



WORLD TRADE
ORGANIZATION

TRADE AND CLIMATE CHANGE

Information brief n° 3



The resilience of trade in the
face of increasingly frequent
natural disasters

TABLE OF CONTENTS

KEY POINTS	3
1. OVERVIEW	4
2. INCREASED OCCURRENCES OF NATURAL DISASTERS	4
3. TRADE AND ECONOMIC IMPACTS OF NATURAL DISASTERS	5
3.1 Direct trade and economic impacts	5
3.2 Indirect trade and economic impacts	6
a) Cross-sectoral impacts	7
b) Cross-border impacts	7
3.3 Heterogeneity in impacts	7
a) Sectoral heterogeneity	7
b) Heterogeneity in impacts on countries	8
c) Increased vulnerability due to a lack of economic diversification	10
4. DISASTER MITIGATION EFFORTS THROUGH TRADE	10
4.1 Phase 1 – Immediate response	10
4.2 Phase 2 – Recovery	11
4.3 Phase 3 – Promoting resilience	12
5. CONCLUSIONS	13

THE RESILIENCE OF TRADE IN THE FACE OF INCREASINGLY FREQUENT NATURAL DISASTERS¹

Information brief n° 3

KEY POINTS

- There is growing evidence that climate change is a major factor in the increasing occurrence and intensity of certain categories of natural disasters, including hydrological, meteorological and climatological events.
 - Natural disasters are a threat to national and international development objectives, and can have far-reaching implications for trade and economic growth.
 - Because of the interdependence of the global economy and the prevalence of international supply chains, damage to local infrastructure or to productive capacity can affect economies and trade in a range of different ways across sectors and borders.
 - The economic impacts of disasters, as well as of recovery efforts and efforts to develop resilience, depend on several factors, including the type of disaster, the severity of the disaster, the prevailing economic conditions, and the level of diversification of the economy.
 - A range of trade measures can be taken under the WTO Agreements to strengthen countries' resilience to natural disasters and to mitigate the impact of disasters by supporting immediate response and recovery.
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1. OVERVIEW

Natural disasters as a result of extreme hydrological, meteorological and climatological events are an increasingly prevalent threat to national and international development objectives. Statistical data point to an upsurge in the number of disaster events on record in recent decades, leading to increased recovery expenditure and significant reconstruction costs. There is growing evidence that climate change is a major factor in the rising occurrence of natural disasters, and the concentration of human activities, due, for example, to increased population and urbanization, have also contributed to the trend. Better reporting due to collaborative global efforts helps to provide a more accurate picture of the impact of these events.

The increasing frequency and intensity of natural disasters are having a significant impact on economic activity and international trade. Because of the complex nature of some disasters and the inter-connectedness of the global economy, even a localized disaster can result in regional or even global trade impacts. The preponderance of global value chains and the multifaceted nature of trading systems increase the probability that a disaster felt in one region will affect the availability or pricing of a good or service in another. The diverse nature of these events and the varying levels of preparedness or resilience among countries lead to varying impacts in costs and recovery times. Thus, building resilience is key to mitigating disaster impacts at the national and international level.

Trade and trade policy within the context of the rules-based multilateral system provide one possible avenue for disaster risk mitigation. Legal analysis points to a range of trade measures covered by WTO Agreements that can support WTO members in building resilience and in responding and recovering when disaster strikes.

2. INCREASED OCCURRENCES OF NATURAL DISASTERS

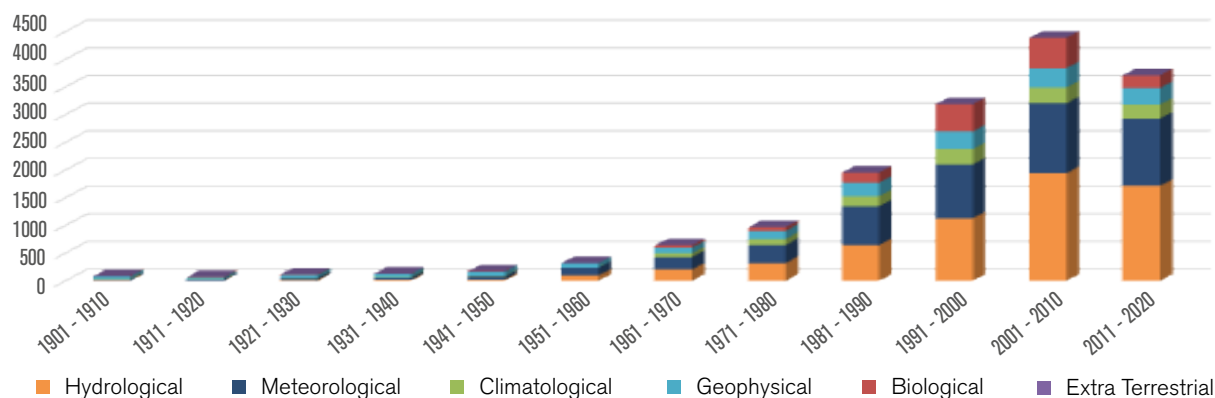
Natural disasters have occurred throughout history, and have been a factor in shaping the direction of human development. Important decisions on where cities are built, how infrastructure is designed, and which industries are pursued are, in part, shaped by our experiences with these events, as humans seek to mitigate and reduce the impact of risks. However, as reported events have increased measurably over the past few decades, they have also exerted increasing economic pressure on lives and livelihoods.

According to the Emergency Events Database (EM-DAT),² the number of reported occurrences of natural disasters increased by an average of 73 per cent each decade from the 1950s through to the 2000s: the number of disasters reported in the past decade (3,718) was almost four times higher than the corresponding number in the 1970s (973) and almost twelve times higher than in the 1950s (322). Figure 1 provides a decadal analysis of the six categories of natural disasters.

The number of reported occurrences of natural disasters increased by an average of 73 per cent each decade from the 1950s through to the 2000s.

Hydrological events including flash and coastal floods, are the most common occurrence, representing 39 per cent of reported events since 1901, while meteorological events, including storms, hurricanes and extreme temperatures, have also been significant, at 32 per cent of the reported events. Possible explanations for the rapid increase in reported occurrences of natural disasters include climate change, higher exposure of vulnerable populations to natural hazards, and better reporting.

Figure 1: Number of recorded natural disasters by category



Source: International Disaster database (EM-DAT) - <https://public.emdat.be>

The rate of global warming has accelerated, with each successive decade from 1970 to 2010 being warmer than any of the preceding decades on record.

A recent report from the United Nations' Intergovernmental Panel on Climate Change (IPCC) indicated that human activity has increased the concentration in the Earth's atmosphere of greenhouse gases (e.g., carbon dioxide, nitrous oxide and methane), which are linked to climate change.³ Over the past six decades, 56 per cent of the carbon dioxide emissions resulting from human activity have been absorbed annually by the land and oceans. The rate of global warming has accelerated, with each successive decade from 1970 to 2010 being warmer than any of the preceding decades on record. This warming is causing ice in the Arctic and Antarctic regions to melt to varying degrees. There is a high

probability that the temperature of the global upper ocean has risen and that global acidification of the surface open ocean has occurred, while evidence suggests that oxygen levels have dropped in many upper ocean regions. Sea levels rose at an average rate of 1.3 mm per annum between 1901 and 1971. This rate accelerated to 1.9 mm per annum from 1971 to 2006 and to 3.7 mm per annum between 2006 and 2018.

Climate change has exacerbated extreme weather conditions across the world including heatwaves, heavy precipitations of snow and rain, droughts and tropical cyclones. The frequency and intensity of heatwaves and heavy precipitation events have increased since the 1950s over most land area. This has also contributed to increases in agricultural and ecological droughts⁴ in some regions. In addition, scientific evidence indicates that climate change increases the probability of heavy precipitation associated with tropical cyclones, as well as of compound extreme events such as concurrent heatwaves and droughts, outbreaks of wildfires in some regions and compound flooding in other locations.

Gradual improvements in reporting over time are also a contributing factor for higher numbers of reported natural disasters. Thanks to improvements in monitoring technology and increased collaboration among governments and agencies, analysts have access to more information from multiple sources. This has helped to paint a more accurate picture of the devastation caused by natural disasters even in the most remote parts of the globe, and has been a key factor in driving related policy shifts and in mobilizing aid for affected populations.⁵

Additionally, the gradual increase in the global population has coincided with a heightened pace of infrastructural and economic development. In some areas, previously uninhabited or scarcely habited lands have been transformed into residential and commercial areas, putting added pressure on already fragile ecosystems. Moreover, poorly planned development, particularly in low- and middle-income countries, increases the risk of exposing resident populations to pre-existing natural hazards. Strong population growth in coastal and deltaic regions for example, exacerbates the vulnerability of coastal ecosystems to sea level rise.⁶ Hazards such as floods, storms or tidal waves in these areas are therefore increased by urbanization. This is not a problem exclusively associated with developing countries, but a planning issue faced by most coastal nations.

The increased exposure of vulnerable populations to natural hazards leads to disasters.

3. TRADE AND ECONOMIC IMPACTS OF NATURAL DISASTERS

A 2019 WTO report, "[Natural Disasters and Trade: Study I](#)", explains that natural disasters and trade interact in complex, and often unexpected ways. The report points to the fact that 31 per cent of WTO Trade Policy Reviews (TPRs) during the period January 2010 to September 2019 cited a natural disaster event which had a trade impact on the reviewed member. A natural disaster generates economic damage and delivers a shock to aggregate supply. Trade, in turn, can cushion the effect on the economy. Increased imports in the short term are a key factor for economic stabilization. In turn, the gradual rebound of export performance helps to fuel economic recovery. This highly intricate push-and-pull factor can happen in a variety of direct and indirect ways.

3.1 Direct trade and economic impacts

Direct costs associated with natural disasters can be divided into two categories.⁷ Direct market losses pertain to loss of infrastructure, inventory and other assets of known or easily estimated market value. Direct non-market losses pertain to the loss of life, and of other non-marketable assets including the environment, and historical or cultural artifacts. While various economic cost estimates can be attributed to non-market losses, there is no agreed standard for their measurement. This note focuses on direct market losses.

Natural disasters lead to destruction of human and physical capital, inventory and infrastructure, resulting in a loss of production capacity in the affected country or region. This devastation may take many forms depending on the type of

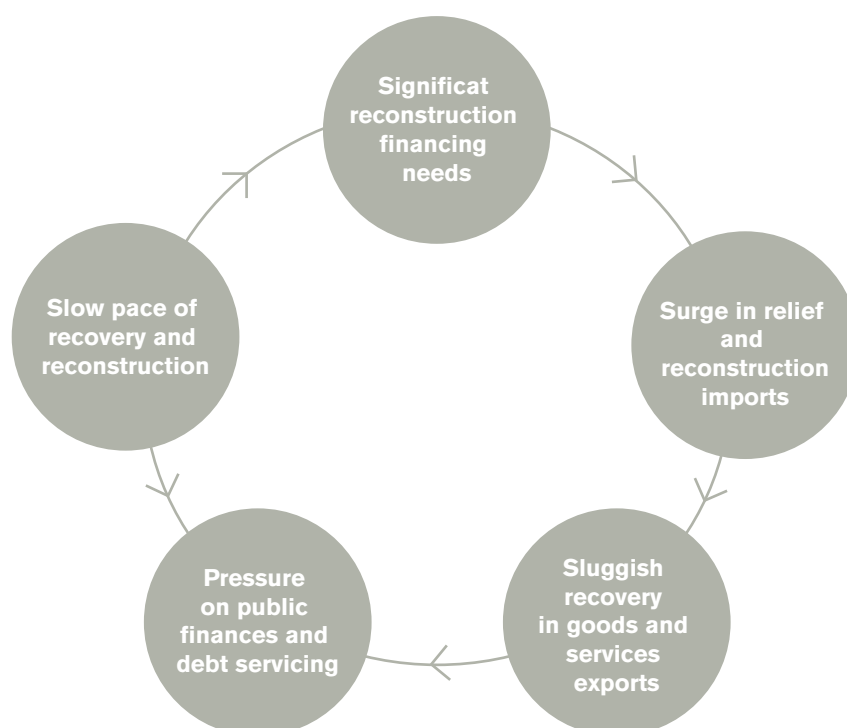
disaster and its severity, as well as on the country's particular vulnerabilities. The 2015 earthquake in Nepal, for example, caused major damage to housing and road networks, while a severe drought in the East African region in 2011 led to major losses in harvest crops that not only impacted agricultural exports but also threatened domestic food security.⁸ In both cases, these natural disasters caused a rise in imports, as emergency supplies of construction materials, food and other essential goods were rushed in to support rescue efforts and re-establish stability.

A natural disaster generates economic damage and delivers a shock to aggregate supply. Trade, in turn, can cushion the effect on the economy.

Following a natural disaster, in tandem with rising import bills, the affected country may also experience a sudden and sometimes severe drop in exports as damage to production plants, infrastructure and value chains hinders productive output.

Over the short term, this upsurge of imports and reduction in exports places added pressure on governments' finances. Governments must meet new socio-economic costs despite experiencing a dip in tax revenues attributed to low output. For countries with already limited fiscal space, further hampered by a sluggish pace of recovery and reconstruction efforts, this scenario can lead to increased national debt. In regions such as the Asia-Pacific and the Caribbean, the regular recurrence of natural disasters, regardless of their destructive intensity, has a compound negative effect on the potential for long-term economic and trade growth. Figure 2 illustrates this cyclical effect.

Figure 2: Trade and economic impact of disasters



Source: Hallegatte, S. and Przyluski, V. (2010).

3.2 Indirect trade and economic impacts

The complexity of calculating the trade and economic impacts attributable to natural disasters becomes more apparent when considering their indirect losses.⁹ These refer to all losses that are not provoked by the disaster itself, but by its consequences. These typically include business interruption costs, as losses in one sector or territory impact the productive output of another. Longer-term consequences of infrastructure and capital damages must also be factored in, one example being that damage to ports and other trade infrastructure in one country may lead to inefficiencies in import and export processes in another.

The resulting increased trading costs are borne by the private sector and consumers at three levels: the impacted country, the impacted (direct) trading partner, and any third-party trading partners. Such a scenario was observed, for example, in 2017 in the Caribbean due to damage caused by Hurricane Irma in Puerto Rico, an important transit point for

Caribbean-bound imports and exports. The damage to an express carrier's regional hub in Puerto Rico led to higher parcel costs as exports to the United States had to be re-routed to other express carriers and use alternative routes, impacting also exporters in other islands that had not been affected by the storm.¹⁰

a) Cross-sectoral impacts

A common example of cross-sectoral impacts is that of producers being unable to operate until electricity and water are fully restored. Similarly, value chains are disrupted if a disaster hits a sector which produces inputs for other sectors, as when Hurricane Maria hit the Caribbean island of Dominica in 2017.¹¹ The category 5 storm felled many thousands of coconut trees and interrupted the domestic supply of fresh coconuts – the main raw material used in the production of coconut oil, among other products. A local coconut oil processor had to cease operations as it was unable to source local supply. The alternative – imports of raw coconut – was hindered by the national authorities due to phytosanitary concerns.

The Dominican authorities decided that the potential risk of importing coconut plant diseases was too high and would set back efforts to rehabilitate the tree crop, as diseases such as lethal yellowing disease, which affects palm trees, can easily be spread through the coconut trade, including with neighbouring islands. In this scenario, the devastation to the agricultural yield borne by farmers may be considered to be direct costs. However, the spill-over effect within the value chain – resulting in a manufacturer having to cease operations – can be classified as an indirect loss.

b) Cross-border impacts

Cross-border impacts can go well beyond the borders of the affected country and create distortions among trading partners as established international value chains must adjust to the fluctuations in supply and demand. One example is the eruption in 2010 of the Eyjafjallajökull volcano in Iceland.

The financial losses to airlines due to flights being cancelled as a direct result of the eruption of Eyjafjallajökull, is estimated run to US\$ 200 million per day, as 100,000 flights were cancelled during an eight-day period following the eruption, and the business and tourism journeys of 1.2 million passengers were disrupted.¹² In addition to lost revenues, airlines will incur added costs for re-routing of aircraft, care for stranded passengers and stranded aircraft at various ports. Another immediate effect of this was to lower the volume of US-bound air freight from Europe by between 10.9 per cent and 21.8 per cent. This also negatively impacted exports from European countries to Japan, as data on Japanese imports reveal reductions of between 11.9 per cent and 27.5 per cent in air freight bound from Europe for the Japanese market.

Cross-border impacts can go well beyond the borders of the affected country and create distortions among trading partners.

Another example of the massive cross-border impact of natural disasters is Hurricane Katrina's devastation of the US Gulf Coast in 2005. The event forced the shutdown of oil and gas production in the region (direct losses), which contributed to an increase in global oil prices, with highs surpassing US\$ 70 a barrel, thereby impacting global trade (indirect losses).¹³

3.3 Heterogeneity in impacts

No two disasters are alike. The economic impact of disasters varies greatly depending on the type of disaster, the severity of impact, and the economic and other conditions within the impacted country or region. Typically, a single event, such as a hurricane, can impact several countries, resulting in a range of economic and environmental effects as well as in greatly differing economic recovery costs, time and efforts.

This point is exemplified by the Atlantic hurricane season – the annual period from June to November in which a series of meteorological events, ranging from hurricanes to tropical storms and tropical depressions, is anticipated to form within the Atlantic Ocean.¹⁴ The number and severity of these events vary each year, and their impacts are felt in all regions in proximity to the Atlantic Ocean.

a) Sectoral heterogeneity

There is an uneven rate of recovery among productive economic sectors depending on the type of disaster. The primary impact of meteorological disasters is often felt in the agriculture sector, with additional impacts on industries and services for which agriculture production serves as vital input. For example, the agricultural sector tends to have strong linkages with the tourism sector, as, for example, it provides the food that is served in hotels and restaurants. Disaster damage

The primary impact of meteorological disasters is often felt in the agriculture sector, with additional impacts on industries and services for which agriculture production serves as vital input.

to agricultural assets and infrastructure causes substantial disruptions in production processes and trade flows, as well as in livelihoods and employment opportunities, with some spillover effects to other sectors along the value chain. In addition, recovery from natural disasters tends to be slow in agriculture, as root crops, fruit trees and livestock require time to grow or reproduce.

WTO TPRs of economies from the Caribbean region allow for analysis of meteorological events impacting the region. A stark contrast can be seen between the effects of these events on agriculture and tourism, two of the largest economic sectors within the region. For example, both the long-

lasting impact of natural disasters on the agriculture sector and the greater buoyancy of the tourism sector can be illustrated by the aftermath of the passage of Hurricane Ivan on nutmeg production in Grenada.

Until 2004, Grenada was one of the world's main producers of nutmeg, which accounted for over 40 per cent of Grenada's total exports. Following the passage of Hurricane Ivan, the rate of production of nutmeg, as well as other main crops, plummeted. Nutmeg production fell by over 90 per cent between 2004 and 2005, as recorded in Grenada's 2008 TPR.¹⁵ By the time Grenada was reviewed again, in 2014, although the industry had recovered slightly, having also been affected by crop disease, it was estimated to be at only 10 per cent of its pre-hurricane levels.¹⁶

In contrast to the laboured recovery of the agricultural sector from natural disasters, the tourism sector has proven more buoyant in the wake of hydro-meteorological events. Referring again to the aftermath of Hurricane Ivan in Grenada in 2004, the 2008 TPR indicated that Grenada had lost nearly 50 per cent of its hotel room capacity in 2004, with tourist arrivals declining by 26 per cent the following year. By 2006 however, over 85 per cent of hotel room capacity had been restored.

Sectoral impacts of natural disasters depend on the type of disaster experienced, its severity, and the prevailing socio-economic conditions within the impacted country or region. For example, in the wake of the 2015 earthquake in Nepal, agricultural exports fell by 24 per cent from US\$ 250 million to US\$ 192 million. By 2017, total exports had rebounded to US\$ 215 million, with some crop categories even surpassing their pre-earthquake levels.¹⁷ According to WTO's trade database, Nepal's agricultural exports, buoyed by a multitude of small-scale farms spread across various regions, surpassed US\$ 400 million as of 2019.¹⁸ In this case, the hardest-hit productive sectors were those associated with infrastructure, including housing and human settlements, along with other tourism-related infrastructure.

b) Heterogeneity in impacts on countries

According to the 2019 WTO report "Natural Disasters and Trade: Study I", there is evidence of severe short-term contractions in economic output and discernible, lasting impacts on GDP growth of natural disasters. In addition, empirical evidence suggests that natural disasters tend to have a more severe long-term impact on small economies.¹⁹ This can be attributed to two factors: first, natural disasters are likely to have disproportionately larger immediate impacts on small economies. Second, small economies often lack means of diversification, which means that natural disasters can create more volatility in economic activities.

Natural disasters are likely to have disproportionately larger impacts on small economies.

Table 1 provides an analysis of various geophysical events in 2010-11 which impacted three countries at different stages of development. Haiti, a least-developed country (LDC) and small economy, experienced the greatest impact in terms of both the death toll and relative economic damage. Chile and New Zealand, meanwhile, experienced greater economic damage in value terms.

Table 1: Country comparison of geophysical disasters, 2010-11

Country	Disaster details	Epicentre	Damage reported (US\$)	Damage reported (% of GDP)	Deaths reported
Haiti	Earthquake 7.3 on the Richter Scale 12 January 2010	25 km South-West	US\$ 9 billion	112%	220,000
Chile	Earthquake and tsunami 8.8 on the Richter scale 27 February 2010	105 km North-East	US\$ 33 billion	17%	577
New Zealand	Earthquakes 7.1 and 6.3 on the Richter scale 4 September 2010 and 22 April 2011	10 km South- East	US\$ 20 billion	10%	185

Source: Authors' summary based on the EM-DAT database and Olson (2012).

In 2010 after the earthquake in Haiti, the high population density within the affected region (363 people per square kilometre), coupled with ineffective land use policies and building standards, exacerbated vulnerabilities to pre-existing seismic hazards. The region's urbanization to meet the growth of its population, which more than doubled between 1980 to 2010, was also a contributing factor. In this scenario, the relationship of the contributing factors becomes apparent: where there is a pre-existing hazard (e.g., seismic activity), exposure of the population (i.e., population density) and vulnerability (e.g., poor building standards), these can contribute to cause a disaster. An important point in the case of Haiti is that, because of the prevalent hazard of storms and hurricanes in the region, Haiti's infrastructural development tends to use concrete and cinder blocks. While these are effective choices in mitigating hydro-meteorological risks, they are less resistant to geological events. This point illustrates the difficulties that developing countries and LDCs may encounter when attempting to build resilience in a context in which risk factors, such as exposure and vulnerability, are compounded.²⁰

For Chile, which underwent an earthquake and tsunami in 2010, and New Zealand, which was hit by earthquakes in 2010 and 2011, less exposure and better preparedness in terms of policy and stringent building codes and standards translated into fewer cases of compromised infrastructure, leading to a lower death toll. More advanced economies are characterized by higher infrastructural investments, resulting in greater average values of economic losses, although these translate into a lower percentage of GDP than losses in less industrialized countries following a disaster. Lower levels of industrialization and a limited number of mature economic sectors result in low productivity and, hence, a disproportionately higher percentage of GDP loss following a natural disaster, as in the case of Haiti.

Tables 2 and 3 show the relationship between damage and GDP in a review of natural disasters around the globe since 1998. Table 2 shows that over the period reviewed (1998 to 2017), large economies such as China and the United States have experienced the greatest economic losses in terms of absolute dollar values from a combined total of natural disasters, including meteorological, hydrological and geophysical disasters. In contrast, Table 3 shows the impact of singular events on smaller economies. While the average absolute dollar cost of these disasters is far less than in the larger economies cited in Table 2, the relative economic damage, expressed as a percentage of GDP, is often far greater in smaller economies.

Table 2: Monetized losses (1998-2017)

	Absolute losses in US\$ billions	Damage as a percentage of GDP (2017 current US\$)
United States	944.8	5%
China	492.2	4%
Japan	376.3	8%
India	79.5	3%
Germany	57.9	2%
Italy	56.6	3%
Thailand	52.4	11%
Mexico	46.5	4%

Source: Authors' summary based on WTO 2019 Report "Natural Disasters and Trade: Study I" and World Bank Data.

Table 3: Losses as a result of natural disaster events (US\$ billions and as a percentage of GDP)

Member	Event (year)	Absolute losses in US\$ billions	Damage as a percentage of GDP
Dominica	Tropical Storm Erika (2015)	0.6	90%
	Hurricane Maria (2017)	1.3	220%
Nepal	Earthquake (2015)	9	33%
	Earthquake (2017)	0.9	3%
Tonga	Tropical Cyclone Ian (2014)	0.05	11%
Vanuatu	Tropical Cyclone Vania (2011)	0.05	6.3%
	Tropical Cyclone Pam (2015)	0.5	64%
	Tropical cyclone Gita (2018)	0.2	38%

Source: Authors' summary based on WTO 2019 Report "Natural Disasters and Trade: Study I" and World Bank Data.

c) Increased vulnerability due to a lack of economic diversification

Intersecting with heterogeneity in impacts, due to sectoral and country dynamics, is a lack of economic diversification in many small economies. Economic activity in smaller countries is typically limited to very few productive sectors, which contribute the bulk of total GDP. When these key sectors are impacted by a disaster, recovery efforts need to take into account that these sectors are under greater strain than they would be in a more diversified economy. Conversely, this lack of diversity exacerbates vulnerability to natural disasters, as well as to other exogenous shocks. In comparison, developed economies tend to rely on a broader range of productive activities, which contribute to their greater economic growth and stability and allow for greater resilience in the face of hazards, as temporary losses to any one sector can be absorbed by continued production in others.

4. DISASTER MITIGATION EFFORTS THROUGH TRADE

The WTO "Natural Disasters and Trade Research – Study II" analyses how measures taken in the context of disaster response, recovery and resilience relate to the rules of the multilateral trading system. The resulting analysis suggests that a wide range of actions can be taken across a broad cross-section of WTO Agreements in the immediate response and recovery phase following a natural disaster and in promoting resilience.

4.1 Phase 1 – Immediate response

The main objectives of any disaster response phase are to provide relief to the affected populations in the immediate aftermath of a disaster, while also facilitating rescue efforts to persons still in peril. Thus, in terms of goods, emergency supplies must be imported to substitute losses and bring aid within the disaster zone, and customs and border control processes may easily become overwhelmed. In terms services, trained professionals, such as doctors and rescue personnel, may require special authorizations before beginning work in the disaster zone.

Trade measures taken by a disaster-affected country might thus include the following:

- Implementing trade-facilitating measures to address bottlenecks related to increased imports of goods such as emergency supplies;
- Establishing anticipatory derogations from customs duties and other charges for specific goods or organizations;
- Giving consideration to how WTO provisions relating to trade in goods and services can facilitate the entry and clearance/authorization of relief items and personnel;
- Ensuring that import licensing procedures do not result in inadvertent delays for essential relief equipment.

Actions can also be taken by trade partners to support disaster response. In the goods sector, for instance, compliance with provisions on traffic in transit can prevent unnecessary delays, as can enhanced cooperation between border agencies.

Table 4 provides a non-exhaustive list of possible trade measures that can be taken during the immediate disaster response phase.

Table 4: Disaster response measures and WTO Agreements and decisions

Trade in goods	
Trade-related measures	WTO Agreements and decisions
Facilitate customs processes and procedures	General Agreement on Tariffs and Trade (GATT) 1994, Trade Facilitation Agreement (TFA)
Ensure the quality and safety of relief items	Agreement on Technical Barriers to Trade (TBT), Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement)
Temporary suspension of regular customs charges on the entry of relief items	GATT 1994 articles II, VIII Members' Schedules of concessions TFA, Information Technology Agreement (ITA) and ITA Expansion
Access to goods of primary necessity: food supplies	<i>International food aid:</i> 1994 Decision on Net Food-Importing Developing Countries (NFIDCs); Agreement on Agriculture (export competition) <i>Domestic food aid:</i> Agreement on Agriculture, Green Box Ministerial decisions on public stockholding
Trade in services	
Trade-related measures	WTO Agreements and decisions
Entry of foreign relief service providers	WTO Members' General Agreement on Trade in Services (GATS) commitments, particularly on mode 4; GATS Article VI (domestic regulation)
Allocation of frequencies necessary for use of information and communications technology (ICT) equipment	Members' GATS commitments, specifically on basic telecommunication services
Access to cash aid resources	Members' GATS commitments, specifically on mode 1 for payments and monetary transmission services

4.2 Phase 2 – Recovery

In the disaster recovery phase, the overarching goal is to restore economic functionality. This is typified by efforts to rebuild critical infrastructure, while addressing the most basic socio-economic and environmental concerns. Impacted productive sectors must be resuscitated, and industrial and commercial activity must be re-established. Ideally, economic output can be brought back up to pre-disaster levels, and at the same time the necessary conditions can be established to strengthen resilience to future disasters.

A major challenge during this phase is the limited fiscal space which both public and private sector stakeholders must navigate. New capital investment is required for recovery in the wake of diminished operational revenue, and often external funding is required, leading to increased indebtedness by public and private sector parties.

Table 5 provides a non-exhaustive list of trade-related measures available to WTO members as they navigate the recovery phase.

Table 5: Disaster recovery measures and WTO Agreements and decisions

Trade in goods	
Trade-related measures	WTO Agreements and decisions
Financial support to enterprises to recover from damages	Agreement on Subsidies and Countervailing Measures (SCM Agreement) (including Annex VII); Agreement on Agriculture, Green Box
Modification of tariff protection policies	Schedules of concessions and exception clauses under GATT 1994 Waivers under the Marrakesh Agreement
Resumption of exports	Tariff preferences by trade partners under Enabling Clause, 2008 and 2013 Ministerial Decisions (LDCs) and Waivers under the Marrakesh Agreement
Ensure the quality and safety of products exported by the disaster-affected country	TBT and SPS Agreements
Trade in services	
Trade-related measures	WTO Agreements and decisions
Financial support to local service suppliers	Members' GATS commitments, specifically under national treatment
Supply of services needed for reconstruction (e.g., construction services to rebuild roads and other infrastructure)	Members' GATS commitments
Public procurement	
Trade-related measures	WTO Agreements and decisions
Procure goods and services needed for recovery	Revised Agreement on Public Procurement (GPA) (Plurilateral)
Procurement for the purpose of providing international assistance	

4.3 Phase 3 – Promoting resilience

Disaster resilience refers to the ability of an economy to minimize its exposure to (natural) hazards and to resist, adapt to and recover from a disaster in a timely and efficient manner. Resilience therefore incorporates proactive and ongoing efforts by a country to mitigate natural disaster risks. This is exemplified in the [Sendai Framework](#) for Disaster Risk Reduction 2015-2030, with its focus on strengthening resilience and managing risks before disasters strike. On goods trade matters, disaster risk management may require the adoption of specific regulatory measures addressing customs issues that may arise in the disaster response phase aiming at ensuring "continuity management" in customs operations.

Beyond trade facilitation, resilience encompasses improving standards for infrastructure through rehabilitation and reconstruction initiatives, while also taking into consideration economic diversification. Table 6 below provides a non-exhaustive list of resilience measures and their relation to the multilateral trading system.

Table 6: Disaster resilience measures and WTO Agreements and decisions

Trade in goods	
Trade-related measures	WTO Agreements and decisions
Define in advance domestic customs disciplines to be implemented in the event of a disaster	Trade Facilitation Agreement
Integrate disaster risk reduction measures into the construction and restoration of buildings and physical infrastructures	TBT Agreement
Increase the resilience of the agricultural sector	Agreement on Agriculture, Green Box
Trade in services	
Trade-related measures	WTO Agreements and decisions
Ensure the automatic recognition of professional qualification of foreign relief service providers	GATS provisions on recognition of qualifications (Article VII)
Encourage the supply of services needed in the event of disasters, such as telecommunication services, insurance services and environmental services (e.g., the collection, processing and disposal of waste)	Members' GATS commitments
Improve the supply of weather-related services	GATS, Revised GPA (but also Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement)

5. CONCLUSIONS

There is a direct link between climate change and the increasing frequency and intensity of natural disasters. Scientific evidence suggests that the steady rise in global surface temperatures has a significant impact on the number, frequency and duration of natural hazards. The heightened emission of greenhouse gases, a key contributor to global warming, is one example of human contributions to the causes of natural disasters, such as flooding, storms and extreme weather events. Similarly, the increased frequency of climatological events such as droughts and meteorological events, including heatwaves and storms, can also be linked to human-induced climate change.

Natural disasters are a threat to national and international development objectives and can have far-reaching implications for trade and economic growth, beyond the borders of the impacted country or region. Due to production and trade linkages, the destruction of local infrastructure or productive capacity can have indirect impacts across sectors and borders. The economic impact of natural disasters furthermore differs across sectors and countries depending on the type of disaster and on factors such as a sector's ability to recover or a country's size and economic diversification. Improving countries' preparedness for hazards and achieving resilience in the wake of natural disasters are key to reducing the economic impacts of these events.

Trade can play an important role in increasing a countries' resilience to the economic impacts of natural disasters. A range of measures can be taken under the current WTO Agreements that can help impacted countries and their trading partners to mitigate the effects of natural disasters in the context of a three-phased approach – immediate response, recovery and resilience. Findings from "Natural Disasters and Trade: Study I" suggest that "there is significant potential to advance actions that will support preparedness in the face of specific, known hazards", and that the negative impacts of natural disasters can be mitigated through effective trade-related measures under the multilateral trading system.

ENDNOTES

- 1 This is an information note which represents research in progress. The opinions expressed in this paper are those of its authors. They are not intended to represent the positions or opinions of the WTO or its members and are without prejudice to members' rights and obligations under the WTO. Any errors are attributable to the authors. The note was written by Esli Kim Lafeiulle, Rainer Lanz, Michael Roberts and Ankai Xu.
- 2 See <https://www.emdat.be/>.
- 3 IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, doi:10.1017/9781009157896.001.
- 4 An ecological drought is an "episodic deficit in water availability that drives ecosystems beyond thresholds of vulnerability, impacts ecosystem services, and triggers feedbacks in natural and/or human systems", per Crausbay, S. D. et al. (2017), "Defining Ecological Drought for the Twenty-First Century", *Bulletin of the American Meteorological Society* 98(12), <https://doi.org/10.1175/BAMS-D-16-0292.1>.
- 5 For instance, the [Centre for Research on the Epidemiology of Disasters \(CRED\)](#) provides a comprehensive database comprising information from UN agencies, non-governmental organizations, insurance companies, research institutes and press agencies, among others.
- 6 See World Health Organization. Regional Office for Africa. (2015). *Continental challenges & change: environmental determinants of health in Africa: second synthesis report on the situation analysis and needs assessments for the implementation of the Libreville declaration on health and environment in Africa*, at <https://apps.who.int/iris/handle/10665/177155>.
- 7 Hallegatte, S. and Przulski, V. (2010), "The Economics of Natural Disasters : Concepts and Methods", policy research working paper no. WPS 5507, Washington, D.C.: World Bank, at <https://openknowledge.worldbank.org/handle/10986/3991>.
- 8 Earth Observatory (2011), "Severe Drought Causes Famine in East Africa", at <https://earthobservatory.nasa.gov/images/51411/severe-drought-causes-famine-in-east-africa>.
- 9 Hallegatte, S. and Przulski, V. (2010), "The Economics of Natural Disasters : Concepts and Methods", policy research working paper no. WPS 5507, Washington, D.C.: World Bank, at <https://openknowledge.worldbank.org/handle/10986/3991>.
- 10 WTO (2019), [Natural Disasters and Trade: Study I](#).
- 11 Ibid.
- 12 Guardian (2010), "Ash cloud costing airlines £130m a day". At <https://www.theguardian.com/business/2010/apr/16/iceland-volcano-airline-industry-iaa>.
- 13 Organisation for Economic Co-operation and Development (OECD) (2016), *OECD Factbook 2015-2016: Economic, Environmental and Social Statistics*, Paris: OECD, at <https://doi.org/10.1787/factbook-2015-en>.
- 14 National Oceanic and Atmospheric Administration (NOAA) (2021), "NOAA predicts another active Atlantic hurricane season", at <https://www.noaa.gov/news-release/noaa-predicts-another-active-atlantic-hurricane-season>.
- 15 Grenada's Trade Policy Review 2008.
- 16 Grenada's Trade Policy Review 2014.
- 17 Nepal's Trade Policy Review 2018 (Agricultural trade).
- 18 See the WTO's member page on Nepal at https://www.wto.org/english/thewto_e/countries_e/nepal_e.htm#statistics.
- 19 Cernat and da Silva (2012), "Coping with loss: The impact of natural disasters on developing countries' trade flows", at <https://cepr.org/voxeu/columns/coping-loss-impact-natural-disasters-developing-countries-trade-flows>.
- 20 Olson (2012) compares the hazards, exposures and vulnerabilities of the 2010 Haiti earthquake and the 2010 Chile earthquake, and concludes that population size, density, and development levels, among other factors, matter significantly in disaster response and recovery. See: https://eei.fiu.edu/case_study/haiti-vs-chile/.



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