



CHAPTER 14

Geology in everyday life

Key words: Resources and humanity, geology in everyday life, sustainable development, geotourism.

Introduction

Geology is all around us! Nearly everything in our daily life is directly or indirectly connected to the lithosphere – the solid geological surface layers of our planet. Geology in everyday life can be obvious – just think about fossil fuels and building stones. But sometimes it can be hidden and unexpected – who would think about geology in food and clothes? Knowledge of our links to geology is also important for understanding and assessing climate-change-related geohazards in the future. Geology can also be very strongly linked to recreation and leisure when it comes to climbing and hiking and even just visiting a beach – and developing this theme leads to *geotourism*, where opportunities to impart geological knowledge and awareness to a broad public are identified, including to help safeguard natural heritage and geodiversity for future generations.

14.1 Geological resources for Humanity

When discussing the use of geological resources for our society, most people will think of mining and fossil hydrocarbon exploration and exploitation. In addition, our need for geological-sourced building materials is also enormous and represents more than just stone for building, as we also exploit gravel, sand and clay for the building industry. The consumption of a typical European exceeds 1,100 tons of natural resources over 70 years, including more than 460 tons sand and gravel, 245 tons of rock, 166 tons of fossil fuel, 145 tons coal, 40 tons of iron, 13 tons of salt, 8 tons of wood, 6 tons of gypsum, 4 tons of phosphates, 2 tons of sulphur, and 1 ton each of aluminum, potassium, and copper. These resources are processed by industry and used by us in our daily lives in the form of many common products.

Coal and lignite (i.e. ‘brown coal’) are other geological resources which are important to a modern society, as sources of energy. Most of this energy in Europe was captured around 300 to 330 million years ago by enormous equatorial swamp forests. Similarly, crude oil and natural gas are fossil organic compounds, typically formed from planktonic marine organisms that lived millions of years ago. All these materials are still crucial for much of our modern industry, transport systems and energy production. Products of the petrochemistry industry, which transforms oil and gas into useful products, literally surround us everywhere, even our clothes and shoes may

be at least partly made from oil, if 'man-made' materials such as fibres (e.g. polyester or nylon), plastics or synthesized rubbers have been used. Plastics, in particular, are almost exclusively produced from fossil hydrocarbons.

Without oil refinement, around 700,000,000 cars globally would stop working – but the car itself, of course, is also largely made from geological sources: steel, aluminum, magnesium and other metals are used for the motor, framework and bodywork, rubber and plastic for tyres, seats and cables and sand for the window glass. Another important geological resource, which plays a major role in our society without much public awareness, are phosphates. Phosphates extracted from geological deposits are fundamental for global agriculture as fertilizer. Geology also provides resources such as stone, metals, minerals, glass, for art and sculpture, paints, architecture as well as for pottery and jewelry.

Although this more or less random list of examples is far from complete, all have something special in common – they are all non-renewable resources and their availability is constantly declining. Peak oil production – the time when a maximum rate of hydrocarbon exploitation is reached (to be followed by only declining production rates) – may have already passed; peak phosphate production will be reached within the next few decades.

14.2. Geology in Everyday Life

It might be surprising to consider our human bodies as reservoirs. Nevertheless, we contain considerable amounts of chemical elements. The origin of the quantitatively most important ones, such as oxygen, carbon, nitrogen and hydrogen, are the atmosphere and hydrosphere. As components of the biological structure of our bodies, they are mainly available to us only through food uptake as only plants and certain bacteria are able to fix carbon by photosynthesis. All the other elements we contain are derived from the lithosphere and are thus “incorporated geology”. Bones and teeth are made from the phosphate mineral apatite. To produce our skeleton we need calcium and phosphorous, which become available to life by the weathering of minerals in rocks. Similarly, iron – an essential component of our blood pigment haemoglobin – is also lithosphere-derived. Most of these geochemical elements pass into our bodies in food and drinking water.

Some geological raw materials are even used by the food industry. Consumers are not usually aware of this as ingredients can be masked by codes, such as by the E-numbers applied to food additives in Europe. Typical examples are gypsum (E 516), chalk and limestone (E 170) and even quartz sand (E 551) among numerous others. These additives are found in bakery and dairy products and are used as acidity regulators, anti-caking agents and for surface treatment. Up to 10g/kg of “rock” may be added to some sausages and soft cheese. Of course, geology in daily life is much more than this: baby powder¹, toothpaste², beer filters³, cat litter⁴, eye glasses⁵, mobile phones⁶ ... and the ceramic cup⁷ from which you may sip coffee and the spoon⁸ you stir it with can all be made from geology (Geological materials used: ¹talca, ²chalk, ³diatomite,⁴ bentonite,⁵ quartz sand,⁶ rare earth elements,⁷ kaolinite,⁸ silver, steel, even plastic derived from crude oil).

14.3. Geological Tourism (Geotourism)

Geology also surrounds us on a much larger scale as topography and landscape are primarily products of geology and climatic processes (although without education, the nature of the geological processes which have produced such landscapes will be poorly understood by most people).

Geotourism has become a key theme in the recent years, mainly as a result of increasing concerns amongst in the scientific community and greater awareness in a broader society about natural heritage, including geological heritage and geodiversity. There can also be economic drivers behind the development of geotourism, as some local and regional administrations try and make nature, including landscapes and geology, contribute to local economic development. The development of the European Geopark Network, in particular, reflects this process, and the increasing number of protected geodiversity sites features are obvious evidence of this growing social concern which combines the nature conservation, geology and tourism development.

Geoparks have a great potential for disseminating knowledge about geology. According to the charter of the European Geopark Network, these are defined areas with a spectacular geological heritage and a sustainable economic development strategy (see also Chapter 10). Geoparks, therefore, include touristic locations in which visitors can be introduced to Earth history in both a local and an international context. Whilst the production and sale of local goods inspired by this geological heritage is encouraged in European and UNESCO geoparks, the sale of geological objects such as fossils is strictly prohibited to avoid unsustainable and destructive exploitation. Positive support from local people comes from the sustainable economic development that geoparks encourage, which results in a raised awareness of the importance of geosciences for society.

Intended learning outcomes:

- Recognise the importance of geological resources for Humanity.
- Demonstrate knowledge and understanding of the importance of geology in everyday life.
- Appreciate geodiversity.
- Appraise geotourism potential within local Sustainable development programmes.

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