

LESSON PLAN: Geology, Earth Sciences

The Boxing Day and Japanese Tsunamis

Grade Level: High School (ages 14-17)

Objectives

Students will be able to:

- define what tsunamis are and how they are caused
- understand the importance of preparedness and emergency response in the event of a tsunami

Materials

- whiteboard and markers
- pictures of the 2004 Boxing Day and 2011 Japanese tsunamis and maps showing the affected areas
- excerpt from MAGE (optional)

Introduction (10 minutes):

- ask the students if they have ever heard of tsunamis or seen pictures of them
- explain that tsunamis are large ocean waves that can cause destruction and loss of life in coastal areas
- distribute pictures of the 2004 Boxing Day tsunami and the 2011 Japanese tsunami to give students an idea of the scale and impact of these events
- distribute the excerpt from MAGE and ask students to read it (optional)

Activity (40 minutes):

Causes of Tsunamis (10 minutes):

- ask students what they think causes tsunamis (this can include earthquakes, volcanic eruptions, landslides) and list their answers
- show a map of the world's major tectonic plates and explain how earthquakes and volcanic eruptions occur at plate boundaries
- discuss how the 2004 Boxing Day and 2011 Japanese tsunamis were caused by massive earthquakes in the Indian Ocean and off the coast of Japan, respectively
- explain how the energy released by these earthquakes caused the ocean water to move and created the tsunamis

Impacts of Tsunamis (30 minutes):

- show a map of the affected areas of the 2004 Boxing Day tsunami, including Indonesia, Thailand, and Sri Lanka; and a map of the affected areas of the 2011 Japanese tsunami
- ask students to discuss the impact of the tsunami on survivors and the affected areas (impacts include ongoing illness, disability, emotional trauma, the loss of life and damage to infrastructure, loss of businesses and livelihoods)
- discuss the response to the tsunami, including aid and relief efforts, and the rebuilding of affected areas

Conclusion (10 minutes):

- summarise the key points of the lesson, including the causes and impacts of tsunamis, and the importance of preparedness and emergency response
- ask students for their thoughts on the two major tsunamis discussed in this lesson

Assessment

Assessment will be based on:

- students' understanding of tsunamis through their participation in group discussions
- their answers to questions about tsunamis and/or the discussion questions on the excerpt from MAGE



MAGE Excerpt

www.magethenovel.com

www.youtube.com/@magethenovel - free audio version

Khao Lak Bay, Thailand, Boxing Day, 26 December 2004

Thirteen-year-old Ambra Lightstone skips across the white sand towards the turquoise sea; the clear water skimming the sand flirts with her feet.

Wearing her new red and silver swimsuit, her most prized Christmas gift from the previous day's festivities, she turns to see if her mother and father are paying attention to her. In the distance, Robert Lightstone, sitting on the third-floor balcony of the family's holiday villa, is watching, and waves encouragingly.

Ambra sees him nudge her mother. Lillian Lightstone looks up from the book she is engrossed in, waves and smiles at her daughter before returning to her book.

Satisfied, Ambra turns back to play in the rippling shallows. Her older brother Jevon would have joined her in her morning swim, but today he has gone on a motorbike tour up the hills behind their villa. She looks up and beyond the villa, wondering if he will see her from the top of the hills.

Wading into the sea, Ambra revels in sinking her toes into the sand, burying her feet up to her ankles. She goes deeper into the water. The caress of the sea is irresistible. She slips into the water to lie on her back and float, gazing up at the powder-blue sky. A perfect morning.

After a minute or so, Ambra rights herself, pulling her wet hair back behind her neck, and wringing out the seawater. She squints into the bright sunlight, taking in her surroundings. Around her are the sights and sounds of carefree bliss. A young couple wading in the ocean are embracing. A family splashes on the shoreline, the smallest child shrieking in delight. An elderly couple are sunbaking on the beach. Out to sea, fishing boats dot the water.

The sun disappears behind one of the few clouds in the sky, casting a shadow across the coast. Ambra's eyes adjust, and she can see further into the distance.

Then a most unexpected thing happens.

The sea disappears. Just like that.

In one instant, Ambra is standing waist deep in water on a tropical holiday. The next, the joyful sounds of other holidaymakers have gone quiet, replaced with confused murmurs as wet bathing suits cling to high-and-dry swimmers.

Ambra looks around to see if her parents have noticed this odd incident, but her mother is still buried in her book, and her father appears to be napping behind his sunglasses. She notices some disturbance along the shore, people gathering, pointing—a shark? Ambra is a surf lifesaver in training at home, and she is well aware sharks are one of the biggest threats in the ocean.

There seems to be some shouting, but she can't make out what is being said. She looks out to sea again, though the shoreline is now far below where it had been all morning and the evening before, when she had celebrated Christmas with her parents and Jevon.

Something is not right.

Then, far in the distance, she sees a concave of blue sitting above the horizon. It is almost imperceptible at first, but as it draws closer, she can see it is clearly racing towards her, and growing larger. The sea is returning—fast and fierce.

'It's a tidal wave!' she shouts, to warn anyone within hearing distance, frantically waving to get the attention of the couple and the family with the child.

'Hey! You have to run as far from the beach as you can—and get up as high as you can!' she screams, shouting and pointing to the horizon, then the shoreline, receiving quizzical looks in return. The older couple who had been sunbaking sit up.

'What are you talking about?' says the woman, with a slight accent. 'Oh—what has happened to the sea?'

'Get up! Get up and run!' yells Ambra.

Her head snaps around to look at the shore, but her parents on the balcony are still unaware. She holds her hands out in front of her. They are shaking uncontrollably. Her legs have turned to jelly.

A millisecond later, Ambra's body explodes with adrenalin, surging through her like fuel that has been set alight, and she turns to run.

She knows the incoming wave is many times her height, and it is moving much faster than she can hope to, despite her athleticism from training in surf and sand. But she has no choice; she must try, or wait to be engulfed by the torrent of water that is racing towards them all.

Her legs are burning with panic as she flies over the sand, wanting to put as much distance as possible between her and the watery wall of death.

She does not look back, but hears a steadily increasing roar behind her, like a thousand planes bearing down on the beach. Over the roar, she can make out faint shouts, but this time not shouts of joy.

Ahead, beyond the beach, she sees tourists, resort staff, and the local Thai people alike reacting—some fleeing, others looking out to sea, transfixed.

Everything goes silent.

Filled with terror and unsure if she will make it to safety, Ambra knows that her family is also in mortal danger. Have they noticed? She must warn them. She cannot get the air into her lungs to cry out—it is as if all of her survival instinct is being channelled to her legs.

Over the fury of the ocean gaining fast on her, she hears her father shouting from the villa ahead of her, two words that seem merged into one long, desperate howl: “AMBRA, RUN!”

Ambra makes it to her family’s villa and halfway up the first flight of stairs. Despite the roar of the water, she can hear her father bellowing to her as he runs down to meet her. But he is too late.

The first wave of the tsunami hits. Water surges up the stairs behind her. She grabs onto the railing in the stairwell, but the water is rising too fast, snatching at her legs, then her waist barely a second later. She sees her father’s crazed eyes looking down at her as he rounds the stairwell, the moment the water tears her from safety.

Everything goes dark as Ambra is sucked into a black washing machine of debris and filth. Around and around she tumbles, losing all sense of up and down. As the water churns, it vacuums out furniture, appliances, people and their belongings from her building into an artery of dangerous, toxic soup flowing into the streets.

Ambra’s head finally breaks the water’s surface and she gasps for breath. She tries to grab an approaching tree branch, but the rapidly moving water, coupled with being in shock, thwarts her attempts. The turbulent water slaps her eyes. It is hard to see far enough ahead to grab anything. There is a foul taste in her mouth, and her legs brush past all sorts of unidentifiable and unspeakable things.

Ambra recoils as she bumps into, and pushes away, drowned people and animals. Something sharp cuts her left leg and she knows it is bleeding, but she can only manage a weak cry.

She bumps into something solid and heavy that knocks the wind out of her. A car has become wedged in between a building and a sturdy palm tree.

Ambra is able to haul herself out of the clutches of the water and climb onto the roof, which is jutting above the surface. She dares not think about whether anyone is inside—if so, they would already be drowned.

Teeth chattering despite the heat, she surveys the surrounding area from her precarious perch. She does not recognise where she is. She looks away from the sea, up to the hills behind, trying to orient herself, looking for a landmark. Jevon should be up there. She imagines him looking down on the scene below, and her throat tightens. Is he up there, or has he returned to the villa? And what of her mother and father? Have they eluded the watery wall of death, or are they in a situation like hers? Or are they—

Ambra shuts out the thought from her mind.

As she stands shaking on top of the car, gulping in deep lungfuls of air, the water appears to slow, though that could be because of the sheer volume of stuff the tsunami has swept into its path. Chunks of wrecked buildings, shredded boats, lifeless bodies, broken glass, plants and tree branches, souvenirs, shoes, fruit, suitcases—all floating past in a foul parade of destruction.

A call in a tongue she does not understand catches her attention, and she sees a boy floating towards her car, dark head bobbing up and down, his petrified eyes looking at her. Despite her own fear, her instincts kick in.

She gestures for the boy to try to move towards the car. The water level has dropped slightly, and she realises he is not going to wash past within arm's reach. Looking around, she finds nothing to aid her, no lifeline to throw to him. There is only one option, and no time to waste.

Ambra peels off her one-piece swimsuit and—strangely given the circumstances—feels a rush of embarrassment as she stands naked on the car roof. She holds one end of the suit and waits for the right time to cast the other end to the boy to give him the best chance of grasping it.

But the tsunami is not yet done. A second surge is churning on shore and moving inland. Ambra drops to her hands and knees and flicks the loose end of the suit towards the boy, who grabs at it and manages to hang on. She lies flat on the car and attempts to reel the boy in. He is calling the same words rapidly, over and over, like a mantra.

Ambra doesn't need to understand what they mean to understand their meaning.

She uses all her strength to fight the current and, using her swimsuit rope to draw him closer, is able to grab the boy's wrist. He is wearing a braided leather bracelet on his wrist, which helps her maintain her grip.

Then the second surge hits. The car wobbles ominously. The boy's eyes are large with fright as the force of the surge causes Ambra to lose her grip on his wrist.

Her fingers snag under the bracelet, a tenuous last line of defence.

But the water is too strong. The leather bracelet snaps, and she watches in horror as the water snatches him away, still clutching her swimsuit. In the next moment, he vanishes under the water.

Over the surge, she hears hysterical screaming and looks up to see a Thai woman on the roof of a still-standing building which had been closer to the shoreline. She is pointing to the spot where the young lad vanished, her petrified eyes darting between the last sighting of the boy and Ambra. She fixes her gaze on Ambra, her face contorting with anger and shock as she wails her grief.

Ambra shakes her head, waving her upturned palms towards the woman.

'No, no, no, no, no ... I didn't let go of him ... he slipped,' she cries.

The woman continues to howl from the building roof. Though her words are incomprehensible to Ambra, every one of them hits her like an arrow.

Ambra collapses on top of the car roof, clutching the boy's bracelet, and bursts into tears—for the boy, and for her parents and brother who could well have met the same fate.

She goes into shock, lapsing in and out of consciousness.

She is still lying comatose, curled up on top of the car roof when rescue teams find her five hours later. Devoid of any other effects or clothing that could identify her, her rescuers assume the leather bracelet she has clutched in her hand is hers, and so tie it to her wrist.

It is three days before Ambra is reunited with her family, who are mercifully all alive—Jevon, because of his decision to go on a tour, and her parents because of the height and structural strength of the building they were in when the wave hit.

Her parents have endured an excruciating search of emergency centres and makeshift bulletin boards, all but certain their daughter has been swept to her death. But unlike so many others, their anguish ends when they find Ambra alive.

Ambra, traumatised, bruised and sore, and fighting an infection in her leg where the open wound had been exposed to the polluted water, is repatriated back to Australia, where she fights off bacterial infections with a cocktail of various drugs that make her nauseous.

Her lung function is affected by the amount of mud she has inhaled, which she is still coughing up months later, and her sinuses and ears have to be operated on to clear them of silt.

And every night she is shaken from her sleep, crying out as the wave chases her, and as the black water snatches a small boy from her grasp.

But she has survived.

Almost a quarter of a million other souls—both locals and visitors, in countries from Indonesia to Thailand, from Sri Lanka to India—have not.

ACTIVITY

Divide up into groups of at least two, and write down your group's thoughts on these questions:

What kind of impact would a tsunami have on the area where you live?

How might the impacts be different to the places impacted by the 2004 and 2011 tsunamis?