

Difference between processes of erosion and weathering in area undergoing glacial...

[Science](#), [Physics](#)



Erosion is defined as the removal and transport of earth materials by natural agents and can be split into two main categories. Abrasion (or corrasion) is the glacier's use of angular debris, held by the ice, to scrape away at the underlying rock. Evidence of this in an area undergoing glaciation are scratches on rock known as striations. Plucking involves the glacier freezing on to blocks of rock and pulling them away. Meltwater will assist in this plucking process: pressure builds up behind a protrusion of rock and so causes melting.

The meltwater penetrates any cracks and freezes around the rock (regelation) which is then pulled out by the glacier. Weathering is similar to erosion in that it includes the breakup of rocks, just not the transportation of the materials formed as does erosion. The specific definition of weathering is the breakup of rock due to exposure to the atmosphere. The weathering of a rock by freeze-thaw action (or frost shattering) may break up rock in periglacial conditions before glaciers advance.

At the early stage of corrie formation freeze-thaw action and possibly chemical weathering will weather rock beneath the accumulating patch of snow (the process of nivation). During glaciation, meltwater will give rise to freeze-thaw action at the base of the glacier. Examine the impact of glacially eroded landforms on human activity " The impact of glaciation on human activity has been considerable both in lowland and highland areas. " (David Jones and Lawrence Kimpton 2000).

This question focuses on how human activity has been affected by glacial erosion. The most recent glacial period began approximately 30, 000 years

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ago and ended 10, 000 years ago. At its peak 29% of the Earth's surface was covered by ice in comparison to 10% covered today. Sea level fell by at least 100 m and the beach was as much as 150 km further east along the Atlantic coast, thus forming land bridges between North America and Asia, which allowed for the migration of animals and humans to previously glaciated areas.

Glacial eroded landforms include the features horns (pyramid shaped peaks), arêtes (knife shaped ridges), cirques (a bowl shaped depression found in mountains), erratics (boulders), valleys, tunnels and lakes. These landforms have affected human activity in various ways, including tourism, communications, farming and settlement and industry. Many upland areas that experienced the effects of prolonged glacial erosion during the Pleistocene have become important centres of tourism.

Highland areas both those glaciated in the past and those with glaciers remaining today, are major areas of tourism because of the spectacular scenery and their suitability for winter sports. The Cirque-arete-trough landscape attracts hill walkers, scramblers, climbers, mountaineers, photographers, botanists, skiers, snowboarders, hang gliders, painting, canoeing, sailing etc. In Britain, the Highlands of Scotland have become an important centre for summer holidays and winter skiing, whilst the National Parks of Snowdonia, the Lake District and Peak District are visited by millions of tourists each year.

Areas such as the Lake District are increasingly popular for short weekend breaks. The attractions of these areas for tourism owe much to the effects of glaciation. The sharply defined peaks, deep U-shaped troughs and numerous lakes are all impressive landform features and provide these uplands with their attractive scenery. The rugged landscape appeals to many weekend hill walkers and mountaineers. The lakes which provide a range of activities - sailing, canoeing, swimming- and possess their own pleasant climates have become important centres of tourism.

Large scale winter tourism is promoted in the Alps and similar locations by the existence of permanent snowfields and the heavy winter snowfall.

Aviemore is one of the largest winter tourism centres in Britain with several ski runs on the upper slopes of the Cairngorms. Communications are also affected by glacially eroded landforms. Glaciated valleys offer natural routeways through high mountain landscapes and lower areas e. g. the Mohawk Gap that leads to New York. Settlement and Industry can hug the glacial trough floor, which often provide transport routeways.

Many aspects of transport and communications -by land, sea and waterways -have been affected to a considerable degree by glacial action. In many upland areas, glacial breaches and troughs often form the only routeways suitable for communication by land. This situation is exemplified in the Highlands of Scotland where communications links by land north, and west of the Glen More are extremely difficult. Much of the land surface lies over 1000 metres above sea level, and consists of rugged mountains with steep, precipitous slope and badly drained moorlands.

The presence of numerous lochs and fjords, hemmed in between high mountains, has effectively prevented any significant north-south routes being developed, even along the coast. Glacial breaches across the major watersheds form the only realistic routeways. Only two railway lines traverse the region -from Dingwall to Kyle of Lochalsh via Glen Carron and from Fort William to Mallaig via Lochs Eil and Ailort. All of the road links between Glen More and the west coast rely on glacial breaches which connect westwards and eastwards facing troughs. Glaciated highlands with high snowfalls present hazards such as avalanches.

As the pressure of development increases, as in skiing areas, the impact of avalanches on people and settlements becomes greater. They are caused when the snow pack is destabilised suddenly by a loss of cohesion between naturally forming layers in the snow. Glacially eroded areas can lead to a channelled avalanche by which the avalanche progresses down a gully. Avalanches can block roads and railways, cut off power supplies and telecommunications and under extreme conditions, destroy buildings and cause loss of life. Therefore, glacially eroded landforms have impacted human activity, leading to management programs.

For example Juneau, in Alaska, has a high avalanche risk. Many houses and businesses lie in the direct path of known avalanche routes and thus the various management schemes as seen above were discussed, and some put in place to protect the now habituated area. However, avalanches only present problems to certain areas. Slopes, for avalanches to occur, are usually greater than 22 degrees but less than 60 degrees, beyond which

point it is unlikely that any significant snow pack will build up. Avalanches also tend to occur more often in spring when the temperatures rise and the snow pack has been accumulating all winter.

Prosperity can be gained from the industrial development available due to glacially eroded landforms. Glacially eroded landforms offer scope for HEP production, with their steep, deep valleys for storage and rock lips providing sites for dam construction. Hydroelectric power (HEP) is the most widely used renewable form of energy. Although globally it accounts for only 6 percent of all electricity generated, in some countries it provides much more. Norway, for example, produces 96 percent of its electricity from HEP. The scale of HEP schemes varies enormously.

In some Alpine villages, small HEP generators supply the power for a single house or hotel. At the other extreme, large HEP stations feed directly into the UK national grid. The advantage of HEP is that running costs are very low and power is instantly available. The main disadvantages are that initial building costs are high, the visual impact might damage the scenic value of a landscape, and the demand for energy is often some distance away. The positive impact of this on human activity can however have some negative impacts. Some ecological damage is also caused if the migratory routes of fish, such as salmon, are blocked.

Fish ladders are sometimes built to avoid this problem. Also, when water passes through HEP schemes, the effect of the vertical drop can be to increase the amount of dissolved oxygen and nitrogen in the water. This can

be harmful to fish, causing gas bubble disease. HEP in Britain is mostly generated in the glaciated uplands of North Wales, Cumbria and the Scottish Highlands. This is, because, firstly, mountain areas receive the highest rainfall in Britain. For a successful scheme to operate there must be a, reliable supply of running water otherwise the turbines will not turn.

Secondly the physical relief is favourable. Glacial troughs, steep stream gradients, hanging valleys and lakes provide the ideal conditions. If natural lakes do not occur, glaciated valleys are relatively cheap to dam because they tend to be narrow and steep sided. Water which is used for HEP is not wasted, it then carries on down the valley. If the valleys are dammed, and the shape of the glacial troughs makes this very straightforward, then the water can be collected and sent to cities in areas of the country where there is perhaps not as much rain as in the highland areas.

Glaciers impact human activity here by provide drinking water direct in some areas: rivers like the Rhine and Rhone are fed from glaciers. There is a fear that they may dry up if global warming melts the Alpine glaciers. People in La Paz, Bolivia have water from nearby glacier as public supply. People in the Rhone valley channel glacial meltwater to irrigate their crops. Llyn Peris is a moraine dammed overdeepened ribbon lake, and provides water for Llanberis in N. Wales.

Lake Vyrnwy in mid Wales occupies a glacial trough which was flooded in 1889 by building a dam across the valley. Glacially eroded landforms affect human activity both positively and negatively. Avalanches expose

inhabitants of the area to great risk, however, they still choose to live there. The positives include tourism, an industry which at present day is thriving and the attractions of these areas owe much to the effects of glaciation. HEP power provides areas with renewable energy and areas with drinking water and natural routeways are provided by glacial erosion.