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Assessing the Impact of Climate Change on Vietnamese Businesses

Hanoi, August 2020

RESEARCH TEAM

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Forward

Vietnam is facing enormous challenges due to climate change, with an increase in a variety of extreme climate events. Countless international studies have shown that Vietnam is one of the top 10 countries most seriously affected by climate change. With estimated economic losses of up to 1.5% of annual gross domestic product (GDP), climate change has made a negative impact on macroeconomic achievements, institutional reforms, and the assurance of Vietnam's environmental sustainability goals.

With the promulgation and implementation of the National Target Program to Respond to Climate Change in 2008 and the National Strategy on Climate Change in 2011, along with many other actions, it is evident that the Government of Vietnam has recognized the importance of responding to climate change. However, the gap between policy adoption and enforcement in this area is still relatively large, especially in the business community.

The business community plays an important role in Vietnam's socio-economic development process, but what is the impact of climate change on Vietnamese businesses? How are Vietnamese businesses coping with climate change? What are the trends in upcoming actions among businesses? Though these pieces of information are crucial for the process of developing and implementing policies or laws on climate change response in Vietnam, the answers remain lacking.

Originating from this reality, and with the support of the global courier group UPS (United States), Vietnam Chamber of Commerce and Industry (VCCI) and The Asia Foundation in Vietnam (TAF in Vietnam) have cooperated to conduct a wide-ranging enterprise survey on the topic of climate change in Vietnam. Attracting respondents from 10,356 enterprises across all 63 provinces and cities throughout the country, this remains Vietnam's most comprehensive enterprise survey on this topic.

The report has been developed under the direct supervision of Dr. Vu Tien Loc, President of VCCI and Vice-president of the National Council for Sustainable Development and Competitiveness Improvement. The report has received significant support and contributions from Dr. Michael Di Gregorio (Chief Representative of TAF in Vietnam) and Mr. Hans-Peter Teufers (Director of International Programs, UPS Foundation under UPS International, Inc. - USA). Moreover, Mr. Nguyen Tri Thanh (TAF's senior expert in Vietnam) and Mr. Le Quang Trung (TAF staff in Vietnam), have contributed valuable comments and advice on the finalization of the report, as well as providing management assistance on this this cooperative activity.

This report has received enthusiastic contributions from many experts and businesses, including: Assoc. Prof. Dr. Mai Quang Vinh, Director of the Institute of Green Technology (Hanoi); Mr. Nguyen Huynh Quang and Ms. Ngan Anh, Center for Natural Disaster Prevention Policy and Technology, Department of Natural Disaster Prevention of the Ministry of Agriculture and Rural Development; Mr. Nguyen Hong Thach, Deputy Head of the Safety Department, Vietnam Electricity; Mr. Nguyen Quoc Huy, Deputy Director of the Risk Management Department - National Reinsurance Joint Stock

Company; Assoc. Prof. Dr. Nguyen Trung Hieu, Chief of the 100-Resilient City Program (100RC), Can Tho City and Director of the Climate Change Research Institute (Dragon-Mekong Insitute), Can Tho University; MSc. Vo Chi Tien, Deputy Director of the Center for Rural Development in Central Vietnam, Hue University of Agriculture and Forestry; TS Ho Thanh Ha, Director of the Central Vietnam Climate Change Research Center (CCCSC), Hue University of Agriculture and Forestry; Mr. Tran Tuan Anh, Vietnam Institute of Environmental and Social Transformation (TT-Hue); Mr. Huynh Cho, Viettronimex Electronics and Informatics Joint Stock Company (Da Nang); Ms. Nguyen Thi Chi, Director of Viet Da Travel Company (Da Nang); Ms. Huynh Thi Ngoc Diep, Quang Ngai Sugar Joint Stock Company; Mr. Nguyen Quoc Quan, Central Plastic Joint Stock Company; Mr. Nguyen Thanh Ngoc, Association of Business Administration; Mr. Do Quang Thanh, Saigon - Danang Investment Joint Stock Company; Mr. Nguyen Anh Chuong, VSIP Quang Ngai Limited Company; Ms. Nguyen Thi Hai, Meteorology and Hydrology Station of Central Vietnam; Mr. Nguyen Duc Hung, Central Department of Information and Communication Center of the Central Highlands; Mr. Truong Cong Gioi, Central Hydropower Joint Stock Company (EVNCHP); Mr. Vu Duc Toan, Chairman of Da Nang PVI Insurance Company; Mr. Duong Tuan Anh and Mr. Pham Van Duoc, Thua Thien Hue Business Association; Mr. Pham Dinh Quang, Truong Thinh Design and Construction Company Limited (Da Nang); Mr. Ho Van Cong, Tin Nghia Design Consulting Co., Ltd. (Da Nang);Mr. Ninh Van Nghi, Weather Plus Joint Stock Company (Hanoi); Mr. Nguyen Tien Quang, Director of VCCI Da Nang branch; Mr. Nguyen Dien, senior lecturer in Natural Disaster Risk Management and former Deputy Director of VCCI Danang branch; Mr. Nguyen Phuong Lam, Director of VCCI in Can Tho branch; Mr. Pham Vu Dung, Vice Chairman of Quang Nam Tourism Association; Ms. Nguyen My Thuan, Standing Vice Chairman and General Secretary of Can Tho City Business Association; Mr. Jacques Poulain, Le Fruit Vietnam Company; Mr. Luu Nguyen Thinh Tri, Minh Dang Seafood Company (Soc Trang); Mr. Nguyen Thanh Su, Vice Chairman of An Giang Young Entrepreneurs Association and Director of An Giang Smart Home Technology Co, Ltd; Mr. Tran Van Hieu, Huynh Ha Agriculture Company; Ms. Nguyen Thi Kim Chi, Kim Chi Embroidery Social Enterprises in An Giang; Mr. Nguyen Ngoc Xuan, Chairman of An Giang Transport Association; Mr. Huynh Thanh Ngoc, BOYS Manufacturing, Trading, Import-Export Services and Tourism Joint Stock Company; Mr. Nguyen Duy Them, Golden Bamboo Company Limited (Dong Thap); Mr. Nguyen Long Hoai, Director of the Department of Irrigation within the Department of Agriculture and Rural Development of Ca Mau province; Ms. Ho Thi Bich Nguyet, Song Hau Food Company; Mr. Vo Anh Nguyen, Sao Mai An Giang Group - Can Tho branch; Mr. Huynh Duc Tam, Chairman of the Board of Directors of NN Construction Investment Consultancy Joint Stock Company (Dong Thap); Mr. Quach Kha Khai Hoang, Minh Hai Seafood Joint Stock Company (Bac Lieu); Mr. Truong Van Kiem, Vice Chairman of Can Tho City Cooperative Union; Mr. Pham Huu Nghia, Director of Tien Giang Victoria Yacht Company (Tien Giang); Ms. Trieu Thy Thanh Thao, Department of Agriculture and Rural Development of Soc Trang province; Mr. Nguyen Quang Vinh, Department of Natural Resources and Environment of Vinh Long Province; Ms. Phung Thi Thao, Department of Natural Resources and Environment of An Giang province; Mr. Cao Thanh Sang, Department of Transport of Soc Trang Province; Dr. Le Duy Binh, Director of Economic Management Consulting Vietnam Economica ... and many other experts.

Most importantly, we would like to thank the enterprises for their valuable time and cooperation in participating in the survey. Each enterprise's questionnaire feedback is extremely valuable for our team's report. Our report will be shared with government agencies to improve policies and laws on climate change, thereby bringing practical benefits to the sustainable development of the business community in Vietnam.

10,356

Enterprises from all 63 provinces/cities throughout the country responded to the survey.

Making it the largest scale survey on climate change ever.

List of Abbreviations/Acronyms

AGRI	Agriculture, Forestry, and Fishery
DDI	Domestic Direct Investment
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
MFG	Manufacturing
PCI	Provincinal Competitiveness Index
SER/COMM.	Services and Commercial
TAF	The Asia Foundation
VCCI	Vietnam Chamber of Commerce and Industry

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Executive Summary

Vietnam is facing enormous challenges from climate change. Economic losses due to climate change amount to up to 1.5% of annual GDP in Vietnam. This figure will increase in future years if natural disasters - extreme events caused by climate change - occur more frequently while effective and timely improvements in climate change resilience and adaptation in Vietnam are still lacking.

The Government of Vietnam has recognized the importance of responding to climate change, as shown in the promulgation and implementation of the National Target Program to Respond to Climate Change in 2008 and the National Strategy on Climate Change in 2011, along with many other actions that have been taken. However, the gap between policy adoption and enforcement in this area remains relatively large, especially for the business community. Policies and laws on climate change adaptation related to the business community should be taken into account more comprehensively and strategically, with high priority given to the actual needs and risks that businesses face. In practice, most businesses currently lack the information and preparedness necessary for responding to climate change. At the same time, the level of interaction, information and experience sharing among businesses on climate change adaptation remains limited.

The business community plays an important role in Vietnam's socio-economic development, but what is the impact of climate change on businesses? How are businesses coping with climate change? What are the trends in upcoming actions across businesses? Though these pieces of information are important for the processes of policy and law formulation and implementation on climate change response and adaptation in Vietnam, data on these issues remains lacking.
In this spirit, through support from the UPS Foundation of UPS International Express Group (United States), The Asia Foundation in Vietnam (TAF in Vietnam) in collaboration with Vietnam Chamber of Commerce and Industry (VCCI) has conducted an investigation on business matters related to the management of natural disaster risk and climate change, which is integrated into the Provincial Competitiveness Index Survey 2019, a large-scale annual enterprise survey conducted by VCCI in Vietnam from 2005 continuously until now.

This is the largest, most comprehensive enterprise survey ever conducted in Vietnam from the perspective of businesses on climate change. 10,356 enterprises from two economic categories (domestic direct investment enterprises and foreign direct investment enterprises) responded to the survey in 2019. There were 8,773 DDI enterprises from all 63 provinces/cities throughout the country, and 1,583 FDI enterprises operating in the top 21 provinces/cities with the highest number of foreign investment projects. Majors findings are listed below:

Changes Caused by Climate Change Phenomena Have been Frequently Observed by Enterprises Operating in Vietnam

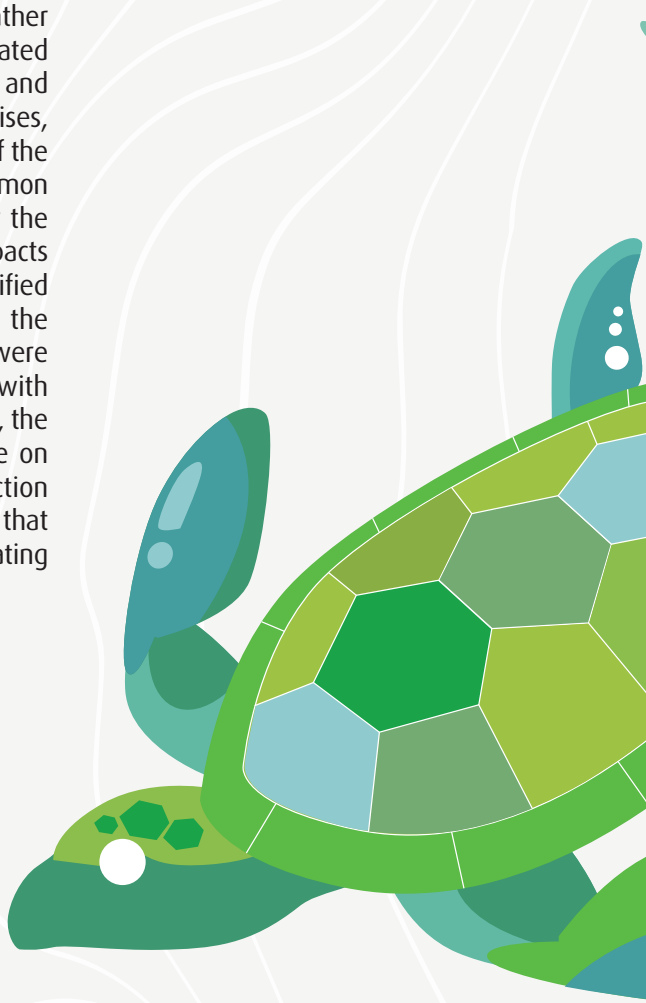
Up to 92% of enterprises recognized that hot periods (over 3 consecutive days) are happening more frequently, and 86% of enterprises reported an increase in average winter temperatures. These are followed by phenomena such as heavy rainfall with storms/tropical depressions (reported by 80% of enterprises), flooding in places where it used to be rare (71%), landslides caused by heavy rainfall occuring more frequently (65%), and drought leading to more frequent water shortages (for irrigation, production and domestic water supply) (62%). Other phenomena observed by enterprises include flash floods due to more frequent heavy rainfall (58%), river water becoming more saline than before, especially in the dry/summer season (55%), storm surges leading to inundation (54%), coastal erosion (48%), and whirlwinds becoming more common (43%). Agriculture, forestry and fisheries are the sectors with production and business activities most closely associated with changes in climate conditions. Therefore, the highest proportion of enterprises observing changes due to climate phenomena were found in these industries.

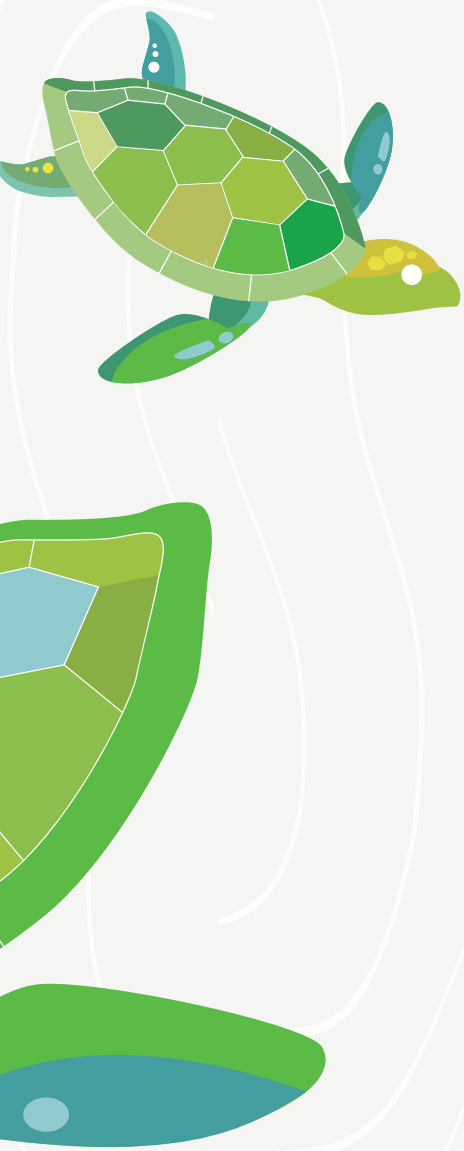
The Phenomena that Most Concerned Enterprises

These include more hot periods (reported by 26% of enterprises), heavy rains with typhoons/tropical depressions (reported by 17% of enterprises), and flooding in places where it used to be rare (reported by 11% of enterprises). Businesses in the Red River Delta region are most concerned about more hot periods, heavy rain with storms/tropical depressions, and average temperatures rising. Businesses in the Northern Mountainous area are most concerned about the phenomena of prolonged hot periods, flash floods, landslides and whirlwinds. In the Central Coastal region, businesses are concerned about more hot periods, heavy rain with tropical storms/depressions, floods and drought. Businesses in the Central Highlands are most concerned about the increased frequency of drought, heavy rain with storms/depressions, more hot periods and flash floods. In the Southeast region, businesses are most concerned by prolonged hot periods, heavy rains with storms/tropical depressions, floods and whirlwinds. Meanwhile, businesses in the Mekong Delta region are most concerned about the phenomena of heavy rains with storms/tropical depressions, more hot periods, flooding caused from high tides and whirlwinds. This is also the region where the proportion of enterprises reporting on problems of saltier river water and groundwater salinization is up to 11%, significantly higher than other regions. Industrial enterprises are most worried about more hot periods, heavy rains with storms/depressions and floods - this is also a concern for the commercial and services sectors. Enterprises in the construction sector are most concerned about more frequent hot periods, heavy rains with storms/depressions and flash floods. Enterprises in the agriculture, forestry and fishery industries are most concerned about more hot periods, more frequent droughts and heavy rains with storms/depressions. Meanwhile, mining enterprises expressed concern about landslides caused by heavy rain with storms/depressions and prolonged hot periods.

Climate Change Has a Relatively Negative Impact on Enterprises

Businesses assess climate change's impact with a score of 4.31 on a 10-point scale (on which a score of 1 indicates natural disaster risk and climate change phenomena only bringing negative impacts, without opportunities for businesses, and a score of 10 indicates natural disaster risk and climate change having no negative effects, but rather creating opportunities for businesses). FDI enterprises rated the overall impact of natural disaster risk reduction and climate change to be more negative than DDI enterprises, with scores of 4.30 and 4.41 respectively. Regardless of the amount of capital or the size of the labor force, a common characteristic that can be observed is that the larger the enterprises are, the more negatively they reported impacts on their production and business activities. When classified by sectors, DDI enterprises in the mining sector had the most negative impact rating, with 4.02 points. These were followed by industrial and agricultural enterprises, with scores of 4.05 and 4.14 points respectively. Meanwhile, the general impact of natural disaster risk and insurance on enterprises in the commerce/services and construction sectors had scores of 4.44 and 4.58, respectively. Note that there is no sector in which an enterprise reported a rating above 5.





Natural Disaster Risk and Climate Change Have a Clear and Diverse Impact on Specific Business and Production Activities of Enterprises

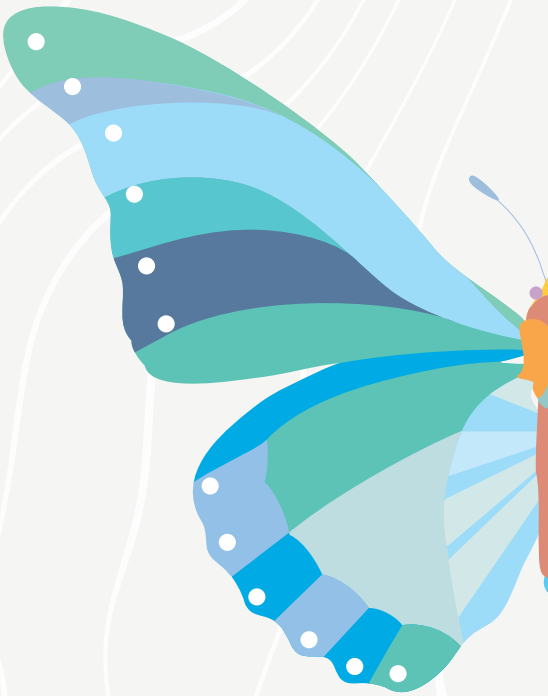
The highest percentage of enterprises reported having business interruptions (54%). This was followed by a decrease in labor productivity due to inclement weather and the decline of revenue (both at 51%). There was also a significant percentage of enterprises reporting disruptions in their transportation channels (46%) and increasing production and business costs (44%). This was followed by a relatively high proportion of enterprises reporting a significant impact due to stagnation in their distribution systems (38%), reduction of product and service quality (37%), damage to facilities (34%), and manpower shortages (33%). 32% of businesses reported that they are relatively or greatly affected by a lack of supply in input production materials. Enterprises in the Central Coast region are more affected by natural disaster risk and climate change compared to other regions. Compared to other sectors, agriculture, forestry and fishery are the most affected by climate change. The cumulative impact of natural disaster risk and climate change on enterprises' specific activities showed that newly operating enterprises are more affected than the other groups.

The Average Number of Days of Business Disruption Reported in the Last Year Was 7 Days

If classified into economic sectors, DDI enterprises had significantly more days of business interruption compared to FDI enterprises. Enterprises in the mining sector had the highest number of days of business interruption, followed by enterprises in the construction, agriculture, forestry and fishery sectors.

The Average Value of Losses Reported in the Last Year is About VND 20 million

Relatively consistent with the number of days of interrupted business operations, the level of losses of FDI enterprises was smaller than that of DDI enterprises. DDI enterprises in the Northern Mountainous area seemed to have the highest normal median losses, followed by those in the Central Coast region. The value of normal median losses of FDI enterprises in the Central Coast region was the highest. The two sectors where enterprises reported the highest value of losses (albeit on a median and mean scale) in all regions were mining and agriculture, and forestry and fisheries.

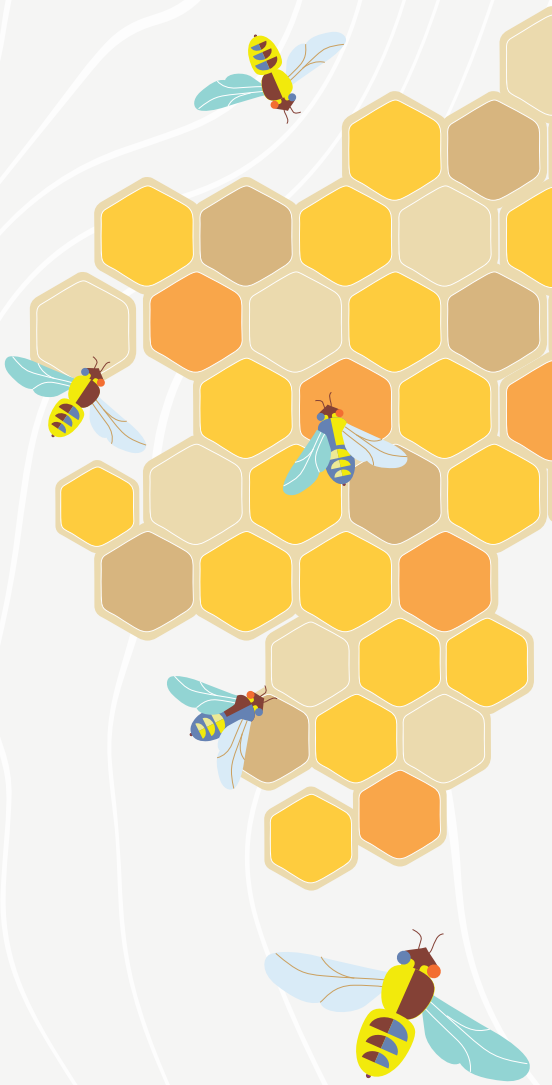


Enterprises Have Implemented Numerous Activities to Cope with Natural Disaster and Climate Change

The most common practices were reinforcing and repairing existing factories and offices (53%), adjusting working hours due to inclement weather (30%), training staff in natural disaster and climate change response (28%), and participating in natural disaster response and rehabilitation post-natural disaster (28%). A significant number of enterprises reported that they have changed their business strategies and methods due to challenges from natural disaster risk and climate change (26%); others started with factory reconstruction (24%). It is worth noting that up to 19% of enterprises said they had upgraded their production technology, and 18% had even asked their business partners to work out plans to cope with natural disaster risk and climate change. There was also a small number of enterprises that said they moved their factories and workplaces to safer places (10%). The proportion of FDI enterprises conducting response activities is less than that of domestic DDI enterprises, possibly because FDI enterprises often have better infrastructure. The Central Coast region had the highest proportion of enterprises conducting these activities compared to other regions, which is understandable since this is the area most frequently affected by natural disaster and climate change in Vietnam. Enterprises operating in agriculture and forestry and fisheries in the Central Coast region, the Red River Delta region, and the Mekong River Delta region had the highest proportion of enterprises conducting response activities compared to other sectors. In some other regions, such as the Northern Mountainous area, the Central Highlands and the Southeast, enterprises in the mining sector claimed this distinction. As the size of these businesses increases (in terms of capital or labor), the proportion of enterprises that undertake response activities increases. In all sectors, the main reason why businesses conducted response activities was because they deemed these activities necessary.

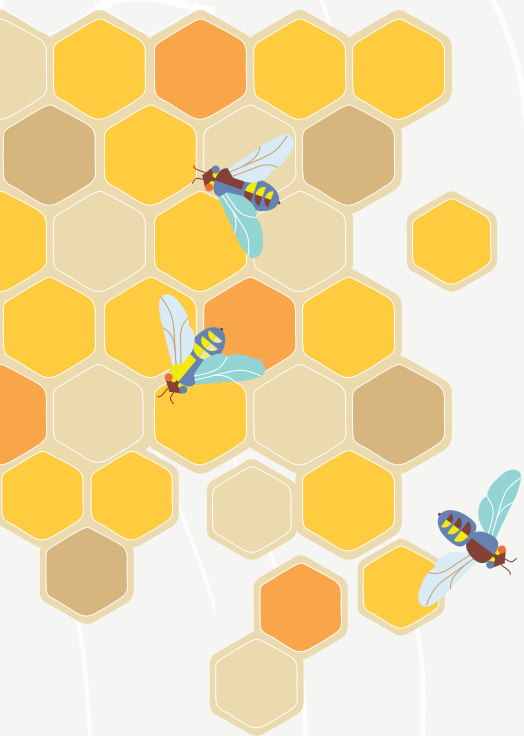
A Significant Percentage of Enterprise Have Purchased Insurance to Prevent Natural Disaster Risk

44.5% of enterprises said they are using a specific insurance product to prevent risks related to natural disaster and climate change. The proportion of FDI enterprises currently using an insurance product is 62.2%, significantly higher than that of DDI enterprise (41.3%). Common types of insurance products that enterprises currently use are insurance on facilities, machines and goods; 55% of FDI enterprises and 33% of DDI enterprises use this type of insurance product. The percentage of enterprises that used business interruption insurance is relatively low, with only 4% of FDI enterprises and 2% of DDI enterprises. About 10% of FDI enterprises and 9% of DDI enterprises use other types of insurance products. Enterprises in the Mekong River Delta have the highest rate of using the listed insurance products compared to other regions. Meanwhile, businesses in the Central Highlands have a lower proportion of firms using insurance products than other regions. The percentage of enterprises using insurance is positively correlated with the size of the business. In terms of years in operation, the higher the number of years in operation, the higher the rate of enterprises using insurance products. Overall, 86% of businesses rated insurance products as useful. Of these, 39% rated the insurance as very helpful and 47% rated it as relatively helpful. Only 10% rated it as less helpful and 4% rated it as not helpful.



Many Have Participated in Contributing to, Responding to, and Overcoming the Consequences of Natural Disasters

About 61% of enterprises surveyed said that they had participated in rescue and relief operation activities after a natural disaster. Cash is the most popular form (57%), followed by in-kind contributions (21%), facilities and manpower (13%), and services (9%). A typical enterprise in Vietnam contributed about VND 5 million (median value). The value of the contribution increases in scale according to the size of the business.



Enterprises Have Relatively Positive Assessments Regarding Government Readiness in Response to Natural Disasters

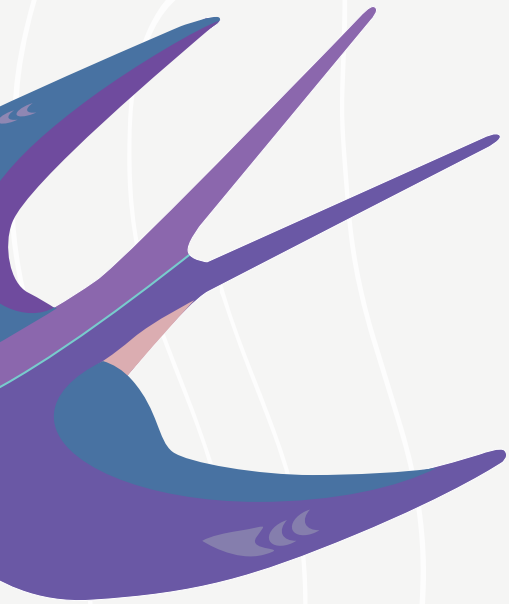
Up to 91% of enterprises said they had easy access to local weather information and data. 90% of enterprises reported that right after a natural disaster occured, basic infrastructure services (electricity, water supply, and telecommunications) were repaired in a timely manner, and most of the time are ready to use immediately. This is a very positive result, as these service providers (most of which are still owned by the state) have done a good job of providing suitable services. 78% of enterprises received an early warning before a natural disaster occurred, and a similar percentage said that local transport infrastructure was quickly restored. Up to 77% of enterprises reported that the local government supported businesses in time for recovering from damages after natural disasters, which shows that the provincial and city governments have been very proactive in post-natural disaster recovery related to businesses. Finally, 68% of businesses rated local infrastructure (roads, embankments, drainage system, etc.) as being of good quality to respond to natural disasters. Although this indicator has the lowest rating from enterprises compared to other indicators, this is still encouraging information, as investing and maintaining good quality infrastructure is still a challenging job for local governments, especially in the context of increasingly limited budgets. Most businesses said they would be willing to participate in relief and recovery after natural disasters. Specifically, 97% of DDI enterprises and 95% of FDI enterprises said they would be willing to participate in this activity.

Enterprises Are Relatively Optimistic When 56% of Them Recognize Opportunities in the Context of Natural Disaster Risk and Climate Change

Specifically, about 30% said that they perceived opportunities for restructuring and reorganizing production. 18% of businesses think this is an opportunity to create new products, services and technologies. A similar percentage, 18%, said that this context provides opportunities for enterprises to expand markets for existing products. About 12% of businesses participating in the survey said that the context of natural disaster and climate change brings branding opportunities, by establishing themselves as environmentally friendly businesses. DDI enterprises seemed to be more optimistic than FDI enterprises. Enterprises in the Central Coast region seemed to have the highest opportunity-recognition rates, followed by enterprises in the Central Highlands and the Mekong River Delta. Enterprises in the fields of agriculture, forestry and fisheries had the highest chance of recognizing opportunities. The newer the businesses, the higher the chance of recognizing opportunity.

Businesses Are Willing to Invest in Improvements to Their Environmental Compliance

On average, enterprises are willing to pay up to 7.32% of operating costs for being more environmentally friendly. Enterprises receiving information that the state will enact and enforce stricter laws related to environmental issues will spend on average 7.44% of their operating costs to improve. Meanwhile, enterprises that receive information on soft solutions and assessments of reputable social organizations in Vietnam are on average willing to pay about 7.29% of operating costs. There is no statistical significance between the two groups of businesses in the experiment. The solution of using voluntary social tools seems to be a good choice in Vietnam, as the willingness of enterprises to pay for investment is not significantly lower than when using of compulsory legal tools. The issuance and implementation of regulations can cost the state's budget, both at the central and local levels. Meanwhile, if using the voluntary tool, the state's resources can be reduced and fully used in other issues which are more efficient given the current financial difficulties that Vietnam is facing.



Specific Actions Businesses Are Ready to Take to Become More Environmentally Friendly

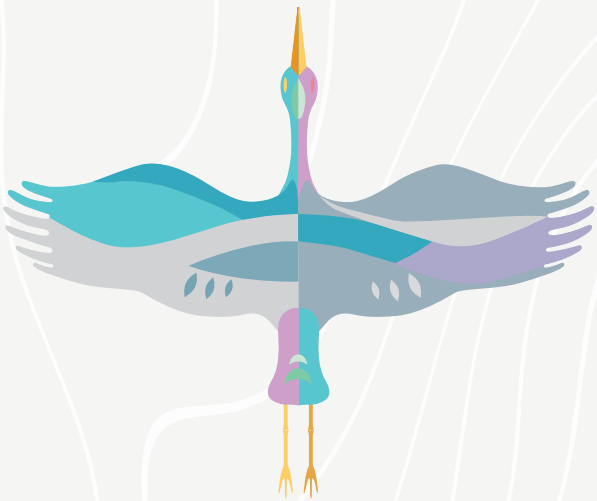
50% of enterprises said they would better train managers and staff on natural disaster and climate change. 36% of enterprises said they would buy input materials from environmentally friendly manufacturers. About one third of enterprises (33%) will apply cleaner technology to production. Notably, up to 10% of businesses will hire specialized staff in charge of compliance with environmental regulations.

Important Incentives for Businesses

The data shows that incentives to increase investment to be more environmentally friendly include local labor quality, a favorable business environment, desire to join global supply chains, and tackling the problem of rising business costs due to climate change.

In Order to Encourage Businesses to Increase their Investment in Becoming More Environmentally Friendly, It is Clear that the Government has a Very Important Role to Play

There is a need to continue creating a favorable business investment environment for businesses to invest safely. It is necessary to focus on improving the quality of labor in localities, but more specifically, the quality of general education and vocational education to better meet the labor needs of enterprises. At the same time, it is important to facilitate businesses taking advantage of opportunities to participate in global supply chains, in the context that Vietnam is increasingly participating in international trade agreements, especially in the new generation free trade agreements, to meet increasingly stringent environmental standards.



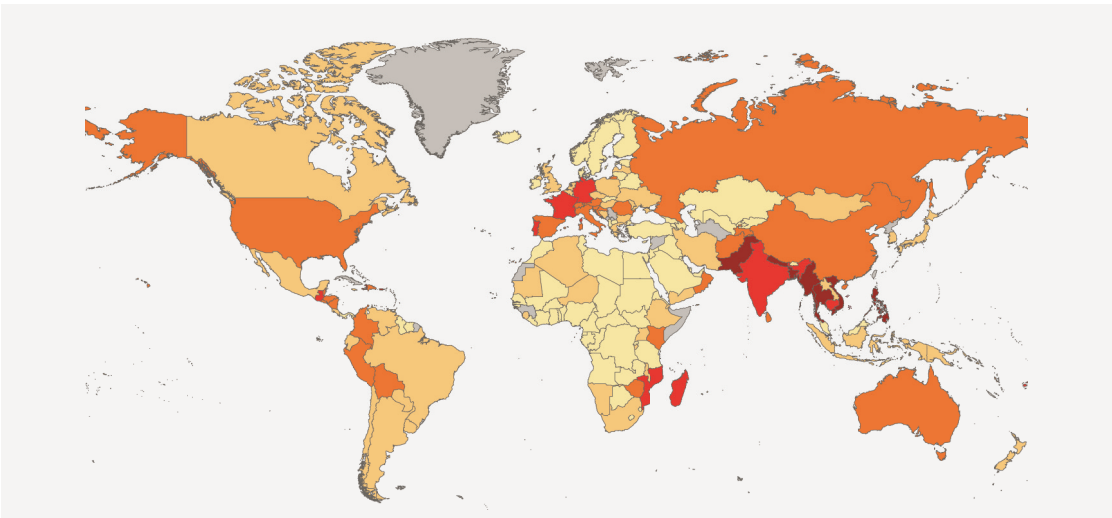
01

Introduction

Background

As one of the most dynamic economies in the world, Vietnam is facing enormous challenges from climate change with its corresponding increase in extreme climate events. Many international studies and assessments have shown that Vietnam is among the countries most seriously affected by climate change. According to the Global Climate Risk Index (CRI) Report published by Germanwatch 2020, in the period 1999-2018, Vietnam ranked 6th among the countries most affected by climate change. With a total of 226 incidents caused by natural disasters in the past 20 years, Vietnam has an average of 285 deaths and a loss of US $ 2 billion annually.[1]

Figure 1.1 Countries Most Affected by Extreme Climate Events (1999-2018)



Countries most impacted by extreme natural disasters (1999-2018)

1	Puerto Rico	6	Vietnam
2	Myanmar	7	Bangladesh
3	Haiti	8	Thailand
4	Philippines	9	Nepal
5	Pakistan	10	Dominica

Climate Risk Index: Ranking for 1999-2018

1-10 | 11-20 | 21-50 | 51-100 | >100 | No data

Source: Germanwatch, Global Climate Risk Index 2020

1 *Germanwatch, Global Climate Risk Index 2020: Who Suffers Most from Extreme Weather Events? Weather-Related Loss Events in 2018 and 1999 to 2018. Đăng tại <http://germanwatch.org/sites/germanwatch.org files/20-2-01e%20Global%20Climate%20Risk%20Index%202020_14.pdf>*

Natural disasters and extreme events caused by climate change are increasing both in scale and number, thereby negatively affecting many achievements of Vietnam's socio-economic development. In the period of 2002-2010, the damage caused by natural disasters nationwide was significant. The damage amount reached its lowest level at 0.14% of GDP in 2004 and peaked at 2% of GDP in 2006. The impact of climate change, with extreme events such as rising temperatures, drought, sea level rise, etc, are narrowing the area of agricultural land, reducing crop and livestock productivity, reducing the supply of raw materials for the manufacturing industry, and increasing energy consumption and production costs in many industries. Climate change also has a negative impact on technical infrastructure such as sea dyke systems, river dykes, embankments, water supply, and urban infrastructure.[2]

Data released by the General Statistics Office (GSO) has confirmed the severity of natural disaster risk and climate change, showing that damages caused by natural disasters have increased significantly in recent years (Table 1.1). In 2017 alone, the total value of damages caused by natural disasters amounted to 60,027 billion VND, with 386 deaths, 668 injuries, 8,309 houses collapsed, 588,845 houses flooded, 243,517 hectares of rice and 130,678 hectares of crops damaged.

Table 1.1 Damages Caused by Natural Disasters in Recent Years

	2011	2012	2013	2014	2015	2016*	2017
Human casualties (persons)							
Number of dead and missing	257	269	313	145	157	264	389
Number of injured	267	440	1,150	165	199	431	668
Housing damages (houses)							
Houses collapsed	1,152	2,776	6,518	1,936	1,088	5,431	8,309
Houses flooded, swept away, damaged roof	391,806	112,184	694,619	51,342	30,953	364,997	588,845
Agriculture losses (Ha)							
Damaged rice land area	241,165	181,516	114,844	128,085	56,894	527,743	234,517
Damaged crop land area	89,341	115,408	155,708	43,809	26,753	150,459	130,678
Total amount of loss (billion VND)	**10,125**	**13,374**	**29,601**	**2,542**	**5,362**	**39,726**	**60,027**

(*) This includes damage due to drought and saline intrusion in the Central Highlands, South Central region and Mekong Delta provinces.

Source: General Statistics Office, www.gso.gov.vn

2 *Tran Tho Dat, Dinh Duc Truong, Vu Thi Hoai Thu. 2013. The impact of climate change on Vietnam's economy (Tác động của biến đổi khí hậu đến kinh tế Việt Nam) published in < https://moitruong.com.vn/moi-truong-sos/bien-doi-khi-hau/tac-dong-cua-bien-doi-khi-hau-den-kinh-te-viet-nam-7424.htm>*

Forecasts on the impact of climate change on Vietnam's socio-economic development indicate that urgent action is needed. The World Bank predicts that climate change may affect 1.5% of Vietnam's gross domestic product (GDP) between now and 2050, and will negatively impact macroeconomic achievements, institutional reforms, and environmental sustainability goals[3]. DARA International's report on climate change vulnerability (2012) pointed out that, if Vietnam does not have a timely response, climate change damage may be as high as 11% of GDP by 2030[4]. The Central Institute for Economic Management (Ministry of Planning and Investment) and the University of Copenhagen (2012) estimated that Vietnam's GDP will reach about US $ 500 billion by 2050, but the damage caused by climate change can reach to about 40 billion USD if effective climate change response policies will not be taken[5].

The Government of Vietnam has recognized the importance of responding to climate change, as shown in the promulgation and implementation of the National Target Program to respond to climate change in 2008 and the National Strategy on Climate Change in 2011, along with many other actions. However, the gap between policy and enforcement in this area is still relatively large, especially for the business sector. A study by the Vietnam Chamber of Commerce and Industry (VCCI) and the Asia Foundation, published in 2017, (the White Paper on Natural Disaster Risks - Climate Change and Action of Vietnamese Enterprises) has shown that in reality, many businesses have not grasped the policies and laws on climate change and natural disaster risk reduction[6]. Accordingly, not many businesses have grasped the laws on natural disaster prevention and response strategies to mitigate the negative impacts of natural disaster risk and climate change. In addition, businesses are not aware of the State's incentives and subsidies related to climate change, such as energy-saving technologies and emission reductions. Therefore, these incentives have not yet been used as advantages or business oportunities. Meanwhile, businesses are crucial elements in the economy, not only from the perspective of contributing via their annual budgets, but also from the perspective of creating jobs for workers, as well as participating in the process of responding to natural disaster risk and climate change in Vietnam.

The business community plays an important role in responding to climate change, but the participation of businesses in this work is still limited. This stems from the fact that the focus of Vietnam's climate change policy does not appear to be directed toward the business community. Specific information about perceptions of Vietnamese enterprises related to climate change, the extent of the impact of climate change on businesses, their actions, etc, seems to be lacking. If this information is supplemented, it will provide useful insights for the process of completing policies and laws on climate change adaptation in Vietnam.

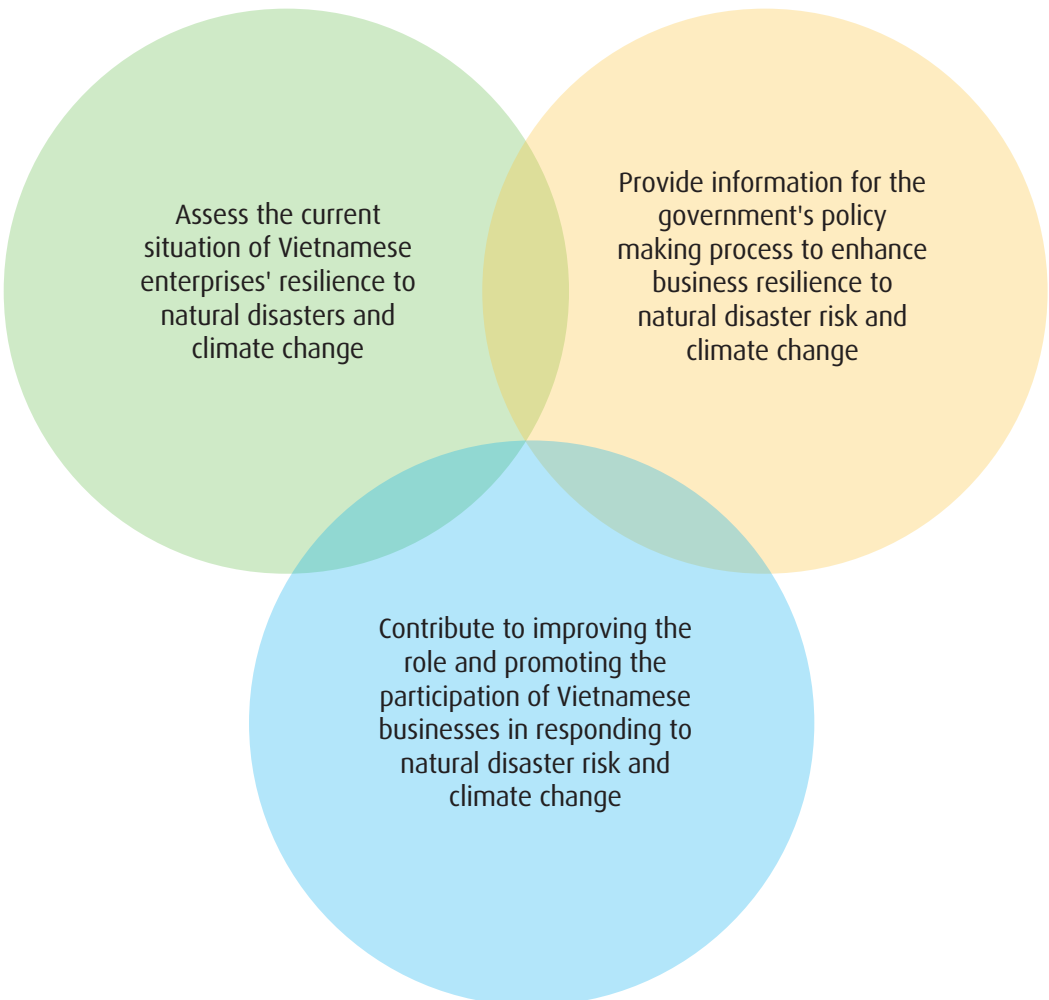
3 *"Climate Change will shrink GDP (Biến đổi khí hậu sẽ 'kéo tụt' GDP), Thanh Nien Newspaper on 18/01/2019, published at < https://thanhnien.vn/thoi-su/bien-doi-khi-hau-se-keo-tut-gdp-1044608.html >*

4 *DARA International. 2012. Climate Vulnerability Monitor 2 Edition. A Guide to the Cold Calculus of a Hot Planet, published at <https://daraint.org/climate-vulnerability-monitor/climate-vulnerability-monitor-2012/report/>*

5 *Central Institute for Economic Management and University of Copenhagen. 2012. Implications of Climate Change for Economic Growth and Development in Vietnam. Published in <http://www.mpi.gov.vn/Pages/tinbai.aspx?idTin=17980&idcm=236>*

6 *VCCI and The Asia Foundation. 2017. The White Paper on Natural Disaster Risks – Climate Change and Action of Vietnamese Enterprises (Sách Trắng Rủi ro thiên tai – Biến đổi khí hậu và Hành động của Doanh nghiệp Việt Nam), Thế giới Publishing House*

Due to this fact, VCCI and the Asia Foundation collaborated to conduct a wide-ranging enterprise survey on climate change topics in Vietnam, which will be integrated into the content of the Provincial Competitiveness Index Survey (PCI). The PCI survey was an attempt by VCCI and the United States Agency for International Development in 2005 to assess and rank the quality of economic governance and the ease of the business investment environment in 63 provinces, aiming to promote the development of the private sector. With an annual response of over 10,000 businesses, this is the most comprehensive annual enterprise survey in Vietnam today. The integration of enterprise resilience assessments into the PCI survey has been agreed by VCCI and the Asia Foundation to:



Methodology

The PCI Survey was implemented with professionalism and scientific transparency, in accordance with international standards. The research team started the survey by selecting a sample of participating enterprises, based on the list of businesses generating taxes in each province or city sourced from the competent tax authorities. Because the research team wanted to make comparisons across provinces, instead of selecting a national sample, a sample selection should be conducted for each province. If the sample were selected for the whole country, the sample of such a survey would be concentrated mainly in the two largest economic centers of the country, Hanoi and Ho Chi Minh City (which accounted for 20.6% and 31.6% of the total 758,610 businesses operating nationwide at the end of 2019.[7])

To conduct a sample selection by province, the research team used a list of businesses that were generating taxes. The list of such enterprises is grouped by enterprise types (DDI enterprises, limited liability companies, joint stock companies, etc), economic sectors (industrial production, construction, mining, commercial and services, agriculture, forestry, fishery, etc) and the year in which the business started operation (before the effective date in 2004 – from 2005 to 2015 - and from 2016 onwards). The size of the enterprise is not a factor for categorization, as this criterion is highly correlated with the type of business. After verifying the phone number and business address, the research team mailed the questionnaire to the corresponding combination ratio of 45 enterprises from the 3 groups of criteria mentioned above. Enterprises were randomly selected by computer in proportion to each of the above groups in each province or city.

After considering a variety of methods, the research team selected the method of investigation by mail. Although the direct survey method has a higher response rate than the mail survey method, it has the disadvantage of affecting the feasibility of the research project. Firstly, sending the research team to all 63 provinces and cities would be very costly, which would limit the scope of the survey. Moreover, by conducting the direct method, many small and micro enterprises in rural, mountainous, island or remote areas will not be mentioned. Secondly, the direct method does not guarantee the confidentiality of information, which would reduce the openness of the investigated subjects. Businesses might be concerned about the survey not maintaining their confidentiality and therefore avoid answering sensitive questions that might affect their business. Finally, a face-to-face survey would require a significant number of enumerators, and although these individuals can be well-trained, they can still influence the respondent, making them nervous and unwilling to provide accurate information. These influences are often caused by interview skills and personalities. Because they are not systematic, these effects are difficult to calculate and can therefore lead to less accurate investigation results. Moreover, the response rate of the two survey methods (direct and by mail) is not so different when other variables such as wrong address and invitation denial have been accounted for.

7 *Ministry of Planning and Investment, White Paper on Vietnamese Enterprises 2020, Statistics Publishing House 2020*

For the reasons mentioned above, the research team decided to choose the method of investigation by mail, and proposed technical solutions to minimize errors caused by the rate of no response. With this survey, the research team conducted thorough training for staff on the content of the questionaire and skills to communicate and connect with enterprises. In this investigation, the research team also paid attention to the design of the professional questionnaire. The team also prepared an electronic copy, a printed copy, and a complete invitation letter with information about survey objectives and survey agencies to strengthen businesses' confidence level.

Characteristics of Participant Businesses

Responding to this survey were 10,356 enterprises operating across the country (from two economic categories: FDI and DDI). In particular, there were 8,773 DDI enterprises from all 63 provinces and cities across the country, and 1,583 FDI enterprises from the 21 provinces with the highest number of foreign investment projects in Vietnam. The table below shows the specific number of responses by province.

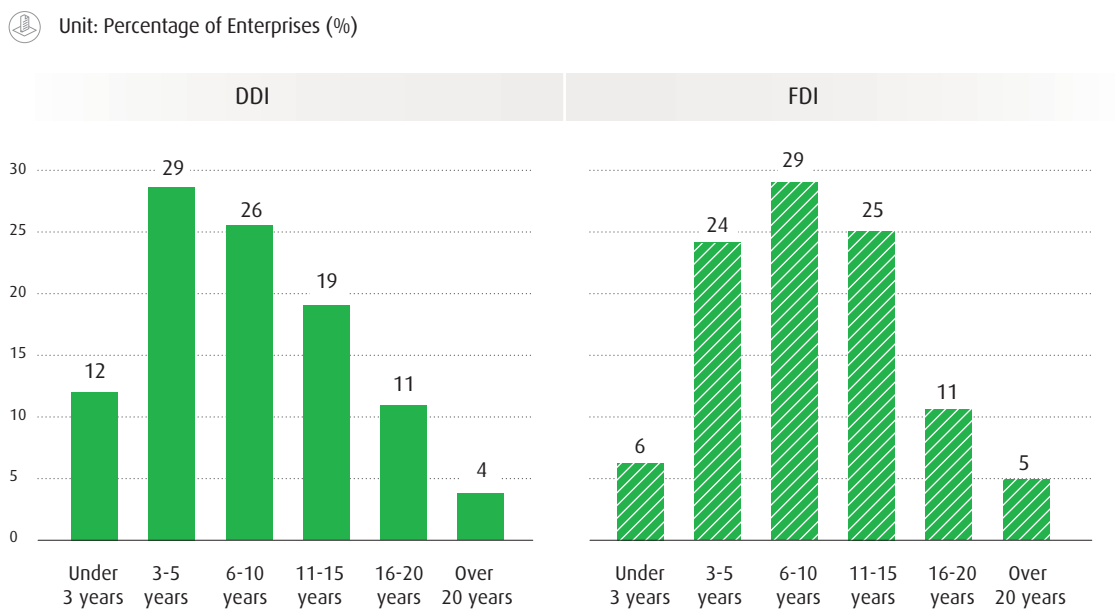
Table 1.2 Numbers of Enterprises Responding to the Survey (Classified by Provinces)

Province/City	Number of Enterprises	Province/City	Number of Enterprises
An Giang	101	Kon Tum	121
Bac Giang	174	Lai Chau	115
Bac Kan	83	Lam Dong	176
Bac Lieu	94	Lang Son	122
Bac Ninh	257	Lao Cai	125
Ben Tre	103	Long An	151
Binh Đinh	154	Nam Dinh	152
Binh Duong	430	Nghe An	195
Binh Phuoc	106	Ninh Binh	110
Binh Thuan	132	Ninh Thuan	115
BRVT	175	Phu Tho	139
Ca Mau	113	Phu Yen	127
Can Tho	120	Quang Binh	100
Cao Bang	125	Quang Nam	181
Da Nang	274	Quang Ngai	128
Dak Lak	141	Quang Ninh	171
Dak Nong	116	Quang Tri	124
Dien Bien	116	Soc Trang	86
Dong Nai	281	Son La	118

Province/City	Number of Enterprises	Province/City	Number of Enterprises
Dong Thap	112	Tay Ninh	158
Gia Lai	103	Thai Binh	159
Ha Giang	89	Thai Nguyen	167
Ha Nam	166	Thanh Hoa	164
Ha Noi	675	Tien Giang	142
Ha Tinh	111	HCMC	616
Hai Duong	207	Tra Vinh	121
Hai Phong	341	Hue	151
Hau Giang	86	Tuyen Quang	130
Hoa Binh	120	Vinh Long	123
Hung Yen	155	Vinh Phuc	213
Khanh Hoa	162	Yen Bai	116
Kien Giang	118	Total	10,356

Most of the businesses that responded to the survey have worked in Vietnam over a long period. Specifically, approximately 60% of the DDI enterprises and 70% of the FDI enterprises have been in operation for 6 years or more. 29% of the DDI enterprises and 24% of the FDI enterprises have had 3-5 years of operation. Only 12% of the DDI enterprises and 6% of the FDI enterprises have been in operation for less than 3 years.

Figure 1.2 Number of Years in Operation of Enterprises



The figure below shows the main sectors of the enterprises. For DDI enterprises, about 64% operate in commercial and services, 18% in manufacturing and 14% in construction. The proportion of enterprises operating in agriculture and mining were only 2% and 1%, respectively (equivalent to 184 and 110 respondents) – for this type of analysis within this sector, it is a significant number of responses. For FDI enterprises, 61% of enterprises operate in manufacturing, and 34% in commerce and services. Basically, the proportions of business sectors in this survey are quite similar to the current structure of Vietnam's economy and its industrial statistics.

Figure 1.3 Main Sectors of Enterprises by Economic Categories

Unit: Percentage of Enterprises (%)

02

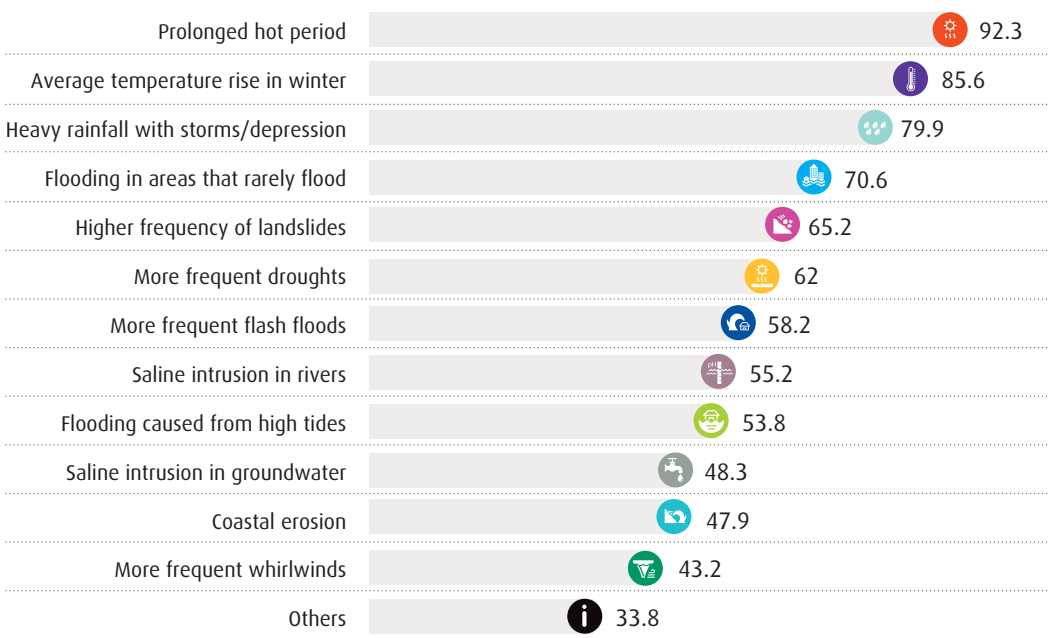
Signs of Climate Change from the View of Enterprises

Observations of the Enterprises on Climate Change Phenomena

The content of the survey on natural disasters, climate change and the adaptive capacity of enterprises begins with a question asking enterprises whether they recognize the changes in some common climate phenomena over the last 5 years. As shown in Figure 2.1, an increase in temperature is the phenomenon most observed by businesses, namely 92.3% of businesses noticing a prolonged hot period (of 3 consecutive days or more); 85.6% of businesses reported the phenomenon of rising average temperatures in winter. Followed by this, businesses reported an increase in the occurrence of heavy rainfall events with storms/depression (79.9%), flooding in areas that rarely flood (70.6%), higher frequency of landslides caused by heavy rains (65.2%) and drought leading to more frequent water shortages (affecting supply for irrigation, production and domestic use) (62%). Some other phenomena observed by enterprises included flash floods due to more frequent heavy rainfall (58.2%), saline intrusion in rivers happening more frequently, especially in the dry/summer season (55.2%), flooding caused from high tides (53.8%), coastal erosion (47.9%) and more frequent whirlwinds (43.2%).

Figure 2.1 Observations of Enterprises on Natural Disaster Risks and Climate Change

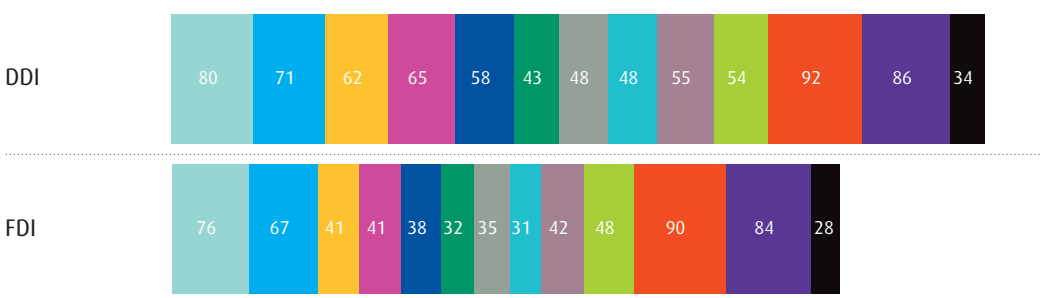
Unit: Percentage of Enterprises reported (%)



The figure below shows the cumulative weather events that businesses observed by each economic category. Although the observed rates for each phenomenon vary among businesses in each economic category, common phenomena that businesses report are extreme weather events such as more hot periods, rising average temperatures, and heavy rain associated with storms, tropical depressions, and floods. The cumulative number of FDI businesses observing extreme weather events is lower than that of DDI. This is probably because the FDI enterprises participating in this survey have investment locations in the 21 most developed provinces and cities across the country, usually those with more favorable climatic conditions than the remaining provinces. Not to mention, FDI enterprises are often located in industrial zones, where there is more integrated infrastructure. Meanwhile, DDI enterprises in this survey cover all 63 provinces and cities across the country, with many businesses in remote and mountainous provinces where climatic conditions are extreme with limited infrastructure.

Figure 2.2 Observation of Natural Disaster Risks and Climate Change Events by Economic Sector

Unit: Percentage of Enterprises reported (%)

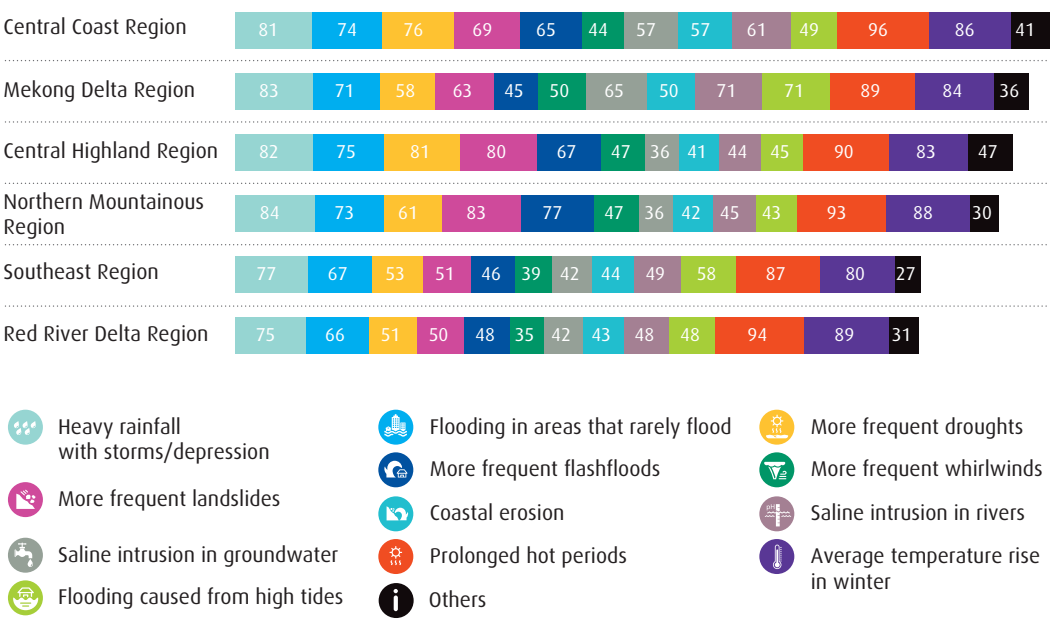


- Heavy rainfall with storms/depression
- More frequent landslides
- Saline intrusion in groundwater
- Flooding caused from high tides
- Flooding in areas that rarely flood
- More frequent flashfloods
- Coastal erosion
- Prolonged hot periods
- Others
- More frequent droughts
- More frequent whirlwinds
- Saline intrusion in rivers
- Average temperature rise in winter

Enterprises' observations on the changes in weather phenomena of climate change are quite similar to the actual climatic situation reflected in the press. Accordingly, the Central Coast region and the Mekong River Delta are the two regions where the enterprises' cumulative rate of observing climate change change was most significant. The Southeast and the Red River Delta are the places where the enterprises' cumulative rate of observing climate change is lowest, however, the data collected still reflects notable characteristics. The data shown in this figure is from DDI enterprises and business groups present in all 63 provinces and cities across the country.

Figure 2.3 Observation of Natural Disaster Risks and Climate Change Events by Region

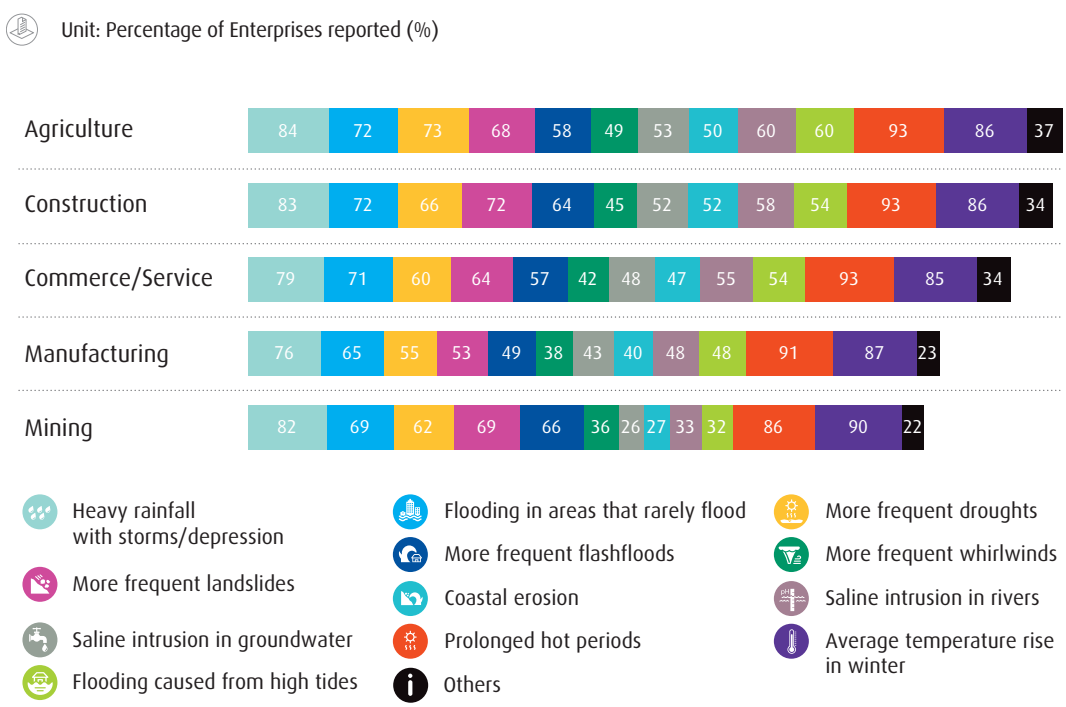
Unit: Percentage of Enterprises reported (%)



Note: Not all weather phenomena apply to each region. For example, saline intrusion of groundwater and coastal erosion never occur in the Central Highlands or Northern Mountainous regions. However, as an enterprise can now carry out production and business activities in many provinces across the country, it may include such phenomena when answering the questionnaire, despite having headquarters in another region. Therefore, we respect enterprises' answers and will reflect the results of this study accordingly.

Figure 2.4 shows the observed levels of extreme weather events, classified by business sectors. Agriculture, forestry, and fisheries is the sector with more production and business activities associated with changes in weather, so this industry has the highest rate of enterprises observing changes in climate phenomena. This is followed by enterprises in the field of construction, as when the weather is too extreme, construction activities may be greatly affected - even postponed, in some cases. Mining enterprises have the lowest cumulative number of observed phenomena compared to the remaining sectors, but some basic phenomena such as average temperature increase, more hot periods, storms, etc, are still observed clearly by enterprises in this sector. Some phenomena, such as flash floods due to heavy rains, are observed more often by mining enterprises compared to enterprieses in other sectors. This is likely because mining enterprises often have mining fields or mines, places where it is easy to spot this phenomenon.

Figure 2.4 Observation of Disaster Risk and Climate Change Events by Industrial Sector



The enterprises' observations on the above phenomena of changing weather are quite similar to the evaluation and research of state agencies. According to the Climate change and sea level rise scenarios for Vietnam (updated 2016 version) published by the Ministry of Natural Resources and Environment, the manifestations and trends of climate change in Vietnam include: an increasing trend in temperature across all regions compared to the baseline period (1986 - 2005), with the largest increase in the northern region; The lowest average and the highest average temperatures tend to increase or decrease significantly; Annual rainfall tends to increase nationally; Rainfall in the dry season in some areas tends to decrease. Compared to the baseline period, average maximum daily rainfall tends to increase across the territory of Vietnam with a common increase from 10 to 70%. Some extreme climatic phenomena include: Number of storms and tropical depressions do not vary, but have a more concentrated distribution at the end of the hurricane season, which is when the active storm period in the South occurs; Strong to very strong storms are on the rise; Summer monsoon tends to start earlier and end later; Rain during the monsoon period tends to increase; The number of cold and damaging cold days in the Northern mountainous provinces, the Northern Delta and the North Central Coast decrease; The number of hot days (the highest number of days with temperature Tx ≥ 35°C) tends to increase across most of the country, the most being in the North Central, South Central and Southern regions; Drought can become more severe in some areas due to rising temperatures, as well decreasing rainfall in the dry season, such as in the South Central Coast during spring and summer, Southern Vietnam during spring, or Northern Region in the winter, etc[8].

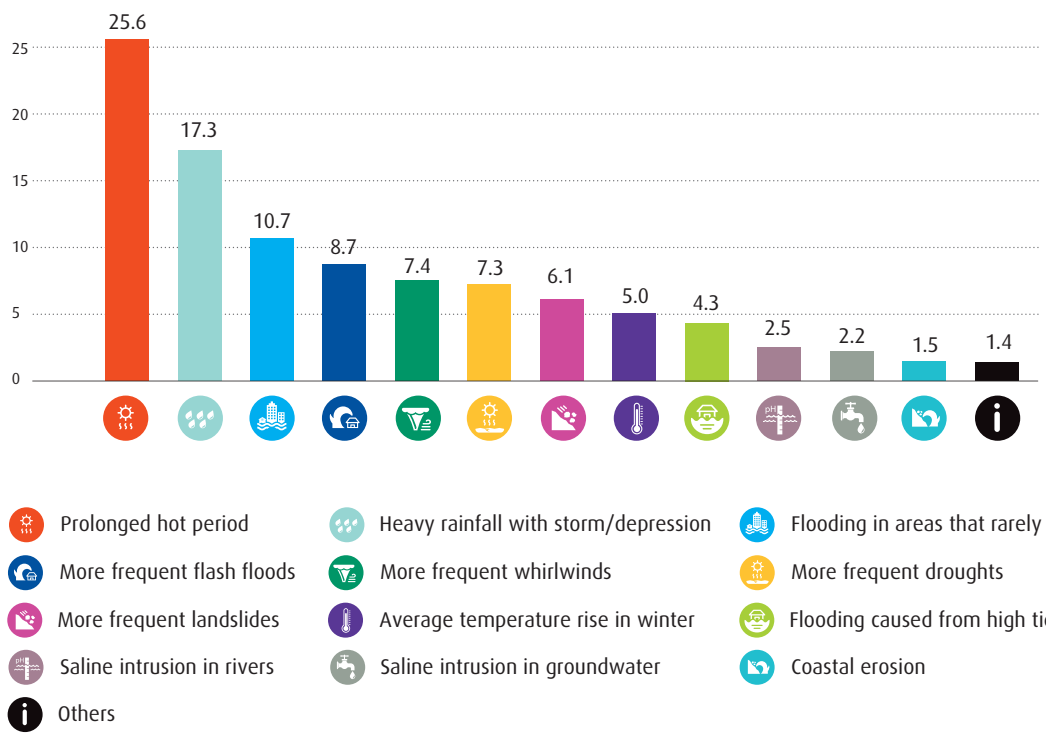
8 *Ministry of Natural Resources and Environment, Climate change and sea level rise scenarios for Vietnam, Vietnam Natural Resources and Environment Publishing House, Hanoi Map, 2016. Published at:<http://chuyentrang.monre.gov.vn/upload/13376/fck/files/KBBDKH_2016.pdf>*

The Phenomenon that Enterprises Are most Concerned About

With the above set of phenomena, the research team asked businesses to list which of the phenomena they were most concerned about negatively affecting their business. The survey results show that, on a national scale, the businesses are most concerned about: more hot periods (25.6%), heavy rain with tropical storms / pressure (17.3%) and flooding in places where this rarely occurred before (10.7%). These are the three phenomena with the highest concern rate among enterprises.

Figure 2.5 Phenomena that Enterprises Are most Concerned About

Unit: Percentage of Enterprises reported (%)



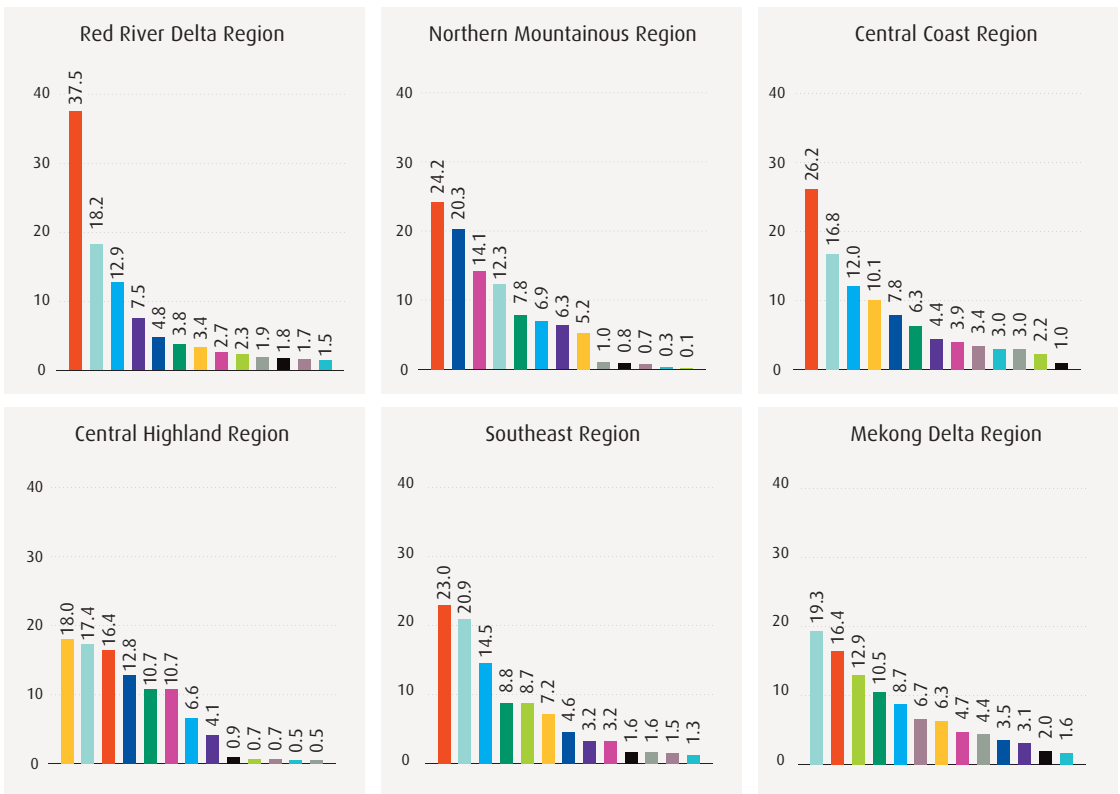
So, which extreme climate events do businesses in different regions worry about? The survey results show that businesses in the Red River Delta region are most concerned about more hot periods, heavy rain with tropical storms / depressions and average temperature increases. For businesses in the Northern Mountainous area, the phenomena of greatest concern are prolonged hot periods,

flash floods, landslides and whirlwinds. In the Central Coast region, businesses are concerned about more hot periods, heavy rainfall with tropical storms / depressions, floods and drought. Businesses in the Central Highlands are most concerned about more frequent drought, heavy rains with storms / depressions, more hot periods and flash floods. In the Southeast, businesses are most concerned about more hot periods, heavy rains with storms / depressions, floods and whirlwinds.

Meanwhile, businesses in the Mekong Delta are concerned about the phenomena of heavy rains with storms / tropical depressions, more hot periods, and flooding due to high tides and whirlwinds. This is also the region where the enterprise aggregation report rate on the problem of river and groundwater salinization is up to 11.1%, significantly higher than other regions. Note that this survey was completed during the rainy season of 2019 in the South. If this survey were conducted at the beginning of the dry season, when negative consequences for production in the area have occurred frequently (from December 2019 to May 2020), then the rate of enterprises reporting on this phenomenon would be even higher.

Figure 2.6 Phenomena that Enterprises Are most Concerned About by Region

Unit: Percentage of Enterprises reported (%)



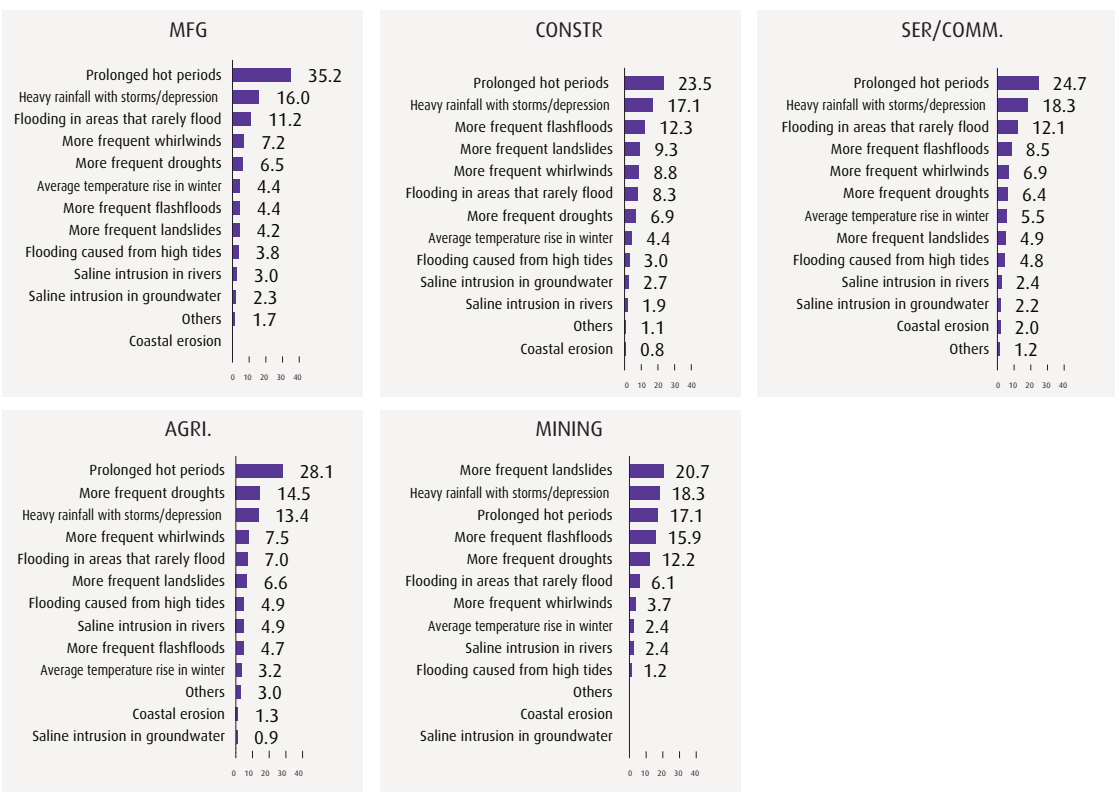
- Heavy rainfall with storms/depression
- More frequent landslides
- Saline intrusion in groundwater
- Flooding caused from high tides
- Flooding in areas that rarely flood
- More frequent flashfloods
- Coastal erosion
- Prolonged hot periods
- Others
- More frequent droughts
- More frequent whirlwinds
- Saline intrusion in rivers
- Average temperature rise in winter

Note: Not all weather phenomena apply to each region. For example, saline intrusion of groundwater and coastal erosion never occur in the Central Highlands or Northern Mountainous regions. However, as an enterprise can now carry out production and business activities in many provinces across the country, it may include such phenomena when answering the questionnaire, despite having headquarters in another region. Therefore, we respect enterprises' answers and will reflect the results of this study accordingly.

Figure 2.7 shows the selection of the most concerning phenomena that enterprises reported, classified by sectors. Industrial enterprises were most worried about more hot periods, heavy rains with storms / depressions and floods. This is also a concern of businesses in the field of commercial and services. Businesses in the construction sector are most concerned about more hot periods, heavy rains with storms / depressions and flash floods. Businesses in agriculture, forestry and fisheries are concerned about more hot periods, more frequent drought and heavy rains with storms / depressions. Meanwhile, mining enterprises expressed concern about landslides caused by heavy rain, heavy rain with storms / depressions and more hot periods.

Figure 2.7 Phenomena that Enterprises Are most Concerned About by Industrial Sector

Unit: Percentage of Enterprises reported (%)



03

Impacts of Climate Change on Enterprises

Overall Impacts

Continuing the question of identifying climate phenomena, we asked businesses to assess the impact of natural disaster risk and climate change on their production and business activities. The scale of assessment is from 1 to 10, in which a score of 1 means the risk of natural disaster and climate change only brings negative impacts and absolutely does not bring any opportunities for businesses, whereas a score of 10 means that natural disaster risks and climate change do not have any negative effects and can only create opportunities for businesses.

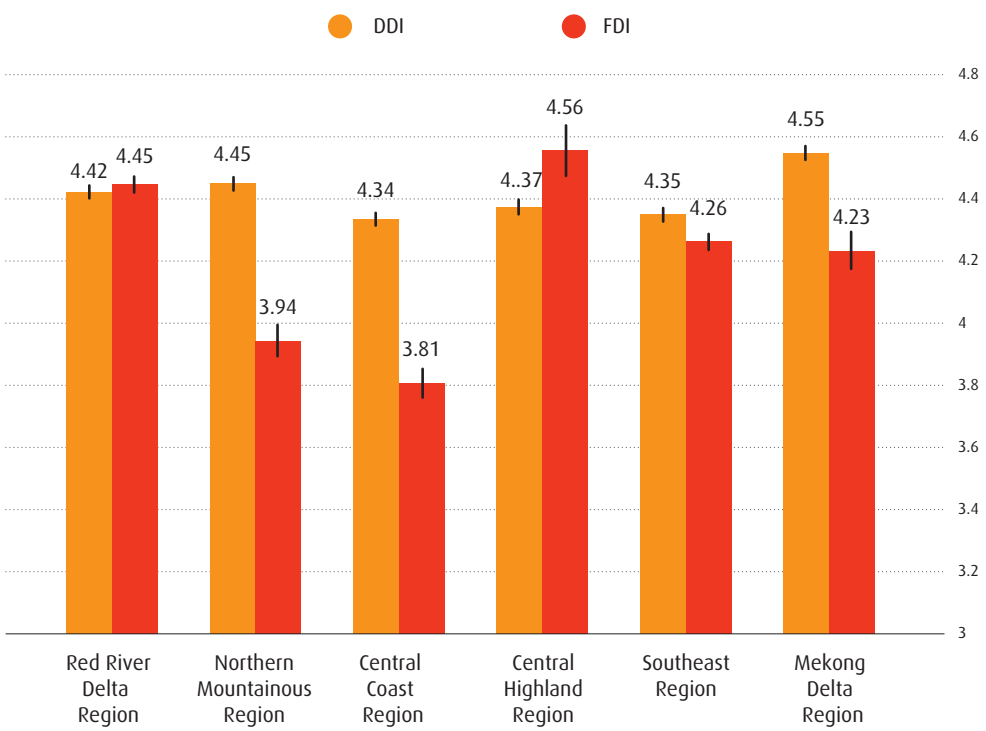
Table 3.1 shows the results of assessing the overall impact of natural disaster risk and climate change on enterprises by economic categories. The median value of both business groups is 5 points, whereby businesses recognize both positive and negative impacts of natural disaster risk and climate change on production and business activities. However, judging by the average score, both groups are more inclined toward negative effects. Specifically, for DDI enterprises, 40.2% rated the impact of climate change at 4 points or less, 34.5% at 5 points and about 25% from 6 to 10 points. For FDI enterprises, 43% rated the impact from 1 to 4 points, 34.5% rated 5 points and 22.4% chose 6 points or more. FDI enterprises rated the overall impact of natural disaster risk and climate change to be more negative than that of DDI enterprises, although this difference was not statistically significant.

Table 3.1 Overall Impact of Natural Disaster Risk and Climate Change on Enterprises by Economic Categories

Economic categories	Number of respondents	Median	Mean	Standard Deviation	Min	Max
DDI	6,458	5	4.41	2.17	1	10
FDI	1,150	5	4.3	2.25	1	10
Total	7,608	5	4.41	2.17	1	10

Further analysis assessing the overall impact of natural disaster risk and climate change on enterprises by region and economic sector shows some noticeable characteristics. First, it can be seen that there are two regions where FDI enterprises assess the impact of natural disaster risk and climate change more positively than DDI enterprises, namely the Red River Delta and the Central Highlands. In the rest of the regions, including the Northern Mountainous area, Central Coast, Southeast and Mekong River Delta, FDI enterprises seem to be more worried than DDI enterprises. The most significant difference is in the Central Coast region, where FDI enterprises are significantly more concerned about the impact of natural disaster risk and climate change than DDI enterprises, so much so that compared to the rest of the country they have the lowest average score.

Figure 3.1 Assess the Impact of Disaster Risk and Climate Change on Businesses by Region and Economic Sector



Impact (1. Absolutely negative – 10. Completely positive)

Table 3.2 presents the overall assessment of the impact of natural disaster risk and climate change on capital size and labor size in DDI enterprises. Regardless of capital or labor size, the general notable characteristic is that the larger the enterprise, the more they are aware of the impact of natural disaster risk and climate change on their production and business activities. Specifically, for enterprises with a capital scale of less than 1 billion dong, the average score is 4.56 points. In contrast, for enterprises with a scale of over 100 billion dong, the average score is only 4.19 points. Similarly, enterprises with less than 10 employees rated an average score of 4.47 points, while enterprises with more than 500 employees rated the average score as only 3.70 points.

Table 3.2 Assess the Impact of Disaster Risk and Climate Change on Businesses by Scale

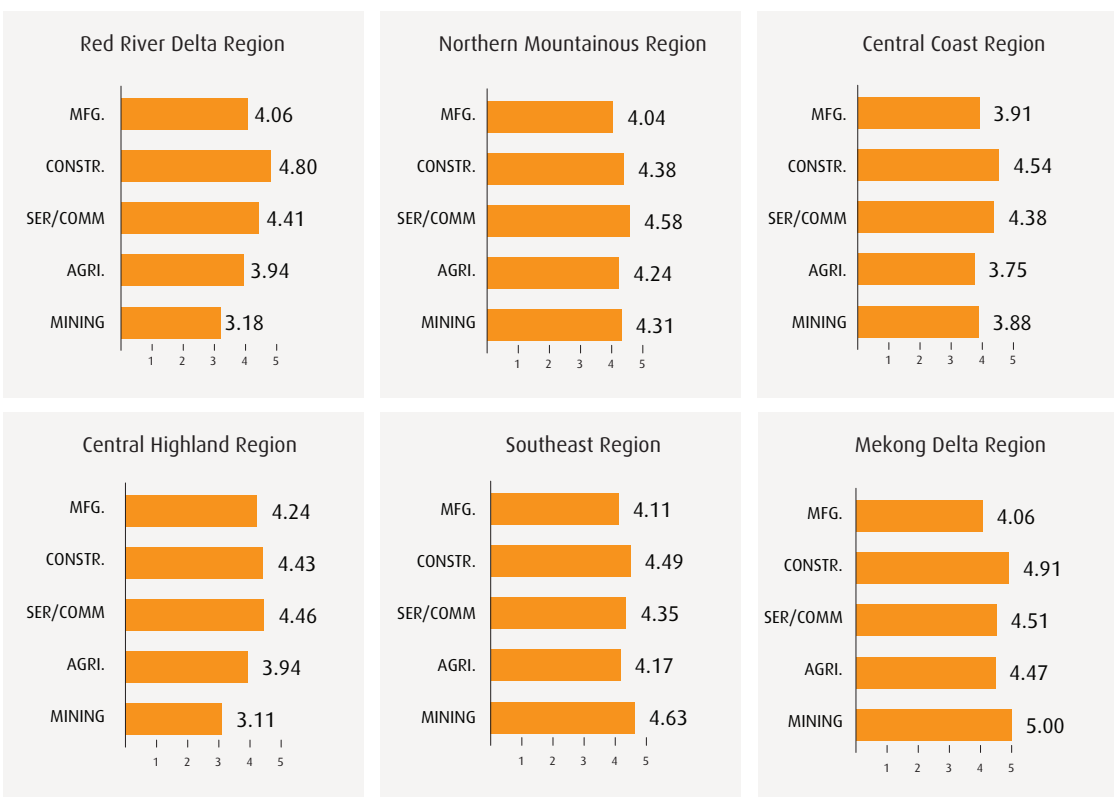
Capital scale (billion VND)	Number of enterprises	Median	Mean	Standard deviation	Min	Max	Confidence Interval 95% [lower bound]	[upper bound]
Under 1	1,262	5	4.56	2.09	1	10	4.45	4.68
1-5	2,477	5	4.40	2.18	1	10	4.31	4.48
5-10	947	5	4.45	2.13	1	10	4.31	4.58
10-50	951	5	4.32	2.23	1	10	4.17	4.46
50-200	325	5	4.38	2.34	1	10	4.12	4.63
Over 200	154	5	4.19	2.22	1	10	3.84	4.54
Total	6,458	5	4.41	2.17	1	10	4.36	4.47

Labor scale	Number of enterprises	Median	Mean	Standard deviation	Min	Max	Confidence Interval 95% [lower bound]	[upper bound]
Under 10	3.287	5	4.47	2.14	1	10	4.4	4.54
10-49	2.076	5	4.40	2.17	1	10	4.3	4.49
50-199	652	5	4.38	2.29	1	10	4.2	4.55
200-499	188	5	4.24	2.2	1	10	3.93	4.56
Over 500	94	3	3.70	2.2	1	8	3.26	4.15
Total	6,458	5	4.41	2.17	1	10	4.36	4.47

If classified by sectors, it can be seen that DDI enterprises in the mining sector had the most negative impact rating, with 4.02 points. This was followed by industrial and agricultural enterprises, with 4.05 and 4.14 points respectively. Meanwhile, the overall impact of natural disaster risk and climate change on businesses in the field of commerce and services and construction are 4.44 and 4.58 points, respectively. Note that there is no field in which a business rated above 5.

Figure 3.2 describes the impact of natural disaster risk and climate change by region and sector. It can be seen that businesses in the industrial and agricultural sectors have the most negative impact assessment in the Central Coast region. Mining enterprises in the Central Highlands have the most negative impact rating compared to mining enterprises in other regions. Construction enterprises in the Northern Mountainous area are the group with the most negative impact evaluation score. In the Southeast region, enterprises in the sector of commerce and services have the lowest score in the region.

Figure 3.2 Assess the Impact of Disaster Risk and Climate Change on Enterprises by Region and Sector



Impact (1. Absolutely negative – 10. Completely positive)

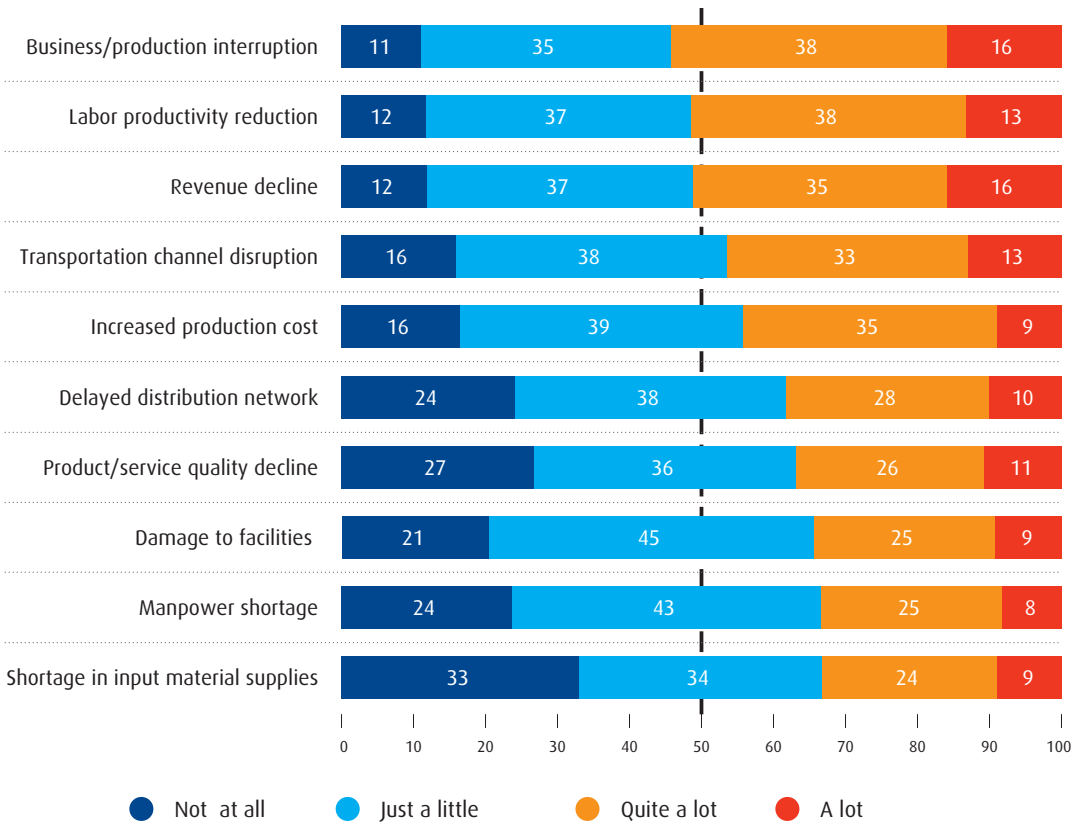
Specific Impacts on Production and Business Activities

In addition to the impact assessment proposal mentioned above, the 2019 survey asks businesses to assess the impact of natural disaster risk and climate change on their specific business and production activities. We list 10 aspects in detail, from increasing production and business costs, disrupting operations, damaged facilities, to declining revenue, etc. There are 4 impact levels for businesses to choose, including: 1) no impact; 2) little impact; 3) Relatively impacted; and 4) Significantly impacted.

Figure 3.3 presents the rating of specific impacts of natural disaster risk and climate change on enterprises (arranged in decreasing order) in the relatively impacted / significantly impacted level. Specifically, at the level of relatively impacted / significantly impacted, interruption in production and business activities has the highest reported rate (54%). It is followed by lower labor productivity and revenue decline (both at 51%). There is a significant percentage of enterprises reflecting a disruption in their transportation channels (46%) and increasing production and business costs of enterprises (44%). Following this is a significant proportion of enterprises reporting on the delayed distribution network (38%), the reduction of product and service quality (37%), damage to facilities (34%), and manpower shortage (33%). Moreover, at the level of relatively / significantly affected, 32% of businesses reported on the problem of shortage.

Figure 3.3 Specific Impacts of Disaster Risk and Climate Change on Enterprises

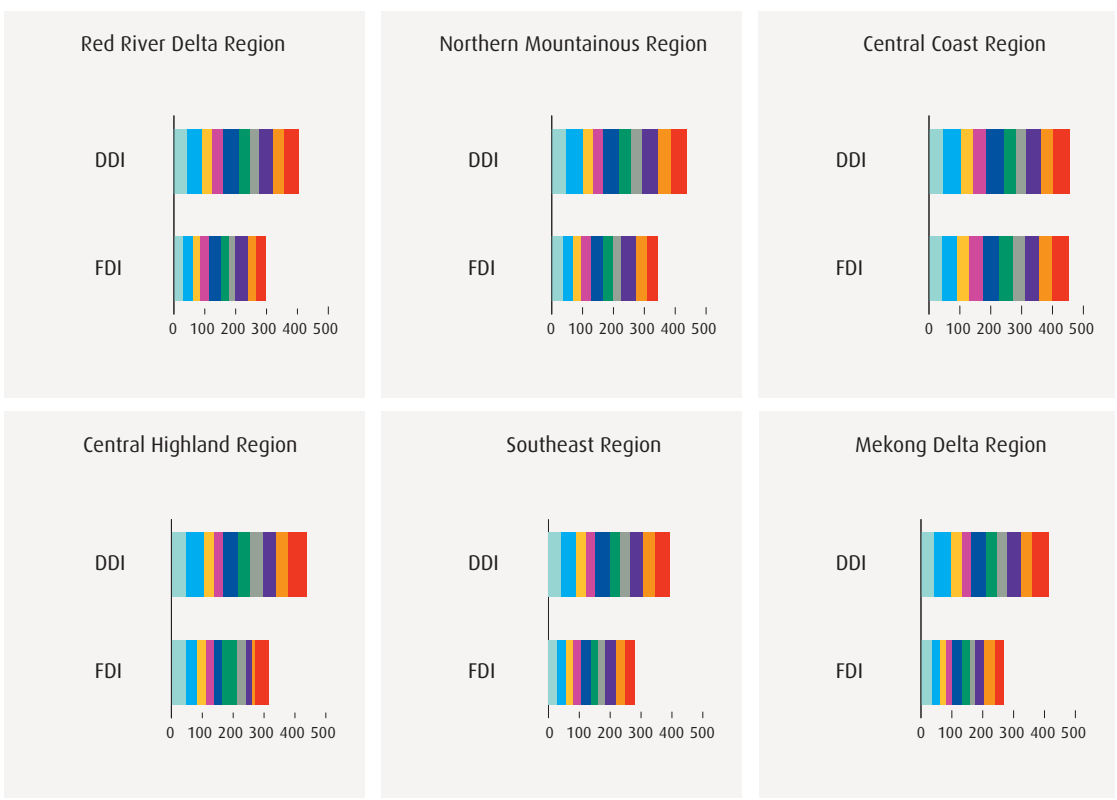
Unit: Percentage of Enterprises reported (%)



The following figure further describes the specific impacts of natural disaster risk and climate change on enterprises by region and economic sector. Consistent with the information from the above general impact assessment (Figure 3.1), enterprises in the Central Coast region are most affected by natural disaster risk and climate change as compared to other regions. DDI enterprises are more negatively affected than FDI enterprises in all regions. It is possible that FDI enterprises have more professional investment, both in terms of facilities and management, and should thus be able to anticipate, withstand, and suffer fewer negative impacts from natural disaster risk and climate change compared to DDI enterprises.

Figure 3.4 Specific Impacts of Natural Disaster Risk and Climate Change on Businesses by Region and by Economic Category

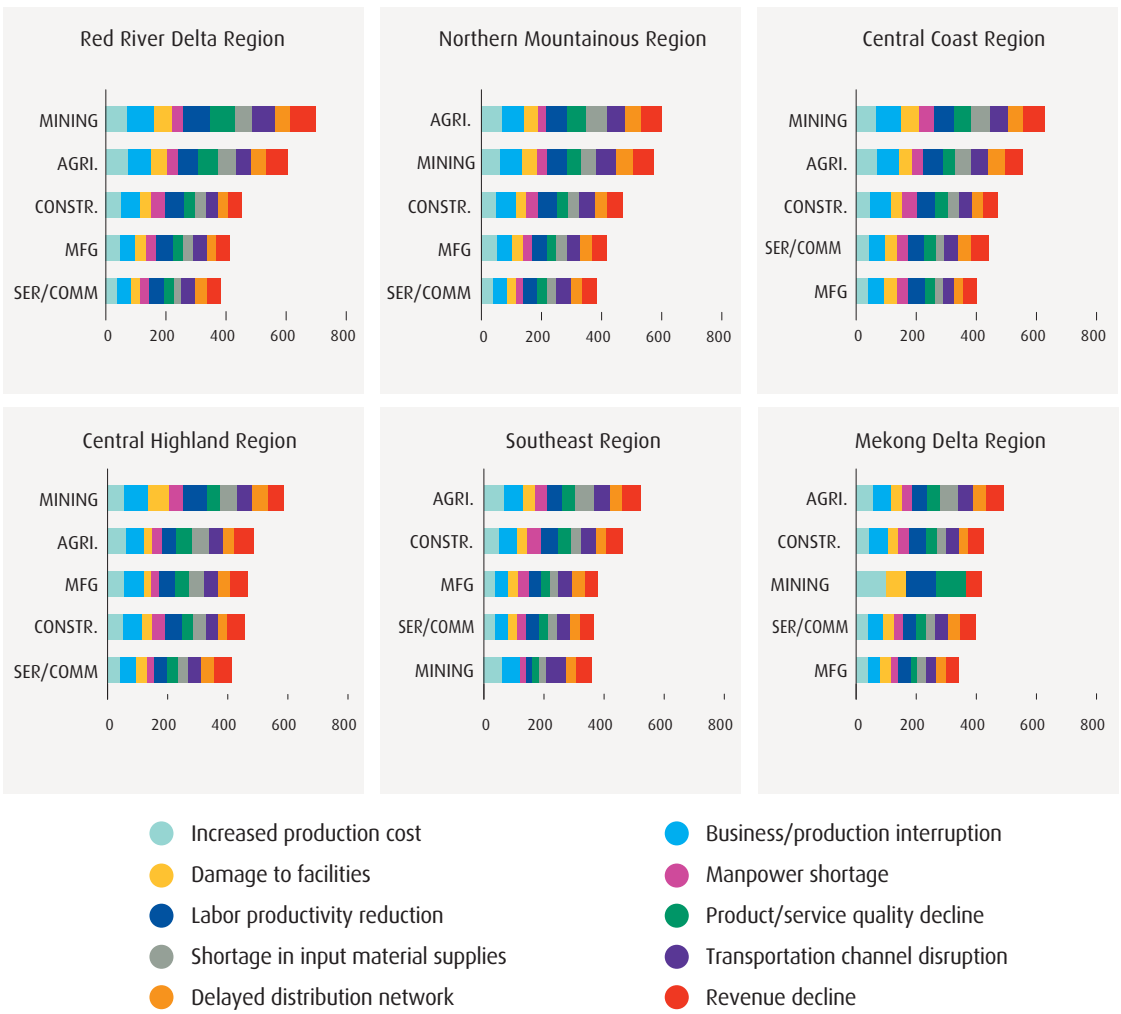
Unit: Aggregate percentage of enterprises reported (%)



Analysis of the specific impacts of natural disaster risk and climate change on enterprises by region and business sector shows that agriculture is the sector in which businesses are most affected. Specifically, enterprises in this sector in the Northern Mountainous area, Central Coast, Southeast, and Mekong River Delta region are the group most affected by natural disaster risk and climate change. Moreover, in the Red River Delta and the Central Highlands regions, this sector is also the second most affected group by climate change and natural disaster.

Figure 3.5 The Specific Impact of Disaster Risk and Climate Change on Enterprises by Region and Business Sector

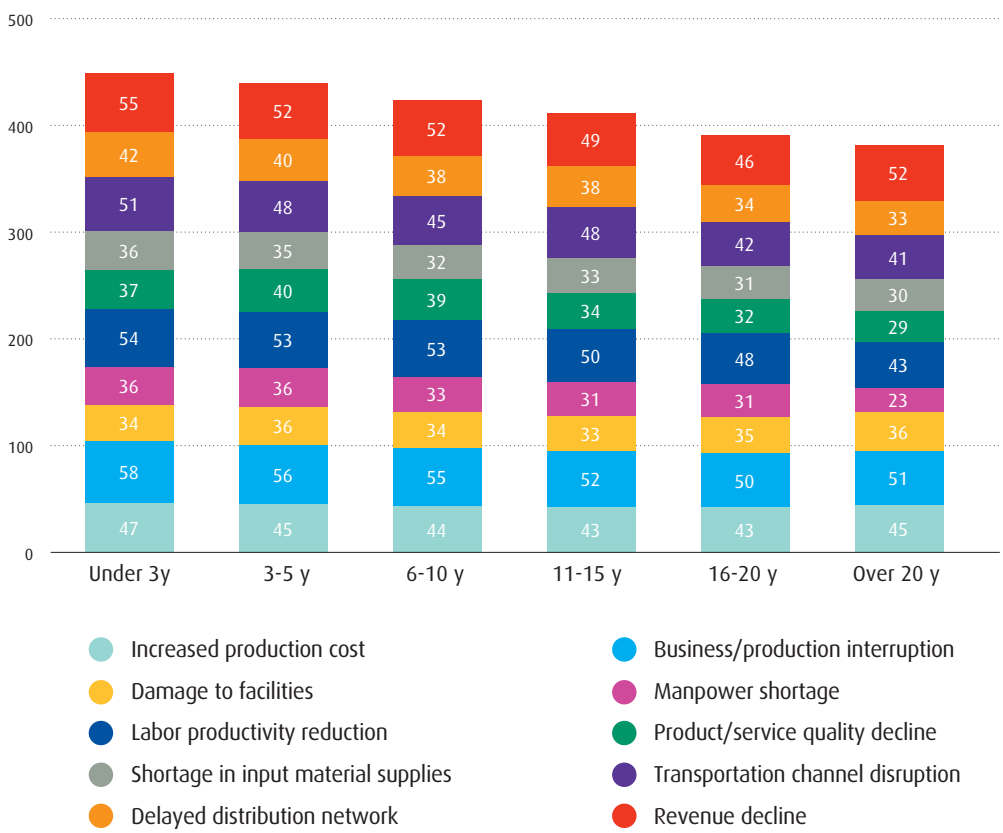
Unit: Aggregate percentage of enterprises reported (%)



The cumulative impact of natural disaster risk and climate change on specific activities of enterprises shows that newly operating enterprises are the group most affected by climate change. Specifically, enterprises with less than three years in operation are the group most affected, followed by enterprises with three to five years in operation. As the number of years in operation increases, the impact level decreases, but note that even for groups with twenty years in operation or more, the impact level is still relatively large.

Figure 3.6 The Specific Impact of Disaster Risk and Climate Change on Businesses by the Number of Years in Operation

Unit: Aggregate percentage of enterprises reported (%)



Time Interrupted in the Production and Business Processes

The impacts of natural disaster risk and climate change on specific production and business activities of enterprises are diverse, but we still want to try to understand this issue more thoroughly with two detailed parameters. Specifically, we suggested that businesses provide information on the total number of days their business was interrupted and the overall value of losses (in millions of dong) due to natural disaster risk and climate change phenomena in the past year. This information can be useful to businesses themselves (in future response planning), as well as providing necessary information to relevant government agencies in an effort to minimize the impact of natural disaster risk and climate change.

Table 3.3 shows the number of interruption days in the past year due to the phenomena of natural disaster risk and climate change. Of the 7,643 businesses that provided this information, it was common for enterprises to lose about seven working days (median value). On average, the number of days of active disruption was up to 16 days (average value). Some enterprises said the number of interrupted days was over 100 days (1.5% of respondents), and there were some cases in which the total number of interrupted days was nearly half a year. Whether measured by median values or median values, DDI enterprises had a much higher interruption time than FDI enterprises.

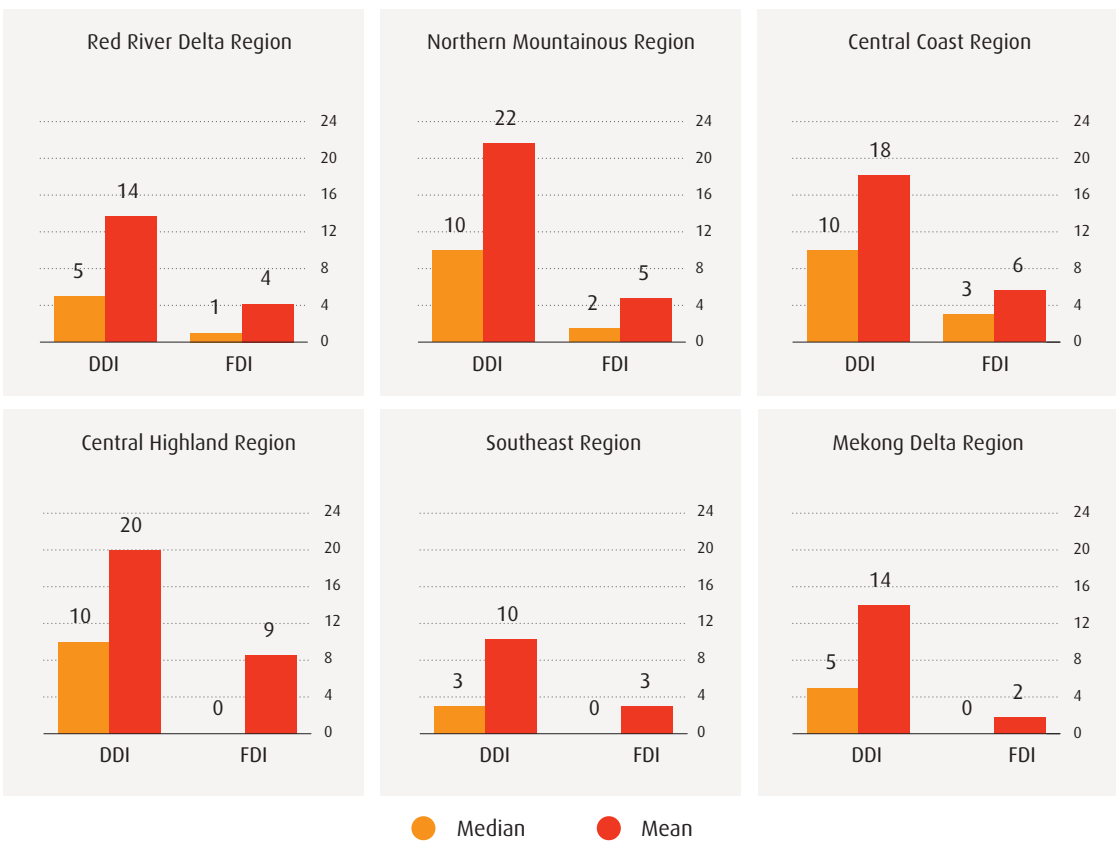
Table 3.3 Number of Days of Business Disruption in the Past Year

Economic characteristic	Number of Enterprises	Median	Mean	Standard deviation	Min	Max
DDI	6,496	7	16.1	24.17	0	187
FDI	1,147	1	3.85	9.7	0	150
Total	7,643	7	16.04	24.13	0	187

Figure 3.7 shows the number of disrupted days in the past year by enterprise, classified by region and by economic category. Compared to the remaining regions, enterprises in the Northern Mountainous area, Central Highlands and Central Coast regions had significantly higher interruption times due to the phenomena of natural disasters and climate change.

Figure 3.7 Number of Disrupted Days in the Past Year by Region and Economic Category

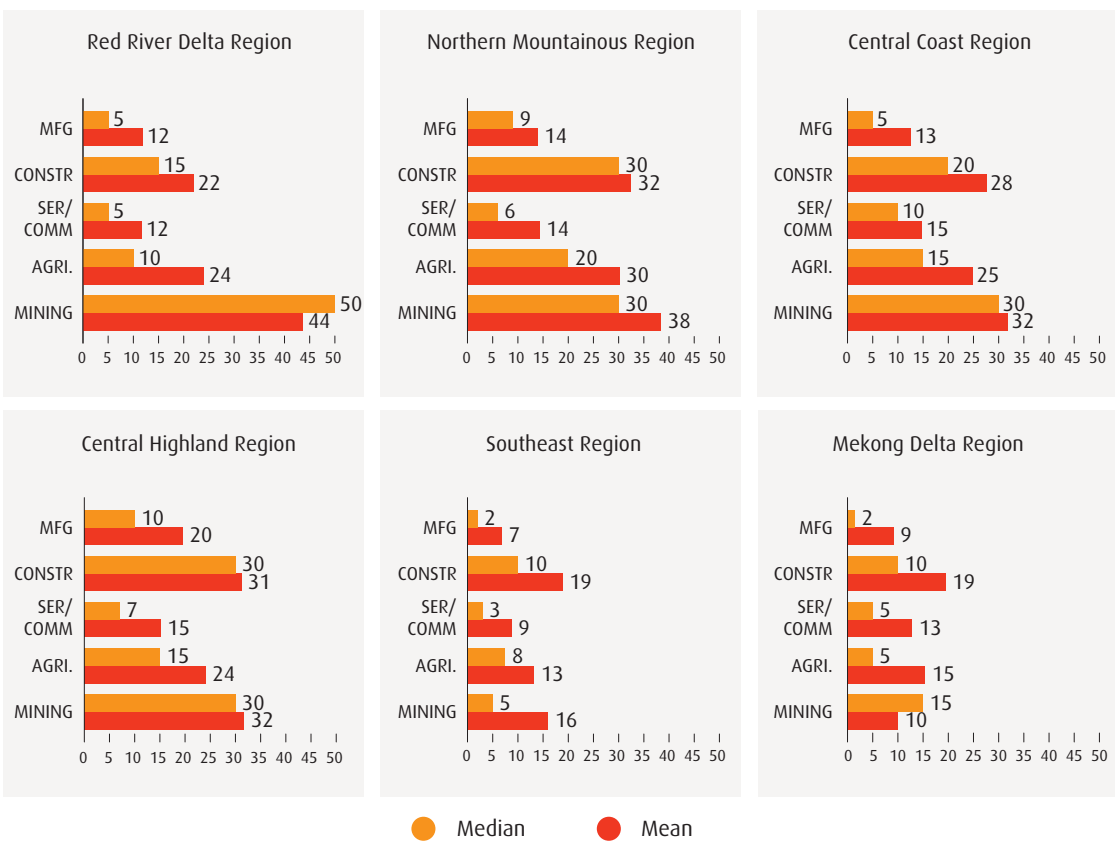
Unit: Number of days



We also tried to calculate the number of days of business interruption in the past year by region and sector. The following figure details the calculation results. Enterprises in the mining sector had the highest rate of days interrupted, followed by the construction and agriculture, forestry, and fisheries sectors.

Figure 3.8 Number of Disrupted Days in the Past Year by Region and Sector

Unit: Number of days



Value of Losses

Besides measuring the number of days of business interruption, we suggested businesses provide information about the total value of losses in the last year due to the phenomena of natural disaster risk and climate change (in millions of dong). Out of 6,225 businesses providing information, the common loss for businesses was about 20 million VND. The average value of losses for an enterprise was about 95.2 million. However, this average value should be used cautiously, because some businesses can be considered an outlier due to their high losses. Specifically, nearly 100 businesses reported losses of over VND 1 billion, accounting for about 1.6% of the respondent businesses. These data are relatively consistent with the number of days of interruption of operation. The value of losses of DDI enterprises was larger than that of FDI enterprises.

Table 3.4 Value of Losses in the Last Year

Economic Category	Number of enterprises	Median (million VND)	Mean (million VND)	Standard deviation	Min (million VND)	Max (million VND)
DDI	5,359	20	95.28	245.32	0	4,500
FDI	866	1.5	77.73	259.73	0	3,500
Total	6,225	20	95.19	245.39	0	4,500

Figure 3.9 describes in more detail the level of losses in the past year due to natural disaster and climate change phenomena by region and business category. Enterprises in the Northern Mountainous area and Central Coast regions suffered the most in comparison with other regions in Vietnam.

Figure 3.9 Value of Losses in the Past Year by Region and Economic Category

Unit: Million VND

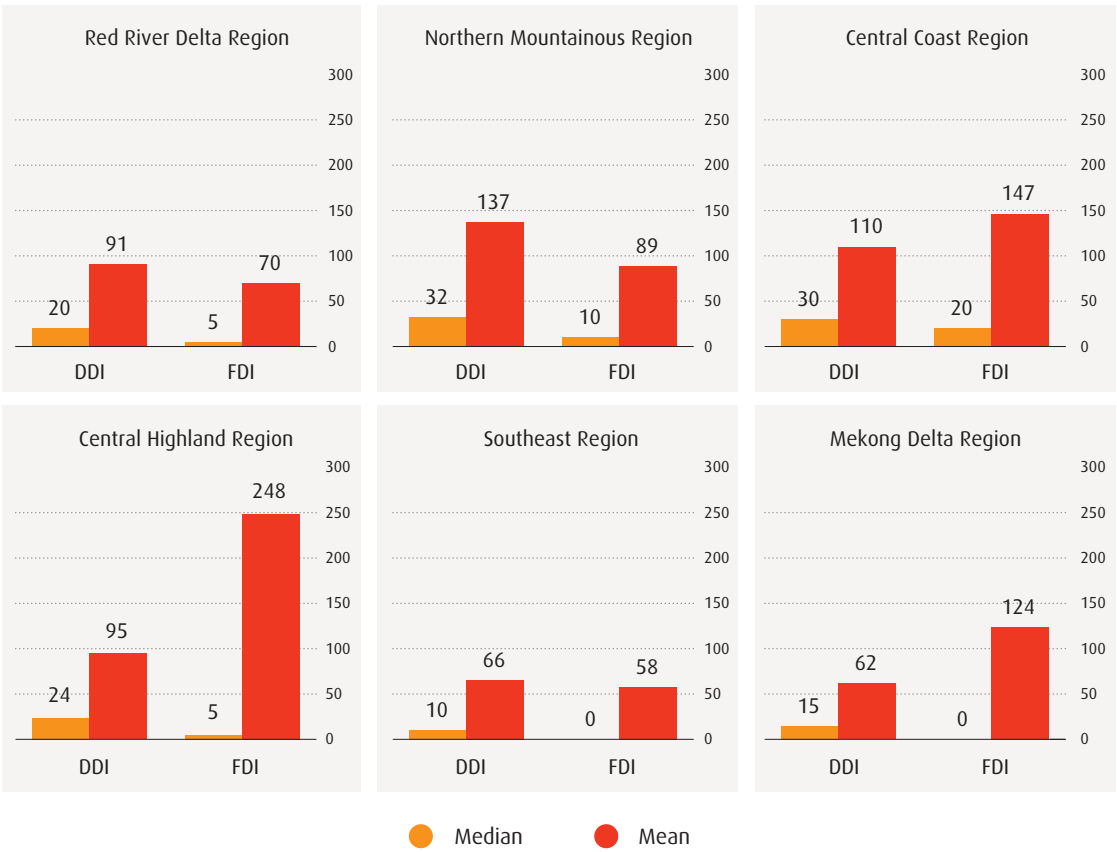
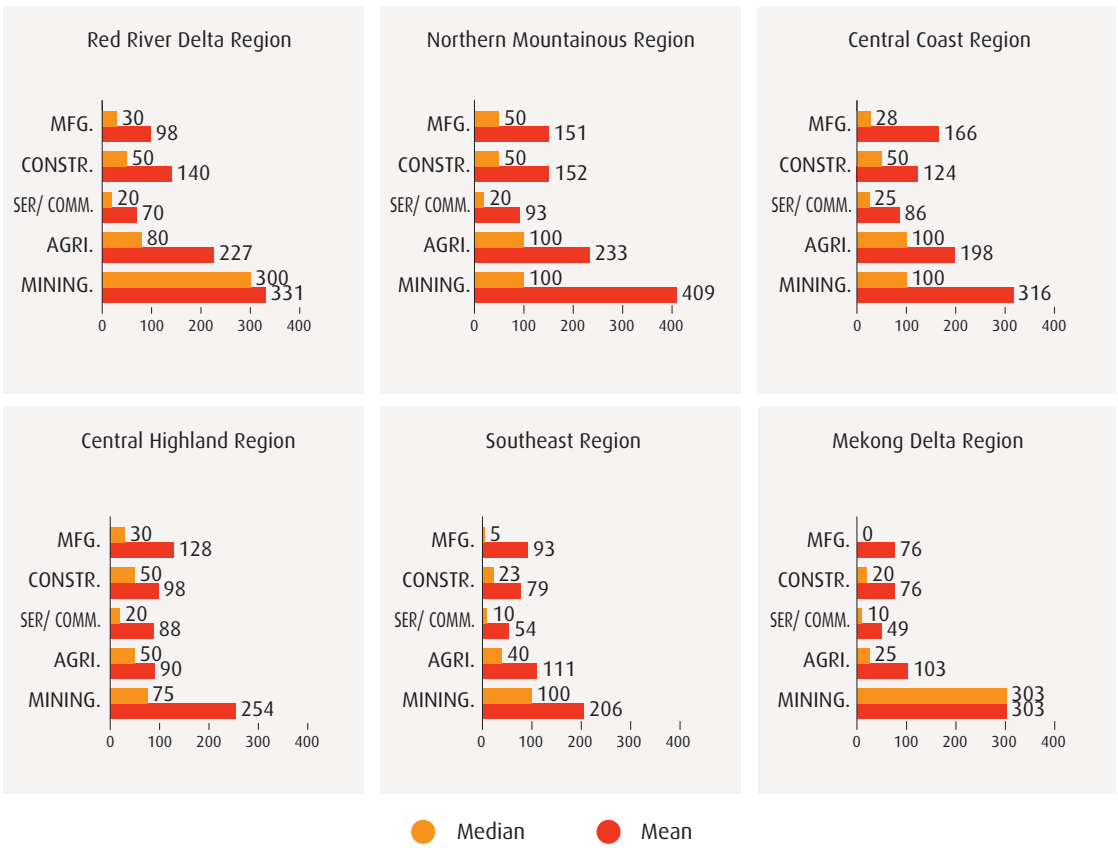


Figure 3.10 depicts the value of business losses due to the phenomena of natural disaster risk and climate change in the past year by region and sector. Mining and agriculture, forestry and fisheries are the areas where businesses reported the highest value of losses (albeit on a median and mean scale) in all regions.

Figure 3.10 Value of Losses in the Past Year by Region and Sectors

Unit: Million VND



04

Responding to Climate Change

Businesses' Response

Faced with the impacts and damages caused by the phenomena of natural disaster and climate change, what actions have businesses taken? The 2019 survey showed businesses have implemented quite a few actions. The most popular was repairing and reinforcing existing factories and workplaces (53%), adjusting working hours due to inclement weather (30%), training staff in coping with natural disasters and climate change (28%) and responding to post-natural disaster relief activities (28%).

There was a significant number of businesses that have changed their strategies and business methods due to challenges from natural disaster risk and climate change (26%), and that rebuilt storage (24%). It is worth noting that up to 19% of businesses said they had upgraded their production technology and 18% had even asked their business partners to prepare a natural disaster risk management plan to cope with these problems. There was also a small portion of businesses that said they moved their factories and workplaces to safer locations (10%).

Table 4.1 Actions by Enterprises in Response to Disaster Risk and Climate Change

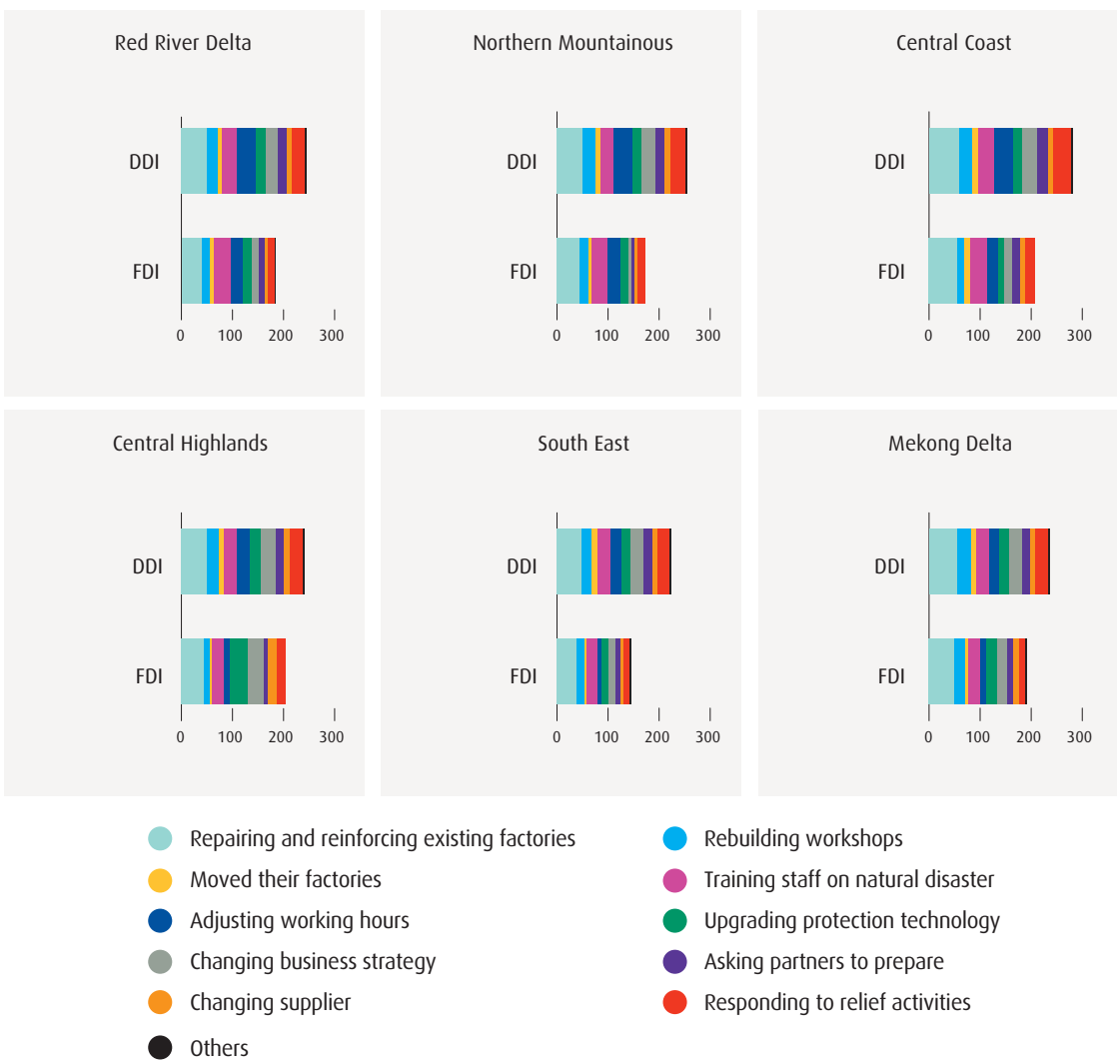
Specific Actions	Percentage
Repairing and reinforcing existing factories and workplaces	53%
Adjusting working hours	30%
Staff training on natural disaster response	28%
Participating in relief activities after a natural disaster	28%
Change business strategies	26%
Rebuilding storage/workshop	24%
Upgrading production technology	19%
Work with partners for DRM plan	18%
Change input supplier	11%
Move factories and workplaces	10%
Others	3%

Businesses carrying out activities to cope with natural disaster risk and climate change vary by region and economic category, as shown in the following figure. The proportion of FDI enterprises conducting response activities is less than that of domestic DDI enterprises, possibly because FDI

enterprises often have better "hardware infrastructure". FDI enterprises often have invested in professional factory infrastructure from the beginning, and they often have factory locations in areas less affected by natural disaster risk and climate change. Regarding "software infrastructure", there is no difference between FDI enterprises and DDI enterprises, where about 28% of both groups of enterprises said that they have conducted staff training in response to natural disaster risk and climate change. As a whole, firms in the Central Coast region had a higher proportion conducting activities compared to other regions, and it is understandable as this is the area most often affected by natural disaster and climate change in Vietnam.

Figure 4.1 Activities Undertaken to Respond to the Impact of Natural Disasters and Climate Change by Region and Economic Category

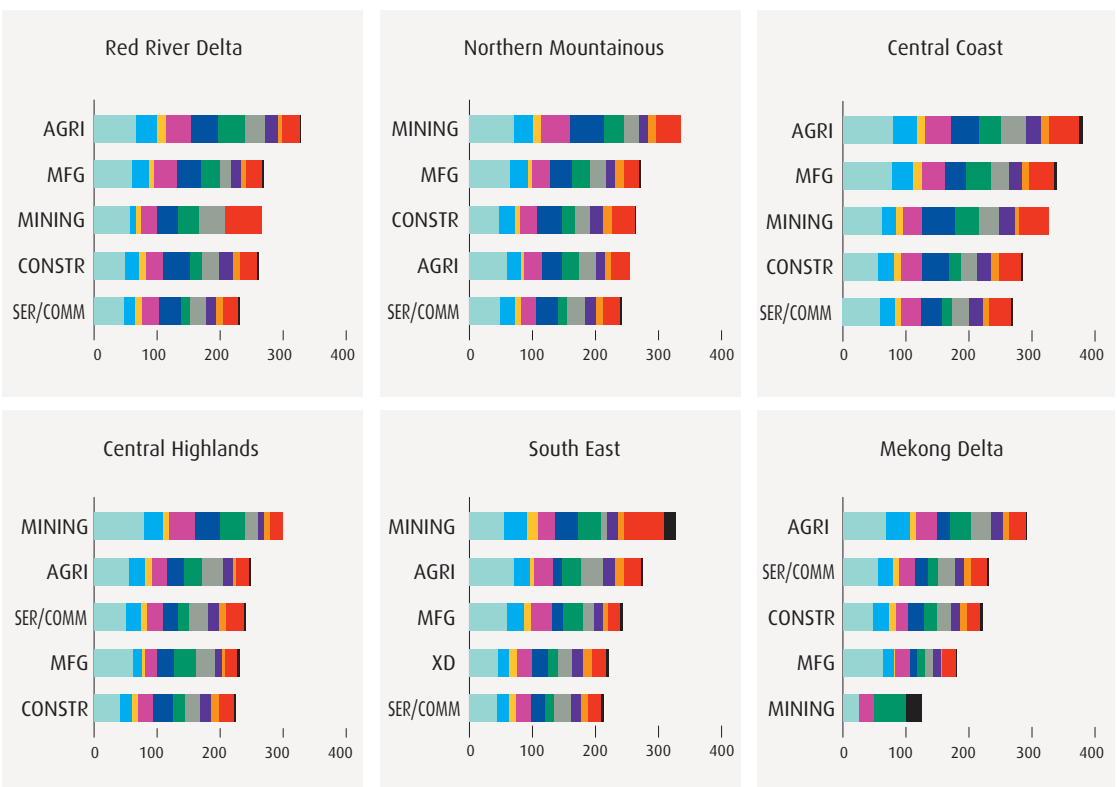
Unit: Cumulative rate of enterprise selection (%)



The figure below shows the cumulative percentage of enterprises that have conducted activities to cope with natural disaster risk and climate change, by region of main production and business areas of enterprises. Enterprises in agriculture, forestry and fisheries in the Central Coast region, the Red River Delta and the Mekong River Delta had the highest rate of conducting response activities compared to other enterprises in that region. In some other regions, such as the Northern Mountainous area, the Central Highlands, and the Southeast, enterprises in the mining sector had the highest number of response activities.

Figure 4.2 Activities Undertaken to Respond to the Impact of Natural Disasters and Climate Change by Region and Economic Category

Unit: Cumulative rate of enterprise selection (%)

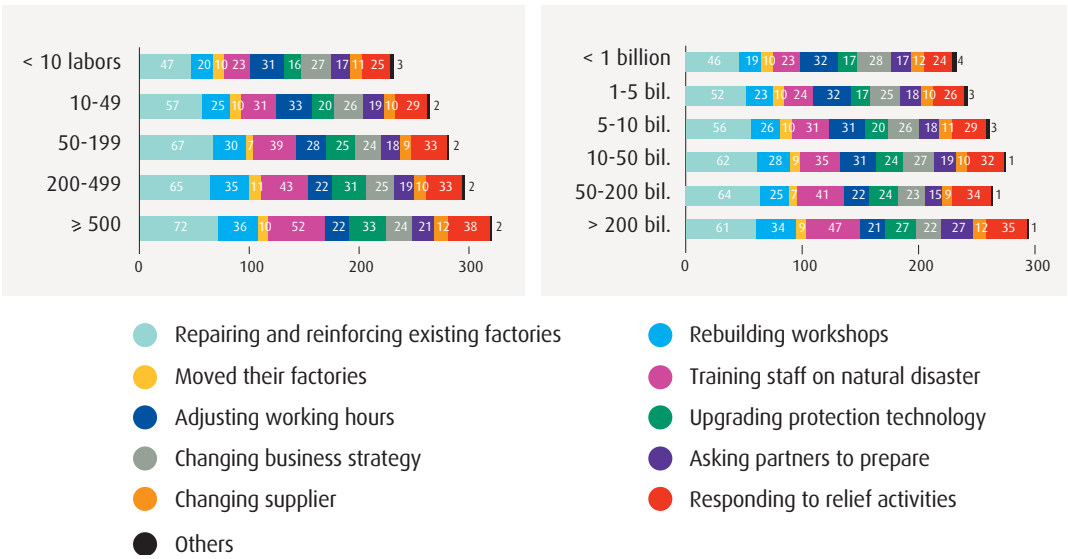


- Repairing and reinforcing existing factories
- Moved their factories
- Adjusting working hours
- Changing business strategy
- Changing supplier
- Others
- Rebuilding workshops
- Training staff on natural disaster
- Upgrading protection technology
- Asking partners to prepare
- Responding to relief activities

Basically, if classified by size, as the scale of the business increases (in terms of capital or labor), the proportion of firms that undertake response activities increases. This may be because larger enterprises have more resources and therefore may have more favorable conditions to implement activities to cope with natural disaster risk and climate change.

Figure 4.3 Activities Undertaken to Respond to the Impact of Natural Disasters and Climate Change by Region and Sector

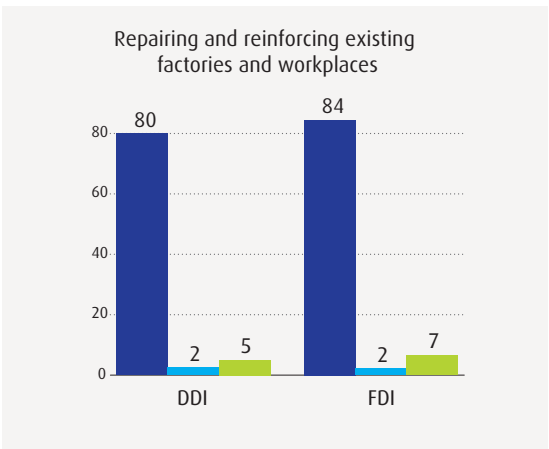
Unit: Cumulative rate of enterprise selection (%)

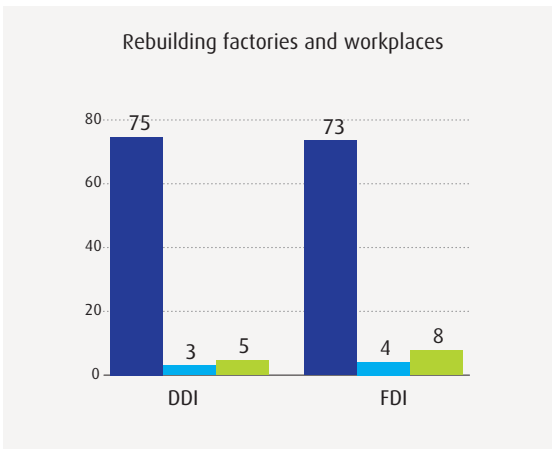


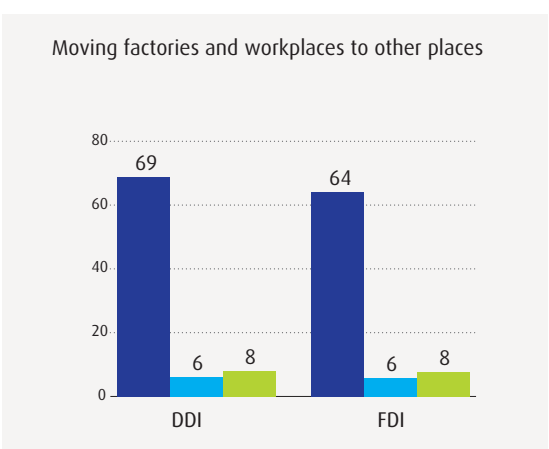
Moreover, in this survey, we also tried to investigate why businesses conduct activities to cope with natural disaster risk and climate change. Accordingly, when an enterprise carries out a specific activity, is it because they feel that the actions taken are necessary, or is it at the request of state agencies or by the request of their partners / customers? The results show that the main reason for these actions is because businesses find them necessary. This is true for all specific activities, regardless of the economic sector.

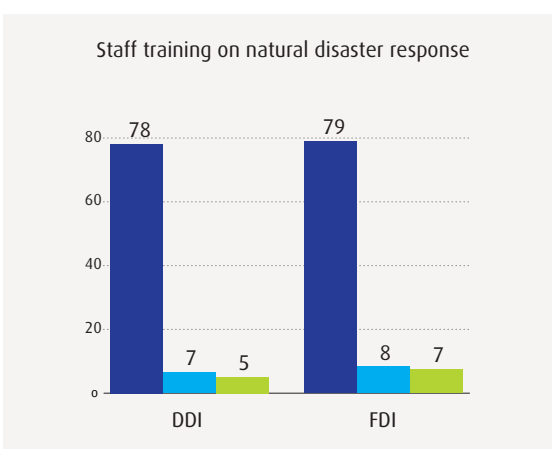
Figure 4.4 Reasons to Undertake Activities to Respond to the Impacts of Natural Disasters and Climate Change

Unit: Percentage of enterprises reported (%)

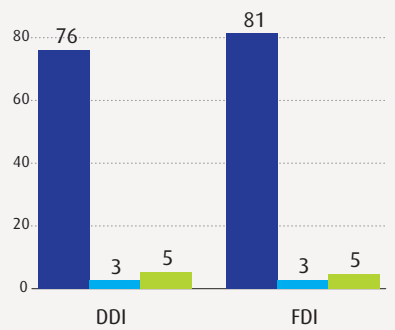




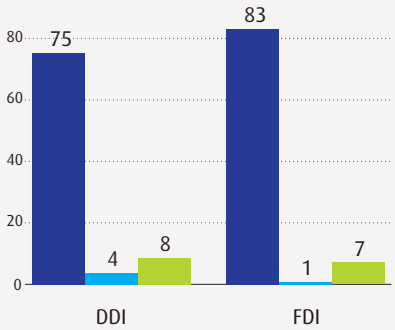




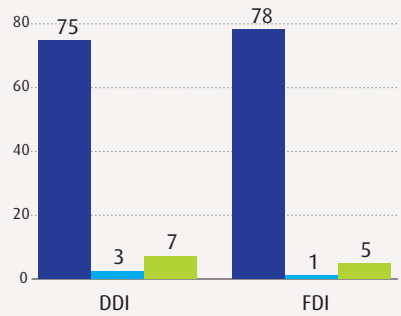
Adjusting working hours



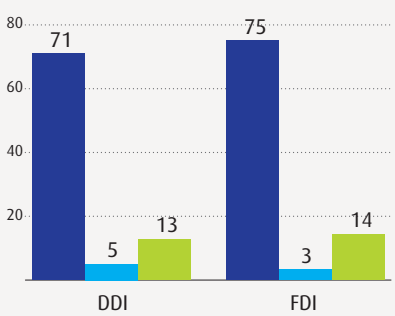
Upgrading production technology



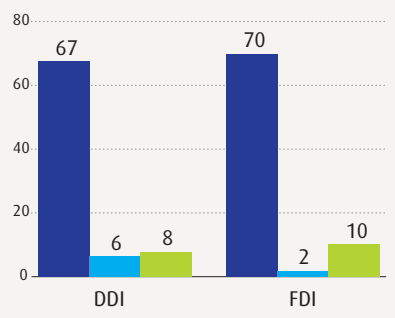
Change business strategies



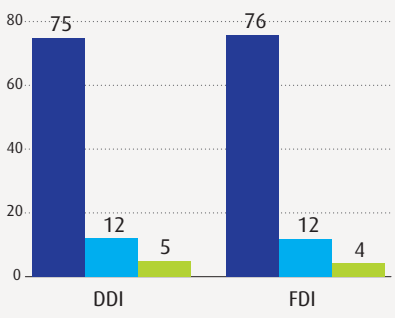
Work with partners for DRM plans



Replacing supplies



Participating in relief activities



Necessary
Required by state agencies
Requested by partners/clients

Climate Change-Related Risk Prevention and Damage Reduction

In addition to conducting specific activities to cope with the impact of natural disaster risk and climate change, businesses can now minimize damage by using insurance products. In this investigation, with the assistance of experts, we designed a questionnaire to find out the current insurance status of businesses. In particular, we asked businesses to say which insurance product they are currently using, whether it may be insurance for facilities, machinery and goods, business disruption insurance or other insurance products.

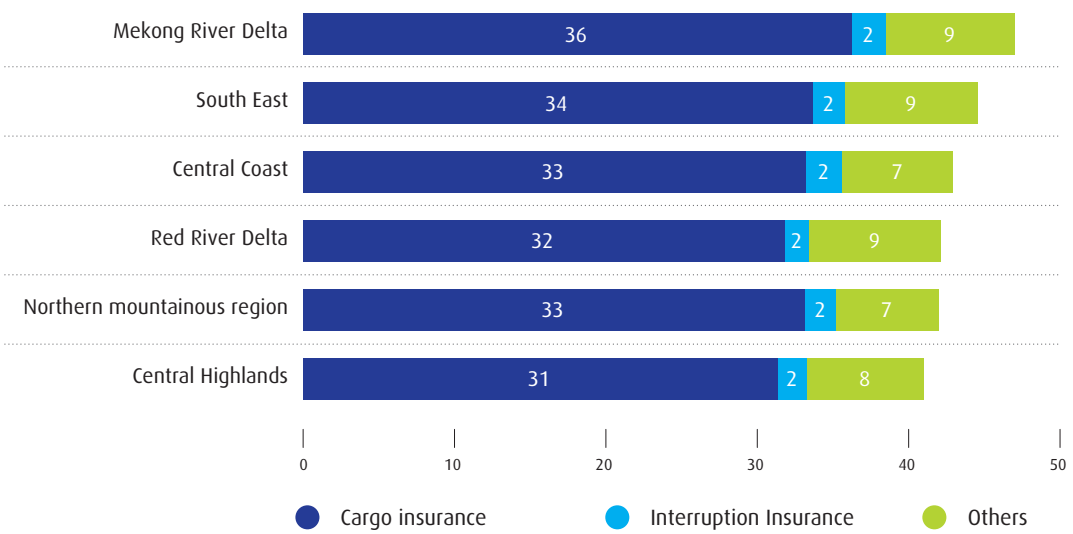
The survey results show that, out of 10,356 enterprises participating in the survey, 44.5% of businesses said they were using a certain type of insurance product to prevent risks related to natural disasters and climate change. The proportion of FDI enterprises currently using an insurance product is 62.2%, significantly higher than that of DDI enterprises (41.3%).

Common types of insurance products that businesses currently use include insurance on facilities, machinery and goods (cargo inusurance). 55% of FDI enterprises and 33% of DDI enterprises use this type of insurance. The percentage of enterprises using business interruption insurance is relatively low, with only 4% of FDI enterprises and 2% of DDI enterprises. About 10% of FDI enterprises and 9% of DDI enterprises use other insurance products.

The figure below shows the percentage of enterprises using certain insurance products by region and economic category. It is worth noting that enterprises in the Mekong River Delta have the highest rate of using the listed insurance products. Meanwhile, businesses in the Central Highlands have the lowest rate of enterprises using insurance products compared with other regions.

Figure 4.5 Types of Insurance that Enterprises Purchased by Region

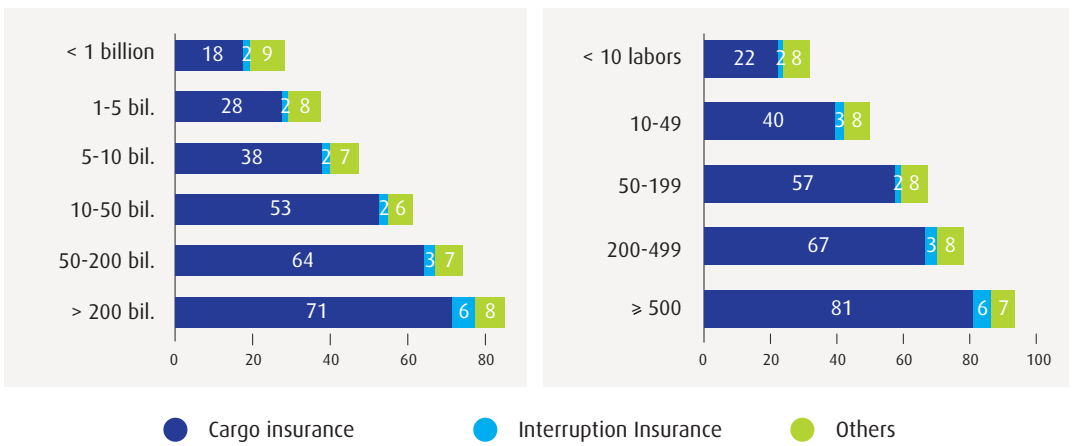
Unit: Proportion of business (%)



The percentage of enterprises using insurance is positively correlated with the size of the business. Whether by size of capital, or size of labor, the analysis shows that as the size of the business increases, the chance of using insurance products increases. This trend continues to be confirmed when analyzed by region.

Figure 4.6 Types of Insurance that Enterprsies Purchased by Capital and Labor Scale

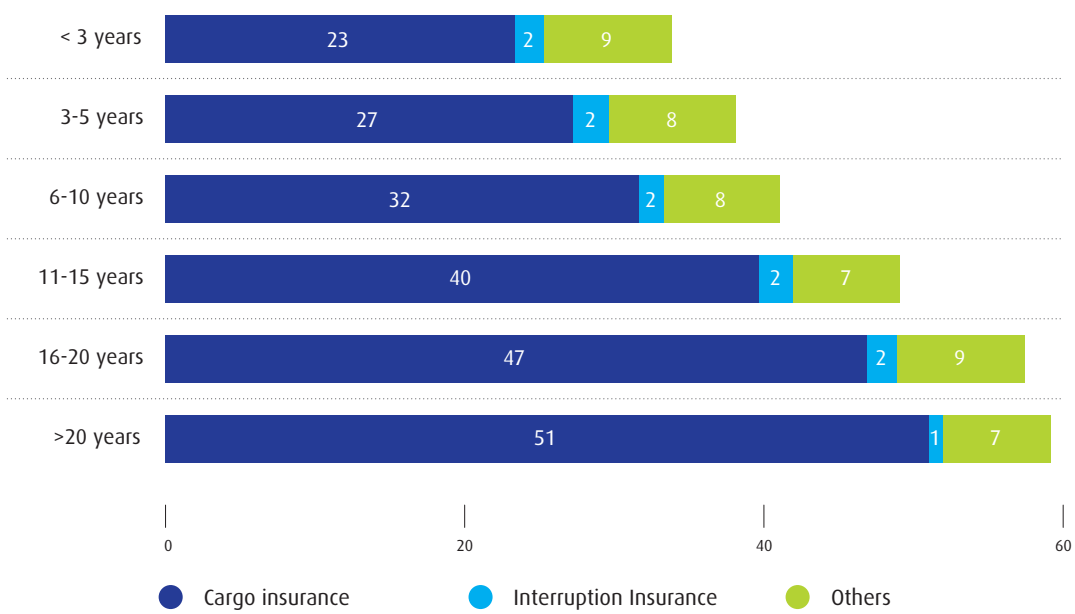
Unit: Proportion of business (%)



As the number of years in operation of an enterprise increases, the proportion of enterprises using insurance products also increases. Specifically, as shown in the figure below, the total of enterprises that use a certain type of insurance product is the lowest among businesses with less than 3 years in operation, and this increases gradually as the number of years in operation increase. The highest proportion of businesses using insurance is in the group of businesses with more than 20 years of operation.

Figure 4.7 Types of Insurance that Enterprises Purchased by Years in Operation

Unit: Proportion of business (%)



For businesses that are using insurance products for natural disaster risk and climate change, what is their valuation on the usefulness of such insurance products? There are 4 levels for businesses to evaluate, including: 1) Very useful; 2) Relatively useful; 3) Less useful; and 4) Not useful. The survey results show that the majority of enterprises, especially FDI enterprises, highly valued the usefulness of insurance products purchased. Overall, 86% of businesses rated insurance products as relatively useful or very useful. Of these, 39% rated it as very useful and 47% rated it as relatively useful. Only 10% rated it as less useful and 4% rated it as not useful.

Table 4.2 The Usefulness of Purchased Insurance Products

Economic category	Number of enterprises	Median	Mean [1.Very useful 4 Not useful]	Standard deviation	Min	Max
DDI	3,653	2	1.8	0.8	1	4
FDI	939	2	1.72	0.69	1	4
Total	4,592	2	1.8	0.79	1	4

The figure below shows the usefulness rating proportion by economic category. For DDI enterprises, 85% rated it as very useful / relatively useful, 10% rated it as less useful and 4% rated it as not useful. For FDI enterprises, 91% rated it as very useful / relatively useful, only 7% rated it as less useful, and 2% rated it as not useful.

Figure 4.8 The Degree of Usefulness of Insurance Products by Economic Category

Unit: Percentage of enterprises reported (%)

Participation in Relief to Overcome the Consequences of Natural Disasters

In the 2019 survey, we have already investigated about businesses' contribution to activities such as relief in overcoming the consequences of natural disasters. The form of contribution may vary in types as it could be cash, in-kind, human resources of the enterprise, etc. The survey showed that about 61% of enterprises said that they had contributed to or participated in rescue and relief operation activities after natural disasters in one of the above-mentioned forms. In particular, 63% of DDI enterprises and 49% of FDI enterprises carried out this activity.

Figure 4.9 Proportion of Businesses that Contributed to or Participated in Post-Disaster Rescue and Relief Operations by Economic Category

Unit: Percentage of enterprises reported (%)

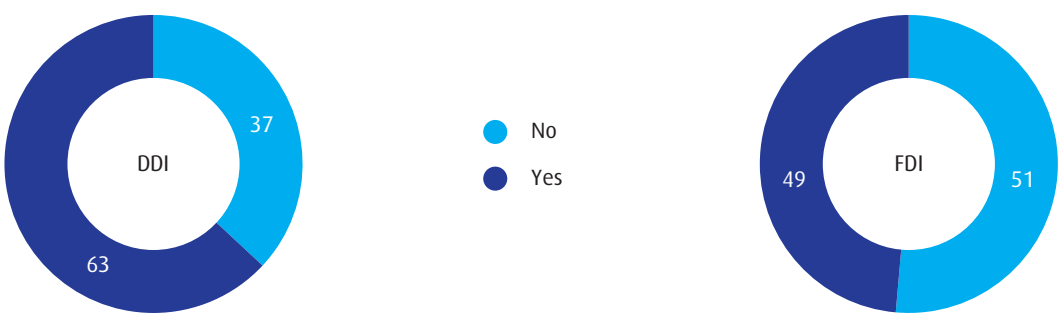
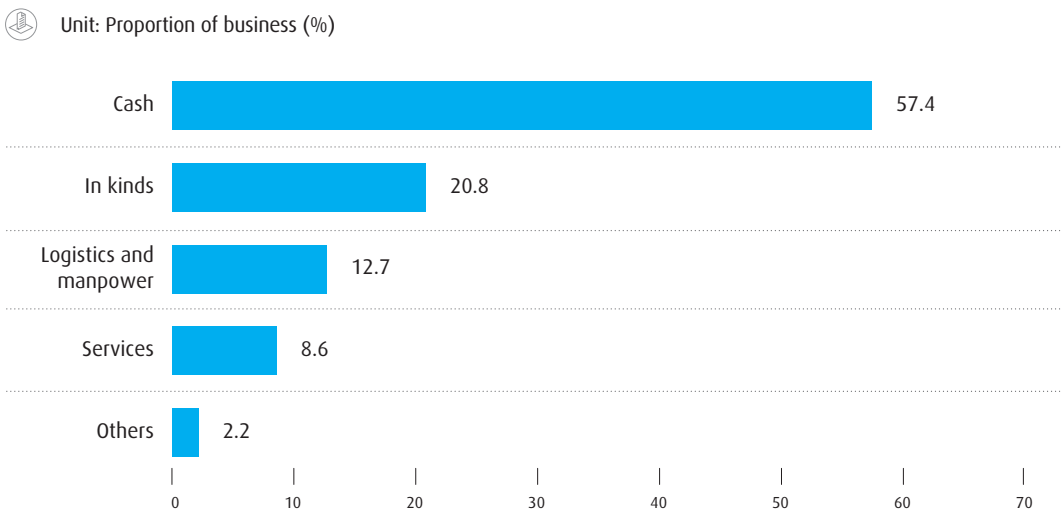


Figure 4.10 reflects the forms of contribution or participation in post-disaster rescue and relief operations. Cash is the most popular form (57%), followed by in-kind (21%), logistics and manpower (13%), and services (9%).

Figure 4.10 Forms of Contribution or Participation in Post-Disaster Rescue and Relief Operations



The contribution of relief and rescue assistance can take many forms, but if the value is estimated, how much have businesses contributed in the past year? Of the 3,092 businesses that provided information, an enterprise in Vietnam commonly contributed about VND 5 million (median value) in relief. Regarding the average value of money donated, it is estimated that the contribution value is about VND 23.3 million. However, as we mentioned above, the average number needs to be used with caution because there are a number of enterprises with an outlier donation amount, contributing over VND 1 billion in the past year.

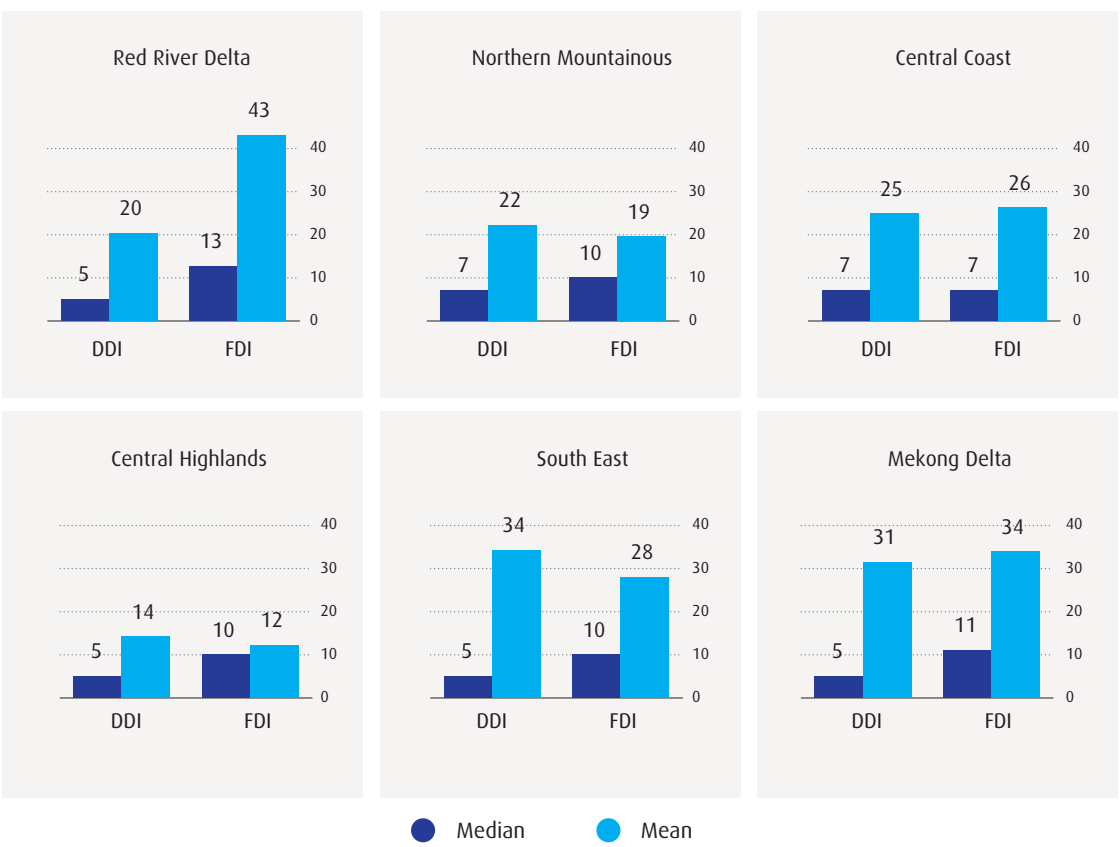
Table 4.3 Estimated Total Contribution Value (million VND)

Economic category	Number of enterprises	Median	Mean	Standard deviation	Min	Max
DDI	2,701	5	23.29	110.91	0	3,342
FDI	391	10	28.7	63.58	0	710
Total	3,092	5	23.31	110.75	0	3,342

The following figure shows the value of enterprises' natural disaster relief contributions in the past year by region and economic category. DDI enterprises in the South East region had a higher contribution than DDI enterprises in the remaining regions, while FDI enterprises in the Red River Delta region had the highest contributions compared to FDI enterprises in the remaing regions (median value).

Figure 4.11 Estimate the Total Contribution Value by Region and Economic Category

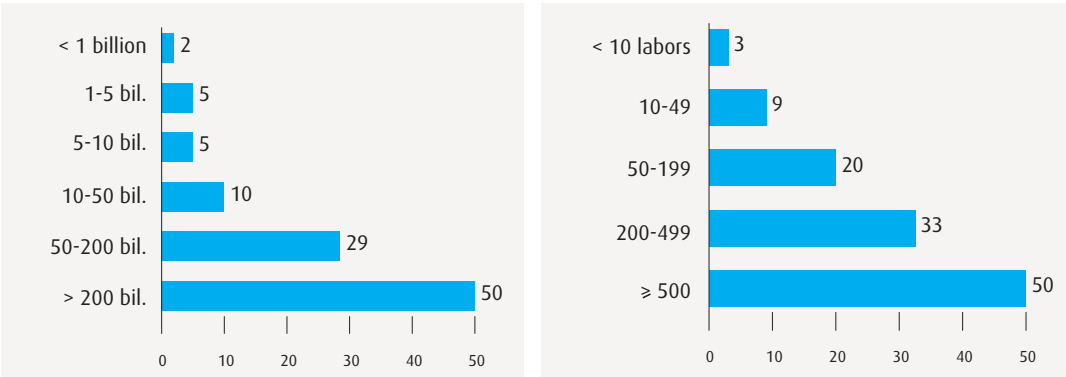
Unit: VND million



The survey showed that the value of the contribution increased in size according to the size of the business. This trend is true for both capital size and labor size. Specifically, for enterprises with a capital scale of less than 1 billion, the usual contribution value was about 2 million / year, and increased gradually, to about 50 million / year for enterprises with capital of over 200 billion dong. Similarly, enterprises with less than 10 employees had a contribution value of about VND 3 million / year, and for businesses with more than 500 employees, the usual contribution value was about VND 50 million / year.

Figure 4.12 Estimate the Total Value of Contributions by Capital and Labor Size

Unit: VND million



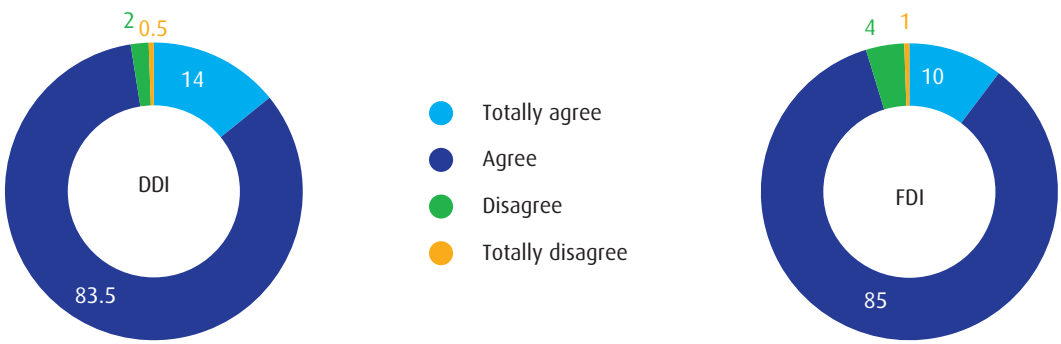
Readiness to participate in natural disaster risk response and climate change

The survey also asked businesses to indicate their readiness to participate in relief operations to overcome the consequences of natural disasters. The Law on Natural Disaster Prevention and Control 2013, Article 30, stated that, "Organizations, households and individuals are responsible for proactive natural disaster recovery for infrastructure and properties under their management and supporting natural disaster recovery activities under the leadership of competent agencies." This Law specifies the obligations of enterprises (economic organizations) in Article 35 including "Participation in local activities of search, rescue, emergency assistance and natural disaster recovery within their own capacity ".

The survey results show that the readiness level of businesses to get involved in local relief and natural disaster recovery efforts is very high. Most DDI enterprises (97%) and FDI enterprises (95%) said they are willing to participate in these activities.

Figure 4.13 The Readiness of Enterprises to Participate in Relief and Rescue Operations after Natural Disasters Occur, by Economic Category

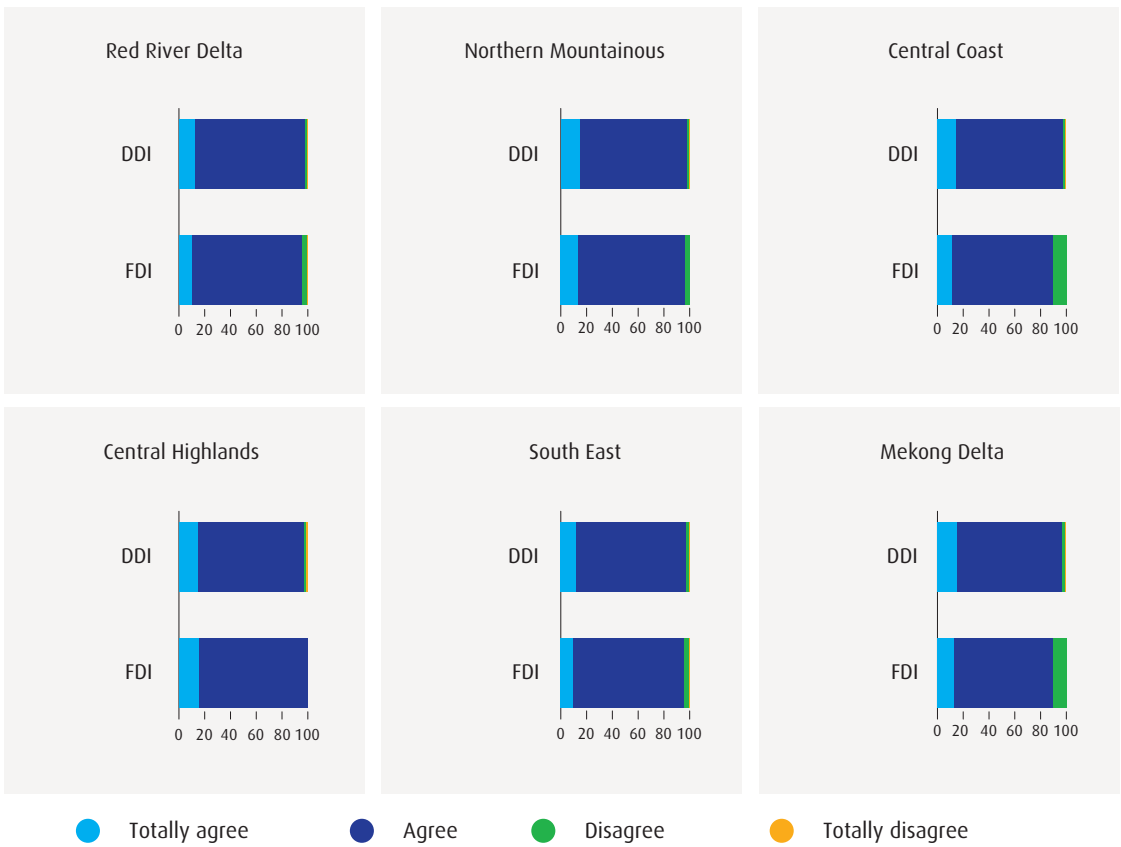
Unit: Percentage of enterprises reported (%)



Hình dưới đây thể hiện mức độ sẵn sàng của doanh nghiệp tham gia cứu trợ, khắc phục hậu quả thiên tai theo vùng và theo khu vực kinh tế. Kết quả cũng cho thấy mức độ sẵn sàng của doanh nghiệp là rất cao.

Figure 4.14 The Readiness of Enterprises to Participate in Relief and Rescue Operations after Natural Disasters Occur, by Region and Economic Category

Unit: Percentage of businesses (%)

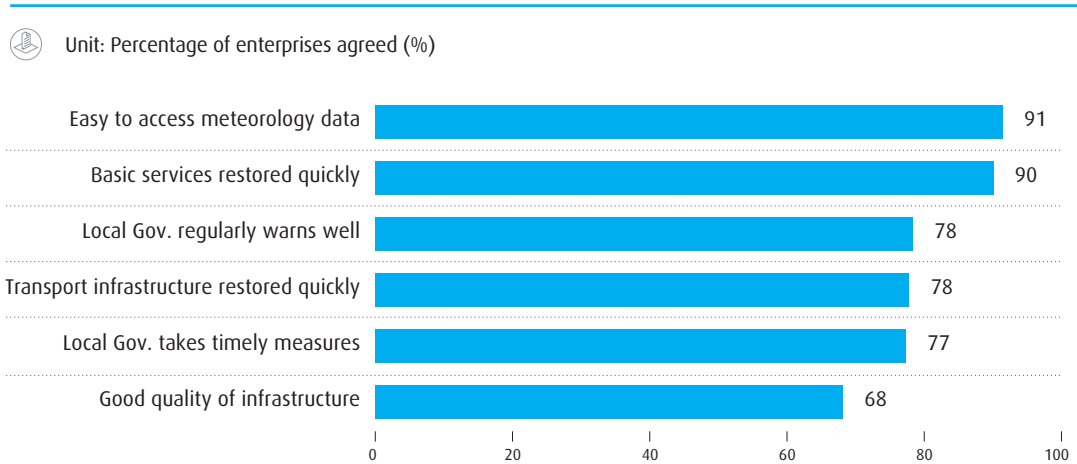


Assessment of Basic Infrastructure Services in Response to Climate Change

Enterprises' ability to adapt and cope with natural disaster risk and climate change depends largely on external factors, especially on basic public services provided by the government. In this survey, we have listed some of the basic public services from the government for businesses to evaluate, such as the providing of information and data on weather, meteorology, hydrology and warnings, the ability to restore transportation infrastructure, the restoration of basic infrastructure, and subsidies of various kinds after a natural disaster has taken place.

The survey results show that businesses have a fairly positive assessment of the readiness of the local government to handle and support businesses in this regard. Specifically, up to 91% of businesses said that they have easy access to local weather information and data. This is perhaps not surprising, as this information is continually available via mass media, both nationally and locally. Up to 90% of businesses reported that basic infrastructure services (electricity, water, and telecommunications) were restored quickly after a natural disaster occurred, which is a very positive result. 78% of businesses received early warning before a natural disaster occurred, and a similar percentage of 78% said that local transport infrastructure was quickly restored. 77% of businesses reported that the local government took timely measures to support businesses after a natural disaster occured– this shows that the provincial and city governments have been very proactive in addressing the consequences of natural disasters. Finally, 68% of businesses rated local infrastructure (roads, embankments, drainage works, etc) as being of good quality to respond to natural disasters. Although this indicator has the lowest rating from enterprises compared to other indicators, this is still encouraging information because investing and maintaining good quality infrastructure remains a challenging job for local governments, especially in the context of increasingly limited budgets.

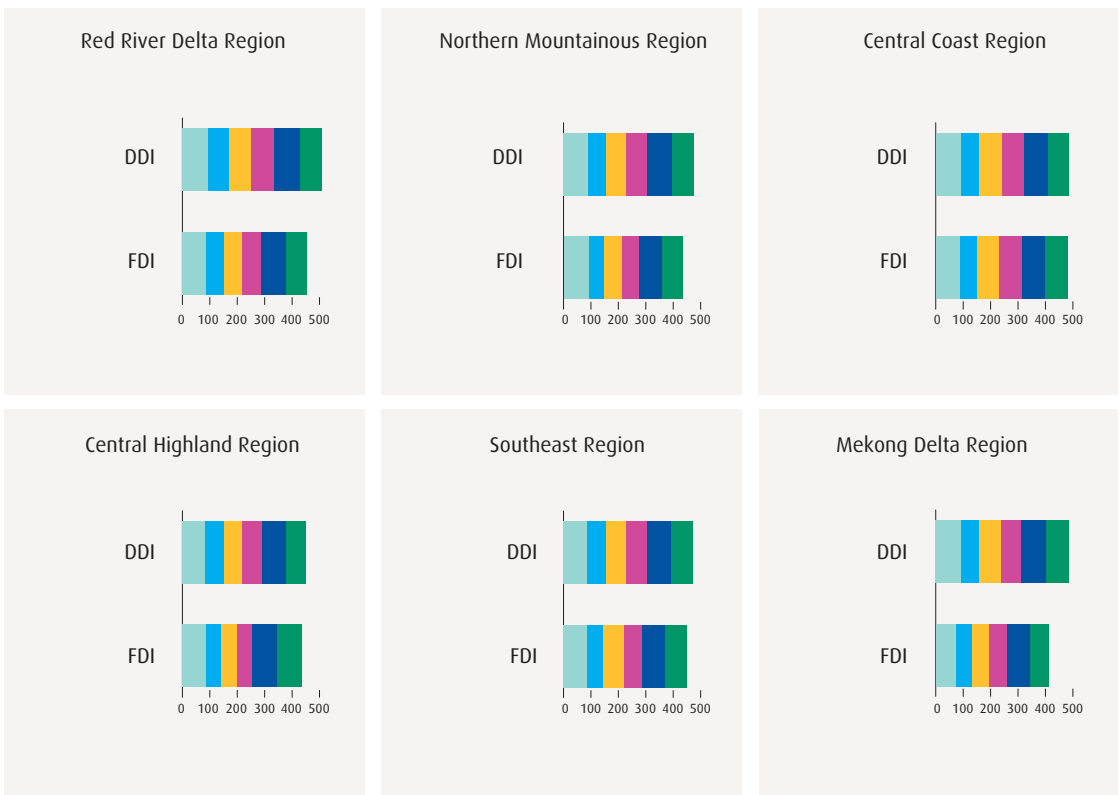
Figure 4.15 Enterprise Ratings of Government Actions Toward Climate Change and Natural Disasters



The following figure shows the detailed assessment of businesses on the local government's readiness to cope with natural disaster risk and climate change response by region and economic category. The Red River Delta had the highest rate of positive evaluation. FDI enterprises assessed the readiness of local authorities to be lower than DDI enterprises; however, theirs is still a positive assesment.

Figure 4.16 Enterprise Rating of Government Actions on Climate Change by Region and Economic Category

Unit: Aggregate percentage of enterprises reported (%)



05

Opportunities to Take Action

Identify Opportunities

Disaster risk and climate change have been and will continue to have a negative impact on businesses in Vietnam, but will businesses see opportunities in that context? In this survey, we asked businesses whether they see any opportunity. We have listed a number of opportunities for businesses to choose from, including: restructuring, rearranging production, creating new products and services, new technologies, developing new markets for existing products, branding opportunities (e.g. environmentally-friendly products), or other opportunities. About 55.6% of businesses said they perceived one of the opportunities mentioned above. Of these, 56.6% of DDI enterprises and 49.1% of FDI enterprises found opportunity in the context of natural disaster risk reduction and climate change.

The table below shows in detail the percentage of enterprises that identified specific opportunities in the context of natural disaster risk and climate change. Accordingly, about 30% said they realized there was an opportunity for restructuring and rearranging production. 18% of businesses thought this is an opportunity to create new products, services and technologies. A similar percentage, 18%, said this context provides opportunities for businesses to develop markets for existing products. About 12% of businesses participating in the survey said that this context of natural disaster risk and climate change brings branding opportunities, such as establishing an environmentally-friendly brand for consumers.

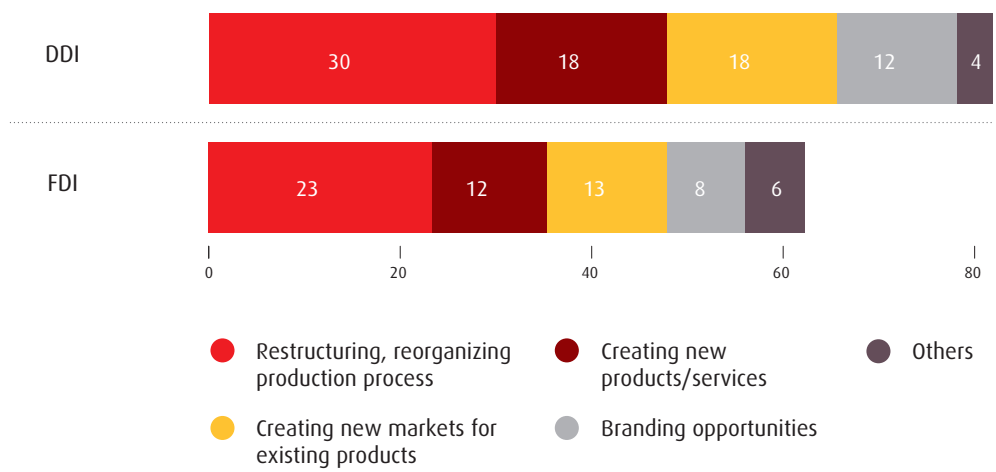
Table 5.1 Identify Opportunities in the Context of Disaster Risk and Climate Change

Opportunities	Percentage
Business restructuring	30%
New products	18%
New markets	18%
Branding activities	12%
Others	4%

We have tried to separate businesses by economic category to find out their views on opportunities in the context of natural disaster risk and climate change. The results are shown in detail in the figure below, illustrating that in many aspects, DDI enterprises are more optimistic than FDI enterprises. DDI enterprises may have a greater degree of flexibility in adjusting their operations, because the scale is often small and compact, which means that activities such as restructuring, reorganizing production, creating new products and services, and market development are easier compared to FDI enterprises.

Figure 5.1 Identify Opportunities in the Context of Disaster Risk and Climate Change by Enterprises' Economic Category

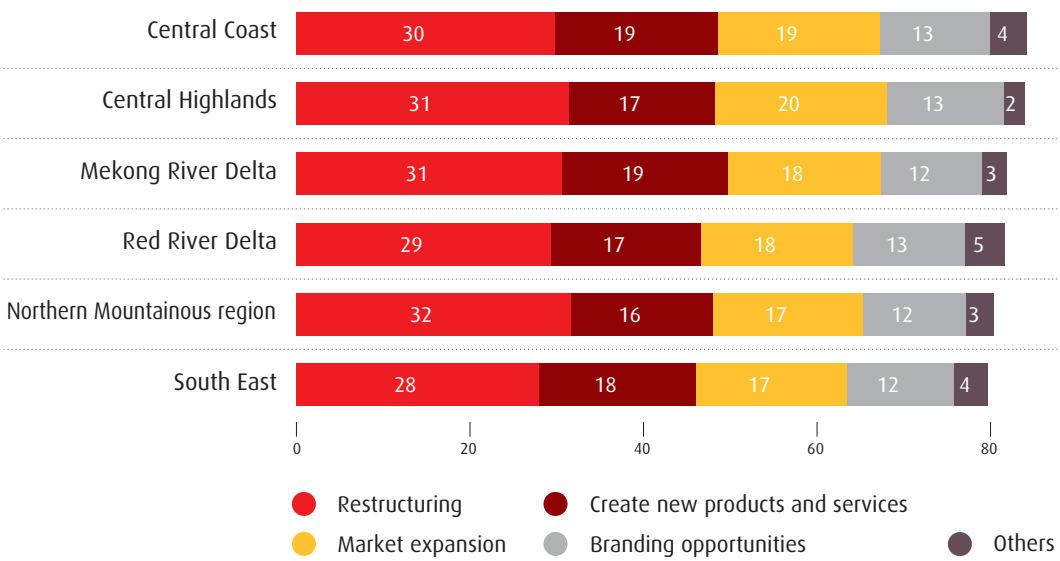
Unit: Percentage of enterprises reported (%)



The following figure describes the identification rate of opportunities in the context of natural disaster risk and climate change by region. The results show that enterprises in the Central Coast region seem to have the highest rate of indentifying opportunities, followed by businesses in the Central Highlands and Mekong River Delta. The Southeast region has the lowest rate of identifying opportunities. However, the level of difference among enterprises in the regions is not significant.

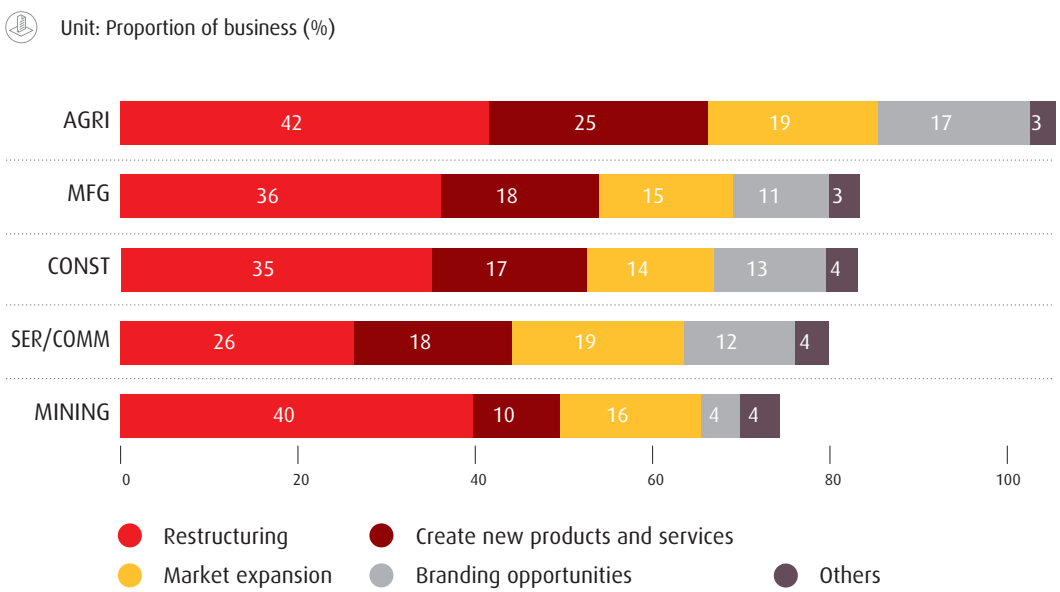
Figure 5.2 Identify Opportunities in the Context of Disaster Risk and Climate Change by Region

Unit: Proportion of business (%)



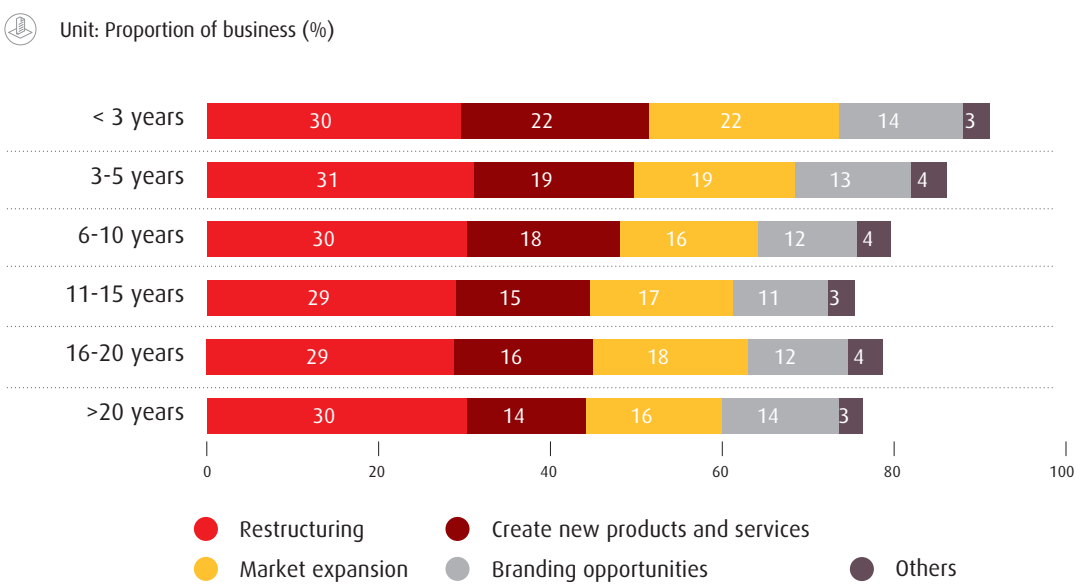
We also tried to analyze this identification of opportunity by classifying enterprises by sector. Surprisingly, businesses in the fields of agriculture, forestry and fisheries are the group with the highest chance of perceiving opportunities when compared to others. They are followed by enterprises in the manufacturing industry, then in the construction sector. Businesses in mining and commercial and services are the two groups with lowest rate of perceiving opportunities. The differences in recognition rates for each type of opportunity are also relatively significant within these last two sectors.

Figure 5.3 Identify Opportunities in the Context of Disaster Risk and Climate Change by Sector



The figure below shows the percentage of enterprises that identify opportunities by the number of years in operation. It can be seen that the younger the business, the higher the recognition rate. This is relatively positive, because these groups often have greater opportunity to adjust their operations than long-term enterprises, as newer businesses' owners are often younger and more agile.

Figure 5.4 Identify Opportunities in the Context of Disaster Risk and Climate Change by the number of Years of Operation



Actions to Become More Environmentally Friendly

Under this context of natural disaster risk and climate change in Vietnam, will enterprises be willing to adjust operations to become more environmentally friendly? More specifically, at what rate are businesses willing to invest to help solve this matter? We asked businesses to answer the above question by indicating the maximum payment (as a percentage of operating expenses), that businesses would be willing to give up. Investigations show relatively positive numbers. Typically, businesses said they would pay about 2% of operating costs for being more environmentally friendly (median). This figure is the same for both DDI and FDI enterprises. The average value shows a slight difference between the two economic categories. DDI enterprises reported that they could spend on average 7.32% of operating costs, while FDI enterprises were slightly better, at 7.72%.

Table 5.2 Cost Enterprises Are Willing to Pay to Be Environmentally Friendly (% of Operating Expenses) by Economic Category

Economics characteristics	Number of Enterprises	Median	Mean	Standard deviation	Min	Max
DDI	5,101	2.00	7.32	13.97	0.00	100.00
FDI	861	2.00	7.72	15.75	0.00	100.00
Total	5,962	2.00	7.32	13.98	0.00	100.00

In this survey, we wanted to investigate the costs that enterprises are willing to pay to become more environmentally friendly, comparing enterprises of two economic categories, by dividing them into two cases. In the first case, the government would issue and enforce more stringent regulations to improve the environmental compliance of the business; in other words, this would be a mandatory solution by legal tools. In the second case, there would be an environmental assessment and ranking report by a reputable social organization in Vietnam, a soft solution.

Figure 5.5 Questionnaire Format of Willingness to Pay to Be More Environmentally Friendly, by Two Cases

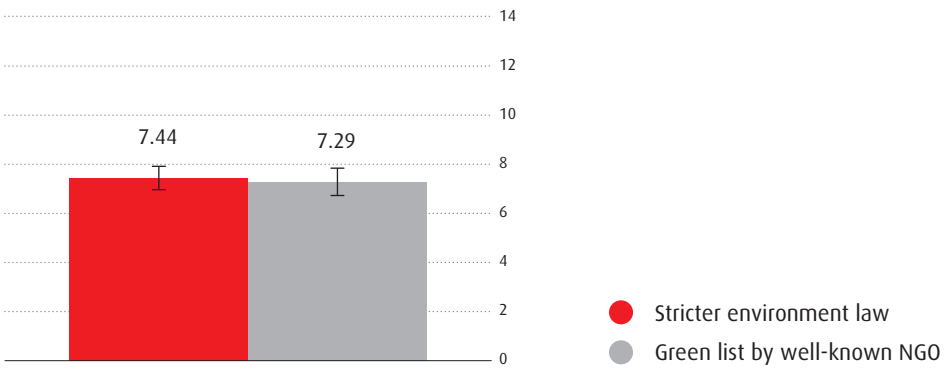
Legal Tool	***Form A:*** *After recent environmental disasters, the national government has announced stricter environmental laws (i.e. environmental impact assessment for new investment projects, compliance review of environmental regulations). These laws involve high penalties, including the withdrawal of a firm's business license in case of violation.*
Evaluation of social organization (NGO)	***Form B:*** *A well-know, non-state organization in Vietnam has begun to publish a green list, ranking individual firms on the size of their environmental impact and classifying firms (including SMEs) as either green champions or dirty polluters. This ranking will be released to customers, who may make purchasing decisions based on a firm's environmental reputation.* *Based on this trend, please tell us the maximum amount of adjustments (as a share of operating costs) that you would be willing to make in order to make your company more environmentally friendly.* *6a. Share of operating costs: (Please simply write the highest cost you would be willing to assume):* ☐ ..% ☐ 0%

The survey results show quite interesting results. For those enterprises that received information that the state will enact and enforce stricter laws related to environmental issues, businesses would commonly spend 7.44% of operating costs to improve their compliance level. Meanwhile, for businesses that received information on soft solutions, they were on average willing to pay about 7.29% of operating costs. The difference in the willingness of enterprises within these two cases is not significant. It shows that businesses are willing to invest to improve their environmental compliance.

The important argument to make here is that the solution of using voluntary social tools seems to be a good choice in Vietnam, when enterprises' willingness to pay in the soft solution case is not significantly lower than the case of using legal tools. The issuance and implementation of regulations can significantly affect state budgets, both at the central and local levels. Meanwhile, if using the soft solution mentioned above, it is obvious that the state's resources can be reduced and fully used in other jobs which are more feasible in the current context of the state budget, which is facing many difficulties.

Figure 5.6 Willingness to Pay to Become More Environmentally Friendly

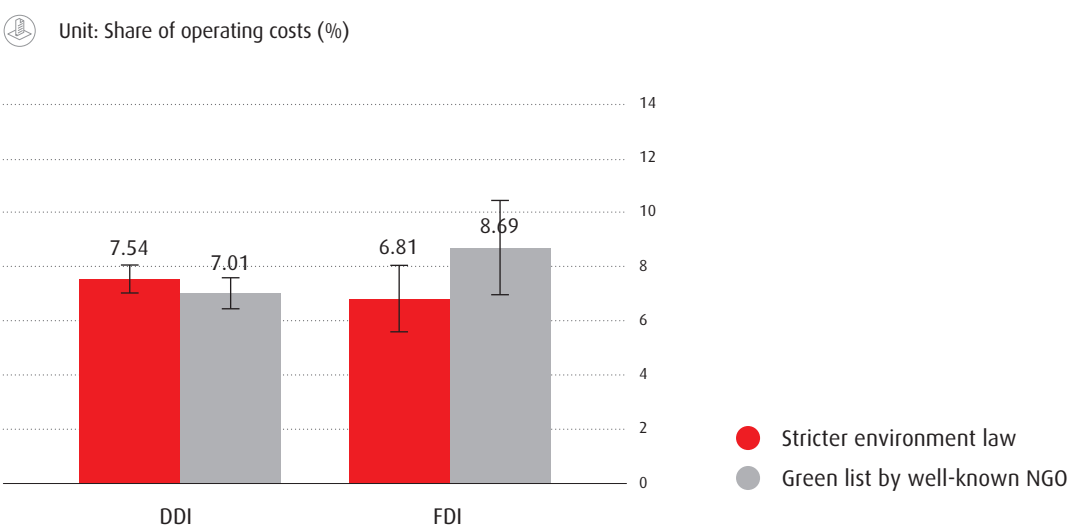
Unit: Share of operating costs (%)



Moreover, we tried to figure out whether there are significant differences between DDI enterprises and FDI enterprises in terms of willingness to pay in the two cases mentioned above. For DDI enterprises that received information on the enactment and enforcement of stricter laws, the willingness to pay was 7.54%, while that of businesses that received information on the evaluation of social organizations was 7.01%. As shown in the figure, the confidence interval (gray bar) overlaps, indicating that this difference is not statistically significant. This result shows that soft solutions are more suitable.

As for FDI enterprises, the results are remarkable. Those who received information on legal instruments said they would be willing to pay 6.81% of operating costs. Meanwhile, FDI enterprises receiving information about the assessment of social organizations said they would be willing to spend up to 8.69% of operating costs. This may be because FDI enterprises place a high value on the assessments of social organizations in developed countries, hence they are willing to pay higher rates. Since the confidence bars are overlapping, this difference is not statistically significant. However, this result shows that the use of social tools can still have a significant impact on FDI enterprises.

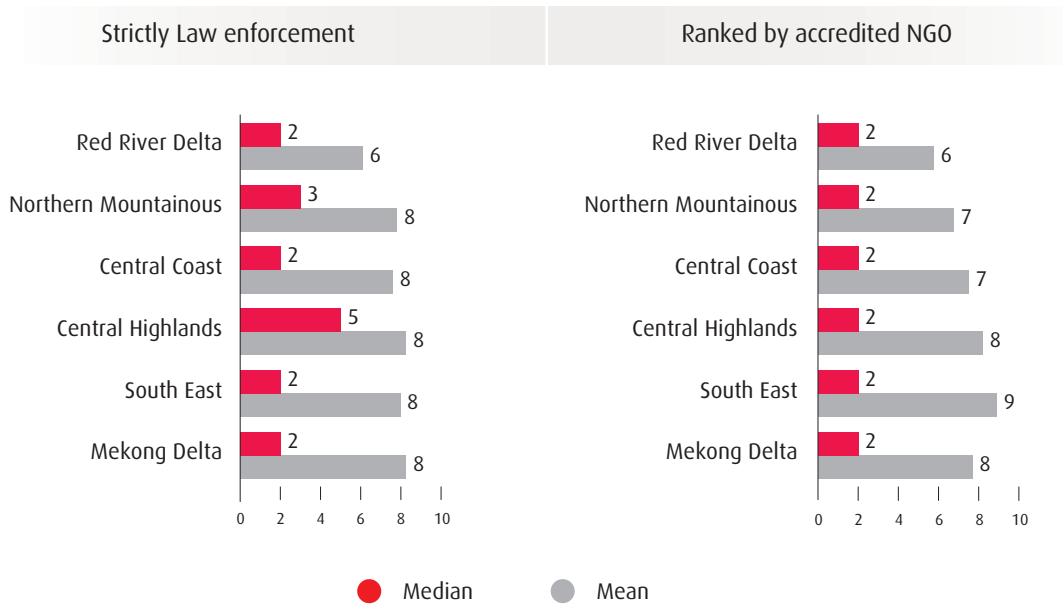
Figure 5.7 The Level of Willingness to Pay to Be More Environmentally Friendly, by Two Investigated Cases and by Economic Category of the Enterprises



We tried to look at the willingness to pay of DDI enterprises by region on two measures: median and mean. The results shown here demonstrate that there are no significant differences between regions, with the exception of enterprises in the Central Highlands, which are generally willing to pay up to 5% of operating costs, while other regions only reach 2%. Regarding the average value, businesses in the Southeast region have the highest willingness to pay, at 9%, while the remaining areas are around 6-8% of operating costs.

Figure 5.8 Cost a Firm is Willing to Assume for Being More Environmentally Friendly by Region

Unit: Percentage of operating cost (%)



For businesses that provided information about their willingness to pay to become more environmentally friendly, what specific activities would they deploy next? This information is, in our opinion, very important. For government agencies, this information will support the policy-making process related to the design of incentives and facilitation measures for businesses to implement activities to improve environmental compliance. For businesses that provide related services, it is clear that this information needs to be taken to advantage.

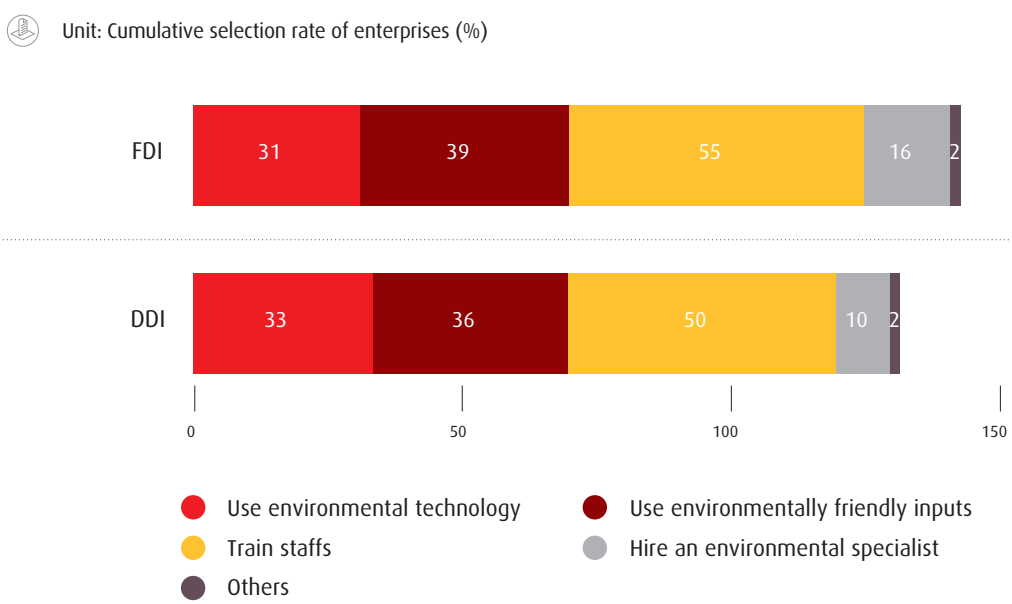
The table below shows the percentage of enterprises choosing specific activities to be more environmentally friendly, with the level of willingness to pay for these improvements. Specifically, about 50% of businesses said that they would improve training for managers and employees about natural disaster risk and climate change. This was followed by 36% of businesses saying they would buy input materials from environmentally friendly manufacturers. About one third of businesses (33%) would apply cleaner technology to production. Notably, up to 10% of businesses would hire specialized staff to be in charge of compliance with environmental regulations.

Table 5.3 Actions from Businesses to Become More Environmentally Friendly

Actions	Number of enterprises	Mean	Standard deviation	Value	
				[Min]	[Max]
Cleaner technology	10,356	33%	47%	0%	100%
Use more environmentally friendly input materials	10,356	36%	48%	0%	100%
Train staff	10,356	50%	50%	0%	100%
Hire compliance staff	10,356	10%	30%	0%	100%
Others	10,356	2%	13%	0%	100%

The figure below shows the rate of actions that enterprises would be most likely to do next (by economic category). Overall, the proportion of FDI enterprises willing to take on new actions is higher. Most significantly, there is a difference of 6% in the willingness to recruit employees in charge of compliance with environmental regulations, followed by 5% difference in willingness to provide better training for managers and employees. Up to 39% of FDI enterprises said they would buy inputs from environmentally friendly manufacturers, while in DDI enterprises this was 36%. For the application of cleaner technology to production, the selection rates of FDI enterprises and DDI enterprises were 31% and 33%, respectively.

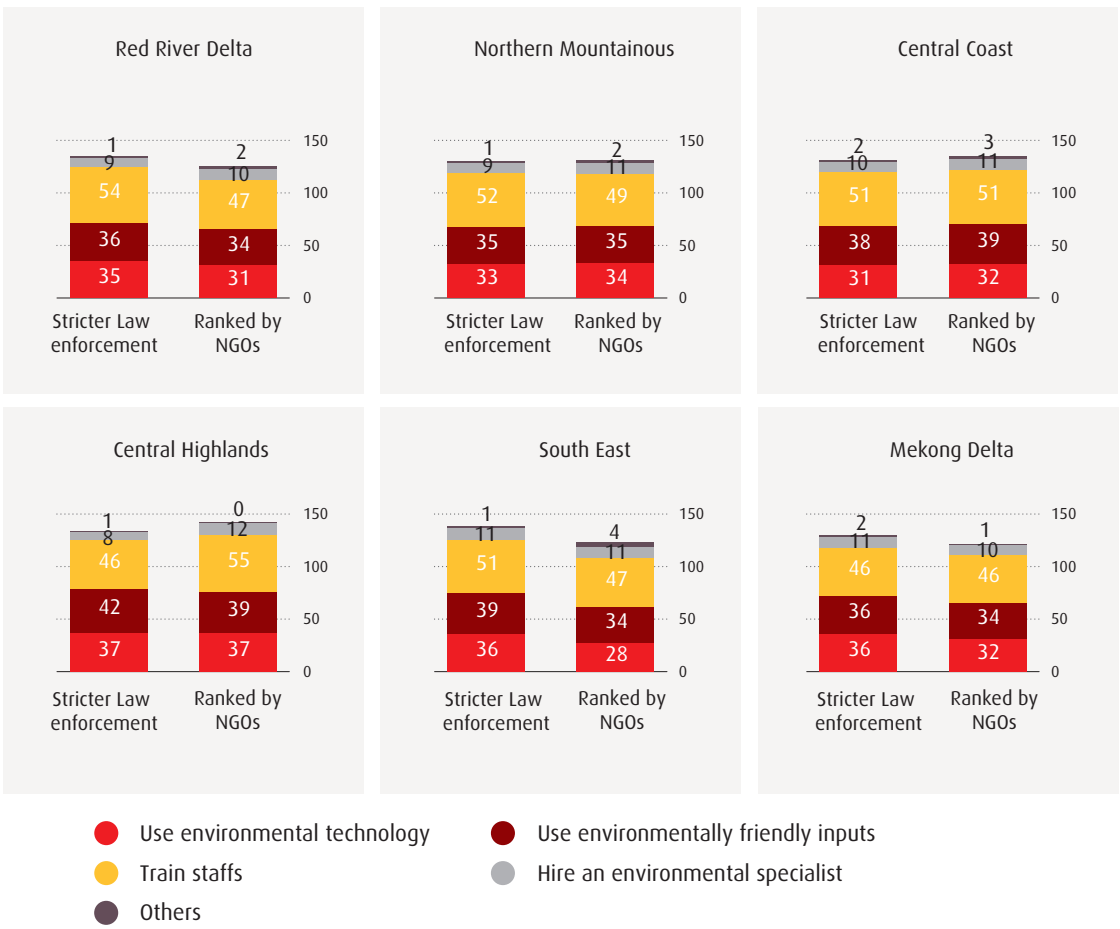
Figure 5.9 Actions that Enterprises Would Be Most Likely to Make by Economic Category of the Enterprises



Again, we tried to see whether there is a difference between legally mandated tools and soft measures by region. The survey results show that enterprises receiving information on legal tools seemed to have a slightly higher rate of taking action, except for the Central Coast and Central Highlands regions, where businesses receiving soft measures were more willing to take action. Whatever the case, the choices of businesses were not significantly different.

Figure 5.10 Actions that Firms Would be Most Likely to Make by Region

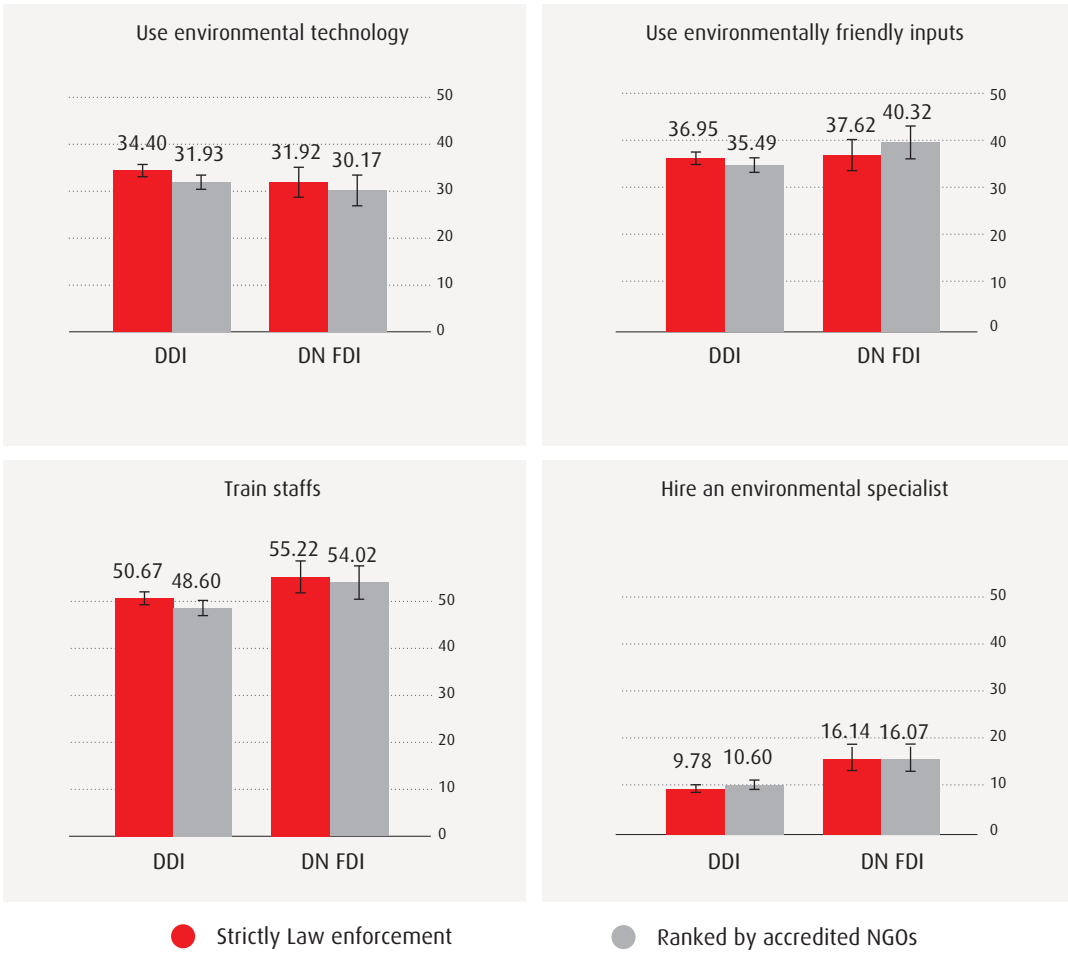
Unit: Cumulative selection rate of enterprises (%)



Finally, is there a difference between DDI and FDI enterprises in conducting activities to be more environmentally friendly, divided by groups receiving information on mandatory versus voluntary tools? The results are shown in the figure below for each activity. Accordingly, although the results obtained for each group and each activity are different, the degree of difference is not statistically significant. This suggests that the use of social tools may still be a good option in the current context of Vietnam.

Figure 5.11 Actions that Firms Would Be Most Likely to Make Classified by DDI and FDI Enterprises

Unit: Proportion of business (%)



Motivations for Businesses to Act

From the survey data, we tried to find out why DDI enterprises are willing to adjust their operations to be more environmentally friendly. Using linear regression analysis, we considered the correlation between sector, traits of enterprises, and the level of willingness to invest (based on operating costs). This method of consolidating standard errors sampled the main unit at the provincial level to reduce the likelihood of errors correlating between firms within similar sectors. Moreover, we used fixed effects according to the sector, to compare the differences between sectors.

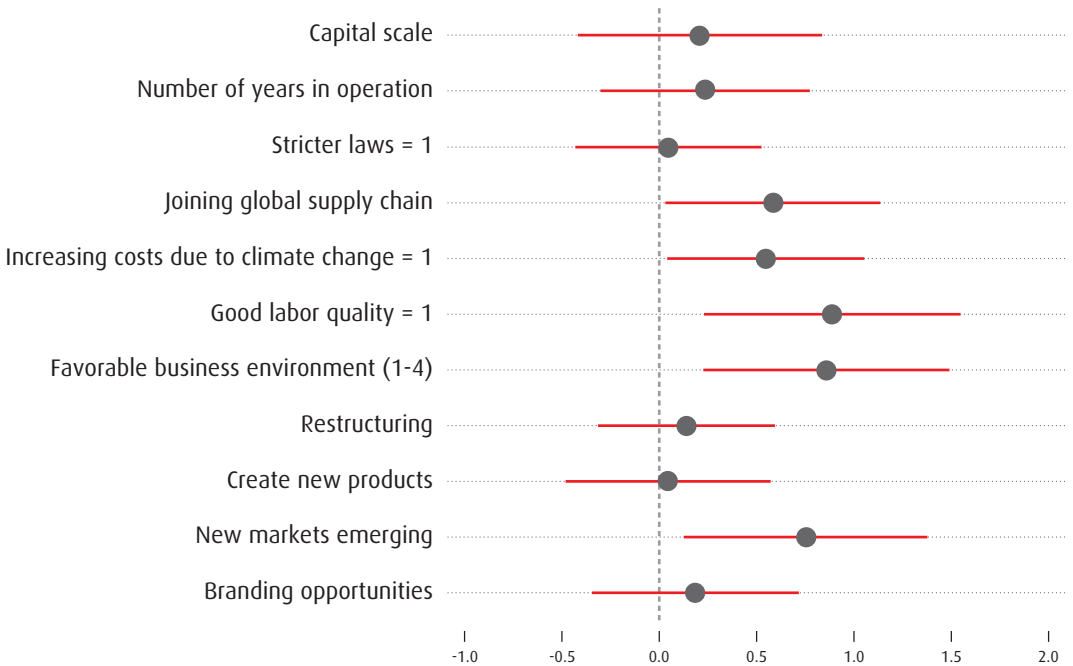
Using this method, we found no evidence of a relationship between willingness to invest in becoming more environmentally friendly and the sector and traits of the business (capital size, or years in operation of the enterprise). Similar to the above analysis, stricter environmental law enforcement was not a motivating factor for businesses to increase investment in becoming more environmentally friendly.

The analysis results show that certain factors are important for DDI enterprises in choosing investment decisions to become more environmentally friendly. First, the higher the quality of local labor, the more businesses are likely to invest in improving their environmental friendliness. According to the survey data, when there is an increase in one standard deviation in the assessment of local labor quality (44%), which is higher than the average assessment of local enterprises' labor (27%), the cost that businesses are willing to pay to become more environmentally friendly [as a percentage of operating costs] will increase by about 1%.

Second, when businesses see a favorable local business environment (measured by whether local government measures are positive), the trend will in general be an increase in enterprises' investment. Developing new markets for existing products of businesses is the third factor that motivates businesses to increase investment in becoming more environmentally friendly. It can be seen that this is an opportunity that businesses can seize in the context of climate change.

The fourth factor motivating businesses to increase investment to be more environmentally friendly is the business's desire to better integrate into global supply chains. Climate change's impact on increasing enterprises' business costs is also an important factor promoting businesses to invest in becoming more environmentally friendly.

Figure 5.12 The Main Factors Motivating Businesses to Invest to Be More Environmentally Friendly



The effect of changing 1 standard deviation (SD) on the rate of willingness to invest in becoming more eco-friendly as a percentage of operating costs (%)

06

Conclusion

The survey results show that climate change is having a relatively negative impact on Vietnamese businesses. This negative impact is multifaceted for certain businesses. They experienced interrupted production and business processes, reduced labor productivity, reduced revenue, interrupted transportation channels, increased production and business costs, delayed distribution channels, reduced quality of products and services, damage to facilities, shortage of manpower, and lack of supply of production materials. Enterprises in the Central Coast region are the most affected by natural disaster risk and climate change compared to other regions. Agriculture, forestry and fisheries is the sector most affected by climate change and natural disaster. Newly operating enterprises are more affected than the remaining groups, as shown by the data on the cumulative impact of natural disaster risk and climate change on specific activities of enterprises. In the context of climate change with its increase in extreme climatic events, Vietnamese enterprises have implemented quite a few activities to cope with natural disaster risk and climate change. The most significant are the consolidation and repair of existing workshops and workplaces, adjustment of working hours, and training officials and employees on coping with natural disaster risk and climate change. A large number of businesses reported changing business strategies and methods due to challenges from natural disaster risk and climate change, such as rebuilding factories, upgrading production technologies, and requiring business partners to work together to come up with plans to cope with natural disaster risk and climate change. There was also a small proportion of businesses that said they moved their factories and workplaces to safer locations. A significant proportion of businesses have bought insurance to prevent natural disaster risk. As the size of the business increases (in terms of capital or labor), the proportion of enterprises that undertake response activities increases. The main reason for conducting response activities is that businesses deem these actions necessary. Many businesses have participated in and contributed to relief operations to help to overcome the consequences of natural disasters. Cash was the most common form of contribution, followed by in-kind contributions, human resources, and services. Most businesses are willing to participate in relief activities, remedying the consequences of natural disasters when they occur. Businesses had relatively positive assessments of government readiness in natural disaster response. Most businesses said that they have easy access to local weather information and data. The government re-operation of basic infrastructure services (electricity, water and telecommunications) has received positive reviews from the business community. The majority of businesses assessed the local government's support to businesses in dealing with damage after natural disasters as timely and efficient, which shows that the provincial and city governments have been proactive in their efforts to overcome the consequences of natural disasters.

Most businesses are relatively optimistic about opportunities in the context of natural disaster risk and climate change. Specifically, businesses see opportunities for restructuring, reorganizing production, creating new products, services and technologies, developing new markets for existing products, and new branding opportunities.

The key finding of this survey is that Vietnamese businesses are willing to invest to improve environmental compliance. On average, businesses are willing to pay up to 7.32% of operating costs for becoming more environmentally friendly. For businesses that received information that the state would enact and enforce stricter laws related to environmental issues, the average business was willing to spend 7.44% of its operating costs to improve. Meanwhile, businesses that received information on soft solutions (assessments of reputable social organizations in Vietnam) were on average willing to pay about 7.29% of operating costs to improve.

The solution of using voluntary social tools will be a good choice in Vietnam for enhancing the role of the business community and promoting its participation in joint efforts to respond to climate change. The survey results show that the willingness to pay among enterprises knowing that there is a social organization assessing their level of environmental compliance, is insignificantly lower than that of the enterprises knowing environmental laws will be more strictly enforced. Not to mention, the promulgation and organization of implementing regulations can place major costs on the state budget, both at central and local levels. If using the soft solution, the state's resources can be reduced and fully used on other, more effective jobs in the context of the state budget, which is currently facing difficulties.

Key incentives for businesses to increase investment in becoming more environmentally friendly include good local labor quality, a favorable business environment, the desire to better integrate into global supply chains, and combating the increase in production costs due to climate change.

In order to encourage businesses to increase their investment in becoming more environmentally friendly, it is clear that the government has a very important role to play. The government’s role involves continuing to create a favorable business investment environment for businesses to invest safely. At the same time, it is necessary to focus on improving the quality of labor in localities, but more specifically, the quality of general education and vocational education to better meet the labor needs of enterprises. This role is also to facilitate businesses taking advantage of opportunities to participate in global supply chains.

Table Annex 1

Assess the Impact of Disaster Risks and Climate Change on Enterprises by Province and City

Province/City	Number of enterprises	Median	Average score [1-Lowest; 10-Highest]	Standard deviation	Lowest	Highest	Confidence interval 95%	
							[lower bound]	[upper bound]
An Giang	76	5.00	5.12	2.10	1.00	10.00	4.65	5.59
Bac Giang	91	5.00	4.52	2.35	1.00	10.00	4.03	5.00
Bac Kan	53	5.00	4.40	2.12	1.00	8.00	3.83	4.97
Bac Lieu	62	5.00	4.26	1.88	1.00	8.00	3.79	4.73
Bac Ninh	83	5.00	4.73	2.23	1.00	10.00	4.25	5.21
Ben Tre	86	5.00	4.63	2.38	1.00	10.00	4.12	5.13
Binh Dinh	114	5.00	4.29	2.24	1.00	10.00	3.88	4.70
Binh Duong	165	5.00	4.58	2.11	1.00	10.00	4.25	4.90
Binh Phuoc	65	5.00	3.88	2.02	1.00	8.00	3.39	4.37
Binh Thuan	94	5.00	4.49	2.54	1.00	10.00	3.98	5.00
Ba Ria – Vung Tau	87	5.00	4.38	2.27	1.00	10.00	3.90	4.86
Ca Mau	91	5.00	4.54	2.07	1.00	9.00	4.11	4.96
Can Tho	82	5.00	4.43	2.46	1.00	10.00	3.89	4.96
Cao Bang	84	5.00	4.39	2.20	1.00	8.00	3.92	4.86
Da Nang	169	5.00	4.41	2.09	1.00	10.00	4.09	4.72
Dak Lak	117	5.00	4.24	2.04	1.00	10.00	3.87	4.61
Dak Nong	89	5.00	4.04	2.02	1.00	10.00	3.63	4.46
Dien Bien	92	5.00	4.29	2.28	1.00	10.00	3.83	4.76
Dong Nai	97	5.00	4.02	2.14	1.00	9.00	3.59	4.45
Dong Thap	82	5.00	4.82	2.32	1.00	10.00	4.31	5.32
Gia Lai	66	5.00	4.45	2.04	1.00	10.00	3.96	4.95
Ha Giang	57	5.00	4.67	2.31	1.00	10.00	4.07	5.27
Ha Nam	108	5.00	4.26	2.46	1.00	10.00	3.80	4.72
Ha Noi	297	5.00	4.45	2.02	1.00	10.00	4.22	4.68
Ha Tinh	87	5.00	4.00	2.04	1.00	10.00	3.57	4.43
Hai Duong	114	5.00	4.41	1.95	1.00	9.00	4.05	4.77
Hai Phong	201	5.00	4.15	2.14	1.00	10.00	3.86	4.45
Hau Giang	68	5.00	4.18	1.87	1.00	8.00	3.73	4.62
Hoa Binh	75	5.00	4.36	2.08	1.00	10.00	3.89	4.83
Hung Yen	69	5.00	4.28	2.20	1.00	10.00	3.76	4.79
Khanh Hoa	100	5.00	4.32	2.11	1.00	10.00	3.91	4.73
Kien Giang	87	5.00	4.16	2.25	1.00	10.00	3.69	4.63
Kon Tum	91	5.00	4.53	2.08	1.00	10.00	4.10	4.96
Lai Chau	92	5.00	4.83	2.19	1.00	10.00	4.38	5.27
Lam Dong	115	5.00	4.59	2.34	1.00	10.00	4.16	5.02
Lang Son	98	5.00	4.40	2.25	1.00	10.00	3.95	4.84
Lao Cai	96	5.00	4.05	2.20	1.00	10.00	3.61	4.49
Long An	57	5.00	4.18	2.46	1.00	10.00	3.54	4.82
Nam Dinh	114	5.00	4.21	2.30	1.00	10.00	3.79	4.63
Nghe An	141	5.00	4.33	2.17	1.00	9.00	3.98	4.69

Province/City	Number of enterprises	Median	Average score [1-Lowest; 10-Highest]	Standard deviation	Lowest	Highest	Confidence interval 95%	
							[lower bound]	[upper bound]
Ninh Binh	82	5.00	4.37	2.06	1.00	8.00	3.92	4.81
Ninh Thuan	92	5.00	4.34	2.18	1.00	10.00	3.89	4.78
Phu Tho	86	5.00	4.62	2.08	1.00	9.00	4.18	5.06
Phu Yen	99	5.00	4.55	2.36	1.00	10.00	4.08	5.01
Quang Binh	84	5.00	4.60	2.30	1.00	10.00	4.10	5.09
Quang Nam	128	5.00	4.21	2.38	1.00	10.00	3.80	4.62
Quang Ngai	82	5.00	4.28	2.19	1.00	9.00	3.81	4.75
Quang Ninh	131	5.00	4.44	2.10	1.00	10.00	4.08	4.79
Quang Tri	89	5.00	4.33	1.95	1.00	10.00	3.92	4.73
Soc Trang	53	5.00	4.57	1.99	1.00	10.00	4.03	5.10
Son La	97	5.00	4.41	2.07	1.00	10.00	4.00	4.82
Tay Ninh	85	5.00	4.19	2.14	1.00	8.00	3.73	4.64
Thai Binh	114	5.00	4.59	2.14	1.00	10.00	4.19	4.98
Thai Nguyen	114	5.00	4.53	2.10	1.00	10.00	4.14	4.91
Thanh Hoa	115	5.00	4.12	2.05	1.00	9.00	3.75	4.50
Tien Giang	110	5.00	4.95	2.23	1.00	10.00	4.54	5.37
TP.HCM	299	5.00	4.43	2.06	1.00	10.00	4.20	4.66
Tra Vinh	87	5.00	4.80	2.47	1.00	10.00	4.29	5.32
TT-Hue	109	5.00	4.59	2.24	1.00	10.00	4.17	5.01
Tuyen Quang	90	5.00	4.38	2.25	1.00	10.00	3.91	4.84
Vinh Long	88	5.00	4.19	1.99	1.00	9.00	3.78	4.61
Vinh Phuc	118	5.00	4.92	2.02	1.00	10.00	4.55	5.28
Yen Bai	94	5.00	4.50	2.30	1.00	10.00	4.04	4.96
Total	**6,458**	**5,00**	**4,41**	**2,17**	**1,00**	**10,00**	**4,36**	**4,47**

Table Annex 2

Estimated Total Number of Days of Operation Interrupted Due to Climate Change and Natural Disaster Risk in the Last year by Province or City

Capital scale	Number of enterprises	Median	Average	Standard deviation	Lowest	Highest	Confidence interval 95%	
							[lower bound]	[upper bound]
An Giang	72	4.00	11.64	17.92	0.00	90.00	7.50	15.78
Bac Giang	95	5.00	11.26	15.69	0.00	90.00	8.11	14.42
Bac Kan	56	20.00	27.58	29.50	0.00	100.00	19.85	35.31
Bac Lieu	63	2.00	9.89	14.95	0.00	60.00	6.20	13.58
Bac Ninh	95	5.00	11.78	17.68	0.00	100.00	8.22	15.33
Ben Tre	82	5.00	15.07	28.52	0.00	150.00	8.90	21.25
Binh Dinh	121	7.00	14.44	26.35	0.00	187.00	9.74	19.13
Binh Duong	164	2.00	7.68	15.64	0.00	90.00	5.29	10.07
Binh Phuoc	65	5.00	15.12	20.14	0.00	100.00	10.23	20.02
Binh Thuan	85	5.00	12.09	16.57	0.00	60.00	8.57	15.61
Ba Ria – Vung Tau	97	5.00	13.64	26.42	0.00	180.00	8.39	18.90
Ca Mau	83	7.00	16.37	23.79	0.00	120.00	11.26	21.49
Can Tho	76	5.00	13.45	23.08	0.00	150.00	8.26	18.64
Cao Bang	94	10.00	23.74	32.43	0.00	187.00	17.19	30.30
Da Nang	183	5.00	13.80	25.33	0.00	187.00	10.13	17.47
Dak Lak	109	10.00	17.85	23.64	0.00	150.00	13.42	22.29
Dak Nong	88	13.50	21.19	26.03	0.00	170.00	15.75	26.63
Dien Bien	94	20.00	25.11	24.83	0.00	100.00	20.09	30.13
Dong Nai	106	5.00	11.08	17.73	0.00	90.00	7.70	14.45
Dong Thap	84	4.50	13.76	25.91	0.00	187.00	8.22	19.30
Gia Lai	72	17.50	26.57	31.64	0.00	150.00	19.26	33.88
Ha Giang	55	10.00	20.35	24.89	0.00	120.00	13.77	26.92
Ha Nam	106	10.00	16.40	21.76	0.00	120.00	12.25	20.54
Ha Noi	306	5.00	10.87	15.41	0.00	100.00	9.14	12.59
Ha Tinh	88	15.00	26.24	30.87	0.00	150.00	19.79	32.69
Hai Duong	113	5.00	13.19	23.05	0.00	187.00	8.94	17.44
Hai Phong	205	5.00	11.26	17.20	0.00	120.00	8.90	13.61
Hau Giang	62	10.00	18.42	23.56	0.00	100.00	12.56	24.28
Hoa Binh	82	18.50	23.83	22.45	0.00	100.00	18.97	28.69
Hung Yen	61	5.00	11.00	16.84	0.00	65.00	6.77	15.23
Khanh Hoa	94	7.00	15.01	24.47	0.00	187.00	10.06	19.96
Kien Giang	88	15.00	22.48	25.68	0.00	120.00	17.11	27.84
Kon Tum	96	6.50	19.98	26.92	0.00	100.00	14.59	25.36
Lai Chau	84	30.00	39.56	41.28	0.00	180.00	30.73	48.39
Lam Dong	122	7.00	17.15	25.09	0.00	150.00	12.69	21.60

Capital scale	Number of enterprises	Median	Average	Standard deviation	Lowest	Highest	Confidence interval 95%	
							[lower bound]	[upper bound]
Lang Son	101	6.00	17.61	29.09	0.00	187.00	11.94	23.29
Lao Cai	98	10.00	21.38	29.97	0.00	150.00	15.44	27.31
Long An	58	2.00	5.55	8.77	0.00	40.00	3.30	7.81
Nam Dinh	115	7.00	13.96	21.46	0.00	180.00	10.04	17.88
Nghe An	152	10.00	20.11	25.06	0.00	180.00	16.13	24.10
Ninh Binh	87	7.00	19.15	30.28	0.00	187.00	12.79	25.51
Ninh Thuan	96	5.00	11.66	17.39	0.00	90.00	8.18	15.14
Phu Tho	86	10.00	16.37	26.56	0.00	185.00	10.75	21.98
Phu Yen	88	10.00	19.16	21.57	0.00	90.00	14.65	23.67
Quang Binh	84	10.00	22.75	27.87	0.00	120.00	16.79	28.71
Quang Nam	124	8.50	16.94	28.03	0.00	187.00	12.00	21.87
Quang Ngai	90	10.00	19.08	28.98	0.00	150.00	13.09	25.06
Quang Ninh	118	10.00	17.88	26.07	0.00	187.00	13.17	22.58
Quang Tri	94	10.00	19.30	24.51	0.00	187.00	14.34	24.25
Soc Trang	47	6.00	14.06	30.57	0.00	183.00	5.32	22.80
Son La	95	10.00	21.53	30.25	0.00	180.00	15.45	27.61
Tay Ninh	90	3.00	9.87	16.82	0.00	120.00	6.39	13.34
Thai Binh	117	8.00	13.44	16.92	0.00	90.00	10.37	16.51
Thai Nguyen	110	5.00	15.27	24.01	0.00	150.00	10.79	19.76
Thanh Hoa	127	15.00	22.52	25.94	0.00	120.00	18.01	27.03
Tien Giang	103	5.00	10.19	16.42	0.00	120.00	7.02	13.37
TP.HCM	279	3.00	8.15	13.29	0.00	90.00	6.59	9.71
Tra Vinh	85	5.00	16.75	28.73	0.00	187.00	10.65	22.86
TT-Hue	111	5.00	12.86	19.96	0.00	130.00	9.15	16.58
Tuyen Quang	92	20.00	25.11	30.26	0.00	180.00	18.92	31.29
Vinh Long	99	3.00	11.95	19.11	0.00	90.00	8.18	15.71
Vinh Phuc	114	10.00	17.75	22.14	0.00	120.00	13.68	21.81
Yen Bai	90	10.00	19.04	25.09	0.00	120.00	13.86	24.22
Total	**6,496**	**7.00**	**16.10**	**24.17**	**0.00**	**187.00**	**15.51**	**16.69**

Table Annex 3

Estimated Loss Level (in Millions of Dong) Due to Climate Change and Natural Disaster Phenomena in the Last Year by Province or City

Capital scale	Number of enterprises	Median	Average	Standard deviation	Lowest	Highest	Confidence interval 95%	
							[Lower bound]	[Upper bound]
An Giang	64	15.00	76.78	189.43	0.00	1,000.00	30.37	123.19
Bac Giang	75	20.00	67.06	112.92	0.00	500.00	41.50	92.62
Bac Kan	48	50.00	73.08	94.11	0.00	400.00	46.46	99.71
Bac Lieu	51	20.00	78.29	136.84	0.00	500.00	40.74	115.85
Bac Ninh	79	6.00	51.06	116.65	0.00	897.00	25.34	76.79
Ben Tre	70	10.00	62.39	148.07	0.00	1,000.00	27.70	97.07
Binh Dinh	91	20.00	81.65	205.22	0.00	1,500.00	39.49	123.82
Binh Duong	135	10.00	46.11	101.36	0.00	500.00	29.01	63.21
Binh Phuoc	50	15.00	142.15	237.36	0.00	1,000.00	76.36	207.94
Binh Thuan	67	50.00	104.97	149.03	0.00	500.00	69.29	140.66
Ba Ria – Vung Tau	84	10.00	65.39	133.93	0.00	800.00	36.75	94.03
Ca Mau	74	21.00	61.87	118.80	0.00	800.00	34.81	88.94
Can Tho	71	10.00	46.59	128.64	0.00	1,000.00	16.67	76.51
Cao Bang	78	25.00	112.77	264.96	0.00	2,000.00	53.97	171.57
Da Nang	150	10.00	53.99	128.60	0.00	1,000.00	33.41	74.57
Dak Lak	93	20.00	65.55	113.43	0.00	520.00	42.49	88.60
Dak Nong	64	35.00	71.98	108.25	0.00	562.00	45.46	98.51
Dien Bien	75	50.00	130.76	203.82	0.00	1,000.00	84.63	176.89
Dong Nai	93	10.00	45.01	113.33	0.00	1,000.00	21.98	68.04
Dong Thap	70	10.00	67.17	160.75	0.00	1,000.00	29.51	104.83
Gia Lai	58	50.00	128.72	320.27	0.00	2250.00	46.30	211.15
Ha Giang	50	32.50	158.92	382.47	0.00	2,500.00	52.91	264.93
Ha Nam	89	40.00	113.13	167.48	0.00	600.00	78.34	147.93
Ha Noi	260	10.00	61.73	160.22	0.00	2,000.00	42.26	81.21
Ha Tinh	72	50.00	159.48	412.16	0.00	3,000.00	64.28	254.68
Hai Duong	100	20.00	98.21	181.69	0.00	1,000.00	62.60	133.82
Hai Phong	155	30.00	106.43	191.31	0.00	1,000.00	76.31	136.54
Hau Giang	55	20.00	69.91	161.68	0.00	1,000.00	27.18	112.64
Hoa Binh	62	100.00	209.48	386.47	0.00	2,000.00	113.28	305.68
Hung Yen	44	20.00	111.36	186.65	0.00	800.00	56.21	166.52
Khanh Hoa	82	30.00	108.63	206.91	0.00	1,000.00	63.85	153.42
Kien Giang	73	40.00	94.63	176.30	0.00	1,000.00	54.19	135.08
Kon Tum	76	17.50	85.68	147.58	0.00	600.00	52.50	118.86
Lai Chau	71	50.00	283.04	709.80	0.00	4,000.00	117.94	448.14
Lam Dong	101	20.00	123.19	393.95	0.00	3,500.00	46.36	200.02

Capital scale	Number of enterprises	Median	Average	Standard deviation	Lowest	Highest	Confidence interval 95%	
							[Lower bound]	[Upper bound]
Lang Son	80	20.00	108.56	353.54	0.00	3,000.00	31.09	186.03
Lao Cai	81	50.00	118.99	189.26	0.00	1,000.00	77.77	160.20
Long An	48	20.00	54.42	102.35	0.00	500.00	25.46	83.37
Nam Dinh	100	20.00	127.99	332.30	0.00	3,000.00	62.85	193.12
Nghe An	113	50.00	158.65	333.01	0.00	2,000.00	97.25	220.06
Ninh Binh	67	50.00	93.57	140.37	0.00	500.00	59.96	127.18
Ninh Thuan	81	15.00	77.12	255.88	0.00	2,000.00	21.39	132.84
Phu Tho	74	22.50	108.43	204.84	0.00	1,000.00	61.76	155.10
Phu Yen	72	30.00	146.92	361.42	0.00	2,100.00	63.44	230.40
Quang Binh	75	50.00	225.72	550.84	0.00	3,000.00	101.05	350.39
Quang Nam	99	30.00	84.42	183.88	0.00	1,500.00	48.20	120.65
Quang Ngai	77	30.00	114.79	233.59	0.00	1,000.00	62.62	166.97
Quang Ninh	88	15.00	92.59	178.63	0.00	1,000.00	55.26	129.91
Quang Tri	86	50.00	83.91	112.50	0.00	500.00	60.13	107.68
Soc Trang	43	10.00	34.31	54.59	0.00	200.00	18.00	50.63
Son La	75	50.00	133.63	236.29	0.00	1,500.00	80.15	187.10
Tay Ninh	72	10.00	66.67	176.88	0.00	1,000.00	25.82	107.53
Thai Binh	96	50.00	67.16	81.19	0.00	450.00	50.91	83.40
Thai Nguyen	90	20.00	120.77	449.28	0.00	4,000.00	27.95	213.59
Thanh Hoa	98	42.50	74.89	93.56	0.00	500.00	56.36	93.41
Tien Giang	89	20.00	71.79	170.89	0.00	1,350.00	36.28	107.29
TP.HCM	236	5.00	53.28	130.78	0.00	900.00	36.60	69.97
Tra Vinh	79	10.00	46.10	84.02	0.00	500.00	27.57	64.63
TT-Hue	91	15.00	94.89	273.02	0.00	2,000.00	38.80	150.98
Tuyen Quang	79	30.00	134.33	265.57	0.00	2,000.00	75.77	192.89
Vinh Long	74	5.00	31.99	62.49	0.00	250.00	17.76	46.23
Vinh Phuc	94	27.50	122.18	241.03	0.00	1,700.00	73.46	170.91
Yen Bai	72	17.50	172.47	561.48	0.00	4,500.00	42.78	302.16
Total	**5,359**	**20.00**	**95.28**	**245.32**	**0.00**	**4,500.00**	**88.71**	**101.84**

Table Annex 4

Enterprise Ratings of Insurance Products

Province/City	Number of enterprises	Average [1-Very useful; 4-Not useful]	Standard deviation	Confidence interval 95%	
				[lower bound]	[upper bound]
An Giang	52	1.79	0.75	1.58	1.99
Bac Giang	42	1.98	0.87	1.71	2.24
Bac Kan	23	1.96	0.82	1.62	2.29
Bac Lieu	37	1.81	0.78	1.56	2.06
Bac Ninh	56	2.20	1.02	1.93	2.46
Ben Tre	51	1.76	0.71	1.57	1.96
Binh Dinh	76	1.64	0.71	1.49	1.80
Binh Duong	95	1.78	0.81	1.62	1.94
Binh Phuoc	51	1.94	0.95	1.68	2.20
Binh Thuan	55	1.89	0.81	1.68	2.10
Ba Ria – Vung Tau	53	1.81	0.71	1.62	2.00
Ca Mau	61	1.59	0.76	1.40	1.78
Can Tho	49	1.78	0.77	1.56	1.99
Cao Bang	42	2.00	0.96	1.71	2.29
Da Nang	87	1.78	0.74	1.63	1.94
Dak Lak	52	1.71	0.72	1.51	1.91
Dak Nong	47	1.81	0.77	1.59	2.03
Dien Bien	48	1.83	0.69	1.64	2.03
Dong Nai	65	1.85	0.78	1.66	2.03
Dong Thap	61	1.62	0.78	1.43	1.82
Gia Lai	40	2.08	0.86	1.81	2.34
Ha Giang	30	1.90	0.84	1.60	2.20
Ha Nam	59	1.90	0.84	1.68	2.11
Ha Noi	130	1.89	0.84	1.75	2.04
Ha Tinh	53	1.81	0.81	1.59	2.03
Hai Duong	65	1.78	0.65	1.63	1.94
Hai Phong	119	1.73	0.72	1.60	1.86
Hau Giang	39	1.79	0.83	1.53	2.06
Hoa Binh	47	1.81	0.92	1.54	2.07
Hung Yen	38	1.82	0.61	1.62	2.01
Khanh Hoa	53	1.89	0.72	1.69	2.08
Kien Giang	48	1.63	0.61	1.45	1.80
Kon Tum	50	1.82	0.72	1.62	2.02
Lai Chau	54	1.91	0.68	1.73	2.09
Lam Dong	60	1.93	0.99	1.68	2.18
Lang Son	51	1.82	0.87	1.59	2.06
Lao Cai	60	1.80	0.71	1.62	1.98
Long An	38	1.82	0.83	1.55	2.08
Nam Dinh	61	1.75	0.77	1.56	1.95

Province/City	Number of enterprises	Average [1-Very useful; 4-Not useful]	Standard deviation	Confidence interval 95%	
				[lower bound]	[upper bound]
Nghe An	71	1.63	0.74	1.46	1.81
Ninh Binh	43	1.70	0.89	1.43	1.96
Ninh Thuan	45	1.60	0.89	1.34	1.86
Phu Tho	45	1.69	0.63	1.50	1.87
Phu Yen	50	1.80	0.83	1.57	2.03
Quang Binh	46	1.80	0.91	1.54	2.07
Quang Nam	71	1.56	0.69	1.40	1.72
Quang Ngai	52	1.73	0.91	1.48	1.98
Quang Ninh	65	1.82	0.79	1.62	2.01
Quang Tri	50	1.62	0.64	1.44	1.80
Soc Trang	41	1.66	0.66	1.46	1.86
Son La	48	1.67	0.69	1.47	1.86
Tay Ninh	62	1.66	0.70	1.49	1.84
Thai Binh	66	1.73	0.80	1.54	1.92
Thai Nguyen	50	1.74	0.80	1.52	1.96
Thanh Hoa	68	1.78	0.83	1.58	1.98
Tien Giang	74	1.93	0.85	1.74	2.13
TP.HCM	155	1.90	0.87	1.77	2.04
Tra Vinh	54	1.83	0.86	1.60	2.06
TT-Hue	61	1.82	0.72	1.64	2.00
Tuyen Quang	63	1.76	0.80	1.56	1.96
Vinh Long	48	1.65	0.81	1.42	1.88
Vinh Phuc	80	1.90	0.79	1.73	2.07
Yen Bai	47	1.94	0.89	1.68	2.19

Table Annex 5

Enterprises Rate the Usefulness of Insurance Products Purchased by City

Province/City	Number of enterprises	Average	Standard deviation	Confidence interval 95%	
				[Lower bound]	[Upper bound]
Ha Noi	246	4.89	7.43	3.96	5.82
Hai Phong	148	7.33	11.58	5.46	9.19
Da Nang	131	7.25	14.17	4.82	9.67
TP.HCM	234	6.96	12.82	5.32	8.60
Can Tho	73	5.70	10.81	3.22	8.18
Thanh Hoa	94	6.16	9.69	4.20	8.12
Nghe An	116	8.41	18.41	5.05	11.76
Ha Tinh	65	7.26	13.52	3.98	10.55
Quang Binh	67	6.06	7.11	4.36	7.76
Quang Tri	72	9.06	17.52	5.02	13.11
TT-Hue	80	5.36	7.19	3.79	6.94
Quang Nam	96	6.00	11.64	3.67	8.33
Quang Ngai	75	10.21	20.76	5.51	14.90
Binh Đinh	83	8.44	18.76	4.40	12.48
Phu Yen	69	9.26	19.98	4.55	13.98
Khanh Hoa	70	9.04	13.25	5.94	12.15
Dong Thap	72	12.57	24.20	6.97	18.16
An Giang	58	6.66	10.97	3.83	9.48
Tien Giang	90	7.30	14.33	4.34	10.26
Vinh Long	63	6.80	10.28	4.26	9.34
Ben Tre	61	8.98	15.73	5.03	12.92
Kien Giang	70	8.86	16.63	4.96	12.75
Tra Vinh	65	10.18	18.77	5.62	14.75
Soc Trang	46	9.90	21.63	3.65	16.15
Bac Lieu	50	6.02	14.57	1.98	10.06
Cà Mau	74	4.62	6.93	3.04	6.20
Binh Phuoc	52	5.32	7.16	3.37	7.26
Tay Ninh	71	11.06	20.85	6.21	15.91
Ninh Thuan	72	12.06	22.13	6.95	17.18
Long An	44	5.72	11.73	2.25	9.18
Quang Ninh	92	5.34	7.81	3.74	6.94
Hau Giang	48	6.56	10.62	3.56	9.57
BRVT	68	8.06	14.27	4.67	11.45
Bac Ninh	80	6.33	13.35	3.40	9.25
Binh Duong	129	7.08	13.18	4.81	9.36
Binh Thuan	73	8.73	17.51	4.71	12.74
Dong Nai	83	8.71	16.77	5.10	12.32

Province/City	Number of enterprises	Average	Standard deviation	Confidence interval 95%	
				[Lower bound]	[Upper bound]
Ha Nam	87	5.64	7.09	4.15	7.13
Hai Duong	93	5.01	6.18	3.75	6.26
Hung Yen	51	7.85	17.11	3.15	12.54
Nam Dinh	92	6.64	12.27	4.13	9.15
Ninh Binh	70	3.31	4.73	2.21	4.42
Thai Binh	76	7.51	14.57	4.24	10.79
Vinh Phuc	89	6.71	10.09	4.61	8.80
Bac Kan	43	6.22	15.42	1.61	10.83
Bac Giang	72	6.04	13.89	2.83	9.25
Cao Bang	78	6.41	10.13	4.16	8.66
Dak Lak	97	9.54	12.07	7.14	11.95
Dak Nong	69	6.95	12.15	4.09	9.82
Dien Bien	67	8.72	17.35	4.56	12.87
Gia Lai	64	5.58	8.17	3.58	7.58
Hoa Binh	63	8.26	15.25	4.50	12.03
Kon Tum	76	8.39	17.40	4.48	12.30
Lai Chau	71	5.24	6.89	3.64	6.84
Lam Dong	95	9.02	15.82	5.84	12.20
Lang Son	70	5.93	12.13	3.09	8.78
Lao Cai	72	6.75	12.71	3.82	9.69
Phu Tho	76	8.64	16.73	4.87	12.40
Son La	67	8.18	11.74	5.37	10.99
Thai Nguyen	92	7.88	12.44	5.34	10.43
Tuyen Quang	70	7.51	16.61	3.62	11.40
Yen Bai	73	8.75	20.31	4.09	13.41
Ha Giang	48	6.11	12.25	2.65	9.58

Table Annex 6

Enterprises' Willingness to Adjust to Be More Environmentally Friendly by Province /City (% of Operating Expenses)

Dependent variable = The rate of willingness to invest to be more environmentally friendly (based on operating costs)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capital scale	0.001	0.005	0.004	0.004	0.004	0.004	0.005	0.004
	(0.005)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Years in operation	0.021	0.034	0.027	0.033	0.033	0.034	0.035	0.036
	(0.034)	(0.038)	(0.039)	(0.042)	(0.042)	(0.042)	(0.041)	(0.041)
Stricter law=1	-0.134	-0.124	0.025	0.084	0.082	0.088	0.099	0.100
	(0.492)	(0.527)	(0.527)	(0.487)	(0.485)	(0.484)	(0.485)	(0.485)
Desire to intergrate into global supply chain=1	1.662***	1.756***	1.686**	1.726**	1.708**	1.638**	1.482**	1.425**
	(0.592)	(0.659)	(0.640)	(0.683)	(0.671)	(0.664)	(0.663)	(0.672)
Rising costs of production =1		0.449	0.480	0.725**	0.709**	0.693**	0.648**	0.637**
		(0.293)	(0.300)	(0.292)	(0.288)	(0.290)	(0.293)	(0.294)
Labor quality=1			2.183***	1.992***	1.990***	1.978***	1.983***	1.997***
			(0.710)	(0.738)	(0.739)	(0.741)	(0.741)	(0.741)
Government support & good business environment (1-4)				0.975***	0.972***	0.971***	1.006***	1.002***
				(0.364)	(0.364)	(0.363)	(0.368)	(0.369)
Business Restructuring					0.176	0.205	0.281	0.307
					(0.499)	(0.499)	(0.498)	(0.496)
New product and service opportunities						0.628	0.200	0.120
						(0.689)	(0.674)	(0.688)
Market expansion opportunities for existing products							2.034**	1.966**
							(0.817)	(0.818)

Dependent variable = The rate of willingness to invest to be more environmentally friendly (based on operating costs)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Branding activities								0.566
								(0.805)
Constant	8.737***	7.362***	6.840***	2.588*	2.561*	2.428	2.017	1.984
	(0.507)	(0.849)	(0.939)	(1.476)	(1.492)	(1.519)	(1.541)	(1.544)
Numbers investigated	4,182	3,676	3,446	3,249	3,249	3,249	3,249	3,249
R-squared	0.010	0.012	0.015	0.018	0.018	0.018	0.021	0.021
n_cluster	.	.	.	.	.	.	.	.
rmse	15.19	14.96	15.10	14.97	14.97	14.97	14.95	14.95

The OLS (least squares method) with standard errors gathered at the provincial level and by manufacturing sector

*** p<0.01, ** p<0.05, * p<0.1

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