GOVAQUA Conceptual Framework

GOVAQUA Deliverable 1.1

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Governance innovations for a transition to sustainable and equitable water use in Europe.

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1. Introduction

Welcome to the GOVAQUA Conceptual Framework! We draw together empirical lessons of the project to understand the broader governance transitions required to move towards more sustainable and equitable water use in Europe, and to create a foundation for conceptualising sustainability transition in water governance, an academic exercise missing to date.

To achieve this task, we build on water governance literature as well as sustainability transition frameworks. The document consists of an introduction to the main concepts, a review of existing normative transition goals, more specific conceptual perspectives as well as a view on the application of the framework by using GOVAQUA methods for meta-analysis and a glossary to guide reading and use. The conceptual framework is a living document that will be updated during the project term based on the empirical work.

1.1 The GOVAQUA focus

The overall goal of GOVAQUA is to identify, assess, develop, and validate innovative water governance approaches to support and accelerate a transition towards sustainable and equitable water use in Europe. However, the sustainability change in water governance does not follow any linear transition pathways, as there are multiple overlapping challenges that blur the view. First, the diverse water uses, and multiple users pose a challenge for equitable and just water governance arrangements, as the resource is connected to multiple areas of social life and economic sectors. Second, water uses are embedded in diverse spatial contexts – thus requiring close attention to the specific socio-technical and social-ecological systems, such as the ways water-intensive production systems are organised or the characteristics of river basin management and governance. Third, the socio-ecological complexities of hydrological cycle including return flows, groundwater-surface interactions, quality, uncertainty of resources provide challenge for environmental governance. Finally, the diverse crises and challenges regarding water are amplified due to environmental and climate change (including non-linear changes and tipping points), contributing to the urgency of action and emphasizing the temporal aspect of transitions. These multi-level and multi-sectoral aspects of water governance require an integrated approach across levels and sectors.

In water governance, the challenges related to equitability are connected to issues of environmental sustainability. Equity connects ethical principles of distributional justice and procedural justice to concrete rules and processes of water governance (Perreault, 2014). On the one hand, issues related to water resource allocation and quantity of water are persistent on different governance levels (from local to global) as well as between competing water demands (such as agriculture, industry, and households). On the other hand, poor water quality can create a disproportionate burden of water pollution and degradation to local communities or societal groups. Both issues are exacerbated by climate change and often hitting the most vulnerable communities the hardest. On the global scale, vulnerability and exposure to risks and hazards is highly unequitable (Harris et al., 2017). In terms of governance transitions, equitability challenges are linked to processes of decision-making and demands of more inclusive governance.

Keeping this in mind, there is an urgent need for a just sustainability transition in water governance (Gleick, 2018). Water governance cuts across sustainability targets throughout sectors and actors (Taka et

al., 2021), and is central to sustainability transitions more generally. However, attention to water governance has been limited in sustainability transition studies. Few studies exist on water governance transitions (cf. Pahl-Wostl et al., 2010; Huitema and Meijerink, 2010; Frantzeskaki et al., 2016), and they are often limited to water management in urban context issues, such as stormwater and greywater management, flood governance, port development or water utilities (Brown et al., 2009; Ferguson et al., 2013; De Haan et al., 2015). These knowledge gaps regarding sustainability transitions in water governance can be attributed, on the one hand, to the fact that the water sector is notorious for being resistant to change because it combines ecological dynamics with socio-technical transitions, undermining the possibility of a system-level transition (Molle et al., 2009; Fuenfschilling and Truffer, 2016). On the other hand, sustainability transitions scholarship has mostly focused on the technological dimension, leaving several knowledge gaps regarding the social (e.g., justice, the role of intermediaries), political (e.g., horizontal and vertical integration, financial reforms) and ecological (e.g., environmental impacts) dimensions (Røpke, 2016; Geels, 2019; Mintrom and Rogers, 2022).

Water governance calls for a comprehensive approach to conceptualising its transition by taking into account the social, ecological, political, economic and technological dimensions. Despite having a shared objective of a more sustainable and equitable water future, water governance and transition governance literatures are not readily combinable. The drift emerges from water governance's focus on specific water use contexts, while transition governance often looks for system level changes. GOVAQUA research can contribute to bridging the gap and providing conceptual foundations as well as empirical evidence for the required transition.

1.2 Innovations in technology, practice, and governance

Sustainability transition research has its focus on governance innovations by exploring new approaches to governing society to promote different sustainability goals across the scales (for review, see Köhler et al., 2019). For example, the multi-level perspective aims to identify means of transforming existing unsustainable regimes by enabling dedicated interventions and scaling of sustainable innovations from diverse niches (Geels, 2004; 2019). More importantly, the focus on policy innovations explicating how dedicated public policy designs can accelerate and support the transition in complex governance contexts (Kern et al., 2019; Rogge et al., 2019; Kivimaa & Kern, 2016). More recently, the policy innovation literature has led to operationalisation of policy interventions through typology of policy interventions that locate multiple types of innovations to the dynamics of systemic change (Kanger, 2020).

The GOVAQUA project approaches governance innovations as instruments to enable and institutionalise sustainable and equitable water governance, thus opening societal transition pathways. Innovation is broadly understood here as "the use of new ideas, products or methods where they have not been used before", and it can refer to both the process of innovating and the product of that process (EUROSTAT, n.d.). In sustainability transition studies, innovation refers to a "radical transformation towards a sustainable society, as a response to a number of persistent problems confronting contemporary modern societies" (Grin et al., 2010, p. 1). Innovations in water governance have "the capacity to radically alter existing approaches in light of new circumstances" (Huitema & Meijerink, 2017, p. 84).

Therefore, innovation is not only about products and artefacts of innovation (whether technologies, practices, or jurisdictions), but also the act of innovating (Jordan & Huitema 2014). The specific acts are tied to enabling a contextual fit related to specific solutions – whether technological, institutional, or practice-related – which requires generation and synthesising of real-world knowledge. Our focus is on innovations that aim to increase sustainable and equitable water use in a given social and political context. We understand sustainable water use as "the use of water that supports the ability of human society to endure and flourish into the indefinite future without undermining the integrity of the hydrological cycle or the

ecological systems that depend on it" (Gleick, 2000, p. 131). Equitable water use refers to a fair water allocation from a societal perspective, going beyond environmental sustainability and resource efficiency (Hoekstra, 2014). Moreover, in GOVAQUA the potential of innovations to accelerate systemic change is approached through Living Labs and selected case studies focused particularly on legal and regulatory, participatory and collaborative, economic and financial, and digital solutions.

The guiding question for the GOVAQUA conceptual framework is, **how can governance innovations support the transition to sustainable and equitable water use in Europe on the catchment scale**? The framework is developed to provide tools to evaluate the stages and (enabling and obstructing) conditions of the transition by iterating the diversity of transition pathways in water governance.

The conceptual framework is at the core of GOVAQUA's conceptualisation, framing and synthesis efforts. Together with three methodological approaches – analysis of innovative water governance instruments, systemic comparisons, further co-creation and validation in Living Labs and finally suggesting a variety of good practices – it creates a methodological cycle that informs understanding of broader governance transitions. Next, we will present the overarching policy targets that create the backbone for advancing sustainable and equitable water use. Section 3 focuses on literature review and main concepts. Section 4 details the links to GOVAQUA's empirical work and the use of the framework, and the concluding section 5 points out directions regarding the next steps.

In addition, the conceptual framework includes a glossary of the main concepts for the GOVAQUA project (See Appendix A). The glossary has been put together to provide a common reference point for the different work packages to utilise similar definitions across the different tasks and publications. The glossary is open for all the consortium members to suggest amendments and additions.

2. Overarching policy targets for water governance

This section provides an overview of the policy targets that are relevant for sustainable and equitable water governance in Europe.

A strong sustainability and equitability mandate has been set in Water Framework Directive (WFD), European Green Deal (EGD) and the Sustainable Development Goals (SDGs). They operate through different mechanisms that provide directionality for action on different scales, from trans-national to local towards improving water governance. Overall, they define the broad societal objectives for sustainable and equitable water governance. The SDGs focus most explicitly on cross-sectoral impacts and issues of equitability, the WFD defines the judicially binding minimum levels, and the EGD mobilises resources to transition economic actions. Several other policies contribute towards the sustainable and equitable water governance, including EU Biodiversity Strategy, the upcoming EU Nature Restoration Law, and the EU Climate Adaptation Strategy. Also, policies on information and data sharing, policies on corporate responsibility, and sectoral policies such as the Common Agricultural Policy can significantly influence water governance and need to be considered. In GOVAQUA, these policy developments will be monitored within thematic work packages and in the context of their relevance to the Living Labs and revisited at the synthesis stage.

2.1 Water Framework Directive

In the EU, **the Water Framework Directive (WFD, 2000/60/EC) institutionalises the water governance objective of long-term sustainability and equitability.** It is the cornerstone of EU water policy. Two daughter directives on groundwater (Groundwater Directive 2006/118/EC) and surface water (Environmental Quality Standards Directive 2008/105/EC) support the WFD, while the objectives and measures of WFD are also linked to other water directives such as the Bathing Water Directive (76/160/EEC), the Drinking Water Directive (80/778/EEC), the Floods Directive, the Urban Waste Water Treatment Directive, the Nitrates Directive and the Marine Strategy Framework Directive (2008/56/EC). The WFD is central in mobilising sustainable water governance innovations as it sets binding environmental targets and institutional monitoring frameworks that are designed to trickle down impact on diverse local and sectoral contexts.

The WFD aims to protect and enhance the status of aquatic ecosystems and aquatic environment and to promote sustainable water use (Art. 1). The main environmental objectives of the WFD are to protect, enhance and restore European surface water and groundwater bodies to prevent their deterioration and to achieve good water status (Art. 4). The principle of recovery of the costs of water services should contribute to these environmental objectives (Art. 9). The WFD also aims at the active involvement of all interested parties in its implementation (Art. 14).

The WFD sets a deadline of 2015 for achieving good status for bodies of surface water and groundwater. This deadline may be extended to 2027 for specific reasons. In addition, the WFD provides for the possibility to designate surface water bodies as artificial or heavily modified and to set less stringent environmental objectives for individual water bodies for specific reasons (Art. 4).

The WFD contains multiple policy instruments that Member States must use to achieve the environmental objectives. The Member States must prepare a River Basin Management Plan (RBMP), including a Programme of Measures, for each River Basin District (Arts. 11 and 13). The basic measures include, for example, the controls over certain water uses and their updating (Art. 13). Member States must

also ensure that water pricing policies provide adequate incentives for the different water users to recover the costs of water services (Art. 9). To promote active involvement, Member States must provide information on the preparation, review and updating of RBMPs and make them available for comments to the public (Art. 14).

Member States are struggling to achieve the good status objective. According to the 2018 assessment of European waters, only around 40% of European surface water bodies were in good ecological or chemical status, while the proportion of groundwater bodies in good quantitative (86%) or chemical (70%) status was significantly higher. Progress has thus been limited. The main pressures include hydromorphological changes, atmospheric deposition and diffuse and point source pollution (EEA 2018). Contributions of public participation to the good status objective have also been limited (Rimmert et al., 2020).

From the perspective of sustainability transitions, WFD provides an instrument mix to transform unsustainable governance regimes in conjunction with other policies. However, the specifics of its implementation remain a key area for research and development. Drought perspective is something not well covered in WFD and requires more explicit governance focus. WFD is also connected closely to implementation of other directives, such as Floods Directive, Drinking Water Directive and Marine Strategy Framework Directive.

2.2 The European Green Deal and beyond

The European Green Deal (EGD) presented by the European Commission in 2019 is an evolving policy framework to coordinate EU-level strategies across the sectors to tackle climate and environmental-related challenges. The EGD is building on the normative objectives defined in the WFD to mobilise resources for implementation.

The EGD's aim is to ensure the long-term availability, quality, and equitable distribution of water resources for current and future generations while minimizing adverse environmental impacts and promoting economic and social well-being. Therefore, the EGD targets are more focused on the economic sustainability and transformation of the diverse business sectors connected to water resources.

Tasks of the Green Deal are closely related to water include:

- **Water Reuse Regulation** implemented since 26.6.2023, the objective is to mitigate water scarcity and drought risks by increasing efficiency in the use of water resources meanwhile simultaneously safeguarding public health and the environment; Regulates water reuse in agricultural irrigation.
- **Recast Drinking Water Directive** in force 12.1.2023, to be implemented from 12.1.2025 onwards. Include higher quality parameters and the obligation for MS to improve or maintain access to safe drinking water for all, in particular to vulnerable and marginalised groups, more transparency for consumers and a target for set leakage threshold level by Jan 2028.
- **Recast Urban Waste Water Treatment Directive** that proposes a reduction on Remaining Pollution and stricter standards for wastewater discharge.
- **Recast of Industrial Emissions Directive** that includes expanding reporting water use and stricter control of polluting industries (including intensive livestock).
- **Nature Restoration Law** including Article 3: Restoration of degraded ecosystems and Article 7: Inventory of obstacles to free-flowing rivers.
- **Farm to Fork** strategy sets targets for reducing nutrient flows and pollution of water bodies as part of the EU food system transformation.
- **Biodiversity Strategy** Target 11 targets restoring freshwater ecosystems (“At least 25,000 km of free-flowing rivers are restored”). Targeted aims include removing or adjusting barriers and restoring flood

plains by 2030 as well as review water abstraction and impoundment permits to implement ecological flows and achieve good status or potential of all surface waters by 2027.

In addition, a Blue Deal for Europe has been called for in 2023 by the European Economic and Social Committee, but how strongly water will feature in the work of the new Commission starting in 2024 is yet to be seen.

2.3 Sustainable Development Goals

Water governance is a central crosscutting theme in the global 2030 Sustainable Development Goals (SDGs) adopted by the United Nations in 2015 (United Nations, 2015). SDGs include direct water governance targets, as well as cross-cutting water-related goals. Two key SDGs for water governance are:

- SDG 6: *Clean Water and Sanitation*. Target 6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.
- SDG 15: *Life on Land* (e.g., Target 15.1: By 2020, ensure the conservation, restoration, and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular, forests, wetlands, mountains, and drylands, in line with obligations under international agreements.)

Additionally, cross-cutting SDGs affect sustainable and equitable water governance framework. These include *Poverty and Hunger* (SDG 1 and SDG 2), *Health and Well-Being* (SDG 3), *Gender Equality* (SDG 5), *Economic Growth and Decent Work* (SDG 8), *Reduced Inequalities* (SDG 10), *Sustainable Cities and Communities* (SDG 11) and *Climate Action* (SDG 13).

The SDGs set the broad normative objectives of societal transitions and operate as meta-goals that require more specific measures and instruments to support sustainability transitions. Therefore, the goals motivate emergence and upscaling of key sustainable innovations as well as transformation of the governance regimes. In sustainability transitions thinking, these goals form basis of landscape level pressure on transforming the society (see, section 3.1).

3. Literature review

This section presents the main conceptual elements from the literature for the GOVAQUA conceptual framework. The aim of this literature review is to provide tools to connect the contextually informed governance innovations to broader sustainability transitions. Therefore, the framework contributes to meeting governance targets on sustainable and equitable water use as well as providing more concrete lessons on improving European water governance.

This section proceeds in five parts, first reviewing the main elements of the multi-level perspective on sustainability transitions, then elaborating on different dimensions of transitions relevant for water governance, proceeding to reflecting upon transition phases and stages as well as discontinuities, followed by illustrating operation of transition pathways, and finally setting up the framework on six transition intervention points. The early view regarding the application of the framework is provided in section 4.

3.1 Multi-level perspective on water governance transition

In the transitions research, the multi-level perspective (MLP) approach has been a popular reference point in explaining the dynamics of systemic change (Geels, 2004). The framework has been developed on a large selection of historical cases from diverse sectoral and spatial contexts to illustrate the temporal dynamics of transition processes. However, the criticisms of the approach point out that it has often been used too prescriptively and giving too much weight for technological innovations (Geels, 2019). Over the years, the heuristic has been reconsidered as a meso-level tool to identify multiple potential points of intervention to the current governance systems rather than an "explanatory map" (see, Kanger et al., 2020; Kanger 2021).

In the MLP, sustainability transitions of specific systems are approached as an interplay of three levels (see, figure 1). Niche level is considered consisting of spaces for sustainable action that can potentially be protected, replicated, and scaled up in suitable conditions to change unsustainable systems. In the water governance context, for example, an abundance of innovative orientations, novel technological applications, age-old practices, and financial instruments exist, but they are rarely approached and utilised in a systematic and coordinated manner. Regime level refers to a dominant socio-technical or socio-ecological system that needs to be changed to an alternative, more sustainable mode. In water governance, there are multiple regimes and systems that create recurring sustainability challenges, as water resources are required in diverse economic activities and fulfilling societal needs. The landscape level is viewed as an arena of cultural and structural dynamics that impact the persistence of unsustainable systemic features. In water governance, for example, the technological framing of water as commodified and technically mediated resource is a landscape aspect that hinders the more diverse understanding of water from an ecosystem perspective.

In the MLP heuristic, protected niche spaces are needed for the development of improved technological applications, as well as sustainable practices, e.g., collaborative governance and management of data and novel financial and legislative innovations. For example, Living Labs can be understood as protective niche spaces for experimenting with novel solutions in real-world contexts. In the water governance context, similar to climate governance, government actors are likely to play important role at niche level that is different from some of the more technical sectors (Scholz & Methner, 2020). The regimes, meanwhile, consist of different sectors that create pressures e.g., for the quantity and quality of water. For example, agriculture, industry and household use are often only weakly negotiated in specific water utilisation

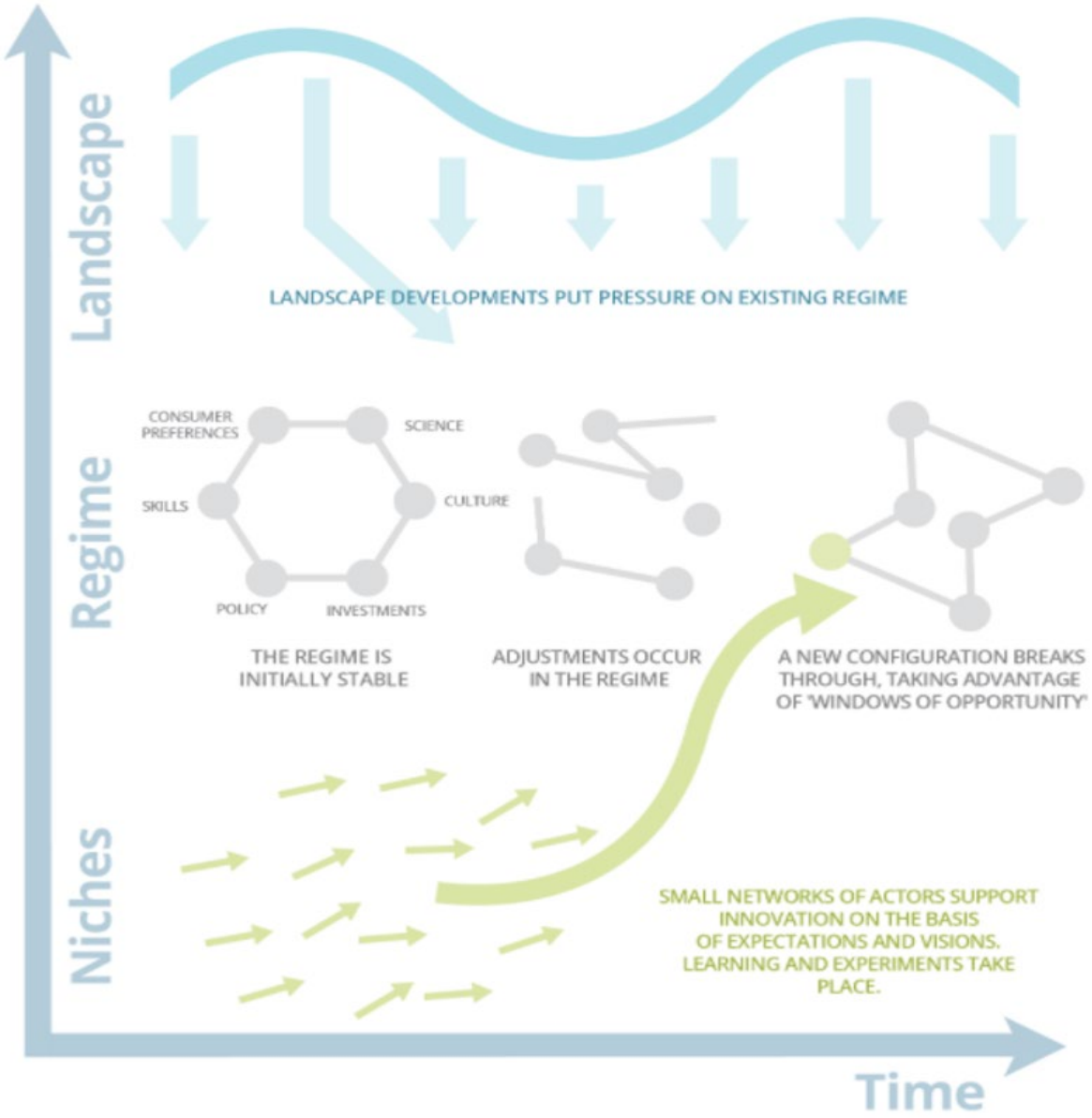

Figure 1. The multilevel perspective (from EEA, 2019, p. 27)

contexts, which amplifies pressures and maintains inequitable situations. Thus, unsustainable regime practices require specific attention. Finally, the landscape level consists of general ecological, social and economic developments as well as framework policies (see, section 2) that constitute a normative pressure to act. Although all three levels are important in consideration of governance transitions, the levels often appear as distinct spheres with quite incompatible qualities (Kanger, 2021). Therefore, additional perspectives are required to inform the understanding on sustainability transition in the water governance context.

3.2 Dimensions of transitions

One shortcoming of the MLP in the water governance context is that it is considered to reflect mainly socio-technical transitions. Many of the historical examples are focused on cases, such as transport or energy sector, where one production system is replaced by another, potentially more sustainable system. Also, the role of governance is quite different in technical context compared to water that reaches across several

different societal sectors and technological regimes. Therefore, in water governance transitions, socio-technical transitions only provide a narrow glimpse of the transition dynamics. To complement the picture, three transition dimensions can be presented.

Different dimensions of transitions – institutional transitions, socio-ecological transitions and socio-technical transitions – have been conceptualised by Niki Frantzeskaki et al. (2016) in the context of water governance. The dimensions are not mutually exclusive, rather help to identify different governance aspects in sustainability transitions. The dimensions mainly inform the understanding of the most important aspects of transition dynamics in play in the given context.

1. **Institutional transitions** refer to an episode of changes that impact the operation of formal institutions – such as political and judicial rules, economic rules and contracts (North 1990, p. 47). In the idealised case, the formal institutions will transform radically (e.g., from centralised to decentralised form) either by adopting one or more rules changing the system of rules or shifting organisation of organisations that promote and implement the rules on the operational level.

2. **Socio-ecological transitions** are viewed as a transition episode, where formal and informal systems and the ecosystem are impacted. As distinction to first dimension, the civil society stakeholders play a more important role. The processes are neither linear nor controlled, as the human-ecosystem interface includes a large extent of complexities and interdependencies.

3. **Socio-technical transitions** zoom into episodes of transitions, where institutions, civil society and technology are impacted. The driving forces emerge from technological development to meet societal demands and challenges. As contemporary societies are technologically heavy, transitions often become framed in terms of (incremental or radical) technological evolution.

Transition dimensions are important in informing and considering the interconnected aspects of transition to understand distinct triggers and forces of transitions better. In GOVAQUA, the empirical approaches to governance innovations in law and regulation, participatory and collaborative approaches, economics and finance and digital solutions cut across the three dimensions but with different emphases. In addition to transition dynamics, the dimensions help to connect the transition dynamics to specific stakeholder groups that may differ greatly between the transition contexts (see Figure 2).

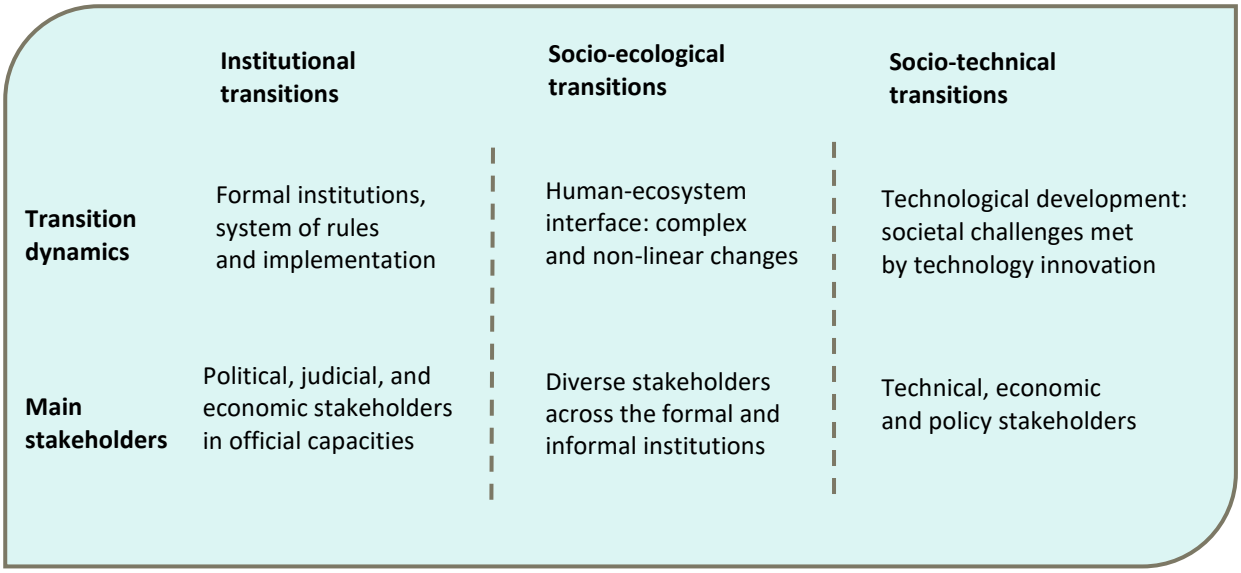

Figure 2. Transition dimensions

The three transition dimensions will be utilised in GOVAQUA to characterise the interplay of the distinct empirical lessons and inform the real-world policy contexts. The dimensions are also critically evaluated regarding potential dynamics that are not covered in the 3D view. Specifically, the issues of equity might become overlooked in each of the three dimensions and might require a different perspective.

3.3 Phases and stages in governance transition

Sequencing of sustainability transitions and evaluation of different transition steps has been another key aspect in the literature. However, the challenge lays in distinction between local developments and the system-level changes that follow different patterns, logics, and drivers. Specifically, the system change includes multiple lock-ins and non-linear aspects that make the promises of linear transition a foregone conclusion (Hölscher et al., 2018; Mathias et al., 2020). Acknowledging these shortcomings, the transition has been attempted to divide e.g. to identifiable phases (in sustainability transition literature) and stages (urban water governance literature).

The transition phases in the MLP are building on innovation research insights on the diffusion of technological innovations across society. **The three phases of start-up, acceleration and stabilisation provide a generic "global" model for transition dynamics (Rotmans et al. 2001; Geels 2004; Kanger 2021).** However, the linear diffusion idea is problematic because it overemphasises niche development and easily leads to generalising successful technological changes to encompass other transition dimensions (explicated above). Nevertheless, it also makes a valuable point of system change not taking place instantaneously.

The stages of water-sensitive cities have been developed and applied in the context of urban water services and their socio-ecological footprints building on historical studies (e.g. Brown et al. 2016; Brodnick et al. 2019; see figure 3). **Like transition phases, six stages (water supply city, sewered city, drained city, waterways city, water cycle city, water sensitive city) provide a linear and technically driven view of change.** However, the framework also connects socio-political drivers (top of the figure) to the technical functions (bottom of the figure). The framework has also been used to illustrate the potential for cities to "leapfrog" several stages, for example, in developing countries (ibid.). Despite being focused on the urban context, the stages carry merit in evaluating more general water transitions evaluated in different contexts.

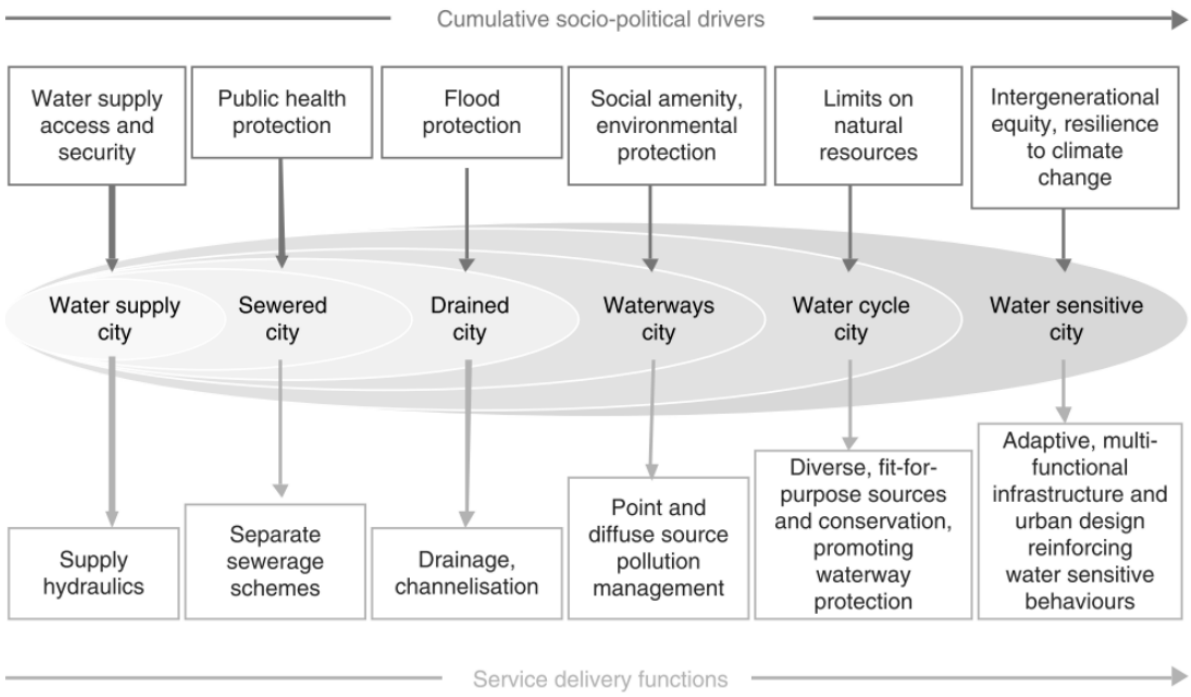

Figure 3. Stages of water sensitive city (from Brodnik et al., 2019, p. 3)

Both approaches support the assessment of equitable and sustainable transition within GOVAQUA. Stages of water-sensitivity are important for bounded spatial and technological contexts especially in the Living Labs, where the enabling and hindering conditions for innovations are studied. Phases that operate on more abstract level of system change and can provide lessons especially regarding the conditions for accelerating the transition. In water governance, water use challenges encompass multiple societal sectors and accentuating issues of equitability and justice as central, which will require further iteration of the phases and stages.

3.4 Transition pathways

Transition pathways have been proposed as a conceptual element to concretise and diversify discussion on sustainability transitions (Geels and Schot, 2007). The typology of pathways is a reaction to fundamental criticisms of transitions literature on providing too functionalistic understanding of society, giving little attention to actors and agency and over-emphasising small-scale niche developments (Kanger, 2021). **To diversify transitions, five pathways illustrate the interplay of main change attributes of amplitude, speed and scope (see, Suarez & Oliva, 2005).** Idealised pathways are presented as non-deterministic ideal types distilled from historical transition cases (see, Geels and Schot, 2007), but they can also take different routes, change, be combined or even stop as the transition process proceeds. Here, the original idealised pathways provide a good starting point for evaluating multiple transition dynamics.

First, reproduction (pathway 0) refers to the stable development of 'regular change', where strong actors (e.g., on markets and policy) accumulate incremental innovations and problem-solving capacities to solve sustainability challenges while maintaining their positions. Second, in transformation (pathway 1), disruptive pressures (from changing perceptions of societal issues) lead to the abandonment of the dominant regime's technologies and practices. The old system elements are replaced with new ones that better accommodate changed perceptions leading to the transformation of the regime. Third, de-alignment and re-alignment (pathway 2) follow a landscape shock, which leads to the de-alignment of the established regime technologies and practices without clear available solutions to meet the challenge. To fill the

vacuum, the regime will organise around alternative and emergent solutions. Fourth, substitution (pathway 3) takes place if alternative technologies or practices develop well, but the established regime needs to be disrupted. External events (e.g., major environmental hazards or shifts in economic landscape), policy shifts, or social pressure are required as a trigger for the substitution pathway. Finally, in reconfiguration (pathway 4), alternative technologies and practices are incrementally adopted by the regime that leads to a gradual shift in the regime architecture. Reconfiguration is especially potent in the setting of multiple interconnected regimes and different technologies. However, it has been stated that the pathways are not a full account on sustainability transition dynamics, but rather an account on historically identified transition processes (Kanger, 2021).

The main lesson behind the typology of the transition pathways is that there is no universal recipe for societal change. Multiple dynamics can lead to gradual or fundamental changes in a given context (Figure 4). Transitions can be triggered by broad landscape-level disruptions that touch whole societies or niche developments, gradually changing technologies and social practices towards a more sustainable system. Landscape-level disruptions can be for example major droughts or floods that force change in water management, while niche developments can be diffusion of sustainable water accounting practices, collaborative planning processes, or technologies that improve equitable access to clean water. In practice, the change can be rapid or incremental, which might have different kinds of implications for the stakeholder groups within transition contexts. In this regard, social justice is crucial to ensure that the change does not lead to major burden towards any social groups. Overall, the transition pathway typology suggests that landscape-level shifts result in more rapid (and potentially less coordinated) transition processes, while upscaling of niche innovations would lead to more coordinated change processes. By combining multiple different approaches and datasets, the transition pathways can support development of informed policy lessons (Turnheim et al., 2015).

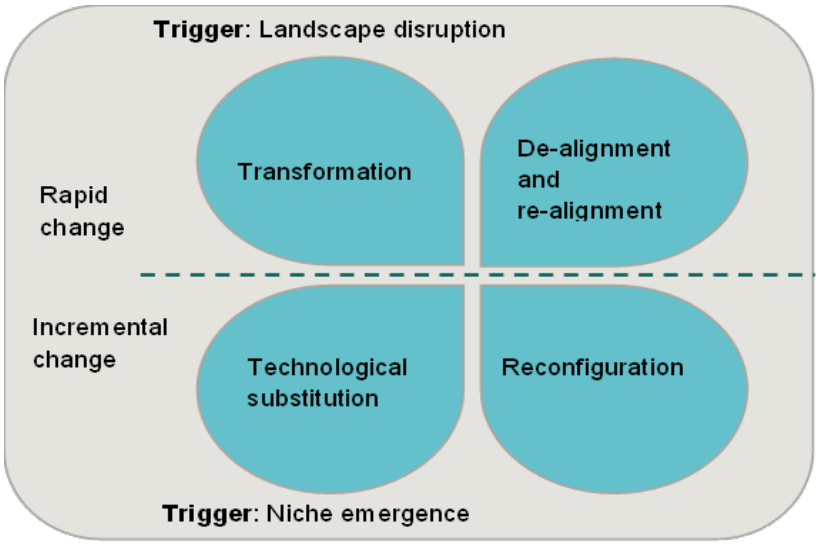

Figure 4. Typology of sustainability transition pathways

In GOVAQUA, the transition pathways are part of synthesising phase, where different innovative approaches are evaluated in terms of their potential to support the overarching transition towards sustainable and equitable water governance (See section 4). The transitions can potentially follow trajectories of different idealised pathways or require expansion of the pathway thinking of new elements. GOVAQUA pathway synthesis will contribute to reflections on equitability and justice that are often overlooked in the illustration of transition dynamics.

3.5 Transition intervention points

In GOVAQUA, the focus on innovations to support sustainable and equitable water governance transition is broad. Innovative interventions in law and regulation, participatory and collaborative approaches, economics and finance and digital solutions play different roles in governance transitions. To better evaluate their interplay in broader governance transitions, we need to consider their mutual relations in different aspects of the transition as well as potentially hindering and enabling conditions. Moreover, the policy intervention points can help to better identify public policy actions to catalyse for the sustainability transition (see, Berbel & Esteban, 2019).

The policy intervention points approach suggested by Kanger et al. (2020) provides a coherent attempt to identify the interaction between different transition aspects. The approach builds on the MLP but focuses specifically on critical junctions between different "levels" as well as potential blind spots regarding multiple regimes and wider societal implications. Although stating to focus on policy mixes for just transition, the approach touches on several aspects of broader governance challenges, such as broader societal repercussions of transition processes, conditions for sustainable social and technical innovations and the importance of cross-sectoral coordination when promoting sustainability transitions.

The six transition intervention points are positioned to different parts of the systemic change (figure 5). Stimulating niche interventions (1) and accelerating niches (2) focus on protecting and scaling up sustainable solutions. As their counterpart, destabilising the current system (3) is directed to interventions that reduce the power of dominant actors and solutions. Addressing the repercussions (4) focuses on the societal implications of transition policies, specifically focusing on the justness of the actions. Multi-regime coordinating (5) touches on how different sectors and interconnected systems impact each other. Finally, tilting the landscape (6) is about broader framework measures that create support for a sustainable and equitable transition, such as the UN SDGs and other normative governance initiatives. Collectively, the transition interventions are aimed to support a systemic change.

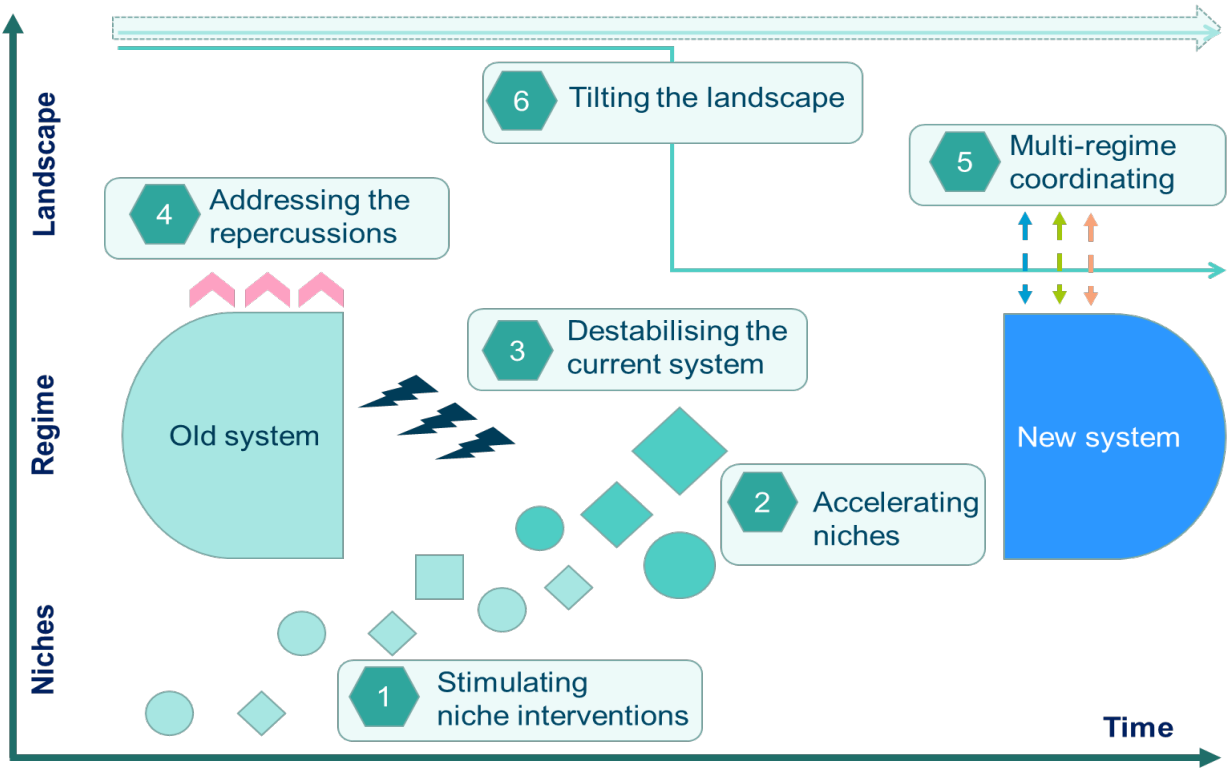

Figure 6. Six transition intervention points

For water governance transitions broadly and GOVAQUA specifically, the policy intervention points open ways of linking identified positive developments to demands for broader system-level change. Firstly, they help to connect the “local” or “small” scale innovations into broader systemic transition developments. For example, the Living Labs that stimulate niche innovations (intervention point 1) can simultaneously address multi-sector coordination (intervention point 5) and social justice and equity (intervention point 4). Novel economic instruments can simultaneously protect acceleration of sustainable niche technologies and practices (intervention point 2) and destabilise the unsustainable governance regime (intervention point 3). This is the first analytical step when using the intervention points for GOVAQUA purposes.

Second, the intervention points support positioning innovative actions on different sectors in relation to each other. For example, innovations in digital technologies might show an emphasis in niche interventions (intervention points 1 and 2) but cannot proceed without legislative developments that destabilise the existing governance regime (intervention point 3) or help to address multi-regime coordination (intervention point 5). Or lessons on landscape tilting (intervention point 6) based on international law require lessons on collaborative governance regarding justice repercussions (intervention point 4) and regime destabilisation (intervention point 3). However, this is not a straightforward task but require reflection between specialists on different areas of water governance. The exercise of linking different types of innovations to each other constitutes the second analytical step of using the intervention points in GOVAQUA.

Finally, the intervention points inform understanding of transition pathways for sustainable and equitable water governance. The intervention points are central in moving between different stages of sustainable water governance innovations as well as phases of systemic change, as they point areas of focus. On the other hand, the role of different intervention points can also explain discontinuities in certain areas and persistence of lock-ins in unsustainable system stage. Thus – regarding different transition pathways – the intervention points can provide a map of the most central areas of focus.

4. Application of the conceptual framework

In sustainable and equitable water governance, the innovative actions reach across the multiple water-using sectors, diverse spatial scales, covering multiple hydrological and jurisdictional levels, and temporally over long periods of time. The GOVAQUA conceptual framework will be applied by focusing on specific intervention points where governance innovations can support the broader societal sustainability transitions. This section provides starting points for the utilisation of the framework along with a brief overview of the different research methods that are applied in GOVAQUA.

The intervention points are not considered to operate equally in all governance contexts. Rather, their role is to pinpoint areas that may be central in leveraging transition or challenges that need targeted interventions to overcome. In GOVAQUA, four work packages (WPs) are devoted to identifying, analysing and comparing governance innovations in four main themes: law and regulation (WP2), participation and collaboration (WP3), economy and finance (WP4), and digital solutions (WP5). The initial hypothesis, as shown in Table 1, is that there are specific intervention points that are relevant for each of these governance areas. However, the picture might change as empirical evidence is created by analysing and evaluating water governance transition across multiple WPs.

Table 1. Emphasis of different work packages on transition intervention points

	WP2 Law & regulation	WP3 Participatory & collaborative governance	WP4 Economy & finance	WP5 Digital solutions
Stimulating niche interventions				✓
Accelerating niches		✓	✓	✓
Destabilising the current system	✓	✓		
Addressing the repercussions	✓	✓	✓	
Multi-regime coordinating	✓	✓	✓	✓
Tilting the landscape	✓			

To apply the framework, a set of questions and examples is needed for each of the six intervention points. As the points are directed to different areas of public administration, the questions and examples can also vary. Table 2 provides an initial list of questions to guide the application of the framework in the effort to synthesise lessons from empirical activities. The questions and examples will be revisited, concretised and

tested at the later stages of the project, as the empirical work proceeds, and policy recommendations become timelier.

Table 2. Operational questions and examples

Intervention point	Guiding conceptualisation questions	Examples
Stimulating niche interventions	What kinds of innovations are available? How can sustainable interventions be protected and supported in specific contexts?	Subsidies and regulatory shielding for niches in various systems
Accelerating niches	What factors help scaling up the innovation? Can the innovation be replicated in different contexts? How can the innovation be aligned with other niche innovations?	Providing support for entering the markets and/or creating links between various niches
Destabilising the current system	Who are the dominant actors in the context? How can the power relations be transformed?	Removal of various forms of regulatory and financial protection favouring incumbents
Addressing the repercussions	What are potential broader societal impacts of system change? How can these be anticipated and coordinated?	Provision of financial and educational support for structural unemployment and skill mismatch
Multi-regime coordinating	How are the different sectors and systems impacted? How can the relations be acknowledged and coordinated?	Devising mutually supporting interventions in multiple systems
Tilting the landscape	What are the broader framework conditions needed to enable system change? How can these best steer local changes?	Participation in international negotiations to arrive at collectively binding agreements

4.1 Connecting the framework and empirical aspects

Although the conceptual framework has not been designed to guide the diverse empirical aspects of GOVAQUA project, but rather help in synthesising the efforts, it is relevant to pay attention to the different empirical aspects of the project design. In figure 7, we illustrate these empirical aspects and how they link to the conceptual framework, and briefly describe them below.

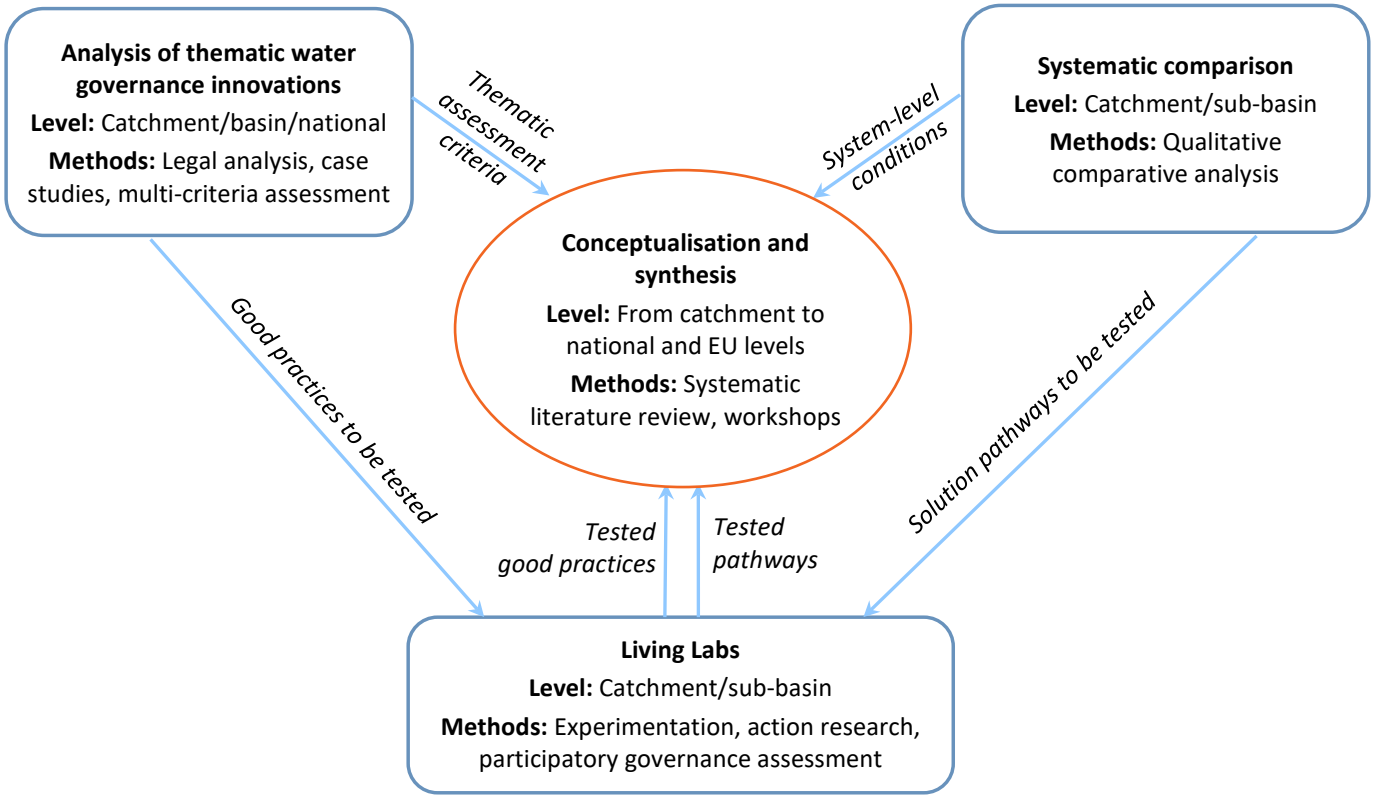

Figure 7. Empirical aspects of the GOVAQUA project and their links to the conceptual framework

Living Labs are a core part of GOVAQUA empirical work. Living labs provide contextual knowledge on implementation of specific innovations to accelerate sustainability transitions in water governance. The living labs have been established by following specific guidelines and a joint process design: (1) on setting up, developing and assessing the respective Living Labs, and collect findings for broader recommendations and lesson learning; (2) on supporting how partners link their work to the Living Lab processes. **GOVAQUA assessment tool** is developed by GOVAQUA partners and applied by the Living Labs. The tool includes a complete set of criteria and indicators on evaluating the performance of living labs. The tool is being properly tested and utilised twice over the project term to provide the progress towards defined ambitions.

Case studies are a cross-cutting aspect across the GOVAQUA thematic WPs 2-5, in which thematic water governance innovations are analysed. Two categories of cases are studied in these WPs. **Primary cases** are the GOVAQUA Living Labs, within which the GOVAQUA researchers create and collect primary data. **Secondary cases** are identified by GOVAQUA partners based on previous studies and projects, in which both primary and secondary data can be collected. Depending on the specific research questions of the WPs, case studies can be **in-depth**, with detailed analysis of typically a single case or small number of cases, or **cross-case comparison** of multiple cases. When feasible, the case studies are aligned across the thematic WPs to streamline data collection.

The GOVAQUA conceptual framework is not directly connected to work on the level of case studies and Living Labs that are coordinated by mid-level analytical frameworks. However, the thematic criteria for the assessment of governance regime, and the aggregated outputs of case studies and Living Lab assessments are important inputs to the system-level analysis informed by the conceptual framework to build European water governance transition pathways (Deliverable 4.4).

In GOVAQUA, Qualitative Comparative Analysis (QCA) is used for the **systematic comparison** of 25 to 30 cases, focusing on the **conditions under which specific water governance innovations contribute to a transition towards sustainable and equitable water use.** For the QCA, we will follow seven steps:

1. Specify a model consisting of an "outcome of interest" and potentially relevant "conditions", building on the GOVAQUA conceptual framework and relevant literature.
2. Select 25-30 cases with varying water governance regimes and conditions.
3. Gather data for pilot cases and develop a survey to collect information for the remaining cases.
4. Collect additional data from policy documents and standardized sources.
5. Create a data matrix by turning case information into numerical values between 0 and 1.
6. Identify **solution pathways**. i.e., conditions or their combinations that are necessary and/or sufficient for sustainable and equitable water use.
7. Interpret the resulting solution pathways for different cases.

The QCA provides important systematic information on basin-level pathways towards sustainable and equitable water governance. The conceptual framework helps to identify system level lessons on how these sustainability aims can be achieved more broadly.

Whilst it is acknowledged that there is no universal recipe for societal change and water governance is always context specific, given the shared regulatory frameworks and markets in the EU, generalisable **good practices** of innovative water governance can be identified. Building on the case studies, Living Labs and QCA analysis, GOVAQUA seeks to build a good practice repository housing validated examples of governance instruments and approaches that have proven to fulfil criteria for a good practice, tentatively, effective and successful, environmentally and economically sustainable and socially just, gender sensitive, technically feasible, inherently participatory, and replicable and adaptable (after FAO 2014).

The good practices may present innovations related to all the governance intervention points. The good practices will be primarily communicated and targeted at national and basin level settings, exemplifying concrete instruments and approaches that could be adopted and implemented to support achieving the set policy aims.

To bring empirical lessons on different factors and conditions affecting sustainable and equitable water governance, the different research inputs are contrasted with notions from literature on water governance, assessments, instruments and sustainability transitions. Here, two steps are particularly important.

First, we will develop and apply a **participatory governance assessment tool**, focusing on the regime level and including multiple criteria and indicators that reflect the dimensions covered in thematic governance innovations. The tool will be applied by Living Labs and their stakeholders that are located in six countries (Finland, France, Romania, Spain, Sweden, the UK). To draw lessons from the progress of the Living Labs throughout the GOVAQUA timeline, the tool will be applied in two iterations, first in 2024, and second in 2026. With the first iteration, the Living Labs will assess the current stage of their governance context and how it supports or hinders the niche innovation that is being developed in the Living Labs. They will also set ambitions to transition to a more sustainable and equitable stage. The second iteration will allow the Living Labs to identify the changes over two years and, if needed, reconsider their ambitions.

Second, **synthesis workshops** will be organized to support transdisciplinary knowledge production. The workshops involve researchers and practitioners of all GOVAQUA thematic innovation areas to cover different insights as broadly as plausible. Throughout the project, the factors and conditions that are hypothesized to influence sustainable water governance are **tested** through multi-method, comparative case study research and **contextualized and detailed through** action-oriented research in the Living Labs. The synthesis workshops will provide a systematic approach in comparing and contrasting these different

lessons. In addition, this step includes facilitated co-production activities with the External Advisory Board in deepening the empirical insights. Finally, the accumulated lessons are translated into action perspectives for policymakers, river basin managers, water and water using sectors and civil society at different governance levels.

The role of the conceptual framework is to enrich these exercises in terms of system-level lessons.

4.2 Putting the framework to use

In practical terms, the framework can be approached through three steps that focus on different questions regarding the transition (Figure 8). Step 1 focuses on the features of the water governance context. This requires a rapid evaluation on how the main governance issues can be considered socio-ecological, socio-technical and institutional. Step 2 focuses on the specific innovations and interventions applied or studied regarding how they address specific intervention points and whether some of the other intervention points remain unaddressed, creating obstacles for the perceived transition. Finally, in Step 3, the potential transition pathways are addressed regarding what kinds of developments the innovation can potentially entail. The pathways can take an idealised form or provide lessons on alternative pathway dynamics or discontinuities of transition governance. Together, the three steps aim to provide policy recommendations that take transition context, efficient interventions and future trajectories into consideration.

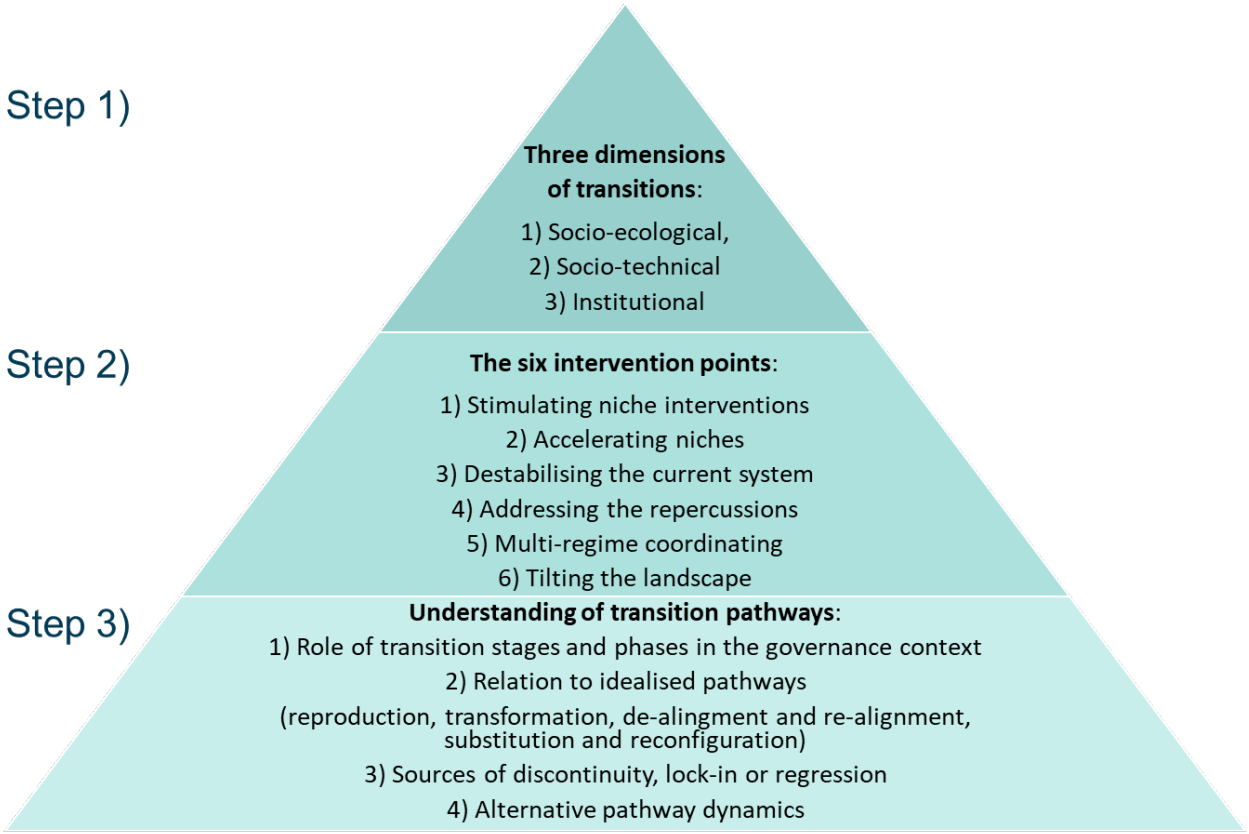

Figure 8. Analytical steps to apply the GOVAQUA conceptual framework

5. What comes next?

This document is the first full draft of the GOVAQUA conceptual framework. In this version, the literature review and background are still visible to enable further use and reflections from the diverse project outputs. In the next stages of the project the aim is to concretise, simplify, test, and use the framework to draw conclusions and lessons on conditions for systemic change from different governance contexts (Figure 9).

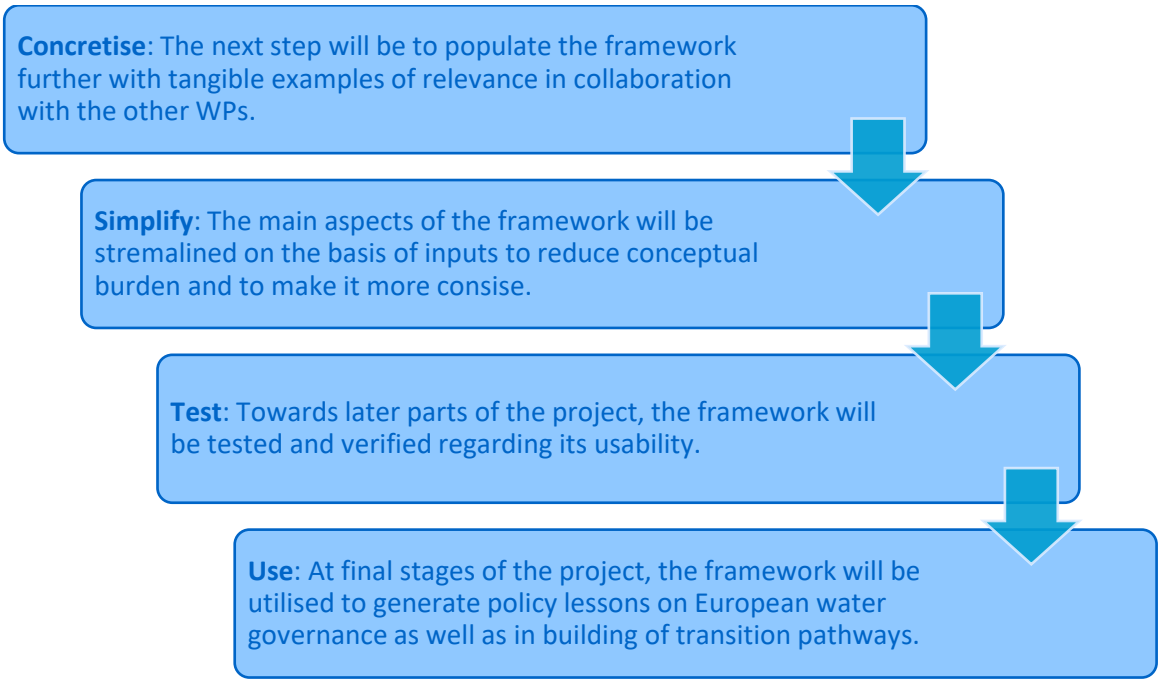

Figure 9. The future steps in refining the GOVAQUA conceptual framework

The aim of this process is to make these perspectives more tangible. The next step is to add more concrete examples on different transition mechanisms in dialogue with the thematic WPs in one-on-one meetings. Next, the application will be further streamlined before the 3rd annual assembly. The framework will then be tested to create a more tangible connection to deliverables 1.4 and 1.5. Finally, the framework will be utilised in drawing lessons on system level water governance transitions based on empirical lessons in the Living Labs. The guiding idea has been that GOVAQUA conceptual framework would be useful in improving the understanding of water transitions and bridging real-world innovations and interventions with sustainable and equitable change. In this work, all the reflections and ideas are highly valued. Thank you for making it this far, we are waiting for comments!

Appendix A. GOVAQUA Glossary

Term	Definition
Equitable water use	"Water allocation may be environmentally sustainable and efficient from a resource point of view, but that does not automatically imply that water allocation is fair from a societal point of view. We need some common understanding of what makes the water footprint of a community of consumers fair or reasonably acceptable, given the limited maximum sustainable water footprint per global citizen. [...] We need a political debate at the international level about equitable sharing of the world's freshwater resources. This implies that we will need to reconsider our consumption pattern." (Hoekstra, 2014, p. 33)
Governance innovation	"The capacity to radically alter existing approaches in light of new circumstances" (Huitema and Meijerink, 2017, p. 84). Decentralization, international organizations, privatization and stakeholder participation are shifts in (water) governance that may be conceived of as governance innovations. "Regulatory governance innovations are innovations that enhance transparency, openness, and accountability as well as the use of scientific knowledge in the legislation process." (De Francesco, 2021)
Governance instruments	Like policy instruments (see below) but can also be developed and utilized by non-governmental actors. In GOVAQUA, these are classified to legal and regulatory (governmental), participatory and collaborative, economic and financial, and digital solutions for information sharing.
Governance approaches	Strategies, processes, and structures utilized by organizations, governments, or communities to make decisions, manage processes, and achieve objectives. Approaches can be e.g., hierarchical, democratic, participatory, or market-based, and are often tailored to specific context. Examples include water user associations and river contracts.
Innovation	Innovation is the use of new ideas, products or methods where they have not been used before. In sustainability transition innovation also refers to "radical transformation towards a sustainable society, as a response to a number of persistent problems confronting contemporary modern societies" (Grin et al., 2010, p. 1)
Just transition	A framework that aims to address the challenges of transitions and seeks to achieve socially equitable outcomes by improving inclusiveness of transition process and addressing challenging societal contexts.
Living Lab	An innovation ecosystem where societal stakeholders and researchers collaboratively explore, experiment with and evaluate one or more water governance innovations.
Policy instruments	"Set of techniques by which governmental authorities wield their power in attempting to ensure support and effect or prevent social change". Generally, there are three main types – regulatory (sticks), economic (carrots), information-based (sermons) (Vedung, 2017) – but in practice the division is not so rigid.
Sustainability transition	Whole society transformation towards sustainability that requires overcoming dominant unsustainable practices by experimenting with and scaling up innovative practices and solutions. In GOVAQUA, the normative targets of sustainability transition are rooted in the Water Framework Directive (WFD), the European Green Deal (EGD) and the Sustainable Development Goals (SDGs).
Sustainable water use	"The use of water that supports the ability of human society to endure and flourish into the indefinite future without undermining the integrity of the hydrological cycle or the ecological systems that depend on it". (Gleick, 2000, p. 131)
Water governance	"The range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society." (Rogers and Hall, 2003) In GOVAQUA, this also covers governance systems beyond the traditional water sector, i.e., sectors with major direct or in-direct water use or impacts.

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