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Duncan, Eloise Alton. "Climate Change: Water Shortfalls in New Mexico." (2020).
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Climate Change: Water Shortfalls in New Mexico

Part 1

The most impacted regional problems in New Mexico are the economy, reduced crop production, loss of jobs, loss of trout fishing opportunities, wildfire property damage, reduced beef, and dairy production. These impacts are due to water scarcity. The whole world is affected by climate change in many ways. One thing that I want to discuss about New Mexico is water shortage, since drought is one of the impacts of climate change in our dry arid state. The damages from increasing water scarcity will make an impact in our economy, consumption will affect dairy, and beef products, since they require a lot of supply not just for consumption but also for production (Paskus, 2018). Even when areas receive rainfall similar to the typical amount they received historically, higher temperatures will increase the water needs for crops and livestock, while also drying out the soil more rapidly. Due to these 20 year predictions, we will face higher input costs, lower consumer incomes, spending, population changes, and changes in the states interregional competitiveness (Repetto, n.d.). The U.S Geological Survey data for October 2019 Water Year revealed 3 of 21 river basins were above average in New Mexico. In the upstreams of Albuquerque, the streamflows were ranging from 19% to 70% average. This is according to the Nov. 20 Drought Monitoring Working Group meeting (Paskus, 2018).

The New Mexico Drought Preparedness Act of 2015 was introduced by U.S senators Martin Heinrich and Tom Udall (Union of Concerned Scientists, 2016). It will provide drought relief and address long-term drought challenges by improving the effectiveness of water management in the state. This will address drought conditions by targeting critical water-management challenges in the Rio Grande. There's also what they call "The Pre-Disaster Mitigation Grant" & "Western Watershed Enhancement Partnership". The Pre-Disaster Mitigation Grant aids in reducing risks to people and property, and to diminish reliance on federal funding during disaster. It funds hazard-mitigation planning, projects that reduce New Mexico's vulnerability to floods, wildfires, and other weather extremes (Union of Concerned Scientists, 2016). On the other hand, The Western Watershed Enhancement Partnership is helping reduce wildfire risks to water supplies by partnering with businesses and managing flammable forest debris (Union of Concerned Scientists, 2016).

According to an NM political report, human-caused climate change is contributing to water scarcity in the southwest (Paskus, 2018). The trees in the southwest are having a harder time providing wildlife habitat & some clean water due to climate change. This happened due to rising temperatures which contributed to other factors like weather patterns, snow, ice, plants, and animals (Paskus, 2018). With continued greenhouse gas emission, habitats will be affected, and indigenous tribes. The tribes are at an increased risk of drought and wildfire due to adjacent housing. So, the tribes are experiencing water scarcity which can lead to a lot of health problems from unsanitary practices like lack of supply, filtration system, and vector-borne diseases (Paskus, 2018).

These problems will affect the animals, plants, crop production, loss of traditional food, decreasing water supply for agricultural, and industrial use (Paskus, 2018). The farmers of the southwest are already worried about water shortages and increased heat waves from drought. Because of potential displacement of existing growers, this will affect rural communities. Southwesterners will also suffer more health risks as the region continues to heat, with more hot days and extreme heat events each year. People of the southwest will be more exposed to infectious diseases like the plague, hantavirus, allergy problems, and more exposure to severe dust storms (Paskus, 2018). This will lead to more health care problems, insurance demands, and mortality rate (Paskus, 2018).

Part 2

The impacts of climate change on New Mexico communities can be anywhere from animals and plants, to the health of New Mexicans. One example that comes to my mind are the ecosystems of New Mexico's forests, grasslands, deserts, streams, and lakes. Predicting the specific influence is difficult, but one thing I can attest is that Rio Grande water level gets lower each year, with fewer species of fishes living in it. Trout are especially affected by this problem. As each species responds individually to its changing environment, existing plants, or animal communities will likely change as well. New species will form, then there will be changes in the ecosystem structure and functioning will be abrupt rather than continuous (Allen, Darden, Floyd, Gallagher, Jones, Kostelnik, . . . & Weaver, 2005).

The aquatic systems are also vulnerable to climate change not only by warmer temperature, but also the changes in the amount of water, and timing. A loss of aquatic habitat will be one of the

challenges we will face from climate change, especially the suitable coldwater fish. Trouts are expected to shrink as the water warms up. There will also be changes in terrestrial ecosystems such as breeding of birds, insects, amphibians, and flower plants. The ranges will be expected to shift to the north, and higher elevations due to warming south temperatures. This geographic effect from climate change will cause fishes to be trapped from isolated mountain ranges and become extinct, if the mountain is not high enough to provide suitable habitat. These species can disperse across intervening deserts to other mountaintops (Allen et al., 2005).

The natural controls and disruption of ecosystems may cause outbreaks of infectious diseases that are transmitted by, or have reservoirs in like rodents, birds, or insects. This causes disease outbreaks such as hantavirus, plague, dengue fever, and arboviruses such as West Nile Virus (Allen et al., 2005). These will be a major health challenge the New Mexicans will face.

Declining riparian health will be affected by lowering water tables, and reduced surface flow. Flycatchers will be affected by decreased habitat suitable for the fishes in the river. Less habitat and lower quality habitat will result in reduced survival of flycatchers (Allen et al., 2005).

According to the Journal of Hydrology studies, there will be changes in infiltration & runoff to the water quality and quantity in the region as a whole (Bennett, Miller, Talsma, Jonko, Bruggeman, Atchley, ... & Middleton, 2020). Any change in snow, rain, and acidity across the regions will affect other cities, resources, operations that rely on consistent high quality sustainable water resources (Bennett et al., 2020). In the future, they will incorporate changing vegetation for the region, investigate different statistical, and dynamic approaches to uncover the impacts of shifting climate (Bennett et al., 2020).

New Mexico will face some water quality conflict due to reduced streamflow, and nonpoint pollutants (Bennett et al., 2020). This will lead to river fall outs and higher pollution control cost. Salinity concentrations will continually rise as the Rio Grande journeys south, picking up urban wastewater loads, and agricultural return flow from upwelling of salt-concentrated spring waters (Bennett et al., 2020).

Dewatering rivers and streams have a significant impact on climate change. With increasing temperatures, the soil continues to dry, and reducing its moisture from rising evapotranspiration. Evapotranspiration is a process of transferring water from the land to the atmosphere by evaporation from the soil, other surfaces, and by transpiration from plants. This affects the runoff

and water availability throughout New Mexico. Agricultural sectors will be affected potentially losing \$2 billion in cash receipts of productivity and livestock (Bennett et al., 2020).

According to NMSU, the hydrologic model are key drivers to changes in water use, allocation, reservoir, aquifer storage, and changes in economic welfare (Hurd, & Coonrod, 2008).

Hydrologic model is the management of water resources such as surface water, soil water, wetlands, and groundwaters. The hydro-economic model optimizes the allocation, use, storage, and management of available water. The important aspect of RBHE is for explicitly treating the underlying value of water. Through specifying this relationship, the modeler implicitly specifies the flexibility of particular water use to price changes in water. The economists refer to this as ‘price elasticity of demand’. By using RBHE, they will be able to replicate models that recognize the opportunity costs and economic tradeoffs in water allocation and storage decisions (Hurd, & Coonrod, 2008).

Part 3

Water scarcity is no doubt much worse in New Mexico than any other state close to the ocean. We are facing the same water stress as the United Arab Emirates, about 95% of New Mexico's water reserves are used leading to droughts, and dry spells (Armijo & Roach, 2013). Other states like Colorado, Arizona, Nebraska, and California, are facing the same challenges (Armijo & Roach, 2013). Our water supply is ultimately threatened by climate change, and it is not getting any better.

Researchers are predicting more “day zeros” when the cities tap runs dry, the population grows, and more demand will be drawn from dwindling water resources (McFall-Johnsen, 2019). Farmers are suffering from drier warmer weather so they plant more drought-resistant crops like beans, or else they will need to abandon their fields altogether. These farmers are only allotted 10 inches of water from the Rio Grande compared to the normal 36 inches (McFall-Johnsen, 2019). Farmers also sold their cattle, so they can pay for hay and due to no grass feeding their herds. Ranchers are qualified to get loans to cover financial losses declared by USDA (McFall-Johnsen, 2019).

To prevent day zeros from happening, better planning, and water-management practices can help lessen water crises. More efficient irrigation systems, recycling of wastewater to use with crops,

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or other industrial processes, and fixing leaks that can cause water to go to waste (McFall-Johnsen, 2019).

One thing I would suggest for this would be having people shower cautiously, only turn on the shower to rinse, then put some soap in their body, and turn it on again when needed to rinse after they shampooed, or soaped up. And when using the toilet, if it's just for peeing then don't flush it right away, instead spray it with disinfectant to prevent it from staining and just flush it after every 2 sessions of urination when appropriate. When there's guests, that's a different story. I know it sounds unsanitary, but it's one way to conserve water. I came from a destitute country, where we have to walk many miles just to get some water in a well, and use it for the whole day. It was old school, but it taught me the value of water.

Seven states pull from the Colorado River, so they are executing the practices mentioned above. They signed a management plan that asks each state to cut water use, and plan ahead to mitigate the depletion of reservoirs.

According to the Salt Lake Tribune, the government introduced the Western Water Security Act of 2019 to strengthen New Mexico's water system and focus on conservation, and restoration of water supplies throughout the West (New Mexico delegation takes aim at West's water scarcity, 2019). We all depend on fragile water ecosystems in New Mexico, and are struggling to adapt to the wild weather swings of climate change. Big pockets of moderate to severe drought are present over the Four Corners region of New Mexico, Arizona, Colorado, and Utah (New Mexico delegation takes aim at West's water scarcity, 2019). New Mexico is making smart investments in water infrastructure that we need as decades-long drought continues. The legislation increased funding of \$120 million for WaterSMART, a program through the U.S. Bureau of Reclamation that offers grant funding for conservation projects across the nation, while allowing non-government organizations to apply (New Mexico delegation takes aims at West's water scarcity, 2019). It will expand the authority of the Native American tribes, declare the states drought emergencies, and access relief funds from the federal government (New Mexico delegation takes aims at West's water scarcity, 2019)

There will also be an aquifer assessment program that will be reauthorized, which allows New Mexico, Texas, and Arizona to partner with institutes in the West, and the U.S. Geological Survey, to study issues in the region together with Mexican water management officials (New Mexico delegation takes aims at West's water scarcity, 2019)

Part 4

The final focus of climate change are the challenges we are facing. There are many challenges we face from health, industry, economy, environment, and pollution. Challenges with climate change are associated with practical management, restoration, and protection of ecosystems in order to mitigate, and adapt to the interventions in place. Natural climate solutions (NbS) is used to tackle mitigation of climate change (Hobbie & Grimm, 2020). NbS is the conservation, restoration, and improved land management actions to reduce carbon footprint, and store more carbon in the landscape. They make a partial contribution to slow and limit global warming, while potentially supporting biodiversity, and ecosystems services. NbS also enhances the adaptive capacity of both ecosystems, and societies. The ecosystem is transformed due to climate change, and its capacity to support human adaptation is also affected (Hobbie & Grimm, 2020). One thing we can do is to focus on carbon through carbon-focused afforestation of natural grasslands. Then, maintain a detailed spatial analysis of carbon storage value in the ecosystem, and their biodiversity value. This will help us assemble maps of proactive biodiversity conservation potential, and areas of reactive conservation priorities that are under immediate threat.

This practical management I mentioned above are the essential solutions to climate change, by providing a framework of biodiversity in place, and water conservation as well. Providing a parking lot with trees and solar panels will help save electricity. Therefore, conserves the heat from the ground to deplete from intense heat. In my opinion, the more trees we plant the better the earth will conserve moisture underground.

Cityscapes do a big impact on climate change, by lowering vegetated cover, high impervious cover, generating pollutants, high demand for freshwater resources, concentration of population, infrastructure in vulnerable areas like coastal zones, and deforested hillsides (Malhi, Franklin, Seddon, Solan, Turner, Field, & Knowlton, 2020).

Enhancing vegetation cover and green space also contributes to construction of structures that restore natural hydrologic function like stormwater ponds, bioswales, green roof, and riparian zones (Malhi et al., 2020). These nature-based strategies need to be assessed in order for these strategies to have positive impacts in a community.

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Mapping and quantification in carbon storage, and forest fragment can be informative about the state (Lu, Wang, Zhang, Yan, & Zhang, 2012). It will suggest that increasing emissions of CO₂ was accompanied by high fragmentation of tropical forests. Habitat fragmentation affects the ecology of forests, by changing its composition and configuration, leading to genetic isolation of plants and animal species, which then reduces the biodiversity of species (Lu et al., 2012). In New Mexico, the other side of the Sandia mountains is lush and green, while the front side of Albuquerque is scarce and less dense forest. If we could think of ideas to replenish water, then it will make Albuquerque a lot greener, by growing more trees. This will eventually lead to more moisture on the ground, and less dry weather. Maybe utilizing watersheds, streams, or even recycling waste water from homes would help water these trees to give us more moisture.

Water supply is the main problem I am focusing on this paper. Therefore, I will also include some solutions we could do. Most cities rely on regional or distant watershed for their water supply, or groundwater sources that are replenished slowly. The impacts of climate change on hydrology are tremendous. It changed the total amount, intensity, and seasonality of precipitation influence in urban areas.

High impervious cover promotes pluvial flooding, it occurs when precipitation rates exceed the capacity of stormwater systems, or infiltration. This is why stormwater ponds will be helpful in New Mexico. Low places in urban landscapes are most at risk, and often inhabited by people slowest to adapt. I think the water system in New Mexico should be managed accordingly, certain measures should be implemented to each household, in order for them to know how to conserve water. Educate every resident on water use and supply-demand, to gain their understanding of the process, and pass on the news to others. Because climate change is not just a hoax, it's something serious that we are facing in our future & for new generations to come.

References:

Allen, J., Darden, T., Floyd, R., Gallagher, M., Dr, Jones, D., Kostelnik, K., . . . Weaver, L. (2005). Potential Effects Of Climate Change On New Mexico. Retrieved from https://www.fws.gov/southwest/ES/Documents/Potential_Effects_Climate_Change_NM.pdf

Armijo, K., & Roach, J. (2013). Water Scarcity Science and New Mexico. Retrieved July 12, 2020, from <https://www.osti.gov/servlets/purl/1314521>

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Bennett, K. E., Miller, G., Talsma, C., Jonko, A., Bruggeman, A., Atchley, A., . . . Middleton, R. (2020). Future water resource shifts in the high desert Southwest of Northern New Mexico, USA. Retrieved June 28, 2020, from <https://doi.org/10.1016/j.ejrh.2020.100678>

Hobbie, S. E., & Grimm, N. B. (2020). Nature-based approaches to managing climate change impacts in cities. *Philosophical Transactions of the Royal Society B*, 375(1794), 20190124.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2019.0124>

Hurd, B. H., & Coonrod, J. (2008). Climate Change and Its Implications for New Mexico's Water Resources and Economic Opportunities. Retrieved 2020, from <https://aces.nmsu.edu/pubs/research/economics/TR45/welcome.html>

Lu, H., Wang, X., Zhang, Y., Yan, W., & Zhang, J. (2012). Modelling forest fragmentation and carbon emissions for REDD plus. *Procedia engineering*, 37, 333-338.

<https://core.ac.uk/download/pdf/81213415.pdf>

Malhi, Y., Franklin, J., Seddon, N., Solan, M., Turner, M. G., Field, C. B., & Knowlton, N. (2020). Climate change and ecosystems: threats, opportunities and solutions.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2019.0104>

McFall-Johnsen, M. (2019). New Mexico faces extreme water scarcity on par with the United Arab Emirates. Experts warn more 'day zeros' are looming. Retrieved from <https://www.businessinsider.com/new-mexico-faces-extreme-water-stress-2019-8>

New Mexico delegation takes aim at U.S. West's water scarcity. (2019). Retrieved 2020, from <https://www.strib.com/news/nation-world/2019/11/04/new-mexico-delegation>

Paskus, L. (2018). Federal climate report shows how climate change will impact U.S. economy, infrastructure and more. Retrieved from <https://nmpoliticalreport.com/2018/11/26/black-fridays-climate-report/>

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Repetto, R., PhD. (n.d.). New Mexico's Rising Economic Risks from Climate Change. Retrieved from <https://www.demos.org/sites/default/files/publications/UpdatedNMFullReport.pdf>

Union of Concerned Scientists. (2016). (Rep.). Union of Concerned Scientists. Retrieved from www.jstor.org/stable/resrep17308