



# Q&A

## ENVIRONMENT



**Q1: This island spells danger with a capital DANG! How might a surveyor - whose job it is to know lots about the geography of a place - be able to help here?**

**A:** First, let's look at the long list of disasters occurring on this ill-fated island. A volcano has blown its top, and at the base, a forest fire is raging. A seriously scary tsunami wave is about to hit the hotel, while on the other side of the island, an oil tanker is spilling its toxic cargo into the water. A mudslide has wrecked two pricey beachfront properties, adding debris to an already polluted beach. In the midst of all this chaos, where would a surveyor even start?

Well, the answer is that they'd start before any of these disaster even happened, and their intention would either be to stop them from happening, or - where they couldn't be stopped - make sure

that people had as much warning as possible before the disaster occurred. Geological surveyors can monitor for changes in nature - clues that might predict events like earthquakes or volcanic eruptions. The data can be used in early warning systems, like the loudspeakers mounted to the hotel that sound a tsunami warning. Surveyors can also use their geographical knowledge to help plan for buildings and structures that, should a disaster occur, can withstand its effects.

When disaster does strike, surveyors also make up part of the emergency response. Search and rescue teams will rely on locational data collected by surveyors to know where to look for

survivors, as well as locating and switching off potentially dangerous utilities (such as water, gas and electricity, all of which could be hazardous if damaged). Surveyors will also be involved in rebuilding efforts following a disaster; they will help to re-map the area, understand its new geology, and establish boundaries and pathways.

**Q2: A terrible landslide has destroyed two beachfront homes. This might seem like a tragic natural disaster at first, but can you figure out what actually caused the destruction?**

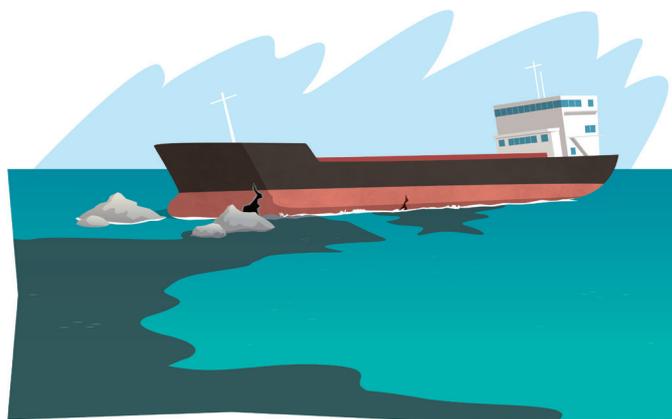
**A:** At the top of the hill, you can see two logging vehicles - they're making short work of a large area of forest. The problem is, the roots of the trees that they've hacked down were actually helping to hold the soil beneath in place. Without these natural support structures, the earth has loosened and shifted, causing the landslide that has reduced those expensive-looking beach houses to rubble and toothpicks.

Thankfully, it looks like this won't happen again. If you look to (G,4), you can see Kengo from the RIPRO Corporation, placing one of his high-tech information stake markers into the ground. These devices, made from recycled plastic waste, have a sensor mounted to the top that connects to form a network of monitoring tech, sensing any land movement. The devices can alert users to unexpected movements that might be an indication of an imminent landslide or earthquake. Can you spot all of Kengo's markers? There are eight to find!



**Q3: There's nothing natural about the two oil spills in this scene! These leaks can be disastrous for wildlife - can you locate them as quickly as the plane and the robosnake have?**

**A:** The oil tanker in (G,5) has hit a rock, and its toxic contents are spilling into the sea. At (C,1), you can see that the underwater oil pipe has sprung a leak. Both of these spillages could spell disaster for the local environment. Luckily, they have been located quickly. The oil spill from the tanker has been picked up by a low-flying aircraft using photogrammetry (collecting information about objects and the environment by recording, measuring and interpreting photographic images), while the leak from the pipe has been spotted by the robosnake, a special survey robot designed to spend its time underwater. Once spills like this have been identified, environmental surveyors can help to assess the damage and find ways to fix these man-made problems and the harm they've caused.



**Q4: That volcano woke up on the wrong side of the tectonic plate! The eruption was predicted by a geological surveyor responsible for 'volcano monitoring' - what clues might they have spotted before the eruption took place?**

**A:** Geological surveyors who are responsible for volcano monitoring will compile a kind of 'volcano diary', made up of detailed observations and measurements of any changes in the volcano and its surroundings.

These could include the amount of steam coming from vents, the development of new cracks - or the widening of existing ones, any unusual activity in plant life - particularly unexplained withering, and changes in the colour of mineral deposits. Any of these could point to a potential eruption. And, if a volcano does erupt (and it is safe to do so), the surveyor will record the course of the eruption in as much detail as they can manage. They will make temperature measurements of the gases and lava that erupt from the volcano, and they will collect samples for later analysis. They will also make measurements of things like the ash plume and the rate of lava flow. When all this information is combined with readings from movement sensors, it creates a picture of the behaviour of the volcano that might be used to predict its future behaviour, and help to keep people in the surrounding area safe by giving them an early warning of any potentially harmful volcanic activity.

**Q5: There's a tsunami wave heading for the hotel... and there's still a few guests hanging around - they must not have read the reviews of Tragic Island! Thankfully they've made it to the roof. Do you know what caused the tsunami?**

**A:** A tsunami is a vast ocean wave caused by the displacement of a large volume of water, the result of underwater movements. Most of these will be natural, like earthquakes, landslides, and underwater volcanos, but some could be made-man, like the eruptions from explosive detonations. At the source of the movement, the resulting waves are relatively small - about one metre high. This is because the water there is deep. However, as the waves near the land, where the water is shallower, they are pushed upwards and begin to grow: to a height of 35 metres or higher! Even more worrying is a tsunami's wavelength - that means how far it can travel inland. While a storm wave might be able to travel around 150 metres inland, a tsunami wave could reach a staggering 1000km.



Fortunately, surveyors are on hand again to keep an eye out for geological movement, even at sea! The Fugro plane at (H,6) is using laser pulses to map the seafloor. The data it collects can be used to perform disaster simulations to test out environmental events, and even determine what strategies would be effective in the event of a search-and-rescue effort. It can also be used for 'seismic modelling', where buildings are tested virtually to see how they stand up to extreme movements. Let's hope the hotel on Tragic Island has benefitted from some earthquake-proofing! At least its residents have done the right thing - they've all headed to the roof, using the height of the building to keep them out of the path of the giant wave.

**Q6: There are both natural and man-made disasters occurring on the island, but the cause of the forest fire could be either! Can you explain how that might be?**

**A:** Sometimes, fires like this start naturally - usually after a period of very hot weather, with very little rain. However, it's just as likely that this fire was man-made - started by a careless camper, perhaps, who did not extinguish a campfire properly. While surveyors can help to avoid catastrophic fires like this by using the data they collect to combine weather conditions with wildfire-capable areas in order to alert people of any heightened risk, it is also the responsibility of people who visit the forest to take care and behave responsibly.

