



CHAPTER 9

Human activities alter the Earth

Key words: Human activities, landscape, environment, building, public works, quarries, mines.

Introduction

Since the first stages of human evolution, people have used our planet Earth not only as a habitat to survive in – like all other species – but also to obtain useful materials and sources of energy. An increasingly intensive use of the planet, however, has resulted in physical, chemical and biological changes to the environment that affect both the resources essential to life and the activities of human society. Large constructions (e.g. dams, docks, roads, bridges, factories, etc.), damming of rivers, cutting through mountains, removal of natural vegetation, for example, change the landscape and interfere with natural processes and can cause serious damage to nature.

9.1. How human activities change the Earth

People are part of the natural environment but often act negatively when human activities oppose or ignore the evolutionary processes that regulate the balance between the constituent parts of the Earth system. There is an imbalance between the rapid growth of human populations and the increased use of resources necessary for their subsistence, because of the tendency to satisfy immediate needs without taking into account long term effects. Humans are the only species able to build and use machines to exploit natural resources and shape the Earth's surface, hence making changes to landscapes in a few years, which would take nature thousands. Humans, therefore, can be considered to be the most important agent able to modify landscapes.

9.2. About public works and landscape changing

Public works are one of the factors with the highest potential environmental impact. Public works often include large scale construction projects which have an impact on humans, animals, vegetation, soil, water, air, climate, landscapes, material assets, cultural and historical heritage and other aspects of the environment and their socio-economic interactions. Public works involve ever increasing land use, high energy consumption and emissions of harmful substances.

In addition, in some areas, there can also be an absence of or disregard for the rules and regulations designed to safeguard and protect the natural environment and landscape. Economic and commercial interests are often behind the use of inappropriate sites for development, such as protected areas, areas subject to high levels of natural risk (e.g. landslides, earthquakes, tsunami, etc.) and contaminated areas - as evidenced by recent disasters worldwide.

9.3. How large-scale constructions (roads, bridges, etc.) change the landscape

Communications infrastructure, such as roads, railways, highways or tunnels are often the public works that have most impact on the ground, especially when they affect areas such as steep hillsides, mountains and coastal areas, leaving highly visible “scars”, as well as potentially creating various kinds of slope instabilities. Damage is not only linked to effects on the profile of the natural slope, but often includes the accumulation of debris on the slopes or into the valley below. This accumulation of rocky materials is usually highly damaging to native vegetation, as well as degrading the geomorphology and aesthetics of the slope itself.

Any artificial basin which accumulates water artificially for removal elsewhere alters the natural balance of rivers and the groundwater-table and can also have significant ecological impact. The exploitation or overexploitation of underground fluids, especially water, but also oil and gas, through the sinking of wells may also produce various negative phenomena, including subsidence of the ground surface. Other harmful effects can include permanent lowering of the water table, changes of the ground level or the sea bed, changes to drainage systems including both surface (i.e. rivers) and underground, alteration of groundwater chemistry, contamination, etc. There are also major problems associated with the construction of ports or coastal defenses. These works can significantly modify sea bed sediments, the morphology of the seabed, wave and currents action and hence may strongly influence the future evolution of the surrounding coastline. Possible consequences include speeding up coastal erosion in adjacent areas, leading to a disappearance of beaches and retreat of the land leading to threats to property and habitats.

9.4. How quarries and mines alter the Earth's surface

Quarries are sites where bulk geological materials are extracted as a resource for construction, agriculture (e.g. lime production) and ornamental uses. Typically, mines are areas where more restricted mineral deposits, for instance in veins or layers are extracted. These minerals include coal, metal ores and gemstones. These deposits can either be worked underground using vertical shafts and tunnels, or extracted in large surface excavations known as ‘opencast’ workings. Whether they are above ground or below ground, mines can have a major impact on natural environments, including:

- Increasing slope instability, leading to collapses and rock falls.
- Disfigurement of a natural landscape, including both through direct excavation and through the tipping of waste materials.
- Destruction of natural habitats, forcing either the migration or the disappearance of the species of animals and plants that inhabit them.
- Interference (including contamination) of surface and ground water systems.

- Production of large volumes of waste materials.
- Air pollution, including dust production.
- Noise pollution through the use of machinery and blasting.

At the end of extraction phase, such sites may be simply abandoned, without appropriate restoration to other uses or to nature and many may become waste disposal sites, or even illegal dumps, leading to further environmental issues. Although some mines and quarries may become important sites for viewing and learning about geology and geological heritage, unless they are well managed, some can still potentially affect the health and quality of life of people living near the works, the natural landscape, the soil and subsoil, air and water quality and flora and fauna.

9.5. How can we minimise the impact of mining and quarrying

Studying the interactions between the natural environment and human activity is fundamental for the protection of landscapes and the Earth's resources. In addition, it is essential to try and put into practice techniques which allow the recovery of damaged natural landscapes and processes. For example the restoration of former quarries and mining areas is becoming a common practice, even long after their closure. The procedures adopted include restoring the original landscape by infilling to the original land surface, the transformation of the quarry site into a nature reserve (including geosite), use of underground facilities, development of recreational, touristic or educational use of the area (including development of parks), flooding to form lakes, etc. In some cases, abandoned quarries are used as landfill sites for waste, which can contribute to their infill and return of the area to a former ground level.

The impact of human activities can be further reduced through:

- Increasing awareness of environmental issues.
- Developing a respect for nature through education.
- A more effective state regulation of potentially environmental damaging activities.
- More sensitive management and safeguard of natural resources.
- Development of a more sustainable use of the environment and landscape.
- Adopting land use planning systems which respect and conserve key natural resources.

9.6. How human activities can destroy the evidence of the history of Earth

All landscapes and ecosystems on Earth today are the result of natural processes taking place over hundreds, even sometimes thousands, of millions of years and for this reason, they are evidence of the geological history of Earth and must also, therefore, be considered to be an environmental asset. From the first appearance of human societies, people have contributed to the story of the Earth, but in the last few centuries this activity has become so intensive that it has begun to destroy some of this natural heritage. Human activities, such as intensive agriculture, large-scale industrialisation and urbanisation, pollution, deforestation, alteration of natural waterways and construction of canals, dams, roads and buildings, changes the natural landscape, destroying or significantly modifying natural features - hence contributing to this ongoing disappearance of the remains and traces of the natural history of our planet.

Intended learning outcomes:

- Explain why people are considered to be important modifying agents of the landscape.
- Describe human impacts on nature.
- Explain how human activities change the landscape.
- Explain how quarries and mines alter the Earth's surface.
- Know how to minimize human impacts on the environment and landscape.
- Appreciate the value of nature.

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