



Collaboration of Operators, Industry, Government, Contractors and Universities. L-R: Doug Grossler (Lillooet Contracting Ltd), Irfan Gehlen (KWL), Warren Brown (EOCP Certified Operator, Lytton First Nation), Jim Brown (EOCP Certified Operator, Lytton First Nation), Ted Molyneux (INAC), Madjid Mohseni (UBC), George Thorpe (BI Pure Water)

# RES'EAU

## Achieving socially and technologically sustainable outcomes in drinking water systems for small, rural and Indigenous communities

By Candace Cook, Jim Brown, Danny Higashitani and Madjid Mohseni

Canada has made several well-publicized commitments toward achieving universal access to clean drinking water in small communities over the past few years, but a clear roadmap — and even consensus on what success will look like — remains elusive. Conflicting agendas and attitudes, disparate goals and baked-in biases have so far resulted in a failure to embrace the notion that issues in drinking water quality are directly connected to broader health and social challenges.

In short, the narrative has been about water, when what relevant players are really talking about, or ought to be, is community health and wellbeing. Our experience working with small communities has taught us that only the stakeholders who truly embrace this new paradigm will drive innovation.

RES'EAU-WaterNET is the Natural Sciences and Engineering Research Council of Canada's (NSERC) strategic response to society's changing expectations about what research and development (R&D) partnerships should deliver. We work in partnership with many other public and private organizations to deliver local solutions to drinking water issues faced by small, rural and indigenous communities (SRCs). We are also engaged in the development of policies in support

of sustainable drinking water supply to deliver on social, economic and environmental goals. This modern multifunctional role represents a significant change from the traditional economic role of the water industry, which has traditionally been primarily about technology production and economic growth. The new role is more service-led, with water regarded as the life of a community.

Strategy is a major preoccupation for many of us working in the water space. It links us and the small rural community ecosystem's concept of supply and demand, and it is meant to identify where we want to be and how we think we can get there. However, the context of national strategy is shaped by the whys -- whether these policies and programs are justifiable solely to those directly affected, or whether these investments must be defended in terms of their impact on the economy, technology or another outcome that will benefit the majority of Canadians. This calls for an innovative method for reconciling these two views.

Strategy states where we want to be and how we think we can get there. It is meant to identify who we should target as customers, what solutions we should offer and how we should deliver them to

those customers. However, the context of national policies and strategy is shaped by the whys – why should we invest in small and rural communities, whether these investments and policies are justifiable solely to those directly affected, or whether these investments must be defended in terms of their impact on the economy, technology or another outcome that will benefit the majority of Canadians. This calls for an innovative method for reconciling these two views.

Over the past several years, our work with small, rural and remote communities has shed light on ways water stakeholders can achieve this reconciliation. RES'EAU has focused its efforts on producing new knowledge derived from the perspectives of various actors with different levels of cultural awareness (e.g. urban culture, rural culture, production culture, financial culture, indigenous culture and academic culture). This problem-solving collaboration, which we call the **Community Circle**, attempts to systematically capture and weigh all relevant considerations within the ecosystem so that decisions can be made based on a deeper understanding of the issues the community is trying to solve.

Under this community-centric approach, scientific, technological and academic communities play an integral role by

re-examining underlying assumptions upon which doubts about the viability of small water systems are built, and assess their plausibility. Concepts such as risk, health, efficiency, affordability, acceptability, market space/profitability, economies of scale and size, demand and the community's size must be revisited

through the lens of this new paradigm. The Community Circle model suggests a number of ways to overcome the unintentional dysfunctional implications that stem from partial understanding of the innovation process by improving the dialogue among stakeholders, achieving a more balanced view of the

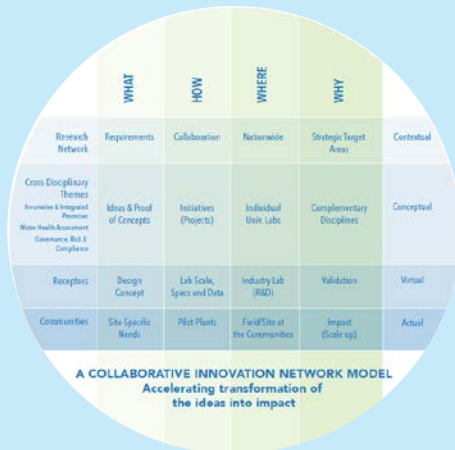
whole innovation process. This includes the mechanisms for the development, diffusions and adoption of the benefits of innovations in the water sector.

In practice, adoption of an innovation will depend on interactions between adopters with different perceptions of benefits and

## The RES'EAU Community Circle Model

The RES'EAU Community Circle is an award-winning and globally unique precision problem-solving model for drinking water in small, rural, and indigenous communities that proposes the customization of solutions, with decisions, practices, technologies, and services being tailored to the individual community.

### COMMUNITY CIRCLE



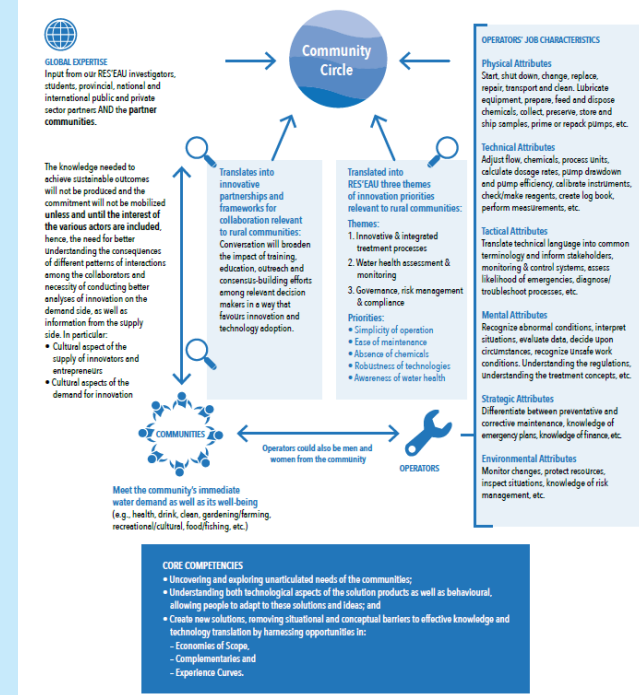
This model takes the research program out of the lab and into the real world, incorporating communities, Operators and all stakeholders' expertise and insight at the earliest stages of the problem-solving process. Students/researchers are working closely with communities to understand the limitations and constraints they face. Together, they

as a community? And why does it matter? How can we begin to create authentic connections and relationships with others, particularly across the different interests and divisions in the water community? How do we change the water community conversation from one of negotiation to one of dialogue? The aim is to develop new conversations free of the cynicism and resignation inherited from the past and to create new possibilities for a future in which everyone has a place and is valued.

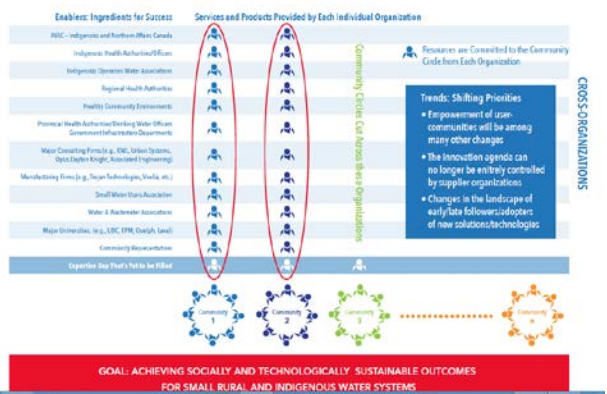
identify research priorities and design and execute research to produce knowledge and integrated game-changing solutions. These findings are then validated by industry so that they can be readily diffused and adopted. This approach is paving the way in defining a vibrant market space for innovative solutions specific to small and rural settings. These solutions will be piloted in collaboration with both public and private sector partners and, according to guidelines set out by regulatory agencies, either at public sector facilities and/or subsequently in actual communities. Successful solutions will then be scaled up through partnerships with national and international strategic programs, or by industry partners.

### FLOW OF INFORMATION IN THE COMMUNITY CIRCLE ECOSYSTEM

Achieving Socially and Technologically Sustainable Outcomes for Small and Rural Water Systems



### EXAMPLE OF CONSTRUCTING CROSS-ORGANIZATIONAL INTERACTIONS IN THE COMMUNITY CIRCLE MODEL



This model allows for participants from every part of the water community to bring their individual concerns and experiences together to explore questions such as: What matters to us as users, Operators, engineers, regulators, decision makers and

To construct this new ecosystem it is essential to understand how user communities can contribute to the innovation process, and how private and public organizations can harness those contributions. Removing barriers to participatory R&D for the latter and reframing the way they look at water problems so that they see the big picture – from identifying a problem to the adoption and diffusion of solutions – is no small feat. For too long, innovation for rural communities has been rooted in outsiders simply ticking boxes on a list of perceived needs, with little or no input from a community. The research community's traditional fixation on creating novel inventions with little regard for affordability, applicability, acceptability, and sustainability has also hindered progress.

risk, and developers with an emphasis on advantages, availability of data, feedback and reduction of barriers to use.

**By placing Operators at the heart of the innovation cycle and incorporating research insights at the earliest stages of problem solving, the Community Circle model cuts across the different challenges specified above.**

However, it is not enough to make Operators aware of the need for better technologies and processes. Community members, municipal leadership, provincial/territorial and federal governments all must understand the need as well, as their buy-in will ultimately influence whether or not a new technology is adopted.

These additional criteria identify institutional barriers and capture site-specific experiences that highlight successes and failures in introducing new solutions to small communities. The core value of Operator/community participation in water innovation processes is now widely appreciated in academia and in some governmental funding organizations. Yet, industry has been slow to adopt the approach in part because such adoption would necessitate a significant re-prioritization of how firms organize and distribute their resources, particularly with respect to gathering information about communities' needs and preferences and its application to solution development.

However, there are two main barriers in achieving the knowledge exchange necessary among all relevant partners:

First, lack of supporting mechanisms to facilitate participation of the Operators (and end-users) at scientific and professional events and meetings that investigate water issues related to small systems; i.e., travel expense, conference registration fees and session contents (not being at an appropriate level) have been mentioned when we discuss the matter with Operators and end-users. Many Operators possess the skills and tools necessary to re-design, adapt or modify the existing technologies to meet their needs. Their contributions should be viewed not simply as critics or evaluators of product but rather as co-designers.

Second, lack of a small-community-relevant sustainability metrics supporting ready buy-in by all partners for a particular solution. Traditionally, technologies are being evaluated based on the degree they meet specific regulations or resolve



Since community circle groups started meeting, boil water advisories have been lifted off two reserves. Clockwise from the left: Warren Brown, Candace Cook, Madjid Mohseni, Amanda Spinks, Rosalin Miles, Chief Janet Webster, Rita Manual, Ted Phillips, Dylan Phillips, Casey Neathway, Grant Robertson, Bryan Phillips.



First Nations Operators at RES'EAU Research Labs at UBC.

specific technological problems (e.g., removing specific contaminant) and not the degree they meet end-users and utility needs, especially for small communities.

The Community Circle model — through building new partnerships, providing opportunities for the various parties to meet, creating dynamic participation, ensuring that there are shared topics to relate to — enables designers to question

the taken-for-granted assumptions embedded in the conventional problem-solution management frameworks.

The model not only acknowledges the implicit importance of questions such as, "Who should be consulted? How to engage with them to maximize their contribution? How to translate their insight into products?" but also recognizes underlying questions concerning, "How do we involve different

public and private organizations without limiting their areas of control and expertise?

How does the Community Circle approach become championed within their organizations?" The deployment of the Community Circle model is itself often an exercise in organizational change, bringing diverse stakeholders together who sometimes challenge each other with very different perspectives on the issues. There is not always a short-term commercial gain from its use, particularly if viewed solely in terms of economic metrics.

**The fieldwork and piloting involved in the Community Circle model is not a question of one particular technology; it is best described as a way to draw fresh boundaries that enable us a brief look at how other people and cultures might view the world.**

With actors' minds as open as possible to put themselves where they can be as surprised as possible, only then they are able to see beyond their taken-for-granted, unarticulated conceptual distinctions, providing the most comprehensive understanding of the contexts of use in small rural communities.

Automated systems are most effective during normal operation. When it comes to trouble shooting, often manufacturers' support staff become the Operator/user of these systems, reading, adjusting, installing, connecting, replacing, servicing and cleaning them. To prepare for these unexpected situations we have to think about the relationship between the technology and the Operators' physical and mental practices. Operators in small rural communities see, touch, feel, hear, smell, walk in the field and often act on hunches working around the system, and it is crucial for them to see the process as a whole, not to just rely on automated technologies. Hence, the solutions should be structured carefully using the Operators' point-of-view.

The figures above outline how Operators' six general performance components relate to the network's three research themes. It is virtually impossible to isolate each subcomponent from the others when it comes to operating, diagnosing and solving any problems in water systems. However, separating them for the purpose of providing more details as to how each theme empowers Operator performance makes the concept more easily understood. For the sake of simplicity, the timeframes and Operators' ability/certification level at which each component becomes seriously

stressed have been omitted.

It is essential to understand not only the contribution that users/Operators can make to innovation process and how this contribution can best be harnessed, but also the potentials and constraints that exist within the public and private organisations and how realistic these approaches may be to implement. The Community Circle Model has proved the possibility of overcoming the management difficulties in achieving socially and technologically sustainable outcomes for the small and rural communities.

There are many barriers to success in solving small community water problems, but RES'EAU-WaterNET's experience has been that meaningful partnerships and constant, open communication and knowledge sharing can pave the way forward. Operators in these settings need mentorship and support for career management, education and certification so that they can rise to the new challenges their role requires. Productive partnerships can ensure in turn that Operators are empowered as catalysts for change within their ecosystems, and strong advocates for their community's health.

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