WATER MANAGEMENT INFORMATION SYSTEM

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ABSTRACT

Due to sudden change in Climatic condition, modifications to natural water flows, population, pesticides and pollution have affected various regions in one way or another which is making a very adverse effect on water. It is not just about an issue of clean water in one small remote region, it's an issue already facing billions of people in many cities and rural areas around the world. In some countries, the situations have already reached critical mass, with people disfigured and dying because of lack of quality water. It is estimated that every day, water takes the lives of over 14,000 people and the problem threatens to get even worse today in India. Same is the situation in Surat, where the Tapi river water is supplied all over the regions of Surat and the quality of water is getting poor day by day due to the water scarcity. So focusing on the problem I came up with the idea that we should keep one centre on each area of the Surat city and that centres should be given to many of the different water purifier companies and they will give two lines of water supply one for drinking water and another with removed impurities but not as pure as drinking water. So each and every region of Surat gets the water supply through their nearby allocated areas. Depending on the economic condition of any family they can take both lines of water purification or any one of them This technique leads the government, purifier companies and public all in profit and also operation research technique is used to make least cost for transportation. Using this technique we can improve the quality of water by 100% and we can save 14,000 lives every day.

Keywords: Information System, Quantitative Technique, Water Supply System and U-V Method.

I. INTRODUCTION

 A UN report published on the eve of World Water Day on Friday has warned that as many as 3.4 billion people will be living in "water-scarce" countries by 2025 and the Indian sub-continent may face the brunt of the crisis as India is at the centre of this conflict due to its unique geographical position in South Asia. Factoring in scientific data and findings of various research institutions, the report says that Asia will be the biggest hotspot for burst-ups over water extraction where water resources straddle national borders. Though the report has not specifically mentioned the possibility of country-wise conflict, it identified river basins in the region which may pit India against Pakistan, China and Bangladesh over the issue of water sharing by 2050.India has just four per cent of world's water but has to cater to 16 per cent of the global population. It has meant a steady decrease in per capita water availability. Today, nearly 50 per cent of villages do not have access to safe drinking water. By 2020, India is expected to become a water-scarce nation. Even worse, 2030 Water Resources Group estimates that by 2030, demand for water in India will outstrip supply by as much as 50 percent. India's economic growth and political stability are at stake in the coming years if it does not change its approach to water management.

The water crisis can be alleviated but to do this, a more structured way of thinking with increased momentum is required. Conserving rainwater through modern water harvesting technology is the urgent and most basic action. This should be accompanied by better use of technology in agriculture, which is the biggest user of water followed by domestic and industrial sector. So I came up with a plan of mixture of management, technology and organization to achieve the solution as to preserve water using Management Information System. The best strategy is used to achieve the aim of minimum transportation problem.

1.1 Management

The most important thing is the management without which no matter how much strong is the strategy or planning but it fails. So for these purpose there should be a construction of dam on Tapi River and the water collected in Tapi River should be supplied to all the centre of Surat as according to our strategy.

1.1.1 Strategy

The burning issue of the whole world is not getting the sufficient amount of pure water for drinking and household activities so for that problem we assign different centre for water purification all across the Surat and the water comes from the Tapi River and according to the economic condition of any family they can get different kinds of water supply. The kind of water supply given to public is of two types: one having the pure quality of water with added preservatives which is used for drinking of water and the other is water with removed impurities less.

1.1 Technology

An information technologist makes a database management system of the how much water is supplied to the centre and when it is supplied. Through the operation research technique we get the most optimal solution for transportation of water from source to destination. Through database management system we can get the information about which area require more amount of water and which area requires less.

1.2 Organization

All the data obtained from the database management are organized in the way as starting from the areas requiring high amount of water to low and this way the supply of water goes first to that area. These records are taken daily and depending on these records the analysis is done. Record of transportation is carried out every day and we choose the path as having least cost for transportation using operation research technique.

1.3 Information System

It is a combination of Management, Technology and Organization. All together are used for the purpose of analysis of any problem which is the most important role of a Manager because through analyzing these data we get the best decision from a manager. Record of the transportation cost is carried out for a day from Tapi River to some of the area of Surat. The main aim is to minimize the cost of transportation through the operation research technique. Following this technique we can obtain best results for transportation problem. Now we do the analysis part by which manager takes the decision.

II. PROPOSED ALGORITHM

5. If (all the values of $P_{ij} <= 0$)
   Then
   Optimality is reached and problem is solved.
6. Consider the most positive non basic cell as the starting point of closed loop formation.

   1. Consider only basic cells.
   2. Start with positive allocation and do alternate positive and negative allocation.

7. Identify the least allocation among negatively charged cells and subtract that allocation to it and add that allocation to negatively charged cells.

The method used to solve the Transportation Problem is u-v Method.

1. Calculate the number of basic cells in the initial basic feasible solution. Check whether the number of basic cells is equal to m+n-1.
2. If((m+n-1) = number of basic cells)
   Then

        Convert the appropriate number of non   basic cells into the basic cells.

   Else

        Go to step 2.
3. For all basic cells apply the formula of
   $u_j - v_j = c_{ij}$.
4. For all the non basic cell apply the formula
   (Penalty) $P_{ij} = u_j + v_j - c_{ij}$

2.1 Function for A Given Linear

Objective function:

$$\text{Mini } Z = \sum_{i=1}^{3} \sum_{j=1}^{4} C_{ij} * X_{ij}$$

Subject to:

$$\sum_{j=1}^{4} X_{ij} = a_i$$

$$\sum_{i=1}^{3} X_{ij} = b_j \qquad \begin{array}{l} i = 1, 2, 3 \\ j = 1, 2, 3, 4 \end{array}$$

$$X_{ij} >= 0$$

2.2 Equation of LPP:

From Tapi River Dam	Centres in Surat				Supply
	P	Q	R	S	
A	12	10	12	13	500
B	7	11	8	14	300
C	6	16	11	7	200
Demand	180	150	350	320	1000

2.3 Nonnegative Restriction:

 $x_1, x_2, x_3 >= 0$

A, B, C are the sources which supply water

P, Q, R, S are the destination which are the centre located in Surat.

P= bhestan area

Q= sachin area

R= udhna area

S= city light area

a_i= total number of suppliers

b_j= total number of demand

P_{ij}= it is a extra cost permuted because of not following minimum transportation cost is called penalty

c_{ij}= the cost of transporting one unit from origin i to destination j

x_{ij}= the quantity transported from origin i to destination j

(All the circled number are the penalty)

(All the squared number are the allocations)

III. OBSERVATION TABLE

Using u-v method / MODI (Modified Research) we have obtained the most optimal solution for the transportation problem and we took the record for a day of transportation cost from Tapi River to 4 areas of Surat. The quality of water being transported is maintained in a very good quality. We obtain the most optimal solution using operation research technique and we obtain optimal table as follows:

3.1 Optimal Table Of Given Problem Is:

| From Tapi River Dam	Centres in Surat				Supply	Ui
	P	Q	R	S		
A	(-1) 12	[150] 10	[230] 12	[120] 13	500	0
B	[180] 7	(-5) 11	[120] 8	(-5) 14	300	-4
C	(-1) 6	(-12) 16	(-5) 11	[200] 7	200	-6
Vj	11	10	12	13		
Demand	180	150	350	320	1000	

3.2 Observation

The value of the Z^*= Rs 9,440

The minimum cost of transportation is obtained as Rs9,440 which is the most optimal solution through which we supply water from source to destination. We supply water of 500 liters, 300 liters and 200 liters of water from dam to destination areas as bhestan, sachin, udhna and city light.

IV. RESULT

According to Operation Research Technique we have obtained the optimal solution for a given Transportation Problem and optimal table is obtained using u-v method and this is done for every day and the results that we obtain by applying this method is

1.   Demand in bhestan area of Surat is 180 liters which is fulfilled by dam B of Tapi River.

2.   Demand in sachin area of Surat is 150 liters which is fulfilled by dam A of Tapi River.

3.   Demand in udhna area of Surat is 350 liters which is fulfilled by dam A and B of Tapi River.

4.   Demand in city light area of Surat is 320 liters which is fulfilled by dam A and C of Tapi River.

5.   The total cost for transporting water from source to destination is Rs 9,440.

V. CONCLUSION
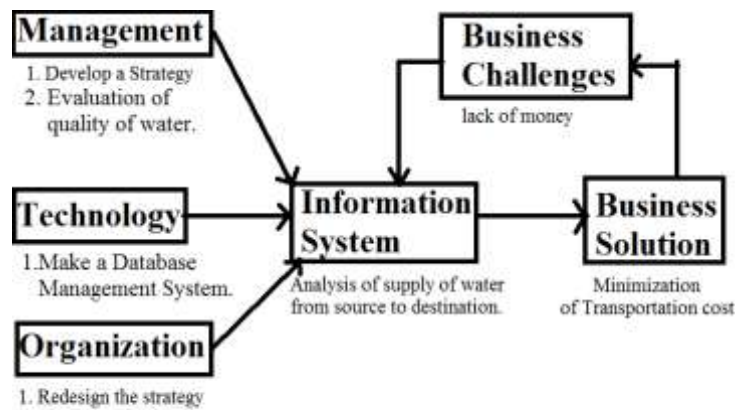
Information System consist of a combination of Management, Organization and Technology where in Management we obtain strategy to manage the water is being reached to each and every area of surat either rural or city. In organization we organize the whole data of how much of the quantity of water is being supplied and using latest Technology, operation research technique gives us the best ever solution to manage the water in a very systematic manner and this entire thing together makes an Information System. Using Information System manager takes the decision to attain Business solution which is minimization of cost but there is also Business challenge which is lack of money, so for that we are making a collaboration with all purifier companies due to which the problem of money is solved because as we give customers to all purifier companies so in return we take 30% of money on total profit. Hence we get a successful way for Water Management Information System.

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