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STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESIS (ES)

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

RECOMMENDATIONS/SUGGESTIONS

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- Garg, Bhavet (2011): Towards a New Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

THE CURRENT STATUS AND FUTURE ECONOMIC IMPACTS ON DRINKING WATER WITH SPECIAL FOCUS ON CHENNAI METRO CITY

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ABSTRACT

"WATER" from an economics stand point has a different insight from the other commodities as its cost depends on multiple parameters such as availability, quantity and quality. Chennai, being a rapidly growing metro with huge floating population but with limited water resource, always leading the scarcity chart against other metros across the country, giving water a special commodity status as "scarcity leads to investment opportunities". With this situation, the authors did a detailed survey through direct interactive survey with chennaites sampled across the city with in Metro boundary to conclude on how drinking water is spent by Chennai Metro populations. The survey questioner designed in such a way to gather information on how every single Chennaite spend their drinking water and their economic impact. The questioner focuses on to understand the response from public on the quantity of water utilized and other information's like drinking water resources, expenditure on drinking water and reliability of their household water resources. This article highlights the water resources of Chennai city, the economics involved in drinking water, the presentation on the survey findings and finally with the authors conclusion.

KEYWORDS
water economics, cost analysis.

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INTRODUCTION

The Chennai Metropolitan Water Supply & Sewage Board (CMWSSB) [1] monitors and controls the metros water system adhering to IS10500:2012 [2] standard for drinking water. Already Chennai is squeezed with population of approximately 10.6392 Million [3], adding to that the alarming finding is that thee population growth rate of Chennai is high than the many metropolitan cities with yearly growth of 0.3232 Million based on recent statics. Against this background, CMWSSB faces one of the toughest challenges providing drinking water supply to its inmates. Moreover, ground water in Chennai is unfit to consume directly due to the high presence of Total Dissolved Solids ranging from 550 to 3000 mg/L sampled from different parts of the city.

In this uncontrolled scenario, to meet the demand of drinking water and at the same time to adhere to the standards, the government is forced to align with private bodies on support services like the water transport, treatment, maintenance of water resources has made the water costlier. This situation is clearly described by the words of Adam Smith in the book chapter 4 of "Wealth of the Nations" [4]. "Two thousand before Smithy, Plato describes that "only what is rare is valuable, and water, which is the best of all things. …is also the cheapest" [5]. Though the present scenario is not matched with the sentence in terms of "Cheapest". At extreme draught times, railway forces are pushed into service to drag 100s of water wagons from different parts of the state making headlines to create psychological water scarcity fear, which adds additional economical value to water.

The difference between the economic value and the market price of water is clearly described by the ward and Michelson (2002) as "Water has economic value only when its supply is scarce relative to demand. Whenever water is available in unlimited supply, it is free in the economic sense. Scarce water takes on economic value because many users compete for its use. In a market system, economic values of water, defined by its price, serve as a guide to allocate water among alternative uses, potentially directing water and its complementary resources into uses in which they yield the greatest total economic return" [6]. These words exactly reflect that the market value is directly proportional to water scarcity and why drinking waters market graph is shooting up against money.

LITERATURE REVIEW

Hicks (1939), Henderson (1941) discovered a way of characterizing the tradeoff that underlies the economic concept of value [7]. When one says that a person is willing to exchange X for 50 units of Y, this could mean either (i) the person would be willing to give up (pay) 50 units of Y to obtain X or (ii) the person would accept 50 units of Y to forego X. The first uses maximum willingness to pay (WTP) as the measure of value, and is the measure mentioned by Dupuit and Marshall and analyzed by Hicks (1939). The second is the new measure that was suggested by Henderson; it uses minimum willingness to accept (WTA) as the measure of value. Together, these exhaust the logically possible ways of expressing a tradeoff. Hicks (1942, 1943, 1946) analyzed the relationship between them in the case of a price change and showed that they differ by an income effect. Water scarcity and economic factor pushes Chennaites to accept and pay for it based on his buying capacity. Commodity water is priced to target people with different buying capacity and income range, where water at low cost must compromise on standards, quality and quantity.

Hicksian analysis and its modern formulation in terms of duality theory carry over from the valuation of market goods to non-market items. Maler's analysis also provides a formal justification for the field of non-market valuation, including the monetary evaluation of the natural environment. Economic valuation deals with the valuation in monetary terms of items that people might care for. The alternative approach, first suggested by Ciriacy-Wantrup (1947), is to interview people and elicit their monetary value; this became known in economics as the contingent valuation (CV) method [8]. Survey helps in getting to know chennaites varied expectation on drinking water, their knowledge on the available water resources, various purpose for which it is utilized and their buying capacity.

Non-market valuation applies the same notion to items that are not sold in a market. It is important to emphasize that the Dupuit-Marshall concept of economic value carries over to such items. This is because, even for something that is not sold in a market, it is still meaningful to conceptualize the economic measure of the satisfaction from the item as the monetary amount which the person would be just willing to exchange for the item if it were possible to make such an exchange. In effect, this generates a monetary measure of the change in the person's welfare by using the change in the person's monetary income that she would consider equivalent to the item in question in terms the overall impact on her satisfaction.

The Authors Weisbrod (1964) and Krutilla (1967) started from the premise that some of people's motives for valuing the natural environment may differ from those for valuing a market good [9]. People may value the natural environment out of considerations unrelated to their own immediate and direct use of it. Weisbrod focused on uncertainty and what became known as "option value": some people who do not now visit a national park, say, may still be willing to pay money to protect it from destruction or irreversible damage because they want to preserve their option of visiting it in the future. Krutilla focused on what became known as "bequest value" and "existence value." With bequest value, the notion is that some people would be willing to pay because they want to preserve the park for future generations. With nonuse value, the notion is that some people would be willing to pay even if they knew that neither they nor their children would ever visit it; in Krutilla's example, people may" obtain satisfaction from mere knowledge that part of the wilderness in North America remains." These are legitimate sources of value, Krutilla and Weisbrod felt, but they would not be respected by private managers of the environmental resource. Nor would they be adequately measured by a conventional revealed preference analysis such as the travel cost method. Consequently, some other method of measurement is needed.

The first significant application was by Davis (1963) which dealt with the economic value of outdoor recreation in the Maine woods; to measure this Davis interviewed a sample of hunters and recreationists and asked how much more they would be willing to pay to visit the area [10]. The next application was by Ridker (1967); to measure the damages from air pollution, Ridker included some questions in a survey [11]. In 1969, a steady stream of CV studies began to appear in the economics literature. Official recognition was given to CV in 1979, when the US Water Resources Council included it along with travel cost as recommended methods of non-market valuation. In consequence, since the mid-1980s it has not been acceptable in the US to perform an economic assessment of a major water project without including some nonmarket valuation of the project's environmental impacts. It should be emphasized that the use of non-market valuation applies to positive as well as negative environmental impacts of water projects [12]. In 1985 Young made a survey to identify the water impact on economy of the different people living standards [13].

In recent times, author spulber (2012) written a book to describe the role of private sectors in the drinking water supply chain [14]. The author booker (2012) written a book about the policies on the drinking water and its economic impact in the country economy [15]. The economic value of the water described by the author Haavisto (2018) with respect to the allocation of water for agriculture and drinking purposes [16].

The literature clearly shows the water is not commercial market product, not a private good to sell, but it impacts the economy of the system. The literature suggest that the interview method or survey will gives the best results to identify the economic value of the non-market goods such as natural resources. So, in this work authors used a survey method to identify the economic value of water in a specified location in Tamilnadu i.e., Chennai city.

OBJECTIVE

The prime objective of the study is to analyse the current status and future economic impacts on drinking water with special focus on Chennai Metro city.

RESEARCH METHODOLOGY

The study is based upon the secondary data available on the websites, books & journals.

WATER RESOURCES OF CHENNAI CITY

Before the modernization of the city kick started, non-perennial rivers Adyar, Kosasthalai and Cooum which flow through the Chennai and drains into Bay of Bengal were once upon a time, good water resource for Chennai. Adding to that the British made Buckingam canal intersects all these rivers and connects them with the northern backwaters and the southern backwaters of the city in order to act as a good flood control system as well as supporting the ground water table where ever they flow through the city. However, the rivers were polluted with zero sewage treatment as the city lacks an effective liquid waste management system. This transformed the rivers gradually into huge gutters.

Huge Wetlands like Pulicat Lake, pallikkaranai, Kattupalli, Jheels around manali and madhavaram, Estuary Creek's of Adyar either shrinked and silted or converted into waste dump yards to make them literally horribly contaminated. These wetlands could have been a great resource to refill the groundwater recharging capacity of Chennai if they had been well preserved. Successive governments tried their best to get water through pipelines from perennial lakes like Veeranam with main aim to increase the water supply, but this project failed to supply the needs though they have greatly reduced the dependency on distant source.

Chennai has massive lakes in the form of Poondi (3,231 Mcft), Sholavaram (881 Mcft), Red Hills (3,300 Mcft) and Chembarambakkam (3,645 Mcft) to leverage the storage service for Chennai people. Telugu Ganga project which gets water from the river like Krishna River in Andhra Pradesh, has also contributed it's share in adding its water supply to puzhal lake. Minjur and Nemili sea water desalination plant has been constructed to increase the future demand in water supply, both plants are working from 2010 and 2013 and one more plant has been planned. More over Chennai is expected to face a huge deficit of water around 713 million liters per day (MLD) as the demand is expected by 2.248 (MLD) and supply estimated only at 1.535 (MLD) in 2026. In 2017, the total volumes of water resources were 339 million cubic feet (mcft) and the groundwater recharge was 170 (mcft).

The expectation from people of Chennai on expansion of Chennai Metropolitan Area (CMA) that has nearly 4100 of new water bodies, which has an effective storage capacity of150000 million cubic feet could go vein if not planned wisely. Recent awareness programs have kick started the rain water harvesting units mandated at every household with a heavy and consistent monsoon rains are contributing their part in increasing the ground water table.

The water storage level will be various between different regions of the city. It was classified as sandy, clay and rock areas. Sandy coastal belt covering New Washermenpet, George Town, Manali, and Besant Nagar in this area water level stood between 5m to 6m in 2012. Clay layer areas like Porur, Kolathur, Pulianthope, Ambattur, Sholinganallur, K K Nagar and Virugambakkam stood at 5.5m to 6m in 2012. Guindy, Perungudi, Taramani and Velechery, considered as hard rock areas, stood at 6.5m in 2012. Unfortunately, compared to other areas, recharge and dip in water level is much faster in sandy and hard rocks area.

The level of water and its quality was consciously checked by Metro Water and it supply water from 145 wells spread across the vast city. From 2012, the approximate water level in Chennai falls between 5 and 6 meters. The water demand will be very high at the time of June when there is a low supply of water. During January the time of north east monsoon the water supply and the ground water level will be increase by 1.5m to 2m.

According to a study done by Ernst and Young, Chennai was given a high score in the working ratio in utilization of water, by measuring their operational efficiency, financial health and stability. This is what measured by most of the other Indian cities and by this standard, this it still a poor working ratio. The Chennai Corporation started the construction of 5000 rain water harvesting structure in and around the storm water drains during 2012.

ECONOMIC VALUE OF WATER

By comparing other commodities and other utility of services, the money which is spending for water is very high and it leads to insufficient in supply. Water, with its heavy weight, expensive to transport compare to its value per unit of weight. The transportation facility for water is very less extensive than that for more valuable liquids such has petroleum. Let us quickly do a comparison between commodity electricity and water. Both are expensive to transport but it can be stored easily, although the shortage problems of electricity and water are handled by different strategy. If there is a sudden shortage in supply with electricity it will be immediately solved by improving power over the grid for resources that could be 1000 million distance away or more. But, with water there is no comparably interlink transportation grid and even if it is there it takes longer to move comparably large quantity of water. Still, this type of storage can help to resolve unexpected demand in the period of peak use.

Another exclusive economic feature is that water supply is highly exceptionally capital intensive compared not only to manufacturing industry but is also used for other public utility. In country like US it is the best i.e: for the ratio of capital investment to make income for the longer than in electricity for tele communications. Similarly, the capital assets which is used for water supply neither be shifted to other locations nor it can be reused for any other purpose. Thus, they show an extreme type of fixed non- malleable capital. Moreover, the physical capital in the water industry is always long term. The infrastructure which relates to surface water storage, transportation and the pipe networks in the streets can have more economic life such as 50 – 100 or more years, such longer period over that of capital employment is a must in manufacturing industry or in other public utility sectors.

In addition to water supply and sanitation there are many significant economics components. Especially for the storage of surface water at any given specific dam site, due to increasing the capacity of the dam one can majorly reduce the unit of cost for storing the water. The ground water source is different in the economics of scale in production are much less noted. There are many other ways to treat convenience of drinking water and waste water in the economics of scale.

The capital power and economics of scale is related with surface water supply have been intense to economic and social implications. Water considered as natural monopoly and more likely there will be a single provider in any given area. Another difficult outcome of the capital intensity longevity of capital and economics of scale in the surface water facility is liability to what might be called as uneven or less elegant, grandness in these systems.

It is very important to note that the price which is paid by the users, reflect at best its real supply cost and not its scarcity value. The consumer pays for the capital and operating cost for the water supply by the Government. Thus, water, which is different from oil, coal or other minerals according to the US Government law, they must pay a royalty for the usage of resources. Some other countries such as European it includes England, France, Germany and Holland also impose a charge for usage of water and these payments are fundamentally administrative fee and not an estimation of the economic value of the water being used.

Water is very important for all the human, animal or plant. In economics there is a basics concept called as essentialness which formalizer this nation? This concept can be applied either to something that is basics raw material to production or some other thing which is directly enjoyed by the people as a consumption commodity. If there is an insufficient of raw material the production will be impossible. In such case, the final goods consider no amount of any other final goods can be recompense for having a zero level of consumption of the product, then it is considered as an essential commodity. Water, a best definition for essential final goods for human life is impossible without consuming 5 to 10 liters of water for per day by single person. For other sectors such as agriculture and for several manufacturing industries such as food and beverages, petrol, paper etc., water is considered as essential raw material.

For human life water is very essential, usage of water is another important way for reduce the water wastage and its gives enjoyment and satisfaction of life. Though, there are many other ways to use the water but in that mainly used for drinking propose. In modern periods water is used for bathing in tubs, water borne sanitary waste disposal, outdoor landscape and gardening, washing clothes in machine, pools, dish washer, car cleaning, waste disposal, hot tubs etc. This constant increased usage of water leads to rise of per capital household water usage and the economic value of the water.

It is clear evident that the economic value of the water directly linked with the availability of the water and its usage rate. Since last 5 years, the rain fall rate has drastically reduced in the Chennai region and water demand has increased rapidly due to the population growth, which leads to an increased per person spending amount of drinking water.

RESULTS AND DISCUSSION

In this survey made a questioner in such a way that to get an accurate response related to the water sources, usage and amount of spending on the drinking water. In 20,000 samples 96.4% are the permanent residents in same location of Chennai. The Chennai Metro water board is major supplier of drinking water throughout the city. The water supplied regular basis through the water connection and are collecting the annual water charges from the public. The Chennai metro water board is also supplying the water through the tankers with a capacity varies from 3000 liters to 9000 liters. The cost of water is depending upon the type of consumers such as domestic/commercial/Industrial. The water board plays a major role in the water supply to the each and every location in Chennai city. The amount collect from the people is on the basis of considering the water as public good and not charging cost of water. The amount paid by the users is for the construction, operation, transportation, processing, treatment and maintenance of the water bodies present in Chennai.

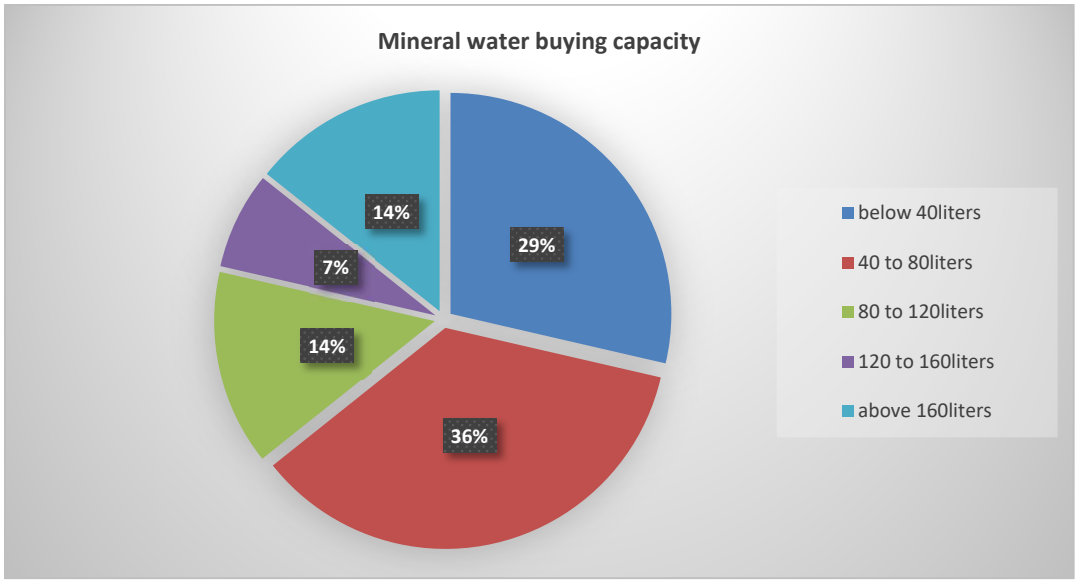
The amount of water utilization is depending on the number of members in a family. So added the number of in a family as a question to estimate the utilization of water per person. The results show that 39.3% people are 4 members in a home, 28.6% are the 3 members in a home and 14.3% are 5 members in a home remaining 17.8% are above 5 members or below 3 members in a home. The average people in a home is considering as 4 for calculating amount spending on each person for utilization of one liter of water. Among all households there is 67.9% people are having the metered metro water connection and are paying the annual charges according to the usage. The remaining 32.1% people are buying the metro water tankers having the capacity of 3000 liters to 9000 liters and above. The majority of the water tanker buyers are likely to buy the capacity below 6000liters.

The Chennai metro water supplying the water through the metered connection are not suitable to drink and it utilized for the household things. The Chennai metro is also supplying the water for the public usage by placing the storage tank in majority of city streets. The water supply is periodic in nature and this water is not suitable to drink directly. In each and every household the majority of the people using the metro water, but it is observed that they are drinking it. It is hard to hear, but the reality is different than the statistics. In this survey, directly visited the more than 500 families whose economy categorizes as poor and middle class. In that 500 houses, taken the water to drink and they gave the mineral water. Then realized that the people of Chennai city majorly depend on the mineral water for drinking purpose.

The Chennai water board supplying the purified drinking water (mineral water) through the several domestic centers maintained by government of Tamilnadu. The living people in the locality using those water purifier centers to access their quota of 20 liters per day with their proof of residence such as Smart card. But this system is successfully operated and functioning in the 40% of the places in Chennai city. So the majority of the people depends on the private mineral water suppliers than the government supplied water. The people are likely to pay money for the private bodies rather than the free mineral water due to transport reasons. That is, the private bodies' supplies the mineral water at the door steps and it is not happening in the case of government supply water.

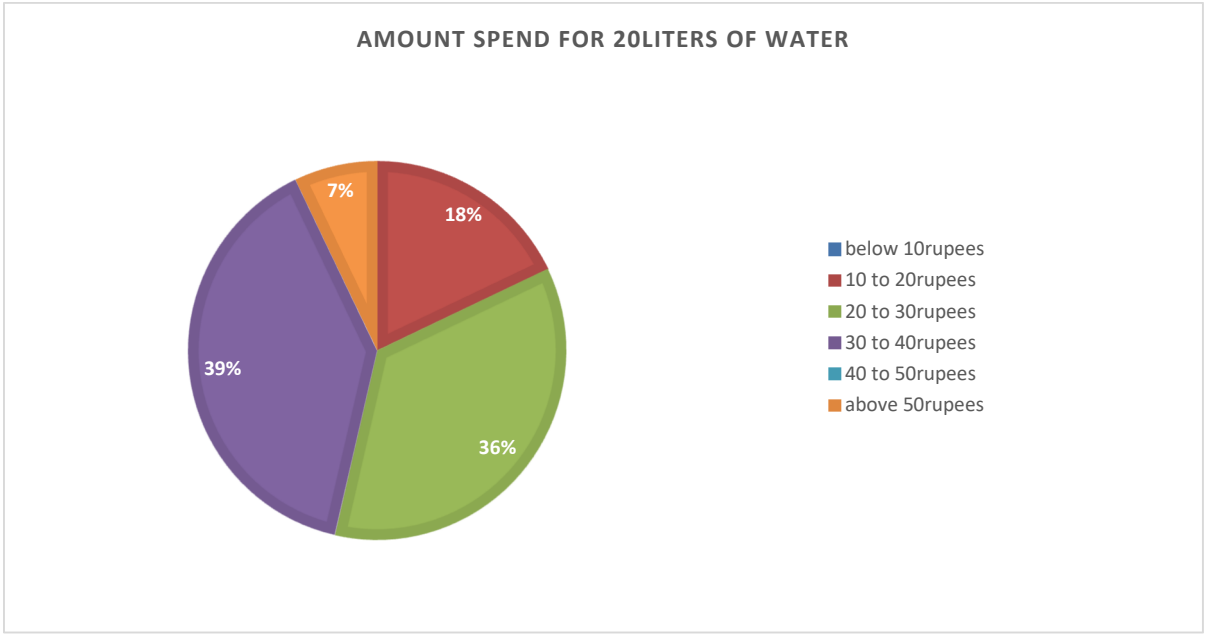
The survey results shows the 60.7% people not accessing the government supplied mineral water and are buying the water from the private bodies. The capacity of buying from all the samples are shown in figure 1.

FIG. 1: WATER BUYING CAPACITY



The private water bodies supply a water capacity of 20 liters' tin. The survey result for amount of spending on 20 liters' water is ranges from 10 to above 50 rupees. In 20000 samples, 17.9% people are spending is 10 to 20 rupees, 35.7% people spending 20 to 30 rupees, 39.3% people spending 30 to 40 rupees and 7.1% people spending above 50 rupees for 20 liters of mineral water and is shown in figure 2.

FIG. 2: AMOUNT SPENDING FOR DRINKING WATER



In some of the family's people using the purifiers to get the mineral water. The cost of investment and it maintenance made this system to utilize only 21.4% and they are spending an average amount of 300 to 500 rupees for 3 months' duration.

The above survey clearly evident that the people of Chennai prefer to drink mineral water and majority suppliers are private bodies. So the economic impact on the water industry raises drastically due to the lack of water reserves. The research studies say that each and every person needs to consume minimum of 3 liters of water for drinking. The results show the one-liter mineral water cost is about 1.75 to 2 rupees. The total expenditure on water increases 30 to 40% as compared to 2010.

CONCLUSION

The economic value of water does not depend on the commodity things. The literature suggests the interview or survey are the best methods to identify the non-market price of public goods i.e., water. The cost of water depends on its investment of reserves, transport, process and maintenance. In the present work used the survey method to find the spending on drinking water. The results highlighted are for 20000 samples lived in Chennai city. The Chennai metro playing a vital role in drinking water. But due to the people awareness and maintenance issues 67.9% of people attracted towards the private water suppliers. The economic index of a human is also depending on the quality of water accessing and amount spent to get water. The survey results show the amount spending for getting mineral water is increased 30 to 40% of the economic value in 2010 scenario. This increment is causing a huge impact on the developing sectors in the area of investments.

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