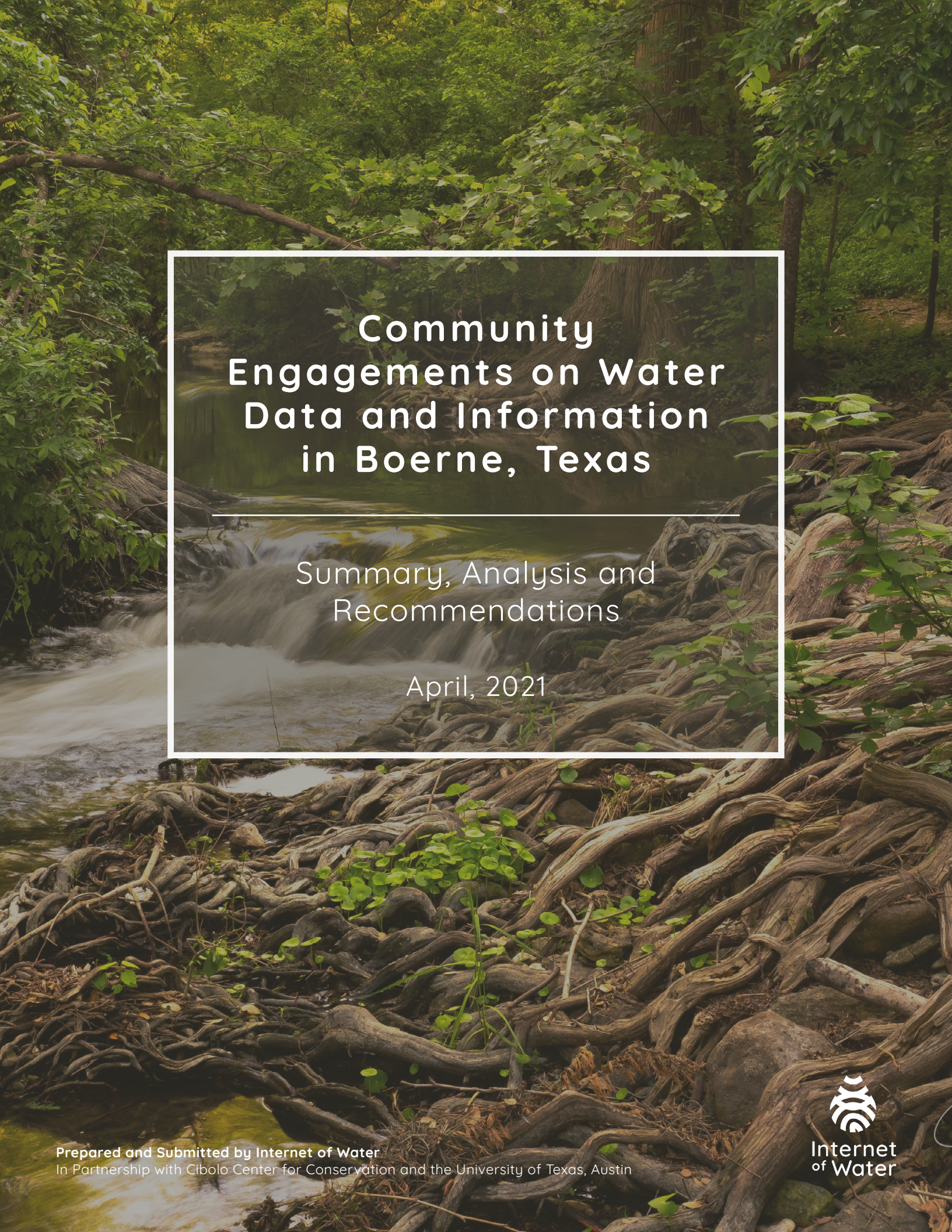


Community Engagements on Water Data and Information in Boerne, Texas

Summary, Analysis and Recommendations

April, 2021

Prepared and Submitted by Internet of Water
In Partnership with Cibolo Center for Conservation and the University of Texas, Austin

Internet of Water

Contents

BOERNE FOCUS GROUP KEY TAKEAWAYS

From November 2020 to February 2021, the Internet of Water team partnered with Cibolo Center for Conservation, and the University of Texas at Austin to hold four focus groups in Boerne, TX. The focus groups consisted of representatives from municipal and county agencies, business leaders, community organizations, and environmental groups, each focusing on better understanding the participants' water data needs. The results of these focus group conversations are to inform the Boerne Water Committee as they plan a Boerne Water Data Hub and design a data product to better support decision-makers and residents in Boerne, TX. These conversations revealed the following six key takeaways.

1. **Create consistency across agencies**

   One of the challenges associated with accessing water data is the lack of consistency between state and local agencies. Some participants expressed frustration over the discrepancies in water data between state agencies such as the Texas Commission on Environmental Quality (TCEQ) and the Texas Water Development Board (TWDB). Many participants utilize the TCEQ's impaired surface water list to understand water metrics but struggle to gain a robust picture of trends in the data because the list is only updated every four years. Although the TWDB's data is more accessible to the public, participants found it more difficult to track down individual parameters in the agency's database. State agencies provide useful water data, but the fragmented nature of available data makes it difficult to integrate and compare datasets.

2. **Provide spatial & temporal data**

   Participants expressed an interest in receiving both spatial and temporal water data. Temporal data would help stakeholders perform historical analyses and track changes in water availability and use over time. Spatial data would allow them to answer a basic question: "where is water coming from and where is it going?" Participants hope to use spatial data to localize trends and gain visibility into the movement of water within Boerne as well as across municipal and watershed boundaries. They also mentioned the importance of access to information about the location of water infrastructure, such as pipeline networks and wastewater treatment plants. Members of both groups indicated that spatial and temporal data would help inform decisions about water management in Boerne, especially those related to impact assessments of new and existing developments.

   "Where is water coming from and where is it going?"

3. Facilitate data interpretation

Participants believe effective visualizations and data management through online platforms or shareable databases could improve communication and collaboration between agencies. Some participants voiced concerns that water data could be misinterpreted by the public which could lead to inaccurate reports of low water supply. Agencies sharing water data should provide context to facilitate data interpretation. Participants also shared concerns that the public is not informed about where their water comes from and how individual actions can impact water quality and availability. In addition to providing sources for efficient data extraction for water managers, residents of the community need informative resources such as descriptive information on water bills and engaging interpretive signage near water bodies.

> **"The public needs to understand the basics of water quality and [the] water sector needs to do a better job of communicating that."**

4. Integrate non-water data

Another theme that emerged was the desire to incorporate both water and non-water data to tell a more complete story. Non-water data, such as population figures and the location of new subdivisions would accompany data shared by local organizations, which currently includes water quality information such as dissolved oxygen, temperature, conductivity, and nutrient levels. In the future, participants would like to see additional water data such as the location of pipelines and hydrologic features such as seeps, aquifers, and creeks. The expanded data would convey information that paints a picture of current water availability and describes the capacity of existing water sources to support new development and a growing population. This information would also clarify the relationships between different parts of the water system to make the community more aware of where their water comes from and the connection between different hydrologic features.

5. Ensure quality, accuracy & transparency

The citizens of Boerne need greater quality control and assurance regarding water data. Participants expressed concerns over the completeness of data available from state agencies and municipal sources, and whether the data provided accurately depict current water conditions, uses, and trends. Participants also believe there needs to be more transparency in water data. Increased transparency can create an environment where data users trust the data available from providers, enabling more effective use of water data. Transparency around water security and water sources servicing future development is also important, particularly when identifying how developments utilize water sources from outside the county.

6. Provide diverse methods for information delivery

Generally, citizens of Boerne are often unsure of where to go to find data and rely on relationships with others to answer their questions rather than a central, trusted source for information. This leads to frustration among community members, but also gaps in access to information about water. Community groups that serve under-resourced communities caution against an overreliance on digital products for information delivery and instead suggest empowering these groups with information (in the form of infographics, for example) that they can disseminate to the communities they serve. These sentiments were echoed among business leaders who suggested a diversity in the formats of information, also preferring access to infographics that explain concepts and challenges facing the community-at-large. The information provided by the water hub will also better inform the groups that serve communities, helping them better determine needs and mitigate challenges when possible.

BOERNE SURVEY SUMMARY

In March 2021 the Cibolo Center for Conservation, along with partners from the University of Texas at Austin and the Internet of Water, distributed a survey through the Office of the Mayor in Boerne, Texas. The purpose of the survey was to gather information from residents of Boerne and the surrounding area in Kendall County regarding the information they receive about their water, the source of their information, their trust in this source, their concerns over water in their community, and their preferences for how they would like to learn more about their water. This survey was in follow-up to focus groups conducted with residents from the community, business leaders, municipal leaders, and environmental groups. Collectively the focus groups and the survey results will inform the Kendall County Water Committee as they develop the Boerne Water Data Hub to better understand water conditions, communicate information about water, and improve water management decisions in Boerne and the surrounding area.

During a two-week period, residents of Boerne were invited to complete the Community Water Survey (n=324). The method of delivery was via email and social media, with anonymous survey links provided through Qualtrics. The largest portion of respondents self-identified as residential water customers. Commercial water customers, municipal leaders, and business leaders were other self-selected categories (See figure 1). The large number of participants from the residential community may serve as an indicator of the magnitude of community concern over water in Boerne. As indicated in the comments and in other questions in this survey, growth in Boerne has caused substantial concern among its residents about the impact of such growth, and the resulting water availability concerns it creates.

The lack of self-identification from the municipal and business leader categories was a curious finding. The business community employs a large number of residents in Boerne (60.8% of residents are employed by local businesses, according to interviews conducted by partners at the University of Texas at Austin). It is possible that the wording of the category, “business leader,” may have deterred respondents from selecting this category if they don’t see themselves as “leaders.” It is also possible that with respect to water, these same respondents did not self-select “business leader” because the business in which they work is service-oriented and not water-intensive. In other words, respondents participated in the survey as residents because it is in their role as a resident that they have the most concern over water. The city’s utilities manager estimates that approximately 80% of water users in Boerne are residential users, compared to about 20% are non-residential water users. Nonetheless, it should be noted the overwhelming response from residential water users may create a bias in the responses in the remainder of the survey.

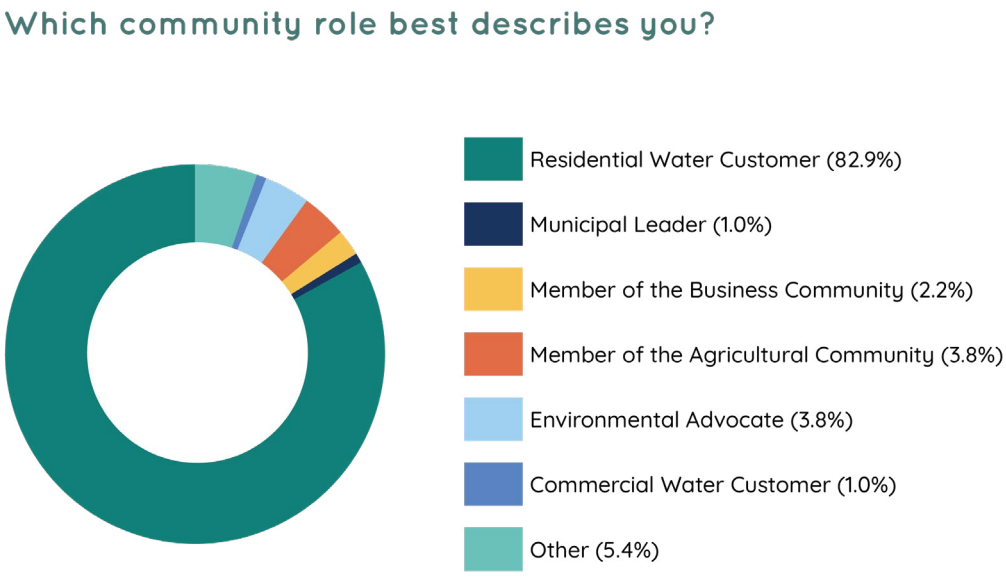


Figure 1: Identifying community role

Of the respondents, a significant majority receive their water via a water utility (73.4%) while others receive water from a private well (24.4%). (see appendix).

CONCERNS OVER WATER USE

When asked about their greatest concerns, water availability and affordability together make up the majority of concern (37.2% and 15.3%, respectively, for a total of 52.5%). However, many respondents selected regional growth and development (16.6%). Given these selections and the comments that followed, availability and regional growth and development were often synonymous with one another. Drinking water quality and environmental water quality were also areas of concern (11.3% and 9.3%, respectively). While these aggregate results are informative, more illuminating is examining water concerns by self-identified community role (Figure 2). Viewing concern by respondents' community role reveals interesting patterns.

Limits to regional growth and development is a consistent concern among all categories of participants, with the exception of business leaders. Only 8% of business leaders selected this category of concern while a much larger percentage of other groups are concerned about growth.

- Water availability remains the primary concern for residential water users (38%) while affordability is the primary concern for commercial water users (33%).
- Municipal water users are equally concerned about environmental water quality as they are availability (33% in both categories).
- Drinking water quality is of moderate concern with commercial water customers (17%) and residential water customers (13%). These groups are more concerned than business and municipal leaders, who do not cite drinking water as a concern at all.

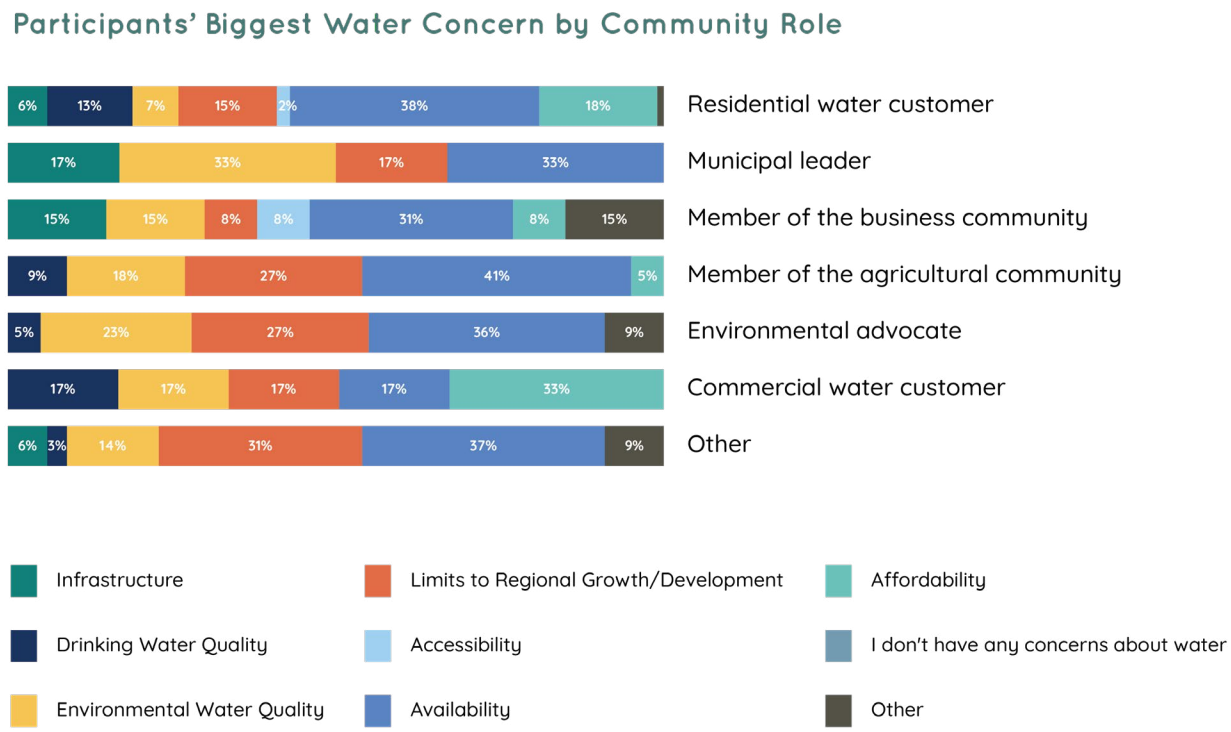


Figure 2: Concerns over water by community role

The magnitude of concern over rapid development becomes clearer when participants are asked to rank their concerns (Figure 3).

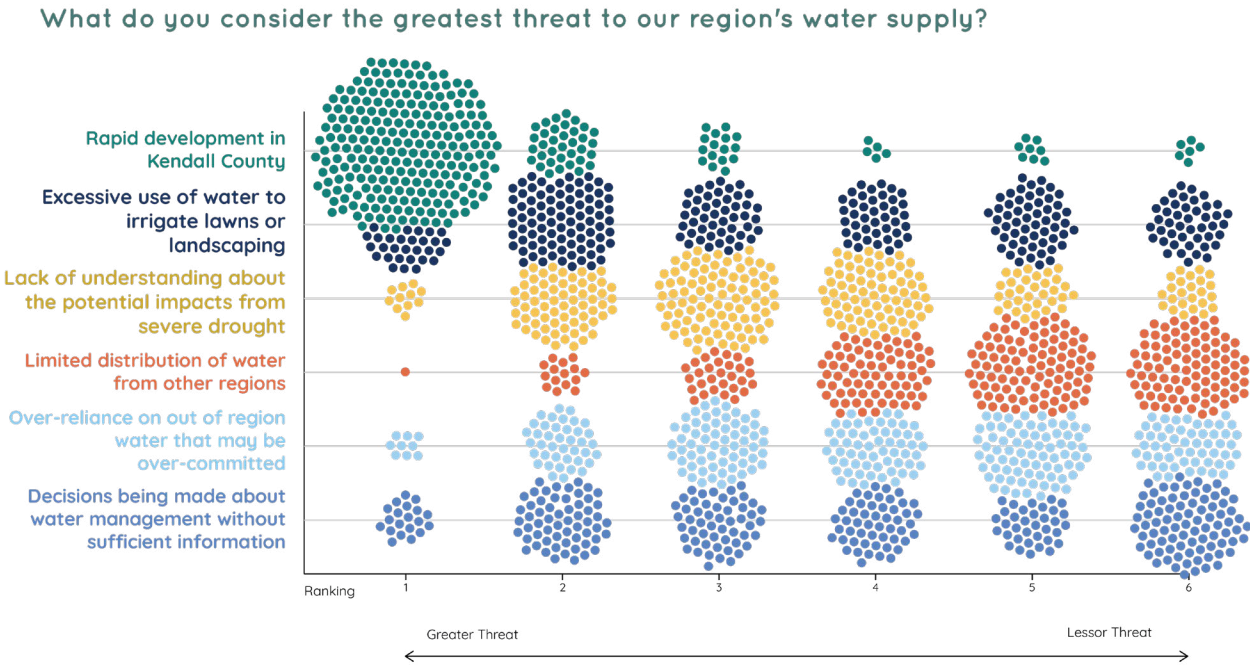


Figure 3: Ranking of concerns over region's water supply

The Figure 3 graphic reveals concern over regional growth in orders of magnitude larger than any other concern. In this graphic, each small dot represents a response. Other concerns are fairly evenly distributed across the remaining rankings; however, regional growth stands out as the overwhelming concern for most respondents.

SOURCES OF INFORMATION AND COMMUNITY TRUST

Respondents were asked to identify the sources from which they receive information about their water (Figure 4). Significant numbers of participants receive their information from city-operated websites (31.5%) with local agencies (14%) and district websites (12.4%) also important sources of information. A number of respondents also depend on social media for information about their water (10.5%).

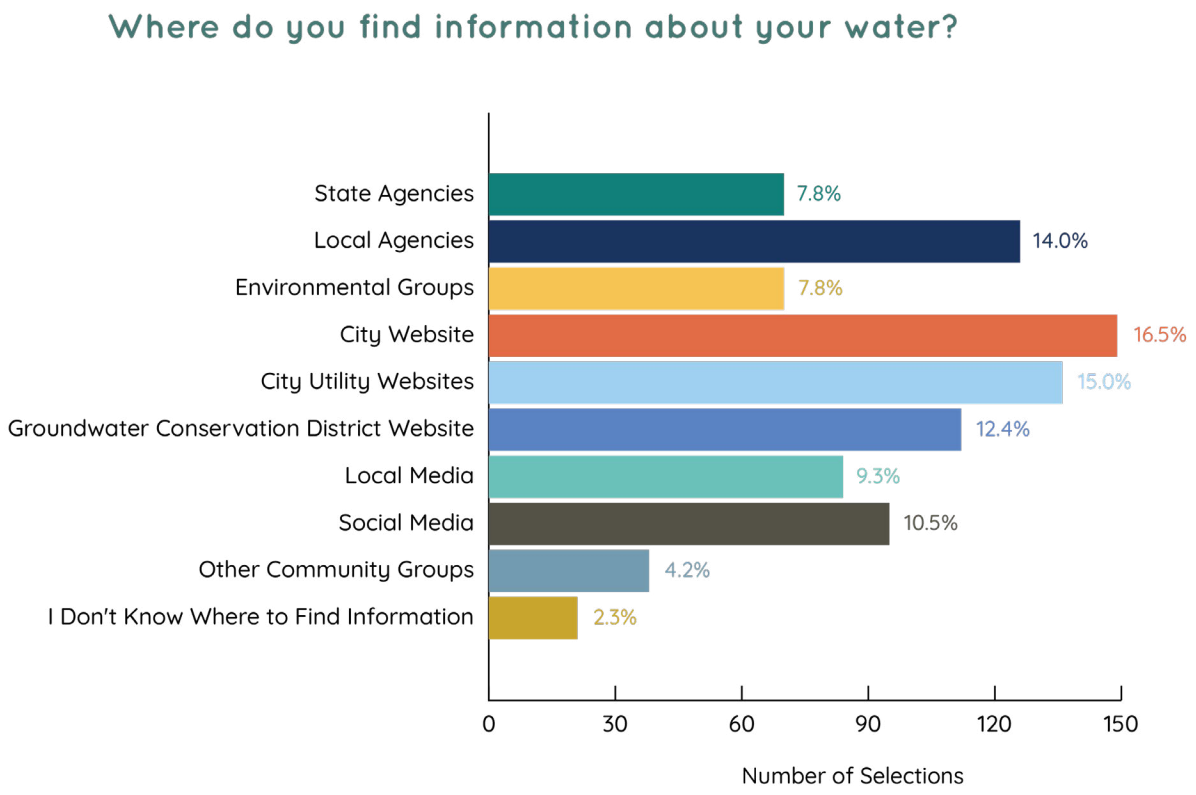


Figure 4: Sources of information about water

However, when sources of information are compared with trusted sources of information, discrepancies arise between the sources of information and those that respondents trust to deliver information (Figure 5).

Where Participants Find Information About Water Compared to which Water Information Sources they Trust

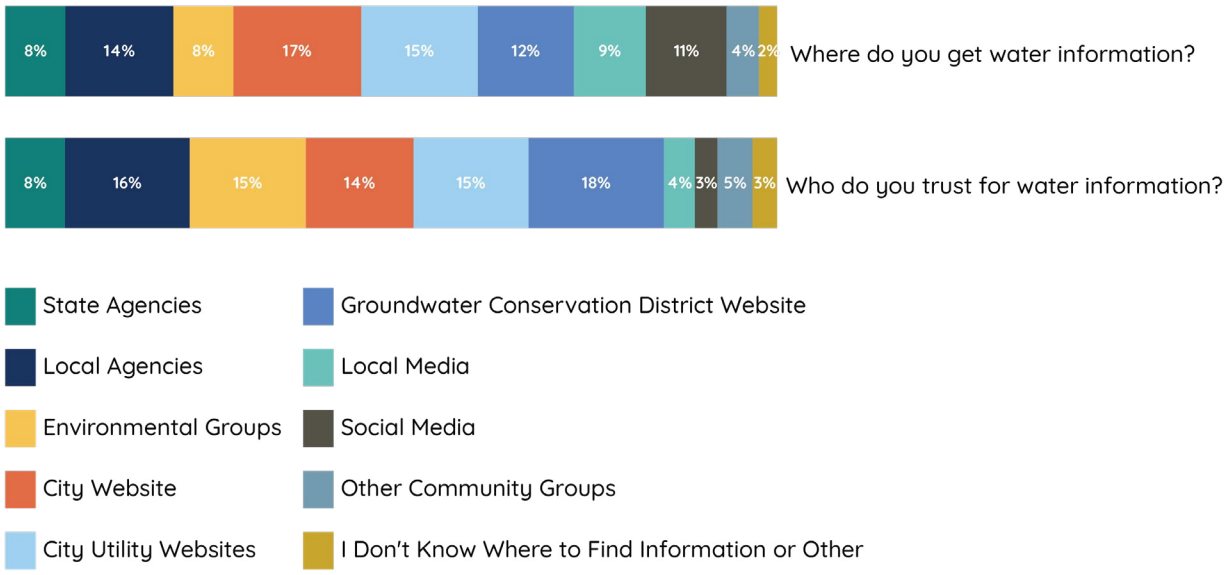


Figure 5: Comparison of sources of information for water versus trusted sources of information for water

In the figure above (Figure 5), the sources of information used to receive information about water are in the top row. Those that are most trusted to deliver information about water are in the bottom row. In many cases, such as state and local agencies, the level of trust is equal to the amount of people who obtain information from these sources. However, environmental groups, for example, are a source for 8% of the respondents but trusted by 15% of respondents. This same phenomenon occurs with Conservation District websites with 12% of respondents obtaining information from these sources but 18% of respondents indicating trust in these organizations. The largest discrepancies occur with social media in which 11% of respondents indicate these outlets as their source of information, but only 3% of respondents trust these outlets for information. A similar discrepancy occurs with local media. This comparison can provide guidance for the selection of the outlets the Boerne Water Data Hub will be housed and from which subsequent information will be delivered.

Further exploration into the issue of trust reveals other noteworthy responses. Overall, an overwhelming majority of the respondents at least moderately trust their source of information (82.7%). However, when asked to discuss their justification for trust or distrust of their source of information, the comments were overwhelmingly negative, focusing on causes of lack of trust. To better understand the causes of mistrust among respondents, comments were categorized by keyword.

The following are categories for keyword classification of comments:

- Uncertainty: expressions of uncertainty or doubt about whether they should trust the information they receive
  - » "What can I say, I get my info from the city, I have to trust someone."
- Transparency: Data/information is being withheld or manipulated, conflicting data/information from different sources, disagreement on the facts
  - » "I'm not sure I trust this water committee, to be honest. They won't even provide the recordings of the meetings and do they take minutes?"
  - » "I don't feel like we are getting the full story as to how all of the new development is going to affect water availability."
- Regulation: Lack of trust due to lack of regulation around development/growth, water conservation, or monitoring water supply/quality
  - » "Water is becoming a scarce resource but, whichever city committee keeps allowing unlimited construction of homes and commercial building in Boerne is doing a poor job."
- Politics: Feeling that political agendas are impacting the type or accuracy of the information they receive, general distrust of government or power structures, inconsistency in enforcement (regular people are held to different requirements than those in positions of power)
  - » "Local control over water sources and allocation is desirable, and at the present, policies are driven by state representatives who are heavily influenced by donors who do not act in the best interest of the environment and local community"
- Confidence: Confident in trustworthiness/accuracy of information
  - » "I mostly get my information from the city. I trust they are giving accurate information."
- Communication: Not enough communication, lack of up to date, timely information, difficult to find or understand information, information is not coming through preferred channels, not sure where to get information
  - » "Because they do not communicate with the people about what is going with the water and with the service"

Politics was the most commonly cited reason for mistrust for water information (31%), followed by lack of communication (17%). Other categories include concerns over transparency and regulation of information (Figure 6). Most specifically, the Boerne Water Committee was cited as a concerning source of information due to the lack of diversity on the committee regarding the representation of community interests. It was also indicated that sources, such as Cow Creek and municipal sources, were highly trusted sources of

information. Overall, 20% of the respondents' comments expressed confidence in the trustworthiness/accuracy of the information they receive. This information, along with the responses represented in Figure 5, indicates a need to think carefully about the branding of any water data product produced through this effort (See Recommendations).

Keywords for Comments about Trust in Water Information

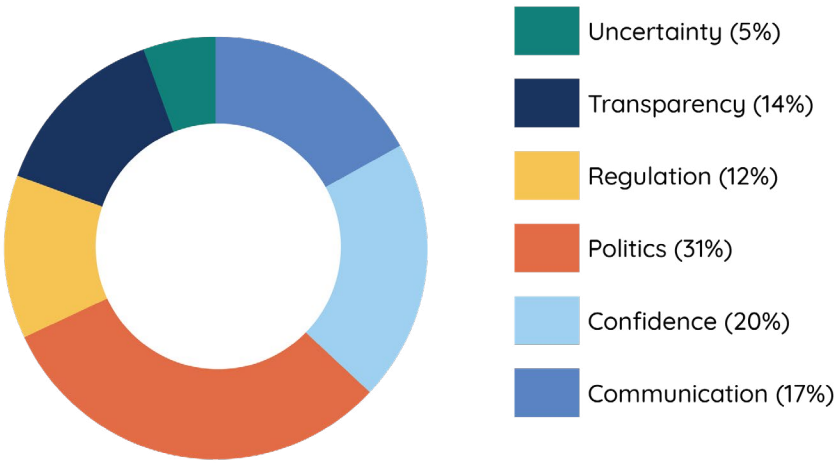


Figure 6: Keyword classification of trust comments

DESIRED TYPES OF INFORMATION ABOUT WATER

In addition to learning the sources of information the community trusts, respondents were asked to indicate the kind of information they would like to receive about their water. Options included:

- Historic trends over time
- Conservation information
- Service area boundaries for utilities
- Watershed boundaries
- Surface water data
- Groundwater data
- Water demand or use data
- Climate and weather data
- Population growth and other demographic data
- Information on water infrastructure
- Water quality data

Respondents were asked to select up to three preferred options. The categories that received the most responses were: population growth and other demographic data (20.7%), water demand or use data (18.5%), and water quality data (16.2%). These responses align with concerns cited in earlier questions regarding growth and the availability of water. The desired information was also classified by community role (Figure 7).

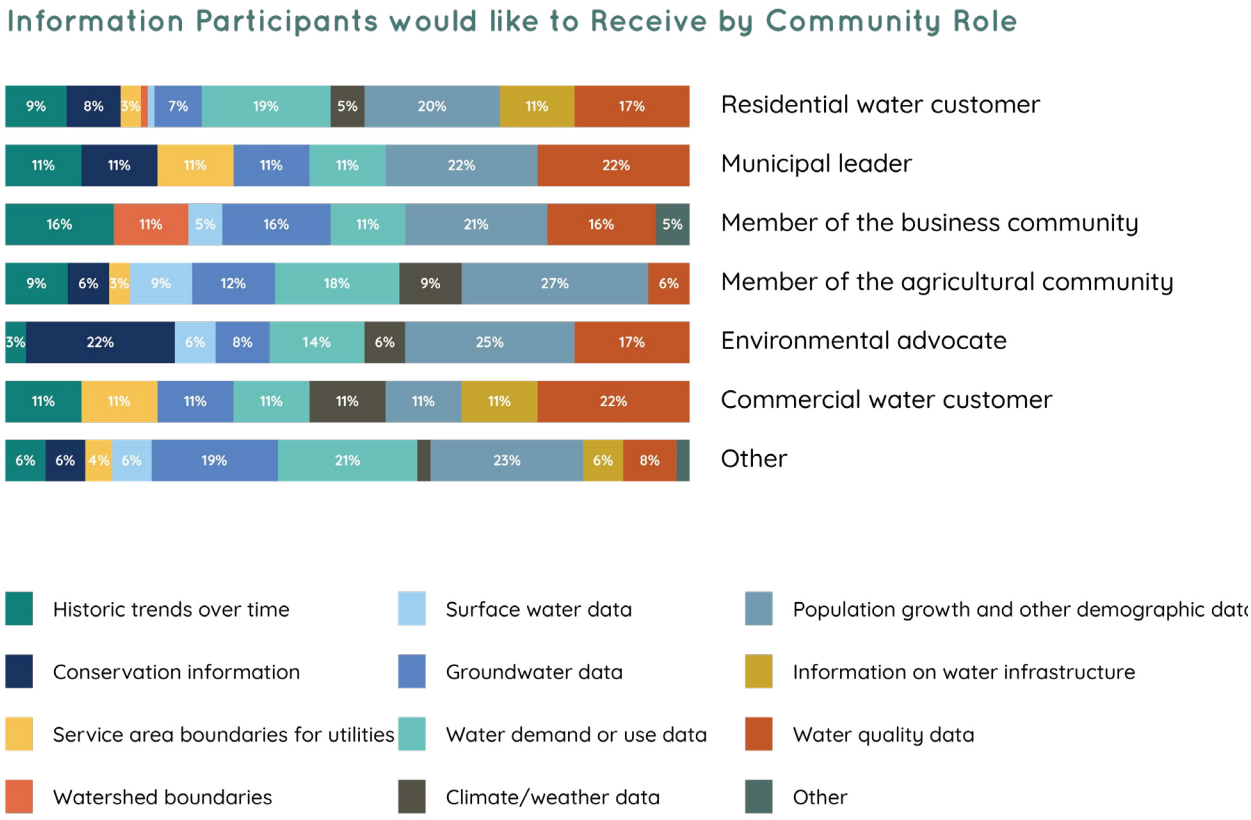


Figure 7: Desired information by community role

As indicated in Figure 7, information on population growth and other demographic data is desired by every defined community role, as is water demand or use data. Perhaps unsurprisingly conservation information is sought by environmental advocates in equal measures of population growth and other demographic data. Historic data is also a desired category for most groups, particularly among the business community, commercial water users, and municipal leaders.

Finally, participants were asked about their preferred method for information delivery. The options included online interactive maps, online interactive graphs, tabular formats, infographics, and text or email alerts. Online interactive maps were the most preferred method of delivery (33.6%), followed closely by text or email alerts (30.4%), and online interactive graphs (21.8%). However, when viewed by community role, interesting patterns in preference emerge (Figure 8).

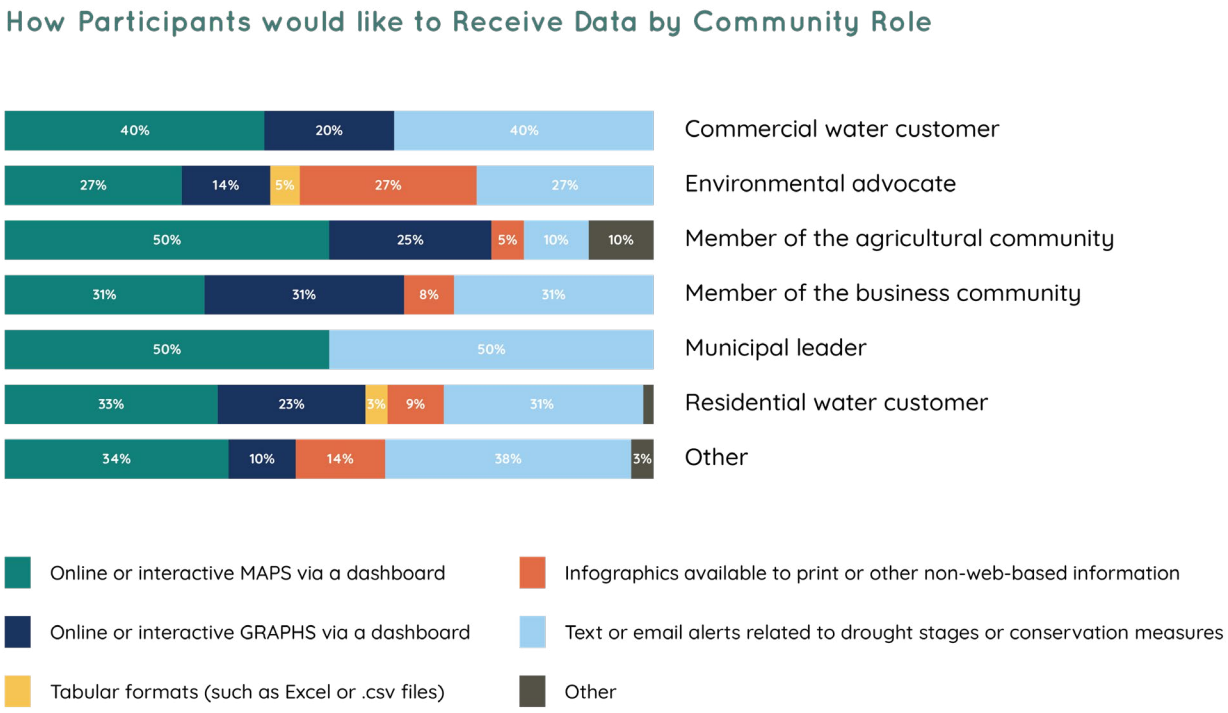


Figure 8: Preferred data delivery method by community role

Overall, all users prefer online interactive maps. As demonstrated in Figure 8, municipal leaders prefer only two data delivery methods: online interactive maps and text or email alerts. There is no other group in which data delivery methods are so starkly divided. It is also important to note that a significant portion of environmental advocates (27%) would like to have access to infographics. This is in line with comments shared during focus groups in which community groups sought prepared information that they can deliver to the populations they serve. It is also noteworthy that very few respondents prefer information in tabular form. These considerations will be critical once the primary and secondary audiences for a data product are identified. For example, should the primary audience for a data product be municipal decision-makers, information delivery in the form of online interactive maps and text or email alerts should be the priority.

Finally, respondents were asked to provide additional thoughts or comments regarding water in Boerne. The following word cloud (Figure 10) reveals the most commonly used words in these additional comments, reiterating the other results of the survey: respondents are primarily concerned about growth and water availability.

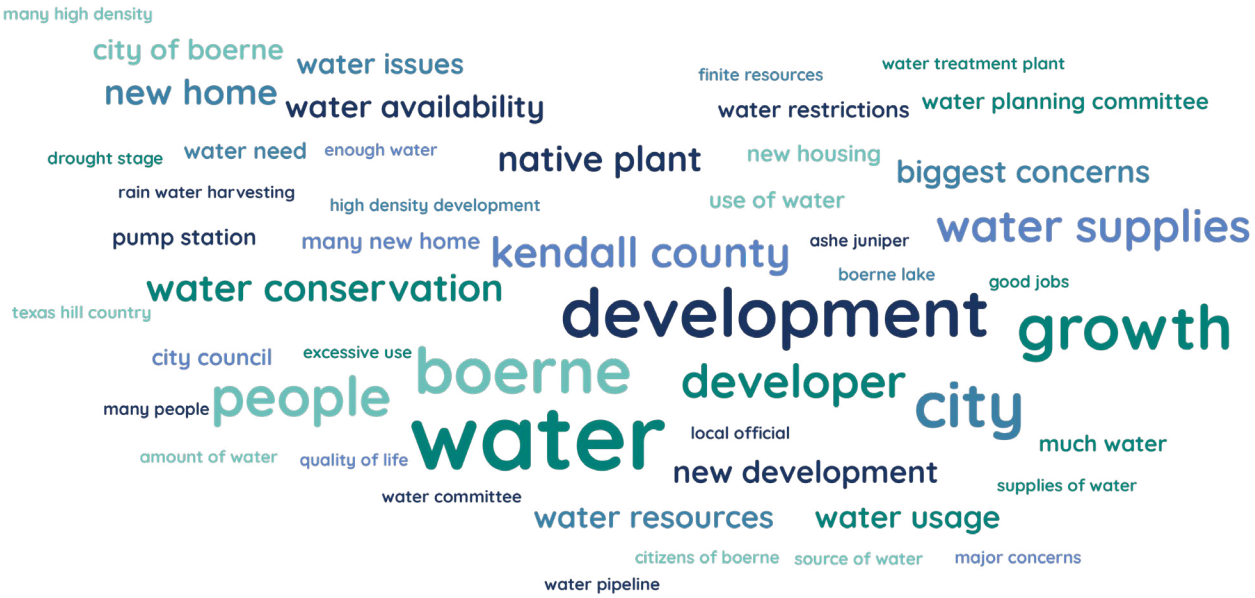


Figure 9: Comment keywords: Other concerns or thoughts

ROAD MAP

1. **Conduct Needs Assessment:** Focus groups and surveys will aid in developing a preliminary understanding of the potential users, their questions, the kinds of information needed to address those questions, and possible methods of communicating that information.

2. **Develop Use Case Personas:** An effective data system addresses the needs of specific target audiences. Personas are representative fictitious individuals based on knowledge about members of the target audience, gained through previously conducted engagements such as focus groups. There may be several personas associated with the design of a data system, each with different goals, needs, capacities, and associated information needs and data requirements. Each persona may have a different User Story, a stylized elaboration of how they interact with the system. An example persona for this project might be:

    - Rebecca is a residential water user. She is a recent resident of Boerne so did not personally experience the 2011 drought but has heard from her neighbors about the difficulties residents faced during this period. She is most concerned about growth in Boerne, and its impact on her household's water availability and affordability. She would like a better understanding of the impacts that new development projects will have on availability and affordability but is currently unsure if the information that she finds is trustworthy or complete. She normally visits municipal websites for her information but would like to see more information from environmental groups and other community organizations so that she can better judge if the available information is complete and fully represents future risks to water availability. Rebecca has reliable access to the Internet and would use a website or dashboard as a source for information if it were delivered by a trusted source. Additionally, Rebecca would like to receive emails or text messages alerts when there is new relevant water scarcity or development information about her area so that she does not have to actively remember to go to a website every day.

3. **Determine required data types and preferred data delivery methods:** From the focus group and survey analysis, along with the personas and user stories, the following can be determined:

    - The kind of data and data sources needed to answer target audience questions.
    - The resolution required of each kind of data, in terms of:

    - granularity (e.g. spatially city-wide, neighborhood, parcel-level)
    - temporal (e.g. annual, monthly, daily, hourly, 15-minute)
    - update frequency (e.g. annual, near-real-time)
- The type of data delivery methods required to deliver data and information in a manner responsive to target audience needs.
- The type of back-end data systems required to serve data of the required resolution to the desired data delivery methods (e.g., tabular data files on an open data portal, a GIS feature server, a time-series database, and API).

4. **Determine ownership of the data system and any data delivery tools and their maintenance requirements:** Critical to the sustainability of each project is to identify the long-term host of the resulting data tool or product. Who will host and maintain the data tool or product? Who will answer user questions regarding the use of the product? And who will address data producer questions regarding data submission? In addition to these considerations, the capacity needs for long-term sustainability for the hosting organization must be addressed and planned.

5. **Develop a data ingestion process:** Required data providers should engage in an iterative process to outline and define the ingestion process, and to develop the template for data submission to the previously identified data tool or product host.
    - This process may vary for each data type. For example, questions about water use for lawn irrigation require discussion with utility providers about whether this data is available: how much water is delivered and what is its use? If water use data is not available, what are the standard estimations for this variable? There may be a need for a household survey looking at each month's consumption, such as comparing use from different seasons, estimating that the differences in use are likely due to irrigation.
    - Why is this step important? Household-level data has ramifications for data volume and de-identification and/or data aggregation. The data standardization process for each data provider can be influenced by these factors. Additionally, this has implications for the overall process for the project, which may require customized data flows for each data provider.

6. **Identify a vendor to build the back-end data infrastructure and front-end user interface:** Refer to the use cases to build an RFQ for vendors and interview potential vendors, considering existing resources. For example, if use cases are simple, geospatial views of static data, it might be useful to deploy using ESRI products that may be currently subscribed by public agencies.

7. **Implementation Period:** Implement the construction of the data tool or product as identified, using datasets prioritized in previous steps.

8. **Soft Launch:** launch the prototype of the finished product to groups of potential users to receive feedback on the usability and functionality of the project.

9. **Refinement:** The feedback from soft launch engagements should be incorporated into the further refinement of the data tool or project to ensure user satisfaction.

10. **Final output and Communications**

Further notes: it is helpful to develop a marketing and communications strategy to support the launch of the final output. This can include public meetings, email blitzes via listservs, social media campaigns, webinars, etc.

Data Hub & Product Development Roadmap

1 **Needs Assessment**
Complete a survey and focus groups to assess the needs of potential users.

2 **Use Case Development**
Develop personas for potential users and examine how they would use the hub or product.

3 **Data Type & Delivery Determination**
Determine what data types are required to meet user needs and what data delivery method is preferred.

4 **Ownership Determination**
Determine who will own the hub/product after development and perform required maintenance.

5 **Data Ingestion Process Development**
Develop a process to ingest data into the data hub. This is an iterative process unique to each data type.

6 **Vendor Identification**
Identify a vendor to build the back-end data infrastructure and front end user interface.

7 **Implementation period**
Build the data hub or product

8 **Soft Launch**
Release the data hub or product to a small group of key users

9 **Refinement**
Refine the data hub or product based on user feedback

10 **Final Output & Communications**
Release the data hub or product to all users and continue to maintain and improve the hub or product.

Figure 10: Data and Product Development Roadmap

RECOMMENDATIONS

1. **Building Public Trust:** the survey revealed significant challenges with public trust for water data in Boerne. While participants did generally indicate trust in the sources they use, the comments in the survey reveal potential challenges with trust, particularly from data sources considered politically motivated. Municipal outlets and environmental groups constituted the lion's share of trust from the survey participants. Because of this, it is recommended that the final home of the data tool or product be a municipal agency. In addition, buy-in from environmental groups, who may be willing to help brand the output (for example, placing their logos on the webpage or tool), would help bolster trust in the final output among community members.

2. **Diversify Water Committee:** the survey revealed mistrust of the Water Committee, largely due to issues of transparency and lack of diversity in community representation. It is recommended that the Water Committee consider expanding its membership to include more members from the trusted organizations outlined in Recommendation 1, in addition to membership from boundary organizations that work directly with communities in Boerne. For example, non-profit organizations that represent a variety of community concerns, community faith leaders, landowners, and business leaders. These additions would increase public trust in the Water Committee as well as increase civic engagement among target audiences.

3. **Ensure Integration with other Initiatives:** the vendor selected to develop the back-end and front-end of the data tool or product should present data using standard APIs, publicly available as appropriate for the Texas Water Development Board's TX Water Data Hub to point to it seamlessly. This would integrate the data from this municipal hub into the larger, statewide water data hub.

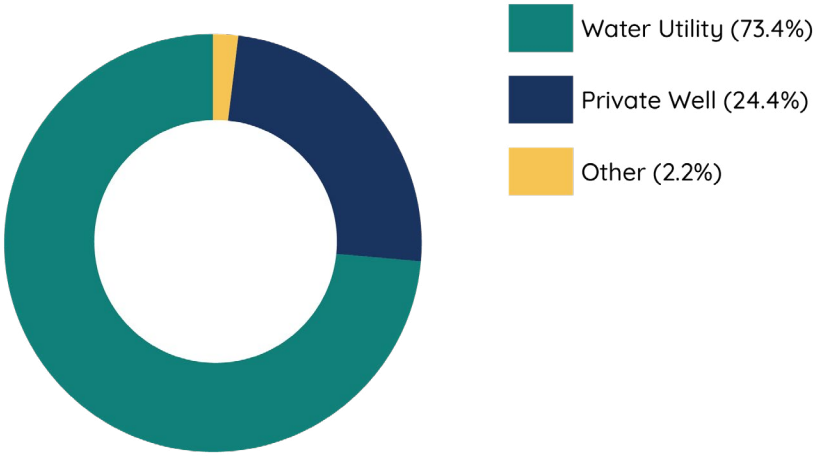
4. **Ensure Data Content Responds to User Needs:** participants in the focus groups as well as in the survey indicated a need for non-digital information and support information, to gain better context for the water-related information. This includes infographics that can be distributed via networks as well as printed to distribute in the community or post in relevant community locations. The need for information for community members to be better informed was a primary request of the product. This indicates a need to provide information outside of data analytics. Additionally, there is a need for improved communications about activities taken by the city to ensure resilience in the water supply. Many respondents did not appear to know that there are current practices to reduce drinking water use for irrigation (such as utilities providing reuse water to homeowners for landscape

irrigation). Additionally, the risk in water supply was also a bit overstated by survey respondents. For example, many did not appear to know that supply is currently twice demand, which provides a good buffer even in periods of drought declaration. Better communications via a dashboard about the current practices, policies, and status of water supply and conservation would go a long way in alleviating misconceptions..

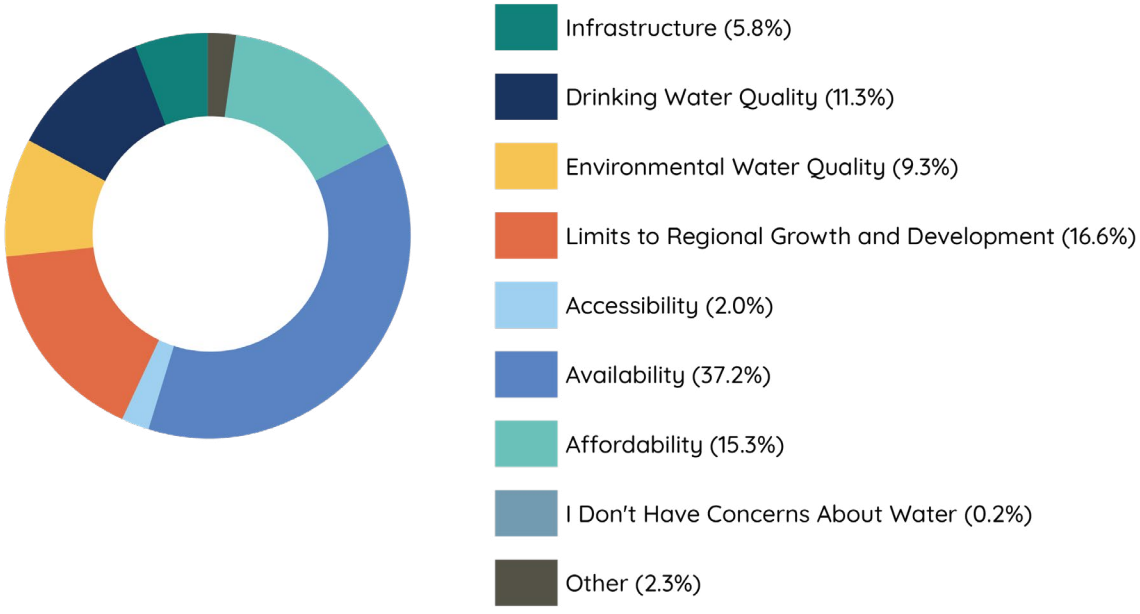
5. **Integrate Water Data with other Public Data Sources:** one of the most frequently cited concerns in the focus groups and survey is the impact of regional development on local water supply. In order to understand the magnitude and impact of these issues, integration with other public sources, such as the U.S. Census data on population growth, would help contextualize the concerns of users.

APPENDIX

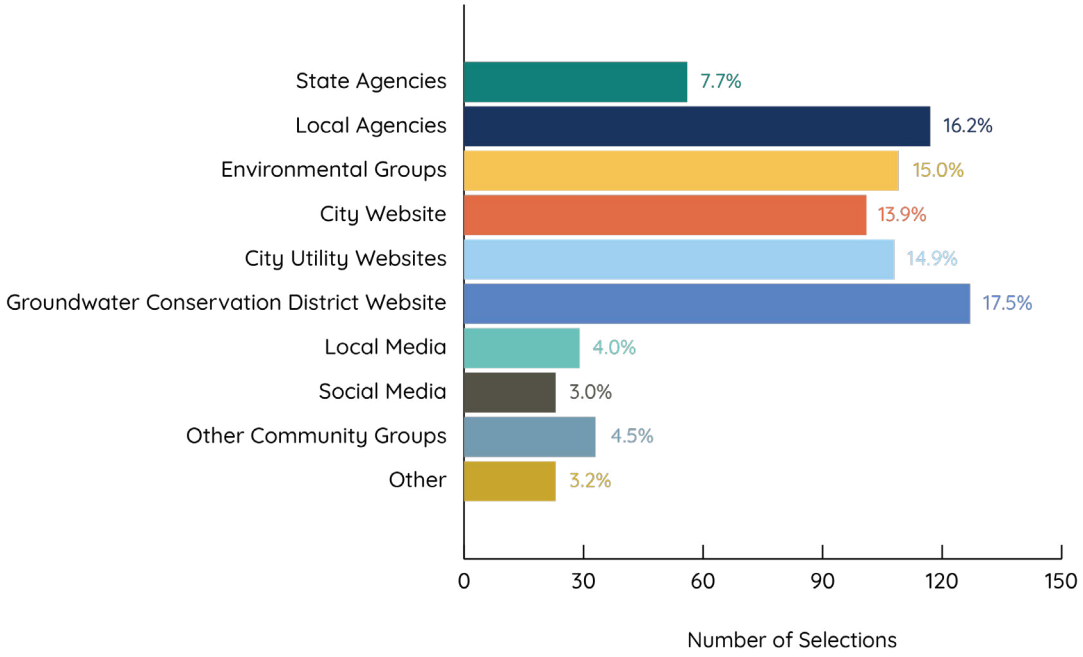
Where do you get your water?



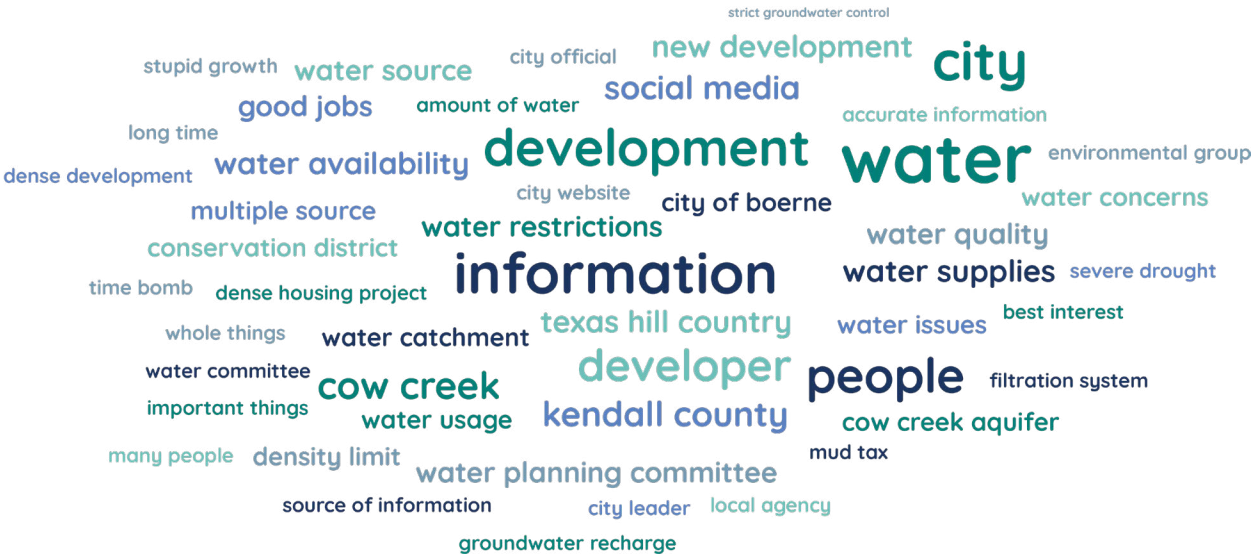
What are your biggest concerns regarding water in Boerne?



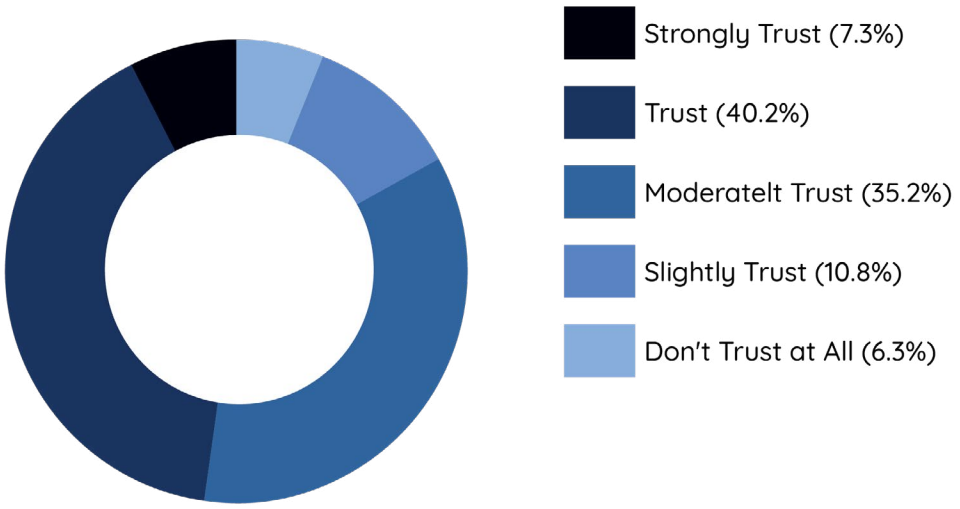
Who do you trust most to provide information about your water?



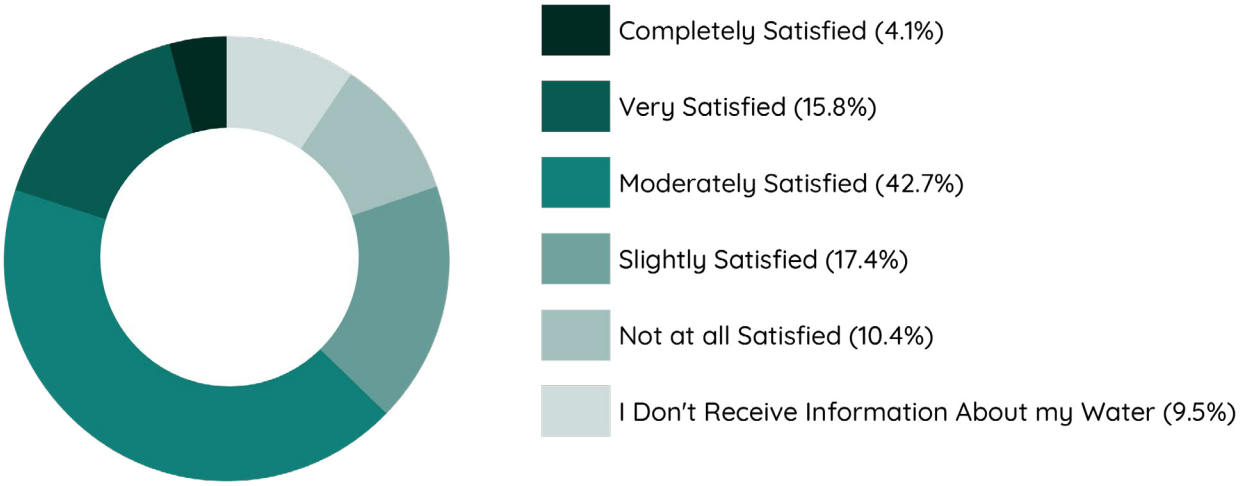
Comments: Trust Level



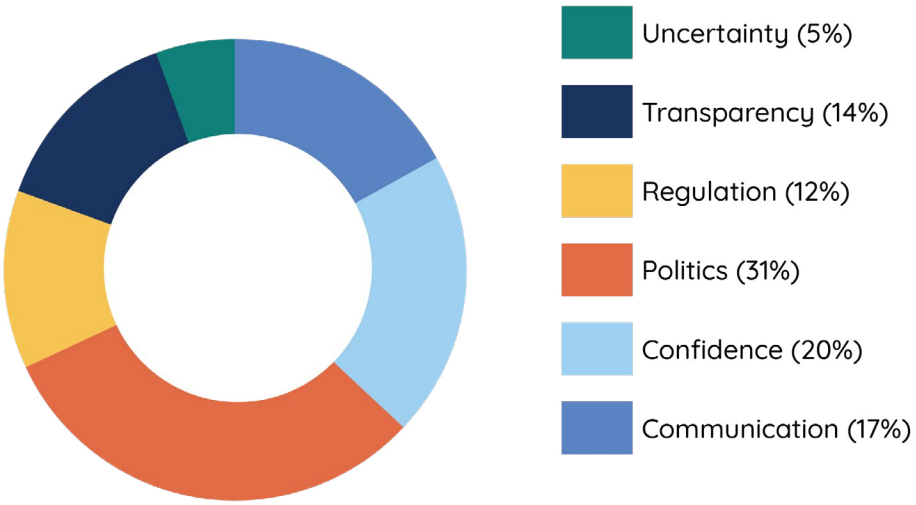
Do you trust your source of information about your water?



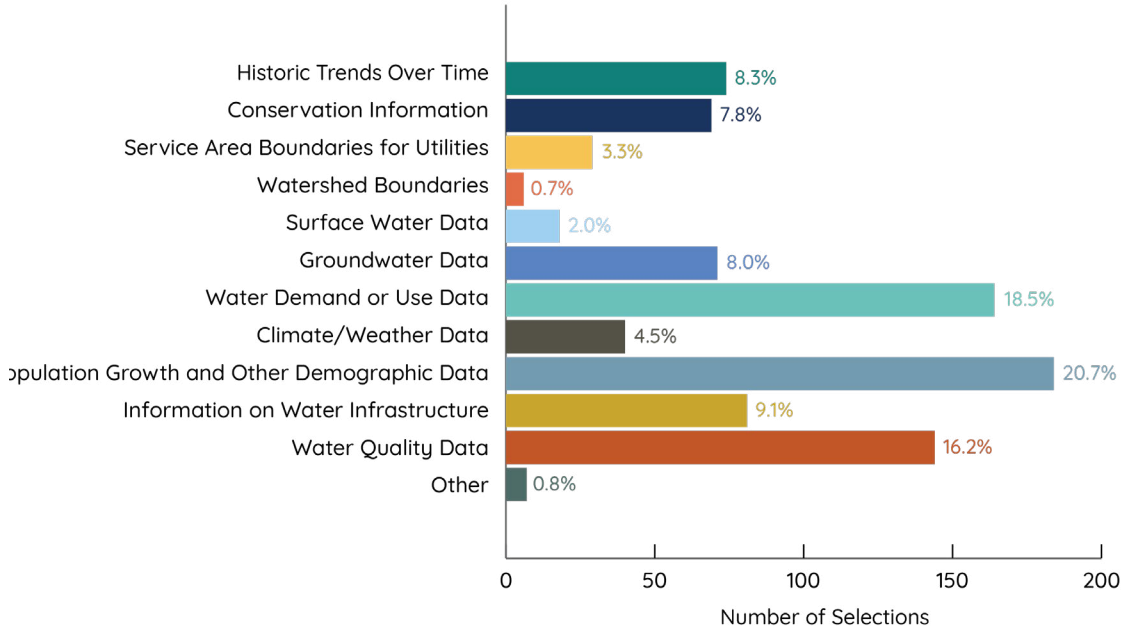
Are you satisfied with how you receive information about your water?



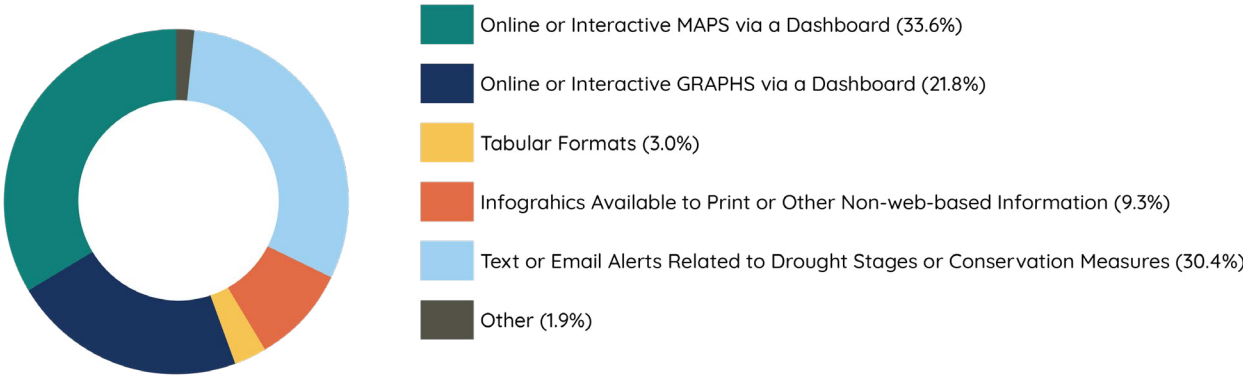
Keywords for Comments about Trust in Water Information



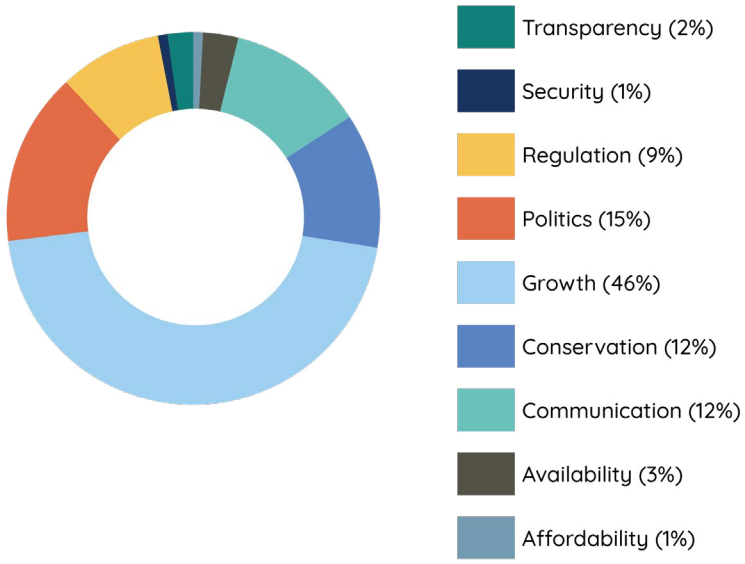
What information would you like to receive to help you make decisions relating to water?



How would you like to receive this data?



Keywords for Other Concerns or Thoughts



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