

Thesis Paper

An Analysis of Transboundary Water Resources: A Case Study of South Asian Rivers

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Contents

Abstract.....	4
Chapter 1.....	6
Introduction	6
<i>Objective and research question</i>	12
<i>Methodology</i>	12
<i>Report structure</i>	14
Chapter 2.....	16
Literature review	16
Chapter 3: the politics.....	25
The Political Accounting.....	26
Chapter 4: the looming Danger.....	33
The river systems.....	Error! Bookmark not defined.
The Vulnerability of river basins.....	35
Two dimensions of water scarcity in The Ganges sub-basin	41
Chapter 5: Discussion and Conclusion.....	44

TABLE 1 GROUP ARRANGEMENT FOR THE PSA "PRINCE."	27
TABLE 2 THE PSA FOR THE KOSI GANDAK TREATY 1950's	29
TABLE 3 THE PSA FOR MAHAKALI TREATY	30
TABLE 4 THE PSA FOR IMPLEMENTATION OF MAHAKALI TREATY	30
FIGURE 1 THE RESEARCH PROCESS	14
FIGURE 2: LARGE, MEDIUM AND SMALL RIVER SYSTEM NEPAL	34
FIGURE 3 NEPALESE RIVER BASIN'S WATERSHED AREA, POPULATION AND WATER RESOURCES	36
FIGURE 4 USE OF WATER IN BASINS	37
FIGURE 5 OVERALL WATER USES	37
FIGURE 6 THE PANDAI RIVER DIVIDED FOR UPSTREAM AND DOWNSTREAM	39
FIGURE 7 TWO DIMENSIONAL WATER SCARCITY, ADAPTED FROM (FALKENMARK, BERNTELL ET AL. 2007) AND BASED ON DATA TAKEN FROM (BABEL AND WAHID 2008, PANDEY, BABEL ET AL. 2010)	42

Abstract

This paper examines the complexity related to the transboundary water management between the Ganges basin's riparian; Nepal and India (South Asia). The Ganges River is the lifeline for 600 million people. Nepal provides more than 55 percent of the Ganges flow in a dry season.

Climate change, increasing spatial and temporal interdependence like population growth and environmental degradation have created uncertainty based on the evaluation of water resource availability, variation, and use. The severe shortage of water is conflict prone. So far, four agreements made between India and Nepal for transboundary water management. However, all of those agreements have been controversial. Despite the large potential for economic growth through transboundary water management, both of the countries are in a stalemate. The water stress indicator and resource variation data allow a quantitative and qualitative perspective on the bio-physical challenges. Likewise, Political Accounting System (PAS) explains the socio-political cause and effects. This paper's finding indicates that for the socio-economic development of both countries, basin wise transboundary water resource development should be given a high priority. India, being a hydro-hegemony, has to adopt a more open and generous approach in engaging with Nepal's interested stakeholders on water and power.

Chapter 1

Introduction

The general Scenario

The fresh-water, a basic human necessity is in trend to getting scarce. Though it is a renewable natural resource, the sharp rise in demand is stressing fresh water supply (UNESCO 2012). The Global Risk reports identified the water scarcity as one and at the top of the biggest societal and economic risk to the world (Forum 2015) which could put 6% of GDP by 2050 in jeopardy (Forum 2017). Currently the fresh-water is available from rivers, lakes, and also from deep aquifers which accumulated water over thousands of years (Chellaney 2013).

There are many rivers in the world which cross the political boundary. It may be a border within the nation or among nations. When it crosses over the political boundary, it becomes a transboundary resource. There are 263 Transboundary Lake and river basins in the world, a total of 145 nations have territory in these basins, and 21 countries lie entirely within international basins.

The South Asia

The South Asia (SA) has a total population of about 1.6 billion as of 2010 which is predicted to be over 2.2 billion by 2050 (Bank 2014, Bank 2015). It possesses 3 % of the total (Rasul 2014) and 5 % of world renewable freshwater sources (UNESCO 2012). Since 1950, the per capita water availability has decreased by 80% (Surie and Prasai 2015) and 20 % of the population don't have accesses to quality water supplies and there is poor

sanitation. The agriculture sector is the largest consumer of fresh water (Babel and Wahid 2008, ADB 2013). The south Asian countries namely India, Pakistan, Bangladesh are either water scarce or water stressed (Babel and Wahid 2008, Bank 2015).

The south Asian countries are dependent on Ganges-Brahmaputra-Meghna (GBM) and Indus river basins which are transboundary. The greater Himalayas and Tibetan plateau are an important geophysical- meteorological area for the development of the monsoons in South Asia and China and the sources of headwater for these rivers (Brennan 2008, Chellaney 2013, Das 2016, Roberts 2016). The Himalayan cryosphere is the third world's largest in magnitude after the polar ice caps (Immerzeel et al. 2009). The GBM river basin is the major trans-boundary basins in the region with a total area of just over 1.7 million km², distributed between India (64 percent), China (18 percent), Nepal (9 percent), Bangladesh (7 percent) and Bhutan (3 percent) approximately (AQUASTAT 2011).

The Ganges River Basin (GRB)

The Ganges river basin (GRB) is home to 8.3 % of world population and a source to feed 655 million and more peoples (Bank 2014). About 80 % (450 Million) population there suffer from multidimensional poverty conditions and about 26 % (126 million) are from low-income groups. The Ganges and its tributaries fulfill the entire water demands. It originates from the Himalayas, travels 2515 KM, aggregating whole GBM river systems, (Parua, after 2001), form the largest delta on earth and the third largest freshwater outlet to the world's oceans, being exceeded only by the Amazon and the Congo River systems (Chowdhury and Ward, 2004).

The river Ganges, most sacred river for Hindus, is the thirtieth longest river in the world (Rahaman 2009). The total drainage area of the Ganges is approximately 1,087,300 km² which is 52 % of South Asia. The basin (by area) shared between India (79 %) China (3 %) Bangladesh (4%) and Nepal (14 %)(AQUASTAT 2011).

The flow of Ganges along with its tributary's depend upon climate variability and relevant Sub basins. The glacier-melt contribution in the Ganges is estimated to be only 3% (Immerzeel and Bierkens 2012), 44 % annual flow is contributed from Nepal (Tibet and China). The Major tributaries Mahakali, Karnali, Gandaki and Kosi and Mahananda (a.k.a Mechi and Kankai in Nepal) of the Ganges originate in Nepal. The Nepalese rivers, perennial in nature, contribute 55 % in a dry season (IWM 2010).

Transboundary water and Nepal-India

The Relation" between India and Nepal is unique and still have an open border between the two countries (Hughes 2016). Nepal is a landlocked country surrounded by India from three sides. The social, economic and political, geographical situation have bound both these countries to live together (Dhungel, Pun et al. 2009).

The most of larger river basins in South Asia are shared by more than two countries, but existing treaties are all based on bilateral agreement (Biswas 2008, Biswas 2011). Especially on the Ganges basins, despite some efforts from Nepal and Bangladesh, India prefers a bilateral approach (CIA 1983, Dhungel and Pun 2009).

Nepal has more than 6000 of rivers and naturally all of the waters flowing into drains in the Ganges in India. Apparently, the water resource relation between India and Nepal

begin with a letter from “British Raj” to Nepal in 1887 (Dhungel and Pun 2009). There are four treaties between Nepal and India on the three larger rivers, a major tributary of the Ganges. They are namely Sharada Agreement 1927, Signed by Government of British India and Rana of Nepal on Mahakali River. The Koshi Agreement (1954) signed by the first democratic government of Nepal and Government of India on Kosi river. The Gandak Agreement (1959), signed between a first democratically elected prime minister of Nepal and India on Gandak river, and Mahakali Treaty of 1996, signed between two government sailing through highly politicised events.

The Kosi/Gandak agreements

The Kosi and Gandak agreement has an impression as a multipurpose project in India and Nepal both, but they were essentially projects conceived by India to meet its requirements or solve its problems, with some benefits to Nepal. The barrages were constructed inside Nepalese territory but construction, control, and maintenance were governed by India. Nepal enjoys irrigation canals and link bridge for East-west highway as the economic concessions, these "multi-purpose projects," suffered from poor design, inefficient implementation, and inadequate maintenance. The construction, control, and maintenance by a foreign country in Nepalese land has been narrated as sovereignty infringement by political opposition and highly sensationalized by media. It criticized in Nepal for conferring substantially more benefits on India where water stored in Nepal's fertile land submerged for perpetuity. Influenced by geopolitical events and to deal with Nepalese concerns, those treaties were amended in 1966/1964, but the sense of

grievance continued (Nepal 1954, Untawale 1974, Salman and Uprety 2003, Jha 2013, Sinha 2016).

The Mahakali treaty and Stalemate

After Kosi treaty amendment in 1966, the three decades spent on discussion of several multi-purpose projects sans any progress.

On December 1991, the Prime Minister of Nepal reached an 'understanding' on Tanakpur barrage with India. The construction on Tanakpur barrage unilaterally started by India in 1989, required 2.9 hectares of land to build an afflux bund on Nepalese territory (Gyawali and Dixit 1999). The leftists, the main opposition, the NGO's and ruling party dissenters raked up the issue and called it a "sellout." In 1992, the Supreme Court defined it as a treaty subjected to be ratified by the Parliament. With a tricky support from the political opposition and international support on 20, September 1996, 'The Treaty Concerning the Integrated Development of the Mahakali River Including Sarada Barrage, Tanakpur Barrage and Pancheshwar Project' was ratified. This treaty is a framework agreement which ratified the earlier Sarda treaty (1920), the Tanakpur Barrage (1991) and proposed the Pancheshwar multi-lateral project (Subedi 1999).

Current Scenario

The Pancheshwar multi-lateral project could not escape the apprehensions of Nepal of not being given the benefit on earlier agreements on the Kosi and Gandak. The upper riparian's importance in transboundary water has been well understood in Nepal. The

power asymmetry, the hegemony of India's are countered by stalling tactics. Even after 20 years the Detailed Project Report (DPR) of Pancheshwar Project, which was to be prepared jointly by Nepal and India within 'six months,' nothing has been done. In 1991, India and Nepal agreed to study the possibility of Kosi high-dam on the Kosi River. The report was supposed to have been ready by August 2007 but is not yet finished.

Objective and research question

Considering these facts, the objectives of this research is to analyze the cause of impediment, the hegemonic behavior of India and effect of current Status-quo. According to this objective, the following research questions are formulated

1. What is the cause of impediment? Why don't existing agreements work? , what led to Stalemate?
2. How the Stalemate or present status-quo is affecting both countries?
3. What is the way out?

These research questions fit the objective to analyze and give an overview of the situation and explore the opportunity for possible cooperation.

Methodology

The research looked at transboundary water issues in the region of South Asia. South Asian transboundary water issues are unique in a sense that one can find the impact of hydro-politics, power asymmetry and disparity among riparian and its effect on socio-economic development on the riparians.

Baxter and Jack (2008) suggests that for a "novice researcher," a 'case study' provides opportunity to understand a case and enables the researcher to answer "how" and "why" questions The "case study' can provide in depth knowledge of a certain subject and current developments around that subject (Robson 2002). Yin (20130) suggests that a case study approach is suitable when there are blurred boundaries between the

phenomenon and context and/or one believes that contextual conditions are relevant to the phenomenon under study. This approach is suitable when, manipulation of the behavior of actors or factors are beyond the reach of the researcher (Baxter and Jack 2008, Yin 2013).

To gather data for the case study, citing Yin (1994) Keetelarr (2007): different methods can be applied to obtain empirical data, namely: 1. informants 2. Respondents 3. Key figures 4. Artefacts 5. Documents 6. Interviews and 7. Observations

This research is primarily based on the studying of existing documents (secondary information) which includes the published scholarly articles, books, policy papers, verbal interactions, videos, newspaper published figures, and observations. Most of the documents are acquired from the public domain using different search techniques. The Jstor, google scholar, and Mc-Master e-library's searches were used to find relevant articles. The Documentary, news portals (print and electronic both) were consulted to understand one's perspective, case scenario, etc.

The acquired data have been analyzed, argued and used for the topics written, the Political System Accounting of treaty and politics, by adapting olarry' PRINCE in intra and international context.

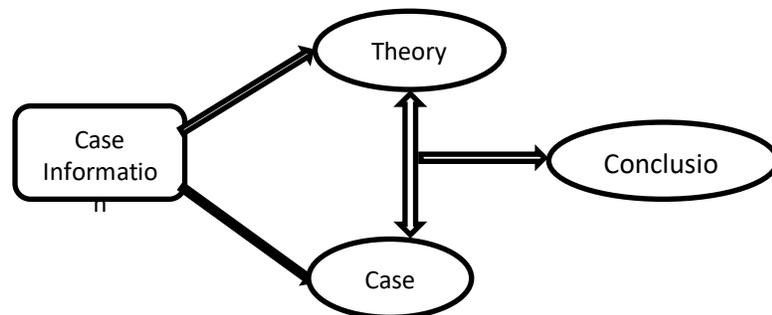
The water induced disaster in Indo- Nepal regions is much-highlighted events where there are little talks on water scarcity at the policy level. Haas (2004) suggest "Construct models so that effects are calculated at meaningful political scales, i.e., corresponding to

significant political divisions that are relevant in developing policy applications”. The two-dimensional water scarcity is adopted and presented to Nepalese Transboundary context.

Limitation

Based on the various literature, evidence suggests that India only intends bilateral transboundary water relations. This study limits itself to Nepal and India trans-boundary water.

The research process illustration



Paper structure

Figure 1 the research process

This paper is divided into three parts. Part I (Chapter 1) is an introduction to the general context of water and transboundary water and transboundary water relation between Nepal and India, a south Asian country, in particular. This part also describes the objective of the research and methodologies adopted for this study. Part II discusses principles, theories and the informative literature on this case study in particular (Chapter 2). Part III discusses the political theory in general and analyses those hydro-politics with PRINCE, a

tool for political system accounting (Chapter 4). This part also consists the water variability with changing environment and its impact on transboundary river basins, the water scarcity is illustrated with examples and based Falkenmark 's water scarcity theory in particular (Chapter 5) Part IV deals with answers raised by research questions, based on conclusion of part I, II, and III in general and the practical recommendations in particular (Chapter 5).

Chapter 2

Literature review

A number of studies focus on the transboundary issues in South Asia including that between India and Nepal but only a few studies have highlighted the complexity of water issues from natural, political, social and economic perspectives (Babel and Wahid 2008).

The domestic articles are either informative but inconsistent or influenced by place of publications. Nonetheless, it might be useful to understand those events and particular perspective. The international scholars have a few lines on bilateral relations sans analyses. Nepalese scholar's write-ups are mostly published as article and or as opinions in national newspapers. Gyawali (2006) describes that the absence of hydro-scholars in Nepal in early days have various reasons, like Nepal is a late comer in hydro-technology, the bureaucratic pessimism to develop corporate/independent hydro entity are some of them.

Merrey, Prakash et al. (2017) suggested that challenges of transboundary water management can be divided into two categories, namely, socio-political and biophysical. Ariel Dinar (2007) suggested that literatures regarding conflict and cooperation over Transboundary water can be categorized by Case studies, Empirical and Theoretical framework.

Nepal and India water relation

IN 1983 a report from CIA (1983) reported that India is only in favor of the bilateral treaties and will reject any effort of regional approach (Nepal, India and Bangladesh, a Gange's basin state) even when it seems beneficial to all. India intends to control Nepal's upper riparian rights by joint development and control of hydroelectric projects where it has more interest in flood control and the free-flowing Nepalese river which is ultimately ending up in India.

Pashupati Shumshere (1971) has mentioned that the political opposition to India only resurfaced during the treaty, though it had been rooted to 1950's "Delhi compromise" which occurred to change Rana regime in Nepal. The change in geopolitics and Indian's wants to keep Nepal under its influence, made India, a major aid donor and concessions on treaties.

Gyawali and Dixit (1999), write that the agreements were signed in haste and lopsided one in favor of India. The ruling party and bureaucrats had not appreciated the legal, socio-economic and political ramifications involved in the issue, or decided to overlook them to appease India. On impasse of the Mahakali treaty they opine, since the treaty is not widely consulted and neither in national benefits, so everyone is apathetic towards implementations.

Dhungel (2009) presenting the Indian- Nepal water relations, believes that India has a long-term strategy for its water resources policy to get hold of all rivers. He accepts that the issues are over politicised, sensitive, and there is trust deficit. Those experts criticizing all agreements, believe that India's hegemonic behavior is more exploiting and her

Hydrocrates attitudes in negotiation are arrogant and secretive (Dixit 1997, Gyawali and Dixit 1999, Gyawali 2002, Dhungel 2009).

Subedi (1999) writes that India viewed as a giant, hegemonic neighbor intent on securing deals favorable to it whether India sees the neighboring leader as paranoid with nationalism and incapable for sensible deals.

T.K. Jha (2016), believes that the geopolitical complication of Nepal and narrow vision of both countries towards joint hydro development have made water relation more complicated.

The official documents are mainly focused on counting the gain to Nepal (Embassy). The Indian water experts have accepted the Nepalese contention about Kosi and Gandak treaties. They wrote that the location of the barrage, corruption and flawed design and maintenance projects, underestimating Nepalese sentiments by mingling in their internal issues are the key reason for contentions but argues that those were circumstantial, no injury to Nepal was ever intended (Verghese 1990, Verghese 1994, Ramaswamy 1999, Ramaswamy 2003).

Untawale (1974) have a similar opinion; he writes that there is a geographical constraint to build the dams on Nepalese territory and the lack of adequate technical manpower, from Nepal, encouraged India to control the construction, maintenance, and control of barrages/dams. The piece-meal concessions, and delayed compensation from Indian side and the oversensitivity of Nepalese to any semblance of encroachments upon their nation's territory, discriminations among construction workers, an opportunistic behavior

of Nepalese politicians and Nepalese medias sensationalization of the issues are the main reasons for stressful relations.

Ramaswamy (2003) writes that the transboundary water issues are not what are complicated, it is other issues which make the water issue more complicated.

Rai, Wolf et al. (2017) have compiled and analyzed the database of historical individual events/actions of water cooperation and conflict from 1874 to 2014. Using Basins at Risk (BAR) project formulae, they conclude that out of 351 events, only 4% were conflictive, 92% were cooperative, and the remaining 4% were neutral. They add that; it is a mere perception that India is trying to capture Nepal's water resources for her benefits. They underscore the need for Nepal is to enhance her negotiation capacity whether Nepal and India should create a conducive environment for hydro politics to flourish and move in a cooperative direction.

Theoretical perspectives

Conflict and cooperation

Renner (2009) writes that the lack of trust and reluctance to cooperate between riparian nations may make less useful to the collective actions on problems and may lead to water conflict. On a range of conflicts, Chellaney (2013) writes that the state's hegemonic behavior along with state-versus-state zero-sum games on water may lead to armed conflicts or war. Wolf (1998), analyzed that there is potential for severe conflict but not any full-scale war and the disputes are more on cooperation trends. He theorized that the negotiation for cooperation is mostly on need-based approach rather than rights-based

approach. The conflicting principles are often reconciled and moderated in negotiations among and between states ((Wolf 1998), Wolf (1999), Wolf and Hamner (2000), Wolf, Yoffe et al. (2003), Rai, Wolf et al. (2017)).

Gleick (1998) explained that the intensity of the conflict and the need for cooperation might depend upon the degree of scarcity or the interdependence of states regarding common water resources or the geographic and historical criteria or drew-out conflict underlies the water dispute.

Hydro-hegemony

Sneddon (2013) writes that hydro-hegemony occurs when one riparian state asserts its power over other riparian states—even upstream ones. Zeitoun and Warner (2006), has defined the Hydro-hegemony as hegemony to control the water resource. The active, leadership for of hydro hegemony are good for all or most of associated with but negative and dominative behavior of hydro-hegemon results ever-growing inequity between the powerful and the weak. Introducing Hydro-hegemony framework, they explained that conflict and cooperation are apportioned in a water interaction is large, governed by the power asymmetry of the riparian, but control over the expense of weak co-riparian will lead to unresolved conflict. The broader political context ultimately governs the hegemon's choice to be in a leadership position or only dominant one in the water sector. By citing Naff and Matson (1984), they propose that the degree of hydro-hegemony achieved by a riparian are dependent on their power position, riparian position and resource exploitation potential. They write that the bullied state may imply various

strategy to counter hegemony. It might be proposing the alternative agenda or new agenda (agenda framing power) by including international law, making delay, de-securitization, issue linkage, etc. They can also find alternative funding sources or might bet on re-negotiations to generate favorable outcomes Cascão and Zeitoun (2010) writes; geography can evaluate the hydro-hegemonic situations; material power; bargaining power; and ideational power. The power relations asymmetric context, are not static and always being contested and challenged. Though the hegemon might be stronger in all fields with the various forms of power, the other riparian (might have capacities of bargaining power in particular, which can be the main element of counter-hegemonic strategy (Cascão and Zeitoun 2010).

Spykman and Rollins (1939) writes that the geographical position of the upper riparian has distinct strategic advantages. It can control and regulate the water supply. Zartman concluded that the geographical position gives the weaker riparian veto symmetry against asymmetrical power citation. Elaborating the hegemonic stability theory Lowi (1993) suggests that the weaker geographic position of hegemony may lead the more just cooperation among riparian

India, a hydro hegemon

Naho Mirumachi argued that the shared water resources are subject to conflict and, at the same time, are also a source of cooperation, conflict, and cooperation coexists. She redefined conflict as interaction and presented a framework for the study of international transboundary river basins. She also defined cooperation as a reflexive process and

introduced the five levels of cooperation intensity: the confrontation of the issue, ad-hoc joint action, common goal formation, common norm formation, and collective identity formation. Analysing the Nepal -India water relation, she used the concept of “hydrocracy” and “act of Speech” of the hydrocracy and demonstrated how it has been used to bolster India’s hegemonic behaviour on shared water to reap maximum benefit on cooperation and also being strong in “Power position” and technological power, it overcomes the weakness of riparian position (Zeitoun and Mirumachi 2008, Mirumachi 2013, Mirumachi 2015). On the importance of hydrocracy Wester, Rap et al. (2009) write that “the hydraulic mission entails that the state, embodied in an autonomous hydrocracy, takes the lead in water resources development to capture as much water as possible for human uses.

Paula Hanasz observed that India scores high to be hydro-hegemony in South Asia. Though India exercises its hegemony using soft power as well as normative and utilitarian mechanisms of hydro-hegemony compliance, India is not a ‘bad’ hegemony that pursues its hydro-goals vis-a-vis its weaker (albeit upstream) neighbors through oppression or domination. It prefers compliance and cooperation to coercion, but it is not taking clear leadership, a character which hegemony is expected to pursue. (Hanasz 2013, Hanasz 2014, Hanasz 2014). On securitization of water, Asthana and Shukla (2014) writes that due to historical bitterness and trust deficit with neighbors the transboundary water are securitized in Indian continent.

Scarcity and conflict

Lowi and Shaw (2000) writes that environmental change can affect the water resource allocation, which can pose a threat to state security. Daoudy (2010) (citing Spector 2002) writes that the four categories of environmental change: degradation (pollution), scarcity (shortage), maldistribution (inequitable access) and disaster, can result in potential transboundary problems.

Stahl (2005) writes that the climatic and environmental changes and rising demands have increased the competition over water and made the cooperation, a more important issue in management and hydro politics.

Analyzing environmental effect on medium and larger River of Nepal, (Babel and Wahid 2008) observed that almost all those rivers are glacier fed and 67 percent glaciers are receding which will result, in the long term, severe water shortages in the basins. Further Babel et al. found that the Nepalese river basins are more vulnerable to environmental change than other selected basins in the Asian region. With the rise in population and mismanagement of resource are exerting pressure on those basin cause changes in function and use of water (Pandey, Babel et al. 2010, Agarwal, Babel et al. 2015)

Biswas (2010) believes that it is not the scarcity, but it is mismanagement of water which makes it scarce. He claims that through basin wise cooperation in transboundary, there is ample of opportunity for economic development from the south Asian transboundary water. The petty nationalism, trust deficit, dishonesty of actors including NGOs are the reason which deprives these underdeveloped regions to reap the economic benefits

(Biswas 1992, Biswas and Uitto 2001, Biswas 2008(Biswas 2011)). Salman and Uprety (2003), on Nepal and India's water relations, writes that there are flaws in treaties, but it is a dichotomy of perception, and questionable emphasis on sharing of the benefits are the main reason for impediment in further cooperation. Bogardus (1964) defined that cooperation, based on the democratic, the voluntary, autonomy, equity and or universality principle, is a process which led individual or groups to better social development.

Chapter 3: the politics

The Transboundary Rivers physically link upstream and downstream riparian. The management of Transboundary Rivers is a complicated affair of technology, politics, and Economics. It offers relatively significant opportunity for water based opportunity for cooperation and development, equally, they create barriers on same, if it goes bad. The water cooperation and treaties between India and Nepal either accused of disparity or under stalemate. The Transboundary water involves different stakeholders(Rogers and Hall 2003) and the collective action of a range of actors, i.e., basin states, sub-national groups, international and transnational organizations make impacts on the transboundary water management. (Robertson 2004, Mirumachi and Van Wyk 2010, Pahl-Wostl and Kranz 2010, Grover and Krantzberg 2015). The stakeholders have their view or "rationality" of how water should be managed and developed. It can be politicized by one group of actors playing up an image or another group of actors depoliticizing it to deflect attention on water resources(Verweij 2017).

Mirumachi (2008), adapting Cultural theory and Grid-group analysis¹, demonstrated that the four general groups of actors – government, environmentalists/NGOs, industry/private sector, and individuals have varying attitudes towards international transboundary water cooperation. Mollinga (2008) writes that there are four types of

¹ grid-group cultural theory is a cultural model developed by anthropologists Mary Douglas, Michael Thompson, and Steve Rayner, with contributions by political scientists Aaron Wildavsky and Richard Ellis etc. One reason it was designed was to show how native rituals and practices were relevant to modern society.

“domains” where politics of water takes place. 1. The everyday politics 2. The politics of water policy. 3. Inter-state hydro-Politics. 4. The global politics of water. Later, he suggests there is a fifth domain which is 5. The linkage of this four domain, which shows that the policy issues and water contestations travel across different domains.

Based on those theoretical perspectives, this chapter investigates the hydro-political relations in the contexts of Nepal and India and can be an example of a hydro-political domain. Adopting a Political Accounting System, the political/ power analysis will shed light over asymmetric, which ultimately affects the processes of water allocation and further developments.

The Political Accounting

The Political Accounting System (PAS) can help us to understand how the political dynamics work. The political accounting system “PRINCE” was developed by Coplin and O’Leary (1972), as a political science tool, Frey and Naff (1985), Dinar and Wolf (1994) used PRINCE to look on middle east’s transboundary waters..

I propose that PRINCE also can be used to analyze the past trend. Using PRINCE, we might explain that having similar nature, why some treaty is functioning but some are not.

The PRINCE system is just a plain common sense, it does not help us, however, how to but what it is. The outcome of Political Accounting System (PAS) analysis can help us to validate or suggests the alternatives so particular hydro-political dynamics can work a cooperatively.

The PRINCE title comes from the four actions

1. **Probe:** To figure out who are the most important actors.
2. **Interact:** To find out their inclinations and influence
3. **Calculate:** how to get them to behave the way it need to
4. **Execute Strategy and plans.**

There is a certain procedure to run PRINCE, It emphasizes the need to recognize the problem, and it suggests to group the important stakeholders and includes those who can or will block the process for the desired results or impede the achievement of the respective goals. To analyze the Nepal India's' Hydro politics, three groups are made, which has/ had governed the decisive stake in transboundary water policy.

Table 1 Group arrangement for the PSA "PRINCE."

Group	Nepal	India
1	Politician/leaders of government of Nepal	Politician/leaders of government of India
2	Bureaucrats of Nepal	Bureaucrats of India
3	The Non-Governmental Actors*	The Non-Governmental Actors*

The Non-Governmental Actors groups comprise the NGOs, Civil society and opposition political parties. Some literature and personal observation show that in South Asia's, sometimes, NGOs acted as an opinion maker, are either influenced by certain political parties or influence them, vice versa. Second, based on narrow Nationalistic mindset,

none of any organizations individual want to be damned with “anti-national” tag by supporting another competing country.

PRINCE analysis is based on three indicators.

1. Issue position: Issue position is defined as the current attitude of actor toward a decision. Based on its firmness, it is expressed as a number ranging +3 to – 3. In the case of neutrality issue position will be zero and so it will increase or decrease with the attitude of the actor.

2. Power: The influence of actor on the decision is defined as power. The power is ranged as 1 to +3. It also reflects the position of the actor on the decision, directly or indirectly, in support of or in opposition to the decision.

3. Saliency is defined by the importance of the decision to actors, how much actor is related to the issues. Saliency also ranged from +1 to +3, similar as Power.

(The details of calculation has been given in Annex-3 Prince)

PRINCE for 1950's and Kosi/Gandak agreements 1950's

After independence, the Indian government was in desperate need to solve the Kosi and Gandak for flood control, two agreements signed (Kosi-1954 and Gandak-1959) between Nepal and India, essentially for flood control, and irrigation projects by building dams or for barrages. Nepal, emerging from prolonged isolation, indebted by India's role in its democratic movement, was too new to Hydrology. The government at the time of agreement were accused as Indian supporter by opposition political parties (Mishra 1997, Dhungel and Pun 2009). The

Table 2 the PSA for the Kosi Gandak Treaty 1950's

Stake Holder	Issue Position	power	Salience	Total support
	3-0-3	1-3	1-3	
Politician Nepal	3	2	2	12
Bureaucrats Nepal	1	2	2	4
NGA Nepal	-3	2	3	-18
Politician India	3	3	3	27
Bureaucrats India	3	3	2	18
NGA India	2	1	3	6
Scores in support				64.00

The scores in support was enough to make a treaty

The Mahakali treaty 1996

In 1990, the democratic movement and again helps from India, and multiparty democracy was restored in Nepal. The Mahakali treaty negotiations started in 1991 with an "understanding, " and amid of controversies, it was signed by both governments in 1996 and ratified by Nepalese Parliament as per Supreme Court order. The ratification was done with the help of opposition political party which was lobbied by India and also supported by a global power (Gyawali 2002) but the splinter political party, media and NGOs were still against to it (Srestha 2003, Tiwary 2006, Jaishy 2007, Malhotra 2010).

Stake Holder	Issue Position	power	Salience	Total support
	3-0-3	1-3	1-3	
Politician Nepal		2	2	8
Bureaucrats Nepal		1	2	4
NGA Nepal		-2	2	-18

Politician India	3	3	3	27
Bureaucrats India	3	2	2	12
NGA India	0	1	3	0
Scores of all actors supporting the issue (A):				51

Table 3 the PSA for Mahakali treaty

The PSA calculation shows that the Mahakali Agreement does generate 78 % support which is enough to make an agreement with India.

The stalemate

Though there is much consultation made after Tanakpur Agreement to the Mahakali treaty (issue position, power and salience in table 4), the opinion makers especially NGO's and Newspapers in Nepal start portraying this treaty as a significant loss for Nepal. The opposition party changes their stance. India is also losing its interest in further negotiation, and some minor issues arise on "historical" rights (table4) (Gyawali 1999, Gyawali and Dixit 1999, Gyawali 2002, Gyawali 2006, Jaishy 2007).

Table 4 The PSA for Implementation of Mahakali treaty

Stake Holder	Issue Position	power	Salience	Total support
	3-0-3	1-3	1-3	
Politician Nepal	0	3	1	4
Bureaucrats Nepal	-2	2	2	-8
NGA Nepal	-3	2	3	-18
Politician India	2	3	2	12
Bureaucrats India	2	2	2	8
NGA India	-1	1	3	-3

Scores of all actors supporting the issue (A):

20

Absolute value of actors opposing the issue (B)

-29

Conduction of PSA (table 4) to check the probability of implementation, the possibility of implementation shown is 40 % which is a sign that in the current scenario, there is less chance for implementation, and in fact, there is the stalemate.

The Prince charts above gives a kind of political "snapshot" of what is happening. To decide on a strategy to help make things change the way it is, the other Prince tools a Friendship-Neutrality-Hostility chart will be helpful.

To demonstrate the actor's behavior, I assigned the points as follows: a + is used to denote political friendship; a 0 to show political neutrality; and a- to represent political hostility.

The three signs (+,0, -) can be interpreted as a prediction of whether or not the actor in the row will attempt to agree with, remain neutral toward, or disagree with the actor designated by the column on any given issue the two are likely to become concernedwith.

	Friendship-Neutrality-Hostility Chart					
	Politician Nepal	Bureaucrats Nepal	NGA Nepal	Politician India	Bureaucrats India	NGA India
Politician Nepal	0	+	-	+	0	0
Bureaucrats Nepal	+	0	0	0	-	0
NGA Nepal	-	0	0	-	-	+
Politician India	+	0	-	0	+	0
Bureaucrats India	0	+	0	+	0	0
NGA India	0	0	+	+	+	0

The result of this case study is shown in Table ---. For example, it can be read that the non-government organization from both countries is likely to agree with issue position but the

NGA Nepal not likely to agree with the Politician (Government's) issue position and been neutral towards Nepal's bureaucracy. The Indian bureaucracy is neutral towards NGA Nepal about the politician of India is negative to NGA Nepal. This chart can be helpful for further research with the scope of "hydro diplomacy" and/ Integrated water resource management.

Chapter 4: the looming Danger

The river systems

The Ganges river system is a life line for half of Indian population, half of Bangladeshis and the entire population of Nepal (ICIMOD). It originates from the Himalayan glacier.

The Glacial meltwater contributes about 20% rest 66 % of runoff is rain falls contribution. 67 % of 34 thousand KM² of the Himalayan glacier, also known as “water tower” is reported to receding (Babel and Wahid 2008). Many experts suggest that glacier receding is a response to rising temperatures which will reduce water availability in some rivers in the medium and long term following an initial increase in meltwater volume (Immerzeel, van Beek et al. 2012).

Agarwal, Babel et al. (2015) developed projections for future precipitation in the Koshi catchment (a major contributor of Ganges flow) in Nepal. Their results indicate that there is an increase in summer, autumn, and annual precipitation, but a decrease in spring precipitation. The authors cautioned that differences exist among the GCMs² are small in the near future (the 2020s) but become significant during the mid and late century. Pervez and Henebry (2014) projected an overall increase in monsoon precipitation of 12.5% and 10% over the Ganges Basin with a decrease during the pre-monsoon and increase during the post-monsoon seasons.

Studies show that there is increasing trend in temperature in the Ganges Basin and the projection data indicate that temperature is likely to increase further under climate

² xxxx

change(Nepal and Shrestha 2015).Though the total amount of flow, in the Ganges, does not seem to affect much by changing the climate, experts suggest that the higher variability and increase in drought and flood are expected. The water demand in Ganges basin is rising with the economic development of riparian. Falkenmark, Berntell et al. (2007), Rockström, Falkenmark et al. (2012) writes that the projected population growth with economic development will be more prone to changes in water availability. Faruqui et al. (2001) warns that the rapid urbanization can lead substantial increase in demand and it will make difficult to provide affordable and safe domestic water.

There is 6000 rivers and rivulets in Nepal which, in combined, contribute 71 % of Ganges flow during lean season (Dhungel) and those rivers can be grouped into three broad categories(Babel and Wahid 2008).

1. Large: Koshi, Gandaki, Karnali(Ghaghra in India),and Mahakali(Mahananda in India)

2. Medium: Bagmati, Kamala, Babai, West Rapti, Kankai etc.)

3. Southern rivers: Raato, Pandai etc.

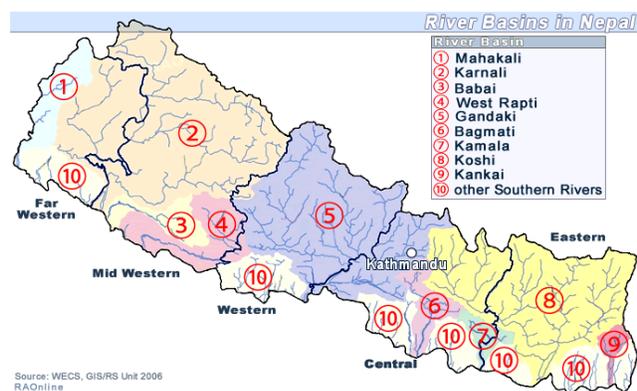


Figure 2: Large, Medium and Small River system Nepal

The larger rivers originate from Upper Himalayas; the medium rivers originate from lower Himalayas in Nepal where the southern rivers are mainly rain-fed type originating from Siwalik Range: (Babel and Wahid 2008). Those rivers formed many micro to macro basins to Gange's sub- basins and many are transboundary basins.

The transboundary water developments between India and Nepal is in a stalemate. The reason of this status-quo is transferred elsewhere-upstream to Nepal or downstream to India.

In every year, bordering peoples of Nepal and India suffered from monsoon floods. Recently, in 2017 only hundreds of peoples life and multi million's property lost (aljazeera 2017). To protect its property from rivers, India had constructed embankment along with Nepalese border(Agrawal).. The embankments are accused of poor planning and without serious attention to local hydrology, resulting in waterlogging of the land along riverbanks. The Nepalese side specially non-government actors blame Indian embankments for flood where the Indian side blames Nepal for floodings. The flooding events, in every year and seasonally, is a much-highlighted topics in both countries.

Amid of global environmental change and socio-economic development in Nepal and India are fueling the demand and mismanagement of water and making it scarce in some region of both countries.

[The Vulnerability of river basins](#)

The Vulnerability assessments for water systems is to evaluate susceptibility to adverse consequences and identify corrective actions that can mitigate the risk of those consequences (EPA 2002). Pandey, Babel et al. (2010) assessed the vulnerability of large and medium Nepalese river basins to environmental change, based on an evaluation of

water resource availability and variation, development, and use, ecological health and management capacity. They defined that “the resource stress is related to availability of water resources and its reliability (measured in terms of coefficient of variation); development pressure is represented by level of water use and drinking water inaccessibility; ecological insecurity is reflected by extent of water pollution and deterioration in natural condition (measured by forest cover area); and management challenge is measured in terms of productivity of water use and sanitation inaccessibility”.

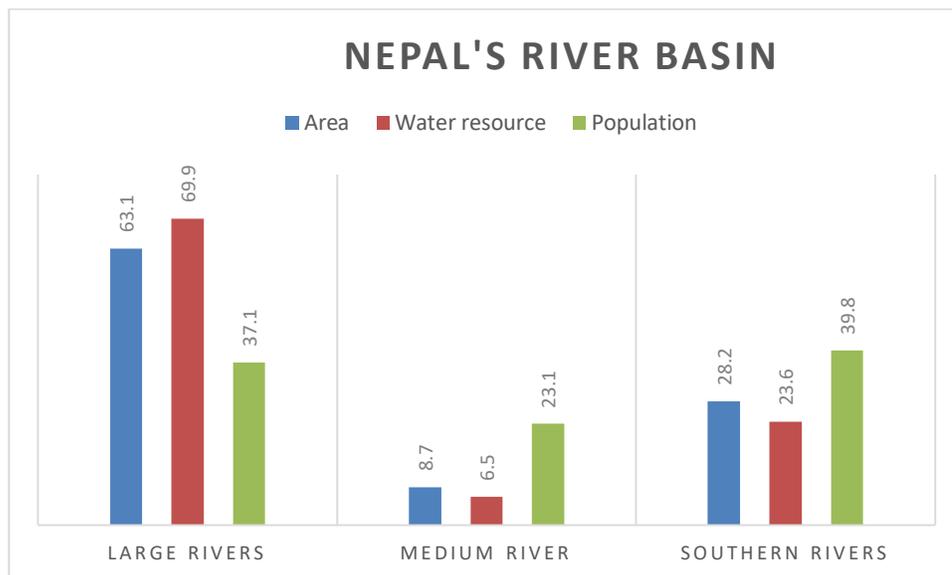


Figure 3 Nepalese river basin's watershed area, population and water resources

Source (Pandey, Babel et al. 2010)

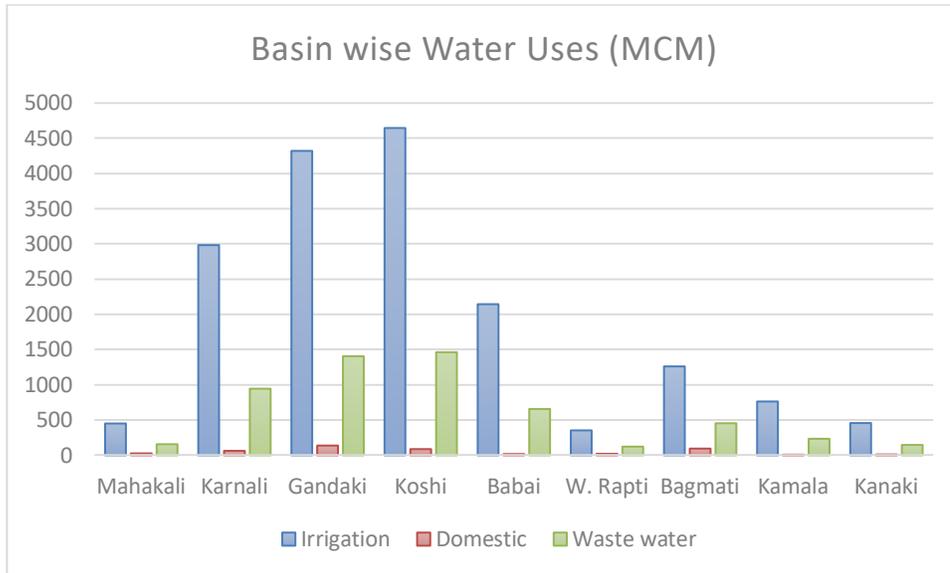


Figure 4 Use of water in Basins

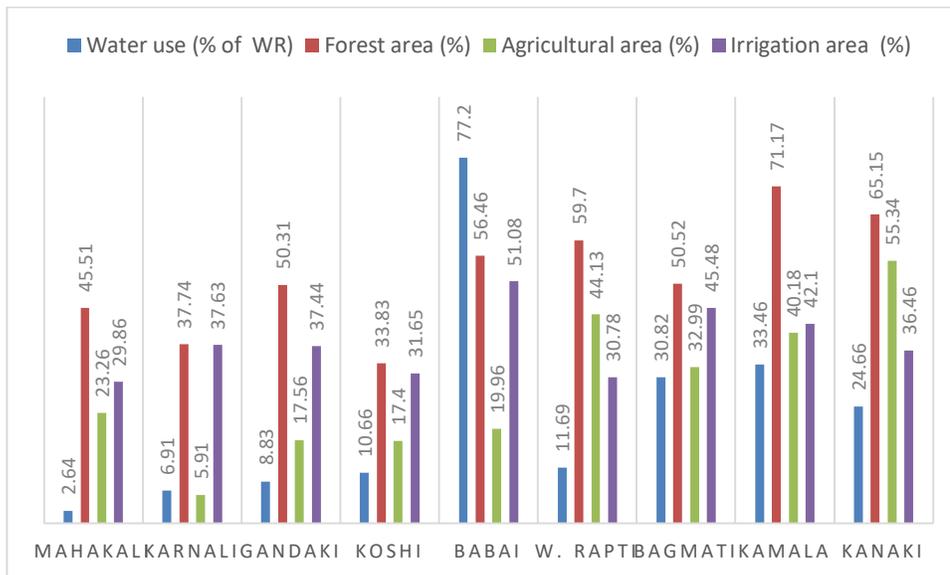


Figure 5 Overall water uses

The data (figure 4 and figure 5) comparing (watershed area, population, water resources and uses in the medium basins in Nepal are slowly but moving towards the water crisis.

The densely populated medium basins are reflecting higher resource exploitation (figure

4 and 6). Though there is less than 50% of lands are irrigated, the higher consumption irrigation reflects that there is the unmanaged use of water in the agriculture sector (figure 6). The waste water in medium basin especially Babai and Bagmati reflects that the risk of socio-economic growth (urbanization, irrigation) which will require more water (figure 6). The water resource system adapted by physical infrastructures (Babai irrigation, drinking water project for Kathmandu valley) hampering the water quality becomes increasingly polluted by more wastewater returned to the river after use (figure 6). On consumption trend, the West Rapti, Babai and Bagmati are more prone towards water stress (figure 6). Unfortunately, those rivers are Transboundary Rivers. All those rivers originate in Nepal and drain out in Ganges, India. Escaping details to each of river basin in Indian part, based on population density (1,102/ KM² in Bihar 800KM² in UP, in average 2 to 3 times more in Medium or larger transboundary river basin's than basin's Nepal catchment), rapid industrialization, urbanisation in those basins are making those basins more vulnerable in India (India). In Bihar (INDIA), the outlet of Bagmati, Kamala, Kosi and Gandak basin, study shows that gross per capita water availability will decline from about 1,950 m³/yr in 2001 to as low as about 1,170 m³/yr in 2050. Surface water coverage in Ghagra-Gandak & Gandak-Kosi Zones has decreased by 43.4% and 37.8%, and Seasonal availability of surface water is declined by 43%(Ghosh 2010).

The Southern Rivers

Thousands of small rivers flow from Nepal's Terai (Madhes) to Bihar and United Province of India. Those rivers are vital for millions of people who live along the river but too small to catch the attention of policymakers.

The Pandai River is a small river originate from Foothill Shivalik, and Mahabharat mountain range marks the international border for a short stretch between the Chitwan National Park in Nepal and the Valmiki Tiger Reserve in



Figure 6 the Pandai River divided for upstream and downstream

India. There is a thin flow of water in pre monsoon in the river, which are a lifeline for thousands of Indian and Nepali villagers living with those open borders. Once enter in India it along goes to join Masan River, ultimately to join the Ganges. The villagers of 7 villages from downstream who are dependent on Pandai allege that the villagers upstream in Nepal block and divert the thin channels so that in summer, they do not even get enough water to drink. Nepalese side claims their sovereignty. It is their river(SINHA 2014, Siddiqui 2017).

That they opened during the rains by when they become afraid of flood threats. Earlier they had had traditional institutions which were able to come up with a sharing formula in the time of water crisis. However, now they were told that decisions would be

taken(Siddiqui 2017). through talks between Kathmandu and New Delhi. Till then villagers are clashing, leading to riots and other sufferings.

Two dimensions of water scarcity in The Ganges sub-basin: the transboundary river basin of Nepal and India

As of Falkenmark, the water stress is more a management problem, and water scarcity is related to availability and demands where water is a shortage. Up-to 40 % of water stress are accepted as considerable water stress, more than 40 % up to 70 % are considered high water stress. Since a residual streamflow is required for protection of ecosystems, beyond 70 % of stress is over appropriation (Falkenmark 2007, Falkenmark, Berntell et al. 2007). The water scarcity, along with population growth led to a situation for water crowding and referred by an indicator which expresses a number of people sharing each flow unit of water, i.e. Water stress = $< 1700 \text{ m}^3 / \text{person}/\text{year}$ and Water scarcity: $< 1000 \text{ m}^3 / \text{person}/\text{year}$ (Pimentel, Houser et al. 1997). Falkenmark introduced a Two-dimensional approach to demonstrate water scarcity. In this approach, the water stress is on Vertical Axis and water shortage or water crowding on Horizontal Axis ((Falkenmark 2007, Falkenmark 2013)). The 40% limit of water stress with the water-crowding limits gives four realms for water scarcity, and the diagonal line is drawn to represent different water demand levels. In his two dimensional diagram, it can be seen population growth is pushing a basin to the right where increasing water demand pushes it vertically.

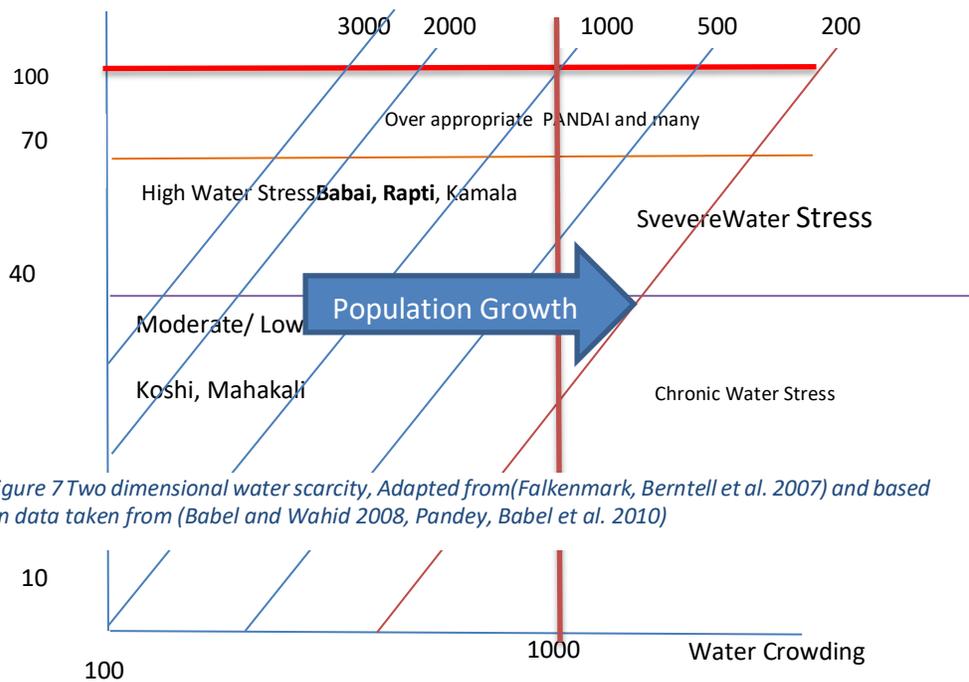


Figure 7 Two dimensional water scarcity, Adapted from (Falkenmark, Berntell et al. 2007) and based on data taken from (Babel and Wahid 2008, Pandey, Babel et al. 2010)

In Nepal- India's transboundary river basins, i.e., Kamala, Bagmati, populations continue to grow which will force people to share every flow unit of river and water crowding will increase (horizontal line in figure 9). When there is more population, more user in that basin have to share available water, and the per capita use of water will decrease (diagonal line). Those stress will be adapted by infrastructures, and the water quality becomes increasingly polluted by more wastewater returned to the river after use.

To curtail those stress, more and more water has to be mobilized which further increase the water stress and further will complicate the situation between riparian. (i.e., Indian opposition towards proposed irrigation facility in medium basins). The rise in water crowding, a decrease in flow complicate water complication and generate conflict (The case of Pandai River).

Chapter 5: Discussion and Conclusion

The transboundary water in South Asia holds the potential for national and regional economic development which are essential for political stability. To achieve this, the transboundary water development agreements are needed. Although there are dozens of transboundary basins and sub-basins lies between Nepal and India, the three agreements between Nepal and India are governing three larger river basins. Those agreements created in an attempt to either prevent water related problems or irrigation but they are significantly contributing to developments. Though These treaties are praised by international scholars as a creative application of economic equity " baskets of benefit"(Wolf 1999), the further developments of shared water resources are in the stalemate.

To conform this trend this research is analyzes the cause of impediment, the hegemonic behavior of India and effect of deadlock. According to this objective, the following questions were formulated to (a. What is the cause of impediment? Why don't existing agreements work? what led to Stalemate? b. How the Stalemate or present status-quo is affecting both countries and What is the way out?

The answer to the first question is based on chapter two and three wherein firstly the perspectives, theoretical concepts are studied and secondly, the political simulation of treaties has been done.

The main conclusion that can be drawn after studying the scholarly concepts relating hydro politics is that the transboundary water involves different actors, so there are different perceptions. Those different perceptions are pivotal. It has been proven with PSA, scrutinizing the PSA (table) for KOSI/GANDAK treaty, India's internally focused unilateral proposal and its influence on Nepalese leadership were a decisive force for those treaties. India's role satisfies the hegemonic theory where power asymmetry leads

the results. It also reflects the use of soft power ("baskets of benefits) as well as normative and utilitarian mechanisms of hydro-hegemony compliance, but this process underscores the importance of shared, trusted information. The lack of information sharing with nongovernmental actors (other political parties, Medias, etc.) gave the opportunity to disgruntled actors to misinform other actors and resulted in negative perceptions which caused the trust deficit and further delayed any other cooperation for 30 years. The PSA of Mahakali treaty (table 4, chap. 3) shows that Perceptions can also be influenced by historical tensions and suspicions (issue position of Gov. of Nepal and Bureaucrats was higher during Kosi treaty (table 3, chap 3). The proactive roles played by government and international make and the Mahakali treaty to ratify from Parliament. The change in opposition political party's stance shows that perception might be tempered by more credible information, (issue position of NGA are less negative during Mahakali treaty), but the exclusion of other stakeholders (NGO's and media especially) left places for misinformation and risk to misguide public opinions. The impacts of these opinions are reflected in PSA simulation of stalemate where the governments are losing interests either due to negative public opinion or annoyed by the counter claims. In summary, a "Non-Leadership" hegemonic attitude of India and counter-hegemony tactics from Nepal, can be seen as a major reason for the current stalemate.

It is reasonable to assume that the anthropogenic and the environmental changes causing flood and water availability in the Transboundary rivers. The annual floods cause the multidimensional effect on Nepal India water relations. The vulnerability assessment of

rivers shows that the water availability is reducing. The medium and small rivers are heading towards water scarcity, which might affect the millions who are dependent on those rivers.

It might be argued that the absence of any cooperation on medium or other small-scale rivers and because of the stalemate, India encouraged to build embankment along with Nepalese border to protect her properties. While the techno-economic capability helps India to protect its properties from transboundary seasonal floods, the water scarcity cannot be solved by a unilateral and or engineering solution. A basin wise approach and efficient management of available water but overall the cooperation is one among few other options.

Nepal, if develops its hydropower potential properly, may have a lot of “surplus” potential, which could be a source of cheap electricity for India, more energy-hungry nations within the basin. At the same time if both country can harness the larger river basins (especially Kosi), a potential water-way can be made which will link Nepal, a landlocked country and several states of India to sea-route via the Ganges. Though there is environmental and investment concern but the biggest concern is both countries perceptions. The current zero-sum game approach, the countries have usually withheld selective information to play the game for their favourable situation. Similarly the river institutions are much more a respective governments officers, this setup cannot change the perceptions towards each-other, an independent and free source of water information and institution that is supposed to be unbiased can be a good start to gather

mutual trust and develop a shared visions. Similarly, the “corporate” structured but independent river basin development authority can be a feasible and a reliable start to reap the benefit from the shared rivers. Conducting an extended research with what may work for each basin may be the way forward

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