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ORIGINAL PAPER

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ARE MACRO AND MICRO ENVIRONMENT AFFECTING MANAGEMENT OF FRESH WATER RESOURCES? A CASE FROM IRAN WITH PESTLE ANALYSIS

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ABSTRACT

Introduction: Oil spill in fresh water can affect ecological processes and accordingly it can influence human health. Iran, due to having 58.8 % of the world oil reserves, is highly vulnerable to water contamination by oil products. **Aim:** The aim of this study was to determine environmental factors affecting the management of the oil spill into one of the river in Iran using the PESTLE analysis. **Material and methods:** This was a qualitative case study conducted in 2015 on an oil spill incident in Iran and its roots from a disaster management approach. Semi-structured interviews were conducted for data collection. Seventy managers and staffs with those responsible or involved in oil spill incident management were recruited to the study. Qualitative content analysis approach was employed for the data analysis. Document analysis was used to collect additional information. **Results:** Findings of the present study indicated that different factors affected the management of the event of oil spill onto one of the central river and consequently the management of drink water resources. Using this analysis, managers can plan for such events and develop scenarios for them to have better performance for the future events.

Key words: oil spill, macro and micro environment, fresh water, PESTLE analysis, Iran.

1. INTRODUCTION

Fresh water is essential to economic, environmental, cultural and social well-being issues (1). Also this is necessary for survival and sustainable development (2) because only about 3 percent of the world's water and a smaller portion contained in our lakes and rivers (3, 4). One of the important components of fresh water resources management is prevention of pollution (3, 5, 6). Rapid industrialization is one of the main causes for aquatic pollution (2).

Water pollution by oil is considered as one of the main chemical pollutions. Due to global economic growth, oil exploration, together with its production and transportation, has been increasing daily thus to fulfill the global demands (7). As far as oil is used, there is the possibility of oil pollutions through oil spill events. Such pollutions are mostly due to ship transport accidents, breaks in the transmission pipelines, and oil reservoirs overturning or blowout (8). Such events can affect ecological processes and, accordingly, it can

influence human health (9). In addition, oil spill events and the existence of fuel and other chemicals in rivers are the disastrous phenomena for the living beings in rivers and can be considered as serious threats to the supplies of drinking water (10). Arvah, having investigated the oil spill events and damages to oil pipelines in Nigeria, states that oil spill events may have adverse effects on drinking water quality and human beings who use the fish and other aquatic animals. These effects may include irritation, dermatitis, cancer, miscarriages, and genetic disorders (11).

Iran, due to having 58.8 % of the world oil reserves, about 30 million tons of petrochemical products per year, with the *second* largest gas reserves worldwide, more than 25,000 km of gas pipelines, more than 1,300 stations and 10,000 tankers carrying fuel transfer of oil and oil products, is highly vulnerable to soil and water contamination by oil products (12). In recent years, therefore, certain events resulting in oil spill into important water resources, particularly sur-

face and potable water, have signaled future dangers (13). In March 2009, due to corrosion and leakage of oil pipelines in Khuzestan Province, southeastern Iran, 9000 barrels of crude oil leaked into Karkheh River, and, In 2014, due to the collision of the shovel blade of a loader with gas transmission pipelines in Lorestan Province, oil spill occurred in Pol Zal Region, thus polluted the Karkheh River, led the Karhkkeh Dam encountered a serious threat (14, 15). Furthermore, other such events have occurred for potable water resources in Kurdistan, Lorestan, Khuzestan, and Isfahan Provinces (16, 17).

By timely management and control of the risky areas, many cases of pollution of water resources and environmental devastations can be avoided. Oil spill events, particularly in potable water, require rapid and effective reaction of the authorities in charge. Due to the complicated nature of these events, they demand necessary coordination must be taken place among the organizations and institutions. In addition, as such events are directly related to the human health, there must be strict supervision over potable water supplies (5).

In this arena, the role of political, economic, sociocultural, environmental, and legal factors in managing such events should be specifically taken into account. Contrary to the SWOT analysis, by which researchers identify strengths, weaknesses, opportunities, and threats, the PESTLE analysis analyzes Political (P), Economic (E), Social (S), Technological (T), Legal (L), and Environmental (E) factors (18). Srdjevic, using the multi-criteria decision-making method, weighted different factors of the PESTLE for the water supply and distribution system in Serbia and presented environmental, economic, and political factors as the most important factors respectively (19). Using the PESTLE analysis, the present study was to investigate one of the greatest oil spill events in one of the central provinces in Iran, occurred in 2008. Due to the poor handling of the event at the time, the present study has thus aimed at clarifying different dimensions of this event, and, moreover, tried to analyze the event from different perspectives using the PESTLE analysis. One of the considerable issues was that after the event took place, all responsible organizations concentrated more on their own strengths and weaknesses than to the effect of environmental factors in managing this event. The present study, using the PESTLE analysis, has aimed at determining environmental factors affecting the management of the oil spill into one of the river in IRAN.

The oil spill incident in one of the most important rivers in Iran

In 2008, an accident in oil transmission pipelines (by a bulldozer from the Department of Urban Development) resulted in the pollution of one of the most important and vital rivers in Iran. Evidence indicates the oil eruption was as high as 60 to 70 meters and polluted a distance from 400 to 700 meters from the crash site (Figure 1). The distance from the accident to the basin (for refinery) was about 70 km and it took about 12 hours the materials reached the refinery. On the other hand, the crude oil transmission pipelines were located in high road above the river and adjacent to it. Therefore, the first step for curbing the running oil was the building of levees in the north of the road so as to block the oil into the river. Immediately after the accident, there

were efforts to build levees in the road for controlling the running crude oil and prevent it from entering the farmlands, gardens, and finally the river. Due to the proliferation and accumulation of oil materials, the built levees could not resist the two pipelines and the accumulated crude oil ran towards gardens adjacent to the river and at last to the channel near the river and then to the river itself.

Given the severity of the event and its effects on facilities, it was therefore decided to enter water into the water refineries and water inlet tunnel. Hence, certain teams were dispatched to dam at a distance of 3 to 5 km and as soon as seeing or smelling oil, they informed other groups to close the valves of water inlet of the dam facilities in due course.

In the reports presented by the Environment Agency,



Figure 1. Oil painting when the pipeline fractured and fires caused by oil spill

about four million liters of oil came out of pipes and the volume of oil entering the river was 1 million liters and about 2.5 million liters of this volume were spread out in farmlands. This event was one of the most disastrous and unprecedented events related to oil spill into freshwater in Iran, which severely affected three central provinces. This event not only had abundant environmental effects and polluted aquatics, soil, trees and agricultural fields, but also resulted in the water pollution and outage and led to people’s anxiety. Since two third of the potable water and 40 other cities is supplied by water refinery, with the occurrence of



Figure 2. Oil stained hills, river, trees and dead leaves

this event, the potable water of the mentioned cities was cut off for 48 hours completely (16, 20, 21) and about five hectares of the lands in the region (about 3 hectares were covered by trees) were polluted. In addition, crude oil entered the river polluted more than 100 km of the river banks and beds, lands, gardens, fields and adjoining facilities (Figure 2).

Hossein Khani in his study points out that with the coordination of staff in the province, the side problems related to water cut-off were reduced to the minimum level; however, this event imposed million dollars losses (22).

Mahabadi Arabkhazaeli investigated the effects of this

incident on the quality of water including water for agriculture, potable water, and its expansive environmental effects. In addition, he investigated the status of oil facilities intersecting with water resources of Iran. He states that oil pollution has devastating, sustainable, and long-term effects, and, in the status quo, the most logical and efficient measure is to prevent the occurrence of such events (13).

Using the PESTLE analysis, factors affecting the management of the event were divided into six political, economic, sociocultural, technological, environmental, and legal classes (Table 1).

2. MATERIALS AND METHODS

2.1. Design.

This was a qualitative case study conducted in 2015.

2.2. Participants.

The study population consisted of all staff and managers working in the organizations and institutes involved in the management of the incident, including Disaster Management Office, Oil Pipeline and Telecommunication Company, Department of Environment, University of Medical Sciences, Water and Wastewater Organization, Regional Water Company, Fire and Safety Services organization and Red Crescent Society. The sampling was purposive, and the snowball technique was employed thereafter. First, key informants from each organization were selected and, then, other members were identified by consulting the first group. The inclusion criteria were having the desire for participation in the study and having an experience of responding to oil spill incidents. Finally, nineteen managers and staff members were recruited to the study.

2.3. Data Collection.

The data were collected by conducting semi-structured interviews. The foci of the interview questions were framed as follows.

- How did this incident occur?
- How did Environmental factors affect the management of this incident?
- What were threats and opportunities to management of this incident?

Moreover, we employed probing questions for acquiring detailed information about experience shared by the study participants. Data collection was pursued until reaching data saturation. The seventeenth interview yielded no further helpful information or insight. However, to ensure data saturation, we conducted two more interviews. Accordingly, nineteen interviews were conducted in total. Interviews were scheduled according to the participants' preferences. All participants were inclined toward being interviewed at their workplace. Before the interview, the leading researcher introduced herself and explained the objectives of the study. An informed consent form was delivered to the potential interviewees before each interview. The interview sessions lasted 15–75 minutes (45 minutes on the median). All interviews were recorded by using a digital voice recorder and immediately after each session, the interview was transcribed verbatim. Also, documents, reports and field notes were used to collect more information about the incident.

2.4. Data Analysis

Data analysis was carried out concurrently with data col-

lection. Qualitative content analysis approach was employed (23) for data analysis and framework analysis with PESTLE analysis approach was the basis of the analysis.

Whole interviews were considered as the unit of analysis. Accordingly, each interview was read several times to achieve a general understanding about it. Then, we started to code the meaning units, i.e. words, sentences, or paragraphs, by using either participants' own expressions or our constructed codes.

2.5. Rigor

The credibility of the study findings was established by using the member- and the peer-checking techniques (24). Accordingly, we provided several participants with their own interview transcripts as well as our generated code and asked them to determine whether our generated codes and concepts reflected their experiences. Also the codes were revised based on research team's comments through negotiation.

2.6. Ethical Considerations.

The Institutional Review Board and the Ethics Committee of Iran University of Medical Sciences approved the study. An information sheet including the aim and the process of the study was provided to the study participants and we asked them to read and sign the study's informed consent form. All of the invited participants gave their written informed consent for participation.

3. RESULTS

3.1. Political Factors

Threats

One of the main threats in management of such events is the lack of coordination among provinces. The place of the occurrence of the event was on the borderline of two Provinces. Regarding the direction of water flow, no loss would have been imposed one of the Province, and all side effects of the event would have been imposed on another Province. This issue is important from two different aspects: firstly, the event with such extent required coordination among Oil Company, Regional Water Company, Road and Transport Organization, Department of Water and Sewerage, Fire fighting, and other organizations. Creating this coordination required a powerful management. Secondly, this coordination should have been conducted between the two provinces, which had its own administrative problems and required a kind of coordination among different ministries. In addition, since one of the province- that incident occurred there- did not benefit from controlling the oil spill event and its side effects, problems were doubled. Regarding the issue that the two provinces are adjacent, their corresponding organizations did not know properly each other and coordination was thus conducted merely via governorates.

Interview 2: "One of our big problems was that we had no control over all affairs. They were under the control of our colleagues at university of medical sciences, Natural Hazards Center, Water and Sewage Organization and Environment Organization of adjacent province, and this issue was problematic for us. Coordinating with another province for doing executive affairs was difficult for us... however, there are some discrepancies... they nationalistically had different opinions, they couldn't bear some issues and we

emphasized they do something for this problem”.

On the one hand, considering the political conditions in Iran and the break in diplomatic relations, certain problems appeared, such as preparing cleaning equipment. On the other hand, conducting some experiments on water was not possible at the time in Iran, and, in this regard, some negotiations were conducted with France and Canada, but they avoided doing experiments in initial stages.

Interview 7: “We contacted with France and they told us that we are under sanctions and they cannot help us”.

Opportunities

From among available opportunities in management of disasters, Senior Management Commitment, supports of senior management, the existence of specialized committees of crisis management, and cooperation of organizations can be referred to as factors for coping with crises. The support of senior managers in managing disasters and events was one of the opportunities to which participants referred. These supports were important from the executive and psychological point of view.

Interview 5: “Managers supported us for managing and controlling this disaster and bosses of these organizations supremely did their best. They really and sincerely advocated themselves to solve this problem. They prepared us immediately with whatever we needed”.

3.2. Economic Factors

Due to the water cut-off and the smell of oil in the potable water, there was an increase in the consumption of the bottled water; hence, the price of the bottled water increased as 6.5 to 8.5 times and they consequently became rare.

Interview 9: “Among its effects was the turn of people towards mineral water, which was really one of the problems to which supervising systems and organizations should have contributed. When such crises take place, there is a rise in the price of bottled mineral water. The distribution of healthy bottled water should be managed appropriately, fairly, and abundantly among the people in order to manage the inevitable increase in demand and consequently the price”. Furthermore, conducting experiments on water was costly at the time and it was not possible to afford such costs at the time of the disaster occurred. Interview 3: “Those experiments they wanted to do imposed heavy costs on them and at the time it was not possible to afford such costs”.

3.3. Sociocultural Factors

Sociocultural factors were divided into two groups related to people and authorities.

Threats

Social tensions, people’s distrust to people, authorities’ lack of knowledge of the occurrences of events and disasters, failure to understand the magnitude of the disaster, the difference in understanding concepts related to crises and crises management on the part of authorities and organizations are considered as threats to the sociocultural fields.

One of the important factors in the social fields is the creation of social tensions. After the occurrence of the disaster, Headquarters of Unexpected Events announced that the residents around the river and the place in which the event occurred, should not use the water of the region and pay attention to its pollution. This announcement had consequences such as the overuse of water resources due to

the people’s fear of water cut-off, people’s use of unhealthy water resources, people’s invasion towards buying bottled mineral water, the creation of false sense about the smell of oil, and rumors.

Interview 7: “After the announcement of the occurrence of the disaster was publicized on TV, people sensed the smell of oil, though the oil had not reached the refineries and pools yet! They regularly called and complaint that water smelled oil and what they should do... this issue stroke us! Because when people find out that there is a crisis, they start to overuse water without needing it, they fill up their pots and every container they have. They water their orchards and they may empty the resources”. Interview 2: “There was another problem and it was that people over consume other water resources, such as springs, wells, river, and those water resources that are not confirmed healthy for drink and there was this possibility they get sick using them”. Interview 2: “People sometimes did not accept authorities’ sayings and they felt that they smelled oil; on the one hand, they knew that there existed a crisis, on the other hand, we told them that water was healthy”.

Opportunities

Opportunities of the sociocultural field include the rapid dissemination of news by the people, people’s calling to organizations to receive the latest news, enjoying popular support, strong collaboration between the private sector and NGOs and official institutions, healthcare for staff, confidence-building and transparency for public by officials, informing the public, authorities’ keeping calm and tranquilly responsible for managing the event.

Interview 1: “We prepared local tribes and we informed the governorates, Islamic councils, to demand people to throw their stored straw and coil onto the river because they are good absorbers. People should have helped anyway”.

3.4. Technological Factors

Threats

Centralized refineries, failure to equip refineries with equipment filtering organics and chemicals, the lack of data banks of similar experiences in Iran, the lack of equipment and cleaning equipment at the time of the accident in Iran, and the lack of systems and databases in such incidents are among technological threats.

Interview 5: “Refineries should not be centralized and we should have several resources for supplying potable water”.

Interview 18: “Refineries must be equipped with the system of filtering oil materials in order not to allow these oil materials to enter refineries and damage facilities”.

Opportunities

Utilization of the capacities of laboratories inside and outside Iran, the existence of systems for communicating people, and the use of simple and primary tools for oil clean-up are among existing opportunities for technological factors.

Interview 3: “The capacities of laboratories of the Research Institute of the Oil Industry under Sharif University of Technology were used. Even, due to the possibility of water pollution, we dispatched a group of academics to French and Canadian universities in order to investigate how the state of oil materials remaining in water was”.

Interview 16: “We recommended that rice straw was

| Threats | PESTLE Factors | Opportunities |
|--|----------------|--|
| <ul style="list-style-type: none"> - Lack of coordination between the corresponding organizations in two provinces - Lack of regulatory relations - Severance of the diplomatic relations (sanctions on Iran to cut off Iran's relations with political and economic hub of the world and its impact on the circumstances of the crisis management) - Lack of clear overall policy in the field of crisis management in Iran | Political | <ul style="list-style-type: none"> - Senior managers' commitment - Senior management support - the existence of specialized committees for crisis management - Interactions and collaborations of organizations to cope with the disaster - The possibility of using urban operational forces outside urban areas by order of the director of the provincial disaster management headquarters |
| <ul style="list-style-type: none"> - Lack of the allocation of financial resources and funding to deal with such disasters before their occurrences - Rising prices for mineral bottled water suspended at the time of disasters - High costs of water experiments - The costs of replacing damaged facilities - The costs of cleaning space, river, and water treatment | Economic | <ul style="list-style-type: none"> - Allocation of sufficient credit at the time of the incident so as to resolve the incident - The use of public funds |
| <p>People:</p> <ul style="list-style-type: none"> - Social tensions - Lack of trust in the authorities - Lack of training the people <p>Authorities:</p> <ul style="list-style-type: none"> - Failure to identify those who are responsible for the consequences of the accident - Lack of understanding of the magnitude of the disaster - Differences in understanding between the authorities and institutions related to the crisis and disaster management | Socio-cultural | <p>People:</p> <ul style="list-style-type: none"> - Rapid dissemination of news by the people - Contact organizations for people with the latest news - Using public aid - Strong cooperation between organizations and official institutions, private sector, and the NGOs <p>Authorities:</p> <ul style="list-style-type: none"> - The importance of public health authorities - transparency for confidence-building in public officials - Informing the public - Authorities to keep calm and tranquil for disaster management |
| <p>Centralized refineries</p> <p>Failure to equip refineries with equipment filtering organics and chemicals</p> <p>Lack of data banks of the similar experience in Iran</p> <p>Lack of equipment and cleaning equipment at the time of the accident in Iran</p> <p>Lack of systems and databases in such incidents</p> | Technological | <ul style="list-style-type: none"> - Utilization of capacity of laboratories inside and outside the country - the existence of systems in organizations - The use of various tools to clean up oil |
| <ul style="list-style-type: none"> - Wind blowing and pollution emissions to distant sites, -Contamination of hills and oil penetration into the soil and groundwater and the return of water in the form of springs into the river - Pollution the river banks and beds up to a distance 100 km and problems of clearing it - Impassability of some parts of the region for using mechanical equipment, - The impossibility of firing oil on the water due to the special situation of the region around the river and the existence of trees surrounding the river, the only source of water supply | Environmental | <ul style="list-style-type: none"> - Use of alternative water resources (Falaman wells) |
| <ul style="list-style-type: none"> - Lack of enforcement for the laws in the field of crisis management | Legal | <ul style="list-style-type: none"> - Determining organizational tasks in the constitution - Judicial proceedings concerning the causes of the disaster -Making severe supervision on potable water resources |

Table 1. Factors affecting management of oil spill incident (PESTLE analysis)

available in the region, and we should use it to close the mouth of the broken pipeline. This was one of the best strategies for absorbing oil. Rice straw, sawdust, and coil and such materials have high special weight, but have low weight”.

3.5. Environmental Factors

Threats

Wind blowing and pollution emissions to distant sites, contamination of hills, oil penetration into the soil and groundwater, the return of water in the form of springs into the river, pollution of the river banks and beds up to a distance of 100 km and problems with clearing it, impassability of some parts of the region for using mechanical

equipment, and the impossibility of firing oil on the water due to the trees surrounding the river, the only source of water supply, are among the threats to the environment.

Interview 15: “Crude oil entered the river and polluted around 100 km of the river banks and beds, lands, gardens, farmlands, and facilities”. Interview 6: “Firing oil was out of question for this case due to the trees around the river, which could double the disaster; but for Karkheh River there were not such problems and we therefore fired the spilled oil and had the issue handled”.

Opportunities

Using the alternative water resources was among avail-

able opportunities. Among these resources, Falaman Wells can be referred to. These wells have been delved near the river and, due to drought, they were pickled and equipped with chlorinator stations and used as alternative resources several months before the disaster. Interview 3: "A series of wells in the city called Falaman Wells were arranged. In case the same disaster occurs, they can be immediately used after water cut-offs. Even those wells were ready for filling reservoirs. If there were water cut-offs, at least we could have some water for people to use; because in such cases, particularly in May, wells are not mostly used. It is our excess capacity and we only use water from the refineries".

3.6. Legal Factors

Threats

Given that there are laws of crisis management in Iran, of the threats might be the lack of enforcement for the laws in the field of crisis management. Interview 11: "We have laws for crisis management, but there is no enforcement for it in order to necessitate organizations for performing the laws".

Opportunities

Among legal factors, the assignment of administrative duties in the constitution and judicial proceedings regarding the causes of the disasters can be referred to.

Interview 4: "Informing the people was the duty of the Water and Sewage Company, because the law of fair distribution of water, approved by the Islamic Parliament, has made the Regional Water Organization responsible for supplying water, and, the Water and Sewage Company, responsible for distributing water. The University of Medical Sciences is responsible for approving the health of water. These are the things one can figure out after having a complete reading of the laws".

4. DISCUSSION

Oil spill onto the river was considered as one of the most unprecedented human-made disasters in Iran, which resulted in the pollution of the environment, firing, intensifying the crisis of drought, the emergence of social tensions, and, most importantly, potable water pollution. After seven years from the mentioned disaster, the oil penetrated onto layers of the earth, returned into the surface via springs and poured into a pool appropriate for it. This issue indicates the extent and magnitude of the disaster. The objective of the present study was to investigate the environmental factors affecting the management of this disaster. Findings of the present study indicated that different factors affected the management of the event of oil spill onto one of the central river and consequently the management of potable water resources. The six factors of the PESTLE analysis created an appropriate vision for the dimensions of the issue. Henriques states that water resources management faces with an extensive range of political, economic, social, technological, legal, and environmental effects (25). Using the PESTLE analysis, he identified different environmental factors affecting water resources management of England up to 2050 and prioritized them, and developed some scenarios in this regard (25). Rezaei states that the continuance of ambiguities in the relations of Iran and the world powers and its negative effects on Iran's conditions in case of the occurrences of disasters, the lack of macro policies and

transparency in the field of crisis management in Iran and the lack of allocation of required and sufficient budget for management of such disasters are among the main threats in the field of crisis management in Iran (26). The findings of the present research identified these threats and classified them under political factors. However, Rezaei considers poor cooperation of official organizations with NGOs as a threat (26). This factor was identified as an opportunity in the present study and it indicated that interactions among different units in crisis management are available and organizations can benefit from the contributions of the private sector and NGOs. In addition, he considers the highness of public participation as an opportunity and the present study confirms this issue as organization used public contributions for cleaning the river. Chaklouk states that the possibility of approval of laws for critical conditions, the possibility of using national resources, the possibility of applying and cooperating with Basij forces and the use of the system of national communication are among opportunities in the field of earthquake crisis management in Tehran City (27). In this line, the present study indicated that at the time of the event, by order of the director of the Provincial Disaster Management Committee (headquarter of the crisis management), the forces of the Fire Department and Safety Services were used, while the field of this organization was limited to the municipalities. On the other hand, the Basij volunteer forces were considered as one of the important organizations for coping with the spill of oil into the refineries, which these forces spontaneously and in the form of an NGO entered the crisis management. In addition, the existence of the communication system 122 under the Water and Sewage Company and the system 1490 of the Health Deputy of University of Medical Sciences have been the two ways for communication between people and authorities and people present a lot of their questions and concerns using these two systems. However, Camp believes that communication links are poor in water resources management and activities related to the answering at the time of oil spill, and the existence of enhanced information instruments of oil spill management for eliminating this problem is valuable (4).

Srdjevic believes that the existence of the PESTLE analysis, costs of reconstructing and maintaining the water refineries and distribution systems are among economic threats in the field of consuming water in Serbia (19). The present study confirmed this issue and indicated that one of the economic threats in this regard is the cost of replacing damaged facilities and cleaning water refineries. In addition, he states that social development and educational improvement in local population are among available opportunities in the field of social factors. The findings of the present study, however, indicated that lack of training the people for such events are among threats in this regard. The considerable point in his research was his concurrent view towards general changes in the laws as a threat and opportunity. Furthermore, he identified the effect of pollutants on water, soil, and air as a threat, which is consistent with the results of the present study.

Regarding the fact that oil spill events usually are considered as one of the worst forms of environmental pollutions (28), and in recent decades, these events have occurred

with high frequency resulting in devastating effects on the environment (29), therefore, such events require expansive resources management, facilities, skills, and human power in organizations with efficient coordination (5). Managers of responsible organizations can apply better management by the PESTLE analysis and changing threats into opportunities.

5. CONCLUSION

Given that Iran has rich resources of oil, crossing the southern oil pipeline to the northern part of the country, and also the fact that some rivers cross these pipelines, the danger of oil spill should be paid more attention. On the other hand, Iran has encountered drought in recent years and its potable water has been reducing. Therefore, the occurrence of such disasters doubles the problems of potable water management and causes pollution and waste of a lot of water. Identifying disastrous and sensitive regions as well as preventing the occurrence of the event can be the first stage, but events do not inform us of their occurrences, thus preparedness for such conditions is vital. In case of being ready, events can be controlled in their initial stages. For managing events related to oil spill events, only considering intra-organizational factors such as facilities, human resources, structures, and financial resources are not enough, but factors outside organizations should also be considered. Managers who enjoy expansive visions will be successful in managing such events and can have appropriate analysis of the threats and opportunities outside such organizations. Although the PESTLE analysis is used for strategic planning, it can also be used for the analysis of crises, by which, the teachings learned from different disasters can be considered and threats and opportunities can be identified from the six dimensions of the PESTLE analysis at the time of the occurrence of events. Using this analysis, managers can plan for such events and develop scenarios for them thus to have better performance for future events.

- **Limitations of the Study:** We strived to create a comfortable and supportive environment during the interviews. Nonetheless, some of the participants might have taken into account different personal and organizational considerations when sharing their experiences.
- **Competing interests:** The authors declare that there is no conflict of interests regarding the publishing of this paper.
- **Authors' contributions:** The first author and the corresponding author did the primary plan of this research. All authors of this research paper have directly participated in the planning, execution, and analysis of this study. All authors read and approved the final manuscript.
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REFERENCES

1. National Policy Statement for Freshwater Management 2014. News-land Government; 2014: 3.
2. Zeitoun M, Mehana E. Impact of Water Pollution with Heavy Metals on Fish Health: Overview and Updates. *Global Veterinaria*. 2014; 12(2): 219-31.
3. Atighechian G, Jahangiri K, Maleki MR. Inter-sectoral interaction in oil spill incident: Zayande Rood case study. *International Journal of Health System and Disaster Management* 2014; 2(1):62-8.
4. Camp J, Abkowitz M, LeBoeuf E. Inland waterway resource and spill management needs in Southeastern USA. *Disaster Prevention and Management*. 2010; 19(4): 483-97.
5. Assilzadeh H, Gao Y. Designation of an interactive oil spill management system. *Disaster Prevention and Management* 2010; 19(2): 233-42.
6. Atighechian G, Jahangiri K, Shishehforoosh M, Saffari H, Mousavian Z, Mazaheri A. inter-sectoral interaction in Zayandeh Rood oil spill incident. *Quarterly Scientific Journal of Rescue & Relief*. 2015; 6(4).
7. Vethamony P. et al. Trajectory of an oil spill off Goa, eastern Arabian Sea: Field observations and simulations. *Environmental Pollution*. 2007; 148: 438-44.
8. Hao Xie, Poojitha D., Kisaburo Nakata. Modelling emulsification after an oil spill in the sea. *Journal of Marine Systems*. 2007; 68: 489-506.
9. Webler T, Lord F. Planning for the Human Dimensions of Oil Spills and Spill Response. *Environmental Management*. 2010; 45: 723-38.
10. Hibbs D, Gulliver J, Voller V, Chen Y. An aqueous concentration model for riverine spills. *Journal of Hazardous Materials* 1999; 64: 37-53.
11. Aroh K.N, Ubong I.U, Eze C.L, Harry I.M, Umo-Otong J.C, Gobo AE. Oil spill incidents and pipeline vandalization in Nigeria Impact on public health and negation to attainment of Millennium development goal: the Ishiagu example. *Disaster Prevention and Management* 2010; 19(1): 70-87.
12. Salehian E. Methods of refining petroleum contamination of soil. Thirteenth Conference on Civil Engineering students across the country; Kerman, Shahid Bahonar University available at: http://www.civilica.com/Paper-CESC13-CESC13_041.html; 2006.
13. Mahabadi Arab Khazaeli T, Gandomkar A, Shams HR. Oil spills into water resources and its environmental impacts (Case Study of Zayandehrood River) [Persian]. Tenth National Congress on Irrigation and Reduction of Evaporation; Kerman, Shahid Bahonar University: available at: http://www.civilica.com/Paper-ABYARI10-ABYARI10_196.html; 2009.
14. IRNA. Gasolin spill contaminated Karkhe River. <http://www.irna.ir/fa/News/81448924/>; [Accessed 2015 Jan 11].
15. Nafir. Thousands story about gasolin spill from Zall to Karkeh river. <http://www.nafir.net/?p=3899> [2015 jan 11].
16. JameJamOnline. Oil spill polluted Zayandehrud river. from:<http://www.jamejamonline.ir/PaperText.aspx?newsnum=100935956420>; [Accessed 2008 April 16].
17. AsreIRAN. Oil crippled for life Poldokhtar. <http://www.asriran.com/fa/news/>; [2011 May 16].
18. Basu R. Tools for analysis - PESTLE analysis in implementing quality: a practical guide to tools and techniques. Fistr ed. London: Thomson Learning; 2004.
19. Srdjevic Z, Bajcetic R, Srdjevic B. Identifying the Criteria Set for Multicriteria Decision Making Based on SWOT/PESTLE Analysis: A Case Study of Reconstructing AWater Intake Structure. *Water Resour Manage*. 2012(26): 3379-93.
20. NiazeEmrooz. Over 130 billion rial damage for oil pollution to Zayandehrood river[internet]. <http://www.niazerooz.com/Key-News/>; [Accessed 2008 June 9].
21. Tabnak. Oil spill to Zayandehrood river and rare mineral water in Isfahan. <http://www.tabnak.ir/pages/?cid=9106>; [Accessed 2008 April 15].
22. Hosseinkhani M. the incident of oil spill into the Isfahan's Zayandehrood river [Persian]. Third Specialized Conference on Environmental Engineering; Tehran University, Faculty of Environment: available at : http://www.civilica.com/Paper-CEE03-CEE03_100.html 2009.
23. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Education Today*. 2004; 24(2):105-12.
24. Mayring P.H. Qualitative content analysis. *Forum: Qualitative Social Research*. 2000; 1(2): 1-10.
25. Henriques C, Garnett K, Weatherhead EK, Lickorish FA, Forrow D, Delgado J. The future water environment - Using scenarios to explore the significant water management challenges in England andWales to 2050. *Science of the Total Environment*. 2015; 512-513:381-96.
26. Rezaei M.R, Hosseini S.M, Hakimi H. Strategical planning for crisis management in Yazd's historical tissue by using SWOT. *Disaster Management*. 2012; 1(1): 35-44.
27. Chalook Gh.R. Tehran security situation analysis for earthquake disaster by SWOT analysis. *Disciplinary Management Research*. 2011; 5(4): 650-76.
28. Liu X, Wirtz K.W. Equential negotiation in multiagent systems for oil spill response decision-making. *Marine Pollution Bulletin* 2005; 50: 463-84.
29. Guo WJ, Wang YX, Xie MX, Cui. YJ. Modelling oil spill trajectory in coastal waters based on fractional Brownian motion. *Marine Pollution Bulletin* 2009; 58: 1339-46.