

## **STATION 1: ISENTHAL, SWITZERLAND**

### **Background Information**

Watch the [video on Isenthal, Switzerland](#).

Traveling south along the eighth meridian, you leave Germany and enter Switzerland. A gondola deposits you high up on the *Bywaldalp* overlooking Isenthal, Switzerland. You put on your summer jacket when you feel the cold air from the nearby [glacier](#). Water drips from the icy mass that clings to rugged rock. Seasonal glacial runoff feeds into Lake Lucerne, which was itself formed by the gouging and melting of ancient Ice Age glaciers. Modern seasonal glacial melt forms streams that provide fresh water for Alpine forest and meadow ecosystems and for humans in Alpine villages like Isenthal.

Descending along a narrow rocky path, you hike into a valley of green forests and grassy meadows. The summer melt from the glacier swells the stream you follow into Isenthal. In reality, you probably would not undertake such a trek, but this *Klimahaus* station provides a sense of the rugged topography and cool, windy conditions that make life in the Alps challenging.

Located at 8° 33' E, 46° 55' N, with a population of 503 residents, Isenthal is a rural community dependent on forestry, farming, and tourism for income. At an elevation of 2,530 feet, the climate of Isenthal is classified as highland (Alpine).

Cowbells clang from the necks of [Brown Swiss](#) dairy cattle grazing on the unique meadow grasses and herbs that give Swiss cheeses their distinctive flavors. In the distance, the sound of mudslides caused by water running from under melting glaciers echoes across the plateau. Families like the *Infangers* depend on predictable seasonal variations in precipitation and temperature to raise dairy cattle and make cheese.

Isenthal has no industrial smokestacks and few sources of transportation emissions. Could there be an unexpected source of anthropogenic (human-caused) greenhouse gas emissions grazing on the Alpine slopes—Brown Swiss cows? The answer is yes and no. Yes, cows are a source of methane, but no, the small herds of Brown Swiss cows are not the cause of warmer temperatures in the Alps.

The herds of Brown Swiss cows are relatively small. The cows are grass fed. The Alpine grasses and herbs consumed by the cows flavor the milk, giving Swiss cheese its distinctive taste. Cow manure dropped during grazing enriches the meadow soils, encouraging plant growth. Plants hold soil in place, which helps prevent erosion by wind and water.

Decomposition processes in soil serve as a source of carbon dioxide, but when left undisturbed, soil is a sink for carbon dioxide. Carbon dioxide will remain in the soil until the soil is tilled (turned over). Reduced till or no-till crop farming reduces the carbon dioxide release from crop farming.

[Methane](#), a gas with high global warming potential, is the natural by-product of a cow's digestive processes. Cow burps contain methane. According to a report from the Intergovernmental Panel on Climate Change, one-third of anthropogenic methane emissions are from ruminants like sheep and cattle. The levels of methane from cow burps and manure are greatest at large-scale feedlots. It would seem that the cause of climate change in Isenthal is not the local Brown Swiss cows, but rather human activity elsewhere in the world.

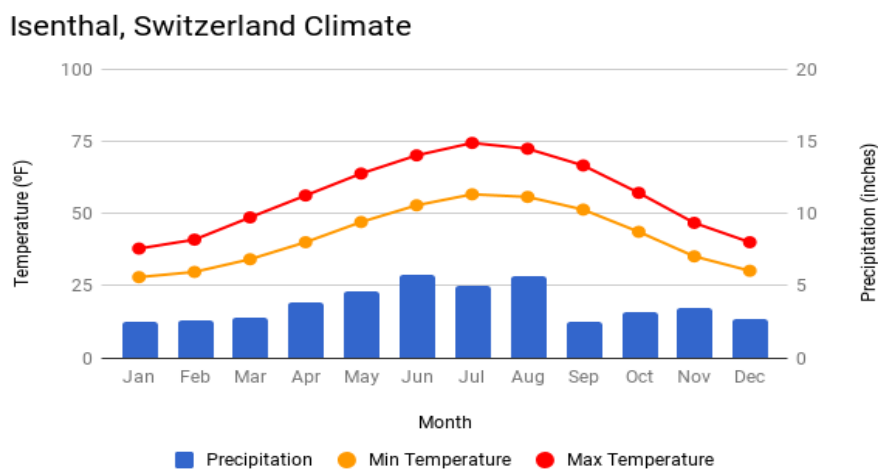
In Germany, *Donnerstag ist Veggietag* (Thursday is veggie day) started in 2010. [Meatless Monday](#) is another trend toward reducing consumption of beef and other animal products. Making one day a week vegetarian helps reduce greenhouse gas emissions. This

also means that there is a reduction in methane gas (due to less demand for meat). Instead of asking people to become vegetarians or vegans, Meatless Monday or *Donnerstag ist Veggietag* are good options to help reduce personal consumption of meat and reduce one's carbon footprint. What is being done in your community, school, or family to reduce your carbon footprint?

Rising temperatures are threatening the traditional way of life in Isenthal and other Alpine villages. Glaciers in the Alps are retreating at a record pace. Could turning on a light bulb in Bremerhaven or eating a hamburger in your hometown be affecting the climate in the Swiss Alps?

### Explore Isenthal

1. Use Google Earth to develop a sense of place.
2. Use the data and information on the climograph to observe patterns in rainfall and temperature.



3. Read “[Climate Change Taking Big Bite Out of Alpine Glaciers](#)” (Berwyn, 2017).
4. Explore glaciers using the [Global Ice Viewer at NASA Climate Change: Vital Signs of the Planet](#).
5. Identify factors that influence climate.
6. Identify sources of carbon dioxide and other greenhouse gas emissions.

Predicted Climate Change	Climate Change Threat	Climate Change Impact
Warmer winter and summer temperatures	Increased glacial melt	Increased stone and boulder avalanches
Reduced snowfall	Glacial retreat	Increased mudslides
Drier summers		
Increasing extreme weather events		

Analyze the climate change impacts of glacial retreat, and propose a mitigation and an adaptation strategy.

### Make a Model

Glacial melting and recession are associated with mudslides and rock slides in mountainous regions. Create a virtual or a physical model to show why landslides occur when glaciers recede.