

Product Guide: Severe Thunderstorm Warning for Heavy Rainfall

Fiji Meteorological Service

1. Purpose of the Product

Afternoon and evening thunderstorms are a common occurrence in the tropics, particularly during the summer months when heat and moisture combine to create unstable atmospheric conditions. These storms often develop inland over mountain ranges and are steered by prevailing wind flows in the upper atmosphere. While many are brief and localized, some intensify rapidly and produce very heavy rainfall in short durations especially when they are slow moving. Such severe thunderstorms are also frequently associated with high-density lightning, which poses significant risks to life, transport and property. In these cases, the likelihood of flash flooding, urban flooding, and other severe impacts increases considerably.

The Severe Thunderstorm Warning for Heavy Rainfall is issued to alert communities, emergency and disaster managers, and the general public of thunderstorms producing intense rainfall capable of causing flash flooding and related hazards. This product supports early action and risk reduction by providing timely and impact-focused information.

2. Definitions

Thunderstorms-

Severe Thunderstorms - Thunderstorms that intensify rapidly and produce very heavy rainfall, often developing inland over mountain ranges and steered by prevailing wind flows in the upper atmosphere. They are typically associated with high-density lightning strikes and intense rainfall, which may lead to flash flooding of low-lying and flood-prone areas. Strong and gusty winds, and hail are also possible, posing additional risks to crops, vehicles, rooftops, and people or livestock caught outdoors.

Lightning - A sudden, visible electrical discharge produced during a thunderstorm when an imbalance of electrical charges occurs between clouds, within a cloud, or between a cloud and the ground. This discharge creates a bright flash of light and is often accompanied by thunder. Lightning can strike the ground, buildings, or other structures, and frequent or high-density lightning poses significant risks to life, property, transport, and infrastructure.

Flash Flooding - a sudden overflow of water caused by intense rainfall that quickly saturates the land and overwhelms drains, streams, and rivers.

Urban Flooding - overflow of rain water runoff in towns and cities when rainfall surpasses the ability of engineered drainage systems to cope, often resulting in disruption to transport, property damage, and heightened public safety risks.

Radar and satellite observations: Track thunderstorms in real time. Radar shows rainfall intensity and movement, while satellites provide a broad view of cloud development and storm systems.

Surface and upper air observations: Weather stations measure rainfall, wind, temperature, and pressure at ground level, while radiosondes (instruments attached to weather balloons) capture temperature, humidity, and wind conditions higher up in the atmosphere. In addition, lightning sensors detect the location, frequency, and density of lightning strikes, providing critical information on storm intensity and electrical activity. Together, these observations reveal the current state of the atmosphere, enabling forecasters to analyse thunderstorm development and issue timely warnings.

Numerical weather prediction guidance: Computer models simulate the atmosphere using physics and current data, producing forecasts of rainfall, storm movement, and severity to support forecaster decisions.

3. Hazards and Impacts

This product focuses on thunderstorms associated with:

- Very heavy rainfall over a short period.
 - Flash flooding of roads, streams, and low-lying areas.
 - Rapid river and creek level rises during high tides.
 - Urban flooding.
 - Reduced visibility affecting road transport.
 - Road slips and land-slides.
- Intense and frequent lightning strikes, with high strike density.
 - Significant risks to life, property, transport, and infrastructure.

Other possible hazards that are associated with severe thunderstorms which are not explicitly covered in this bulletin.

- Potential for small to medium-sized hail (included only when the risk is high, as hail is uncommon in Fiji's tropical climate).
 - May damage crops, vehicles, and rooftops, and pose risks to people and livestock caught outdoors.
- Strong and gusty winds.
 - May cause damage to weak structures, uproot trees, and create hazardous conditions for transport and outdoor activities

4. Criteria for Issuance

A Severe Thunderstorm Warning for Heavy Rainfall may be issued when:

- Thunderstorms are expected to produce intense rainfall (e.g., > 50 mm in a short duration within 3 hours), and
- There is a high risk of flash flooding or significant surface runoff, and
- High-density lightning strikes are observed or expected to pose a significant danger to life, property, transport, or infrastructure.

Warnings may be based on:

- Radar and satellite observations
- Observed lightning data
- Surface and upper air observations
- Numerical weather prediction guidance
- Forecaster expertise and situational awareness

5. Areas Covered

Specific districts or divisions over Viti Levu and Vanua Levu.

- Can be localized, affecting small areas
- May be updated as storms develop, intensify, or shift

6. Product Format

The warning typically includes:

- Product title and number
- Issue time and date
- Affected areas
- Nature of the hazard (severe thunderstorms with heavy rainfall)
- Expected impacts
- Safety advice
- Validity period
- Graphical forecast attached with the bulletin

** A sample warning and accompanying graphical forecast are provided in Appendix 1.**

7. Timing and Updates

Issued: As soon as confidence is high that significant impacts are likely, with up to 2 hours lead time where possible.

Valid: For a short duration, typically a few hours, with a maximum validity of 6 hours.

Updates: Warnings may be updated, extended, or cancelled depending on storm evolution, observed rainfall, or reported impacts.

8. Target Users

- General public
- Disaster and emergency authorities
- Road and transport agencies
- Media organisations

9. Key Public Safety Messages

<input checked="" type="checkbox"/> Do	<input checked="" type="checkbox"/> Don't
<input checked="" type="checkbox"/> Keep clear of flooded creeks and drains	<input checked="" type="checkbox"/> Walk, cycle, or drive through floodwaters
<input checked="" type="checkbox"/> Unplug computers and electrical appliances during thunderstorms	<input checked="" type="checkbox"/> Leave appliances connected when lightning is around
<input checked="" type="checkbox"/> Stay indoors, away from windows, and keep children indoors	<input checked="" type="checkbox"/> Shelter under trees during lightning
<input checked="" type="checkbox"/> Take shelter in a sturdy building whenever possible	<input checked="" type="checkbox"/> Remain in open fields or playgrounds during lightning
<input checked="" type="checkbox"/> Use a fully enclosed car or vehicle if no building is available	<input checked="" type="checkbox"/> Ignore official warnings or underestimate storm risks
<input checked="" type="checkbox"/> Stay vigilant and continue to monitor weather conditions	<input checked="" type="checkbox"/> Assume all areas will be equally affected by thunderstorms

10. Limitations

- **Localized Nature:** Severe thunderstorms are highly localized.
- **Coverage:** Due to the “hit and miss” nature of convection, not all locations within the warning area may be impacted.
- **Unwarned Impacts:** Impacts may occur immediately outside warned areas.
- **Rapid Changes:** Rapid development means conditions can change quickly.
- **Vulnerability and Exposure:** At times, communities may be exposed to hazardous weather but not necessarily vulnerable, meaning impacts can vary depending on local conditions and resilience.

11. Official Advice

Always rely on official warnings and forecasts from the Fiji Meteorological Service (<https://www.met.gov.fj/alerts/>) and local emergency authorities.

Appendix 1 : Sample Warning Product

SPECIAL WEATHER BULLETIN NUMBER ONE

SEVERE THUNDERSTORM WARNING FOR HEAVY RAINFALL

ISSUED FROM THE NATIONAL WEATHER FORECASTING CENTRE, NADI AT 01:30PM ON SATURDAY 31ST JANUARY, 2026.

A Severe Thunderstorm Warning for Heavy Rainfall is now in force for Macuata, northern Bua, interior and northeastern parts of Viti Levu (From Ba through Rakiraki to Korovou).

Situation: A moist southeasterly wind flow prevails over the country, bringing unstable weather conditions. Afternoon and evening thunderstorms are expected with heavy rainfall over the above-mentioned areas.

Impacts:

Severe thunderstorms may produce;

- Heavy rainfall, which could lead to flash flooding in low-lying areas within the next few hours.
- Frequent and dangerous lightning strikes.

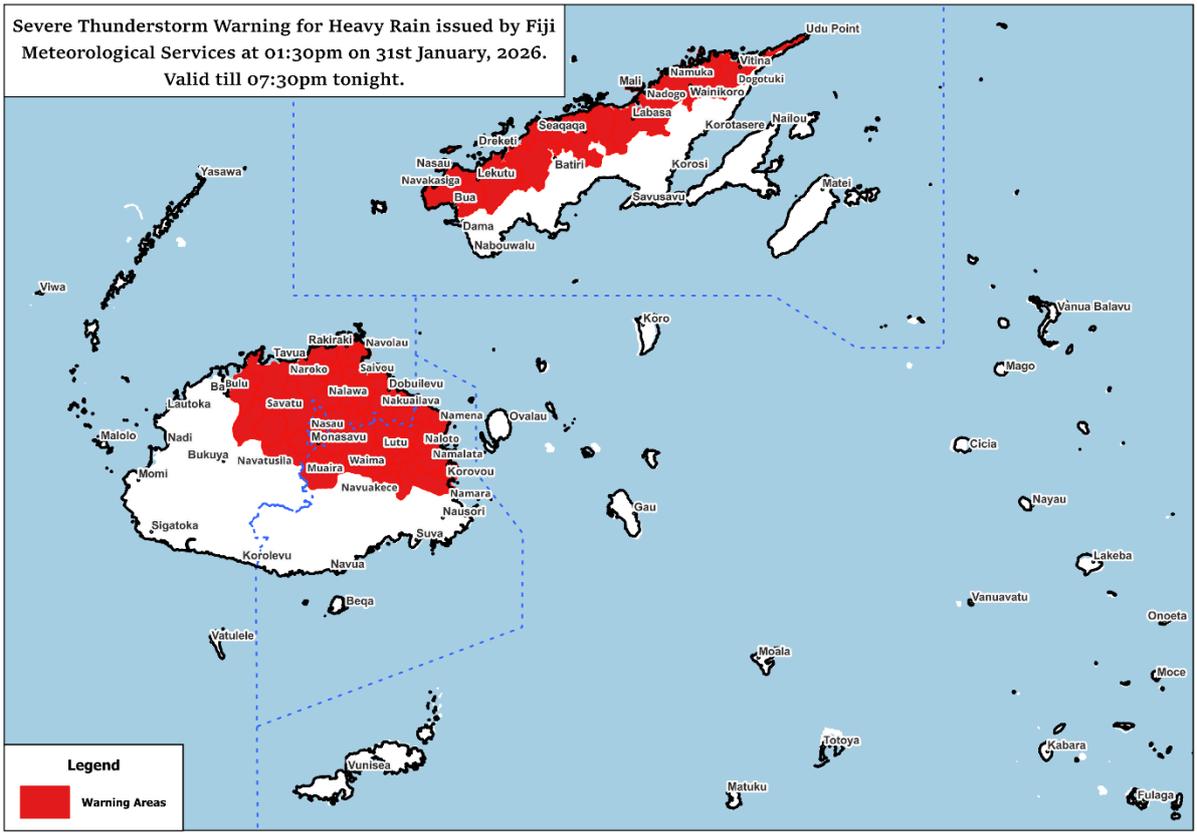
People are advised to:

- a) Keep clear of flooded creeks and drains.
- b) Do not walk, cycle, or drive through floodwaters.
- c) Unplug electrical appliances and computers if lightning is around.
- d) If caught in an open field or playground during lightning, minimize body height and move quickly to a safe shelter such as a building or house.
- e) Do not shelter under trees during lightning.
- f) Stay indoors, away from windows, and keep children indoors.
- g) Stay vigilant and continue to monitor weather conditions.

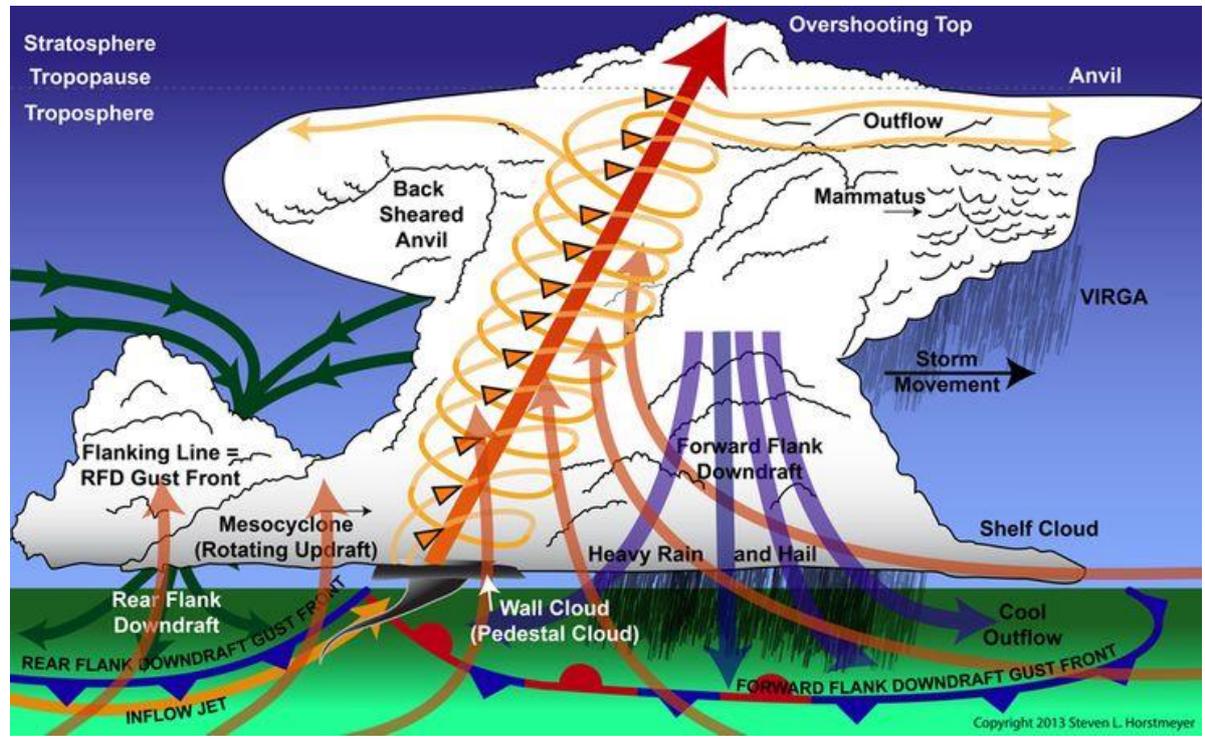
Thunderstorm activity with heavy rainfall and intense lightning is expected until late afternoon or evening.

Due to uncertainty in thunderstorm movement and development, not all areas may be affected, and impacts may vary from place to place.

The next Special Weather Bulletin on Severe Thunderstorm with Heavy Rainfall will be issued by 07:30pm tonight (Saturday) or earlier if situation changes.



Legend:
Red shaded areas – Locations currently at risk of heavy rain and thunderstorms.



Vertical structure of a severe thunderstorm, including updrafts, downdrafts, and hazard zones.