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Institutional Arrangement of the Indus Water Treaty- A Transboundary Water Management between India-Pakistan

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1. [Abstract ID: 863] Abstract

This paper is aimed at understanding institutional arrangement of the Indus Water Treaty (IWT-1960) between India and Pakistan that sustained for nearly six decades amidst several geo-political disagreements and distresses. It further intends to identify characteristics that can be considered robust in maintaining peace between the neighboring countries including but not limited to the principles now internationally crucial in hydro-diplomacy and in enabling sustainable trans-boundary water management. The Design Principles for sustainable management of the Common Pool Resources (CPRs) such as river, fishery, forest, etc. developed by Elinor Ostrom (1990) are used to understand formal and informal rules of action situation and thereby assess the success of the IWT.

The Indus river basin comprises of six east and west river basins whose social-ecological aspects have worked towards robustness. The paper is part of personal endeavour of the authors to understand the idea of peace ecology and contribute towards the peace building process between Pakistan and India through highlighting the principles that sustained the IWT for six decades.

This study of IWT within Ostrom's SESF helps in analysing institutional strengths and weaknesses, influences, approaches to understand role of collective action in determining how the commons are created, maintained and recovered.. The paper gives a brief overview of the rules of the collective agreement. The analysis helps identify some vital institutional characteristics of the IWT that can transcend into other resource sharing.

2. Keyword

IWT, transboundary water management (TBWM), Institutions, Common Pool Resource (CPR), Social ecological systems framework (SESF)

3. Introduction

One of the challenges of this century is predicament related to common pool resources (CPRs). Elinor Ostrom, (1990) while being biggest critic of the "Tragedy of Commons" (Hardin, 1968) believed in the ability of social groups to manage shared resources and insisted that "common pool resources must be governed in some fashion while they operate under different governance protocols" (Ostrom, 1990).

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The very fact that ocean cannot be parcelled (McKean, 1996, p. 228) and ecology cannot be divided by geographical bounds, yet the reality remains that the world is divided into states by geographic limits. Within this reality, states exercise control and power over natural environment and resources forgetting the nature of natural resources (e.g. water) and ecosystems they thrive/ sustain do not develop and grow in limits but follow the free flow rule of nature. Furthermore, crucial global challenge of climate change, requires development of a culture of collective compassion and caring for environment by thinking beyond geographical bounds and with human centred approach (Amster, 2009) as the problem is as much shared between states as are the resources.
Water is known as a complex common with sufficient evidence from the complexities of transboundary waters, vulnerabilities and conflicts arising with shared (water) resources, case studies of transboundary water conflicts between nations and the treaties that prevent misuse of valuable resource. It is predicted that the future wars including the worst will be on resources mainly like water and food and Asia being the most water distressed is most vulnerable to water war (Chellaney, 2011 & 2013). At the UN convention, Annan (2002) talked about the fierce competition over fresh water that may well become a source of conflict and wars in the future. He argues that the water problems of the world need not raise tensions rather be the catalysts for cooperation, "*If we work together, a secure and sustainable water future can be ours".*

Increasing water scarcity worldwide has activated not only environmentalists, ecologists and scientists who are trying to work on adaptive solutions to tackle the phenomenon of climate change and its link with water conditions, but also has motivated peace and conflict risks experts who have anticipated the outcome of the phenomenon may be water war (Chellaney, 2011 & 2013). Water security is thus an issue of prime importance for the current era and sustainable future.

While the idea of water war was anticipated historically also because of which treaties were devised as preventive measures. The shared resources and transboundary waters were studied for their potential for the peace besides the conflict. The literature with optimists' views and suggestions for cooperative solutions are equally abundant. A Transboundary Freshwater Dispute Database developed by the scholars at Oregon State University (2005) provides a list of water related events where cooperation prevailed over conflict. As many as 6,400 cases of water conflicts were also listed from 1948-2005. The United Nations Economic Commission for Europe (2015) published extensively and issued Policy Guidance Note on the benefits of transboundary water co-operation: identification, assessment and communication.

Water security has been an issue between India and Pakistan particularly since independence of the two countries in 1947. The transboundary water agreement that came up thirteen years later has sustained beyond adversities of relationship of the two countries due to robustness of institutional arrangement of the Treaty. The IWT-1960 serves as a significant and successful case study in the area of transboundary water management and agreement that helps to understand the institutional characteristics of the transboundary water treaty and identify further what makes the agreement robust to check whether the variables identified in the process can be also used for overall peace ecology between the transboundary regions.

The issue of managing diplomatic relations as well as TBWM between India and Pakistan have been a continuous challenge since partition of the Sub-continent. Both countries have been trying to manage both within tumultuous situations and changing political conditions. The IWT signed in 1960 brought about by formidable change within political environment and a mediation brought by World Bank was a sigh of relief, nonetheless there have been issues that

erupted only within a decade of the signing of the Treaty. The issues that have been pronounced by the actors involved and associated with the institutional arrangement are mainly the interpretation and technical issues and ones that are believed to have been inadequately dealt with or not foreseen at all in the Treaty (Mahmood, 2018). The disputes that were seen by Neutral Expert and the Court of Arbitration have also pointed towards the interpretive capacity of the IWT, the allocation of rights to resource use, to define the nature of disputes within the framework of the Treaty and a speedy resolution of conflict, which has by far been inadequate according to experts. The political thought within India in 2016 that changed the commitment towards TBWM between the two nuclear states with a collective choice of cooperation to use the potential of the TBW for war, jeopardised the IWT and the PIC specifically.

The Indus River basin that flows in the Punjab region between India and Pakistan primarily stands on a collective agreement for water sharing since 1960 under the Indus Waters Treaty. The Treaty however is only between two of the four riparian who share the water resource.

With a framework for analysing key international water treaties using indicators such as, water as a venue for future co-operation, employing a multi-disciplinary, transformative approach to conflict resolution, offers research ideas cases of various geo-political contexts, spatial and temporal diffusion, equity analysis, how to mitigate the spatial and geographic patterns of water distribution which make even the most dynamic spatial models inefficient and uncertain (Abukhater, 2013). For example, the cooperative co-management of the Indus waters will remain critical for both the countries and it will be the only way forward towards governance of water resources shared by India and Pakistan under the IWT. There are characteristics that are crucial for the successful governance and there are room for improvisation of those (Rao, 2017). Conflict resolution mechanisms are present within the Treaty which have been exercised from time to time. The possibility for improvement and adaptation of the Treaty will enhance its effectiveness while monitoring will increase transparency making institutions more robust eventually enables facilitation of cooperation in new areas.

It has also been observed while most of the international treaties include cooperation mechanisms for monitoring, information exchange and conflict resolution- which is always a vital objective of any treaty, few overlooked elements like not including all stakeholders and riparian sharing the resource may constitute for externalities that go unaccounted for or create bigger problems and adding to institutional vulnerabilities with time[3]. With new knowledge and developments some of the treaties now also cater to the SDGs and environmental concerns. Flexibility and adaptability in treaties can be useful in managing new developments and unforeseen externalities.

4. The Principles of Long-Term Sustenance

The Design Principles of long-term sustainable resource management (Ostrom, 1990) is selected as a starting point for a simple explorative analysis to take an early stock of the situation. The Design Principles (DPs) form the essential characteristics or conditions that help to account for the success of any institution in sustaining the commons and gaining the compliance of generations of users to the institution (Ostrom, 1990). Each DP is an independent concept that together forms a phenomenon/theory which is inclined towards sustainable resource management. The DPs are translated into a set of questions that in designing and

[3] http://www.waterencyclopedia.com/St-Ts/Transboundary-Water-Treaties.html

adapting institutional arrangements for regulating the commons to achieve multiple objectives needs to be addressed in a way that is understood by all those involved and considered legitimate given the characteristics of the resource, the community, the institutions, the values and the larger socio, economic and political setting.

These set of eight rules for sustainable governance of the resources are i) clearly defined boundaries (of rights for the resource and actors), ii) proportional equivalence between benefits and costs, iii) collective choice agreements (by those involved and affected), iv) monitoring (of resource conditions and behaviours), v) graduated sanctions (on actors for violation of rules), vi) conflict resolution mechanism, vii) minimal recognition of rights to organize and viii) nested enterprise for the resource.

The DPs help to distinguish successful and unsuccessful cases is supported by multiple case studies, field experiments and laboratory experiments. The cases vary from small, self-contained systems of homogeneous resource users (for example, Nepal Irrigation management by Shivakoti and Ostrom 2002; Shivakoti et al. 2005; Ostrom et al. 1994) to complex systems organized in modern economies where the resource users are linked to public infrastructure providers through a variety of mechanisms (for example, public infrastructure by Janssen et al. 2004). Anderies et al. (2004) argue that the institutional arrangements that have managed to sustain resources tend to be characterized by most of these principles and are defined as robust system where robustness is a situation in which a social system adapts to an ecological system whose dynamics do not change over time (Shepsle 1989). When ecological dynamics change, the institutions may need to adapt to this change to sustain the robustness of the social-ecological system (Anderies et al. 2004). Institutional arrangements that have failed to sustain resources tend to be characterized by only few of the principles, and those that are characterized by a few of the principles are fragile (Pereira et al. 2002).

Studies of long-time existing institutional arrangements are useful to help guide design new institutional arrangements. However, the DPs themselves do not directly guide to design new institutional arrangements. They miss addressing the mechanisms related to match between spatial and temporal dynamics of ecological and social systems, those that sustain institutional and ecological memory (Berkes and Folke 1998). Besides, ecological dynamics are implicitly addressed in the DPs (Byrd and Brown 2003) making it more inclined to institutional components. Despite these limitations of the DPs, they are extensively used as an analytical framework to understand the basic institutional arrangement of any system. It is also used extensively for river systems and as a start point of a study as we intend to do in the early phase of the research before we manage to establish a theoretical framework for analysing the system and evolving a mechanism for proving recommendations for improvising the system.

5. The Indus Water Treaty

The Indus Water Treaty (IWT) between Pakistan and India came into existence on April 01, 1960. It is considered as a successful example of mutually agreed and formulated transboundary water treaty in a most amicable atmosphere and cooperative spirit. It bears testimony to cooperation under severed relations and stands intact even after two major wars in 1965 and 1971, one limited war (1999) and a series of geo-political cum military conflicts (1987,1989–90, 2002 and 2008) between the two countries (Ranjan, 2016). The Treaty is appreciated globally as the conflicts between the two countries have not affected the functioning of the Treaty and it has never been disregarded by either party.

There are four key features of the IWT (Briscoe, 2010) that are important to understand:

1. The division of the waters;
2. The financing plans;
3. Use of the hydroelectric potential of 'Pakistan's rivers' before they reach Pakistan.
4. The conflict resolution mechanism, through the Indus Commissioners or through external arbitration (Annexure F and G).

The Treaty is comprised of 12 Articles and 8 Annexures with clearly laid down cooperative intentions for common interests in complete and satisfactory utilization of the Indus River waters, knowledge exchange and development cooperation by both the parties. The cooperative treaty holds justice and respect for opinions, rights and obligations of each party in high regard. In short it will not be untrue to term the IWT as most authentic example of transboundary water treaty that works as catalyst for peace, with essential elements of 'good faith' and 'co-operation' which are explained as relevant factors for the settlement of conflicts (Ahmed, 2018). While good faith negotiations are considered an international norm and a treaty requirement in some areas area clear that it does not pressurize the parties to make any concessions to bring the deal together but requires effective bargaining. The concept of good faith negotiation as a useful tool to analyse and identifies the IWT as a successful model. The elements of sincere compliance for implementation and mutual intention of cooperating in the agreement makes the IWT a successful treaty (O'Neill, 2001).

The Article numbers VI, VII, VIII and IX of the treaty are particularly assigned for establishing and maintaining cooperative arrangements and peace building while governing the rights and obligations of the concerned parties without prejudice. Ironically, the continuation of the cold war between India and Pakistan have affected the Permanent Indus Commission formed in compliance with Article VIII to promote cooperation between the parties in development further affecting the exchange of data (Article VI) and settlement of differences and conflicts (Article IX) through Annexure F and G due to the issues of trust. Interestingly, in safeguarding the treaty, the institutions of the collective agreement provide due regard for version of intent and opinion of the involved parties.

For effective management of the Indus Basin, the Treaty has an intensive framework devised for cooperation, yet there are challenges observed in the IWT that requires assessment for identifying the collapsing factors with 'potentially disastrous consequences'. A number of events have pushed the treaty towards the collapsing situation and destroyed the spirit of the treaty altogether (Briscoe, 2010). The issues (identified) call for institutional analysis, transparency and compliance, questions of trust in third party or external arbitration, flexibility and provisions in the Treaty, technical digression availability and interpretation of the Treaty with respect to concerns of the parties involved. While Briscoe (2010) argues that the IWT had provision for updating the Treaty as new knowledge accumulated, this can provide lead for inclusion of concept of peace ecology perspective in the operations/ implementation of the Treaty as well which will be for greater benefit of mankind rather than concerning only two nations. Rao (2017) argued that the IWT must undergo improvisation to address adaptation for climate change. It is important thus to understand the institutional characteristics of the IWT to explore the larger potential of the Treaty. The design principles for long term sustainable management of resources developed by Elinor Ostrom (1990) can help to understand the institutions, the institutional structure and characters, the social-ecological interconnections and inter-dependencies, intentions, perspectives and interests.

The growing challenges of the today require strengthening and expansion of monitoring and cooperative arrangements and institutions like the Permanent Indus Commission in terms of scope and mandate to alleviate the need for external arbitration (Akhtar, S. 2018). Akhtar (2018) suggests clear definition and alignment of role of the Commission with the current realities to maintain its relevance. To further the role of the Commission supportive technical assistance should be provided in form of Indus Water Consultative Group with environmental and climate change experts. All this combined with a wilful agreement on a framework for sustainable management from both countries is suggested way forward according to her.
A study of the IWT with reference to the international conventions protecting the water commons with five major principles that are most significantly considered to be included in rules and agreements distinguishes the very essence and nature of the IWT to be understood in terms of the type of treaty it is. Kamran et al (2017) claim that IWT has to be seen as an allocative treaty rather than a water sharing treaty.

6. The Study Area and the Research Methodology

The Indus (also known as Sindhu) River is the longest river of Asia. It originates in the central China and unites with the Arabian Sea at Pakistan. The river is of great importance throughout the history and is an indispensable resource, identity, a landmark and a reference for the region. The river basin is home to one of the oldest civilizations namely, the Indus Valley Civilization. The Indus River Basin length 2,900 Km (Encyclopaedia Britannica, 2006) and a Basin size of 1,081,718 Km2 (WRI4, 2003) comprises rich biodiversity of four countries that share the Indus basin namely, Pakistan (63%), India (29%) and China and Afghanistan (8%). The Indus basin provides a variety of complex and essential ecosystem services to the billions of people. It provides more than prosperity and stability to the region (Romshoo, 2012).

Figure 1. The Indus River
Image Credit/ Source: https://commons.wikimedia.org/w/index.php?curid=66085475

[4]Water Research Institute

South Asia is expected to suffer 50 percent water deficit by 2030, whereby the water demand in largest country in the region, India, is expected to double due to blast in population growth and uneven distribution will make the lower riparian states extremely vulnerable.

With 7th largest mangrove forests in the world, the Indus delta which itself ranks 5th largest in the world, is home to rare migratory birds, the Indus dolphin and forms a unique ecosystem that thrives on freshwater requirement for survival.[5]

The study assembles the building blocks of the transboundary water management, sustainable peace process and institutional arrangement with the IWT as a case to observe, analyse and understand. The basic queries are on the available literature on institutional arrangement in transboundary water management, an institutional process to attain peace using water as a connector, and the required institutional arrangement to sustain peace through transboundary water management (refer figure 2). The philosophical question is, *how/can an institutional arrangement of a transboundary water management be used for sustainable peace process?* The terms how/can in the question implies an implicit proposition that *sustainable peace process in transboundary water management* is possible, only thing is to understand the process through the existing institutional arrangement. A working question thus will be, *what characteristics of the institutional arrangement (of IWT) are crucial in building and continuing the peace process between the parties in the collective agreement.* What is done and found depends on the approach through which a phenomenon is built. Two things are happening simultaneously, one the institutional arrangement of the IWT must evolve to embrace new transboundary issues such as climate change, and two the long sustaining institutional arrangement of the IWT be used as a model to develop the new domain of the peace ecology that transcends boundaries. The methodological question thus to address will be, *how to make the IWT robust enough that it sustains the social-ecological system of the Indus region spanning the two countries as well as establishes a peace ecology model to continue a dialogue between the two countries?*

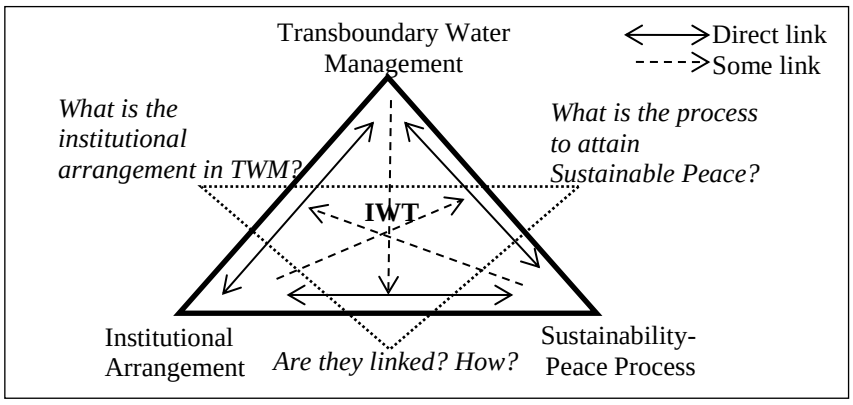

Figure 2. Research Triangle

The research is planned to be qualitative and quantitative involving exportation, identification, description, and explanation. It will be a combination of induction, deduction, (Moses and Knutsen 2007) and abduction (Schwartz-Shea and Yanow 2009) approaches. The abductive approach will include observing a case (IWT here) through history that confounds the expectations and asks what might explain it i.e., what situation of X makes Y less surprising such that Y is 'natural', where X refers to the characteristics of institutional arrangement and

[5] http://wwf.panda.org/knowledge_hub/where_we_work/indus_delta/)Accessed 11/3/2018 Indus Delta, Pakistan | WWF

Y refers to the sustenance of the IWT which in other words, is that the peace process continues. The inductive approach will include a normative assumption that the sustainability/ peace process is a field that embeds laws of institutions i.e. inducing the universal instances from the general laws. The analysis is expected to lead to a preliminary theoretical/conceptual model. The deductive approach will include building a conceptual model with a logic of reasoning that under certain conditions/characteristics of institutional arrangement, sustainable peace process happens deducing the premise from the universal hypotheses. The multi-stage analysis assembles like building blocks into a theoretical edifice of the emerging peace ecology.

The analysis is predominantly interpretive (Schwartz-Shea and Yanow 2009) in nature within the broader purview of positivism (Haverland 2010). The normative assumption of the causality that X (institutional arrangement) leads to Y (sustainability/ peace process) pulls the analysis towards positivism. Trying to understand questions such as, why/how institutional arrangement matters; what characteristics influence institutional arrangement; what form of institutional arrangement; and how institutional arrangement influence sustainability/ peace process; using different methods and sources pull the analysis towards interpretative. The source of the interpretative approach in the study will be based on the available literature on,

- the historical overview;
- the transboundary water (river) management;
- the peace ecology;
- the institutions towards collective action;
- the case studies of un/successful transboundary water and peace processes;
- open ended interviews of the experts involved in transboundary water and peace; and

The historical study will include to begin with the chronological study of the events in the region with global context such as the independence and division of the two countries, the inception of the IWT, the follow up wars and continued conflicts, the peace efforts and economics, and the current state of the affairs. The transboundary water management study will include the concepts such as, the adaptive management, the integrated water management, the connective capacity of the water, robustness and resilience of a social-ecological system. The peace ecology study will include to begin with the peace building models (for example, OyaDursun-Ozkanca 2016; Kyrou, 2007), the socio-economic and political aspects that explain the reasons of conflict and the way forward to a peaceful resolution, the ecological realm of peace and the peace-making potential of ecology (Randall, 2015). We will also investigate the indicators of the Water Institutions for International Peace Building. The institutions study will include to begin with the design principles of sustainable resources management, formal and informal rules of collective action, and the levels of analysis in the polycentricity of water governance. The case studies of un/successful transboundary water and peace processes will be the main source of empirical understanding to analyse what institutional arrangements have worked under which conditions and when do they collapse. For example, the processes and perceptions leading to international water conflict resolutions are emphasized as key issues in advancing cooperation and robust implementation of international water treaties (Abukhater, 2013).

In addition to the above literature from the secondary sources, we plan to carry out interviews (open ended) of the experts involved in the transboundary water, international relations and peace process. We also plan to carry out online survey of the actors in the governance process including those users residing in the region that are influenced by the IWT. The online survey will focus on the physical state of the basin pertaining to climate change, water and peace since

we wish to find ways to propose integration of the climate change aspects into the IWT and bring for the perception of the users with respect to water share and peace at the forefront of the peace debate between the two countries. We will engage the respondents for our and their understanding of the social-ecological concerns of the users, the role of the users in the governance process and the influence users are able or unable to make in addressing the water stress and the stress of conflicts. We will go with the snowball sampling in selecting the respondents besides carry out a strategic sampling with the help of the involved organisations in the transboundary water, international relations and peace process. It is important that perception of the local users of the basin is captured and analysed to differentiate between the geo-politics and the social-ecological needs of the region. Since solving the issues of transboundary water conflicts and climate change now require moving beyond the geo-politics and towards a more humanitarian thinking which will be drawn from a bottom up approach.

7. The Design Principles and the Indus Water Treaty 1960

7.1. Clearly defined boundaries of the resource and the actors with rights to harvest resource units from resource. Who is allowed to use which kinds of resource units?

The IWT 1960 has a unique distribution of the water resource that sets clear geographic and administrative boundaries of the CPR for the allocation of the resource between neighbouring countries and rights to harvest. It is the strongest part of the IWT that affirms robustness with at least five out of twelve articles and five out of eight annexures that are solely dedicated to set clarity of the CPR boundaries and resource use. This is an instrumental design principle that is also found to aid the two countries in prevention of conflict arising due to a shared resource with equitable sharing through distribution of rivers to gain full possession of rivers instead of quantity of water of the rivers based on principles of hydro-engineering and economics than legal principles (Khan et al 2013). Thus the eastern rivers were allocated to India while the western rivers were allocated to Pakistan

While these boundaries (Principle 1) are very well defined in the articles and annexures of IWT, it also covers a temporal (seasonal) dimension to the boundaries and rights to harvest backed by other provisions in the Treaty that relate to monitoring and enforcement (principle 4 and 5 respectively) .Kamran et al (2007) suggests the boundaries need to be defined not only in political or geographic terms but also requires a shift of focus to include ecosystem boundaries. The IWT defined terms in 1960 as deemed appropriate with the available knowledge and issue at that time that encompassed seasonal conditions and requirements of the two riparian. While the term "Rivers" defined in the IWT refers to the names of the six rivers that were distributed among the two countries, a new and broader definition accepted for "rivers" at the first India rivers week on 27 November 2014 covered its nature, characteristics and ecology to give a totalitarian view of a hydrological and ecological system (Ranjan, 2016.). This new definition that incorporates perception of CPR being a larger social ecological system yet has to find way in the TBWM agreements.

7.2. Proportional equivalence between benefits and costs, i.e. congruence between use and provision, rules and local conditions. What are the time, place, technology and/or economy used to appropriate resource?

The IWT like any other treaty was a set of compromises and adjustments to work out a dispute (Ranjan, 2016) that started right after the two states gained independence. Congruence may

hence be viewed from different perspectives in both the riparian states but the fact remains that "despite grievances, the IWT is still intact" (Ranjan, 2016).

The IWT in light of Ostrom's DPs has clearly laid down Articles and supporting annexures that appropriate benefits and costs of the shared resource. The congruence between use and provision/appropriation of characteristics of resource and resource rules time governed are part of the treaty. The DP 2 is regarded as supported in the spirit and intention of Treaty i.e. resolution of (initial) conflict, while this is heavily dependent on the perception of the parties involved that in turn are influenced by the perception of legitimacy, prevailing political climate, social and economic conditions.

The International Law Commission (ILC) has termed the IWT as one of the prime cases of equitable apportionment or utilization. (The Law of the Non-navigational Uses of International Watercourses, Third Report (1982), 146, para. 65) in Pratap, (Jan 2018), However, Table 13.3 (Kamran et al, 2017 P.214) debate the claim by ILC and contests that the IWT was not meant to be a water sharing treaty, it is allocative treaty with division of rivers that again is not equitable from the viewpoint of the lower riparian. Ostrom et al (2003) claim here fits the example of IWT, that rules established by resource users themselves are considered legitimate and respected and have a lesser chance of being challenged or violated. In the case of IWT, the World Bank mediation brought the Treaty whereby the lower riparian not only perceives it an unfair allocation with its incomplete rights to western rivers, but the ambiguities and possibility of suspension of data sharing, leave room for further manipulation by the upper riparian being technologically and politically stronger making the lower riparian vulnerable, insecure and living on the whims of the stronger state like in the case of Ganges Water Treaty (Oswald, 2007; Kamran et al, 2017; Thomas, 2017: Akhtar, 2010: Mirza, N. 2011). This vulnerability of lower riparian state is also indicated by Briscoe (2010) and Akhtar, (2010) who posit that "this ball is very much in India's court" and a possibility that India can choke Pakistan's flow of water for pressure.

7.3. Collective-choice arrangements by those involved/ affected in modifying the operational rules. Who to contribute resources to maintain resource system?

IWT is itself a collective choice agreement between the two neighbouring rival states. Interestingly, in safeguarding the Treaty, the institutions of the collective agreement provide due regard for version of intent and opinion of the involved parties (parties being defined as the "Government of Pakistan" and "Government of India"). As such the governments are representative of the all masses dependent on the resource and there is no direct representation of voice of all resource dependents like in most treaties (Kamran et al, 2017).

7.4. Monitoring by the monitors on the resource conditions and actors behaviour that are accountable. How to monitor and enforce proper use and maintenance activities?

The monitoring system for the Western and Eastern waters is very clearly laid out by articles and annexures of the IWT and tools/ forms devised to record data on daily and monthly basis. The Treaty by clear instructions to the parties and setting up of a Permanent Indus Commission (PIC), mandates ensuring monitoring of resource conditions and developments including actors' behaviours. The Treaty has laid down that it will not allow for any skip in the monitoring and regular interval meetings, and has defined the period as well as venues for exchange of cooperative meetings. However, though the PIC had been fully authorized and responsible for

effective implementation, it has suffered a suspension in communication and in the exchange of information affecting the monitoring owing to political tensions between the two countries

7.5. **Graduated Sanctions** on actors violating the rule compliance by the other actors of the agreement.

Unfortunately while the Treaty has defined boundaries and rules in place along with the monitoring of the resource conditions and the actor's behaviour, the perceived breach of the Treaty considered as violations have been recorded only as "differences" and later as "disputes" in cases that remain unresolved or unsettled to satisfaction of the complainant. The "differences" and "disputes" both have no sanctions imposed as there is no provision of this DP in the Treaty. This particular lack in the agreement has not only made the Treaty weak in its enforcement capacity of the boundaries but also jeopardises the very essence of the institutions involved and their trust in the third party whether neutral expert or court of arbitration. The Treaty also does address a part of the principle and has a mechanism that furnishes and declares the degree of seriousness of the violation to decide the arena of conflict resolution but it has not been able to control the violations and subsequent increasing frequency.

It is important to understand the purpose and intent of the Treaty including circumstances which brought the IWT 1960 as a settlement of ten year long dispute. The question remains why was there no mention of sanctions to guard against violations of context and to cater to the seriousness or frequency of offence? Another question comes up that if sanctions were accorded in the Treaty for violations, would it have saved the occurred violations? Kamran et al (2017) suggest it would definitely help provided the sanctioning body has not only the power to impose sanctions but also the technical expertise for the graduated sanctions.

While sanctions ensure aiding compliance and enforcement of rules, can this design principle also be a catalyst to a dispute that jeopardises a treaty? The design principle and its validity in management of transboundary resources are a bit tricky to understand its role especially in volatile regions with both nuclear power states where a violation sanctioned might be a trigger to war itself. The Treaty has survived only because all differences arising so far were negotiated and not sanctioned as the complainant parties continued to fulfil their commitment to safeguard the essence of the Treaty and look for amicable solutions in the context. This however does not put both parties at ease with the consideration of the risks of the unknown.

7.6. **Conflict-resolution mechanisms** at low cost the local action situations to resolve conflict among the actors and between the actors and the institutions. How to resolve conflicts over use and maintenance?

The fourth key feature of the IWT 1960 identified by Briscoe (2010) is its conflict resolution mechanism, through the Indus Commissioners or through external arbitration and further through Court of Justice through Annexure F and G. The conflict resolution mechanism of the IWT 1960 is most unique, well-planned and geared towards resolving conflicts of various levels, scales and situations. This Treaty is unique in the world where a third party (World Bank) that had helped the two countries resolve dispute through this agreement also signed the Treaty (Khan, et al 2013). This feature remains one of the strongest design principle which is covered with six out of twelve articles (50% weightage) and three out of eight annexures in the IWT. These articles seen in light of Ostrom's theory are sufficiently backing up prevention of conflict through the DP 1 defined boundaries and DP- 4- monitoring for maintenance of rights and rules to avoid any violations and thereby abating any chances of arising conflicts in the

first place. The articles while furthering the intent of co-operation also provide a mandatory setup of institutions on both sides of the border as Permanent Indus Commission (PIC) for what can be considered a low-cost local action for the resolution of conflicts arising. The PIC is seen as an instrumental institution for safe keeping and having absolute responsibility of implementation of rules.

The IWT while having clear and detailed mechanism for conflict resolution however, has not been able to prevent the violations or reduce the frequency which may be attributed to lack of support of DP-5. However, with the two states already in state of cold war have a consolidated commitment to resolve conflict through negotiations and if required through external arbitration and safeguard the sanctity of the Treaty. The commitment here weighs stronger and a positive feature that makes the IWT robust. Commitment hence is a variable that influences the DPs.
The external arbitration through the Court of Justice has not proved to be effective for any of the treaties so far in seven decades; the one case ruling relating to international waters given so far was of the Dam on the Danube River between Hungary and Slovakia in 1997 which remained a dispute till 2002[6]. The co-riparian states of Pakistan and India have had a number of cases of differences and dispute due to violations pending for much longer periods of time. Both countries have held the issue of prime importance at various international forums yet remains bone of contention. Third parties and mediators have failed to gain trust of the co-riparian states and resolve issues of IWT.

The tensions between the two countries that are beyond water sharing issue (intense political climate) have also impacted the PIC with a period of suspension of this very cooperative arrangement mechanism which itself is a violation of the Treaty. Effect of this conflict is the suspension of communication, co-operation and knowledge exchange through the Indus Commission that was the very essence of the IWT. One of the major issues identified in the conflict resolution is the difference in the perception and interpretation of the nature, degree and finally the definition of the conflict and cooperation by the riparian and the arbitrators (Thomas, 2017).

7.7. **Minimal recognition of rights to organize** by the actors their own institutions if challenged by any external actor that has long-term rights and responsibilities to the resource.

How to modify rules over time, affecting the above, with changes in the performance of the resource, the strategies of actors and external opportunities and constraints?

While Fleishman et al (2014) argue that it is unclear how this design principle relates to larger scale systems; Kamran, et al (2017) interprets the DP for TBW as Institutional integrity not being challenged by other regional and international agencies and countries. While the Treaty has stayed intact over seven decades it has also been regarded as a successful example (Sattar, et al, 2018; O'Neill, 2001). Yet this feature not found to be strong in the Treaty or at least its potential not utilised. While Briscoe (2010) argues that there is provision to modify rules over time with new knowledge and changes, the ability of this provision in the IWT for climate change adaptation remains underutilised and overlooked. Article XII of the Treaty allows for ratification (Akhtar, 2010) which the parties can use to adapt to newer challenges of changing ecological dynamics to sustain the robustness of the social-ecological system (Anderies et al. 2004).

[6] In (http://www.waterencyclopedia.com/St-Ts/Transboundary-Water-Treaties.html).

7.8. Nested enterprise for resources as part of a larger system in which the above are organized in multiple layers of nested system.

How to deal with cross-scale linkages on a regular basis?

The IWT serves a perfect strong example of this design principle. The water governance in this scenario of larger scale needs collaboration and coherent water management that has ability to deal with tensions arising due to different perspectives, institutions, approaches and interests. In a nested enterprise the ability to make connections between interests, values water domain and planning is the key to success of a coherent water management (Edelenbos, 2012). While the issues of a nested enterprise are too complex and compounded this principle can formulate one whole research study focused entirely on the larger complex social ecological system analyzing the roles and responsibilities of actors involved, the level (international, regional, national, federal, provincial etc) and capacity in which they are connected or inter-connected. The inter-organizational co-operation, process of joint explorations and studies, and the role and meaning of control and trust in this principle plays an important role in finding bottlenecks that need to be adapted to insights for effectiveness of the SES.

While the nested system of the IWT only takes into consideration the water issues at different scales and levels (Kamran et al, 2017), another much required and recommended approach to the nested enterprise in case of TBW with new knowledge and challenges coming in would be the "Nexus Approach".

The connections and inter-linkages need a detailed analysis to understand the multi-actor, multi-dimensional and multi-layered system and understand the roles and responsibilities, the level of co-operation required, interests and motivations, adaptability and flexibility in the institutional arrangement

8. Discussion

Ostrom's Design Principles are accepted world-wide as good initial analytical /investigation tool for the study of the institutions related to the CPRs. The precedents have indeed been useful in understanding the initial investigation of institutional arrangement of the TBWM. The key features of IWT 1960 (Briscoe, 2010) in relation to Ostrom's (1990) Design principles through this paper have not only validated the theoretical use of the SESF for analysing the TBWM agreement but has also given insights into various dimensions of the same while categorically declaring the IWT to be a successful case.

Summary of four key features of IWT 1960 identified by Briscoe, (2010) and how they relate to Ostrom's Design Principles provided in Table 1 below shows overlap of design principles with four key identified features of the IWT. Design principles 1, 2 and 3 being the most recurring themes explain how significant and well addressed are the boundary definitions in the IWT and how the mechanism aimed to achieve congruence through a collective choice agreement. It is also observed that while presence of seven out of eight principles in the IWT though with varied degrees have made this already acclaimed comprehensive Treaty a successful case not merely by presence of the DPs but because of its survival through tough times. The absence of DP-5 (Graduated Sanctions) however, puts a question mark to the importance of graduating sanctions and the myth of control, which seems otherwise an important principle for compliance and enforcement of rules. Nevertheless the "commitment" to the Treaty overcomes the principle in question and suggests "commitment to cooperation" which is 8th indicator of Water Cooperation Quotient to be an important factor in the success and robustness of the Treaty. It also highlights the importance of analyzing institutions with water cooperation quotient to assess their capacity and index towards active cooperation.

It is clear from the above analysis using the DPs as well as through secondary sources that the IWT is primarily based on the concepts of "commitment" to peaceful solution of the transboundary water management and aimed at building "trust" and enhancing "cooperation". The Treaty is more inclined to an optimist approach to the TBWM than a coercive formal institutional setting to solution.
The cost of such agreements and intentions are not easy. There are evidence and belief that the weaker or lower riparian eventually succumb to conditions of upper riparian ending in negotiation that benefits the peace process but at the cost of lower riparian or another riparian weaker in position or ones not involved/ part of agreement [7] Such agreements have survived due to riparian giving in their rights to maintain peace.

The Water Cooperation Quotient of the IWT by definition proclaims it as an active cooperative arrangement with the presence of more than four indicators. A detailed study of measurement may further help ascertain this in numerical value of the WCQ with the indicators to provide insights on the intensity and capacity of the active water cooperation. The WCQ can be useful for analysing the IWT and if values are analysed for every year (from 1960 onwards) can shed light on further variables and their interaction in further studies.

It is however realized at this point of the discussion that while understanding the complex SES is a challenge in itself, the use of an appropriate theoretical framework is as important. The authors question and implore whether using the IAD framework for analysing the institutional arrangement of this kind of large and complex SES would have been more appropriate to study explicitly the multiple contexts, action arena and interactions in the IWT 1960.

[7] (TNN | Sep 12, 2011, https://timesofindia.indiatimes.com/india/All-the-world-is-made-up-of-3600-water-treaties/articleshowprint/9950748.cms. Accessed 2/16/2019).

Table 1: Summary of key features of IWT 1960 (Briscoe, 2010) in relation to Ostrom's (1990) Design principles

Key Features Of The IWT (Briscoe, 2010)	Corresponding Articles in IWT 1960	Corresponding Annexures in IWT 1960	Corresponding Design Principles (Ostrom, 1990)
The Division Of The Waters	• ***Article II*** Provisions Regarding Eastern Rivers • ***Article III*** Provisions Regarding Western Rivers • ***Article IV*** Provisions Regarding Eastern Rivers And Western Rivers • ***Article XI*** General Provisions	**ANNEXURE B** Agricultural Use by Pakistan from certain tributaries of the Ravi *(Article II (3))* **ANNEXURE H** Transitional arrangements *(Article II (5))* Part 1 Preliminary Part 2 Distribution of the waters of the Ravi Part 3 Distribution of the waters of the Sutlej and the Beas in Kharif during Phase I Part 4—Distribution of the waters of the Sutlej and the Beas In Kharif During Phase II Part 5—distribution of the waters of the Sutlej and the Beas In Rabi Part 6—Water-Accounts At Ferozepur Part 9—General Part 10—Special Provisions For 1960 And 1961	1. **Clearly defined boundaries** of the resource and the actors with rights to harvest resource units from resource. Who is allowed to use which kinds of resource units? 2. **Proportional equivalence between benefits and costs**, i.e. congruence between use and provision, rules and local conditions. What are the time, place, technology and/or economy used to appropriate resource? 3. **Collective-choice arrangements** by those involved/ affected in modifying the operational rules. Who to contribute resources to maintain resource system?
The Financing Plans	• ***Article V*** Financial Provisions • ***Article X*** Emergency Provision	**ANNEXURE H** Transitional Arrangements *(Article II (5))* Part 1 Preliminary Part 7—Financial Provisions Part 8—Extension Of Transition Period	2. **Proportional equivalence between benefits and costs**, i.e. congruence between use and provision, rules and local conditions. What are the time, place, technology and/or economy used to appropriate resource? 3. **Collective-choice arrangements** by those involved/ affected in modifying the operational rules. Who to contribute resources to maintain resource system?
Use of the **hydroelectric potential of 'Pakistan's Rivers'** before they reach Pakistan.	• ***Article III*** Provisions Regarding Western Rivers • ***Article IV*** Provisions Regarding Eastern Rivers And Western Rivers • ***Article XI*** General Provisions	**ANNEXURE C** Agricultural use by India from The Western Rivers *(Article III(2)(C))* **ANNEXURE D** Generation of hydro-electric power by India on The Western Rivers *(Article III (2)(D))* Part 2 Hydro-Electric Plants in operation, or under construction, as on the effective date **ANNEXURE E**	**1. Clearly defined boundaries** of the resource and the actors with rights to harvest resource units from resource. Who is allowed to use which kinds of resource units? **2. Proportional equivalence between benefits and costs**, i.e. congruence between use and provision, rules and local conditions. What are the time, place, technology and/or economy used to appropriate resource?

		Storage of Waters by India on The Western Rivers *(Article III (4))*	
The conflict resolution mechanism, through the Indus Commissioners or through external arbitration (Annexure F and G).	• ***Article VI*** Exchange Of Data • ***Article VII*** Future Co-Operation • ***Article VIII*** Permanent Indus Commission • ***Article IX*** Settlement Of Differences And Disputes • ***Article XI*** General Provisions • ***Article XII*** Final Provisions	**ANNEXURE F**—Neutral Expert *(Article IX (2))* Part 1 Questions To Be Referred To A Neutral Expert Part 2 Appointment And Procedure Part 3 Expenses **ANNEXURE G** Court Of Arbitration *(Article IX(5))* **ANNEXURE H**- Part 10—Special Provisions For 1960 And 1961	**3. Collective-choice arrangements** by those involved/ affected in modifying the operational rules. Who to contribute resources to maintain resource system? **4. Monitoring** by the monitors on the resource conditions and actors behaviour that are accountable. How to monitor and enforce proper use and maintenance activities? **5. Graduated Sanctions** on actors violating the rule compliance by the other actors of the agreement. How to take into consideration the risks of the unknown? **6. Conflict-resolution mechanisms** at low cost local action situations to resolve conflict among the actors and between the actors and the institutions. How to resolve conflicts over use and maintenance? **7. Minimal recognition of rights to organize** by the actors their own institutions if challenged by any external actor that has long-term rights and responsibilities to the resource. How to modify rules over time, affecting the above, with changes in the performance of the resource, the strategies of actors and external opportunities and constraints? 8. ***Nested enterprise** for resources as part of a larger system in which the above are organized in multiple layers of nested system. How to deal with cross-scale linkages on a regular basis?

Source: Adapted from Briscoe, 2010: Ostrom, 1990; IWT 1960

Table 2: Summary of findings for Institutional Analysis of the IWT using Design Principles

Design Principles	Finding weightage in IWT Articles/ Annexure
1A. Clearly defined boundaries: (Governance defined social boundaries) **1B. Clearly defined boundaries:** (spatial/biophysical boundaries)	With five articles, two annexures covering defined boundaries the DP is clearly supported and a strong reason for the success of Treaty. The boundaries are however defined by allocation of the three Rivers to each country in the agreement. The definition of the River and the boundaries however are inadequate to cover social-ecological system.
2A. Congruence between appropriation and provision rules and local conditions: (fit) **2B. Congruence between appropriation and provision rules and local conditions:** (proportionality)	Supported in the spirit and aim of Treaty i.e. resolution of (initial) conflict, while this is heavily dependent on the perception of the parties involved that in turn are influenced by the prevailing political climate, social and economic conditions. The International Law Commission (ILC) has termed the IWT as one of the prime cases of equitable apportionment or utilization. (The Law of the Non-navigational Uses of International Watercourses, Third Report (1982), 146, para. 65) in Pratap, Ravindra (Jan 2018)**.** However, Kamran et al, (2017) clearly debates the claim by ILC as this was not meant to be a water sharing treaty it is allocative treaty. Ostrom et al (2003) claim fits the example of IWT that rules established by resource users themselves are considered legitimate and respected and have a lesser chance of being challenged or violated.
3. Collective-choice arrangements:	The Treaty is a clearly supportive example of collective choice arrangement in totality. However, like any other Treaty, the Governments of both riparian are representatives only.
4A. Monitoring: (presence) **4B. Monitoring:** (Accountability to users)	Clearly supported, while support seems stronger for monitoring of CPR conditions than appropriator behaviour, which is not supported by DP 5 for enforcement. The principle is clearly supported and in order by regular monitoring through the PIC
5. Graduated sanctions:	While importance of sanctions is widely supported as a logical tool in most institutional settings for international water management for enforcement of rules and compliance yet this principle is found missing as a major article and annexure in the IWT. However, the provisions of the Treaty related to monitoring and conflict resolution address the risk of the unknown and the degree of seriousness of violation/ offense can be seen addressed through the degree/ stage of arenas arrangement for addressing DP-6 conflict resolution.
6. Conflict-resolution mechanisms:	More than 50% of Treaty is allocated to avoid conflict in first place and further resolve if any difference or dispute occurs explicit conflict resolution arenas (national and international) are present including the presence of a low cost local action arena (PIC), which is a permanent institution and serves not only to resolve differences but also avoid occurrence of conflict in first place by regular monitoring and enforcement of DP 4. The varied perceptions and definition of cooperation and conflict (Thomas, 2017) have been a major problem in conflict resolution
7. Minimal recognition of rights to organize by the actors	The IWT has an in-built flexible provision identified by the experts for adaptation and inclusion of new knowledge and conditions in the Treaty. The actors however who can modify the rules remain the two parties between whom the Treaty is signed. However, this provision has remained unutilized.
8. ***Nested enterprise** for resources as part of a larger system in which the above are organized in multiple layers of nested system.	The IWT is a strong example of Nested enterprise. The connections and inter-linkages need a detailed analysis to understand the multi-actor, multi-dimensional and multi-layered system and understand the roles and responsibilities, the level of co-operation required, interests and motivations, adaptability and flexibility in the institutional arrangement

Source: Adapted from Ostrom (1990) for Institutional Analysis of IWT

9. Conclusion

This study presents the capacity and potential of almost six decades old surviving and declared successful Treaty, analysed through the Ostrom's Design Principles for SESF Analysis. The IWT 1960 studied as a large scale social ecological system in light of Ostrom's framework validates the appropriateness of use and limitations of SESF to analyse large scale systems. The study of institutions and their design principles is the first step to understand and predict the behaviours and what constitutes robust institutional design. However changing times and needs require pondering on what more can be done to increase and aid to the robustness of institutions and how can the IWT 1960 be continued to be catalyst for peace with improved efficacy. The paper provides insights on how the case of IWT- a hydro-diplomatic intervention in the management of CPR helps to add to the body of knowledge and contribute to the IAD Framework and design principles of Ostrom, which are considered the best frameworks for analysing SESF (Binder, C. R., J. Hinkel, P. W. G. Bots, and C. Pahl-Wostl. 2013).

While the presence or absence of these design principles do not determine the success or failure of cases they do indicate observed regularities in successful cases (Fleischman, et al, 2014). The presence of most of the design principles in the IWT with varied strengths is indicative of observed regularities that successful cases present and in light of the purpose of the Treaty the configuration of the DP 1, 2, 3, 4, 6 and 8 with much higher strengths and presence of DP 5 and 7 though weaker and not pronounced very strongly yet can be attributed to successful case. It is also important to note that although the IWT may be considered a successful treaty for surviving even in the midst of wars, it is not to be mistaken to be successful in mitigating chances of erupting differences nor resolving disputes and definitely not because it has survived for more than sixty years (e.g. Pandey, 2014 in Thomas, 2017)

Further, building up on this study other variables considered important and those that influence the case of IWT where a TBWM works or fails within a certain set of procedures, can be studied in relation to the Ostrom's DPs. It further can lead studies to understand the internal and external factors that affect the robustness of institutions and can be regarded as important variables to analyse institutions that constitute towards new principles or help to add to the existing principles making them more expansive and detailed. For example, the *Cooperation of the South Asian Rivers* has many interesting insights into various dimensions of water management e.g. civilizational, religious, political etc. that influence and sometimes dominate the actions between neighbouring countries (Ahmed, 2018; Dixit, 2018). These dimensions however remain unaddressed and tapped in the Ostrom's DPs.

It can be deduced from this study that institutional arrangements are product or outcome of the dominant conditions and emerging paradigms that create perceptions to guide focus and translate intentions into institutions (see Figure 3). The institutions and their structure hence to an extent reflect the intentions with which the institutions were created, while a timeline review may give a glimpse of external factors and their power to influence, and the adaptability of the institutional arrangement. The adaptive tools like cultural and moral beliefs are considered to have a power of their own and can be used to spearhead decisions and actions making deliberate political choices for solution of collective action problems (Boyd. et al, 2018). This is especially true for larger social ecological systems where political institutions have a major role in defining the norm, content and establishing supporting formal institutions (Boyd. et al, 2018).

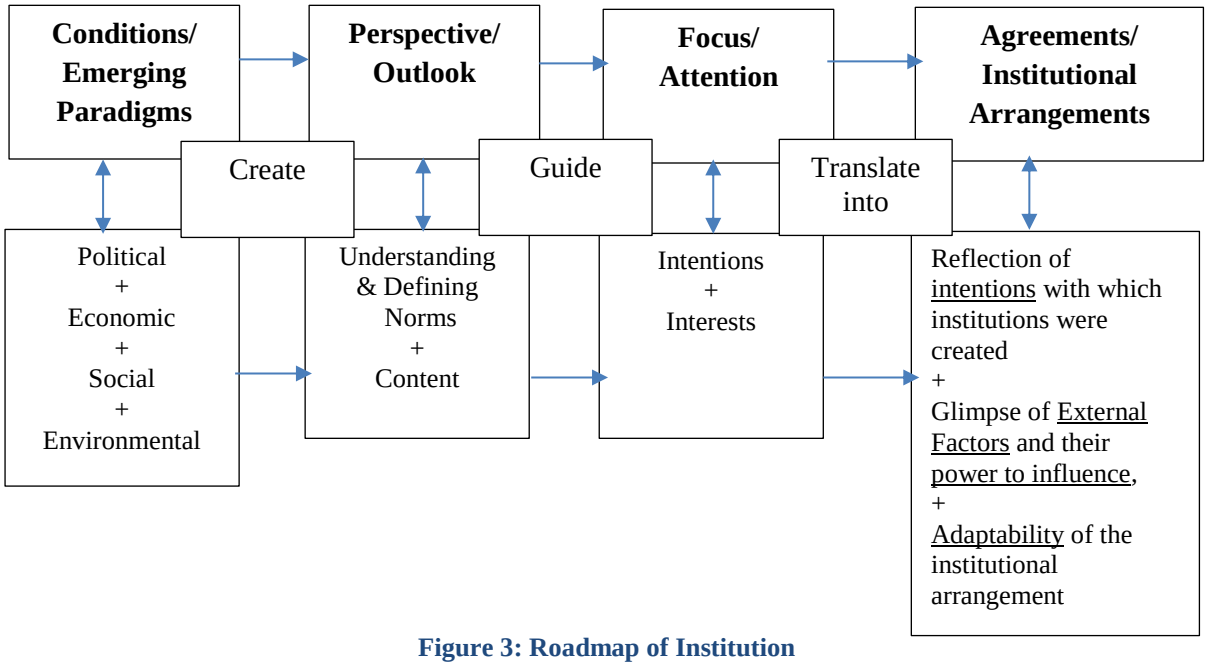

Figure 3: Roadmap of Institution

Hence, it will not be untrue to say perceptions can be considered as an important variable which is instrumental in guiding the design template of intentions for institutions. It is these perceptions that have sparked debates of "water as an instrument of peace", "water as a weapon of war", "water as an issue of National security" and "water as a means for co-operation". At this point even further attention is required to the perception of "cooperation" which itself is not without ambiguities and difference of opinion (Thomas, 2017). Nonetheless emerging paradigms, norms and conditions, all that can impact the focus of the institutional arrangement and structure, are deemed important variables and be counted for when analysing institutions.

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