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**Impacts of Media Communication to Motivate State Level Policy Action:
The Case of the Colorado River Basin**

An All College Thesis

College of Saint Benedict/Saint John's University

By

Abigail F. Rader

May 4, 2020

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Abstract

The cultivation of life within the American Southwest would not have been possible without the Colorado River Basin. The water in the basin today maintains 40 million people and one-twelfth the American economy. As a result of the significance of this river, the Colorado is one of the most regulated waters in the world, yet drought concerns continue to proliferate due to climate change. Drawing from communication and political science literature, the media have frequently been cited as impacting the policy agenda, particularly local media. This paper addresses how the frequency of *The Denver Post* news reporting and its framing impacts state legislative bill introduction on Colorado water management—arguing that an increase in objectively framed media attention will increase the abundance of bills introduced in the Colorado state legislature. Following the review of 459 newspaper articles, and 265 introduced bills, over the period of 2008 to 2018, further analysis was determined to be necessary due to the lack of statistically significant evidence on state legislative bill introduction. This paper concludes with a call for improved data archiving and a discussion of the importance of party affiliation and changes in majority party control in dictating legislative changes to state water policy. Looking to the future, understanding factors that drive water management will be necessary to more deeply understand the longevity of this imperative resource.

Introduction

Joaquin Esquivel (2019), Chair of the California Water Resources Control Board, opened his keynote speech at the Second National Drought Forum by quoting John Steinbeck's *East of Eden*: "During the dry years, the people forgot about the rich years, and when the wet years returned, they lost all memory of the dry years. It was always that way." In essence, hydrological fluxes in yield are inevitable, but resolving the issue of drought fails to progress because interest in action falters when high water yields return. As the American West faces the difficulties of changing tides, the Western states traverse everchanging policy discourses set to resolve water stress and challenges in water appropriations. With such a pressing element at the core of the debate, the media is tasked with documenting these changes, and the policy agenda must accommodate for the changing water yields. This paper seeks to understand how effectively various stakeholders are able to communicate these challenges to the others to effect change.

As a cyclical resource, water will remain abundant for the foreseeable future. That said, clean, fresh water will grow scarcer as climate change intensifies, a notion often referred to as climate extremism. In terms of water quantity, climate extremism contributes to wet regions growing wetter and dry regions becoming drier. Therefore, global water security will become increasingly problematic, not in the absence of water, but instead as a concern of *management*.

To discuss water stress in the context of North America, one must first look at the waters of the American West, specifically, the Colorado River. The Colorado River runs through seven states along the American Southwest and has long been viewed as "the American Nile" due to its considerable agricultural and economic significance (Owen 2017). Despite, or perhaps as a result, the river presents a host of challenges as it is impacted by naturally- and

anthropogenically-induced fluxes in water yield. The Colorado's economic significance and changes in flow have made the river a pressing policy issue both on a state level, and, as a transboundary water, at and international levels. As a result, the Bureau of Reclamation has participated in a significant number of interstate and international¹ agreements and reservoir projects regarding its outflow. The river continues to be susceptible to significant fluxes in flow (Kuhn et al. 2019). In fact, in the past century alone, the river has declined approximately 20 percent due to climate change (Milly and Dunne 2020).

Citizens of the American West know just as well as Colorado River researchers that the waterbody is susceptible to significant changes in natural flow in addition to being an overallocated water.² In the American Southwest, waters are managed on the system of prior appropriation, which is governed by landowner applications for water rights. These applications are organized by their appropriation date, such that senior water rights always hold priority over junior rights, regardless of where they are located and how much water they require. This system is made more problematic as the baseflow calculation that the appropriations were originally allocated in proportion to occurred during 1922, a year of abnormally high-water yield. As a result, during dry years many junior water rights go unfulfilled, which poses a large issue for agriculture, industry, and municipal water users. As climate change further intensifies the climate extremism principle, the overallocation of water becomes a more dramatic concern and impacts more rights – negatively affecting both individuals and economically significant industries, namely agriculture in the lower basin.

¹ Agreements have been made with Mexico since 1944 regarding Mexico's anticipated water allocation.

² Water overallocation occurs when the amount of water appropriated to users, paper water, is in excess of the physical amount of water in the basin.

Research has shown that public participation is needed to motivate public policymaking in order to protect the wellbeing of the river (Bhaduri and Sharma 2014). For example, public awareness of energy security concerns, measured through objectively framed media attention, increases the rate at which bills on the subject enter the state legislature (Smith et al. 2016). Specifically, *The Denver Post* has been shown to directly influence state legislative bill introduction with confidence to the 95th percentile (Tan and Weaver 2009). Following from previous researchers' work, this study will assess, quantitatively, the degree to which news article framing in *The Denver Post* regarding Colorado River water impacts the number of bills that enter the Colorado state legislature. Assembling a framework and analyzing this data will increase research on the effectiveness of media communication in driving public policy on water stress.

Background

Forty-million people and an annual \$1.4 trillion are supported by the Colorado River (Owen 2017), equivalent to one-twelfth of the U.S. economy. This makes the American Southwest, and the nation as a whole, greatly reliant on the success of this poorly understood and drying river. Given the economic importance of the Colorado River, individuals and policy makers are forced to accept trade offs to ensure the sustainability of the land (Owen 2017, Cobb and Elder 1984). However, because long-term changes in environmental action and public policy only occur when the public acknowledges that the environment will not support an exponentially growing economy, democratic participation is necessary for water resource management to take place (Piccoli et al. 2016).

According to *The Economist* (2019) which released a special report on water, “Thirsty Planet” in March of 2019, the three main factors that will make water security scarcer are “population, prosperity and climate change.” Population will increase demand for water, prosperity will increase water demand and effluent pollution, and climate change will vastly alter global water distribution. As climate change intensifies, and the population of the West continues to grow, drought patterns and an increase in municipal and industrial water demands will heighten the need for more intentional water management. In order to motivate this action, it is necessary to educate the public on the local and global ramifications of this crisis.

In an attempt to better inform the public of Colorado River water stress, the Denver water utility, Denver Water, publishes monthly water reports intended to educate the public of water quality and availability alongside the Colorado Foundation for Water education. However, despite utility’s efforts, paper deliverables pushed in utility bills become just another “envelope stuffer” and are thrown out by consumers (Phillips, Carvalho, and Doyle 2012). This appears to demonstrate that to motivate public action, stronger initiatives must be targeted more directly to the public.

One place to look for direct, public-facing information is the media. In fact, the relationship between the media and public participation is well studied throughout communications research. Likewise, public participation is frequently linked to policy change by policy researchers. The media’s impact upon policy is not linear, and this relationship is poorly understood and less researched than other policy models, as media and policy studies infrequently collaborate (Wolfe, Jones, and Baumgartner 2013). Despite this non-linear relationship, given the strength of previous relationships (between media and public

participation, and public participation and policy change) it is likely that the media plays a significant role in policy action, specifically in environmental governance.

Media presence provides information to the public, which increases awareness of topical subject matters that often have policy ramifications. Smith et al. (2016) demonstrate that public awareness of energy crises rooted in objectively framed media attention increases the rate at which bills on the subject enter the state legislature. The fact that energy bills are introduced to the state legislature indicates a general public and governmental interest in seeing the bills play out. This seems to indicate that the media are opening a policy window for bills to make entry into the public sphere.

Given the significant impact the Colorado River Basin has on the nation as a whole, it is important to understand how the government and relevant stakeholders can motivate public action. Since the individual deliverables released by Denver Water and the Colorado Foundation for Water Education were ineffective at instigating change, this research looks to more established avenues of public communication. Additionally, as the media has been shown to effectively motivate change in energy legislation (Smith et al. 2016), it is reasonable to believe that a similar effect could be seen for water policy. This paper will contribute to a greater understanding of environmental policymaking and the role media actors play in facilitating state-level policy formation, a currently understudied subject (Wolfe, Jones, and Baumgartner 2013).

Literature Review

The Media and The Public

The media serve a complex, yet essential, role in setting the public agenda. As indicated by Wolfe, Jones, and Baumgartner (2013), media effects are pervasive, but not likely to be

captured by simple linear causal models. This is the direct result of the media's numerous stakeholders: the public, government officials, industry and lobbys. Not only is the media used to inform the public of government action, but it is used also by the government to assess public preferences, determine policy action and inform other government stakeholders of policy intentions (Ali and Puppis 2018).

In addition to the relationship that the media has with both the government and the public, the media is also used by scientists to communicate dangers to the public (see Chapman et al. 2014). The media increase the legitimacy of health officials, strengthening their ability to convey necessary information to the public. This function of the media to protect public health is also shared in cases of environmental concern. For example, thousands of residents failed to evacuate prior to Hurricane Katrina until the media reported out to the public that it was 'time to leave' (Preist 2016). Despite numerous advisories given by scientific experts previously, it was not until after the media directed 'time to leave' report that citizens followed the direction, demonstrating the media's considerable role in influencing public action, largely the result of public trust in media actors.

Trust in the media is necessary to successfully disseminate information to the public, as the media must be perceived as objective observers. However, public trust goes beyond the substance of the stories reported on, and also plays a role in the salience of the media chosen to be reported. This expected media salience stems from the notion that the subject prominence has a larger impact than the substance of reporting in the media-public feedback loop (Carmichael and Brulle 2017, Preist 2016, Russell, Dwidar, and Jones 2016). Likewise, Wolfe, Jones and Baumgartner hold that the media is "fundamentally about the politics of attention" (2013,179).

As a result, frequency corresponds directly to attention, and Wolfe, Jones and Baumgartner argue that the attention is largely attained by elite stakeholders.

Elites, namely government officials, are often the initiators of media reporting that sometimes runs counter to science-based information, creating the potential for confusion and disinformation among the public. When elite cues, particularly cues from government actors, override scientific information, the media can be seen in juxtaposition between valid scientific information and trustworthy reporting (Artell, Ahtiainen, and Pouta 2013; Carmichael and Brulle 2017). In these instances, the media may inadvertently or intentionally be altering the perception of risk in the public. An overt example of this behavior is media coverage during the time frame surrounding 9/11. To increase public attention and policy potential, the media, by aid of government elites, amplified the fears of the American public. The result was a public more willing to accept what otherwise would have been seen as risky foreign policy ventures in Afghanistan and Iraq (Boydstun and Glazier 2013). In using the media in this way elites were publicly coercive, with the purpose to initiate foreign policy change.

The Media and Policy Windows

It is important to understand public perception of risk as it directly impacts how the public feels they should act towards a specific event and with what level of urgency. Therefore, in the media, risk-based narratives create an impact due to the media's ability to convey pieces of information that are especially important for the public and therefore serve as focusing events (Wolfe, Jones, and Baumgartner 2013). A focusing event could be a mass shooting leading to gun control, but as Lawlor and Crow (2018) point out, it could also be a drought leading to policymakers taking action to address the potential policy failure.

This notion is likewise shared in Kingdon’s (2003) view of the policy window and streams theory. As focusing events open the door for policymakers to act, they are said to open the window through which policy can be brought to center stage. In essence, the focusing event does not drive policy creation, but instead allows a preconceived policy solution to enter the policy debate. Anderson (2015) also points out that the media can have this effect: “the media does not involve changing policy, but rather influences the capacity of officials to convert their ideas into policy” (69).

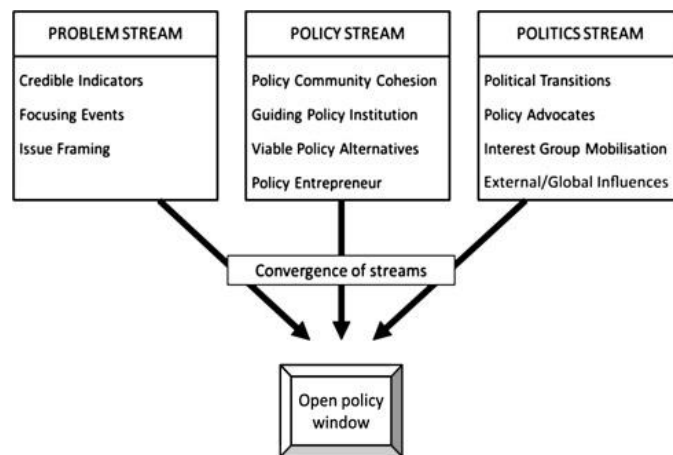


Figure 1. Factors contributing to policy agenda setting, as adapted from Kingdon (2003). Figure provided by Balarajan and Reich (2016).

As represented in Figure 1, once a policy enters the arena, the media continues to assist by bolstering the legislature’s information processing capacity (Tan and Weaver 2009). The media can serve as an assessment of public opinion, determining the benefit of and interest in a bill. Given the significant benefit that media-driven focusing events can have on a policy, it is imperative that windows are utilized by policy-makers. The alternative, Dolšan and Houston (2014) state, is creating policy debate in the wake of focusing events, shifting the focus to view

the policy as the problem. Therefore, it is important that policy-makers and lawmakers use these policy windows intentionally to avoid creating more distrust within environmental debates, particularly in an era of extreme political polarization (Boykoff 2011).

The Media and Framing

Although Carmichael and Brulle (2017) indicate that the frequency of media attention is a better predictor of legislative activity than the substance of media activity, framing, especially within the lens of risk perception, can be a major driver in legislative content. This is because media framing “diagnoses, evaluates and prescribes” policy problems and solutions (Smith et al. 2016, 54). Therefore, the media’s content can influence elites’ abilities to set the terms of the debate (Happer and Philo 2013). Likewise, “narrative construction may influence public or elite perception of risk” (Lawlor and Crow 2018, 845). This struggle between framing and frequency for impact again reflects the complex feedback loop suggested by Wolfe, Jones and Baumgartner (2013, 178).

The ability for the media to communicate risk is of particular influence in disaster and hazard policy realms (Lawlor and Crow 2018). This is largely driven by the public, as issues gain more salience when citizens perceive their own ability, and need, to impart change (Stough-Hunter, Lekies, and Donnermeyer 2014). Larger issues need solutions, and therefore the public gains traction in advocating for them. Likewise, when the media generates solutions to large public problems, the impact of the media coverage gains more traction as it imparts ability to craft change (Liu, Robinson, and Vedlitz 2016). This is achieved both through the development of a policy, eliminating the need for a public official to take on the role of policy entrepreneur,

and, in garnering public support it greatly eliminates policy discourse, opening the policy window.

Three main media frames have been demonstrated to increase public perception of importance: narrative or objective framing (Artell, Ahtiainen, and Pouta 2013); severity and risk (Lawlor and Crow 2018); and spatial proximity (Liu, Robinson, and Vedlitz 2016; Lawlor and Crow 2018; Dolšak and Houston 2014; Artell, Ahtiainen, and Pouta 2013). According to Smith et al. (2016), objective media framing is important in motivating legislative activity.

Additionally, Jenner (2012) indicates that news photographs have stronger appeal to policy elites than written text. Both views point to the fact that policymakers seek to make objective decisions, undirected by polarized frames. Objective framing and media that is *perceived* as first-hand information permit policymakers and citizens the perception that they are making an independent and informed decision. However, Artell et al. (2013) indicate that objective measures often divert from public perception, potentially indicating that the interpretation of facts by the public is not always accurate.

Severity and risk are also important in the assessment of news framing. In the context of drought, this is the assessment of high and low water yield, where low yield indicates high level of concern. Understanding the risk of circumstance is important because where there is risk, perception of problems is heightened (Kingdon 2003), meaning the policy window can open. Additionally, news coverage that portrays the consequences of problems and policy actions, creates a greater impact than those that exclusively indicate the circumstance (Dolšak and Houston 2014). In this way impending risk is associated with a greater drive to urge action by all three streams: the media, elites and the public (Lawlor and Crow 2018, Preist 2016).

Spatial proximity also plays a significant role in how news stories and related policies are portrayed by the media. Driven by local media actors, news reported from, and to, a closer geographic audience is more likely to interpret stories and policy proposals in their reporting (Tan and Weaver 2009). Public familiarity with the topics that the media chooses to cover will also increase awareness of the issue.

The Media and Locality

Spatial proximity alters the attitudes and behaviors of actors in the public and political spheres (Branton and Dunaway 2009; Lawlor and Crow 2018; Dolšak and Houston 2014). For this reason, local actors are often more successful in motivating public action and response than national media actors. Although Smith et al. (2016) saw media coverage on wind energy regulation to be directly impacted by the national media system, the most direct correlation was between state media coverage and policy. This indicates that the ability of news coverage to impact policy-makers is most strongly affiliated with localized media.

As state level newspapers report on state-specific problems, state level policy issues are framed in a more local and relevant context than are national policy concerns (Dolšak and Houston 2014). Likewise, issues that are broadcast to a local audience are typically more relevant to the public, giving them a greater interest in the stories. “This further increases the public’s dependence on the media agenda” (Tan and Weaver 2009, 457), as revealed by the positive and significant correlation that Tan and Weaver (2009) saw in 20 states through cross tabulation of state legislative policies and state level media frequency.

It is important for the public to feel as though they have the ability to impart change (Stough-Hunter, Lekies, and Donnermeyer 2014); but it is equally as important that state

legislatures have the ability to enact the changes they propose to make. In the case of water quality and quantity control, while the Colorado River is under numerous agreements organized and controlled by the Bureau of Reclamation, much policy jurisdiction falls at the state level, as indicated in section 101(g) of the Clean Water Act (CWA). The CWA indicates that “the authority of each State to allocate quantities of water within its jurisdiction shall not be superseded, abrogated or otherwise impaired” (U.S. Environmental Protection Agency 1977). Therefore, in order for citizens or stakeholders to enact the changes they wish to see, it is crucial that they petition policy changes at the state level, not federal. Given that local media will have a greater understanding of local policy concerns and actors, it is logical that these media actors will be the actors in play when discussing this type of policy change.

The Media, Policy and Political Culture

The power of locality also plays into how the political culture can shape policy change. State political culture determines how public officials react to policy opportunity. Political culture falls into three categories: individualistic, moralistic and traditionalistic. Each of these distinct cultures determines a legislature's willingness to initiate new programs dependent on public support or elite interest (Anderson 2015). Accordingly, the type of culture determines how much influence the media has in states; “state political culture moderates the degree of agenda-setting effects between the newspaper coverage and the legislative policies” (Tan and Weaver 2009, 471). As a result, the most significant agenda-setting effects are in the states of moralistic political culture.

Colorado has a moralistic political culture (Tan and Weaver 2009), leading to the belief that legislative authorities in the state will be motivated by the media agenda both to elevate

particular aspects of the public agenda and protect public interest, independent of public action. As a result, the role of the media is heightened in Colorado and therefore policy may enter the state legislature more quickly than would be common in a traditionalistic or individualistic state culture.

Although state level political culture will remain constant throughout the duration of the study, party control over the state legislature and the Congress at the national level will vary over time, especially on national scales. Though this is unlikely to affect the local media relevance, just as elite discourse impacts the way the public views the policy agenda, so too can local and national strife impact the salience of the media and policy agendas.

Majority Party Agenda Setting

Although constituent preferences and state political culture appear to influence state legislative actions, procedural cartel theory postulates that legislative agenda setting is largely dictated by the party majority, especially in the case of officials seeking reelection or party rank climbing. According to Cox and McCubbins (2005), legislative control of agenda setting seeks to ensure that the most extreme internal party conflicts never reach the floor and that the majority party collectively monopolizes agenda setting. In essence, “the majority party uses its control over the agenda to screen out bills that would split its own membership, devotes more floor time to bills that divide the majority from minority party legislatures, and ultimately uses agenda control to protect the policy interests of its members” (Cox, Kousser, and McCubbins 2010, 799).

According to Cox, Kousser, and McCubbins (2010), the loss of majority party legislative agenda setting increased the proportion of bills moving away from the party’s interest. Given

significant party polarization this can affect a wide range of bills on the agenda. Specifically to the Colorado legislature, majority party changes affected all types of bills on the agenda (Cox, Kousser, and McCubbins 2010, 809). Democrats and Republicans, in the state and national legislature, have very different voting preferences on environmental issues. In fact, the League of Conservation of Voters (LCV) gives U.S. federal Democrats an LCV score of 85 for the Senate and 86 for the House, while only assigning Republicans an 8 for the Senate and 10 for the House (Lyon and Yin 2010), indicating that on conservation issues, Democrats are far more likely than Republicans to take a positive stance. In fact, Lyon and Yin (2010) found that the percentage of Democrats in the state legislature was positively correlated with a 14% change from the baseline regarding the adoption of Renewable Portfolio Standards. This demonstrates that having more Democrats in a state legislature should mean a stronger preference to introduce bills that preserve the environment.

As indicated by Hayes-Clark (2012, 492), researchers are largely unable to independently analyze constituent opinion, ideological preferences and party from legislator's decision making. As a result, it is necessary to assess these variables together. For the purpose of this research, the procedural cartel impact is the only one analyzed, however, Hayes-Clark (2012, 503) finds that party influence does not always impact the final-passage voting record. Additionally, Hayes-Clark (2012) demonstrates that the strength of procedural cartel is impacted by the legislatures place within their term. Indicating that legislatures who are term-limited are less likely to abide by cartel theory than those still seeking reelection, something unassessed in this paper.

Risk, Policy and Local Media in Colorado

The media play a substantial role in guiding the perceptions of the public and public opinions and attitudes. This influences the policy sphere as the public's perception influences public actions. The way that subjective narratives are portrayed to audiences can still have a role in shaping the policy discussion as, "A precise description of people's perceptions of environmental amenities should therefore provide the most accurate estimates of the values attached to those amenities" (Artell, Ahtiainen, and Pouta 2013, 288). Since valuation leads to interest and action, when amenities' values are considered, knowledge of public interest can likewise be accounted for.

As indicated by Fawzi (2018), a citizen's ability to influence policy is restricted by the influence of opening policy windows, regardless of that citizen's perceptions. Policymaker's perceptions of public interest is also capable of increasing the rate of policy agenda setting. Therefore, the importance of the media is evident, even if the public itself fails to take-up the risk-based cues presented in the media, since those messages will still be conveyed to government officials. Moreover, close spatial proximity alters attitudes and behavior at a faster rate than media of events at a distance (Branton and Dunaway 2009). This heightened awareness could be of concern to those who fail to recognize the importance of media. Without proper consideration of the role that the media plays on our policy, it will come as no surprise to media and environmental researchers when it leads to the greater deterioration of our planet (Nash 1993). It is imperative that the role of the media in governing our environment is considered in policy debates.

As environmental concerns have grown in prominence in the public and media, it is more important than ever to understand their impacts on the policy agenda. Additionally, as local concerns have been demonstrated to have significant weight in rapid changes in public perception, local concerns, media, and policy should be considered to identify short-term changes. Given the importance of framing and risk, especially economic risk, the Colorado River becomes an interesting and relevant point of interest. While water policy in Colorado is nonspecific to the water source, as the state mandates that the states net water use is comingled from all sources, the significance of the river on state citizens makes it a key indicator of strain on the water system, and is a hot button issue in the water field. Additonally, as the river is known to flux in yield from year to year, and is a hub for economic and social development, low yield years should correspond with high risk for citizens, businesses and government officials. Further, Colorado's moralistic political culture would seem to indicate that government officials would choose to be more proactive in protecting both citizens and the environment.

Methodology

While the Colorado River runs through seven states, Colorado was selected to study media impacts due to the belief that the state is responsive to the media in creating legislative change. This was identified through Tan and Weaver's (2009) study of newspaper reporting and legislative impacts that indicated that *The Denver Post* significantly impacted legislative change. Additionally, as a state of moralistic political culture, responsiveness to the public and their best interests increases policymaker action.

To perform this study, I collected newspaper articles from *NewsBank*, a newspaper research database, and filtered for "*The Denver Post*" (source); "Colorado River" (Keyword);

and “1/1/2008-12/31/18” (date range). I then read the first four paragraphs of each article to ensure the article directly pertained to water quantity and access. If articles discussed wildlife preservation, water travel or indirect water use within the first four paragraphs, they were eliminated from the study. Agricultural, mining and oil fracking articles were maintained as these represent the most water taxing industries; these fields’ competing needs for water are also the original cause for water appropriations, making them a key factor in understanding western water rights. After filtering for unrelated topics and eliminating double posted articles, 459 articles remained.

I then assessed the collected 459 articles individually to sort into subjective and objective media framing, and high and low water yield. Although it could be argued that all newspaper articles are inherently subjective, the framing of these articles changes the perception of its content. While there are scientists and researchers who write articles objectively within the opinion section of newspapers, I assume that people would treat op-ed articles as less objective than a traditional news writer. Therefore, I classified all articles coming from an opinion section as subjectively framed. Additionally, articles that did not address data or a research paper within the first four paragraphs or told a personal narrative within these first four paragraphs, I also coded as subjectively framed. The remaining articles that addressed data and/or a research paper within the beginning paragraphs I coded as objectively framed articles, as I assume readers would be more likely to see these as trusted and informative.

Next, articles were sorted by sufficiency of water availability. Constraints of high and low stress were determined dichotomously, where high stress existed when Colorado River Water annual use exceeded Colorado River Water annual supply. This was coded based on a

model provided by the United States Bureau of Reclamation (USBR) 2012 study “Colorado River Basin Water Supply and Demand Study.” The USBR study, graphed water supply and demand, showing an overall increase in use and decrease in demand with fluctuations in sufficiency in more recent years. As the data from the study has become outdated, the model was recreated from new data provided by Dr. James Prairie, a Hydrological Engineer at the USBR. A visual representation of this model is available in Appendix A.

Next, to identify how the number of bills introduced into the legislature were impacted by the media, I reviewed legislative data to determine the number of bills introduced in the Colorado State Legislature each year. I collected bill introduction data from Colorado’s State Legislature website.³ Bills were selected by hand review of all bills introduced from January 1, 2008 to December 31, 2018. As bills prior to 2016 are not published by bill type, every bill from each legislative year had to be reviewed to determine if the bill pertained to Colorado water use. In the same way I reviewed newspaper articles, I eliminated bills that were related to water travel (boating or recreational use), and other non-direct water uses,⁴ and maintained bills centered around utility, agriculture, mining, fracking and individual water use. To maximize differences from year to year, I included both House and Senate legislative bills in data collection.

To identify how bill introduction impacted party control, the majority party was coded dichotomously, and separately, creating one variable for the Senate and one variable for the House. Again, this data was collected using the Colorado State Legislature website. The

³ www.leg.colorado.gov.

⁴ Non-direct uses to mean uses which do not extract water from the river.

governorship did not need to be coded as the entire period of 2008-2018 included a Democratic governor.

After each of these data were collected, the media frames, yield and party affiliation were assessed using a negative binomial model using SPSS statistical software. I selected a negative binomial model to account for the discrete count data. From here I was able to determine each variable's full and partial effects on Colorado state legislature bill introduction regarding water management. Given the state legislature meets in the first 120 days of the calendar year, to ensure media and yield had time to be processed by the legislators, I instituted a one-year time lag on the media and water yield; however the party affiliation was kept synchronic with the legislative session's bill introduction count.

Hypothesis

Given that media frequency is believed to impact politicians' voting behaviors (Carmichael and Brulle 2017, Preist 2016, Russell, Dwidar, and Jones 2016), I expect more total newspaper articles to correlate with more total bill introductions. However, more specifically, articles that frame the human impact of water stress will lead to more bills than will scientifically framed articles, as people tend to be more responsive to issues that immediately impact them and those like them, than by data which must be interpreted to demonstrate potential harm (Wolfe, Jones, and Baumgartner 2013). Additionally, I expect to see that articles published during lower water times will lead to the greatest increase of bills, due to a heightened perception of public risk. Finally, the presence of a Democratic majority in either the House or the Senate, I believe, will correlate to a higher number of bills introduced as a result of national Democratic trends to favor conservation (Clark 2012, Lyon and Yin 2010), and the interest of the majority party to

push for policies that divide the minority (Cox, Kousser, and McCubbins 2010; Cox and McCubbins 2005). The following five hypotheses list the expected outcomes of this study:

H₁: If objectively framed articles are published during times of high-water availability, then fewer bills will enter the state legislature.

H₂: If objectively framed articles are published during times of low water availability, then more bills will enter the state legislature.

H₃: If subjectively framed articles are published during times of high-water availability, then fewer bills will enter the state legislature.

H₄: If subjectively framed articles are published during times of low water availability, then more bills will enter the state legislature.

H₅: Regardless of framing or water yield, a Democratic party majority in the House and Senate will increase bill introduction in the state legislature.

Results and Discussion

Upon analysis of the results of the model (Table 1), the data show no statistical significance, due to the small sample size. While negative binomial regressions are ideal for analyzing the significance of overdispersed count data of non-negative and non-zero numbers, this regression model is that it is not recommended for small samples. Given the model run has five variables and two interactions, this regression likely would have needed more than ten samples regardless of the model chosen. However, that is not to say that the data reveal no interesting results. Given the small sample size of the data, the coefficients revealed in the regression model are extremely small. While small and insignificant, they may begin to reveal

initial trends of directionality that could be more clearly identified in future research with access to more data.

Table 1. Negative binomial model demonstrating the impact of water yield, media framing and Democratic majority party on Colorado state legislative bill introduction from 2009 to 2018, including interaction effects. Media and water yields on a one-year time lag.

Variable	
High Yield	-0.328 (0.911)
Objective Media	0.000 (0.996)
Subjective Media	0.022 (0.811)
House Democratic Control	0.510 (0.706)
Senate Democratic Control	-0.181 (0.847)
Yield*Objective	0.014 (0.890)
Yield*Subjective	0.014 (0.930)
Y-intercept	2.044 (0.173)
N	10

Source: Colorado General Assembly Bill Introductions, *The Denver Post* (2008-2018) and the 2018 updated Colorado River Basin Supply and Demand Study (Appendix B).

While the coefficients' insignificance indicates that only the most general assumptions can be made regarding the regression results, the variable coefficients do begin to reveal expected data trends. For example, having high water yield years did show a negative trend on bill entry, potentially providing support for the notion of fear and focusing events (Wolfe, Jones, and Baumgartner 2013; Lawlor and Crow 2018; Kingdon 2003).

Likewise, House Democratic control yielded a positively trending coefficient. This appears to show, albeit limited, support for the role of the party in agenda setting in

environmental topics (Clark 2012); however contrarily Senate Democratic control appeared to negatively influence bills entering the state legislature, further demonstrating a need for more data to foster deeper understanding of these trends. Additionally, the differences in these results could be indicative of broader measurement issue. This study does not analyze the directionality of the policies being proposed, meaning some policies could be in favor of conservation while others in favor of decreasing efficiency for the sake of industry interests. If directionality of these bills is considered while also understanding legislative control, this could potentially permit the better understanding of the results. In future avenues of research, two separate regressions could be used to separately assess the impact of legislative action on policies that favor conservation and policies that favor industry.

Similarly, media framing, whether objective or subjective, revealed inconclusive results given their extremely weak coefficients. In each of these cases, more data would be needed to identify these trends, or to indicate more strongly that these variables truly are not significantly related.

As these results are not statistically significant, we are unable to make claims that the small variations in coefficient trends and relative strength are robust findings. However, given that these trends are consistent with the literature, there could be evidence to support this data, should this statistical model be used with a larger number of annual observations, particularly if greater understanding of bill directionality was held as an additional control. While disaggregating data by month to gain a greater sample size may seem tempting, due to seasonal fluxes in water yield as a result of snowmelt, in addition to the 120 day legislative session, this does not appear to be a functional alternative at this time.

This dataset was also tested using a linear regression model, unfit for this discrete dataset, to see if treating the dependent variable as continuous could reveal other trends (Appendix B table B 1). The results of this model were still insignificant. However, it can be noted that the overall trends continued to show similar trends in directionality as both the literature and the negative binomial regression. The differences were predominantly in relative strength. Coefficients as a whole increased in strength. The increase in coefficient strength is an expected trend as negative binomial regressions function on a logarithmic scale and linear regressions do not.

Conclusion

With the vast majority of Colorado water coming from the Colorado River Basin, the importance of the continued success of Colorado is inextricably linked to the success of the river. Gaining an understanding of what external factors guide the Colorado state legislature's decision-making regarding state water policy is an important way to identify factors that could contribute to positive change within the river basin. In order to approach this topic with a more holistic understanding, additional studies will be necessary to formulate significant conclusions about what variables are significant drivers in formulating Colorado water policy.

Given this study yielded incomplete results, the complexity of this issue continues to pose interesting questions, and the relationship between media and policymaking continues to be insufficiently understood. However, the immense importance of Colorado water in social, consumer and corporate uses, at the state, regional, and national levels, indicates that understanding how this upper basin state manages its resource is useful in protecting the water

source's sustainability. As a result, continuing this research past the scope of these initial studies could yield meaningful results.

If further studies are conducted, significance of results will hinge on understanding the directionality of the legislation introduced. Currently, without being able to indicate whether the legislation is conservative or liberal in terms of protecting the river, it is difficult to conceive of the types of changes that would occur unto the basin upon policy implementation. An extension of this research could potentially guide a discussion on what type of agendas *The Denver Post* reporting may be setting up, particularly if it deviates from traditional public and conservation interests.

Within each step of this process, data collection took a great deal of hand sorting and coding. There was no easily accessible mechanical way to analyze media framing, specific bill legislation types, or high and low flow years of the Colorado River and thus data collection required significant manual effort. With the exception of the Colorado River data, which was received upon a data request from the USBR (though this data was publicly accessible, it did require a public access request rather than data freely available online), codifying all the data was completed by hand. Given the number of avenues for research that would deepen our understanding of state legislative systems and media impacts, both independently and as covariates, data should be made more accessible to researchers and the general public.

Fortunately, the Colorado state legislature has begun to codify legislation by subject material; however, as of present this data only goes back as far as the 2016 regular session. Though this is a good sign for the future, data collection and thus future research, there needs to

be an effort to retrospectively categorize legislation. This would permit researchers to complete more expansive studies with greater ease.

Ultimately, due to the insignificance of my results, I must reject each of my hypotheses. However, the framework and model that have been set up through this research continue to demonstrate a lacunae regarding the impact of media on state legislative environmental rulemaking. The fundamental concern within this model was the insufficiency of annual observation data to create any conclusive findings. To have a more sufficient study to truly test this model, at least thirty more years' worth of data will be necessary. In order for this to be feasible, data accessibility must be improved, particularly within the Colorado state legislature archives.

Moving forward, researchers should take greater care in understanding bill directionality. While party affiliation may play an overarching role in all bill introduction, a long history of literature would indicate that conservation oriented bills would be favored by Democratic members over Republican members. This research could also be performed on states of similar water stress but of different political cultures to understand potentially differentiated responsiveness to public and industry needs. Overall, in looking to the future, understanding factors that drive water management will be necessary to more deeply understand the longevity of this imperative resource.

Appendix A:

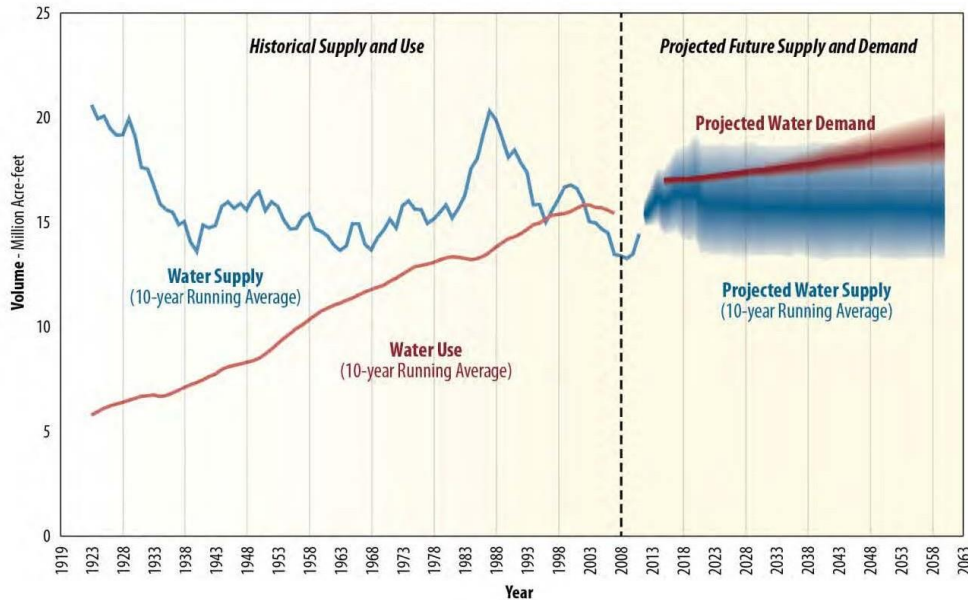


Figure A 1. Water supply and demand data from 1919 to 2008 (Reclamation 2012).

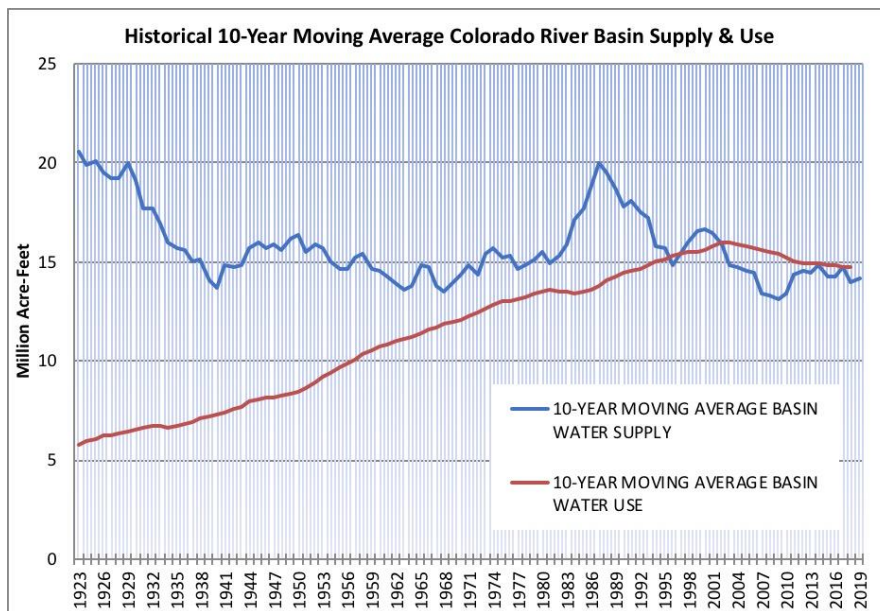


Figure A 2. Updated water supply and demand data from 1914 through 2019. Note that the 2015 through 2018 use data is still preliminary and subject to change. Though the graph demonstrates the annual supply in 2019, the water use is still being calculated and is therefore not included. Data was provided by the United States Bureau of Reclamation through Jim Prairie on January 24th, 2020.

Appendix B:

Table 2. Linear regression model demonstrating the impact of water yield, media framing and Democratic majority party on Colorado state legislative bill introduction from 2008 to 2018, including interaction effects. Media and water yields on a one-year time lag.

Variable	
High Yield	-6.811 (0.381)
Objective Media	-0.098 (0.593)
Subjective Media	0.479 (0.109)
House Democratic Control	8.038 (0.078)
Senate Democratic Control	-3.710 (0.182)
Yield*Objective	0.308 (0.451)
Yield*Subjective	0.152 (0.570)
Constant	6.499 (0.149)
N	10

Source: Colorado General Assembly Bill Introductions, *The Denver Post* (2008-2018) and the 2018 updated Colorado River Basin Supply and Demand Study (Appendix B).

Reference List

- Ali, Christopher, and Manuel Puppis. 2018. "When the Watchdog Neither Barks Nor Bites: Communication as a Power Resource in Media Policy and Regulation." *Communication Theory* 28 (3):270-291. doi: 10.1093/ct/ctx003.
- Anderson, James E. 2015. *Public Policymaking : An Introduction*. Longman Classics, New York.
- Artell, Janne, Heini Ahtiainen, and Eija Pouta. 2013. "Subjective vs. objective measures in the valuation of water quality." *Journal of Environmental Management* 130:288-296.
- Balarajan, Yarlina, and Michael R. Reich. 2016. "Political Economy of Child Nutrition Policy: A Qualitative Study of India's Integrated Child Development Services (ICDS) Scheme." *Food Policy* 62:88-98.
- Bhaduri, Saradindu, and Aviram Sharma. 2014. "Public understanding of participation in regulatory decision-making: The case of bottled water quality standards in India." *Public Understanding of Science* 23 (4):472-488.
- Boydston, Amber E., and Rebecca A. Glazier. 2013. "A Two-Tiered Method for Identifying Trends in Media Framing of Policy Issues: The Case of the War on Terror." *Policy Studies Journal* 41 (4):707-735.
- Boykoff, Maxwell T. 2011. *Who Speaks for the Climate?: Making Sense of Media Reporting on Climate Change*. Cambridge, New York: Cambridge University Press.
- Branton, Regina P., and Johanna Dunaway. 2009. "Slanted Newspaper Coverage of Immigration: The Importance of Economics and Geography." *Policy Studies Journal* 37 (2):257-273.
- Carmichael, Jason T., and Robert J. Brulle. 2017. "Elite cues, media coverage, and public concern: an integrated path analysis of public opinion on climate change, 2001–2013." *Environmental Politics* 26 (2).
- Chapman, Simon, Abby Haynes, Gemma Derrick, Heidi Sturk, WayneD Hall, and Alexis St. George. 2014. "Reaching "An Audience That You Would Never Dream of Speaking To": Influential Public Health Researchers' Views on the Role of News Media in Influencing Policy and Public Understanding." *Journal of Health Communication* 19 (2):260-273.
- Cobb, Roger, and Charles Elder. 1984. "Participation in American Politics: The Dynamics of Agenda Building." In *Participation in American Politics: The Dynamics of Agenda Building*.
- Cox, Gary W., Thad Kousser, and Mathew D. McCubbins. 2010. "Party Power or Preferences? Quasi-Experimental Evidence from American State Legislatures." *The Journal of Politics* 72 (3).
- Cox, Gary W., and Mathew D. McCubbins. 2005. *Setting the Agenda Responsible Party Government in the U.S. House of Representatives, Setting the Agenda*: Cambridge University Press.

- Dolšak, Nives, and Kristen Houston. 2014. "Newspaper Coverage and Climate Change Legislative Activity across US States." *Global Policy* 5 (3):286-297.
- Economist, The. 2019. "Thirsty Planet; Water."
- Fawzi, Nayla. 2018. "Beyond policy agenda-setting: political actors' and journalists' perceptions of news media influence across all stages of the political process, Information, Communication & Society." *Information, Communication & Society* 21 (8).
- Happer, Catherine, and Greg Philo. 2013. *The Role of the Media in the Construction of Public Belief and Social Change*. Vol. 1, 2013. media; social change; policy; climate change; disability; economy.
- Hayes-Clark, Jennifer. 2012. "Examining Parties As Procedural Cartels: Evidence from the U.S. States." *Legislative Studies Quarterly* 37 (4): 491-507.
- Jenner, Eric. 2012. "News Photographs and Environmental Agenda Setting." *Policy Studies Journal* 40 (2):274-301.
- Kingdon, John W. 2003. *Agendas, Alternatives, and Public Policies*. Cengage Learning. Stamford, CT.
- Lawlor, Andrea, and Deserai Crow. 2018. "Risk-Based Policy Narratives." *Policy Studies Journal* 46 (4):843-867.
- Liu, Xincheng, Scott Robinson, and Arnold Vedlitz. 2016. "Public Problem Characterization, Policy Solution Generation, and Intra-Agenda Connectivity." *Policy Studies Journal* 44 (4):396-423.
- Lyon, Thomas P., and Haitao Yin. 2010. "Why Do States Adopt Renewable Portfolio Standards?: An Empirical Investigation." 31 (3):133-157.
- Milly, P. C. D., and K. A. Dunne. 2020. "Colorado river flow dwindles as warming-driven loss of reflective snow energizes evaporation." *American Association for the Advancement of Science*.
- Nash, Steve. 1993. "Reviewed Work: Media and the Environment by Craig L. LaMay, Everette E. Dennis." *Forest & Conservation History* 37 (2):94-94.
- Owen, David. 2017. *Where the water goes : life and death along the Colorado River*. Penguin Books.
- Phillips, Louise, Anabela Carvalho, and Julie Doyle. 2012. *Citizen Voices : Performing Public Participation in Science and Environment Communication*. Bristol, UNITED KINGDOM: Intellect Books Ltd.
- Piccoli, A. S., D. C. Kligerman, S. C. Cohen, and R. F. Assumpcao. 2016. "Environmental Education as a Social Mobilization Strategy to Face Water Scarcity."
- Preist, Susanna. 2016. "Communicating climate change : the path forward." In *Communicating climate change : the path forward*. Camano Island, Washington: Springer Nature.
- Reclamation, United States Bureau of. 2012. Colorado River Basin Water Supply and Demand Study.

- Russell, Annelise, Maraam Dwidar, and Bryan D. Jones. 2016. *The Mass Media and the Policy Process*. Oxford University Press.
- Smith, H. M., J. W. Smith, L. Silka, L. Lindenfeld, and C. Gilbert. 2016. "Media and policy in a complex adaptive system: Insights from wind energy legislation in the United States." *Energy Research & Social Science* 19:53-60.
- Stough-Hunter, Anjel, Kristi S. Lekies, and Joseph F. Donnermeyer. 2014. "When Environmental Action Does Not Activate Concern: The Case of Impaired Water Quality in Two Rural Watersheds." *Environmental Management* 54 (6):1306-1319.
- Tan, Yue, and David Weaver. 2009. "Local Media, Public Opinion, and State Legislative Policies." *The International Journal of Press/Politics* 14 (4):454-476.
- U.S. Environmental Protection Agency. 1977. "Federal Water Pollution Control Act."
<https://www.epa.gov/sites/production/files/2017-08/documents/federal-water-pollution-control-act-508full.pdf>.
- Wolfe, Michelle, BryanD Jones, and FrankR Baumgartner. 2013. "A Failure to Communicate: Agenda Setting in Media and Policy Studies." *Political Communication* 30 (2):175-192. doi: 10.1080/10584609.2012.737419.