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Global Climate Change and Higher Education

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GLOBAL CLIMATE CHANGE AND HIGHER EDUCATION

by

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Introduction

How do the concepts of Higher Education and Climate Change merge? The answer that this paper is exploring is the critical issues our nation and institutions of higher education are facing. Our higher education model must initiate new ways of thinking about climate change and help lead the way of progress to reduce the effects of climate change on the institution of higher education.

What is global climate change? Most politicians on television use the term "Global Warming" to describe global climate change. Unfortunately, warming is only part of the equation. When people use warming to explain global climate change, it would be similar to Einstein only developing E=M instead of $E=MC^2$.

The cause of global climate is the warming of our atmosphere because of an unnatural amount of greenhouse gasses that is being released into our atmosphere. Our planet is one that uses balance to make our existence tolerable. The reason we have liquid water and life on our planet is because the earth is considered to be the "Goldilocks Zone." We are far enough from the sun that our water is not vapor or steam, yet close enough that our water is not solid ice. Two examples of these concepts are our planetary neighbors, Venus, and Mars (Lamb, 2010)

Venus has a runaway greenhouse effect. The planet has trapped too much of the sun's radiation that the average temperature for the planet exceeds three hundred degrees Fahrenheit. The liquid that forms its lakes and oceans is not water, but rather hydrocarbons. These hydrocarbon pools are the same hydrocarbons that form our fossil fuels. Unfortunately, Venus is too far along to reverse the greenhouse effect and earth could potential fall into that same trap (Schweiterman, n.d.).

If anything Venus is a forewarning for us to look upon of what not to do, but warming is not all that is going on. Our planet absorbs the sun's radiation. Either the radiation is reflected back into space or absorbed by the planet. When greenhouse gasses are part of the equation, the radiation reflected from the surface becomes trapped. The inability for this extra amount of radiation to escape our planet causes our planet to warm unnaturally (Schweiterman, n.d.).

What happens to a warming our planet? There are many answers to that question. One is that the warming is melting our ice caps, and that will cause sea levels to rise. Let us return to the 3rd grade when we watch ice cubes melting. When our ice cubes melt in the water, does it overflow the glass? No, it does not, however the issues is not directly with sea ice, but rather land ice called glaciers. These glaciers store billions of gallons of fresh (non-salt) water. If the Greenland Glacier and the West Antarctic Ice Shelf were to melt, we could see a sea level rise of around 20 feet per glacier or 40 total feet of global sea level rise (Cortfield, 2012).

The ice on our planet also helps reflect a significant portion of our incoming radiation. Ice is our natural deflector dish and as both sea and land ice melt, we have fewer reflectors and more absorbers. Remember when a person goes outside in summer, and they wear darker clothing they tend to be warmer than if they were wearing lighter clothing. The same principle exists when talking about our oceans. Water roughly covers 70% of our surface, which is numerous surfaces to absorb the sun's radiation, warming the oceans naturally. The oceans naturally cool themselves through the different thermal belts that are called currents. These currents drive our planet's weather patterns (Dinniman, Klinck, & Hofmann, 2012).

If we continue to increase the rate of melting the glaciers, we risk damaging or interrupting our global currents, which could lead to severe weather events in different parts of the world. Tornados have already been more frequent in other regions of the world. More severe

droughts in the West have led to more frequent wildfires. Stronger hurricanes and typhoons continue to assault the Caribbean and South Asia. The consequences of global climate change are the challenges that higher education faces. Our society is staring down a loaded handgun, with only one option, adapt or die.

How can higher education adapt to the various different threats? This paper will focus on the effects of global climate change on higher education for the next two decades. The paper will address five major hurdles that higher education faces: 1) Rising Sea Levels, 2) Changing Weather Patterns, 3) Severe/Extreme Weather. 4) Drought and 5) Impact of Government rules and regulations.

Each of these issues shares many common links. They are not independent ideas; they are links in the chain called Global Climate Change. A great deal of these issues have already begun, whether it was extreme wildfires in California, super tornadoes that shred the Midwest or super storms like Katrina and Sandy. We are already behind the eight ball, and the clock is ticking.

Rising Sea Levels

Rising sea levels are a serious threat to our way of life in America. Our economy is a fragile system with many little parts. The sea also supplies us with energy in the form of crude oil from the Middle East or South America. However, the bastion of economic wealth is also a bringer of doom.

As stated earlier in this paper if the global sea levels increase at our present rate, then we could witness sea level rises within our generation's lifespan. The amount of sea level rise could be anywhere from 25 to a 100 foot rise in sea levels. This drastic change could inundate rivers

and flood the Mississippi, Missouri, and Ohio River Valleys, not to mention or coastal communities (Dinniman, Klinck, & Hofmann, 2012).

Sea level rise would destroy many cities. However, some cities would be able to cope. Cities such as New York, Boston, and Philadelphia, which have the resources, can construct floodgates and dams. We can relate this to what the Netherlands have done. Those universities that are behind the walls would be safe, but these cities will become islands and the local communities and universities outside the barriers will flood.

The disaster to higher education would not be a natural disaster killing thousands in one giant tsunami, but rather the institutions would gradually shut down and either move or close. Other institutions will have to absorb more students, as well as to hire the displaced faculty and staff that were forced to move. We would have mass migrations from the south, east and west move toward the plain states and the north. There would be an economic shift that would cost institutions millions possibly billions of dollars to increase their infrastructure to help housing, feed and teach these new students.

By 2100, our global population will exceed 10 billion people. United States will almost double its population to 400 million in that time span. That means more students will be attending college or some restructuring of our national education system, in order to restore some order. In the late 1940s and early 1950s, the GI Bill was enacted into law, many institutions were overwhelmed by the amount of incoming students they received. This event would be a drop in an ocean compared to the increase that we will see over the next century (Carrington, 2014)

Universities on the coast will have to start diverting their funds into relocation efforts if they want to survive. Otherwise, the institutions will be forced to close. Relocation efforts for private schools will be easier since they do not rely on state funding. States such as Florida, will

not be so lucky. Our current modeling projects by 2100, most of the state will be underwater. Wherefrom will they move their state schools such as the University of Florida, Florida State University, University of South Florida and the University of Central Florida? Combined these institutions contain upwards of 225,000 students, not to mention the Miami Dade College which enrolls almost 175,000 students over eight campuses (Geno, 2013). These schools would never relocate because Florida would lack the space to house or even fund them.

Weather Patterns

Our climate is an engine that drives our weather. Our weather patterns depend on our climate and ocean currents. Ocean currents are also affected by climate. So our planet is dependent upon or climate. What happens when our climate shifts?

Across the United States were are seeing trends that worry us. The west is becoming drier, as well as the central plains. Severe droughts have crippled the water supplies and river systems and have begun heating up as well. These warming trends will begin to affect food supply and food costs.

The shifting weather patterns have shown warmer winters in the west and colder winters in the north and east. We have felt and seen these effects in the increasing amounts of polar vortex's that have inundated cities of Boston and New York with the record levels amount of snow. The snow levels have impacted universities, forcing many to shut down, impacting the school year length and forcing employees to take time off of work. Also when these huge snow packs melt it has caused rivers to rise, in the East, also in the Ohio River Valley and the Mississippi River.

In the west, the warming trend has brought on severe droughts for the entire west coast. With record lows in rainfall, the Colorado River has become drought stricken. Since 1989, the city of Las Vegas has been pursuing a way to increase their water supply, without taking more from the Colorado River, which is severely drought-stricken. Currently, the Colorado River provides 90% of the water to Las Vegas. The severe drought that the West is facing is placing more pressure on officials of the Southwest Nevada Water Authority to help find other water sources (Brean, 2013).

In 2006, the SWNA along with approval from the Bureau of Land Management and State Engineers had proposed a $15 billion dollar water pipeline that would carry water from Eastern Nevada counties of White Pine and Lincoln. Both counties have large groundwater reserves that have existed for millennia. However, the counties have filed suit against the SWNA citing that this pipeline can cause damage to their communities and the environment. In April 2014 the SWNA and State Engineers have filed a counter to the appeal against the pipeline (Brean, 2013).

Both of these examples listed above are real problems that our nation faces today in regards to shifting weather patterns. These changes are not isolated events either, and the drought conditions that are impacting the west are real issues that are forcing new legislation to be passed and considered by local, state and federal governments. Universities and colleges will have to comply with the new laws and regulations causing costs to rise for the institutions and its students.

Drought

Currently, we are witnessing one of the worst droughts in American history. The drought is affecting California, Washington, Oregon, Idaho, Nevada, Arizona, New Mexico, Utah,

Colorado, Oklahoma, Kansas, and Texas. The U.S. Drought Monitor, part of the USDA, labels the droughts two ways, S or L. The letter S stands for Short-Term meaning the drought conditions will last less than six months. The letter L, which means long-term, which signifies a drought lasting longer than six months. The drought that we are currently facing in the west are labeled SL to L meaning that the drought conditions are either going to last around six months to last more than six months (Artusa, 2015).

Universities across the country are paying higher food costs for their students. California's drought has affected beef, produce, milk, eggs and water prices for the West and the contiguous United States. Beef prices this year skyrocketed in price to $3.55 a pound, the highest it has ever been. That is an increase of 56% from 2010 prices, which is almost as bad as tuition rates in this country. (Vercammen, 2014)

Drought conditions also have affected energy output of the one of the largest hydroelectric power plants in the world, the Hoover Dam in Nevada. The Hoover Dam power plant have been the poster child for reusable energy in the United States, but the drought across the West has dropped the water levels in Lake Mead, the dam's reservoir.

The Hoover Dam the power source is Lake Mead, the artificial lake that formed during the damming process. Lake Mead is full when it is around 1296 feet above sea level. Current levels as of March 27, 2015, read at 1,082 feet above sea level. The last time that the reservoir was full was back in 1998. The last time the lake was ever this low was in the 1950s during another long drought. Suggesting that there have been droughts in the past, but nothing as severe as the one we are facing now. Unfortunately, climate change has increased the frequency and duration of these drought conditions (Lusvardi, 2014).

On April 1st, 2015 the California Governor Jerry Brown mandated that all towns and cities in California cut their water consumption by 25% due to the small snowfall that occurred over the past winter. The snow melt each year helps replenish the from the Sierra Nevada's help in replenishing the surface and ground water reservoirs. Unfortunately, the snow pack has not measured this depression for over 60 years. The action only affects urban areas; the agricultural community is only under a voluntary water cut (Megerian, Stevens, & Boxall, 2015).

Now with all of the data presented about the current drought conditions what does this mean for the universities in the western states. For starters, food prices along with potable water prices will rise for the next several decades. We can only speculate, but these drought conditions will make a direct impact on universities bottom line when it comes to tuition and fees. There is the real possibility of western universities of charging a water fee to help offset some of the institution's initial cost.

Also in states of California, Nevada, and Arizona the lower water levels in Lake Mead will increase power demands for the power plant, raising prices. Currently, the power plant is divided amongst the three states roughly 55% going to California, 25% going the Nevada and 20% in Arizona (U.S. Department of the Interior). Those costs could eventually raise tuition and fees for incoming students.

Climate change has raised the possibility of increasing tuition rates and the creation of new fees. The states of California, Nevada and Arizona only serve as an example. There are still nine other states that face the same or similar challenges as these three states.

Severe and Extreme Weather

Imagine a small college town in the Midwest or South, a town that has a population of 50 to 100 thousand residents when school is in session. Now imagine it is April, historically the month with the most tornadoes. A fast moving thunderstorm approaches from the west, forecasters have predicted this storm to be severe in nature and have issued the appropriate warnings, and have posted a tornado watch. However, for this college town, this is an everyday hassle, and many students and residents do not know that a tornado cell is heading right for them.

Within minutes, the National Weather Service changes the watch to warning, sirens blare throughout the community, warning people to find safe shelter away from windows and doors. An EF-1 tornado touches down southwest of the town. The event was not hypothetical; this happened on April 28th, 2014 in Tuscaloosa, Alabama, home of the University of Alabama ("National Weather Service Weather Forecast Office," 2014).

The storm reached wind speeds of only 100 mph, which is nothing compared to the super tornado that we watch tear through the suburbs of Oklahoma City in 2013. The town of Moore, OK was rocked by an EF-5 tornado that reached speeds of over 200 mph. The damage was a 14 miles stretch that claimed 24 lives and injured dozens more. The one that struck Tuscaloosa claimed only 13 lives and missed the heart of downtown and campus. Imagine if that tornado had hit the heart of campus. The destruction would have been massive and would have killed and injured many more ("National Weather Service Weather Forecast Office," 2014).

The threat is real for stronger severe storms to strike urban areas and cause incredible amounts of destruction in the form of human life and dollars. Tornadoes are only one variable to the severe weather that plagues our country. Hurricanes, earthquakes, volcanoes and forest fires are all real and potential threats that our nation faces.

In 2005, the Gulf of Mexico delivered a massive hurricane to southern states of Louisiana, Mississippi, and Alabama. The damage in dollars was hundreds of millions, and the damage to life was staggering. Iconic images, where many residents of New Orleans could not evacuate and sought refuge in the Super Dome. The warming of the Gulf of Mexico has brought about more severe hurricanes, which have caused more damage.

Hurricanes do not solely affect the south, most recently Hurricane or Superstorm Sandy struck the eastern seaboard, damaging the east coast from North Carolina through the Northeast. New York and New Jersey were the hardest hit states, destroying several coastal communities and killing over 100 people (Sharp, 2012).

Now these next two examples are not affected by climate, but they can still impact our weather. Volcanic eruptions and earthquakes have been taken place on our planet since the beginning of our planet almost 6.5 billion years ago. While rare, they can still have tremendous impacts on our infrastructure.

Volcanoes are located primarily in subduction zones and spreading ridges, where the oceans crust is being pulled underneath the continental crust. The ocean crust, which has water, is melted due to the high heat and pressure. This heated material is magma, and it rises to the top. When magma reaches the surface of the crust, it will become lava. Now there are two main types of eruptions, little energy, and high energy. Low energy eruptions are typically lava flows that have minimal explosive force. High energy events, have very explosive events, with large ash clouds, spewing toxic gasses while erupting.

The main subduction zones on our planet are found surrounding the Pacific Ocean. Since we have an active planet, our tectonic plates are always in motion. Currently, North America and Asia are coming closer together while Europe and Africa are moving further away from North

America. The Pacific Ocean is a dying ocean; it no longer producing newly formed crust. The oceanic crust is being recycled as it subducts underneath North America, South America, and Asia.

There are volcanoes where the ocean is spreading as well, most notably the volcanic island of Iceland. The island was formed by volcanism and is in the center of the Atlantic Ocean. These volcanic events can be very explosive and inject tons of debris into the atmosphere. This scenario occurred when one of Iceland's volcanoes erupted in 2013, showering northern Europe with fine dust particles, interrupting air travel and having a moderate economic impact in Europe.

How does a volcano eruption effect Higher Education? Well, one example would be the University of Washington, located in Seattle, Washington. Mt. St. Helens lies only 185 from Seattle and only 70 miles from Portland Oregon. The impact of large explosive eruption could damage both cities and the institutions that lie within the region.

Another tectonic event that causes millions of dollars in damage when it happens is an earthquake. The San Andreas Fault, which stretches most of central and southern California, has been the root of many deadly and destructive earthquakes. When the tectonic plates shift, they cause violent earthquakes. In order to minimize damage to infrastructure and life, California has passed many resolutions for stricter building codes to help mitigate the destruction.

Federal Government Impact/Building for the Future

Part of our changing environment is forcing lawmakers on all levels to pass legislation to help it offsetting the effects of climate change or ways to mitigate the damage. The United States

is the second largest polluting countries following only China. Industry and automobiles are the largest producers of CO2 and other greenhouse gasses.

Some college campuses across the nation have begun to see the breadcrumbs and have chosen to do something about the problem. By reducing their carbon footprint, or how much CO2 the university is putting into the environment, institutions have begun to become greener. Green is not only a color but means that something or someone is trying to become more environmentally friendly.

Reducing the emissions from their fossil fuel power plant or use renewable energy sources such as Solar, Wind or Water, can reduce the about of CO2 the University is pumping into the environment. Also reducing the amount of waste that the university makes, using biodegradable materials, recycling or composting. There are more expensive ways, which are all upfront cost.

The US Green Building Council is one of the leaders in the wave of new sustainable construction. They are responsible for developing the LEED classification scale that ranks a buildings environmental sustainability. LEED stands for Leadership in Energy and Environmental Design, which is helping to transformer the way we think about construction within our communities. ("LEED | U.S. Green Building Council," n.d.)

Their classification system ranks are as follows:

1. Building Design and Construction: "Applies to buildings that are being newly constructed or going through a major renovation; includes New Construction, Core & Shell, Schools, Retail, Hospitality, Data Centers, Warehouses & Distribution Centers, and Healthcare."

2. Interior Design and Construction: “Applies to projects that are a complete interior fit-out; includes Commercial Interiors, Retail and Hospitality.”
3. Building Operations and Management: “Applies to existing buildings that are undergoing improvement work or little to no construction; includes Existing Buildings, Schools, Retail, Hospitality, Data Centers, and Warehouses & Distribution Centers”
4. Neighborhood Development: “Applies to new land development projects or redevelopment projects containing residential uses, nonresidential uses, or a mix. Projects can be at any stage of the development process, from conceptual planning to construction; includes Plan and Built Project.”
5. Homes: “Applies to single family homes, low-rise multi-family (one to three stories), or mid-rise multi-family (four to six stories); includes Homes and Multifamily Low-rise and Multifamily Midrise” ("LEED | U.S. Green Building Council," n.d.).

According to these classifications, many universities can fit into each of these categories. The ranking system is as follows certified, silver, gold and platinum. Buildings that are awarded a ranking. Once certified buildings are able to reduce their overall cost and become more efficient. For commercial buildings, companies can charge higher leases. Similarly for student housing, more efficient apartments can justify higher rates for fees and rent.

The point that LEED and the USGBC are trying to improve upon is improving the planet, without sacrificing profit and the company itself. Universities can work within the system, and many campuses have already started implementing LEED into planning.

Recommendations

This paper's purpose was to highlight some of the real threats that can compromise our institutions across the country. Whether we have a gradual change or extremely catastrophic events, we as educators and administrators must start working for a better tomorrow. The three recommendations that I will make are: 1) Stop planning year-to-year; 2) Spend money now, and 3) Educate.

We as institutions of higher learning are becoming more bureaucratic each year. We worry about the bottom line, not about student success. Well, the bottom line we face is a different planet in as little as 20 years. We need to stop planning year-to-year just so we can make it, we need a strategy to combat the real threat of climate change.

That leads to the next point; we need to spend money now rather than waiting until the last possible moment. If a student procrastinates turning in an essay, they risk a potentially lower score. However, a lower score for a university could mean loss of life or property. As our weather and climate shift, we can expect more extreme and dangerous weather. We need to harbor a place of safety, even if a tornado or hurricane is looming.

Inflation is not our friend, and as prices go up for new materials and the overall cost of labor, we need to spend and borrow now. Prices could double or even triple, forcing the institutions to make harder choices. We need government also to help the state institutions. Some public schools have the resources to change, but for those that do not, we need to government to step in and offer financial support.

The final recommendation is that we need to start educating. Education begins with our students but does not end there. Our institutions need to educate our communities or the real and

dangerous threats that can affect the community. Universities and Colleges have always represented progress and change, and now more than ever do we need to exude that.

The institution of higher education has done its job to inform the public and its leaders. Now we need to become models of change. We need to put the money into building sustainable infrastructure that exceeds current law requirements. By educating our youth, we can demonstrate to our communities, states, the United States and the world, that environmentally conscious does not mean great sacrifice. We can either sacrifice a little now or a great deal in the future.

The goal for our institutions for Higher Education is to lead the movement. Change has always been difficult, but through educating and planning we can change and adapt to the coming environmental shifts. We need to adjust the way we think and act, placing student's success over everything else will guarantee our place as the leading superpower of the modern world. The United States has always stood for change and progress, it time that we should the world that the American Dream is no longer a dream.

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