Niagara Irrigation Governance Phase 2 Report

FEEDBACK, SYNTHESIS AND RECOMMENDATIONS FROM WORKSHOPS WITH KEY INTERESTS

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Introduction and Objectives

The first phase of work in this project focused on identifying potential irrigation governance models for Niagara, identified 12 principles and considerations for any governance approach, and sketched out three promising models of governance. Upon completion of the Phase 1 report, the research moved into its second phase, described here.

The objectives of Phase 2 were to: 1) collect feedback on the findings of the Phase 1 report from those with an interest in irrigation for Niagara using an approach that promoted dialogue and building a shared understanding (details related to this objective are available in the Appendix I) to synthesize the feedback and develop recommendations for the Niagara Irrigation Committee on next steps for moving forward with the articulation of a governance model for irrigation in Niagara. The results of this second objective form the focus of this report.

Phase 2 involved collecting feedback about the 12 key governance principles and three governance models through two workshops and online interviews. The focus was on ensuring broad participation by those with an interest in irrigation in Niagara through workshops using small and large group discussions. This approach follows a social learning model for governance issues[1] where multiple, potentially diverse, interests come together and build a shared understanding of the issue and learn about and from each other. The facilitated workshop approach including a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis of various governance models to generate understanding of points of agreement and disagreement among participants.

Workshops were held virtually on November 29 and December 1, 2021. The agenda for the workshops is included in Appendix I. Feedback was collected using two main approaches: small group 'breakout' sessions of between four to six participants, designed to be as diverse in representation as possible; and, full group feedback and discussions sessions, where all participants interacted with each other and with the content. Note takers were employed to ensure all relevant feedback from participants was captured throughout the workshops. The detailed findings from the workshops are included in Appendices II-V, including the finding related to key design principles and considerations, findings related to the three governance model options, and finding from a pre/post survey of workshop participants on the three governance models.

Through the Phase 2 work there was strong optimism for an irrigation system from a range of interests in the region, and a clear desire to move forward with it. Water is a critical resource for a wide range of users in agriculture and related industries in Niagara, and there was overwhelming recognition that additional water provided through irrigation is beneficial, and indeed essential, to those who will use it and to the broader region in terms of economic benefits and support for what makes the region vibrant and unique.

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[1] Baird, J., Plummer, R., Haug, C., & Huitema, D. (2014). Learning effects of interactive decision making processes for climate change adaptation. *Global Environmental Change, 27*: 51-63. DOI: 10.1016/j.gloenvcha.2014.04.019.
Baird, J., Plummer, R., Moore, M.-L., & Brandes, O. (2016). Introducing resilience practice to watershed groups: What are the learning effects? *Society and Natural Resources, 29*(10): 1214-1229.

Summary of Phase 2 Findings

A general discussion of governance models in both workshops identified the potential for design elements from more than one of the three potential models identified above to be brought together in a 'hybrid' governance model. Participants generally expressed that there were elements in each that were desirable and that there were pragmatic considerations that prevented any one governance model from being fully implementable. Further, that each main actor in the models (the Regional government, municipalities, and private actors) all have strengths and an important role to play in governing an irrigation system.

In Workshop 1, participants commented that all three models were needed in some way – that a governance model should be user-driven but government-supported (Region and municipalities). They saw an important role for potential users to push this project forward, for the municipalities to support them (e.g., permitting, access to implement infrastructure, access to funding), and for the region to support municipal efforts and cooperate with all parties. Some participants preferred a focus on the private model but with a strong regional presence. Regardless of the model, participation by users was identified as important.

In Workshop 2, most participants indicated that some form of hybrid model was preferable to strictly adhering to one of the three potential models proposed in the Phase 1 Report. The organization of that hybrid governance structure varied among participants. There was a strong level of support for a regional model, but some differing ideas about what 'regional' means. For some, regional meant governed by the Niagara Region government using a utility model. Others felt that a 'regional' (from a geographical perspective) approach with substantive private and local involvement was preferred. The potential for a decentralized approach, where governments are partners but not 'leading' was also identified as preferable. The potential for private systems to be used in parallel with a regional irrigation system was promoted by at least one participant. A provincial model was proposed by one participant as well.

To summarize, there was not a single governance model from the three described in the Phase 1 report that participants within or across workshops agreed was preferable. Instead, participants identified that there were elements of more than one model that were desirable in an irrigation governance scheme. Ultimately, the private consortium / cooperative model was not considered feasible based on the different context in which it was implemented (see Section 7.1 in the Phase 1 report) and Niagara. Accordingly, while elements of this model (i.e., strong private involvement in irrigation system development and governance) are desirable, there was strong preference for a hybrid model that reflects the unique and diverse context of irrigation interests in the Niagara region.

Niagara Irrigation Partnership – A Governance Model

After considering the initial three governance models proposed in the Phase 1 report, as identified from a review of irrigation governance research and consideration of other irrigation systems across Canada and Ontario, we propose the following irrigation governance approach: A '**Niagara Irrigation Partnership'** approach with **equal roles and authority** in governing among: the Niagara Region, municipalities with an interest in irrigation, and potential users.

It is important here to clarify what we mean by the term 'regional'. We differentiate between two uses of the term: 1) 'regional' referring to the geographic sense, see Figure 1 below, and specifically the areas of the region below the escarpment; and, 2) 'Region' in specific reference to the upper-tier municipality – the Regional Municipality of Niagara.

The boundaries of the Niagara Irrigation Partnership would focus on the geographic area below the Niagara escarpment, including portions of the lower-tier municipalities of Lincoln, St. Catharines, and Niagara-on-the-Lake (Figure 1). However, The Niagara Irrigation Partnership would have the potential to extend within the 2,424 km squared watersheds covered by the Niagara Peninsula Conservation Authority (NPCA). This would make the irrigation works align with the existing water management boundaries (e.g., municipal drinking systems/intakes and Niagara Peninsula Source Protection Area).

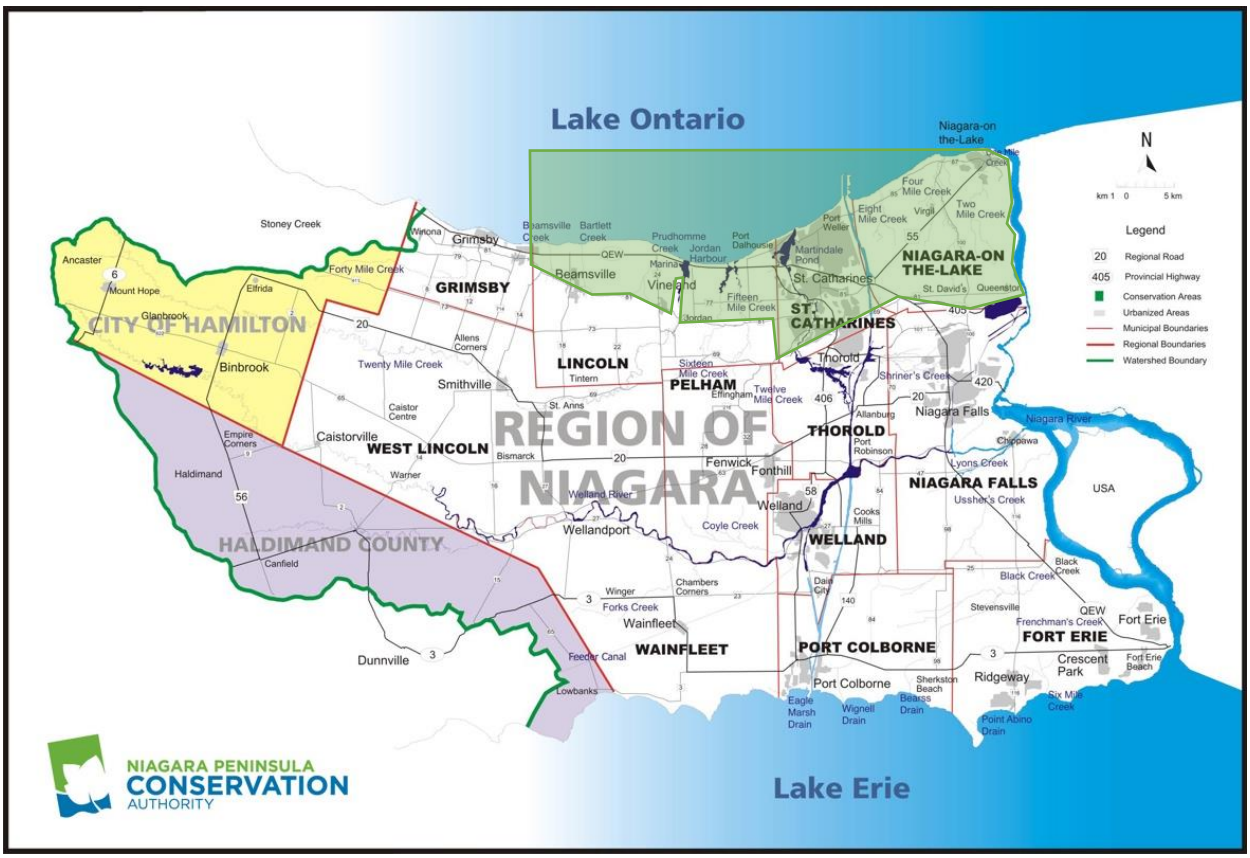

Figure 1. Approximate area for proposed irrigation in Niagara north of the escarpment (shaded in green). Map from the Niagara Peninsula Conservation Authority.

While the proposed governance model outlined in this report is similar to the Regional Model described in the Phase 1 report, it differs in a few important ways. Specifically, it provides equal authority to three key actors with specific and complementary roles played by:

- Regional government: support access to water permits, support for a regional utility including day-to-day management and operations, support for funding applications and administration, regional level considerations including Conservation Authority issues focused on ecosystem health
- Municipal governments: support access in implementing infrastructure through easements, support applications for funding, provide a voice for users and non-users in decision-making
- Irrigation users: know and understand the need and will provide input into design of the system, will hold some ownership over the system, bringing forward practical concerns/issues

This model includes a governance board for oversight made up of representatives of multiple interests and include 15-20 members. This model is inspired by the Alberta Irrigation Council model (see Phase 1 report, Section 5.3) but differs in that it is not overseen by the provincial government and is instead a true partnership. Irrigation users could be represented by area (Lincoln, St. Catharines, NOTL) and by user type (grape growers, horticulture, greenhouses, tender fruit growers, and wineries). Government representation would include the Region, relevant municipalities, Indigenous Nations, and the Niagara Peninsula Conservation Authority. For the Region and municipal governments, public works and planning should be represented. Specific numbers per interest could be decided by those involved in planning. Other interests such as watershed groups and the Niagara Escarpment Commission may be included as appropriate. Board membership could be drawn from the existing Committee of the Whole and supplemented as needed by users from the specific areas of interest and user types. Hugh Fraser's work to discuss irrigation needs with those in the region would be beneficial in filling gaps in membership from an irrigation user perspective.

As identified in the principles and considerations, users represent an important source of funding for irrigation infrastructure as well as fee-based water use (by area and volume) under this model. There are benefits to the irrigation users for this model, including the potential for their investments to be considered equity and increase in land and property values (from feedback on the SWOT analyses).

Potential sources of funding for the irrigation system could include federal sources such as Agriculture and Agri-Food Canada, Environment and Climate Change Canada, Canada Infrastructure Bank, and the forthcoming Canada Water Agency. Provincial sources could include Ontario Ministry of Agriculture, Food and Rural Affairs, Ministry of Environment, Conservation and Parks, and the Ministry of Infrastructure (see also Section 9.2.7.1 'Infrastructure Funding' in the Phase 1 report)

A dispute resolution mechanism would be required and the details of the process made in writing (see the Alberta Irrigation Council appeals body in Section 5.3 in the Phase 1 report for an example). Disputes could be addressed by the board or a subset thereof.

Alignment of Niagara Irrigation Partnership Governance Model with Design Principles and Considerations

The hybrid model proposed aligns with the governance design principles and considerations developed in Phase 1 and refined in Phase 2 (see Appendices II and III). Table 1 below outlines how the proposed governance model aligns with the Governance Principles and Considerations that emerged from Phase 1 and 2. This reflects the consensus from Phase 2 that features from the three models in Phase 1 combined into a hybrid model captures and addresses the specific context and considerations critical to those in the region.

Table 1. Alignment of the Niagara Irrigation Partnership governance model with design principles and considerations and next steps required.

Principle / Consideration	Governance Model Feature	Next Steps Needed
Long-term sustainability including ecological considerations	Yes, via inclusion of future-oriented planning and climate change and other models	Ensure this perspective is included in pilot project and governance planning
Climate modelling data used to support decision-making	Yes, an explicit recommendation from development to ongoing system management	Review existing climate models for the Region and from relevant municipalities and incorporate into planning processes
Governance model developed collaboratively	Yes, recommendation to bring interested parties together to develop a governance model	Develop governance model collaboratively with interested parties as the first step in the pilot project
Irrigation users must be centrally involved in design	Yes, the partnership is explicit about equal authority for users as for regional and municipal representatives	Bring users into pilot project planning from the beginning
Governance should be user-centred and have strong leadership	Yes, the partnership is explicit about equal authority for users. Strong leadership will be supported by a clear governance model detailed in writing	Prepare a document that clearly sets out the roles and responsibilities of all parties involved in governance of the irrigation system as part of the pilot project planning process
Include an adjudication committee	Yes, as stated above, an arms-length adjudication body should be developed independent from those governing the system. The mandate of this committee	As part of the pilot project planning process, develop a document that articulates the representation and authority held by an adjudication committee

	should be clearly articulated in a document as part of the governance structure for the system	and procedures for this committee to follow.
Strong public awareness	Identified in the next steps section, this can be achieved through a range of recommended actions	See Section 3 below – user and public awareness is needed and can be built in Niagara
Well-planned water intakes and permitting based on data	In progress, irrigation system design should be finalized and include PTTW application and ongoing discussions related to water access, use, efficiency and sustainability	Build on design in progress; pursue PTTW application; continue discussions with other water users including OPG; detailed consideration of engineering and infrastructure needs is required, identified in Section 3 below
Piped raw water delivery	General consensus that this is key design feature; as preferred by most, but not all interests. Strongly recommended	Confirm infrastructure and engineering requirements and feasibility as part of developing the pilot project
Year-round system	Identified as preferred feature by most, strongly recommended related to sustainability of the system	Confirm infrastructure requirements and feasibility as part of developing the pilot project
Fee structure that is part area-based and volume-based	Yes, identified as a key component of the model	Investment and specific user fees will need to be set as part of the pilot project planning process
Use of smart technology	Yes, identified as a key component of the governance model	Draw on existing knowledge and use in NOTL system. During the planning process it may also be useful to review other cases where smart technology is used from the Phase 1 report

This model recognizes a strong interest expressed in the Phase 2 work in having governments play a role in irrigation system implementation and governance but ensuring that, for example, shifting political priorities do not derail it and that users play a meaningful and ongoing role in decision-making. It capitalizes on the benefits of government involvement (through accessing permits to take water, easements, access to provincial and federal funding, utility management and other resource supports) and that users have a role to play in investing in the system and ensuring the system meets their diverse needs now and in the future. While further elaboration of

this model is certainly required, this provides a foundation for further discussion and decision-making.

Next Steps: Pilot Proposal

The overarching next step is to develop a pilot project plan and funding proposal using the governance model 'Niagara Irrigation Partnership' above as a foundation and drawing on the revised principles and considerations for guidance (see Appendix III). This pilot project proposal can be submitted to federal and provincial ministers and departments (listed above) to secure pilot project funding and include preliminary medium-long term projections for a phased regional irrigation system. The plan and proposal development process would benefit from engagement of a sustainability consulting firm that works broadly across areas of governance, economic analysis, and engineering.

To support this process, we recommend the following:

- Bringing others (who have not yet been involved) into discussions around the recommended governance model and the irrigation system more generally should be a priority to develop the governance model in more detail. This can be accomplished by circulating the Phase 1 and 2 Reports on irrigation governance models for Niagara within the region and inviting public comment and expressions of interest in participating in the pilot project (e.g., through Public Information Centres or future meetings or workshops).
    - Specifically, building a reciprocal relationship between those committed to moving an irrigation system forward and Indigenous Nations for whom this project may impact their traditional territory, should be an urgent priority. The perspectives of Indigenous Nations are absent from this report and the findings contained herein will benefit from greater inclusion. A first point of contact is the Niagara Regional Native Centre, which has a formal MOU with the city of St. Catharines establishing the Centre as the primary advisory body on Indigenous matters.[2] Those members of the Committee of the Whole who are affiliated with the Region may provide an entry point to engagement with the Niagara Regional Native Centre.
    - Engagement should also include other interests related to ensuring the sustainability principles are incorporated into the pilot project including NPCA, watershed and climate change representatives.

- Further discussion is required around the use of a utility model, which was identified by several participants as preferable, and could be instituted under the Niagara Irrigation Partnership approach. Existing private irrigators' infrastructure to be brought into the new system and further discussions should include details on how this could be done.

- Bring together key interests (representatives from the Region, relevant municipalities, irrigation users, and others as deemed appropriate) to draft the governance protocols (see Principle 3 in the Appendix III). These individuals could be largely drawn from the

[2] Heritz, J. (2021). Municipal-Indigenous relations in Ontario: Initiatives in Brantford, Hamilton, and Niagara. *Journal of Canadian Studies, 55*: 541-563.

Committee of the Whole and supplemented as required. Hugh Fraser's work to discuss irrigation needs with those in the region would be beneficial in filling gaps in membership from an irrigation user perspective.

- Bring together existing resources to develop an engineering / technical plan for irrigation infrastructure. This can build from the substantive work of Hugh Fraser and previous reports including hydrologic models. Close review of regional and municipal climate change models and adaptation plans is critical as part of this process to ensure that the system now, and in the future, is compatible or even supports climate change mitigation and adaptation efforts. Incorporating a focus on climate change and modelling could also strengthen proposals for funding.

- A costing analysis and report for the development of the pilot project and phased regional irrigation system, including specific targets for provincial and federal sources of funding. (Funding required)

- Invest in building public awareness of the critical role water plays in Niagara in supporting agriculture and related industries. This may include (but is not limited to): a) press releases/new coverage to increase awareness of the importance of efficient use of water to support key users in the region in the context of climate change; b) profiles of leading edge water technologies in various sectors; c) work being done to develop an irrigation system; and, d) public engagement initiatives for comment on reports as they are generated (e.g., engineering report, costing report, pilot project plan and funding proposal) through Public Information Centres, Town Halls, or other means as appropriate in person or virtually.

- Continue to engage Ontario Power Generation in discussions about access to water from above the escarpment to fully take advantage of gravity to move water through an irrigation system - as this is the most efficient means to do so from an energy use and cost perspective – and to discuss opportunities and pressing needs of existing models below the escarpment.

Appendix I: Phase 2 Workshop Methods and Agenda

Approach to collecting feedback
Phase 2 unfolded as a set of two workshops and online interviews. The focus was on ensuring broad participation by those with an interest in irrigation in Niagara as described below. The main approach to collecting feedback was through workshops using facilitated small and large group discussions about the principles and considerations and potential governance models for an irrigation system in Niagara. The facilitated workshop approach allows for discussion and an understanding of points of agreement and disagreement among participants not only by us as researchers but also by the participants.

Workshops were held virtually on November 29 and December 1, 2021 due to participant preference and extenuating circumstances. Feedback was collected using two main approaches: small group 'breakout' sessions of between four to six participants, designed to be as diverse in representation as possible; and, full group feedback and discussions sessions, where all participants interacted with each other and with the content. Note takers were employed to ensure all relevant feedback from participants was captured throughout the workshops. The agenda for the workshops is included in Appendix I and is described briefly here:

- Overview of Phase 1 development of irrigation governance principles and considerations for the full group
- Small group discussions, facilitated by a researcher, focused on what participants agreed with, disagreed with, and thought was missing or required elaboration
- Overview of the three potential governance models for the full group
- Small group discussions, facilitated by a researcher, focused on one of the three models per group. A SWOT analysis (strengths, weaknesses, opportunities, and threats) was performed
- Full group discussion of the three SWOT analyses of the governance models, and general discussion about feasibility and implementation
- An individual ranking exercise related to the governance models, pre- and post- the workshop discussions, to understand any shifts in thinking and preferences as a result of the workshop discussions

In addition to the two workshops, two virtual interviews were conducted with individuals who could not attend the workshops but were interested in providing feedback. These individuals were invited to share their thoughts on the principles and considerations and the three potential governance models.

Two individuals also submitted written feedback and this was incorporated into the results as well.

Broad participation
Those with a potential interest in providing feedback on the Phase 1 report were identified through several sources, including individuals from the Niagara Irrigation Committee, consultants who have been involved in other aspects of assessing the feasibility and design of an irrigation system in Niagara, and those working in the Region with specific expertise related to

irrigation. A broad definition of an 'interest' in irrigation was used to ensure inclusivity. The final list of those invited to participate included:

Workshop 1:

- Potential users of irrigation across four sub-regions: Lincoln (Jordan); Lincoln (Vineland – Beamsville); St. Catharines; and, Niagara-On-The-Lake (NOTL) and included grape growers, wineries, tender fruit growers, horticulture operations, and greenhouse operations

Workshop 2:

- Municipal utility / water managers in affected municipalities in the region: Town of Lincoln, St. Catharines, and NOTL as well as the Niagara Region
- Agricultural Policy and Action Committee members, Niagara Irrigation Committee members, and elected officials from the affected areas of the region
- Relevant provincial and federal government ministries
- Environmental organizations with a specific focus on water in the affected areas of the region

In addition to the broad groups listed above, Indigenous Nations were identified as holding a separate and critical interest in irrigation in Niagara. As a result of the short timeframe for this project, appropriate approaches for engaging Indigenous participation in the workshops, following best practices identified through the Tri-Council Policy Statement on research ethics and regional guidance, was not possible. However, we strongly recommend those involved in ongoing discussions about irrigation and its governance in Niagara place urgent priority on building relationships with Indigenous Nations who have an interest and traditional territory on which this project would sit.

Irrigation Models for Niagara: Workshop Agenda

Time	Activity
2:00-2:15	Welcome and introduction – Julia Baird, Sarah Marshall, Bill Schenck
2:15-2:25	Niagara Region irrigation system work on the ground – Hugh Fraser
2:25-3:00	Overview of Phase 1 report principles and considerations – Carolyn Johns Breakout group activity
3:00-3:10	Feedback to full group and discussion
3:10-3:25	Break/coffee
3:25-4:15	Overview of Phase 1 report governance models – Carolyn Johns Breakout group activity
4:15-4:25	Feedback to full group
4:25-4:50	General discussion of the implementation and feasibility and of governance models
4:50-5:00	Next steps, depart with thanks

Appendix II: Detailed Findings on Key Principles and Considerations

Principles and considerations

The Phase 1 report identified 12 irrigation governance principles and considerations important to any irrigation governance system implemented in Niagara. Workshop participants discussed these principles and considerations related to three questions: What principles do you strongly agree with? What principles do you disagree with, or have concerns about? Is there anything missing from the list?
The following represents the content of those discussions in relation to each principle:

1. **Ecological principles, sustainability, water quantity and quality, and surface water-groundwater interactions need to be foundational principles for designing a leading-edge, climate change-centred, and future-oriented irrigation system**.

Participants agreed with this broad principle and its dimensions that sustainability for the long term is key and with this being the first principle. Participants in Workshop 2 emphasized the importance of considering the ecological consequences of water use for irrigation. Food safety should be considered as part of this principle. Multiple participants in Workshop 2 raised the question of cost / funding in relation to sustainability, noting that this was not clear.

The question of 'what do we mean by sustainability' was raised in Workshop 2. For example, cost sustainability was raised as an important consideration and was not clearly articulated in the principles and considerations. Further, sustainability should extend to the community in Niagara (including environmental and economic sustainability). A participant suggested adding a definition of sustainability related to this principle. Regardless of questions around the specific meaning or scope of the term 'sustainability', long term sustainability was an explicit priority for the irrigation system from many participants.

2. User centred and strong stakeholder involvement and engagement is critically important. Farmers and other water users must be centrally involved in the design of any system; to ensure individual user, farmer, and grower buy-in and maintenance individual users must have some stake in this system as its long-term success can only be achieved with sufficient buy-in to justify initial capital and continuous operational and administrative costs.

Participants in both workshops emphasized the importance of users of the system being involved in the design of the system, and that stakeholder engagement is important. Good leadership was emphasized. In Workshop 1 some participants felt that government representatives should not take the lead and that strong representation was critical. In Workshop 2 there were comments about what sectors would have access to irrigation and which would not, and this prompted comments about competition and the critical importance of good leadership.

In Workshop 2, inclusion of stakeholders and rightsholders was generally considered important, but there was not clear agreement on who should have access to the irrigation system (some

favouring a more limited system that could be seasonal with others favouring a year-round system).

3. Strong public awareness and transparency in the decision-making process to build community support and a 'social license to operate'. Building an understanding of public awareness and developing educational and public engagement approaches is identified as a key activity in the Niagara Irrigation Strategic Action Plan and remains a priority.

In Workshop 1, some concerns were raised about public involvement and how much transparency is needed for irrigation governance. Discussions occurred around the term 'strong public awareness'. In Workshop 2, a focus on a lack of food policy that recognizes the full food chain was noted as a mechanism for improving not only public awareness, but awareness of governments also. Irrigation would factor into those food policies.

4. The governing body should include representation of key stakeholders, including local growers and water users, as well as First Nations/Indigenous representation, watershed groups, provincial, regional, and municipal government representation; recognizing provincial authority for PTTW and adherence to relevant laws and policies.

The importance of full representation was emphasized in Workshop 1 to ensure the irrigation system meets the needs of its users and they have a voice. This principle was not explicitly discussed in Workshop 2.

5. Well-planned water intakes and permitting based on best available surface and groundwater data, information and modelling.

There was no explicit discussion of this principle in either workshop.

6. Piped raw water delivery infrastructure to maximize efficiency and sustainability and minimize evaporation and maintenance costs.

Concerns were raised about a piped system in both workshops, in terms of the logistics and costs associated with this approach, and no consensus. Most participants seemed to prefer a piped system, however, there may be an opportunity for a hybrid model of piped delivery and open water delivery through ditches.

There was substantive discussion about the infrastructure used to deliver irrigation water (piped vs open ditch) and raw water vs potable (for Workshop 1). Concerns related to cost, access issues and more general feasibility. A potential user provided some feedback outside of the workshops and noted that holding ponds are needed to support users' diverse needs.

7. Investment in a year-round, closed, water-reuse system.

Participants in both workshops agreed that a year-round system was important. Some concerns about the need for this principle and prioritizing plant-based agriculture over animal agriculture

was raised in an interview with a stakeholder. Participants also noted that a year-round model has additional maintenance and cost concerns.

8. Area-based fee structure to ensure minimum operational costs are covered regardless of the level of service required by growers and users and to ensure equitable access. A year round, climate-change, future-oriented irrigation system must be developed and in operation regardless of current precipitation levels to cover operational and maintenance costs.

Fee structure was a key topic in both workshops, with participants generally favouring a volume-based fee structure or a hybrid area- and fee-based structure, though agreement was not reached. Further clarification, details and discussion around this is needed.

A participant in Workshop 1 noted that the infrastructure used at the farm level to deliver water varies markedly in its efficiency and fees should reflect the volume of water used.

9. Climate modelling data must be used to support decision making related to water takings to ensure that irrigation activities are not adversely impacting local ecosystems. System development must explicitly consider future demand and supply for water, inclusive of other related water sectors and growing areas where demand has not yet fully materialized to ensure that future infrastructure remains a strong investment many decades into the future.

There were no concerns raised/discussion about this principle. However, there was a strong emphasis in both workshops more generally on considering the long-term viability of the system and ensuring it met needs now and in the future, which includes considering climatic changes.

10. System operation and management using smart technology developed for use at the farm/water user scale.

There were no concerns raised / discussion about this principle in either workshop.

11. The governance model and user participation should be developed collaboratively and detailed in writing.

In Workshop 2, participants stated that collaboration needs to occur from the beginning, during development. This principle was not explicitly discussed in Workshop 1.

12. The governance system should include an appeals body which can settle disputes between irrigators and different water users to ensure the system can maintain minimum standards of service, accountability and integrity for all irrigators.

Participants in Workshop 2 emphasized that it was important to ensure diversity of backgrounds in an appeals body to make decisions together and that the process was clear and detailed. Suggestions were made for alternate wording (e.g., dispute resolution or adjudication committee)

but agreed that a body that functions in this capacity is important. This principle was not explicitly discussed in Workshop 1.

Broader themes from the discussion of principles and considerations

In general, there was strong agreement with the majority of the principles in both workshops, with specific concerns and suggestions for revision as identified in the above section. In addition, some non-principle-specific feedback was captured in the two workshops.

There were some suggestions provided regarding the order with which the principles and considerations were listed, and some of the language used (e.g., 'appeals body', 'transparency' in relation to the public). For example, one participant suggested that Principle 9 could be a sub-point of Principle 1. We elected to retain the number of principles to ensure that each presents a single message but have revised the order to group 'like' principles together. We addressed some language suggestions, providing a definition of sustainability, removing a reference to public transparency in relation to governance, and revising the terminology in relation to dispute resolution. Another participant suggested creating a 13th principle of 'rewarding innovation in water saving techniques' that emphasized the importance of water use efficiency and this was incorporated into an existing principle (#11).

Appendix III: Revised Principles and Considerations

The revised list of principles and considerations for the governance of an irrigation system in Niagara are presented here, based on the feedback described above. Changes to the original list are emphasized in bold. The order of the principles was also revised from the Phase 1 report based on feedback from workshop participants. We wish to also note that these principles and considerations are not listed in order of importance, the order in which they are presented has been revised to group them into 'like' items.

1. **Long-term** sustainability* **(inclusive of environmental, social and economic aspects),** and ecological considerations including water quantity, quality, sustainability sources, natural flows / gravity, and surface water-groundwater interactions need to be foundational principles for designing a leading-edge, climate change-centred, and future-oriented irrigation system.

   ***We define sustainability in this context as the ability of the system to support the long-term healthy functioning of ecosystems and wellbeing of communities within the watershed(s) in which the system is located. This includes supporting agricultural and other sectors that are potential users of the irrigation system, and the sustainability of the cost of operation and funding sources.**

2. Climate modelling data must be used to support decision making related to water takings to ensure that irrigation activities are not adversely impacting local ecosystems. System development must explicitly consider future demand and supply for water, inclusive of other related water sectors and growing areas where demand has not yet fully materialized to ensure that future infrastructure remains a strong investment many decades into the future.

3. The governance model and user participation should be developed collaboratively **from the outset** and detailed in writing.

4. **Irrigation** water users must be centrally involved in the design of any system; to ensure individual user, farmer, and grower buy-in and maintenance individual users must have some stake in this system as its long-term success can only be achieved with sufficient buy-in to justify initial capital and continuous operational and administrative costs.

5. **Governance should be user centred, and strong stakeholder involvement and engagement is critically important.** The governing body should include representation of key stakeholders, including local growers and water users, as well as First Nations/Indigenous representation, watershed groups, provincial, regional, and municipal government representation; **include appeals and dispute resolution mechanism and** recognize provincial authority for PTTW and adherence to relevant laws and policies. **Strong leadership is needed to support a diverse governing body.**

6. The governance system should include an **adjudication committee** which can settle disputes between irrigators and different water users to ensure the system can maintain minimum standards of service, accountability and integrity for all irrigators.

7. Strong public awareness in the decision-making process to build community support and a 'social license to operate'. Building an understanding of public awareness and developing educational and public engagement approaches is identified as a key activity in the Niagara Irrigation Strategic Action Plan and remains a priority. **A food policy that recognizes the importance of irrigation water to the sustainability of agriculture would be beneficial in raising awareness among governments and the public**.

8. Well-planned water intakes and permitting **should be** based on best available surface and groundwater data, information and modelling, **using where possible existing utility corridors and easements that already exist.**

9. Piped raw water delivery infrastructure **is preferable** to maximize efficiency and sustainability and minimize evaporation and maintenance costs. Though upfront costs for new piped irrigation conveyance infrastructure are significantly greater than ditches or even lined channels, **logistics of implementing the infrastructure more complex**, and raw water would require some water quality monitoring and testing, the lifespan and low-maintenance nature of pipelines make them preferable as a long-term investment, particularly in the context of climate change.

10. Investment in a year-round, closed, water-reuse system.

11. **A hybrid area-based and** volume-based fee structure to ensure minimum operational costs are covered regardless of the level of service required by growers and users and to ensure equitable access. **Inclusion of a volume-based element ensures that costs are more aligned with needs that vary among users (due to greater efficiency or crop needs) and serves as a reward mechanism to support innovations in efficiency**. A year round, climate-change, future-oriented **and full cost of water approach** for the irrigation system must be developed and in operation regardless of current precipitation levels to cover operational and maintenance costs.

12. System operation and management using smart technology developed for use at the farm/water user scale.

Appendix IV: Detailed Findings Related to Governance Models

All workshop participants and those interviewed were provided with the Phase 1 report Executive Summary and full report, that described the three governance models (regional model, municipal model, and private consortium model). Then, workshop participants engaged in a SWOT analysis (strengths, weaknesses, opportunities, and threats) in small groups. This analysis was followed by a larger group discussion about the models. The three models are described briefly below and the outcomes of the SWOT analyses and discussions for each model presented thereafter.

Feedback on models

Regional model: Niagara Irrigation Partnership

Description: This regional model could take the form of an irrigation partnership, district, or utility model. A regional irrigation model could have subdistricts with regional irrigation water investment and infrastructure owned and operated by a new irrigation partnership, district, or utility in the Niagara region that has broad-based user and stakeholder leadership, engagement, and funding. This model could include a multi-stakeholder regional board with membership from all 12 municipalities in the region, or the 5 municipalities with irrigation governance agendas; representatives from the existing irrigation committee, interested agricultural industries; other irrigation users; and, important interests such as Indigenous representation, the Niagara Peninsula Conservation Authority, and watershed groups.

SWOT analysis: Participants identified a number of specific strengths and weaknesses of this model (Figure 1). In addition to the benefits and challenges of this model identified in the Phase 1 report, participants highlighted that this was a geographically inclusive model and emphasized that access to funding would be easier than other models. One additional challenge included was a loss of control by users.

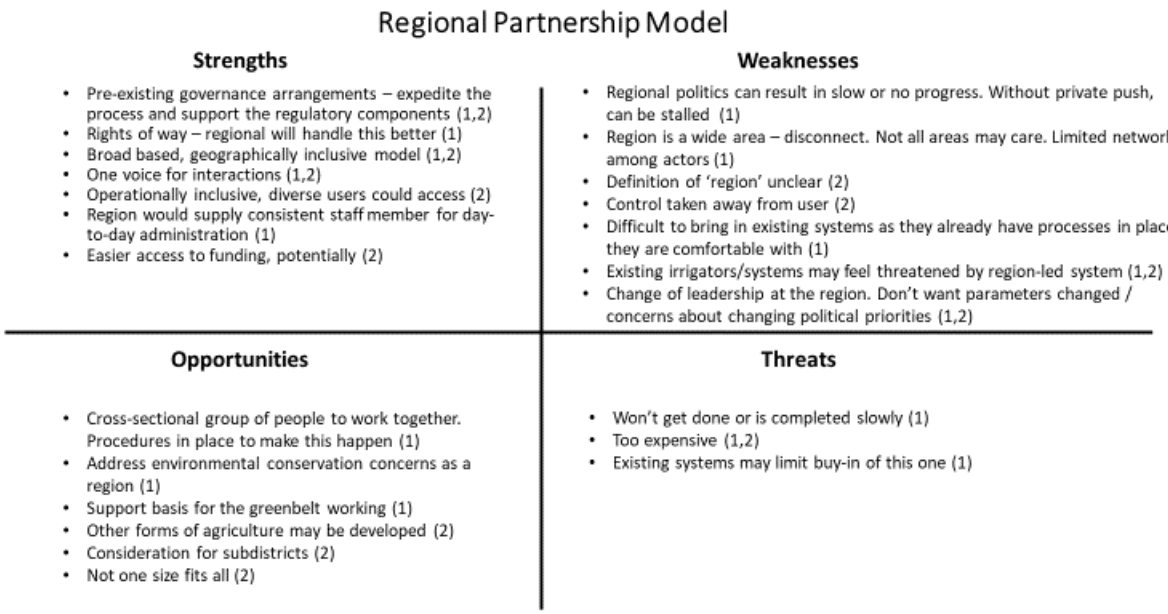

Figure 1. SWOT analysis of the regional model. Numbers denote the workshop (1 or 2) in which each item was identified.

Feedback: There is a need to clarify what is meant by 'region' or 'regional': does this mean the entire region or just the north of Niagara? This was identified in both workshops. Discussion of how to clarify this term resulted in a definition of 'regional' that focused on the geographic scope of an interest in irrigation. Within this, a focus on ecosystem considerations (e.g., watershed perspective) and the range of governments with authority in the region are important.

In Workshop 1 there was a desire expressed to have the Region hold responsibility for irrigation and act in a leadership role for this model. Concerns were expressed about challenges of bureaucracy in moving this model forward, with the Region leading and the complexity of multiple municipalities and political priorities.

Municipal model: Decentralized experimental model

Description: Research completed for this Phase of the study indicates that there are some municipalities and industry sectors and individuals ready to experiment with smaller scale irrigation districts or systems. Previous reports highlight potential in three districts in Niagara Region (Lincoln, St. Catharines, and Niagara-on-the-Lake) where a pilot system could be initiated (perhaps with a new Lincoln irrigation system or building on the NOTL municipal model) using a proof-of-concept with private and public sector collective investment, user and municipal leadership, whereby the municipality would own and operate a piped distribution system; the Region manages and operates pumping infrastructure and obtains the permit to take water; and users pay for sustainable water access and maintenance. This model could use the NOTL municipal model.

SWOT analysis: Participants identified a number of specific strengths and weaknesses of this model (Figure 2). In addition to the benefits and challenges of this model identified in the Phase 1 report, participants highlighted the existing experience municipalities have with large-scale infrastructure and could facilitate easements to implement the system more easily than a private system. Additional limitations included the possibility of a diminished sense of ownership and advocacy by potential users, changing political priorities, and that this approach would move more slowly than others because multiple municipalities would be involved in decision-making.

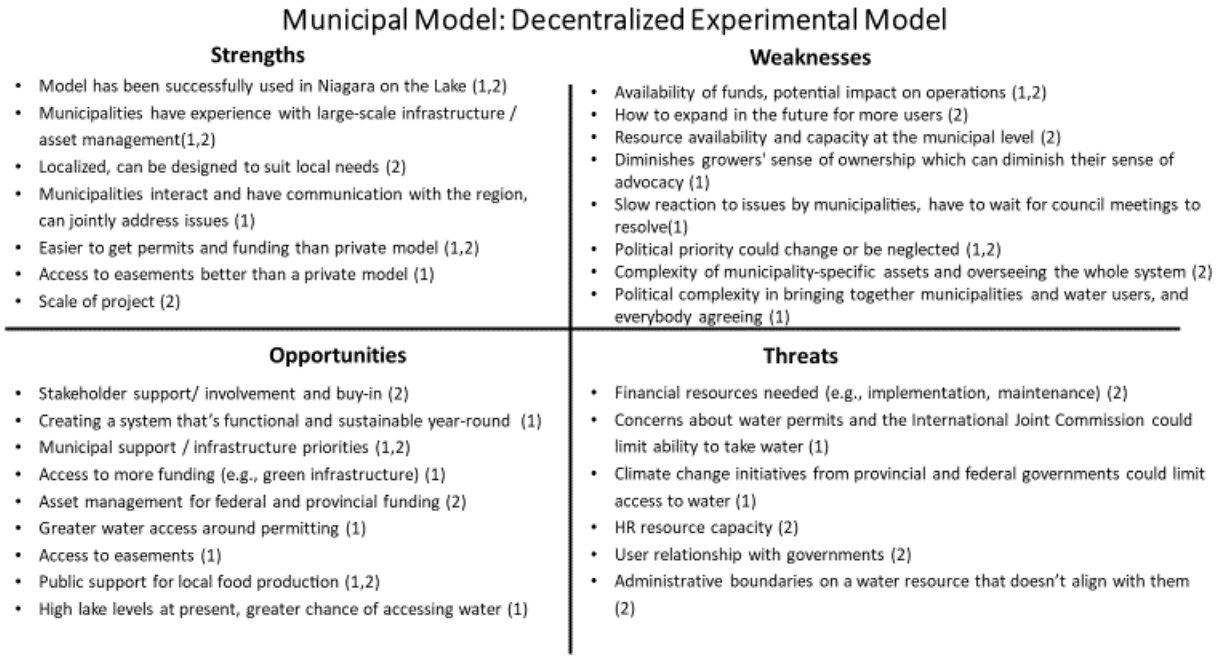

Figure 2. SWOT analysis of the municipal model. Numbers denote the workshop (1 or 2) in which each item was identified.

Feedback: Participants from both workshops recognized that there is already a system in place in NOTL that could be used to support the development of this model, and municipalities would be important in supporting this model with funding, operations, dealing with disputes, and other issues. Politics were recognized as both an opportunity and a threat, especially with elected representatives changing every four years that could change the priorities of the municipalities and Region.

Private consortium / Cooperative model

Description: The industry-led, private consortium model has several important strengths as a model. This model could take the form of a private consortium or a cooperative model owned by user members and supported by regional stakeholders. Consortiums and co-operatives can be formed as either for-profit or not-for-profit allowing for investment, permitting and operation of an irrigation system with a goal of financial sustainability and reinvestment to ensure the future maintenance of the irrigation system. A consortium or co-operative model generally has three key groups of participants: members/owner-users; a Board of Directors; and management

personnel responsible for the day-to-day management and operations of the system.

SWOT analysis: Participants identified a number of specific strengths and weaknesses of this model (Figure 3). In addition to the benefits and challenges of this model identified in the Phase 1 report, participants highlighted the flexibility and potential for the system to suit user's needs, the potential to move quickly to implement and make decisions with fewer layers of government, the potential for increased land values and investments treated as equity, and the potential for existing irrigators to be brought in more easily. Further limitations included concerns about access and permitting to implement infrastructure, particularly around right-of-ways, liability issues, the time and effort required by users to govern the system when they are already busy, and questions about how the system could be funded.

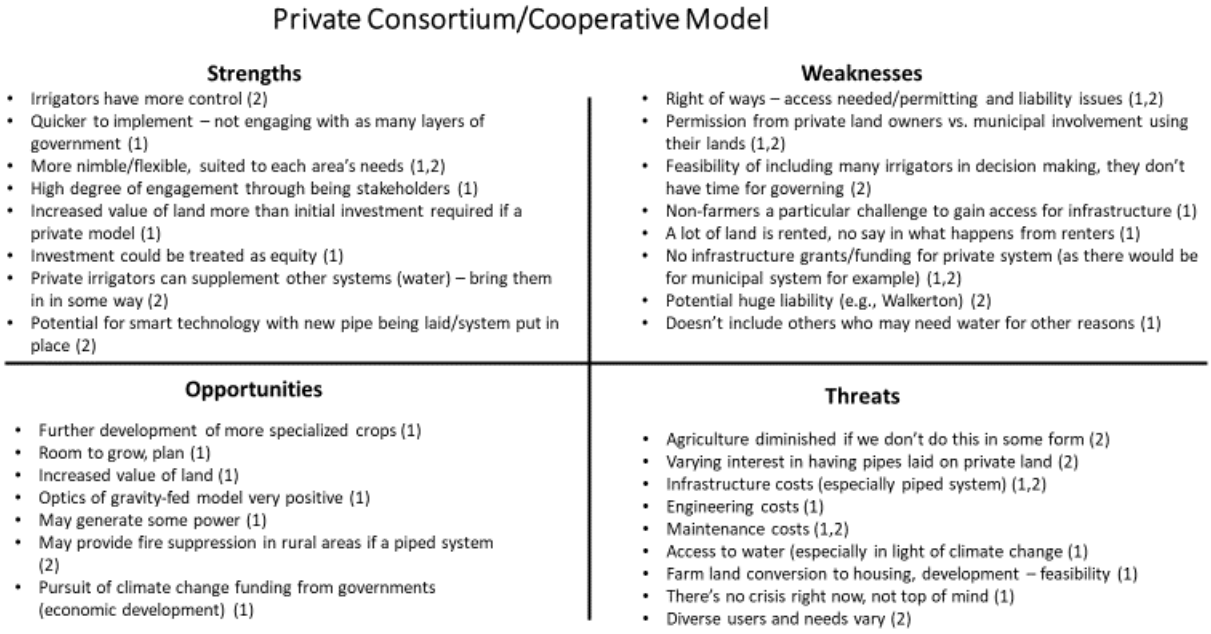

Figure 3. SWOT analysis of the private consortium/cooperative model. Numbers denote the workshop (1 or 2) in which each item was identified.

Feedback: In Workshop 1, participants were concerned about gaining the permission of private property owners and for government property for infrastructure. In both workshops, participants identified that municipal and regional involvement was required even for this model (e.g., for supporting the building of a piped system, permits). Concerns were expressed in both workshops about water access and capacity – that the infrastructure would be difficult to put in place due to the high number of private owners and other interests that would need to provide access (both workshops) and that the amount of water would be sufficient for diverse users and needs (Workshop 2).

Future considerations for the three governance models

For all governance models, the discussions included consideration of the future (50 years from now) and how that might change the items in the SWOT analyses. For all three models, concerns

about climate change and its impacts on water availability and policies for access to water were identified as important. There was general recognition that the present offers an opportunity to develop a Niagara irrigation system – due to high water levels in the Great Lakes and public support for local agricultural products - that may not exist in the future. Further uncertainty around how climate change policies may be implemented and impact agriculture was expressed.

Appendix V: Pre-Post Discussion Preferences for Governance Models

Workshop participants ranked the three models (Regional model, Municipal model, Private consortium / cooperative model) before and after having discussions about them. The results of these rankings show that there was not clear agreement in either workshop about what model would be preferable (Figures 4-5).

In **Workshop 1** (Figure 4) potential users of irrigation identified a regional model as preferable more often than the other two models, and the municipal model as the least preferable. Support for the regional model appeared to grow with discussion, and the feedback from the discussion supports this (see Section 3.2.3 below).

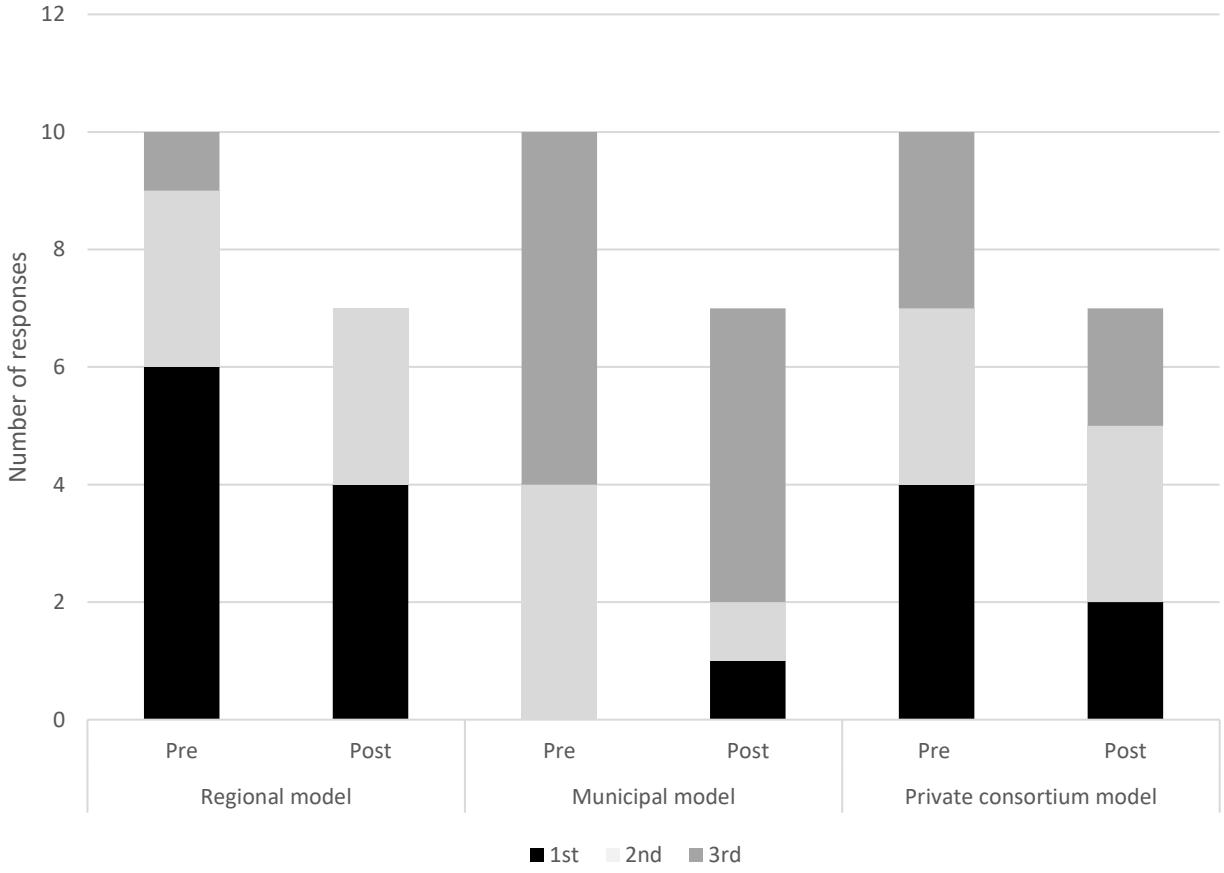

Figure 4. Workshop 1 pre- and post-discussion rankings of three irrigation governance models. Black = most preferred; light grey = next preferred; dark grey = least preferred.

In **Workshop 2**, where a range of interested parties in irrigation participated, there was a clear preference for the regional model over others and a general lack of interest in the private consortium model before discussing the models (Figure 5). However, after the workshop discussions preferences became somewhat less clear, while the private consortium model remained the least preferred overall (Figure 5). The municipal model remained the most evenly

distributed across all three preference levels. Discussion in this workshop also turned to the potential to bring aspects of more than one model together (detailed in Section 3.2.3 below).

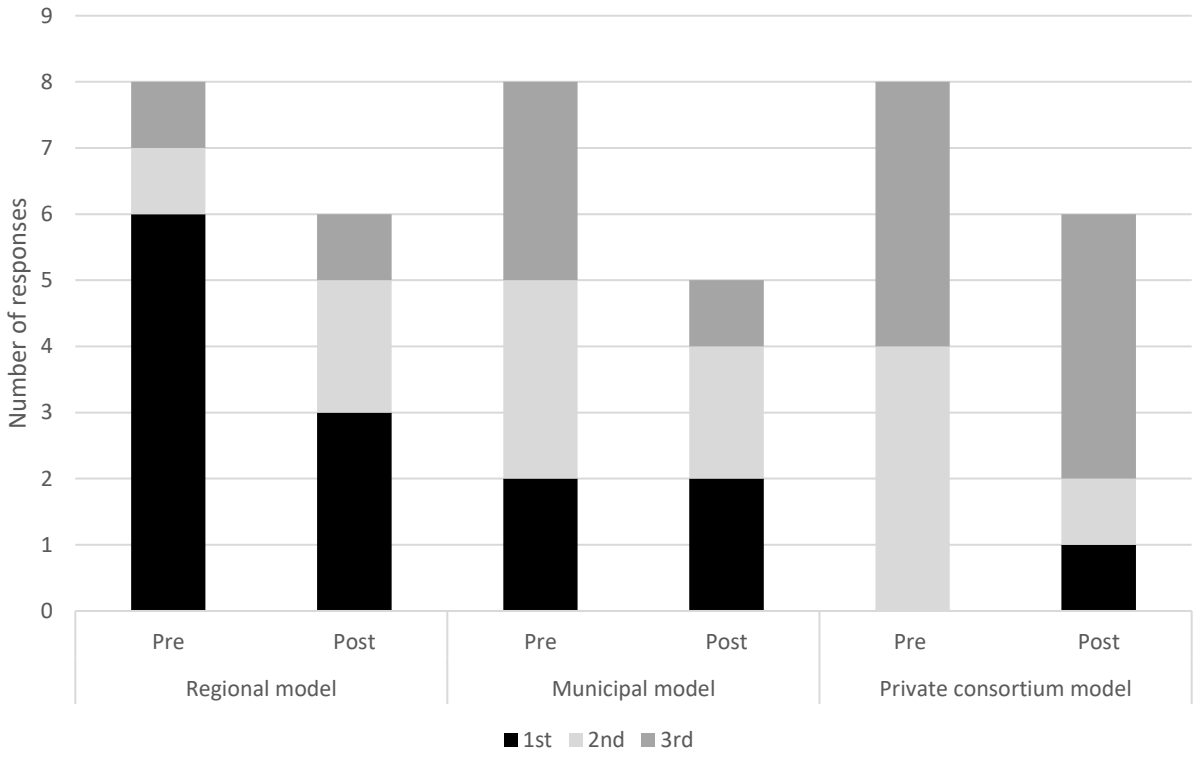

Figure 5. Workshop 2 pre- and post-discussion rankings of three irrigation governance models. Black = most preferred; light grey = next preferred; dark grey = least preferred.