RISK INSIGHTS

The Jamaica Civil Aviation Authority's Risk Newsletter

VOLUME 2 | JANUARY 2021

HURRICANES & SEVERE WEATHER EVENTS

Hurricane Gilbert 1988
Mona Road (Hermitage)

BEFORE AFTER

WHAT'S INSIDE

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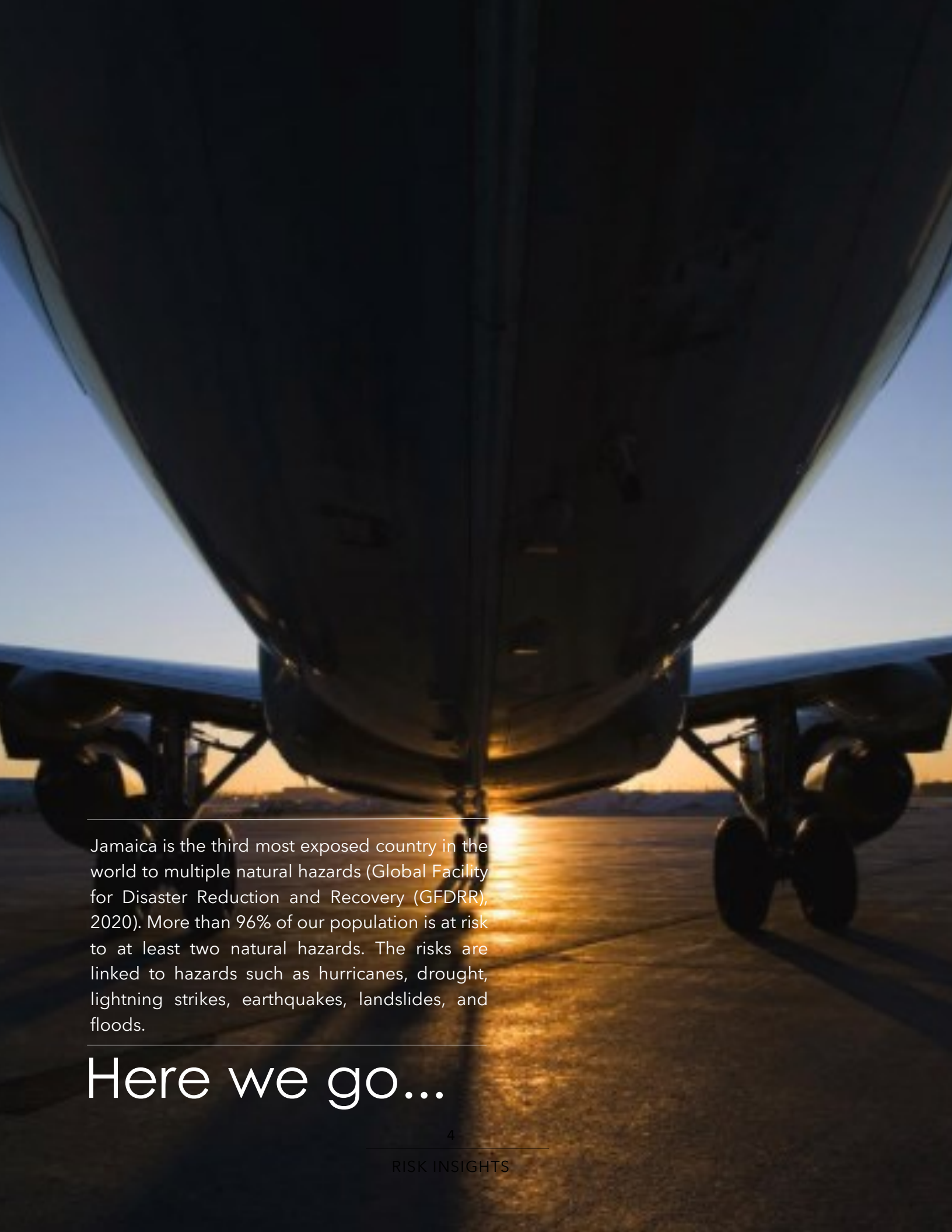


Jamaica is the third most exposed country in the world to multiple natural hazards (Global Facility for Disaster Reduction and Recovery (GFDRR), 2020). More than 96% of our population is at risk to at least two natural hazards. The risks are linked to hazards such as hurricanes, drought, lightning strikes, earthquakes, landslides, and floods.

Here we go...

Foreword

Mr. Nari Williams-Singh

Director General,
Jamaica Civil Aviation Authority

2020 has certainly been a challenging year for the entire world. Two significant risk factors for 2020 have been the Covid-19 pandemic and hurricanes - the topic of this publication.

At the Jamaica Civil Aviation Authority (JCAA) we have been fortunate as it relates to the impact of Covid-19 on our Team Members' health, a trend we sincerely hope continues. Our revenues however, have been severely impacted due to vastly reduced passenger movements and overflights.

Our country has also sustained significant damage caused by recent severe weather events which passed close to our shores. The impact of the inclement weather we have experienced has underscored that we cannot relax our efforts in maintaining preventative measures to keep us safe while at work and elsewhere.

That being said however, Risk Management in any organization is of utmost importance. By definition it *is the identification, evaluation, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability or impact of unfortunate events or to maximize the realization of opportunities.* The JCAA has mobilized its various Departments namely, Engineering & Maintenance Services, Property Management, Office Management, Finance, Research, Planning and Risk Assessment, and other supporting departments to ensure that we are prepared in the event of a major hurricane or natural disaster. All such measures are monitored by the Office of the Director General through regular communication via email or Microsoft Team Meeting updates.

The JCAA anticipates the usual support and continued collaboration from our stakeholders as we prepare for eventualities to ensure the continuation of safe, efficient and reliable operations and a stable work environment.

A hurricane is a violent warm-core tropical storm with a minimum wind speed of 119 km or (74 mph) rotating in a counter-clockwise spiral around a region of low pressure called the center, or the eye (ODPEM). The generic, scientific term for these storms, wherever they occur, is tropical cyclone.

Hurricanes

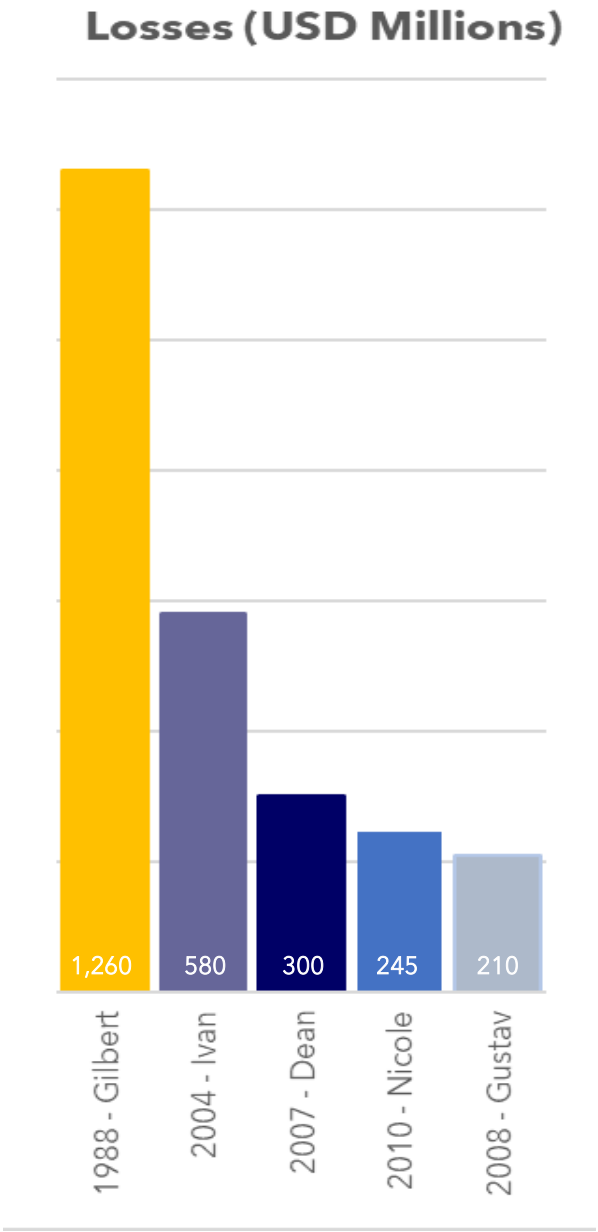
Top 10 hurricanes to form in the Atlantic Ocean

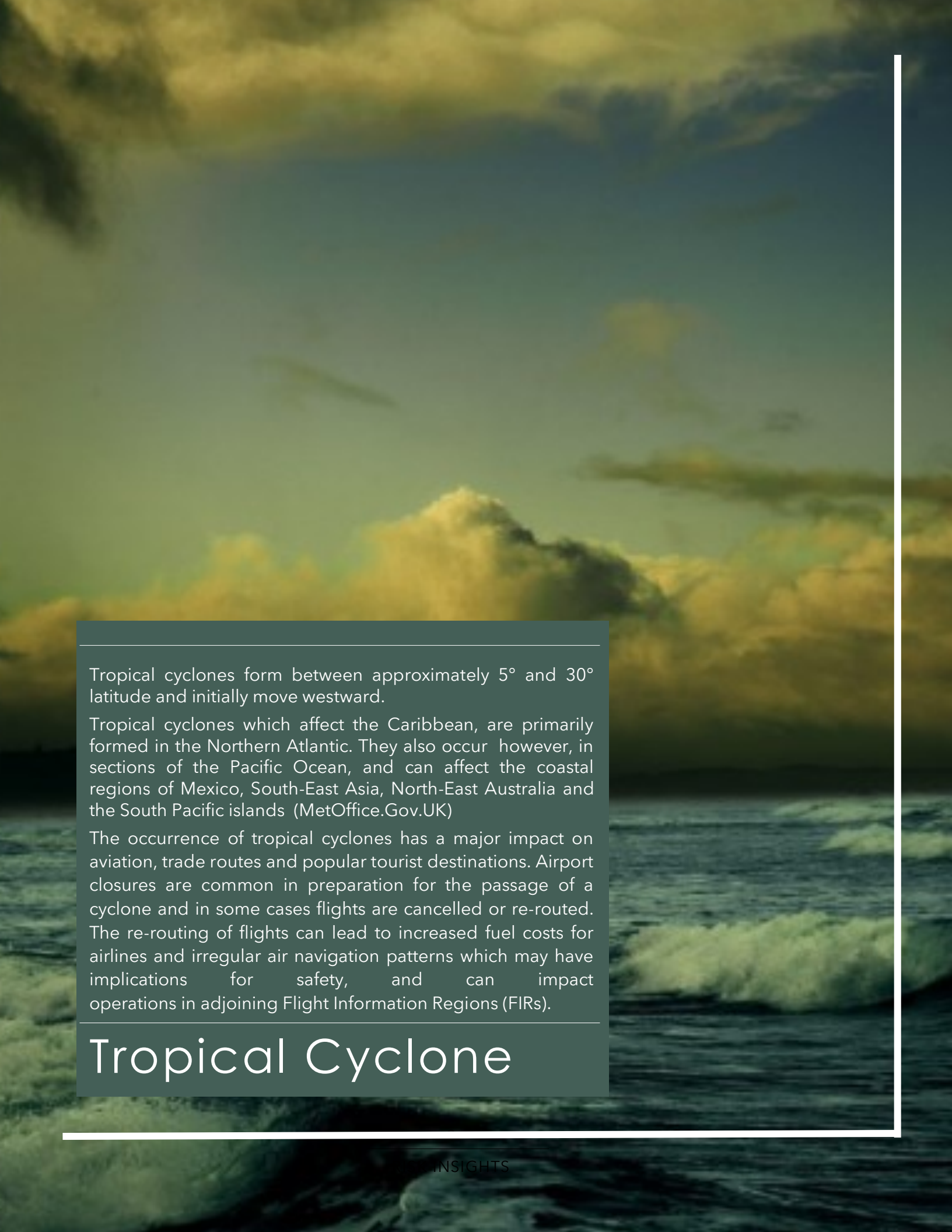
Ranked by Wind Speed

1.	Hurricane Katrina	2005	175/140 mph
2.	Hurricane Andrew	1992	175/165 mph
3.	Hurricane Camille	1969	175/115 mph
4.	Hurricane Mitch	1998	180/80mph
5.	Hurricane Rita	2005	180/115 mph
6.	Hurricane "Labor Day"	1935	185/180 mph
7.	Hurricane Gilbert	1988	185/165 mph
8.	Hurricane Irma	2107	185/180 mph
9.	Hurricane Dorian	2019	185/185 mph
10.	Hurricane Allen	1980	190 mph

Several hurricanes were recorded at 185 mph and 175 mph. For the purpose of the Top 10, the most recent or most significant hurricanes were selected for each group.

Jamaica's Top 5 costliest tropical cyclones since 1979





Tropical cyclones form between approximately 5° and 30° latitude and initially move westward.

Tropical cyclones which affect the Caribbean, are primarily formed in the Northern Atlantic. They also occur however, in sections of the Pacific Ocean, and can affect the coastal regions of Mexico, South-East Asia, North-East Australia and the South Pacific islands (MetOffice.Gov.UK)

The occurrence of tropical cyclones has a major impact on aviation, trade routes and popular tourist destinations. Airport closures are common in preparation for the passage of a cyclone and in some cases flights are cancelled or re-routed. The re-routing of flights can lead to increased fuel costs for airlines and irregular air navigation patterns which may have implications for safety, and can impact operations in adjoining Flight Information Regions (FIRs).

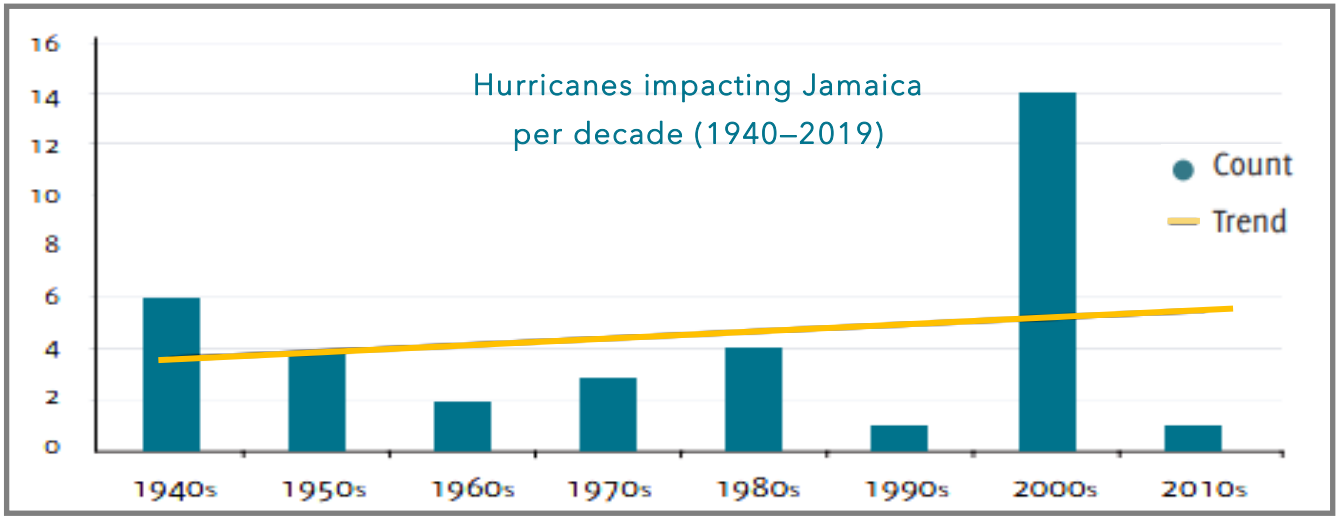
Tropical Cyclone

TROPICAL CYCLONE CATEGORIZATION

1-Minute Sustained Winds	NE Pacific & Atlantic Basin (NHC/CPHC)	NW Pacific Basin (JTWC)
0 – 38 mph (0 – 33 knots)	Tropical Depression	Tropical Depression
39 – 73 mph (34 – 63 knots)	Tropical Storm	Tropical Storm
74 – 95 mph (64 – 82 knots)	Category 1 Hurricane	Typhoon
96 – 109 mph (83 – 95 knots)	Category 2 Hurricane	
110 – 129 mph (96 – 112 knots)	Category 3 Major Hurricane	
130 – 148 mph (113 – 129 knots)	Category 4 Major Hurricane	
150 – 157 mph (130 – 136 knots)		Super Typhoon
158+ mph (137+ knots)	Category 5 Major Hurricane	

HURRICANES

Tropical cyclone activity in the Caribbean and wider North Atlantic Basin has increased since 1995. Both frequency and duration of hurricanes have increased as well as the number of intense hurricanes traversing the tropical Atlantic. However, the maximum intensity of hurricanes has remained fairly constant over the recent past. (ODPEM)



Tropical Cyclones in the Caribbean and Wider Atlantic per decade (1940–2019)

Strategies for Effective Hurricane Risk Reduction

Contributed by the Office of Disaster Preparedness and Emergency Management

The mission of the Office of Disaster Preparedness and Emergency Management (ODPEM) is to lead the process of reducing the impact of disasters on Jamaica through comprehensive disaster management.

Jamaica lies within the North Atlantic hurricane belt and by virtue of its location is vulnerable to multiple hazards including hurricanes and floods which are among the most frequent hazards to affect the island.

The ODPEM is the National Disaster Office (NDO) that functions as the national coordinator for hurricane planning, mitigation, preparedness, and response and recovery efforts. This coordination role is reflected in the roles and responsibilities of the ODPEM as outlined in Section 17 of the Disaster Risk Management Act (2015).

The coordination takes place at three (3) levels: national, parish and community. The projects and programmes coordinated by the ODPEM achieved risk reduction through targeted interventions both at the community and parish levels. Government resources address capacity issues at the parish level using defining tools to aid in the identification and ranking of vulnerable communities.

Some of these targeted interventions are policies developed such as the Building Code and Development Approval Process for construction of residential development and critical infrastructure to offer oversight on the Disaster Risk Management Framework and legislation (DRM Act 2015)

> Nationally, many of the disaster risks faced by communities are rooted in climate hazards.

At the household level, knowledge of hazard risk is a key component to effect changes within the homes. Having preparedness and response plans in place to guide appropriate actions in emergencies and hazard events can significantly contribute to the overall strengthening of community resilience.

ODPEM has therefore developed a programme known as Building Disaster Resilient Communities (BDRC) which examines disaster risks and provides guidelines for developing Disaster Resilient Plans for Communities across Jamaica.

These plans are known as the Community Disaster Risk Management (CDRM) which includes: community boundaries, demographic data, hazard assessment, detailed hazard maps etc. They provide a strategy for disaster preparedness and emergency response.

ODPEM strengthens the capacity of the community through the Community Emergency Response Teams (CERTs) to plan for and assist with recovery and rebuilding processes. The ODPEM facilitates regular training seminars (post-COVID-19 online) in areas such as first aid training and shelter management. ODPEM is also a part of several projects and programmes aimed at building disaster resilience.

These include the Improving Climate Data and Information Management (ICDIM) Project funded by Climate Investment Fund and administered through the World Bank, the Jamaica Disaster Vulnerability Reduction Project (JDVRP) which seeks to conduct multi-hazard risks Assessments and Micro zonation studies and to develop a National Risk Information Platform. There is also the National Hazard Risk Reduction Policy developed for

Jamaica through the European Commission's Disaster Preparedness Programme (DIPECHO) and which was adopted by the ODPEM to reduce Jamaica's vulnerability to natural and man-made hazards by contributing to national sustainable development objectives through hazard vulnerability reduction and minimizing physical, economic, and social dislocations through hazard-risk reduction strategies.

This Policy focuses on strengthening local physical and human resources in high-risk areas. The Policy promotes the inclusion and active participation and partnership of communities, governmental and non-governmental organizations, the private sector, and development partners, in the conceptualization, design and implementation of hazard-risk reduction measures, and provides the basic guidelines for realization of these measures in disaster management and the overall support to the sustainable development process.

Disaster Risk Management is a dynamic ongoing management function seeking to address components of risk identification and assessment, risk reduction, mitigation, preparedness, response, and recovery process. This process while it includes conducting public education and awareness campaigns, also requires a direct engagement in communities where recovery projects and programmes are developed to reduce risk.

Companies should manage their risk by identifying potential risk in advance, analyze them and take precautionary steps to reduce or curb the risk.

Hurricanes produce hazards such as high winds, storm surge, and heavy rainfall. These hazards produce secondary hazards such as inland flooding, land-slides, downed electrical lines, and structural damage. The number one greatest threat from a hurricane comes from storm surges (NOAA).

Hazards & Threats

Key Hurricane Risks to the Operations of the Jamaica Civil Aviation Authority

This list of hazards captures the key threats, and is therefore not exhaustive

HAZARD: STRONG WINDS

Risk:

1. EQUIPMENT DAMAGE

Potential impact:

1. Inability to restore air navigation service within the Authority's Recovery Time Objective (RTO)
2. Inability to provide air navigation services

HAZARD: DOWNED ELECTRICAL LINES

Risk:

1. ELECTROCUTION
2. POWER LOSS

Potential impact:

1. Death and/or serious injury to JCAA Team Members (*Electrocution*)
2. Loss of stakeholder confidence (*Electrocution*)
3. Inability to provide air navigation services (*Power loss*)
4. Loss of core IT services (*Power loss*)
5. Inability to provide regulatory services

HAZARD: EXTENDED WORK HOURS (RECOVERY)

Risk:

1. FATIGUE

Potential impact:

1. Errors in critical recovery steps
2. Death and/or serious injury to JCAA Team Members or members of the flying or overflown public
3. Loss of stakeholder confidence

HAZARD: ROAD BLOCKAGE

Risk:

1. STAFF UNAVAILABILITY

Potential impact:

1. Inability to carry out restore operations
2. Inability to recover air navigation service within the Authority's Recovery Time Objective (RTO)
3. Loss of productivity

HAZARD: STORM SURGE

Risk:

1. INLAND FLOODING
2. LAND SLIPPAGE
3. STRUCTURAL DAMAGE
4. CONTAMINATION OF WATER SUPPLY

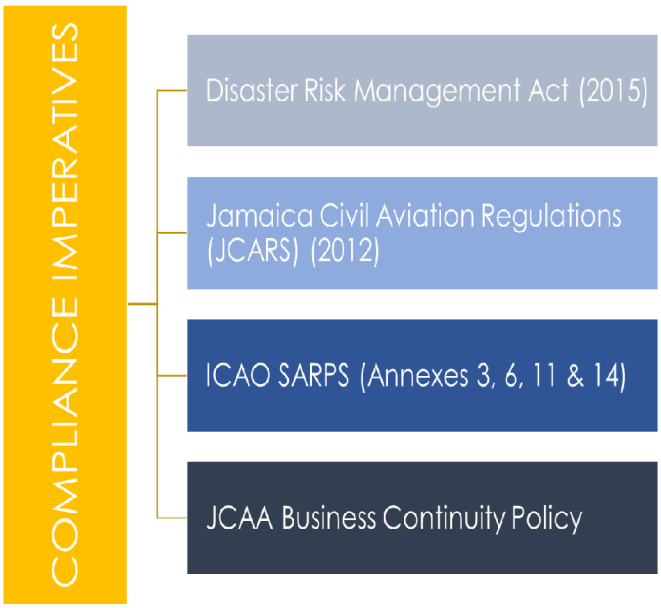
Potential impact:

1. Loss of life (death and/or serious injury to members)
2. Inability to restore air navigation service within the Authority's Recovery Time Objective (RTO) (Equipment Damage)
3. Loss of stakeholder confidence

MITIGATION STRATEGIES

Hurricane risk mitigation strategies are heavily biased towards the development and implementation of **PREPAREDNESS** and **RESPONSE** plans.

These plans aim to protect JCAA Team Members and meet the JCAA's compliance imperatives.



BUSINESS CONTINUITY

Business Continuity is the capability of an organization to continue the delivery of products and services within acceptable time frames at predefined capacity during a disruption
(ISO 22301:2019)

BUSINESS CONTINUITY PLANS

A Business Continuity Plan is documented information that guides an organization to respond to a disruption and resume, recover and restore the delivery of products and services consistent with its business continuity objectives
(ISO 22301:2019)

JCAA INTEGRATED BUSINESS CONTINUITY PLAN

The JCAA BCP is the main vehicle by which the JCAA designs and implements its preparedness and response plans.

HURRICANES

JCAA BUSINESS CONTINUITY PLAN COMPONENTS

HURRICANE CRISIS MANAGEMENT & RECOVERY TEAM

COMMUNICATION PLAN

(JCAA Team Members and external partners)

CNS AND POWER SYSTEMS RESILIENCE AND REDUNDANCY

ANS OPERATIONS CONTINGENCY PLAN

IT DISASTER RECOVERY PLAN

ASSET PROTECTION AND REPLACEMENT PLAN

(security & insurance)

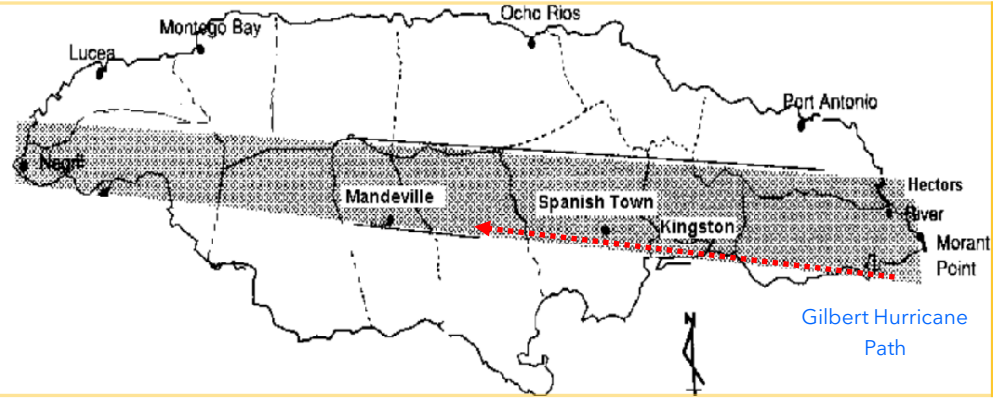
ALTERNATE BUSINESS PROCESSES AND BUSINESS SITES

ESSENTIAL WORKERS

(on-site support)

1 Hurricane Gilbert—September 12, 1988

A.k.a. Wild, Gilbert!!!



Gilbert Hurricane Path

Hurricane Gilbert was an extremely powerful tropical cyclone that formed during the 1988 Atlantic Hurricane season.

On September 12th Hurricane Gilbert made landfall at approximately 10 am on the eastern tip of Jamaica as a Category 3 Hurricane with sustained winds of 125mph and gusts up to 150mph. It was the first hurricane to make landfall in Jamaica since Hurricane Charlie in 1951. Most of the population therefore, had never experienced a major hurricane.

Hurricane Gilbert moved relatively quickly through the island from east to west maintaining Category 3 status, producing a 9-foot storm surge along the northeast coast. Jamaica was devastated, as the eyewall traversed the entire length of the island. Then Prime Minister, the late Most Hon. Edward Seaga, ON, P.C., LL.D., stated that the hardest hit areas near where Gilbert made landfall looked "like Hiroshima after the atom bomb".

The night before the hurricane, some Jamaicans went about their usual business, "New Kingston was alive with mostly young people having a good time at The Club".

Preparation:

1. *Hurricane Alert* issued Sept. 9;
2. *Hurricane Warning* issued at 3pm on Sept.11; and
3. Relocate residents in at-risk communities

Impact:

1. 45 fatalities;
2. 90% of health facilities suffered major damage resulting in reduced capacity
3. Over 800,000 persons sought shelter and 100,000 people were left homeless due to property damage
4. Financial: US$1.3 billion (PIOJ)
5. Economic: 62% of Gross Domestic Product, GDP) (PIOJ)
6. Island-wide loss of electrical power and reduced water supply
7. Only 1 of 4 water treatment plant was functional after the hurricane
8. Loss of transport and communication systems (road, ICT, radio which undermined the execution of centralized plans)
9. Food shortage (E.g., banana crops were wiped out. Disruption to all economic sectors)

Immediate response:

1. The security forces were deployed to help in rural areas which were badly damaged by the hurricane.
2. Relief supplies were distributed to needy communities.
3. The business sector was used to ensure food supplies were available in shops across the island.

1 Hurricane Gilbert— September 12, 1988

Lessons Learnt:

1. The warning systems did not provide adequate preparation time.
2. The destruction of the communication system: road, radio, telephone, meant that it was impossible for centralized planning teams to effectively execute response measures. Affected locations must have the autonomy and capacity to respond to disasters.
3. The Building Code, especially with respect to health facilities and public buildings, needs to be upgraded and standards rigorously enforced if losses of the magnitude experienced are to be avoided. There is also a need for preventive maintenance and the provision of mitigation devices such as hurricane shutters.

Long-Term Response:

1. In-depth assessment into hazard risk reduction
2. Development of the disaster risk management framework
3. Introduction of new building standards
4. Private investment in underground telecommunications wiring

In 1988 when Hurricane Gilbert struck, most of the JCAA's current workforce were quite young, either in high school or college. **Mark Phillips, Unit Manager, NMIA Air Traffic Control Tower** shares his Hurricane Gilbert experience.

"I was attending Kingston College at the time. I did not now what to expect.

The day before I noticed that **the sky turned orange** and my mother said, "when you see that it means hurricane is coming".

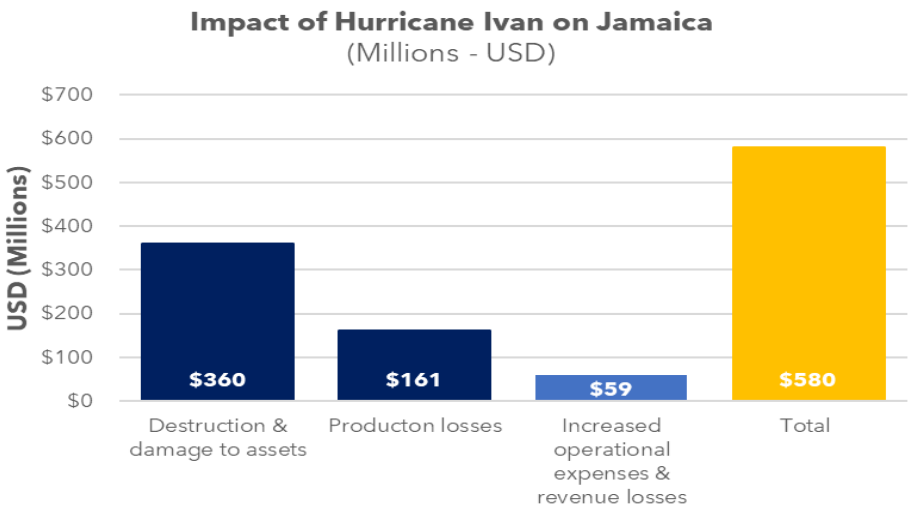
VIVID MEMORIES

1. I was in awe of the strength of the wind, the movement of the trees, and the howling sound which was unnerving
2. I recall the moonlight after the hurricane passed seemed extra bright
3. Watching as my neighbours' roof "took off" in the wind, and them running to take shelter
4. Taking in a family from my community who needed shelter
5. The image of an aircraft which was taken up by Gilbert's winds and placed in the willow trees nearby.

6. The many ways people responded to the circumstances: (a) even without electricity for months my uniform was always neatly ironed by heating an old pressing iron on the stove, and (b) using rain water to take baths
7. Prime Minister, Honourable Edward Seaga's speech on the radio

2 Hurricane Ivan—September 10-12, 2004

The Costliest that did not make landfall



Hurricane Ivan is remembered in Jamaica as the costliest hurricane on record to have never made landfall.

The 2004 Atlantic Hurricane Season posed a major challenge to Jamaica. On August 10, Hurricane Charley, a Category 1 storm, passed along the island's south coast causing extensive flooding in southern parishes. Four weeks later, Hurricane Ivan, followed a similar path, though with far more devastating results.

Ivan, initially forecast to pass directly over Jamaica as a Category 5 storm, eventually passed along the South Coast as a Category 4 between September 10 and 11. At its closest point of approach it was 30 km south of Clarendon. Strongest winds recorded were at 214km/hr on the Pedro Bank, 90 km off the South Coast. Doppler radar estimates sustained winds of 180km/h across the island during the early hours of September 11.

Preparation:

1. Public education and awareness (promoting mitigation);
2. Drain cleaning to limit urban flooding;
3. *Hurricane Watch* issued on Sept. 8 at 9 p.m.;
4. *Hurricane Warning* issued at 3 p.m. on Sept. 9;
5. *Tropical Storm Warning* issued on Sept. 12 at 3 a.m. and lifted at 3 p.m. later that afternoon;
6. 1,000 shelters established;
7. Evacuation orders issued; and
8. Residents in at-risk communities relocated.

Impact:

1. 17 fatalities
2. 36% of health facilities suffered minor to severe damage
3. 47,000 homes were damaged (5,600 were completely destroyed)
4. Financial: US$580 million (62% relates to asset damage)
5. Economic: 8% contraction in Gross Domestic Product (GDP)
6. Loss of transport and communication systems (road, ICT, radio which undermined the execution of centralized plans)
7. Food shortage (E.g. banana crops were wiped out.)
8. Loss of electrical power and reduced water supply
9. Banana export, crops, coffee, cocoa, sugar cane and pimento were destroyed .

2 Hurricane Ivan— Sept. 10-12, 2004

SEVERAL RELIEF initiatives were announced yesterday by Prime Minister P.J. Patterson as an initial response to the devastation caused by Hurricane Ivan on Friday and Saturday.

The hurricane, packing winds of up to 250 kilometres per hour, claimed 17 lives, directly and indirectly, including those of eight persons in Portland Cottage, south-east Clarendon.

Addressing members of the essential services at a Disaster Response Committee meeting at the Office of the Prime Minister on Hope Road, St. Andrew, the Prime Minister said a plane with relief items was expected to arrive here from Mexico within 24 hours.

Immediate Response:

1. Emergency relief supplies were distributed to needy communities.

Key Observations:

1. Warning systems were better co-ordinated and provided more time for planning and preparation at the household and community levels.
2. Co-ordinated evacuation plan executed for at risk communities such as Portmore. The level of pre-planning, as well as the simulation exercise and a continuous public awareness exercises allowed residents to find assembly points easily.
3. Loss of life was minimized even though property damage was not spared.
4. Recovery of utility services occurred comparatively quickly . Within 3 weeks an estimated 80% of electricity and water capacity was restored.

Derrick Grant, Director, Communications, Navigation & Surveillance, shares some close encounters in the work environment when recalling the impact of Hurricane Ivan in 2004.

"I recall Ivan being a very powerful hurricane. I was working with Aeronautical Telecommunications Limited (AEROTEL) at the time and working closely with the JCAA. I was assigned to the airport."

The Task

Part of the preventative procedures involved de-energizing the equipment prior to the passage of a hurricane or weather event. "Initially the Doppler Very High Frequency Omni Range (DVOR) was not enlisted to be de-energized. While at home in Harbour View, observing the roaring of the sea, I received a call to go to the airport to de-energize the DVOR." The task was accepted with some hesitation, as the effects of system were already being felt.

Execution

I sneaked out of the house, (I did not tell my wife) and decided to rush out to the airport to quickly turn off the equipment and shutdown the generator. The road to the airport was smooth. The mission was accomplished. Heading back home, **there was no road.**

A storm surge pushed debris onto the Palisades strip. I was racing to get back before the next surge. It was not easy, It was like driving through a river bed. I made a narrow escape.

Vivid memories of Post-Ivan activities

1. Equipment was under water. Water had to be pumped out of the generator room before it could be restarted.
2. Because of damage to roadways, we needed to find a means of getting fuel to the site at Ayr Hill in Trelawny where JPS power was not restored for 4 months. **A donkey was hired to take fuel to the site.**

Storm surge is an abnormal rise of water generated by a storm, over and above the predicted astronomical tides. This rise in water level can cause extreme flooding in coastal areas.

A little over 60% of the population in Jamaica lives within 5km of the coastline (PIOJ).

Storm Surge

75% of all deaths
from hurricanes in the United States between 1963 and 2012 were due to storm surges and rainfall flooding

(National Hurricane Center)

Storm surges are produced by the force of a hurricane's winds pushing water toward the shore. A storm's winds can cause an abnormally large rise in the water level, which can destroy buildings, bridges and roads; sweep people away; and cause damaging erosion to beaches (Business Insider).

Storm surges appear as powerful water bulldozers that sweep inland across coastlines, sweeping everything in its path. The storm surge is a rise in water level that can take hours to reach its maximum height. It is a huge wave that can extend as far as 80 km (50 miles) wide. Water starts to rise as the storm approaches and continues to rise faster as the centre of the hurricane nears the coast. The stronger the hurricane and the shallower the offshore water the higher and more powerful the surge will be (ODPEM)

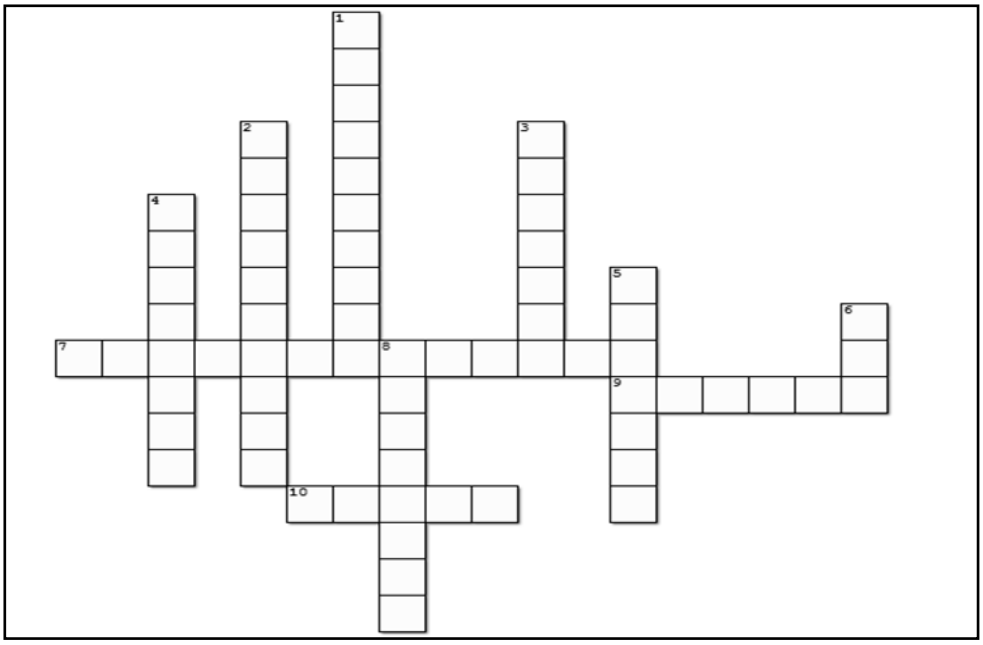
19ft (5.8m)
Hurricane Gilbert (Sept 1988) produced a 19 ft (5.8 m) storm surge and brought up to 823 millimetres (32.4 in) of rain in the mountainous areas of Jamaica, causing inland flash flooding. Forty-five people died.

Climate Change

Natural disasters such as hurricanes are becoming more intense and more frequent. Climate is the long term state of atmospheric variables like rainfall and temperature. Climate change is the long-term alteration of temperature and typical weather patterns in a location, or the planet as a whole. It is one of the biggest issues facing the planet. **People, species, and our environment are all at risk.**

Hurricane-associated storm intensity and rainfall rates are projected to increase as the climate continues to warm. (Nasa.gov)

1. **Tropical storms** that form in the Atlantic or Northeast Pacific (near the United States) are called hurricanes, those that form near in the Northwest Pacific (near Japan) are called typhoons and those that form in the South Pacific or Indian oceans are called cyclones. In Australia, hurricanes are called **"willy-willies."**
2. The word hurricane was derived from the name for the **Arawak God of Stormy Weather "Huraken",** and the **Spanish word "Huracan" meaning 'big wind'**.
3. Hurricanes in the Southern Hemisphere spin in a **clockwise** direction. Hurricanes in the Northern Hemisphere turn **counterclockwise**.
4. The **deadliest hurricane** on record is the **1970 Bhola Cyclone** in Bangladesh, which killed between 150,000-300,000 people.
5. There was a huge and noticeable **baby boom** some nine months after Wild Gilbert passed.
6. **Project STORMFURY** was an experiment conducted to control hurricanes by **seeding** them with **silver iodide**, which would cool the hurricanes. It had little success.
7. Thirty-six of the 64 major hurricanes (Categories 3-5) that hit the United States in the 20th century struck in **September.** August was the second busiest month, with 15.
8. Hurricane names are chosen from a list selected by the World Meteorological Organization. There are six separate lists for Atlantic hurricanes, with one list used each year. Each list is repeated every 7th year. The name of hurricanes that have caused a great deal of death or damage are retired. **Retired names include Andrew, Camille, Bob, Fran, Katrina, and Hugo**.



PUZZLE CHALLENGE

Solve the cross word puzzle and email your solution to PlanningRiskandResearch@jcaa.gov.jm

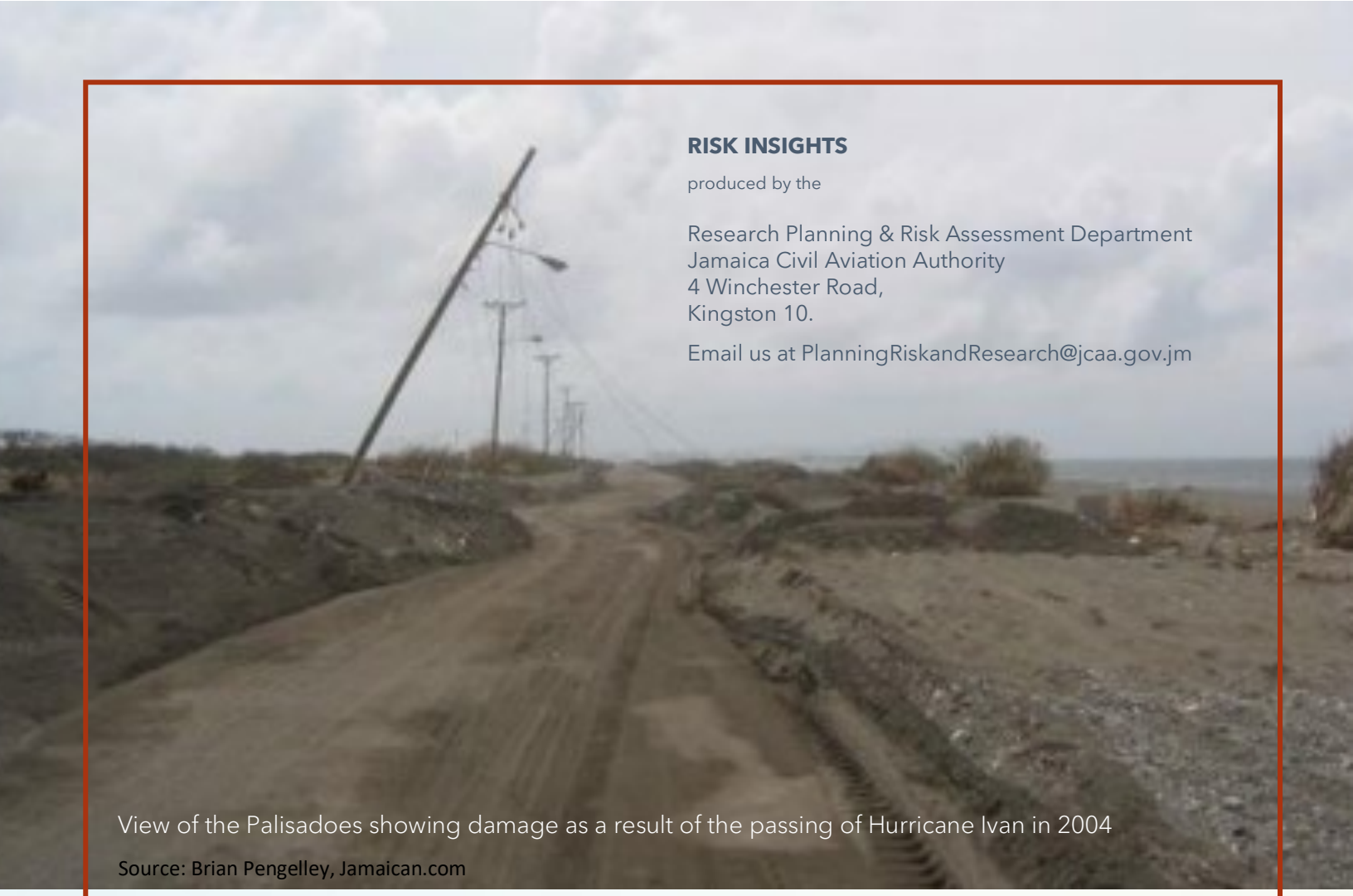
The first three (3) persons to send the correct solution will **win a prize**

Down

1. An abnormal rise of water generated by a storm's winds
2. The spirals of rain that wrap around the center of a tropical storm
3. Tropical cyclone that forms in the Pacific Ocean between 180° and 100°East Longitude
4. A unit of measure for pressure
5. The ring of cumulonimbus clouds that surround the eye of the storm
6. A region of mostly calm weather at the center of a cyclone
8. The counter-clockwise spin associated with a tropical system

Across

7. The long-term alteration of temperature and typical weather patterns
9. Australian forecaster who first named hurricanes
10. An overflow of water that submerges land that is usually dry



View of the Palisadoes showing damage as a result of the passing of Hurricane Ivan in 2004

Source: Brian Pengelley, Jamaican.com

RISK INSIGHTS

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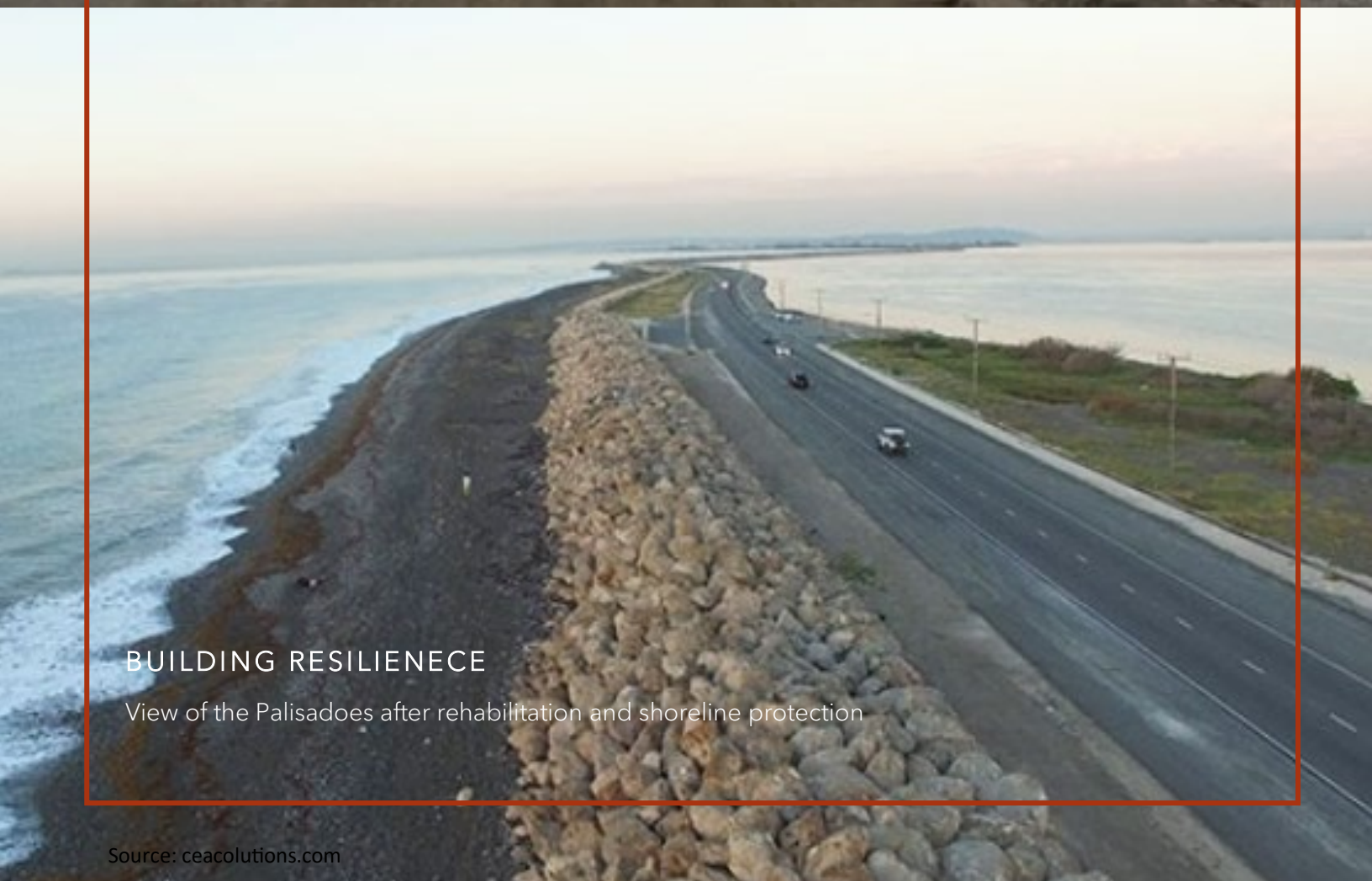

BUILDING RESILIENECE

View of the Palisadoes after rehabilitation and shoreline protection

Source: ceacolutions.com