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Water Data and Information Sharing: Qualitative Research Report

Prepared for the BC Ministry of Environment (Science Policy and Economics Section)

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Background and Objectives

- The explosion of online data availability, combined with new tools like wikis, online communities, and social networking sites, is transforming the way we collaborate and how we report on the state of the environment.

- In 2010, the BC Ministry of Environment hosted the BC Water Symposium that brought together over 200 leading experts who both create and use information to manage water resources and aquatic ecosystems. A key theme emerging from this meeting was the need to improve the flow of information and knowledge amongst water science practitioners working and living in watersheds.

- The Ministry commissioned Adelaide Consulting and Econnics - Eco-Efficiency Specialists to conduct focus groups to explore the interests of stakeholders in improving water data and information sharing.

- Key questions include:
  - What data or information do stakeholders not currently have access to that they think should be more available?
  - How can knowledge about BC's water resources best be shared?
  - What tools would be most useful to the BC water science community?
  - What role do different stakeholders have in improving online communication?

Research Methodology

- Four virtual focus groups were held using teleconference and webinar technology (using the Blackboard Collaborate™ platform) between 5 and 13 March 2012.

- Each group consisted of 6-9 participants and lasted two hours. In total, 31 people participated.

- Respondents were recruited via email, using a mailing list created for the BC Water Symposium, as well as through advertizing on the Ministry's website, supported by a number of blog and Twitter posts (see Appendix 1). While participation was open, recruitment effort focused on individuals with an interest in water science or sharing water data and information.

- Participants were sent a background report by email with information on the availability of existing online resources for water science at least one week prior to their focus group session.

- Focus groups were guided by a PowerPoint presentation with a series of questions and the facilitator employed a discussion guide (see Appendix 2).

- All participants were asked to complete a short, online evaluation questionnaire at the end of their session. See Appendix 3 for the results.

- Additional insight was derived from 27 completed online comment forms posted on the Ministry website (see Appendix 4).

Notes on Reading the Report

- Focus groups such as those used in this study provide qualitative information that can be used by the Ministry and others to learn about the range and nature of the factors linked to the issue under investigation. They can raise unexpected issues for exploration and help explain the motivations and interests of participants.

- However, given the nature of this type of investigation and the small sample size, the observations that emerge and the conclusions offered must be viewed as preliminary and directional only. The extent to which these results occur across all interested parties and the total population can only be determined using statistically representative quantitative research.

Key Insights

Key Insights

Key Insight #1: Practitioners strongly desire better access to data and information (particularly data) and believe this would help them do their work better.

- They believe there is more data and information available than they currently have access to
  - When prompted, many can cite various specific examples.
- Some are also frustrated by challenges with effectively sharing watershed or local scale data and information.
  - Watershed specific data are of primary importance for local decision making, yet a number of participants indicated that these are the most difficult data to locate.
  - Practitioners are certain that lots of data are being collected in some watersheds (e.g. by consultants, academics, industry) but there is no mechanism to readily share these data.
- Although background material was geared towards discussing sharing of data, information and expertise, the primary interest to almost all participants was sharing data.
  - Sharing information came up occasionally when talking about informing decision making.

Key Insights

Key Insight #2: People are overwhelmed by various barriers to sharing data and information and by the sheer number of tools and resources out there.

- Barriers cited include:
  - not knowing where to look for data;
  - having limited or no access to known datasets;
  - data consistency and quality control concerns;
  - proprietary issues around data ownership;
  - bureaucratic hurdles with accessing government data;
  - data and information simply being non-existent.
- Interestingly, participants tend to agree that technological challenges, while important, are not the main barrier.
  - Barriers such as permission to use data or technological capacity will not be aided by a new tool.
- Participants are very cautious about adopting new online tools given the time investment required to learn how to use them.
- Complicating things, there are also significant structural and governance challenges at play.
  - Some people feel that these must be addressed as a priority; others see value in addressing data and information sharing challenges as a starting point.

Key Insights

Key Insight #3: One of the main barriers to the success of new online resources is the ability to keep the material and tools up to date.

- This can present almost a "chicken and egg" scenario where users wait to see if a tool will be sustainable, but without adoption and support from the water community the tool will likely be unsuccessful.
  - Some practitioners are wary about taking time to upload data to a new site because of fears that the tool may not be widely adopted.
- There were two views on how to ensure success:
  - Some feel that the key is to build features into tools that will keep drawing people in, supported with good marketing.
  - Others feel that the key lies in securing long-term resources to keep new tools up to date.

Key Insights

Key Insight #4: People have different ideas about what they want from new online tools and what would work to meet their needs; there may not be one data-sharing tool that will fit all users.

- Many participants seemed to struggle with the question of what a "best tool" would be.
- There were a range of views about the best way to ensure quality of uploaded data (and even the extent to which this is a priority provided that data is accompanied by well documented meta-data).
- There wasn't widespread agreement about what a new tool might look like.
  - Some felt that something as simple as a complete and current list of links would be useful
  - Others felt that a "hub" or "cloud" model that allowed users to easily upload and download data would be useful.
  - Still others wanted a "one stop shop" that would provide all kinds of data in one central place.

Key Insights

Key Insight #5: Despite different needs and interests, people found commonality on various specific suggestions about how to improve data sharing.

- By far, the most interest is in a tool that would facilitate data sharing. Ideally, the tool would allow users to:
  - search for data;
  - upload and download both raw data and "soft data" such as local observations;
  - facilitate communication with a data host or contributor.
- They also agree that new tools need to be easy to use.
- Given the nested nature of watersheds, participants articulated the need to ensure the data, which may be collected at multiple scales, is linked back to the local watershed.
- They agree that regional governments are leading the way in terms of developing databases to house regional water quantity and/or quality data.
- Some participants felt that social networking tools are quite far down the list of priorities. No one spoke strongly about this as a priority.

Key Insights

Key Insight #6: Participants agree that the Province has key responsibilities, but are conflicted about exactly what role it should take.

- Some believe that the Province should have a central role in hosting data and making it available over the long term.

- Others have doubts about the Province's capacity to deliver on such a commitment.
  - They would opt for a more limited provincial role, either as a tool creator or as a facilitator that brings partners together.

- No one argued for an NGO or local government lead on developing new online tools.

Current Practices

Use of Existing Tools for Sharing Data

- Data collected by local groups or by industry are often emailed or uploaded on ftp sites.

  - *"We also use data collected by community monitoring groups, like lake stewardship societies and that kind of thing… We do get that data from online sources, but it's mostly emailed in rather than posted on a website."*   [Provincial Government Participant]

  - *"On the sharing side, we do have probably 20 plus years of basic information on the Peace River - lab analysis - things like pH, solids levels, temperature. On occasion we have been asked to share this on a case-by-case basis… Its usually just shared by email.*   [Private Sector Participant]

- Participants utilize provincial and federal online databases.

  - *"I use data all the time, largely from the provincial networks, so the snow pillow network, the fire weather and Ministry of Transportation networks and the Water Survey of Canada."*   [Provincial Government Participant]

Use of Existing Tools for Sharing Information

- Some participants make use of Google products such as Google Earth, Fusion Tables and Google Docs as well as other widely available platforms.

  - *"We share [data and information] online using Google Earth mostly, Fusion Tables, Google Docs and Dropbox…. We share data with whomever we are working with, so we might have a multi-partner project, which might include industry and government… We mostly use Dropbox to share the big files. When it comes time to sharing with the public at large, we tend to us Google Earth and the Community Mapping Network."* [National NGO Participant]

- Blogs, websites and other social media tools are seen as having limited use for sharing data, but are useful to get the word out.

  - *One site that is good for collaboration and that I like lately is the Live Smart BC platform. Its been helpful… The range of practitioners that are on there with different issues - its been good.*
    [Federal Government Participant]

  - *We use…Twitter with good hash tags to get word out and there is always the blog and website, although those don't tend to get too much traffic when it comes to data.*
    [National NGO Participant]

Emerging Local Innovation

- Regional governments are leading the way in terms of developing databases to house regional water quantity and/or quality data.

  - *"I think that SWURT [Streamlined Water User Reporting System, developed by the Okanagan Basin Water Board] is a really good example of local motivation to create a system we all would like to see and I hope it will inspire some of the smaller water districts and enable them to house their data and see how they compare to other areas… Its interesting to see districts that are way ahead and health authorities that are way ahead and how maybe we can approach the goal of having a common data set without going through the government, because I think that is what stalls it out a lot of times."* [Provincial Government Participant]

  - *"We developed an automated tool last year to get data from our partners within the region… It captures all of the annual water consumption for each of the customers and then sends us a report that we can drop into our database. That all used to be done by hand and it would take us months to process… Now we get it all in about two minutes. There is no more room for error, so that has been really helpful."* [Local Government Participant]

Data and Information Gaps

Data Gaps

- There was agreement that data gaps have multiple causes: that data are collected but not available; collected but not quality controlled and therefore difficult to use; or that data are non-existent.

- Water quantity data, both surface and groundwater, were commonly mentioned as a data gap.

- Not having access to data was seen as a critical issue in a number of cases.

  – *"Everything I see is an estimate, so what I'm trying to do is bring the uncertainty around the estimates in a bit tighter than it is currently. The main reasons for doing this is because mine sites carry with them a lot of liability. The tighter your estimates can be the better it is. I'd say its fairly critical."* [Provincial Government Participant]

  – *"I'd say from our perspective for the sake of land use planning, I would say critical as well. We have areas where, because we haven't been able to know how much water is available, we see probably half of the observation wells in our regional district are showing declines, some of them as great as 30 feet every 10 years. I would say that it is going to be really important to get that information out before we find ourselves in a crisis."* [Local Government Participant]

  – *"We have situations where a developer will destroy part of a watershed because no one had mapped it and we did not even know what was there. So I think the biggest concern right now is actually getting the data into the system."* [Provincial NGO Participant]

Data Gaps

- Absence of water quality data can also affect the capacity to inform local decision making

    - *"Speaking about what information health authorities would like when they are trying to assess a drinking water system and what an appropriate level of treatment would be for that water, the more information they have or have access to about what the sources water is like, that would probably be very beneficial to them… It can certainly save water suppliers a lot of money if you have some good solid information to say that parameter X isn't a problem in that particular area."*
        [Provincial Government Participant]

- Baseline data and accurate land use data would support local water management

    - *"I also think baseline information would be immensely valuable. We could use it for comparisons and for assessments of cumulative impacts. This would include water quality … We are trying to come up with our own baseline data, but being a community group, it would be really helpful if there was other data available. I also think it would be great if I could easily compare and contrast with other studies that other community groups are doing."* [Local NGO Participant]

    - *"Having a way to capture all water resources (quantity & quality) information by watershed or basin would be very valuable and could lead to better watershed management planning that protects and enhances aquatic and riparian values. CWN [the Canadian Water Network] does this to some extent but a lot of information resides with local, regional and senior levels of government that is not included."* [Online Commenter]

Data Gaps

- People completing online comment forms are able to provide numerous specific examples of data that they think they need but do not currently have access to, either because they do not exist or because they have not been made widely available.

  - *"Surface water temperature data; monthly discharge/flow data (modelled for ungauged systems)."*
  - *"Nowhere is there data that outlines the QUANTITY of water and any water sources. That means above ground water, aquifers and karst systems."*
  - *"Historic (daily) data on stream discharge and meteorological conditions in small watersheds across BC. Groundwater (aquifer) levels and pumping data. Trends in water pricing by utility.*
  - *"Data on ungauged systems, small hydro data, and other hydro data sets."*
  - *"Response of fish populations to changes in flow regimes."*
  - *"For our region, we need a sensitive ecosystem inventory and tributary creek assessment and ground water assessment. These have not been done."*
  - *"Hydrometric flow data - collected by groups other than Water Survey of Canada."*
  - *"Area specific and province wide recreational, commercial and subsistence fishing licenses; area specific and province wide recreational water quality."*
  - *"Climate data from the MoTI road weather network, and the fire weather network. Also, the data collected by major project proponents in support of EA submissions or permitting."*
  - *"Up-to-date water licence and water use information, and applications for and processing of appurtenancy changes, etc."*

[Online Commenters (sample)]

Benefits of Access to Data

- Better access to data could raise public awareness and improve local involvement in stewardship issues.

  - *"Information that could trickle down to local watersheds would not only inform naturalists, it could enlist them to relevant volunteer work in the public interest."* [Provincial NGO Participant]

- Better access to data would inform research.

  - *We are mostly interested in looking at data to look at microbial transport, so we are interested in having better land use data as well as flow data, which is really hard to get these days...For land use, we want to understand what kind of land use is done on certain parcels in close proximity to the water resources that we are studying. A lot of the land use maps and surveys are really old, so we don't have any knowledge of what the current land use is unless we go out and count cows ourselves."* [Health Authority Participant]

Information Gaps

- There were a number of examples of information gaps where analysis is out of date or has not yet been completed.

  - *"I would have thought with the state of environment reporting, that a good place to talk would have been reviewing the last state of environment report that was done and some of the information that was compiled for it as a starting base for this discussion. For example, there were a few maps that showed water allocation throughout BC on a watershed-by-watershed basis. It was excellent work and needs to be updated."* [Federal Government Participant]

  - *"Things that are missing in terms of analysis or products derived from the data... [one] is a baseline model of the watersheds for the Skeena River... There isn't one available for the Northwest that I am aware of. Given all the development that is coming online up here, that would be a pretty useful tool to have for everyone the province, the feds, community groups..."*
    [Provincial Government Participant]

  - *"Some information around the performance of best practices [would be useful]. Definitely let's look at the impact of different land uses and water uses, but let's also gather information about how we can mitigate the impacts by adopting and using best practices. This may be there in isolated studies, but something that is a bit more systematic would help facilitate the adoption of best practices, whether its agriculture or urban development or whatever."*   [Provincial NGO Participant]

Barriers to Sharing Data and Information

The Challenge of Finding Data

- A number of reasons were given by participants to explain the challenge of finding data:
  - people are not sure where to look for data that have been collected for a specific area;
  - much of the data are in databases with interfaces that make it difficult to find what one is looking for (e.g. it may be difficult to identify a monitoring station code);
  - data can be held by specific organizations and not accessible online;
  - URLs change and links to databases become broken;
  - many government sites are not indexed on Google.

  - *"When I did my Master's thesis, one thing that got me interested in working in water was that I spent months trying to locate information related to drinking water, specifically groundwater in British Columbia...I've always sort of know that information is out there, but finding it is not actually that easy."* [Provincial Government Participant]

  - *"The problem is finding the data. Everyone is saying data is out there, and I agree that it is out there. Sometimes you hit on it quite by accident and its terrific. But there is no card index file or library where you can go to a listing and to pick and choose what you want to look at... The problem is that it is just very, very hard to find it."* [Local NGO Participant]

Data is Collected but Not Distributed

- There was a sense that a lot of data is being collected – for example by academic researchers, industry consultants, different levels of government, and local stewardship groups. However, much of these data are never put in a format that can be easily found and accessed.

    – *"This question about information to support water based decisions is huge. There is so much information out there that is in boxes, under people's desk... There is still a huge amount of information out there that is not organized and made available."* [Federal Government Participant]

    – *"Another issue is that people that have the information may not have it organized. If there was a portal for people to upload the data immediately, it would at least be there and organized. From my experience, people just keep it in Excel spreadsheets here, there, and everywhere. That makes it hard too."*   [Health Authority Participant]

Not Having a Place to Share Data

- In many cases, people are more than willing to share the data they have, but are unaware of repositories for them to easily do so.

  - *"As an environmental NGO, we collect information regarding the rivers and tributaries in our region… including temperature, water quality, habitat surveys, planting/invasive removal, fish counts, etc. We also rehabilitate streams and riparian habitat and have many projects through the years relating to water (and beyond). It would be beneficial to have a place to share this information centrally rather than having people not knowing what we do or having a hard time locating the information about what we do."* [Online Commenter]

Data Consistency and Quality Control

- Aside from making data available, collecting data in a consistent manner across watersheds was flagged as a problem.

    - *"…from my limited perspective of working with water meter data, while we [the regional district] manage water supply, water meter data is collected by separate municipalities. This data has been collected for many years, but unfortunately the data that was collected in the early years is extremely poor, just because there have not been any standards or direction in terms of needing to use this information for water supply monitoring… From the perspective of a water supply management dataset, we have a very poor supply of data here… It still requires hours of work to get the data massaged to be comparable across different municipalities."* [Local Government Participant]

- Not knowing the quality of the data can also be problematic.

    - *"I definitely know that there are large benthic invertebrate data sets out there across the province with all sorts of different organizations and that is information that we would love to have access to. But this also comes back to QA/QC, which is a huge issue for us. I know there is lots of data out there, but how useful is that data? It can be quite difficult to know."*
    [Provincial Government Participant]

Willingness to Share Industry Generated Data

- Although industry collects monitoring and baseline data, sometimes this is considered proprietary, so may not be shared.

    - *"Sometimes people are unwilling to share…Ownership of data is a pretty serious structural impediment."*   [Provincial Government Participant]

- In other cases, industry is willing to share, but does not have the data well organized in a manner that facilitates easy distribution.

    - *"On the sharing side, we do have probably 20 plus years of basic information on the Peace River … If someone wants data to 1989, its not easily accessible to use, and we would have to look back to individual lab sheets and then put that together."*   [Private Sector Participant]

Commitment to Open Government Data

- Participants suggested that even given strides with open government policies, there are still barriers to governments sharing data. They talked about internal bureaucracy and the need for data sharing agreements between jurisdictions.

  - *"Money will not solve problems if the various jurisdictions are not willing to share their data."* [Provincial NGO Participant]

  - *"We do have problems getting local jurisdictions to share their watershed data, particularly Riparian Areas Regulation reports."* [Provincial NGO Participant]

No Widespread Commitment to Open Data

- Proprietary ownership of data and unwillingness to share was not limited to industry and government. Academic competitiveness, concerns of others making a profit, and confidentiality were also given as examples of reasons for not sharing data.

  - *"A lot of my challenges are getting access and permission to use data, and not just one time but having it automatically come in to some sort of a system that we can access."* [Provincial Government Participant]

  - *"If people are going to use data for publication or personal gain, how do you deal with making that data publicly available? … If you start to use data without acknowledging the producer or if you start to develop novel tests using it, that could have implications for people wanting to share their data in the first place, so you have to protect the data sharer."*
    [Health Authority Participant]

  - *"Water quality data collected by water providers including First Nations water providers - those we have been trying to get copies of for probably well over a decade. The ownership of the data is an issue, confidentiality, just the culture of different agencies willing to cooperate is an issue. I think that one of the values of getting this data would be that it would help us better define baseline conditions or characterize water quality issues in lakes and aquifers. Another example would be how much water people are diverting or extracting. That information is useful to determine beneficial use and water availability....Those are two examples where data is collected all over the place and we are having trouble getting that data either due to lack of legislation, lack of cooperation or lack of capacity and lack of systems."* [Provincial Government Participant]

Barriers to Using Existing Tools

- Some people feel overwhelmed with the number and variety of tools available today. There is also a concern that investing time in these tools may not give the anticipated return.

  - *"I find it challenging sometimes because there are many tools that have been developed, and are being developed. I know about many of these tools just haphazardly. And when I find out about tools I have to be very choosy about which tool I devote time to get to know let alone put data into. With dozens of different types of tools - geographical, communication, data storage and use - I just don't have the time to determine which will be appropriate for me. Which ones are proven? Where can I find them?"*   [Provincial Government Participant]

  - *"There is no shortage of websites out there that claim to do all sorts of things until you get in there and try play around and the find out that they are not what you really want... The other things is timeliness and completeness of the website... Having a website means having ongoing support to make sure it is complete. Otherwise people lose interest very quickly."*
    [National NGO Participant]

Barriers to Using Existing Tools

- Within agencies, there may be a question of comfort using external tools.

    - *"Some of the problems we had [with a tool we developed in the past] beyond merely presenting a tool for use would be engaging different types of people and agencies to use the tool in a way that they were comfortable to share information, comfortable personally with technology, and comfortable from an agency level in regards to confidentiality and also policies... Our experience with that would be that there is no wider process that the tool was necessarily embedded in, that people understood in order to get more comfortable quicker and actually use it as a place to share information."*
    [Private Sector Participant]

- Some people may not trust very popular tools.

    - *"Personally, I wouldn't use Facebook... I don't like its lack of security. I won't use it and I don't have the ability to use Twitter."*   [Local NGO Participant]

Barriers to Using Existing Tools

- Participants generally agreed that technology was not the main barrier.

  - *"The barriers are not just technological… There are so many over-arching challenges related to this issue. The tools are probably not the biggest issue."* [Provincial Government Participant]

- Technology is still a deterrent for some participants. For example, uploading data is sometimes a cumbersome process.

  - *"We also upload data to the EMS [BC Environmental Monitoring System], but it is really klunky and we don't like doing it. So I would have to say that, as a tool for community water monitoring, the EMS would not be a first choice."* [Local Government Participant]

- Different tools employ different protocols which can be overwhelming.

  - *"Just a comment on barriers - if I need a computer science degree to get the information, it's no good to me."* [Private Sector Participant]

Barriers to the Success of New Tools

- A common barrier for creating successful new tools (e.g. a listing of websites) is it becoming outdated due to loss of funding or other resources.

  - *"We've put a lot of resources into a tool for managing data, but there is no money for collecting the data and summarizing it, so its all out of date. So we've got a great tool. A lot of money spent... but there is no money for updating the database."*   [Federal Government Participant]

  - *"One of the things that keeps occurring is that a good project loses its funding ... I guess there is an overall question: what are the tenets of creating something that is long term and long lasting? ... We can put it off on the government and say that government should come up with the funding, but we know that we are having trouble accessing data off government sites, let alone a third party site that is trying to draw together community data sources as well as some of the provincial datasets... There are 55 water sites because they keep getting reinvented and they keep getting a lifespan and a shelf life. When they stop being current, we stop going back to them and then it becomes hard for them to prove their currency and get funding..."* [Provincial Government Participant]

Barriers Identified by Online Commenters

- People completing the online comment form identified a range of barriers similar to those noted by focus group participants.

   Q9. A number of online water tools have been developed in the past but then are not adopted by the water community. What are some of the barriers that may prevent you from contributing to and using an online water tool?

   – *"Workload (time), lack of awareness, not a match for my needs."*

   – *"As a researcher, it is a matter of whether the tool provides useful access to data. My speculation on other water professionals is that if there is no incentive - it doesn't help their business to have this information or use this tool - then they won't use it. Information is not in itself valuable knowledge."*

   – *"Available time to navigate through online government water tools. Government websites are massive."*

   – *"Ease of use, not targeted to local problems or local data sets, information not current, no information on metadata like sources, year collected, author etc."*

   – *"Generally, barriers that might prevent me from contributing to or using an online water tool could include our internal departmental web-blockers, speed of the web connection required to make the tool work, and my level of understanding of how the tool works."*

   – *"If it is complicated, hard to find, not used by many other groups, we would not use it."*

   – *"Lack of knowledge about the existence of such sites; no common grounds for release of data information; no "common" method used in release of info."*

   [Online Commenters (sample)]

Summary of Barriers

- The following is a list of the barriers to sharing data and information identified by the focus groups and through the online comment forms:

    - Data and information are difficult to find
    - Data are collected but not made accessible online
    - No commonly used repository to share data
    - Data are of unknown quality (lack of meta-data)
    - Data are not consistent (difficult to make comparisons, summarize or roll-up to larger scales)
    - Organizations are not willing to share data (proprietary concerns, confidentiality, jurisdictional concerns)
    - Organizations do not have the capacity to share data
    - Data and information sharing sites are not kept up to date
    - Individuals are overwhelmed by the number of new tools and websites
    - Difficulty using new tools
    - Not able or willing to invest time necessary to learn new tools
    - Not aware of the capabilities and advantages of using new tools

Structural and Governance Issues

Water Governance

- The larger process that leads from data to decision-making was a concern, particularly in one of the four focus groups.

  - *"I see a range of complex needs that continue. Information access and information portals being one part of much larger challenges. If we haven't fed information into a process we will always be challenged... I would caution that a tool for information exchange, if it's not part of a wider process, can create more questions than it answers... There is a lot of ambient confusion about where people even begin to go to communicate concerns, to make decisions, to think in watersheds. The question about information access and exchange fits into a much larger context of governance."*
    [Academia Participant]

  - *"Although the issue of access to data is a huge one, it can't be lost that "what do you do with the data once you have access to it"...We've been in a policy loop for a long time, and I think there has to be a much more holistic approach to that issue."* [Academia Participant]

- Though no one in the focus group denied the importance of resolving water governance questions in the province, some felt that having better access to data would still be helpful.

  - *"Even if you don't create the system that addresses complex [governance] issues, a tool to collate water information is extremely important. Even if the tool or tools that need to be created don't ever address those questions, I still think it would be an extremely useful thing to have... There is still a ton of information out there that is not available... With our shrinking budgets, that kind of information would be invaluable."* [Provincial Government Participant]

Structural Challenges

- Other participants and online commenters noted break-downs in the link between making data available and enabling action and decision-making with this data.

  - *"There is a bottleneck with communication and support for people that are volunteering [to collect data]."* [Federal Government Participant]

  - *"[We] provide information to MoE, but it does not really seem to do anything for them. We provide the information to them, but there is no one there to receive it due to downsizing and cutbacks."* [Local NGO Participant]

  - *"The key is to provide key decision makers with information in a timely fashion in a form they can use it so they can take timely action as needed!"* [Local NGO Participant]

  - *"We are not at the stage where we can effectively use data, so we don't need to enhance [it] or [there is] little use in exchange until we have a clearer understanding of our roles in decision making, agreement on conservation values, goals for managing ecosystems.   This requires more facilitated community input."* [Online Commenter]

  - *"Until government ties the science of water together with its enforcement, all of our combined efforts are weakened. Enforcement is a constant topic in every water initiative I have organized."* [Online Commenter]

What Would New Tools Look Like?

Tools to Help Share Data

- Participants could not identify one single tool that would solve all issues with data sharing. Many participants seemed to struggle with the question of what a "best tool" would be.

  - *How does one decide what is going to be the "be all, end all" central registry and who is going to fund that not only to get it started but also in perpetuity?...There are lots of places where data is stored, but the trick really to be would to have an awe inspiring central data base, and everyone is going to go there knowing that there is going to be enough resources to sustain it over time so it doesn't just get started and die."* [Provincial Government Participant]

Desired Features

By far, the most interest is in a tool that would facilitate data sharing. This tool could be a central index website that has links to all available online data or it could more directly search water websites. Ideally, the tool would allow users to:

- Search for data
    - *"What would be useful to me would be search function that would enable you to drill down to specific sites and easily navigate to what information is already posted or at least information about a group or project you can pursue to find what you are looking for… Even just a straight ahead water data search engine that is a little more focused than a Google search."*
        [Provincial Government Participant]

- Upload and download both raw data and "soft data" such as local observations
    - *"If you want to make it simpler, it would be really important to have different groups that you want to store information on the site - whether its regional districts, NGOs - to be able to upload their own information. I know historically, in terms of provincial databases and information stores, there has been a lot of administration, so NGOs and regional districts have to submit information and there is some sort of vetting process, the Province takes on responsibility for posting things and I think that this is inefficient and not really working out… There needs to be understanding that as long as the standard of data or information quality is identified, people should be able to upload their own information, because it would save on administrative time."*   [Local Government Participant]

- Facilitate communication with a data host or contributor
    - *"I like the idea of an index page where you can go to and find the site, and start drilling down and start discussing back and forth, perhaps even find out where the data came from and speak to the people that provide the data."*   [Local NGO Participant]

Desired Features

- The tool would also need to be easy to use.

    - *"One of the other barriers is to just to make the application very, very easy to use so that it doesn't bog people down trying to find their data… Being able to get through the datasets quickly and being able to find what you are looking for would be really helpful… [This might include] maps of the province, broken into its regions, and then that might expand out and go into some folder so you could look at water quality or water quantity or watershed detection or other sections…"*

        [Local Government Participant]

Nested Feature

- Given the nested nature of watersheds, participants described the need to ensure the data, which may be collected at multiple scales, is linked back to the local watershed.

  - *"What I would really like to see is a hierarchically based system…There is lots of information [at the local level] that is not being fed up to any wider database, and those larger databases lots of times don't meet the needs of users at that specific watershed…There is definitely a break right now…And I think that as long as there is some degree of consistency, the information that is being collected at that really fine scale can be fed up to inform decisions at that larger spatial scale… Once you get critical mass you can have tools which can answer questions at the finer scale as long as you are getting information being fed both ways. I think that is definitely lacking right now."*
    [Provincial Government Participant]

  - *It's great to have a database but it doesn't really work for us unless the watersheds are linked together, in other words unless the smaller sub-basins talk to the larger watersheds… It would really help us if we could add cumulative data together. So, if you take water out of a headwater, what does it mean lower down."*   [National NGO Participant]

Access to Local Data

- A new tool would need to support sharing or locating data at a local scale, but also allow aggregation.

    - *"I'm really torn because I know that realistically the future of water management is at the community level… I think there is a real value to locally held data and doing it on a project by project basis. But for me, the worry I have with that is that then you get pockets of data all over the place that are not necessarily consistent in terms of format or quality… Unless you've got underlying data that allows you to be comparative with that information to other areas in the province, you kind of have a lot of secluded ponds of data, which are very important locally and allow groups to manage their own water sources but don't provide that bridge up to informing legislation and provincial policy and all those other things that you want to create a 30,000 foot level snapshot."* [Provincial Government Participant]

Differences on Desired Tools

- There were a few suggestions on what the tool might look like. At the simplest, a complete and current list of links would be useful.

  - *"We really like the idea of a hub and it doesn't necessarily have to be fancy. In some ways, I find an index page can be more helpful than a search box. If you have each topic listed, you can go through each topic and find sub-headings and drill down to find the websites that you are looking for. Sometimes you just don't know the wording for the title that that you are looking for and the search doesn't work out. So some sort of a giant page with all the different ministry headings and provincial data and then drilling down within the ministries to where the information is would be really helpful… If we had that one search hub website that we could always go to then we wouldn't have to worry about ministries changing names or the format for how they present their resources."* [Local Government Participant]

  - *"I like the idea of an index page where you can go to and find the site, and start drilling down…"* [Local NGO Participant]

- Participants also felt that a "hub" or a "cloud" model that allowed users to easily upload and download data would be useful:

  - *"I think that the idea of the cloud is very powerful. I would be happy if you had a cloud facility where anyone could upload anything. However, it would have to have the meta-data indicating what standards were used to collect it, and so we could pick and choose from the data. If there was a single repository where everyone had access to the data, that would be amazing."* [Provincial NGO Participant]

- Respondents to the online comment form indicated strongest preference for the tools listed in the table below in response to the following question:

Q8. Recognizing the distributed nature of water information in BC, what additional water information sharing tools and resources would you most likely use? (You can make multiple selections.)

Water Data and Information Sharing Tool	# of Times Selected
Synthesized data products (e.g., indicators, maps, graphics)	20
Spatial analysis tools	18
Directory of current water research or assessment projects	16
Spotlight of new water research or assessment results	15
Data catalogues (listing of data sources)	14
Directory of water experts	13
Discussion forums	10

n=27; this is a partial list of responses, only including those with 10 or more selections

Social Networking

- Some participants felt that a social networking tool is quite far down the list of priorities. No one spoke strongly about this as a priority.

  - *"As far as the apps and social networking thing, I would say that is almost a third order task. The first order would be collecting the data and making sure that its good data… The second order would be actually putting that into a database and having that be available and the third order would be the analysis of that data and the dissemination of that analysis… I could see that social networking could be very useful at every step and phase, but I don't think its an end in and of itself."*
    [Provincial Government Participant]

- Mobile applications and social networking sites were also ranked quite low by online commenters when asked which additional water information sharing tools and resources they would most likely use.

  - *Many of us do NOT use Facebook or other social network sites."*   [Online Commenter]

Keeping Material Up to Date

- One of the biggest challenges once a tool is built is keeping it up to date. Participants see one advantage of a distributed model is that data holders would be responsible for updating data.

  - *"Government has tried in the past to accumulate all the data but there are really big problems with that. One of them is that if you are copying data from some other organization, if you put it on to your own server, the minute you do that it becomes obsolete... Over the years, we have developed systems that focus on distributed databases so that you can access it from a central place. It's a lot more manageable that way."* [Federal Government Participant]

  - *From my perspective, the wiki model, where everyone can provide their own information after the initial structure is created, would be really useful... If there was a wiki component, we could add to our community of interest... things like our agricultural information, our watershed protection plans or our latest drought management plan if anyone wanted to have a look at that...*
    [Local Government Participant]

Data Quality

- Although participants generally agreed that the tool would need to be inclusive and allow for submission of all data, there were concerns regarding data quality.

  - *"Having data is one thing but making sure that the data is either accurate or precise is really important... For any of this to be worthwhile in the long run, there has to be a good foundation to the data - meta-data on how it is collected, the QA/QC processes that it goes through, flagging of data that has been estimated... It takes a lot of time and effort to do QA/QC of data, so I think that it is pretty important that this is mentioned as being a significant part of the work early on."*
    [Provincial Government Participant]

- Participants were cognizant of the potential administrative burden of ensuring data quality and suggested a self administering, or bottom-up process.

  - *"We have found that the second you try to identify the differences in quality, you run into trouble.... it needs to be a self-identifying system. And by trouble, I mean you get into administrative decision making."* [Local Government Participant]

Data Quality

- Well documented meta-data was seen as the solution to ensure inclusivity and usability of the data.

  - *"[We need to] assign a level of quality associated with the data, specifying the various levels of rigour that the data has gone through, be it a citizen reporting something they have seen or a company hiring a consultant to produce a report and summarize the data. All the data have their place, we just need to be sure that the we are able to account for the source for the data, the quality that you can expect from the data and the confidence you can expect when you are using it."*
    [Private Sector Participant]

  - *"Whenever you are looking at data or information, you need to be able to assert the quality as well. You need to have associated meta-data. You need to know how that sample was collected, where it was collected, how it was processed and how it was analysed to be able to understand what that information means to you."*   [Health Authority Participant]

- Although there was debate about this, some participants also felt that efforts to standardize and share data collection protocols would help to ensure the usability of data.

  - *"In addition to sharing data, are we also talking about sharing data collection methodologies and database infrastructure and all those sorts of things? I know people hate when government gets involved in standardization of data collection… I appreciate the onerous nature of creating standards for data collection, but there is some benefit to that."*
    [Provincial Government Participant]

Success Factors

The success of a new tool will hinge on the ability of the tool to stay up to date and be well known. There were two views on how to ensure success:

1. Build features into the new tool that continue to draw people back to visit.
   - *"It all comes down to making sure that the tool is useful… Just having that frequent use built in to the website is really key."*   [Local Government Participant]

   - *"It comes down to the website being useful and being known to be useful for having specific tools."*   [Local Government Participant]

2. Secure long term resources to keep the site updated.
   - *"The community mapping network doesn't use a lot of money to achieve the web presence and build the particular tools that a client uses, but what it takes is a couple of bodies with a ten year commitment to make the connections within their communities of interest - all the water stewards or groundwater stewards or whatever. That is the expensive part… Often what happens is that just as you build a full head of momentum, you find don't have the resources to sustain the person-to-person, organisation-to organisation contact that you need to fill the content for the website… If you want to put some money into this, put it into a couple of bodies with a travel budget and a phone budget and get them working on it…"*   [Provincial NGO Participant]

   - *"In order to be credible, please have the courtesy to address funding."*   [Online Commenter]

The Importance of Marketing

- Successful marketing of the tool to get the word out was also mentioned a number of times as a major success factor.

  - *"I know it's hard to get the word out, but the more people who know of a shared resources for sharing data, the better!"*   [Online Commenter]

Training

- An alternate suggestion to creating a new tool would be to provide support for people to make better use of the tools that are already available.

  - *"Rather than government spending time developing these tools, there are some really interesting, widely accessible things like Google Earth that are emerging. If we can equip people to work with those tools rather than developing a new super tool, we can then spend the resources and time and effort to fill other gaps that people are mentioning. We can then focus not on the tool itself but how the information is getting into and out of the tool. It's the entry and exit piece that I find more important than the tool itself."* [Academia Participant]

- This could take the form of training or other means to improve capacity, especially at the local level, to benefit from new online tools.

  - *"Part of the Web 2.0 type thinking is about diversity. If it is possible to think not about how we are going to provide "the" solution, but how are we going to build capacity for people to be able to benefit from these new opportunities and once they have done the information sharing and are benefiting from new knowledge and access they have, to have places to go where sharing may be able to happen across local contexts."* [Academia Participant]

Summary of Desired Features for New Tools

- The following is a list of features for new tools suggested by participants:

  - Search for data and information
  - Upload and download both raw data and "soft data"
  - Facilitate communication with data host or data contributor
  - Easy to use
  - Data and information linked to local watersheds
  - Access to local data
  - Allows data aggregation
  - Material is kept up to date
  - Known data quality (standardized meta-data)
  - Better support for existing tools

Roles and Responsibilities

Roles and Responsibilities: Provincial Role

There were three main views on the role of the Province in the development of a new tool to support water data sharing :

- The Province should be responsible for hosting data and making them available over the long term.
  - *"I think that the Province should definitely be responsible for storing and disseminating information. You need to have consistency across the province in terms of information that is collected, stored and shared. Different regional districts don't necessarily follow watershed boundaries and so you need to have consistent information across watersheds and across the province so you can do studies on large and small scales and actually use that information and data. With the Water Act modernization, I see that the Province is kind of divesting itself of a lot of different responsibilities, but collecting and storing information is really one that I just don't see should ever leave….The Province already has several databases already started, so it doesn't make sense for us to all individually start our own now."* [Local Government Participant]

- The Province should develop and maintain a tool to help share data.
  - *"Where is the [data] cloud going to live and who's going to pay for it? I hate to say it, and I like the cloud idea, but someone has to pay for it. This is a common resource… I'm in the government camp… I think that is where the standardization and living space is going to be found."*
    [Private Sector Participant]

- The Province should take the lead in bringing together partners.
  - *"We like the idea of the Province taking the lead in the sense of bringing everyone together, but we certainly would not want the have to put all the pressure on them to have to do all the work."*
    [Local Government Participant]

Roles and Responsibilities: Other Organizations

- Participants felt that non-government organizations (NGOs) could take on the challenge of collecting some of the data and also support the tool through marketing and promotion.
- NGOs would also contribute by disseminating information and communicating it to diverse audiences.
- However, no one indicated that NGOs should take on overall responsibility for developing and supporting new data sharing tools.

    - *I think with an NGO, there are challenges around providing certainty and continuity. We're just not in the same position [as the Province] with certainty of funding. We're largely surviving on project based funding and that is not a model that is viable for this sort of thing... So we'll try and contribute where we can, but there are some practical constraints around that.*
        [Provincial NGO Participant]

- One suggestion was to create an organization separate of government to oversee any new tools.
    - *"Why not create a Special Operating Agency so the data portal holder is at arm's length from government and can generate revenue to support itself after an initial start-up fund from government."* [Local NGO Participant]

What Stakeholders Want Next

- As an immediate next step, participants felt that communication pathways could be improved.

  – *"One of the critical items after this is all done is just getting back to the people who participated on the focus groups with a report that says what was found. Also just staying in touch with all the people that have been involved in this. I've often wondered what happened with the Water Science Strategy that I attended in 2010. I haven't really heard too much about what is happening with that. If you expect people to buy in and use these tools that are developed, just knowing that there has been progress with these types of initiatives [is important]."*   [Local Government Participant]

  – *"I would think that setting up a community of practice, either on Live Smart BC or some other place that we all go to would be a good way to keep the discussion live. Or even the Living Water Smart Blog."*   [National NGO Participant]

  – *"CONSULT before you determine the tool to be used so we can become advocates!"*
  [Online Commenter]

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