

TSUNAMI WARNINGS AND ADVISORIES

- A PUBLIC INFORMATION GUIDE -

January 2022



National Emergency
Management Agency
Te Rākau Whakamarumarū

Tsunami that affect New Zealand may be generated on, near, or far from our shores.

New Zealand is at risk from tsunami that happen near us, and around the Pacific.

We know from geological evidence that our coasts have experienced many large tsunami before human settlement, and some smaller but still damaging tsunami since people arrived here.

We now live, work and play all along the coast. The likelihood of tsunami is as clear and present as it ever was — we just haven't had any really big ones since New Zealand became a relatively populous country.

Tsunami are unpredictable...

A tsunami is most likely to be caused by an earthquake that moves the sea floor*. No-one can predict exactly when or where earthquakes will happen, and how big they'll be.

We know a lot about specific tsunami source areas around the Pacific that have caused tsunami in the past, including some that run through and near New Zealand.

But events such as the earthquake and tsunami that occurred on 14 November 2016 show us there is still a lot to learn. They also show us that assessments about tsunami threat can change, as more data about the earthquake's characteristics becomes available over time.



Tsunami can also be caused by volcanic activity, underwater landslides, or landslides into water.

...but are also (in a way) predictable.

We know earthquakes happen, and we know some of them will cause tsunami. We also know that some of these future tsunami (regardless of where in the Pacific they may be generated) will affect New Zealand.

Once a tsunami has been confirmed, scientists have the expertise to estimate where and when tsunami activity may affect New Zealand's coasts.

'Tsunami activity' may mean unusual, dangerous swells or currents at beaches and coastal waters. Or, more seriously, it may mean waves that inundate the land.

Given enough time and confirmed data, it's possible to estimate what sort of tsunami activity we can expect. If waves are likely, scientists can estimate a range for how big they might be.

WHO ARE THE SCIENTISTS?



GNS SCIENCE

Our friends at GNS Science's National Geohazards Monitoring Centre examine and review earthquake and tsunami-related data, and determine what it means for New Zealand.

Scientists from other organisations assist GNS Science by participating in the Tsunami Experts' Panel.

REMEMBER

GNS Science are our go-to experts regardless of where tsunamis are generated. This is because GNS Science is a New Zealand-based organisation. Only they have the necessary depth and breadth of local scientific knowledge required to make informed estimates of a tsunami's effect on New Zealand.

Information that comes from international agencies (such as the Pacific Tsunami Warning Centre (PTWC)) is always examined as part of the assessment process — but data from international agencies should never be presented as definitive for New Zealand.

WHERE DOES NEMA FIT IN?

TSUNAMI WARNINGS AND ADVISORIES

The National Emergency Management Agency (NEMA) is the official agency for providing tsunami advisories and warnings.

Using information from our GNS Science partners, we issue these advisories and warnings to regional Civil Defence Emergency Management Groups (CDEM Groups), local government, a wide range of agencies, the media and the public.

REMEMBER

Only advisories and warnings issued by NEMA represent the official threat status for New Zealand, as we use information confirmed by GNS Science.

Information from international agencies (e.g. PTWC, or the United States Geological Survey (USGS)) should never be presented as definitive for New Zealand.

WHAT ARE CDEM GROUPS RESPONSIBLE FOR?

CDEM Groups and CDEM Group members are responsible for the planning, development, and maintenance of appropriate public alerting and tsunami response systems, including public education and evacuation zone identification for their areas.

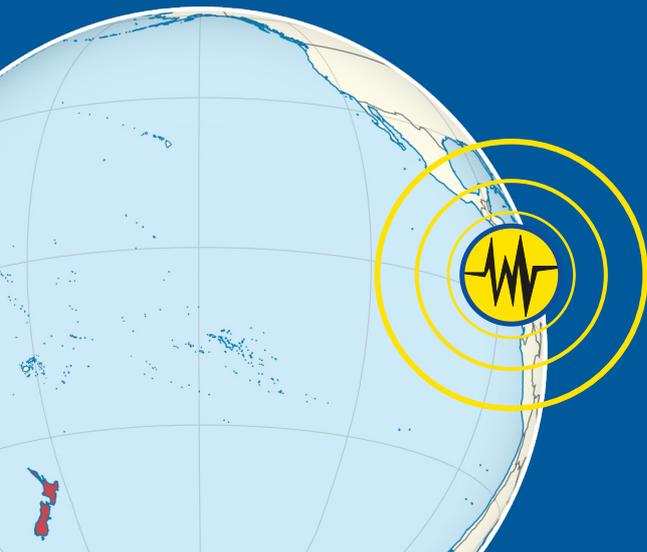
All CDEM Groups and CDEM Group members receive official national tsunami advisories and warnings. When time and expertise is available, CDEM Groups are responsible for further local threat assessment and advising the public which local areas or zones should be evacuated in their regions, or which marine areas and coasts are off limits.

REMEMBER

NEMA can only ever identify very broad areas for evacuation. We can't issue evacuation advice for specific locations.

CDEM Groups and local councils will have the information about which tsunami zones are being evacuated in their areas of responsibility, or which specific coastal areas are off limits

DISTANCE IS EVERYTHING

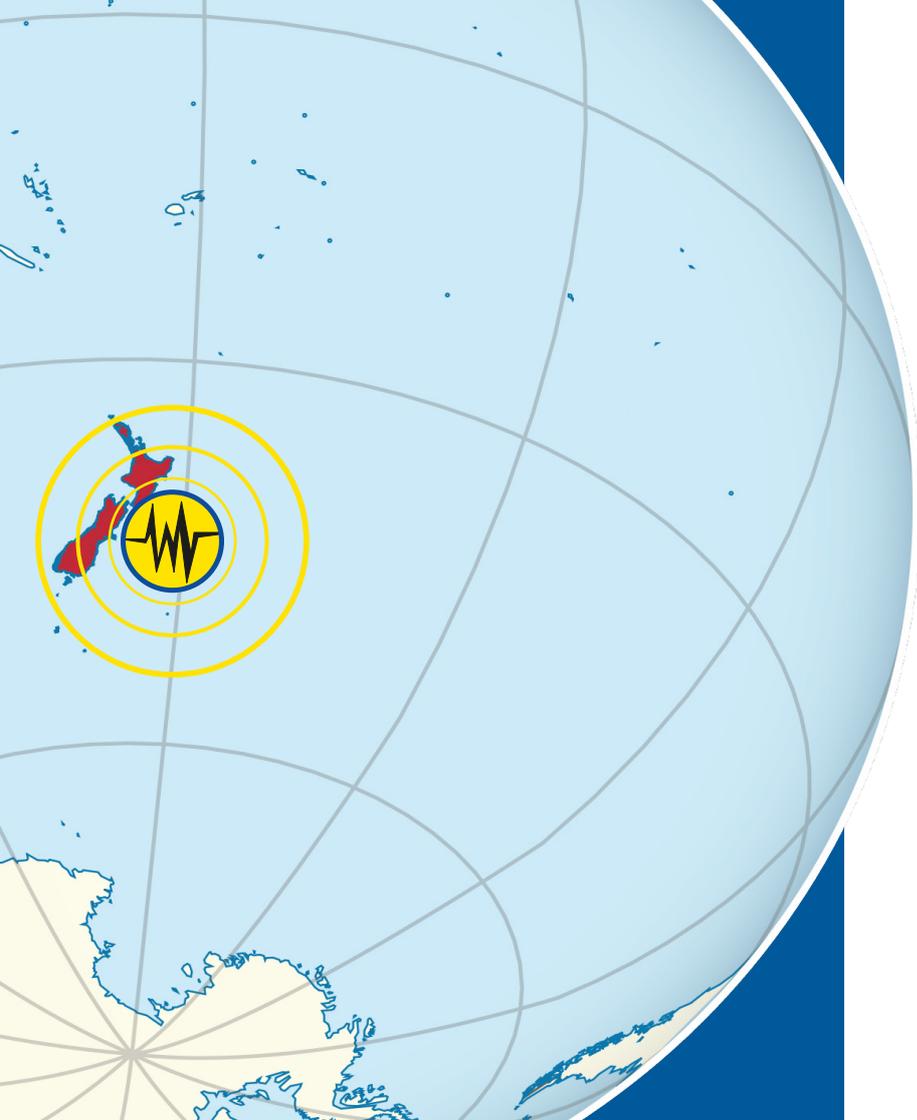


Assessing tsunami activity and providing accurate, timely warnings depends on distance. A tsunami coming from far away gives GNS Science time to gather confirmed data and assess the tsunami's characteristics. The more distant the tsunami's origin, the more time they have to assess it, and the more accurate that assessment will be.

If the tsunami's origin is far from New Zealand:

- GNS Science have time to assess
- Assessments are based on confirmed data
- NEMA can issue more refined advice
- Communities have time to prepare and act

UNFORTUNATELY, THE INVERSE IS ALSO TRUE.



IF THE TSUNAMI'S ORIGIN IS CLOSE TO NEW ZEALAND...

- a tsunami could arrive within minutes
- communities must act immediately
- GNS Science may not have enough time to assess the threat before the first waves arrive
- NEMA may not have enough time to issue an official warning before the first waves arrive.

HENCE: LONG OR STRONG, GET GONE.

If you feel a **LONG** earthquake that lasts more than a minute or a **STRONG** earthquake that makes it hard to stand, or see or hear unusual ocean behavior, move immediately to the nearest high ground, out of tsunami evacuation zones, or as far inland as possible. Don't wait for an official warning.

“Long or Strong, Get Gone” is the best advice for people near the coast after a large, strongly-felt earthquake.

We encourage media to share the “Long or Strong, Get Gone” message with audiences if an earthquake of this sort occurs, even if no detailed information is yet available.

IF AN EARTHQUAKE IS
LONG
OR
STRONG
—
GET GONE

MOVE IMMEDIATELY TO THE NEAREST
HIGH GROUND OR AS FAR INLAND AS POSSIBLE.
DON'T WAIT FOR AN OFFICIAL TSUNAMI WARNING.



TSUNAMI SOURCES

WHAT IS A LOCAL-SOURCE TSUNAMI?

A local-source tsunami is one that is generated close to New Zealand's coastline.

Scientific information for a local-source tsunami is often uncertain at first. It takes time to assess whether a tsunami has been generated, so there may not be time for an official warning. If people experience the natural warning signs, they need to act immediately — that's why it's all about "Long or Strong, Get Gone".

It's important to remember that, in a local-source situation, New Zealand communities may have experienced the primary effects of the earthquake. This means there may be injuries and damage to buildings. It also means roads, bridges, power supplies, and communications networks may have been affected.

Local-source tsunami may also be caused by volcanic activity, underwater landslides, or landslides into water.

WHAT IS A REGIONAL OR DISTANT-SOURCE TSUNAMI?

A regional or distant-source tsunami is one that is generated at least one hour's travel time from New Zealand.

In a regional or distant-source situation, New Zealand communities are likely to have been spared the primary effects of the earthquake. Although the tsunami itself may be dangerous and destructive, there will be some time to warn people before the first waves arrive.

The warning process and the messages we send are different for local-source tsunami and tsunami from further away (regional and distant-source tsunami).

Regardless, you can help us save lives by sharing the right messages with your audiences.

OUR PROCESS

REGIONAL AND DISTANT-SOURCE TSUNAMI

1

New Zealand receives notification of a possible tsunami threat from the Pacific Tsunami Warning Centre (PTWC). This notification goes directly to NEMA and GNS Science.

2

NEMA will rapidly send out a “**Large Pacific Earthquake Being Assessed**” advisory to let everyone know we are checking whether there is a threat to New Zealand. Remember that this advisory is not the same as confirmation of a tsunami threat for New Zealand.

3

GNS Science tsunami experts review the available information to determine what it means for New Zealand. This will include looking at DART (Deep-ocean Assessment and Reporting of Tsunami) buoy data and tsunami modelling to help determine the most likely scenario.

4

GNS Science determines the severity of the threat and informs NEMA. NEMA issues an advisory or warning based on this. A tsunami threat level map will accompany a warning.

NATIONAL WARNING: LAND AND MARINE THREAT

Tsunami waves are expected to affect the land. A land and marine threat means that evacuations will be required.

NATIONAL ADVISORY: TSUNAMI ACTIVITY

There is a threat to beach and marine areas. The tsunami is likely to cause strong and unusual currents and unpredictable surges at the shore. People should stay off beaches and out of the water.

NATIONAL ADVISORY: NO TSUNAMI THREAT TO NEW ZEALAND

There is no tsunami threat to our coasts.

5

For regional and distant source tsunami, there is more time for assessment of possible local impacts. CDEM Groups are responsible for further local threat assessment and for advising which local areas or zones should be evacuated in their regions (National Warning: land and marine threat), or which marine areas and coasts are off limits (National Advisory: tsunami activity). They will advise the media and the public.

6

If there is a land and marine threat, NEMA will send an Emergency Mobile Alert to all capable mobile phones in the areas under threat. CDEM Groups will also send supporting Emergency Mobile Alerts providing local evacuation information.

7

If a National Warning or National Advisory: Tsunami Activity is issued, it will remain in effect until GNS Science advises that the threat has passed. This may take as long as 24 hours, as tsunami waves and currents can be dangerous long after the first waves arrive. When NEMA receives this confirmation, we issue a cancellation message.

REMEMBER

PLEASE SHARE OUR MESSAGES

Please share the messages we issue and any relevant local information through all your channels as quickly as you can. We want to reach as many people as possible. Remember that information from international agencies (including PTWC) should not be presented as definitive for New Zealand. If the situation is serious enough we will officially request our broadcast media partners (who are identified in our MOU with broadcasters) to broadcast the emergency information at regular intervals until we issue a cancellation.

NATIONAL WARNING: LAND AND MARINE THREAT

Land and marine threats are as serious as our warnings get. A land and marine threat means that tsunami waves are coming, and will reach inland. A Land and Marine Threat will usually mean evacuation for at least some areas.

Always remember that the first tsunami waves may not be the largest.

NATIONAL ADVISORY: TSUNAMI ACTIVITY

Beach and marine threats are unlikely to require any evacuations (besides getting people off beaches). Strong and unusual currents and unpredictable surges are obviously dangerous for people in or on beaches and coastal waters, but people on dry land don't need to worry about waves reaching them.

It's extremely important that we get the strong currents and surges information out there, but generally this type of threat should be positioned as 'low risk' for anyone not actually in the water or at the beach.

TIMING

Some tsunami warnings and advisories may have a long lead-in time, i.e. it may be as much as 12 hours before tsunami activity affects our coasts.

This means communities need to be absolutely clear about **timing**, as well as the appropriate safety advice. For example, if we know at 8pm in the evening that tsunami activity is due to begin at 6am the next morning, this information needs to be shared ASAP and throughout the evening, to ensure that anyone who's going to be on the water the next day can cancel their plans.

LOCAL EVACUATION INFORMATION NEEDS TO COME FROM THE CDEM GROUP

NEMA can only ever identify very broad areas for evacuation. We can't issue evacuation advice for specific locations. CDEM Groups and local councils will have the information about which tsunami zones are being evacuated in their areas of responsibility, or which specific coastal areas are off limits.

INFORMATION CAN CHANGE

GNS Science experts make their determinations based on the data available at the time. But information develops, and situations can change. Thankfully, in a regional or distant-source situation, there should be enough time to recalibrate and issue revised advice.

WHEN WE KNOW, YOU'LL KNOW

Information becomes clearer, more reliable, and more specific as time passes. Bottom line — once we have confirmed information, we will give it to you straight away.

OUR PROCESS

LOCAL-SOURCE TSUNAMI

1

A very large earthquake near the coast (or, less likely, an offshore volcanic eruption/landslide) happens. We won't know whether a tsunami has been generated until DART buoys or coastal instruments detect waves, or people see tsunami waves.

2

Anyone near the coast who feels the earthquake LONG (more than 1 minute) or STRONG (hard to stand up), or sees or hears unusual ocean behaviour must evacuate immediately.

We don't want anyone to wait for an official warning of any kind. IF IN DOUBT, GO. These will always be the key messages for local-source tsunami, regardless of any new systems or technology the future brings.

3

NEMA will rapidly send out an “**Earthquake Being Assessed**” advisory to CDEM Groups and the media, to let everyone know we are checking whether there is a threat to New Zealand. Remember that this advisory is not the same as confirmation of a tsunami threat for New Zealand.

4

NEMA issues a National Warning or Advisory based on available data.

NATIONAL WARNING: TSUNAMI THREAT

If the earthquake is very large, and/or located near a known dangerous tsunami source (off the East Coast of the North Island), NEMA will issue a “National Warning: Tsunami Threat” stating “Long OR Strong, Get Gone”.

We may send this warning before GNS Science can provide a detailed assessment — even if we don't know whether a tsunami has been generated. This first warning may arrive after the first waves.

Our tsunami warning may have an action map attached, which indicates broad areas for evacuation. These maps are prepared based on modelling.

NATIONAL ADVISORY: NO TSUNAMI THREAT TO NEW ZEALAND

If GNS Science determines there's no threat to our coasts, NEMA issues a “No tsunami threat for New Zealand” advisory. Bear in mind that communities may be dealing with the earthquake's aftermath, including possibly severe damage and aftershocks. NEMA will work with CDEM Groups to figure out what the situation is on the ground, and what help is needed.

5

If there is a land and marine threat, NEMA will send an Emergency Mobile Alert to all capable mobile phones in the affected areas. CDEM Groups will also send supporting Emergency Mobile Alerts providing local evacuation information.

6

If a National Warning is issued, it will remain in effect until GNS Science advises that the tsunami threat has passed. This may take as long as 24 hours, as tsunami waves and currents can be dangerous long after the first waves arrive. When NEMA receives this confirmation, we issue a cancellation message.

REMEMBER

LOCAL-SOURCE TSUNAMI ARE A BIG DEAL

Local-source tsunami can arrive within minutes at areas closest to the source, and New Zealand has some local tsunami sources (e.g. the Hikurangi Trench) that can produce very large, life threatening tsunami.

TSUNAMI ACTION MAPS ARE BROAD INDICATORS

The maps indicating evacuation areas we may issue for a local-source tsunami warning are conservative. They show black areas which NEMA advises should be evacuated immediately, and shaded areas which are under assessment (noting that 'Long or Strong, Get Gone' still applies to all areas — both black and shaded).

In issuing these maps, there's always a risk of overstating the threat to some areas. But in these situations, we only have preliminary data to go on (if any), and we just can't afford the time it takes refine the advice.

THE CHALLENGE FOR GNS SCIENCE AND NEMA

Local-source tsunami are challenging. We have to make rapid decisions in highly uncertain situations. Instruments can detect earthquakes, but cannot confirm whether a tsunami has been generated until DART buoys detect changes in water pressure or waves hit the coastal tsunami gauges.

It can also be difficult for scientists to determine the exact location and size of very large earthquakes in the first few minutes, because the shaking can overwhelm monitoring instruments. We need a scientist to interpret the data and make sense of it. This takes time.

WE NEED LOCAL SUPPORT MORE THAN EVER

If there's a large earthquake that looks like it's in local-source tsunami territory (due to its magnitude and location), we need you to help us keep people safe.

The best things you can do to help us are:

1. Push the "Long or Strong, Get Gone" message.
2. CDEM Groups and the public should not wait for an official warning from NEMA if long or strong shaking is felt. Take immediate action to evacuate predetermined evacuation zones, or in the absence of predetermined evacuation zones, go to high ground or go inland.
3. Keep watching your email and NEMA's website and social media accounts. That's where the latest, official information will be sent when it is ready.
4. Publish and share our messages along with any relevant local information through all the channels you have. This includes tsunami maps.
5. Remember that our officials will be 100 per cent focused on issuing safety messages and assessing the ongoing threat. Please be understanding if we can't grant you requests for information right away. Rest assured, all we know (and all the information you'll need during the initial stages of the event) will be appearing ASAP in your email and on our social media.

**NOTHING WILL
EVER BEAT
'LONG OR
STRONG, GET
GONE'**

THERE'S NO SILVER BULLET...

No single process or piece of technology will ever be able to provide a 100 per cent failsafe way to warn the public about local-source tsunami.

An effective overall warning system involves many people and many tools. GNS Science, NEMA, and CDEM Groups work constantly to build knowledge of tsunami, develop modelling and tools, enhance processes, and improve warning messages.

...BUT THERE IS A GOLDEN RULE

No matter what systems or technology we develop, nothing will ever beat this golden advice for a local-source tsunami:

Long or Strong, Get Gone.

Anyone near the coast who feels the earthquake LONG (more than 1 minute) or STRONG (hard to stand up), or sees or hears unusual ocean behaviour must evacuate immediately.

If people know and understand 'Long or Strong, Get Gone', it won't matter if the earthquake has knocked out the cell towers, or cut power to tsunami sirens.

People in the areas most likely to be affected by the tsunami - i.e. those areas where the earthquake was felt LONG or STRONG - will know exactly what to do.

If there is a tsunami threat to land and marine areas, NEMA will send an Emergency Mobile Alert to all capable mobile phones in the areas under threat.



EMERGENCY MOBILE ALERT

Emergency Mobile Alerts are messages about emergencies sent by authorised emergency agencies to capable mobile phones. The alerts are designed to keep people safe and are broadcast to all capable phones from targeted cell towers.

The alerts are targeted to areas affected by serious hazards and will only be sent when there is a serious threat to life, health or property, and, in some cases, for test purposes.

Depending on how far away the tsunami is, we'll send an Emergency Mobile Alert to phones in the areas under threat telling people to EVACUATE IMMEDIATELY or to PREPARE TO EVACUATE (if the first waves aren't expected to arrive for several hours).

Local CDEM Groups will also issue an Emergency Mobile Alert

CDEM Groups will have the information about which tsunami zones are being evacuated in their areas of responsibility, or which specific coastal areas are off limits. They will send a supplementary Emergency Mobile Alert to the areas under threat providing more detailed local evacuation information.

Don't wait for an alert if the earthquake is LONG or STRONG

Emergency Mobile Alerts do not replace the need to take action after natural warnings. For a local source tsunami, which could arrive in minutes, there won't be time for an official warning. It is important that people recognise the natural warning signs and act quickly.

NO NEED TO SUBSCRIBE

There is no need for people to sign up or download an app. If a phone is on and capable of receiving them, it should get the alerts. People can check whether their phone can receive the alerts at getready.govt.nz and should ensure their phone is on the most up to date operating system.

WORKS BY GEO-TARGETING

Emergency Mobile Alerts will be targeted to areas under threat only. People outside the targeted broadcast area won't receive the alert.

YOU CAN'T OPT OUT

As Emergency Mobile Alert is about keeping people safe, it isn't possible to opt-out. Some phones may show optional settings used in other countries, but in New Zealand we use a special broadcast channel that is permanently on.

WHO CAN SEND AN ALERT?

Emergency Mobile Alert messages can only be sent by the National Emergency Management Agency, Civil Defence Emergency Management Groups, NZ Police, Fire and Emergency New Zealand, the Ministry of Health and the Ministry for Primary Industries.

DON'T DITCH THE RADIO

Emergency Mobile Alert is an additional channel to help keep New Zealand safe in an emergency and does not replace other alerting channels such as radio and social media, or the need to take action after natural warnings. If you feel your life may be in danger, don't wait for an official warning. Take immediate action. Remember – Long or Strong, Get Gone.

WILL EMERGENCY MOBILE ALERT WORK IF CELL PHONE TOWERS ARE DAMAGED, OR IF THERE IS A POWER OUTAGE?

Emergency Mobile Alert may not work if mobile phone towers are damaged or if there is a power outage.

Emergency Mobile Alert is an additional channel to help keep people safe in an emergency and does not replace other alerting systems or the need to take action after natural warnings.

WILL EMERGENCY MOBILE ALERT WORK EVERYWHERE IN NZ?

Emergency Mobile Alert should work in areas with cell reception. About 97% of populated areas get cell reception and work is being done by the mobile service operators to improve mobile coverage all the time.

TSUNAMI MONITORING AND DETECTION NETWORK

While Long or Strong, Get Gone is still the best action to take to stay safe, not all tsunami that could affect New Zealand come from earthquakes that people will feel. Because of this, being able to detect tsunami waves while they are in the deep ocean is very important. This is particularly critical for unfelt earthquakes originating from the Kermadec trench.

New Zealand's end to end arrangements for monitoring, detecting and issuing warnings about tsunami include a network of DART (Deep-ocean Assessment and Reporting of Tsunami) buoys to provide early detection and support warnings for tsunami generated from the Kermadec and Hikurangi trenches and Pacific sources further away.

Not all sea floor disturbances, such as underwater earthquakes, cause tsunami. The DART buoys also provide rapid confirmation when no tsunami has been generated following large earthquakes and other possible "trigger" events in the ocean.

WHAT IS A DART BUOY?

DART (Deep-ocean Assessment and Reporting of Tsunami) buoys are deep-ocean instruments that monitor changes in sea level. They are currently the only accurate way to rapidly confirm a tsunami has been generated before it reaches the coast. Early detection of a tsunami using DART buoys allows us to accurately provide early warnings using a range of communication channels including Emergency Mobile Alerts.

HOW DO DART BUOYS WORK?

DART buoys detect tsunami threats by measuring associated changes in water pressure via sea floor sensors. They are capable of measuring sea-level changes of less than a millimetre in the deep ocean. Two-way communication between a DART buoy and GNS Science's 24/7 National Geohazards Monitoring Centre allows rapid assessment of threats and enables subsequent warning advice to be provided to the public.

END TO END PROCESS FROM SEAFLOOR TO TSUNAMI WARNING



1. An undersea event (earthquake, volcanic eruption, landslide) occurs.
2. A sensor on the ocean floor detects significant changes in water pressure.
3. The data is sent by acoustic signal to a buoy on the surface.
4. The buoy sends the signal to a satellite.
5. The signal is sent to the 24/7 National Geohazards Monitoring Centre based in Lower Hutt.
6. Geohazard experts analyse the data.
7. If a tsunami has been detected, the National Geohazards Monitoring Centre will notify the National Emergency Management Agency.
8. The National Emergency Management Agency will issue a tsunami warning directly to the public via their website and Twitter and to CDEM Groups, emergency services and media.
9. If the tsunami is expected to inundate (flood) land areas, an Emergency Mobile Alert will be sent to all capable mobile phones in the affected areas.

TSUNAMI SIRENS

The decision to use sirens and their ongoing maintenance is the responsibility of CDEM Groups and local authorities. If CDEM Groups and territorial authorities do choose to install tsunami sirens they need to comply with the Tsunami Warning Sirens Technical Standard (available at <https://www.civildefence.govt.nz/resources/tsunami-warning-sirens/>).

It is important to recognise that sirens are only one component within a wider warning system, and sirens have a number of disadvantages. Local source tsunami, where the earthquake has occurred close to New Zealand's coastline can arrive within minutes at areas closest to the shore and there won't be time to issue an official warning before the first wave arrival, nor even activate the sirens. The sirens may also be damaged by the earthquake itself.

CDEM Groups and local authorities who decide to use sirens must undertake targeted and continuous public education and awareness activities. Public education and awareness activities related to the use of sirens in tsunami warnings must promote the importance of the recognition of natural warning signs. Activation of sirens must not be expected for local source tsunami events – the long or strong earthquake is the only reliable warning.



MORE INFO

PLANNING FOR EMERGENCIES AND BEING PREPARED

www.getready.govt.nz

HOW TO CONTACT CDEM GROUPS

www.civildefence.govt.nz/find-your-civil-defence-group

ABOUT CDEM

www.civildefence.govt.nz/cdem-sector/plans-and-strategies/guide-to-the-national-civil-defence-emergency-management-plan

ALL ABOUT TSUNAMI

www.getready.govt.nz/emergency/tsunami

TSUNAMI EVACUATION ZONES

www.getready.govt.nz/emergency/tsunami/tsunami-evacuation-zones

GUIDELINES AND TECHNICAL STANDARDS

www.civildefence.govt.nz/cdem-sector/guidelines

MOU WITH BROADCASTERS

www.civildefence.govt.nz/media/memoranda-of-understanding-mou-with-radio-and-tv-broadcasters

MEDIA CONTACTS

www.civildefence.govt.nz/media/local-regional-media-contact-information





THANK YOU

for helping us keep New Zealanders safe.



**National Emergency
Management Agency**
Te Rākau Whakamarumarū