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Navigating the pathway from collaborative governance to impacts under uncertainty: A theory of change for watershed visions

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ABSTRACT

Collaborative governance is considered effective in environmental problem solving. However, it is not always successful in delivering benefits. In Finland, collaborative 'watershed visions' are gaining popularity as a way to advance holistic water management. Watershed visions bring the public, private, and civil society actors across sectors together to agree on a desired future for a river basin and to plan steps for achieving it. The capability of watershed visions to lead to positive environmental impacts is, however, highly uncertain. We applied a Theory of Change approach to conceptualize an outcome-oriented impact pathway for the watershed visions to enhance the understanding of their possibilities to achieve their desired long-term impacts. Using empirical material, we structured a watershed vision process into an impact pathway of nine phases necessary for achieving the desired future. From each phase, we identified assumptions suggesting why and under what conditions the impact pathway successfully works, risks to its realization, and key uncertainties inherent to the risks. Focusing on the uncertainties, we developed a tool for ex-ante, interim, and ex-post evaluation of the watershed visions. We suggest that a longitudinal Theory of Change is a useful tool for addressing change and managing uncertainty in any collaborative process with long-term aims, and that applying this tool can increase the success of collaborative governance.

1. Introduction

Collaborative governance (CG) is considered more capable than conventional governing to deal with complex environmental problems (Koontz and Thomas, 2006; Newig and Kvarda, 2012; Clement et al., 2020). The benefits of CG arise *inter alia* from knowledge integration, social learning, and consensus building (Newig and Kvarda, 2012; Graversgaard et al., 2017; Bodin, 2017), which can produce both tangible (agreements, plans, policies, ideas, or strategies) and intangible (social, intellectual, and political capital) results (Innes and Booher, 1999; Bryson et al., 2006). Conceptualization of the first-, second-, and third order effects of CG illustrates how consensus building can lead to new practices, partnerships, and perceptions in the short term, the evolution of new modes of discourse, new norms, and new social heuristics for addressing problems in the long term, and further to impacts on the ground (Innes and Booher, 1999; Bryson et al., 2006). Still, collaboration is not always successful in delivering benefits (Bodin, 2017).

In Finland, the Ministry of Agriculture and Forestry (MMM) has initiated collaboration between public, private and civil society actors across sectors to develop 'watershed visions' (WVs) for river basins. The purpose of WVs is to integrate the management, restoration, and use of waters, flood management, and other water related needs into a jointly agreed vision for the future and to identify sector-specific objectives and measures to make the vision come true. Collaboration around a WV is believed to enhance an active and experimental water management approach at the public sector and to motivate private actors to participate in planning and to take responsibility in the implementation of management measures (Aapala et al., 2017). The WVs are based on voluntary collaboration. Thus, they are not aimed to implement the statutory river basin management and the underpinning EU Water Framework Directive (WFD). However, collaboration around a holistic perspective to watersheds is considered to support the achievement of the objectives of the WFD. WVs are gaining popularity: in a few years the approach has been adopted in at least nine watersheds in Finland.

However, the actual capability of a WV to produce social, political,

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and intellectual outcomes that can also benefit the environment is highly uncertain. Watershed problems are complex and influenced by a myriad of factors, the time perspective of a WV is long, and the potential environmental impacts are even further away. A WV may end in a stalemate or produce none or only partial or short-term benefits while the long-term impacts remain unseen. Uncertainty can erode the credibility and societal legitimacy of the approach, weaken funding opportunities, and decrease stakeholders' motivation to participate. Better understanding of the causal pathway from a WV to the desired impacts, and the related pitfalls, is needed.

The understanding of CG regimes *per se* and the factors underlying their success is well advanced (Bryson et al., 2006; Ansell and Gash, 2008; Emerson et al., 2012). The social and intellectual outcomes of CG have been analyzed (Connick and Innes, 2003; Robinson et al., 2020) and, despite methodological challenges (Conley and Moote, 2003; Koontz and Thomas, 2006; Clement et al., 2020), also research on the environmental outcomes of CG has evolved (Plummer et al., 2017; Biddle, 2017; Dressel et al., 2020; Baudoin and Gittins, 2021). Conceptual process or logic models of CG have been presented (Selin and Chavez, 1995; Bentrup, 2001; Thomas and Koontz, 2011; Emerson et al., 2012) and used to *ex-post* examine the degree to which collaborative partnerships have attained their environmental goals (Biddle and Koontz, 2014). Also, causal mechanisms between variables affecting the outcomes have been identified (Newig et al., 2018). However, there is an obvious lack of studies elaborating how and why CG can lead to the desired impacts (Thomas and Koontz, 2011; Emerson et al., 2012; Bodin, 2017; Newig et al., 2018).

We contribute to this research gap by applying a Theory of Change (ToC) to conceptualize an outcome-oriented impact pathway for the WVs to enhance the understanding of their possibilities to achieve their desired long-term impacts. Like process and logic models, a ToC describes the impact pathway from inputs to the results. Specific for ToC is that it adds to the impact pathway the causal assumptions underlying its linkages (Weiss, 1995; Connell and Kubisch, 1998; Mayne, 2015). This means that ToC also addresses the conditions needed for the causal pathway to be realized and to induce changes. Thus, a ToC facilitates anticipating how and why an initiative can lead to the desired impacts, which provides a strategic tool for the planning, management, and evaluation of the initiative (Weiss, 1995; Connell and Kubisch, 1998; Mayne, 2015). In CG, an explicit ToC can be articulated collectively at the outset of the process to align the theories held by different participants into a shared one to enhance consensus on the course of the process (Weiss, 1995; Connell and Kubisch, 1998; van Tulder and Keen, 2018). Also, alternative or complementary ToCs can be used, e.g., to help deal with difficult issues such as conflicts (Fisher et al., 2020).

ToC based evaluation was introduced by Weiss (1972) and it was first developed in the context of community development initiatives (Weiss, 1995; Connell and Kubisch, 1998). Since then, the approach has become mainstream (Stein and Valters, 2012; Lam, 2020) and applied to, e.g., collaborative and participatory projects related to public health (Sullivan et al., 2002; Mackenzie and Blamey, 2005) and rural innovation (Secco et al., 2019). Leach et al. (2002) acknowledged the potential of a ToC approach to promote watershed management through identifying evaluation and monitoring criteria in each step of the causal pathway from problem to its solutions. Still, the potential of the ToC approach in collaborative environmental governance is rarely tested (see e.g. Fisher et al., 2020).

We build a generic ToC to understand the nature, potentials, and challenges of WVs as an approach to river basin management. For this, we explicate an outcome-oriented impact pathway of a typical WV process based on empirical material collected from six WVs. The ToC includes the collaborative visioning project, yet the focus is on the long-term changes that achieving the desired future requires, and the underlying assumptions. In particular, we address the uncertainties that risk the success of any WV in achieving the desired future. Based on the identified uncertainties, we develop a diagnostic evaluation matrix for

controlling and enhancing the success of a WV. Finally, we discuss the value of an uncertainty sensitive ToC for visioning and other CG processes with long-term goals.

In Section 2 we introduce the current water management in Finland. Section 3 focuses on CG, and WVs as a form of CG, and introduces six Finnish WV cases. Section 4 describes the methodology of the study. In Section 5, we develop a ToC for the WVs by identifying common features of the six WVs. Section 6 presents an evaluation matrix for the WVs. Section 7 is for discussion and Section 8 for conclusions.

2. Water management in Finland

Water management in Finland is organized through river basin management plans (RBMP) and the associated programs of measures (PoMs), as required by the EU Water Framework Directive (WFD) (2000/60/EC). For surface waters, the main objective of the WFD is to halt the deterioration of the status of all water bodies and to achieve a good ecological status (GES). For artificial or heavily modified water bodies, the aim is to achieve good ecological potential and good surface water chemical status. In Finland, the Ministry of the Environment and the Ministry of Agriculture and Forestry steer and monitor the implementation of the WFD in their respective sectors. Five regional governmental bodies (The Centres for Economic Development, Transport, and the Environment, ELY-centres) hold the authority over producing the RBMPs and PoMs for eight river basins and updating them every six years (Nielsen et al., 2013).

The Common Implementation Strategy of the WFD (Impress, 2003) highlights integration as a key concept underlying the Directive. Successful implementation of the WFD requires a holistic approach capable of integrating the environmental objectives with other objectives, uses, functions and values related to waters, including aspects beyond the scope of the WFD (e.g. flood management) (Impress, 2003). This implies the need to include the perspectives and expertise of all relevant stakeholder groups and civil society in the development of the RBMPs and in decision making (Directive 2000/60/EC; IMPRESS, 2003; Voulvoulis et al., 2017).

However, integration has not worked to the extent required, neither in Finland nor in other EU-countries (Nielsen et al., 2013; Voulvoulis et al., 2017; European Commission (EC), 2019a; European Commission (EC), 2019b; Heinilä et al., 2021). Horizontal communication between sectors and their stakeholders has been weak and ineffective, and tended to reflect typical power asymmetries (Zingraff-Hamed et al., 2020). Stakeholder participation in water management has restricted to dealing with problems and goals determined by the WFD and to providing implementation-relevant knowledge, whereas stakeholders' contribution to goal setting or decision making has been poor (Valinia et al., 2012; Voulvoulis et al., 2017; European Commission (EC), 2019a; Heinilä et al., 2021). Thus, conflicts between the WFD-guided river basin management and the objectives of, e.g., agriculture, forestry, and hydropower have continued to exist and institutional mechanisms to solve them are missing (Nielsen et al., 2013; Soininen et al., 2018). Projects focusing on specific problems, such as the restoration of spawning grounds for migratory fish have been realized, but they have largely remained disconnected and without significant effects, especially in more holistic terms. In Finland, 32 % of rivers and 13 % of lakes had not reached GES by 2019, and since 2013, the situation has not significantly changed (Finnish Environment Institute, 2023).

3. Collaborative governance to enhance river basin management

3.1. Collaborative governance

CG is a response to the increasingly complex societal problems that the fragmented institutional systems are unable to govern (Bodin, 2017; Newig and Kvarda, 2012). The concept refers to the processes and

structures that bring public, private, and civil society actors across sectors and policy levels together to consensus-oriented decision making (Ansell and Gash, 2008; Emerson et al., 2012; Emerson and Nabatchi, 2015). Collaboration integrates knowledge, viewpoints, and values, can enhance the legitimacy and effectiveness of decisions (Ansell and Gash, 2008; Newig and Kvarda, 2012), and has even potential to promote innovation (Torfing, 2019). It builds on face-to-face dialogue, trust, commitment, and shared understanding, and its success depends on, e.g., the prior history of conflict or cooperation, incentives to participate, power sharing, leadership, and institutional design (Ansell and Gash, 2008; Emerson et al., 2012). CG can be initiated by the public or other actors, and it involves different operational bodies and roles. In addition to representatives of organizations, CG can involve citizens (Batory and Svensson, 2019). CG can be either permanent or task oriented, and its objective may be open or relate to a public purpose (Batory and Svensson, 2019). CG is widely applied to water management (Leach and Pelkey, 2001; Leach et al., 2002; Scott, 2015; Graversgaard et al., 2017; Robinson et al., 2020).

3.2. Watershed visions as a form of collaborative governance

In Finland, the idea of WVs arised from the lack of holism and insufficient stakeholder involvement in river basin management. The WVs bring together a variety of actors to agree on a desired future for a river basin, and to identify measures for achieving it (Aapala et al., 2017; Ministry of Agriculture and Forestry of Finland MMM, 2022). WVs can link sectors and actors from large watershed areas from the headwaters to river mouth, but they also provide a framework for planning at a smaller scale. In contrast to the law-based RBMPs and PoMs that set requirements for the government to implement the environmental objectives specified by the WFD, the WVs provide an autonomous platform for stakeholders to define environmental objectives and measures by themselves, in relation to, and in addition to diverse socio-economic objectives, such as the development of the recreational use of the waters, or tourism (Heinilä et al., 2021). Thus, the WVs is a flexible approach for dealing with a broader variety of objectives and measures than the statutory WFD-based water management.

Visioning has been traced back to participatory planning that emerged at the end of 1980s in local communities in the U.S. to inspire planning for the future (Peltonen et al., 2022). This type of “community visions” provide a framework for keeping the actors together in order to build a program of actions to generate change towards a collectively idealized future (Van der Helm, 2009). Visioning can motivate people to participate because they deal with an idealized world instead of only solving current problems (Shipley and Michela, 2006).

In practice, visioning proceeds from recognizing challenges to imagining an idealized future and further to formulating a course of actions to meet the desired goals (Shipley, 2002; Shipley and Michela, 2006; Van der Helm, 2009). Through the joint development of new ideas, visioning strives to influence first human thinking and then human behavior, which eventually can lead to transformations in the material reality (Van der Helm, 2009). However, similarly as CG in general, visioning can face difficulties and poor success (Uyesugi and Shipley, 2005; Shipley and Michela, 2006). Since the 1980s, visioning has been applied in different contexts (John et al., 2015; Columbia Basin Partnership (CBP), 2019; Madsen and Ulhøi, 2021) and is currently also associated with anticipatory learning and imagination to support sustainability transformation (Wiek and Iwaniec, 2014; Tschakert et al., 2016; Milkoreit, 2017).

In a WV, the watershed and its problems and opportunities are explored from different stakeholders’ perspectives, relevant knowledge is shared, and diverse values, interests and ambiguities are discussed. Based on this, an idealized, or desired future, and sector-specific objectives and measures for achieving them are agreed. The WVs involve public, private, and civil society actors across the geographical and administrative parts of the watersheds, relevant policy domains, and

different uses of the waters. Representatives of e.g. hydropower, agriculture, forestry, peat extraction, fisheries, tourism, and nature protection are invited to participate in the processes. A challenge for the WVs is that the expectation to take actions does not only concern the stakeholders involved in the collaborative process, but also other people, e.g., individual farmers and forest owners.

3.3. Six WVs

We analyzed six WVs: The River Iijoki WV (WV1), the Iisalmi Watercourse WV (2), the River Karjaanjoki WV (3), the River Siuntionjoki WV (4), the River Kokemäenjoki WV (5), and the River Oulujoki WV (6). These WVs were chosen for the analysis as they were completed by the time of this writing. The WVs differ from each other in many ways: by their content, actors, the intensity and length of the visioning process, spatial and temporal scale, and the level of specificity of the outputs. Table 1 summarizes details of the WV processes. A description of each is provided in Appendix 1.

The idea of WVs was developed in the Ministry of Agriculture and Forestry that in some cases suggested the regional governmental authority or other regional organization to launch a WV process. In some river basins, the WV was initiated locally by a non-governmental organization. All WVs covered several regionally relevant water-related themes (e.g. water quality, migratory fish, recreation). The themes determined the stakeholders to be invited to the collaborative process. The themes also structured the visioning processes e.g. by dividing participants into working groups, and by guiding objective setting and the identification of measures. As a rule, the participants represented their organizations in the process and no individual citizens were invited. In all WVs except WV3, stakeholder groups were widely represented. (Table 1)

The WVs were task-oriented projects established to build future visions for the river basins. No political decisions have been taken for institutionalizing the WVs as ongoing processes. The duration of the visioning processes was bound to project-based public and private funding varying from one to three years including different types of events. Necessary operational bodies and roles were established for organizing and performing the visioning tasks. Different methods were used to exchange ideas (e.g. roundtables) and to integrate and analyze data (e.g. multi-criteria decision analysis). Scientific knowledge and expertise was utilized to understand cause-effect relationships relevant for the watersheds. For example, in WV6, the visioning process was divided into four overlapping and iterative main phases (Marttunen et al., 2023):

- 1) Identification and structuration of objectives for different themes;
- 2) Examination of potential future changes in the operational environment (e.g. nutrient input in relation to alternative land use and climate scenarios);
- 3) Identification and evaluation of measures (using e.g. impact assessments);
- 4) Formation of the vision

Each WV process produced a vision document where the desired future was encapsulated into a vision statement, or a narrative as in WV5 (Table 1) (Gaia Consulting, 2017; Iijoen Otva, 2018a; Iijoen Otva, 2018b; Koski-Vähälä, 2017; Länsi-Uudenmaan vesi ja ympäristö ry (LUVY), 2015; Länsi-Uudenmaan vesi ja ympäristö ry (LUVY), 2018; Marttunen et al., 2023). The vision documents varied in their level of detail in defining sector/theme specific goals and measures. WV1, WV3, WV4 and WV6 specified responsible actors to implement or finance the measures; WV 3 and WV4 also included cost estimates. (Table 1)

Similarly, the activities following the collaborative visioning processes varied. WV1, WV3 and WV4 aimed to ensure the implementation of the vision through funding agreements with stakeholders (Iijoen Otva, 2018b; Micropolis, 2022; Länsi-Uudenmaan vesi ja ympäristö ry

Table 1
Details of the WV processes.

Watershed	River Iijoki basin (WV1)	Iisalmi Route (WV2)	River Karjaanjoki basin (WV3)	River Siuntionjoki basin (WV4)	River Kokemäenjoki basin (WV5)	Oulujoki water course (WV6)
Surface area	14 191 km ²	5583 km ²	2045,81 km ²	487 km ²	27 100 km ²	22 841,4 km ²
Initiation	Ministry of Agriculture and Forestry (MMM)	MMM	Water protection association	Water protection association	MMM	Regional governmental organization
Visioning time	2016–2018	2016–2017	2014–2015	2018	2017	2021–2023
Coordinator	Regional Council (a coalition of municipalities)	Water protection association	Water protection association	Water protection association	Three regional governmental organizations in turns	Research institute
Operational bodies	Executive board Working groups Facilitator	Project group Working groups Facilitator	Expert group Steering group	Expert group Steering group	Steering group Facilitator	Steering group Executive board Working groups Facilitator
Time scale	2030	Not specified	2030	2030	2050	2035
Themes	1) Interaction, communication 2) Migratory fish 3) Water quality and drainage 4) Attraction, economy 5) Recreation, well-being	1) Agriculture 2) Forestry 3) Fisheries 4) Industries 5) Tourism 6) Recreation 7) Communities 8) Education, research, culture, administration	1) Fish passages 2) Habitats 3) Migratory fish, freshwater pearl mussel 4) Flood protection 5) Water quality	1) Nutrient load 2) Ecological state and quality of waters 3) Migratory fish 4) Biodiversity 5) Recreation	1) Bio/circular economy 2) Recreation, welfare 3) Culture and living 4) Habitats 5) Household water management 6) Flood control 7) Economic life	1) State of waters, land use 2) Migratory fish, hydropower 3) Water level regulation, restoration, fisheries 4) Nature tourism, recreation 5) Livelihoods, municipalities
Participants	Broad participation from public and private sectors, and NGOs	60 organizations from public and private sectors, and NGOs	Municipalities, private companies	Municipalities, water owner associations, farmers, fisheries region, industries, nature tourism	Broad participation from public and private sectors, and NGOs	Broad participation from public and private sectors and NGOs
Process events (examples)	Preliminary study, nine executive committee meetings, several working group meetings, citizen forums, excursions	Three project group meetings, eight working group meetings, two workshops	Stakeholder events to discuss the project	Preliminary study, stakeholder meetings, webinars	Two stakeholder meetings	Preliminary study, ten executive committee meetings, approximately 20 working group meetings, webinars, excursions
Vision statement	“The River Iijoki is a fresh oxygen-rich aorta which delivers energy to the activities of the whole region”	“Wellbeing and prosperity from common clean water to the Upper Savonia”	“The River Karjaanjoki watershed is in good ecological status, the natural cycle of freshwater pearl mussel and salmonids is guaranteed and the recreational use potential of the waters has become more diversified”	“The River Siuntionjoki watershed is in good ecological status, the natural cycle of sea trout is guaranteed and the recreational use potential of the waters has become more diversified”.	“The watershed area including both surface and ground waters is jointly managed, and it creates sustainable prosperity and wellbeing to the area”	“Vitality, flow and recreation from the headwaters of Kainuu to the estuary of the River Oulujoki”.
Outputs	Vision, Action plan incl. 22 sets of time-scheduled (2018–2030) measures with responsible actors, Financing agreement (2019–23).	Vision incl. sector-specific objectives and measures.	Vision incl. goals, actions, cost estimates, and a financing plan (2016–21, 2022–29).	Vision incl. goals, actions, cost estimates, and a financing plan (2019–24).	Vision including goals, challenges, and unspecified actions.	Vision including sector specific objectives and action plans (65 time-scheduled measures with responsible actors).
Follow-up activities	River Iijoki agreement (2019–23) to finance implementation, Steering group established, Coordinator hired	Communication project: (Vesiviestillä vaikuttavuutta, 2018–2020), Steering group to promote implementation	Funding agreements (2016–2021), (2022–2029), Steering group to promote implementation	Funding agreement (2019–2024), Steering group to promote implementation	No significant follow-up activities	To be agreed

LUVY, 2022a; Länsi-Uudenmaan vesi ja ympäristö ry LUVY, 2022b). WV2 established a follow-up project focusing on communication. Also, WV5 aimed to share knowledge to raise awareness and appreciation of the waters. However, in autumn 2022, a lack of funding forced the steering group to cease the activities of the WV with a wish for all stakeholder groups to include relevant implementation actions in their work (Vesivisio, 2050). At the time of this writing, WV6 negotiated ways to deliver a follow-up project.

4. Methodology

4.1. Theory of change

A ToC represents the understanding of how and why an initiative or intervention works. It determines the intended results of the initiative, the sequence of phases, activities, or events leading to the results, and the assumptions about the conditions needed for the impact pathway to work as expected (Connell and Kubisch, 1998; Mayne, 2015). By its explicit account of the ‘whys’ and ‘hows’, a ToC supports the designing

of questions, methods, timing, and data collection for the evaluation of the initiative. Thus, the ToC helps to understand and manage an initiative through facilitating 1) an *ex-ante* evaluation of the proposed initiative by providing a guideline for the setting of objectives for each step of the impact pathway, for preparing a work plan, and for anticipating the potential effectiveness of the initiative, 2) *interim* evaluation to sum up what has happened in the previous steps, what is happening and whether the theory is being realized, and to identify critical issues for taking correcting actions or complementing the theory, and 3) *ex-post* evaluation to demonstrate the success of the initiative after its completion by attributing change to the activities and assessing the role of the initiative in the occurred change in relation to external factors, and learn lessons for the future (Weiss, 1995; Connell and Kubisch, 1998; Mayne, 2015).

We apply the approach suggested by Mayne (2015) and Mayne and Johnson (2015) to build a ToC for the WVs. The ToC includes a) the impact pathway from activities to outputs (immediate results), outcomes (achievements), and long-term impacts, and b) the causal assumptions on why and under what conditions the impact pathway (successfully) works (Mayne, 2015). Each assumption includes a risk of failure to the realization of the ToC, caused by uncertainty (Mayne, 2015). In the context of the WVs, the impact pathway includes the phases that are necessary for achieving the desired future and that the coordinator can consider when planning the project. The causal assumptions relate to uncertain events and conditions that the coordinator necessarily cannot anticipate and that pose risks to the successful realization of the WV process.

We distinguish the following steps in the ToC of the WVs:

- 1) Initiative and launch of the collaborative process. Assumptions relate to the events/conditions needed for the process to become operational.
- 2) Visioning: the collaborative process in which the desired future (vision) for the watershed is defined. Assumptions include the events/conditions needed for the collaborative process to perform successfully.
- 3) Vision: the direct output of collaboration. Assumptions relate to the events/conditions required for successful delivery of the vision.
- 4) Legitimacy: wide societal approval to be achieved for the vision. Assumptions relate to the events/conditions required for the output to gain legitimacy.
- 5) Capacity change: incremental or fundamental changes in stakeholders' knowledge, attitudes, skills, aspirations, and opportunities required for taking actions to contribute to the implementation of the vision. In a WV, capacity change implies that stakeholders adapt their prior knowledge and aims to those of the vision, which provides the opportunity for adopting new practices and skills. Capacity change takes place both during the collaborative process and as a consequence of communication after the process. Assumptions are the events/conditions required for the information communicated to result in changes in stakeholders' capacity to take actions.
- 6) Behavioral change or implementation implies that stakeholders proceed to taking actions. Assumptions relate to events/conditions required for the changes in the capacities of stakeholders to result in actual actions.
- 7) Direct benefits refer to improvements in the state of the watershed, which reflects positively in the community/society. Assumptions cover the events/conditions for the actions to be materialized into benefits.
- 8) 8–9) Well-being changes are mid- and long-term cumulative improvements in the watershed and in the community/society, where the assumptions refer to the events/conditions required for the benefits to lead to such improvements.

In visioning, the coordinator can directly control phases 1–3. What happens in phases 4–9 may be out of control, which also indicates

increasing uncertainty along with time. The ToC acknowledges feedback between the steps: improvements in the watershed caused by actions taken may motivate further implementation and promote capacity change. The ToC also addresses factors that are distinct from the initiative but may influence it, as well as the side-effects of the initiative.

4.2. Methods

We built a generic ToC for the WVs based on documents, participatory observation, and thematic interviews related to the six WVs presented in Section 3.3. First, documents and websites provided data of the coordination and other formalities of the WV processes, the stakeholders involved, the visions created, and the objectives and measures agreed.

Second, the process of WV6 was observed from its beginning in January 2021 to its end in February 2023. The first author took part in every meeting of the executive board and five working groups, several preparatory meetings organized to plan the aforementioned collaborative events, and four excursions to the watershed area. She documented the meetings by taking detailed notes. In addition, the internal email communication of WV6, the minutes of the meetings and other shared materials were used in the analysis. The coordinator of WV6 was invited to co-author this paper.

Third, 22 structured interviews were conducted. Purposeful sampling (Patton, 2002) and snowballing was used to identify interviewees who had been involved as key actors (coordinators, initiators, members of the executive boards, active participants) in WV1 (5 persons), WV2 (4), WV3/WV4 (5), and WV5 (7). In addition, a governmental official actively dealing with and participating in WVs was interviewed. The interviews were not specifically formulated for building a ToC, but more generally to understand how the WVs are assumed or intended to work and achieve their goals, and how they have worked. In the analysis, the applicability and usefulness of the ToC approach for the understanding and evaluation of the WVs was noticed, and the interview data was considered adequate for building a generic ToC. The questions covered the emergence, character, aims, process, content, implementation, added value, effectiveness, impacts, and challenges of the WVs, as well as the enabling and constraining factors. The interviews were documented on the spot by taking detailed notes and by audio-recording. In the analysis, the audio recordings were listened to again to check and complete the notes. Parts of the interviews were transcribed to clarify issues and to derive perceptions of the interviewees in their own words, to be translated from Finnish to English and included in the analysis as quotes. The interviewees are referred to by ID numbers 1–22.

For analysis, the notes, transcripts and parts of the WV documents were imported in the NVivo software for coding. In the first round, the material was coded to build an impact pathway from a WV collaboration to its desired outcomes. Participatory observation of WV6 formed an important backbone for understanding how a WV proceeds from initiative to outputs and how it is expected to produce outcomes and long-term impacts. The second coding round concerned the assumptions and risks behind each step of the impact pathway. From these, the key uncertainties underlying the possibilities of a WV to lead to the desired impacts were finally deduced.

5. Developing a ToC for the WVs

5.1. Initiative and launch

Fig. 1 depicts the phases of the ToC. As the first step, a public authority (WV1, WV2, WV5, WV6) or an NGO (WV3, WV4) suggests a WV process to be launched, as a response to recognized water-related problems and opportunities. A public organization (WV1, WV5, WV6) or an NGO (WV2, WV3, WV4) takes the lead, a consortium is built, a coordinator selected, and funding applied for. Stakeholders are invited to participate. Public organizations and private companies are also requested to fund the process. A WV governance regime including, e.g.,

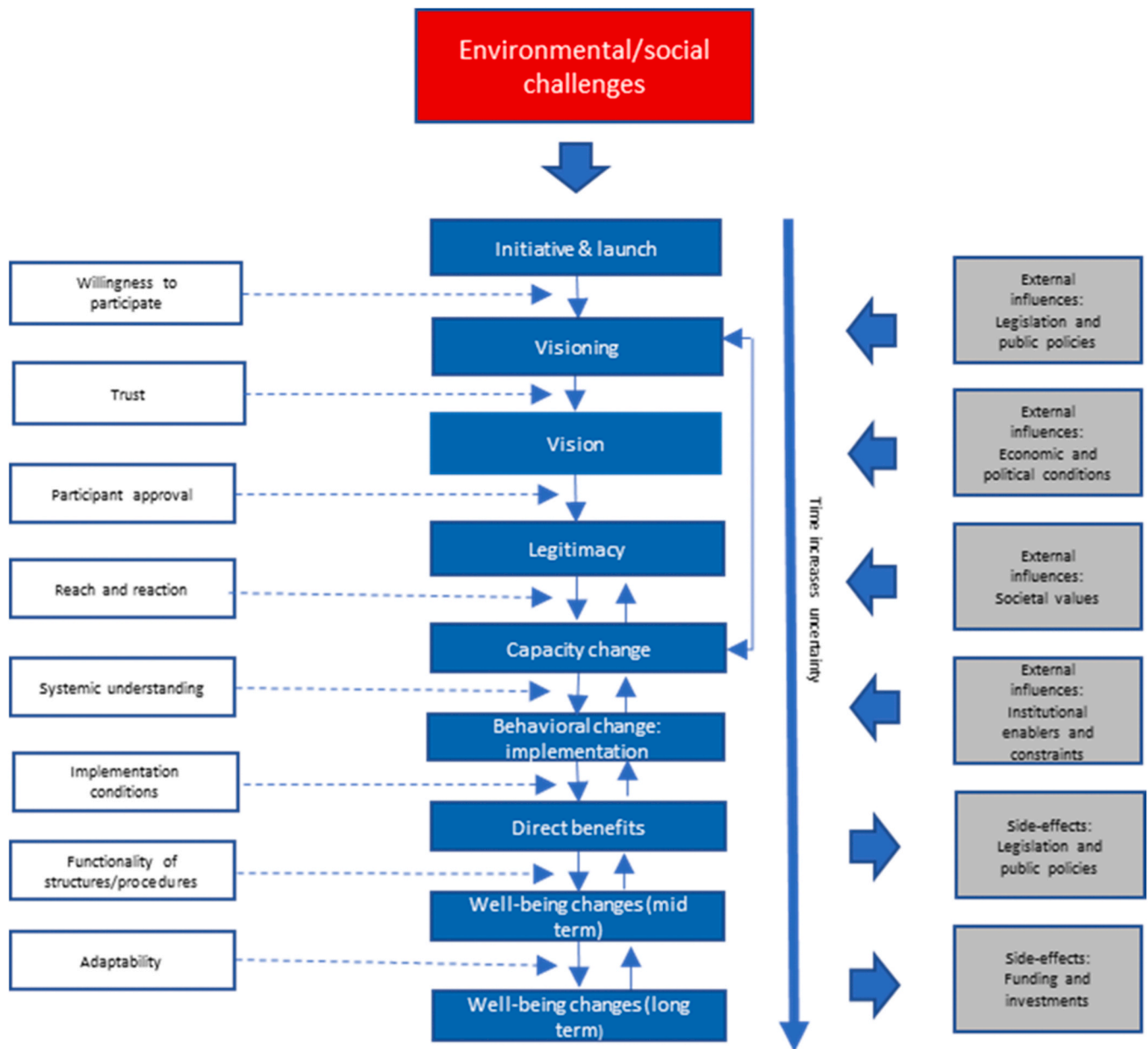


Fig. 1. Theory of change of the WVs. The impact pathway (boxes in the middle) includes the phases necessary for achieving the desired future. Top-down arrows between the boxes depict the expected progress. Bottom-up arrows indicate feedback. The arrow connecting visioning and capacity change suggests that for the participants of the collaborative project, capacity change may take place already during the collaborative process whereas for those not involved it starts later and requires legitimacy. The white boxes on the left indicate the key uncertainties that in the different phases of the impact pathway risk the achievement of the vision. The long thick arrow from top to down shows how uncertainty increases along with time. External factors influencing the WV process and potential side-effects of the WV are depicted on the right.

a steering group, a decision-making body, and thematic working groups are established. Process rules are agreed. A facilitator may be hired to ease the discussions (WV 1, WV2, WV5, WV6).

“We had the right actors, widely invited, some of them withdrew towards the end, but the most important ones were there till the end, nobody was excluded, and it was allowed to get involved anytime. That kind of work must be done broadly-based, to get a shared view of the direction.” (ID6).

Assumptions and risks

The WV process materializes if stakeholders are willing to engage and have sufficient resources for participation. Risks relate to missing key stakeholders or poor overall participation. In the River Kemijoki

basin, the suggested WV did not materialize as stakeholders refused to participate owing to deep-rooted conflicts originating from the loss of migratory fish stocks in the mid 1900s and their aftermaths. In WV1, an environmental NGO (eNGO) abstained from participating despite several invitations. ID11 assumed that the reason for this was their unwillingness to compromise on their goals, which they assumed participation would require.

“In the River Kemijoki the situation is similar to the River Iijoki but even more heated. There are many groups that pull in different directions and the vision-type thinking has not gotten any support...A general will is missing and a WV process could be useful but cannot be created forcefully.” (ID10)

Key uncertainty: Willingness to participate

5.2. Visioning

The WV process consists of interaction and communication (meetings, excursions, email, minutes, reports etc.) between the participants to produce and share different types of knowledge about the watershed and its use, and to deliberate values and interests (Fig. 1). Different perspectives are discussed in a holistic way to enhance shared understanding and to motivate the stakeholders to contribute to the implementation of the WV. The aim is to reach a consensus on the desired future for the watershed, to reconcile contradictory objectives, and to agree on ways to achieve the desired future.

“The good thing...is that different perspectives, problems, solutions and aims that can contradict with each other come out...everyone can talk about their own field, which despite the ostensible familiarity can actually be unfamiliar to the others...” (ID21).

Assumptions and risks

All interviewees emphasized that in a successful WV process the participants trust each other and the process. Trust enhances their capacity to listen to and approve the other participants' arguments and to respect their values, interests, and aims. Thus, trust is essential for achieving shared understanding. A successful WV process both maintains and generates trust, whereas lack of trust is a key risk for the process. Distrust can result from a party feeling that their views have been ignored due to e.g. imbalanced power relations or issues related to personal chemistry. In WV6 some of the eNGOs were dissatisfied with the way the needs of the hydropower companies were listened to and incorporated in the output of the WV, and the way experts were selected to give presentations. Some participants also eroded trust and the atmosphere by disregarding the joint rules by, e.g., blaming the process or the other parties of predetermined results, biased approaches and/or poor practices (WV6). In WV1, a partner weakened trust by promoting objectives relevant for the WV on its own, silently and independently of the collaborative effort.

“Distrust is deep and our dissenting opinion must be documented...” (Argument, WV6)

Key uncertainty: Trust

5.3. Vision

The main output is a jointly agreed vision for the watershed for a target year, covering different themes, written in the form of a vision document (Fig. 1). The vision incorporates more or less ambitious sector-specific aims and more or less detailed measures for achieving the aims, specified in the vision document itself (WV2, WV3, WV4, WV6) or in a separate action plan (WV1) (Gaia Consulting, 2017; Iijoen Otva, 2018a; Iijoen Otva, 2018b; Koski-Vähälä, 2017; Länsi-Uudenmaan vesi ja ympäristö ry (LUVY), 2015; Länsi-Uudenmaan vesi ja ympäristö ry (LUVY), 2018; Marttunen et al., 2023). Thus, the vision serves as a guiding tool for the water-related activities of the regional stakeholders and citizens for the future. Other outputs (www-pages, seminars, workshops, local meetings, blogs, excursions, school lessons, and other events and materials) support, contribute to, or disseminate the contents of the vision.

“The vision ... is a checklist ...each actor can check and realize sector-specific measures in their own activity” (ID2).

Assumptions and risks

The vision proceeds to wider societal evaluation if the participants first approve it as a valid output of a satisfying visioning process. This means that they recognize their perspectives included in the vision document. Risks relate to participants' rejection of the outputs. In WV6, all the involved four eNGOs announced that they did not approve the

outputs of the WV process.

“We have participated for two years in the...process. Our aim has been to safeguard the environmental values of the River Oulujoki watershed. To our disappointment, the result of the vision process has failed in advancing nature protection, migratory fish stocks and biodiversity. Therefore, we cannot stand behind the created vision.” (WV6, written statement)

Key uncertainty: Participant approval

5.4. Legitimacy

The WV is communicated to all stakeholders, including those not involved in the collaborative process, and citizens, and to the public administration using various strategies, media (internet pages, newspapers, blogs), social media, and events (local events, seminars) (Fig. 1). A follow-up project may be established (WV2) for communication. The aim is to gain legitimacy, that is, broad acceptance and support from the society for the WV. An important goal for communication is to enhance stakeholders' holistic understanding of the cause-effect relationships relevant for solving the identified problems, and the related values. Gaining legitimacy is a continuous process which increases as actions are taken and the WV shows effectiveness.

“The current world is so complex that a top-down command...does not work, instead, things must be done in collaboration... we must create the contacts, belief in doing...continuously motivate, encourage and provide the backbone, so that at some point they start to believe that this can get forward” (ID22).

Assumptions and risks

Achieving legitimacy requires that stakeholders are, first, reached. Once reached, they must understand the content of the WV and consider it as fair and credible, and relevant for the management of the waters, and moreover, compatible with their own values. Risks relate to failures in identifying or reaching stakeholders or gaining their confidence. Interviewees (ID2, ID11) highlighted the difficulty to identify representatives of sectors such as forestry and agriculture with high numbers of individuals and small entities. It may also be difficult to get the attention of these and other sectors not directly dealing with waters, if the actors do not acknowledge the relevance of the WV to them. Stakeholders' lack of understanding or belief, or disapproval of the outputs can decrease legitimacy. An eNGO criticized the vision projects for delaying sustainable and legal solutions to the predicament of flowing waters and migratory fish, on its internet-pages (Suomen Luonnonsuojeluliitto (SLL) (SLL), 2023). This type of statements, together with the dissenting views of the eNGOs in WV6 may decrease the legitimacy of WVs.

“It is in their own consideration how they will appraise it [the vision] ...whether it will exceed the threshold of importance” (ID4)

Key uncertainty: Reach and reactions

5.5. Capacity change

Neither the consensual basis of a WV nor legitimacy ensures that stakeholders commit to take actions to contribute to the implementation of the vision. In addition, capacity change is needed (Figure1). Capacity change implies that stakeholders adapt their aims and prior knowledge to those of the WV, consider the requirements of the WV against this change and view the WV as an opportunity for behavioral change. Thus, the WV facilitates the stakeholders to see the planned measures not as restrictions or burdens but as enablers that can lead to common good, and the potential short-term losses and concessions caused by the measures to themselves as “tolerable, reimbursable or replaceable” (ID11). ID16 pointed out that a vision can motivate stakeholders to consider the added value they can get from taking actions by themselves to improve

the status of waters, instead of just, e.g., blaming farmers for nutrient loads. This leads to the evolution and sharing of new ideas and knowledge of different practices and techniques, and to enhancing motivation to adopt them. Capacity change takes place as a result of interaction and communication both during and after the WV process.

“People understand the watershed and that it must be taken care of. They understand the cause-effect relationships.” (ID21)

Assumptions and risks

The outputs result in capacity change if stakeholders acknowledge their roles and responsibilities in the implementation of the vision, consider the required actions as appropriate, their implementation feasible, and the expected consequences commensurate with their own needs, interests and values. ID11 reminded that the short-term business goals of, e.g., an individual entrepreneur do not necessarily align with the long-term goals of the WV, which may hinder his/her capacity change. In addition, capacity change may require that stakeholders consider the measures useful for the achievement of the WV as a whole. Risks relate to stakeholders' difficulties in comprehending the systemic nature of the watershed problems, which prevents them from acknowledging their own role in the whole. Stakeholders may also be worried or skeptical about the side-effects of measures (WV3, WV4). In WV3, farmers were worried about the impacts of the restoration of trout streams on their livelihood.

“These...things are huge, conceptually wide...understanding the whole is perhaps the most challenging issue ... some specific thing, it must be understood that it promotes the whole.” (ID1).

Key uncertainty: Systemic understanding

5.6. Behavioral change: implementation

Stakeholders proceed to taking actions that contribute to the implementation of the WV (Fig. 1). These include non-recurring measures such as the building of fish passages, permanent changes in practices (e.g. in forestry), and/or the delivery of follow-up projects, as well as supporting or advisory activities, education, or actions to promote collaboration. The implementation of the vision takes place incrementally through multiple separate and subsequential actions and agreements.

“A vision consists of several pieces, projects...implemented by different consortia with different responsible persons” (ID8).

Assumptions and risks

The interviewees identified several conditions and related risks for the implementation of actions. First, capacity change can lead to actions provided that the actions are in accordance with the EU directives and the national law. ID14 explained how "directive species" (protected mussels) found in the River Kokemäenjoki area had delayed and complicated the implementation of flood control measures. Second, taking actions may require judicial permissions, granted in a reasonable time. In WV1, permission processes have slowed down the building of fish passages for years. Third, taking actions may also require positive political decisions. In WV6, a municipality stakeholder reminded about the need to take the political processes into account, e.g., if fish passages are planned in a culturally or environmentally valuable area. Fourth, taking actions may entail that all affected stakeholders approve them. ID2 reminded that in Finland, a minor group of forest owners can prevent e.g. the blocking of ditches for the restoration of peatlands in a forestry area. Fifth, the implementation of measures also requires economic resources. Ensuring funding for, e.g., several fishways needed for opening the migration route for salmonids can be challenging, as noticed by ID11. Sixth, implementation also implies that environmental (natural/built) conditions allow taking the action. In WV6, the possibilities of

building natural fish passages in different power plants was a topic much discussed. Seventh, the actions must be synchronized with other actions needed for solving the problem. In WV6, the need to combine the building of fishways with the restoration of spawning habitats was reminded. Poor understanding of the implementation conditions and failure to anticipate obstacles to implementation involves the risk of nullifying the execution of a measure. Lengthy legal, political, or administrative processes coupled with uncertain decisions and complaints may slow down or prevent implementation and reduce stakeholders' commitment to the implementation.

“Our organization is mentioned as a contributor to the restoration activities...but ...we can do it if there is an EU-project that finances it, or we conduct a small individual action that costs maximum 100 000 euros...if we are lucky and get resources and funding in the house, we will contribute” (WV6, argument)

Key uncertainty: implementation conditions

5.7. Direct benefits

The actions taken promote the achievement of GES, which creates a favorable environment for the development of water-related economic sectors (e.g. tourism) and recreation, and the related jobs, services, and products (Fig. 1). This further activates collaboration and networking within and between the administrative areas and stakeholder groups around the aim of improving the ecological state of the waters. The WV informs the RBMPs, as well as other relevant policy instruments. This increases the consistency of river basin management in the long term.

“The awareness of the inhabitants has improved significantly, it has created motivation, knowledge about techniques, created networks” (ID19).

Assumptions and risks

The actions taken can benefit the environment and/or the community given that they are functional in the existing environmental, societal, and economic context and produce expected results. For example, migratory fish must find their way to the fish passage upstream and be able to spawn, and their offspring must migrate downstream to their feeding grounds (WV1, WV6). In addition, the new procedures or structures must be found cost-effective. Any new procedure, technical structure or new business involves the risk of malfunction.

“The problem is that it [a fish passage] will not necessarily produce the desired result.” (ID10)

Key uncertainty: functionality of new procedures or structures

5.8. Well-being changes (mid-term)

The actions improve the state of the waters. GES is achieved and the environmental, economic and social sustainability of the river basin has improved (Länsi-Uudenmaan vesi ja ympäristö ry LUVY, 2015; Länsi-Uudenmaan vesi ja ympäristö ry LUVY, 2018; Koski-Vähälä 2017; Gaia Consulting, 2017; Iijoen Otva 2018a) (Fig. 1). The watershed is a source of mental and physical wellbeing for people. The area is economically viable and attracts new inhabitants. Sense of community and collective responsibility over the waters are high. The management of the waters is spatially and temporally consistent.

“The starting point of a vision is non-political, and its long-term horizon brings consistency to the water protection and management while the political decision makers and decisions change.” (ID14)

Assumptions and risks

The direct benefits lead to long-term cumulative improvements in

sustainability given that the WV adapts to changing circumstances, new societal demands and evolving knowledge or technologies. Thus, besides that the WV represents continuity and consistency, it must be updatable and cyclical. Adaptability includes stakeholders' persisting commitment in the face of change and adversities, and slow materialization of the expected benefits. Risks relate to poor adaptability of the WV to changing conditions. ID5 highlighted the importance of a lasting "memory trace" for the implementation of a WV, implying that keeping the same people involved in the process enhances consistency and implementation success.

"It has this guiding consistent line, but in addition, a vision should allow updates if there are surprises over decades...Think about a strategy of an enterprise, if you make a strategy for 2050, it fails." (ID14)

Key uncertainty: Adaptability

5.9. Well-being changes (long-term)

A consistent WV adaptable to external changes can bring about well-being also in the long term (Fig. 1). Anticipating and monitoring changes, and evaluating the WV against its own goals and against the goals of sustainability is important.

5.10. External factors

The interviewees identified external factors that can enable or constrain the realization of a WV (Fig. 1). Favorable legislation (e.g. the WFD), high-level strategies (e.g. the National Fish Passage strategy of Finland) and political decisions were recognized as important supporting factors. Legislation and political decisions were also seen as potential constraints for a WV. The prevailing international, national, and/or regional economic and political situation was considered important for WVs as it can influence not only funding and incentives but also the outputs of the vision processes.

"Considering the situation in the electricity market [caused by the Russian attack to Ukraine in 2022] it is realistic to believe that changes are not forthcoming in the near future. Therefore we... cannot suggest restrictions in the short time water level regulation in the...vision" (WV6, argument).

Societal and cultural values were highlighted as key factors shaping political decisions as well as stances on water management. Thus, values also influence the way the WVs will evolve as an approach to water management. In addition, the interviewees considered that institutional issues such as the strict and complex funding terms and conditions of the EU may complicate the delivery of projects.

"This government as compared to the previous ones, invests much money in environmental and watershed issues, so I think this is the momentum to promote these issues. But it can change, the name of the game can be totally different after five or ten years...new types of valuations, decision makers and fundings" (ID 1).

5.11. Side-effects of a WV

Not only is WV a management approach in itself, but it can also, intentionally or unintentionally, inform government-led policy instruments, such as the RBMPs, regional strategic plans, regional land use plans, and other relevant policy instruments (Fig. 1). A few interviewees considered that a vision could even include recommendations for the legislator if inadequacies are identified in the way the law, tax policy, or agricultural subsidies take the environment into account. For example, the decrees of the Finnish law regarding the requirements for hydro-power companies to compensate the fishery losses were generally considered outdated in WV6. Furthermore, the interviewees saw that a

vision can induce funding and investments for new environmental projects, and guide funding organizations or development programs to consider the water perspective.

"Now that we are making the regional plan, the representatives of the regional council...know much more of the watershed issues than before the vision" (ID 22).

6. Developing a ToC-based evaluation tool for the WVs

We used the key uncertainties identified in the ToC to develop an evaluation matrix for the WVs (Table 2). The matrix includes guidelines and questions for an *ex-ante*, *interim*, and *ex-post* evaluation of a WV covering every step of the impact pathway. *Ex-ante*, the matrix can be used to assist the objective setting and planning of the WV, and to assess the potential effectiveness of the plan. *Interim* evaluation can facilitate considering whether an ongoing project is on the right track and if correcting actions are needed. *Ex-post* evaluation focuses on the change occurred as a result of the project.

7. Discussion

7.1. What does the ToC tell about the potentials and challenges of WVs in river basin management?

WVs, a new collaborative approach for river basin management has emerged in Finland. We built a ToC for the approach by structuring a WV into nine causal phases to capture the expected change, including assumptions on the events or conditions necessary for the impact pathway to work. The assumptions include risks associated with the causal links. The risks enabled us to infer the key uncertainties underlying the impact pathway.

The ToC is based on features shared by six different WVs. Representing the backbone of a typical WV process the ToC provides answers to questions concerning the nature, potentials and challenges of the WV approach and a basis for the evaluation and management of individual WVs. Thus, it guides the government, funders, and the society in assessing the merits of the approach, and stakeholders to consider their participation.

The ToC depicts a WV as a collaborative process that through shared understanding of facts and values agrees on the desired future for the watershed. The main output is a vision including sector-specific aims, and measures for achieving the aims. The output is communicated to the society to gain legitimacy and to induce capacity change, that is, preparedness of stakeholders to take actions to implement the WV. Actions taken can lead to environmental and socio-economic benefits which can further improve the mid- and long-term sustainability and well-being of the area.

The ToC shows how each phase of the impact pathway involves uncertainties that risk the success of the vision. It also illustrates how uncertainty increases along with time. The study identified the most prominent uncertainties underlying the different phases of the WV. These related to:

- *Stakeholders' willingness to participate in the collaborative project.* Many reasons can lie behind stakeholders' refusal or hesitation to get involved. The analysis pointed at deep-rooted disagreements and the perception that a consensus-oriented process works against the promotion of certain interests (WV1). If collaboration is not expected to produce meaningful results, the incentive to participate may be low, especially given anticipated power and resource imbalance (Ansell and Gash, 2008). All stakeholders may not believe in the power of collaboration, overall, to be "the answer" to difficult problems (McCloskey, 2000).
- *Trust between actors.* Distrust was the starting point especially in WV1 and WV6 dealing with former famous salmon rivers, and in WV6 it

Table 2
An evaluation matrix for WVs.

Impact pathway / Key uncertainty	Ex-ante -evaluation	Interim evaluation	Ex-post-evaluation
Initiative, launch / Willingness to participate	<p>Guidelines for setting objectives: Define stakeholder groups (and number of participants per group) to be involved.</p> <p>Anticipate potential effectiveness of the plan: Consider the likelihood of each of these groups to participate. Are there issues that may decrease the willingness or possibility of some groups to participate?</p> <p>Work plan: Consider how the participation of these groups could be ensured.</p>	<p>What is happening? Are all (key) stakeholders involved?</p> <p>Are there critical issues suggesting correcting actions or complementing the theory? Consider ways to improve communication to get missing people involved. Should any other uncertainties underlying participation be included in the theory?</p>	<p>What kind of change has occurred? Did all relevant stakeholders participate? Which group did not, and why? Did some stakeholders leave before the end of the process? Why?</p> <p>What are the lessons for the future? Consider ways to ensure stakeholder involvement in a WV process.</p>
Visioning / Trust	<p>Guideline for setting objectives: Define objectives /criteria for trust.</p> <p>Anticipate potential effectiveness of the plan: Consider if (dis) trust exists between stakeholders? If trust is poor, is it likely that collaboration could improve it?</p> <p>Work plan: Consider ways to increase/ ensure trust.</p>	<p>What has happened in the previous steps? Did the initiative lead to a WV process involving all / key stakeholders?</p> <p>What is happening? Do the participants trust each other? Can the process increase trust?</p> <p>Is the theory being realized? Is trust a key uncertainty underlying the visioning process? Are there other uncertainties to be addressed?</p> <p>Are there critical issues suggesting correcting actions or complementing the theory? Consider ways to increase trust. Should any other uncertainties underlying the visioning process be included in the theory?</p>	<p>What kind of change has occurred? Has trust increased between stakeholders? If not, why? Did trust support consensus-building? If not, why?</p> <p>What is the role of the WV in the change? Was there distrust between stakeholders before the process? What is the role of the process in improving trust?</p> <p>What are the lessons for the future? Consider what were / could have been ways to improve trust.</p>
Vision / Participant approval	<p>Guideline for setting objectives: Define objectives/criteria for</p>	<p>What has happened in the previous steps? Was the visioning process successful? Did it</p>	<p>What kind of change has occurred? Did all participants approve the output, i.e. the</p>

Table 2 (continued)

Impact pathway / Key uncertainty	Ex-ante -evaluation	Interim evaluation	Ex-post-evaluation
Legitimacy / Reach and reaction	<p>participant approval of the output.</p> <p>Anticipate potential effects: Consider how likely it is for stakeholder group x to approve consensus-based outputs?</p> <p>Work plan: Consider ways to ensure participants' approval.</p>	<p>achieve a trusted atmosphere / consensus?</p> <p>What is happening? Will all participants approve the output? If not, why?</p> <p>Is the theory being realized? Is participant approval a key uncertainty underlying the delivery of successful outputs? Are there other uncertainties to be addressed?</p> <p>Are there critical issues suggesting correcting actions or complementing the theory? Consider if the output must/can be revised to ensure the approval of all involved. Should any other uncertainties underlying participant approval be included in the theory?</p> <p>What has happened in the previous steps? Was the WV approved by all participants?</p> <p>What is happening? Can all stakeholders be reached? If not, why? How are their reactions?</p> <p>Is the theory being realized? Are reach and reaction key uncertainties underlying legitimacy? Are there other key uncertainties to be addressed?</p> <p>Are there critical issues suggesting correcting actions or complementing the theory? Consider if reaching stakeholders and the potential of their positive</p>	<p>vision? If not, why?</p> <p>What are the lessons for the future? Consider ways to ensure that all participants approve the outputs.</p> <p>What kind of change has occurred? Did the WV achieve legitimacy?</p> <p>What are the lessons for the future? Consider ways to ensure that a WV achieves legitimacy.</p>

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Table 2 (continued)

Impact pathway / Key uncertainty	Ex-ante -evaluation	Interim evaluation	Ex-post-evaluation
Capacity change / Systemic understanding	<p>Guideline for setting objectives: Define objectives/ criteria for systemic understanding.</p> <p>Anticipate potential effectiveness: Consider how likely it is for stakeholders to learn to think systemically. How likely this leads to capacity change? What else is needed?</p> <p>Work plan: Consider ways to enhance/ ensure systemic understanding by all stakeholders.</p>	<p>reactions could be improved to ensure legitimacy. Should any other uncertainties underlying legitimacy be included in the theory?</p> <p>What has happened in the previous steps? Did the WV achieve legitimacy?</p> <p>What is happening? Do participants understand the causal relationships (relevant for themselves) underlying the watershed problems? If not, why?</p> <p>Is the theory being realized? Is systemic understanding a key uncertainty underlying capacity change? Are there other key uncertainties to be addressed ?</p> <p>Are there critical issues suggesting correcting actions or complementing the theory? Consider how to improve systemic understanding. Should any other uncertainties underlying capacity change be included in the theory?</p>	<p>What kind of change has occurred? Has capacity change taken place? Are stakeholders capable of understanding cause-effect relationships underlying the watershed problems? Do they acknowledge their own role in the whole?</p> <p>What is the role of the WV in enhancing systemic understanding and in inducing capacity change? Are there other factors inducing capacity change?</p> <p>What are the lessons for the future? Consider ways to enhance systemic understanding and capacity change.</p>
Behavioral change: Implementation / Implementation conditions	<p>Guideline for setting objectives: Define objectives/ criteria to understand the conditions of implementation and their potential effect on the implementation of actions.</p> <p>Anticipation of potential effectiveness of the plan: Consider if there are factors or conditions that can prevent the implementation</p>	<p>What has happened in the previous steps? Has/is capacity change taking place?</p> <p>What is happening? Are the conditions for behavioral change / the implementation of measures favorable? What issues hamper implementation?</p> <p>Is the theory being realized? Are legal, environmental, economic, and social/societal conditions key</p>	<p>What kind of change has occurred? Have stakeholders been able to take actions? Have legal, economic, environmental, or social/societal conditions prevented actions?</p> <p>What is the role of the WV in the change? Have the actions been taken as a consequence of the WV? Have there been other reasons, motivations, or incentives for</p>

Table 2 (continued)

Impact pathway / Key uncertainty	Ex-ante -evaluation	Interim evaluation	Ex-post-evaluation
Direct benefits / Functionality of structures, procedures	<p>of action x.</p> <p>Work plan: Consider ways to analyze the implementation conditions beforehand.</p>	<p>uncertainties underlying the implementation of measures? Are there other key uncertainties to be addressed ?</p> <p>Are there critical issues suggesting correcting actions or complementing the theory? Consider if correcting actions could be taken to facilitate the implementation of measures. Should any other uncertainties underlying implementation be included in the theory?</p> <p>What has happened in the previous steps? Have stakeholders taken / are they taking actions as expected?</p> <p>What is happening? Are the new structures / procedures working as expected? If not, why?</p> <p>Is the theory being realized? Is functionality of structures/ procedures a key uncertainty underlying the benefits to be achieved from the WV? Are there other uncertainties to be addressed?</p> <p>Are there critical issues suggesting correcting actions or complementing the theory? Consider if correcting actions could be taken to enhance the functionality of the new procedures/ structures. Should any other uncertainties be included in the theory?</p>	<p>taking actions?</p> <p>What are the lessons for the future? Understanding the conditions that enabled/ constrained the implementation of actions.</p> <p>What kind of change has occurred? Given that the stakeholders have taken actions, do the new structures or procedures work as expected?</p> <p>What is the role of the WV in the change? Are there other factors or conditions that have contributed to or caused the change?</p> <p>What are the lessons for the future? Consider ways to enhance or ensure the functionality of new structures/ procedures.</p>
Well-being changes (mid-term) / Adaptability	<p>Guideline for setting objectives: Define objectives/</p>	<p>What has happened in the previous steps? Are the new structures/</p>	<p>What kind of change has occurred? Have well-being changes occurred</p>

(continued on next page)

Table 2 (continued)

Impact pathway / Key uncertainty	Ex-ante -evaluation	Interim evaluation	Ex-post-evaluation
Well-being changes (long-term)	<p>criteria for the relevance/ adaptability of the WV in changing conditions. Anticipate potential effectiveness: Consider how likely the WV maintains relevance/can adapt to changing conditions. Work plan: Consider ways to ensure adaptability.</p>	<p>procedures working as expected? Do they induce benefits? What is happening? Is the WV still relevant? If not, why? Is the WV adaptable to changing conditions? If not, why? Is the theory being realized? Is adaptability a key uncertainty underlying well-being changes? Are there other key uncertainties to be addressed? Are there critical issues suggesting correcting actions or complementing the theory? Consider if correcting actions could be taken to improve the relevance / adaptability of the WV. Should any other uncertainties underlying well-being changes be included in the theory?</p>	<p>as expected? Is the WV still relevant/ adaptable to changing conditions? What is the role of the WV in the change? Are there other factors that have contributed to or caused the change? What are the lessons for the future? Consider ways to ensure the expected change by addressing the relevance/ adaptability of the WV.</p>
	<p>Guideline for setting objectives: Define objectives/ criteria for well-being changes.</p>	<p>What has happened in the previous steps? Has the WV led to mid-term well-being changes? What is happening? Is the WV bringing / can it bring well-being changes in the long term? If not, why? Is the theory being realized? Are there critical issues suggesting correcting actions for the future and/or complementing the theory?</p>	<p>What kind of change has occurred? Have enduring well-being changes taken place? What is the role of the WV in the change? Are there other causal factors/ conditions influencing the enduring changes? What are the lessons for the future? Consider how to deliver a successful adaptable WV process.</p>

continued throughout the process. However, achieving consensus requires trust (see e.g. Katagiri et al., 2013). Distrust can relate to e.g. historical conflicts or power asymmetry, and implies a need for trust building from the outset of the process (Ansell and Gash, 2008; Emerson et al., 2012; Ran and Qi, 2019).

- **Participant approval of the outputs.** The study indicates that the participants' approval of the outputs of the collaborative process cannot be taken for granted despite an apparent consensus achieved. For some parties, consensus may merely represent the lowest common denominator, an easy way out of the process, or an unbalanced

compromise (McCloskey, 2000). In WV6, the eNGOs required their dissenting statement to be included in the report (Marttunen et al., 2023).

- **Reach and reactions of the wider society towards the outputs.** The WV gains societal legitimacy provided that it reaches out to all or at least the key stakeholders, including those not involved in the collaborative process but required to take actions, and that their reactions are positive. Stakeholders' perception of their perspective missing from the outputs (the vision) or their distrust of the organizations involved in the process may be reasons for not approving the vision (Gray, 1989; Ansell and Gash, 2008; Lee and Esteve, 2023). Some stakeholders may simply disregard the WV as an approach to water management. However, legitimacy can be gained in the course of time if actions are taken and stakeholders' confidence in the effectiveness of the WV increases.
- **Stakeholders' systemic understanding of causes and effects.** Systemic understanding of the watershed problems is a precondition for the stakeholders to proceed to taking actions that contribute to the realization of the WV. Systemic thinking helps the actors to see their own role in the whole and enhances their readiness to solve the problems (Kim, 1999; Arnold and Weid, 2015; LaMere et al., 2020; Voulvoulis et al., 2022).
- **Implementation conditions of actions and measures.** A variety of conditioning factors can risk the actual realization of actions despite the stakeholders' willingness to act. Proactive analyses of the environmental, societal and economic conditions in which actions are to be taken are important for successful implementation.
- **Functionality of the implemented practices or structures.** The functionality of the new practices or structures in their environmental context or their cost-effectiveness is not self-evident. Even the societal acceptability or legality of some measures may be ambiguous. This implies a need for context-specific proactive analyses to better understand how the novelties may work and what factors may affect it.
- **Adaptability of the WV to changing conditions.** The capability of the WV to adapt to changing conditions in the long term is important yet uncertain. Developing adaptive management processes including monitoring, evaluation, and continuous learning-by-doing (Armitage et al., 2009), and revising the WV accordingly would facilitate keeping the objectives, targets, and measures updated in the long term, yet this might be difficult to realize. Still, understanding the external factors that may influence the WV in different phases is crucial: the use of scenarios has been suggested to facilitate the testing of the robustness of a vision in the face of an uncertain future (O'Brien and Meadows, 2001).

A variety of legal, political, societal, and institutional factors external to the WV affects the possibilities to realize a WV successfully. Also, the WV can have side-effects on issues external to the process.

Based on the key uncertainties identified in each phase of the ToC, we compiled a matrix for an ex-ante, interim, and ex-post evaluation of a WV. In the planning phase, the matrix provides guidelines for setting objectives or criteria for managing the uncertainties, anticipating the potential effectiveness of the plan, and considering ways to decrease risks of failure. In interim evaluation the matrix instructs how to assess the success of the process so far, the prevailing situation, the uncertainties, and critical issues. Ex post, the matrix guides to reflect the change that has taken place, the role of the WV in that change, and lessons for the future. As the matrix covers all phases of the WV and its expected impacts, it facilitates the linking of change to the WV.

Initiating a CG process, ensuring productive collaboration and gaining societal legitimacy for the outputs require competent leadership (Ansell and Gash, 2008; Emerson et al., 2012; Ulibarri et al., 2020). The outcome-oriented ToC suggests extending leadership or coordination from the collaborative process to the post-process time, to enhance the control of the events and conditions affecting the possibility to achieve the goals, and thus to decrease the uncertainty related to achieving the

vision.

7.2. Usefulness of ToC for CG

The ToC built here makes tangible the main steps required for achieving the long-term goals of a collaborative governance project, specifically focusing on the changes after the collaborative work has ended. This post-process time often remains unaddressed in the analyses of CG that mostly focus on the performance of the collaborative process, as such. The ToC provides a tool for envisioning how a successful WV process unfolds through first-, second-, and third order effects (Innes and Booher, 1999; Bryson et al., 2006), for analyzing each phase of the impact pathway separately and in relation to the previous and next phases, and for identifying the changes expected to take place after each phase.

In particular, the ToC facilitates identifying the key uncertainties that in the different phases of the impact pathway risk the achievement of the long term goals. The evaluation matrix compiled based on the uncertainties guides to explicitly address the uncertainties to enhance the success of the impact pathway. If not proactively managed, the uncertainties can also dilute the efforts already done. The matrix facilitates an *ex-ante* and *interim* evaluation of a CG process, but in addition, it provides a tool for linking changes to the collaborative project *ex-post*, a task considered challenging (Conley and Moote, 2003; Koontz and Thomas, 2006; Clement et al., 2020).

ToCs have been criticized for being simplistic, linear, and generic (van Tulder and Keen, 2018; Lam, 2020). Indeed, the ToC built in this study is a simple representation of a complex process including only the most obvious phases and the most prominent uncertainties underlying the impact pathway. Still, we believe that the logical story that a simple ToC presents can be more approachable and comprehensible, and thus more applicable for a CG and its evaluation than a complex one would be. The ToC looks linear, but it explicitly addresses uncertainties that in each phase risk the impact pathway, and acknowledges feedback between the phases (Mayne, 2015).

The generic ToC built here *per se* can guide individual CG processes towards their long term goals. It can also be extended by case-specific details or sub-theories identified in different phases of an individual CG process. Corresponding to the ToC, the evaluation matrix advises to address context-specific factors and uncertainties, and to adapt the matrix accordingly. Thus, the ToC enables unpacking the complexity underlying the impact pathway. Articulating a case-specific ToC in collaboration with the participants of a CG project could increase the joint understanding of the impact pathway and build collective capacity and commitment to the process (Sullivan et al., 2002; Lam, 2020). This way, the ToC could also serve as a boundary object thus bridging the gap between the groups involved (Star and Griesemer, 1989; Caccamo et al., 2023).

Change is the requirement for CG to achieve its long-term aims. Applying an outcome-oriented ToC implies the adoption of a forward-looking approach for CG to support systematic deliberation of change and the continuity of the process phase-by-phase in the changing environmental and societal context. This could enhance the success of CG in achieving the desired long-term goals. Indeed, similar to visioning (Milkoreit, 2017; Tschakert et al., 2016; Wiek and Iwaniec, 2014), ToCs are considered to have the potential to support projects aimed at advancing sustainability transformation (Oberlack et al., 2019). The ToC built in this study can be used as an inspiring model for the development of ToCs for other CG arrangements.

7.3. Limitations of the study

The generic ToC was built as a scientific desk work based on the analyst's interpretation of the empirical material collected from several WVs at the time when the WV approach was relatively new. This ToC calls for empirical testing and collaborative elaboration in the course of

time as the WV approach evolves.

The ToC focused on the output, outcomes, and impacts of WVs, whereas the critical factors underlying the collaborative project and the process that produced the vision were encapsulated to 'willingness to participate' and 'trust'. While the empirical data indicated these to be the most important uncertainties, we acknowledge that also several other issues affect the success of collaboration. Linking the outcome-oriented ToC to a ToC describing the collaboration would further deepen the understanding of the success possibilities of CG projects, such as the WVs.

8. Conclusion

ToC is a useful tool for linking changes to CG and for improving the success of CG. It facilitates structuring a collaborative process and its expected long-term changes into sequential phases and identifying uncertainties that in each phase risk the impact pathway. We developed a generic ToC and an evaluation matrix for the WVs, based on identified uncertainties in each phase of the impact pathway. Addressing the uncertainties could enhance the success of individual WV processes. This could further enhance the value of WVs for river basin management. Case-specific detailed analyses of the different phases of the impact pathway would address the complexity involved in the long-term process and help identify the enablers of a successful process and avoid pitfalls.

Author statement

Päivi Haapasaari: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Writing – original draft, Writing – review and editing, Visualization

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CRedit authorship contribution statement

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

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Appendix A. Supporting information

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Data availability

The data that has been used is confidential.

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