

The BC Framework is a powerful tool for local governments to focus their community planning and infrastructure decision processes on beneficial life-cycle outcomes.

Asset management has traditionally been about hard engineered assets such as waterlines, sanitary and storm sewers, and roads. Yet, watershed systems are also “infrastructure assets”. Trees, soil, green spaces and **Water Balance pathways** contribute to a municipal service function. These assets provide *hydrologic integrity* for a healthy watershed system. This desired outcome is a driver for protecting and managing nature’s services in the same way that engineered assets (and the services they provide) are managed.

Whole Systems Approach

Restoring hydrologic integrity, and thus the water balance, is key to achieving a water-resilient future in urban areas. A key message in the Primer is the necessity of “staying true to the science” IF communities are to achieve a vision for *sustainable watershed systems*. The Partnership hopes that readers will be inspired to learn more about the science behind the Water Balance Methodology and the four themes introduced (figure 2).

Harness nature to adapt to a changing climate: Part 1 introduces new ecosystem-based adaptation (EbA) research in BC that may inspire a new generation to “think and act like a watershed”.

Get the hydrology right and residential water quality typically follows along: Part 2 celebrates the 20th anniversary of publication of the seminal Washington State research by Dr. Richard Horner and Dr. Chris May on the primacy of hydrology.

A journey to a water-resilient future starts with the first rain garden: Part 3 showcases breakthrough rain garden water quality research by Dr. Jenifer McIntyre at Washington State University that builds on the work of Horner and May.

Water balance pathway to a water-resilient future: Part 4 introduces the parallel journeys of Washington State, California and BC; and how the Water Balance Methodology is the foundation for an ecosystem-

Figure 2: Four Themes of Water Balance Methodology

Achieving sustainable watershed systems through asset management will require long-term commitment by communities, successive municipal councils and regional boards, and generations of land and water professionals.

Getting the Most from Infrastructure Assets: Ecological Accounting Protocol

By Tim Pringle, Chair, Ecological Accounting Protocol Initiative, Partnership for Water Sustainability in BC

Note: This article is the second in a 2-part series.

The earlier article, titled **Getting the Most from Infrastructure Assets: the idea of ecological accounting** (AMBC Newsletter Issue No. 16, February 2016) introduced the concept for the Ecological Accounting Protocol (EAP) as an asset management tool.



The current article outlines how the EAP would work.

Figure 1 (next page), illustrates where the EAP would fit within the provincial framework for *Living Water Smart and Building Greener Communities*. Application of the EAP would enable local governments to progress along the **Asset Management Continuum for Sustainable Service Delivery** to achieve “Sustainable Watershed Systems” (AMBC Newsletter Issue No. 17, June 2016)

Context

The Partnership for Water Sustainability in British Columbia has developed several tools that practitioners can use to protect the hydrology of a watershed. These tools apply to infrastructure design and construction as well as agriculture and other land use practices. The EAP will be another resource in this suite of tools.

Released by the Partnership for Water Sustainability in November 2015, *Beyond the Guidebook 2015: Moving Towards “Sustainable Watershed Systems, through Asset Management”* introduced a new paradigm, and that is – watersheds are infrastructure assets, and therefore they must be protected and managed as such to both ensure hydrologic integrity and restore the natural water balance.

Watersheds as Infrastructure Assets: A watershed is an integrated system. The three pathways by which rainfall reaches streams (over the land surface, shallow horizontal through the soil layer, and deep vertical to groundwater) are “infrastructure assets”. They provide “water balance services”.

As proposed, the Ecological Accounting Protocol (EAP) is an economic tool to make real the notion of “watersheds as infrastructure assets”.

Practitioners would use it to determine whether or not drawing services from natural assets for drainage infrastructure makes financial sense. It would enable practitioners to price expenditures or avoided expenditures that occur in such contexts.

It follows that potential capital expenditures for engineered services and those drawn from natural assets could be compared. Practitioners could determine the optimum balance of these options. Such design of infrastructure services offers enhanced protection of watershed hydrology (and ecology) as well as lower life-cycle costs for the assets.

The EAP is a natural extension of asset management with the inclusion of the value and costs associated with the use of natural assets. The EAP would allow Asset Managers and Owners to see a more complete picture of value and future costs and the resulting funding required for Operating and Maintenance of the components of the watershed that begin as a Natural Asset and are converted into infrastructure to save initial capital construction costs.

Water Balance Methodology: As indicated on Figure 1, the EAP would be used in conjunction with the Water Balance Methodology (Methodology) to establish the watershed operation and whether its streams are capable of being altered for use as part of the drainage system.

The Methodology enables assessment of the hydrology of one or more sites in a watershed and it compares different scenarios of watershed development. The assessment analyzes rainwater interception and infiltration as well as surface water retention, flows, subsurface inter-flows and groundwater characteristics of a site(s).

The Methodology guides design of infrastructure to maintain hydrological functions at pre-development levels. The Methodology also can indicate design to improve hydrological functions.

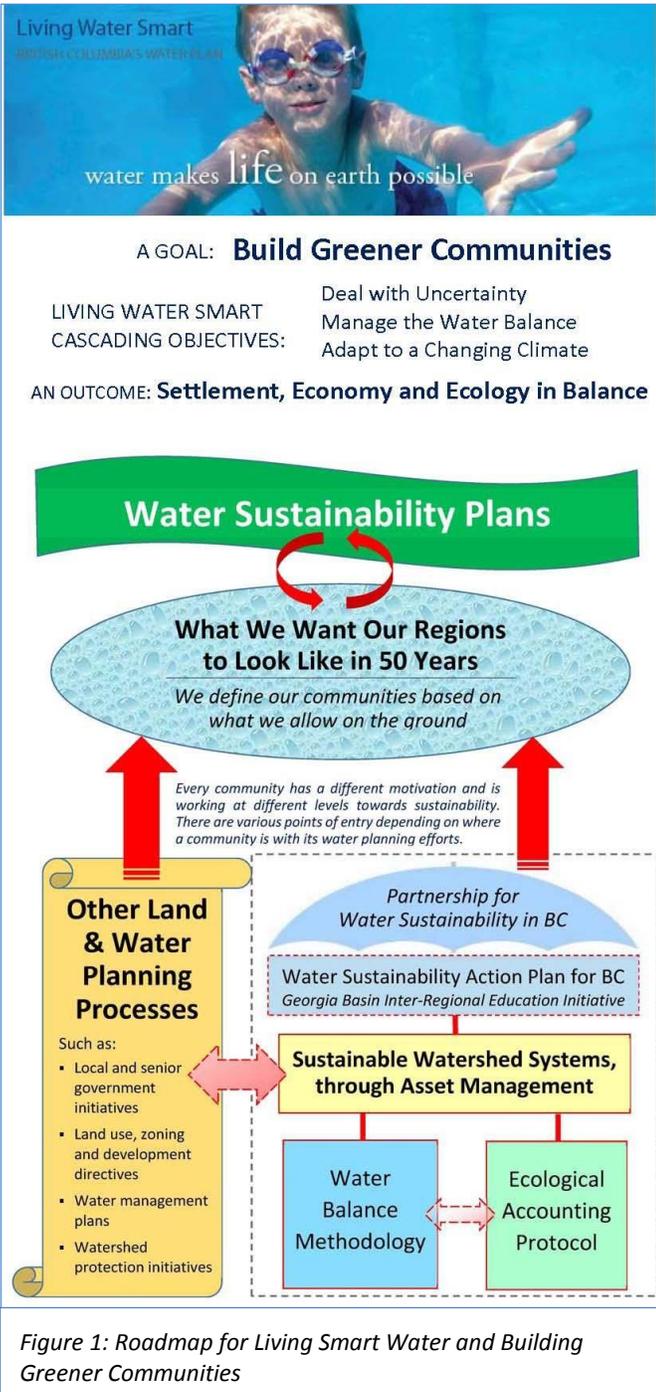
Four Analytical Approaches: The Ecological Accounting Protocol would support four related analytical approaches to capital expenditure and life cycle costs represented in infrastructure (drainage) services drawn from natural assets. These are Substitution, Cost Avoidance, Environmental (watershed health) Benefits, and Attributed Values. They are explained as follows.

Analytical Approach #1 - Substitution

Practitioners involved in providing civil services for land and real estate development may utilize both natural and engineered assets to meet design and opportunity cost objectives for the required infrastructure (drainage) services. In practice designers, installers and regulators usually focus on engineered assets to provide these services.

The emphasis tends to cost avoidance. Use of services derived from suitable and available natural assets occurs infrequently. This reality suggests that from an asset management point of view opportunities to reduce life-cycle costs of infrastructure may have been left on the table. Why?

An obvious reason is metrics and pricing. For example, a natural wetland / pond and stream system might retain, release and infiltrate rainwater volumes in a similar or



more efficient manner than would an engineered retention pond and storm drain system. However, there are few examples of proven performance of solutions based on natural assets.

While expenditures for machine work, materials and labour for the engineered retention pond are at hand, no corresponding metrics exist for the natural wetland system.

If the various engineered inputs were priced on the basis of cubic metres of water handled by the system, then the volumes passing through the natural system would add up to comparable capital expenditure. By considering the annual or periodic maintenance as well as replacement expenditures for each system, life-cycle costs might be calculated.

The EAP would support the substitution approach and, from an opportunity cost point of view, help determine whether or not services drawn from natural assets would be a better investment than engineered services only. The EAP would indicate the optimum balance of services from engineered and natural assets.

Analytical Approach #2 - Cost Avoidance

Cost avoidance really is about how much infrastructure costs now and later. Developers and contractors want to keep current expenditures for infrastructure works as low as possible, while meeting design and regulatory requirements.

The management and life-cycle costs are the problems of other practitioners with different but limited sources of funding. There is a heavy bias to rely on what has been constructed and proven in previous projects. Drawing services from natural assets infrequently occurs. Likely, this traditional approach would not optimize or lower life-cycle costs.

When regulating infrastructure design and construction, local government will want to avoid negative post-construction impacts resulting from altered hydrological conditions. These impacts include stream erosion and degradation, property damage, flooding of lowland areas, and contamination of surface and well water.

In conjunction with the Methodology, practitioners could use the EAP to price capital expenditures that would maintain the hydrological condition of a watershed and avoid future costs related to altered surface and subsurface flows.

Finally, infrastructure that utilizes services from natural assets would offer other cost benefits. The assets would

not need to be replaced and they can be used for a longer life cycle. Local governments could realize reduced future costs for infrastructure assets and services, thus lowering pressure to increase property taxes. Property owners likely would applaud this scenario.

Analytical Approach #3 - Environmental (Watershed Health) Benefits

As discussed above, the EAP is a tool that would help practitioners design drainage infrastructure which preserves, and possibly improves, the hydrological conditions of a watershed. This approach equates with protection of watershed health.

The benefits to the ecology of a watershed are obvious. Not only would the flora and fauna benefit, but healthy watershed systems would better withstand climate change impacts.

Healthy watersheds offer natural systems that may contribute to infrastructure required by human settlements. Examples include streams (water conveyance), wetlands (water quality, aquifer recharge, and release rates), tree cover (interception and infiltration), soils (infiltration, conveyance and storage) and groundwater (storage). The value of these natural assets are the focus of the current Municipal Natural Capital Initiative.

Analytical Approach #4 - Attributed Values

The EAP would also support another approach to improved infrastructure investment that includes use of services from natural assets and lower life cycle costs; this emphasis is on attributed values of natural assets. These are cultural and economic values capitalized in natural systems.

For example, many resort and recreational property developments are situated where natural amenities (the sea, lakes, rivers, forests, etc.) are an attraction. The condition of these natural assets has a bearing on the financial success of the resort and recreational property investments.

In a residential development, the expenditure for use and protection of natural assets may be offset to some degree by increased property values related to natural areas, streams, ponds, trails, etc. We all are aware that homes on waterfront, with "water views," or adjacent to natural areas command higher prices than similar homes without such exposure.

Such attributed values also may have cultural importance, that is, widely shared values. These include clean and abundant potable water, natural areas for passive enjoyment, viewsapes and other values.

Not the least of these is improved capacity to adapt to climate change.

A Look Ahead

The Partnership for Water Sustainability in BC intends to develop the EAP as a natural extension of asset management. It would make sustainable service delivery more robust with the inclusion of the value and costs associated with the use of services from natural assets to supply infrastructure.

The EAP would allow Asset Managers and Owners to see a more complete picture of value and future costs, including the funding required for Operating and Maintenance of the components of the system that adapted Natural Assets for infrastructure to save initial capital construction costs.

Figure 1 – The road map (Figure 1 on page 9) illustrates where the Ecological Accounting Protocol fits within the provincial framework for Living Water Smart and Building Greener Communities.

Asset Management in British Columbia: Looking at the Results from the Gas Tax Asset Management Assessment Form

By Christina Ross, UBCM

From May to July 2016, the Union of BC Municipalities (UBCM) asked British Columbia (BC) local governments to complete an assessment on the current state of their asset management.

The completion of the Asset Management Assessment Form (the Survey) was a mandatory reporting requirement of the Federal Gas Tax Agreement. Survey results shared here describe aggregate responses from those local governments that submitted by the deadline.

The Survey design was based on *Asset Management for Sustainable Service Delivery: A BC Framework* (the Framework). The purpose of following the Framework was to assess asset management in BC from a high level perspective, based on best practices established within the Framework. Additionally, a desired outcome was to achieve strides towards increasing asset management



Figure 1: Framework Process Wheel

literacy among local governments. Focusing on desired outcomes, the Survey was comprised of over 50 questions related to the process of asset management. Continuing with this theme, the results shared below will follow the outer circle of the Framework's established process: **Assess, Plan and Implement** (Figure 1).

Assess

Assessment of Asset Management practices and the current state of assets

The assessment of asset management practices supports local governments in identifying existing practices and processes; evaluates how well these processes are applied and how effective they are; and most importantly, it identifies areas of organizational strength and opportunities for improvement.

When asked if a formal asset management process had been established over 50% of local governments responded that a formal process was under development or currently in place.

While half of local governments have formalized a process for asset management, many more local governments have been busy managing information on existing assets.

Survey responses from local governments show that 58% had assessed the current state of assets (Figure 2 – on next page) while 84% had developed an asset inventory for at least one asset category.

When local governments were asked about the quality and availability of data on existing assets (Figure 3), over two-thirds of responses regarding the condition and location of assets were described as competent to strong. Over a half of responses regarding asset service