



Water Crisis Management: Satisfaction Level, Effect and Coping of the Consumers

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Abstract. The recent global experience of the 1998 El Nino has caused a long drought in Malaysia. The lack of rainfall in the catchment areas especially in the state of Selangor has resulted the two dams that supply water to Kuala Lumpur and surrounding regions to almost critical levels. The water crisis lasted from March to September 1998 and affected 1.8 million residents. This study was undertaken to investigate the consumers' level of satisfaction towards the strategy of the water crisis management undertaken by the state water authority. The effect of the crisis and the coping behaviour of the affected residents were also assessed. Data were collected by using interview survey on 140 residents living in one of the affected regions. It was found that on the whole the residents were only moderately satisfied with the strategy of water crisis management carried out by the state water authority. They were very unsatisfied with the quantity and quality of water provided and the distance to fetch the water from the static tanks. Majority of the respondents adopted a coping strategy by prioritizing their daily activities. The crisis had affected their work and daily activities. The positive effect of the crisis was the changing attitude of the residents in appreciation of the value of water and an increase in neighbourly spirit and relationships. Underlying causes were analyzed, ways to overcome any future water crisis were discussed and recommendations were proposed.

Key words: coping, effect, satisfaction, water crisis

1. Introduction

Due to the advancement of forecasting and monitoring technology, the El Nino of 1997/98 and its effects were notified to the world in advance. It had deranged weather patterns around the world, killed an estimated 2,100 people, and caused at least 33 billion dollars in property damage (Suplee, 1999). The estimated savings resulting from its successful anticipation were in the ten billion dollar range (Hooke, 2000). Malaysia was struck by two major disasters related to El Nino effects. In 1997 the nation had to face the haze crisis, which was due to the forest fire in Indonesia that lasted from the months of July to October (Aini *et al.*, 2001). The following year, the nation had to face a water shortage crisis which lasted for almost six months starting from 27 March to 16 September. The worst affected regions were the state of Selangor and the Federal Territory.

The state of Selangor consists of 9 districts, and out of these, six districts were affected. These areas are heavily populated and many industries are located in the vicinity. The Federal Territory, which houses the capital city of Malaysia, Kuala Lumpur, is sandwiched between these regions, also succumbed to the crisis. The four water treatment plants that supplied water to these regions obtained their raw water supply from either the Semenyih or Langat Dams. Due to the long drought and the absence of rainfall in the water catchments, the water levels of both dams dropped to almost critical levels. Consequently the quantity of water released to these respective water treatment plants was regulated and their production capacity dropped to less than fifty percent.

These water treatment plants were privatized in January 1995, but the management of the water supply is managed by the Selangor State Water Authority. These two operating bodies are added to the list of many other departments, under various ministries, each operating independently according to specific functions assigned to them. The privatization scheme was implemented with the aims of improving efficiency and cutting costs. However the 1998 water crisis expose the weaknesses of the fragmented approach of the water management in the country.

1.1. THE CAUSES

On the onset, it appears that the drought and the resulting water shortage were inevitable consequences of the effect of El Nino. Studies have shown that the root causes of the seemingly natural disasters were man-made (Hewitt, 1983), resulting from choices and policies with respect to land use, engineering practices, ecosystem management and social institutions (Hooke, 2000). Similar underlying factors were found to be contributing towards water related crises in Malaysia, such as water shortages, flash floods and landslides (Chan, 1998).

According to the report by the Department of Environment (1998) there were 25 rivers (21.4%) that were polluted in 1997, a doubling of the figure in 1996. This is of grave concern since rivers are the main sources of water supply to the country. They were due to the dumping of industrial waste, domestic effluent, agriculture and livestock production processes (Environmental Quality Report, 1994). Even though currently the water supply is adequate for the nation, there is a lot of wastage on the part of the domestic and industrial consumers. According to the Malaysian Water Association and the Institution of Engineers Malaysia, an average volume of water wasted per household of five is 1,165 liters per day (Mohd Mazlan, 1998). A Malaysian consumed an average of 300 l/p/d (litres per person per day) (Chan, 2000) and this is far above the recommended amount of 20 l/p/d as recommended by World Health Organization (WHO) revised standard in 1970 (Roberts, 2000). The percentage of Non-Revenue Water (NRW) was at a high rate of 36% in 1998 and steps are presently undertaken to decrease it by upgrading and repairing the water supply system and improving its maintenance (Mid Term

Review, 1999). These are only some of the underlying factors that aggravate the stress on the water supply in the country.

1.2. THE RESPONSE

In response to the critical situation, the state government activated a crisis management approach. Committees that comprised of various government agencies, public sector and non-governmental organizations were formed at the state and district level to monitor and control the situation. The Selangor State Action Committee comprised of: the head of the various state committees (Infrastructure and Information; Village, Research & Development; Agriculture & Fishery; Industry, Investment and Local Government); State Finance Officer; District Officers; Head of various State Departments, Puncak Niaga (M) Sdn Bhd, and FOMCA. All are government agencies except the last two. Puncak Niaga (M) Sendirian Berhad is the private company that manages most of the water treatment plants in the state of Selangor while FOMCA is the Federation of Malaysian Consumers Association. The Selangor State Water Department (SSWD), who is the responsible agency for the water crisis management, activated eight operation rooms and the one at the headquarters opened 24 hours to answer any queries and complains from the public. The effectiveness of the actions undertaken to deal with the situation was monitored through various means by the SSWD; regular meetings with committee at the district level; daily video conferencing with the secretariat of the State Water Action Committee; daily reports on the levels of each dam, the output capacity of the treatment plants, the rainfall level, operation of mobile water tankers, static water tanks and information statistics that were provided to the media for the public attention and knowledge; 3 press conferences per week; and consultation with experts from various related disciplines.

According to Subramaniam (1998) there were various immediate actions undertaken to manage the situation including; water rationing, provision of water through the water tankers and static water tanks, processing of lake water using ultra-source filtration, water transfer from surrounding lakes to the Semenyih River, extraction of groundwater, cloud seeding, urgent repair of broken and leaking pipes and water saving campaigns to the public. The total expenditure in managing the crisis amounted to RM56 Million. The economic loss due to the lowering of productions by industries or in some cases even a complete shutdown of factories, the inconveniences and disruption of the people to their daily lives were unquantifiable.

The demand for water from the domestic and industrial sectors is expected to increase to 3.7 billion cubic meters (bcm) in the year 2000 from 2.6 bcm in 1990 (Seventh Malaysia Plan, 1996). The expected increase in population to 32 million in the year 2020 from the present 23 million, it will put a lot of stress on the water demand in the country. Thus it is vital that the current malpractices by individuals and other sectors and the mismanagement by the water authorities be recognized and addressed so that the water shortage will not re-occur in the future.

The previous water shortage crisis occurred in 1991 in the state of Malacca but its impact was not as severe the crisis as in Selangor and the Federal Territory. These regions are the most developed and industrialized areas in the country and are densely populated. As such the effect of the water crisis was not just regional but also of national concern and interest. Thus it is appropriate and vital to assess the effectiveness of the authority, in particular the Selangor Water Authority who was responsible for the water crisis management in handling the situation so that lessons can be learned from the event. Therefore the underlying objectives of the of the study are: a) To investigate the household's level of satisfaction towards the strategy of water crisis management carried out by the authority, (b) to identify the coping behaviour of an individual in managing the crisis and (c) to evaluate the effect of the water crisis on the awareness, attitude, financial expenses, and social relationship of the individual.

2. Methodology

Through systematic sampling, 140 households living at Taman Sri Rampai, Setapak were selected for the study. Setapak is in the Federal Territory and was one of the seven regions affected. Data was collected employing the interview survey method. The respondents were either the husband, the wife or the head of the family. The interview survey consisted of 5 parts: (1) The demographic profile of the respondents, (2) 20 questions to assess the satisfaction level, (3) 20 questions to assess their coping strategies, (4) 30 questions to gauge the effect of the crisis on the social relationship, financial expenses, awareness and attitude of the respondents, and (5) open-ended questions for recommendations. All the questions in parts 2 and 4 were 5-point likert scale weighted 1 to 5 from strongly disagree to strongly agree. Questions in section 3 were also weighted 1 to 5 from never to nearly all the time. Some questions were negatively phrased. The instrument was pre-tested and the alpha value of the reliability coefficient (post-test) was 0.74, 0.76 and 0.86 for satisfaction, coping and effect respectively. Data were analyzed using Statistical Package for Social Science (SPSS), version 6.0.

The limitation of the study was that the respondents were selected from one of the regions affected by the water shortage. Thus the results and the consequential evaluations reflect the intrinsic characteristics of the contacted people. In order to minimize this effect, the respondents selected for the study were chosen so as to represent typical affected population.

3. Results and Discussions

3.1. BACKGROUND INFORMATION OF THE RESPONDENTS

There were more female respondents (63%) as compared to the males in the study. The average age of the respondents was 43 and 88% of them married. The other respondents were either divorced males or females. Majority of the respondents

Table I. Levels of satisfaction towards the water crisis management

Score	Level of satisfaction	N	%
< 46	Low	2	1.4
47–73	Medium	131	93.6
>73	High	7	5

M = 3.1

N= Amount of respondents.

had higher secondary education qualifications. The average household income of the respondents was in the range of RM2000–2500 per month. This indicates that the residents were in the lower middle class of socio-economic status. They had an average of 4 children and about 40% of them had either one of their parents or relatives staying with them. Only ten families had a domestic helper in the house.

3.2. LEVEL OF SATISFACTION TOWARDS THE STRATEGY OF WATER CRISIS MANAGEMENT

Referring to Table I, the majority of the respondents was only moderately satisfied towards the strategy of water crisis management carried out by the authority. The average score for satisfaction level of the study was 3.1 on a scale of 1 to 5.

The least satisfied facets of the water crisis management were the distance traveled to fetch the water, the quality and quantity of the water supplied by the lorry tankers and the static water tanks. This strategy was carried out to supplement the water rationing system. According to the report of the SSWD there were only 336 water tankers and 536 static tanks to cater for 1.8 million residents, business and industrial premises. It was reported that the unsatisfactory and ineffectiveness of this system was due to many factors namely: the distance and unconducive conditions (traffic jams, narrow and inaccessible roads) of the journey, the long time taken to fill the tankers with water, the different types of housing and premises, and the lack of facilities and manpower to manage the situation (Subramaniam, 1998). The other unsatisfactory aspect was the water rationing system that was carried out whereby each specified region was provided with an alternate day of 12 hours water supply. However due to the inconsistent production of the water from the treatment plants, the rationing system did not run as smoothly as planned. In some areas, the users only managed to obtain a few hours of the water supply instead of the 12 hours promised, as publicly announced by the authority in the mass media such as television, radio and newspaper. This is reflected in the unsatisfactory rating of the respondents towards the efficiency of the water rationing system and the reliability of the information provided by the authority regarding the rationing timetable. However, the public was moderately satisfied with a mean of 3.6 towards the receptiveness and responsiveness of the SSWD personnel in

Table II. Coping strategies

Coping types	Mean value
Proper planning in the utilization of water	4.2
Prioritizing of daily activities	4.0
Changing of methods/techniques/habits to conserve water	3.1
Social support especially from family members	3.6
Information seeking	3.5

handling the queries from the public regarding the crisis. The 24 hour manning of the hotlines to answer any queries from the public was thus valuable and beneficial. In the midst of the crisis, there were a lot of promises and assurances made by the authorities and the government that steps would be taken so as to ensure that a similar crisis would not happen again. Thus the respondents rated fairly satisfied to the suggested future planning of water management in the country ($m=3.3$).

3.3. COPING STRATEGY

As depicted in Table II, the respondents became more sensitive concerning the usage of water as the result of the water crisis. They would plan their daily activities and try to conserve as much water as possible. They would prioritize their daily activities by doing the more important activities such as cooking and washing clothes while giving less consideration to activities such as taking daily bath, washing of cars and watering of plants. In order to optimize the usage of water, the respondents utilized sullage (wastewater from bathing & dishwashing) and laundry wastewater, changing their manner of washing dishes and clothes. Some of them would change their habits such as eating more frequently outside, purchasing of bottled mineral water for drinking, and sending their clothes to the shop for laundry. It was noted that during the crisis, the restaurant owners reported an increase in the number of their customers.

The respondents also received support from their family members in fetching water from the lorry tankers or static tanks. In addition, they occasionally obtained additional water from other sources such as nearby lakes. Another regularly used coping strategy was searching for appropriate information. The respondents were very vigilant and attentive to the notices given by the authority through the mass media and they would not hesitate to contact the authority to solicit explanations or requests.

Table III. The effect of the water shortage crisis

Types of effects	Mean value
Positive attitudinal change	4.3
Improved relationships between family members and neighbors	3.9
Disruption of daily activities	3.9
Increase in financial expenses	3.8
Improved awareness level	3.8

3.4. THE EFFECT

From the study, it was found that there were both positive and negative effects of the water crisis to the people. The greatest effect with a mean of 4.3 was the positive changing of attitude of the people towards the value of water, this could make them become more responsible water users in the future. In terms of social consequences, the relationships between the family members and the neighbours were enhanced (m=3.9) although the disruption to their daily life and work was quite bad (m=3.9). During the crisis, they had to buy water containers / tanks for storing water and bottled mineral water for consumption while some resorted to eating out or sending their clothes to the shops for laundry. These factors resulted in an increase of their monthly expenses. Due to the extensive coverage by the media during the crisis, the respondents reported that they are now more aware of the factors that contributed to the shortage of water and realized their roles as consumers.

4. Conclusions and Recommendations

The world was notified in advance of the effects of 1997-1998 El Nino, which had deranged weather patterns around the globe. If early warning was given attention by the authority, pro-active steps should have been taken in anticipation of the effect of El Nino. The emergency response was activated only when the water levels in the dams had reached almost a critical level. Total avoidance of the crisis might have been impossible but the severity of the crisis could have been minimized. This raises the issue of the ineffectiveness of governmental agencies and authorities in handling the matter. It was affirmed in the report of the Mid-Term Review of the Seventh Malaysia Plan (1999) whereby the government realized that there was an urgent need to improve the monitoring and management of water including rigorous continuous assessment of the water level in the dams, effective water regulating techniques and public campaigns to increase their awareness and knowledge on optimization of water usage. Even though many private companies assisted in providing lorry tankers to distribute the water (240 out of the total 336 lorry tankers), the quantity was insufficient. The respondents also questioned the

quality of the water. During the crisis, these issues were highlighted on numerous occasions by the mass media and the authority was aware of the situation but due to the lack of pre-planning of the water shortage crisis management, the problems could not be addressed satisfactorily. It was fortunate that there was no outbreak of diseases during the crisis. This was due to the fact that the affected residents were urban dwellers and had proper sanitation facilities.

During the peak of the crisis, the National Council of Water Resources (NCWR) was formed in June 1998 and has been given the mandate to look into holistic water management for the country. Among the responsibilities of the NCWR are: act as a co-ordinating body between the state government and the relevant ministries and agencies, formulation of national water policy, water tariff, water quality standard, development of a guide for water catchment management strategy and to propose rules and regulations towards the establishment of the Dam Safety Monitoring Acts. Among other steps that were proposed to be taken by the government were: a comprehensive study of water resources in the country in order to ascertain its existence and projection of future water demand until the year 2050, to protect the present water catchment areas, speedy approval of water development projects, development of inter-state water transfer facilities, and upgrade and repair water infrastructure systems. If these pro-active measures are undertaken and implemented, it would contribute towards the holistic approach of the water management system in the country.

Although as a consequence of the crisis, the public was made more aware of various water related issues and the positive impact on their attitudes towards water usage, a persistent effort is needed to upgrade the awareness, knowledge, attitude and practices of the public regarding water related issues. The ever increasing demand for water from the domestic, industrial and agricultural sectors, the rise in the number of polluted rivers, and the decimation of water catchment areas represent some of the challenges faced by the nation with regards to water management. A holistic approach to water management can only be materialized if individual consumers, industries, government and non-governmental agencies work collectively. This would ensure sustainable development of the country and thus realizing the vision for 2020 of achieving a developed nation status.

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