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## **ADVISORY FOR OUTDOOR ADVENTURE EDUCATION PROGRAMME PROVIDERS ON MANAGING THE EFFECT OF ADVERSE WEATHER ON ACTIVITIES IN SINGAPORE**

### **Introduction**

1. The effect of climate change is altering weather patterns and amplifying extreme weather events across the globe. Human-induced climate change, primarily driven by greenhouse gas emissions, has increased global surface temperatures by approximately 1.1°C compared to pre-industrial levels. As temperatures rise, the atmosphere holds more moisture—about 7% more for each degree Celsius of increase in temperature. This increase in atmospheric moisture fuels heavier rainfall events, enhances storm formation, and contributes to more severe weather phenomena worldwide.<sup>1</sup>
2. In Southeast Asia, the effects of climate change manifest as stronger monsoons—with more intense storms and Sumatra squalls, which can likely be attributed to the higher sea surface temperatures in the oceans surrounding Southeast Asia. Changes in the dynamics of larger weather systems, such as typhoons in the Pacific Ocean, may also amplify the strength and frequency of these storms and squalls.
3. Adverse weather events, such as heavy rainfall, strong winds and flash floods arising from storms and Sumatra squalls create significant challenges for the conduct of outdoor adventure activities in Singapore. Proactive measures to monitor and mitigate the risks posed by severe weather events will be essential to ensure the safety and sustainability of outdoor programs.

### **General Mitigation Measures in OAE Programmes**

4. The OAE Council strongly encourages all OAE programme providers to adopt the following measures when conducting OAE programmes:
  - a. Review Risk Management Plans for OAE programmes to ensure there are sufficient mitigation and contingency measures in place for adverse weather.
  - b. Adapt programme planning accordingly based on forecasts and warnings of thunderstorms/heavy rain through NEA's [weather monitoring website](#) or myENV mobile app. Monitor closely and respond proactively using the [NEA Rainmap](#) during OAE programmes to make adjustments appropriate for the actual on-ground situation.
  - c. Stay updated with Advisories/Notices issued by the management authorities for your area of operations (e.g. Parks and Nature Reserves - [National Parks Board](#), Singapore Port Limits - [Maritime Port Authorities](#), Reservoirs and

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<sup>1</sup> Intergovernmental Panel on Climate Change. (2023). [AR6 synthesis report: Climate change 2023](#).

waterways - [Public Utilities Board](#) etc.), and adhere to the recommended etiquette and best practices where applicable.

- d. Setting clear No-go criteria for activities for modifying or halting activities (also known as trigger points) based on measurable environmental factors (e.g. [heavy rain warning](#), [lightning risk](#), [wind speed](#), [heat stress](#) etc.)
- e. Conduct pre-activity screening for participants to ensure that they are fit to perform the activity and react to changes on the ground should the situation call for it. Monitor participants' fitness throughout the programme and ensure that they have sufficient rest, food and hydration.
- f. Have an Emergency Action Plan (EAP) in place. This should include pre-, during- and post-emergency procedures, including but not limited to the following:
  - i. Evacuation/Exit points: Ensure that there is a clear plan for evacuation to advanced medical care facilities at your activity location, and ensure all staff are familiar with this information.
  - ii. Incident Response Equipment: Be equipped with the appropriate equipment to support and facilitate effective incident response and management.

For more information on EAP, refer to the [EAP Best Practice Guide](#) published by the OAE Council.

## Area-Specific Mitigation Measures

5. **Open Water bodies**. Operating in open water bodies may present higher risks during a Sumatra squall. Squalls can rapidly increase wind speeds and wave heights, making the seas/channels dangerous for sailing, kayaking, or other related activities. Providers are recommended to:

- a. Watch for signs of adverse weather, such as
  - i. Picking up of wind speed;
  - ii. Presence of “white horses” on sea surface;
  - iii. Shorter swell periods; or
  - iv. Greater swell heights.
- b. Plan and designate safe landing zones on land, where participants should head to, before the onset of adverse weather. The landing zone should have facilities for seeking shelter and secure stowage/mooring of marine crafts used. Conduct programmes close to the shoreline as much as practicable to allow for quicker response to adverse weather.

6. **Closed Water Bodies**. In closed water bodies like swales/rivers/canals and reservoirs, the effect of adverse weather is generally less intense and easier to mitigate due to surrounding topographical features and proximity to shelter on land. Providers are recommended to observe similar measures for open water bodies. Avoid operating in swales/rivers/canals in the event of adverse weather as rapid water level rises and waterflow may occur.

7. **Tropical Forests and Forested Areas**. Activities in tropical forests and forested areas (e.g. park connectors, nature reserve) may be exposed to hazards such as falling trees, flash floods, and lightning strikes. Providers are recommended to:

- a. Stay on designated walking/hiking paths to allow for quicker evacuation to shelter if needed.
  - b. In the event of adverse weather, maintain a safe distance from trees as far as practicable and seek shelter to reduce risk of being exposed to falling trees, branches or lightning strikes.
    - i. Trees with shallow roots or weak branches such as [Albizia](#) and [African Tulip Tree](#), may generally be more prone to the effects of adverse weather. Take particular care to avoid such trees during adverse weather.
8. **Campgrounds**. Camping in the open using tents (e.g. at NParks' campgrounds) may provide basic shelter from the rain but would be inadequate in the event of adverse weather. Additionally, Providers are recommended to select campgrounds carefully and avoid campgrounds located:
- a. On low-lying ground (due to hazard of water ponding or flash floods);
  - b. Next to steep-slopes (due to hazard of landslides);
  - c. In proximity of trees (due to hazard of falling branches/trees or lightning strikes);  
or
  - d. In proximity of water bodies (due to hazard of flash flood).
9. **Adventure Towers, Challenge Rope Courses (CRCs) and Climbing Structures**. Adventure towers, CRCs and Climbing Structures shall not be operated during adverse weather events. In addition, Providers are recommended to:
- a. Conduct detailed inspection of these structures after an adverse weather event, in accordance to the criteria set in the Original Equipment Manufacturing (OEM) Manuals, to ensure that the structures are safe for use. As these structures are constantly exposed to the elements, parts of the structure may be damaged by high winds or debris caused by an adverse weather event.
  - b. Review the risk assessment for the activity to ensure that no new hazards/risks are present after an adverse weather event. Appropriate control measures should be implemented to adequately mitigate any new hazards/risks.

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