

Geotechnical engineering

with Dr Renato Macciotta

Talking points

Knowledge

1. What are geohazards?
2. What is geotechnical engineering?

Comprehension

3. How do Canada's specific features present unique challenges to rail networks and ground hazard systems?
4. How are Renato and his colleagues helping rail networks mitigate landslide impacts?

Application

5. How do you think climate change might impact Canada's rail networks beyond those impacts mentioned in the article?
6. Having read about Renato's career path and the research he conducts, what do you think you would find rewarding about working in geotechnical engineering, and why?

Analysis

7. What are the strengths and limitations of artificial intelligence within geotechnical engineering?
8. How do you think that geotechnical engineering can contribute to ensuring that development is sustainable?

Evaluation

9. How do you think the field of geotechnical engineering is likely to change in the next fifty years, given factors such as technological developments and climate change?
10. To what extent do you think that Canada is likely to expand its passenger rail network in the future, given what you have read in the article? How might geotechnical engineering contribute to such a development?

Activity

Imagine you are a geotechnical engineer working as part of a railway safety team in a remote region. A section of your track runs through mountains and forests. In the past year, the region has experienced:

- Increased rainfall
- A nearby forest fire
- Reports of small rockfalls.

In a small group, create a Hazard Monitoring and Response Plan for this region. Your plan should include:

1. Identification of likely hazards
2. Monitoring methods (e.g., satellite radar, laser scanning, photography/drone imaging)
3. Modelling and prediction: how you will use data to make hazard predictions
4. Suggested actions.

Use Renato's article and online research to help you build your plan. The Railway Ground Hazard Research Program features latest research and publications on its website: sites.google.com/view/railway-ground-hazard-research/home

While designing your presentation, think about how you can:

- demonstrate confidence in your monitoring methods and predictions
- persuade your audience of the importance of your suggested actions
- ensure your audience fully understands the plan and its components.

Once ready, present your plan to your class. Your audience will take the role of decision-makers – those with the power to allocate resources to carry out your plan.

Be receptive to questions and feedback following your presentation and think about how you could improve your plan further based on their responses.

More resources

- The University of Alberta's Geotechnical Centre has a YouTube channel: youtube.com/@ualbertageotech?si=8SCMxRZdYr6T2YeF
- This video from People Team provides an introduction into the roles of a geotechnical engineer: youtube.com/watch?v=wheH4BCajgc
- This article from DW explores how Switzerland predicts landslides and provides lessons for other nations: dw.com/en/how-does-switzerland-predict-landslides/a-72739293