An institutional analysis framework to close the regional water cycle

Ward van Es (4112261). Department of Technology, Policy and Management, Delft University of Technology, Jaffalaan 1, 2828 CN Delft, Netherlands

Key words: Closed water cycle, four-layer model, IAD framework, institutions, Ostrom, wastewater reuse, Williamson

Abstract

Climate change and urbanization put increasing stress on urban water management (UWM). Prolonged periods of drought in densely populated areas threaten the quantity and quality of freshwater sources. Closing the water cycle by wastewater reuse can alleviate pressure on these freshwater sources. However, a closed water system requires a different institutional environment. A comprehensive and specific institutional analysis framework can provide guidance to stakeholders in the regional water system. A literature review has concluded that academia has not yet provided such framework (van Es, 2017a). This research proposes an institutional analysis framework by combining two widely used frameworks in institutional analysis: the four-layer model of Williamson (1998) and the Institutional Analysis and Development (IAD) framework of Ostrom (2011). The aim of the institutional analysis framework is twofold: 1) to find the critical issues that can be expected in closing the regional water cycle and 2) to provide recommendations on coordination of the action situations in which the critical issues are addressed. The framework is applied to the case of closing the water cycle in the service area of water authority Delfland in the western part of the Netherlands. This research shows that the proposed institutional analysis framework is highly useful in finding and coordinating crucial issues in closing the water cycle. An empirical operation of the four-layer model of Williamson (1998) provided a deep and structured understanding of the expected issues by relevant stakeholders. It also provided insight into the attitude and main drivers of stakeholders on a closed water cycle. The IAD framework of Ostrom (2011) helped to specify the most critical action situations. Further research can contribute to the field of institutional analysis by conducting more case studies with the proposed Williamson-Ostrom framework and execute the case study in a theoretical way instead of an empirical way.

1. Introduction

Climate change and urbanization put increasing stress on urban water management. Climate change will lead to intensified and prolonged periods of both drought and precipitation. Meanwhile urbanization is creating areas with extraordinary high population density, in which water demand and pollution emission levels are high. Prolonged periods of drought, due to climate change, in densely populated areas threatens the quantity and quality of freshwater sources of the urban water cycle. This cycle runs from fresh water supply to water treatment and use (by a variety of users and purposes) to wastewater treatment and discharge into the environment. Closing the water cycle by wastewater reuse can alleviate pressure on these freshwater sources. However, a closed water system requires an adequate institutional environment. A comprehensive and specific institutional analysis framework can provide guidance to stakeholders in the regional water system. A recently conducted literature review concluded that academia has not yet provided such framework (van Es, 2017a). This paper proposes a framework that is both comprehensive and sufficiently guiding for stakeholders in the regional water system.

2. Literature review

In the literature review of Van Es (2017a), eleven scientific frameworks have been studied (see Van Es, 2017a). The frameworks range from more general ones (e.g. Hellstroms (2000) 'Framework for sustainable UWM) to more focused on a specific aspect of UWM (e.g. Harris-Lovett 'Societal legitimacy framework'). All authors mention a sense of urgency to address future water challenges, and agree that current water management practices will not be adequate to face future challenges. Many scholars

emphasize the need for an integrated approach to urban water management. A framework should be "broader than a strictly technical approach" (Lafforgue, 2015) and should include economic, social and environmental aspects (Wilcox, 2016).

However, the proposed frameworks remain either general or focused on a specific aspect of UWM (e.g. social legitimacy). The research gap is a comprehensive framework, acknowledging the importance of different aspects (technological, social, economic, and environmental) while providing a sufficient level of detail to be applicable for actors in the field of UWM. This research proposes an institutional analysis framework, by combining two widely used frameworks in institutional analysis: the four-layer model of Williamson (1998) and the Institutional Analysis and Development (IAD) framework of Ostrom (2011).

3. Institutions

Institutional analysis can address all important aspects in closing the regional water cycle (technological, social, economic, and environmental). Scientific literature offers a myriad of definitions and explanations of the term 'institutions'. Hodgson (2006) defines institutions as 'systems of established and prevalent social rules that structure social interactions'. North (1991) defines institutions as 'the humanly devised constraints that structure political, economic, and social interactions.' This research, combines the definitions of Ghorbani (2010) and North (1991): *institutions influence, guide and limit the behavior of actors and structure political, economic and social interaction.* The next sections will discuss two frameworks for institutional analysis: the four-layer model of Williamson (1998) and the Institutional Analysis and Development (IAD) framework of Ostrom (2011). The Nobel Prize in Economics was jointly awarded to Elinor Ostrom and Oliver Williamson for their work on nonmarket economic arrangements (Toonen, 2010).

4. Four-layer model of Williamson (1998)

The four-layer model of Williamson (1998) conceptualizes social analysis by categorizing institutions in four different layers (see Figure 1). The higher and lower levels are connected: a higher level imposes constraints on the level immediately below (solid arrow in Figure 1) and a lower level signals feedback to a higher level (dashed arrow) (Williamson, 1998).

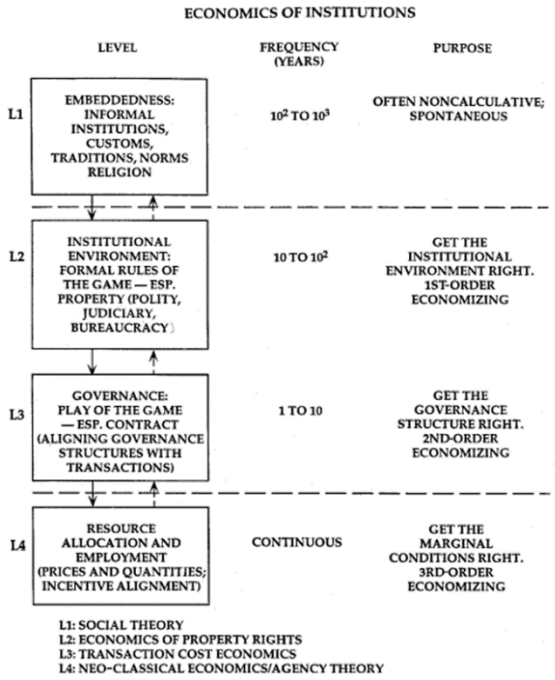

Figure 1 - Four-layer model of Williamson (1998)

The top level of the model is the social embeddedness level, in which norms, customs, traditions, mores etc. are located. Institutions at this level are regarded as a given for most economists since they change very slowly – over centuries or even millennia (Williamson, 1998). The second level is the institutional environment in which institutions are the product of politics. These institutions provide the rules of the game within which the economic activity is organized (Williamson, 1998). In (re)designing socio-technical systems this level, as Williamson (1998) states it, is important to 'get the institutional environment right'. Major changes in institutions at this layer mainly occur at rare windows of opportunity (Williamson, 1998). The institutions of governance are located at the third level of the model. Transaction costs economics operates at this level to deal with the 'play of the game'. With the constraints of the *rules* of the game from the level above, the *play* of the game can be determined at this level. Redesigning this level is

'getting the governance structures right' (Williamson, 1998). The lowest level of institutions concerns marginal analysis; the examination of costs and benefits of individual actions. Neo-classical economics and agency theory play a role in this institutional layer (Williamson, 1998). Agents take price and output into account in their decision making. Altering this level of institutions is about 'getting the marginal conditions right'. Price and output continuously change in response to market conditions and this is hence the fastest changing institutional level.

5. IAD framework of Ostrom (2011)

Another well-known framework for institutional analysis is the Institutional Analysis and Development (IAD) framework by Elinor Ostrom. The IAD framework helps analysts to understand complex social situations and to break these situations down into manageable sets of practical activities (Polski and Ostrom, 1999). The framework can also help in organizing knowledge from empirical studies (Ostrom, 2011). The core of the IAD framework is the 'action situation'; a conceptual unit that can be utilized to describe, analyze, predict and explain behavior within institutional arrangements (see Figure 2) (Ostrom, 2011). External variables (left in Figure 2) affect the action situation (Ostrom, 2010). Action situations are the social spaces where individuals interact and exchange goods. In the action situations regularities in human behavior and results of the interaction can be explained.

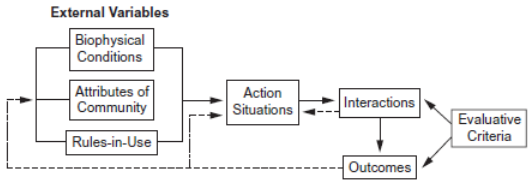

Figure 2 - IAD framework (Ostrom, 2011)

Figure 2 shows that Ostrom identifies three categories of external variables affecting an action situation at a particular time (Ostrom, 2010). *Biophysical conditions* include the physical and material conditions influencing action situations (Polski and Ostrom, 1999). *Attributes of community* describe the cultural context of policy activity. *Rules-in-use* are the set of rules that are needed to explain actions, interactions and outcomes (Polski and Ostrom, 1999). The core question in the analysis is what the resulting patterns of interactions and the outcomes of the action arenas are and how these are evaluated by the participants of the action situation. The interactions and outcomes provide feedback on both the external variables and the action situation.

Ostrom uses seven sets of variables to describe the structure of an action situation, also called the internal working parts of an action situation. Figure 3 shows the internal working parts, their relation and a description of the variables is given below, based on Ostrom (2011).

I. Characteristics of the *actors* involved (e.g. who withdraws resources?)
II. *Positions* that the participants hold (e.g. members of farming association)
III. Set of *actions* that actors can (potentially) take (e.g. groundwater extraction)
IV. The amount and nature of *information* available to actors at certain moments (e.g. information on condition of resources)
V. The *outcomes* of the interaction (e.g. will groundwater extraction result in salt intrusion?)
VI. The level of *control* participants have over their choices (e.g. do greenhouse farmers act on their own or do they confer with others?)
VII. *Costs and benefits* of actions and outcomes (e.g. what is the cost of overexploiting a resource?)

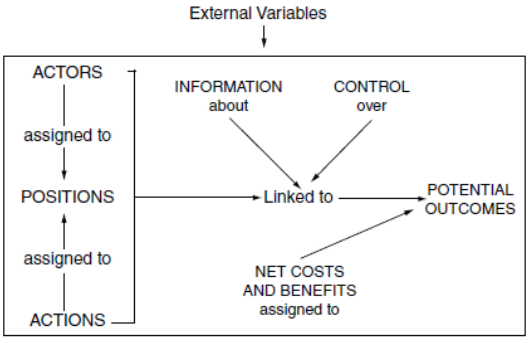

Figure 3 - Internal structure of the action situation (Ostrom, 2010)

When the behavior of actors in the action arena is thoroughly analyzed, the patterns of interaction follow logically from the analysis (Polski and Ostrom, 1999) (see Figure 2). Patterns of interaction show the structural characteristics of an action situation how the participants behave in this structure. Outcomes flow logically from well-founded observations about patterns of interaction (Polski and Ostrom, 1999) and can be seen as the performance of a policy system.

6. Proposed framework

Both the framework of Williamson and Ostrom can be used separately in institutional analysis. This research aims to combine both frameworks to strengthen the analysis. To date, the two frameworks have not been combined for institutional analysis and/or institutional (re)design. Ghorbani (2010) used both frameworks independently to conceptualize agent-based models of socio-technical systems. She concludes that both frameworks can be used to give structure to agent-based models. However, she does not elaborate on whether both frameworks can be combined in any way to improve institutional analysis of socio-technical systems. To the best of this researcher's knowledge, no other scholar has attempted to do so either. This section discusses how the frameworks can be combined.

The IAD framework of Ostrom (2011) allows more detailed institutional analysis than the four-layer model of Williamson (1998) by specifying the input and interaction of the action arenas. However, Ostrom acknowledges that it can be hard to identify relevant action arenas in large, complex policy systems (Polski and Ostrom, 1999). Ostrom claims that 'the most relevant arenas readily emerge from a rigorous application of the IAD framework'. This paper argues that the solution of just starting to apply the IAD framework, will not suffice. Rather, the four-layer model of Williamson (1998) can be used to find the critical action arenas in institutional redesign. The four-layer model is a high-level conceptualization which gives liberty in analysis (Ghorbani, 2010). The distinction of four different levels of institutions provides structure in analysis to find the critical action issues. Figure 4 shows that the first step of the methodology is finding the critical issues using Williamson's (1998) framework.

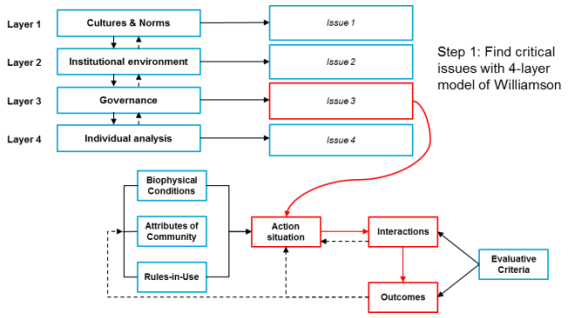

Figure 4 - Schematization of methodology of institutional design

The critical issues found with Williamson's (1998) framework can be addressed at one or multiple action situations. The critical action situations are those arenas that will be critical to the success of redesigning the urban water cycle towards a closed system. These arenas are complex due to for instance involvement of multiple actors with different views and goals or interfaces between technological system components. These critical action situations require coordination by the system designer to guide interaction towards desired outcomes. To use the same example, the interaction between the drinking water company and the customers requires coordination to attain social acceptation of wastewater reuse. It can also be possible that an action situation deals with multiple issues in institutional redesign. Thus, issues and action arena's do not automatically fit one-on-one. With information on the critical issues, the critical action situations that require coordination can be chosen by the institutional analysist.

The IAD framework of Ostrom (2011) is well suited to specify key features of the action situations that have proven to be critical (step 2 in Figure 4). With physical conditions, community attributes, rules-in-use and the action arena specified for each critical situation, the patterns of interaction and outcomes can be predicted. It is expected that the critical action situations will involve multiple actors who will have a broad range of strategies. This will make adequate predictions on the pattern of interactions and subsequent outcomes difficult. To address this issue, the institutional analyst can draft different scenarios of interaction and corresponding outcomes. Different actions within the range of strategies available to actors, will result in different patterns of interaction.

The action situations are nested in other action situations, potentially located at other institutional layers of the four-layer model of Williamson (1998). The *outcomes* of one action situation can affect the external variables and subsequently the *interaction* within another action situation. Especially when affected action situations are located at different institutional levels, the actors involved in one action situation might not have any influence in another action situation. Institutional analysis could provide insight into the nestedness of action situations.

To summarize, the four-layer model of Williamson (1998) will be used in the first step to identify the critical issues and subsequently the action situations that require coordination in institutional redesign. The Institutional Analysis and Development framework of Ostrom (2011) will be used in the second step to specify the critical action situations, to predict interactions and outcomes based on the external variables and eventually to provide recommendations on coordination.

7. Case study application

The framework is applied to the case of closing the water cycle in the service area of water authority Delfland in the western part of the Netherlands. The water cycle includes extraction or abstraction, treatment, use and the return of water to the hydrological cycle (Correljé and Schuetze, 2012). HH Delfland expressed its ambition to close the regional water cycle through wastewater reuse. The water authority is responsible for the water quantity and quality in a densely populated area, including the cities of The Hague and Schiedam. Two wastewater reuse project are currently in (an early stage of) development: the 'Freshwater Factory' (FF) to reuse wastewater for a recreational water body and the potable wastewater reuse project in cooperation with drinking water company Dunea. The operationalization of the proposed framework is executed in an empirical way, by conducting 22 interviews with relevant stakeholders in the regional water system.

7.1 Step 1: Identifying the critical action situations

The institutional issues have been structured in the four-layer model of Williamson (1998). The interviews have resulted in a long list of issues. Classifying these issues in the four institutional layers of Williamson (1998) created a structured and clear overview of the issues mentioned. Issues that have been mentioned most often and/or with most emphasis, have been considered as the most critical ones. Social acceptability is the most often mentioned issues at the highest institutional level of cultures and norms. The main issue at the level of the formal institutional environment is meeting all legislation to obtain a permit for wastewater reuse. The wide variety of actors involved in the regional water system and the political nature of the system are issues mentioned in the third layer of governance. Finally, the economic feasibility of wastewater reuse is a critical issue at the institutional level of marginal analysis. Not all issues that have been addressed are institutional issues. The required technological changes in wastewater treatment and transportation infrastructure is a non-institutional issue. Also seen as an issue in closing the water cycle, is that this cycle is part of the energy and resources cycle.

With a better understanding of critical issues in closing the water cycle, the critical action situations that address these issues can be identified. This research will further specify the action situation of obtaining a permit to discharge treated wastewater and new arrangements between HH Delfland and Dunea. These action situations have proven to be the most critical in closing the water cycle and are also suitable for analysis in this research (e.g. the accessibility of actors in these action situations for the researcher). Section 7.2 will further specify these two action situations.

The four-layer model is not only applicable to structuring the expected issues. An unexpected contribution of the four-layer is providing insight into the attitudes towards a closed water cycle. The attitudes of relevant stakeholders in the water system showed great differences. These differences have even been observed *within* organizations. The four-layer model of Williamson can be used to visualize the differences in drivers of stakeholders. The most

interesting difference has been found within the board of HH Delfland. Figure 5 shows three different groups within the board. The first group of board members is driven by values of sustainability and circularity and hence has a positive attitude towards closing the water cycle. The second group of board members is driven by the institutional layer of governance (level 3). This level concerns the 'play of the game' and actors at this level stress the importance of politicians and organizations effectively working together in closing the water cycle. The third group of actors is driven by the lowest institutional level of marginal analysis. The costs and benefits of wastewater reuse projects are decisive at this level. The difference in institutional level of reasoning and values by which actors are driven, can be a source of disagreement within an organization or between organizations. The four-layer model contributes in explaining and visualizing the different attitudes. Common understanding on drivers and attitudes of other actors, can be a first step in the decision-making process of closing the water cycle.

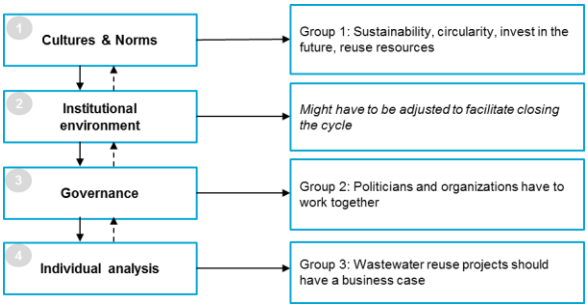

Figure 5 - Different positions and drivers of board members of HH Delfland

7.2 Step 2: Specifying the critical action situations

As explained in the previous section, the four-layer model of Williamson (1998) yielded an overview of the most critical issues. The institutional analyst can subsequently specify the action situations in which these critical issues are addressed. Figure 6 shows how four critical issues are addressed in two action situations. These two critical action situations will be further specified in step 2 with the use of the IAD framework of Ostrom (2011).

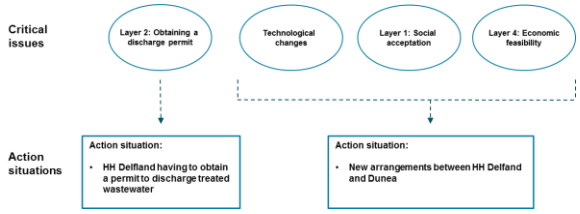

Figure 6 - Overview of critical issues and critical action situations

The first action arena shows the complexity of three departments of HH Delfland being involved in the granting of a discharge permit. HH Delfland is both the applicant and provider of a discharge permit. The tension in this action situation is between preventing risks for public health (by preventing pollutants to be discharged into surface water) and imposing such strict standards that reuse projects become financially unviable. Together, the three departments must find a balance in the trade-off between water quality and costs. This balance can be presented to the board of HH Delfland. The board is eventually responsible for deciding whether the project will be implemented at full-scale.

The second action arena of new contractual arrangements between HH Delfland and Dunea addresses three main issues: technology, social acceptation and financials. A lot of interaction in this arena is required, before an understanding of the feasibility of the project can be obtained. Since both organizations hardly interact at the moment, there is a long way to go before both organizations can work together in a water reuse project. Interaction on these three issues will give an idea of the form of collaboration between the two organizations. This can range from no collaboration to the formation of water cycle company, including both the drinking water and wastewater system.

8. Evaluation of framework

The aim of the institutional analysis framework was twofold: 1) to find the critical issues that can be expected in closing the regional water cycle and 2) to provide recommendations on coordination of the action situations in which the critical issues are addressed. This research can evaluate the proposed framework based on the application to the case of HH

Delfland. The four-layer model of Williamson (1998) has proven to be very helpful in structuring the expected issues mentioned in 22 interviews and to identify the critical issues. The IAD framework of Ostrom (2011) allowed thorough analysis of the action situations in which the most critical issues are addressed. Based on this analysis, recommendations on coordination of the critical action situations have been provided. The use of both frameworks, and the combination, is discussed below.

Four-layer model of Williamson (1998)

The framework helps to structure institutional issues by positioning them at one of the four institutional levels. A long list of issues can be converted into a clear overview of issues at four institutional layers. It also provided good insight in how institutions are embedded in different institutional levels (e.g. a discharge permit of HH Delfland is embedded in national and EU legislation).

The contribution of the four-layer model in providing insight into drivers, attitudes and values of actors has proven to be highly valuable. The four-layer model was mainly intended to be useful in structuring the expected issues, not to provide insight into the drivers, attitudes and values of the respondents. The similarities and differences in these aspects, found in the case study, have been crucial in understanding the current positions of and relations between relevant stakeholders. The advantage of the four-layer model of Williamson (1998) is that it is easily understandable for non-institutional analysist. The four institutional levels can be easily explained, and actors can quickly get a grip of the different levels. The positioning of board members at the four different institutional levels in the case study, was known within the organization. However, the four-layer model was highly useful in making the different positions explicit and in visualizing them.

Another advantage of the four-layer model is that it provides valuable input for the analysis of the critical action situations. For instance, the differences in the positions within the board of HH Delfland is of great importance in the action situations of obtaining a discharge permit and new arrangements with drinking water company Dunea. Thus, both frameworks do not have to be used completely separately and in the proposed sequence: the four-layer model provides valuable input for the IAD framework.

However, in structuring the issues according to the four-layer model, it was noted that not all issues could fit the framework. In the case study this resulted in an overview of institutional issues, categorized in the four institutional layers, and a separate overview of non-institutional issues. The framework is still very useful in structuring the institutional issues, but the analyst should be aware that some issues might not fit the framework.

From issues to action situations

With a clear overview of the most critical issues in closing the water cycle, the action situations that address these issues can be further specified with the IAD framework. The four-layer model of Williamson structured empirically obtained information. However, there is a discrepancy between *issues* and *action situations*. Critical issues can be addressed at one or multiple action situations. These critical action situations require coordination by the system designer to guide interaction towards desired outcomes. It can also be possible that an action situation deals with multiple issues in institutional redesign. Thus, issues and action arena's do not automatically fit one-on-one. In the application of the Williamson-Ostrom framework, the question rises how to choose the critical action situation, based on information about the critical issues. The institutional analyst must consider the relevance of an action arena in addressing the issue. Is the specified action arena *the most critical arena* in which the issue is addressed? Another, practical, consideration is whether the actors in the action situation are accessible for the institutional analyst. Without the ability to gather empirical information, it is questionable whether an analysis will provide insight into the action situation. The translation of critical issues into critical action situations is a less defined action in the proposed Williamson-Ostrom framework and will hence be subject to discussion.

IAD framework of Ostrom (2011)

The IAD framework is supposed to help analysts understanding complex social situations and to break these situations down into manageable sets of practical activities (Polski and Ostrom, 1999). In the application of the framework to the case study, the IAD framework has been highly useful in specifying the two critical action situations. In the four-layer model of Williamson (1998), the issues have been addressed, but real understanding comes with unraveling the action situations by using the IAD framework of Ostrom (2011). By describing the external variables (biophysical conditions, attributes of community and rules-in-use) in detail, the IAD framework showed how these variables influence the action situation. For instance, the discussion of biophysical conditions provides the insight that wastewater is reused as two different types of good in the two action situations analyzed, as a public good and as a private good. Insight into the external variables also allows predictions of interaction. This yields an understanding of the crux of an action situation and what the positions of the stakeholders are in this action situation. The IAD framework also shows the nestedness of an action situation in the water system. Figure 7 illustrates how the first analyzed action situation is nested in other action situations. For instance, the outcome of the analyzed action situation (obtaining a permit for wastewater discharge) influences the action situation (rules-in-use) of the board of HH Delfland deciding on full scale implementation.

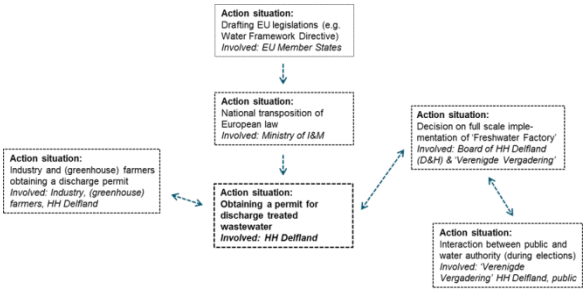

Figure 7 – Nestedness of the first action situation

The IAD framework is rather conceptual and it is hence challenging to meaningfully apply the framework in a case study. Simply filling in the framework soon leads to a static enumeration of variables. The institutional/policy analyst should work backwards from the most critical question to the (external) variables, action situation and interaction. However, the IAD framework does not help in determining the most critical question in the action situation. Rather, the critical question must be known to use the framework. This research has made use of interviews to determine the critical question in the action situation.

The institutional analyst can present the specified action situation to the actors involved. The actors involved in the action situation can benefit from the (objective) perspective of the institutional analyst. It can show them what the potential outcomes of an action situation is, when certain patterns of interactions are followed. The IAD framework allows the institutional analysist to provided recommendations on the coordination of the action situation.

9. Conclusion

Imperial and Yandle (2005) describe the job of the policy analyst as "to clarify and define problems and then help decision makers identify appropriate goals, objectives, and values to achieve". In this paper, the proposed Williamson-Ostrom framework has been used to define, structure and specify the expected issues and critical action situations in closing the regional water cycle.

The institutional analysis framework has provided a comprehensive framework, including the main economic, social and environmental aspects, provided clarity in attitudes and positions of actors in closing the water cycle (four-layer model of Williamson (1998)), has helped to structure the search for issues in closing the water cycle (four-layer model of Williamson (1998)) and has provided further insight into these issues and recommendations for coordination (IAD framework of Ostrom (2011)). Further research can contribute to the field of institutional analysis by conducting more case studies with the proposed Williamson-Ostrom framework. Also, in addition to the empirical way in which this research has been conducted, the case study could be executed in a theoretical way. It will be interesting to

evaluate whether the same critical issues and action situations are found with the two different methods (empirical and theoretical).

References

Correljé, A. and Schuetze, T., 2012. Decentral water supply and sanitation. Inverse Infrastructures. In: Egyedi, T.M.,Mehos, D.C (eds., 2012), pp. 161-185.

Es, W. van, 2017a. Evaluation of frameworks guiding towards a sustainable practice of urban water management. A Literature Review. January 2017.

Ghorbani, A., Ligtvoet, A., Nikolc, I., Dijkema, G., 2010. Using institutional frameworks to conceptualize agent-based models of socio-technical system. Cosmos 2010; 33-48.

Harris-Lovett, S., Binz, C., Sedlak, D., Kiparsky, M., & Truffer, B. (2015). Beyond user acceptance: A legitimacy framework for potable water reuse in California. Environmental Science & Technology, 7552-7561.

Hellström, D., Jeppsson, U., & Karrman, E. (2000). A framework for systems analysis of sustainable urban water management. Environmental Impact Assessment Review, 311-321.

Hodgson, G., 2006. What are institutions? Journal of Economic Issues, Vol. XL, No. 1, March 2006.

Imperial M, Yandle T, 2005. Taking Institutions Seriously: Using the IAD Framework to Analyze Fisheries Policy. Society and Natural Resources, 18; 493-509.

Koppenjan, J. and Groenewegen, J., 2005. Institutional design for complex technological systems. Int. J. Technology, Policy and Management, Vol. 5, No. 3, 2005.

Lafforgue, M., & Lenouvel, V. (2015). Closing the urban water loop: Lessons from Singapre and Windhoek. Environmental Science , 622-631.

North, D., 1993. The New Institutional Economics and Development, Washington University, St. Louis.

Ostrom, E., 2010. Beyond markets and states: polycentric governance of complex economic systems. American Economic Review 100: 641-672, June 2010.

Ostrom., E., 2011. Background on the Institutional Analysis and Development Framework. The Policy Studies Journal, Vol. 39, No.1, 2011.

Polski, M., Ostrom, E., 1999. An institutional framework for policy analysis and design.

Toonen, T., 2010. Resilience in public administration: the work of Elinor and Vincent Ostrom from a public administration perspective; a conversation with Elinor and Vincent Ostrom. Public Administration Review; March-April 2010.

Wilcox, J., Nasiri, F., Bell, S., & Rahaman, S. (2016). Urban water reuse: A trip bottom line assessment framework and review. Sustainable Cities and Society, 448-456.

Williamson, O., 1998. Transaction cost economics: How it works; where it is headed. De Economist 146, No.1, 1998.

Williamson, O., 2010. Transaction cost economics: the natural progression. American Economic Revies 100: 673-690, 2010.