



Natural Disasters and Trade

Study I

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Study I

Executive summary



1. (WTO) Members approved research funded by the Permanent Mission of Australia to study the impact of natural disasters on trade. Section I of this report presents findings on the frequency, risk factors and trade effects of natural disasters. Section II examines the experience of six recently disaster-affected WTO Members across three different regions.

Section I: Frequency, risk factors and trade effects of natural disasters

2. There is a growing awareness of the risk of economic and trade disruption caused by natural hazards. The World Economic Forum's Global Risks Report 2018 ranks "extreme weather events" and "natural disasters" as the number one and number two risks most likely to occur in the next ten years by a multi-stakeholder panel. Worldwide, some 11,178 geophysical and hydro-meteorological disasters were recorded in the period 1980-2018 (EM-DAT 2019).
3. The number of natural disasters, especially hydro-meteorological disasters, recorded has been on the rise in recent years. Over the period 1998-2017, disaster-hit countries reported total direct economic losses valued at USD 2.9 trillion, of which hydro-meteorological disasters caused 77% of the damage. Direct and indirect economic damage has grown from USD 70 billion per year on average in the 1990s to USD 113 billion per year since 2000 (IMF, 2017). Economic losses from weather- and climate-related disasters have increased, but with large spatial and interannual variability (IPCC 2012).
4. Looking at disaster loss statistics over the period 1998-2017, the United States recorded the biggest losses (USD 945 billion), reflecting high asset values as well as frequent events. China, Japan, the European Union and India recorded the next largest economic loss figures. When expressed relative to national population or GDP, the impacts of disasters on smaller economies give high values. Hurricane Maria was the single most costly event relative to GDP in recent times, with damage reaching 225% of Dominica's GDP – a disaster that hit the Island less than two years after Tropical Storm Erika had inflicted damage estimated at 90% of GDP.
5. For small states with less than 1.5 million populations, the average economic cost per year for the period of 1950 – 2014 has been calculated at equivalent to nearly 13% of GDP, while for larger states the cost is less than 1% of GDP. The Caribbean emerges as particularly affected, with annual losses equivalent to 2.4% of GDP. Haiti is estimated to have incurred annualized natural disaster damage of 17.5% of GDP during the period 1998-2017. Some 1,273 natural disaster events in Least Developed Countries were recorded over the period 1998-2017 (17.5% of disaster reported

world-wide), with total damage estimated at USD 40.6 billion.

6. Of the 172 Trade Policy Reviews (TPRs) conducted during the period January 2010-September 2019, 54 refer to a natural disaster event – some 31%. The most commonly cited natural hazard is drought (referenced in 31 TPRs), severe storms (e.g. cyclones, hurricanes, typhoons) (9), flooding (7), and volcanoes (4), and earthquakes (3).
7. Figures for the impact of natural disasters are conservative estimates, as data on the economic impact of disasters are sparse, especially for smaller-scale disasters. In low and middle-income countries, accumulated losses from small-scale and localized disaster events approach the same magnitude of those from major disasters.
8. The likelihood that natural disasters will follow past trends cannot be assumed. Natural hazard is dynamic. A factor exerting an influence on the incidence of hydro-meteorological hazards is climate change, both anthropogenic and natural climate variability. Neither is exposure static. Rapid urbanization, especially the accumulation of assets in seismic areas, is increasing exposure to natural hazards – and giving opportunities to reduce risk. The literature points to some disaster risk hotspots where hazard, exposure and vulnerability converge.
9. Natural disasters and trade interact in complex, and often unexpected ways, as well as in different dimensions, including at a macro or economy-wide level in disaster-affected countries, and at a sectoral, product or firm level. One important function that trade performs is that of a "shock absorber" for natural disasters. Put simply, trade allows the supply shortage in one location to be covered by imports from other unaffected places.
10. Imports play a critical role in recovery and reconstruction. As a general rule, the more severe the damage inflicted by a natural disaster, the broader the range of different goods and services that may need to be imported. Insurance and international reinsurance markets can help absorb losses and shift the burden of disaster response and recovery from the government budget to the private sector. Income remitted by nationals working abroad can also act as an important fiscal buffer for businesses and households. Various other imported goods and services can support recovery and resilience.
11. From the macroeconomic perspective, a natural disaster generates economic destruction and delivers a shock to the aggregate supply curve, resulting in a decline in real output and employment. While most disaster impacts on economic activity appear to be short-lived, in some cases the effects may persist for a long time. There is also evidence that poor countries can experience prolonged, slow, and incomplete recovery in the aftermath of severe disasters. Nevertheless, the

evidence of both short-term economic output contraction and medium to long-term difficulties is growing more robust, particularly in situations where the fiscal space is unavailable to engage in fiscal stimulus or funds are insufficient to achieve reconstruction. The deleterious effect of recurrent natural disasters on the same economy is also growing.

12. Countries experiencing a natural disaster can see a sharp deterioration in the trade balance. Import bills rise for food, raw materials and reconstruction materials, while exports tend to decline. Public debt rises, as imports put pressure on the current account and taxes revenue falls. Sluggish export recovery can constrain recovery and add further pressure to the financing gap when disaster losses exceed the fiscal capabilities of a disaster-affected government. In turn, vulnerability to recurrent disasters affects medium-term growth potential.
13. One factor masking the impact of natural disasters is that many disaster-affected states continue to register positive economic growth, either in the year of a disaster or subsequent years. A 2017 World Bank report highlights how a flood or earthquake can be disastrous for the poor but have a negligible impact on a country's aggregate wealth or production. The report estimates that extreme weather events push some 26 million people into poverty every year.
14. Another factor diverting attention and complicating the measurement of natural disaster effects is that other crises or challenges may impinge on the disaster-affected state. Conflict, migration and economic shocks often intertwine with natural disasters, as demonstrated in the Trade Policy Review examined for this report. Paraguay is a case in point. The drought conditions of 2011-2012 caused a contraction in economic output of equivalent size to that of the global economic crisis just two years before.
15. Economic research also suggests that natural disasters can exert more severe impacts on specific groups of the society: poor and marginalized people are far more affected by the same economic loss, the life expectancy of women are more negatively affected by natural disasters than that of men, and Micro- Small and Medium Sized Enterprises (MSMEs) bear more burden from natural disasters. The loss of business documents, including electronically stored documents, and delays in restoring essential services such as electricity can further lengthen interruptions to normal commercial operations.
16. Floods and drought emerge as exerting an impact on trade for countries with a high concentration of agricultural exports in their foreign trade. The TPRs of Burkina Faso, Kenya, Namibia, Niger, Senegal all highlight this effect. Measures taken to support recovery in the agriculture sector in the event of a natural disaster were reported in the TPRs of more than 20 Members. Several Members also reported actions in support of public stockholding for food security, including the establishment of such schemes in the wake of a natural disaster. Provisions for the enactment of price controls for agriculture products were reported, as were export restrictions. Various measures were also taken to address the threat or impact of natural disasters on the fisheries sector.
17. Natural disasters can also severely affect trade in a wide array of services sectors. Damage and losses to the electricity sector, for example, can have a ripple effect through the economy. How quickly power can be restored will affect the recovery of other sectors, including the communications sector. The TPRs of Kenya, Brazil and Costa Rica reported inflation in electricity prices and drops in hydroelectric power output due to the higher operating costs associated with frequent droughts.
18. One sector that may suffer direct physical damage from natural disasters is the travel and tourism sector. A less direct mechanism through which the tourism sector may be impacted is consumer perception which may be informed by perceived, rather than actual risk. Tourism earnings often declined after disasters.
19. Fiscal space, institutional capacity, and ex-ante preparedness can help mitigate the cost of natural disasters. However, it may not be available to governments of small, poor countries who lack the "fiscal space" to carry out stimulus policies. A further complication for many disaster-affected Members is that a fall in output is likely to reduce revenue from taxes and duties. Amongst the reasons reported for output declines in the research are damages to export-oriented firms and trade-related infrastructure, such as ports, airports, roads, and customs.
20. One way in which the economic shock of a natural disaster may be transmitted is through supply chain effects. A nascent economic literature points to evidence that supply chains propagate idiosyncratic shocks at least in the short run following a natural disaster. The extent to which natural disaster shocks are amplified in a supply chain network depends on the level of input specificity (i.e. whether companies can find substitutable inputs from alternative sources). The impact of a natural disaster event in one Member affecting another is referenced in five TPRs. One less known example is Uganda's 2012 TPR that references problems in coffee exports as a result of air transport disruption following the 2010 eruption of the Eyjafjallajökull volcano in Iceland.
21. At the same time, some empirical evidence indicate that supply chain networks enable firms to more easily find substitutes for damaged suppliers. Firms can benefit from diversified networks with suppliers and clients because they can substitute the surviving firms in the network for the damaged

partners and receive support from them. In addition, trust, quality information-sharing and public-private partnership are critical enablers of resilience in supply chains.

22. Strengthening resilience of supply chains is a topic that has elicited a great deal of interest in the last decade, both in the private and the public sectors. The main recommendations from these studies are enhanced multi-sectoral cooperation, better information sharing, development and adoption of international standards on resilience and greater use of risk assessment tools. The disaster reduction community recognizes that “there is no such thing as a natural disaster, only natural hazards.”
23. The Sendai Framework for 2015-2030 aims to achieve “the substantial reduction of disaster risk and losses” through disaster risk reduction (DRM) measures. A range of DRM measures to promote resilience are reported in Members’ TPRs. Maintaining financial reserves sufficient to cover nine months imports was one of the measures reported. Risk management plan to mitigate the risk of droughts and the use of agricultural weather-index insurance product are two examples. Mandatory legal requirements for buildings insurance and infrastructure investment to protect against natural hazards are reported. Drought resistance crops, food security laws and, disaster insurance products for farmers are among the measures cited.
24. In conclusion, the evidence reviewed in this research, suggests that an open, rules-based trading system can support resilience in the face of natural disasters. Some economic evidence suggests that countries with an open and competitive market are better prepared for a disaster, better able to respond when it strikes, and able to recover more quickly in the aftermath.

Section II: experience of six recently disaster-affected WTO Members

25. Dominica, Fiji, Nepal, Saint Lucia, Tonga and Vanuatu face a range of hydro-meteorological hazards (e.g. drought, flooding, landslides and storms, including cyclones and hurricanes) and geo-physical risks (e.g. earthquakes, tsunami and volcanoes). To varying degrees, these events have curtailed economic growth, depressed exports and fuelled import growth, exerting pressure on the current account and debt levels. Climate change is predicted to make hydro-meteorological hazards more frequent and severe. Natural disasters have pushed back the graduation from Least Developed Country status of both Vanuatu and Nepal.
26. On an annualized basis, losses as a percentage of GDP due to natural disasters are estimated in a range of 3.4% for Saint Lucia and up to 6.6% in Vanuatu. In any given year, it is likely that the five island states surveyed (Dominica, Fiji, Saint

Lucia, Tonga and Vanuatu) will be either hit by, or recovering from, a major natural disaster, most commonly hydro-meteorological in origin. Nepal must also contend with seasonal rains and flooding. Prior to the 2015 earthquake, flooding accounted for 53.2% of combined economic losses in Nepal from natural disasters over the period 1990-2014.

27. The recovery time between storm events can be short. Successive storms hit Dominica only two years apart (Tropical Storm Erika in 2015 and Hurricane Maria in 2017) causing damage estimated at 90% and 226% of GDP respectively. Since 1990, Vanuatu has experienced at least 20 damaging tropical cyclones. Seismic hazard is also an ever-present risk among most of the surveyed Members. Risk arises not only from direct damage caused by the earthquakes themselves, but also secondary hazards such as landslides and tsunamis. Earthquakes tend to have graver consequences for life in Nepal than more frequent disasters such as floods, landslides and droughts.
28. “Mega events” tend to mask the burden of smaller, localized events. Droughts, flooding and minor earthquakes are examples of frequently under-reported events that cumulatively may have deleterious impacts on economic growth and trade in specific localities or regions. For example, Volcanic eruptions also necessitated the evacuation of Vanuatu’s Ambae island in the same year. The economic impact of natural disasters can be costly even when the Member concerned is not itself directly impacted. Saint Lucia was spared direct damage during the 2017 hurricane season, but still faced trade disruption and higher costs that affected its economic performance due to weather-related disruption of regional air and maritime shipping, rerouting of consignments and delays resulting in lost business and reduced profit margins.
29. Natural disasters may also coalesce with other “man-made” factors to magnify their economic impact. In Nepal, the economic losses and dislocation from the 2015 earthquakes were exacerbated by the disruption to essential supplies on Nepal’s southern border. The cumulative impact of these two events was a contraction in economic growth from a projected 4.6% down to just 0.4% in 2015. Nepal’s experience underlines a broader point on the importance of transit for disaster resilience in landlocked countries.
30. Tropical cyclones (TC) and hurricanes also exert downward pressure on economic growth. TC Gita knocked three percentage points off Tonga’s GDP growth in 2018. Fiji’s growth dropped 2.5% after TC Winston, and Vanuatu’s economic growth contracted 2.8% percentage points after TC Pam. With trade to GDP ratios above 50% for all six surveyed economies (and closer to 100% in the case of some of the island economies), weather-induced falls in economic activity rapidly translate into slow-downs in trade flows.

31. Reconstruction activity can be an important economic stimulus in the aftermath of disasters, but also debt-creating in the absence of sufficient external aid or dedicated domestic reserves set aside to cover such eventualities. In Dominica, fiscal adjustment and restructuring had driven public debt down from a high of 100% of GDP in mid-2000s to around 63% in 2009. Reconstruction activity in the wake of tropical storm Erika and Hurricane Maria risks placing upward pressure on public debt and creating a significant risk of debt distress in the IMF's view. In Vanuatu, the stock of public debt to GDP increased by 20 percentage points after Cyclone Pam.
32. IMF research highlights that reconstruction and recovery efforts after disasters reduce resources for productive investment, further tighten limited government budgets, and create higher debt risk. Furthermore, projections on future debt sustainability worsen if exposure to future natural disasters is included. Without transfers of Official Development Assistance (ODA), external debt would be significantly higher among some of the surveyed countries.
33. For several of the disaster-affected countries surveyed, remittances act as a fiscal buffer. Remittances account for some 26% of GDP in both Nepal and Tonga. Income remitted by Nepalis living abroad jumped 14.3% in 2015 (the year of the earthquakes) to reach USD 6.7 billion. Temporary labour mobility (i.e. services mode 4) schemes play an important role in this regard.
34. A range of trade facilitation issues emerged during the disaster response phase in the country research. Some of the issues can be attributed to the scale of the damage faced by relevant national authorities. Another difficulty was that import systems even in normal times were not set up for the sudden surge in volumes of relief imports that arrived in the immediate disaster response phase. Container traffic into the damaged port of Roseau, Dominica jumped from an average of 80 containers per week to a peak of 300 containers in the aftermath of Hurricane Maria. Airport congestion due to landing load and plane size restrictions were a complicating factor limiting response at Tribhuvan International Airport in Nepal. Issues relating to airport runway management also arose in Port Villa, albeit after the passage of Cyclone Pam.
35. Private sector representatives strongly underlined the criticality of port functions to business continuity. A series of customs and border issues were distilled from the country research. These included:
 - Delays in triggering emergency legislation;
 - Uncertainty about the exemption of relief organizations and relief goods from customs and other duties and charges;
 - Doubt as to the scope and duration of exemptions;
 - Difficulties in distinguishing between relief and commercial goods;
 - Restrictive customs policies requiring payment in full prior to release from customs control;
 - Unfamiliarity with, and difficulties in, accessing relevant official documentation relating to customs and other border clearance formalities;
 - Concern at relief actors working outside official channels and coordination mechanisms;
 - Delays in securing visas and recognizing professional qualifications of relief personnel;
 - Quarantine restrictions on the import of search and rescue animals;
 - Cumbersome import license requirements, including for telecommunications equipment;
 - Problems in securing temporary admission of relief equipment, at both entry and exit;
 - Control, inspection and release procedures ill-adapted to emergency situations;
 - Concerns on the part of plant and animal quarantine officials about the entry, establishment and spread of pests with relief consignments;
 - Pressure on governmental revenue from prolonged, extensive duty exemptions; and
 - Problems with the storage and disposal of unsolicited bilateral donations.
36. How lists of relief items are established, the charges that are exempted, the duration of exemptions and quantitative restrictions on waivers for some import items were issues raised by private sector actors during national consultations in one region. Distinctions were also drawn between the needs of relief organizations and households on the one hand and commercial operators on the other hand. A concern expressed by many stakeholders was that commercial actors were given lesser priority even though they were essential to economic recovery.
37. A surge in imports, static or declining exports and pressure on the current account are common trends that emerge from the trade performance of the six disaster-affected countries surveyed. Furthermore, disaster events tend to accentuate underlying structural trends. Sluggish exports have been outpaced by imports as the merchandise trade balance widens. In some cases, the deterioration in the trade balance precedes a natural disaster.

- Cyclone Pam appears to have accentuated an established underlying trend in Vanuatu.
38. One factor to highlight is higher infrastructure investment spending, which has been a factor driving import growth, financed largely through concessional lending and donor support. Activity in the construction sector associated with infrastructure upgrading and post-disaster reconstruction acts as an important economic stimulus. It can also lead to sharp increases in the import of construction materials. In Nepal, buildings sustained about 50% of the losses and damage caused by the 2015 earthquakes. Due to the limited availability and/or quality of local materials, a significant proportion of building materials are imported into Nepal, including an estimated 80% of all cement, as well as glass, aluminium, plaster, fixtures and fittings.
 39. Natural disasters can also put additional pressure on an already struggling manufacturing sector. Damage to premises, stocks and machinery, together with labour shortages all disrupted operations in the Members surveyed. Sustained power outages, restricted access to credit and slow pay-outs of insurance claims were all reported as factors aggravating recovery in manufacturing and services including tourism.
 40. A sector that emerges from the research as directly negatively impacted is the agriculture sector. Research from the Pacific highlights that natural disasters have proven a set-back in efforts to diversify merchandise exports, notably in the agriculture sector. Much the same conclusion can be drawn also from the Caribbean research. With a high proportion of merchandise exports originating in the agriculture sector, drops in agricultural exports have been precipitous (37% in Vanuatu after Cyclone Pam) and slow to recover, particularly for market segments with long production cycles e.g. tree crops.
 41. A further example of a disaster “double-whammy” emerged from the St. Lucia research. Banana farmers there were still struggling with the after-effects of Hurricane Tomas (2010) when an outbreak of the soil-borne fungus black sigatoka further compounded their efforts to recover from hurricane damage. Changes in phytosanitary status were noted as a risk factor after disaster events and as a complicating factor in the recovery of fresh produce exports.
 42. Direct damage has also been reported to fisheries. In Fiji, tropical cyclone damage to coral reefs forced fish to migrate thus reducing local catches. Similar effects were reported in Tonga where Tropical Cyclone Ian caused damage to the fisheries sector. World Bank research suggests that the fisheries sector in Dominica is “extremely vulnerable to hurricanes and storms”. Consequently, capital losses tend to be high in every major storm.
 43. Among the different sectors surveyed, services fared the best in terms of its speed of recovery, albeit with some important caveats. One of the fastest service sectors to recover was tourism – and important and growing area of economic activity for all six Members surveyed. Among island states surveyed, the recovery of cruise tourism was quicker than overnight stays. The provision of accommodation as an integral part of the cruise offering seems to be an important factor in this regard. Factors holding back recovery in the overnight sector mirrored those constraining recovery more generally e.g. ability to refinance debt, access to credit, availability of and tariffs on building materials.
 44. The resilience of services, particularly tourism is positive, not least given the scope for diversification in outbound source markets among the six surveyed Members. For all of them, investment in upgrading trade connectivity (e.g. runway, port and airport upgrading) would both boost tourist arrivals, and also increase critical airlift capacity for future disasters.
 45. The research analysis identified areas where action is already being taken by the six Members to build resilience. Prominent is the topic of reform of customs and other border clearance systems where implementation of the WTO Trade Facilitation Agreement (TFA) is acting as a catalyst for reform. Further action here could also be envisaged, and not just in relation to implementation of the TFA disciplines. For example, there is further scope to work with regional partners e.g. the Caribbean Disaster and Emergency Management Agency and the Caribbean Customs Law Enforcement Council to promote coordination and mutual cooperation in the event of disasters. Similar action could be envisaged in other regions.
 46. Another key principle found in the Sendai Framework is that of “Build Back Better” (i.e. in a way that is risk-informed and resilient). Building codes and standards underpin this approach. Here the experience of Nepal is instructive. The housing reconstruction programme sought to rebuild through grants for housing reconstruction that required usage of earthquake-proof building techniques and materials. With much of these building materials used coming from imported sources, there is an interplay also with standards in international trade.
 47. Discussion in Dominica on how to ensure that building material imports meet local building codes (e.g. for corrugated sheet roofing) is indicative of a broader debate on the role of standards for resilience. Such standards also cover issues such as business continuity planning and involve a broad range of international and national standard-setting bodies.
 48. Import tariff policy can also influence resilience. Where the hardening of infrastructure is the option

- pursued to improve resilience, care is needed so that steel and cement tariffs do not act as a disincentive by pushing up prices and reducing usage of these materials. Import data from one of the regional reports indicate higher volumes of imports after tariffs were unilaterally reduced.
49. Government procurement is another avenue to pursue resilience, and one with an obvious trade dimension given the high trade to GDP ratios of the economies surveyed. Services are also an important dimension that emerges from the research. A particular services category where island Members struggled was in environmental services, notably the clearance of debris caused by hydro meteorological events. The clearance efforts needed surpassed the capacity of local service suppliers to manage. *Ex ante* international tendering of such services could help bring down costs rather than reliance on *ex post* clean up.
 50. Expanding renewable sources of electricity generation was another action identified as both boosting resilience and economic performance. The import of liquid fuels is a major drain on the balance of payments among the Members surveyed. Further development of hydro-electrical (Nepal), geothermal (Dominica) and other renewable energy sources were considered actions that could improve both the current account situation and also economic resilience.
 51. All six States surveyed demonstrate a significant insurance protection gap. Expansion of insurance coverage would support resilience. Innovation in sovereign insurance products through vehicles through the Caribbean Catastrophe Risk Insurance Facility and its Pacific equivalent has pioneered the use of quick-disbursing parametric insurance schemes (i.e. schemes that pay out when certain pre-defined parameters are met, not on the basis of actual damage).
 52. The role that the “weather enterprise” can play in disaster resilience and reduction emerged strongly. The Caribbean research highlighted not just the potential of such services for disaster resilience, but also for economic efficiency gains.
 53. The stated intention of the Dominican Government to become the first climate-resilient nation is recognition of the need to break the cycle of periodic disasters and debt distress. IMF research suggests that a do-nothing policy will deliver dramatic negative economic outcomes, with large permanent losses of capital, output, and growth.
 54. The three country research papers suggest that trade, and trade policy, can play a role in achieving the objective of furthering disaster resilience. The research has borne out how the economic impact of disasters can be magnified by trade policy measures, but also how trade measures can improve disaster response, recovery and resilience.

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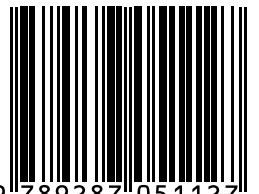
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