



UNM Staff Council Resolution 2020 #2

Name: Addressing Climate Change at UNM

Primary Author: Stefi Weisburd, Education and Outreach Manager, School of Engineering. Sponsored and co-authored by Staff Councilors Grace Faustino, Precinct 6; Carla Sakiestewa, Grade 13; and Nancy Shane, Precinct 22.

Adopted by Staff Council on: May 19, 2020.

Climate Change is a Global Problem

1. Whereas, human-caused climate change is a scientific fact supported by research conducted globally and at the University of New Mexico, (Allen, et al., 2013) (Reidmiller, et al.) (Gutzler & Robbins, 2011), and;
2. Whereas, scientists and nations have determined the imperative for capping average global warming to 1.5°C (2.7° F) above pre-industrial (circa 1880) temperatures to ensure the survival of human civilization and life-sustaining ecosystems, (Masson-Delmotte, et al., 2018) (Adoption of the Paris Agreement, 2020) and;
3. Whereas, the global average temperature has increased by more than 1°C (1.8°F) since 1880, (Masson-Delmotte, et al., 2018) and;
4. Whereas, due to this rise in temperatures, the global community is experiencing severe impacts including: local record-breaking temperatures; heat waves; severe storms; sea level rise; coastal and inland flooding; and droughts. (NOAA, 2019) (Reidmiller, et al.) and;
5. Whereas, these environmental impacts contribute to human harm such as crop failures; clean water shortages; asthma, allergies, vector- and water-borne diseases and deaths due to heat exposure; displacement of climate refugees and war; threatened species; mental health issues due to the traumas associated with all of these events and property damage. In the U.S. alone, extreme weather and fire events cost the federal government \$350 billion in the decade ending in 2013. (WHO Fact Sheet, 2018) (Podesta, 2019) (Gleick, 2014) (Zaveri & Rueb, 2020) (Reidmiller, et al.) (Climate Change, 2017) (Red List of Threatened Species, 2008) and;
6. Whereas, without major reductions in greenhouse gas emissions, models conservatively predict warming of 5°C (9°F) or more, compared to pre-industrial levels, by the year 2100, and most of this warming is likely to persist for 10,000 years (Reidmiller, et al.) and;
7. Whereas, scientists have determined that carbon emissions must decrease by half of 2010 levels by 2030 and drop to zero by 2050 in order to have any chance of limiting warming to 1.5°C (2.7 F) (Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.), 2018) and;

Climate Change is a Local Problem

8. Whereas, New Mexico's average annual temperature has already increased 1.1°C (2°F) since the 1970s, with increasing trends in both extremely hot days and warm nights (NOAA 2019) and;

9. Whereas, New Mexico, as the most water-stressed state in the nation, is particularly vulnerable to the effects of climate change (Berkowitz & Blanco, 2019) (States at Risks, 2015) and;
10. Whereas, New Mexico has already begun to feel the effects of climate change in terms of unusually hot summers, intense storms and fire seasons, less predictable harvests and altered snowpack, and starting in 2000, climate change pushed the U.S. Southwest into the second worst megadrought since 800 CE (New Mexico Climate Action Strategy, 2019) (Park, 2020) and;
11. Whereas, unprecedented future warming is forecast for New Mexico, worsening such conditions (NOAA, 2019) and;

The UNM Community Has Demonstrated a Strong Commitment to Addressing Climate Change

12. Whereas, former UNM President David J. Schmidly, recognizing the unique role higher education plays in society, signed the American College & University President's Climate Commitment in 2007, placing UNM on a path to carbon neutrality by the year 2050, with an 80% reduction of UNM's 2006 greenhouse gas emission levels by 2030, (Clark, 2019) and;
13. Whereas, Facilities Management undertook greenhouse gas emission inventories in 2006, 2009 and most recently in 2013 (See Appendix B) and;
14. Whereas, various UNM parties have shown repeated interest in implementing President Schmidly's goals as indicated by these and other actions:
 - Sustainability adopted as a Core Value (2008) and;
 - Facilities Management and Sustainability Studies wrote a Climate Action Plan, though it has largely remained unimplemented (2009) (UNM Climate Action Plan, 2019)) and;
 - ASUNM Senate unanimously passed two resolutions for 100% renewable energy by 2050 (2017, 2018) and;
 - 1,500 members of the UNM community signed a petition to President Stokes supporting 100% renewable energy by 2050 (2018) and;
 - The student environmental collation UNM Leaf asked President Stokes to declare a climate emergency, divest the Endowment from fossil fuels and promote more climate change instruction and research (2019) and;
 - The Faculty Senate Budget Committee approved a Resolution to divest the Endowment from fossil fuels by 2022 (2020) and;
 - Facilities Management and ASUNM worked together in a joint financial effort to install solar panels atop Zimmerman Library after a 2017 survey revealed sustainability to be the most important student priority (2020) (Peña-Parr, 2020) (see Appendix C for the full UNM Climate timeline)) and;

UNM is Making a Difference

15. Whereas, UNM faculty and staff expertise as well as UNM Administrative initiatives have improved local climate change conditions as indicated by these actions:
 - Facilities Management Utilities and Engineering and Energy Services as well as Lobo Energy, Inc. have many years' experience monitoring and reducing energy usage and estimating greenhouse gas emissions and;
 - Facilities Management meets the efficiency standards established by Governor Richardson's Executive Order 2006-001 (U.S. Green Building Council's Leadership in Energy & Environmental Design [LEED®] Silver) for new or renovated facilities (Executive Order 2006-001, 2006) and;

- the University has already put into place many of the pieces necessary for planning and has begun implementing sustainable practices in its formation of the Sustainability Office in 2010 and;
- the University has also committed to the Sustainable Water Resources Grand Challenge, which is intimately related to climate change, (Sustainable Water Resources, 2019) and;
- UNM is working to implement New Mexico Executive Order 2019-003, which calls on all state agencies to contribute to climate change prevention and mitigation efforts in alignment with the 2015 Paris Agreement (Executive Order 2018-003, 2019) and;
- UNM has accepted its 'unique ability to not only incorporate the values of sustainability into all aspects of operations, but...also...to educate and prepare future leaders, employers, and workers in sustainable values and practices' (Policy 2100: Sustainability, 2019) and;
- UNM Facilities Management uses money it receives from commissioning and utility incentive rebates for energy-conservation projects and;

UNM Should Build on its Excellent Work and Achievements

16. Whereas, the most recent University greenhouse gas emission assessment calculated emissions at 128,425 metric tons of carbon dioxide equivalent (MTCDE), down 26% from 2006 levels, the largest contributors being electricity, heating, commuting, and cooling (see Appendix B) and;
17. Whereas, UNM can achieve more cost saving by taking advantage of further energy efficient measures (Mohammadalizadehkorde & Weaver, 2020), (Richardson, 2019) and;
18. Whereas, Facilities Management would benefit from consistent resources, capacity and executive direction, for example to estimate gas house emissions regularly and;
19. Whereas, the President of UNM is an important thought leader for the State of New Mexico, and;
20. Whereas, it is incumbent on the UNM's educational community to prepare our students to prevent, mitigate and adapt to the serious and widespread repercussions of climate change that are becoming major challenges in their lifetimes, especially and;

The Rationale for Investing in Fossil Fuels Has Significantly Weakened

21. Whereas, the burning of fossil fuels is the largest driver of climate change (Environmental Protection Agency) and;
22. Whereas, investments in the fossil fuel industries have significantly underperformed in the past ten years and investors' concerns about the fiscal risks of climate change are mounting (Reuters, 2019) (Fink, 2020) and;
23. Whereas, renewable energy costs are competitive with fossil fuels in many markets, making investing in renewable energy increasingly attractive (International Renewable Energy Agency, 2019), (Lacey, Monk, & Odey, 2019) and;
24. Therefore, be it resolved that the UNM leadership accelerate its engagement on climate change and build on the excellent work already achieved: (Masson-Delmotte, et al., 2018) (Masson-Delmotte, et al., 2018)
 - Publicly affirm that Climate Change is a scientific fact that requires immediate action, given the growing evidence of severe physical, economic and social consequences of climate change.
 - Recommit the University to the carbon goals set forth by President Schmidly by convening a campus-wide, fully funded and resourced Climate Action Committee that reports to the President with a new Climate Action Plan.

- Recommit the University to Sustainability Policy 2100, particularly its calls for ‘triple bottom line’ decision-making and its charge to monitor and report on a comprehensive sustainability plan.
 - Commit to better practices, exceeding the standard set forth in New Mexico Executive Order 2006-001, for construction and renovation projects given that nearly three quarters of University emissions are attributed to electricity, heating, and cooling functions.
 - Publicly share and annually update information regarding UNM climate action goals and progress towards them.
 - Consider ways to divest the endowment from the fossil fuel industry and replace with investments in sustainable energy and climate change prevention and mitigation sectors.
25. Copies of this resolution will be sent to members of the UNM Board of Regents; Garnett Stokes, PhD, President of the University; Teresa Costantinidis, Senior Vice President for Finance and Administration; Chris Vallejos, Associate Vice President of Institutional Support VP ISS; James Holloway, PhD, Provost-EVP for Academic Affairs; Jeff Todd, President and CEO of the UNM Foundation; Matt Cherrin, Lobo Energy Vice President and Energy Conservation Specialist; Finnie Coleman, Faculty Senate President; Mia Amin, ASUNM President; Tommy Tafoya, Facilities Management Energy Services Manager; Mary Clark, Facilities Management Sustainability Manager; Hans Barsun, Facilities Management Utilities Engineer.

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Staff Council Climate Change Resolution Appendices

Appendix A: Climate Change Temperature Maps

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Appendix B: UNM Greenhouse Gas Inventories

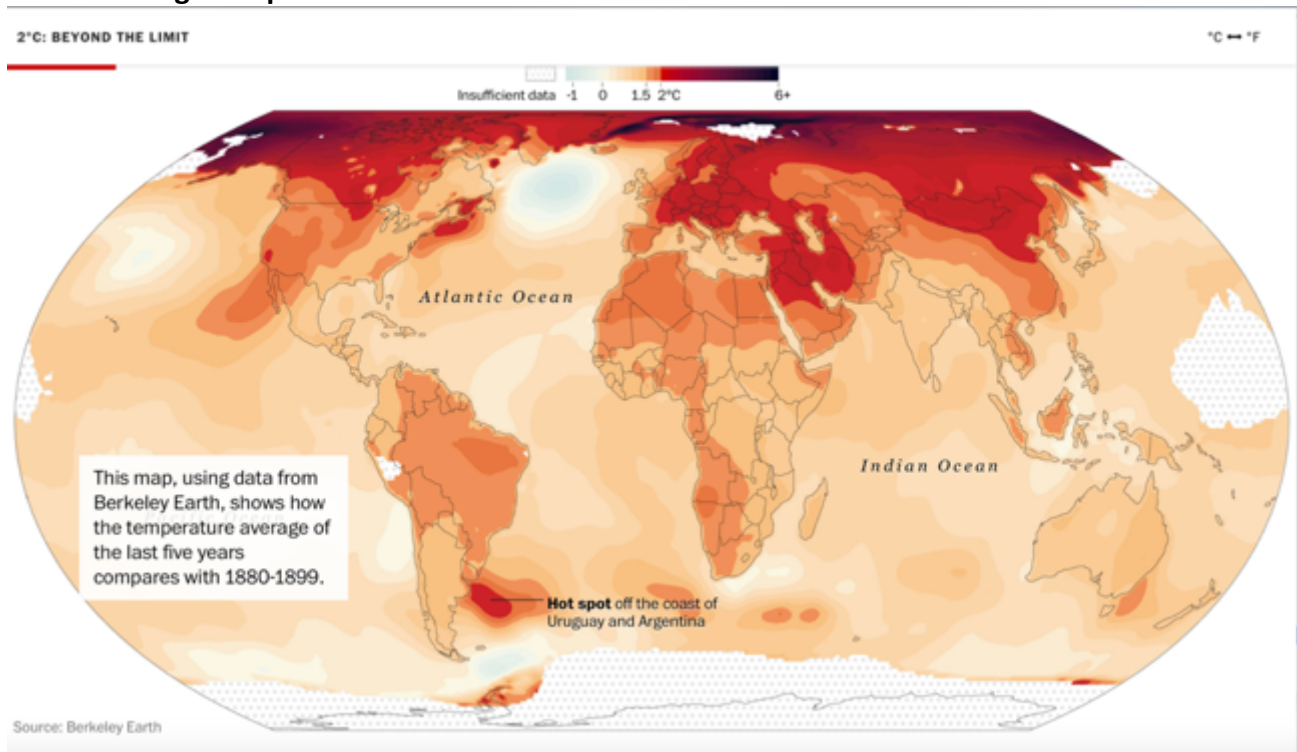
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Appendix C: UNM Climate Action Timelines

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Appendix A: Climate Change Temperature Maps

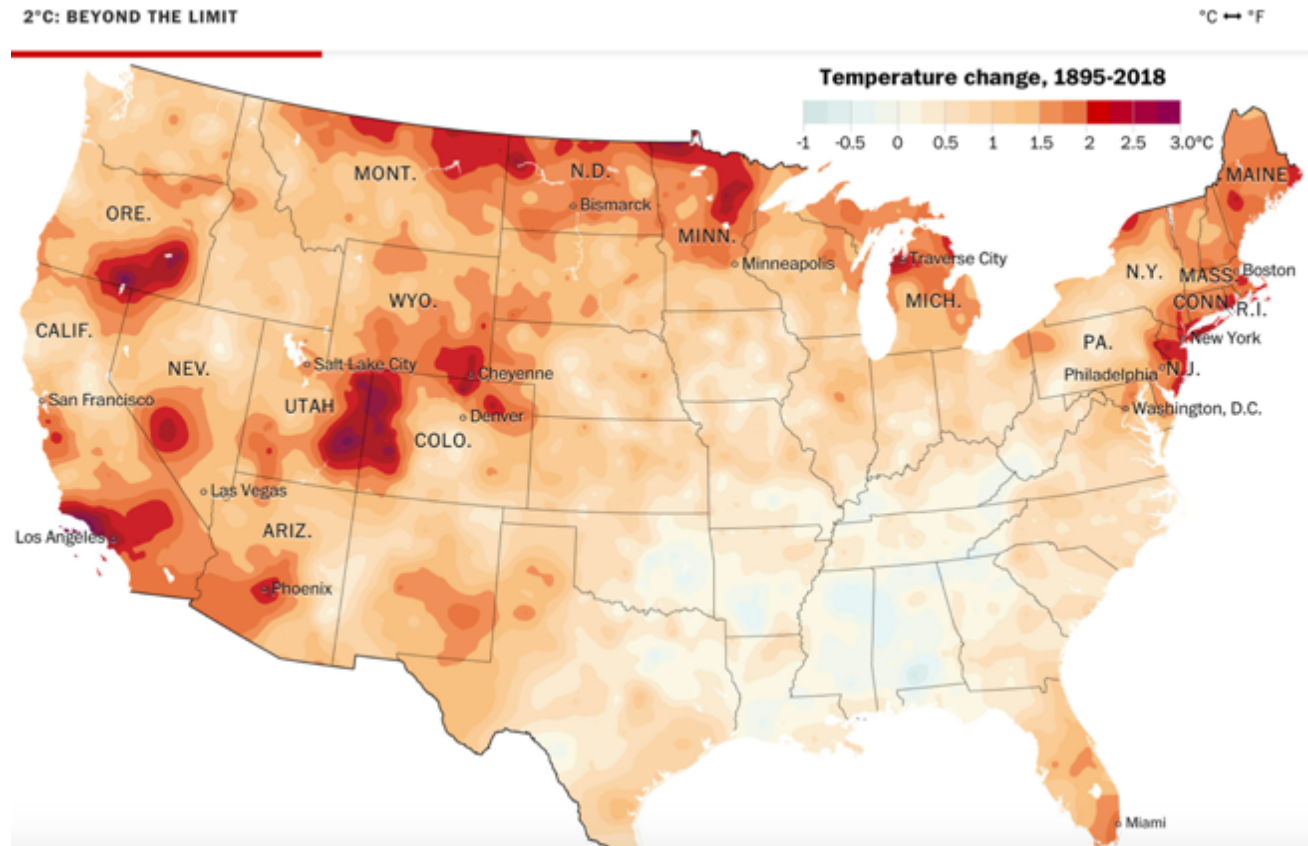
Global average temperatures



A Washington Post analysis of four data sets found that 10% of the world has already warmed by more than 2°C, when the last five years are compared with the mid- to late 1800s. That's more than five times the size of the United States. About 20% of the globe has warmed more than 1.5°C

<https://www.washingtonpost.com/graphics/2019/national/climate-environment/climate-change-world/>

US Average Temperatures



New Mexico's and Bernalillo County's average temperature and have increased 1.1°C. Increases in other counties range from Chaves County 1.7°C to 0.5°C in Union County. Data based on [NOAA](#) (2018).

From <https://www.washingtonpost.com/graphics/2019/national/climate-environment/climate-change-america/>

APPENDIX B: UNM Greenhouse Gas Inventories



*Jeffrey A. Zumwalt
Associate Director, Utilities
Physical Plant Department*

November 12, 2007

Introduction

As the flagship institution of the state of New Mexico, the University of New Mexico has a responsibility to exercise leadership and vision when addressing societal concerns. A recent and significant societal concern is climate change. President Schmidly demonstrated the university's leadership role when he signed the American College and Universities Presidents Climate Commitment June 21, 2007.

The Climate Commitment requires signatory institutions to complete various steps in pursuit of climate neutrality. One of these steps is the calculation of the greenhouse gas emissions from the university. This report is the first greenhouse gas inventory for the University of New Mexico.

This report will quantify the greenhouse gas emissions for the Albuquerque campus. The scope of the analysis includes the north campus, the central campus, and the south campus. The analysis does not include the UNM Hospital, but does include the various smaller buildings located on the periphery of the campus. The methodology for the analysis was adopted from the "Greenhouse Gas Protocol" developed by the World Business Council for Sustainable Development and the World Resources Institute.

Methodology

The Greenhouse Gas Protocol provides detailed guidance for institutions to develop their own inventory. In addition, the protocol directly addresses the issue of "double counting" greenhouse gases (GHG). Double counting of GHG occurs when two or more parties include the same emissions in their respective GHG inventories. An example of this is the GHG associated with commuting to work. This activity generates a finite amount of GHG, but the entity responsible for the GHG is less clear. Both the employee and the employer have the ability to reduce the GHG associated with commuting. Thus, it is likely that both parties will include the commuting GHG in their respective inventories.

The protocol addresses this by delineating between direct and indirect emissions. The employer can provide incentives for the employee such as car pooling or mass transit subsidies. However, it is clear that the effectual decisions such as the type of vehicle, the use of mass transit, the distance of the commute, etc.; are all made by the employee. Accordingly, the GHG emissions associated with commuting to work are "direct" for the employee and "indirect" for the employer.

The protocol categorizes the direct and indirect emissions into three scopes. Scope 1 is direct GHG emissions such as fuel burned to heat a building or gasoline used in a fleet vehicle. Scope 2 is for indirect GHG emissions associated with purchased electricity. Scope 3 is for all other indirect emissions and is defined as emissions that are a consequence of the activities of the institution, but occur from sources not owned or controlled by the institution.

UNM Scope 1 Emissions

The University of New Mexico directly generates GHG emissions. The primary sources of these emissions are from the fuels used for utilities and campus vehicles. The following table summarizes the emissions in metric tons of carbon dioxide equivalent (MTCDE) from scope 1 sources.

Table 1 - UNM Scope 1 GHG Emissions		
Source	Energy (MMBtu)	GHG (MTCDE)
Natural Gas (utilities)	775,378	41,052
Gasoline	14,695	1,057
Diesel	2,921	213
Natural Gas (vehicles)	9,792	521
Total:	802,786	42,844

The natural gas data is from the utility bills from the local utility (Public Service Company of New Mexico) and Coral Energy (wholesale gas provider) including the south campus and other smaller facilities adjacent to the main campus. The gasoline and diesel fuel figures are from the Physical Plant Department's fueling station. The conversion factors were taken from the EPA's "Inventory of Greenhouse Gas Emissions and Sinks 1990 – 2004".

UNM Scope 2 Emissions

The protocol defines scope 2 emissions as those associated with the generation of electricity, heating, or cooling utilities purchased for own consumption.

Table 2 - UNM Scope 2 GHG Emissions		
Source	Energy (MMBtu)	GHG (MTCDE)
Purchased Electricity	837,657	74,408
Purchased Heating	0	0
Purchased Cooling	0	0
Total:	837,657	74,408

UNM Scope 3 Emissions

Scope 3 emissions are a reporting organization's indirect emissions other than those covered in scope 2.

Table 3 - UNM Scope 3 GHG Emissions		
Source	Energy (MMBtu)	GHG (MTCDE)
Student Commuting	483,158	34,770
Faculty/Staff Commuting	145,573	10,475
Air Travel	58,243	11,484
Solid Waste	n/a	406
Total:		57,135

Most of the components of scope 3 emissions are not directly measured. In particular, the commuting and air travel calculations required the use of assumptions and estimates. The commuting values were estimated based on the addresses of the students, faculty, and staff. Human resources provided the zip codes for the fall of 2007. This data was used to calculate an average distance per trip which was then applied to the population data for 2006.

Commuting

About 15% of the student zip codes were for locations that were in excess of 60 miles from campus. It was assumed that these were the addresses of student's homes prior to moving to the Albuquerque area. Thus, the commuting calculation did not include any zip codes that were greater than 60 miles away. These assumptions resulted in an average student commuter distance of just under 22 miles per day for those who drove alone. The calculation for the total number of trips for students assumed that they made one trip to campus for each day in which classes were in session or 159 days.

The number of trips for faculty and staff was based on 21 days of annual leave, 10 days of sick leave, and 13 holidays for a total of 217 trips per year. The approach used to estimate the average student commute was also applied to the zip codes for faculty and staff employees. This resulted in a calculated average daily commute of 19.3 miles for faculty and staff.

The commuting calculations also assumed that mass transit commuters traveled half of the distance of automobile commuters. This was a rough estimation based on the premise that mass transit options diminished greatly for commuters who lived more than 10 miles from the campus in 2006. The percentage of commuters who car pooled, used mass transit, walked, bicycled, or drove alone

was from the 2003 Walker Parking Consultants Study conducted for Parking and Transportation Services.

Air Travel

UNM does not track the miles of air travel for university business. The ACUPCC Implementation Guide September 2007 v1.0 provides a method for estimating air travel. The guide allows for a conversion of total dollars spent on air travel to be converted to miles by using 0.25 \$/mile. The UNM accounting system tracks total dollars spent on out of state travel. This value for calendar year 2006 is \$7,391,223. It was assumed that half of the total travel cost was for air travel. The result of this estimation method is 14,782,446 miles.

Summary

The total GHG emissions from UNM for calendar year 2006 were 174,386 metric tons of carbon dioxide equivalent. The sources identified in the previous tables can be categorized into particular activities at UNM. Table 4 summarizes the various GHG emissions into causes. This table clearly highlights the three greatest contributors to GHG at UNM; electricity, commuting, and heating. These three causes account for 86% of the total. Any substantive effort to reduce GHG emissions at UNM will require focus on these three areas.

Table 4 - UNM GHG Emissions - Causes		
Cause	GHG (MTCDE)	
Electricity	72,131	41%
Commuting	45,245	26%
Heating	33,291	19%
Air Travel	11,484	7%
Cooling	10,038	6%
UNM Vehicles	1,792	1%
Solid Waste	406	0.2%

Appendix A – Conversion Factors

	Units	CO ₂ kg/unit	CH ₄ kg/unit	N ₂ O kg/unit
Natural Gas	MMBtu	52.791	0.00528	0.00011
Gasoline	gallon	8.72	0.00174	0.00060
Diesel	gallon	9.99	0.000567	0.00026
Natural Gas (vehicles)	MMBtu	52.791	0.014	0.00041
Purchased Electricity	kWh	0.738	0.0000065	0.0000146
Air Travel	miles	0.774	0.0000076	0.000009
Solid Waste	ton	0	11.16	0

Appendix B – References

1. Clean Air – Cool Planet’s Campus Carbon Calculator v5.0
2. ACUPCC Implementation Guide September 2007 v1.0
3. “The Greenhouse Gas Protocol – A Corporate Accounting and Reporting Standard revised edition” developed by the World Business Council for Sustainable Development and the World Resources Institute

The University of New Mexico Greenhouse Gas Inventory 2009



2009 GHG Inventory Team

Mary Clark, Danielle Gilliam, Claudia Miller, Michael Polikoff, Tom Weeks, and Jeff Zumwalt

September 22, 2010

Introduction

As an institution of higher learning, the University of New Mexico has a responsibility to exercise leadership and vision when addressing societal concerns. A significant societal concern is climate change. President Schmidly demonstrated the university's leadership role when he signed the American College and Universities Presidents Climate Commitment June 21, 2007.

The Climate Commitment requires signatory institutions to complete various steps in pursuit of climate neutrality. One of these steps is the calculation of the greenhouse gas emissions from the university. UNM completed the initial inventory in 2007 for the 2006 calendar year. This report is the second greenhouse gas inventory for the University of New Mexico.

This report quantifies the greenhouse gas emissions for the Albuquerque campus for the calendar year 2009. The scope of the analysis includes the north campus, the central campus, and the south campus. The analysis does not include the UNM Hospital, but does include the various smaller buildings located on the periphery of the campus. The methodology for the analysis was adopted from the "Greenhouse Gas Protocol" developed by the World Business Council for Sustainable Development and the World Resources Institute.

Methodology

The Greenhouse Gas Protocol provides detailed guidance for institutions to develop their own inventory. In addition, the protocol directly addresses the issue of "double counting" greenhouse gases (GHG). Double counting of GHG occurs when two or more parties include the same emissions in their respective GHG inventories. An example of this is the GHG associated with commuting to work. This activity generates a finite amount of GHG, but the entity responsible for the GHG is less clear. Both the employee and the employer have the ability to reduce the GHG associated with commuting. Thus, it is likely that both parties will include the commuting GHG in their respective inventories.

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The protocol categorizes the direct and indirect emissions into three scopes. Scope 1 is direct GHG emissions such as fuel burned to heat a building or gasoline used in a fleet vehicle. Scope 2 is for indirect GHG emissions associated with purchased utilities. Scope 3 is for all other indirect emissions and is defined as emissions that are a consequence of the activities of the institution, but occur from sources not owned or controlled by the institution.

The Clean Air - Cool Planet Campus Carbon Calculator version 6.4 was used to convert the fuel and other input data into metric tons of carbon dioxide equivalent (MTCDE).

UNM Scope 1 Emissions

The University of New Mexico directly generates GHG emissions. The primary sources of these emissions are from the fuels used for utilities and campus vehicles. The following table summarizes the emissions in metric tons of carbon dioxide equivalent from scope 1 sources.

Table 1 - UNM Scope 1 GHG Emissions		
Source	Energy (MMBtu)	GHG (MTCDE)
Natural Gas	794,142	42,017
UNM Vehicles	22,499	1,491
Total:	816,641	43,508

The natural gas data is from the utility bills from the local utility (Public Service Company of New Mexico) and British Petroleum (wholesale gas provider) including the south campus and other smaller facilities adjacent to the main campus. The vehicle fuel figures are from the Physical Plant Department's fueling station and from Purchasing Card receipts for off campus sources.

UNM Scope 2 Emissions

The protocol defines scope 2 emissions as those associated with the generation of electricity, heating, or cooling utilities purchased for consumption.

Table 2 - UNM Scope 2 GHG Emissions		
Source	Energy (MMBtu)	GHG (MTCDE)
Purchased Electricity	637,806	51,444
Purchased Heating	0	0
Purchased Cooling	0	0
Total:	637,806	51,444

UNM Scope 3 Emissions

Scope 3 emissions are a reporting organization’s indirect emissions other than those covered in scope 2.

Table 3 - UNM Scope 3 GHG Emissions		
Source	Energy (MMBtu)	GHG (MTCDE)
Student Commuting	360,716	26,017
Faculty and Staff Commuting	59,408	4,286
Air Travel	56,799	11,192
Solid Waste	n/a	433
Purchased Electricity – Line Losses	63,080	5,088
Total:		47,016

Some of the components of scope 3 emissions are not directly measured. In particular, the commuting and air travel calculations required the use of assumptions and estimates. The commuting values were estimated based on a 2010 survey conducted by Parking and Transportation Services. This data was used to calculate the average miles traveled per week which was then applied to the population data for 2009.

Commuting

The Parking and Transportation survey revealed the following commuting patterns for the UNM community:

Table 4 - UNM Commuting				
Population	Personal Vehicle - Alone	Carpool	Bus	Commuter Rail
Students	54%	7%	15%	2%
Faculty	65%	6%	7%	4%
Staff	67%	8%	10%	3%

Air Travel

UNM does not directly track the miles of air travel for university business. However, the Purchasing department does track the airport codes for each trip. This data was used to provide a good estimate of the air travel.

Summary

The total GHG emissions from UNM for calendar year 2009 were 141,818 metric tons of carbon dioxide equivalent. The sources identified in the previous tables can be categorized into particular activities at UNM. Table 5 summarizes the various GHG emissions into activities. This table clearly highlights the three greatest contributors to GHG at UNM; electricity, commuting, and heating. These three activities account for 85% of the total GHG emitted by UNM. Any substantive effort to reduce GHG emissions at UNM requires focus on these three areas.

Table 5 – GHG Emissions Activities (MTCDE)		
Activity	2009 GHG	
Electricity	60,753	43%
Commuting	30,303	21%
Heating	29,940	21%
Air Travel	11,192	8%
Cooling	7,856	6%
UNM Vehicles	1,491	1.1%
Solid Waste	433	0.3%

UNM has engaged in many sustainable efforts since the first inventory for 2006. Some of these have had a direct impact on the GHG emissions of the university. Table 6 compares the GHG emissions generated by activity between 2006 and 2009. The table identifies a substantial reduction in emissions of 19%.

Table 6 – 2006 vs. 2009 Activities (MTCDE)			
Activity	2006	2009	Change
Electricity	72,131	60,753	-16%
Commuting	45,245	30,303	-33%
Heating	33,291	29,940	-10%
Air Travel	11,484	11,192	-3%
Cooling	10,038	7,856	-22%
UNM Vehicles	1,792	1,491	-17%
Solid Waste	406	433	+7%
Total:	174,386	141,818	-19%

An analysis of these activities and the methods used to calculate GHG emissions revealed four main causes for the reduction. These are conservation, utilities efficiency, more accurate data, and societal improvements in energy use.

The campus-wide energy conservation efforts at UNM were a major factor in the reduction of the electrical, heating, and cooling emissions. Low natural gas prices allowed the university to generate a greater percentage of its electricity in 2009 resulting in a lower amount purchased from PNM. This generation is much more efficient than the technologies used by PNM which translates into lower GHG for electricity. The reductions in commuting can be attributed to more accurate data. The 2006 commuting data was based on the zip codes of the UNM population. This required a lot of assumptions to convert to overall miles traveled. The use of a survey for the 2009 data revealed a reduced percentage of single occupancy vehicles. This is likely due to better data and also to the free bus program and the implementation of the Rail Runner commuter rail system. Lastly, as society as a whole decreases energy usage it affects UNM's overall GHG emissions. This is reflected in the conversion factors used by the carbon calculator for vehicle efficiency and GHG emissions per unit of electricity from the local utility company.



Appendix A – References

1. Clean Air – Cool Planet’s Campus Carbon Calculator v6.4
2. ACUPCC Implementation Guide September 2007 v1.0
3. “The Greenhouse Gas Protocol – A Corporate Accounting and Reporting Standard revised edition” developed by the World Business Council for Sustainable Development and the World Resources Institute

The University of New Mexico Greenhouse Gas Inventory 2013



Mary Clark and Jeff Zumwalt

January 6, 2014

Introduction

As an institution of higher learning, the University of New Mexico has a responsibility to exercise leadership and vision when addressing societal concerns. A significant societal concern is climate change. President Schmidly demonstrated the university's leadership role when he signed the American College and Universities Presidents Climate Commitment June 21, 2007.

The Climate Commitment requires signatory institutions to complete various steps in pursuit of climate neutrality. One of these steps is the calculation of the greenhouse gas emissions from the university. UNM completed the initial inventory in 2007 for the 2006 calendar year. This report is the third greenhouse gas inventory for the University of New Mexico.

This report quantifies the greenhouse gas emissions for the Albuquerque campus for the fiscal year 2012-2013. The scope of the analysis includes the north campus, the central campus, and the south campus. The analysis does not include the UNM Hospital, but does include the various smaller buildings located on the periphery of the campus. The methodology for the analysis was adopted from the "Greenhouse Gas Protocol" developed by the World Business Council for Sustainable Development and the World Resources Institute.

Methodology

The Greenhouse Gas Protocol provides detailed guidance for institutions to develop their own inventory. In addition, the protocol directly addresses the issue of "double counting" greenhouse gases (GHG). Double counting of GHG occurs when two or more parties include the same emissions in their respective GHG inventories. An example of this is the GHG associated with commuting to work. This activity generates a finite amount of GHG, but the entity responsible for the GHG is less clear. Both the employee and the employer have the ability to reduce the GHG associated with commuting. Thus, it is likely that both parties will include the commuting GHG in their respective inventories.

The protocol addresses this by delineating between direct and indirect emissions. The employer can provide incentives for the employee such as carpooling or mass transit subsidies. However, it is clear that the impactful decisions such as the type of vehicle, the use of mass transit, the distance of the commute, etc.; are all made by the employee. Accordingly, the GHG emissions associated with commuting to work are "direct" for the employee and "indirect" for the employer.

The protocol categorizes the direct and indirect emissions into three scopes. Scope 1 is direct GHG emissions such as fuel burned to heat a building or gasoline used in a fleet vehicle. Scope 2 is for indirect GHG emissions associated with purchased utilities. Scope 3 is for all other indirect emissions and is defined as emissions that are a consequence of the activities of the institution, but occur from sources not owned or controlled by the institution.

The Clean Air - Cool Planet Campus Carbon Calculator version 6.9 was used to convert the fuel and other input data into metric tons of carbon dioxide equivalent (MTCDE).

UNM Scope 1 Emissions

The University of New Mexico directly generates GHG emissions. The primary sources of these emissions are from the fuels used for utilities and campus vehicles. The following table summarizes the emissions in metric tons of carbon dioxide equivalent from scope 1 sources.

Table 1 - UNM Scope 1 GHG Emissions		
Source	Energy (MMBtu)	GHG (MTCDE)
Natural Gas	828,342	44,054
UNM Vehicles	14,673	1,078
Total:	843,015	45,132

The natural gas data is from the utility bills from the local utility (Public Service Company of New Mexico) and British Petroleum (wholesale gas provider) including the south campus and other smaller facilities adjacent to the main campus. The vehicle fuel figures are from the Physical Plant Department's fueling station and from Purchasing Card receipts for off campus sources.

UNM Scope 2 Emissions

The protocol defines scope 2 emissions as those associated with the generation of electricity, heating, or cooling utilities purchased for consumption.

Table 2 - UNM Scope 2 GHG Emissions		
Source	Energy (MMBtu)	GHG (MTCDE)
Purchased Electricity	586,952	45,753
Purchased Heating	0	0
Purchased Cooling	0	0
Total:	586,952	45,753

UNM Scope 3 Emissions

Scope 3 emissions are a reporting organization's indirect emissions other than those covered in scope 2.

Table 3 - UNM Scope 3 GHG Emissions		
Source	Energy (MMBtu)	GHG (MTCDE)
Student Commuting	322,857	23,779
Faculty and Staff Commuting	51,284	3,769
Air Travel	25,662	5,023
Solid Waste	n/a	444
Purchased Electricity – Line Losses	58,050	4,525
Total:		37,540

Some of the components of scope 3 emissions are not directly measured. In particular, the commuting and air travel calculations required the use of assumptions and estimates. The commuting values were estimated based on a 2013 survey conducted by Parking and Transportation Services. This data was used to calculate the average miles commuted per week.

Commuting

The Parking and Transportation survey revealed the following commuting patterns for the UNM community:

Table 4 - UNM Commuting				
Population	Personal Vehicle - Alone	Carpool	Bus	Commuter Rail
Students	48%	5%	20%	3%
Faculty	58%	6%	6%	2%
Staff	60%	6%	15%	3%

Air Travel

UNM does not directly track the miles of air travel for university business. However, the Purchasing department does track the airport codes for each trip. This data was used to estimate air travel miles.

Summary

The total GHG emissions from UNM for fiscal year 2013 were 128,425 metric tons of carbon

dioxide equivalent. The sources identified in the previous tables can be categorized into particular activities at UNM. Table 5 summarizes the various GHG emissions into activities. This table shows that electricity, commuting, and heating are the three greatest generators of GHG at UNM. These three activities account for 87% of the total GHG emitted by UNM. Any substantive effort to reduce GHG emissions at UNM requires focus on these three areas.

Table 5 – GHG Emissions Activities (MTCDE)		
Activity	GHG (MTCDE)	
Electricity	56,348	44%
Commuting	27,548	21%
Heating	27,585	21%
Air Travel	5,023	4%
Cooling	10,400	8%
UNM Vehicles	1,078	1%
Solid Waste	444	0.3%

UNM has engaged in many sustainable efforts since the first GHG inventory. Some of these have had a direct impact on the GHG emissions of the university. Table 6 compares the GHG emissions generated by activity between 2006 and 2009. The table identifies a substantial reduction in emissions of 19%.

Table 6 –Activities Comparison (MTCDE)				
Activity	2006	2009	2013	2006 to 2013 Change
Electricity	72,131	60,753	56,348	-22%
Commuting	45,245	30,303	27,548	-39%
Heating	33,291	29,940	27,585	-17%
Air Travel	11,484	11,192	5,023	-56%
Cooling	10,038	7,856	10,400	+4%
UNM Vehicles	1,792	1,491	1,078	-40%
Solid Waste	406	433	444	+9%
Total:	174,386	141,818	128,425	-26%

An analysis of these activities and the methods used to calculate GHG emissions revealed four main causes for the reduction. These are conservation, utilities efficiency, more accurate data, and

societal improvements in energy use.

The campus-wide energy conservation efforts at UNM were a major factor in the reduction of the electrical, heating, and cooling emissions. Low natural gas prices allowed the university to generate a greater percentage of its electricity in 2009 resulting in a lower amount purchased from PNM. This generation is much more efficient than the technologies used by PNM which translates into lower GHG for electricity. The reductions in commuting can be attributed to more accurate data. The 2006 commuting data was based on the zip codes of the UNM population. This required a lot of assumptions to convert to overall miles traveled. The use of a survey for the 2009 data revealed a reduced percentage of single occupancy vehicles. This is likely due to better data and also to the free bus program and the implementation of the Rail Runner commuter rail system. Lastly, as society as a whole decreases energy usage it affects UNM's overall GHG emissions. This is reflected in the conversion factors used by the carbon calculator for vehicle efficiency and GHG emissions per unit of electricity from the local utility company.



Appendix A – References

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3. “The Greenhouse Gas Protocol – A Corporate Accounting and Reporting Standard revised edition” developed by the World Business Council for Sustainable Development and the World Resources Institute

APPENDIX C: UNM Climate Change Timeline

February 1889 University of New Mexico is founded.

February 1889 295 ppm¹ CO₂ atmospheric level (ice core).

1889 -0.1°C Land-Ocean Temperature Index (relative to 1951-1980 average temperatures which are close to 1880)².

February 1979 336.69 ppm³ CO₂ (Mauna Loa Observatory).

1979 Temperature Rise 0.17°C.

1979-1985 UNM Energy Conservation Program, National Award Program for Energy Innovation.

February 1990 355.02 ppm⁴ CO₂.

1990 Temperature Rise 0.45°C.

1990s \$60 million upgraded utility system included two new boilers, new gas turbine, 30-inch pipes to improve the chilled water distribution more efficiently and relamping, which reduced energy usage by 30%.

Engineering and Energy Services continues to re-commission existing buildings to optimize building performance and increase energy conservation. Lobo Energy, Inc. has been developing partnerships and strategic alliances to incorporate renewal energies on campus. Since 2009 UNM energy use has declined by 23%.

February 2000 369.54 ppm⁵ CO₂.

2006 Temperature Rise 0.64°C.

2006 Governor Richardson issues EO 2006-001 **Green Buildings**, which requires new state buildings greater than 15,000 square feet to be built to at least LEED Silver standards.

2006 Greenhouse Gas Inventory by Jeffrey Zumwalt Associate Director of the UNM Physical Plant Department: Total= 174,387 metric tons of carbon dioxide equivalent. 42,844 MTCDE (Scope 1, direct, mostly from natural gas utilities); 74,408 MTCDE (Scope 2, purchased electricity); 57,135 MTCDE (Scope 3, commuting, air travel). Found in Climate Action Plan.

2007 UNM Implemented smart metering system in utility system.

2007 Sustainability Studies Program⁶ officially begins.

June 2007 President David J. Schmidly signed the American College & University **President's Climate Commitment** (ACUPCC – later became Second Nature) committing UNM to carbon neutrality. The University has made it a strategic objective to reduce campus carbon emissions by 80% of 2006 level by 2030 and establish the needed framework to make UNM carbon neutral by the year 2050. The ACUPCC also requires GHG inventories every other year.

2008 UNM begins **Energy Conservation Program** to change behaviors.

April 2008 UNM adopts **Sustainability as a Core Value**.

June 2008 [Sustainability Policy 2100](#) adopted.

September 2009 UNM Sustainability Council Submits **Climate Action Plan**. It contains two parts:

1. A list of projects that *outline specific actions and goals that UNM can accomplish in five year increments with a reasonable level of funding and technological advances compiled by the Carbon Neutral Task Force formed by the Sustainability Council and headed by Jeff Zumwalt, Associate Director – Utilities. It met for over a year;*
2. *Dr. Bruce Milne, director of the Sustainability Studies program, and his Sustainability 434 students put together a report titled “Carbon Neutrality at UNM.” The students presented this plan at an open forum in May and invited the UNM community, neighborhoods associations, local environmentalists, and others to give their input.*

2009 Greenhouse Gas Inventory. Total=141,818 metric tons of carbon dioxide equivalent. 43,508 MTCDE (Scope 1); 51,444 MTCDE (Scope 2); SW inferred-46,866 (Scope 3). 19% reduction from 2006 (only increase was in solid waste, 7%).

February 2010 360.20 ppm⁷ CO₂.

2010 Temperature Rise 0.72°C.

2010 UNM [Office of Sustainability](#) is established.

April 2013 The Associated Students of the University of New Mexico (**ASUNM**) Senate unanimously passed Resolution 11S requesting that UNM President Robert Frank form a committee to create a student-governed **Green Fund** to support the efforts of the 2009 Climate Action Plan. “We’re trying to refocus and re-center our commitment to sustainability,” former Student Regent Jacob Wellman said. “Part of that is how the University is trying to better the world for the citizens of tomorrow.”⁸ As of 2018, \$43,000 of allocated student fees were used to support student-created projects like electric charging stations, a seed library and a composting system in Lobo Gardens, and events educating the public on zero waste initiatives.⁹

2013 UNM buys second natural gas cogeneration unit to double electricity generation capacity 12 MW and to lower dependency on PNM electricity. It also provides backup to UNMH.

2013 Greenhouse Gas Inventory. Total= 128,425. 45,132 MTCDE (Scope 1); 45,753 MTCDE (Scope 2); 37,540 MTCDE (Scope 3). 26% reduction from 2006.

2015 NM350 Cofounder Tom Solomon presents to the Regents on **Divesting Endowment from Fossil Fuels**. Committee formed in response declines to divest.

December 2015 (Signed June 2016) Paris Accord agreed to keep temperatures below 2°C, aspired to 1.5°C. This should be done by peaking emissions as soon as possible, in order to "achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases" in the second half of the 21st century.

2016 UNM [Sustainability Plan 5 Year Plan](#) Under budget pressure UNM withdraws from Second Nature, AASHE and USGBC. UNM is still listed as a signatory in Second Nature (2020).

October 2018 IPCC's [Special Report on Global Warming of 1.5 °C \(SR15\)](#) warns that limiting global warming to 1.5 °C will require net human-caused CO2 emissions to fall rapidly to 45% of 2010 levels by 2030 and be net zero by 2050. This will require "rapid, far-reaching and unprecedented changes in all aspects of society." Human activities have already caused about 1°C in warming, and if these continue to increase at the current rate, global warming will reach 1.5°C sometime between 2030 and 2052. At 1.5 °C, we face increasing risks to our water supply, economic security, health, livelihood, food security, crop yields, nutritional quality, livestock, forests, and freedom from vector-borne diseases. If we fail to act and temperatures go to 2°C, the risks become more extreme.

October 2017 In a press conference at UNM, Environment New Mexico unveiled their [10-point plan](#) to assist colleges and universities with the transition to using 100 percent renewable energy¹⁰.

October 2017 ASUNM Senate unanimously passed a resolution for UNM to take concrete steps to transition to 100% renewable energy. Senator Emily Hartshorn said the benefits of 100% renewable energy could include: saving money on utilities, providing education and research opportunities for students and allowing UNM to become a leader in renewable energy, in hopes that it will create more jobs¹¹.

October 2018 ASUNM Senate unanimously passed a resolution in support of UNM transitioning to 100 percent renewable energy by 2050. "As the generation that will be most affected by climate change, we bear the burden to make changes in the places where we have power to make the world sustainable," said Harper Gamble, president of Environment New Mexico UNM Chapter and co-founder of the UNM Environmental Coalition.¹²

December 5, 2018. UNM faculty, student government representatives, and student group leaders joined Environment New Mexico, to **deliver a petition to President Stokes**. The petition, signed by 1,500 people in the UNM community, supported making UNM the next campus to commit to going 100% percent renewable by 2050. Students and faculty also unveiled a 'Renewable Energy 101' toolkit, a series of ten factsheets detailing tools that universities can use to transition to 100 percent.¹³

2019 Temperature Rise 0.98°C.

2019 New Mexico Temperature Rise since 1970s is 1.1°C¹⁴; NOAA reports: "Unprecedented future warming is likely" for New Mexico.

(Counties range from Chaves County 1.7°C to 0.5°C in Union County; Bernalillo County is 1.1°C)¹⁵.

2019 Due to lack of movement on climate crisis, University Climate Change Coalition (now called Second Nature) revises their emissions target to 50% of 2019 GHG emissions by 2030.

January 2019 ASUNM President Becka Meyers requests and receives a **\$250,000 capital outlay for a solar panel project** on the Student Union Building on behalf of ASUNM. However, due to weather damage to the roof, Zimmerman is considered as an alternative site¹⁶.

January 29, 2019 Governor Michele Lujan Grisham issues NM **Executive Order 2019-003**, which requires all state organizations to reduce GHG emissions 45% of 2005 levels by 2030 in compliance with the 2015 Paris Agreement Goals. All State Agencies shall evaluate the impacts of climate change on their programs and operations and integrate climate change mitigation and adaptation practices into their programs and operations. The agencies shall share these actions with the Climate Change Task Force for Inclusion into the New Mexico Climate Strategy document.

September 2019 University of California, citing financial risks, pledges to divest its \$13.4 billion endowment fund and its \$80 billion pension fund of fossil fuel investments¹⁷. More than 40 US colleges and universities had divested from some form of fossil fuels as of 2018¹⁸.

December 6, 2019 UNM Leaf asks President Stokes to declare a climate emergency, divest from fossil fuels and obtain carbon neutrality and zero waste by 2030.

January 2020 Due to rising GHG emissions and 1.5C IPCC report, EU Parliament moves to revise Paris target from 40% of 1990 level by 2030 to 50% of 1990 level by 2030.

February 2020 414.11 ppm¹⁹ CO₂.

March 2020 Joint ASUNM-Facilities Management Utilities Division Photovoltaic Array \$400,000 Project approved for Zimmerman Library²⁰

April 2020 Due to decreased demand brought on by the COVID19 pandemic and other factors, the price of oil fell below \$0 per barrel.²¹

April 2020 Science magazine reports that climate change has pushed the Southwest into the second worst megadrought of the last 1,200 years.²²

¹ https://sealevel.info/co2_and_ch4.html

² NASA Global Climate Change: Vital Signs of the Planet: <https://climate.nasa.gov/vital-signs/global-temperature/>

³ <https://www.co2.earth/monthly-co2>

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- ⁴ <https://www.co2.earth/monthly-co2>
- ⁵ <https://www.co2.earth/monthly-co2>
- ⁶ <https://sust.unm.edu>
- ⁷ <https://www.co2.earth/monthly-co2>
- ⁸ <https://www.dailylobo.com/article/2013/04/asunm-proposes-green-fund>
- ⁹ <https://www.newmexiconewsport.com/unm-green-fund-uses-student-fees-support-student-projects-sustainability/>
- ¹⁰ <https://www.dailylobo.com/article/2017/10/environment-nm>
- ¹¹ <https://sust.unm.edu/news/2017/11/asunm-resolution-hopes-to-edge-unm-toward-total-renewable-energy.html>
- ¹² <https://environmentnewmexico.org/news/nme/asunm-senators-pass-resolution-move-unm-towards-100-renewable-energy>
- ¹³ <https://environmentnewmexico.org/news/nme/100-renewable-unm-delivers-1500-petitions-‘renewables-101’-toolkit-president’s-office>
- ¹⁴ <https://statesummaries.ncics.org/chapter/nm/>
- ¹⁵ <https://www.washingtonpost.com/graphics/2019/national/climate-environment/climate-change-america/>
- ¹⁶ <https://www.dailylobo.com/article/2019/07/solar-panels-sub>
- ¹⁷ <https://calmatters.org/education/higher-education/2019/09/uc-divests-fossil-fuels-citing-finance-renewable-energy-climate-change/>
- ¹⁸ <https://nonprofitquarterly.org/taking-stock-of-the-fossil-fuel-divestment-movement/>
- ¹⁹ <https://www.co2.earth/monthly-co2>
- ²⁰ <https://news.unm.edu/news/solar-panels-to-go-on-roof-of-zimmerman-library>
- ²¹ https://www.marketwatch.com/story/us-oils-may-contract-skids-about-20-at-nadir-as-crudes-woes-continue-2020-04-19?mod=article_inline
- ²² <https://science.sciencemag.org/content/368/6488/238>