UNESCO/IOC – NOAA ITIC Training Program in Hawaii (ITP-Hawaii)
TSUNAMI EARLY WARNING SYSTEMS
AND THE PACIFIC TSUNAMI WARNING CENTER (PTWC) ENHANCED PRODUCTS
TSUNAMI EVACUATION PLANNING AND UNESCO IOC TSUNAMI READY PROGRAMME
7-18 August 2023, Honolulu, Hawaii USA

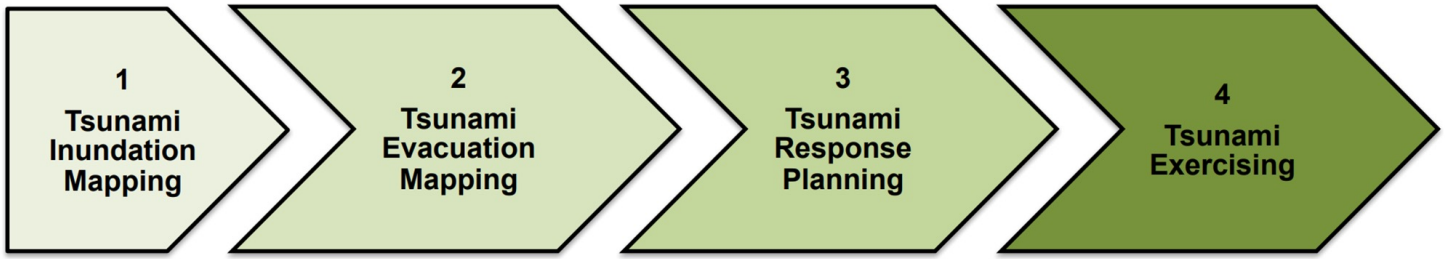
14.5 Evacuation maps when inundation modeling is not possible or practical

Case Study – Caribbean Example

Desireé Bayouth-García

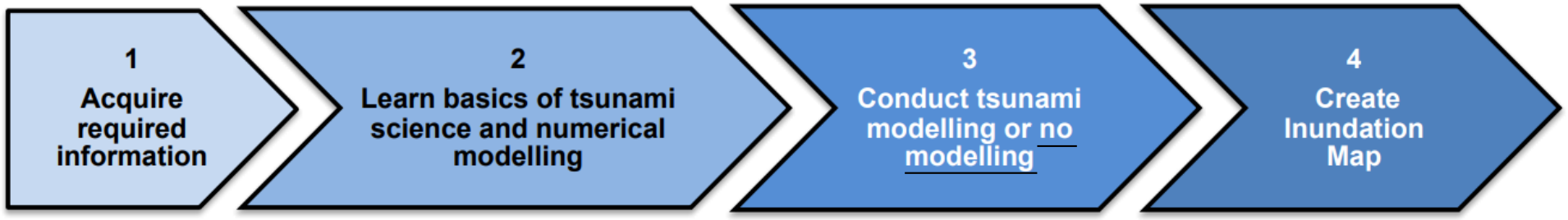
UNESCO/IOC – NOAA International Tsunami Information Center

Introduction



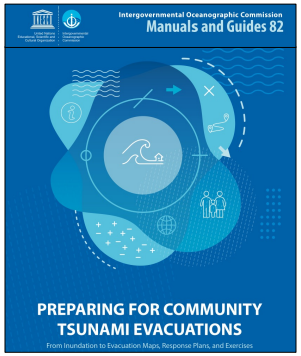
	TSUNAMI READY INDICATORS
I	**ASSESSMENT (ASSESS)**
1	**ASSESS-1**. Tsunami hazard zones are mapped and designated.
2	**ASSESS-2**. The number of people at risk in the tsunami hazard zone is estimated.
3	**ASSESS-3**. Economic, infrastructural, political, and social resources are identified.
II	**PREPAREDNESS (PREP)**
4	**PREP-1**. Easily understood tsunami evacuation maps are approved.
5	**PREP-2**. Tsunami information including signage is publicly displayed.
6	**PREP-3**. Outreach and public awareness and education resources are available and distributed.
7	**PREP-4**. Outreach or educational activities are held at least three times a year.
8	**PREP-5**: A community tsunami exercise is conducted at least every two years.
III	**RESPONSE (RESP)**
9	**RESP-1**. A community tsunami emergency response plan is approved.
10	**RESP-2**. The capacity to manage emergency response operations during a tsunami is in place.
11	**RESP-3**. Redundant and reliable means to timely receive 24-hour official tsunami alerts are in place.
12	**RESP-4**. Redundant and reliable means to timely disseminate 24-hour official tsunami alerts to the public are in place.

MG-82 Module 1 – Identifying Tsunami Inundation Areas

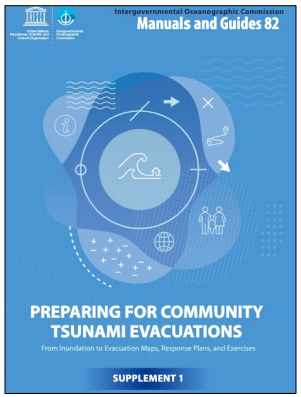


Methods of determining inundation/flooding extents

1. **"Bath-tub" line methods**
   - Historical records of maximum tsunami run-up at the community level
2. **Establishing tsunami inundation zone for evacuation mapping and planning in regions without tsunami modeling.**
   - National Tsunami Hazard Mitigation Program guidelines
   - Historical inundation information
   - Elevation and distance from the shoreline
   - Tsunami modelling for nearby areas
   - Safety buffers
   - Hurricane storm surge maps and data
   - Strong offshore currents



REFER TO
Module 1, p. 14-15



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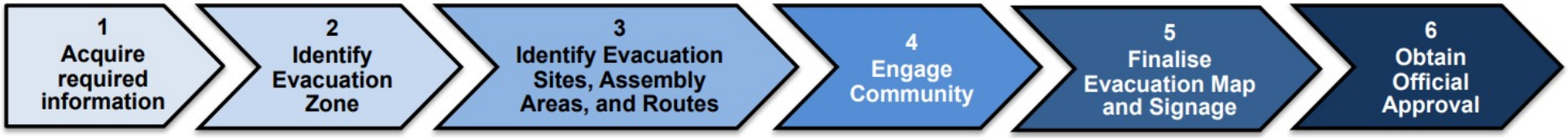
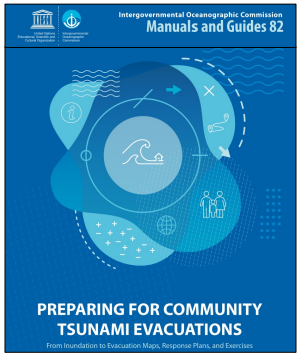
2.3, p. 14-23

MG-82 Module 2 – Developing Tsunami Evacuation Maps



- **Use the no modeling inundation result as the preliminary evacuation zone**
- **Buffer addition? Team decision**
  - Following the “bath-tub” approach do not reduce extents to elevations lower than the contour selected
- **Follow the remaining evacuation map development steps as you would with a tsunami modeling result polygon**
- **Non-modeling approach > Conservative evacuation map**



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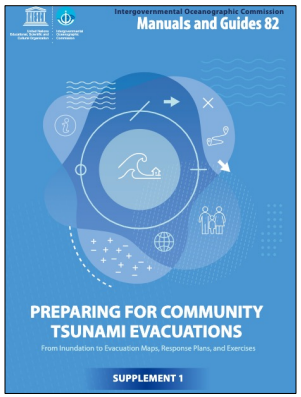
Module 1, p. 14-15



REFER TO
p. 38 - 51

Caribbean Case Study - Jamaica

Tsunami Response Plan and Standard Operating Procedures

Old Harbour Bay

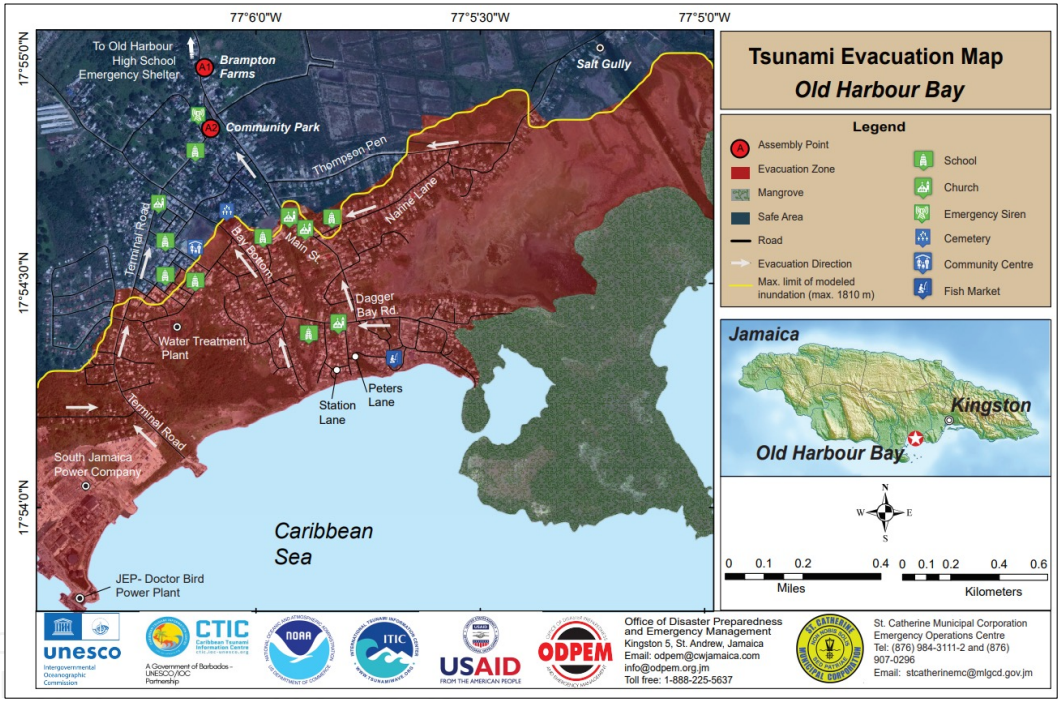
Community tsunami inundation zone

Modeling

National

Island wide tsunami inundation zone

No modeling



Caribbean Case Study - Jamaica

Tsunami Response Plan and Standard Operating Procedures

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↓

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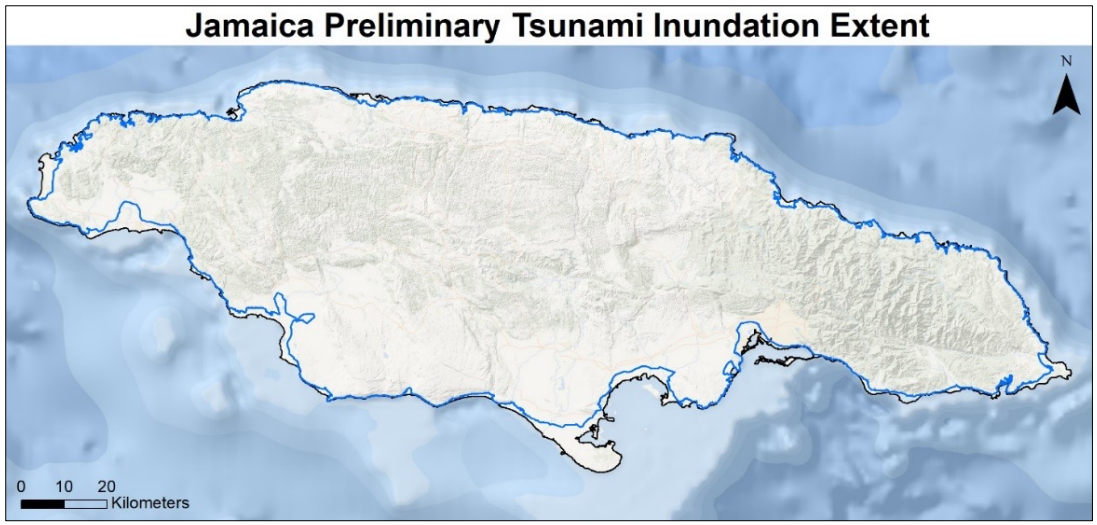
↓

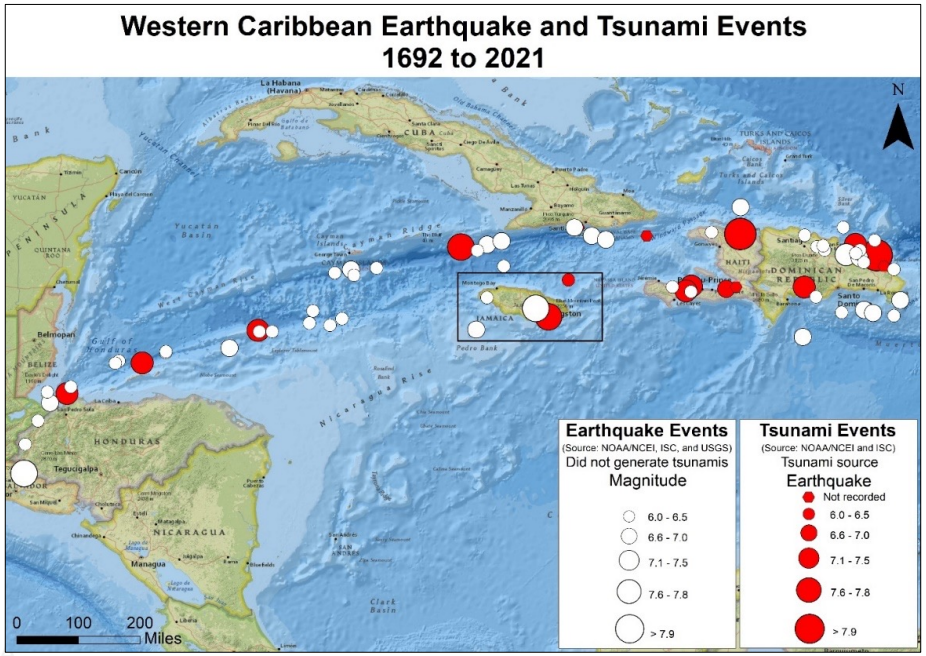
No modeling



Caribbean Case Study - Jamaica

Following the MG-82 guidelines

- **Use of GIS tools to support Jamaica's Tsunami Ready recognition**
- **Event and runup data obtained from**
  1. NOAAs National Center for Environmental Information (NCEI)
  2. International Seismological Center – Global Earthquake Model (ISC-GEM) Global Instrumental Earthquake Catalogue
  3. United States Geological Survey (USGS) Earthquake Catalogue



Caribbean Case Study - Jamaica

Following the MG-82 guidelines

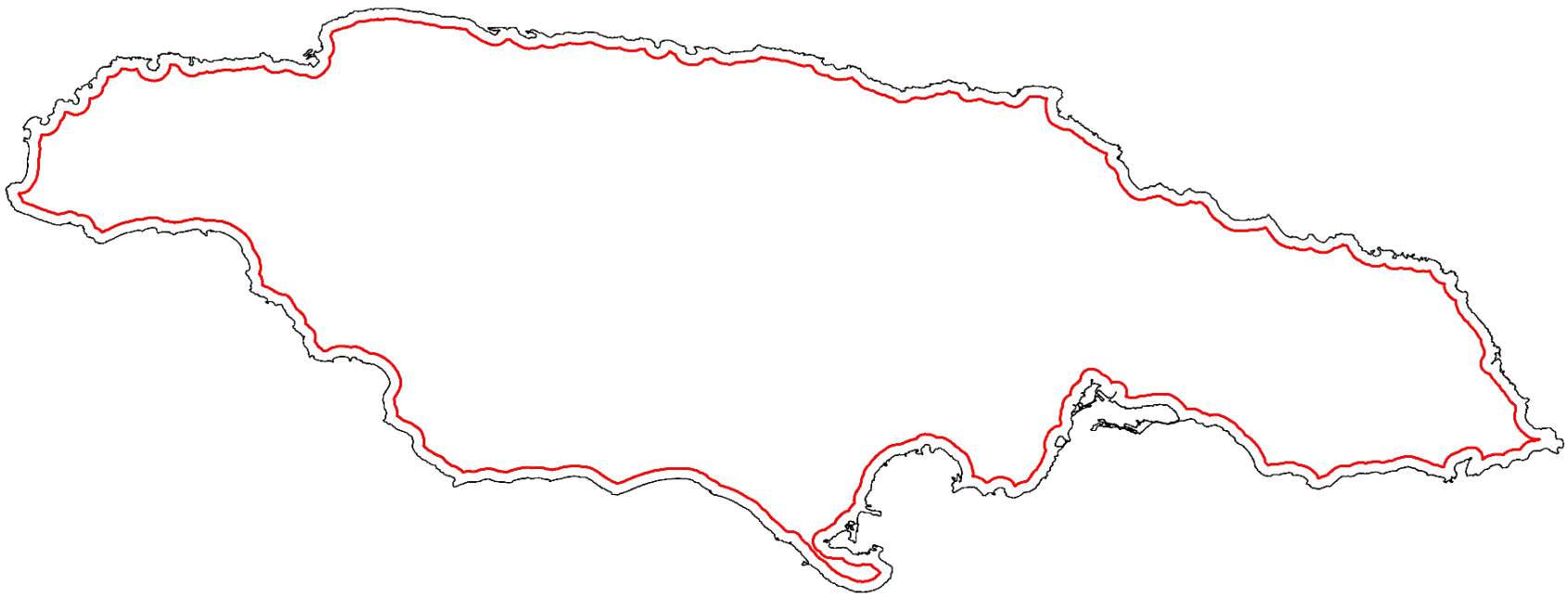
- **Local and historical data provided by Jamaica's Office of Disaster Preparedness and Emergency Management (ODPEM)**
  - Island's outline
  - Digital elevation model (DEM)
  - Hurricane Allen storm surge data
  - Coastal inundation data

- **Establish a nationwide preliminary inundation extent using the provided datasets, GIS software, ArcMap, and consulting ODPEM on specific mapping considerations and parameters**
  - 10 m elevation and 1.6 km distance from the shoreline

Caribbean Case Study - Jamaica

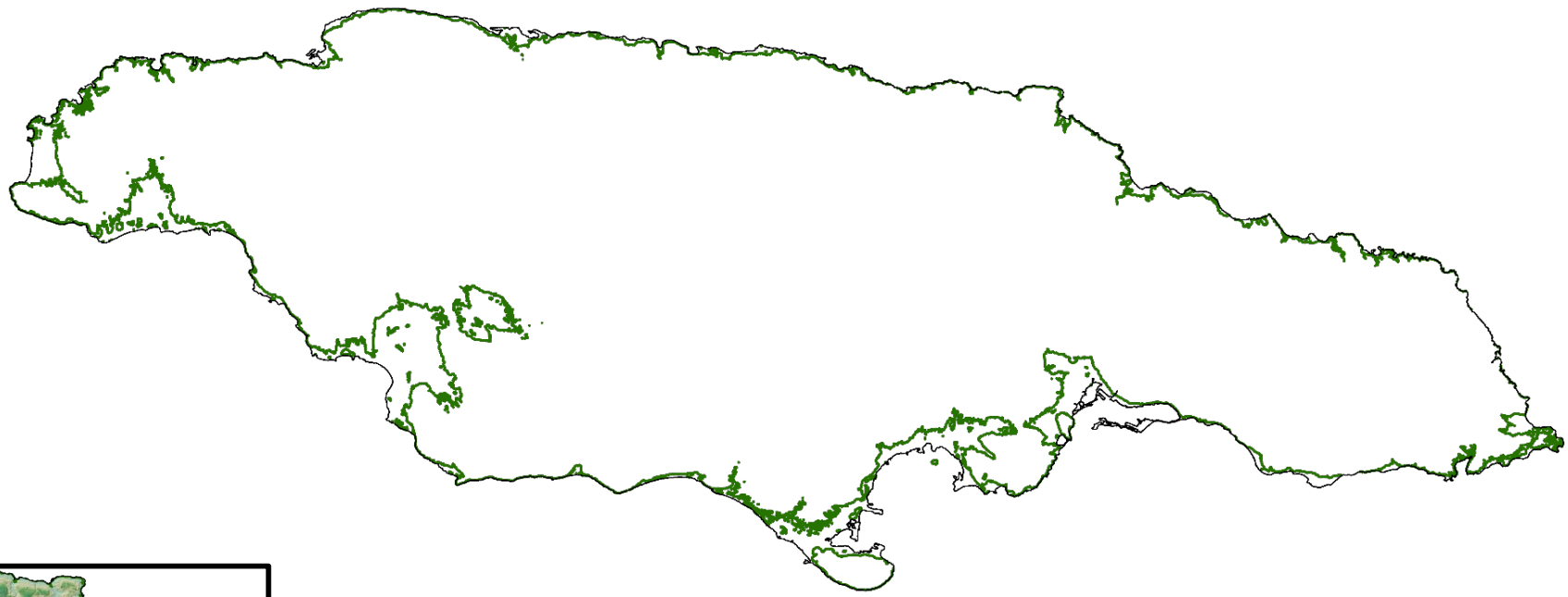
Jamaica's outline

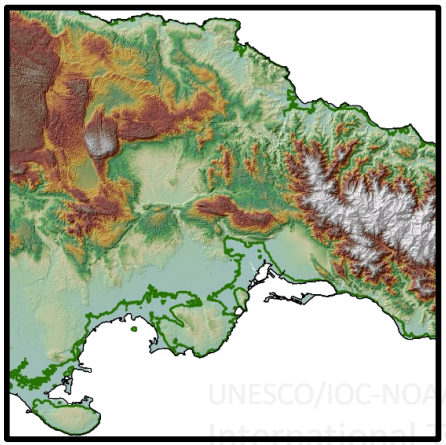
Caribbean Case Study - Jamaica



1.6 km buffer (inland)

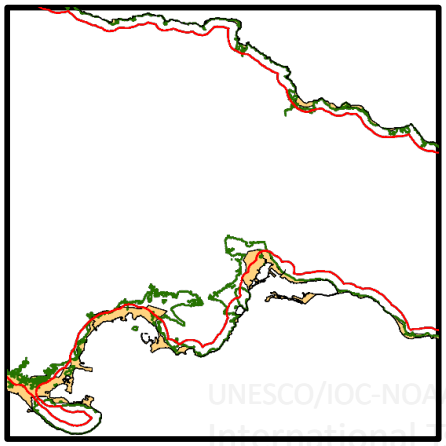
Caribbean Case Study - Jamaica





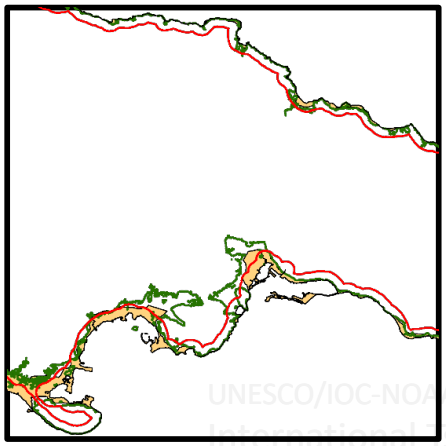
Jamaica DEM – 10 m contour

Caribbean Case Study - Jamaica



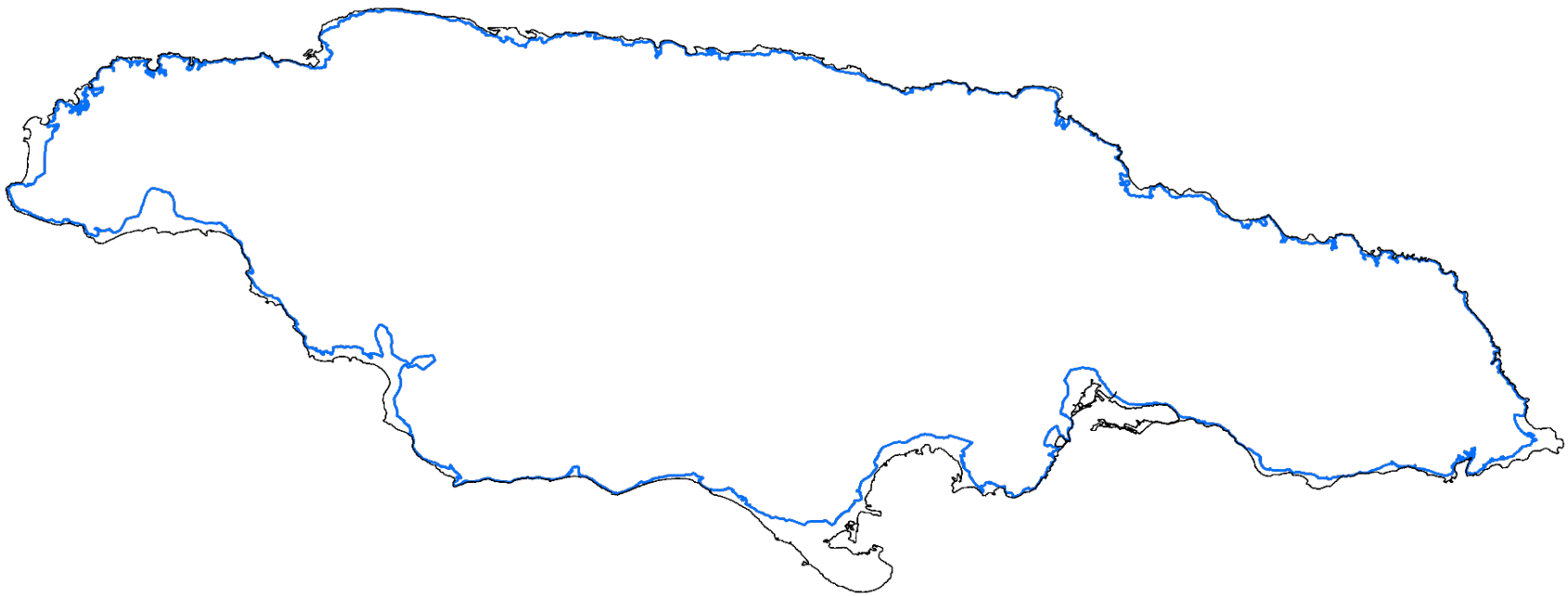
Coastal inundation

Caribbean Case Study - Jamaica



Trace the file that is first reached from the coastline

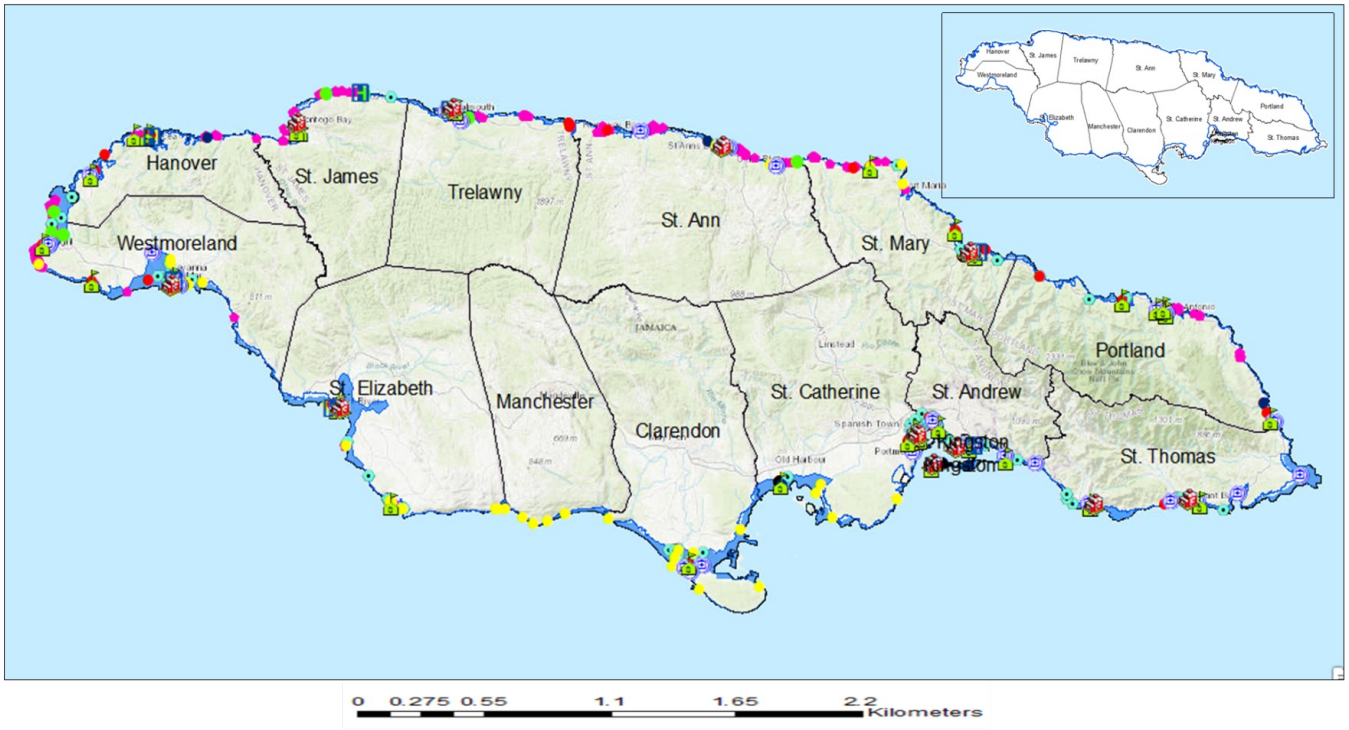
Caribbean Case Study - Jamaica



Trace the file that is first reached from the coastline

Caribbean Case Study - Jamaica

Critical Assets at Risk to Tsunamis in Jamaica



Critical Assets at Risk

- 2 airports
- Roads
- 11 fire stations
- 7 hospitals
- 47 schools
- 18 port facilities
- 23 health centres
- 12 tourist attractions
- 50 emergency shelters
- 12 tourist facilities
- 133 heritage sites
- 29 police stations
- 115 well systems
- 8 cemetaries
- 347 hotels
- Tsunami inundation extent
- Parish

Critical assets located within the tsunami inundation extent

Map creation: Anna Tucker-Abrahams

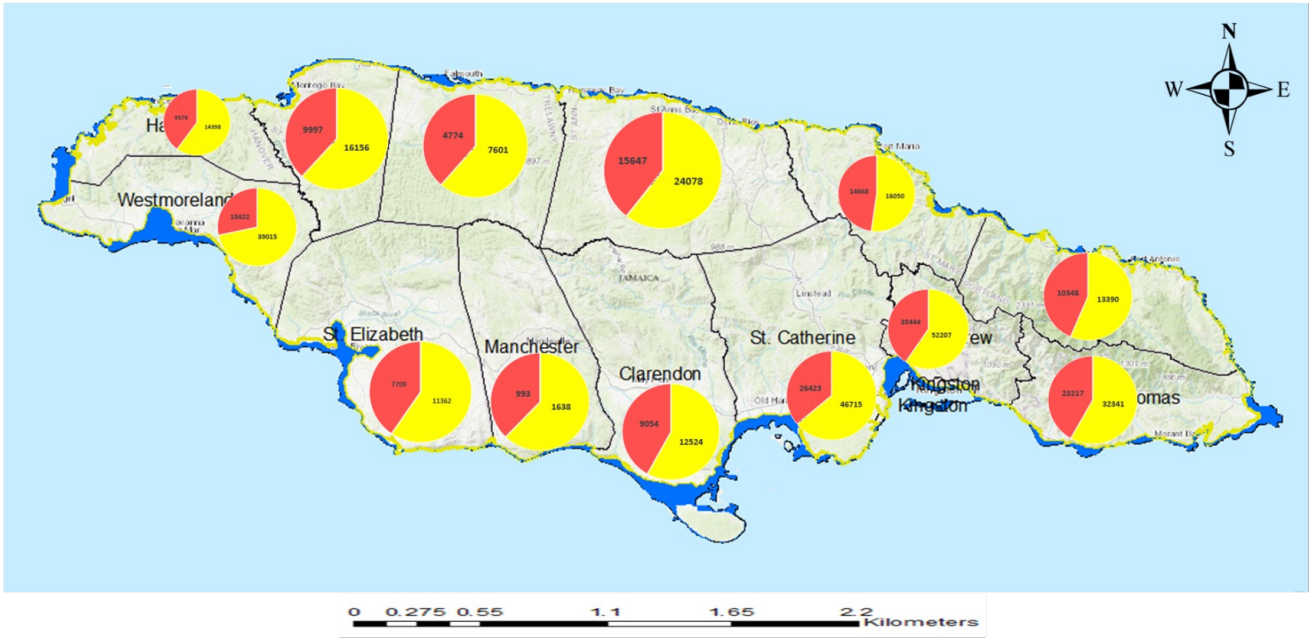
Date created: September 27,2021

Data credits: ODPEM Critical assets at risk,
NOAA Tsunami Inundation Extent

Office of Disaster Preparedness and Emergency Management

Caribbean Case Study - Jamaica

Exposed Coastal Population within Tsunami Inundation Extent



Parish	Exposed Population	
	15-64yrs	<15/>64yrs
Clarendon	12,524	9,054
St. Catherine	46,716	26,423
KSA	52,207	35,444
St. Elizabeth	11,362	7,709
St. Ann	24,078	15,647
St. Mary	16,050	14,668
St. James	16,156	9,997
Manchester	1,638	993
Hanover	14,398	9,574
Trelawny	7,601	4,774
Westmoreland	39,015	15,422
Portland	13,390	10,348
St. Thomas	32,341	23217
Total	**287,476**	**183,270**

LEGEND

- Exposed Population (15—64yrs)
- Exposed Population (<15yrs & >64yrs)
- Tsunami Inundation Extent
- Coastal Inundation Areas
- Parish Boundary

Exposed population within the tsunami inundation extent

Map creation: Anna Tucker-Abrahams
Date created: September 27,2021
Data credits: STATIN Census 2011, NOAA Tsunami Inundation Extent

ODPEM
Office of Disaster Preparedness and Emergency Management

Thank you

Desireé Bayouth-García

UNESCO/IOC – NOAA International Tsunami Information Center