

### Highlights

- The tropical storm made Chalane landfall in the district of Muanza, north of Beira City, in the province of Sofala in Mozambique, in the early hours of 30 December 2020. In the provinces of Sofala and Manica, at least two people died, several injured, more than 11,275 affected, about 1,156 houses destroyed and 1,439 damages by strong winds and significant floods.
- A total of 1,237,951 people was modelled as living in the areas affected, and economic losses caused by cyclone Chalane in Mozambique are 5,929,581 USD as estimated by the ARC Tropical Cyclone Explorer (TCE).
- Portfolio losses of storm Chalane in Mozambique are less than the attachment point of 7,221,694 USD set in the country's insurance policy. As a result, no payout is due to the Government of Mozambique.

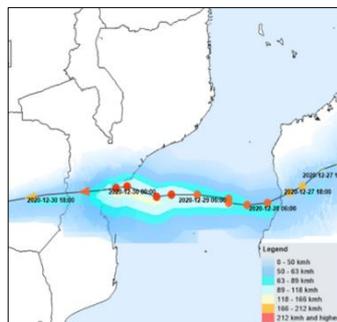
### Event Overview

The tropical depression that formed in the Southwestern Indian Ocean intensified on 24 December 2020 as the tropical storm Chalane. It made landfall in the district of Muanza, north of Beira City (Sofala) in Mozambique, in the early hours of 30 December 2020, at a speed of about 83 km/h according to the Mozambique's National Institute of Meteorology (INAM)<sup>1</sup>. Chalane storm brought heavy rainfall, strong winds and flooding across the country. It then moved inland across central Mozambique, weakening into a tropical depression as it moved towards Zimbabwe and Botswana where it dissipated in the north-central regions.

The National Institute for Disaster Management (INGC) and humanitarian partners carried out rapid assessments and reported at least two deaths, several injured in the provinces of Sofala and Manica, while several communities were evacuated<sup>2</sup>. In Sofala, at least 10,930 people have been affected by Chalane, about 1,156 houses were destroyed and 1,439 damaged. It was also reported that 82 schools were destroyed and 87 damaged which affected 22,910 pupils. In the province of Manica, 345 people were affected, 68 houses and makeshift shelters and 13 classrooms were destroyed, and 11 health units were damaged.

### Monitoring TC Chalane using ARC's TCE

The ARC's *Tropical Cyclone Explorer (TCE)* software was used to monitor the characteristics of the tropical storm Chalane in Mozambique. The wind and storm surge footprints are parts of TCE's outputs, which shows the regions affected by certain extents of the tropical storm. TCE's footprint for the storm Chalane indicated that the storm made landfall with a maximum wind speed of 89 km/h, which rapidly decreased



thereafter to below 63 km/h. The storm surges caused by Chalane reached a maximum height of about 1.5 m.

### TCE Loss Calculations

The post-event run of the ARC's TC model showed that a total of 1,237,951 people was living in the areas affected by the tropical storm Chalane. The economic losses associated to TC Chalane in Mozambique were estimated at 5,929,581 USD. These losses are direct losses solely due to wind hazard and storm surges, and do not consider damages due to flooding, nor indirect economic losses.

Country	Event name	Losses (USD)	Population potentially affected per wind speed category				
			Category 1 (63 km/h)	Category 2 (89 km/h)	Category 3 (119 km/h)	Category 4 (159 km/h)	Category 5 (211 km/h)
Mozambique	Chalane	5,929,581	1,226,674	11,277	0	0	0

### TC Insurance Policy

The payout under the parametric cyclone insurance policy held by a country depends on the conditions of coverage chosen. A key parameter is the Attachment point, the minimum severity of the event loss that results in a payout.

For Mozambique, the calculation of the losses caused by the cyclone Chalane was made using the following insurance model parameters: Premium of 1,700,000 USD, Coverage limit of 14,720,025 USD, Ceding percentage of 2.50%, Attachment point of 7,221,694 USD and Exhaustion point of 596,579,708 USD. The results showed that if Mozambique had taken the TC parametric insurance, the losses caused by Chalane would be less than the Attachment point of \$7,221,694 USD. As a result, no payout would have been due to the Government of Mozambique under the policy of the parametric insurance against the risks of tropical cyclones with the above parameters.

ARC expresses its sympathy to the government and people of Mozambique for the impacts on communities and infrastructure caused by the tropical storm Chalane.

For additional information, contact the ARC at: [info@arc.int](mailto:info@arc.int)

<sup>1</sup> Southern Africa, Flash Update No.6: Tropical Storm Chalane - <https://reliefweb.int/report/zimbabwe/southern-africa-flash-update-no6-tropical-storm-chalane-31-december-2020>

<sup>2</sup> Southern Africa, Flash Update No.6: Tropical Storm Chalane - <https://reliefweb.int/report/zimbabwe/southern-africa-flash-update-no6-tropical-storm-chalane-31-december-2020>

# Tropical Cyclone Explorer (TCE)

## About ARC

The African Risk Capacity (ARC) was established by treaty as a Specialised Agency of the African Union (AU) to help Member States improve their capacities to better plan, prepare and respond to extreme weather events and natural disasters, therefore protecting the food security of their vulnerable populations. By linking early warning systems with contingency planning and supported by modern financial mechanisms, ARC enables governments to provide targeted responses to disasters in a more timely, cost-effective, objective and transparent manner, thereby reducing response costs and loss of livelihoods.

## About TCE

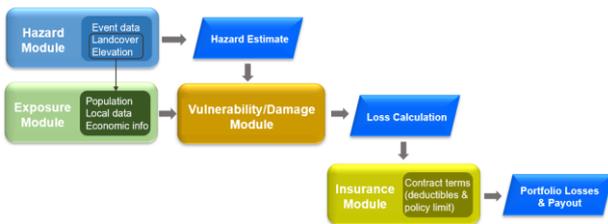
The ARC Tropical Cyclone (TC) risk model is a parametric insurance product developed for the South West Indian Ocean (SWIO) region to provide rapid financing and early response to countries affected by tropical cyclone events. It covers winds and storm surge hazards while excess rainfall associated with cyclones will be covered under another ARC insurance product.

The Tropical Cyclone Explorer (TCE) software package is a dedicated interface, developed by the ARC to allow users to easily access all the model data and view the characteristics of the cyclone (trajectory, wind speed, storm surge heights, etc.), calculate the affected population as well as the economic losses caused by the cyclone event. The losses calculated by TCE are limited to six SWIO countries: Mozambique, Comoros, Madagascar, Mauritius, Seychelles and Tanzania. The TCE will be available to ARC Member States and partners via the ARC's *Africa RiskView* (ARV) platform.

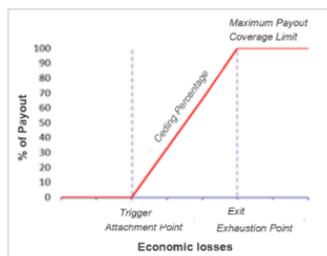
## Methodological Note on TCE

### TC Risk Model

The ARC's TC risk model is implemented through four modules, logically sequenced to offer a reliable estimate of people affected and economic losses caused by cyclones, namely hazard, exposure, vulnerability/damage and insurance modules.



- **Hazard module:** It calculates in near-real time the maximum wind speed and the height of storm surges caused by a tropical cyclone.
- **Exposure module:** It describes the economic assets based on the land use categories in each country as well as the replacement cost of each exposed asset.
- **Vulnerability/Damage module:** It defines the probability distribution of economic losses for different levels of wind speed and storm surge height induced by a tropical cyclone.
- **Insurance module:** It calculates loss estimates for an asset portfolio based on contractual conditions. The payout is based on the following set of parameters selected by each country: Attachment Point, Exhaustion Point, Coverage Limit and Ceding Percentage.



As per Section 6.2 of the TC Policy, the calculation of the MCLD (*Modelled Cyclone Losses and Damages*) payout amount is shown below using the following formula:

$$P = \min(L, y * x), \text{ where } x = \min(EP - AP, \max(MCLD - AP, 0))$$

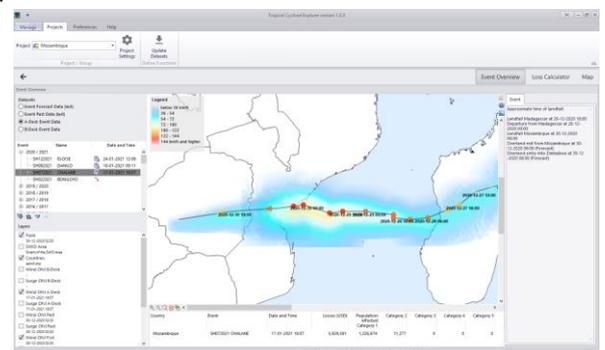
where:

- P MCLD Payout Amount
- L Coverage limit
- AP Attachment Point
- EP Exhaustion Point
- x The amount by which the MCLD exceeds the Attachment Point (AP) (which amount shall not be greater than the Exhaustion Point (EP) minus the Attachment Point)
- y Ceding Percentage

### TCE Components

The TCE is a client Windows application which is composed of three main modules:

- **Loss Calculator:** It is the main element for calculating the economic losses and the population affected and for each country.
- **Event Overview:** It is a dedicated module which combines mapping and loss calculation. It helps viewing different elements of one event during calculation.
- **Map:** It provides to users a general GIS mapping functionality including vector and raster-based project parameters.



After downloading the dataset, the *Loss Calculator* engine calculates the modeled losses for the selected country (ies) and selected cyclone event(s). The losses (in USD) is calculated only for A-deck and B-deck data, not for in-event data and forecasts. In addition, the TCE's *Loss Calculator* calculates the number of populations affected for five categories of cyclone wind speeds.