**ACTIVITY: Responding to *Rena***

**Activity idea**

In this activity, students consider short-term and long-term responses to an environmental disaster such as the *Rena*.

By the end of this activity, students should be able to:

* describe what might happen (environmentally) in the event of a maritime disaster such as the *Rena*
* explain some short-term and long-term responses that might help to limit environmental damage.

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**Introduction/background**

The response to the *Rena* disaster was immediate. The Bay of Plenty Polytechnic and the University of Waikato sent a team close to the Astrolabe Reef to survey baseline samples of marine life. They needed to get a record of marine biodiversity in the area before oil or pollution had any effect on it.

These results would be compared to later surveys so they could determine whether the pollution had a detrimental effect.

The video clip (made by the Bay of Plenty Polytechnic) used in this activity was taken on the day of the disaster. The team was surveying before the oil had time to settle anywhere.

Other responses included decisions about cleaning up the oil ([Cleaning up the oil spill](https://www.sciencelearn.org.nz/resources/1140-cleaning-up-the-oil-spill)), retrieving containers and debris ([Pollution from *Rena*](https://www.sciencelearn.org.nz/resources/1138-pollution-from-rena)), rescuing oiled birds ([*Rena* bird recovery](https://www.sciencelearn.org.nz/resources/1135-rena-bird-recovery)), seafood ([Iwi and kaimoana](https://www.sciencelearn.org.nz/resources/1141-iwi-and-kaimoana)) and long-term research ([Marine biodiversity and biodiscovery](https://www.sciencelearn.org.nz/resources/806-marine-biodiversity-and-biodiscovery)).

In this activity, students consider responses to such an environmental disaster. After exploring responses to the *Rena*, they are asked (through role-play) to draw up a response plan for a similar occurrence.

This should help students think through what might happen, what would require immediate action and what some long-term responses might be, such as the study of marine life in the area to ascertain the health and numbers of species. These studies would be compared to the original baseline survey.

Differences may be considered in light of the effects of the ship’s pollution, but students should be mindful it could be because of something else – organisms would need careful testing, for example, for PAHs from the ship’s oil and so on.

[Examples of responses](#examples) have been included to provide some ideas. Teachers should be aware of these and use them to make suggestions if students are struggling.

**What you need**

* Access to the video [Rapid Response to *Rena*](https://www.sciencelearn.org.nz/videos/609-rapid-response-to-the-rena)
* Access to the articles [*Rena* bird recovery](https://www.sciencelearn.org.nz/resources/1135-rena-bird-recovery), [Cleaning up the oil spill](https://www.sciencelearn.org.nz/resources/1140-cleaning-up-the-oil-spill), [Pollution from *Rena*](https://www.sciencelearn.org.nz/resources/1138-pollution-from-rena), [Iwi and kaimoana,](https://www.sciencelearn.org.nz/resources/1141-iwi-and-kaimoana) and [Marine biodiversity and biodiscovery](https://www.sciencelearn.org.nz/resources/806-marine-biodiversity-and-biodiscovery).

**What to do**

1. Present the initial facts to students:

In the early hours of 5 October 2011, the 236 m cargo vessel *Rena* strikes the Astrolabe Reef about 12 nautical miles off the Tauranga coast and becomes grounded. The ship is carrying 1368 containers, 1700 tonnes of heavy fuel oil and about 200 tonnes of diesel in its tanks. Concern for the ecosystem rises over the next weeks as the stranded ship slowly splits and spills hundreds of tonnes of thick fuel oil and dozens of containers into the sea. This causes sickness and death in the seabird wildlife and pollutes the Bay of Plenty coastline.
2. The Bay of Plenty Polytechnic and the University of Waikato responded immediately by sending out boats to do a survey – getting baseline health data on marine life. What is this and why do they need to do this? Discuss this as a class (see [introduction/background](#Introduction)).
3. Show the video [Rapid response to *Rena*](http://www.sciencelearn.org.nz/Science-Stories/Where-Land-Meets-Sea/Sci-Media/Video/Rapid-response-to-the-Rena). As students view the video, ask them to identify and record what is needed for the survey such as:
* boats
* wetsuits
* diving gear – including air tanks
* clipboards
* depth finder
* underwater pens
* underwater watches
* quadrat (sampling grid)
* video cameras
* buoys with flags
* maps
* chilly bins for survey samples
* marine samples
* computers.
1. In small groups or pairs, discuss what each of the items was used for.
2. Watch the video again and answer the following questions in groups. (Put the questions up for students to read before viewing the video.)
* What were they surveying?
* How many underwater reef areas were surveyed?
* About how many quadrat samples did they take at each area?
* Why was one of the scientists holding up different fingers under water?
* Why was he pointing to his watch?
* What do you think he was writing on the underwater clipboard?
* How will the scientists know if the oil has had an effect on this marine life?
* What will the scientists need to do at a later date?
* How many surveys should they do?
* How much later should they do them?
1. Role-play in small groups: Students are marine experts from Maritime New Zealand. Their mission is to lead and support the maritime community to take responsibility for ensuring our seas are safe, secure and clean. A cargo ship has just grounded off the coast of a beautiful bay in New Zealand. It appears to be breaking up. There is an oil slick coming from the ship and debris is floating in the water. Group members (students in role) hold a meeting to determine their response (short-term and long-term) to the grounded ship. They draw up a plan of action. People in the group are assigned to lead in different areas (such as oil response, container and debris response, initial surveys, bird recovery, liaison with iwi, science research and so on). Some people might have two jobs.

Each area leader needs to consider their role (what they are responsible for), research the related *Rena* response (and others using the internet) and record their response individually. *Rena* responses for research:
* For bird recovery: [*Rena* bird recovery](https://www.sciencelearn.org.nz/resources/1135-rena-bird-recovery)
* For oil response: [Cleaning up the oil spill](https://www.sciencelearn.org.nz/resources/1140-cleaning-up-the-oil-spill)
* For container and debris response: [Pollution from *Rena*](https://www.sciencelearn.org.nz/resources/1138-pollution-from-rena)
* To liaise with local iwi: [Iwi and kaimoana](https://www.sciencelearn.org.nz/resources/1141-iwi-and-kaimoana)
* For long-term research: [Marine biodiversity and biodiscovery](https://www.sciencelearn.org.nz/resources/806-marine-biodiversity-and-biodiscovery)

The group meets again (in role) to share and agree on possible responses. Remember that all responses come at a cost, so this should be considered as well in terms of people’s time and equipment needed. The group will have to decide on its priorities, and these may be based on value judgements. The group will have to agree with members’ responses.

A plan of action should be drawn up and presented to the class by each group. Group members should justify reasons for their actions (using scientific arguments and quoting what others have successfully (or unsuccessfully) done in the past.

More able students should be encouraged to think beyond what was done for the *Rena* and offer a variety of responses (see [Examples of responses](#examples)).

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| **Response** | **Possible solutions** | **Consequences** |
| **Birds** covered in oil | Catch birds and bring them to a centre so they can be cleaned. | May stress birds further but could result in saving birds including endangered species. |
| Leave the situation to nature. | Depletion of bird populations in the area. May result in fewer birds of already endangered species such as dotterels. |
| **Oil** spilling into the ocean | Spray oil with dispersants using boats. | Rough seas may make it difficult for boats to get close enough. Wind could blow dispersants away from target area. Dispersants could harm marine life, particularly benthic organisms. |
| Spray oil with dispersants using small planes. | Wind could make application difficult. Dispersants could be harmful to marine life, particularly benthic organisms. More expensive than using boats. |
| Contain oil using booms and clean up with skimmers (vacuum machine, oil absorbent material). | Rough weather could prevent booms from staying in position and make it difficult to use skimmers. |
| Leave the oil to disperse naturally. | Oil may reach the coastline, damaging or killing birds and other marine life. Oil makes an unsightly mess on beaches. |
| Burn the oil off the water. | Produces air pollution. Conditions need to be calm to effectively burn off oil. |
| **Containers and debris** falling into the ocean | Send in flotilla of boats to salvage containers before they break up and to scoop up debris. | Difficult to do in rough weather. May take a lot of time, boats and people. |
| Leave containers/debris to come ashore and salvage then.  | Contents of containers that might break open could be hazardous to marine life, particularly seabed dwellers. Could be a lot more debris due to broken containers. Debris such as plastic could be harmful to birds and other marine life. Debris near/on beaches is unsightly. |
| Airlift containers from wreck before they fall off/break up. | Could be expensive and difficult to do in rough seas/weather. Containers might be too heavy to lift. |
| Liaise with local **iwi** concerning incident, responses and consequences | Make no special effort. They will hear news like everyone else. | Local iwi often depend on kaimoana for a substantial part of their diet. People may be poisoned by affected kaimoana. |
| Keep iwi informed and include them in clean-up operation. | Most iwi have a fundamental belief in kaitiakitanga (protecting our resources) and that, as tangata whenua, they are kaitiaki (those who carry out kaitiakitanga). Most will want to help restore the coastline. Keeping them informed will help protect them from eating poisonous kaimoana. Iwi may have knowledge/ways of dealing with the situation or be willing to work with helpful ideas, for example, a rāhui (restriction) may be placed on certain seafood. Iwi may reseed areas where shellfish have been depleted. |
| **Long-term research** on effects on marine organisms | Don’t do anything. | No one will know long-term effects of the oil. Ecosystems may be affected and damaged. |
| Test for toxins in organisms. | It often takes time for toxins to get into the food web. Toxins tested for may not show up. |
| Take a baseline survey immediately. | This will show health of the environment before being affected by the oil spill and can then be compared with subsequent surveys. Comparison may indicate whether a particular species has disappeared or toxins have appeared in species that didn’t have them before.  |