THE CAUSE AND EFFECTS OF WATER SHORTAGE IN UKHRUL DISTRICT, MANIPUR, INDIA

ABSTRACT

Water is an essential element and fundamental natural resources of human survival. It is a vital and inextricable part of human existence for the socio-economic development of the people of Ukhrul district. The methodology employed includes in-depth interviews, questionnaires, discussions, transient walk and field observation. Purposive sampling was used to select the localities and simple random sampling was used to select 500 respondents for the study. Data collected were analysed using SPSS 27. This paper investigated the socio-economic issues hindering water accessibility in Ukhrul town. The identified significant water sources ponds, springs, and the distribution system such as public hydrant, household pipeline and water vendors. The household pipeline in the study areas is not reliable because the water did not flow regularly and the respondents believed that available water is inadequate. Residents face acute water scarcity every year since the majority of the water sources dry up during the dry months from December to May. Scarcity of water has affected the daily lives and residents are now required to procure water from the dry-up ponds. The scarcity has been exacerbated by the population rise, inadequate water sources, lack of infrastructure and most importantly deforestation that has encroached upon habitats and forest cover, exacerbating the effects of climate change. It requires the concerted efforts of stakeholders and community to develop integrated approaches to overcome the multifaceted nature of water scarcity.

Keywords: climate change, socio-economic, sustainability, Ukhrul, water scarcity

1.INTRODUCTION

Water is one of the most indispensable resources not only for sustaining life but the backbone for a vibrant and healthy society. Water is the essential natural resource for sustainable development and quality of life and access to water is the basic fundamental human rights, however it is unevenly distributed among the populations of the world. Water covers 70% of the Earth's surface, but only 3% of water is fresh water, of this only 1% is usable which is locked in glaciers, ice caps, rivers, lakes and aquifers (Bharucha, 2005). Water scarcity has been a persistent issue in many regions of the world for decades (Marshall, 2011; Ogendi & Ong' oa, 2009). The study discovered that at least one month of the year, almost 4 billion people, or two thirds of the world's population, suffer from acute water scarcity[32,33,34,35]. Of those, China and India account for over half of the population (Mekonnen & Hoekstra, 2016). It is estimated that 2.8 billion people globally face water scarcity for at least one month of the year (Nivithra and Sreeya, 2019) and by 2050, more than half of the population (57%) would undoubtedly reside in places where there is at least one month of water scarcity annually (Boretti and Rosa, 2019). Economic growth and social cohesiveness are severely hampered by water shortages. According to (Ingrao et al., 2023) freshwater, lakes and aquifers have emerged as the central topic of discussion regarding water scarcity worldwide, as they form the integral component of the ongoing competition to use water to meet social and environmental needs.

According to UN Water, Water scarcity is defined as the point at which, under existing institutional arrangements, the combined influence of all users affects the quantity or quality of water to the extent that the demand from all sectors, including the environment, cannot be adequately supplied (UN WATER, 2005).

Water shortage is used to describe a situation where levels of available water do not meet the minimum water demands for the people.
Water resources refer to naturally occurring water resources that could be used as source of water supply.
A water distribution system is a part of a water supply network with components that carry potable water and transport the water from the treatment facility to the consumers such as household pipeline connectivity, public hydrant or community tap and water vendors.

1.1. Physical and economic water scarcity

Physical scarcity occurs when the demand for water exceeds its supply. According to the Food and Agricultural Organisation (FAO) of the United Nations ,1.2 billion people primarily in arid and semi-arid regions, experience physical shortage (Petruzzello, 2023).The lack of water infrastructure or the ineffective management of water resources in places where infrastructure is present are the causes of economic water shortage. Over 1.6 billion people are estimated by the FAO to be affected by economic water scarcity (Petruzzello, 2023). Water scarcity is defined as having an annual per capita water availability of less than 1000 cubic metres, while water stress is defined as having an annual per capita water availability of less than 1700 cubic metres (Press Information Bureau (PIB), 2022).

1.2. Socio economic effects

In addition to being a vital environmental component for all living things, water also plays a significant part in the economic and social progress of the human population (Aromolaran et al., 2019). Water accessibility and availability are inextricably linked to socio-economic development, which encompasses advancement in the economy, well-being of people, and quality of life (Israilova et al., 2023). As the population grows and per capita consumption rises, there is a growing pressure on water resources to meet the needs of households, industry, and agriculture. There are significant social and economic repercussions from water scarcity (Israilova et al., 2023). The imbalance between water availability and demand increases water scarcity and results in stress in societies (Bharti et al., 2020). Depending on how water is managed, when in excess or scarce, it could lead to destruction, misery and death (Rice, 2015). On the other hand, with proper management, water may be a tool for development and growth. Reducing poverty and enhancing the well-being of individuals can be facilitated by the adequate use of water (Kingsland, 2021) since all ecosystems on the world are built on water (Durrani, 2020). Sustainable use of water and an adequate supply of water while preserving the environment are global issues (Chopra & Ramachandran, 2023).
Due to excessive groundwater extraction, essential water supplies have run out. Aquifer and water source replenishment are disrupted, and unpredictable rainfall patterns are the results of climate change, which makes the already dire condition of water scarcity worsened. In addition to it, several obstacles including population growth, rising water demand, ageing infrastructure or inadequate infrastructure hindered the access to water (Angelakis et al., 2020). The condition is further exacerbated by inadequate infrastructure and poor management. Water scarcity has rendered children more vulnerable, affecting their education to an extent where children in certain places skip school in order to get water (Mulwa et al., 2021). When there is a scarcity of water, the burden becomes heavier on the people engaged in the collection of water.
One of the most pressing challenges residents are facing is the scarcity of water in Ukhrul town, the headquarter of Ukhrul district. The water supply of Ukhrul town is drawn from two sources of Shirui village, Ukhrul district. The new supply is drawn from Namra kong and kokthi kong, located 16 and 18 kms respectively from the Treatment Plant Phungreitang, Ukhrul town while the old source is still being maintained from the Singuira stream. However, there are roughly 1,500 households pipeline connectivity in Ukhrul town, according to the data from the Water Supply Department dated April 2022. The daily demand of water stands at 27 lakh litres whereas, only 3 to 4 lakh litres are able to supply twice in a week (Chiphang, 2024). This imbalance in demand and supply of water has made daily activities of the people terrible. Inadequate water resources affect households' socioeconomic activity in addition to their daily requirements. Direct or indirect effects may be seen in the results of socioeconomic activity(Isa et al., 2022).

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1.2. OBJECTIVES

The paper strives to achieve specific objectives-

- To identify the available water sources in the study area
- To examine the accessibility of the water sources and its procurement
- To identify the causes of water scarcity in the study area
- To determine the effect of water scarcity on the livelihoods of the people

2. METHODOLOGY

2.1. Description of the study site

This study was carried out in Ukhrul town, the headquarter of Ukhrul district in Manipur, located in the northeastern region of the state of Manipur, India. Ukhrul district covers an area of 4544 sqkm which is 26% of the total geographical area of the state Manipur located at 94.37°E (latitude) and 25.12°N (longitude). It is 1,662 metres (5,453 feet) above sea level on average. Ukhrul has sub-tropical monsoon type of climate and the temperature varies between the maximum and minimum of 3°C to 28°C. The Tangkhul tribe is concentrated in Ukhrul district. The state flower of Manipur, Shiroi Lily, *Lilium macklinae* blooms only in the hills of Shirui village, Ukhrul district. The migratory Grey-sided Thrush, locally known as 'Shiri' travels from Siberia and other frigid European countries, is drawn to the Shirui hill (Nakhedei and Roy, 2024).

2.2. Research design

This paper investigated the socio-economic issues hindering water accessibility in the Ukhrul town, Ukhrul district Manipur. The study was conducted using a combination of mixed-methods, quantitative and qualitative approaches, including a comprehensive study of the relevant literature and study design. (Creswell, 2011) further revealed that mixed-method research is a theoretical framework that provides direction on gathering and evaluating data from several sources in a single study. Given the nature of the subject, it is essential to use a mixed method approach in order to evaluate the socioeconomic challenges and status of accessing water can be analysed in a comprehensive manner (Adom et al., 2023).

The present research was carried out in five localities of Ukhrul town, Ukhrul district, Manipur. The data for the present research was derived from the primary sources in the water scarcity localities- Alungtang, Seipet-Ramlung, Khamphasom, Awontang and Vashingtang. The sites represent a diverse geographical coverage and suffers water scarcity.

Purposive sampling under non-probability sampling technique was used to select the localities based on the diverse geographical coverage and suffers water scarcity. The household's survey was conducted through simple random sampling. The study was conducted with 500 respondents for the study where 100 respondents are recorded each from the selected localities. The data collection process was done in the years 2020 and 2022.

The key informants were conducted with the officials from the PHED, Government of Manipur, and the local community leaders, members of the community, respondents from the selected localities, selected through purposive sampling. Personal interviews were carried out with the locals, and the study incorporates transient walk and personal field observation.

Demographic variables are taken into consideration. The dependent variables are the sources of water, the challenges, the issues, the impact of water scarcity. causes of water scarcity.

In order to obtain primary data, the researcher conducted interviews with local respondents, the officials and engineers from the Public Health Engineering Department, Government of Manipur. The obtained primary data on water scarcity were triangulated using secondary reviews.

Secondary data includes journals, newspapers, and relevant literatures. The secondary data concerning to the study have been collected from the office of the Public Health Engineering Department, Ukhrul and Divisional Forest Office, Ukhrul, Government of Manipur.

SPSS version 27 was used to analyse the data.

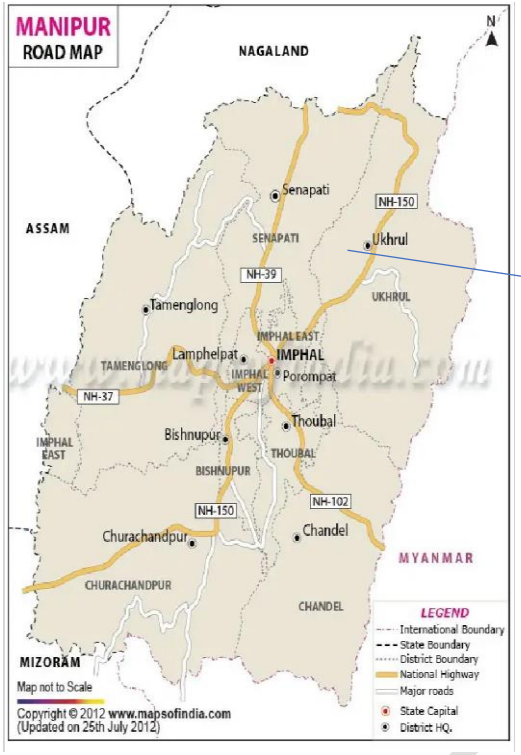

Figure 1: Map of Manipur

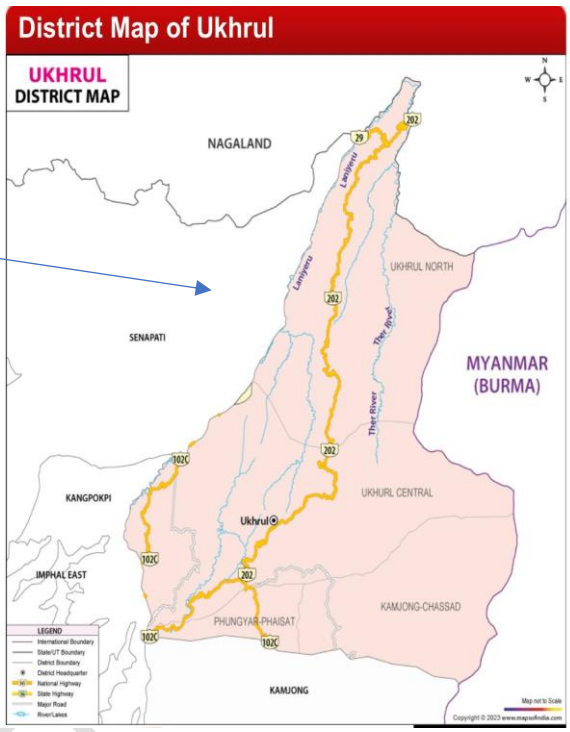

Figure 2: Map of the study area

3. RESULTS AND DISCUSSIONS

3.1. Water resources in Ukhrul town

Table 1: Water sources and distribution systems

		Responses		Percent of Cases
		N	Percent	
Watersources[a]	Household pipeline connectivity	100	11.6%	20.0%
	Public hydrant from the springs	186	21.6%	37.2%
	Ponds	376	43.6%	75.2%
	Springs	37	4.3%	7.4%
	Water vendors	163	18.9%	32.6%
Total		862	100.0%	172.4%

a. Dichotomy group tabulated at value 1.

The main water source available in the study areas is the ponds, and major distribution systems such as shared community tap or the public hydrant, water vendors are identified. Table 1 shows the sources and distribution systems of water available in the study area. The frequency table of multiple response set shows that 75.2% and 37.2% are the most important water source and distribution system of water for the households, i.e., pond water which is owned by the community and shared community tap water or the public hydrant. We can say that 32.6% of the households purchase water from the water vendors and only 20% has the household piped connection. The pipe water in the study area is not reliable because the water did not flow all the time from the water supply. The study area received water twice a week during the months of December to May, daily in the months of June to September and three to four times a week during the months of October and November. Due to the uncertainty about the frequency and length of the water supply, which is available for 2-3 hours per day, gathering 8-10 buckets of water that is equivalent to 80 litres-100 litres per households has turned into a nightmare. Ukhrul town has no permanent rivers and even the available streams dry up during the dry season. However, there are few seasonal springs which flows and serves as a freshwater resource for 7.4% of the households.

Spring water, streams, lakes depend on the weather condition which we cannot predict and determine. The alteration in water balance parameters, which in turn affects water recharge and storage capacity, is partly caused by the hydrological impact of global warming (Ayeni et al., 2013). Consequently, the surface water's ability to provide rural areas with water is reduces when rainfall decreases and, eventually, surface water levels drop. This increases water scarcity and causes water insecurity in the communities (Aromolaran et al., 2019). The change in climatic condition, to some extend may have a significant impact on surface water availability, the increased temperature leads to an increase of evapotranspiration (Aromolaran et al., 2019).
For the effective and sustainable livelihoods, these water sources are not sufficient to solve the problem of water scarcity in the study area. Both groundwater and surface waters supplies will not be sufficient to meet future requirements, thus, water conservation and the construction of alternate sources of water are now essential.

3.2. Distance, accessibility of the water sources and its procurement

Access to water source is the basic human right. According to WHO, the water source must be within 1000 metres and the time for collection should not exceed 30 minutes (UNDESA, 2010) and each person requires 100 litres per day and each household's requirement is 400-600 litres of water to ensure the most basic needs for a healthy existence (Ki-moon, 2005). Figure 2 shows most of the residents travelled within 500-1000m to access the domestic water. In addition to that, the interviews with the respondents revealed that accessing to water especially during the dry months from November to May, the residents are compelled to walk for several distances in scorching heat to fetch water for their daily use and spent their valuable time, forming queues before sunrise for their turn to get few buckets of water.

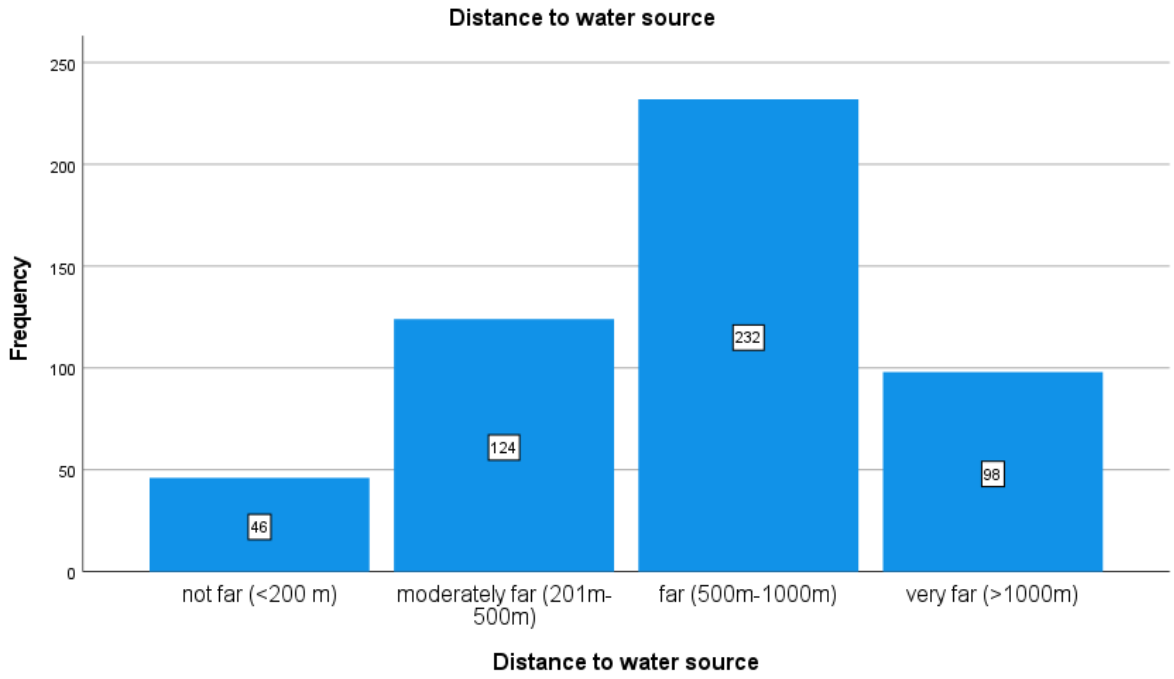

Figure 3: Distance to water source

Family sizes influence the water consumption of water of households; therefore, information about the family size of the respondents is necessary. The majority of the respondents (56.8%) in the study area were within the family size of 5-8, as shown in Table 2. The daily requirements of water in the households with larger family sizes would be more compared to homes with smaller family sizes and the effects on the socio-economic activities (Isa et al., 2022).

Table 2: Family Size

		Frequency	Percent
Valid	1-4 members	211	42.2
	5-8 members	284	56.8
	9-12 members	5	1
	Total	500	100

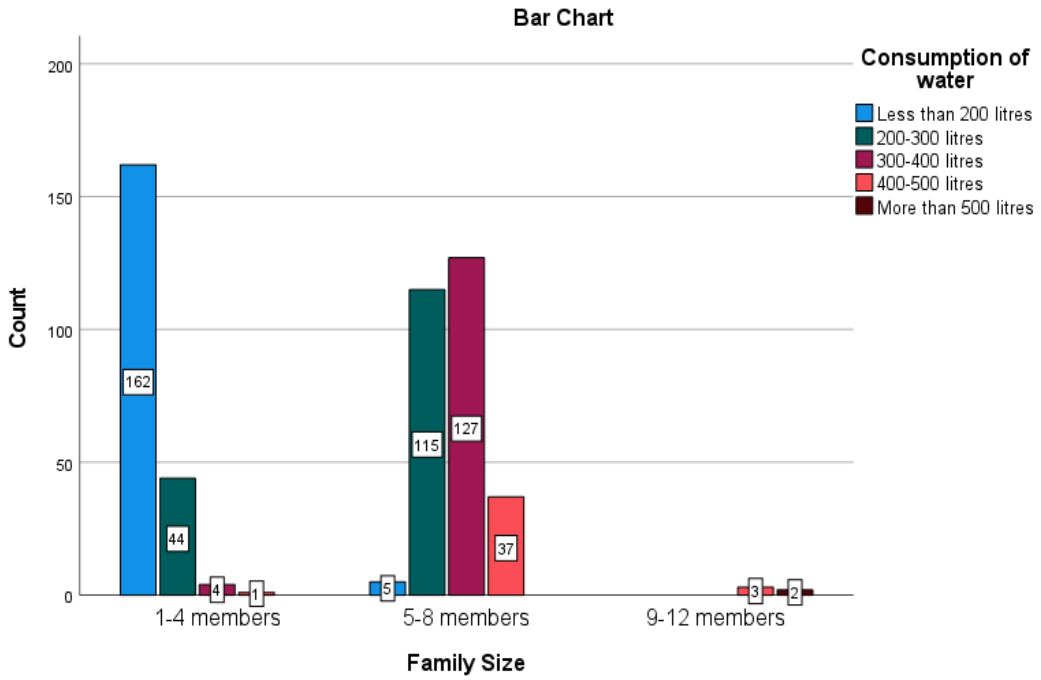

Figure 4: Consumption of water by family size in litres

It is clear from the figure 4, consumption of water depends on the size of the family. However, it is evident that households do not obtain enough water and consume less water for their daily activities, which subsequently hinders the smooth functioning of life.

3.3. Causes of water scarcity in the study area

Table 3 shows that most of the respondents 34.4% indicated that poor infrastructure or lack of infrastructure was the cause of water scarcity in the study area. The next factor that followed this was inadequate water sources 25.4%, and 21.8% believed that change in climatic conditions over the years has resulted in the scarcity of water. Information gathered from oral interviews revealed that the distance to the source or inability to access accounts 10.2% because some private ponds are located quite far, privately owned and has locking system. The existing water sources are even polluted due to lack of maintenance and the mindless attitude of the people while collecting water, 23% of the respondents complained of pollution. 3.6% of the respondents suggested that the population rise in Ukhrul town had a serious effect on the availability of water sources. Migration of people from different villages to Ukhrul town is one significant indication of population rise in the district headquarter, Ukhrul. The population from 27,187 in the 2011 rise and estimated to be around 32,564 in 2022. The study also projected that the population of Ukhrul town is increasing at an average rate of 1.8% per annum. The migration of people from the villages to Ukhrul town seeking better prospects and means of subsistence is one reason contributing to the population growth. Lack of access to adequate water is one of the major challenges among the residents in Ukhrul town. With the increase in population, the demand for the water both for their daily sustenance and livelihoods also increases. The pressure on the water resources increases due to growing population as the demand for the water increases (Aromolaran et al., 2019).

From the study it was observed that majority of the respondents spend most of their time looking for clean water in instead of engaging in different economic activities. This result was quite similar with the findings of (Jonah et al., 2015), which believes that lack of access to water would have an impact on the livelihoods of the people and that changing the vicious circle of poverty can be challenging.

Table 3: Causes of water scarcity identified by the households in the study area (frequency)

	Frequency	Percentage

Valid	Poor infrastructure/lack of infrastructure	172	34.4
	Inadequate water resources/ dry state	127	25.4
	Climate change	109	21.8
	Pollution	23	4.6
	Inability to access/ distance	51	10.2
	Population rise	18	3.6
	Total	500	100

3.4. The effects of water scarcity on the livelihoods of the people

People are impacted by water scarcity in several ways, and one aspect of their lives that has been affected is their livelihood activities. For various activities water is required for their livelihoods. It is clear from the Figure 4, 46.8% or 234 of the households are below the average income. Higher household income has access to clean and freshwater, because they could purchase water from the water vendors regularly. On the other hand, households having low income could not afford the cost of clean drinking water, compelling them to depend on water ponds despite the challenges they faced while procuring water. It was established that while access to water is challenge in general for the entire population, lower income households are impacted and linked to water insecurity as well (Adom et al., 2023). The findings is in line with the work of (Adams et al., 2016), which stated that low-income households is generally associated with less access to safe and clean water. Residents are battling water scarcity and a skyrocketing rate for water from the private tankers. The private water distributor in Ukhrul town seems to charge ₹900 for 1500 litres on average. The fact that certain water sources require suppliers to pay taxes has caused water rates to increase even further. The distributor charged ₹1500 for 1500 litres of water during the dry months of December through May. This is practically costly; hence water has become a pricey commodity and difficult to obtain by majority of the people. Most respondents had a similar reasoning, people having a low income are limited to access safe water, stating that greater educational attainment increases a person's chances of landing a well-paying job and having enough money to pay for increased access to clean, safe water (Deck & Roy, 2019; Muazzinah et al., 2020).

Women constitute 62.6% of the respondents agreed that, women are responsible for managing and procuring water for their households. In addition to that, women are often perceived higher consumption of water than men because women carry out more water related activities. Women and children are often engaged in fetching water and they face the worst implications of water scarcity. Water scarcity increases concerns regarding personal safety of women and educational setback for the children. This finding is further expanded by (Graham et al., 2016) that women do not have time for other productive activities.

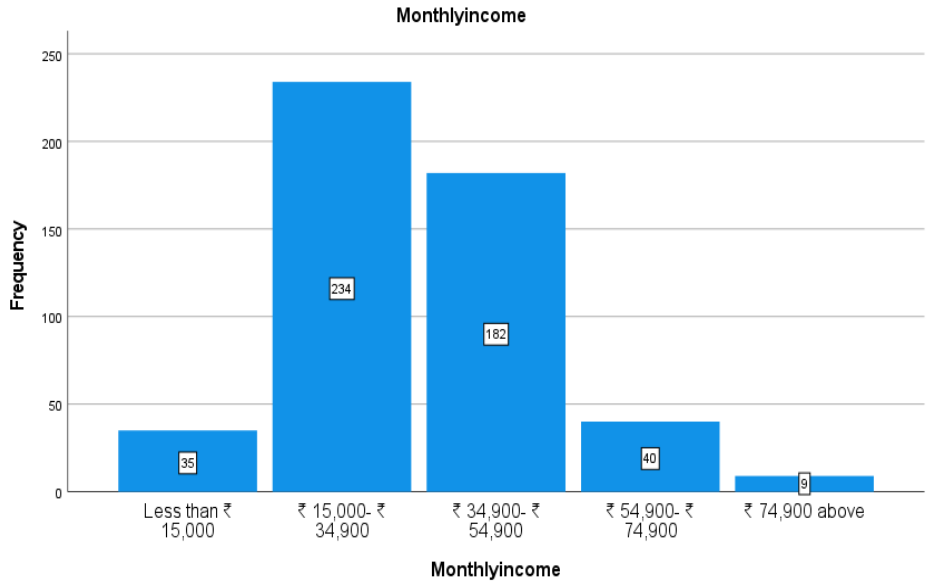

Figure 5: Monthly income of the households

4. CONCLUSIONS

Access to water is an everyday struggle for majority of the residents in Ukhrul town. Water scarcity is severely constrained by lack of infrastructure, inadequate water sources, climate change and distance to the source. The available water for households in the study area is inadequate. Residents face acute water scarcity every year since the majority of the water sources dry up during the dry months from December to May. The residents are negatively impacted by water scarcity primarily in their socio-economic activities, these include high prices for water from water vendors, time and distance in obtaining water and inability to meet the required available water sources for their livelihoods. Due to the uncertainty around the frequency and length of the water supply, which is available for 2-3 hours per day, gathering 6-8 buckets of water per family has turned into a nightmare. Thus, water ponds appear to be one of the main sources because the residents cannot rely solely on the water supply. Women and children are often labelled for collection of water and held responsible for obtaining water from far distances compromising household chores. In addition to this, the stakeholders ought to emphasize in improving the infrastructure, that helps minimizes water losses by promoting maintenance and encourage water conservation strategies that includes, construction of water points at localities household connectivity of pipelines. Sustainable supply of water resources needs sophisticated water management projects as per demand to changing conditions and requirements of the people. It requires the concerted efforts of stakeholders and the community to develop integrated approaches to overcome the multifaceted nature of water scarcity.

THE WAY FORWARD

The findings indicate that certain factors need to be taken into account in the context of any water governance system in order to manage water resources effectively.

- Adopting effective water management techniques, such as managing watersheds and practising rainwater harvesting can help replenish water sources.
- Integration of water resources with a focus on proportionate distribution and ecological sustainability should be employed to regulate the supply and demand of water.
- Municipality must increase support to provide small-scale water suppliers to increase access and rural communities and the water supply department. Our findings recognised that water accessibility in the town cannot be achieved if the government work without the effort of the communities.
- Construction of rainwater harvesting technology must be encouraged for collection and storage of rain water for direct use during shortage of water.
- Reuse of water can be an adaptation solution too water scarcity in Ukhrul town. Waste Water Treatment Plant can be set up with reliable and new upgradation.
- Restoration of eutrophic aquatic ecosystem in a sustainable way can be an approach to restoration of water sources such as ponds.
- The government can take an integrated pond conservation approach to restore the ponds at the local level.

Figure 6: Various water sources for the collection of water

Figure 7: Water source

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