MAGMA DRILLERS

SAVE PLANET EARTH

ENVIRONMENTAL RISK MANAGER

Mission 2: Energy from magma

It is the year 2035, natural disasters ravage the planet. The world is recovering from years of environmental exploitation under Donald Trump (who tragically died after a freak wave of plastic burger boxes buried him during a beachside golf tournament). Kim Kardashian is now president of the United States; her revolutionary thinking leads the world in a search for cleaner energy and an effort to become better guardians of the natural forces around us. She has chosen you to be part of team to push the limits of science, technology, and bravery to save the planet- and build the Magmathermal Environmental Research Centre- also known as 'MERC'.

In order to complete this mission, you will have to watch both the "energy from magma" video and the hazard advisor video for this mission.

Again, you will be asked to collaborate with other scientists in order to achieve your goals. You will use what you have learnt so far to help you decide on

the hazards associated with magma, and how to safely drill the next well. You will also need to help decide where to build the MERC. The information on the following pages will help you answer the questions below. Once you are confident about your answers to those questions, you will be able to report back to your team and help make a final decision on how to drill to intercept magma bodies safely.

Hazards associated with magma

Drilling into a magma chamber does not come without risk. A big question on everybody's mind is- what if we trigger an eruption? Well, let's think about that.

The first thing to consider when assessing the risk of drilling into magma is to figure out what has happened when a drill has intercepted magma previously. We know that at Krafla, we intercepted magma at least twice. No eruption was triggered on either of those occasions. We also know that the magma was rhyolite in composition on both of those occasions. However, at Krafla, magma erupted out of an old borehole, however that magma and its volcanic outputs were basaltic.

Date	Drillhole magma interception	Magma type	Eruption ?
1979	Eruption through borehole 4, 11 years after drilling.	Basalt	Yes
2008	K-39 drilled into magma	Rhyolite	No
2009	IDDP-1, drilled into magma	Rhyolite	No

Question 1 Eruption likelihood

What type of magma is most likely to erupt, if drilled into?

A. Basalt
B. Rhyolite
C. Both as likely

The second consideration would be what the consequence of the eruption would be. A short, small volume eruption would not have serious effects. However, a long sustained eruption might have severe consequences on infrastructure, people's health and the environment.

Another consideration is the footprint of the eruption- what area will be affected by the eruption? Volcanic ash is notorious for affecting large areas as small ash particles can travel long distances in the wind.

Question 2 Consequence of eruption

Fill in the following table.

Magma Type	Hazard	Footprint Size	Consequence
Basalt			
Rhyolite			

Question 3 Risk Assessment

Use the following risk planning tool to assess the risk with the different hazards.

		Consequence	
		Marginal	**Catastrophic**
Likelihood	**Likely**	High	Extreme
	Rare	Low	High

What is the risk level associated with drilling into a basaltic magma?

What is the risk level associated with drilling into a rhyolitic magma?

Question 4 Locating the MERC

You will be tasked with locating the Magmathermal Environmental Research Centre(MERC). Some new information –if you move outside of the caldera, the consequence of an ashfall eruption is marginal. What is the risk to associated with locating the MERC inside and outside the caldera boundary?

Question 5

What other information might help you achieve the best outcome for the drilling project?

Well done! You are now at the end of your passport. The next section will be filled out by a judge.

Drilling planning evaluation

Did everyone on the team share information that helped make the final decision?

How well did your team communicate to achieve its goals? What could improve your communication in the future?

Did your plan address all the potential risks and hazards?

Was your mission cost effective?

Did your drilling plan meet all requirements for the mission?

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CURIOUS MINDS
HE HIHIRI I TE MAHARA

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