSES

1.1. Disaster risks and climate change in Vietnam

1.1.1. Overview of natural disasters and climate change globally and in Vietnam

Goal number 13 of the UN's Sustainable Development Goals offers this succinct summary of the worldwide threat of global climate change:

> Climate change is now affecting every country on every continent. It is disrupting national economies and affecting lives, costing people, communities, and countries dearly today and even more tomorrow.
>
> People are experiencing significant impacts of climate change, which include changing weather patterns, rising sea level, and more extreme weather events. Greenhouse gas emissions from human activities are driving climate change and continue to rise. They are now at their highest levels in history. Without action, the world's average surface temperature is projected to rise over the 21st century and is likely to surpass 3 degrees Celsius this century—with some areas of the world expected to warm even more. The poorest and most vulnerable people are being affected the most.[1]

Climate change has been linked to salinity intrusion, super storms, floods, and droughts, disasters that have caused millions of deaths, substantial damage to houses and infrastructure, the spread of disease due to lack of sanitation, and social ills due to poverty and despair. As the UN notes, "The poorest and most vulnerable people are being affected the most." [2]

[1] United Nations, 2015. Sustainable Development Goal 13: Take urgent action to combat climate change and its impacts, accessed at http://www.un.org/sustainabledevelopment/climate-change-2/
[2] Ibid.

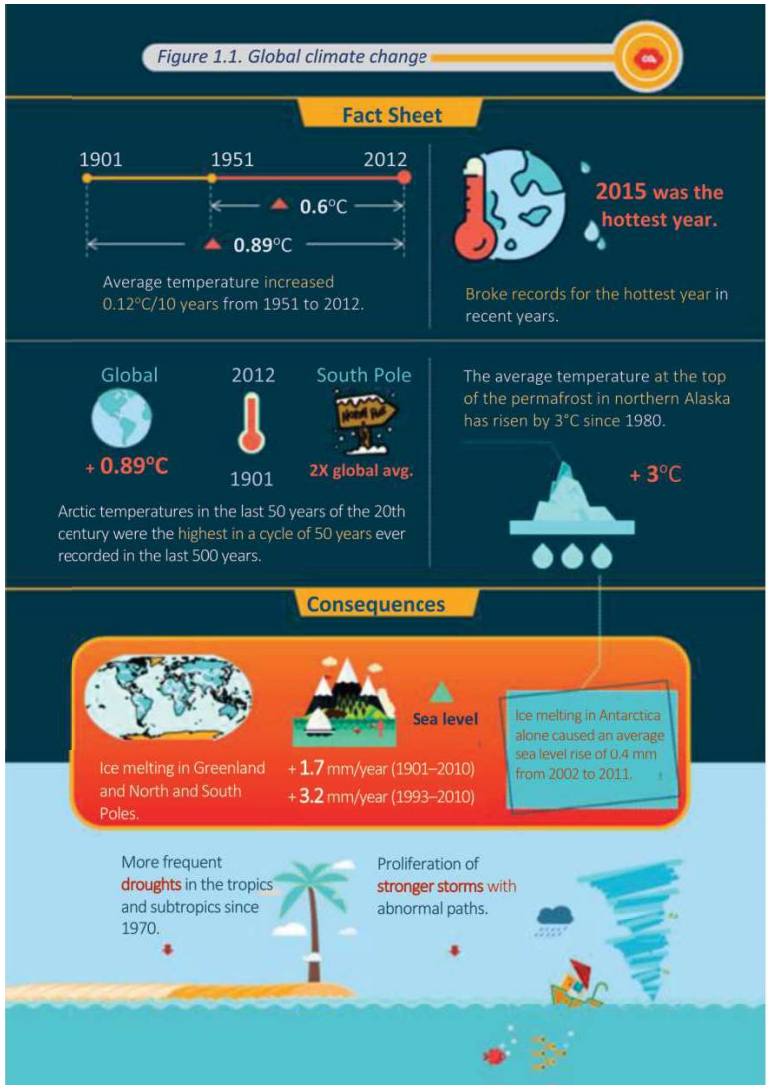


Figure 1.2. Natural disasters due to extreme weather events in Vietnam,

Source: Central Committee for Natural Disaster Prevention and Control, *Report on the Flood Response and Rehabilitation in the Central Region,* December 17, 2016.

Vietnam is one of five countries that are particularly vulnerable to the adverse effects of climate change. Over the past 50 years, the average annual temperature in Vietnam has increased by 0.5–0.7^{o}C, and the sea level has risen about 20cm.[3] Climate change has increased the likelihood of natural disasters, especially floods, severe storms, and droughts. The potential consequences of natural disasters and climate change have undermined Vietnam's progress towards achieving the Millennium Development Goals and the Sustainable Development Goals.

Climate change in Vietnam has been linked to extreme weather phenomena such as historic heat waves (2009–2010) and major typhoons like Xangsane in 2006, Ketsana in 2009, and Conson in 2010. Figure 1.2, above, catalogues the damages inflicted by natural disasters in Vietnam in 2016.

Dong Son Reservoir (Thanh Hoa) at the peak of the 2016 drought [4]

[3] "Scenarios for climate change and sea level rise for Vietnam, 2009" [Kịch bản biến đổi khí hậu, nước biển dâng cho Việt Nam], Institute of Meteorology, Hydrology and Environment (IMHEN), August 06, 2015, accessed at http://www.imh.ac.vn/nghiep-vu/cat52/53/Kich-ban-bien-doi-khi-hau-nuoc-bien-dang-cho-Viet-Nam-nam.

[4] Image: Minh Tuyet – Duc Tinh, "Droughts that affected agricultural production in Tinh Gia district" [Hạn hán ảnh hưởng đến sản xuất nông nghiệp ở huyện Tĩnh Gia], Thanh Hoa television, accessed at http://truyenhinhthanhhoa.vn/web/trang-chu/tin-tuc-su-kien/kinh-te/han-han-anh-huong-den-san-xuat-nong-nghiep-o-huyen-tinh-gia.html

1.1.2. Impact of climate change on the Vietnamese economy

According to climate change scenarios prepared by the Ministry of Natural Resources and Environment in 2016, a one-meter rise in mean sea level would threaten an estimated 20 percent of Vietnam's population and reduce annual GDP by 10 percent.

In 2012, DARA International's Climate Vulnerability Monitor calculated that climate change is causing annual losses and damages to Vietnam of up to USD 15 billion, equivalent to five percent of GDP. The report projects that if no effective measures are taken to limit the impacts of climate change by the Vietnamese government, the damage may reach 11 percent of GDP by 2030.[5]

1.1.3. Climate change awareness and Vietnam's policy responses

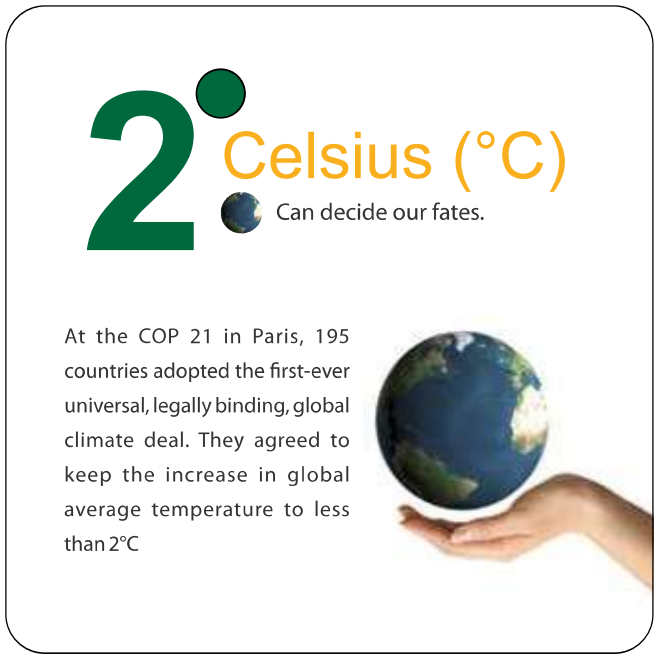
Established in 1988, the Intergovernmental Panel on Climate Change (IPCC) oversees the assessment of climate change risks. Its first and foremost task was to prepare thematic reports on the implementation of the United Nations Framework Convention on Climate Change (UNFCCC), which later became a prerequisite for the introduction of the Kyoto Protocol.[6]

To continue the emissions reduction targets of the Kyoto Protocol, the UN organized a Conference of the Parties (COP) under the United Nations Climate Change Conference to seek a follow-up global treaty to limit climate change. At the Paris climate conference (COP 21), on December 12, 2015, 195 countries adopted the first-

[5] ibid (IMHEN).

[6] "Intergovernmental Panel on Climate Change," Wikipedia, https://en.wikipedia.org/wiki/Intergovernmental_Panel_on_Climate_Change.

ever universal, legally binding, global climate agreement. The agreement sets out an action plan to limit global warming to less than 2°C above preindustrial levels, and given the grave risks, to strive for 1.5°C. Implementation of the Paris Agreement is essential for the achievement of the Sustainable Development Goals, and provides a roadmap for climate action that will reduce emissions and build climate resilience.



Recognizing the climate change impacts, Vietnam has sent delegations to attend meetings from COP 15 to COP 21. Vietnam has actively participated in the international activities on climate change response under the framework of the United Nations Climate Change Conference. In November 2016, the Vietnamese government officially ratified the Paris Agreement on Climate Change.

Vietnam has updated its climate change scenarios and will update sea level rise scenarios for different periods up to 2100. It is projected that average annual temperature rises will result in a 2.3oC annual average increase in Vietnam by the end of 21st century. Total annual rainfall will increase, and it will be more concentrated in the rainy season, with decreased rainfall in the dry season. A rise in mean sea level of 75cm over 1980–1999 levels is also projected for Vietnam.

The Vietnamese government approved the National Target Program to Respond to Climate Change (NTP-RCC) in December 2008. The NTP-RCC enumerated eight specific objectives:

1. Identify the extent of likely climate change impacts in Vietnam, including sea level rise and extreme weather phenomena, and how they will affect every sector, region, and locality.
2. Identify measures to respond to climate change.
3. Develop scientific and technological resources to support practical responses to climate change.
4. Improve organizational structures, institutional capacity, and policymaking to respond to climate change.
5. Increase public awareness and participation and develop human resources to respond to climate change.
6. Promote international cooperation to secure outside support to respond to climate change.
7. Integrate climate change issues into all national, sectoral, and local development planning.
8. Develop climate change action plans and pilot projects for all ministries, sectors, and localities.

1.2. Climate change impacts on Vietnamese businesses

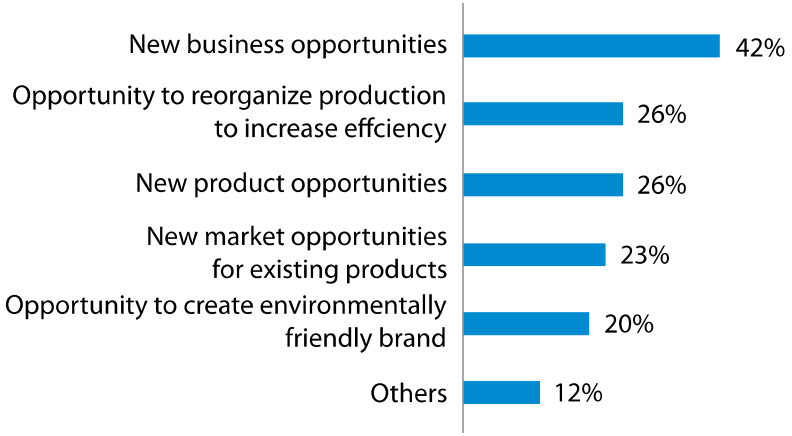
In a 2016 survey, VCCI and The Asia Foundation, explored businesses' awareness of natural disaster risks and climate change. The survey compared the responses of business managers and CEOs who received training in disaster risk management and those who did not [7]. More than half of the businesses that did not receive disaster risk and climate change training provided by VCCI and The Asia Foundation said they were either "concerned" or "very concerned" about four main issues: markets (63 percent), customers (60 percent), business production and operation (57 percent), and local infrastructure (52 percent). These businesses were also concerned about their own infrastructure (49 percent), workforce (44 percent), and supply chains (44 percent). Twenty-nine percent were concerned that their reputations might be affected.

Among businesses that did receive the training, 66 percent were concerned about the operation of their businesses and production, 65 percent about the market, and 65 percent about customers. Sixty percent worried about the stability of supply chains, 59 percent about their own infrastructure, 57 percent about local infrastructure, and 56 percent about distribution systems. Up to 53 percent of participating businesses were concerned about the value of their insurance, compared to 40 percent of nonparticipants. Fifty-two percent of participants were worried about negative effects on the workforce, compared to 40 percent of nonparticipants.

According to the same report "no matter whether businesses participated in the training courses or not, the majority agreed that climate change may bring them new opportunities". Specifically, 42 percent of businesses believed that climate change could create new business opportunities, 26 percent thought climate change would be a chance to create new products, and 26 percent said climate change would be an opportunity to restructure and reorganize the production process to reduce costs and increase efficiency. In addition, 23 percent of businesses selected the option that climate change could open new markets for their existing products, and 19 percent agreed that climate change could also create opportunities to promote a new, environmentally friendly brand (Chart 1.1).

[7] Vietnam Chamber of Commerce and Industry (VCCI) and The Asia Foundation, 2016. Survey on Responses of Vietnamese Businesses to Disaster Risks and Climate Change.

Chart 1.1. Opportunities presented by climate change



1.2.1. Impacts on businesses in the agricultural sector

Extreme weather events and natural disasters are already increasing in frequency and intensity due to climate change, with dramatic results in the agricultural sector. At the same time, sea level rise shrinks the area of available farmland, while salt water intrusion, flood, erosion, drought, and desertification degrade or destroy soil quality. In addition, the changing climate is reducing crop yields,

interferes with traditional agricultural practices, and slows the progress of agricultural development. Due to climate change, some unique characteristics of Vietnam's agricultural regions will disappear.

- *Impacts of natural disasters and climate change on crop production*

Climate change poses tremendous threats to the agriculture sector, in general, and farming, in particular. Farming depends heavily on climate, making crop production extremely sensitive to rainfall, temperature, and extreme weather events. Along with natural disasters, climate change has caused crop losses and increased the spread of pests and diseases. In the end, this raises the costs of production and reduces yields, with implications for the broader economy.

i

"Total crop productivity might decline by 1 to 5 percent; the yield of principal crops might decline by 10 percent. In some extreme weather events, there is a risk of total loss. Eighty to 90 percent of the population of Vietnam is impacted by typhoons. Ethnic minorities and people in remote areas suffer from disasters such as hail, droughts, floods, etc." [8]

Mr. Cao Duc Phat, former minister of the Ministry of Agriculture and Rural Development

The mountainous northwest and northeast regions face the risk of severe drought due to harsh weather changes. In the north-central region, drizzle in the spring is becoming rare, and May and June are projected to be as hot as in the south-central region. In the central highlands, the growing instability of rainfall

[8] Opening remarks of Cao Duc Phat at the workshop Agriculture of Vietnam Responses to Climate Change: Opportunities and Challenges, September 10, 2013, quoted in in Vietnam Academy of Agricultural Science, "Crop production sector will be directly affected by the climate change", accessed June 25, 2017 at http://www.favri.org.vn/vn/tin-tuc/tin-tuc-cap-nhat/553-nganh-trong-trot-se-chiu-tac-dong-truc-tiep-cua-bien-doi-khi-hau.htm .

patterns will make the region vulnerable to abnormal drought. This trend is increasingly apparent in the central coast provinces. In fact, the central highlands provinces faced water scarcity in the winter-spring crop 2012–2013, the summer-autumn crop of 2013, and the winter crop of 2013.

Climate change has caused a substantial increase in new pest outbreaks.[9]

Climate change has adverse effects on irrigation management, severely reducing drainage capacity, raising river flood levels and record-breaking flood peaks that threaten dykes and embankment systems, increasing the duration and inundation area of floods, and causing demand for water drainage and supply that exceeds the capacity of irrigation systems.

i

"Drought has profound impacts on rice production and export. It is estimated that since the beginning of the drought agricultural production has decreased by 2.2 percent. In 2016, the estimated declines in rice production and rice exports are 1.5 percent and 11 percent, respectively."

Source: ndh.vn [10]

Rice is one of Vietnam's most important food crops, cultivated primarily in the Red River and Mekong River Deltas. As projected in the 2015 Climate Change Scenarios, a 100cm rise in sea level would inundate 16.8 percent area of the Red River Delta and 8.9 percent of the Mekong River Delta in sea water, cutting rice production by 30–35 percent.[11]

[9] Pham Dong Quang, deputy director of the Crop Production Department, quoted in Ibid., accessed at http://www.favri.org.vn/vn/tin-tuc/tin-tuc-cap-nhat/553-nganh-trong-trot-se-chiu-tac-dong-truc-tiep-cua-bien-doi-khi-hau.htm .

[10] Thach Thao, "Drought and the Vietnam economy through the view of VinaCapital" [Hạn hán và kinh tế Việt Nam dưới góc nhìn VinaCapital], NDH, May 24, 2016, accessed at http://ndh.vn/han-han-va-kinh-te-viet-nam-duoi-goc-nhin-vinacapital-20160523031754898p145c153.news.

[11] Nguyen Van Bo, "Rice development in the context of climate change and integration in Vietnam" [Phát triển lúa gạo trong bối cảnh biến đổi khí hậu và hội nhập ở Việt Nam], Can Tho: Proceedings of the National Workshop on Agricultural Production Applying Hi-tech and Responding to Climate Change in Vietnam (Vietnam Academy of Agricultural Sciences, August 10, 2016).

Salinity intrusion in 2015 affected the winter and autumn-winter crops on 90,000 ha of rice paddy in the Mekong Delta, heavily damaging 50,000 ha. The winter-spring crop of 2015–2016 on 104,000 ha of rice paddy in eight coastal provinces was affected when 11 percent of the cultivated area suffered from salinity intrusion. It is projected that the affected area will grow to 340,000 ha, representing 35.5 percent of the cultivated area of the eight provinces.[12]

Heavy rain and flood damaged vineyards in Ninh Thuan[13]

[12] "Saline intrusion in the Mekong Delta, drought in the central region, and solutions to overcome" [Xâm nhập mặn ở Đồng bằng sông Cửu Long (2015 – 2016), hạn hán ở Miền Trung, Tây Nguyên và giải pháp khắc phục], Directorate of Water Resources webpage, accessed at http://www.tongcucthuyloi.gov.vn/Tin-tuc-Su-kien/Tin-tuc-su-kien-tong-hop/catid/12/item/2670/xam-nhap-man-vung-dong-bang-song-cuu-long--2015---2016---han-han-o-mien-trung--tay-nguyen-va-giai-phap-khac-phuc .

[13] Tan Quynh, "Ninh Thuan grapes died dry, hundreds of households lost the Lunar New Year" [Nho Ninh Thuận chết khô, hơn trăm hộ dân mất Tết], Vnexpress.net video, 1:15, January 10, 2017, accessed at http://video.vnexpress.net/tin-tuc/xa-hoi/nho-ninh-thuan-chet-kho-hon-tram-ho-dan-mat-tet-3525923.html

• *Impacts of natural disasters and climate change on livestock*

Worldwide, the livestock sector accounts for 70 percent of the land in agricultural production and 40 percent of agricultural GDP. This sector could be severely affected by climate change. Climate change is altering habitats, threatening the supply of food and water for livestock, reducing resistance to disease, curtailing productivity growth, inhibiting livestock reproduction, and threatening the economic health of the sector and the food security of much of the world.[14]

Box 1.1 . Devastating drought threatens hundreds of thousands of cattle in the highlands [15]

Prolonged heat waves struck the highlands in 2016. The most devastating drought in 20 years has turned once-green grazing areas brown. Hundreds of thousands of oxen have struggled with the lack of food and water. Many have become nothing but skin and bones.

[14] Bui Thi Kim Dung, Climate change and its challenges to the livestock sector [Biến Đổi Khí Hậu và Những Thách Thức Đối Với Ngành Chăn Nuôi], Journal of Science & Education, No. 2, accessed at http://sac.edu.vn/images/filedownload/170130130083744.pdf

[15] Duy Tran, Severe drought that has threatened hundreds of thousands of cattle in Central Highland [Đại hạn đe dọa đàn bò trăm nghìn con ở Tây Nguyên], website of the Steering Committee For Climate Change Mitigation and Adaptation in Agriculture and Rural Development, accessed at http://occa.mard.gov.vn/Tác-đgov.vn/T%C3%A1c-%C.

At the center of the drought, Mr. Nguyen Van Ba of Chu Puh District, Gia Lai, scrapes the bottom of the barrel to feed five oxen. The rivers and wells have all dried up, he says, and his oxen must drink washing water. He divides an eight-liter bucket of vegetable wash water among the herd, the only drinking water they will have all day.

Hundreds of reservoirs in the Central Highland provinces have completely dried up, and so have the small rivers and springs. In 2016, the Central Highlands people suffered from thirst for more than three months.

• *Impacts on fisheries*

In Vietnam, 58 percent of the population in coastal areas earn their livelihoods from fisheries. About 480,000 people are directly involved in fishing, 10,000 are engaged in processing, and 2,140,000 provide services to fisheries[16]. The majority are poor. Climate change and natural disasters pose serious threats to communities that depend on fisheries.

Climate change has significant impacts on the outputs of the fisheries sector. Changes in sea temperature and acidity will affect the habitat of some species,

[16] "Assessing the economic loss and livelihood of the fishermen communities due to the impact of climate change and natural disasters" [Đánh giá thiệt hại về kinh tế và đời sống cộng đồng ngư dân do tác động của BĐKH, thiên tai], website of the Steering Committee For Climate Change Mitigation and Adaptation in Agriculture and Rural Development Sector, accessed at http://occa.mard.gov.vn/T%C3%A1c-%C4%91%E1%BB%99ng-B%C4%90KH/Th%E1%BB%A7y-s%E1%BA%A3n/catid/27/item/2790/danh-gia-thiet-hai-ve-kinh-te-va-doi-song-cong-don.

their sources of food, and the quality and abundance of fish and shellfish. Climate change will accelerate the degradation of coral reefs, increase the frequency and intensity of floods and natural disasters, reduce the productivity of fishing in the sea, and increase the cost of repair and maintenance of ships and boats and the construction of harbors and fishing ports.

Climate change also has serious impacts on aquaculture, causing ecological changes to fish-farming areas, slowing the growth of fish and shellfish, reducing food sources, causing habitat loss for fish species in mangrove forests, spreading disease, and drying out sources of water in fish-farming areas before the harvest period. Climate change reduces the area available for aquaculture through the loss of coastal wetlands, coastal erosion, salinity intrusion, and soil deterioration.[17]

Despite these negative impacts, climate change will create opportunities in the fisheries and aquaculture sector. Salinity intrusion areas that are no longer suitable for rice cultivation or freshwater aquaculture can be converted to saltwater aquaculture, which offers higher economic value, as illustrated by the story in box 1.2.

Box 1.2 . Drought and salinity intrusion: threats and opportunities

The slow response to climate change by local authorities is partly due to the national policy that emphasizes rice production as the top priority for food security. In today's context, food security also involves fish and shrimp. For example, where people in the old days would eat three or four bowls of rice with salt to get full, today they will have one bowl of rice with meat and fish.

[17] Impacts of Climate Change on the Fishery sector," [Tác Động của Biến Đổi Khí Hậu Đến Ngành Nuôi Trồng Thủy Sản]Special Briefing for the Ministry's Leadership, Trade Promotion website of the Ministry of Agriculture and Rural Development, March 2014, accessed at http://xttm.agroviet.gov.vn/Site/vi-vn/76/tapchi/69/126/7835/Default.aspx.

There is a need to take advantage of salinity intrusion for shrimp farming, which is of higher economic value than agriculture. Especially in areas at high risk of salinity intrusion, local authorities should convert agricultural land to aquaculture, because rice consumes a lot of water. In Vietnam, 70 percent of water use is for agriculture.

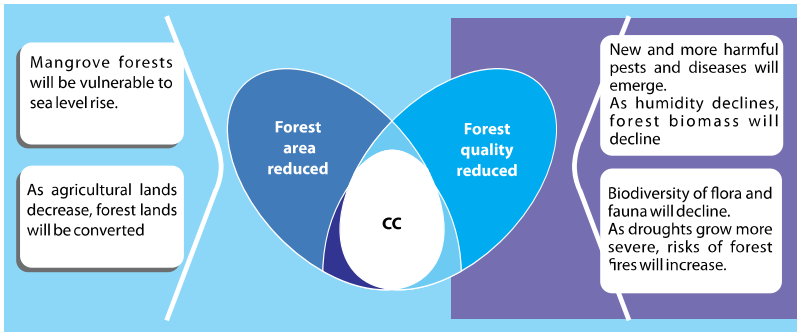
Associate Professor Le Anh Tuan, deputy director of the Institute for Climate Change Research (Can Tho University), said: "*In my opinion, this historic salinity intrusion is an opportunity for us to restructure the agriculture sector in the Mekong Delta. Especially in the most severely affected areas, we should not try to fight against the disaster, but take the opportunity to deploy shrimp farming or mangrove afforestation*".[18]

1.2.2. Impacts on businesses in the forestry sector

Climate change has reduced forestry land, sea level rise has caused significant loss of mangrove forests, and the decline of agricultural land will lead to the conversion of forests to other uses, eventually affecting forestry production. Climate change has reduced forest quality. Outbreaks of forest pests will increase, and low humidity will cause biomass to decline in most types of forest. The risk of decline, even extinction, of plants and animals is likely to increase. Higher mean temperatures, more evaporation, and increasing severity of droughts will raise the risk of forest fires.

[18] Hung Vo, "The war with salinity intrusion: do not try to save the rice, instead think of the shrimps" [Cuộc chiến" hạn mặn: "Đừng cố gồng cứu cây lúa, mà hướng đến con tôm], Voice of Vietnam, March 23, 2016, accessed at http://www.vietnamplus.vn/cuoc-chien-han-man-dung-co-gong-cuu-cay-lua-ma-huong-den-con-tom/377575.vnp.

Figure 1.3 . Climate change impacts on the forestry sector



Nevertheless, the forestry sector can benefit from international commitments on climate change response. Carbon pricing, carbon credit exchanges, and payments for forest environmental services (PFES) can be developed through market approaches based on results.

Box 1.3 . Climate change and opportunities for the forestry sector

Negotiations on greenhouse gas (GHG) emissions reduction have received worldwide attention, but there is still debate over how to reduce them. France decided to set a levy of 17 euros per metric ton on carbon dioxide emissions from January 2012. Australia introduced a carbon tax through the Clean Energy Act 2011, which went into effect in July 2012[19]. These efforts have encouraged businesses to invest in the protection and development of forests as a means of earning carbon credits and payments for forest environmental services (PFES).[20]

[19] It was repealed by the Liberal Government two years later.

[20] Pham Van Tan, deputy director general of the International Cooperation Department, Ministry of Natural Resources and the Environment, as quoted in "Climate Change: Challenges and Opportunities" [Biến đổi khí hậu: Biến thách thức thành cơ hội], Dong Nai Newspaper Online, October 24, 2011, accessed at http://www.baodongnai.com.vn/kinhte/201110/Bien-doi-khi-hau-Bien-thach-thuc-thanh-co-hoi-2104886/

1.2.3. Impacts on businesses in the processing and manufacturing sector

Climate change affects processing and manufacturing in terms of environmental standards, appropriate technology, and adaptation costs. The businesses in this sector must adopt new technologies to increase energy efficiency and reduce greenhouse gas emissions.

Most industrial parks in Vietnam are in the low-lying deltas and coastal areas; hence, they are vulnerable to climate change impacts such as sea level rise, storm surges, and flooding. The processing industry's inputs are from agriculture, fisheries, and aquaculture, which also come predominantly from low-lying zones, placing this industry at high risk of supply instability and scarcity. Ultimately, rising production costs will push up the price of goods, and quality will become unstable.

Box 1.4 . Serious shortages of input materials due to drought and salinity intrusion

The impacts of climate change on agriculture, aquaculture, fisheries, and seafood processing in the Mekong Delta are obvious. Natural disasters are a constant concern not only of farmers, but also of businesses in Vietnam's agriculture and fisheries value chains.

Due to prolonged drought and serious salinity intrusion—consequences of climate change—businesses purchasing, processing, and exporting agricultural and fisheries products face the risk of raw materials shortages. The 10,000 ha sugarcane field that was the most productive area of the Mekong Delta was struck by drought and then submerged in salt water. The whole area is full of yellow and withered sugarcane, seriously damaging the productivity and quality of sugarcane plantations.

According to Mr. Trinh Trung Uy, a sugarcane processor in Soc Trang, sugarcane productivity has dropped sharply, and businesses like his cannot [use] salinity-affected sugarcane. "*Businesses must seek other sources of supply*," he says. "*It is not easy, because severe drought has struck on a large scale. The price of raw material will certainly be higher—yet another challenge for these businesses.…*"

Dried sugarcane in a drought-stricken area of Cu Lao Dung, Soc Trang

To withstand the challenges of climate change and natural disaster, processing and manufacturing businesses must seize new opportunities. Climate change will open the door for international cooperation. Thus, developing countries like Vietnam must obtain financial assistance and technology transfer from developed countries. With this assistance, the sectoral structure will gradually shift to adapt to the socioeconomic and climate changes.

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Under the Paris Agreement, developed countries have a collective goal of making available USD 100 billion per year by 2020 to build climate change resilience in developing countries such as Vietnam. This will be a useful financial resource for Vietnam to restructure its development model with more emphasis on a sustainable economy and reduced use of fossil fuels. An added value of the Paris Agreement is its equal attention to adaptation and mitigation. Thus, international support may also be available for disaster-prevention infrastructure (e.g., against floods or sea level rise). In general, the Paris Agreement has created new institutions and resources to tackle climate change.

On the other hand, scientific achievements and advanced technologies allow the world to develop clean and renewable energy, reduce and eventually eliminate the use of fossil fuels, develop renewable energy from waste and bioenergy, and utilize the residual heat in cement factories and thermal power plants.

1.2.4. Impacts on financial institutions

In combating climate change, investors face potential risks such as bad debt and the devaluation of collateral. Insurance companies, reinsurance companies, and banks also bear the risks of infrastructure damage, human deaths and injuries, and additional risks to markets, customers, investment portfolios, etc.

- *Impacts on the banking sector*

Natural disasters and extreme weather events can have significant impacts on the banking sector. Most companies and households do business based on the financial leverage provided by banks. Natural disasters and extreme weather events cause loss of life, damage business property, and disrupt production, leading to income and capital loss, reduced productivity, and loan defaults. Natural disasters and extreme weather events put banks at risk indirectly, making it difficult to collect debts, restructure loans, etc. Banks preparing to operate in such an environment must dedicate time and effort to reviewing loan proposals and documents of businesses and households. They must also take into consideration the risk-management aspects of natural disasters and extreme weather events.

Box 1.5 . Disasters impose a significant burden on banks.

According to figures from the Agribank branch in Tran De District, Soc Trang Province, 224 loan receivers, who mostly cultivate rice, all suffered from salinity intrusion. Until May 12, 2015, the affected loan balance was approximately VND 6.5 billion. The districts cultivating the higher value crops had higher losses even. For example, in Cu Lao Dung district, more than 1,100 ha of sugarcane and fruit trees were damaged, the debt reached VND 69.3 billion, and the interest to be paid about VND 4.7 billion.

Mr. Ngo Thanh Binh, Director of an Agribank district branch, observed that drought and salinity intrusion had "stricken" many households whose debt was still held by the Bank. Most of the households in the communes of Trung Binh, Lich Hoi Thuong, and Lieu Tu had Agribank debt when their shrimp died of disease. They recently switched to rice cultivation, but were still affected by natural disasters.[21]

- *Impacts on investment funds*

Like banks, investment funds provide financial assistance to investment projects. Facing natural disasters and climate change pose the risk of property losses and damages that may lead to the inability of capital recovery, unprofitability of projects, possible losses of the investment funds, and a reduction in business efficiency.

[21] "Disasters put burden to the banks" [Thiên tai nặng vai ngân hàng], Vietnam Bank for Agriculture and Rural Development, May 20, 2016, accessed at http://www.agribank.com.vn/31/822/tin-tuc/tai-chinh-ngan-hang/2016/05/10451/thien-tai-nang-vai-ngan-hang.aspx .

Besides, investment funds are also facing the pressure of implementation of corporate social responsibility for environmental protection and climate change mitigation. These requires the funds to apply the criteria for their investment portfolios to prioritize projects which do not harm environment and the application of low emissions technologies. Fulfilling these responsibilities will help the investment funds gain public sympathy and attract additional capital for sustainable development.

Investment funds are beginning to see responses to natural disaster, as well as mitigation of and adaptation to climate change, as business opportunities. For example, start-up and innovation programs prioritize projects on environmental sustainability and climate change mitigation, promote scientific research on clean energy technologies, reduce investments in high emissions projects, and increase investments in renewable energy to gradually replace fossil fuels.

- *Impacts on insurance companies*

Natural disasters and extreme weather events have had enormous impact on the agricultural sector, in particular, and the economy in general. They have also led to large payouts by insurance companies that have affected the profitability of agricultural and nonlife insurance.

Box 1. 6. Insurance companies in Ho Chi Minh City have to pay large compensation due to flooding

Liberty Insurance Company paid USD 50,000 to one customer to cover flood damage to a Mercedes E300 in Ho Chi Minh City. Since the beginning of 2012, Liberty has covered 43 cases of flood damage, with an aggregate value of approximately VND 3.2 billion. The average compensation for a flood-damaged car is very high. According to Liberty Insurance, the average insurance payment was VND 75 million per case in 2011, and VND 98 million per case in 2012.

After severe flooding in the central provinces in 2010, Vietnamese insurance companies paid hundreds of billions of dong to cover the damages. To cope with the enormous damages, foreign reinsurers have had to raise premiums, particularly for natural disasters. This greatly affected Vietnamese insurers, because domestic insurance rates are driven by the international reinsurance market.

Bao Minh Company piloted an agricultural insurance project in Ha Tinh and Thanh Hoa. In Ha Tinh, the insurance covered rice production, with a total premium of VND 5 billion. In Thanh Hoa, the insurance covered livestock, with a premium of VND 1.5 billion. Bao Minh reported that compensation for losses of animals in Thanh Hoa is also significantly high.[22]

Climate change brings risks and challenges to the insurance sector, yet it also opens new business opportunities. Unexpected disasters due to extreme weather conditions raise the demand for insurance to protect people's life and property. This represents an opportunity to develop new insurance products.

[22] Ngoc Lan, Insurance compensation facing flood disasters [Bồi thường bảo hiểm thiệt hại lũ lụt], website of Military Insurance MIC, accessed at https://mic.vn/NewDetail.aspx?id=176

The Law on Natural Disaster Prevention and Control established state policies for businesses. Specifically, Clause 5 of Article 5 establishes as a policy:

To offer incentives to and encourage insurance businesses to provide insurance against natural disaster risks; to support businesses conducting production and business activities in areas frequently affected by natural disasters in accordance with the laws on investment, enterprises and natural disaster prevention and control; to offer enterprise income tax exemption and reduction regarding contributions made for natural disaster prevention and control purposes.[23]

Box 1. 7. Opportunities to develop new insurance services to respond to natural disasters and climate change

According to the Swiss Re Annual Report 2015, Vietnam has a large gap in flood insurance, with just 1.3% of properties that are under insurance. In Vietnam, flood insurance protection is not "staged" for performance. Generally, policies are designed in one of two ways: (1) standard package policies, which include all perils; and (2) fire policies, which offer fire protection and can also be extended to cover other perils. As for the damages of public property or by floods, the source from contingency, which is of 2–5 percent of the total annual budget,[24] is used for the recovery and rehabilitation.

However, only 30 percent of the contingency budget is allocated to cover damages; the remainder is for emergency relief. Hence, post-disaster recovery has not been thoroughly addressed. Insurance is the solution to fill the gap. Specialized services will enrich the insurance market in Vietnam, increasing the sector's importance, and improving the rate of adoption of insurance.[25]

[23] Law on Natural Disaster Prevention and Control (No. 33/2013/QH13), accessed at http://www.ifrc.org/Global/Publications/IDRL/Law%20on%20Natural%20Disaster%20Prevention%20and%20Control_No%20%2033_IFW.pdf.

[24] Of state at all levels

[25] Swiss Re, 2016. Reporting home: 2015, accessed at http://reports.swissre.com/2015/.

1.2.5. Impacts on businesses in the energy sector

Climate change may have negative impacts on some renewable energy resources. Because climate change has increased flood intensity and raised flood crests in some extreme events, hydropower plants have had to discharge water to prevent dam failures. Due to high water levels, electricity companies could not store water. The water levels in reservoirs were reduced, and electricity production consequently declined. Severe droughts also reduced power generation. In addition, disasters contributed to higher costs of operation for flood spillways and power lines, damaged infrastructure and power lines, and increased the maintenance and repair costs for electrical infrastructure.

Fossil-fuel mining is affected by climate change and extreme weather phenomena. A coal mine in Quang Ninh and a potential brown coal mine in the Red River Delta will face more difficulties. Specifically, coal productivity has decreased due to the rising frequency and intensity of floods and storms, and production costs have risen along with the operation and maintenance costs of drilling and transportation systems. Seaports and warehouses must be redesigned to accommodate sea level rise. In the worst-case scenario, new infrastructure will be more expensive to build and operate.

Oil and gas exploration companies on the outer continental shelf and refinery companies will have to pay more for operation and maintenance of machinery and vehicles. While it may not become more expensive to transport oil and gas from offshore wells, it may become more risky and expensive.

Fuel and energy costs and market demand will be affected by climate change regulations such as fuel quality standards, fuel efficiency standards, emissions standards, and renewable energy regulations.

Figure 1.4. Climate change impacts on the energy sector

Increased costs for irrigation of rice and industrial tree crops

Increased electricity consumption for domestic and industrial devices such as air conditioners, electric fans, and refrigerators due to rising temperatures

Increased costs for ventilation and cooling of coal mining pits, and reduced operational efficiency of power plants

On the other hand, climate change paves the way for new opportunities for energy businesses.

Green growth will be a key to improving the quality of life of the Vietnamese people. Developing appropriate green-growth policies will be an important contribution to sustainable development in Vietnam. But embracing green growth will require time, raising awareness, and the commitment of resources. Vietnam has decided to move towards green growth, restructure the economy, and reduce poverty in a sustainable manner.

1.2.6. Impacts on businesses in the tourism sector

Tourism today has become an important economic sector in Vietnam. A record 10 million foreign arrivals and 62 million domestic tourists in 2016 made a direct contribution to GDP growth of 6.8 percent, and an indirect contribution of 14 percent [26]. However, this industry has recently suffered from the negative impacts of climate change.

Climate change narrows the zones of ideal temperature, making many scenic spots less attractive to tourists. Climate change also threatens tour itineraries and accommodations: infrastructure on beaches must be upgraded to cope with sea level rise; deeper water and higher waves increase the risk of accident for tourists; extreme weather events increase costs for travel agencies.

Box 1. 8. Cua Dai beach, Hoi An, faces imminent risks of climate change.

Cua Dai beach is stunning, with the breathtaking landscape and historical charms of an ancient seaport, but the beach has suffered serious erosion along roughly 1.3 km of the shoreline. The damage extends between 20 and 80m inland, with the most severe damage penetrating as deep as 200m.

In recent years, silt deposits in the estuaries have interfered with boats and ships, slowed the discharge of river floodwaters, and increased flood levels in the old town area. According to statistics from the Hoi An Economic Office, threats that the city may be inundated have become extremely urgent. Specifically, a level 1 flood (0.7m) would inundate 1,500 ha of the city; a level 2 (1.2m) would flood more than 2,158.29 ha. More alarming, in a 3-meter flood, all of Hoi An city would be submerged.

If coastal erosion is not halted, Cua Dai's current and future prospects will be dim. Climate change threatens the livelihoods of the coastal community in Cua Dai. It is also the principal challenge to the tourism sector, affecting the operations of coastal hotels and resorts in Cua Dai. Already, the restaurants along the beach receive fewer tourists, many of whom now stay for only a short time.[27]

Hotels in Cua Dai (Hoi An) damaged by coastal erosion.

1.2.7. Impacts on businesses in other sectors

Transportation

Transportation is also sensitive to weather conditions. Sudden changes in temperature, high humidity, and increasingly severe typhoons, floods, and droughts interfere with the transportation system, increase the risk of traffic accidents, and damage roadways, causing slipperiness, cracks, and subsidence. Negative impacts of climate change have increased costs for transportation

[26] The Politburo's Resolution on developing tourism into a spearhead economic sector by 2020 at http://mt.gov.vn/Images/editor/files/XUAN%20NGUYEN/Nam%202017/Quy%20I/16-1-NQ08.pdf

[27] Phuoc Binh, "Climate change from Quang Nam province's viewpoint" [Biến đổi khí hậu Nhìn từ Quảng Nam], Laodong, February 13, 2016, accessed at http://laodong.com.vn/thoi-su-xa-hoi/bien-doi-khi-hau-nhin-tu-quang-nam-516811.bld.

businesses, and the decline in bridge and road quality will raise the cost of vehicle maintenance and repair. Natural disasters and climate change can damage other national transportation infrastructure such as pipelines, railways, seaports, and airports, all of which are prone to flooding, erosion, and inundation. Additional costs are incurred when floods or storm surges require seaports to be dredged.

Construction

Construction is another sector that has suffered from natural disasters and climate change. Rising temperatures and humidity will slow construction projects and reduce quality. Sudden changes in the weather can interfere with or damage concrete that is curing, and even damage the reputations of construction companies.

While natural disasters and climate change pose significant challenges, they also offer opportunities for the sector, repairing or reinforcing threatened structures, building new disaster prevention infrastructure, and developing new techniques and materials to adapt to climate change and reduce energy consumption.

Public health

Prolonged hot and humid weather affects the human body's heat exchange resulting in muscle cramps, heat exhaustion, confusion, heatstroke and even heart attacks. People working in hot weather, such as construction workers and farmers, are particularly vulnerable. The elderly, particularly those homebound, are also vulnerable to heat stroke and heart attack caused by dehydration.

Climate change will also increase the spread of diseases and infectious hosts. It increases the growth rate of bacteria, allows infectious diseases to thrive in new areas, and reduces the resistance of the human body. According to the World Health Organization, climate change has contributed to the increased incidence of 11 infectious diseases, including dengue fever, Japanese encephalitis, and influenzas AH5N1 and AH1N1. Malaria has returned to Vietnam, especially in mountainous areas, and dengue fever is raging in many areas, including cities.[28]

[28] Vietnam Institute of Meteorology, Hydrology and Climate Change, 2013, Climate change and impacts in Vietnam [Biến đổi khí hậu và tác động ở Việt Nam]. Hanoi: Trung Tâm Khí Tượng Thuỷ Văn Quốc Gia.

PART 2

CLIMATE CHANGE AND RESPONSES OF VIETNAMESE BUSINESSES

Climate change is a global challenge that disregards national boundaries. GHG emissions in any place affects the human population worldwide. Combating climate change will require coordinated action at all levels. A climate change mitigation and adaptation agenda must include steps to establish a low-carbon economy and reduce GHG emissions. Already, many governments have announced strategies, action plans, and specific policies to reduce GHG emissions. The Vietnamese government has called for joint actions from the business community to reduce emissions and mitigate climate change impacts. This call reflects both the emerging needs of businesses and the development requirements of the state and society.

2.1. Responses of Vietnamese businesses

2.1.1. Businesses save energy and reduce emissions in production

Fuel and electricity account for a large proportion of the costs of industrial production, and energy-saving technologies can reduce costs as well as combat climate change. Below is a case study of energy savings in a cement plant.

Currently, the main sources of energy for cement production in Vietnam are coal and electricity. During the manufacturing process, large amounts of waste heat and dust are discharged into the air, wasting energy, polluting the environment, and reducing economic efficiency. In 2010, Vietnamese cement plants each day produced 120,000 tons of clinker and discharged residual heat equivalent to 4.1 million kWh of electricity. If all dry rotary kiln cement production lines in Vietnam were equipped with power systems utilizing residual heat, the power recovered would be equivalent to roughly a 200MW power plant, or 25 percent of power consumed from the grid[29]. This is an impressive number for such an energy-intensive industry.

[29] Vietnam Electricity, "Vietnam: The need for a power plant to utilize waste heat from cement production" [Việt Nam: Rất cần một nhà máy phát điện tận dụng nhiệt khí thải từ sản xuất xi măng], Online news of the National Target Program on Energy Efficiency, July 6, 2010, accessed at http://tietkiemnangluong.com.vn/tin-tuc/hoat-dong-chuong-trinh/t8371/viet-nam-rat-can-mot-nha-may-phat-dien-tan-dung-nhiet-khi-thai-tu-san-xuat-xi-mang.html

For this reason, the application of advanced technology to recover residual heat for electricity generation should be a priority for the cement industry. Recovering waste heat to generate electricity would not only provide economic benefit to the cement industry, but also protect the environment

Box 2. 1. Residual heat power generation in Ha Tien Cement Plant

Many nations have installed residual heat generators on cement production lines. Japan is the leading country in Asia in the use of this technology, including residual-heat boilers and steam turbines. Japan's New Energy and Industrial Technology Development Organization (NEDO) has funded a residual heat power generation station in Vietnam with a capacity of 2,950 kWh. The dry rotary kiln at the Ha Tien 2 Cement Plant, with a capacity of 3,000 tons per day, is equipped with the new system. In seven years of operation, the residual heat power generation station has generated 105 million kWh, producing obvious economic and social benefits, saving energy, protecting environment, and significantly reducing the cost of cement production. The system has been stable, and has not affected cement production.

Based on studies and these experimental results, and the supporting government policy, the installation of residual heat power generation equipment throughout the cement industry is a necessity. [30]

The Ha Tien Cement Plant

[30] Ibid.

2.1.2. Businesses in the crop production sector apply water-saving technology and change products to adapt to drought and salinity intrusion.

Drip irrigation is a practical response to the increasingly severe droughts and water shortages associated with climate change in Vietnam. It also provides better economic value to farmers. Drip irrigation technology improves economic efficiency by reducing the cost of labor, electricity, water, and fertilizer. Because it is highly water efficient, farmers are less affected by water shortages. Vietnam's Ministry of Agriculture and Rural Development has encouraged businesses in the agriculture sector to support and invest in drip irrigation and other water-saving technologies

Box 2.2. Drip irrigation, a new approach to climate change adaptation

Experiments by the Vietnam Academy for Water Resources have found that water-saving irrigation technologies, such as tree-root sprinklers and drip irrigation, combined with appropriate fertilizers, can achieve a rate of coffee flowering of 93 to 95 percent. Tree-root sprinklers and drip irrigation also produce substantial water savings—17 percent and 50 percent, respectively, compared to traditional irrigation methods. These technologies also require less fertilizer—7 to 9 percent less for tree-root sprinklers and a substantial 30 to 40 percent less for drip irrigation. Finally, tree-root sprinklers and drip irrigation can save as much as 50 percent in labor and operating costs.

To save water during periods of peak drought and adapt to climate change, Quang Tri installed drip irrigation for peanuts in two communes in Cam Lo District, Cam Hieu and Cam Thuy, at a total cost of VND 250 million. The system delivers water directly to roots through pressurized drip tubing. The nozzles at the ends of the tubes are small, limiting water consumption. Remarkably, the new drip system has doubled peanut production, achieving 2.5 to 3 tons/ha. Moreover, with drip irrigation, farmers can now plant two peanut crops and one maize crop in the same area during the growing season. [31]

[31] Quang Long, "Saving irrigation water to cope with climate change" [Tưới nước tiết kiệm ứng phó với biến đổi khí hậu], Vietnam Famers Union website, June 22, 2016, http://mtnt.hoinongdan.org.vn//sitepages/news/1105/44695/tuoi-nuoc-tiet-kiem-ung-pho-voi-bien-doi-khi-hau.

Drip irrigation equipment by Khang Thinh Irrigation Technology JSC.[32]

2.1.3. Businesses in the fisheries sector change farming objectives to adapt to drought and salinity intrusion.

Recently, many hydropower dams have been built in the upper Mekong River. Environmentalists have warned that the restricted water flow that results is endangering downstream areas, where water levels have hit historic lows. In the Mekong Delta, known as Vietnam's rice bowl, drought caused by climate change and El Niño weather patterns has combined with this reduced river flow to produce a crisis of salinity intrusion. Amid the region's worst drought in 100 years, the Southern Institute for Water Resources Research recorded salinity levels in the Mekong Delta in April 2016 at greater than 4g/l, and saltwater had intruded hundreds of kilometers inland. In this context, businesses in the Mekong Delta must find a way to "live together with severe drought."

2.1.4. Opportunity to restructure the agricultural sector?

Rather than bringing fresh water to grow rice in affected areas, the optimal solution for drought and salinity issues that are threatening agriculture in the Mekong Delta may be to switch from rice farming to aquaculture, with high value crops such as shrimp, crabs and fish. In addition to providing an alternative source of income for farmers, switching to brackish and salt water aquaculture offers an economically viable means of gradually retreating from eroding coastlines.

[32] Image source: Khang Thinh, http://irritech.vn/vi-vn/trang-chu.aspx.

Box 2.3. A rice-fish farming model for climate change adaptation

In the Southeast region and the Mekong Delta, farmers are beginning to adopt a hybrid, rice-fish farming model. During the rainy season, upstream flooding combines with sea level rise to inundate large areas, reducing the amount of land available for cultivation and producing unstable yields. To adapt, the farmers must change their old cultivation pattern, from three rice crops per year to two rice crops and one fish crop. By surrounding the paddy with fishing net, the farmers can harvest fish at the end of the rainy season. When the water recedes, they can cultivate rice. As a bonus, the fish crop may produce higher returns than a third rice crop.[33]

The combined rice-fish farm model [34]

[33] "Summary of climate change adaptation measures that have been applied to agriculture in the regions" [Tổng kết các biện pháp thích ứng với BĐKH đã được áp dụng cho nông nghiệp tại các vùng], The Steering Committee for Climate Change Mitigation and Adaptation website, accessed June 25, 2017, accessed at http://occa.mard.gov.vn/Giai-phap-mo-hinh/Mo-hinh-thich-ung/catid/18/item/2815/tong-ket-cac-bien-phap-thich-ung-voi-bdkh-da-duoc.

[34] Image source: Minh Tri–Voice of Vietnam, http://www.vietnamplus.vn/ca-mau-mo-rong-mo-hinh-san-xuat-lua-ket-hop-voi-nuoi-ca-dong/303339.vnp.

2.1.5. Businesses invest in infrastructure to respond to climate change.

As extreme weather phenomena such as storms, cyclones, and floods have become more common in the 21st century, the government of Vietnam has made and encouraged infrastructural and nonstructural investments to mitigate the effects of natural disasters and reduce the loss of human life. Among these investments are disaster-proofing works such as sea dykes and damping systems to control storm-surges, upstream dams to control downstream flooding, embankment systems to control or divert river flow, and residential clusters that incorporate designs for disaster mitigation. Nonstructural solutions include measures such as urban and rural planning, urban zoning ordinances, and crop substitution to minimize loss and damage when disasters occur, as well as creating buffer zones along seasonally flooded rivers and re-establishing coastal mangroves to prevent storm surges and provide habitat for commercially important fish and shellfish.

According to the 2016 survey by VCCI and The Asia Foundation, a large proportion of businesses chose structural measures to reduce risks associated with natural disaster and climate change. Specifically, 24–43 percent changed the design of existing factories and workplaces, and 22–44 percent invested in new construction of factories and workplaces to ensure safety from natural disaster.

2.1.6. Businesses use insurance services to mitigate risks.

Faced with the growing threat that they may incur significant damages from natural disasters and extreme weather phenomena due to climate change, businesses use insurance services to transfer and share disaster risks. The VCCI/Asia Foundation survey found that many businesses agreed with this approach to disaster preparedness.

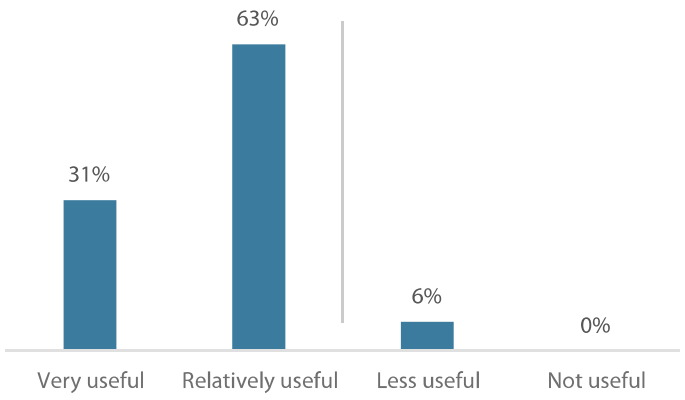
Table 2.1. What steps have businesses taken to prepare for natural disasters and climate change? [35]

	Preparations for natural disasters and climate change	%
1.	Seek information on risks	41
2.	Reconstruct factories and workplaces	44
3.	Relocate factories and workplaces	16
4.	Change the design of existing factories and workplaces	36
5.	Prepare temporary response measures	66
6.	Create budget reserve for climate change risks	43
7.	Provide training for employees	50
8.	Organize drills for employees	24
9.	Prepare safety measures for employees	47
10.	Prepare business continuity plan	40
11.	Request that business partners have a response plan	25
12.	Change suppliers if they do not meet requirements	11
13.	Purchase insurance for factories	50
14.	Purchase insurance for employees	48

According to the VCCI/Asia Foundation survey, businesses with disaster insurance protecting their property and employees appreciated the usefulness of this insurance product. Among businesses that participated in the climate change training course, 31 percent said insurance was "very useful," and 63 percent said insurance was "relatively useful." Only 6 percent said it was "less useful," and none believed it was "not useful."

[35] VCCI and The Asia Foundation, Disaster Risks and Climate Change: Responses of Vietnamese Businesses, (VCCI and The Asia Foundation, 2016).

Chart 2.1. Business assessment of the usefulness of disaster insurance



2.1.7. Banks adjust their loan portfolios.

Climate change brings with it the risk for banks that the loans in their portfolios may cease to perform or become unrecoverable. To adapt to climate change, banks must carefully review their investment and loan portfolios. Borrowers should be required to show that they have a comprehensive risk management plan to protect the assets supporting the loan.

At the same time, banks must share social responsibility. Loan portfolios should be adjusted to avoid investments in projects that damage the environment or contribute to climate change. Caution and prudent lending will make banks better able to survive the effects of natural disaster and climate change.

Box 2.4. International experience in adjusting loan portfolios in response to climate change—action plan of Australian banks

Australia's four big banks—Australia and New Zealand Banking Group (ANZ), Commonwealth Bank of Australia (CBA), National Australia Bank (NAB) and Westpac Banking Corporation (WBC)— could act on their stated ambition to help achieve a 2°C warming target simply by giving no new loans to coal projects, analysis by financial activists Market Forces reveals. Such a move – including a halt to refinancing existing loans – would virtually empty the banks' loan book of the $8bn they are lending to coal in just five years.

ANZs statement acknowledged worries that lending to fossil fuels conflicted with the need to reduce greenhouse gas emissions. Westpac went so far as to say it would take "*concrete action to ensure our lending and investing activities support an economy that limits global warming to less than two degrees*".

The four banks have kept a database of loans to fossil fuel projects since 2008, which now contains 475 deals. Of those loans, 142 are to coal projects. If all the current loans to Australian coal companies were simply allowed to run their course, all but one would expire by 2021.

"*Urgent action is not just necessary but possible, as financial flows can change very quickly*," said Julien Vincent, the chief executive of Market Forces. He said the group was calling on banks to remove coal from their loan books by 2021.[36]

[36] Michael Slezak, "Climate change: Australia's big banks urged to reject new loans for coal projects," Guardian, May 17, 2016, accessed at https://www.theguardian.com/business/2016/may/18/australia-climate-change-big-four-banks-urged-to-reject-new-loans-for-coal-projects.

2.1.8. Investment institutions adjust their portfolios.

In response to challenges and opportunities related to climate change, both national and international investment institutions should adjust their investment portfolios to support disaster prevention, emissions reduction, and environmental protection projects.

Box 2.5. Green growth opportunities from investment institutions

In June [2016], the World Bank approved the first US$90 million Development Policy Financing of a proposed series of three operations to support a range of green growth and climate change related policy reforms—ranging from improving the way coastal zones and forests are managed and water used to increase climate resilience and promote greener growth, to changing transportation and industry norms to improve air quality, and promoting cleaner and more resource efficient production systems as well as renewable energy measures that reduce greenhouse gas emissions.…

The World Bank is also supporting an integrated effort to steer the power sector toward lower carbon options. This includes the preparation of a Vietnam Energy Efficiency for Industrial Enterprises Project that aims to facilitate energy efficiency investments in industrial sectors, and support for the development of a national roadmap to put on line 12 GW of solar energy by 2030.

"*…KGGTF [the Korea Green Growth Trust Fund], working through the IFC, helped the Vietnamese government leverage Korean expertise in Eco-Industrial Parks, to go beyond pollution abatement while targeting growth by identifying symbioses between industries.*" [37]

[37] "A Commitment to Grow Green and Address Climate Change in Vietnam," World Bank website, November 8, 2016, http://www.worldbank.org/vi/news/feature/2016/11/09/a-commitment-to-grow-green-and-address-climate-change-in-vietnam.

2.1.9. Businesses in the tourism sector adapt to climate change.

Travel businesses should develop environmentally friendly services and guide clients to protect landscapes, ecosystems, and the environment. The tourism sector can mitigate climate change by reducing greenhouse gas emissions. By using appropriate transportation, travel companies can reduce CO_2 emissions per metric ton of goods and passengers, save water and electricity, improve the resort landscape, and reduce environmental pollution.

Erosion at resort on Cua Dai beach [38]

[38] Image source: Dang Cong San Viet Nam website, http://dangcongsan.vn/xa-hoi/giai-phap-nao-cho-tinh-trang-xoi-lo-bo-bien-cua-dai-374714.html.

2.2. Improving business sustainability by taking advantage of climatechange opportunities

2.2.1. Businesses in the agro-forestry sector seize opportunities due to climate change.

The acute drought in the central coastal provinces, such as Ninh Thuan, Khanh Hoa, Phu Yen, and Binh Dinh, has caused serious water shortages for agriculture, livestock, and domestic use. On the other hand, farming households in the south-central provinces have favorable conditions to raise cattle, sheep, and goats for meat. Despite drought conditions, livestock production is more developed in this region than in other areas.

To seize the opportunities presented by climate change, livestock breeders in the south central and central coastal provinces have adopted breeding methods appropriate to their local conditions. The region has a diverse livestock population that includes sheep, ostriches, bees, and silkworms, animals that require relatively less water, reflecting the region's experience with drought conditions. The region accounts for a large proportion of these animals in Vietnam, and enjoys a healthy growth rate.

Ninh Thuan and Khanh Hoa, the "holy land" of sheep, accounts for 98 percent of the country's sheep output [39]

[39] Image source: VietGAP website, http://www.vietgap.com/thong-tin/997_6081/phat-trien-chan-nuoi-trong-dieu-kien-bien-doi-khi-hau.html.

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According to the Department of Livestock Production, the south-central and central coastal provinces, and provinces in the central highlands account for a considerable share of the country's livestock output. Ostrich meat from these provinces, at over 10,000 tons, accounts for 83.6 percent of the country's yearly output; lamb and mutton from Ninh Thuan and Khanh Hoa, at 18,500 tons, accounted for 98.3 percent of the country's output; 93,000 tons of honey from the highlands accounted for 60 percent of the country's output; and nearly 50,000 tons of silk cocoons from Lam Dong and Binh Dinh accounted for 74 percent of the country's output. These climate-smart livestock and husbandry models have increased farmer income even as other forms of agriculture have been curtailed by drought and salinity intrusion. [40]

2.2.2. Businesses find opportunities as climate change brings changes to global markets and supply chains

Vietnam is endowed with great potential wind resources throughout the country. This wide geographic distribution, and the ability of wind power to work with Vietnam's extensive hydropower assets, holds the promise of high levels of low-cost wind power. Wind power will play an important role in maintaining Vietnam's energy flexibility and security as the government works to meet the energy needs of a developing nation. International cooperation to develop renewable energy infrastructure in Vietnam is a good chance for Vietnamese businesses to gain experience and expertise with an energy technology that will be crucial to mitigating environmental impacts and climate change.

A 1,000MW wind power project with General Electric includes a commitment to locally source 30 percent of the project's parts and equipment. The question is, will this provide Vietnamese businesses with sufficient opportunity to participate in the project? Do domestic businesses have the competence and capacity to meet the project requirements ?.

[40] Manh Tuan, "Promoting animal husbandry in the contexts of climate change" [Phát triển chăn nuôi trong điều kiện biến đổi khí hậu], VietGAP website, accessed at http://www.vietgap.com/thong-tin/997_6081/phat-trien-chan-nuoi-trong-dieu-kien-bien-doi-khi-hau.html.

Box 2.6. Climate change encourages Vietnamese businesses take part in global supply chains.

General Electric Corporation (GE) played a key role in the development of Vietnam's first wind farm, in Bac Lieu province in the Mekong Delta. GE supplied 62 wind turbines, totaling over 99MW of power generation capacity. The first phase of this wind farm connected to the national grid in June 2013.

GE has signed a memorandum of understanding (MOU) with the Ministry of Industry and Trade on the development of wind energy in Vietnam. This is a new opportunity for domestic businesses to accelerate the development of renewable energy. Both parties are committed to develop a minimum of 1,000MW of new wind farms by 2025. This represents enough energy to power approximately 1.8 million Vietnamese homes.

The MOU also supports the implementation of Vietnam's National Target Program through local manufacturing of wind turbine equipment and components at GE's Hai Phong facility, plus collaboration with other local suppliers. Domestic businesses supply parts of the wind energy system including gas and electric components and associated infrastructure, and the localization rate is about 30 percent. The project has created hundreds of local jobs, building the capacity of both businesses and workers.[41]

[41] Van Anh, "Wind power development: Opportunities for domestic businesses" [Phát triển điện gió: Cơ hội cho doanh nghiệp nội], Construction Magazine, May 31, 2016, accessed at http://www.baoxaydung.com.vn/news/vn/kinh-te/phat-trien-dien-gio-co-hoi-cho-doanh-nghiep-noi.html.

2.2.3. Businesses seize opportunities from energy-saving technology to build construction materials businesses.

Producing construction materials consumes a lot of energy and causes significant emissions. Bricks account for a large proportion of construction materials in Vietnam, where demand for bricks is high. With 20–22 billion bricks used each year, the country devotes some 2,500 – 3,000 ha of land to brick manufacture that could otherwise be used for agriculture[42]. The production of fired brick requires large amounts of coal or firewood, and releases toxic gases into the atmosphere, polluting the environment and accelerating climate change.

Brick kilns in Cho Moi, An Giang, cause atmospheric pollution[43]

[42] Hanoi Department of Natural Resources and the Environment, "The technology of producing unbaked bricks that saves energy" [Công nghệ sản xuất gạch không nung tiết kiệm năng lượng], Online news of the National Targeted Program on Energy Efficiency, August 4, 2011, accessed at http://tietkiemnangluong.com.vn/tin-tuc/pho-bien-kien-thuc/t11885/cong-nghe-san-xuat-gach-khong-nung-tiet-kiem-nang-luong.html.

[43] Image source: Quoc Dung, "Smoke from brick kilns: Assassin with hidden face - Suspended threats" [Khói lò gạch: Sát thủ giấu mặt - Tai họa lơ lửng] http://nld.com.vn/xa-hoi/tai-hoa-lo-lung-20101117104743148.htm.

How to address these two issues is a question. Green building materials are the answer. Environmentally friendly building materials are an idea whose time has come in the construction sector. New building materials should meet two requirements: consume less energy in production, and save energy in use. In 2010, Vietnam adopted new standards for the production and use of unbaked building materials to replace baked clay bricks[44]. The resolution called for the proportion of unbaked materials in new construction to rise to 20–25 percent by 2015, and 30–40 percent by 2020. Box 2.7 presents a case study of lightweight concrete blocks, an unbaked building material. Construction businesses should work to develop similar products to respond to climate change.

Box 2.7. Green materials replacing fired bricks

The concrete blocks are manufactured by the low-pressure grouted method, not traditional firing. Blocks, roof slabs, and wall panels can all be made from lightweight concrete. The lightweight aggregates are filled with fine sand, water, lime, cement, aluminum powder and additives. The mixture is then poured into a mold, using low pressure to fill the voids. The lightweight concrete blocks are environmentally friendly products that eliminate the waste of firing and cause no damage to the environment.

Lightweight concrete blocks

[44] Decision of the Prime Minister of Vietnam No. 567/QD–TTg, April 28, 2010.

The cost of lightweight concrete blocks is 10–15 percent higher than fired bricks, but they save costs in other ways. The unit weight is roughly half that of fired clay brick, which saves foundation construction costs. According to the manufacturer, the compression strength is superior to normal bricks, as is the thermal insulation the blocks provide, which can reduce electricity use for air conditioning by 30 percent. The blocks also provide good sound insulation, and can resist fire for four hours. The flat surface requires less plastering.[45]

2.2.4. Businesses seize opportunities in renewable energy

Along with challenges and risks, climate change opens doors to new opportunities and investments for businesses and banks. Recently, Vietnam has attracted substantial international funding for climate change activities. Japan has provided USD 500 million for the three-year Climate Change Response Program (2010–2012); the Clean Technology Fund has provided USD 250 million for projects on transportation, urban planning, irrigation, and energy; the Norwegian government committed USD 100 million for the Program on Forest Degradation Prevention and Sustainable Management. Including some 50 other projects, the committed budget is over USD 1.2 billion. This is a huge capital resource for businesses seeking new opportunities.[46]

Reflecting world targets for GHG emissions reduction, the demand for renewables like wind and solar to replace fossil fuels is increasing. In 2012, the government issued Decision No. 37/2011/QD–TTg supporting the development of wind power projects in Vietnam. The decision set a target of 1,000 MW of wind power capacity—0.7 percent of total electrical capacity—by 2020, and 6,200 MW by 2030

[45] Duc Anh, "Green materials in modern construction" [Các loại vật liệu xanh trong xu hướng xây dựng hiện đại], Vietnam Environment Administration Magazine, March 4, 2016,accessed at http://tapchimoitruong.vn/pages/article.aspx?item=Các-loại-vật-liệu-xanh-trong-xu-hướng-xây-dựng-hiện-đại-40651.

[46] Remarks by Mr Nguyen Van Thang, deputy director of IMHEN and deputy head of the Standing Office for NTP-RCC. Van Nam, "Climate Change: Turning Challenges into Opportunities" [Biến đổi khí hậu: Biến thách thức thành cơ hội!], Dong Nai online newspaper, October 24, 2011, accessed at http://www.baodongnai.com.vn/kinhte/201110/Bien-doi-khi-hau-Bien-thach-thuc-thanh-co-hoi-2104886/.

The National Power Development Plan (also known as Power Master Plan VII) lays out the government's goals for electricity production for the period from 2011 to 2020, along with an outlook for 2030. It calls for combined domestic and imported capacity of 194–210 billion kWh in 2015, 330–362 billion kWh in 2020, and 695–834 billion kWh in 2030; and it prioritizes the development of renewable energy sources for electricity, increasing the contribution of renewables from 3.5 percent of total electricity production in 2010, to 4.5 percent in 2020, and 6.0 percent in 2030 [47]. As of June 2017 [48], solar power projects in Vietnam are eligible for tax and other incentives, such as subsidized feed-in tariffs.

Box 2.8. Renewable energy: Investment capital is available for businesses.

The government of Vietnam received a credit from the World Bank of USD 201.1 million to finance the Renewable Energy Development Project for Vietnam (REDP) for the period 2009–2014. The funds were made available through domestic banks to support investments in renewable energy projects.

Germany's Development Bank (KfW - Kreditanstalt für Wiederaufbau) had some financing programs, for example the Initiative for Climate and Environmental Protection (IKLU—Initiative für Klima und Umweltschutz). The German government has agreed to support a loan of USD 35 million through KfW for the Thuan Binh wind power project of the Vietnam Electricity Corporation (EVN).

[47] Decision of the Government of Vietnam No. 1208/2011/QD-TTg, July 21, 2011, approving the national master plan for power development for the period from 2011 to 2020, with outlook to 2030.

[48] Decision of the Prime Minister of Vietnam No. 11/2017/QD-TTg, April 11, 2017, on mechanisms to encourage the development of solar power in Vietnam.

Dragon Capital also established the Mekong Brahmaputra Clean Development Fund, focusing on clean energy, saving energy, and environmental protection. The first round of fundraising raised USD 45 million. The second round is expected to bring in up to USD 100 million. The fund will provide loans up to of USD 7 million.

The Vietnam Development Bank (VDB) has programs to provide financial support for renewable energy projects, including medium- and long-term loans, and lending government ODA from international banks[49]. The maximum loan is 85 percent of a project's total budget, for a maximum period of 20 years with a five-year grace period.[50]

2.2.5. Businesses in forestry sector enhance forest environmental services to respond to climate change

Deforestation and forest degradation produce 4–14 percent of total global GHG emissions. They are the second-ranked factor in climate change[51]. Vietnam is actively involved in international initiatives on forest conservation and development. The initiatives will provide financial assistance to developing countries to reduce GHG emissions and protect the global climate system through five main activities: reducing emissions from deforestation, reducing emissions from forest degradation, conserving high-carbon-stock forests, managing forests sustainably, and enhancing forest carbon reserves.

[49] ODA stands for Official Development Assistance

[50] "Effervescent market for wind power projects in Vietnam" [Sôi động dự án điện gió Việt Nam], Industrial Automation Magazine Vietnam, November 03, 2012, accessed at http://iavietnam.net/detailnews/M46/N906/soi-dong-du-an-dien-gio-viet-nam.htm.

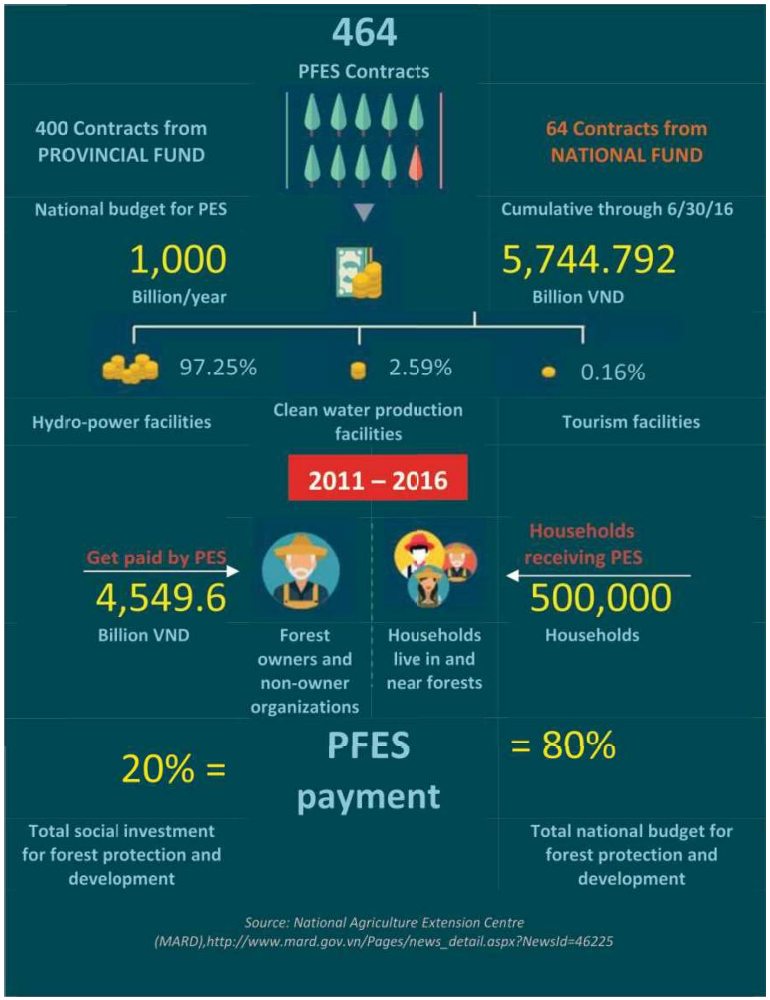
[51] H.Q, "Implementing REDD+ initiatives to mitigate climate change" [Triển khai sáng kiến REDD+ nhằm giảm thiểu biến đổi khí hậu], Quang Binh (online newspaper), July 8, 2015, accessed at http://baoquangbinh.vn/toa-soan-ban-doc/201507/trien-khai-sang-kien-redd-nham-giam-thieu-bien-doi-khi-hau-2126524/.

Since 2009, Vietnam has participated in two international forestry initiatives. The first is REDD+: Reducing Emissions from Deforestation and Forest Degradation, Sustainable Management of Forest Resources, and Preserving and Enhancing Forest Carbon Stocks. In 2012, the government approved the National REDD+ Action Plan for 2011–2020. This is one of the most important documents for the implementation of REDD+ in Vietnam.[52]

The second initiative is Payments for Forest Environmental Services (PFES). The PFES system pays individuals and communities to protect forests in return for the benefits they provide, such as sequestering carbon, regulating river flow, and providing natural habitat for wild species. PFES achieves the objectives of forest protection and sustainable development while increasing incomes for forest protectors, often people of low income. The government has phased in PFES to gradually create a market mechanism for the forestry sector. Income from PFES will increase the value of the forestry sector, reduce government investment in forest management, and increase total social investment in the forestry sector.

[52] Decision of the Government of Vietnam No. 799/QD-TTg, June 27, 2012.

Figure 2.1. Payments for Forest Environmental Services (PFES), through 6/June 30/, 2016



2.2.6. Businesses in the banking, finance, and insurance sectors develop new products.

The complexity of natural disasters and climate change has increased risk in agricultural production, raising the demand for insurance. The active participation of insurers in developing new products and services is essential. Specialized products and services will enrich the Vietnamese insurance market, enhance insurer capacity, and increase the insurance penetration rate among businesses and communities.

Weather index insurance was introduced in developing countries such as India and Mexico. Weather index insurance pays benefits to policyholders based on a predetermined index, such as rainfall, that tends to be highly correlated with actual losses. Weather index insurance has several advantages over traditional insurance. It reduces moral hazard—the likelihood that a farmer who has insurance will be less diligent in his farming, for example—because claims are paid based on an objective index that the farmer's practices cannot influence. Weather index insurance has lower administrative costs, and offers little opportunity for insurance fraud.

In Vietnam, weather index insurance has been piloted in the Mekong Delta province of Dong Thap for three years. In this case, the index is based on the early Mekong flood levels. If the flood level is higher than 270cm at Tan Chau dam and rice fields will be inundated during the rice harvest, and farmers in the districts of Hong Ngu and Tam Nong will receive insurance payments.[53]

Agencies have been developing plans for widespread implementation of weather index insurance in the agricultural sector. The government will subsidize premiums for certain groups such those who live in particularly disaster-prone areas or make less than a certain income.

[53] Ha Yen, "Piloting of agricultural insurance based on weather conditions" [Thí điểm thực hiện bảo hiểm nông nghiệp theo thời tiết], Vietnamnet, January 12, 2009, ACCESSED AT http://vnn.vietnamnet.vn/kinhte/2009/01/823474/.

Vietnam's weather index insurance initiative is still in the research phase. In the meantime, other solutions for agricultural insurance are emerging.

Box 2.9. Quang Nam: A whole village buys cattle insurance [54]

Not just people, but thousands of cattle have insurance against disease and death in Dien Quang commune (Dien Ban district, Quang Nam). Dien Quang Cooperative launched the Cattle Insurance Fund in 2009. Since then, it has provided insurance coverage for 2,068 cattle and buffalo.

Benefits include coverage for 80 percent of the cost of examination and treatment of sick animals, and 100 percent of the cost of government-required vaccinations. If a covered animal dies, the insurance fund will pay 80 percent of the market price in Dien Quang commune.

Since the fund's inception, the cooperative has paid benefits of VND 128 million to affected households. Mr. Pham Tan Phong, a farmer in Xuan Dai Village, says, "*I purchased insurance for three cattle. No insurance means risk of loss. When the cattle are sick, the cooperative's veterinarian will treat them; if they die, I suffer no damages. If a cow worth 10 million dong dies, I will get 8 million in compensation.*"

[54] "Strange thing in Quang Nam province: The whole village buys insurance for the cow herd" [Chuyện lạ Quảng Nam: Cả làng đóng bảo hiểm cho bò], Vietnamnet, October 1, 2015,accessed at http://vietnamnet.vn/vn/kinh-doanh/chuyen-la-quang-nam-ca-lang-dong-bao-hiem-cho-bo-265088.html.

A veterinary officer checks an animal's health as required by the insurance contract.

The subject of climate change has received attention from financial institutions, including start-up funds. Recently, several start-up funds have developed new credit and investment services to attract investors in the climate change arena. The World Bank's Vietnam Climate Innovation Centre (VCIC) is one promising model.

Box 2.10. Start-up businesses to receive funding from VCIC.[55]

The Vietnam Climate Innovation Centre (VCIC) is part of the World Bank Group's Climate Change Technology Development Program. The goal of the program is to establish a network of 7 Innovation Centers to respond to climate change worldwide.

[55] Vu Hung, "VCIC – The place for the starts up to respond to climate change in Vietnam" [VCIC - Nơi khởi nghiệp sáng tạo ứng phó với biến đổi khí hậu tại Việt Nam], Vietnam Science and Technology Online Magazine, June 29, 2016, accessed at http://www.khoahocvacongnghevietnam.com.vn/khcn-trung-uong/12566-vcic-noi-khoi-nghiep-sang-tao-ung-pho-voi-bien-doi-khi-hau-tai-viet-nam.html

VCIC's objectives for its first three years are to support clean technology businesses and help 1,700 households gain access to climate-smart technologies and services. The priority areas for VCIC are energy efficiency, sustainable agriculture, transportation technologies, water management and filtration, renewable energy technologies, biofuels and biomass, and other climate technology businesses.

In June 2016, VCIC honored 19 start-ups from its 2014 VCIC Bootcamp, offering them financial support and other incubation services such as domestic and international business and technology consultants. Among the projects honored were an energy-efficient LED attractor for fishing that reduces CO2 emissions by 60 tons per vessel per year and increases crew members' income, a low-emissions fuel made from pressed rice husks and sawdust that is 15–20 percent cheaper than coal, and a system for using wastewater from alcohol distillation to produce biochemicals for agriculture production.

The VCIC program is a great opportunity for Vietnamese business and for Vietnam. These innovative start-ups understand the challenges and the potential of their localities, and can devise locally appropriate solutions to combat climate change, create jobs, and contribute to the local economy.

PART 3

RECOMMENDATIONS TO GOVERNMENT AND STAKEHOLDERS

3.1. A framework for government and stakeholder action

3.1.1. Raise businesses' awareness of climate change and disaster risk through increased publicity.

State management agencies should make policies related to disaster management and climate change more widely known within the business community and include businesses in disaster risk planning. According to the 2016 VCCI/Asia Foundation survey, few businesses at the time of the survey had heard about the Law on Natural Disaster Prevention and Control, two and a half years after its enactment. Among businesses that had not participated in VCCI/Asia Foundation training courses, 27 percent were hearing about the law for the first time, 35 percent knew about the law, 30 percent had read the law, and just 8 percent had studied the law thoroughly.

There are other government policies that support the National Target Program on Energy Efficiency and Conservation, Phase 2012–2015, approved by the prime minister in Decision No. 1427/QD-TTg dated October 02, 2012. Decision No. 11/2017/QD-TTg, dated April 11, 2017, encourages the development of solar power projects in Vietnam, and should also be introduced to businesses by state management agencies.

Publicity should focus on key sectors such as industrial manufacturing, large energy-consuming buildings, transportation, and high-performance equipment and facilities, and emphasize specific policy objectives, such as coordinated deployment of programs, removing barriers, and creating breakthrough improvements in energy efficiency.

State management agencies could also organize disaster simulations to encourage businesses to take part in local action plans for natural disasters. By giving businesses a chance to participate in planning before a disaster occurs, simulations can also give business a better idea of where vulnerabilities in the urban and periurban areas exist. This is extremely important for businesses, especially those in processing and manufacturing, since many are located in low-lying coastal areas. In Quy Nhon, for example, a 2009 flood caused an estimated $10 million in damage to just one industrial zone in the Ha Thanh River flood plain within the city[56]. Despite the vulnerabilities businesses in many areas face, according to the VCCI/Asia Foundation survey, nearly 35 percent of businesses that did not take the VCCI/Asia Foundation training did not know about their local climate change plan, and 39 percent had heard about it only briefly. Just 21 percent had read the plan, and only 5 percent said they had studied it thoroughly." [57]

Along with campaigns to raise business awareness, the government and stakeholders must raise the awareness of local authorities about the role of businesses in disaster prevention and climate change adaptation. If local authorities and relevant agencies understand how businesses can participate in disaster risk management and action planning, they will be able to devise policies to support businesses in this role. Intermediary agencies that support businesses, like business associations and other non-governmental organizations can play an important role between government and businesses in both developing and implementing these policies.

[56] DiGregorio, M., & Van, H. C. (2012). Living with floods: A grassroots analysis of the causes and impacts of Typhoon Mirinae [Sống chung với lũ: Phân tích ở cấp cơ sở về nguyên nhân và tác động của trận bão Mirinae]. Hanoi, Vietnam: Institute for Social and Environmental Transition-International.

[57] Vietnam Chamber of Commerce and Industry (VCCI) and The Asia Foundation, Survey on Responses of Vietnamese Businesses to Disaster Risks and Climate Change (VCCI and The Asia Foundation, 2016).

3.1.2. Develop programs to help businesses overcome the challenges and capitalize on the opportunities of climate change.

The government, business associations, and NGOs should conduct studies on the likely impacts of natural disasters and climate change on local businesses, by sector, particularly those located in vulnerable areas and those affected by supply chain disruptions. The results and recommendations should be widely publicized within the business community. With solid information, businesses can more effectively restructure their own operations, as well as collaborate with each other, local communities, and government to respond to disaster risks and climate change. Consider, for example, how hotels and resorts can respond to natural disasters. First, their clients are not local and will need food and accommodations. Second, they may also be better able to offer shelter to their employees and members of neighboring communities. By collaborating in developing a disaster plan before disasters occur, resources available in different facilities can be shared appropriately, providing the best possible outcomes. Devising a strategy in the midst of a crisis, which is what is commonly done, offers the least favorable results.

The government, business associations and NGOS should help businesses expand their knowledge on climate change and take measures to respond appropriately. The forms of training can include workshops that meet the needs of businesses at many different scales and sectors as well as large convenings, such conferences, where businesses can learn as they network. Business and professional associations can be a particularly effective way to reach out and gain access to businesses.

The government's role must extend beyond producing legislation, policies, and administrative procedures. Government and other stakeholders should promote disaster risk and climate change consultancy services for businesses to help them develop their own response plans, redesign buildings and factories, and plan for disaster risk management and climate change adaptation.

With funding from the Office of Foreign Disaster Assistance of the United States government, over the past six years the Asia Foundation, VCCI, SMEDEC 2, and the Center for Education Development have trained more than 2,500 business managers and CEOs in 21 provinces, representing roughly 2,000 businesses. The business oriented program has also trained 80 individuals to serve as disaster preparedness trainers. Both these businesses and the trainers are key resources in expanding both the awareness and engagement of businesses in climate change and disaster risk management.

We need a new professional career providing training and consultancy services on disaster risk management and climate change for businesses.… Thousands of trainers and trainees received proper training, but they don't have the conditions or the environment to sharpen their knowledge. We should consider mobilizing businesses to operate in this field."

Mr. Nguyen Dien, Deputy Director of Da Nang VCCI[58]

[58] CED, "E-newsletter" [in Vietnamese], February 27, 2017,

3.1.3. Create a favorable business environment and support businesses to implement the above-mentioned initiatives.

The Fund for Disaster Prevention and Control must be managed and utilized transparently to gain the trust and support of business. In the in-depth interviews conducted by VCCI and The Asia Foundation in 2016, a business manager in Da Nang responded, "The Fund has no clear purpose and does not support businesses at all. The government must fill the role of supporting businesses in coping with natural disaster. Imposing a fee on total assets is not the right way, and affects the development of businesses."[59]

The Ministry of Planning and Investment and the Ministry of Finance should issue implementing guidance for the application of the Law on Natural Disaster Prevention and Control for businesses. Specifically, the Ministry of Finance should provide guidance on Clause 5 of Article 5:

> To offer incentives to and encourage insurance businesses to provide insurance against natural disaster risks; to support businesses conducting production and business activities in areas frequently affected by natural disasters in accordance with the laws on investment, enterprises and natural disaster prevention and control; to offer enterprise income tax exemption and reduction regarding contributions made for natural disaster prevention and control purposes

The Ministry of Planning and Investment should provide instruction on Clause 1(b) of Article 35 on the rights and obligations of economic organizations:

> To invest in projects on building multi-purpose natural disaster prevention and control works under master plans and plans of ministries, ministerial level agencies, government-attached agencies and localities, and may enjoy benefits from such investment in accordance with law.

[59] CED, "E-newsletter" [in Vietnamese], February 27, 2017,

If guidance is clearer, businesses will be better able to take advantage of opportunities to serve their own interests and the interests of their communities in responding to the challenges of climate change and planning for natural disasters.

3.1.4. Adjust the investment portfolio: Support projects that apply emissions reduction and energy saving technologies.

Amid increasing natural disasters and climate change, the government must support businesses with appropriate policies. These policies should support the whole value chain and must include policies encouraging banks to invest in environmentally friendly products and technologies and avoid investments that will harm the environment. Such policies would encourage insurance companies to provide disaster related insurance to businesses in at risk areas. This might include "index based" agricultural insurance as is now being tested in the Mekong delta as well as similar programs in other sectors. The government might also support businesses to recover from disasters with fast access to capital and low interest loans.

Specifically, in the energy sector, the government can provide tax credits to businesses that conserve energy through a variety of means. This includes waste heat recovery, as in the example of the Ha Tien cement factory. Other examples might include use of biogas generators as a fuel source in the fish processing industry, use of rice chaff as a fuel in pottery kilns, and use of waste heat from kilns to dry sanitary ware prior to glazing and firing, among others. With supporting policies, businesses will be quick to take advantage of opportunities to reduce their costs for energy. In previous research, The Asia Foundation and VCCI/Da Nang observed that businesses regarded these opportunities not so much as a reflection on the cost of energy, which is comparatively low in Vietnam, but rather as a competitive advantage.

By clarifying the rules, government can also create opportunities in new sectors of the economy. Solar energy is one example. For years, the commercial solar

sector in Vietnam was stalled, despite producing solar panels for export, due to lack of clarity on feed in tariffs. Following the Prime Minister's issuance of Decision No. 11/2017/QD-TTg adopting the new policy for solar power, the Ministry of Industry and Trade of Vietnam (MOIT) released the first draft of a Circular providing guidelines for the development of solar power projects in Vietnam. The Draft Circular includes a draft solar power purchase agreement template, as well as detailed guidelines on the formulation and approval of national and provincial solar power development plans. Even though the draft circular leaves many issues unsettled, shortly after its issuance, several large scale solar development projects were announced across the country.

3.1.5. Support research and development of new technologies for emissions reduction and energy conservation.

The Vietnamese government should encourage businesses to invest in research and development of new technologies, especially advanced technologies using energy-saving and low-emissions technologies, as well as improved systems and technologies for waste treatment. The Chinese government has already taken a global lead in these areas with support for research and production of low cost, high efficiency solar panels, batteries and electric vehicles, even going so far as to cancel construction of 103 coal fired power plants[60]. Vietnam is far behind this learning curve and needs to catch up, not only because such actions are required to reduce the impacts of climate change, but also because these new sectors of the economy offer businesses many opportunities to innovate and grow. The government can promote investment in these areas of green technology by encouraging existing innovation funds to give priority to these new opportunities.

[60] Forsythe, M. Jan 18, 2017. China cancels 103 coal fired power plants, mindful of smog and wasted capacity. The New York Times accessed at https://www.nytimes.com/2017/01/18/world/asia/china-coal-power-plants-pollution.html.

3.2. Conclusions

Disaster risks and climate change have had a tremendous impact on Vietnamese businesses and the Vietnamese people. But along with risks and challenges, climate change has created new business opportunities. Forward-thinking companies are investing in new technologies, and green and clean production. Climate change is a shared challenge for government, businesses, and the community, and proper action must be taken to fully support businesses. Working together, communities, businesses, government, and donors will help Vietnam effectively respond to climate change and achieve sustainable development.

To support businesses as they seek to mitigate and adapt to climate change, international donors and organizations need to continue their ongoing support in the following ways:

- *Establish information centers for businesses.*
- *Establish investment funds for technology innovation and transfer that better accommodate existing business infrastructures and practices.*
- *Organize media campaigns to change business behavior toward natural disaster risk and climate change from post-disaster response to pre-disaster preparedness.*
- *Develop and implement programs to support innovation in response to climate change.*
- *Disseminate lessons learned to promote the successful implementation of the Decree on Payments for Forest Environmental Services.*
- *Conduct research and share experiences to promote implementation of the National Action Plan on Reduction of Greenhouse Gas Emissions through Efforts to Reduce Deforestation and Forest Degradation, Sustainable Management of Forest Resources, and Conservation and Enhancement of Forest Carbon Stocks, Period 2011–2020.*
- *Continue to support the effective implementation of projects and programs on community-based disaster risk management, infrastructure development, and poverty reduction.*