GEOSCIENCE FOR LEAVING CERTIFICATE GEOGRAPHY

Continuing Professional Development Course 2021

IRISH GEOHAZARDS:
HOW WE MONITOR AND MITIGATE THEM

LESSON PLAN

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iCRAG
SFI RESEARCH CENTRE IN APPLIED GEOSCIENCES

Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

An Roinn Comhshaoil, Aeráide agus Cumarsáide
Department of the Environment, Climate and Communications

About the programme

The aim of this resource is to encourage the teaching and inclusion of geology in Leaving Certificate Geography classrooms. To achieve this, iCRAG and Geological Survey Ireland developed this CPD course which partnered up 6 Leaving Certificate teachers with 12 geoscience practitioners across Ireland. The course involved a series of talks by the geoscience practitioners which informed the teachers of current and ongoing geoscience research happening in Ireland. They then worked together to create either a classroom-based or field-based lesson or module plan for a particular subject area, complete with presentation and teacher and student notes. The teachers brought in their expertise and experience with teaching Leaving Certificate Geography and how the various aspects of geoscience can be linked to the curriculum, and the geoscience practitioners contributed their knowledge and relevant applications of geoscience at a classroom level.

The subjects covered by these 6 resources include a Glendalough field study, geothermal energy, an introduction to geology, Irish geohazards, seismic activity, and volcanoes.

The CPD course was led by Elspeth Sinclair and Fergus McAuliffe, from iCRAG, and Siobhán Power and Amrine Dubois Gafar, from Geological Survey Ireland. We would like to thank Peter Lydon for his help in recruiting our wonderful teachers.

About us

Geological Survey Ireland, a division of the Department of Environment, Climate and Communications, has been mapping Ireland since 1845. They continue to map the Irish land and marine territories, as well as mineral and groundwater resources. They have responsibility for actions in the current Climate Action Plan including monitoring coastal change, the Just Transition in the midland counties, and providing data for de-risking offshore renewable energy. Irish geoscience research, particularly as it contributes to the development of government policy, is an important part of their work and they fund and co-fund many research projects, including some of the iCRAG research work. Their data and maps are freely available to all at www.gsi.ie.

iCRAG, the Science Foundation Ireland (SFI) Research Centre in Applied Geosciences, are a team of researchers creating solutions for a sustainable society. They develop innovative science and technologies to better understand Earth's past, present, and future and how people are connected to it. iCRAG drives research into areas that are critical to society, including:

- The minerals and metals we need for decarbonisation and sustainable energy.
- Securing and protecting groundwater and marine resources.
- Protecting society from Earth's hazards, such as floods and landslides.

Further information is available at: www.icrag-centre.org

About this resource

Irish Geohazards: How we monitor and mitigate them

This resource has been created by Eileen Kelley from Castleknock Community College, alongside geoscientists Drs Eve Daly and Haleh Karbala Ali both from iCRAG at NUIG and DIAS respectively. This resource examines the geohazards that affect Ireland, such as groundwater and flooding, and investigates the methods we use to monitor the hazards and mitigate for their potential effects. This resource has been designed to cover at least a double class and is suitable for Leaving Certificate level students.

Disclaimer

Irish geohazards: how we monitor and mitigate them: Lesson Plan

Links to curriculum

Leaving Certificate Geography

Core unit 1:

- 1.1 the tectonic cycle, earthquakes
- 1.2 the rock cycle
- 1.6 landform development – rivers
- 1.7 human interaction – flooding

Core unit 2:

- 2.1 the concept of a region – physical regions
- 2.2 the dynamics of a region – climate, relief, soils, and drainage.

Elective 4:

- 4.5 environmental impact, sustainable development, and conflicts of interest in economic development and environmental impact.

Junior Cycle Science

Senior Cycle Physics

Learning Outcomes

Students will:

- Learn what Geo hazards are and identify Irish geo hazards
- Find out geo hazards are monitored and mitigated in and environmentally and sustainable manner.
- Learn how a seismograph works and identify how they are used outside of earthquake and volcano monitoring
- Make their own seismograph
- Identify flood areas using websites and maps and assess suitability for land use.

Keywords and definitions

Seismometer	Instrument used to measure the intensity of seismic waves
Geo hazards	Geological and environmental conditions that can lead to widespread damage or risk
P and S waves	Primary and surface waves in earthquake/ seismic activity
Flooding	An overflow of water that submerges land that is usually dry
Earthquakes	A sudden shaking of the surface of the earth caused by a release of energy in the earths lithosphere that creates seismic waves
Richter Scale	Scale used to measure the strength of an earthquake
Ground water vulnerability	The natural ground characteristics that determine the ease with which groundwater can be contaminated by human activities
Turlough	A seasonal lake in a limestone region
Bedrock geology	The solid rock beneath the surface looser material
INSN	Irish National Seismic Network
IRIS	Incorporator research institutions for seismology
GSI	Geological Survey of Ireland
Converging boundaries	Colliding boundaries
Diverging boundaries	Separating boundaries
Transform boundaries	Passive or sliding boundaries
Permeable	Water can pass through
HEP	Hydroelectric power

Learning activities

Students will:

- Engage in discussion and group work based on website information
- Make their own seismogram
- Research earthquake activity in Ireland and the world using the websites
- Research vulnerable flood areas
- Complete homework questions based on information given in class on seismometers and their use
- Complete a written task on geohazards in Ireland
- Create reports on topics learned - a flood event and assessing a location for building
- Download the seismometer app on their phones. *"Vibrometer".*

Extra info and files

- www.floodinfo.ie
- www.gsi.ie
- www.insn.ie
- www.iris.edu

Resources provided

- PowerPoint

Materials needed

- iPad or computers/computer room

Methodologies

- Inquiry based and student-based learning.
- Group work and communicative and collaborative learning.
- Teacher led and guided but student engagement and control of learning.
- Investigating topic and reflective learning

Assessment

- Questions and discussions in class
- Formative feedback on written work and tasks
- Teacher observation
- Graphic organiser on topics learned i.e., fish bone diagram
- Written assessment

Differentiation

- By the teacher- lower order questions
- Support by teacher
- Differentiated worksheets if needed

Irish Geohazards: Teacher Notes

Introduction to teacher notes

This lesson plan is aimed at TYs and or 5th years. It is planned for a double class or over two single classes.

Lesson one: Introduction to geohazards

Use the power point to guide through the lesson.

1. Introduction to geohazards.
   1.1. Give examples and prompt discussion.
2. Power point slides on earthquakes and plate boundaries and types of earthquakes.
3. Look at the IRIS website and world seismic events.
   3.1. Specifically, look at the Pacific Ring of Fire and investigate recent events. What are their size?
   3.2. Look at what a seismogram is in the instrument section. View the component seismogram-P and S waves video.
   3.3. Find the 'Build your own seismograph' video in lessons demonstration. Build the seismogram as homework task. Take down notes on how to do it from the website.
4. Power point slides on seismometers and their use in earthquakes. Introduction to the Richter Scale slide.
5. Focus on Irish geohazards specifically earthquakes and groundwater and flooding. Look at INSN website and identify recent and older seismic events in Ireland. Note the strength and date of the events
6. Power point slides on the history of the Seismogram and its relationship with Killiney beach
7. Slides on using seismometers to monitor groundwater and flooding

Lesson two: Geohazard investigation

For this class it would be ideal to have access to the computer room/ school laptops, so students can access the websites also.

1. Go to the GSI website and find the GSI map viewer.
   1.1. Look at the tab for Groundwater and tick the groundwater vulnerability and bedrock geology layers.
   1.2. Study this map. Seismology can monitor groundwater before it gets to the surface.
   1.3. Look at the predicted groundwater flooding map - groundwater programme satellite imagery- monitoring on the surface. How can this information be used?
2. Power point slides on areas likely to flood e.g., rivers and Karst. Human interaction with rivers. HEP on the River Shannon.
3. Look at potential flood areas e.g., Karst and rivers.
4. Look at floodinfo.ie. Choose an area and assess its suitability for building a house. Look at flooding- causes, monitoring and preventing.
5. Power point slides on seismic instruments and Avoca River project
6. Download the phone app. Seismometer- Vibrometer and test it

7. Worksheet, questions and report based on the lesson. This includes questions, downloading the seismometer app on their phones, making a homemade seismometer, and writing two reports. One on an Irish flooding event and the other on assessing a location on its suitability for building a house.

Sources:

- "Earth" Leaving Cert Geography core book. Michael Organ
- "Landscapes" Leaving Cert Geography core book. Declan Fitzgerald and JP White. Gill and Macmillan
- www.Educate.ie
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- www.iris.edu
- www.gsi.ie
- https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228
- www.floodinfo.ie