

Sheep in the land of Fire and Ice

Glossary

Adaptive management

Adaptive management is a structured, iterative process of robust decision making in the face of uncertainty. Through monitoring systems responses, adaptive management accrues information needed to improve future management and reduces uncertainty over time. Adaptive management is widely applied in conservation and natural resource management, and it involves the integration of designing and managing the project with monitoring to systematically test the initial assumptions in order to adapt and learn.

Adaptive monitoring

The application of the [adaptive management](#) framework to environmental monitoring is called adaptive monitoring. This approach allows monitoring programs to evolve as we learn more about the system and new information becomes available. One of the challenges is that these changes and refinements of the research questions should not breach the integrity of past and ongoing data collection.

Andosols

Andosols (andisols in the USDA Soil Taxonomy) are highly porous, dark-coloured soils developed from parent material of volcanic origin. Andosols occupy less than 1 percent of the ice-free land area on Earth, mostly around the Pacific Ring of Fire, but they also occur in the East African Rift, Italy, Iceland and Hawaii.

Andosols contain high proportions of glass and amorphous colloidal materials. Because they are generally young soils, Andosols are typically very fertile, and in many regions Andosols support intensive cropping. The physical characteristics of Andosols include high infiltration rates and hydraulic conductivity, but also high wind erosion susceptibility. Andosols have extremely high water retention but a low plasticity index. These properties contribute to the high susceptibility of Icelandic Andosols to frost heave, land sliding, and transport by rain-splash and running water.

Arctic Circle

The Arctic Circle marks the southernmost latitude (66°) in the Northern Hemisphere at which the centre of the sun can remain continuously above or below the horizon for twenty-four hours. Directly on the Arctic Circle these events occur, in principle, once per year at the June and December solstices, respectively. The region north of this circle is known as the Arctic, and the zone just to the south is called the Northern Temperate Zone.

Iceland is not truly in the Arctic, as the Arctic Circle only passes through the small island of Grímsey, off the northern coast of Iceland.

Biodiversity

Biodiversity generally refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level and thus includes diversity within species, between species and of ecosystems. Terrestrial biodiversity is not distributed evenly on Earth, and tends to be greater in tropical areas near the equator¹. Declines in biodiversity and the accompanying loss of genetic diversity have been associated with human impacts, particularly habitat destruction, introduced and invasive species and overexploitation. For more information see the [Biodiversity Factsheet](#) published by the United Nations Environmental Programme (UNEP).

Biological crust

Biological soil crusts are communities of living organisms that grow on the soil surface, typically in arid and semi-arid ecosystems. They are often composed of fungi, lichens, cyanobacteria, bryophytes, and algae in varying proportions. Biological soil crusts perform important ecological roles including carbon fixation, nitrogen fixation and soil stabilization. Biological crusts also alter soil albedo and water relations, and affect germination and nutrient levels available for vascular plants. They can be damaged by fire, recreational activity, grazing, and other disturbances and can require long time periods to recover.

Carrying capacity

The carrying capacity of a species in an environment is the maximum population size of the species that the environment can sustain indefinitely, given the resources available in the environment. The concept of carrying capacity was originally used to determine the number of animals that could graze on a land without destroying it. Below carrying capacity, populations typically increase, while above, they typically decrease. The carrying capacity of an environment may vary for different species and may change over time due to a variety of factors, including food availability, water supply, environmental conditions and living space.

Coprophilous fungi

Coprophilous fungi are specialized on growing on animal dung. Coprophilous fungi release their spores to the surrounding vegetation, which is then eaten by herbivores. The spores pass through the animal's digestive tract and are defecated. Animal feces provide an environment rich in nitrogen, where the fruiting bodies of the fungi can grow. Because of their intimate relationship with grazing animals, the presence of spores of coprophilous fungi in the [palaeoenvironmental record](#) are reliable indicators of the presence of grazers in past times.

Desertification

The [United Nations Convention to Combat Desertification \(UNCCD\)](#) defines desertification as "*land degradation in arid, semi-arid and dry sub-humid regions resulting from various factors, including climatic variations and human activities.*" In general, desertification is caused by variations in climate and by unsustainable land-management practices in dryland environments. By their very nature, arid and semiarid ecosystems are characterized by sparse or variable rainfall. Thus, climatic changes such as those that result in extended droughts can rapidly reduce the biological productivity of those ecosystems. At the same time, because drylands are used for a variety of human purposes (such as agriculture and fuelwood collection), the various activities undertaken in them can exacerbate the problem of desertification and bring about lasting changes to dryland ecosystems.

Ecological thresholds

An ecological threshold is the point at which a relatively small change or disturbance in external conditions causes a rapid change in an ecosystem. When an ecological threshold has been crossed, the ecosystem may no longer be able to return to its original state. Ecological thresholds represent a non-linearity of the responses in ecological or biological systems to pressures caused by human activities or natural processes.

Ecosystem services

Ecosystem services are the many and varied benefits that humans gain from the natural environment and from properly-functioning ecosystems. The concept of ecosystem services was popularized by the [Millennium Ecosystem Assessment \(MA\)](#) in the early 2000s. Ecosystem services are grouped into four broad categories: provisioning services, such as the production of food and water; regulating services, such as the control of climate and disease; supporting services, such as nutrient cycles and oxygen production; and cultural services, such as spiritual and recreational benefits.

Ecosystem states

In ecology, the theory of alternative stable states predicts that ecosystems can exist under multiple "states" (sets of unique biotic and abiotic conditions). These alternative states are non-transitory and therefore considered stable over ecologically-relevant timescales. When perturbed, ecosystems may transition from one stable state to another, in what is known as a state shift or transition. Due to ecological feedbacks, ecosystems display resistance to state shifts and therefore tend to remain in one state unless perturbations are large enough. Alternative stable state theory suggests that discrete states are separated by [ecological thresholds](#), in contrast to ecosystems which change smoothly and continuously along an environmental gradient. In [state and transition models](#), ecosystem states are represented by boxes, and arrows indicate the possible shifts between ecosystem states.

Environmental conditions

Environmental conditions comprise all the environmental or ecological factors that influences living organisms or their interactions. These environmental factors can be either biotic or abiotic. Abiotic factors include for example ambient temperature, amount of sunlight, and pH of the water or soil in which an organism lives. Biotic factors include the availability of food and the presence of conspecifics, competitors, predators, and parasites.

In the course we talk about the environmental conditions in which herbivory takes place. By that we mean all the environmental factors that can affect the outcomes of herbivory. For example, soil fertility (abiotic factor) can influence the ability of plants to regrow after being partially eaten. Similarly, the presence of predators (biotic factors) can influence where in the landscape herbivores will graze.

Environmental degradation

The [United Nations International Strategy for Disaster Reduction](#) defines environmental degradation as "*the reduction of the capacity of the environment to meet social and ecological objectives, and needs*". Environmental degradation is of many types. When natural habitats are destroyed or natural resources are depleted, the environment is degraded. Environmental degradation is one of the ten threats officially cautioned by the High-level Panel on Threats, Challenges and Change of the United Nations. Efforts to counteract this problem include environmental protection and environmental resources management.

Farmers Heal the Land

The Farmers Heal the Land (*Bændur Græða Landið*) is a 'cost-share' program initiated by the [Soil Conservation Service of Iceland](#) to assist farmers to revegetate degraded land, to halt erosion, and to reclaim land. The program started in 1990 with the aim of improving management and land quality. The program was adapted from the Australian landcare movement. Currently, around 30% of Icelandic farmers participate in the program.

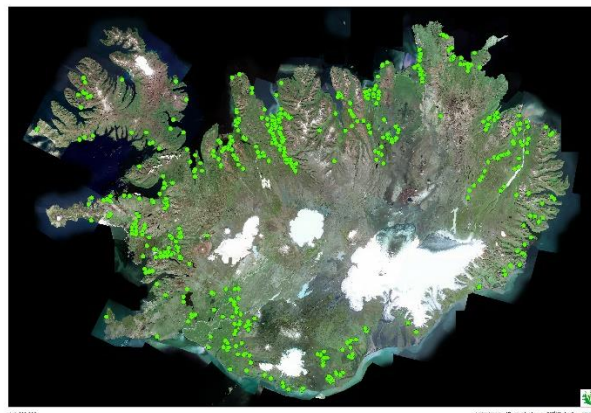


Figure 1. Map of participating farms in the Farmers Heal the Land programme in 2018 (source: Soil Conservation Service of Iceland)

Frost-heaving

Frost heaving is an upwards swelling of soil during freezing conditions caused by ice as it grows towards the surface from the depth in the soil where freezing temperatures have penetrated the soil (the frost front; **Figure 1**). Ice growth requires water supply via capillary action from the soil. The weight of the overlying soil restrains vertical growth of the ice and can promote the formation of lens-shaped areas of ice within the soil, but the growth of the ice lenses pushes the soil upwards. [Needle ice](#) is frost heaving that occurs at the beginning of the freezing season, before the freezing front has penetrated very far into the soil and there is no soil overburden to lift as a frost heave.

Frost heaving creates typical raised-soil landforms, such as palsas in soils that are rich in organic matter. In Arctic permafrost regions, a related type of ground heaving over hundreds of years can create structures, as high as 60 metres high, known as pingos, which are fed by upwelling of ground water, instead of the capillary action that feeds the growth of frost heaves. Cryogenic earth hummocks are small formations that appear in seasonally frozen ground; these formations are called *púfur* in Iceland.

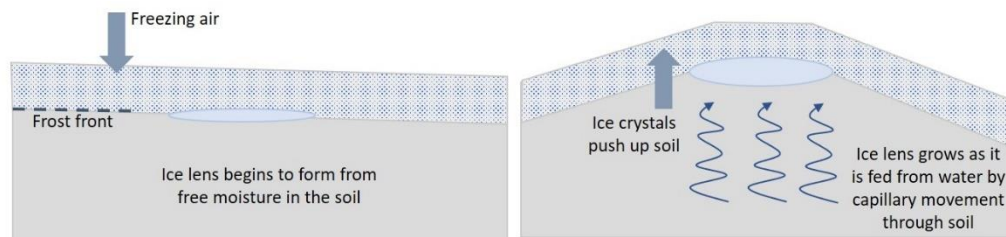


Figure 2. Frost heaving. The formation of ice lenses can push up the soil creating different land forms.

Forestry Service of Iceland

The [Icelandic Forest Service \(IFS\)](#) is a governmental institution that works with the government, the public and other interested parties, on research, development, consultation and distribution of knowledge within forestry. For over a century the IFS has been protecting and expanding the remaining native birch woodlands in Iceland as well as executing afforestation projects and growing commercial forests on its lands across the country. In recent years, carbon sequestration has become one of the most important drivers of new afforestation projects in Iceland.

Grazing commons

Common land is owned collectively by several people, or by one person, but over which other people have certain traditional rights, such as to allow their livestock to graze upon it, to collect wood, or to cut turf for fuel. In Iceland, most local farming communities have rights to grazing commons that are usually located in the Highlands. Grazing commons vary in size, from less than 100 km² to more than 5000 km², and are limited by natural boundaries, like large rivers, glaciers or high mountains, or by fences.

Grazing systems

A grazing system is a particular way of managing the interactions between plants, soils, and grazing animals. When properly implemented, a grazing system can help rangeland and livestock managers achieve management objectives related to rangeland and livestock production and ecosystem structure and function. The selection of a proper grazing system depends on understanding the unique combination of topography, soils, vegetation types, and climate in an area; each grazing system is thus appropriate for specific conditions.

Herbivore

A herbivore is an animal anatomically and physiologically adapted to eating plant material as the main component of its diet. Herbivores form an important link in the food chain because they consume plants; carnivores in turn

consume herbivores, while omnivores can obtain their nutrients from either plants or animals. Herbivores play important roles in processes that determine the functioning of both natural and managed ecosystems.

Highlands

Highlands generally refer to any mountainous region or elevated mountainous plateau. The Highlands of Iceland cover about 75% of the country and are generally considered to be any land at elevations above 400 meters. Most of the Highlands are dominated by tree-less heathlands and wetlands, and extensive, sparsely vegetated deserts.

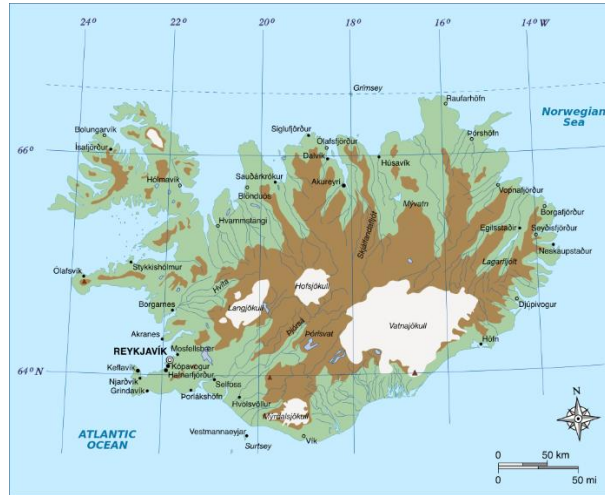


Figure 3. Map of the Highlands of Iceland (source: [Map of Iceland highlands.svg](#) by Pethrus)

Icelandic low

The Icelandic low is a semi-permanent centre of low atmospheric pressure found between Iceland and south Greenland. The exact location of the Icelandic low varies seasonally: in winter it extends into the Barents Sea, and in summer it weakens and splits into two centres, one near Davis Strait and the other west of Iceland. The Icelandic low is a main centre of action in the atmosphere circulation of the Northern Hemisphere, associated with frequent cyclone activity. The Icelandic low forms one pole of the North Atlantic Oscillation (NAO), the other being the Azores High. Through fluctuations in the strength of the Icelandic low and the Azores high, the NAO controls the strength and direction of westerly winds and the location of storm tracks across the North Atlantic.

Icelandic plume

Iceland lies above a hotspot, a volcanic region thought to be fed by underlying mantle that is anomalously hot compared with the surrounding mantle. This hotspot is called the Icelandic plume. The volcanism of Iceland is attributed to this plume, which is believed to have caused the formation of Iceland itself, when it appeared over the ocean surface about 16 to 18 million years ago. Since Iceland is located on the [mid-Atlantic Ocean ridge](#), some scientists believe the Icelandic plume could have contributed to the rifting of Pangaea and the subsequent formation of the Northern Atlantic Ocean, because igneous rocks found on both sides of the Mid-Atlantic Ocean ridge originating from the Icelandic plume are 57-53 million years old (around the time North America and Eurasia separated and the sea floor started to spread in the Northeast Atlantic).

Icelandic sagas

The Icelandic Sagas (*Íslendingasögur*) were written in the 12th and 13th century and tell the stories of the early settlers of Iceland from the 9th, 10th, and early 11th centuries, during the so-called Saga Age. The sagas provide a great source of historical knowledge about the early years of settlement in Iceland. The sagas reflect the struggle and conflict that arose within the societies of the early generations of Icelandic settlers, and are focused on history, especially genealogical and family history.

Icelandic sheep

The Icelandic sheep is a breed of the Northern European short-tailed sheep, brought to Iceland by the first settlers. The Icelandic sheep is a mid-sized breed, generally short-legged and stocky, with face and legs free of wool. The fleece of the Icelandic sheep is dual-coated and occurs in white and a variety of other colors, including brown, grey and black. The Icelandic sheep has been used for meat, wool and milk; it is not a very productive breed but is very cold-hardy.

Land degradation

Land degradation is a process in which the value of the biophysical environment is affected by a combination of human-induced processes acting upon the land. It is viewed as any change or disturbance to the land perceived to be deleterious or undesirable (see also [environmental degradation](#)).

Landnám

The settlement of Iceland (*landnám*) is generally believed to have begun in the second half of the ninth century, when Norse settlers migrated across the North Atlantic. Written sources consider the age of settlement in Iceland to have begun with settlement by Ingólfur Arnason around AD 874. Archaeological evidence shows that extensive human settlement of the island indeed began at this time. Estimates of the number of people who migrated to the country during the Age of Settlement (from 874 to 930) range between 4,300 and 24,000.

Landnám tephra

Two large volcanic eruptions took place in southern Iceland around the time of human settlement (~ AD 871) and deposited a tephra layer over almost the whole country. The layer, which is usually called the landnám tephra, provides a marker horizon that helps in reconstructing the history of human settlement in Iceland and its environmental impact.

Maedi-visna disease

Maedi-visna disease is a viral infection, sometimes known as "ovine progressive pneumonia" (OPP). The maedi-visna virus is a Lentivirus that was first described in Iceland in 1954 by Björn Sigurdsson. The disease was introduced to Iceland following an import of Karakul sheep from Germany in 1933. The virus causes encephalitis and chronic pneumonia in sheep. The virus is known as visna when found in the brain, and maedi when infecting the lungs. Lifelong, persistent infections in sheep occur in the lungs, lymph nodes, spleen, joints, central nervous system, and mammary glands. The infection may progress to total paralysis leading to death via inanition. The susceptibility to maedi-visna infection varies across sheep breeds. Eradication programs have been established in countries worldwide.

Mid-Atlantic Ocean ridge

The mid-Atlantic Ridge is a mid-ocean ridge, a divergent tectonic plate boundary located along the floor of the Atlantic Ocean. Even if mostly underwater, the mid-Atlantic Ocean ridge is the longest mountain range in the world! In the North Atlantic, the mid-Atlantic Ocean ridge separates the Eurasian and North American plates, and in the South Atlantic it separates the African and South American plates. The section of the ridge that includes Iceland is known as the Reykjanes Ridge. The ridge has an average spreading rate of about 2.5 centimetres per year.

Native species

In biogeography, a species is native (or indigenous) to a given region or ecosystem if its presence in that region is the result of only natural processes, with no human intervention. The Bern Convention (1979) defines native species as "a species that has been observed in the form of a naturally occurring and self-sustaining population in historical times." In contrast, an introduced species (alien, exotic, or non-native species) is a species living outside its native distributional range, but which has arrived there by human activity, either deliberate or accidental. Non-native

species can have various impacts on the local ecosystem. Introduced species that become established and spread beyond the place of introduction are called invasive species.

Needle-ice

Needle-like ice crystals are formed when water in the soil is brought to the surface via capillary action and freezes in contact with below 0°C air temperatures. The formation of needle-ice requires the presence of flowing water underneath the surface. The ice needles are typically a few centimeters long. While growing, ice needles can lift or push away soil particles, rocks and even seedlings, preventing the establishment of new plants.

NDVI (Normalized Difference Vegetation Index)

The Normalized Difference Vegetation Index (NDVI) is an index of greenness that can be calculated based on the difference between red and near infrared light that is absorbed and reflected by plants relative to incoming radiation. Because green plants actively absorb red light and reflect near infrared light NDVI allows detecting changes in cover of vegetation at a large spatial scale using satellite images and remotely-sensed data.

North Atlantic current

The North Atlantic current is an oceanic current within the Atlantic Ocean that extends the Gulf Stream northeastward. The North Atlantic current transports warm tropical water to northern latitudes and is characterized by warm temperature and high salinity. The current often mixes with northern cold polar water to produce excellent fishing grounds near islands and along the coast of northwestern Europe. The North Atlantic current is responsible for the relatively warm winters of northwestern Europe.

Overgrazing

Overgrazing occurs when plants are exposed to excessive grazing for extended periods of time, or without sufficient recovery periods. Overgrazing can alter plant communities and deplete plant resources, and eventually can lead to vegetation degradation and soil erosion. The likelihood of overgrazing depends on the characteristics of the system and how plants respond to herbivory.

Paleoenvironmental record

The paleoenvironmental record includes all the information available to reconstruct what the climate and vegetation were like at a particular time and place in the past. This information is usually extracted from soil cores, for example from peatlands and lakes, but also from ice cores from glaciers. Sediments are deposited and become characterized by the environment in which they were formed. The data that are collected and interpreted in paleoenvironmental reconstruction are known as proxies, and include pollen grains of plants, spores of fungi, microfossils and chemical signatures.

Participatory approaches

Participatory approaches aim at the active involvement and empowerment of stakeholders. Participatory approaches include a range of activities that enable ordinary people to play an active and influential part in decisions which affect their lives.

Plant productivity

In ecology, productivity refers to the rate of generation of biomass in an ecosystem. Productivity of plants is called primary productivity and involves the synthesis of organic material from inorganic molecules such as H₂O and CO₂ using sunlight, in a process called photosynthesis. In colder regions primary productivity is relatively low compared to warmer regions, because both temperature and the availability of sunlight limit plant productivity to certain times of the year (i.e. the plant growing season).

Polar cell

Global circulation patterns are created by differential heating of air masses on the planet. Air masses at the 60th parallel undergo convection and drive a thermal loop, called the Polar cell. At 60° latitude, the air is still sufficiently warm and moist so it rises to the tropopause (about 8 km at this latitude) and moves poleward. As it does so, the upper level air mass deviates toward the east because of the rotation of the Earth. When the air reaches the polar areas, it has cooled and is considerably denser than the underlying air. It descends, creating a cold, dry high-pressure area. At the polar surface level, the mass of air is driven toward the 60th parallel, replacing the air that rose there, and the polar circulation cell is complete.

You can read more about global circulation patterns on the website of the [UK Meteorological Office](#).

Réttir

The end of summer round-up of sheep from the Highland rangelands in Iceland is called réttir. Sheep are collected from the mountain ranges on foot, horse or ATVs, aided by sheepdogs. The sheep are brought back and sorted at the rétt, a circular pen with radiating sections where farmers separate their herds. The réttir has become a big country party, where friends, family, and neighbors come together to play music, picnic outdoors, and help each other collect their sheep.



Figure 4. Hamarsrétt in North Iceland. When sheep are collected from their summer ranges they are sorted out in these circular pens. Initially sheep are driven to the central area, and the farmers separate their herds into the different sections.

Rofabard

One of the most distinctive erosion forms in Iceland is the rofabard. Rofabards are erosion escarpments formed in thick but non-cohesive Andosols that overlie more cohesive materials. As erosion progresses, the relatively loose Andosols are undermined and escarpments are formed, with a resistant root mat on top. Rofabards can have various shapes, with heights ranging from about 20 cm to more than 3 m. The height of a rofabard is affected by the eroded material in the surroundings that are trapped in the remaining vegetation on top, so the height of a rofabard does not reflect the thickness of the original soils. An important characteristic of rofabards is that they retain the escarpment form as they retreat as active erosion progresses.

Seasonality

In time series data, seasonality is the presence of variations that occur at specific regular intervals less than a year. In ecological systems, seasonality may include variations in temperature, precipitation, or other processes. Seasonal variables relevant in ecological systems obviously include temperature and photoperiod, but also include rainfall, wind, human activity, upwelling, and resource pulses.

Selective foraging

One of the mechanisms through which herbivores have impacts on vegetation is through selective feeding. By eating some plants and not others, herbivores can influence the structure and composition of plant communities. Other mechanisms through which herbivores affect their environments are [trampling](#) and [waste deposition](#).

Sheep scab

Sheep scab is a contagious disease caused by the mite *Psoroptes ovis*. Affected sheep develop large, yellowish, scaly, crusted lesions, accompanied by damage to the wool and hide. Emaciation and secondary bacterial infections can occur in untreated animals. Sheep scab is an animal welfare concern due to the pain and irritation caused by the mites. This mite is usually transmitted by direct contact between animals, but it can also be spread through fenceposts and other structures that sheep use when scratching themselves. Not all infested animals develop symptoms, and asymptomatic sheep can also spread the infestation to other animals.

Soil Conservation Service of Iceland

The [Soil Conservation Service of Iceland](#) (SCSI, Landgræðsla ríkisins) is a governmental agency under the Ministry for the Environment and Natural Resources. The Soil Conservation Service of Iceland was founded in 1907 with the main aims of combating desertification, sand encroachment and other soil erosion, promotion of sustainable land use and reclamation and restoration of degraded land.

Soil erosion

Soil erosion is the loss of the upper layer of soil, as a result of the dynamic activity of erosive agents like water, ice, wind, or human activities. Human activities have increased by 10–40 times the rate at which erosion is occurring globally. Intensive agriculture, deforestation, anthropogenic climate change and urban sprawl are amongst the most significant human activities in regard to their effect on stimulating erosion. Soil erosion causes declines in agricultural productivity and can lead to [desertification](#).

State and transition models

State and transition models (STMs) are used to organize and communicate information regarding ecosystem change, especially the implications for management. The value of STMs for rangeland managers is in fostering a general understanding of how rangelands function and respond to management actions, thereby leading to more efficient and effective allocation of management efforts. STMs provide a simple representation of different ecosystem states and the possible shifts between them in response to management actions or natural processes.

Stocking rate

Stocking rate is defined as the number of animals on a given amount of land over a certain period of time. Stocking rate is generally expressed as animal units per unit of land area.

Subsidies

A subsidy or government incentive is a form of financial aid or support extended to an economic sector (or institution, business, or individual) generally with the aim of promoting economic and social policy. Subsidies come in various forms including: direct (cash grants, interest-free loans) and indirect (tax breaks, insurance, low-interest loans, accelerated depreciation, rent rebates) subsidies. The most common forms of subsidies are those to the

producer (ensuring producers are better off by either supplying market price support, direct support, or payments to factors of production) or the consumer (for example reducing the price of goods and services to the consumer).

Sustainable management practices

The definition of sustainability stands on three pillars: the environment, the needs of present and future generations, and the economy. Sustainable practices are thus those that maintain economic viability without compromising the needs of the present and future generations by limiting resource depletion. Sustainable management applies sustainability principles to the management of natural resources in a way that will benefit current and future generations. Sustainable management is critical to successfully maintain the quality of life on our planet.

Tephra layer

Tephra is fragmental material produced by a volcanic eruption. Once deposited on the ground, this volcanic ash forms deposits or layers that can be used as markers in the stratigraphy. Tephra layers bear their own unique chemistry and character and their age is usually known. Tephrochronology is a geochronological technique that uses discrete tephra layers to create a chronological framework in which paleoenvironmental or archaeological records can be placed.

Trampling

One of the mechanisms through which herbivores have impacts on vegetation is through trampling. By walking on soil and vegetation herbivores (especially large herbivores) damage vegetation and cause soil compaction. The intensity of trampling will depend on the body size of the animal and the shape of its footprints, as well as on the density of animals using an area. In tundra ecosystems the effects of trampling by large herbivores are noticeable through their effects on the moss layer. Trampling reduces the thickness of the moss layer, reducing its insulating effect, with consequences to soil temperatures and soil processes. Other mechanisms through which herbivores affect their environments are [selective foraging](#) and [waste deposition](#).

Trophic level

The trophic level of an organism is the position it occupies in a food chain, the succession of organisms that eat other organisms and may, in turn, be eaten themselves. The trophic level of an organism is the number of steps it is from the start of the chain. In a simple food chain, the first trophic level is comprised by primary producers such as plants; herbivores represent the second level, and carnivores the third level or higher, finishing with apex predators at level 4 or 5.

Volcanic active zone

Most of the volcanoes of Iceland are concentrated along the [mid-Atlantic Ridge](#), crossing the country from the southwest to the northeast. This area is geologically young and is less well vegetated than other areas in Iceland. Iceland has 30 active volcanic systems, of which 13 have erupted since the settlement in AD 874.

Waste deposition

One of the mechanisms through which herbivores have impacts on vegetation is through waste deposition. With their urine and their dung, herbivores affect the cycling of nutrients in the soil. Herbivores also redistribute nutrients across the landscape from the sites where they feed to the areas where they rest. Other mechanisms through which herbivores affect their environments are [selective foraging](#) and [trampling](#).