



Tropical Cyclone Scenario Selection Tool

User Guide

3 December 2021

eCat 146037

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About

The [Tropical Cyclone Scenario Selection tool](#) enables users (e.g. emergency managers, engineers, researchers, etc.) to query the catalogue of tropical cyclone scenarios, developed as part of the 2018 Tropical Cyclone Hazard Assessment (TCHA18). The TCHA18 catalogue is comprised of 10,000 simulated years of tropical cyclone activity in the Australian region, amounting to over 160,000 tropical cyclone events.

Using the search tools, the tracks and wind fields of individual events affecting a location or region can be discovered and explored. The returned scenarios are retrieved from a catalogue of synthetic tropical cyclones and can be queried within the map and/or downloaded in various formats for follow-on analysis.

Use-cases include:

Emergency managers

- In a planning context, I want to know what events are possible in an area of interest, with what likelihood and potential impacts. With this information, I can estimate what impact these events might have and develop necessary plans.
- As part of the pre-disaster season briefings with my community, I want to show what events might be possible in the future, and what the impacts may look like so we can be better prepared.

Engineers

- As an engineer, I want to find suitable scenarios to test my design, and to associate that scenario with the design hazard level.

Planners

- In planning towns and cities, I need to ensure that buildings that are at-risk are identified and construction is either prevented or restrictions in place for vulnerable areas.

Researchers

- I'm conducting research into understanding how:
 - Remote communities can be better prepared for tropical cyclone events,
 - Tropical cyclones affect the agriculture sector,
 - Different buildings respond to tropical cyclones events (and so I need a number of scenarios for different wind speeds to investigate).
 - Etc.

Disclaimer: the Tropical Cyclone Scenario Selector Tool and information is not be used for safety of life decisions.

Portal familiarisation

Landing Page



1. Icons

- Share:** Allows users to share a URL with current map extent and selected layers. Will only work on 2D layers.
- Auto Save:** Allows users to save their map and layer state when they close the portal or when the page is refreshed. Will only work on 2D layers.
- Portal Help:** Find definitions to all the icons on the portal
- Switch Persona:** Allows users to select from multiple personas, which contain tools and data layers relevant to a range of disciplines.

2. Teal bar

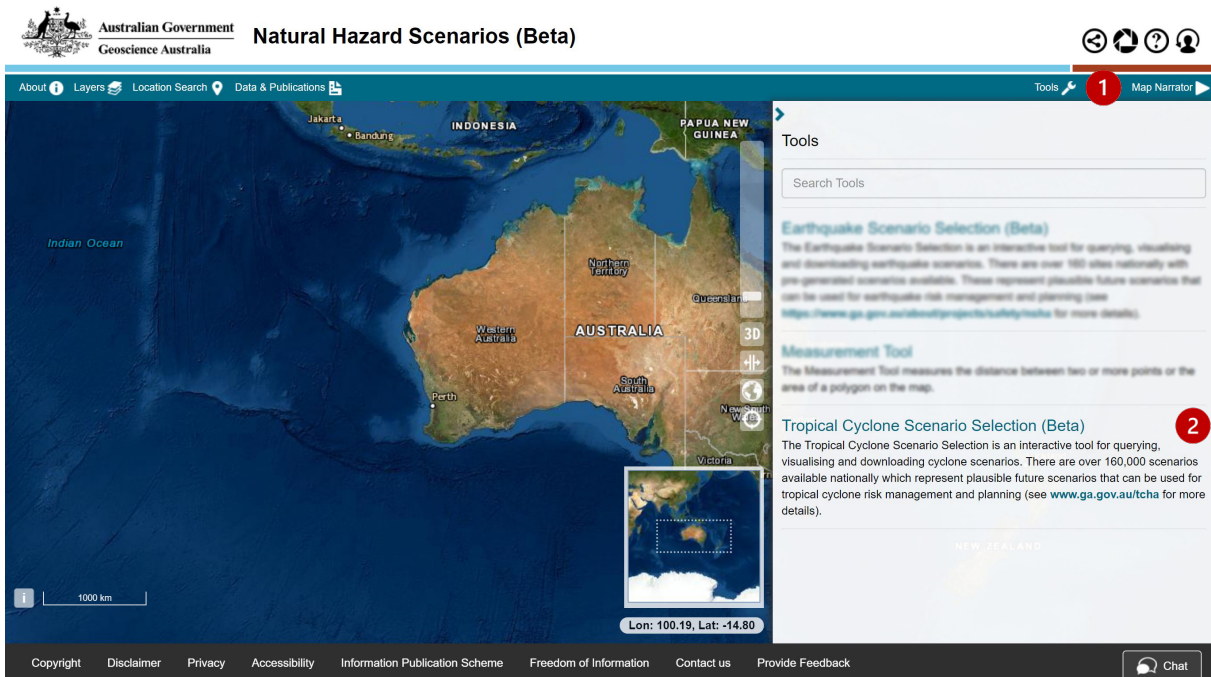
- About:** The history of the tool
- Layers:** Select layers of interest to your study
- Location Search:** Use our location search to refine the area you're interested in assessing
- Data & Publication:** Find resources and learn more about this capability
- Tools:** Access the portal tools including the *Tropical Cyclone Scenario Selector Tool* in the tools tab
- Clip:** Allows users to download a specified extent of data. Learn how within the [portal help](#) icon.
- Map Narrator:** Map Narrator allows users to capture and share a series of interactive scenes. Learn how within the [portal help](#) icon.

3. Side bar

- Zoom toggle:** Move the white bar up to zoom in, and down to zoom out. For mobile and tablet devices users can zoom the map by pinching with two fingers on the touch screen.

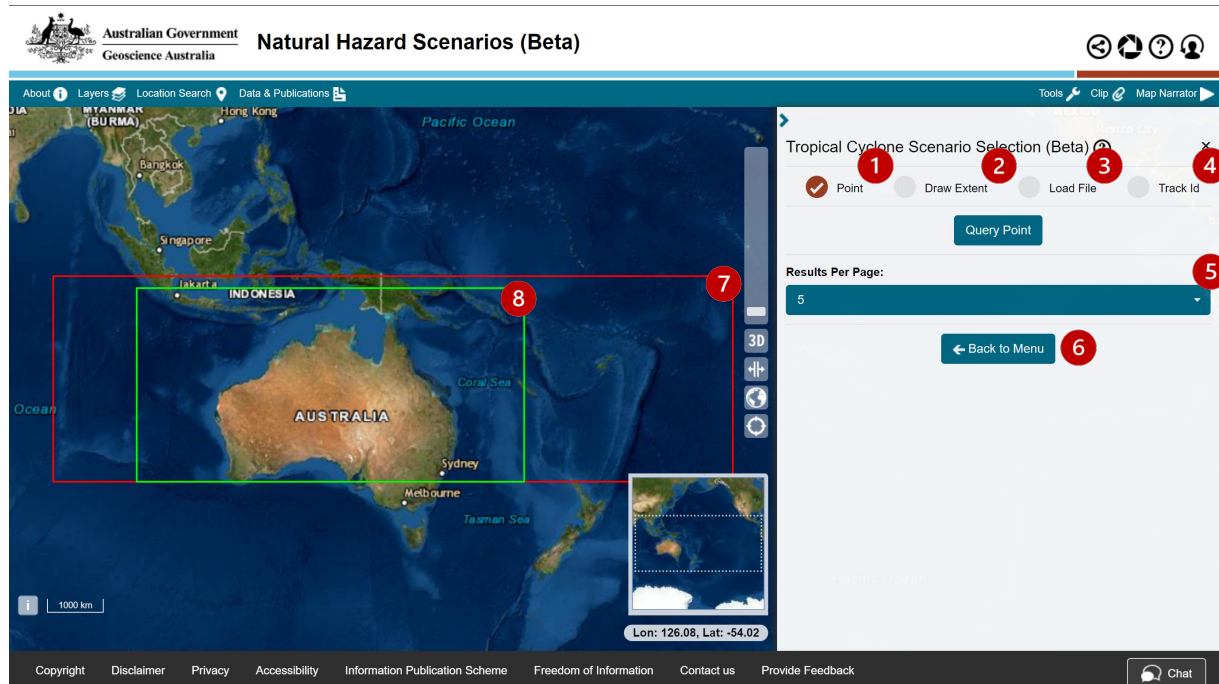
- b. **Switch to 2D/3D:** Switch between 2D / 3D map view
- c. **Enable Splitter:** Use the split screen tool to view two datasets, alongside each other. The tool will split the map view in two and you can use the layers menu to assign one data layer to each side (active left and active right) A splitter icon will appear in the middle of the map view.
- d. **Reset Map position:** Resets the map position.
- e. **Centre Map on Current Location:** Centers the map on the user's current location.

Accessing the Tropical Cyclone Scenario Selector Tool



1. Locate the **Tools** tab from the landing page
2. Click on the **Tropical Cyclone Scenario Selector Tool**
3. The application will automatically load

Tool Familiarisation



When the **Tropical Cyclone Scenario Selector Tool** is [loaded in the portal](#), two domain boxes (one red, one green) appear over the map of Australia. These are the Data Extents.

Data Extents

The **simulation domain (in green)** indicates the region for which we calculated the wind fields of simulated tropical cyclones, along with average recurrence interval wind speeds. Areas outside of this region will have no wind speed data, or recurrence interval data.

The **track domain (in red)** indicates the region for which tropical cyclone tracks were simulated. This represents the area traversed by tropical cyclones that entered the simulation domain at some point in their lifetime. Not all tracks that form within the track domain will enter the simulation domain. Tracks may extend outside the track domain, however the number would not be a complete picture of possible tropical cyclone tracks.

Icons

Defining areas of investigation

1. **Point:** Select a specific point location (and/or buffer) to query
2. **Draw Extent:** Draw a rectangle over an area of interest to query
3. **Load File:** Upload an area of interest (spatial extent) to query
4. **Track Id:** Reload a previously identified event using the track identification number

Other options

5. **Results per Page:** Set the number of results viewed per tab. The default is set to 5.
6. **Back to Menu:** Return to Natural Hazard Risk portal tool tab to load a different tool.

Over the map

7. **Data Extent (red):** Track domain
8. **Data Extent (green):** Simulation domain

How to select an area of interest

1. [Load the Tropical Cyclone Scenario Selector Tool](#) into the portal. This will open a panel that offers 4 options for defining an area of interest.
2. Before defining the area of interest, select how many results you would like to view listed on each tab on the result carousel.
3. Define an area of interest.

Option 1 - Point

Select a specific point location (and/or buffer) to query

- a. Click on the *Point* option to select it
- b. Click on the *Query Point* button
- c. Set the search radius using the slider bar
- d. If the distance slider is set to 0 km, then the nearest event to the selected point is returned. Depending on the selected distance (recommend an initial distance of 20 km), the query may take a few seconds to run. It may be possible that there are no scenarios in the catalogue within the search distance for the selected point. If the query returns no results, then the distance slider could be increased to increase the search, or another point can be selected.
- e. Click on a point on the map that is an area of interest. You can zoom in to improve selection accuracy.
- f. Alternatively, the "Location search" button on the top left-hand section of the toolbar can be used, which may aid in finding a location of interest.

Option 2 - Draw Extent

Draw a rectangle over an area of interest to query

- a. Click on the *Extent* option to select it
- b. Click on the *Draw Extent* button
- c. Click on the map to begin drawing the rectangle, move the mouse and click again to complete the extent
 - i. If the first anchor point is in the incorrect position, select the *Clear Extent* button, now visible in place of the *Draw Extent* button.
 - ii. If the second anchor point is in the incorrect position, and the extent requires to be redrawn, scroll to the bottom of the tab (below the results), and click on the *Refine Search* button.

Option 3 - Load File

Upload an area of interest (spatial extent) to query; accepted formats are either a zipped shape file, GeoJSON or KML file.

- Click on the *Load File* option to select it. An upload box will appear.
- Click on the *Choose File* button, locate your file and click Open
- The tool will automatically load your extent

Option 4 - Track Id

If you have previously identified an event, you can enter the [track id number](#) (in the form XXX-XXXXX) to retrieve the track and wind field data

- Click on the *Track Id* option to select it. A text box will appear.
- Type in the track id number you want to revisit and click the search button
- The query will be processed and results automatically appear in the tab to be selected as required (view [exploring results](#) for more information).

Search Results Familiarisation

The screenshot shows the 'Natural Hazard Scenarios (Beta)' interface. On the left is a map of Australia and the Indian Ocean with a location pin. On the right is a search results panel for 'Tropical Cyclone Scenario Selection (Beta)'. The search criteria are 'Longitude 121.103, Latitude -19.628 with 60km Distance'. The results table has columns for Track ID, Max Wind Speed, Min Central Pressure, and Category. Below the table are navigation buttons (First, Previous, 1-10, Next, Last) and a Download button. Further down are buttons for 'All Wind Speed at Selected Point', 'Filter Search Results', 'Visualisation Styles', 'Refine Search', and 'Back to Menu'.

Track ID	Max Wind Speed	Min Central Pressure	Category	Track	Max Wind Field
000-00064	215.30 km/h	945.50 hPa	Category 4	<input type="radio"/>	<input type="radio"/>
000-00445	184.43 km/h	976.88 hPa	Category 2	<input type="radio"/>	<input type="radio"/>
000-00581	253.17 km/h	927.65 hPa	Category 5	<input type="radio"/>	<input type="radio"/>
000-00811	159.68 km/h	974.74 hPa	Category 2	<input type="radio"/>	<input type="radio"/>
000-00919	174.11 km/h	979.22 hPa	Category 2	<input type="radio"/>	<input type="radio"/>

- Search Results Location:** Query location details (coordinates and buffer distance if applied).
- Search Results Table:** Returned results from the query location appear in a results table. Click individual headings to sort table with ascending or descending characterisers. Use the page bar to move between result pages.
 - Track ID:** Unique identifier for the event.
 - Max Wind Speed:** Maximum gust wind speed in km/h of the tropical cyclone over its entire lifetime. This is not the maximum wind speed at the selected point, or in the selected extent.
 - Min Central Pressure:** Minimum central pressure in hPa of the tropical cyclone over its entire lifetime. This is not the minimum central pressure at the selected point, or in the selected extent.

- d. **Category:** Tropical cyclone intensity category, based on Australian Bureau of Meteorology [tropical cyclone intensity classification](#).
 - e. **Track:** Select to view and hide tracks over the map. Selecting a track will enable the [wind field impact](#) profile to appear in the results.
 - f. **Max Wind Field:** Select to view and hide the wind fields of selected TC events over the map. Selecting a track will enable the [wind field impact](#) profile, and maximum wind speed colour chart to appear in the results.
3. **Download:** Download results in either a NetCDF, shape file (for tracks), Windfield GeoTIFF or Windfield PNG format.
 4. **ARI Wind Speed at Selected Point (see below):** This feature is only accessible with Point Location Searches. Expand to see the average recurrence interval (ARI) wind speed in graph and tabular form.
 5. **Filter Search Results (see below):** Expand to further filter the search results by wind speed units, speed and/or cyclone category.
 6. **Visualisation Styles (see below):** Expand to change how the track and wind fields are stylised on the map – using track width, track opacity, or wind field opacity.
 7. **Refine Search:** Return to the selection tool start to select new location.
 8. **Back to Main Menu:** Return to Natural Hazard Risk tool menu.

Additional Information

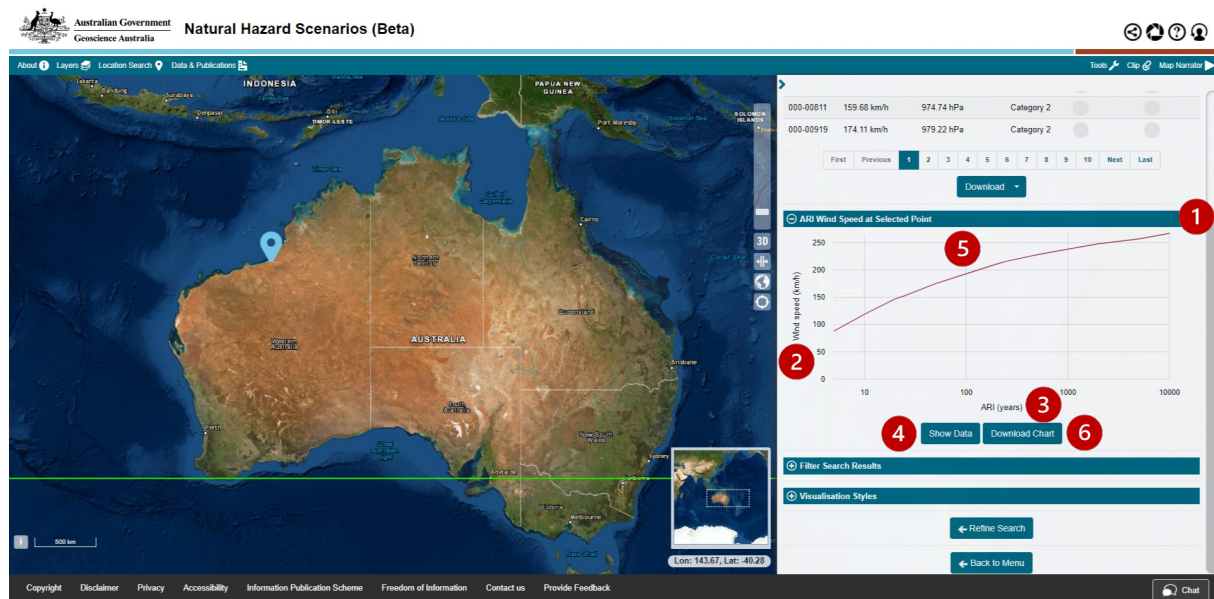
Track ID: You can revisit an event of interest by using its unique track id number (in the form XXX-XXXXX). To retrieve the track and wind field data, inserting this number into the text box when [searching for an extent by Track ID](#) upon entry of the tool.

'Max Wind Speed' refers to the maximum wind speed (km/h) generated by the tropical cyclone along the full track. This may occur in only a small region of the tropical cyclone's wind swathe.

'Min Central Pressure' is the minimum sea level pressure (hPa) attained along the full track.

'Category' is the maximum tropical cyclones intensity category over the entire lifetime. These values do not represent the values at the selected point.

ARI Wind Speed at Selected Point



i The ARI Wind Speed feature is only accessible for [Point Location Searches](#). It will not appear if you search by drawing an extent, entering a track ID, or loading an extent file.

- ARI Wind Speed at selected point:** Expand to see the average recurrence interval (ARI) wind speed in graph and tabular form.
The ARI Wind Speed graph displays the average recurrence interval (ARI) plotted against wind speed in km/h. This provides a representation of how often we can expect to see a recurrence of the wind speeds at that location
- Wind Speed (km/h):** The Y axis defines the gust wind speed at the selected location.
- ARI (years):** The X axis defines the average recurrence interval (ARI) in years at the selected location.
- Show/Hide Data:** Click to display or hide the ARI Wind Speed values table in the panel.
- Mouse hover:** Alternatively, to view data for a specific time or speed interval, hover the mouse over the graph line at the point of interest.
- Download Chart:** Click to download the average recurrence interval (ARI) wind speed graph as a .png image.

Filter Search Results

1. **Filter Search Results:** Expand to further filter the search results by wind speed units, speed and/or cyclone Category.
2. **Max Wind Speed Unit:** Change results from kilometres per hour (km/h) to metres per second (m/s).
3. **Max Wind Speed Between:** Change the results to only show those events with maximum wind speeds in the selected range.
4. **Category:** Select to view which cyclone categories are included the search results, from Category 0 (Tropical Low) to 5 (Severe Tropical Cyclone).
5. **Reset Filter:** Reset filters to original/default search settings.

Visualisation Styles

The screenshot displays the 'Natural Hazard Scenarios (Beta)' web application. The main map shows Australia with a green rectangular selection box. The right-hand control panel includes a 'Visualisation Styles' section with five numbered red circles (1-5) pointing to specific settings: 'Wind Field Colour Ramp' (2), 'Track Width' (3), 'Track Opacity' (4), and 'Wind Field Opacity' (5). The 'ARI Wind Speed at Selected Point' section is also visible at the top of the control panel.

1. **Visualisation Styles:** Expand to change how the track and wind fields are styled on the map.
2. **Wind Field Colour Ramp:** Change the wind field's colour from the default to 'Colour Blind Safe' colours.
3. **Track Width:** Change the width of the returned tracks
4. **Track Opacity:** Change the opacity of the returned tracks.
5. **Wind Field Opacity:** Change the opacity of the returned wind fields.

Additional Information

i Track and Wind Field Style Changes: Changes to styles will only be visible if there are tracks and/or wind fields visible on the map. This can be done by checking a track and/or wind field in the Search Results Table.

Displaying Tracks, Wind Fields and Impacts

The screenshot displays the 'Natural Hazard Scenarios (Beta)' web application. The main map shows a large green and yellow wind field over the eastern coast of Australia. The sidebar on the right contains the following elements:

- Search Results Table:** A table with columns: Track ID, Max Wind Speed, Min Central Pressure, Category, Track, and Max Wind Field. It shows 930 results (Page 1 of 186). The first row is highlighted with a red circle '1'.
- Wind speed:** A color chart ranging from green (Low: 22 m/s) to red (High: 140 m/s). A red circle '2' is next to it.
- Wind Field Impact:** A section with an 'Email:' field containing 'craig.arthur@gs.gov.au' and a 'Submit for impact processing' button. A red circle '3' is next to the button.

1. **Search Results Table:** Returned results from the query location. Click individual headings to sort table and the page bar to move between result pages
 - a. **Track:** Select to turn tracks on or off within the map.
 - b. **Max Wind Field:** Select to turn max wind fields on or off within the map.
 - c. **Wind speed:** A colour chart appears when a Max Wind Field is selected. The chart provides a visual indicator of where the strongest wind speeds occur along a track.
2. **Wind field Impact:** Expand to submit event for impact processing or display previously calculated impact data
3. **Submit for processing:** Enter a valid email address and submit for processing. This will deliver an email to the given address on completion (typically 10-15 minutes) which includes a link to [download impact data for the event](#).

Returned Impact Processing Requests

The screenshot shows the 'Tropical Cyclone Scenario Selection (Beta)' interface. The main map displays a tropical cyclone track over the Indian Ocean and Australia. A search results panel on the right shows a table of tracks with columns for Track ID, Max Wind Speed, Min Central Pressure, Category, Track, and Max Wind Field. A 'Wind Field Impact' bar is highlighted with a red circle and the number 1. Below the table are buttons for 'Query Impact', 'Hide Impact', and 'Download'.

Track ID	Max Wind Speed	Min Central Pressure	Category	Track	Max Wind Field
000-00064	215.30 km/h	945.50 hPa	Category 4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
000-00445	184.43 km/h	976.88 hPa	Category 2	<input type="checkbox"/>	<input type="checkbox"/>
000-00581	253.17 km/h	927.65 hPa	Category 5	<input type="checkbox"/>	<input type="checkbox"/>
000-00811	159.68 km/h	974.74 hPa	Category 2	<input type="checkbox"/>	<input type="checkbox"/>
000-00919	174.11 km/h	979.22 hPa	Category 2	<input type="checkbox"/>	<input type="checkbox"/>

1. **Wind field impact bar:** When impact processing is complete, the email submission form will be replaced with 'Query Impact', 'Show impact' (or 'Hide impact') and 'Download' buttons.
 - a. **Show impact:** will add the impact data to the map as another layer. When data is visible, it can be queried using the 'Query impact' button. 'Hide impact' will remove the layer from the map display.
 - b. **Query impact:** will add a table in this section when the features are selected in the map. The table will present available impact information for that feature.
 - c. **Download:** allows user to download a geospatial data file containing impact data for the selected event.

FAQ's?

How many scenarios are there?

The TCHA18 catalogue has over 160,000 unique tropical cyclone events, representing 10,000 years of simulated tropical cyclone activity. More information on how the TCHA was calculated can be found at <https://www.ga.gov.au/about/projects/safety/tcha>

What does TCHA18 mean and how does it relate to the selection tool?

The national Tropical Cyclone Hazard Assessment (TCHA) defines the severe wind hazard posed to Australia based on the frequency and intensity of tropical cyclones making landfall around the Australian coastline. The latest version of the assessment was released in 2018 and forms the basis for the tropical cyclones scenarios stored within the TCHA18 catalogue. These synthetic scenarios are retrieved by the Tropical Cyclone Scenario Selector Tool.

Learn more about the [2018 Tropical Cyclone Hazard Assessment \(TCHA18\)](#).

How are these tracks different from a tropical cyclone forecast?

The Australian Bureau of Meteorology's (BoM) [published tropical cyclone tracks](#) are observations of past tropical cyclones. This track information is stored in the [Australian Tropical Cyclone Track Database](#) which is a fundamental input to the TCHA18. The TCHA18 scenarios are modelled scenarios that represent plausible future tropical cyclone scenarios which can be used to inform preparation and risk reduction decisions. Historical tropical cyclones will not be found in the TCHA18.

How do these tracks compare to previous events, like Tropical Cyclone Tracy in 1974?

The scenarios available in this tool are modelled events which have been informed by historical events, such as Tropical Cyclone Tracy. A user may select a track that has similar characteristics to a previous event, however, there will be no event that is identical to a historical event. Information on historical events can be discovered in the [Australian Tropical Cyclone Track Database](#).

What does ARI mean?

Average Recurrence Interval – the average period (years) between events of a given intensity when taken over a long period of time. For example, an ARI of 100 years means that events of a given intensity will occur, on average, once every 100 years. This does not mean those events will occur only once in every 100 years. It also means that every year, there is a 1% chance of an event of that intensity occurring (or the Annual Exceedance Probability).

How does ARI relate to AEP?

An Annual Exceedance Probability (AEP) may be expressed as the reciprocal of Average Recurrence Interval. The AEP is the likelihood of occurrence of an event of given size or larger occurring in any one year. AEP is expressed as a percentage (%) and may be expressed as the reciprocal of ARI (Average Recurrence Interval).

Can I use this tool when there is a tropical cyclone approaching my location?

This tool is intended to support stakeholders to plan for future tropical cyclone events, to develop response and recovery plans, to design buildings or infrastructure, or to generally understand tropical cyclone wind hazard. The scenarios have already been prepared as part of the TCHA18. A scenario may have similar characteristics to historical or current events however, the tool is separate to the forecasting and warning service provided by the Bureau of Meteorology. Please refer to your local emergency service for how to prepare for and respond to tropical cyclones.

How realistic are these tracks?

The tracks available for discovery through this tool have been developed as part of the Tropical Cyclone Hazard Assessment (TCHA). The tracks were developed through a simulation process that considered the behaviour of historical tropical cyclones, and those available through the tool are considered plausible tracks. All data and tools that have been used to develop the TCHA are openly available, supporting the transparency and repeatability of the work. The Tropical Cyclone Risk Model (TCRM) has been used by agencies nationally and internationally. A technical paper describing the TCRM is in review (August 2020), which outlines the method applied in developing the TCHA and validation examples are also publicly available, see below. Future updates for the TCHA will include climate projections.

How can I determine the impact of a scenario?

Estimating impact requires an understanding of the hazard (described by its intensity and likelihood), what is exposed to the hazard (e.g. residential buildings) and how vulnerable each of the exposed elements are to the intensity of the hazard. For example, in the case of tropical cyclones, residential houses constructed in Cairns today will be more resilient than houses that were constructed prior to the building code updates in the 1980s. This tool provides the hazard input to assessing impact of a tropical cyclone at a location. Further information on the available cases studies are available on the [Severe Wind WA](#), and [Severe Wind QLD](#) project pages.

Email hazards@ga.gov.au for more information.

Do these scenarios consider climate projections?

The TCHA18 is based on the current climate. The [Severe Wind Hazard Assessment for Queensland](#) project is integrating downscaled climate projections into the hazard information.

Do these scenarios tell me how much rainfall there will be with the tropical cyclone event?

The scenarios define the tropical cyclone track and the associated maximum wind field. The scenarios do not yet provide the expected rainfall at this time. Future versions of the Tropical Cyclone Risk Model which is used to develop the TCHA18 will incorporate models for rainfall.

Why are there scenarios south of Brisbane?

The TCHA18 simulates 10,000 years of plausible tropical cyclone events. This can include events in regions where there have been very few or no recorded tropical cyclones, such as the northern NSW coastline. The decay rate model used in TCHA18 includes a random term that means the rate can be very low, especially for weak, slow-moving tropical cyclones, which can lead to tracks that persist over land for long periods.

What are the caveats to the information?

The Tropical Cyclone Hazard Assessment considers severe winds caused by tropical cyclones only. Other weather events such as thunderstorms, east coast lows and tornadoes can also generate severe winds capable of causing major damage. These are not included here. The TCHA does not consider storm surge or flooding arising from rainfall associated with tropical cyclones. Impact information applies only to residential separate houses, and only estimates damage caused by severe winds.

When will the TCHA18 be updated?

Geoscience Australia will continue to update the TCHA to incorporate advancements in the underlying science of tropical cyclone, consider future climate and utilise improvements in technology which will result in more scenarios with wind fields available at a higher spatial resolution.

How can I give feedback on the tool?

Feedback can be sent to hazards@ga.gov.au.

Where can I go for further information on tropical cyclones?

For information on tropical cyclone forecasts, please refer to the [Bureau of Meteorology](#) website. Your local emergency services can provide information on how to prepare your home for a tropical cyclone and the location of evacuation centres in your area.