

WESTERN WATER ASSESSMENT **WHITE PAPER**

Media Treatment of 'Climate Change' in Shaping Colorado River Problems and Solutions

**Abby Kuranz and Doug Kenney
University of Colorado**

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Introduction

A significant body of academic research indicates that climate change is having a profound effect on the hydrology of the Colorado River Basin and those water systems dependent upon the river.¹ Among the impacts, climate change is expected to result in earlier snowmelt and runoff, enhanced evaporation and transpiration, an increase in extreme events (including drought), and according to most projections, a decline in average river yields. The USGS reviewed seven studies, which project declines in flows ranging in 5-20% by 2050 (USGS, 2011). Collectively, these factors combine with population growth to further stress already strained water supplies—an obvious concern to the 40 million people currently reliant on the river’s flow, and the 76.5 million projected users by 2060 (Reclamation, 2012). A consideration of climate change, thus, should be central to any discussion of problems and solutions in the Basin. But is it?

In this study, we trace how the subject of climate change is featured in media coverage of Colorado River Basin water issues, acknowledging the salient role of the media in shaping public understanding and sentiment. In doing this, we are operating on the assumption that the existence and importance of the phenomena should be increasingly featured, but motivated by the observation that this does not appear to be the case. To formally test this observation, we compiled and reviewed local and regional print media (newspaper articles) located in the Colorado River Basin published over the past 13 years. Specifically, we reviewed how climate change has been discussed within the Colorado River Basin in terms of: (a) how and how often is it referenced, (b) it is presumed to exist, (c) is it characterized as an important problem requiring action, and (d) are there proposed solutions being communicated to the public. Acknowledging that media content both shapes, and is shaped by, public sentiment on an issue, this review is one tool in helping understand the perceived relevance of climate change science in the Colorado River Basin. This information is helpful to climate professionals in assessing the effectiveness of climate change education efforts conducted thus far, and in shaping strategies for more effectively informing and influencing public policy in the Basin with respect to climate change.

Methods

We first conducted the media analysis using the search engine Academic LexisNexis, which hosts over 2,500 current and archived full text newspaper publications from over 350 different U.S. and international newspapers. The search was limited to local newspaper articles published in the United States that mentioned the Colorado River or one of its major tributaries. Newspapers located outside of the United States and outside of one of the seven Colorado River Basin states were not included in the sample. A total of 537 were returned. Duplicate articles, and articles in which the Colorado River was not a central focus, were eliminated, leading to an eventual sample of 215 articles from 18 different newspapers across three different Colorado River Basin states (CA, NM, WY)(see Appendix B). Articles were grouped into three time periods bracketed by two focal points: (1) the release of the draft 2007 Environmental Impact Statement (EIS) associated with the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lakes Powell and Mead (Reclamation, 2007), and (2) the release of the 2012 Colorado River Basin Water Supply and Demand Study (Basin Study) (Reclamation, 2012).² These events marked two important milestones in the treatment of climate change as an important factor in Colorado

1 For example, see National Research Council’s 2007 Colorado River Basin Water Management: Evaluating and Adjusting to Hydroclimatic Variability; CWCB’s 2010 Water Availability Study; Pacific Institute’s 2011 Municipal Deliveries of Colorado River Basin Water; Reclamation’s 2011 SECURE Water Act Report; and Reclamation’s 2012 Colorado River Basin Supply and Demand Study

2 Specifically, the time periods were defined as: January 1st, 2000-October 31st, 2007; November 1st, 2007-December 12th, 2012; and December 13th, 2012-July 1st, 2013.

River management. Specifically, in a technical appendix³, the 2007 EIS featured the first comprehensive review of climate change impacts in a key decision-making document, presenting the phenomenon in a matter-of-fact manner divorced from any debate about whether climate change actually existed. The Basin Study built upon this foundation. In an effort to “develop and evaluate adaptation and mitigation strategies to address future water supply and demand imbalances” in the region, the Basin Study evaluated system performance under four climate scenarios, one of which was based on climate change projections synthesized from 112 sequences of future streamflow (Reclamation, 2012).

Articles were coded using a content analysis approach as well as a Python programming code specific to extracting information from the exported articles. Codebook questions (see Appendix A) included:

- Does the article focus on a specific geographic location?
- What are the dominant and secondary themes of the article?
- How does the article recognize climate?
- How does the article treat climate change?
- Does the article offer solutions to water issues? If so, which water user sector should apply those solutions?

Inter-coder reliability was established for all 9 of the subjective questions in the codebook between three different coders for 31 randomly selected articles, or 3.6% of the total population. We calculated Krippendorff’s alpha score for each question to measure agreement between the three coders and each question received an alpha score of 0.78 or higher (Krippendorff, 2004). All Krippendorff alpha scores are reported alongside each question of the codebook in Appendix A.

Following an initial analysis of the articles from Academic LexisNexis, which only included local newspaper coverage, an additional media search was conducted using the search engine ProQuest, which partners with over 9,000 publishers worldwide, in order to capture regional newspaper coverage. This search involved choosing one major regional newspaper for six of the seven Colorado River Basin states: NV, CO, UT, CA, AZ, and NM (see Appendix B)⁴. Regional newspaper selection for each state was based, in part, on availability in the ProQuest search engine; however, none of the chosen regional papers were returned in the initial search through Academic LexisNexis; therefore, the two samples are mutually exclusive in newspaper coverage. While ProQuest and Academic LexisNexis differ in their searching capabilities and access to publications, the same query parameters were used in the both search engines.⁵ Three of the newspapers (the Las Vegas Review-Journal, the San Diego Union-Tribune, and the Albuquerque Journal) were not fully indexed in ProQuest through the year 2013. A total number of 1,705 articles were found in ProQuest across all six newspapers. The articles were combined across all six newspapers and ordered chronologically so that every 6th article was coded. Full text was included in ProQuest for all of the articles returned from the search query for four of the six newspapers. ProQuest did not have the full text for the San Diego Union-Tribune or the Arizona Daily Star; therefore, the full text for each of the selected articles was found individually using a variety of additional search engines and resources. A total of 4 articles between the San Diego Union Tribune and the Arizona Daily Star could not be found in full text

3 Appendix U, or the Climate Technical Work Report, was entitled: Review of Science and Methods for Incorporating Climate Change Information into Bureau of Reclamation’s Colorado River Basin Planning Studies.

4 Wyoming Eagle Tribune was included in the initial Academic LexisNexis search and coded as a local paper.

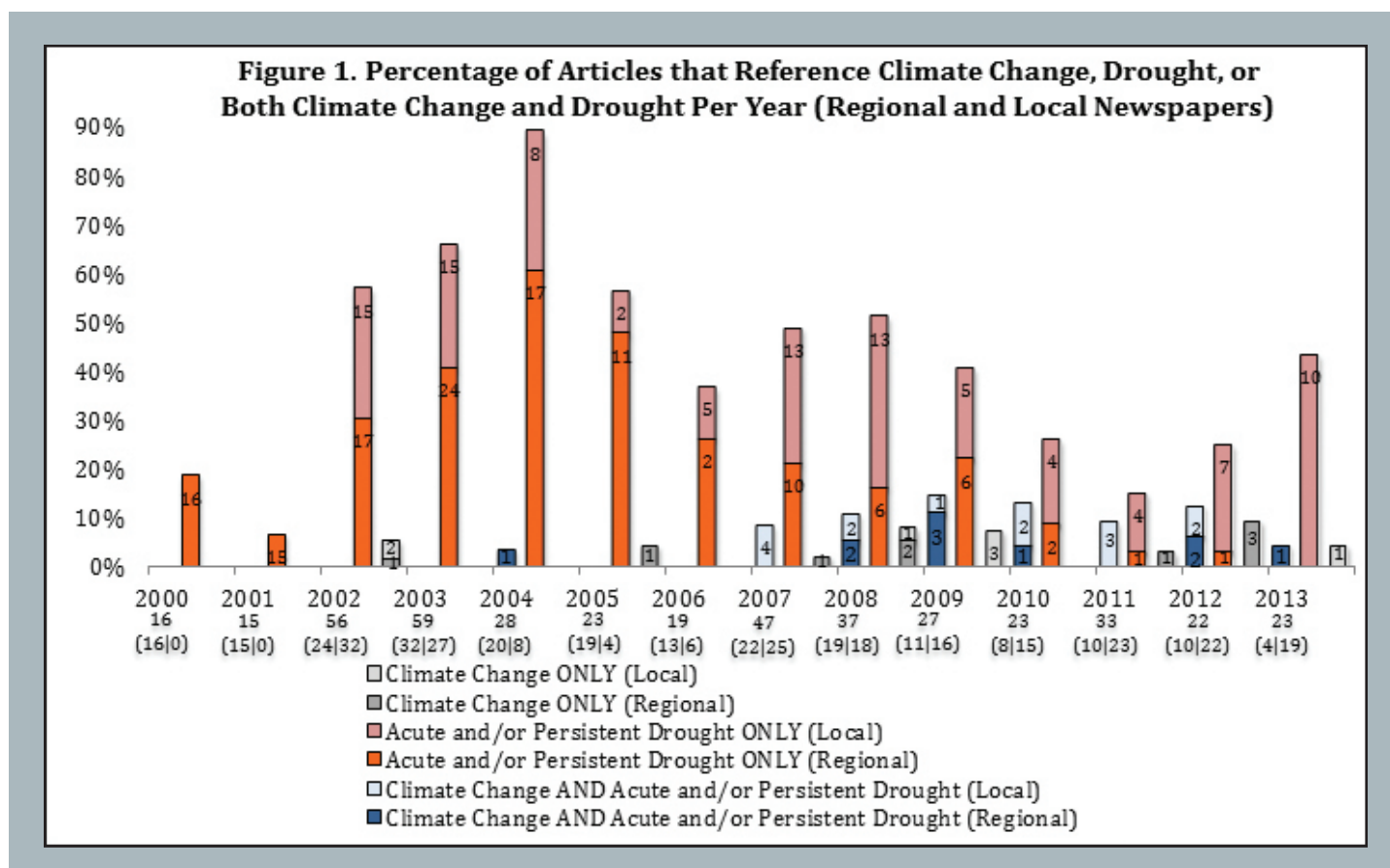
5 Search Query: “Colorado River” OR “Fraser River” OR “Eagle River” OR “Roaring Fork River” OR “Gunnison River” OR “Dolores River” OR “San Juan River” OR “Little Colorado River” OR “Bill Williams River” OR “Gila River” OR “Green River” OR “Dirty Devil River” OR “Escalante River” OR “Kanab River” OR “Virgin River” OR “Upper Colorado” OR “Lower Colorado” OR “Central Arizona Project” OR “Water Supply” OR “Water Resource” OR “Water Right” OR “Water Use” OR “Water Project”

and were therefore not included in the final analysis. Articles that did not strongly mention the Colorado River or Colorado River Basin were not coded. Ultimately, 223 out of 1,705 articles returned in the query were included in the regional newspaper sample (Appendix B).

Data Summary

The percentage of articles (per year) that reference climate change, drought, or both climate change and drought are shown in the Figure 1 below. The total number of articles coded for each year are shown below each year on the x-axis; the values in parentheses show the breakdown between the number of regional (left) and local (right) articles. In the bar graphs, the local newspaper percentages are shown in relatively lighter colors, stacked on top of the regional newspaper percentages. The number of local and regional articles per year is also displayed in relation to each percentage. Two important limitations to the samples include:

- 1) While the years 2000-2013 were queried for the local newspaper search, no papers were returned for the years 2000-2001.
- 2) The six chosen regional newspapers were all queried from 2000-2013; however the Las Vegas Law Review was only indexed in ProQuest until 2012, the San Diego Union-Tribune was only indexed until 2010, and Albuquerque Journal was only indexed until 2009. This may be a major contributing factor in the fact that the number of regional articles coded per year from 2009-2013 is so low (n is never above 11).



The total number of articles coded for each year in both the local and regional newspaper samples are shown below each year on the x-axis. The numbers below the total in parentheses are the number of regional (left) and local (right) articles coded in that year. The local newspaper percentages are shown in relatively lighter colors, stacked on top of the regional newspaper percentages. The number of local and regional articles per year is also displayed in relation to each percentage.

Key Findings

Two clear themes emerged from the analysis:

1) Climate Change References Are Largely Absent in Colorado River Basin Media Coverage

- Climate change is only referenced in 9.77% of the local newspaper articles and 7.62% of the regional newspaper articles in the entire study period.
- Grouping climate change within a larger category of “Biophysical / Ecological” themes increased the frequency (to 22.33% of total local newspaper articles and 32.29% of total regional newspaper articles as shown in Figures 2 and 3), however this is still dwarfed by articles focused on “Political/Policy-oriented” issues (73.49% of total local newspaper articles and 57.85% for regional newspaper articles as shown in Figures 2 and 3).⁶ Additionally, for articles not featuring “Political/Policy-oriented” issues as the dominant theme, they were the most common secondary theme.

Figure 2. Dominant Themes in Local Newspapers (by Percentage)

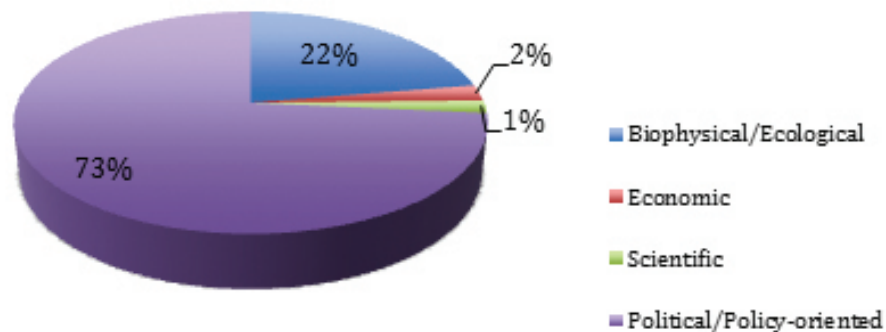
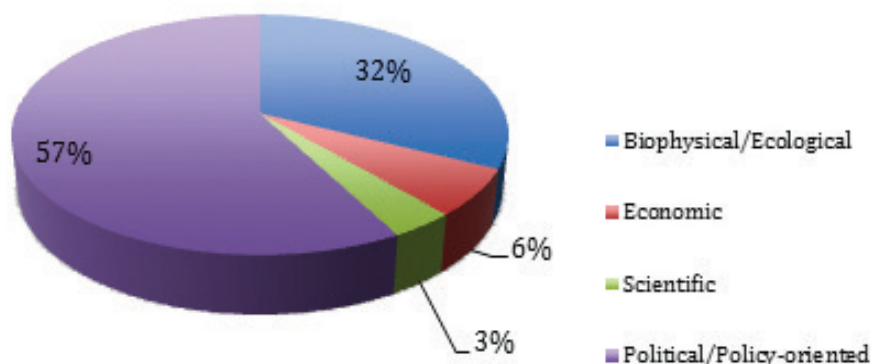
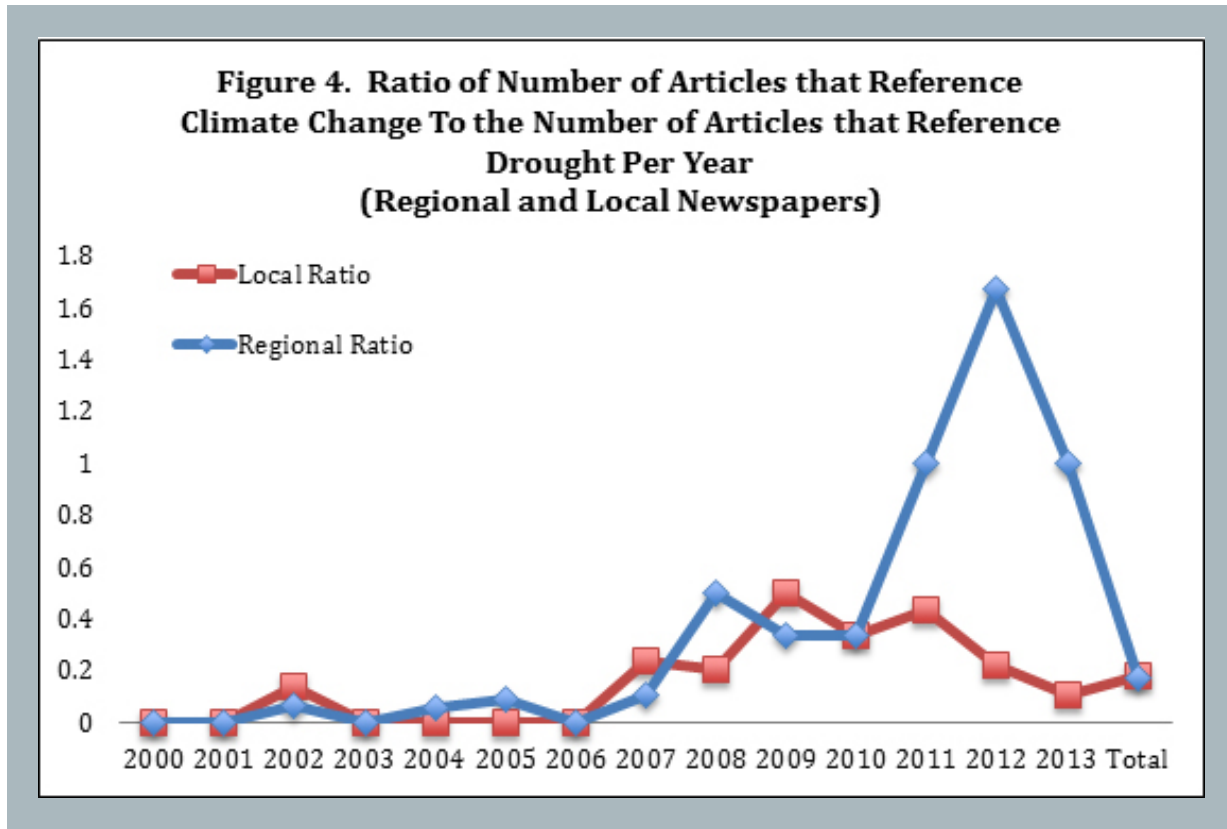


Figure 3. Dominant Themes in Regional Newspapers (by Percentage)



⁶ Biophysical/Ecological themes include a focus on natural resources, wildlife, air, land, water, drought, climate, and similar issues; Political themes include topics such as compacts, regulation, and municipal supply; Economic themes include monetary values, cost-benefit analysis, and similar issues; while Scientific themes primarily emphasize study findings and related research activities.

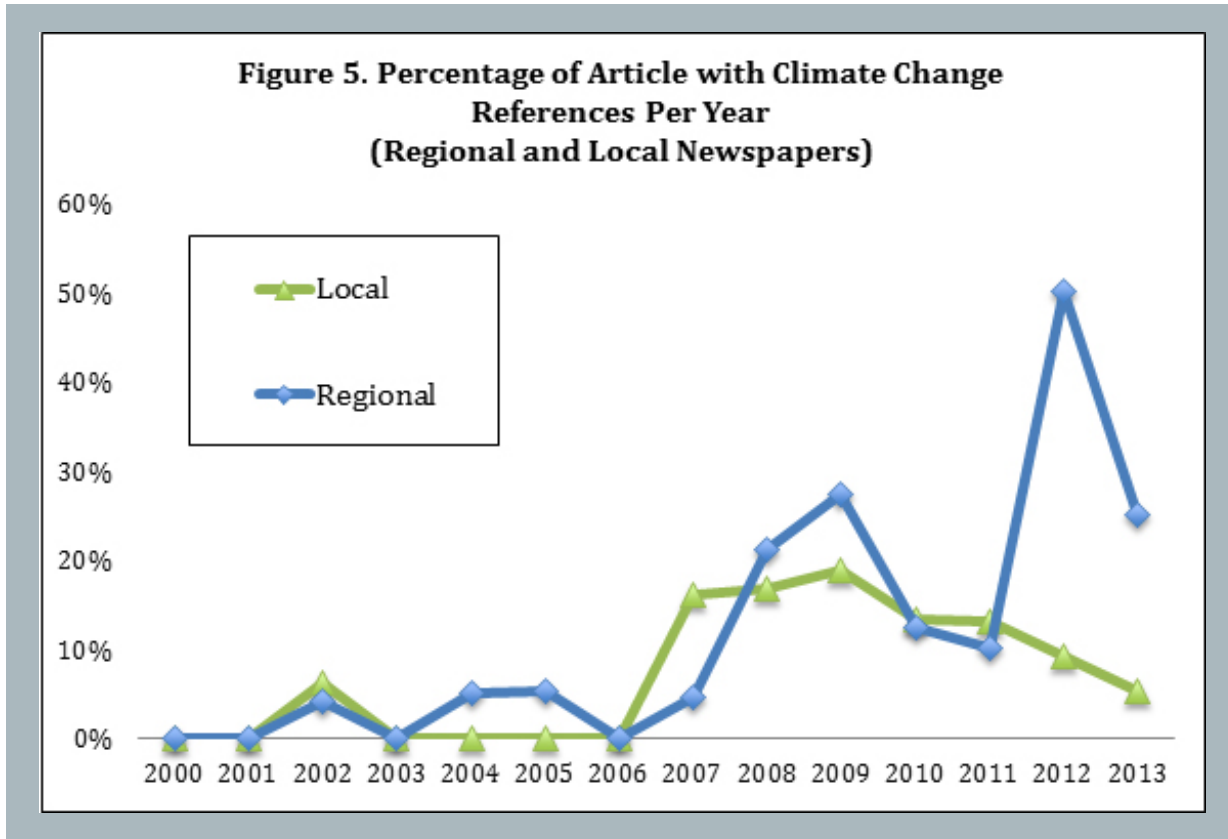
2) To the Extent that Climactic Issues are Mentioned, Drought Dominates the Conversation



- The ratio of total number of articles that reference climate change to the total number of articles that reference acute drought or persistent drought⁷ is 0.17 in local newspapers and 0.18 in regional newspapers, or in other words, drought was referred to 5.6 times more than climate change in local newspaper articles and 6 times more in regional newspaper articles (Figure 4).
- The ratio of total number of articles that reference climate change to the total number of articles that reference drought in local and regional newspapers has increased slightly over time but is highly variable between years. The decrease in the number of articles coded per year after 2008 in regional newspapers likely explains the large increase in the ratio in 2011, 2012, and 2013 (n equals 10, 10 and 4, respectively, in those years) (Figure 4).
- The ratio of the number of articles that reference climate change to the number of articles that reference drought in local newspapers is below 0.20 for years 2002-2006, after which the yearly ratios are all above 0.20, with the exception of 2013 (Figure 4).
- The ratio of the number of articles that reference climate change to the number of articles that reference drought in regional newspapers is below 0.20 for years 2000-2007, after which the yearly ratios are all above 0.20, including 2010-2013 which are ratios above 1, indicating the climate change is referenced as often or even more than drought in these yearly samples. Again, this “spike” should be considered with respect to the low number of articles coded for these years (Figure 4).

⁷ In this study, Acute Drought is defined as a short-term, specific event that had occurred in the past or was currently happening when the article was written while Persistent Drought is defined as a conditional state that was projected to last or frequently reoccur in the future. Both acute and persistent drought could have been referred to in the same article and are not mutually exclusive in the codebook. Note that Acute and Persistent Drought articles from the codebook were combined post-coding, accounting for any change of counting the articles twice, to look at the overall number of articles that referenced Drought.

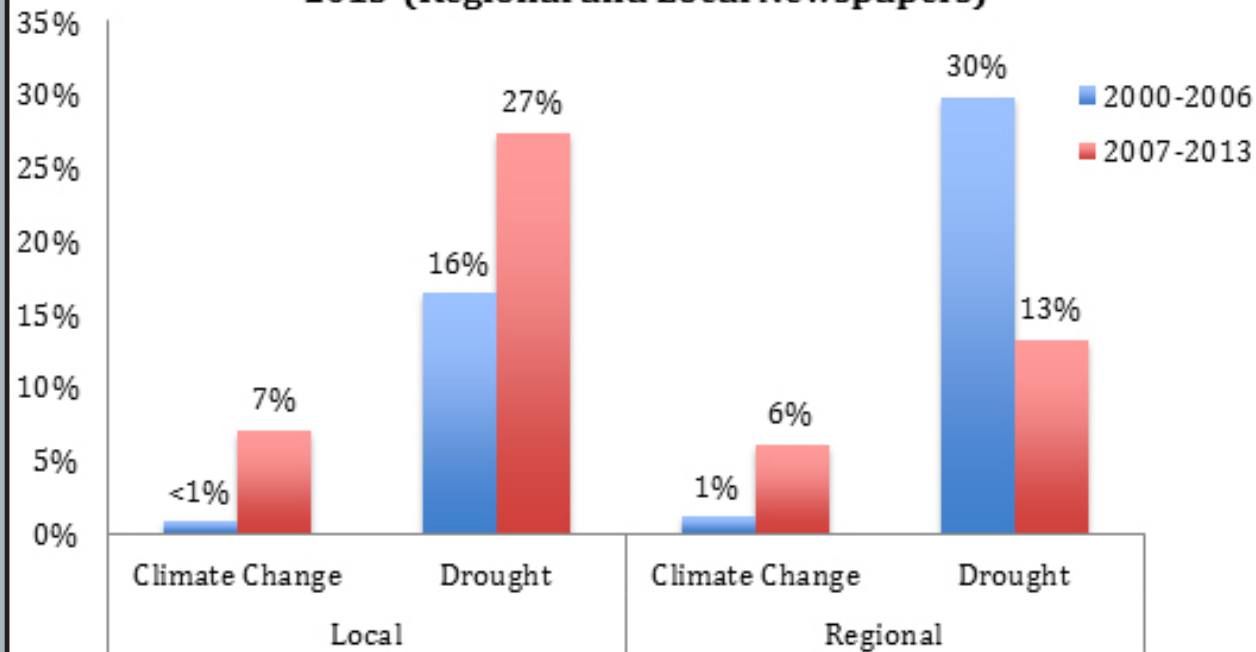
3) References to climate change have become more frequent since 2007



- The percentage of articles that reference climate change in local and regional newspapers has increased slightly over time but is highly variable between years. For regional newspapers, the spike in 2012 for regional newspapers is most likely due to the low number of articles coded for that year (Figure 5).
- When the local newspapers sample is split into two time periods (2000-2006 and 2007-2013)⁸, the percentage of articles that reference climate change increases significantly (at a p-value of 0.05) from <1% to 7%; the percentage of articles that reference drought increases from 16% to 27%, however, this change was not statistically significant. In both time periods, the percentage of articles that reference drought is greater than the percentage of articles that reference climate (Figure 6).
- When the regional newspapers sample is split into two time periods (2000-2006 and 2007-2013), the percentage of articles that reference climate change increases significantly (p-value < 0.01) from 1% to 6%. The percentage of articles that reference drought in regional newspapers also decreases significantly (p-value < 0.01) from 30% to 13%. In the 2000-2006 time periods, the percentage of articles that reference drought is greater than the percentage of articles that reference climate change. However, in the 2007-2013 time periods, the percentage of articles that reference climate change is greater than the percentage of articles that reference drought (Figure 6).

⁸ A split for articles at the 2007 time period is appropriate 1) following our initial rationale that the 2007 EIS would affect media coverage of the Colorado River Basin in the treatment of climate change and 2) in that the yearly breakdown of the ratio of articles that reference climate change to drought suggest there is an increase in references to climate change over time (Figure 4). A split for 2012 was also analyzed, however due to a low sample size for this third time period, these findings were not included in the final analysis (Appendix A).

Figure 6. Percentage of Articles that Reference Climate Change And/Or Drought Between 2000-2006 and 2007-2013 (Regional and Local Newspapers)



Implications

The findings of the analysis show that, despite a recent uptick in references, “climate change” is largely absent in media coverage of water issues in the Colorado River Basin, and when climate is discussed in the media it is most often referred to in terms of drought. While there may be compelling reasons to avoid using highly politicized concepts such as “climate change” in public discourse, media outlets—more so than political leaders—should be immune from such constraints, and should appreciate that a focus on drought may inadvertently draw attention away from the broader suite of challenges presented by climate change. Although the occasional use of terms like “persistent drought” suggests a greater degree of permanence or severity, drought is a term used to describe an inherently transient state—an inconvenience until a “normal” condition resumes. This is a dangerous assumption inconsistent with the vast majority of modern climactic research, which suggests that future conditions will not resemble those of the recent past. This concept is vital to understanding the present and future challenges facing the Colorado River Basin. Given the lack of direct coverage of this issue, it is questionable whether the public will push for or accept adaptive solutions in the Basin, even in those situations where decision-makers are knowledgeable about climate change. It is also important to note that the few times climate change is referenced, the science is never disputed.

While not necessarily a key finding, the analysis also suggests that water issues in the Colorado River Basin are most often discussed in terms of the political entities at the local and state level (i.e. cities, counties, water districts, states) as opposed to featuring a basin-wide perspective. Only 8% of local newspapers and only 20% of regional newspapers discussed water issues from a basin-wide perspective. While this is to be expected from media outlets that serve local constituencies, this geographically narrow focus may inadvertently draw attention

away from the opportunities for the Basin States to pursue solutions at larger, basin-wide scales. The strong focus on augmentation in regional newspaper articles (44%) may be a product of this geographically narrow focus, as such schemes are often built on the assumption that neighboring regions are immune from the scarcity problems that the project is supposed to rectify. In the modern West, this is rarely the reality.

References

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Appendix A

Question (Codebook)	Regional Articles						Local Articles						Krippendorff's Alpha Score		
	Frequencies			All Three Time Periods	P-Value (<0.05)	Significant (<0.10)	Frequencies			All Three Time Periods	P-Value (<0.05)	Significant (<0.10)			
	01/01/2000-10/31/2007	11/01/2007-12/31/2012	12/12/2012-07/01/2013				01/01/2000-10/31/2007	11/01/2007-12/31/2012	12/12/2012-07/01/2013						
Q1. Does the document focus on the Colorado River Basin? If no, throw article out of sample. (Exclude articles that refer to Colorado River Basin in the context of travel, geographic references, book reviews, community events, etc)	159	59	223	5	223	98	20	215	97	20	215	N/A	N/A	N/A	1
Yes	46	14	60	0	60	N/A	0	N/A	181	10	342	N/A	N/A	N/A	
No	205	73	283	5	283	N/A	5	236	107	22	236	N/A	N/A	N/A	
Total Number of Articles Included in Final Results															
Q2. Coder initials	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All articles coded by one coder															
Q3. Does the article focus on a specific geographic location?	69.81%	69.49%	60.00%	60.00%	69.51%	0.895	No	No	84.69%	90.00%	82.33%	No	No	No	0.864
State-which one?	5.29%	10.17%	0.00%	0.00%	7.17%	0.595	No	No	5.10%	10.31%	7.91%	No	No	No	
>1 State-which ones? (if all 7 = basin)	22.68%	11.86%	40.00%	40.00%	20.18%	0.114	No	No	9.18%	0.00%	8.37%	No	No	No	
Basin	1.26% (-1.60)	8.47% (4.65)	0.00% (-8.14)	0.00%	3.14%	0.023	Yes	Yes	0.00%	0.00%	0.00%	No	No	No	
Reservoir/Dam	0.00%	0.00%	0.00%	0.00%	0.00%	No/Bata	No	No	1.02%	0.00%	1.40%	No	No	No	
Other (Add as coding)	29.56%	37.29%	60.00%	60.00%	32.29%	0.226	No	No	19.39%	20.00%	22.33%	No	No	No	0.964
Q4. What is the DOMINANT theme of the article?	5.66%	8.47%	0.00%	0.00%	6.28%	0.631	No	No	2.04%	2.00%	2.33%	No	No	No	
Biophysical/Ecological (natural resources, wildlife, air, land, water, drought, climate)	5.03%	0.00%	0.00%	0.00%	3.59%	0.188	No	No	0.00% (-1.89)	0.00% (-3.23)	1.86%	No	No	No	
Economic	59.75%	54.24%	40.00%	40.00%	57.85%	0.548	No	No	78.57%	68.04%	73.49%	No	Yes	Yes	
Scientific (informative, study findings)	0.00%	0.00%	0.00%	0.00%	0.00%	No/Bata	No	No	0.00%	0.00%	0.00%	No	No	No	
Political/Policy-oriented (compacts, regulation, municipal supply)	0.00%	0.00%	0.00%	0.00%	0.00%	No/Bata	No	No	0.00%	0.00%	0.00%	No	No	No	
Other (describe in boxes to the left)	0.00%	0.00%	0.00%	0.00%	0.00%	No/Bata	No	No	0.00%	0.00%	0.00%	No	No	No	
No clear theme	21.38%	20.34%	20.00%	20.00%	21.08%	0.984	No	No	21.43%	20.62%	20.47%	No	No	No	0.781
Q4. What is the SECONDARY theme of the article?	16.35%	8.47%	0.00%	0.00%	13.90%	0.217	No	No	11.22%	11.34%	12.09%	No	No	No	
Biophysical/Ecological (natural resources, wildlife, air, land, water, drought, climate)	5.66%	6.78%	20.00%	20.00%	6.28%	0.421	No	No	2.04%	4.12%	2.79%	No	No	No	
Economic (monetary values, cost-benefit analysis, trade-offs)	20.75%	32.20%	40.00%	40.00%	24.22%	0.152	No	No	19.39%	26.80%	22.79%	No	No	No	
Scientific (informative, study findings)	0.00%	0.00%	0.00%	0.00%	0.00%	No/Bata	No	No	0.00%	0.00%	0.00%	No	No	No	
Political/Policy-oriented (compacts, regulation, municipal supply)	35.85%	32.20%	20.00%	20.00%	34.53%	0.694	No	No	45.92%	37.11%	45.00%	No	No	No	
Other (describe in boxes to the left)															
No clear theme															
Q5. Does the article present the dominant theme as a point of concern or problem?	78.63%	74.58%	100.00%	100.00%	78.03%	0.397	No	No	79.59% (2.55)	58.76% (-3.75)	90.00% (9.76)	Yes	Yes	Yes	0.913
Yes	3.14% (-2.85)	20.34% (6.43)	40.00% (51.00)	40.00%	8.52%	0.000	Yes	Yes	6.12%	13.40%	5.00%	No	No	No	
Climate Change	28.93%	22.03%	20.00%	20.00%	26.91%	0.559	No	No	27.55%	20.62%	23.72%	No	No	No	0.79
Acute Drought	26.42%	18.64%	20.00%	20.00%	24.22%	0.481	No	No	29.59%	26.80%	28.37%	No	No	No	
Persistent Drought	1.89%	1.69%	0.00%	0.00%	1.79%	0.950	No	No	0.00%	0.00%	0.00%	No	No	No	
Other	58.45%	54.24%	60.00%	60.00%	57.40%	0.847	No	No	51.02%	64.95%	55.00%	No	No	No	
No Mention	0.00%	0.00%	0.00%	0.00%	0.00%	No/Bata	No	No	0.00%	0.00%	0.00%	No	No	No	
Implicitly	55.35%	40.68%	40.00%	40.00%	51.12%	0.138	No	No	57.14%	47.42%	52.09%	No	No	No	
Acute AND/OR Persistent Drought															

APPENDIX B			
Local Newspapers			
In-Basin Newspapers	State Where Newspaper Is Based	Number of Articles/Newspaper	Years in LexisNexis
Alameda Times-Star	CA	20	2000-2013
Chico Enterprise-Record	CA	2	2000-2013
Contra Costa Times	CA	6	2000-2013
Inside Bay Area	CA	2	2000-2013
Pasadena Star-News	CA	16	2000-2013
San Gabriel Valley Tribune	CA	25	2000-2013
San Mateo County Times	CA	10	2000-2013
The Daily Review	CA	5	2000-2013
The Oakland Tribune	CA	5	2000-2013
Tri-Valley Herald	CA	3	2000-2013
Whittier Daily News	CA	7	2000-2013
Carlsbad Current-Argus	NM	1	2000-2013
Deming Headlight	NM	10	2000-2013
Farmington Daily Times	NM	48	2000-2013
Las Cruces Sun-News	NM	21	2000-2013
Ruidoso News	NM	5	2000-2013
Silver City Sun-News	NM	11	2000-2013
Wyoming Tribune-Eagle	WY	18	2000-2013
18 Total Newspapers	3 States	215 Total Articles	
Regional Newspapers			
In-Basin Newspapers	State Where Newspaper Is Based	Number of Articles/Newspaper	Years in ProQuest
Las Vegas Law Review	NV	54	2000-2012
Denver Post	CO	39	2000-2013
Salt Lake Tribune	UT	29	2000-2013
San Diego Union-Tribune	CA	42	2000-2010
Arizona Daily Star	AZ	45	2000-2013
Albuquerque Journal	NM	14	2000-2009
6 Total Newspapers	6 States	223 Total Articles	

Abby Kuranz is a graduate student in the Environmental Studies program

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Comments and questions regarding this work should be directed to Abby Kuranz at Abby.Kuranz@colorado.edu.