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Water Security and the Role of New Technology: A South Asian Regional Framework

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Abstract

The Sustainable Development Goal 6 (SDG 6) which deals with the availability and sustainable management of water and sanitation for all, shares strong linkages with other SDGs. This paper will analyse the prospects and challenges of addressing SDG 6 - specifically to manage of transboundary water security in South Asia, aided by the advances in the fourth industrial revolution. The fourth industrial revolution (4 IR), as distinguished from the previous ones, is reinforced by the digital economy and the swift advances in artificial intelligence. Given the rise in water stress combined with increase in population, it is obvious that hydro-political issues are going to be the major cause of conflicts in the years to be. The 2018 UN Sustainable Development Goals Report identifies areas around the Nile, Ganges-Brahmaputra, Indus, Tigris-Euphrates, and Colorado rivers to be the most likely zones for eruption of social and political unrest over water conflicts. Against this backdrop, the paper would briefly examine the history of competition and cooperation for limited water resources in South Asia and recommend measures for a South Asian regional initiative to effectively address any consequent regional instability through the application of emerging technologies. The study seeks to contribute to the research on how the technologies of 4IR can be harnessed to manage transboundary water politics for sustainable development.

Key words: security; trans-border water issues; water security; water stress; water diplomacy; interstate water conflict; transboundary water resources; South Asia; Fourth Industrial Revolution (4IR); block chain technology; RSCT; NRA; South-South cooperation

Introduction

Klaus Schwab, the founder and executive chairman of the World Economic Forum, observes in his book 'The Fourth Industrial Revolution', that till date there are four distinct periods of industrial revolution throughout human history. He explains the evolution as follows. "The First Industrial Revolution used water and steam power to mechanize production. The Second used electric power to create mass production. The Third used electronics and information technology to automate production. Now a Fourth Industrial Revolution is building on the Third, the digital revolution that has been occurring since the middle of the last century. It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres". This industrial revolution, as distinguished from the preceding ones, is reinforced by the digital economy and the swift progresses in artificial intelligence (AI), the Internet of Things (IoT), robots, autonomous vehicles, biotechnology, nanotechnology and quantum computing to name a few (PricewaterhouseCoopers). In other words, the convergence of advances in physical, biological and digital technologies has

ushered the world into an era of the Fourth Industrial Revolution (4 IR). While the potential for a global transformation in the wake of this 4IR is tremendous, it also comes with its fair share of challenges of power asymmetries and issues of access and values. What is distinctive about the 4IR is its applicability across sectors and ability to cater to a multi stakeholder approach.

The Sustainable Development Goal 6 (SDG 6) which deals with the obtainability and sustainable management of water and sanitation for all, shares robust linkages with other SDGs. This paper will analyse the prospects and challenges of addressing SDG 6 aided by the 4 IR- specifically the case of management of transboundary water security in South Asia. Water is a nodal connection of food, energy, environment and urban issues. Reliance of states and populations on transboundary aquifers and upstream rivers are a likely source of short-term crises and long-term unsustainable use, although resultant protracted conflict is rare (Wolf et al., 1998). The 2018 UN Sustainable Development Goals Report reveals that conflict, climate change and inequality are major factors that are impeding the progress towards attainment of the 2030 agenda. Given the rise in water stress combined with increase in population, it is obvious that hydro-political issues are going to be the major cause of conflicts in the years to be. The above mentioned UN report identifies areas around the Nile, Ganges-Brahmaputra, Indus, Tigris-Euphrates, and Colorado rivers to be the most likely zones for eruption of social and political unrest over water conflicts. Any regional attempt at management of transboundary water resources would involve river basin-wide planning. Successful transboundary water management promotes economic growth alongside regional peace and security which can thwart the much-anticipated water wars (Rai et al. 2017). Against this backdrop, the paper would briefly examine the history of competition and cooperation for limited water resources in South Asia and recommend measures for a South Asian regional initiative to effectively address any consequent regional instability through the application of emerging technologies. The study seeks to contribute to the research on how the technologies of 4IR can be harnessed to manage transboundary water politics for sustainable development.

The methodology is based on external secondary data research, applying existing data on the research theme from government statistics, published reports from different organizations, international agencies (such as IMF, World Bank, etc.), and so on. These are then analysed to explore alternative solutions to address the water security issue in the region and come up with a regional security framework. In such a framework, capacity building through the application of technologies of 4IR is reviewed.

Theoretical background:

Analysis of satellite data by the World Resources Institute (WRI) reveals that while global water demand is projected to increase by 55 percent between 2000 and 2050, reservoirs are shrinking at an alarming rate that may spark major water crisis globally. Their research projects that ‘36 countries face extremely high levels of baseline water stress, meaning that more than 80 percent of the available water is withdrawn annually -- leaving businesses, farms, and communities vulnerable to scarcity…An estimated 20 percent of the world’s

largest aquifers are overexploited (Vizzuality). There is a growing acknowledgement of the seriousness of the risk posed by water scarcity across the government, private and non-government sectors. In today's globalized world, the impact of floods and droughts is no longer restricted to local consequences. The 2011 Thailand flood is a glaring example of the same. The floods impacted the major industrial sectors in Thailand, viz. the automotive and electronics industries which not just impacted the local and national economy but according to UNISDR estimate, it reduced the world's industrial production by 2.5%. The World Bank (2012) report on 'Thai Flood 2011' pegs the consequent global economic losses due to the interruption of global electronics supply chains at $46.5 billion. Given such occurrences, both the public and the private sector seem to agree that there needs to be a radical shift in the way we have been treating water as an unlimited resource basket to serve the human population and acknowledge the existence of water stress.

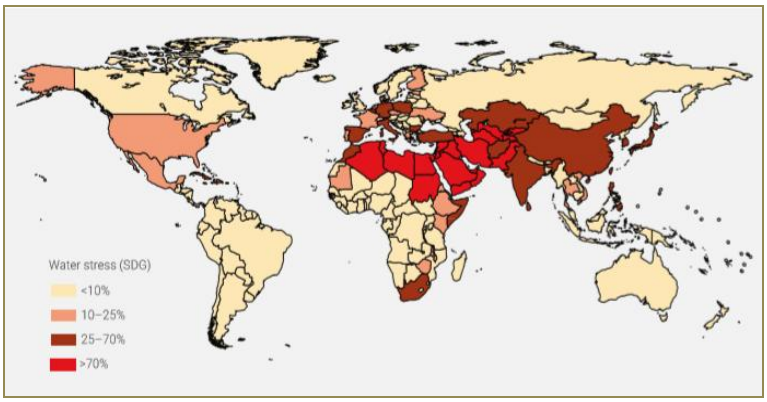
The findings of the FAO (2018) report on the 'Progress on Level of Water Stress Global baseline for SDG indicator 6.4.2' are quite insightful and applies to South Asia as well. These can be summed up as follows (Food and Agricultural Organization of the United Nations and United Nations Water (FAO& UNW),2018, p IX): -

1. Water stress is defined as the share of water extraction by all sectors in relation to the accessible water resources. The worldwide average for this proportion is 13 per cent. Water Stress = the ratio between total freshwater withdrawn (TFWW) by all major sectors and total renewable freshwater resources (TRWR), after taking into account environmental flow requirements (EFR).

1. Water stress impacts every region, impedes sustainability and restricts socio-economic development. More than 2 billion people live in countries facing excessive water stress. While the global average water stress is only 13 per cent, 32 countries experience water stress between 25 per cent (at the beginning) and 70 per cent, and 22 countries that are above 70 per cent, are considered extremely stressed.

2. Agriculture is responsible for nearly 70 per cent of all water extractions across the globe. While it is undoubtedly the largest water user, in recent times, its share in the overall sectoral distribution, has been observed to be declining. This indicates that other sources of water usage are now on the increase.

Fig.1. Levels of water stress by country (%) (2000–2015)



Data Source: FAO 2018 report on the Progress on Level of Water Stress Global baseline for SDG indicator 6.4.2

Water security is another critical concept closely aligned with water stress. UN-Water (1970) defines water security as "The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability." According to Pachova and Jansky (2008), water security in the context of shared river basins, involves a wide range of objectives as well as manifold goals, such as, ensuring peace, human security and environmental protection in the process of planning, using and managing water resources and so on. Incorporation of the language of security in water politics resonates with the concept of security formulated by Buzan and Weaver, the representatives of the Copenhagen School. According to them, security is about survival; it is when an issue, presented as posing an existential threat to a designated referent object, vindicates the application of extraordinary measures to manage it (Buzan, Weaver and de Wilde, 1998). When the scarcity of shared water is perceived as an existential threat, it becomes 'securitized' and therefore measures outside of the conventional ones can be adopted by the actors to ensure access to water. Thus transboundary water resources get tangled with state sovereignty and power equations in the absence of a binding treaty. Under such circumstances, usually the upstream states play the card of the principle of sovereignty over the water resource that flows from within its territory while the downstream states take recourse to the principle of prior use and economic dependence to continue usage. Often the result is a deadlock.

International relations theories define security through varied lenses. The Neo-realist school of thought in international relations emphasizes on the competitive aspirations of states towards enhancing their revenue and on that ground seeks to validate the heightened prospect of conflicts in the expanse. As opposed to this view, the Neoliberals hold that the economic interests of the stakeholders would actually abate the creation of institutionalized cooperation over competing resources. "Inside-out" (regionalist) approaches proclaim that, regional actors are found to respond first and foremost to the local factors and developments since the region is the most vital environment to impact their security interests (Miller, 2001). The

constructivist-structuralist framework offered by the Regional Security Complex Theory (RSCT) gives prominence to sectoral analysis (Buzan & Waever, 2003). The model of regional security complexes (RSCs) is described as 'a set of units whose major processes of securitization, de-securitization, or both are so interlinked that their security problems cannot reasonably be analysed or resolved apart from one another' (Buzan & Waever, 2003). Here, the units may denote both states and non-state actors. The regional complex can fluctuate depending on the influence of external powers and amity or hostility within the region. The RSCT is criticized for failing to take into cognizance asymmetrical, transnational non –state centric challenges such as the environment. The New Regionalism Approach (NRA) which falls under the larger ambit of the English School theory posits that more than the structure, the key players in new regionalism are agency, actors, visions and strategies. It views regions as a result of shared interests and identities, which are shaped in the process of interaction and intersubjective understanding (Ndayi, 2006). The NRA puts forth five levels of formation of a regional entity – regional space, regional complex, regional society, regional community and regional institutionalized polity. Regional space is one that has identifiable geographical physical boundaries and distinct ecological characteristics. Regional complex is characterized by increased social contacts and transactions between constituent units. The relationships re marked more by rivalry than cooperation. Regional society is marked by the creation of varied non –state actors that act beyond national boundaries, making use of a more rule-based pattern of relations. Regional community possesses a distinctive regional collective identity and institutionalised or informal actor competences. Regional institutionalized polity is an imagined entity instituted out of volitional progression of a cluster of previously sovereign national communities into a novel political structure. However, the NRA fails to account for the role and impact of the external or extra- regional powers on regional dynamics. South Asia, according to both RSCT and NRA is regional security complex, corresponding to their respective definitions of regional security complex.

South Asia and Water Security:

South Asia as a region is host to trans boundary river basins – the Ganges, Indus, and Mekong - which serve as potential hotspots for water related conflicts. Focussed on rapid economic growth, both India and China are exhibiting a rapid rise in water consumption. While as a region it is not truly water scarce, it is impacted more by issues of water security, agricultural dependence on fresh water sources and a rise in erratic rainfall and climate patterns resulting in floods, droughts, and natural disasters. These are further exacerbated by unplanned management of water resources and unequal access to water. The inequality is a direct consequence of the asymmetric power relations both within and among the countries of the region. The Mekong river for instance, is mired in controversy due to political tension between the People's Republic of China and Vietnam; similarly, the Indus and its tributaries are a bone of contention between arch rivals India and Pakistan; the Ganga - Brahmaputra water system is a cause of feud between India and Bangladesh; the Kosi – Mahakali rivers involve disputes between India and Nepal; the Irrawady river basin is shared by Myanmar, China and India.

The Indus Water Treaty (IWT) was signed to regulate water sharing between India and Pakistan (World Bank. n.d. 1960). While Indus, Jhelum and Chenab were allocated to Pakistan, the right to utilize these rivers for the purposes of generation of the hydroelectric power was granted to India. Many short term agreements were signed between India and Bangladesh since the 70s for sharing of the Ganges waters. In 1996, India and Bangladesh became signatories to the Ganges Waters Treaty that was to be in effect for a period of thirty years. The Treaty created a joint committee to record the daily flow of waters at Farakka and authorized the committee to act as the first response instrument for settling any dispute. Another contentious issue between Bangladesh and India is the latter's river-linking project which proposes to divert water from "water-surplus areas" (i.e. from Ganga-Brahmaputra basin) to "water-deficit areas" (its western and south-western regions). India and Nepal share three water sharing treaties, viz - the 1954 India-Nepal Agreement (amended 1996) on the Kosi River Project, the 1959 Gandak River Treaty between India and Nepal (amended 1964) and the 1996 Mahakali Treat. China shares forty-two major transboundary watercourses with neighbouring countries (GWF, 2020). The 2005 MOU between China and India requires the latter to provide data on the Sutlej and Yarlung-Tsangpo rivers during the flood season. However, the 2017 China- India border standoff or Doklam standoff resulted in China refusing to share the hydrological data (PTI / Aug 18). China has recently endorsed the formation of the Lancang-Mekong Cooperation Mechanism (LMCM), a multilateral institutional mechanism that serves to coordinate water sharing over the Mekong among the states of China, Myanmar, Laos, Thailand, Cambodia and Vietnam. Nepal possesses tremendous hydropower potential due to its geographical location but lacks the financial and technical knowhow to utilize the resources. Geopolitically sandwiched between the Asian rivals India and China, Nepal is faced with the delicate task of balancing its diplomacy to benefit from the competition between India and China. Considerable differences exist among the countries over perception of water sharing.

Here it becomes important to understand the causes of political tensions over the transboundary river basins in South Asia so that effective measures for cooperation can be chalked out. An analysis of previous conflicts reveals that the following are the major factors that influence the state's response to water stress.

i) power aspirations

ii) resource scarcity

iii) increase in population and

iv) changing socio –economic conditions

This results in a complex negotiation process involving stakeholders with conflicting interests that include upstream-downstream trade-offs and investment decisions which end up being long drawn. It is also important to note that in the South Asian region, food, water, and energy are closely entwined regionally with upstream actions impacting downstream effects. For instance, floods generated in Nepal also result in floods in India; glacial lake outburst floods in China can affect hydropower stations in Nepal; erosion in one country deposits

sediment in another; and hydropower potential in one country serves markets in another (Tiwari, 2012). Given that water as a commodity is essential for livelihood, building consensus and awareness around future risks should work in tackling the clash in national interests arising from power aspirations that lead to conflict situations.

Thus we find that water is deeply intertwined with the national security of the countries in this region which lends to the frequency in distrust and discords over building dams, reservoirs etc. over shared rivers. At any point in time a conflict on some other issue can spiral into a water conflict, as was evinced by the recent India- Pakistan standoff over a dastardly terrorist attack in Kashmir (Johnson, 2019) and the tensions on the Line of Actual Control (LAC) between Indian security forces and China's PLA in Galwan (2020). History is witness to the fact that China uses water as a geo-political tool to bully smaller regional actors. It has been building dams and extensively investing in hydro projects to use access to freshwater as a leverage to create pressure on the other states to settle political disputes. Mekong and Brahmaputra are the two key water resources of the South Asian region that China is trying to reengineer towards this goal. Trans border water issues in South Asia are not just due to the existence of these conflicts, but can also be ascribed to the lack of a democratic regional mechanism.

Bilateral water agreements are not enough to facilitate a cohesive water management strategy for this vulnerable region. It is imperative to go beyond the sphere of national sovereignty and address the issue at the regional level. Although the region does have water sharing arrangements (including treaties) in place, there are no clearly defined principles of water resource management. Successful management of shared water resources among political/ economic rivals require building of trust and transparency and setting up of a multilateral monitoring mechanism.

Legally such an effort can be grounded in the 1997 UN Convention on the Law of the Non-Navigational Uses of International Watercourses (1997) that recommends the creation of a regional cooperation mechanism under customary international law [Art 8(2)]. Art 9 of the Convention states that – 'watercourse States shall on a regular basis exchange readily available data and information on the condition of the watercourse, in particular that of a hydrological, meteorological, hydrogeological and ecological nature and related to the water quality as well as related forecasts'. However, the main issue with the international law principle, lies in the fact that they are legally binding only if all the states concerned (especially the riparian states), ratify and comply with those particular instruments. The refusal to ratify by even one major power in the region can result in deadlocks to find negotiated solutions to managing transboundary water sharing. Given the history of mistrust in the region, a stalemate is a very likely situation. This explains why none of the countries in South Asia ratified the UN Watercourse Convention (Bangladesh and Nepal only voted for the convention at the UN General Assembly but did not ratify).

Therefore, it is of critical importance to establish a multi-lateral mechanism in South Asia for water security management. Ideally the South Asian regional initiative for water security should be an elected, representative body possessing trans-boundary legislative powers

pertaining to the river basins and its waters. Mere recommendation authority has not sufficed in the past to ensure long term solutions.

A study (Swain, Man, Islam, & Huntjens) conducted by The Hague Institute for Global Justice and its partners on a Multi-Track Water Diplomacy Framework tested for the Brahmaputra basin to identify the zone of possible effective cooperation (ZOPEC) for water conflict management reveals that the delegates representing all riparian countries (China, India, Bangladesh and Bhutan) were willing to support the establishment of such a framework to identify and develop benefit-sharing arrangements across sectors.

As Brahma Chellany has rightly observed, 'To underpin peace and cooperation, Asian states must manage transnational water resources on the basis of transparency, collaboration, sharing and dispute settlement (Chellaney, 2014). It is the need of the hour for the South Asian countries to establish a coordination framework to address the management to transboundary water resources to ensure water security for all. Emerging technologies like artificial intelligence and drones can be of great use in assessing and addressing water stress. However, harnessing such technological advances of the 4IR comes with the responsibility of adopting a sustainable ecological approach that would involve collective action by all stakeholders to optimize water management. The paper would now examine the prospects of creating a South Asian regional initiative for water security management that would look into the effective institutional monitoring of water sharing and conservation aided by the advances in the 4IR.

A new framework: South Asian Regional Initiative for Water Security (SARIWaS)

For management of water security dynamics within the South Asian region this paper relies on a combination of the RSCT and NRA and proposes the creation of a South Asian Regional Initiative for Water Security (SARIWaS) through a cooperative management framework. The objectives of this cooperative framework would be –

1) to avoid water conflicts and reduce water stress

2) to enable water security and promote sustainable economic growth

3) to ensure unprejudiced distribution of the benefits of the water resources for water allocation and water quality management

4) to function by the standard of inclusivity in agenda, membership and action

The functions would include efforts -

1) to integrate local knowledge and scientific research to understand the water systems and their interconnections with human activities

2) to set up hydro-meteorological and agricultural monitoring networks

3) to create mechanisms for national and regional capacity building for flood and drought management

4) to develop sustainable water infrastructure development plans

5) to harness technological advances of the 4IR for water resource management and hazard monitoring

6) to facilitate transfer of knowledge and technology

7) to empower the local communities and ensure gender mainstreaming through a participatory approach in decision making

8) to create and follow an agreed upon and executable dispute resolution mechanism

9) to achieve self-funding through multi-donor trust funds to be managed by donor coordination committee. Impetus should be provided to promote public–private partnerships to apply strengths of the private sector to the regional infrastructure.

However, the success of such a body to ensure water security would depend majorly on political will, trust building and people to people connect. Institutionalizing a multi-stakeholder approach to the complex issue of transboundary water governance would help address the larger problem of emergence of a risk-response divergence. To counter a possible aggressive stance by China, the three members of the Quad (Australia, US and Japan) can be invited to be part of this strategic framework, as external members with voting rights.

Role of 4IR in managing Water Security in South Asia:

The paper would now seek to comprehend the type of intervention required of the advances of 4IR to address these issues. As has been established by the above analysis, the proposed South Asian Regional Initiative for Water Security would need to implement decision-making on water governance with a long term vision that would anticipate the conflict possibilities and help individuals, corporations and governments make informed choices to prevent the same. Attainment of water security goal demands exhaustive understanding of water resources dynamics based on verified data and observations.

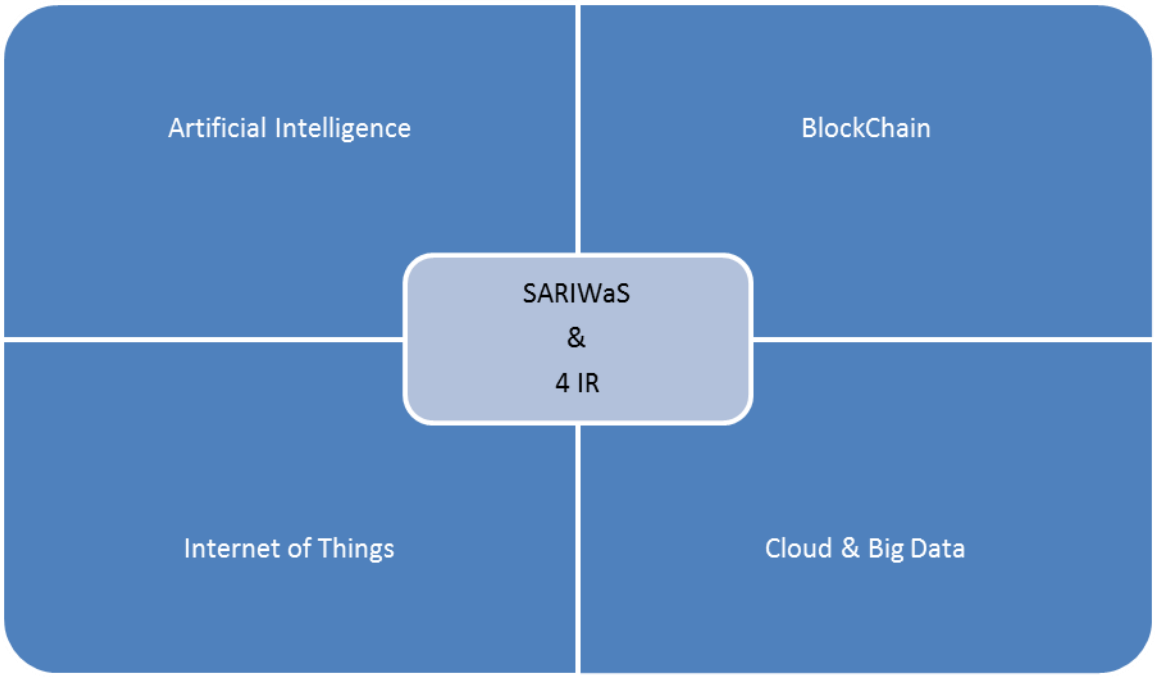
This is where new technologies have a critical role to play in bringing about transparency and effectiveness in water resource management. The fourth industrial revolution promises new opportunities for people and machines to collaborate across territorial boundaries to improve living conditions, conserve natural resources and apply increasingly sophisticated artificial intelligence to resolve conflicts. Tools of artificial intelligence, predictive analysis, satellite imagery, sensor platforms, drones, geographic information system (GIS) technology and so on, as offered by the 4 IR have to be harnessed to predict and effectively address the effects urbanization, industrialization and climate change on of water scarcity, groundwater over-usage and degeneration of water quality. These technologies have the potential to gather much more accurate, timely and accessible data on water supply and demand, which would then enable the policy makers to implement corrective measures for conservation, reuse and recycling. Sensors and automated controls are projected to make water management more efficient through real-time process control. Block chain technology could bring about major transformations in the way shared water resources are managed and traded by democratizing

access to data and preventing the tampering of data. Social media platforms have revolutionized human interaction through increased connectivity. This is turn facilitates instant spread of information and knowledge sharing which in turn encourages the formation of a collective intelligence. Flip side of this accelerated spread of information (false propaganda) aside, this shared intelligence could be used in faster replication of successful water management projects. Artificial Intelligence can be applied by experts to simulate the health of the waterbodies and in combination with satellite data on weather forecasts and real-time imagery of river basins, help policy makers make better informed decisions for water conservation and usage. Environmental engineering can be applied in the creation and management of water infrastructure through a combination of machine learning, predictive modelling and robotics.

Some of the segments where 4 IR technology can be put to use are as follows:

1) Water demand, supply and usage monitoring
2) Water quality monitoring
3) Water reallocation and utility management
4) Hazard (drought / flood) prediction and early warning systems
5) Predictive impact assessments
6) Forecasting and simulations
7) Real time data alerts
8) Smart contract systems

The proposed South Asian cooperative management framework for water security would need to incorporate this smart approach in its policy making.



First, data which is the lynchpin of the 4IR can be served by initiatives such as the GSAT-09, a communication satellite developed by the Indian Space Research Organisation (ISRO) with

the objective of providing various communication applications in Ku-band (Narasimhan, 2017) with coverage over South Asian countries. The satellite remote sensing would facilitate real time data sharing for assessment of risk in the context of regional water security. This information mapped with in situ observations would feed into water conservation initiatives and usage monitoring across the countries in the region. The availability of the data would also change the way consumers view and interact with water resources. It would be the foundation for managing water sustainably across boundaries.

Secondly, the agricultural sector accounts for the major source of water usage in the region. Advances in technology would enhance the efficiency of this sector and play a major role in the sustainability of the water resources. Responsible Block chain technology can be implemented to manage water allocations for automated irrigation systems that cater to specific needs of the crops based on location, time, season and soil moisture content. Block chain is a distributed ledger on which data can be permanently stored so that it is open, verifiable, and cannot be modified.

Thirdly, successful local experiments in water management, conservation and delivery in different countries can be shared as best practices. Smartphones can be used to facilitate online platforms for sharing of local knowledge as well as advanced know-hows such as fog nets, recharge pits, desalination mechanisms etc. The information can be fed into regional policy making. This would also facilitate a bottom-up approach to the regional cooperative framework.

Fourthly, AI can be harnessed to compute the groundwater level, the groundwater surface water exchanges, / aquifers and the river flows at multiple river gauging stations. The opportunity to combine and compare the different sets of data made available through open source will pave the way for innovations in transboundary water resource management. A real time open source digital dashboard reflecting the different aspects of water resource and corresponding data would enable the tracking and managing of the transboundary water systems at an unprecedented scale and speed.

Fifthly, block chain technology can be used to create open, transparent and smart contract systems whereby water usage can be optimized in accordance with the equitable and reasonable utilization principle. Also the block chain's key characteristics of shared, secured and consensus based database go a long way in overcoming the fundamental lack of trust.

Sixthly, the forum can fund innovative and affordable solutions from entrepreneurs involving 4 IR technology to address issues of water supply, regulation, reuse, quality control, knowledge dissemination and so on. Here also one can make use of the block chain-enabled finance platforms to encourage new investors and public-private partnership to finance innovative projects that address water challenges. An example is the Clean Water Coin, which uses a block chain platform to raise funds for clean-water projects worldwide.

Seventhly, shared water resources management decisions cannot be based on verifiable and measurable data alone, since geo-economics and geo-politics make it a dynamic process involving immeasurable and uncertain aspects. It involves linguistic inputs trough policy

documents and rhetoric of speech, which are vague and imprecise. AI enabled algorithms based on fuzzy logic could be applied to analyse these variables in order to identify the priority and risk areas and facilitate informed decision making and timely intervention.

Finally, the forum should utilize open-source decision support tools that would help the member states to objectively assess the impacts of the projects on transboundary waters, thereby reducing the chances of conflict. This should also include e-inputs from social accountability tools such as citizen reports cards and social audits.

It is also pertinent to put in place safeguard mechanisms to guarantee a sustainable application of technologies of the 4IR to check inadvertent negative consequences and ensure the security of data and digital identities.

Conclusion:

Contemporary research on tackling climate change and global commons is increasingly focussing on the rising awareness of own identity by native peoples through the political processes of democratization, self-government, and regionalization. Chakrabarti S. (2018) observes that while climate change can act as an impetus for intra- or interstate water conflicts in a region, it can also lead to furthering of collaboration. The 4IR facilitates the of ease of access to integrated, data-driven approach to water security for environment informed decision-making that accounts for the regional and domestic economic needs while protecting the environment. However, mere harnessing of the technological advances will not provide solution to the water crisis that is looming large. It is equally important to ensure that the policy frameworks being set up are based on realistic assessments backed by civil society engagement, promotion of awareness and impetus for investments in the sector through public private collaborations. It is necessary to widen the ambit of policy-making and involve all stakeholders and bring the consultative process to the affected people. It is important to acknowledge that water security is both a scientific and a social issue. Ultimately, the biggest challenge to water security lies with governance i.e. who wields the power to make decisions and how the decisions are made. The first step towards solving the trust deficit over shared water resource management would be initiation of Track II diplomacy that facilitates an open and effective discussion and forum between policy makers, scientists, environmental managers, NGO representatives, civil society actors and representatives of the indigenous populace. Thus, democratic decisions based on information shared over verified and transparent data base obtained through applications of the 4IR will enable trust building over the proposed regional cooperative framework SARIWaS and help it emerge as a neutral platform for collaboration to manage water sustainably and engage in active and positive South -South water diplomacy.

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