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NEW MEXICO'S RISING ECONOMIC RISKS FROM CLIMATE CHANGE

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New Mexico's current political leadership is reversing state and regional policies to reduce greenhouse gas emissions even as the risks posed by global warming to the state's economy and population become more evident.¹ The New Mexico Environmental Improvement Board repealed a cap on greenhouse gas production, which would have required a three percent decrease in carbon emissions from power plants, refineries, and other large polluters in the state. The current governor actively seeks to reverse climate policies and is not convinced there is a link between climate change and human activity. New Mexico's own scientists find that the climate is already changing in ways that exacerbate water shortages, drought and other threats that will damage the state's economy. Experts foresee even more difficult problems in the future unless steps are taken to stabilize the climate. In its own interests, the state should embrace opportunities to lessen dependence on highly polluting energy sources and should strongly support policies to reduce emissions at the state, regional and national levels.

CLIMATE CHANGE'S IMPACT ON NEW MEXICO'S ENVIRONMENT

Over the past century, average temperatures in New Mexico have been increasing 50 percent faster than the global average. Annual temperatures have been rising throughout the state by almost two degrees F since 1976. Both minimum and maximum monthly temperatures also show rising trends.² The number of very hot days and nights-- defined as temperatures above the warmest 10 percent of days on record-- has increased since 1950. Heat waves lasting longer than four days have also significantly increased since 1960.³

Several projections of future climate conditions in New Mexico and the Southwest region are now available that draw on simulations from global climate models scaled down to the area. The projections find that average temperatures will continue to increase, rising five to seven degrees F over the course of this century. Precipitation levels will decline in the Lower Colorado River and Rio Grande Basins, mostly in winter, and more precipitation will fall as rain. Snowpack and run-off will decline and the run-off will occur earlier in the year.⁴ There will be a significant reduction in reservoir storage from both the Colorado River and the Rio Grande Basin.

Impact on Precipitation Patterns

Climate change's impact on precipitation patterns is complex: parts of the state, mainly in the north, have experienced wetter conditions; other regions in the state have experienced drier conditions.⁵ While there has been decent snowpack, an early and rapid warming period led to significant amounts of snow sublimating, resulting in lack of Spring runoff. Superimposed on these trends have been severe droughts affecting large parts of the state in the past two decades, including the recent drought that extended throughout 2011.

The consequences have been severe. In drought conditions, ranchers have been forced to liquidate their herds and cities have had to restrict water usage. In 2011's drought, fires burned more than 650,000 acres, including the Las Conchas Fire in New Mexico which, burned more than 150,000 acres and threatened the Los Alamos National Laboratory.⁶ In the summer of 2012, the Whitewater-Baldy fire burned over 259,000 acres, nearly twice the damage of Las Conchas.⁷

The median projections in a recent study by the Bureau of Reclamation forecast a) declines in precipitation in the Rio Grande and Lower Colorado Basins of two percent or more by 2070, b) increases in temperature of five degrees F, c) drastic declines of 70 to 100 percent in snowpack, d) large declines of 20 percent or more in annual runoff, e) declines in winter runoff, and f) larger declines in spring runoff.⁸

An assessment by the New Mexico State Engineer anticipates that these climate changes will have a wide range of impacts on both water suppliers and users. Higher freezing altitudes, changes in snowpack elevations and water equivalency mean less snowpack overall and essentially no snowpack south of Santa Fe. Higher evapo-transpiration losses will further decrease annual runoff. Milder winters and hotter summers, resulting in longer growing seasons, will increase plant and human water demands but lower, and earlier, run-off volumes will make less water available for irrigation and for ecological and species needs. Increased evaporative losses from reservoirs, other surface waters and soils resulting from hotter, drier conditions and increased evapo-transpiration by agricultural and riparian plants will reduce soil moisture in northern New Mexico and exacerbate desert conditions in the south.⁹ Extreme droughts will become more frequent.¹⁰

Ironically, because a growing percentage of all rain will fall in heavy storms, spring floods in warmer weather will become more frequent. This trend, along with reduced snowpack, will increase reservoir inflows during the winter and early spring months. Flood control space maintained in reservoirs during winter months will be filled earlier so more runoff is likely to go through reservoirs earlier in the year, decreasing the amount available for hydropower and irrigation later on.¹¹ According to the State Engineer, "Climate change will thus present an additional challenge to management of the State's water resources. Along with population growth, economic development, existing climate variability, and recurring drought, . . . , it injects another layer of uncertainty and complexity into the arena in which strategic planning and water policy development occur."¹²

Impact on Water Supply

Most regions of New Mexico already face severe water constraints. For example, the city of Albuquerque traditionally drew its water from a large underlying aquifer that for decades was thought to be inexhaustible due to recharge from the Rio Grande. In 1993, however, it was found that the water table had dropped about 160 feet since 1960 and only half of the withdrawals were being recharged, so that water levels were falling about two feet per year. Evapo-transpiration rates in the region average 60 inches per year but average rainfall is only nine inches so little moisture reaches the aquifer.¹³ Climate change will not only unsettle existing allocations, perhaps even the vital Colorado River Compact, but will also introduce uncertainty into future allocation decisions.¹⁴

The responses to recent droughts provide a preview of the issues that will become more acute with climate change. New Mexico's major cities have been forced to raise water rates significantly, restrict outdoor residential water use, and adopt aggressive conservation programs. Since urban water demands rise with temperature and lack of

rain,¹⁵ global warming will force cities into more such programs. Though urban conservation programs have reduced per capita usage significantly, they will not be able to offset the increasing supply deficiencies if climate change continues unabated.

The cost of transferring water from rural to urban uses is projected to increase significantly over coming decades due to declines in run-off and reservoir storage.¹⁶ Even under the most optimistic assumptions about the feasibility of such transfers, the costs are projected to rise 50 percent by 2030 under dry conditions.¹⁷ However, difficulties and conflicts will continue to surround these adjustments and reallocations, as increasing water demand from urban users will impact existing water rights. For example, the state's obligation to deliver a minimum stream flow to Texas from the Rio Grande will constrain uses in New Mexico in increasingly dry years.¹⁸ The need to maintain adequate stream flows in the middle Rio Grande to support the silvery minnow, an endangered species, will impose a significant additional constraint, especially on irrigation along the Middle Rio Grande.¹⁹ As these obligations are inflexible, the burden of adjustments to water deficiencies will fall almost entirely on New Mexico's water users.

CLIMATE CHANGE'S IMPACT ON NEW MEXICO'S ECONOMY

Climate change will impact nearly every aspect of New Mexico's economy. A recent study by researchers at the Sandia National Laboratory considered impacts of temperature increases and precipitation declines on the half-dozen industries with the greatest water consumption (e.g., agriculture, utilities, mining, chemical manufacturing),²⁰ such as the large coal-fired power plants in New Mexico's Four Corners area, that use massive amounts of water. The study found that economic damages from increasing water scarcity and costs would be spread widely throughout the rest of the state's economy. There would be higher input costs, lower consumer incomes and spending, population changes and changes in the state's inter-regional competitiveness. Retail trade, food manufacturing and construction would be among the sectors most severely affected by these secondary effects but no sector will emerge unscathed. This study found New Mexico to be among the US states with the largest percentage losses in income and employment, even though the full range of possible future heat, drought, and precipitation impacts was not considered and optimistic assumptions about adaptation to future water shortages were adopted.

In addition to the Sandia study, in 2009 an economic consulting firm undertook an effort to estimate the direct economic costs of climate change to the New Mexico economy.²¹ Various estimation methods were brought to bear and the results must be considered approximations and indirect costs arising from reduced spending and employment were not included. Nonetheless, the results show the cost impact of climate change rising rapidly, doubling between 2020 and 2040 to \$3.3 billion per year, as the table indicates.

Quantified Economic Costs (\$mil)	2020	2040
Higher residential air conditioning costs	209	519
Higher electricity transmission losses	39	128
Reduced Trout Population	37	46
Wildfire Property Damage	88	181
Reduced Beef & Dairy Production	42	68
Reduced Crop Production	31	61
Forest & Timber Losses, Pests & Fire	378	778
Fire Suppression Costs	110	227
Ozone Air Pollution: Deaths, Illness, Lost Work	305	492
Heat Wave Deaths & Hospitalizations	116	267
Loss of Skiing Days	50	78
Loss of Trout Fishing Opportunities	234	480
Total	1,639	3,325

Beyond the economic costs, studies have shown that the disruptions in water supply due to climate change will cause unquantifiable impacts to the state's ecology and traditional ways of life.²²

Impacts on Agriculture and Ranching

As detailed above, the minimum economic impact of climate change on the agriculture and ranching sectors is a loss of \$73 million annually by 2020. In percentage terms, New Mexico's agricultural sector is by far the most vulnerable to climate change. Though agriculture and ranching account for only a small percentage of New Mexico's state product, about two percent, it comprises 21,000 holdings covering 43 million acres.²³ The sector is the mainstay of many long-standing rural communities throughout much of the state and these communities and ancillary businesses would be devastated by adverse impacts.

Crop production will be affected by water shortages, increased pressures on irrigation supplies in competition with other uses, and in the lower Rio Grande, reduced stream flows will raise salinity concentrations. Crop production is also likely to suffer increased losses from pests and diseases. Climate change will modify the distribution of weeds, insects, parasites, and disease pathogens. Earlier springs and warmer winters will raise their survival rates and many weeds respond better to increased levels of carbon dioxide than cash crops do. It has also been found that glyphosate, the most widely used herbicide in the U.S., loses its effectiveness on weeds grown at increased carbon dioxide levels.²⁴

Production of beef, dairy products and forage crops is the largest component of New Mexico's agricultural sector. Water availability is marginal for most operators even under current conditions. Reduced precipitation and more frequent droughts will force many marginal or mortgaged holdings out of operation.²⁵ Weight gain, reproduction and milk production fall in extreme heat, exacerbating the effect of high feed prices on dairy profits.

Impact on Tourism and Cultural Significance

New Mexico's tourism, travel and arts industries contributed \$5.5 billion in revenues, almost 56,000 jobs and over \$1.1 billion in wages and salaries to the state's economy in 2006.²⁶ It is the state's second largest industry but already, according to consumer surveys, New Mexico lags in competition with neighboring states: it can't match Colorado for skiing and beautiful scenery or Arizona for golf and ease of access.²⁷ Climate change will have serious adverse effects on the tourist industry. Warmer winter weather, reduced snowpack and earlier melting will shorten the ski season and force ski areas to spend more money on snowmaking equipment and operations. Warmer river and lake waters and more ash deposition from forest fires will reduce the draw of the state for the 84,000 out-of-state fly fishermen, putting their \$100 million expenditures at risk.²⁸ Habitat for Gila trout is projected to decline by 70 percent.²⁹

Climate change will also affect bird-watching, an attraction in which New Mexico now ranks 5th in the nation with almost half its practitioners visiting from out-of-state.³⁰ Many birds that have traditionally wintered in New Mexico are shifting northward, with in-state populations declining by 80 percent or more.³¹ Disappearing species include the mountain chickadee, stellar jay, cedar waxwing, red-breasted nuthatch and pygmy nuthatch.

In addition to decreased tourism, climate change threatens the state's thriving arts and culture sector. In Santa Fe and Taos, the arts are well established and boast a long tradition. Santa Fe ranks first in terms of the economic contributions of the arts and cultural industries among cities of similar size. The city boasts the largest proportion of artists, performers & writers as share of total employment of any U.S. city. In 2002, Santa Fe's arts & cultural industries and cultural tourism generated over \$1 billion in receipts, employed 12,567 workers (17.5 percent of total employment in Santa Fe county), and paid \$231.5 million in wages and salaries – numbers that have undoubtedly increased since then. Most of the spending is done by out-of-state visitors.³²

Other locations in the state, such as Albuquerque, are striving to establish their own centers and clienteles. Heat waves, wildfires, high pollen counts and deteriorating air quality will discourage potential visitors to New Mexico's arts centers. For that matter, artists and craftspeople are themselves "footloose". They were drawn long ago to Santa Fe and Taos by the excellent climate and scenery, picturesque surroundings and moderate cost of living. The next generation of artists could just as easily go elsewhere.

Impact on Property Value

One indication of the economic impact is the significant effect that dead and dying trees have on nearby mountain property values. With other considerations held equal, property values are higher for houses near forests, lakes and rivers but the presence of trees killed by mountain pine beetles lowers property values by \$17 per tree for dead trees within a kilometer radius and by about \$650 per tree within a 0.1 kilometer radius.³³ This represents an enormous economic cost. Another adverse economic consequence of climate change is the significant effect of fire and drought on visits to parks and forests. Extreme drought reduces visits to national parks and forests in Arizona and New Mexico by seven percent and the Cerro Grande fire in New Mexico reduced visits to Bandelier National Monument by 21 percent.³⁴

Rising Health Care Costs

Climate change will place further stresses on New Mexico's health care system, which is already burdened by rising costs. Three of the five highest causes of terminal illness and death in New Mexico will be exacerbated by climate change: heart disease, stroke and chronic lower respiratory disease.³⁵ Higher ozone and particulate levels are reliably linked to increased mortality and morbidity from these causes.⁴⁶ Asthma attacks and allergies will be exacerbated by higher air pollution levels, including ozone, particulates from dust and wildfires, and higher pollen counts that start earlier in the spring.^{37,38}

Of the 8.6 percent of the state's children suffering from asthma many will seek medical care in emergency rooms or hospitals because one in six lacks health insurance.³⁹ In fact, one in four working age New Mexicans are dependent on Medicaid while another 25 percent have no health insurance at all. An additional 175,000 currently uninsured residents will get Medicaid coverage in 2014 under the Affordable Care Act.

Among the elderly, risk of stroke and heart attack increases with rising heat.⁴⁰ People with chronic heart or lung diseases are twice as likely to suffer heat stroke during a heat wave. In the past decade a six percent increase in heat-related mortality was observed for each one degree F rise in the heat index and mortality also rose with the duration of the heat wave.⁴¹

NEW MEXICO'S ENERGY FUTURE

New Mexico is benefitting from a production boom in shale oil and gas and estimates of recoverable reserves have soared. The state has the country's second largest gas reserves and fourth largest coal reserves, so many believe that for this reason alone the state should oppose policies to reduce carbon dioxide emissions. However, New Mexico also has huge potential for wind energy, almost 50 gigawatts, and also vast potential for solar energy, both of which are also experiencing a global production boom. Worldwide sales increased in 2011 by 18 and 29 percent respectively.⁴² Going forward, New Mexico should invest in its renewable energy potential and diversify its electricity generation sources.

Increased Cost of Electricity

Electricity generating costs will increase for several reasons. Low-cost hydroelectric production will fall with the reduced runoff from the Colorado and Rio Grande Rivers. Cooling water required for nuclear and coal-fired thermal generating plants will become scarcer and more costly, which could reduce power availability in drought conditions by up to 10 percent.⁴³ Because hotter weather boosts the photochemical reactions that create atmospheric smog and national ozone standards are being tightened substantially, coal-fired power plants will have to install expensive controls on nitrogen oxide emissions, an ozone precursor, in order to keep operating.

The large coal-fired power plants in the Four Corners area are highly polluting and are already under a confirmed court order to spend an additional \$750 million to \$1 billion dollars on air pollution control equipment to reduce smog and particulate forming emissions.⁴⁴ Global warming will also raise the summer peak in electricity demands and extend it through a longer air conditioning season, when it accounts for 70 percent of household electricity consumption. Meeting summer peak demands is nearly twice as costly as meeting off-peak requirements and considerably more costly than meeting the lower cool season peak demand. Increased heat and drought conditions can drive up electricity rates by 35 percent. Ironically, the main objection to policies limiting greenhouse gas emissions is that they will raise energy costs but energy costs will also increase if such policies are not enacted and climate change goes unchecked.

Renewable Energy Potential

New Mexico has a strong history of supporting renewable energy development. In 2005, New Mexico embarked on a renewable energy and energy efficiency pathway. The 2005 Efficient Use of Energy Act required utilities to develop and implement cost-effective demand-side-management programs, established cost recovery mechanisms for both electric and natural gas utilities, directed the New Mexico Public Regulation Commission to establish rules for integrated resource planning, and removed financial disincentives for utilities to reduce customer energy use through DSM programs—i.e., enact some type of “decoupling”.⁴⁵

In November 2007, former Governor Bill Richardson announced a goal of reducing per capita energy consumption ten percent by 2012 and twenty percent by 2020 below 2005 levels. A study by the Southwest Energy Efficiency Project identified a wide range of cost-effective options targeting transportation, residential, industrial and other energy uses that would meet those targets.⁴⁶ Energy efficiency investments could provide energy at only 1.86 cents per kwh, a small fraction of additional supply costs.⁴⁷

The Public Service Company of New Mexico’s most recent integrated long-term resource plan acknowledges that this is its least-cost option and finds that reducing load growth through energy efficiency would substantially lower its system-wide costs by eliminating the need for most capacity expansions.⁴⁸ In April 2010, the New Mexico Public Regulation Commission (PRC) established new energy efficiency rules that encourage electric utilities to seek low-cost energy efficiency programs before building costly and potentially unnecessary power plants. These rules provided a financial bonus to utilities for energy savings achieved through their efficiency programs. A strategy centered on energy efficiency improvements and renewable energy development would be advantageous for New Mexico’s economy.

In addition, New Mexico has an unmatched opportunity to benefit from both its vast solar and wind resources and its natural gas reserves by linking its complementary renewable and natural gas resources. If developed responsibly to minimize methane linkages and adverse effects on water resources, natural gas can be burned with only half the greenhouse effect that burning coal produces. Moreover, new combined-cycle gas turbine plants have much higher energy efficiency than existing coal-fired plants, lower capital costs and shorter construction lead-times. Such plants are highly complementary to large-scale intermittent wind and solar power installations because they can be powered up quickly when needed.

For these reasons and because natural gas prices are expected to remain low for considerable periods into the future, an energy strategy based on energy efficiency, renewable power and natural gas is an economical way in which New Mexico can fulfill its renewable energy portfolio standard and make good use of its natural resource advantages. A national policy that places a “price on carbon” and carves out a secure market space for renewable energy would guarantee this strategy’s success.

THE WAY FORWARD

Climate change threatens New Mexico's prosperity and economic development. It jeopardizes the health of its citizens and its remarkable natural environment. If climate change continues unabated, these threats will not only be realized, they will be aggravated. New Mexico's business and political leaders should therefore implement policies that have been developed within the state to mitigate climate change and its effects. As a first step, the cap on greenhouse gas production among New Mexico energy companies should be re-instated and clean energy targets increased. The political leadership should support cost-effective policies within the Southwest region and for the nation as a whole to bring about a rapid and sustained reduction in greenhouse gas emissions.

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