The Cost of Climate Change in Colorado

Abstract

Climate change has hit the Midwest hard, significantly damaging the Colorado region in particular. Colorado has a history of frequent droughts and wildfires, and rising temperatures resulting from climate change have worsened these conditions in recent years. Climate change has also decreased the snowpack in the Rocky Mountains, which cuts into the profits of one of the state’s main sources of revenue: the ski industry. Here, I explore both the environmental and the economic effects of these changes on the Colorado region. I assess the cost of climate change in Colorado and conclude that policymakers must increase climate change research, decrease carbon emissions, and invest in tools to aid the failing ski industry in order to adapt to these changing conditions. Only with these measures in place can Colorado survive the impending catastrophe of global climate change.

Climate change scientists across the globe acknowledge and support findings that temperatures are rising. In regions with high susceptibility to hydrological crises, this warming causes serious problems. The Colorado region in particular has a history of frequent droughts and wildfires, and the state’s water supply depends on consistent snowfall. As climate change worsens, these conditions worsen, resulting in economic and environmental implications for the Colorado region.
Climate Change Will Increase the Frequency of Wildfires in the Colorado Region

Rising temperatures will increase the frequency of wildfires in Colorado, which will severely damage the climate and property of the state’s residents. Compared to the period from 1970 to 1986, the wildfire season length in Colorado increased by seventy-eight days for the period from 1987 to 2003 (West, Kumar, and Jarnevitch 566). Increased wildfire season length results in a longer period of time when Colorado fire prevention teams must enact fire suppression measures, which increases expenses for the state’s security budget as a whole. Not only is the wildfire season lengthening, the frequency of the wildfires themselves is also increasing: fourteen different global circulation models project that the relative probability for very large wildfires will increase by at least thirty percent for the West for the next fifty years (West, Kumar, and Jarnevitch 566). Increased wildfire frequency will also increase state expenses by destroying civilian property. In addition to damaging property, increasing frequency of wildfires will also cause extended deforestation. Forests compose twenty to forty percent of carbon pools in regions across the United States (West, Kumar, and Jarnevitch 575). Their photosynthesizing capacities allow forests to reduce the harmful impacts of carbon emissions, and many large forests are located in Colorado. However, emissions from wildfires occurring in these forests add to the concentration of carbon in the atmosphere. Thus, the increasing wildfire season length and frequency is likely to transition forests from carbon sinks to carbon sources (West, Kumar, and Jarnevitch 575). Increasing carbon will deteriorate the climate of Colorado. By intensifying the frequency of wildfires and subsequently damaging the climate and property of Colorado inhabitants, climate change negatively affects the Colorado region.
Climate Change Will Increase the Frequency of Droughts in the Colorado Region

Climate change will also harm Colorado by increasing the severity and frequency of droughts. The Colorado River Basin region is highly sensitive to climactic variability like temperature and precipitation changes. Reduced water availability to this region is acutely severe because the Colorado River Basin supplies water to approximately forty million people, irrigates over sixteen thousand square kilometers of cropland, and supplies hydropower plants that generate more than ten billion kilowatt-hours annually (Ayers, Ficklin, Stewart, and Strunk 3807). Thus, precipitation losses result in huge losses for the population of Colorado as a whole. Unfortunately, these losses have increased in recent years as a result of a global increase in average temperatures. Precipitation in the Colorado River Basin area has shrunk to sixty to seventy-five percent of its former normative levels (Ayers, Ficklin, Stewart, and Strunk 3808). These effects extend across the state, where each of the four major drainage basins were five to thirty-seven percent lower during the period from 2001 to 2010 than their average flows were during the twentieth century (Cayan, Dettinger, Pierce, Das, Knowles, Ralph, and Sumargo 20). Since loss of water to the state damages agriculture, energy, and the population as a whole, climate change damages the Colorado region by increasing the severity and frequency of drought.

Climate Change Will Decrease the Size of the Snowpack in the Rocky Mountains

One of the most harmful impacts of climate change on Colorado is the decreasing size of mountainous snowpack. Since 1950, warming temperatures in North America have resulted in a large-scale decline in winter and spring snowpack (Cayan, Dettinger, Pierce, Das, Knowles, Ralph, and Sumargo 26). Warming at the surface has caused an increase in the freezing altitude
of the atmosphere, which has risen two hundred meters since the period from 1950 to 1975. Since a rise in freezing altitude increases the elevation of the transition between rain and snow and between thawed and frozen ground, this effect has severely diminished the size of the snowpack in Colorado (Cayan, Dettinger, Pierce, Das, Knowles, Ralph, and Sumargo 24). The reduced fraction of precipitation falling as snow is particularly harmful because snowpack accounts for fifty to eighty percent of the Colorado River’s annual flow (Ayers, Ficklin, Stewart, and Strunk 3808). With less snow available to melt, large decreases in stream flow will occur throughout the Colorado River Basin region, augmenting the problem of drought. Thus, climate change will damage the Colorado region by reducing the size of the snowpack in the Rocky Mountains.

Declining Snowpack in the Rock Mountains Will Harm the Colorado Ski Industry

Reduced snowpack harms Colorado economically because the ski industry relies on consistent annual snowfall. Climate change scientists project that the snow season in the Rocky Mountains will decline by thirty days as a result of reduced snowpack (Williamson and Ruth 8). The average ski resort requires one hundred to one hundred and five days of skiing to secure the average industry profit margin of six point five to seven percent (Williamson and Ruth 8). Thus, any decline in the number of days in the snow season severely cuts into ski resort profits. This decrease in the snow season damages Colorado economically because it is the number one ski and snowboard state in the United States. Furthermore, the ski industry is also linked with Colorado’s forty-two billion dollar insurance, real estate, and leasing sector because so many tourists and homeowners buy or rent homes and condos near ski resorts (Williamson and Ruth 8). With diminished snow conditions, this industry will decline, harming the Colorado economy.
Snowmaking procedures can mitigate some of the effects of decreased snowpack, but this strategy undermines the concept of sustainable tourism: one hectare of technical snow requires between sixty thousand and one point five million liters of water and between five thousand and twenty-seven thousand kilowatt-hours of electricity (Duglio and Beltramo 2). It is not sustainable for the Colorado ski industry to expend the massive amount of water and energy required for the snowmaking process. Thus, climate change will continue to negatively impact the Colorado region by cutting into the economic profits of the ski industry.

**Colorado Decision Makers Must Prepare for Rising Temperatures and Their Effects**

In order to alleviate the damages caused by increasing frequency of wildfires and droughts and diminished snowpack, Colorado policymakers must increase climate change research, decrease carbon emissions, and implement tools that will aid the ski industry. Climate scientists attest to the need for tools “to evaluate areas most at risk for large wildfires given future potential climate change at temporal and spatial scales relevant to environmental management” (West, Kumar, and Jarnevitch 566). Evaluating which regions are most at risk for wildfires in light of rising temperatures will allow Colorado policymakers to efficiently allocate fire suppression resources and reduce the cost of these measures. To reduce the potential pitfalls of increased drought, scientists also prescribe the need for “drought indicators describing the beginning of drought or the recovery from drought” (Cayan, Dettinger, Pierce, Das, Knowles, Ralph, and Sumargo 21). Investing this research will prepare Colorado decision makers for impending drought conditions so that they will be able to reduce the severity of this phenomenon’s effects. Policy makers should also invest in up-to-date climate simulations to assess the future impacts of rising temperatures on reduced snowpack (Ayers, Ficklin, Stewart,
This measure is especially crucial because the snowpack composes such large portion of the Colorado water supply. Investing in predicting the future of this decline will prepare the Colorado region to implement water-saving measures. Research on the declining snowpack must also encompass the impact of this decline on the ski industry. Since snowmaking installations have made it “partly possible to cope with the problem posed by the shortened ski season due to the lack of natural snow,” Colorado policymakers should invest in increased snowmaking operations, which will at least ameliorate the problem in the short run. In the long run, however, the Colorado region must decrease its greenhouse gas emissions. Ski resorts in particular should minimize their environmental impact and communicate this goal to tourists, who will have a vested interest in the cause considering their predisposition for skiing. Scholars have described how “the ski industry can implement tools strictly designed for ski lifts [and] cable cars…taking into consideration management systems as well as eco-labels devoted to sustainability” (Duglio and Beltramo 4). Investment in research and systems such as these along with a marketing push by ski resorts to both decrease emissions and increase tourist awareness of climate change will allow the Colorado region to both prepare for rising temperatures and adapt to their effects.

The Future of Climate Change in Colorado

Colorado residents must prepare for the many negative impacts climate change will have on the region, from increased frequency of wildfires and droughts to decreased snowpack and a subsequent decline in the profits of the ski industry. Increased climate change research, decreased carbon emissions, and policies specifically targeted at the ski industry and its consumers will allow the Colorado region to adapt to the catastrophic effects of rising
temperature as much as possible. While the Colorado region is definitely a loser on the spectrum of climate change, there is still hope for the region in the development of research and policy. However, only with increased investment in climate change prevention and adaptation measures can Colorado survive the impending disaster of global climate change.
Works Cited


