

Feast AND Famine: Moving Towards “Sustainable Watershed Systems, through Asset Management”

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The ‘new normal’ in British Columbia is floods and droughts. The summer dry season has extended on both ends and we can no longer count on a predictable snowpack and reliable rain to maintain a healthy water balance in our watersheds. Annual volumes of water entering and exiting our regions are not necessarily changing; instead, what is changing is how and when water arrives – it is **feast AND famine!**

Watershed Systems as Infrastructure Assets

A watershed is an integrated system, is infrastructure, and must be viewed as an asset that provides municipal services. Watershed systems thinking covers the continuum from water supply to drainage, and encompasses human and/or ecosystem needs.

Where a local government regulates land use, a watershed is an integral part of the drainage infrastructure assets of the local government. More specifically, the three pathways (surface, interflow, groundwater) by which rainfall reaches streams are infrastructure assets. They provide ‘water balance services’. As such, protection and maintenance of the three pathways has financial, level-of-service and life-cycle implications for asset management.

Asset Management for Sustainable Service Delivery: A Framework for BC makes the link between local government services, the infrastructure that supports the delivery of those services, and watershed health.

This article provides context and describes why the **BC Framework** and two other provincial game-changers are drivers for **Sustainable Watershed Systems, through Asset Management**.

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It then introduces the ‘Water OUT= Water IN’ mind-map for looking at the Water Balance differently. Finally, the article enlightens how the Georgia Basin Inter-Regional Educational Initiative (IREI) would facilitate integration of watershed systems thinking and adaptation to a changing climate into asset management.

Over the next two years, the IREI program would progressively inform and educate an expanding network of practitioners, inside and outside local government.

What Happens on the Land Matters!

A systems approach to watershed health and protection recognizes that actions on the land have consequences for the three pathways to streams and hence the *water balance* of the watershed. Those consequences are felt in both dry weather and wet weather – too little or too much water, respectively.

Local governments regulate how land is developed, drained and serviced. This means local governments have the authority and ability to determine and implement **watershed-based volume targets** that would help to prevent drainage impacts in wet weather and also maintain an adequate water supply in dry weather for human and/or ecosystem needs.

Call to Action: A ‘teachable year’ heightens awareness, leads to a sense of urgency, and engenders political will to implement necessary changes in how communities service land and respect water.

Drought, forest fires, floods and pine beetle in 2003 created a teachable year for change in BC. It truly was a ‘watershed moment’ and led directly to the *Water Sustainability Action Plan for BC*, released in 2004. The subsequent response by provincial, regional and local government champions to a ‘call to action’ by former Premier Gordon Campbell gave BC a head-start on many other regions to include water supply sources, streams and aquifers as infrastructure assets.

The outcome? A decade later, provincial ‘game-changers’ are now in place that would enable protection and/or restoration of ‘water balance’ assets in the built environment. A key objective (desired outcome) for integration of watershed systems thinking into asset management is protection of hydrologic integrity.

Get It Right & Avoid Expensive Fixes: 2015 is yet another ‘teachable year’. The impact of the 2015 drought on public awareness has created a timely window of opportunity. The stage is set for BC to take a quantum step towards implementing a full-scale Water Balance approach.

This would go beyond traditional drainage infrastructure to encompass services that nature provides. It would connect land and water. We define this holistic approach as *Sustainable Watershed Systems, through Asset Management*. Benefits would accumulate over time and would include lower life-cycle costs for infrastructure assets. Also, communities would be more resilient during periods when there is either too much or too little rain.

What happens on the land does matter – for example, hardening the land surface short-circuits the water cycle (balance). The result: either too little or too much flow in watercourses. Consequences include avoidable and expensive fixes in an era when communities are challenged to fund and replace essential infrastructure services.

The 2015 drought could be the catalyst for widespread implementation of tools and experience gained by local government leaders over the past decade. Apply an understanding of watershed systems as infrastructure assets to turn the clock back, restore watershed health and build water-resilient communities.

Game-Changers Enable Action

The Province has long recognized that communities are in the best position to develop solutions which meet their own unique needs and local conditions. Viewed through a local government lens, a fundamental difference between BC and other provinces is that BC legislation enables ‘bottom-up’ solutions and action, whereas other jurisdictions prescribe ‘top-down’ requirements.

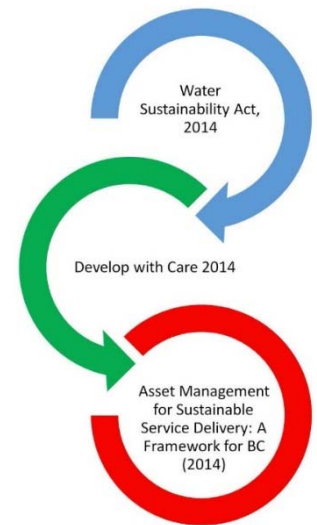
Furthermore, the emphasis in BC is on progressing towards a desired outcome. By comparison, the main

focus in other regions of Canada is on compliance with engineering criteria. This is a fundamental difference in approaches. It helps explain why integration of watershed systems thinking into asset management goes beyond engineering criteria.

In 2014, the *Across Canada Workshop Series on Resilient Rainwater Management: Adapting to a Changing Climate* introduced audiences in Alberta, Ontario, Quebec and the Maritimes to BC’s collaborative and adaptive approach. The series provided an informed basis for comparing BC’s ‘top-down & bottom-up’ approach with initiatives in other provinces.

Protect Hydrologic Integrity and Watershed Health: Three landmark initiatives came to fruition in 2014. All embody the enabling philosophy. Together they provide a platform for integrated and coordinated actions that would enable local governments to achieve *Sustainable Watershed Systems, through Asset Management*.

- **WHAT** – The ‘Water Sustainability Act’ connects land and water, and makes the link to desired water balance outcomes (that would be achieved by integrating watershed systems thinking into asset management).
- **SO WHAT** – ‘Develop with Care 2014’ makes the link between environmental function and resilience as communities grow.
- **THEN WHAT** – ‘Asset Management for Sustainable Service Delivery: A Framework for BC (2014)’ makes the link between local government services, the infrastructure that supports the delivery of those services, and watershed health.

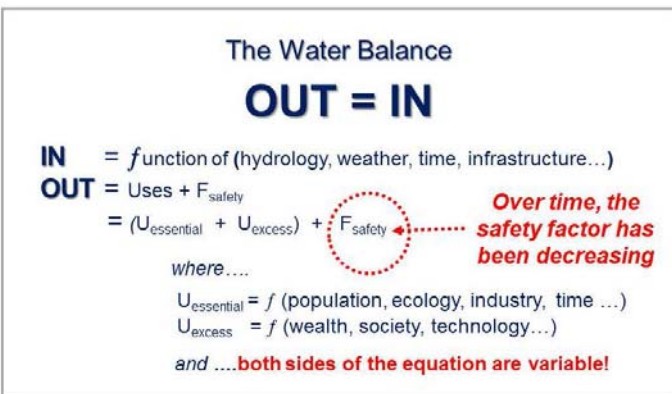


Money talks. The *BC Framework* is aligned with the asset management requirements for the Province’s capital grants program. This is the financial incentive for implementation of watershed systems thinking into asset management. Of the three drivers, this means the *BC Framework* is the lynch-pin for local governments to

protect (restore) hydrologic integrity and watershed health. Resilient communities will be the ones that can affordably manage the urban water cycle as a closed loop.

The BC Framework focusses on desired outcomes. It does not prescribe specific solutions. This allows local governments to develop and implement an approach that can be measured and incrementally tailored to the individual needs and capacities of individual local governments. This encompasses all aspects of the local government domain, including infrastructure and assets that relate to water.

Build Resiliency to Achieve a Balance:
 ‘Water OUT = Water IN’



The figure above is a communication tool. Deceptively simple, the ‘OUT=IN’ equation embodies basic principles and concepts for dealing with uncertainty, managing risk, and implementing an integrated approach to land and water management.

Adapt to a Changing Climate: The equation is variable on both sides, and over time the safety factor has been decreasing in BC, in large part due to population growth. The 2015 drought shows that BC may be at a tipping point. One needs to think about and act in relation to newly experienced extremes in anticipation of these becoming potentially future norms. Something for the reader to mull over is that in mathematics one cannot solve for two variables with a single equation.

Population-support capacity and ecosystem needs are two of many variables. When water needs are small relative to the water resource, variability on the OUT side is not that noticeable and the safety factor is large. But when needs are large relative to the available water, a small variation on the IN side magnifies the perception of impact. The safety factor may be marginal or non-

existent. In many cases, BC communities are operating on narrow margins.

Climate change is exacerbating an existing vulnerability (a seasonal water imbalance). When we are vulnerable on the IN side of the equation, we then have to build in resiliency on the OUT side. But where will we do that, recognizing that everything is in flux? The answer is that we look for the little things that will yield cumulative benefits in the built environment. This is key to being able to mimic the seasonal Water Balance distribution and volumes.

Start with soil, vegetation and trees - protect and preserve the absorbency of the landscape in the built environment. Sustain the three pathways by which rainfall reaches streams – maintain the natural proportions of annual Water Balance volumes for surface runoff, groundwater and interflow (lateral flow in shallow soils).

Look at a Watershed as a Whole System: Protection of watershed health starts with an understanding of how water gets to a stream from individual sites, how long it takes, and whether there are impacts along the way.

Apply the Water Balance Methodology, adopted by the Province in 2002, to mimic the hydrologic performance of a watershed. Establish targets that maintain the Water Balance distribution, both by season and pathway. Urban hydrology is a compromise between accuracy and data availability. Avoid the pitfalls of Voodoo Hydrology. Include streams as assets that need protection from land servicing consequences.

Andy Reese, prominent American water resources engineer and author, coined the term Voodoo Hydrology in 2006 to describe the pseudo-science that characterizes drainage engineering and stormwater management practice. He cautioned:

“We must understand that urban hydrology is an inexact science where we are simply trying to get close to the right answer. We are dealing with probabilities and risk, a changing land-use environment, and many real-world factors that can alter the answer. The applications we may encounter can vary radically. Therefore, it behooves us to better understand the inner workings of the black boxes we commonly use.”

The need to protect headwater streams and groundwater resources in BC means communities must expand their view from one that looks at the site by itself, to one that considers the site, watershed, stream and aquifer as an integrated system.

Integrate Watershed Systems Thinking Into Asset Management

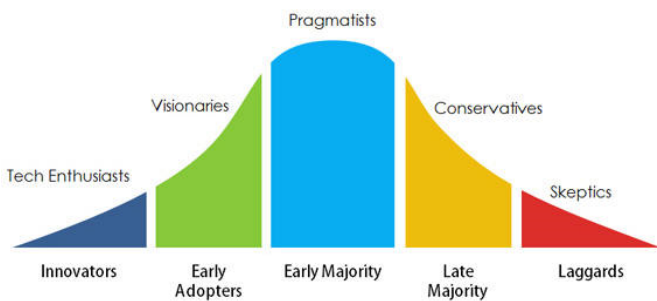
Launched in 2012, the Georgia Basin Inter-Regional Educational Initiative (IREI) is endorsed by five Regional Boards representing 75% of the population of BC. In April 2015, all five – Capital Region, Metro Vancouver, Nanaimo Region, Cowichan Region and Comox Valley – recommitted through 2017. Program delivery is led by the Partnership for Water Sustainability in BC, which serves as the secretariat for the IREI.



By 2017, a program goal is that all local governments would **understand** how to achieve *Sustainable Watershed Systems, through Asset Management* (supply source, stream, aquifer). The goal is a modest one. It is achievable because it recognizes how an idea or innovation is adopted or accepted. Progress in leading and implementing change is incremental.

Implementing Change – from Genesis to Mainstream:

The figure below illustrates the process of adoption of a new idea or innovation over time.



This understanding has guided implementation of the Water Sustainability Action Plan (including the IREI

program) for the past decade. Everyone learns from stories and the most compelling ones are based on the experience of the champions who are leading implementation of watershed-based solutions.

Over the past decade, the Water Sustainability Action Plan has facilitated cross-pollinating of ideas and approaches in the local government setting. The ongoing process of sharing and learning has influenced initiatives and outcomes within the five partner regional districts. Through 2017, IREI program objectives are four-fold:

1. **Build** on the existing IREI technical and educational foundation to further integrate the asset management lens.
2. **Develop** additional content and a *Sustainable Service Delivery Methodology* through a ‘demonstration application’ (with the Cowichan Valley Regional District taking the lead and the IREI Leadership Team serving as a sounding board).
3. **Communicate** the story of the content development process, outcomes and deliverables.
4. **Conduct** training to apply the *Sustainable Service Delivery Methodology* to water resources.

By 2017, it is envisioned that professional development provided by the IREI program would result in a common understanding among all departments within an organization about how they could align their efforts to achieve Sustainable Watershed Systems, through Asset Management.

Concluding Remarks

The rate of progress in implementing new ideas or standards of practice generally depends on the willingness of individual champions in local government to push the envelope in applying new approaches. The number of water sustainability champions throughout British Columbia is growing, and they are collaborating.

Asset Management for Sustainable Service Delivery: A BC Framework is a game-changer. It signifies the dawn of a new era for local governments in terms of how communities service urbanizing and redeveloping areas, and define how infrastructure is planned, financed, implemented and maintained. Watershed systems are infrastructure assets.

British Columbia local governments are sharing and learning from each other. The province is at a tipping point. Water balance tools and case study experience are in place. It is within the grasp of local governments to move beyond traditional infrastructure asset management. They can account for nature's services by implementing *Sustainable Watershed Systems, through Asset Management*.

Over the next two years, the IREI program would progressively inform and educate an expanding network of practitioners (inside and outside local government) on how to integrate watersheds systems thinking and climate change adaptation into asset management (to achieve hydrologic integrity and hence avoid expensive fixes).

Sustainable Watershed Systems, through Asset Management, and getting it right at the front-end, would apply to land uses that local governments regulate and/or can influence within settled areas of watersheds.

New international online course in AM Planning through the Institute of Public Works Engineering of Australia

Chris Champion, IPWEA

Online Professional Certificate in Asset Management Planning has proved increasingly popular with international participants since its launch last year in Australia.

More than 200 students have now undertaken the online course, including 13 international participants. Participants have originated from locations as diverse as Canada, Australia, United States, Malaysia, South Africa and New Zealand. A further 15 international participants including 8 from Canada are undertaking the current online course.

The online course is an adaptation of IPWEA's face-to-face workshops but delivered through 8 online modules over 3 months. The online modules include live and recorded events, online chat, and forum discussions between the course participants and the presenters. Participants are required to complete coursework assessments to achieve the accreditation.

The biggest feedback from participants is the interactive and engaging nature of the course. Also the helpful guidance to develop a draft asset management plan

using the NAMS.PLUS tools and templates and a personal qualification for those that successfully complete the course.

David Love from the City of Courtenay has completed the online Professional Certificate and has commented "We in Canadian local governments have only just begun adopting sound Asset Management practices. The reasons we have chosen NAMS.PLUS in Courtenay is because it is a mature method of practice designed by the public sector, for the public sector."



David Love

"The introductory three-day face-to-face NAMS workshops create a foundation that is well-suited to all practitioners. However, the Professional Certificate in Asset Management Planning provides further skills at the leadership level which builds on that foundation", commented David Love. "This new knowledge has initiated substantially improved stewardship of our assets. I fully endorse this advanced training."

Business Operations Analyst Troy Sykes is one of five from the City of Calgary to also complete the Professional Certificate. Sykes believes the course is well suited to international participants because it follows ISO 55001 standards and the asset management principles taught are universal.

Troy Sykes commented "Asset Management is a field dominated by engineer professionals. As a non-engineer it is difficult to find a designation to illustrate your skill set. The IPWEA Professional Certificate course not only provides a valuable asset management education opportunity; it also gives successful participants an asset management professional certificate."

"Take this course, not because it's easy, but because it is hard," said Sykes. "Participants will learn valuable asset management skills in a real life situation."

Course Structure

- Introduction: why, what, benefits of AM plan
- AM plan; data requirements
- Entering your data: asset register, asset values
- Interpreting the data, consequences; data confidence
- Service levels: customer & technical