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Distribution of Water and Precipitation

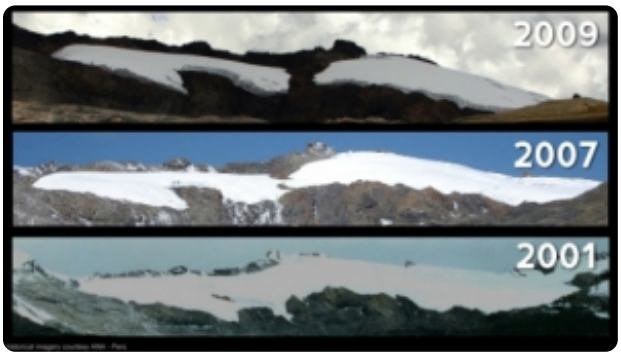

Figure 15: These photographs show the retreat of ***Peru's Pastoruri Glacier*** *between 2001 and 2009. Today, what little remains of the Pastoruri is no longer technically a glacier because it does not build up ice in the winter to release in the summer.*

Photo courtesy Daltonic Films, from the film "Glacial Balance"

Source: http://www.picarro.com/community/blog/glacial_balance

A recent study on Global Water Security estimated that during the next 10 years, many countries will experience water problems, such as water shortages, poor water quality, and floods. As we discovered in the Water Chapter, it is possible that the availability of fresh water will not be sufficient to meet the demands for water in the future, as is already the case in the western part of the United States and in many countries of Africa and Asia.

Global climate change is one of the drivers behind these water problems. For example, climate change has also caused the distribution patterns of snows and rains to change in many parts of the world. Many nations of the world depend on mountain **snowpack** melt for fresh water in the summer. However, warming temperatures caused by climate change will continue to change winter snowfall into rain, which quickly runs off

mountains and diminishes snowpack, thus reducing the amount of melt water stored in snowpack that becomes available in the summer.

North America, diminishment of snowpack is already affecting California, a state that depends on snowpack for 30% of its water supply. Similarly, in South America, Peru and Chili are also largely depend on glacier and snowpack meltwater during the spring and summer, but their major glaciers are shrinking (Figure 15). Kenya, in Africa, relies on the glacier atop **Mount Kilimanjaro** to provide life-giving water to all people living on the mountain and near the mountain's base. However, an estimated 82% of this glacier has melted since 1912, and today people are moving further and further toward the mountain top in a struggle to get their share of the dwindling water supply. At the present rate of melting, this glacier is expected to be completely gone in less than 15 years.

Figure 16: In 2010, Russia suffered a severe summer heat wave with temperatures reaching 101° F (38.33° C) and average temperatures 14° higher than normal for July. Wildfires erupted in Russia as did debate about the role of global climate change in the heatwave.See a summary of this debate.

Kari Greer/USFS Gila National Forest

Source: http://www.nasa.gov/topics/earth/features/climate-fire.html

Glacier and snowpack reduction can also ultimately reduce river flows. In the Water Chapter, we read about the Ganges River, which originates in the Himalayas and is a major water source to most of India. Glacier and snow melt support summer flows in Asia's major rivers, including the Ganges and Brahmaputra rivers of India, and the Yellow, Yangtze, and Mekong rivers in China. As glaciers diminish in size due to global warming, so does the source of water for these important rivers.

Droughts also diminish the availability of water for many in the world. For example, droughts reduce water flow in smaller rivers,

Looking Ahead

In the upcoming Global Climate Change and Action section, you will learn about Africa's efforts to combat climate change in its Action Against

causing nomadic herders such as those in Mongolia to move towards larger rivers. Unfortunately, the larger concentration of herders at bigger rivers destroys the vegetation in these riverside pastures, which are called **riparian** pastures. These pastures cannot sustain such high densities of grazing herds.

Desertification program.

Long periods of drought in East Africa and Australia have resulted in the death of large numbers of domesticated animals and wildlife. In Russia's wheat belt and the Western U.S., long droughts have spurred enormous wildfires, which destroy vegetation that stabilizes the soil (Figure 16). Areas that have experienced drought and wildfires are susceptible to mudslides, which are caused by intense rain storms that can follow drought and wildfires.

Intense rain storms are also becoming more frequent in general. Increased evaporation rates of surface ocean water due to warmer air and water temperatures provide more water vapor for rains, transforming gentle showers into more intense rainstorms, as the Mongolian herdsmen are experiencing.

Learn more about threats associated with the global ocean conveyor.

More intense rains can overwhelm storm water drainage systems in cities. In more rural areas, intense rains can cause increased soil **erosion** and damage to farm crops, and can kill farm animals, wildlife, and people who are washed into flooding streams and rivers. For example, in 2012, an intense rain storm hovered over Beijing, China, resulting in almost 200 mm of rain during a ten hour period, which caused flooding in many areas of the city. Similar heavy rains have hit Central Europe, Greece, and the United States.

Another concern is the impact of warming ocean water on the global ocean circulation currents, or the ocean conveyor, which in turn will affect regional climate and precipitation patterns.

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