# CLIMATE PROOFING INDUS WATER TREATY: SYNERGISTIC INTEGRATION OF TRANSBOUNDARY WATERS' CLIMATE CHANGE ADAPTATION PRACTICES

*Fiaz Hussain Shah*[*]

## *Abstract*

*Understanding potential impacts of climate change on trans-boundary water resources is of paramount significance for devising adaptation strategies. Climate change adaptation strategies devised after due deliberations, promise dividends in socio-political, economic and environmental domains. Indus Water Treaty (IWT) signed in 1960 is internationally considered a successful mechanism for regulating water resources between Pakistan and India. At that time, climate change due to its late realization was not incorporated in it. As the climate change phenomenon became known globally, the scarcity of water also started getting pronounced thus leading both the countries towards a conflicting situation. While the long conflict between India and Pakistan has attracted extensive interest amongst the scholars, approaches related to climate proofing IWT have largely remained ignored in the academic literature.*

**Keywords:** Climate Proofing, Indus Water Treaty, Trans-boundary Water Resource, Climate Change Adaptation, Segmented Practices.

## Introduction

Increasing Green House Gases (GHG) emission is causing rise in global temperature and is the major source of climate change. In 20th century, as reported by the Intergovernmental Panel for Climate Change (IPCC) - 2007, the rise in global temperature was 0.76°C whereas in first decade of 21st century, a rise of 0.6°C has been observed.[1] Studies have revealed that the rise in temperature has disturbed weather systems.[2] Resultantly, the water has been the most affected element on earth as both of its main sources i.e., rainfall and glaciers have been adversely impacted.[3] Uncertain conditions for the availability of water in different parts of the world, with regards to water quantity particularly variations in terms of magnitude, timings and duration have further accentuated the impact of water scarcity.[4] More importantly, in the countries where water resource is shared by two or more states or countries, the implications of the temperature rise are more evident.[5]

[*]Fiaz Hussain Shah is faculty member at Centre for International Peace and Stability (CIPS), National University of Sciences and Technology (NUST), Islamabad.

Climate change is a global phenomenon and its impacts also go beyond borders. As the precursors like weather systems, glaciers etc. to climate change have trans-boundary roots similarly are its impacts which by its unique nature involve more than one state. Involvement of more than one state has a potential of turning such an issue into a conflicting situation. Pakistan mainly dependent on Indus River Basin (IRB) for its fresh water is no exception in suffering from the implications of climate change.[6] To rationalize the use of water between both the countries, an international protocol known as Indus Water Treaty (IWT) was signed on 19 September 1960 under the auspices of World Bank.[7] Indeed, the treaty has proved itself as a longstanding symbol of cooperation between India and Pakistan.[8] However, while the treaty was being framed, the phenomenon of climate change was not incorporated.[9] Absence of this reality from the Treaty has negatively affected IRB and has constrained Pakistan as it has only one river basin to draw waters from. Contrarily India has over a dozen river basins to be accessed.[10] The water quantity with different variables like volume of water, timings and duration of its flow and frequency with varying intensity has immensely changed in last fifty years.[11] As a result, with variation in quantity of water, the quality of water has also been negatively impacted.[12]

In the face of water variability, incorporating mechanisms to bring flexibility and introducing climate change related clauses and provisions to deal with water quantity and quality issues is the way to retain stability in a treaty. To incorporate climate change related clauses and provisions with a view to ensure sustainability of a water agreement, termed as its *Climate Proofing,*[13] provides the flexibility to an agreement with which it can adjust to the consequences of climate change.[14] The dominant climate change related factors like equitable and sustainable utilization of water resource and avoiding damage and loss to other riparian states are the most important factors to be incorporated in a treaty. Consideration of such factors can ensure socio-economic, environmental and political dividends and will also help to manage and respond to extreme events like drought and floods, maintaining ecological balance in the basin and management of basin aquifer and ground water. In addition, the effectiveness of a treaty relies on a comprehensive mechanism that offers: monitoring and data archiving, data and information sharing, joint institutions for basin water management, amendment and review procedures, dispute resolution, and conflict management. Such mechanisms in the context of trans-boundary agreement create culture which facilitates the process of cooperation.[15]

This paper aims to introduce the concept of *climate proofing* in the context of IWT. In doing so, the paper first provides the global context of trans-boundary water treaties citing pertinent climate change adaptation examples which can be emulated in case of IWT. Thereto, IWT is peeped through with an aim to identify the conceptual contours of *climate proofing* while illuminating its geographical, legal and institutional dimensions. The applicability environment which poses challenges and provides opportunities in Indo-Pak context is broadly considered. The implementation milieu is then deliberated upon which leads the discussion precipitating into synergized effects of integrating climate change adaptation practices in IWT before the paper is finally concluded.

## Trans-boundary Water Treaties - Global Context

Like oil is one of the major sources of disputes and conflicts amongst the states, similarly as a natural resource issue, hydro-politics also has a long history of conflicts on world arena. All trans-boundary river basins which have led to inking of over 300 mutual water agreements across the globe are testimony to the fact that timely management of future supply and demand matrix are necessary for peace and stability in the region in general and within the riparian states in particular.[16] Review of trans-boundary agreements amongst riparian states for Nile, Rhine, Mekong, Jordon, Danube, Tigris, Euphrates, Brahmaputra and Colorado Rivers etc., show an effective cooperation and coordination at play which have been suitably applied to create an environment of cooperation. The studies by Wolf [17] and Daoudy [18] reveal that with the help of trans-boundary agreements acting as institutional mechanisms, the conflicting situations between the riparian states have been amicably avoided. Water, the foundation of human life, is a finite and shared resource which is divided based on the availability.[19] Indus River System (IRS) is the lifeline for regional economies of Pakistan and Western India. Any threat to its availability is considered challenging for both the countries.[20]

## Conflicting Pressures

According to theory of liberalism which advocates foreign relations between liberal states based on democratic principles and institutions,[21] the conflicts are resolved through non-traditional ways like establishment of institutional mechanisms in form of agreements and treaties outlining rules of the game with no ambiguities. If the agreed rules are established with an inbuilt mechanism to monitor and implement the distribution of scarce resource, however, when the governance of such mechanism is weak to be effective then the dominant party takes advantage of the void whereas relatively weaker party develops discontent and frustration.[22] In a particular conflict situation, actions and counter actions lead to attempts for control of outcome of interventions. Since aspirations of all stakeholders cannot be met simultaneously therefore the goals and activities become incompatible when one's own interests are threatened by action of another.[23] Stakeholders in a competitive environment with opposing interests, endeavor to deny each other the achievement of desired objectives. This leads to disagreement on the means to attain the same end which in turn results into tensions. Perceived goal incompatibilities and efforts to control each other choices result into conflicting situations. If the causes and sources of discontent are left unresolved and unaddressed then the conflict has latent potential to negatively affect interdependent bilateral relationships and peace equations.[24]

## Climate Proofing Concept and its Efficacy

Climate proofing trans-boundary water agreement or treaty is a comprehensive concept in itself. It can reduce the climate change-based risks and impacts to minimum possible level. At first instance, it shall keep away from a conflicting situation between the riparian states and shall lead to conflict resolution institutionally if at all a difference in interpretation or implementation of the concept shall arise. The climate proofing concept may not be an end in itself rather it is an effective mean to bring

flexibility in the treaties and agreements. The concept when appropriately applied can suitably absorb the negative impacts of climate change by applying technological, institutional, social and legal innovations rather than waiting for the existing treaties to succumb to the burgeoning future pressures. The concept besides addressing the water quantity and quality issues, has promising potential to address low probability but high magnitude climate events like floods and droughts as well which shall provide a long-term sustainable solution to the stresses being caused by climate change on political, economic, and social planes.[25]

Climate proofing being a wholesome concept shall integrate isolated or fragmented climate change adaptation practices which are applied by different countries to their respective trans-boundary water agreement to multiply its dividends and creating synergy in efforts and results. After establishing its feasibility and practicability, climate proofing concept is applied on trans-boundary agreements in a customized manner. Through a comprehensive monitoring mechanism, the concept is allowed to endure which gives it sustainability to meet intended future needs and dictates. The whole concept thereby results into synergy of effort and outcome.[26] It will be in line with national road map of economic growth, social inclusion and sustainable development as given in Pakistan's Vision – 2025.[27] More significantly, climate proofing of IWT will reflect Pakistan's resolve to implement its Intended Nationally Determined Contributions (INDC) in compliance to the decision taken at the 20$^{th}$ session of Conference of Parties (COP) UNFCCC. At global level, climate proofing of IWT will have profound effect in the realm of conflict management through the incorporation of climate change phenomenon in trans-boundary watercourse treaty. It will be the manifestation of the resolve shown by world leaders at 21$^{st}$ session of COP at Paris from 30 November to 11 December 2015.[28] Climate proofed IWT will mean that concerns expressed in Paris Agreement about acknowledging climate change as a common concern of human kind has been practically applied and IWT has been configured to become sustainable instrument particularly under climate change scenario inspired by its guiding principle of equity and common but differentiated responsibilities and respective capabilities in the light of different national circumstances.

At conceptual plane, the outcome of synergy is visualized by integrating segmented climate change adaptation practices through climate proofing of an institutional mechanism like treaty or an agreement. Traditionally, Pakistan and India are embroiled in host of disputes. Kashmir dispute dominates the conflict matrix. Others major traditional disputes include Siachen Glacier and Sir Creek issues. Subsequently nuclearization of both the countries has more serious dimension to the conflict matrix. Politicking on Indus Water Treaty can usher an era of non-traditional conflict matrix which can exacerbate the existing stress level. Conceptually strengthening of existing institutional mechanism like Indus water treaty by its climate proofing and subsequent application of integrated globally segmented climate change adaptation practices on ground has the promise of building peace between two nuclear states.

## Global Climate Change Adaptation Practices – Rich Source for Emulation.

There are numerous examples on international arena where climate change adaptations have been practiced by riparian states for trans-boundary water bodies thereby drawing immense benefits from their outcomes. Some of the examples are cited here for inspiration and emulation.[29]

- International Commission for the Protection of Rhine (ICPR) started a study on "Impacts of Climate Change on the Rhine River Basin" in January 2013 by multi-disciplinary working group comprising hydrologists, chemists, ecologists, engineers, flood experts and NGOs which was concluded in end 2014 and published at the beginning of 2015 is being implemented now.[30]
- Danube River is shared by 19 countries and is the most shared international basin in the world. To raise the awareness and draw conclusions about the impact of climate change on Danube Basin, the International Commission for the Protection of Danube River (ICPDR) started work in December 2007 with an international conference and in a period of about five years prepared a strategy in December 2012 to be incorporated in existing legal and institutional mechanisms and structures for complete basin which provides guidance for how to address climate adaptation in the Danube basin particularly flood risk management.[31]
- Zambezi River Basin is shared by seven countries. Basin experienced increasing number of disasters like floods, droughts and hailstorms often resulting into outbreak of infectious diseases. It was in 2009 that International Federation of Red Cross and Red Crescent Societies and National Red Cross Societies of all riparian states established Zambezi River Basin Initiative, initially for helping in flood relief operations but later it developed into an effective body forging an integrated and comprehensive long-term strategy to reduce vulnerability to flooding and other risks brought about by climate change particularly the disaster preparedness measures.[32]
- Mekong River Basin is shared by four countries. In 1995, Mekong River Commission (MRC) signed an agreement for cooperation on the sustainable use of Mekong River. MRC also developed five procedures which provide detailed implementation guidance for the basins. In 2009, MRC created Climate Change Adaptation Initiative which supports member countries to integrate climate change in development planning aspects and design frameworks which guide adaption and monitoring of implemented measures and mechanisms.[33]
- There are host of adaptation practices which have been implemented on various trans-boundary waters like Dniester River for environment planning,[34] Great Lakes by US and Canada for joint integrated assessment and ecosystem adaptation strategy,[35] the Sava River Basin flood protocol.[36]
- Bugesera Initiative by Burundi and Rwanda for climate change adaptation and water resource management.[37]

- Agreement between China and Kazakhstan for protection of trans-boundary waters particularly the water quality etc.[38]

These practices are implemented for the challenging concerns of a particular trans-boundary basin but if the same segmented practices are integrated through a comprehensive plan it can climate proof a trans-boundary water body creating synergistic effects of their collective outcome. That's what is expected from climate proofing of Indus Water Treaty which resultantly will benefit both Indus River Basin riparian states.

## Indus Water Treaty: Geographical, Legal, Institutional and Historical Profile

Indus River Basin (IRB) comprises six major rivers (the Indus, Jhelum and Chenab commonly known as western rivers and Ravi, Beas and Sutlej as eastern rivers). Indus River is the only tributary which cuts across Himalayan – Karakorum – Hindukash (HKH) [39] ranges having its major portion in Pakistan.[40] (Husain 2010). IRB covers an area of about 1.12 square kilometers. With varying proportions, the Basin is shared by China (8%), Afghanistan (6%), India (39%) and Pakistan (47%). The total water from IRB amounts to 171 Million Acre Feet (MAF) and is shared between Pakistan and India. 20% of it amounting to 34 MAF flows in eastern rivers whereas 80% amounting to an average of 138 MAF flows in western rivers.[41]

IWT outlines principles to share water of IRB between Pakistan and India. The treaty specifies the jurisdictions of both the countries on different sets of rivers in the western and eastern halves. Treaty also defines the rights and obligations of both the countries for sharing the water. In addition, the treaty imposes various provisions regarding unrestricted use of waters of eastern rivers (Ravi, Beas and Sutlej) except for domestic and non-consumptive use by Pakistan of the water which flows down into its territory.[42] Similarly, waters of western rivers are earmarked for Pakistan except some non-consumptive and agricultural use by India as outlined in the provisions.[43] It is repeatedly highlighted in the Treaty that both the countries should exchange information, share data and not to create any damage or harm to other party in the process of applying its right on its respective waters.[44] For implementation of the treaty, monitoring and dispute resolution, a 'Permanent Indus Commission' serves as a functional instrument to avoid localized conflicts.[45]

Since the activation of the treaty, Pakistan and India are sharing waters of IRB. As an amicable resolution of trans-boundary conflict between newly born two states, IWT has been considered as a successful undertaking by the World Bank. [46] Nevertheless, there have been instances where India as an upper riparian state has exercised its right over non-consumptive utilization of water resource of western rivers, without due regard to the damage or harm to Pakistan in the process. In addition, the treaty has an inbuilt mechanism of information and data sharing, monitoring and implementation through 'Permanent Indus Water Commission' (PIWC). Although PCIW endeavors to resolve the issues mutually, however, the Commission has been criticized for not resolving various disputes bilaterally. Consequently, Pakistan as a

lower riparian state has been forced to approach international platforms of justice or arbitration for third party dispute resolution.

In commenting on trans-boundary water resources and geographical advantages and disadvantages of upper and lower riparian states, Salik argues that, lower riparian states are usually at disadvantage.[47] This is mainly because of the 'natural' geographical access and control that upper riparian has over lower riparian. Although technical, legal and institutional arrangements of IWT are keeping it functional yet its inadequacies do create conflicting situations between both the states. At times it becomes pronounced particularly when the internal mechanisms of IWT fail to resolve the issues mutually and the doors of international mediators are knocked for the solution. Climate change phenomenon has further accentuated the existing inadequacies of IWT. The issue is especially crucial to recognizing the impact of climate change on water quantity, water quality and ecological systems. For instance, the fifth assessment report of IPCC-2014 notes that the extreme meteorological events like floods and droughts have increased in frequency and intensity. According to Roic and Garrick et al, the frequency of violations of water utilization on western rivers has also increased.[48] Another approach led by different scholars begs the consideration of geographical and environmental factors contributing towards climate change: significant increase in energy and food demand resulted by the unprecedented population growth,[49] increasing urbanization,[50] intensive ground water extraction, and aquifer depletion.[51] Furthermore, Petersen-Perlman and Veilleux et al make a strong case against the prevalent weaknesses in the treaty and highlights issues related to lack of information and data sharing, weak monitoring and implementation mechanism.[52] While considering these arguments, one is bound to see that Pakistan stress over water resources is exorbitantly increasing.[53] Therefore, this paper aims to highlight the necessity of *climate proofing* IWT in order to make it sustainable under climate change scenarios.

Pakistan and India have a peculiar historical background[54] which has defined both the countries as 'rivals.' This 'historical' view is important because it significantly influences and shapes the contemporary relationship between the neighboring countries. Since independence during 1947, both the countries have fought four wars. First and second wars were fought in 1948 and 1965 respectively and both were related to Kashmir Dispute. In 1971, once again war broke out for the third time between India and Pakistan on East Pakistan issue which resultantly led to breaking of the country and creation of Bangladesh. This never-ending animosity created a deadly scenario which eventually led both the countries toward their nuclearization[55]. The last standoff between the nuclear rivals took place in 1999 which was once again linked to Kashmir Dispute and is commonly known as 'Kargil War'. Iconic international event like the 9/11 with its consequent fallout like NATO invasion of Afghanistan further complicated regional security balance and created triangular rivals comprising India, Pakistan and Afghanistan. The spill-over of extremism from Afghanistan into Pakistan have also significantly contributed to create never-ending tension between Pakistan and India. More significantly, 'The War on Terror' stepped over the boundaries of Afghanistan and did expose divergence of interests of Pakistan and India. Destradi and Sandra in their

work on "*India: A Reluctant Partner for Afghanistan*." state quite categorically that India leveraged Afghanistan against Pakistan thereby complicating their bilateral relations.[56] Recent spate of hydro politics between India and Pakistanis also a great challenge and more serious is the denial syndrome by the upper riparian which has further exacerbated the situation.[57] No doubt the environment prevailing between Pakistan and India is extremely challenging but there exist 'peace' opportunities as well which need to be explored and capitalized.

## The Applicability Environment for Climate proofing IWT – Challenges and Opportunities

Water and national security are inextricably linked and perhaps this relationship can be considered as the most significant nexus which can be threatened due to the impact of climate change, particularly in the context of trans-boundary shared water resource. Thus, within this inextricability of 'water and security', trans-boundary water resources have always remained a potential source of international conflict.[58] Expanding on this point, various studies have pointed out that, any effort to control the shared trans-boundary water resources (geographical/territorial exercise of power) and its consequent impacts on the fair distribution and management create a competition and escalate conflict between riparian states. Such kind of scenario between the riparian states, indeed necessitates either conflict or cooperation in order to utilize the shared water resources.[59] Usually, disputes over trans-boundary water resources are managed through cooperation and the role of various institutions such as World Bank (WB) and International Court of Justice (ICJ) etc. have been instrumental to this end.

Also, the United Nations well realizes the situational gravity of trans-boundary water issues and has been therefore highlighting the vulnerability of freshwater resource in relations to the climate change at different global forums. For instance, following the creation of the World Water Council, the meeting of the first World Water Forum was held at Morocco on 21 – 23 March 1997 which laid foundation for the development of a long term 'Vision for Water, Life and Environment for 21st Century[60]. The Forum reaffirmed that the incompatible water demand and its availability will significantly impact the socio-economic development. Moreover, the limited or reduced water availability will directly impact the agriculture productivity, public health, migration, human well-being and livelihood.[61] Global warming and climate change are indeed key features of understanding the increasingly widespread natural disasters around the world. In this vein, various assessments and reports particularly IPCC 2014 have also led to the realization that intense rains and more water flows in rivers will cause catastrophic floods that would adversely affect human lives, physical assets/ capital and the livelihood etc.[62]

There are several and obvious reasons which insist to consider the Indus Water Treaty (IWT) as a 'success story'. Akhtar,[63] Jamir [64] and Mehra [65]in their works on IWT are appreciative of its strengths and find dividends in capitalizing those. The treaty has endured the tests of time since it's signing in 1960; survived three major wars, continued

border tensions, hydro controversies and political rhetoric as well. Though, recently Indian Prime Minister Modi threatened to revoke IWT,[66]yet the treaty has proved itself as a successful instrument for regulating shared waters of IRB between Pakistan and India. In general, the waters of the western and eastern rivers as per the treaty are being utilized by Pakistan and India respectively and demonstrate the effectiveness of means other than confrontation. Between India and Pakistan, some of the major hydraulic controversies like Baglihar HPP,[67] Wullar Barrage [68] and Ratle HPP [69] may show proneness to contradiction of aforementioned claims. However, various scholars have considered these arguments as sophistical because of the strong and mature institutional mechanism of IWT. Following this argument, Petersen-Perlman and Veilleux call for the exploration of opportunities that can be capitalized to make IWT a source of strong cooperation and dependence through its climate proofing i.e. formation of one of the principle 'turn' within the studies of natural resource management, disaster risk management and conflict resolution can help establish the required framework.[70] Here, a greater engagement with some of the climate change adaptation practices applied to trans-boundary water resources between riparian states would be highly worthwhile[71]. Recognition of such climate change adaption practices would become both imaginable and promising to move towards 'climate proofing' of trans-boundary shared waters across the globe.

## Climate Change Adaptation: Trans-boundary Waters' Cooperation Possibilities

Climate change has direct bearing on water demand. With increased population growth, urbanization, industrialization and improved quality of life, in warmer temperatures water demand will increase. It has been observed that most of the treaties and international agreements do not incorporate economic, social and political impacts which climate change has on trans-boundary water resources.[72] Particularly in those treaties which were framed during the time period when knowledge about climate change was either nonexistent or rudimentary. The absence of climate change related factors make those treaties fall short of the perceived sustainability standards as set out in international water law documents like the Helsinki Rules,[73] the UN Watercourses Convention[74] and the Berlin Rules[75] Significance of the impacts of climate change is so glaring that its incorporation in trans-boundary water treaties is unavoidable.[76] According to Fischhendler, legal and institutional adaptation to climate change uncertainties in trans-boundary watercourse treaties is essentially required to make it sustainable.[77]

## Water Resource and Trans-boundary Dependence

Around 60% of global freshwater flow across politically divided borders.[78] Cooperation framework in management of trans-boundary waters is essentially required to prevent or reduce the negative impacts of unilateral interventions by the riparian states and to facilitate the application of structural as well as non-structural climate change adaptation and mitigation measures at basin level. Trans-boundary waters cooperation framework can enable integrated development of intervention as a

cost-effective solution. It can help synergize the hydrological effects of interventions applied by riparian states in their respective areas. Economically also, the cooperation framework can lead to shared costs and benefits of adaptations, will broaden the knowledge base, enlarge the range of adaptation measures and reduce social inequalities. Resultantly the process shall promote sustainable development.[79]

## Collaboration Leading to Cooperation

Water is a cross cutting element for civic amenities and merits multi-sectoral and multi discipline attention by all stakeholders at all levels. Water issues involve conflicting and competing needs. These requirements transcend physical, political, institutional, disciplinary and jurisdictional boundaries. The cooperation at trans-boundary level shall therefore remain always necessary to address core issues. These issues shall invariably include water allocation and distribution, pollution sources, water abstraction, infrastructural development, over exploitation of scarce water resource and bearing the financial burden of water management. Trans-boundary waters cooperation framework as a consequence contributes in reducing the poverty and inequities. It accrues economic benefits through efficient and sustainable use of water resource. As a consequence, it facilitates exchange of data and information and promotes sustainable natural resources management of water and the ecosystem and the species dependent on that water body. In nutshell, the trans-boundary waters cooperation framework can prove catalyst in reducing geo-political pressures and build needed trust amongst the riparian states.[80]

## Climate Proofing – The Envisaged Implementation Context

Climate change adaptation phenomenon is a recent experience and its application on trans-boundary water resources is an even newer field.[81] For many of the climate change adaptation practices, the foundational knowledge of existing Integrated Water Resource Management (IWRM) concept is being used for policies and interventions. One such example is the European Union Water Framework Directive (EU WFD)-2000 which has been essentially used to draw climate change adaptation responses particularly for extreme events like floods and droughts.[82]Climate Change adaptation and IWRM due to their conceptual similarities are complementary to each other. One of the key elements of IWRM is the integration of water management decisions across sectors which can be instrumental in identifying the potential climate change vulnerabilities and synergies. Similarly, approach followed in IWRM for hydrological analysis to establish the patterns of extreme events for their frequency and severity can also help in identification of trans-boundary manifested or potential patterns of climate change. Although IWRM as a concept is generally accepted framework for natural resources of water yet there exists a possibility that different countries may interpret, define and implement the concept differently which may cause hindrance in building desired cooperation amongst the riparian states. It would, therefore, be more practical to outline a contextual frame work for climate proofing within the context of IWRM so as to apply climate change adaptation strategies and practices in trans-boundary context.[83] For this purpose, the exhaustive work by the

United Nations and documented in the form of lessons learned and good practices for water and climate change adaptation in trans-boundary basins in March 2015 alluded to in preceding paragraphs can help customize climate proofing strategies and its projected application context[84].

## Implementation Strategy – A Preferred Model

The formulation of climate proofing strategies will essentially comprise two functional planes, one at policy level and the second one at intervention level. At policy level, the functions shall comprise four major activities. These activities include umbrella dialogue between the riparian states, effective communication through different political, diplomatic and technical means, application of policy frameworks and capacity building at all levels. At intervention level, the functions essentially shall comprise five cardinal activities. Firstly, the collection of information about climate impacts will set the stage for further activities. Secondly the assessment of vulnerability to climate change and the need for adaptation for capacity building will help in formulating the scope of work. Thirdly the development of climate proofing strategies will outline the conceptual contours of intervention. These contours shall include adaptation measures and the mechanism for their implementation, prioritization for interventions, the development of institutional arrangement, creating policy synergies and ensuring financial support. Fourthly implementation of adaptation intervention will be the major activity which shall need consensus and cooperation to produce optimum results. Lastly the process of monitoring and evaluation will ensue which shall suggest the adjustments on the basis of the effectiveness of implemented climate proofing interventions.

## Contextual Framework – How Will It Be Done?

The climate proofing of a particular trans-boundary water treaty will be done by integrating all those climate change adaptation practices which are applied by different countries on trans-boundary rivers, lakes or aquifers basins. There will be four dominant pillars of climate proofing contextual framework. These shall include feasibility, applicability, monitoring and sustainability. For feasibility, principles of basin adaptation, legal and institutional frameworks and institutionalized approach for climate proofing strategy development shall be considered. The basin principles shall include basin wide approach to climate change adaptation, reconciling uncertainty and retaining flexibility in implementation of interventions, establishing linkages between various levels and sectors and using climate as an added pressure for formulating strategies. For legal and institutional frameworks, these should be adaptive to existing trans-boundary protocols with implementation flexibility. The institutions for trans-boundary basin adaptation should be individual context sensitive and functional. To adopt institutionalized approach for climate proofing strategy development, the process shall be systematically organized through collaborative, integrative, transparent and participative measures. The capacity for that purpose should be developed through deliberate planning, data and knowledge sharing, collaboration between technical specialists and decision makers and clear communication amongst all stakeholders.

## Implementation Methodology

Applicability of the climate proofing concept will revolve around vulnerability and impact assessment in trans-boundary river basins. The vulnerability and impact assessment will be done by gathering, compiling and exchanging information. Only set of data and information from complete basin and across water cycle will prove helpful. Based on thematic, spatial and temporal areas of data coverage, a common repository of the information needs to be developed, communicated and used for vulnerability and impact assessment. Under applicability regime, after completing vulnerability assessment at basin and sub basin levels, the opportunities and synergies need to be identified for formulating climate proofing strategies. Similarly, to integrate and harmonize the use of climate, environmental and socio-economic models and scenarios, all stakeholders should form part of the vulnerability assessment process. Furthermore, in applicability scenarios, the adaptation measures in the trans-boundary context need to be identified which shall be a mix of structural and non-structural measures. These measures should also include the basin wide monitoring and observatory system which shall be an important component to be subsequently used for evolution purposes. The economic, environmental and social costs and benefits of adaptation interventions and their impact on mitigation need to be established at basin level. Prioritization of the interventions is the most important component which shall form part of final plan for implementation. Sharing the costs and benefits of interventions on the basis of economic analysis shall lead to crystallize climate proofing options for adaptation at basin level.

## Monitoring Mechanism

Monitoring and evaluation is a progressive measure to keep the intervention alive and updated. It shall be a basin wide, comprehensive monitoring mechanism preferably by integral as well as impartial monitors. Monitoring shall be done for a theory of change, shedding away the status quo and following the assessment when it is dictating a change from original intervention. The effectiveness of intervention shall be regularly re-assessed and the space for flexibility should be maximized by applying correction and adjustments where needed. For making the climate proofing interventions sustainable, its implementation mechanism and financing arrangements need to be well organized and structured. For financing the implementation of adaptation measures, mix of public and private funding sources need to be explored. Basin adaptation for development policies and programmes if properly mainstreamed will help in sustaining the intervention otherwise in absence of regular funding the complete climate proofing process may stall.

## Climate Proofing IWT: Adaptations' Integration Leading to Synergy

IWT regulates water of Indus Basin. IWT negotiated in 1950s was signed in 1960. According to that time, it was probably one of the best solutions to resolve an acute water dispute between newly born states. From hindsight, one can say with certainty that the best available knowledge of that time was applied in framing IWT. In

second half of last century, there has been immense educational and technological advancements in the field of hydrology, water resource management, trans-boundary watercourse management, conflict resolution, environment, monitoring techniques, data acquisition, storage, sharing and archiving techniques and above all new paradigm of climate change has emerged which was not exhaustively researched by that time. Moreover, the water demand has also increased due to more population, economic development and improved living standards whereas contrarily due to climate change phenomenon, the availability of freshwater has become uncertain, unpredictable and reduced. Consequently, freshwater a finite commodity has become a source of tension and conflict between the riparian states. The extreme meteorological events have added yet another dimension to the adversity, whereby water resource management inadequacies have started revealing more strongly than before. Besides other solutions at users' end for efficient water resource management, the basic solution lies in reviewing IWT to incorporate current knowledge particularly of climate change which is missing from the document and is a major source of rendering IWT incompatible to latest knowledge. This places the treaty serious risk of creating tension between India and Pakistan which can naturally be impregnated with the latent potential of turning it into a conflict of grave character if existing gaps in IWT are not timely addressed.

## Advantages and Disadvantages of IWT in the Context of Climate Change

While framing IWT, only the quantity attribute of the shared water was mainly focused and that too without incorporating the impact of climate change. Even the ground water and aquifer which are integral part of a basin and now have attained a relevant position in water utilization were not included in the Treaty. Provisions regarding water quality, pollution, environment, aquatic life, ecological systems and extreme events which have immense political, economic, social and environmental implications are all together missing from the original Treaty. When IWT was formulated, it was a standalone effort. There were no internationally established and accepted trans-boundary watercourse rules under international water law. Whereas now an effective framework under international law is available in the form of Helsinki Rules-1966, UN International Watercourse Convention - 1997 and Berlin Rules – 2004 which need to be applied on IWT as well for making it more efficient and effective. Climate change has impacted every facet of human life which needs to be accurately measured for precise and timely response. For that purpose, water mapping, data acquisition and monitoring through GIS and Remote Sensing for accurate water analysis and response is an essential component of response strategy which needs to be incorporated in IWT for effective management by both the countries. Moreover, for complex trans-boundary water management where bilateral monitoring and implementation mechanisms are not very effective, for making the process more transparent and responsive, there is a need to constitute mutually consented external body for monitoring, data acquisition and subsequently information and data sharing to all stakeholder with a view to make the response strategy more efficient particularly for extreme events like floods and droughts. In this way, IWT will be climate proofed and become sustainable under climate change scenarios. The current climate change

knowledge application on IWT can become recourse to future trans-boundary water conflict management and peace building between India and Pakistan.

## Climate Proofing – An Instrument of Capacity Building

Building multi-level governance capacity an instrumental facet of climate proofing is achieved by coordination and cooperation at inter-institutional and inter-sectoral levels normally referred to as horizontal integration and vertical integration which is done by establishing linkages and empowering multi-level actors for evolving strategies and finding solutions to climate change problems. For climate proofing IWT, the framework for the development of climate change adaptation strategy for IRB would have to be evolved. This framework shall comprise the universal components like data or information collection, impact, vulnerability and capacity assessment, development of legal and institutional frameworks, adaptation measures, implementation, monitoring and financial support mechanisms, instituting mechanisms and implementation of measures and evaluation of implemented measures and mechanisms for adjustment in strategy. This strategy development shall define the realized and expected climate change impacts, anticipated vulnerabilities and general principles for adaptation at Indus River Basin level. Consequently, it shall be minimizing the possibility of unilateral adaptation measures while maximizing adaptation interventions beneficial for trans-boundary perspective. As a conclusion this paper crystallizes that there are five fields for climate proofing of Indus River for which customized climate change adaptation interventions would have to be instituted. These fields shall include the water (quantity and quality), the ecology (ecosystems and species), the data acquisition and sharing (thematic, spatial and temporal), impartial monitoring and evaluation system and finally the sustainability of interventions through shared financial responsibilities[85].

## Conclusion

The paper has revealed that both Pakistan and India are water stressed countries so there is no scope of wasting water in any way. Climate change phenomenon will further aggravate water scarcity. Climate change adaptation measures need to be undertaken by both the countries to conserve water. Shared water across the globe has latent potential of creating conflictual situations in water resource management. Pakistan and India have a history of wars and conflicts, but shared IRB water has been more of a source of cooperation rather than dispute. The concept of climate proofing IWT will foster the level of cooperation when it shall be applied with consensus and collaboration. Climate proofed IWT where on one hand will lay down the rights of riparian states for equitable and reasonable water utilization with more specificity, on the other hand it will outline the obligations as well to conserve water through adaptation measures. The formulation of climate proofing strategies will essentially be done at policy level and the secondly at intervention level. The climate proofing IWT will be done by integrating all those climate change adaptation practices which are applied by different countries on trans-boundary rivers, lakes or aquifer basins. For making the climate proofing interventions sustainable, its implementation

mechanism and financing arrangements need to be well organized, structured and monitored.

Climate proofing will also help in reducing GHG emissions which are contributing to global warming and subsequently the climate change. The current climate change knowledge application on IWT will become recourse to future trans-boundary water conflict management and instrument of peace building between Pakistan and India. Numerous practices on international arena where climate change adaptations by the riparian states for trans-boundary water bodies have delivered immense benefits can also be a source of emulation in IWT context. These practices when integrated, a comprehensive climate proof concept can create synergistic effects of their collective outcome. Therefore, the climate proofing concept shall be minimizing the possibility of unilateral adaptation measures while maximizing adaptation interventions beneficial from trans-boundary perspective. Long term outcome envisaged from the climate proofing of IWT will render credence to the process which if emulated globally will create enviable inspiration for trans-boundary water course riparian states.

# NOTES

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[85] These shall indeed be five pillars of climate proofing implementation strategy.