Ogmius

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Emperor penguin and icebreaker in the Ross Sea, Antarctica. Photo: John B. Weller.

The CSTPR blog, Prometheus (http://ciresblogs.colorado.edu/prometheus), was revived in 2016 to regularly feature content from CSTPR core faculty, affiliates, postdocs, and visitors to serve as a resource for science and technology decision makers. This dynamism reflects the new energies and pursuits taking place in and around CSTPR. Below we feature one of the recent blog posts.

The Complexity of Consensus: Protecting the World's Most Remote Ocean by Cassandra Brooks

Every year I travel to Hobart, Tasmania at the southern tip of Australia to study international negotiations about protecting the oceans around Antarctica. The future of our oceans demands the establishment of large protected areas and arguably we are leading the way in the Antarctic.

The Antarctic region is exceptional. The coldest, windiest, iciest, driest, and most remote of continents is celebrated for its rich history of exploration, science and diplomacy. The Antarctic Treaty System (https://www.ats.aq/e/ats.htm), the suite of legal agreements that govern the region, lay out strict principles in the service of peace, science, and environmental preservation.

Among these agreements, the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) (https://www.ccamlr.org) carries forward the mandate for conserving the Southern Ocean ecosystem, including its marine living resources. Fishing is allowed under the Convention, but only under strict, ecosystem and science-based management.

THIS ISSUE

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http://sciencepolicy.colorado.edu/ogmius

Adélie penguins hunting in the Ross Sea, Antarctica. Photo: John B. Weller.

CCAMLR has been deemed a leader in international ocean management for its precautionary approach. In line with this leadership, in 2002 CCAMLR committed to designating a network of Southern Ocean marine protected areas in accordance with global international targets. Working towards this goal, CCAMLR adopted the world's first international marine reserve in 2009 when they protected 94,000 km^2 south of the South Orkney Islands. In 2011 they adopted a management framework to guide the protected area process.

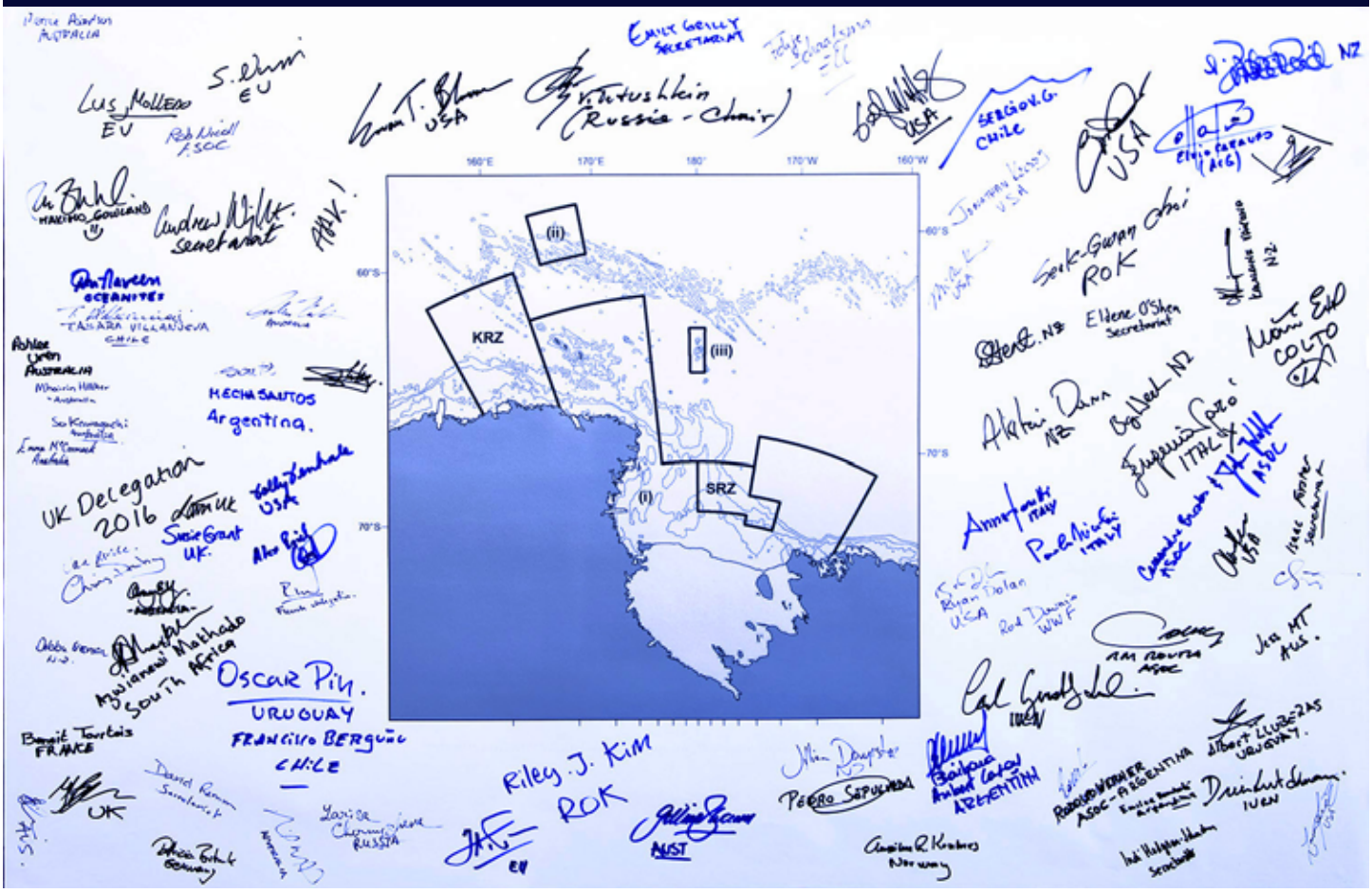
Then in 2016, CCAMLR made headlines when they adopted, by consensus, a vast 1.6 million km^2 marine protected area in the Ross Sea. This is the world's first large-scale international marine protected area, and in a region deemed to be one of the healthiest marine ecosystems left on the planet.

My research revolves around understanding under what conditions consensus is possible in managing these global commons. In recent years, I have seen that competing national incentives among CCAMLR states and complex international relations extending far beyond the protected area negotiations stymie consensus as states negotiate power and fishing access in this icy commons at the bottom of the world.

Looking to what ultimately drove consensus in the Ross Sea can provide insight into the process of reaching consensus and understanding the necessary trade-offs. China and Russia steadfastly blocked adoption of a Ross Sea marine protected area until 2015 and 2016 when high-level diplomacy created a political window of opportunity. China's support for the Ross Sea protected area in 2015 has been directly attributed to presidential level political meetings between the United States and China.

In 2016, Russia was isolated as the last member state not supporting the adoption of a Ross Sea protected area, not a good political position. Further, Russia had an opportunity and incentives to demonstrate leadership. Russia was chairing the annual CCAMLR meeting and was preparing to celebrate the 200th anniversary of its contested discovery of the Antarctic continent. Russian President Vladimir Putin had announced that 2017 would be a special 'Year of Ecology' (https://www.iucn.org/news/eastern-europe-and-central-asia/201703/year-ecology-russia) and he had appointed a new 'Special Representative for Ecology'.

Perhaps most importantly, the United States Secretary of State, John Kerry, wanted a Ross Sea marine protected area to be part of his legacy. With his term coming to an end, he



Map of the newly adopted Ross Sea MPA, with the signatures of international CCAMLR delegates who were there at adoption. Photo: John B. Weller.

brought the issue to the forefront with his counterparts in Russia throughout 2016.

Pressure was building both inside and outside of the meeting room for Russia to join the consensus. But before Russia would agree to adopt the Ross Sea protected area, the Russian delegation requested changes to the proposal, negotiating for a higher level of fishing to be allowed inside and around the Ross Sea protected area.

That left one outstanding issue to deal with: Duration. How long would the protected area be in place for? To meet the demands of countries who wanted to ensure future access, the protected area was adopted for 35 years. With these final concessions, consensus was achieved and the Ross Sea marine protected area was immediately a source of pride for CCAMLR member states.

In managing one of the great oceanic commons, despite political plays, CCAMLR has continued to be an international leader. No other international management body has outpaced CCAMLR in adopting marine protected areas. The Southern Ocean harbors the world's largest marine protected area in the Ross Sea and three large areas remain under negotiation for protection: The Western Antarctic Peninsula, the Weddell Sea and the East Antarctic. Negotiations will resume in October 2018 when member states again gather in Hobart, Tasmania.

It is often unclear in the moment how a political window of opportunity opens. International consensus demands patience. It may still take some time to align national incentives and generate international diplomacy for the remaining areas to achieve protection. One thing is clear: CCAMLR has collectively agreed to designate a network of marine protected areas in the Southern Ocean and ultimately the 25 members need to find the political will to see the effort through.

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FACULTY AFFILIATE FORUM

Learning from Colorado's 2013 Floods: Decisions, Processes, and Outcomes Four Years Later

by Deserai Crow and Elizabeth Albright

Nearly five years ago this coming fall, a stationary storm settled on Colorado's Front Range foothills, dropping more than 16 inches of rain over 72 hours in some places. Flash flooding along foothills communities (Boulder, Lyons, Longmont, Estes Park, and Loveland, among others) occurred within hours. As the flood waters moved east, Colorado's plains communities (Evans and Greeley, among others) were impacted.

Elizabeth Koebele (Assistant Professor at University of Nevada Reno), former CSTPR graduate student and RA on the flood project, presents at the concluding stakeholder workshop for flood study participant communities in September 2017. Photo: Deserai Crow.

Communities, households, and individuals are vulnerable to floods due to factors such as human development and changing weather patterns associated with climate change. Local governments focus much of their preparedness attention on emergency response, such as evacuation and restoration of utilities, and may assume that those skills can translate into longer-term disaster recovery.

However, during disaster recovery, local governments are faced with a myriad of policy challenges, from repairing and replacing infrastructure to broader questions of reducing vulnerability to future hazards, which must be dealt with over months and years with no clear path toward 'success'.

Understanding how local governments respond to a disaster and plan for the future is critical to consider in order to determine whether experiencing a disaster results in safer and more resilient communities. Our work is focused on what leads to increased community resilience to future disasters. **We have spent the last four years focused on understanding how communities, the public, and governments can learn from disasters**.

Resilience, as we define it in our study, is seen when communities learn to adapt to hazards they face, encourage feedback and learning among and from residents, and make decisions with future risks and goals in mind. The goal of our study is to help communities learn how to improve recovery decisions that decrease their vulnerability to a wide variety of hazards and prepare for future disasters that may strike. Hazards in this case include flood risk, but can also include natural, human-made, accidental, economic, or other risks that communities face. The difference between ongoing vulnerability to hazards and long-term resilience may, in part, depend on learning from and adaptating to disaster risks in local communities. Residents and decision makers who understand the factors that increase the likelihood of successful resilience policy may be more likely to develop long-term local-level adaptability and resilience.

While communities learn most dramatically from their own experience with disasters, we believe **our research can help communities that face myriad hazards establish processes that can mitigate their risk for future disasters**. Based on our research findings, we presented the following recommendations to local governments working on disaster recovery planning at a fall workshop with our research participants (http://www.learningfromdisasters.org/findings).

Risk Perception, Communication, and Community Participation

1. Conduct a disaster recovery planning process similar to existing disaster preparedness processes including the processes and personnel that will guide recovery.

2. Develop a forum to bring together leaders of existing neighborhood and community groups to facilitate

conversations about including a diversity of residents in planning and advocacy, identifying important mitigation/recovery resources, and partnering with the local government and other organizations on recovery goals.

3. Maintain an on-going dialogue between local officials and community members to facilitate an in-depth understanding of local hazard risks and risk reduction strategies, focused on using multiple methods of communication and education targeted at specific segments of the community (e.g., children, older adults, immigrants).

4. Capitalize on residents' direct experiences with hazards to learn more about potential high-risk areas; incorporate these residents into the process of developing risk reduction tools such as hazard maps.

5. Make risk maps available to the public, using simple color-coding or other systems, so that individuals can clearly see their own risk as well as their neighborhood and community risks.

Needs of Diverse Communities

1. Seek assistance from faith-based organizations and community non-profits that are already working with residents who face barriers to accessing government aid programs and decision-making processes.

2. Work across governmental departments (such as human services, health, animal control, and code enforcement) to find points of positive engagement with residents regarding risk and resilience, including developing both an emergency plan and a recovery plan to work with their constituents and identify segments that may be most affected by a disaster.

3. Identify existing relationships in the community – both organizations and individuals – who will be important points-of-contact after a disaster to assist and communicate with various segments of the population, rather than relying only on government-run or established leadership.

Financial and Budgetary Planning

1. Incorporate disaster finance planning in all government departments rather than sequestering the skills only within a single department. Consider requiring an existing training module (or developing a more robust module for communities within a single state) for emergency managers and financial and procurement staff, to train them in the requirements for response and recovery documentation.

2. Determine an appropriate level of budget reserves and clearly document the justification for this level so future government staff and elected officials have insight into past budgetary decisions.

3. Develop pre-disaster relationships and formal partnerships (e.g., MOUs) between larger and smaller capacity governments to aid smaller communities, including with fiscal management, during disasters.

Visit the research team's website at http://www.learningfromdisasters.org for a full report and publications.

The full report of our project findings is available at our project website: http://www.learningfromdisasters.org/publications/final_report.pdf. Our hope is that local governments can use the recommendations to move towards a more resilient state in the face of ongoing and increasing hazards.

Drs. Crow and Albright thank the study participants who gave generously of their time over three years, collaborator Dr. Todd Ely, and research assistants Dr. Lydia Lawhon, Dr. Elizabeth Koebele, Dr. Jack Zhou, Corrie Hannah, and Daniel Kojetin. This project was funded by the National Science Foundation and pilot data were collected through a quick response grant from CU's Natural Hazards Center.

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FACULTY AFFILIATE FORUM

A More *Effishient* Way to Conserve Forests and Support Livelihoods?

by Peter Newton

Sr. Luís tosses a handful of feed into the large pond, and the water erupts as dozens of large *Arapaima* fish compete for it. These freshwater fish, known here in Brazil as *pirarucu*, are found naturally in Amazonian lakes but are also now produced by small-scale farmers who have adopted aquaculture as part of a diversified farming system. *Pirarucu* are a well-known and popular fish: they taste delicious, and since they can grow up to an enormous 200lbs, they produce large boneless fillets. Sr. Luís began investing in aquaculture a few years ago. He dug two ponds on his small farm in the state of Acre, in the northwest Brazilian Amazon, and stocked them with pirarucu. He receives the juvenile fish from a large facility in the state capital of Rio Branco, rears them on his farm, and sells the adult fish back to the same cooperative when they are large enough to slaughter and process. Aquaculture brings additional income to Sr. Luís' farm. It is also a space-efficient production system, which enables him to comply with legal environmental obligations to retain large parts of his property as native Amazonian forest. Alternative and more traditional forms of animal agriculture, such as cattle ranching, are much less space efficient and are thus much less compatible with forest conservation.

Investing in the infrastructure and training necessary to support a new industry in aquaculture is one of several initiatives designed, funded, and implemented by the Government of Acre in recent years. Acre has become famous as an example of strong subnational leadership, which is committed to a pathway of low-emissions development focused on forest conservation and sustainable socio-economic activities. The state thus contrasts sharply with many other parts of the Brazilian Amazon, where the model of rural development has been based on extensive cattle ranching and soy agriculture, which have been associated with widespread deforestation, environmental degradation, and social injustices. In addition to aquaculture, Acre's state leadership has developed economies in other sectors that are also more compatible with forest conservation, including Brazil nuts, açai, natural rubber, and agroforestry. Each is supported through a combination of subsidies, training and capacity building, cooperatives, processing facilities, and markets, making engagement in these activities a viable livelihood strategy for rural producers.

I visited Acre in May 2017 and again in March 2018, to develop research and education collaborations with stakeholders in the Federal University of Acre (UFAC) (http://www.ufac.br) and the Government of Acre. Acre was a founding member of the Governors' Climate and Forests Taskforce (GCF) (https://gcftf.org), which is coordinated from CU Boulder, and Governor Tião Viana visited Boulder in January 2017 with a delegation of ministers and professors. An MOU between CU Boulder, UFAC, and the Acre Government resulted from this visit, and has laid the path for a growing number of collaborations.

Together with colleagues from the GCF, the Laboratory for Energy and Environmental Policy innovation (LEEP) (http://www.leepinnovationlab.org), and the Center for International Forestry Research (CIFOR) (https://www.cifor.org), I am conducting research in Acre to understand whether and how different sustainable development interventions that have been implemented as part of Acre's low-emissions development strategy have had impacts on either rates of deforestation or the livelihoods of rural people. Using socio-economic panel data collected by CIFOR, and deforestation data from satellite imagery, we are quantifying changes over time in rural properties that have adopted these new production economies and those that haven't. We hope that our work will provide the Acre Government with insights about the strengths and challenges of its policies and programs.

Acre is a global leader in innovative subnational governance, and something of a laboratory for experimental governance and the development of best practices to reconcile environmental and development goals. As such, other GCF members are closely observing Acre's progress, successes, and challenges, and are poised to learn from its example. There is, therefore, value to be gained from documenting and reporting the lessons learned from Acre's experiences, to guide the pursuit of socio-environmental sustainability elsewhere.

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LOCAL HIGHLIGHT

How to Find Out About Boulder Creek Streamflow: Data for Your Outdoor Adventures

by Abigail Ahlert, CSTPR Science Writing Intern

Boulder Creek is an iconic and vital Colorado waterway. Weaving through Boulder Canyon and into the city, the creek provides abundant opportunities for outdoor recreation. One of the most popular events on Boulder Creek is Tube to Work Day (https://www.tubetoworkday.com), which is billed as "Colorado's premier aquatic mass transit". This year's Tube to Work Day, taking place on Wednesday, July 11th, celebrates 11 years of tube commuting on Boulder Creek.

CSTPR Director, Max Boykoff, participating in the 2018 Tube to Work Day.

It only takes a quick trip to the creek (or a viewing of some fun Tube to Work Day videos: https://www.youtube.com/watch?time_continue=263&v=Rx6SVW3Tno0) to show that most of Boulder Creek isn't exactly a lazy river. High, swift water can make activities on Boulder Creek adventurous, and sometimes even hazardous. In early June, a man tubing found himself stranded on a rock, unable to move through the rushing water to safety. The Boulder County sheriff's office and numerous other rescue groups were called to the scene and successfully helped the man to shore.

While activities in Boulder Creek can be risky, understanding the streamflow can help minimize risk and maximize fun for those seeking aquatic adventures. Streamflow—the amount of flowing water—can vary greatly in Boulder Creek due to snowmelt, heavy rains or drought. One useful resource is the online "Rocky Mountains-High Plains Climate Dashboard" (http://wwa.colorado.edu/climate/dashboard2.html), hosted by the University of Colorado Boulder's Western Water Assessment (http://wwa.colorado.edu). The dashboard links to multiple resources on streamflow, temperature, snowpack and drought in the Rockies. The streamflow information is part of the U.S. Geological Survey (USGS) National Water Information System (https://waterdata.usgs.gov/nwis/rt), which collects data from river sites around the country every 15-60 minutes.

Jeff Kagan, one of the founders and organizers of Tube to Work Day, uses the National Water Information System to plan the annual event. Kagan checks the website regularly in the three months leading up to Tube to Work Day. This way, the organizers can set a date for when they expect stream flows in Boulder Creek to be good for tubing. "It's hard to time it perfectly, especially since flows can't be controlled," Kagan says. "Too big and it's cold and downright dangerous, too low and there's a lot of scraping tush and bruised knees, not to mention people who work in East Boulder won't make it into the office until 11 am. It's really a matter of assessing snowpack and looking at flow data from years past."

Streamflow is commonly measured in cubic feet per second (cfs)—one cubic foot per second means that almost 7.5 gallons of water are flowing each second. Kagan says the ideal streamflow for Tube to Work Day is between 150-200 cfs. That's between 1100-1500 gallons of water rushing down Boulder Canyon per second, carrying commuters on their merry way. Kagan says that if the streamflow is ever over 300 cfs on Tube to Work Day, the event will be postponed. That doesn't seem to be a problem this year—the streamflow is reaching its peak earlier than usual, which means that water levels may actually be on the low end by July 11th, particularly between Eben G. Fine Park and Broadway. Kagan expects that the Boulder Creek streamflow will strike "a nice balance between exhilarating and safe" for Tube to Work Day 2018.

Tubers aren't the only ones in need of Boulder Creek streamflow information. Other outdoor recreators, such as fly fishermen, rely on accurate stream information to decide when and where to cast their lines. Jeremiah Osborne-Gowey

LOCAL HIGHLIGHT CONTINUED
How to Find Out About Boulder Creek Streamflow

is an avid fly fisherman and spent over 15 years as an aquatic and landscape ecologist throughout the West. He fishes Boulder Creek year-round, mostly for brown, rainbow and cutthroat trout.

Like Kagan, Osborne-Gowey is a user of the USGS National Water Information System. He also consults the NOAA River Forecast Center (https://water.weather.gov/ahps/rfc/rfc.php) and the EPA Surf Your Watershed tool (https://www.epa.gov/waterdata/surf-your-watershed). Local knowledge is a valuable resource to him as well, since fly fishing shops often keep close tabs on nearby river conditions. Osborne-Gowey says that fishes have different preferences when it comes to streamflow and temperature (and a fun fact I learned from him: the plural version "fishes" indicates multiple species). "In general, fishes tend to be least active at the lowest and highest flows, which coincides with generally poor fishing conditions," says Osborne-Gowey. He says trout seem to be most active when the creek flow is experiencing change (either starting to decrease from the highest flows or increase from the lowest).

When flows are too low to fish in Boulder Canyon, Osborne-Gowey will try heading up to Nederland, or to parts of South Boulder Creek. This is because the creek's streamflow depends on the location where it's measured. Currently, streamflow in the Middle Boulder Creek near Nederland is at 72 cfs (https://www.dwr.state.co.us/SurfaceWater/data/detail_graph.aspx?ID=BOCMIDCO&MTYPE=DISCHRG). The streamflow in the eastern part of Boulder Creek near Longmont is much lower, at about 18 cfs (https://waterdata.usgs.gov/nwis/inventory/?site_no=06730500).

By checking streamflow data, recreators can have safer and more ideal experiences in Boulder Creek. Osborne-Gowey also recommends wearing water shoes with good grip when fishing, since "balance when walking streams is an ever present thing to be aware of, with loose boulders, branches and roots, slippery conditions, et cetera." For Tube to Work Day, the organizers require closed-toed shoes and helmets. They also strongly recommend that tubers wear personal flotation devices and wetsuits. These precautions help keep people safe in Boulder Creek during average conditions, such as those expected for Tube to Work Day. But history has shown that the water is not always so hospitable. During the September 2013 flood, streamflow in Boulder Creek leapt to over 5,000 cfs (https://www.bouldercast.com/the-2013-boulder-flood-two-years-and-three-billion-dollars-later). In nearby Lyons, the St. Vrain Creek (which is said to reach its peak during the spring runoff at 1,200 cfs), had a jaw-dropping estimated streamflow of over 26,000 cfs (http://www.govtech.com/em/disaster/6-Takeaways-Colorados-Devastating-Flooding.html). This streamflow data is used by the National Weather Service to validate flood models and improve flood forecasts. In light of past flood events, Boulder County has numerous on-going projects related to floodplain management.

Bienvenido León, Max Boykoff, and Peter Newton participating in the 2017 Tube to Work Day.

When it comes to Colorado waterways, preparation is the key. Below are the most helpful resources for you to safely navigate some of our state's rivers and creeks this summer:

Environmental Data

- Rocky Mountains-High Plains Climate Dashboard: http://wwa.colorado.edu/climate/dashboard2.html
- USGS National Water Information System: https://waterdata.usgs.gov/nwis/rt
- NOAA River Forecast Center: https://water.weather.gov/ahps/rfc/rfc.php
- EPA Surf Your Watershed: https://www.epa.gov/waterdata/surf-your-watershed

Helpful tips from past years

- Tubing safety tips as you enjoy our Colorado rivers this summer: https://www.thedenverchannel.com/lifestyle/tubing-safety-tips-as-you-enjoy-our-colorado-rivers-this-summer
- Seven tips for safe wading this summer: https://troutsflyfishing.com/info/blog/post/7-tips-for-safe-wading-this-season

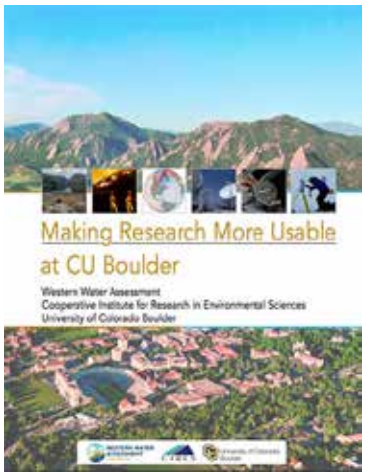
Thanks to Ursula Rick and Jeff Lukas for introducing me to the Rocky Mountains-High Plains Climate Dashboard.

CENTER HIGHLIGHT

Making Research Relevant for Decision Makers

CIRES' Western Water Assessment releases new usable science guide for researchers hoping for impact

CIRES News, https://cires.colorado.edu/news/making-research-relevant-decision-makers



Experts in NOAA/CIRES' Western Water Assessment have released a new usable science guide (http://wwa.colorado.edu/publications/reports/usable_research_guide.pdf) to break down common barriers: research questions may not be targeted to resolve issues of most relevance to stakeholders, and research products such as publications or datasets are often inaccessible or impractical for use by non-experts. The handbook provides tested, tangible methods for researchers to produce useful science for those who write legislation, implement policy, manage natural resources or public resources, or manage their own business—bridging the gap between critical scientific research and constructive societal impact.

"To create usable research, we must deliberately make connections with decision makers throughout the path of our projects," said Lisa Dilling, director of Western Water Assessment, associate director of CIRES' Center for Science and Technology Policy Research, and CU Boulder associate professor in Environmental Studies. "This ensures the questions we are asking and the research we are producing are useful and relevant to the decisions at hand—whether in land management, health care, disaster prevention, or transportation planning."

The guide features easy-to-follow steps, tools, and resources to improve usability. It also spotlights several CU Boulder researchers who have made their research usable and accessible to various sectors in society:

There's Lise St. Denis in CIRES/CU's Earth Lab who works on wildfire issues. She built trust and established early, meaningful connections with hazard-management decision makers to work toward a flexible, web-based fire risk-management interface that can be used by experts and non-experts alike.

And there's Florence Fetterer, a National Snow and Ice Data Center researcher, who sought to improve sea-ice forecasts in the Arctic. She identified the specific operational needs of several external stakeholders, including the Naval Research Laboratory and U.S. National Ice Center, to drive her research forward.

How will YOU make your science usable to decision makers? Access the usable science guide online here: http://wwa.colorado.edu/publications/reports/usable_research_guide.pdf.

CENTER HIGHLIGHT

RC/RCCC Notes from the Field: Climate Message and Land of Good People
by Juhri Selamet, CMCI PhD student, 2018 CU-RCRCCC Intern

A group of women walking back from the local market on Barra Beach, Mozambique. Photo: Juhri Selamet.

Juhri Selamet is the 2018 Junior Researcher in the Red Cross Red Crescent Climate Centre (RCRCCC) program in Maputo, Mozambique. He is a PhD student in the College of Media, Communication and Information at University of Colorado Boulder. He has a bachelor's degree from Bandung Institute of Technology, Indonesia and a master's degree from the University of Illinois at Chicago. His research interests are visual communication, corporate social responsibility, climate change, water, conservation, media coverage of risk and the environment, and strategic environmental communication.

Arielle, *Delegada da Pesquiça* (Research Delegate of Forecast-based Financing) told me there was an exciting event held at Centro Cultural Franco-Moçambicano, Maputo, and she asked whether or not I was interested in joining the event, which, of course, I was. The Centro Cultural Franco was only about a 15 minute drive from Cruz Vermelha De Moçambique. It was a Climate Changes games event hosted by France Red Cross. When I arrived at the Center around 9 a.m., Janio Danio Dambo, Gestor da CVM do Projecto FbP (Forecast-based Financing project manager of Mozambique Red Cross), was already there to join and facilitate the event.

The participants for the event were from several institutions, such as NGOs and governmental institutions. From the participants' introductions, I learned that some of them were from *Instituto Nacional de Gestão de Calamides* (INGC) (National Disasters Management Institute), *Instituto Nacional de Meteorologia de Moçambique* (INAM) (National Meteorology Institute), *Direcção Nacional de Águas* (DNGRH) (National Water Directorate), and Red Cross. From my observation, there were 13 female participants and 16 male participants for this event. After gathering in the center's lobby for a short explanation about the activity, we moved to the second floor to partake in the workshop.

By 10 a.m., we started to play the game called "Climate Message." We were divided into two groups. Eric SAM-VAH, *Adjoint au chef de delegation, Gestion des risques de catastrophes* – Deputy Head of Delegation, Disaster Risk Management from France Red Cross had prepared a climate message on a piece of paper to be shared with the groups. The climate message was in three languages: French, Portuguese, and English. In English, I noted the message was:

"Currently we are experiencing a strong ENSO signal, and are in an El Nino phase. There is a 60% chance that there will be less than average rainfall and a 45% chance that the maximum temperatures will be lower than average for the months of November, December, and January. The long-term forecasts show that there is an increased chance that the central parts of the country might experience drier conditions or even drought conditions."

A game designed to teach children and communities about climate change. Photo: Juhri Selamet.

CENTER HIGHLIGHT CONTINUED

RC/RCCC Notes from the Field: Climate Message and Land of Good People

As we sat in a line, Eric explained the setting that different extension officers had been tasked to share the seasonal climate forecast with the farmers of their area. They hold a meeting with lead farmers and pass on the seasonal forecast message. The rules of the game were no repeating of the message – only say it once – and no notes may be taken. I was the first person in the row, so Eric handed the letter to me to be told the forecast. I turned to my group, laughed, *"Inglês ou Portugues?"* They said they wanted the message in Portuguese. Since I did not want to make the group feel lost with my broken 'Portuguese' pronunciation while reading the message, I gave the message to the person who sat next to me, telling him, "I cannot handle this big responsibility."

The message was passed one-by-one to each of the participants. They made shocked faces when they heard the message. Janio kept reminding the groups that there would be no repeating of the message, "Only say it once," he said. Once the message reached the end of the line, Eric asked the last person of the groups to write down the message that had reached them; he asked them to read it as well. After that, Eric asked the first person who received the message to read the original message. One of the questions that I remember Eric asking the groups was, "What made it easy or difficult to communicate a climate message?" which, from my note, the groups responded the message was too long and too *"complicado."*

At the end of the climate message game, Eric, as facilitator, explained to us the game's relevance to climate resilience and that complex climate messages could often cause more confusion than clarity. This light-hearted exercise could open the space for an exploration of the effectiveness of seasonal forecasts and how to communicate them effectively without oversimplifying the message. The objectives of this activity were learning to explore how complex climate messages are transferred and to explore options for appropriate use of climate messages. From this activity, as players for the games, we have learned the challenges associated with climate communication. It encourages us to take action and develop solutions to provide knowledge and understanding of the climate issue that could be adapted to local context.

There were many laughs and much discussion, and for sure, we had fun at that event. I was fortunate to attend and participate in this activity.

'Land of Good People'

In my sixth week in Maputo, as we had a public holiday on Monday, June 25th, 2018, I spent a three-day weekend outside Maputo and saw other provinces in Mozambique. I discussed this plan to Samuel Massango, Gestor da CVM dos PAAs/EAPs, CVM Manager of the PAAs/EAPs for the FbF project, and he offered a help take me to Inhambane. So, on Saturday morning, we drove about 9 hours from Maputo city

Juhri Selamet, Red Cross Red Crescent Climate Centre Junior Researcher, with baby Eliseu.

to Inhambane province, a province of Mozambique located on the coast in the southern part of the country.

On our way to Inhambane, we crossed the Gaza province. When we were making a stop in Xai-xai, the capital of the province of Gaza, Samuel gave me a brief explanation of the FbF project in three districts in Gaza. Those districts are Chokwe, Guijá, and Chibuto. The choice of districts was based on the historical impact and magnitude of extreme events, and these three districts have had a high number of deaths resulting from floods.

As we arrived in Inhambane, we stopped at the Red Cross office of Inhambane province for a while before driving to Barra. Barra lies on the Indian Ocean coast, on the Ponta da Barra peninsula in Inhambane Province, which is about a 25 km drive from Inhambane city. "Where are you from, originally?" asked Andre, warmly, when we first arrived in Barra. When I told him that I am Indonesian, he replied, "Wow. A long way from home, huh! Hope you will have a great time here!" I did have a good time in Barra.

At the beginning, I told Samuel that I might fall asleep on the way back to Maputo. However, the Mozambique countryside amazed me with handsome landscapes and colorful street markets. We stopped many times to buy many things, ranging from cordwood to papayas. We dropped cordwood and oranges that we had bought on the street at Samuel's family's place while stopping there. Samuel's mother-in-law served us a delicious lunch and allowed me to play with a cute baby named Eliseu.

It is true. Inhambane, also known as *Terra de Boa Gente*, translates to the "Land of Good People."

See more field photos by Juhri Selamet: http://sciencepolicy.colorado.edu/students/redcross/selamet/photo_gallery.html

CENTER NEWS

Olivia Pearman awarded Colorado Governor's Energy & Environment Fellowship

Olivia Pearman

CSTPR Graduate Student, Olivia Pearman was recently awarded the Colorado Governor's Energy & Environment Fellowship (https://www.colorado.gov/governor/governors-executive-internship-program). Olivia will be working primarily with the Department of Natural Resources on Greater sage-grouse conservation issues in Colorado. The Governor's Energy & Environment Fellowship seeks to develop the next generation of energy & environment leaders in Colorado.

Congratulations to Our 2018 CSTPR Grads!

Congratulations to the following 2018 CSTPR grads on successfully defending each of their theses!

John Berggren, PhD defense
Transitioning to a New Era in Western United States Water Governance: Examining Sustainable and Equitable Water Policy in the Colorado River Basin

Sofia Corley, Senior Honor's Thesis in ENVS
Measuring Progress: Methods of Success in Endangered Species Conservation Programs

Marisa McNatt, PhD defense
Lessons Learned for U.S. Offshore Wind Energy Development: Case-Study Comparison of Offshore Wind Policy and Planning in Rhode Island and New Jersey

Lauren Gifford, PhD defense
See the Forest Through the Trees: Market-Based Climate Change Mitigation, Forest Carbon Offsets, and the Uneven Power of Carbon Accounting

Rebecca Page, MS defense
Finding New Ground for Advancing Hydro-Climatic Information Use and Adaptive Capacity Among Water Systems

CSTPR Noontime Seminar Series - Fall 2018 Schedule

The fall 2018 noontime seminar series will be beginning soon. All talks take place on Wednesdays at noon in the CSTPR conference room (unless otherwise noted), are free and open to the public, and most will also be webcast. Directions: http://sciencepolicy.colorado.edu/about_us/find_us.html. The schedule is as follows:

September 19, 2018
Private Forest Owners and Climate Change Adaptation: How Science and Society Will Shape Future Forests
by Angela Boag
Winner of the 2017 Radford Byerly Award
Environmental Studies Program, University of Colorado Boulder

October 17, 2018
Local Responses to Disasters in Peru and Puerto Rico: An Approach from Zero-Order Responders
by Fernando Briones, Consortium for Capacity Building, Institute of Arctic and Alpine Research

October 24, 2018
Climate Change Scientists as Policy Advocates?: Navigating the Tensions Between Scientific Independence, Poor Policy, and Avoiding a Dangerous World
by Lydia Messling, Leverhulme Trust Doctoral Scholar, University of Reading

October 31, 2018
Fracking and Technological Momentum: Risks, Hazards and Features of the Oil and Gas Extraction System in Colorado
by David Oonk, ATLAS Institute, University of Colorado

November 28, 2018
AAAS "Catalyzing Advocacy in Science and Engineering" Workshop Student Competition Panel Discussion
Past competition winners, Julia Bakker-Arkema, Kaitlin McCreery, Adalyn Fyhrie, and Nicholas Valcourt, Moderator: Heather Bené, University of Colorado Office of Government Relations

CSTPR 2017 Annual Report is Released

The annual report includes CSTPR highlights from 2017 as well as a complete list of activities: http://sciencepolicy.colorado.edu/about_us/annual_report2017.pdf. Also included are selected activities of CSTPR faculty affiliates as an indication (not exhaustive accounting) of what those affiliates engage in.

In 2017, we were pleased to celebrate our 15th anniversary against the backdrop of our parent institution's 50th anniversary (the Cooperative Institute for Research in Environmental Sciences) here at CU Boulder. Throughout our celebrations and reflections on our accomplishments in this 'quinceañera' year, we also contemplate our ongoing ambitions going forward as a Center.

Amid the dynamism of contemporary science and technology policy activities in the US and around the world, we remain steadfast in our mission to improve how science and technology policies address societal needs through research, education and service. Today we are a Center that draws strength through our commitments to non-partisan and inclusive engagement with diverse and varied perspectives. This annual report contains many highlights emerging from robust collaborations, projects and partnerships. To me, these are indications of the great community of people –core faculty and affiliates, staff, visitors, postdocs, graduate and undergraduate students – here in CSTPR.

CENTER PUBLICATIONS

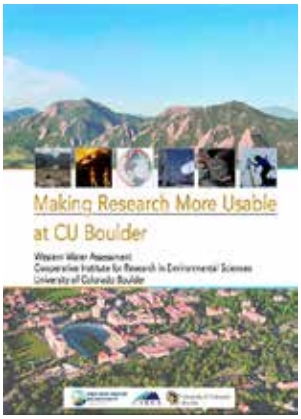
Regional Climate Response Collaboratives Multi-Institutional Support for Climate Resilience

Averyt, K., J.D. Derner, **L. Dilling**, et al., 2018. Bull. Amer. Meteorol. Soc. 99 (5) 891-898.

Abstract: Federal investments by U.S. agencies to enhance climate resilience at regional scales grew over the past decade (2010s). To maximize efficiency and effectiveness in serving multiple sectors and scales, it has become critical to leverage existing agency-specific research, infrastructure, and capacity while avoiding redundancy. We discuss lessons learned from a multi-institutional "regional climate response collaborative" that comprises three different federally supported climate service entities in the Rocky Mountain west and northern plains region. These lessons include leveraging different strengths of each partner, creating deliberate mechanisms to increase cross-entity communication and joint ownership of projects, and placing a common priority on stakeholder-relevant research and outcomes. We share the conditions that fostered successful collaboration, which can be transferred elsewhere, and suggest mechanisms for overcoming potential barriers. Synergies are essential for producing actionable research that informs climate-related decisions for stakeholders and ultimately enhances climate resilience at regional scales. Read more: http://sciencepolicy.colorado.edu/admin/publication_files/2018.04.pdf.

Making Research More Usable at CU Boulder

Dilling, L., K. Clifford, E. McNie, J. Lukas, and U. Rick, 2018. Western Water Assessment Report , 26 pp. **See highlight on Page 9**.



Excerpt: Despite its potential, research is often critiqued for being not as usable for decision making in practice. This guide provides tangible, tested ways for making science more usable based on our experience in the Western Water Assessment as well as other input. It also highlights examples of researchers at CU Boulder who have produced usable research to serve practical needs. We recommend several possible options for overcoming barriers to making research at CU Boulder more usable. Read more: http://wwa.colorado.edu/publications/reports/usable_research_guide.pdf.

MULTIMEDIA HIGHLIGHT

More Than Scientists Campaign

Working Together with Ingenuity and Hope Interview with Bruce Goldstein

Sometimes it's not easy working on climate every day. In face of the "looming apocalyptic threat to most everything I care about", Bruce Goldstein looks to people working together with ingenuity and hope to make the changes we need.

Video [1:52]: http://www.insidethegreenhouse.org/media/bruce-goldstein-envs

In this Inside the Greenhouse project, students along with the More than Scientists campaign, create and produce a short video based on an interview of a climate scientist in the local Boulder area, depicting human/personal dimensions of their work. These scientists work at NCAR, NOAA, CIRES, INSTAAR, WWA, NSIDC, LASP and various other units at CU-Boulder.

To view more videos from the More Than Scientists Campaign see: **http://www.insidethegreenhouse.org/project/inside-greenhouse-more-scientists-collaboration**

MEDIA AND CLIMATE CHANGE OBSERVATORY MONTHLY SUMMARY

The Media and Climate Change Observatory (MeCCO) (http://sciencepolicy.colorado.edu/media_coverage) analyzes traditional/legacy media representations of climate change. MeCCO team endeavors to comprehensively aggregate, monitor, appraise and critically examine media coverage that influence the spectrum of possibility for effective responses to ongoing climate challenges. The MeCCO team monitors 74 sources (across newspapers, radio and TV) in 38 countries in seven different regions around the world.

Issue 19, July 2018

'connecting the dots'

"As the stories of summer heat and other extremes (e.g. flooding, wildfires) unfolded in July, analyses of media links (or lack thereof) between weather and climate change emerged in media sources themselves."

July media attention to climate change and global warming was up 7% throughout the world from the previous month of June 2018, but down about 2% from July last year. Increases were detected in Asia (up 7%), Africa (up 9%) Europe (up 11%), Oceania (up 16%), and North America (up 5%), while going down in the Middle East and Central/South America (-23% in each). At the country level, coverage went up from the previous month in Australia (+20%), Germany (+28%), New Zealand (+9%), the United Kingdom (UK) (+13%), and the United States (+27%), while it went down in Canada (-29%), India (-7%), and Spain (-31%).

Figure 1 shows these ebbs and flows in media coverage at the global scale – organized into seven geographical regions around the world – over the past 175 months (from January 2004 through July 2018).

In January of this year, MeCCO expanded coverage to sixty-two newspaper sources, six radio sources and six television sources. These span across thirty-eight countries, in English, Spanish, German and Portuguese. We strengthened our Spanish-language searches for articles with the presence of terms "cambio climático" or "calentamiento global", while we expanded our searches now to Portuguese through searches for the terms "mudanças climáticas" or "aquecimento global".

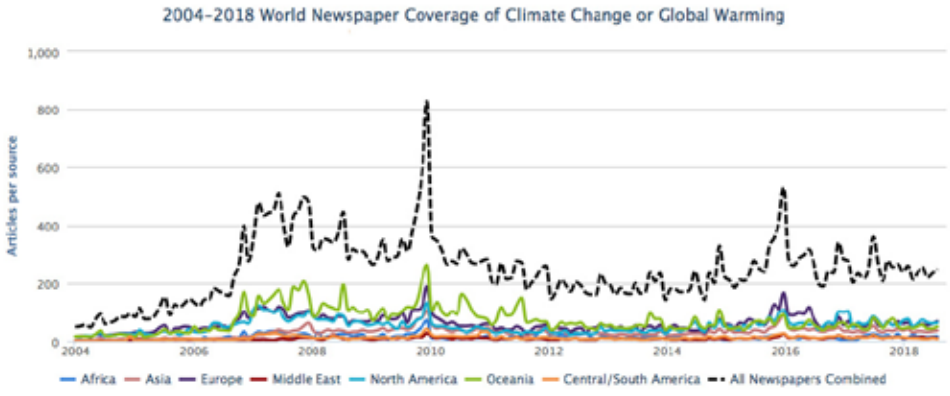


Figure 1. Newspaper media coverage of climate change or global warming in sixty-two sources across thirty-five countries in seven different regions around the world, from January 2004 through July 2018.

Figure 2 shows Latin American newspaper coverage over 163 months now (January 2005 through July 2018).

Moving to considerations of content within these searches, Figure 3 shows word frequency data at the Latin American newspapers in July 2018.

In July, considerable coverage related to ecological and meteorological issues, and this spun into a meta-analysis of the extent to which media connected extreme events (e.g. heat waves) with a changing climate. Beginning the month, there were a number of stories about extreme weather events around the world. For examples, in July heat records were set in many northern hemispheric countries. In particular, record setting lows in cities like Montreal, Quebec in Canada and Los Angeles, California in the US threatened vulnerable populations with unprecedented heat. While Alanne Orjoux from *CNN* reported on 17 heat-related deaths in Quebec at the time of reporting (raised a few days later to 33, according to *ABC News* (Australia)), over in the UK, the *BBC* reported record-setting heat across England and Wales. Meanwhile, southern California baked in many all-time temperature records. Journalist Shelby Grad from *Los Angeles Times* wrote that "the heat brought a big surge in power use — and power outages… Peak energy demand climbed to 6,256 megawatts Friday, knocking down the previous July record of 6,165 megawatts set in 2006 and making it the fifth-highest peak demand recorded in the city's history…Consumers were urged to reduce their electricity usage from 2 p.m. to 9 p.m. Saturday, the hours when high use is typical. (Air conditioners pull much of that power, but other appliances such as washing machines, dryers and dishwashers also contribute)". In mid-July, *The Guardian* journalist Jonathan Watts

MEDIA AND CLIMATE CHANGE OBSERVATORY MONTHLY SUMMARY

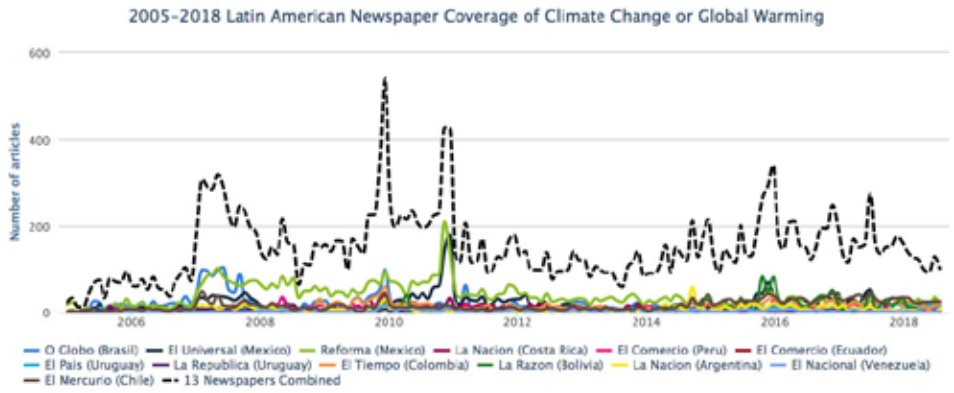


Figure 2. Newspaper media coverage of 'cambio climático' or 'calentamiento global' Spanish or 'mudanças climáticas' or 'aquecimento global' in Portuguese (climate change or global warming) in thirteen Latin American sources in eleven countries, from January 2005 through July 2018.

reported that "Record high temperatures have been set across much of the world this week as an unusually prolonged and broad heatwave intensifies concerns about climate change" and a "concern is that weather fronts – hot and cold – are being blocked more frequently due to climate change. This causes droughts and storms to linger, amplifying the damage they cause. This was a factor in the recent devastating floods in Japan, where at least 150 people died after rainfall up to four times the normal level". On the heels of the flooding in Japan, a heat wave then swept over the country where many without power due to the flooding were vulnerable to the high daytime and nighttime temperatures. Journalist Elaine Lies from *The Sydney Morning Herald* wrote, "An intense heat wave has killed at least 14 people over a three-day long weekend in Japan, media reported on Tuesday, as high temperatures hampered recovery efforts in flood-hit areas where more than 200 people died last week". At the end of July, journalists Saw Nang and Richard C. Paddock of *The New York Times* reported on Myanmar flooding that had displaced over 16,000 people by July 31. For the story they interviewed Myanmar's minister of social welfare, relief and resettlement, Win Myat Aye, who blamed heavy monsoon rains and climate change for the recent flooding. He said, "I just want to alert the people that climate is changing all over the world and we all have to be careful about it". However, while these particular stories made connections between weather and climate change, they were exceptions rather than the norm.

Figure 3. Word cloud showing frequency of words (4 letters or more) invoked in media coverage of 'cambio climático' or 'calentamiento global' in Spanish or 'mudanças climáticas' or 'aquecimento global' in Portuguese (climate change or global warming) in Latin American newspapers in July 2018.

In fact, as the stories of summer heat and other extremes (e.g. flooding, wildfires) unfolded in July, analyses of media links (or lack thereof) between weather and climate change emerged in media sources themselves. A *Los Angeles Times* opinion piece on July 15 titled 'Climate change is behind the global heat wave, why won't the media say it?' appeared to catalyze this set of reflections. Author Leah Stokes wrote "Although [media] reports (sic)on each fresh disaster — every fire, every hurricane, every flood — it tends to stop short of linking extreme weather events to global warming, as though the subject were the exclusive province of reporters on the climate beat". Then on July 25, Emily Aitkin of *The New Republic* called out 'the media's failure to connect the dots on climate change, asking "why are some major news outlets still covering extreme weather like it's an act of God?". From a UK perspective, on July 27 researcher Adam Corner drew out a lack of these connections when he wrote an opinion piece in the *The New York Times* entitled 'Britain, Can We — Really — Talk About This Weather We're Having?'. Then on July 29, journalist Laurel Wamsley from US *National Public Radio* asked the question 'when the weather is extreme, is climate change to blame?'. Following all these stories, at the end of the month, Daisy Dunne and Robert McSweeney from Carbon Brief catalogued "how the media has reported the extreme weather and how the coverage has – or has not – referenced climate change". And at the end of the month, in a *New York Times* story entitled 'The Heat Is Coming in Waves and Surges', journalists Somini Sengupta, Tiffany May and Zia ur-Rehman wrote, "Is it because of climate change?" Scientists with the World Weather Attribution project concluded in a study released Friday that the likelihood of the heat wave currently baking Northern Europe is "more than two times higher today than if human activities had not altered climate." While attribution studies are not yet available for other record-heat episodes this year, scientists say there's little doubt that the ratcheting up of global greenhouse gases makes heat waves more frequent and more intense". Read more: http://sciencepolicy.colorado.edu/icecaps/research/media_coverage/summaries/issue19.html.

ABOUT US

Ogmius is the newsletter of the Center for Science and Technology Policy Research. The Center is within the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado Boulder. The mission of CIRES, which was established in 1967, is to act as a national resource for multidisciplinary research and education in the environmental sciences. CIRES is jointly sponsored by the University of Colorado Boulder and the National Oceanic and Atmospheric Administration.

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