

Questions for any rock face 13: quarry economics

What questions about potential for quarry re-opening might be asked at any rock exposure?

The ELI* series of 'Questions for any rock face' helps teachers to plan investigative fieldwork at any rock exposure**. In each case some possible questions are given, with some likely answers, to help you to decide whether the questions might work well at your site, or whether they would be asked better elsewhere.

Quarry economics

Take your pupils to an abandoned quarry and ask this series of questions to help them to understand the economics of exploiting raw materials. The questions would work equally well in a working quarry, but then the answers would be much more obvious and it may be more difficult to obtain access to a working quarry.

Possible questions	Possible answers
What are the dimensions of this quarry (length, breadth and height)	<ul style="list-style-type: none"> Estimate length and breadth by pacing Estimate height on the basis that an average teacher (if there is such a thing!) is around 1.6 metres high, or measure the face with a tape measure
What is the volume of the quarry (volume (m ³) = length (m) x width (m) x height (m))	Calculators may be useful, if the pupils can cope with the numbers of noughts
What is the economic value of the rocks in this quarry at today's prices? (value (£/\$/€) = volume (m ³) x price (£/\$/€m ⁻³))	<p>As a guide to approximate prices:</p> <ul style="list-style-type: none"> normal building stone (e.g. sandstone or limestone) = £40/\$60/€50 m⁻³ high quality crushed rock aggregate for road surfaces, railway ballast – (e.g. basalt, metaquartzite) = £50/\$70/€60 m⁻³ lower quality crushed rock aggregate for adding to cement to make concrete – (e.g. limestone, sand) = £20/\$30/25€ m⁻³ <p>Notes:</p> <ul style="list-style-type: none"> High quality stone blocks for building/repairing imposing buildings - cut to size (e.g. high quality sandstone or limestone) = £2000/\$3000/€2500 m⁻³ Thin slabs of high quality stone for kitchen worktops – cut and finished (e.g. granite) = £8000/\$12,000/€10,000 m⁻³ <p>Pupils will need help with the numbers of noughts, and the enormous value of the quarry products in bulk</p>
Which nearby cities/towns would be most likely to want to buy these quarry products?	Transport costs for bulk materials like quarry products are huge – which is why they are mainly available only to local markets unless they are of high value
What might they be used to build in the nearby city/town?	There may be local initiatives requiring bulk materials, such a restructuring a town centre or building a runway. Local historic buildings may need repairing with matching stone.
Do you think the quarry might re-open?	In 99% of cases – no. Existing quarries tend to continue and gaining planning permission for new quarries is a very difficult process – especially near urban areas



Státní lom, an abandoned quarry in the Velký Kosíř nature park, Czech Republic.

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* ELI = Earthlearningidea

** An exposure is where rocks can be seen at the Earth's surface, exposed by natural or artificial means; anywhere where a rock reaches the surface, even if it is covered by soil, etc. is an outcrop, so an exposure is also part of an outcrop.

The back up

Title: Questions for any rock face 13: quarry economics.

Subtitle: What questions about potential for quarry re-opening might be asked at any rock exposure?

Topic: Questions to enable pupils to begin to understand the viability of quarrying raw materials.

Age range of pupils: 9-16 years

Time needed to complete activity: 15 minutes

Pupil learning outcomes: Pupils can:

- carry out arithmetical calculations (with an optional calculator);
- describe the potential uses of quarry materials;
- describe the economic potential of a quarry site;
- debate the issues around the re-opening of an old quarry.

Context:

Pupils are asked questions about the economic potential of quarried material to help them begin to understand the economic background to the quarrying industry.



Chalk pit.

Following up the activity:

Continue with other 'Questions for any rock face' Earthlearningideas

Underlying principles:

- Quarry volume can be simply estimated.
- Calculations of the value of raw material are made using quarry volumes and the value of the material.

Thinking skill development:

Pupils use estimating and arithmetical skills to work out values of bulk raw materials.

Resource list:

- the resources needed for pupil fieldwork listed in the Earthlearningidea, '*Planning for fieldwork: preparing your pupils before setting out to "ask questions for any rock face"*'
- optional calculators
- optional tape measure

Useful links:

Take the 'Virtual Quarry' tour by the Mineral Products Association at:
<http://www.virtualquarry.co.uk/virtualquarry.htm>

Source: Devised by Chris King of the Earthlearningidea Team. Many thanks to Phil James and his colleague Julian Smallwood and Gill Odolphie and her colleague Justin Thorner for providing notional rock price estimates.

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**The 'Questions for any rock face' series of Earthlearningideas
and the sites where they may be applicable**

'Questions for any rock face' Earthlearningidea	Site
Planning for fieldwork	Preparation in school beforehand
1: weathering	Any exposure (cliff, coastal exposure, quarry, cutting) or weathered constructions (wall, gravestone, monument)
2: erosion	Any exposure and many walls
3: soil	Some exposures have a useful soil profile at the top (but many do not)
4: rock group (igneous or sedimentary)	Any exposure of igneous or sedimentary rock or both; also applicable to sedimentary and igneous building stones, gravestones or monuments
5: sedimentary grains	Any exposure of sedimentary rock and also building stones, gravestones or monuments
6: fossils	Any exposure containing readily found and obvious fossils, including some building stones, gravestones or monuments
7: tilted or folded rocks	Any exposure of clearly tilted or folded rocks
8: faults	An exposure where rocks are clearly faulted, preferably where beds can be matched up on either side of the fault
9: metamorphism	An exposure where metamorphic features are clearly visible and preferably, where there is also evidence of the former rock type
10: sequencing	An exposure where a sequence of geological events can be relatively dated using 'Stratigraphic Principles'
11. tectonic plates	An exposure of sedimentary rocks containing evidence of deposition in different climates and altitude/depths from today, with further evidence of plate margin processes
12. quarry/ cutting potential	An exposure in any quarry or cutting
13: quarry economics	An abandoned (or working) quarry
14: recording	Any exposure