



Case Study

Perception of the Users Regarding the Water Delivery for Domestic Purposes in Jammu City: A Human Rights Based Approach

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Abstract: The situation of domestic water supply is grim in Jammu City. The crisis is attributed to the city's high functionality and massive population burden. This has led to several unallocated settlements expanding beyond the command of utility providers. Further, the constantly growing needs of the capital city has contributed to the demand-supply imbalance contributing to unevenness in the availability of water utility services. The discrepancy in the interests of stakeholders have threatened the water security and adds vulnerability through deprivation of water as a basic human right in the city. The study discusses the perception of the Users regarding water delivery for domestic purposes in Jammu City with respect to six factors of HRBA namely-availability and accessibility, acceptability, affordability, equity, citizen's participation and accountability dimensions. The implications of poor service delivery for domestic needs have added to the social and economic challenges through the increased intensity of water shortage and high economic burden of water procurement. The statistical validation of this association highlights the fundamental flaws prevailing in the utility delivery mechanism, adding to the misery of residents in Jammu city. The failure is attributed to the unfocused investments and the inappropriate infrastructure in coherence with the needs of the community. The perspective of Human Rights based approach is aimed at ensuring an unwavering commitment from the policymakers to effectively allocate and manage water resources and deliver water and sanitation services under good governance. Further, the community responses with respect to HRBA principles help in picturing the civic familiarity of the problems of domestic water delivery due to institutional failure and the problems associated with it. The shortfalls can prescribe suggestions for the policymakers that coincide with the principles of HRBA in achieving citizen's oriented smooth and efficient delivery of water resources.

Keywords: domestic water delivery, economic burden of water procurement, human rights based approach, water crisis, water management and governance, user based analysis

JEL Codes: D02, P25, Q25, R28, R58

1. Introduction

Water is a multidimensional resource. The resource has several economic, social and environmental usages. The manifold uses of water lead to the involvement of multiple stakeholders (Dudgeon et al., 2006). Efficient management

and robust governance can account for the vested interests of stakeholders and pave the way for water secure society (Brown et al., 2009). Managing water resources with strengthened governance requires an unwavering commitment from the policymakers to deliver water and related services in an economical, sustainable and socially equitable sense (Bressers & Kuks, 2004; Wostl et al., 2007). However, the underperformance of institutions has led to failure in water resource management and development (Huitema et al., 2009). This has created a situation of vulnerability, especially for the weaker sections of the society.

The severity of the problem in the water sector has led to the worldwide acknowledgement of “Right to Water” (Gerlak & Wilder, 2012). The process of recognition of water as a fundamental instrument for sustenance began nearly 30 years ago and several international treaties and declarations including Convention on the elimination of all forms of discrimination against women, 1979, the convention on the rights of the child, 1990 etc. have reflected the international commitment in providing basic water facility to households (Vega & Kloeve, 2018; Wahi, 2022). Finally, in the year 2010, United Nations General Assembly formally recognized Water as one dimension of human rights (UNGA, 2010). The legal recognition of water has led to the adoption of Human Rights Based Approach at the institutional level for guaranteeing the citizens with sufficient, acceptable, accessible and affordable water in equitable manner (Brown et al., 2016). Water resource management requires allocative effectiveness among several uses through the process of planning, implementing, monitoring and delivering in an appropriate and effective manner through strengthened governing institutions (McNabb, 2017). This mechanism of efficient management and governance ensures that the task of water delivery is synced with the needs of the community (Jiménez et al., 2019). The addition of the human rights-based perspective to the lens opens up opportunities for streamlining water management and governance of local water resources aligned with the objectives of human development and sustainability (Jimenez & Foguet, 2010).

The water resources in Jammu and Kashmir are transboundary flowing across national territories and have multifaceted institutional involvement that adds up to the complexities of governing water resources in Jammu and Kashmir (Nazakat & Nengroo, 2012). The cross-country dependency and state of rivalry among the two riparian nations-India and Pakistan for water resources have led to the formulation of Indus Water Treaty. The treaty explicitly prescribes the legal lines for the Indus River Basin by permitting unlimited usage of eastern rivers-Beas, Ravi and Sutlej with the confined water availability from western rivers-Chenab, Jhelum and Indus (Biswas, 1992). As Jammu and Kashmir is a fundamental part of the basin and holds a significant flow of western rivers, the treaty defines the legal ambits of surface water resources in the region (Miner et al., 2009). Further, the task of delivering a sufficient, acceptable and affordable water resources for in equitable manner is entrusted with Public Health Engineering Department (PHED) to meet domestic and industrial needs of water and Irrigation and Flood Control Department for the Irrigation purposes as prescribed by JKSWRRA Act (JKSWRRA, 2010).

Despite the actions by the institutions in the Union Territory, the water resources are at stake. The coverage of the water supply is not optimum. The total Demand of the city ranges to 65 MGD. The existing infrastructural facilities are able to meet up to 54 MGD leaving a margin of 19 MGD. As a result, several regions in the UT are deprived of water as a fundamental right. The demand-supply imbalance in resource availability in Jammu City is a consequence of massive population expansion. This surge in population in the union territory is owed to its high functionality as a capital city. The city has witnessed voluntary and involuntary migration settlements as a consequence of border disputes, religious biases and economic compulsions (Kapoor, 2012). This has led to unplanned settlements and thus, the failure of sufficient water delivery in ensuring water as a basic human right. The study discusses the perception of the Users regarding the management and governance of water in Jammu City through six classifications of HRBA namely availability, acceptability, affordability, equity, participation and accountability dimensions and draws socio-economic implications on the residents. The user perceptions can furnish public understanding of the water resource delivery by the institutions thus, prescribing suggestions for the policymakers as per the needs of the community.

2. Review of literature

Water as a resource is essential for the sustenance of life through its economic, social and cultural needs (Madani, 2014). The fundamental nature of water has led to the involvement of several institutions at multiple levels (Jury & Vaux, 2007; Khandker et al., 2020). Institutions are an integration of legal, political and organizational frameworks that are aimed at effective performance in an enabled environment (Da Silva et al., 2019). Well-defined institutional

arrangements as per the community needs can lay a firm base for efficient resource delivery and resilient governance of resources (Märker et al., 2018). However, the multiplicity of the institutions creates complementarity in its functions, thus posing a challenge for effective management and governance (Radif, 1999; Cleaver & Whaley, 2018). Human rights-based approach streamlines the principles of effective management and governance into the institutional framework backed legally (Cornwall & Musembi, 2004).

Human Rights based approach aims to address the asymmetry of information between the institutions and citizens thus, creating accountability for effective management and governance (Van Koppen et al., 2017). Human Rights Based Approach aims to move a step ahead of the outcome/service-based approach and attempts to reform process along with the outcome (Broberg & Sano, 2018). The approach further adds legal imperatives to the service delivery that institutionalizes the human right to water and sanitation into development policies and raises obligations for the administration (Gauri et al., 2012; Mishra et al., 2020). The exclusivity of human rights-based approach is that it aims at empowering the locals about their fundamental right and thus ensuring community involvement in the governance process (Gerlak et al., 2018). The HRBA provides the right perspective in guiding the organizations and agencies involved in the water sector. Acceptance of human rights-based principles by institutions helps in improving the provisioning, budgeting, implementing and maintenance of water services (Water Governance Facility, 2012).

Apart from the incorporation of Water, Sanitation and Hygiene (WASH) in legal and administrative frameworks, the approach seeks to structurally change the inequalities prevalent in the delivery of services (Tremblay, 2010). This ensures that the vulnerable population of the community is protected in the development policies and programs of governing bodies (Choukroune, 2017). The approach offers practicality and comprehensibility in addressing the concerns of poverty and inequality through social, political and economic structures (Sano, 2020). The HRBA offers a holistic approach by addressing the interdependencies between water and other sectors directly or indirectly affected by it. Further, Human Rights Based Approach is outcome-based and sets a progressive path towards a sustainable environment (Ohdedar, 2021).

HRBA revolves around the five criteria of Human rights to water and sanitation (HRWS)-availability, accessibility, affordability, acceptability and quality (Meier et al., 2014). Adequate availability and accessibility aim at ensuring a sufficient quantity of water within reachable limits, such that the households do not have to depend on adjoining unimproved sources of water (Bain et al., 2014; Tirumala & Tiwari, 2022). Acceptability and quality of water must be maintained for ensuring a safe and hygienic lifestyle for citizens (Komarulzaman et al., 2017). Affordability criteria aims at delivering the services that extract the surplus from the consumers and simultaneously ensure a smooth cost recovery mechanism for the suppliers (Hutton, 2012). The pricing framework must ensure that the users do not have to bear the burden of water procurement from informal economic instruments such as private water tankers (Goddard et al., 2021). The methodological usage of HRBA further Human Rights principles of equity, accountability and community participation in decision making (Wilson, 2005; WaterAid, 2011; Gosling, 2014). HRBA can guide the institutions in the water sector to lay a firm base for equitable distribution of water resources in regional and sectoral terms (Luh et al., 2013). Further, the principles aim at citizen centric approach through accountable service delivery and confirming input of the community in decision making (Nelson & Dorsey, 2018). Failure of one or more principles can have adverse socio-economic implications troubling the lives of locals (Harvey & Reed, 2007). The users' perspective of the above-mentioned criteria can offer an insight into the community's vision of the water resource handling, and help the policymakers in visualizing the alternate scenarios for guarding smooth and effective delivery to match domestic needs (Jaspers, 2003).

3. Materials and methods

The study discusses the perception of the households regarding the water delivery for domestic purposes with six criteria under consideration-availability and accessibility, acceptability and quality of water resources, affordability of water services, equity in distribution, accountability of the providers and local participation. For the study, primary data is collected from the households of the sample wards of Jammu City. Jammu is the capital city of Jammu and Kashmir and extends up to 287 Km. The city sustains a population of 7.6 Lakh and is further experiencing expansion due to rapid migration and informal settlements (Digest of Statistics, 2019).

The water supply in Jammu city is facilitated by the Tawi river and 270 tube wells to cater to the multiplicative

needs. The three major Water treatment plants located on river Tawi have a capacity of 90 MLD (Sitlee), 5.4 MLD (Dhounthly) and 8.1 MLD (Boria). The City’s water supply for domestic and industrial purposes is facilitated by the Public Health Engineering Department (PHED). The department intends to facilitate all the households in urban divisions with uninterrupted and efficient water delivery. To achieve this, the department takes on the task of planning, operation, maintenance and execution of smooth water delivery to households (Ministry of Jal Shakti, 2019). The department allocates the water among 75 wards by dividing them into two broad segments City Division-I and City Division-II. The map of the 75 wards facilitated by PHED in Jammu city is displayed in Figure 1.

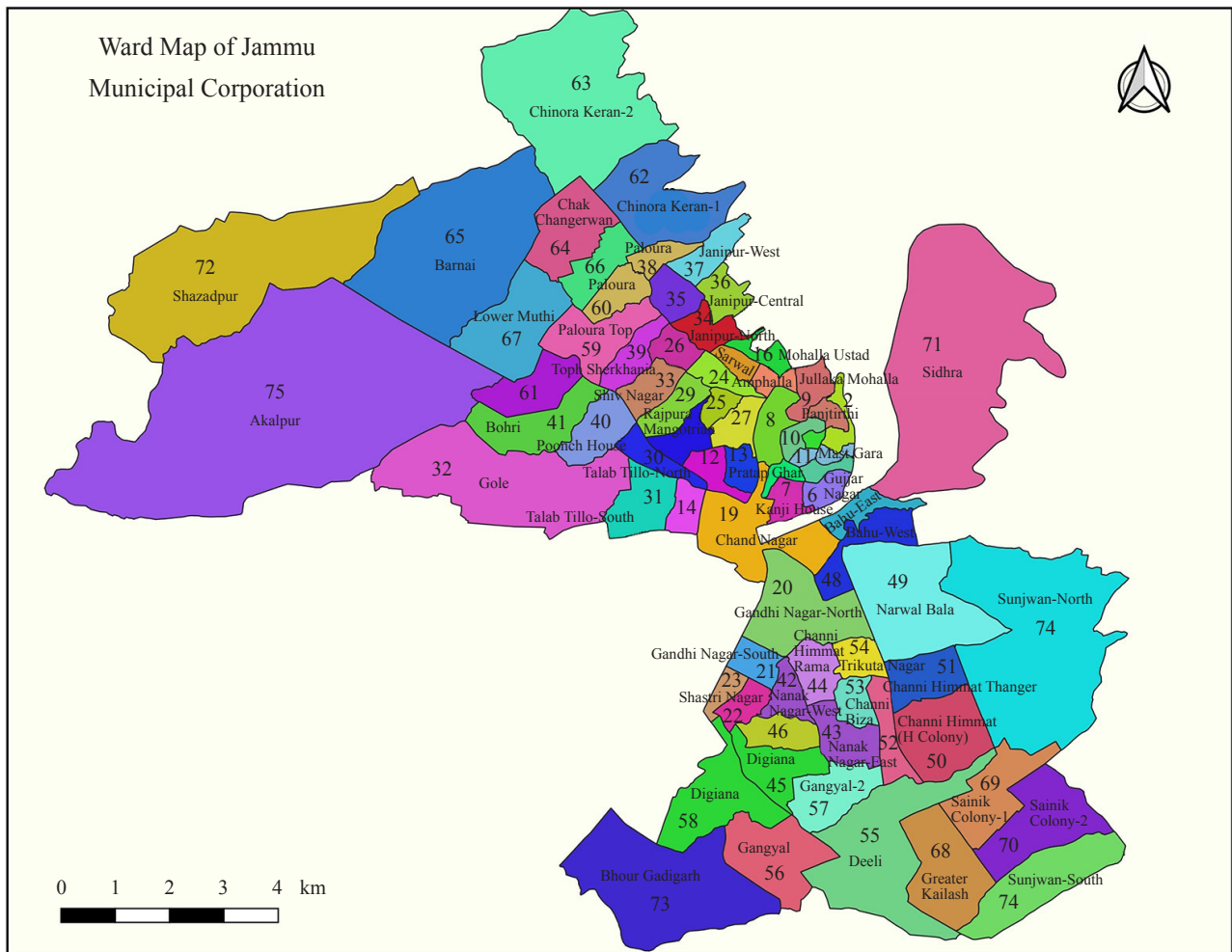


Figure 1. Ward wise map of Jammu municipal corporation

The choice of the sample wards in the study is purposive. Two wards are chosen from City division-I and City Division-II respectively such that one ward has sufficient water availability and the other faces constraints in meeting water needs for domestic purposes. The wards chosen from City Division-I are Talab Tillo and Janipur, while the wards chosen from City Division-II are Trikuta Nagar and Sainik Colony. Out of each sample ward, 30 households are surveyed making the total sample size 120. The questionnaire attached in the appendix aims to explore the responses of the households with respect to HRBA principles and their economic and social implications. The sample wards chosen for the study are presented in Figure 2.

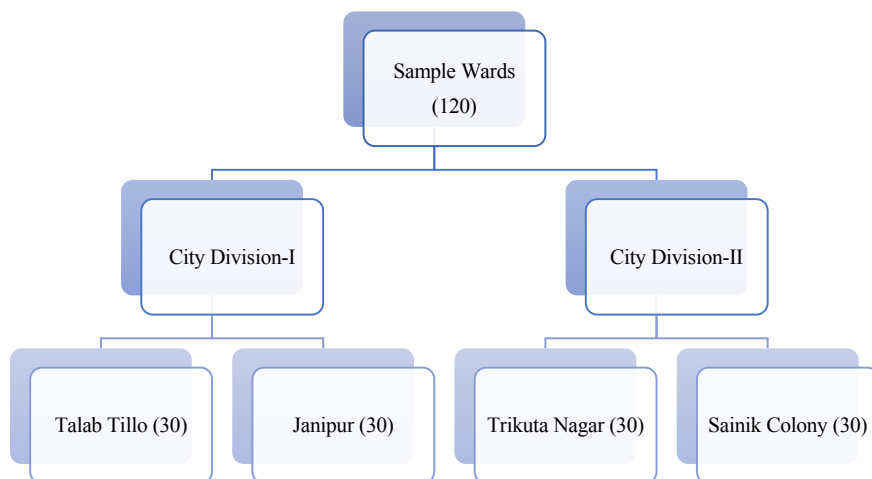


Figure 2. Sample wards and their sizes respectively

The responses of the households are recorded on the five major principles of human rights namely-Availability of water, accessibility of water, equity in distribution, affordable services and efficiency in the complaint redressal process. Further, the association of the satisfaction derived from the households regarding the water delivery and socio-economic effects in the form of the severity of water shortage and increased economic burden are analyzed through chi square test (Onchiri, 2013). The study aims to identify the independence of non-parametric attributes namely Adequacy of Water Management and governance, the severity of water shortage and incidence of economic burden, therefore, Chi-square test is used (Nihan, 2020).

$$\text{Formula for Chi Square: } \chi^2 = \frac{\sum(O - E)^2}{E}$$

The analysis is aimed at establishing the linkage between dissatisfaction of the residents in Jammu City from the suppliers of Water with acuteness of water shortage and high economic burden of water procurement.

4. Results of the study

The results are broadly divided into three sub-sections: The first subsection explains the effectiveness of the management and governance of the water supply in the study area on the six broad principles of HRBA from the perspective of users. The second subsection deals with the perception of the users regarding socio-economic implications in terms of the severity of water shortage and the economic burden of water procurement. The third section analyzes the association between the satisfaction derived by the users from the Water Suppliers with the severity of water shortage and the incidence of economic burden on the residents in the city.

4.1 Effectiveness of the management and governance from the perspective of users

The effectiveness of management and governance is evaluated through the user's lens based on six major criteria as prescribed by Human Rights Based Approach. The criteria are: Sufficient Availability and accessibility of water, Acceptability of water in terms of safety, reasonable affordability of water services from dominant and adjoining sources of water, equitable distribution among the society, accountable service providers and citizen's participation.

4.1.1 Availability and accessibility of water supply in the study area

The first principle of the Human Rights Based Approach focuses on ensuring continuous and a sufficient water availability to the citizens. Adequate availability of the water focuses on maintaining sufficient and continuous supply of

water for drinking and domestic purposes. Several international accords have set a limit for identifying the households without sufficient water availability (Saroj et al., 2022). Further, the water services must be genuinely accessible to the users. Accessibility of the services must be secured in terms of its infrastructural design along with the time and distance travelled for it (Shaheed et al., 2014). The Availability of the water supply in the urban segment of Jammu District is analyzed by responses regarding the dominant and adjoining sources of water supply, duration of the water delivery from the service providers and the dependency on the tankers to meet the water requirements.

Table 1. Major Sources of water Supply for the sample Urban Households

Sno.	Wards	Major Sources of water Supply for the sample Urban Households					Total
		Indoor Water Connection	Connection + Shared Tap	Connection + Borewell	Connection + Hand pump	Connection + Water Tanker	
1	Trikuta Nagar	18	-	7	-	5	30
		(60)	-	(23.3)	-	(16.7)	(100)
2	Sainik Colony	4	-	-	2	24	30
		(13.3)	-	-	(6.7)	(80)	(100)
3	Talab Tillo	9	2	9	4	6	30
		(30)	(6.7)	(30)	(13.3)	(20)	(100)
4	Janipur	3	-	-	-	27	30
		(10)	-	-	-	(90)	(100)
5	Total	45	2	16	6	51	120
		(37.5)	(1.7)	(13.3)	(5)	(42.5)	(100)

Source: Field Survey (2021)

Table 1 presents the major sources of water supply in four wards of urban regions of Jammu district. Major Sources of water supply considered in the study are-Indoor Water Connection, Public Standpost, Private Borewell, Community Handpumps and Water Tankers. PHE Department is the sole authority responsible for ensuring the urban households with an unvarying water supply for domestic purposes. The responses of the households in the sample wards reveal that the major source of water supply is Indoor Water connection provided by PHE. However, the adequacy of the water supply varies from the source. The residents of Trikota Nagar and Talab Tillo are dominantly satisfied with the water supply from the utility providers as depicted in Table 2. The residents from the above two wards have supplemented the water supply with water from private borewell and community stand post. Apart from the Indoor connection, Private Borewell and Community stand post are next in the chronology of “Improved” Water Sources. Community Handpump is another source of water supply. The distinguishment of community handpump as improved or unimproved depends on the maintenance and protection of the resource from runoff water. The other two wards-Sainik Colony and Janipur have experienced irregularity in water availability from the utility providers as reflected in the data. Therefore, several households have a dependency on water tankers as a dominant source. Water Tankers occupy the last position on the ladder of sources for water supply. With the payment attached to the source, dependency on them is considered an “Unimproved” source of Water Supply (WHO/UNICEF, 2006).

Table 2. Dominant Source of water Supply for the sample Urban Households

Sno.	Wards	Major Sources of water Supply for the sample Urban Households					Total
		Indoor Water Connection	Connection + Shared Tap	Connection + Borewell	Connection + Hand pump	Connection + Water Tanker	
1	Trikuta Nagar	23	-	7	-	-	30
		(76.7)	-	(23.3)	-	-	(100)
2	Sainik Colony	6	-	-	-	24	30
		(20)	-	-	-	(80)	(100)
3	Talab Tillo	21	-	9	-	-	30
		(70)	-	(30)	-	-	(100)
4	Janipur	3	-	-	-	27	30
		(10)	-	-	-	(90)	(100)
5	Total	53	-	16	-	51	120
		(44.2)	-	(13.3)	-	(42.5)	(100)

Source: Field Survey (2021)

Table 3. Duration of Water Supply from the dominant source of water

Sno.	Wards	Duration of Water Supply from the PHE					Total
		Twice a Day	Once a Day	Alternative Days	Twice a Week	Once a Week	
1	Trikuta Nagar	28	2	-	-	-	30
		(93.3)	(6.7)	-	-	-	(100)
2	Sainik Colony	-	9	16	5	-	30
		-	(30)	(53.33)	(16.67)	-	(100)
3	Talab Tillo	26	4	-	-	-	30
		(86.7)	(13.3)	-	-	-	(100)
4	Janipur	-	5	9	12	4	30
		-	(16.67)	(30)	(40)	(13.33)	(100)
5	Total	54	20	25	17	4	120
		(45)	(16.7)	(20.8)	(14.2)	(3.3)	(100)

Source: Field Survey (2021)

PHE Department is mandated to provide its citizens with an uninterrupted water supply through an indoor public

connection. The responses of the households regarding the duration of water supply from PHED are prescribed in Table 3. WHO (2003) has prescribed 50-100 litres of water while Watkins (2006) has set the bar low at 5 litres per day for distinguishing the households with adequate water availability. As per the Indian Standards, as prescribed by CPHEEO, an individual having 135 load of water through a 24-hour water supply is characterized as a benchmark for sufficient water availability (Bhawan, 2012). The majority of residents in Trikuta Nagar (93.3) and Talab Tillo (86.7) wards receive water through an indoor connection twice a day. A few residents in the abovementioned wards recorded that water is received once only. The current status of supply fulfills the need of locals in terms of availability. Households of Sainik Colony ward receive either once a day (30) or on alternative days (53.3). However, around 16.67 percent of households received water twice a week. Responses of the residents in Janipur ward regarding the duration of water supply gathered around alternative days (30) or twice a week (40). However, 16 percent received water once a day and 13 percent received it only once a week. This depicts the failure of utility providers in attaining the standards prescribed for basic human needs of water.

Table 4. Adjoining Source of water Supply for the sample Urban Households

Sno.	Wards	Adjoining Source of water Supply for the sample Urban Households			
		Shared Tap	Hand pump	Water Tanker	Total
1	Trikuta Nagar	-	-	5	5
		-	-	(100)	(100)
2	Sainik Colony	-	2	24	26
		-	(7.7)	(73.3)	(100)
3	Talab Tillo	2	4	6	12
		(16.7)	(33.3)	(50)	(100)
4	Janipur	-	-	27	27
		-	-	(83.3)	(100)
5	Total	2	6	62	70
		(2.9)	(8.6)	(88.5)	(100)

Source: Field Survey (2021)

Estimated of WHO has defined a water service as physically accessible if it is within 30 minutes timing and a distance of 1000 meters from the users (Bartram & Howard, 2003). WHO/UNICEF (2006) has further classified the water sources as improved and unimproved depending on their physical reach and infrastructural conditions. “Improved” sources of drinking water include piped connection, public tap or standpipe, bore well, protected dug well, protected spring, bottled water as well as rainwater. Water supply from unprotected spring, unprotected dug well, tankers or surface water including rivers, dams, lakes, ponds, etc. are identified as an “unimproved” supply of drinking water. The delivery of water services to the households must be from Improved Sources (Lee, 2004). Table 4 presents the responses of the households with regard to the usage of adjoining water sources. The dependency on the adjoining sources is high in the three wards except Trikuta Nagar ward. Further among the users of adjoining sources, usage of water tankers is the highest, especially among two wards-Sainik Colony (73) and Janipur (83). This indicates the dependency on “unimproved” water sources for basic purposes.

Table 5. Reasons for using adjoining water sources

Sno.	Wards	Reasons for using adjoining water sources				Total
		Administrative Inadequacy	Easy Availability	Time Saving + Less Costly	To meet additional needs	
1	Trikuta Nagar	-	-	-	5	5
		-	-	-	(100)	(100)
2	Sainik Colony	24	-	2	-	26
		(92.3)	-	(7.7)	-	(100)
3	Talab Tillo	-	2	4	6	12
		-	(16.7)	(33.3)	(50)	(100)
4	Janipur	27	-	-	-	27
		(100)	-	-	-	(100)
5	Total	51	2	6	11	70
		(72.8)	(2.9)	(8.6)	(15.7)	(100)

Source: Field Survey (2021)

Table 6. Satisfaction from PHE regarding Water Availability and Accessibility as responded by sample households

Sno.	Wards	Satisfaction from PHE regarding Water Availability and Accessibility as responded by sample households					Total
		Strongly Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Strongly Satisfied	
1	Trikuta Nagar	-	-	4	17	9	30
		-	-	(13.3)	(56.7)	(30)	(100)
2	Sainik Colony	10	14	6	-	-	30
		(33.3)	(46.7)	(20)	-	-	(100)
3	Talab Tillo	-	-	5	14	11	30
		-	-	(16.7)	(46.7)	(36.7)	(100)
4	Janipur	14	10	5	1	-	30
		(46.7)	(33.3)	(16.7)	(3.3)	-	(100)
5	Total	24	24	20	32	20	120
		(20)	(20)	(16.7)	(26.7)	(16.7)	(100)

Source: Field Survey (2021)

Table 5 displays the responses of the households on the reasons highlighted by the respondents for the usage of adjoining water sources. The major reason attributing to the increased dependency among the households is the administrative inadequacy of the water utility provided. The households of Talab Tillo and Trikota Nagar have adopted the provision of adjoining sources in order to meet additional availability and time saving as well as cheap nature of

sources nearby. Whereas the respondents of other two wards have emphasized the inefficiencies in the service delivery causing them to avail the adjoining facilities for water sources.

Table 6 presents the opinion of the sample households regarding the satisfaction derived from the institutions in ensuring sufficient water availability for domestic purposes. The responses of the households reveal the extremes in water availability prevailing in the urban areas of Jammu District. More than 50 percent of respondents in Trikuta Nagar ward (57 percent) were somewhat satisfied with the water delivery mechanism to ensure sufficient and continuous availability of water. Similarly, the majority of the households in Talab Tillo ward recorded responses with a 4 or 5 ranking reflecting the high satisfaction derived in terms of water availability. A contrasting situation existed in the other two wards. The responses of the households reflected the dissatisfaction concerning the sufficiency of water facilities and regularity in supplies for meeting the domestic needs at the individual and community level.

4.1.2 Acceptability and quality of water services

Acceptability of water services is an important prerequisite for ensuring dignified and healthy life for the citizens. Water Services are considered acceptable when they succeed in achieving social and cultural norms with respect to personal and community hygiene (Marques et al., 2015). This requires delivering water services of sufficient quantity that do not compromise the health of the community. Efficient water quality can be ensured when water delivered is free from any microorganism or substance that can pose a threat to the health of those consuming it (Garriga et al., 2017). The acceptability and quality of water services in Jammu City is evaluated through their responses of satisfaction regarding water quality, usage of water purification methods and reporting cases of compromised health due to water-borne diseases.

Table 7. Satisfaction from PHE regarding Water Quality as responded by sample households

Sno.	Wards	Satisfaction from PHE regarding Water Quality					Total
		Strongly Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Strongly Satisfied	
1	Trikuta Nagar	9	18	3	-	-	30
		(30)	(60)	(10)	-	-	(100)
2	Sainik Colony	2	13	5	10	-	30
		(6.7)	(43.3)	(10)	(33.3)	-	(100)
3	Talab Tillo	8	8	3	11	-	30
		(26.7)	(26.7)	(10)	(36.7)	-	(100)
4	Janipur	8	13	9	-	-	30
		(26.7)	(43.3)	(30)	-	-	(100)
5	Total	27	52	20	21	-	120
		(22.5)	(43.3)	(16.7)	(17.5)	-	(100)

Source: Field Survey (2021)

The acceptability parameter of the HRBA requires water to be in a safe and usable condition in terms of taste, color and odor for domestic and drinking purposes. Table 7 presents the responses of the households revealing the satisfaction derived by the sample households on a scale of 1 to 5 from the suppliers to provide safe and acceptable water facilities

for domestic and drinking purposes. The responses of the residents from all the four wards majorly gathered around strongly or somewhat dissatisfied. This depicts the failure of the water utility providers in providing safe and acceptable quality of water. A few respondents in Sainik Colony (33) and Talab Tillo (37) revealed satisfaction in terms of water quality delivered to them by the PHE. However, the overall status of water quality provided depicts a crooked picture of the PHE in providing safe water facilities.

4.1.3 Affordability of Water Delivery

Affordability is another major parameter defining the adequacy of management and governance from the user's opinion. Delivery of affordable services by the utility providers aims at providing water at a reasonable price without making them rely on unsafe and expensive alternatives for meeting water needs (Pierce et al., 2021). Affordability of water services must ensure the fundamental nature of water in sustaining life and its availability at a reasonable price to its citizens (Brown & Heller, 2017). Securing affordable services by the suppliers aims at working out a mechanism where water services are provided at an inexpensive rate and do not drain the supplier's budget as well (Martins et al., 2016). The affordability of water services in Jammu City is assessed by the responses of users about the satisfaction derived from the water service providers regarding affordability and their dependency on tankers for meeting the basic water needs.

Table 8. Satisfaction from PHE regarding Water Affordability as responded by sample households

Sno.	Wards	Satisfaction from PHE regarding Water Affordability					Total
		Strongly Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Strongly Satisfied	
1	Trikuta Nagar	-	-	4	15	11	30
		-	-	(13.3)	(50)	(36.7)	(100)
2	Sainik Colony	10	12	6	2	-	30
		(33.3)	(46.7)	(20)	(6.7)	-	(100)
3	Talab Tillo	-	-	5	13	12	30
		-	-	(16.7)	(43.3)	(40)	(100)
4	Janipur	14	9	5	2	-	30
		(46.7)	(30)	(16.7)	(6.7)	-	(100)
5	Total	24	21	20	32	23	120
		(20)	(20)	(16.7)	(26.7)	(16.7)	(100)

Source: Field Survey (2021)

Table 8 presents the opinion of the households regarding the provision of affordable services by the households. The households of Trikota Nagar ward and Talab Tillo ward have majorly recorded satisfactory responses in terms of affordability of water services. However, the residents of Sainik Colony and Janipur wards have expressed dissatisfaction in terms of the delivery of affordable services. The high percentage of dissatisfaction is attributed to the insufficient and interrupted water supply from the utility providers. The inadequacy has increased dependency on the informal market instruments that are expensive alternatives to water supply such as Tankers making water an unaffordable commodity.

4.1.4 Equity in water distribution

Institutions engaged in the management and governance of water are liable to ensure sufficient availability of water services in an equitable manner (Luh et al., 2013). Appropriate action must be taken to abandon any kind of discrimination on the basis of caste, race, gender or any other form of social or economic exclusion. Apart from the societal inequalities, actions by the administration can often create a situation of inequitable distribution as well (United Nations, 2003). Equity in the distribution of water services among the sample wards of Jammu city is evaluated through their responses about the satisfaction from the PHE with respect to equity in the distribution of water services.

Table 9. Satisfaction from PHE regarding Water Supply Equity as responded by sample households

Sno.	Wards	Satisfaction from PHE regarding Equitable Distribution					Total
		Strongly Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Strongly Satisfied	
1	Trikuta Nagar	-	3	4	11	12	30
		-	(10)	(13.3)	(36.7)	(40)	(100)
2	Sainik Colony	9	5	8	6	2	30
		(30)	(16.7)	(26.7)	(20)	(6.7)	(100)
3	Talab Tillo	1	2	2	12	13	30
		(3.3)	(6.7)	(6.7)	(40)	(43.3)	(100)
4	Janipur	11	13	6	-	-	30
		(36.7)	(43.3)	(20)	-	-	(100)
5	Total	21	23	20	29	27	120
		(17.5)	(19.2)	(16.7)	(24.2)	(22.5)	(100)

Source: Field Survey (2021)

Table 9 displays the responses regarding the equitable distribution of water services as ensured by the utility providers. Households of Trikuta Nagar ward revealed satisfaction in the equity aspect of water services. The respondents of Talab Tillo and Sainik Colony expressed a diverse views regarding the equitable distribution of water services. Responses of residents of Sainik Colony ward were inclined towards dissatisfaction. Whereas the majority of residents of Talab Tillo (83) have stated satisfaction from the utility providers regarding the equity aspect of water services. Prevalence of unequal distribution is evident from the responses of residents of Janipur ward who have expressed high dissatisfaction with the utility providers.

4.1.5 Accountability of the officials

Human Rights Based Approach makes an obligation for the institutions to realize water as a human right. Accountability of the institutions guarantees a set of control and supervision to the citizens for the failure of actions and decisions with respect to efficient management and governance of water resources (Laban, 2007). This can prevent any abuse of power and raise the culpability among the institutions for delivering poor performance. The accountability of the institutions involved in management and governance is evaluated in Jammu City through the responses of the citizens with respect to the satisfaction derived on a scale of 1 to 5 and the promptness of service providers in delivering efficient services.

Table 10 displays the satisfaction of the households regarding the complaint redressal process of the utility providers. Residents of Trikuta Nagar ward have expressed satisfaction with the complaint redressal mechanism adopted by the utility providers with 70 percent of sample households giving a score of 4 or 5. While the other three wards present a diverse scenario of satisfaction, residents of Talab Tillo have a higher vote towards satisfactory services of utility providers. However, the residents of Sainik Colony and Janipur have responses inclined towards dissatisfaction. The discontentment is high, especially among the sample households of Janipur where nearly 47 percent of responses point towards fair dissatisfaction and 27 percent point towards high dissatisfaction. The impact of dissatisfaction is seen in the responses of the households on the timing taken by the authorities in addressing the complaints related to pipe leakage, breakage or interruption of services.

Table 10. Satisfaction from PHE regarding Accountability as responded by sample households

Sno.	Wards	Satisfaction from PHE regarding Accountability					Total
		Strongly Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Strongly Satisfied	
1	Trikuta Nagar	-	2	7	9	12	30
		-	(6.7)	(23.3)	(30)	(40)	(100)
2	Sainik Colony	6	10	5	7	2	30
		(20)	(33.3)	(16.7)	(23.3)	(6.7)	(100)
3	Talab Tillo	6	8	4	7	5	30
		(20)	(26.7)	(13.3)	(23.3)	(16.7)	(100)
4	Janipur	8	14	4	3	1	30
		(26.7)	(46.7)	(13.3)	(10)	(3.3)	(100)
5	Total	20	34	20	26	20	120
		(16.7)	(28.3)	(16.7)	(21.7)	(16.7)	(100)

Source: Field Survey (2021)

4.1.6 Participation

One exclusive feature of the HRBA approach is that it cores on the principle of inclusivity and participation for achieving strengthened management and governance. Participation of citizens aims at creating awareness among the citizens about water as a human right and accessibility of all the information relevant for their involvement in decision making (Wilson, 2005). Efficacy in management and good governance requires the involvement of the stakeholders that are directly impacted by the decision-making. Stakeholder participation can supplement the citizens' role in society and improve resource availability to them by service providers (Fiorino, 1990). The evaluation of citizens' participation in Jammu city is performed through the rating of satisfaction of respondents regarding their role in decision making.

Table 11 presents the role of PHE in ensuring citizens' participation within the community fin context of decision making. Though the responses vary among the respondents of sample wards, yet the majority of the responses articulated dissatisfaction with the administration in ensuring the cruciality of citizens' involvement in decision making. The residents were of the opinion that the sole responsibility of delivering water services is under the authority of PHE. The authorities seldomly involve the community in the decision-making and therefore, has often failed to tackle the problem that is specific to the region. The insufficient involvement of the locals is reflected through their negative

responses with respect to awareness about water harvesting infrastructures and other water conservation techniques.

Table 11. Satisfaction from PHE regarding Citizens’ Participation as responded by sample households

Sno.	Wards	Satisfaction from PHE regarding Citizen’s participation					Total
		Strongly Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Strongly Satisfied	
1	Trikuta Nagar	7 (23.3)	17 (56.7)	3 (10)	3 (10)	-	30 (100)
2	Sainik Colony	8 (26.7)	12 (40)	3 (10)	7 (23.3)	-	30 (100)
3	Talab Tillo	3 (10)	16 (53.3)	5 (16.7)	6 (20)	-	30 (100)
4	Janipur	7 (23.3)	10 (33.3)	9 (30)	4 (13.3)	-	30 (100)
5	Total	25 (20.8)	55 (45.8)	20 (16.7)	20 (16.7)	-	120 (100)

Source: Field Survey (2021)

4.1.7 Overall satisfaction from institutions in domestic water delivery

Table 12. Overall Satisfaction from Institutions in Domestic Water Delivery as responded by sample households

Sno.	Wards	Overall Satisfaction from Institutions in Domestic Water Delivery as responded by sample households					Total
		Strongly Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Strongly Satisfied	
1	Trikuta Nagar	-	-	4 (13.3)	11 (36.7)	15 (50)	30 (100)
2	Sainik Colony	5 (16.7)	14 (46.7)	7 (23.3)	4 (13.3)	-	30 (100)
3	Talab Tillo	5 (16.7)	8 (26.7)	5 (16.7)	7 (23.3)	5 (16.7)	30 (100)
4	Janipur	9 (30)	17 (56.7)	2 (6.7)	2 (6.7)	-	30 (100)
5	Total	17 (14.2)	39 (32.5)	22 (18.3)	22 (18.3)	20 (16.7)	120 (100)

Source: Field Survey (2021)

The integration of the six principles is reflected in the overall score for the institutions in ensuring effective water delivery to the households. Table 12 defines the overall satisfaction values as responded by the households in sample wards of Jammu city.

The responses summarize the six criteria above such that two wards have a relatively satisfactory score value whereas two wards have dissatisfactory responses. The overall satisfactory scenario is experienced by Trikuta Nagar and Talab Tillo wards due to the fulfillment of the majority of the six conditions. The infrastructural provisioning is adequate in the two wards. Whereas, a contrast is depicted in the other wards due to a lack of strengthened supply initiatives, thus contributing to dissatisfaction.

4.2 Implications of inadequate institutional delivery of water for domestic supply

The implications of poor institutional delivery of water for domestic supply are observed through the severity of water shortage, health implications, delay in complaint redressal by the institutions and economic implications in the form of increased dependency on the informal market instruments (tankers) and induced burden due to it.

4.2.1 Severity of water shortage

The existence of water shortage is evidence of the failure of the institutions in delivering continuous water supply to the households. This section discusses the responses of the sample households with respect to the existence of water shortages either created naturally or artificially due to poor administrative actions. The section also discusses the frequency of the shortage of experienced and to what extent it affects the lives of residents.

Table 13. Responses of sample households regarding Severity of Water Shortage

Sno.	Wards	Frequency of existence of water shortage			
		Acute	No Shortage	Occasional Shortage	Total
1	Trikuta Nagar	-	21	9	30
		-	(70)	(30)	(100)
2	Sainik Colony	20	-	10	30
		(66.7)	-	(33.3)	(100)
3	Talab Tillo	-	22	8	30
		-	(73.3)	(26.7)	(100)
4	Janipur	21	-	9	30
		(70)	-	(30)	(100)
5	Total	41	43	36	120
		(34.2)	(35.8)	(30)	(100)

Source: Field Survey (2021)

Table 13 records the responses of the households regarding the severity of water shortages. The responses of the households varied from acute shortage to occasional shortage and no shortage at all. The majority of the respondents in Trikuta Nagar Ward (70) and Talab Tillo ward (73.3) were of the opinion that water shortage is nonexistent in their

area. However, 30 percent of households in Trikuta Nagar and 16 percent in Talab Tillo responded that water shortage was an occasional phenomenon existed mostly during extremely hot weather conditions. The severity of Water Shortage is high in Sainik Colony and Janipur wards is high. More than 70 percent of households in both the wards faced acute water shortages while 30 percent of residents of Sainik Colony and 23 percent of Janipur recorded that water shortages prevailed occasionally.

Table 14. Responses of sample households regarding Frequency of existence of water shortage

Sno.	Wards	Frequency of existence of water shortage				Total
		No Shortage	Several Hours	Several Days	Several Weeks	
1	Trikuta Nagar	21	9	-	-	30
		(70)	(30)	-	-	(100)
2	Sainik Colony	-	1	21	8	30
		-	(3.3)	(70)	(26.7)	(100)
3	Talab Tillo	22	8	-	-	30
		(73.3)	(26.67)	-	-	(100)
4	Janipur	-	-	16	14	30
		-	-	(53.3)	(46.7)	(100)
5	Total	43	18	37	22	120
		(35.9)	(15)	(30.8)	(18.3)	(100)

Source: Field Survey (2021)

Table 14 presents the responses of the households regarding the duration of water shortage if prevailing occasionally or acutely. Water shortage may prevail for several hours, several days or extend up to several weeks as recorded by the respondents. Households of Trikuta Nagar ward and Talab Tillo ward who had confirmed that water shortage is an occasional occurrence were of the view that such shortage extended for several hours only. Majority of the respondents of Sainik Colony facing water shortage opinionated that the shortage extended for several days. Around 26 percent of them responded that the shortage was prolonged to several weeks. Responses of the households in Janipur Ward regarding the duration of water shortage varied between several days (53) and several weeks (47) depicting the extremity of water shortage. The severity of shortages is attributed to the supply-demand imbalance as a consequence of the failure of utility providers.

4.2.2 Health implications

The incidence of health issues due to poor and unhygienic delivery of water is significant. Exposure to pathogenic microorganisms increases the risk of severe health problems. The prolonged intake of unacceptable water can affect mental along with physical health, especially among children (Damania et al., 2019). Unsafe water facilities can be the root cause of the incidence of water-borne diseases (Ruckart et al., 2019). To avoid the consumption of unsafe drinking water several households resort to some method of purification-either boiling or installation of a purifier depending upon the respective economic status (Tarrass & Benjelloun, 2012).

Table 15. Purification Method Adopted by the sample households

Sno.	Wards	Purification Method Adopted				Total
		Purifier	Boiling	Purifier and boiling	Nil	
1	Trikuta Nagar	26	-	4	-	30
		(86.7)	-	(13.3)	-	(100)
2	Sainik Colony	23	2	2	3	30
		(76.7)	(6.7)	(6.7)	(10)	(100)
3	Talab Tillo	24	4	-	2	30
		(80)	(13.3)	-	(6.7)	(100)
4	Janipur	22	3	-	5	30
		(73.3)	(10)	-	(16.7)	(100)
5	Total	95	9	6	10	120
		(79.2)	(7.5)	(5)	(8.3)	(100)

Source: Field Survey (2021)

Table 16. Health problem associated with provision of unsafe water as recorded by sample households

Sno.	Wards	Health problem associated with provision of unsafe water		
		Yes	No	Total
1	Trikuta Nagar	8	22	30
		26.70%	73.30%	(100)
2	Sainik Colony	15	15	30
		50.00%	50.00%	(100)
3	Talab Tillo	8	22	30
		26.70%	73.30%	(100)
4	Janipur			30
				(100)
5	Total	50	70	120
		41.70%	58.30%	(100)

Source: Field Survey (2021)

Table 17. Type of Health diseases associated with unsafe drinking water as recorded by households

Sno.	Wards	Health diseases associated with unsafe drinking water among sample households					Total
		Diarrhea	Dysentery	Typhoid	Malaria	Cholera	
1	Trikuta Nagar	3	-	3	-	2	8
		(37.5)	-	(37.5)	-	(25)	(100)
2	Sainik Colony	2	-	1	-	-	3
		(66.7)	-	(33.3)	-	-	(100)
3	Talab Tillo	2	-	1	2	-	5
		(40)	-	(20)	(40)	-	(100)
4	Janipur	4	-	4	1	2	11
		(36.4)	-	(36.4)	(9.1)	(18.1)	(100)
5	Total	11	-	9	3	4	27
		(40.8)	-	(33.3)	(11.1)	(14.8)	(100)

Source: Field Survey (2021)

Table 15 records the responses of the households regarding the purification method adopted. More than 70 percent of the households in all the four wards have installed a purifier depicting the grim state of water quality. A few respondents in Trikota Nagar and Sainik Colony wards have resorted to both methods of purification in order to improve water quality for consumption. This indicates the severity of poor qualitative delivery of water in the majority of the wards.

Table 16 presents the responses regarding the health problems arising due to the delivery of unsafe and unacceptable water on the premises. An overall Figure of 22 percent from the four sample wards has confirmed the health issues associated with the delivery of unsafe water from the utility providers. Table 17 displays the various water-borne diseases associated with the prevalence of unsafe water as recorded by the households in sample wards. Around 40 percent of households in four wards have experienced diarrhea, 33 percent have experienced Typhoid, 11 percent have incidences of Malaria and 14 percent of respondents have witnessed Cholera due to the prevalence of unacceptable water for domestic and drinking purposes.

4.2.3 Delay in complaint redressal

The institutional failure is often reflected by the lacking accountability mechanism. The utility providers ought to address the concerns of all the individuals and offer region-specific solutions (Dwianika et al., 2020). Accountability of the Management and Governance is reflected from the promptness in addressing the complaints of the citizens by the water service providers (Arickal et al., 2015).

Table 18 presents the responses regarding the timing of complaint redressal undertaken by the authorities. The households who have expressed satisfaction with the services are of the view that the timing taken by the service providers varies from the same day to a week or within the same month. However, the wards where the users are dissatisfied with the services have expressed that service providers may take three to six months or even a year to address the problem. Nearly 12 percent of the total respondents have opined that there is no action on the part of authorities to correct the flaws prevalent in the system.

Table 18. Responses of sample households regarding Timing of complaint redressal

Sno.	Wards	Responses of households regarding Timing of complaint redressal							Total
		Same Day	Within week	Within a Month	Within Three Months	Once in Six months	Once in a year	No Action	
1	Trikuta Nagar	6	14	3	-	5	-	2	30
		(20)	(46.7)	(10)	-	(16.7)	-	(6.67)	(100)
2	Sainik Colony	2	7	4	-	5	7	5	30
		(6.7)	(23.3)	(13.3)	-	(16.7)	(23.3)	(16.7)	(100)
3	Talab Tillo	4	11	3	5	-	4	3	30
		(13.3)	(36.7)	(10)	(16.7)	-	(13.3)	(10)	(100)
4	Janipur	-	4	2	1	7	11	5	30
		-	(13.3)	(6.7)	(3.3)	(23.3)	(36.7)	(16.7)	(100)
5	Total	12	36	12	6	17	22	15	120
		(10)	(30)	(10)	(5)	(14.2)	(18.3)	(12.5)	(100)

Source: Field Survey (2021)

4.2.4 Economic implications: Economic burden of water charges

The expansive water demand in urban areas calls for incorporating water as a key ingredient in economic strategy. This requires the adoption of formal economic instruments that can rectify the demand-supply imbalance and incentivize water conservation at the household level (Bjornlund, 2003; Grafton et al., 2020). Few examples of such instruments are-tariffs, taxes or environmental charges for covering the externalities and several compensatory mechanisms for inculcating the attitude toward water resource preservation and efficient management (Brooks & Harris, 2008; Bakker, 2010). These economic instruments used in managing water have a crucial role in encouraging sustainable behavior among the water users along with inducing appropriate allocation of water resources and reducing its adversities to the community (Easter et al., 1998; Young & Loomis, 2014). However, the failure of the public delivery mechanism often causes individuals to assure self-supply of water through private water tankers thus leading to a dependency on the informal water markets (Vij et al., 2019).

Water is a public entity. Therefore, the public authorities bear the onus of providing uninterrupted water services to its citizens at a nominal price. In Jammu and Kashmir, JKSWRRA prescribes the formal economic instruments within the urban areas dominantly in the form of water charges along with certain incentives through rebates in water bills for water conservation (JKSWRRA, 2010). The charges are updated after a stipulated time and are prescribed in order to sustain the delivery mechanism financially. However, the inadequacy of the supplies from the water suppliers often causes the users to rely on informal market-based supplies such as private water tankers. With the surge in scarcity of water, the dependency on privately provided instruments has increased, creating a situation of Burden and rendering it unaffordable for several households. Table 19 lays the dependency of the residents of sample areas on informal market instruments along with the formal economic instruments. It is clearly evident from the table that the residents of Sainik Colony and Janipur seek self-supply of water through private water tankers.

Table 19. Economic Instruments to manage Water as responded by sample households

Sno.	Wards	Economic Instruments to manage Water		
		Household User Charges	User Charges and Informal Market Instruments	Total
1	Trikuta Nagar	25	5	30
		(83.3)	(16.67)	(100)
2	Sainik Colony	6	24	30
		(20)	(80)	(100)
3	Talab Tillo	24	6	30
		(80)	(20)	(100)
4	Janipur	3	27	30
		(10)	(90)	(100)
5	Total	58	62	120
		(48.3)	(51.7)	(100)

Source: Primary Survey (2021)

Table 20. Provisioning of Water Tankers as responded by sample households

Sno.	Wards	Provisioning of Water Tankers			
		Government	Private	Both	Total
1	Trikuta Nagar	1	4	-	5
		(20)	(80)	-	(100)
2	Sainik Colony	3	19	2	24
		(12.5)	(79.2)	(8.3)	(100)
3	Talab Tillo	1	5	-	6
		(16.7)	(83.3)	-	(100)
4	Janipur	2	23	2	27
		(7.4)	(85.2)	(7.4)	(100)
5	Total	7	51	4	62
		(11.3)	(82.2)	(6.5)	(100)

Source: Field Survey (2021)

Table 20 displays the figures of the households in the selected wards which have a dependency on water tankers for

meeting domestic needs. The provision of water tankers is facilitated by the government (PHE) and private enterprises simultaneously in the district. The meagre households of Trikuta Nagar and Talab Tillo using water tankers meet their demand majorly through the tankers provided by the private sector. However, the situation is not the same in other two wards. The residents of the two wards-Sainik Colony and Janipur have a heavy dependency on water tankers. Therefore, their requirements are fulfilled jointly by both the suppliers. The constraints on the availability of government tankers and the highly repetitive demand of these wards make them rely on private enterprises mainly with 79 percent in Sainik Colony and 85 percent in Janipur.

Table 21. Frequency of Government/Private Tankers as responded by sample households

Sno.	Wards	Frequency of Government/Private Tankers						Total
		More than once a week	Once a week	Twice in a month	Once in a month	Only for Seasonal shortage	Only for additional purposes	
1	Trikuta Nagar	-	-	-	-	3	2	5
		-	-	-	-	(60)	(40)	(100)
2	Sainik Colony	-	6	7	9	2	-	24
		-	(25)	(29.2)	(37.5)	(8.3)	-	(100)
3	Talab Tillo	-	-	-	-	4	2	6
		-	-	-	-	(66.7)	(33.3)	(100)
4	Janipur	5	7	9	6	-	-	27
		(18.5)	(26)	(33.3)	(22.2)	-	-	(100)
5	Total	5	13	16	15	9	4	62
		(8.1)	(20.9)	(25.8)	(24.2)	(14.5)	(6.5)	(100)

Source: Field Survey (2021)

Table 21 presents the frequency of water tankers among the households opting for water tankers. Since the reliance of households in Trikuta Nagar and Talab Tillo is very low and there is a sufficiency in water availability from public connection, their usage of tankers is for additional purposes only. A few households in these wards seek water tankers to cover up the season shortage occasionally. The regularity of water supply from the public connection in the wards of Sainik Colony and Janipur is subject to constraints. Therefore, the frequency of water tankers varies from once a month to twice a month and sometimes twice a week. 25 percent of the households in Sainik colony call for a tanker once a week. While the figures for the same in Janipur are 26 percent. 20-30 percent of households in both wards use tanker service once or twice a month. The situation is acute in Janipur where nearly 18 percent of the residents call for a tanker more than once in week. This high percentage is majorly due to the large family sizes and lacking supplies from the public utilities to cover up the various wants of water.

Table 22 defines the responses of the households with respect to the economic burden of securing regular water delivery for domestic requirements. Nearly 80 percent of the total sample households have responded that the burden has increased. However, respondents confirmed the increase in economic burden is more than 90 percent in the case of Sainik Colony and Janipur wards. The rating varies from being cheap or affordable to expensive and unaffordable. Respondents in Trikuta Nagar and Janipur wards have rated the charges paid for water as cheap and affordable. However, the respondents of the other two wards have rendered the price paid in securing regular water delivery as expensive or unaffordable. The difference in the responses is due to the additional expenditure incurred on the private

instruments by the residents of Sainik Colony and Janipur wards to maintain regularity in water provisioning.

Table 22. Incidence of burden for water procurement as recorded by sample households

Sno.	Wards	Incidence of burden for water procurement as recorded by sample households		
		No Burden	Increased Burden	Total
1	Trikuta Nagar	22	8	30
		73.30%	26.70%	(100)
2	Sainik Colony	16	14	30
		53.30%	46.70%	(100)
3	Talab Tillo	9	21	30
		30.00%	70.00%	(100)
4	Janipur	5	25	30
		16.70%	83.30%	(100)
5	Total	52	68	120
		43.30%	56.70%	(100)

Source: Field Survey (2021)

4.3 Statistical verification of inadequacy of the institutional actions and its implications

Competent institutions are the major driving factor for effective management and proficiency in governance. Whereas, Ineffectual performance by the institutions can distress the management and governance in a region and thus, create several social and economic consequences to the society. To study the association between the inadequacy of the institutional actions in ensuring effective management and governance and the social and economic consequences to the society led by the accentuated water crisis and economic burden on the users for domestic water procurement. The association is analyzed through non-parametric-Chi Square test.

Table 23. Hypotheses proposed in the Study

Sno.	Hypothesis	Decision
1.	H ₀ : There is no association between inadequacy of management and governance institutions in ensuring effective domestic water supply and severity of water shortage	Rejected
2.	H ₀ : There is no association between inadequacy of management and governance institutions in ensuring effective domestic water supply and incidence of burden for procuring water	Rejected

Source: Author's Calculations

The two-hypothesis proposed in the study are presented in the Table 23. The decision regarding acceptance or rejection is based on the results presented below in Table 24. The hypotheses are tested at a 5 percent level of significance and the values reject the hypotheses. The acceptance of two hypotheses confirms the adverse socio-

economic implications of ineffectual water management and governance of domestic water resources (p-value < 0.05). The failure of the institutions in ensuring sufficient availability, acceptability, creating affordable water resources, creating equity and balance in water distribution and ensuring accountability and transparency in their functioning have invited a situation of shortage as clearly witnessed by two wards-Sainik Colony and Janipur. This has added stress to the lives of the residents in these regions. Apart from the social adversities, the inefficiency is contributing to the increased economic burden to ensure safe and sufficient access to water resources for domestic needs. Thus, the institutional reforms must be laid for ensuring effective management and governance.

Table 24. Chi Square Test Value Phi and Cramer's V Values and their P Values for Hypotheses

Sno	Hypothesis	Value (a)	df	P-value	Nominal by Nominal	Value	P-value
1	Inadequate Management and Governance * Severity of Shortage	66.828	8	0.00	Phi	0.746	0.00
					Cramer's V	0.528	0.00
2	Inadequate Management and Governance * Incidence of Burden	41.894	4	0.00	Phi	0.591	0.00
					Cramer's V	0.591	0.00

0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.00.

Source: Author's Calculations

4.4 Reasons for the poor performance of management

Table 25. Reasons for the poor performance of Management

Sno.	Wards	Reasons for the poor performance of Management				
		Unfocused Investment	Inappropriate Infrastructure	Lacking Awareness	Insufficient Public Participation	Environmental Concerns not Emphasized
1	Trikuta Nagar	4	12	19	17	23
		(13.3)	(40)	(63.3)	(56.67)	(76.67)
2	Sainik Colony	18	22	14	12	19
		(60)	(73.3)	(46.67)	(40)	(63.3)
3	Talab Tillo	3	9	11	19	21
		(10)	(30)	(36.67)	(63.3)	(70)
4	Janipur	21	23	17	12	18
		(70)	(76.67)	(56.67)	(40)	(60)
5	Total	46	66	61	60	81
		(38.3)	(55)	(50.8)	(50)	(67.5)

Source: Field Survey (2021)

Table 25 displays the reasons for the failure of management and governance as quoted by the respondents of the sample wards. The five prime reasons that are responsible for poor performance are: Unfocused Investment, Inappropriate infrastructure, Lacking Awareness, Insufficient Public Participation and insufficient emphasis on environmental concerns. The residents of all the four wards have given diversified responses. Out of all the reasons, the majority have voted for insufficient emphasis on environmental concerns as the major reason for the delivery of poor performance of institutions. The residents of Trikuta Nagar and Talab Tillo have blamed insufficient public participation and inadequate awareness apart from the above-mentioned reason. The residents of Sainik colony and Janipur have opined the fundamental reasons for the failure of service providers are-Unfocused Investment and Inappropriate infrastructure. It is the inadequacy of the infrastructure and absurd investment that have accentuated the water crisis in these two wards as recorded by respondents.

5. Conclusions and policy implications

Human Rights Based Approach is a formal step by United Nations in order to entitle everyone to water as a human right. The purpose of HRBA approach is to address the structural drawbacks prevent in the institutional framework and lay the base for robust management and good governance. The institutional setup of Jammu City is viewed through the lens of HRBA to address the complications involved in it. Jammu City is the home to a vast amount of population and the high functionality of the city has attracted a huge migratory population as well. This has led to huge pressure on the existing water supply. Due to the increasing burden on water resources in the city, the onus lies on the institutions involved in ensuring water as a fundamental right to its citizens. The study has evaluated the performance of water service providers to manage the water resources effectively on the basis of six fundamental principles of HRBA approach. The assessment of domestic water delivery through HRBA principles supports the literature and provides evidences of severe socio-economic implications on the locals due to its failure.

The study reveals that there is a contrasting situation existent in the Jammu City such that the two wards report high satisfaction on the parameters of HRBA while two wards have expressed dissatisfactory responses. Further, The chi square analysis reveals that there is an association between the institutional performance and the severity of water shortage. In other words, the wards quoting poor performance of management and experiencing water shortage. This clearly points to the failure of institutions in delivering performance up to the mark. The major reason contributing to this failure is the absence of strategic investments in infrastructure and institutional mechanisms in coherence with the needs of the locals and the regions. The city has experienced a rapid expansion of municipal limits without ensuring supply-side back up for the region. The imperfect awareness among the locals and neglect of the environmental concerns in the policies are other factors contributing to the poor domestic delivery of water.

Therefore, it is important for the policymakers to ensure delivering water services that fulfill the benchmarks of sufficient availability and accessibility of water resources irrespective of their locational advantages, acceptable and safe quality of water and affordable water services without creating an additional burden to secure sufficient water availability. Apart from this, the institutions must aim at ensuring equitable distribution, maintain transparency and accountability in their functioning and move forward with a sense of inclusiveness for the communities. This can foster behavioral change on the part of citizens with respect to water conservation and entrust the institutions to handle water resources responsibly and sustainably.

Conflict of interest

The authors declare that there is no personal or organizational conflict of interest with this work.

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APPENDIX

Questionnaire for perception of the users regarding the water delivery for domestic purposes in Jammu city: A human rights based approach

Socio-Economic Characteristics

Sno.	
1. Name of the Ward	
2. Name of the respondent	
Household characteristics	
3. Family size (1 = 0-5, 2 = 6-10, 3 = Above 10)	
4. Literacy level (1 = Formal Education, 2 = No formal Education)	
5. Monthly Income (1 = 0-24999, 2 = 25000-49999, 3 = 50000-74999, 4 = 75000-99999, 5 = Above 100000)	

HRBA Principles

Sno.
1. Major Source of water Supply (1 = Indoor water connection, 2 = Shared Tap, 3 = Bore well, 4 = Well, 5 = Hand pump, 6 = Water Tankers)
2. Dominant Source of water Supply (1 = Indoor water connection, 2 = Shared Tap, 3 = Bore well, 4 = Well, 5 = Hand pump, 6 = Water Tankers)
3. Availability of water (1 = Within Premises, 2 = up to 200mts, 3 = 500mts, 4 = 1km, 5 = up to 2km, 6 = more than 2km)
4. Duration of water Supply in the area (No. of times in a day) (1 = More than 2 times, 2 = Two times, 3 One time, 4 = Alternative days, 5 = Once a week)
5. Adjoining Sources of Water Supply (1 = Shared Tap, 2 = Hand pump, 3 = Water Tankers)
Reasons for Using Adjoining Sources of Water
6. (a) Administrative Inadequacy (b) Easy Availability (c) Time Saving and Less Costly (d) To meet Additional Needs for Domestic Purposes
7. Overall Satisfaction from the Utility Providers with respect to ensuring Availability and Accessibility (1 = Highly Dissatisfied, 2 = Somewhat Dissatisfied, 3 = Neutral, 4 = Somewhat Satisfied and 5 = Highly Satisfied)
8. Overall Satisfaction from the Utility Providers with respect to ensuring Acceptability and Quality (1 = Highly Dissatisfied, 2 = Somewhat Dissatisfied, 3 = Neutral, 4 = Somewhat Satisfied and 5 = Highly Satisfied)
9. Overall Satisfaction from the Utility Providers with respect to ensuring Affordability of Water Services (1 = Highly Dissatisfied, 2 = Somewhat Dissatisfied, 3 = Neutral, 4 = Somewhat Satisfied and 5 = Highly Satisfied)
10. Overall Satisfaction from the Utility Providers with respect to ensuring Equitable Distribution (1 = Highly Dissatisfied, 2 = Somewhat Dissatisfied, 3 = Neutral, 4 = Somewhat Satisfied and 5 = Highly Satisfied)
11. Overall Satisfaction from the Utility Providers with respect to ensuring Accountability (1 = Highly Dissatisfied, 2 = Somewhat Dissatisfied, 3 = Neutral, 4 = Somewhat Satisfied and 5 = Highly Satisfied)
12. Overall Satisfaction from the Utility Providers with respect to ensuring Citizen's Participation (1 = Highly Dissatisfied, 2 = Somewhat Dissatisfied, 3 = Neutral, 4 = Somewhat Satisfied and 5 = Highly Satisfied)
13. Overall Satisfaction from the Utility Providers with respect to domestic water delivery (1 = Highly Dissatisfied, 2 = Somewhat Dissatisfied, 3 = Neutral, 4 = Somewhat Satisfied and 5 = Highly Satisfied)
Reasons for the poor performance of management
14. (a) Unfocused Investment (b) Inadequate Infrastructure (c) Lacking Awareness (d) Insufficient Public Participation (e) Environmental concerns not emphasized

Socio Economic Implications of Inadequate Domestic Water Delivery

Sno.	Water Shortage
1.	Severity of water shortage? (1 = Acute Shortage, 2 = Occasional Shortage, 3 = No Shortage)
2.	How long does water shortage last? (1 = No Shortage, 2 = Several hours, 3 = Several days, 4 = Several weeks)
Health Implications	
3.	Any purification method followed? (1 = Purifier, 2 = Boiling, 3 = Purification and Boiling, 4 = Nil)
4.	Any health problem associated with provision of unsafe water (1 = Yes, 2 = No)
5.	If yes, specify (1 = Diarrhea, 2 = Dysentery, 3 = Typhoid, 4 = Malaria, 5 = Cholera)
Complaint Redressal Mechanism	
6.	Approximate time taken by utility providers in answering complaints (1 = Same Day, 2 = Within a week, 3 = Within a month, 4 = Within 3 months, 5 = Within 6 months, 6 = Once a year, 7 = No action)
Economic Burden of Water Procurement for Domestic Water Needs	
7.	Economic Instruments to manage water (1 = Water Charges 2 = Informal Market Instruments-water tankers)
8.	If 2 in above, then Provision of Tankers (1 = Government, 2 = Private, 3 = Both)
9.	Frequency of water tankers (1 = More than once a week, 2 = Once a week, 3 = Twice a month, 4 = Once a month, 5 = for Seasonal shortages, 6 = For additional needs only)
10.	What amount is paid for water tankers?
11.	Incidence of burden for water procurement as recorded by sample households (1 = No Burden, 2 = Increased Burden)