# **Towards a Tailored Institutional Analysis within the Complex Adaptive Systems of Delta Regions**

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#### Abstract

In the complex, adaptive systems of delta regions institutions are needed to arrange the behavior of the parties involved in the system. Institutions are systems of interrelated shared concepts consisting of strategies, rules and embedded norms used by humans to structure situations. When looking at the characteristics of a complex adaptive system I considered it is challenging, but required to analyze institutions in delta regions. The aim of this paper is to find out what we can learn from literature for the development of an institutional analysis tool that is entailed to analyze institutions in delta regions. After reflecting on existing institutional analyses frameworks and analysis methods derived from disciplines, I introduce an institutional analysis toolbox. The toolbox consists of an adjustable matrix, which offers building blocks for analyzing institutions in delta regions from different perspectives. Even though this tool is still under development, I conclude that the tool is a successful first attempt for supporting institutional analyses in delta regions.

**Key Words**: Complex Adaptive Systems; Delta regions; Institutions; Institutional frameworks; Institutional Analysis Tool; Multidisciplinary Perspectives.

## 1 Introduction

Throughout the world delta systems are unique and significant regions. Delta regions are important centers for economic activities, agricultural production and industries. The regions have great ecological significance and are often areas with a high human population density (Bucx et al., 2010a). An essential delta feature is the complex relationship between land and water (GWP, 2000, p24), which can be expressed in the following statement of Verhallen et al. (2001): 'Every land-use decision is a water management decision'. The previous aspects result in the involvement of different type of scholars (e.g. spatial planners; civil engineers; water governance experts) in delta regions. Moreover, each of these features adds to the complex, dynamic environment that characterizes each delta system in the world.

In addition both physical and societal phenomena are drivers of change in delta regions (Bucx et al., 2010a). Examples of physical phenomena driving change are climate change and technological development. Societal trends, on the other hand, such as the organizational and

political situation, also affect how deltas are conceptualized. It is challenging to acknowledge and adapt to both phenomena with suitable interventions. Especially because, even though we see that in all deltas similar trends and complications exist, the actual manifestations of these problems are location specific and demand a unique intervention. The existence and the need for specific solutions within a given delta create possibilities for learning when searching for new ways to counter delta-related management problems. So, I consider it is of great importance to understand why certain adaptive solutions and interventions work in a given delta.

Typically these interventions consist of both technological and institutional arrangements. The technological, and often physical, components of delta management, such as a water defense work, can play a critical role in safeguarding the flood safety in a delta. Moreover, it seems that technical aspects are often relatively easy to design, when they are engineered independently from other domains or for only one actor (Hermans, 2005 p.2). However, when these interventions are implemented in a complex system, many problems and difficulties can occur regarding limitations of institutional arrangements. Hence, the technical components do not completely 'oversee' the system (Koppenjan & Groenewegen, 2005). Institutions are essential in safeguarding and protecting the values of stakeholders in a delta system, as they are able to provide stability and predictability (Koppenjan & Groenewegen, 2005, p.246). Additionally, for a system to work it needs certain institutional arrangements to guide and structure the interdependencies, positions, relations and behavior of the parties that own, (re)design, plan and operate the system (Koppenjan & Groenewegen, 2005).

In contemporary times, multiple delta studies exist that are able to share knowledge about delta regions. However, the institutional analysis is commonly excluded in these delta studies (e.g. in the studies of Aerts et al., 2009). In my opinion this omission can be caused due to the complex definition of the term institutions (Hodgson, 1988; Ostrom, 2011), the unawareness of the existence of institutions, a system perspective based on one discipline and the lack of a structured institutional analysis method (e.g. in the studies of Bucx et al., 2010). Nonetheless, some scholars have presented well-known institutional analysis frameworks that are able to understand institutions in complex systems. Examples of such frameworks are the Institutional Analysis Development (IAD) framework of Ostrom and the four-tier institutional analysis framework for transaction costs economics of Williamson (1998). However, on first sight it seems that these frameworks are not accustomed to deal with the challenges related to the complex adaptive system of deltas. Moreover, it is assumed that there is a need by practitioners for a tailored institutional analysis framework that is able to explore institutional arrangements regarding flood risk management in (local) areas within delta regions. However, a well-founded theoretical basis is an essential aspect for development of such a tool, as when the institutional analysis tool does not have the capability to be: 'systematic and consistent, recommendations based on the outcome of the institutional analysis framework may provide an incorrect impression of the institutional environment.' (Ostrom, 2011 p.9).

The described situation and complications result that the research objective of this article is to find out what we can learn from literature for the development of an institutional analysis tool needed to analyze institutions in the complex adaptive systems of delta regions. To clarify the research objective, first an explanation of some terms is given. An institutional framework is defined as: 'the most general list of variables that should be used to analyze all type of institutional arrangements.' (Ostrom, 2011, p.8). An institutional analysis tool is a type of institutional framework that combines (elements of) existing institutional frameworks with various analysis methods. The definition of institutions is extensively explained in section 2 and the term complex adaptive delta system is described in section 3.

The references and articles used for this paper are found in literature via the library of the Delft University of Technology searching for 'institutional analysis frameworks' in combination with 'institutions' and 'complex adaptive systems'. The time period chosen for these publications is from the initiation of institutional theory in 1977 (Tolbert & Zucker, 1999, p. 2), until the present time. Research methods used are literature reviews, desk research and interviews.

The structure of this article is the following; it begins with a brief contextual positioning the term institutions in Section 2. The role of institutions in the complex adaptive systems of delta regions is presented in Section 3. In Section 4 the existing institutional analysis frameworks are presented. In section 5 ways of dealing with different disciplines in complex, adaptive delta systems is presented. Section 6 shows the proposed institutional analysis tool. The paper concludes with Section 7, by taking a step back to reflect on the presented tool. At last required future research opportunities are mentioned in this section.

## 2 Definition of Institutions

Institutions are commonly referred to as particular formal organizations of government and public services (Van Dale, 2013). The definition of institutions in this paper is more far-reaching than just indicating organizations. In this context institutions also contain rules, customs and behaviour patterns that are important to a society. Institutions consist of: norms and customs; laws and rules; policies and objectives; organizations and their bylaws; operational plans and procedures; contracts, covenants; and stakeholder's interaction. These elements reiterate the comprehensiveness of the term institutions and the difficultly of defining this term in one phrase. Hodgson (1996) argued that there is no unified and solid definition for the term institutions, especially because various scholars use this term. However, in order to discuss and describe institutions some explanation is required. One can conclude that the role of temporal dynamics of institutions is essential, as institutions can have a long evolving path (Hodgons, 1998 p.565). On the other hand institutions can also be transformed, as institutions are constantly changing in relation to their physical environment or when interacting with other types of institutions (Williamson, 1998; Koppenjan & Groenewegen, 2005). Moreover, I conclude that the term institution is encompassing and consist of multiple distinctive aspects. When using the term institutions, it is suggested that multiple concepts are separately identified. As a consequence it might be useful to explain thoroughly what each aspect means, how these aspects relate to one another and what the frequency of change is of the type of institutions.

In this article I consider the term institutions as: 'a system of interrelated shared concepts consisting of strategies, rules and embedded norms used by humans to structure situations' (Hurk, 2013). In this respect institutional arrangements are interpreted as: 'sets of institutions to coordinate and regulate the different (in)formal regimes and coalitions for collective action and inter-agent coordination.' (Koppenjan & Groenewegen, 2005). It seems that currently some multiple-tier institutional frameworks are able to support this definition of institutions. Examples of multi-layered frameworks are the IAD framework of Ostrom (2004) and the multi-tier institutional frameworks of Williamson (1998) and Koppenjan & Groenewegen (2005). These institutional frameworks are explained in section 4.

## **3** Institutions in the Complex Adaptive Systems of Delta Regions

Delta systems are difficult to classify, as they often have characteristics of several types of systems. In this article a delta region is considered as a Complex Adaptive System (CAS). CASs are: 'open systems in which different elements interact dynamically to exchange information, self-organize and create many different feedback loops, relationships between causes and effects

are nonlinear, and the systems as a whole have emergent properties that cannot be understood by reference to the component parts' (Grus et al., 2005 p37-38). CASs are adaptive, because they have the capacity to change and learn from experience (Rotmans & Loorbach, 2009).

The role of institutions in the CAS of delta regions can be explained with the following conclusions: the complex system of deltas consists of multiple (institutional) components that are constantly changing and can be characterized with different frequency of change (Barnes et al., 2003; Batty & Torrens, 2005). In this setting the presence of components results that a delta is considered as a multi-actor system. A multi-actor system consists of various unknown or conflicting cross-causal interrelations with undetermined and unpredictable behavior (Koppenjan & Groenewegen, 2005). Therefore, there is a need for institutions to structure and guide the social structures in delta system. It seems that institutions in a delta region often evolved over time (Hodgons, 1998) and include shared values, market & governmental regulation and established relationships between actors, which are able to create stable situations (Koppenjan & Groenwegen, 2005). However, deltas have an open relation with its environment and are influenced from both the inside and outside of the system (Koppenjan & Groenewegen, 2005). Additionally, institutions are able to change relatively fast, for example when dealing with unstable situations such as a natural disaster. In some cases institutions can even cause a deadlock, be counterproductive or create unstable situations. To clarify, an example of a gridlock can be the lack of a covenant to speed up procedures regarding land sales (Ruijgh, 2009). In my opinion the incompatibility of certain institutions can be caused due to the CAS characteristics: complexity, the unpredictability and the openness of a delta system, which result that not all components and relationships are known in a delta system. Moreover, the multi-actor system results that a wide range of disciplines are involved in delta regions, which all demand a different type of institutions.

Based on the previous I conclude that delta systems show characteristics and behaviour of a complex adaptive system. Furthermore, is determined that the CAS perspective provides insight in the essential role institutions in delta regions. However, the literature review regarding institutions, delta systems and CAS also identified that it is difficult to analyze institutions in delta regions. I suppose it is critical that these difficulties are addressed when designing an institutional analysis tool. These are:

- Dealing with temporal dynamics within a complex adaptive delta system;
- Providing insight in the multi-actor system of a complex adaptive delta system;
- Providing insight in the shared values within a complex adaptive delta system;
- Dealing with different disciplines involved within a complex adaptive delta system.

The challenges are the input criteria for the analysis of the existing institutional frameworks in section 4 and dealing with disciplines in complex, adaptive delta systems in section 5.

#### 4 Existing Institutional Analysis Frameworks

It is valuable to understand the functioning of existing institutional framework when developing an institutional analysis tool. Therefore, the three institutional analysis frameworks: the fourlayer institutional framework of Williamson (1998), the IAD framework by Ostrom (2005) and the institutional framework of Koppenjan & Groenewegen (2005), are explored in this section. First, a general description of the institutional analysis framework is given and how they relate to one another. After that the institutional analysis frameworks are put against the challenges of section 3. The conclusions of this study helps to identify which elements of the frameworks are useful for the development of a institutional analysis framework in the CAS of deltas. 4.1 Transaction Costs Economics Four-tier Institutional Analysis Framework

Williamson (1998) has specified the definition of institutions based on transactions costs economics by focusing on the' institutions of governance', which is included in part two of the new institutional economics. The four-layer framework of Williamson (1998) is a framework to describe institutions in an integrated manner as can be seen in figure 1.



Figure 1 The four-layer model of Williamson

The different layers of Williamson have bidirectional connections. The frequency of change of each layer results that the layers are constrained from above by 'slower' levels, but are also influenced by 'faster' levels from underneath. As a consequence in the framework: 'the lower layers, entirely operational and are influenced, either constrained or facilitated, by the layers above' (Broekhans & Correljé, 2008). Moreover, the focus in this framework is mainly on the third 'governance of institutions' level. Williamson suggests it is possible to arrange all the organizational activities in previous described four layers. This enables to explore how certain institutions, such as shared values have formed over in a period of time (Stepney et al., 2010 p.43). Hence, I agree with the conclusion that in Williamson's framework: 'the researcher can conceptualize the system by thinking in layers and also the interactions the layers may have with each other.' (Stepney et al., 2010). The framework is sufficiently generic to be applied to almost any type of complex system.

#### 4.2 Institutional Analysis Development Framework

The IAD framework is a multi-tier conceptual map that offers a way to understand the policy process by outlining a systematic approach for analyzing institutions that govern action and outcomes within collective action arrangements (Ostrom, 2007, 44). The central concept in the IAD framework is the action arena. Ostrom (2004) distinguishes seven separate components influencing the arena, as shown figure 2. The action arena selected for analysis depends on the outcome that is aimed to achieve. What happens in the action arena leads to certain patterns of interaction between actors, which leads to (collective) outcomes. Both aspects can be judged and are influenced by a set of evaluation criteria (Stepney et al., 2010). Attributes of the physical environment, community attributes and rules are used to govern and guide the behavior of the

involved actors and the action arena (Ostrom, 2011). Biophysical variables are for example the availability of natural resources and aspects of the community are factors such as norms. The type of rules within the IAD can consist of entry and exit rules, payoff rules, aggregation rules, position rules, scope rules, authority rules, and information rules (Ostrom, 2011).



Figure 2 The Institutional Analysis Development Framework

The IAD framework is related to the layers in Williamson's framework. The IAD is focused on the rules that are similar to Layer 2 within the framework of Williamson. The IAD is focussed on this layer because Ostrom (2011) states that: 'even though the physical world and community influence the action arena, it are the rules that define the action arena.'. Furthermore, the rules in the IAD can be analyzed by distinguishing three layers, which match quiet precisely to the levels of Williamson: the operational (Williamson L4), the collective choice (Williamson L3), and the constitutional choice levels (Williamson L2). Additionally, the different layers relate almost to the same time frames as mentioned by Williamson. Moreover, Williamson's Level 1, is part of the attribute of community in the IAD. Based on the previous argumentation I conclude that these frameworks are related and that certain elements within the frameworks are exchangeable.

#### 4.3 Socio-technical Four-tier Institutional Analysis Framework

Koppenjan and Groenewegen (2005) have set-up a framework inspired on the four-layer framework of Williamson (1998) and Ostrom (2011). They do this by linking the development of complex technical systems to institutional arrangements. The aim of this framework is to argue that the evolution of socio-technical systems and its institutions is intertwined and related to each other (Koppenjan & Groenewegen, 2005). This means that institutions restrict and steer technical developments. However, on the other hand Koppenjan & Groenewegen (2005) proposed that technical innovations require new rules and open up paths to different organizational arrangements. Koppenjan & Groenewegen's model provides insight for a stable momentum of institutional design in relation to technical design and process design. As shown in figure 3, on first sight the content of the institutional frameworks of Williamson (1998) and Koppenjan & Groenewegen (2005) look similar. However, the frameworks are different for three reasons. First, the indication of time seems less important in Koppenjan & Groenewegen's model as the aim of their framework is to provide insight in a stable momentum. Secondly, the four-layer model allows relationships between all layers (Koppenjan & Groenewegen, 2005; Marchand & Ruijgh, 2009). Thirdly, Koppenjan & Groenewegen added the layer of the actors and their strategies to the transaction costs framework. As a result the framework has more emphasis on the L1 actors and games in the socio-technological systems, which has a link with the action arena mentioned in the framework of Ostrom. In this framework Layer 1 stands for the level of individual actors and their interactions in the context of a complex technological system or setting. The other layers are similar to the once mentioned in the transactions costs framework of Williamson. Just like the other frameworks also this framework is able to provide insight in institutions within complex systems.



Figure 3 The four-layer framework of Koppenjan & Groenewegen

#### 4.4 Basic Institutional Analysis Framework

As shown in the previous sections the presented institutional analysis frameworks are related to one another. Moreover, all the frameworks are successful in explaining behaviour and interpreting global outcomes within many different contexts such as economy, organization and policy analysis (Koppenjan and Groenewegen, 2005; Imperial, 1999). Furthermore, all frameworks provide insight in the shared values and take into account the frequency of change of different types of institutions.

Although these frameworks have similar aims and all can be insightful in complex systems of delta regions, they also differ in nature. The Williamson's and Koppenjan & Groenwegen's frameworks allow for more 'liberty' in the analysis by looking at only four separate layers. While, the IAD framework is specified further by including more separate variables, such as the explicit representation of the physical world and the focus on actors. Williamson's framework does not provide specific insight in the multi-actors setting and the interaction between stakeholders. While, the framework of Koppenjan & Groenewegen is more linked to the framework of Ostrom in comparison with the framework of Williamsons, by focusing on the actors and games in L1. The latter indicates that scholars of the existing institutional frameworks all have a different focus for analysis within their framework.

Even though the frameworks are successful for analyzing institutions in a broad range, it seems that the frameworks are all not fully able to meet the challenges defined in section 3 on their own. However, when combining elements of all frameworks a basic institutional analysis framework can be developed, which is able to meet most of the institutional challenges. Therefore, the suggested basic institutional framework is inspired on all the existing institutional analysis frameworks described in section 4. The four-tier framework consists of the framework of Koppenjan & Groenewegen (2005), which distinguishes four interrelated institutional layers. Two adjustments are made to the framework of Koppenjan & Groenewegen. First, there will be

more focus on the temporal dynamics of each layer of the framework by presenting the frequency of years above each layer (inspired on framework of Williamson (1998)). This is done to enable a clear distinction in the definitions used in the basic framework. Second, the framework is adjusted to show the role of actors within the system better. The latter is inspired on the *action arena* in the IAD framework of Ostrom (2004). As a consequence the *L1: Actors and Games* is split up in two parts consisting of the actors and the interaction. This separation enables to show which actors are involved within a system and how they cooperate. Figure 4 presents the basic institutional framework.



Figure 4 Basic Institutional Analysis Framework

To have a clear tool the basic institutional analysis framework is supported by clear definitions.

L1: Actors and Games. Actors and their interaction aimed at creating and influencing provisions and outcomes. Actors stand for all the stakeholders involved within the interaction arena. *Interaction* stands for: 'strategic interactions between actors, the rules devised to constrain the actions of actors, and the process used to generate the institutions' (Anderies, 2004, p. 18). The frequency is relatively fast; interaction between stakeholders can take place on a short notice. However, the interaction can also include long-term relationships built on trust.

L2: Formal and Informal arrangements are also known as governance structures, and are designed to coordinate arrangement among actors. This layer also contains the arrangements that are created to meet the rules enforced by the formal arrangements in level 3. The average frequency of change varies between 1 and 10 years.

L3: Formal institutions are the mechanisms available to coordinate formal relationships between the involved agents and stakeholders in a system. Additionally, the formal institutions determine the legal positions of the involved agents and stakeholders. Formal institutions are the formal rules, laws and regulations and constitutions. The average frequency of change of formal institutions can vary between 10 to 100 years.

**L4: Informal institutional environment** consisting of shared values, norms, and culture. The frequency is relatively slow, as it takes time for norms and values to evolve over time. However, this layer can be influenced by abrupt changes such as a natural disaster.

The structuring and formalizing of the analysis in the basic institutional framework, makes it easier to understand the complex patterns generated in complex adaptive delta system. It does this by primarily meeting the challenges regarding defining insight in temporal dynamics, culture and actors. However, it does not comply with the existence of different scholars and system perspectives. As a consequence the basic framework might need to be extended to meet also these challenges.

**5 Dealing with complex adaptive delta systems by looking at disciplines** The involvement of various disciplines in a delta region, results in different reasons to analyze institutions in delta regions. In this article I take into account the viewpoints of the three disciplines: spatial planning & design, science & engineering and water governance. It seems that these disciplines have different motivations, aims and perspectives of dealing with institutions in a delta system. To motivate what kind of institutional analysis methods fit with a certain discipline, first the discipline is described. Based on this description a suggestion of accompanying institutional analysis methods are presented.

**Spatial planning** is dealing with: 'the problem of coordination or integration of the spatial dimension of sectorial policies through a territorially based strategy' (Cullingworth, 2006, p. 91). However, it seems that spatial planners often deal with more complex institutions than land-use regulation, as they also address the tensions and contradictions among 'sectorial policies' (UNECE, 2008). The analysis method of the spatial layer approach (McHarg, 1969; Nijs & Kuiper, 2006; VROM, 2001) seems useful to address this complication. The Dutch layers approach is: 'a stratified model that distinguished spatial planning tasks on the basis of the differing spatial dynamics of substratum, networks and occupation patterns (Van Schaick & Klaasen, 2011, p.1). The layers stand for aspects in the domain of urban and regional design and planning. This method includes different sectorial perspectives and has proved to be useful to analyze responsibilities and positioning of actors (Marchand & Ruijgh, 2009).

**Engineering** is dealing with the development or (re)design of technological solutions. In order to do so, engineers often must balance different design choices and user prerequisites to select the solution that matches best with all the requirements. In other words: 'the task of engineers is to identify, understand, and interpret the constraints on a design in order to produce a successful result.' (US DL, 2006). When conducting an engineering project these requirements are often related to design, building, financing and operation (DBFO) (GBA, 2013). This distinction seems helpful to analyze institutions related to these life-cycle elements of an engineering work in a structured way. Moreover, this method proved to be useful for getting insight in the relationships between institutions in the design, construction, operating & financing of water related systems (Ruijgh, 2011, p. 201).

**Water governance** is dealing with integrated water management approaches by balancing between water safety, flood risk management, socio-economic activities and ecosystems. It does this by the formulation and implementation of water legislation and policies (UNDP, 2013). Furthermore, within water governance the roles of the government, citizens and the private sector are studied. It primarily does this by looking at the responsibilities regarding management, maintenance, ownership, and administration of flood defense structures and services (UNDP, 2013). Water governance plays and important role for the safeguarding of flood risk management in delta regions (Delta Programma, 2012). Experience has shown that the most effective approach is through the development of flood risk management programs incorporating the five elements: prevention, protection, preparation, emergency response and recovery and lessons learned (EC Europe, 2012). Using these elements enables to analyze institutions regarding flood risk management from an all-encompassing perspective.

It can be concluded that the presented disciplines have different motivations, aims and perspectives of dealing with institutions in a delta system. The suggested methods of the spatial layer approach; life cycle elements and flood risk management elements enable a widespread institutional analysis, for example by having special focus on planning, responsibilities and financial structures within water system. Hence, the analysis with these methods enables to analyze institutions from different perspectives. However, when analyzing institutions with these methods this does not takes into account the challenges of providing insight in the multi-actor setting, providing insight in shared values, and the role of temporal dynamics. Another important remark of these methods is that they are not able to provide information regarding the multiple types of institutions.

#### 6 Institutional Analysis Tool

When looking at the basic framework one can conclude, that the framework does not fully comply with the challenges presented in section 3, as it has shortcomings regarding providing sufficient insight in different disciplines. In the previous section methods are described based on the activities of scholars that enable to do an institutional analysis specified for a certain discipline. However, these methods do not provide insight in the different types of institutions and their interrelations.

Therefore, it is suggested to combine the basic framework with the different institutional analysis methods. One can consider the basic institutional framework as a fixed horizontal axis, which can be combined with various methods, hereafter named 'bits', of which the combination results in a matrix. The term bit finds an analogy with bit-screwdrivers. These types of screwdrivers have a basic frame in which different bits can be installed. This enables to use one tool to drive a broad range screws (e.g. crossheads, trod heads, Phillips heads). Each bit is presented as an independent column and enables to provide insight in the institutional environment from another *perspective*. All the matrices together form the suggested institutional analysis toolbox. The presented matrix meets all the challenges mentioned in section 3.



Figure 5 Institutional Analysis Toolbox

## 7 Conclusion & Discussion

It is considered important to provide insight and to share knowledge regarding institutional arrangements that are able to deal with the indisputable drawbacks of both societal and physical

phenomena in delta regions. However, the complex, adaptive system characteristics of a delta region make it challenging to analyze these successful institutions. The aim of this paper was to present an institutional analysis tool entailed to meets the challenges of conducting an institutional analysis in the complex adaptive systems of delta regions.

In figure 5 an institutional analysis toolbox is presented, which builds on existing institutional analysis frameworks and is combined with three different methods based on the system perspectives of disciplines involved in a complex adaptive system. However, one should know that even though the basic framework is built on a well-found theoretical base, the user group consisting of practitioners in complex adaptive delta regions did not accept the framework at this moment.

Another discussion point is that the scholars of the existing institutional frameworks all have a different focus of analysis in their framework. It seems that Ostrom focuses in her framework on formal regulations (L3) and the actors, Williamson focuses of the 'governance of institutions' (level 2) and Koppenjan & Groenewegen emphasize Actors & Games (L1). Hence, before doing an institutional analysis with the toolbox one should define on which aspects one wants to focus in the framework. In addition the extension of the framework reflects that institutional analysis is 'situational' and can be conducted for different purposes. This means that experts using the framework should define the research questions before doing an analysis. These questions are leading for the choice of the bits and matrix selected for analysis. A possible way to help the user with getting a research purpose is by developing a guideline, regarding the research approach and research steps necessary for conducting an institutional analysis with the tool.

The toolbox is a first version and therefore is not fully developed and accepted. To improve the tool it is recommended to conduct multiple tests and reviews of the tool by doing case studies and by conducting interviews with experts. Nonetheless, even though the first framework is still under development I conclude that the framework is a successful first attempt for providing an institutional analysis tool. The tool is able to structure institutions in the complex adaptive delta systems of which the outcome allows a dialogue between the involved actors.

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