Traffic Accidents in Kuwait: A Decision Making Analysis

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***Abstract*—**Road traffic accidents are ranked ninth as a leading cause of death worldwide, and it is predicted to move to the second rank by 2020. The estimate cost of traffic crashes globally reaches to 518 billion US dollars each year and account for around 1.5% of many countries GDP. The Middle East region has the highest rate of car accidents fatalities in the world and within this region Kuwait is ranked as one of the highest number of car accidents fatalities with around 28 fatalities per 100,000 vehicles. The problem is very alarming and hence proper and immediate actions ought to be taken to resolve it. In order to contribute in solving this problem, this paper attempted to closely examine it and provide some solutions. Due to the complexity of the problem with multiple objectives, the Analytic Hierarchy process (AHP) is used. Expert opinions wither solicited in order to identify and rank the important targets and select and address the various relevant policies.

***Keywords*—**Fatalities, the Analytic Hierarch Process, Policies, Targets.

I. Introduction

Road traffic accidents (RTAs) kill 1.2 million persons per year (3242 per day), and accounting for injured and disabled between 20 to 50 million. RTAs rank 9th as a leading cause of death (2.1% of all deaths globally). More than 50% of RTAs occur among young adults between 15 and 44 years of age, and 73% of all fatalities are male. If no proper actions are taken, RTAs are predicted to increase globally by 67% by 2020 and rank second as a leading fatality cause. Estimate costs of traffic crashes globally are US$ 518 billion each year accounting 1-2% of gross national product (GNP) of many countries. The global road mortality rate is 19.0 per 100,000 populations. Although road traffic injuries are a major health concern for all countries, the problem is particularly acute in low-and middle-income countries, which account for about 85% of deaths and 90% of the mobility resulting from road traffic crashes globally, where a large proportion of the victims are vulnerable road users (pedestrians, cyclists, and riders) [1].

The actual risks encountered in Japan and the united States were examined in [2]. Results clarified the traffic risks in the two countries and confirm their potential for explaining cross-national difference in risk perceptions.

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In [3], it was stated that about 90% of the disability adjusted life years lost worldwide due to road traffic injuries occurred in developing countries, it was found that the problem is increasing at a fast rate in these countries due to rapid motorization amongst other factors. When comparing European countries, Belgium has one of the worst road safety records; 502 road traffic injures per 100,000 inhabitants and 14 fatalities (deaths within 30 days) per 100,000 populations. The second worst hit country in road traffic injures was Portugal with 462 road traffic injuries per 100,000 inhabitants. Portugal has however a higher number of fatalities than Belgium (16.8 per 100,000 inhabitants) [4].

Data from the International Road Traffic accident database (IRTAD) was used [5] to compare between the safety levels and trends in OECD from 1980 to 1994 using a statistical model. It showed that the average annual of fatalities due to car accidents decreased in all the selected countries except Japan (+12%), Greece (+56%), and ex-East Germany (+50%). The highest decrease was observed in ex-West Germany, Switzerland, Austria, and UK with -48%,-44%, -40%, -39% respectively. The work in [6] examined the road traffic accidents in Philippines, review of 35 years of data on injuries in the Philippines showed that one in 11 deaths in this country is due to traffic accidents. 42% of deaths are for people 15-44 years of age. The proportion of all deaths are attributed to intentional injuries has increased by 925% and that of motor vehicle crashes by 600% from 1960 to 1995. The study recommended that more research should be undertaken into the factors that contribute to RTAs and appropriate measures for the prevention of these accidents should be implemented.

The problem of traffic congestion was addressed in [7], a traffic management system was developed based on the automatic vehicle location (AVL). The result suggested that efficient use of mass transport will contribute in minimizing both congestion and pollution. Mathematical modeling was used to improve vehicle inner safety, such measures will reduce the passenger movement during car collisions and decrease neck and body injuries [8]. This research work was conducted in view of reducing the number of pedestrians injures due to motor vehicles accidents. The authors studied the dynamics and kinematics of impact in order to better understand the problem. They suggested manufacturing changes in front and rear design of vehicle in order to reduce the degree of injures to pedestrians. This article [9] compared the severity of traffic accidents among several counties in France, and investigated whether the difference could be explained by the difference in road types distribution and by the socio-economic differences.

This study attempted to measure the burden on the individual, family, and government due to car accidents injures on children and adolescents in South Asia [10]. It was found from the analysis that around 67-80% of injuries occurred in males and the age group between 1-9 represented 40% of the cases. Children and adolescences represented around 135 of the fatalities. The study suggested an extensive research and governmental interventions to find the reasons for traffic fatalities among the young. This study investigated the prevalence of using seat belt and mobile phone among college students in Iran. It was found that more than 50% of college student did not use seat belt while driving and stated that using mobile phone while driving is not hazardous. It was also observed that the college students had a high percentage of trauma and head injuries from car accidents [11].

The work in [12] provided an assessment of traffic safety conditions for rural roads in Egypt. Egypt having a significantly high rate of deaths per 100 million vehicle km. Data is calculated in five rural roads in Egypt (1990-1999). Three ANOVA statistical tests were conducted to establish if there are any significant differences in the data used for models' calibrations as a result of differences among the five considered roads. The result showed that six causes contributed to around 83% of all accident on the five roads. Drivers related causes contributed to around 59-73% while vehicle related causes are around 23%, and pedestrian related accidents were around 4%.

In [13], the economic costs of traffic accidents in Jordan during 1996 were estimated. In this regard, several indicators were used to estimate the unit cost of property damages. Indicators included vehicle repair cost, detention period cost, and public and private costs among others. Results indicated that the total traffic costs in 1996 were 146.3 million. These costs attributed mainly to human losses, property damages with 40% and 43% of the total costs, respectively. In Lebanon, the congestion on roads was estimated to cost around 15% of the Gross National Product (GNP) while the total traffic costs were estimated to be around 1.5% of the GNP [14].

In order to forecast traffic fatalities by geographic regions, the relationship between traffic fatality risk and per capita income was examined in [15]. Data from 1963 to 1999 for 88 countries were collected. Linear and log linear models were used in order to project traffic fatalities. It was concluded that in general, the death rate will increase in the future. A decline will be observed in fatalities in high-income countries with an increase in China and India.

In this article, cross sectional data from the Gulf countries and time series data of road accidents were employed. Significant relationship was established between fatality rates and motorization levels. Fatality rates per vehicle were found to be inversely related to vehicle ownership levels. Fatality rates were also related to some social and environmental indicators such as population per physician, population per hospital bed, gross national product per capita [16]. According to [17], the total cost of accidents in Spain in 1997 was around six million Euros, this amounted to around 158 Euro per person. This represented around 1.35% of GNP of the country.

Recent data on Road traffic accidents and road user behavior in United Arab Emirates (UAE) were studied in [18]. Careless driving was identified as one of the major factors contributing to the RTAs, accounting for more than 35% of all accidents. Excessive speed was the second factor accounting for 13.1% of total accidents, 19.5% of causalities, and 26.9% of fatalities. Tail gating comes third with around 6.4% of total accidents. In [19], a description of road pattern accidents in Qatar was provided; it includes crashes, injuries, and fatalities for the period from 1983 to 2000. It was observed that although accidents had increased during this period, injuries had actually decreases by 285 and most accidents involved young drivers (10-19 years old).

In this article, the effect of tire blowouts in the hot summer weather of Saudi Arabia on car accidents was examined [20]. It was found that in the year 2001, around 13% of traffic accidents attributed to tire failure. It was also concluded that drivers need to be educated on the proper procedures and practices on how to select and maintain tires in order to avoid road accidents.

Kuwait has one of the highest accident rates per population in comparison to many of the countries of the Gulf Cooperation Council (GCC), although having very good roads and traffic infrastructures. The different aspects of traffic problems in Kuwait had been studied and their causes have been investigated. The fatal motor vehicle accidents in Kuwait were examined in [21]. The objective was to find the epidemiological features of these accidents and establish a baseline for future evaluation. In this work the accidents between 1977 and 1998 were analyzed. It was found that the numbers are very higher than those of the some industrialized countries. It was also found in this study that children under age of 15 were involved in almost 25% of the total car accidents

The author in [22] investigated the association between distractions, both inside and outside the vehicle, and the increased risk of car crash injury among drivers across different ages. The results showed that those drivers of all ages are more susceptible to distractions inside the vehicle than those from outside the vehicle. According to a research study conducted at the Kuwait Institute for Scientific Research [23] that relates the number of accidents during the day, it was found that the early morning accidents are higher than late evening. However, the peak number of accidents was in the late afternoon and early evening. The study also revealed that bad environmental factors contribute to the increase in the number of accidents.

The results of seven years of data from three air pollution monitoring stations in Kuwait is provided through several stations positioned in different locations such that the influence of traffic source on ambient air pollution contaminants could be detected [24]. The concentration of pollutants was measured during peak traffic hours. Analyses of the data showed a slight increase in the concentration of air pollution especially in districts located closer to the city.

In this article [25], the effect of seat belt use on motor vehicle accident fatalities in light of enacting Kuwait's belt law in 1994 was investigated. Data of more than 1200 accident victims were collected; statistical analysis showed that seat belt use has had a positive effect in reducing both road traffic fatalities and injuries. In [26], attempts were undertaken to identify the trend in seat belt use, smoking while driving, and road accidents of young drivers in Kuwait. A survey questionnaire was used in a sample of 1467 randomly selected young drivers in Kuwait. It was found that females are usually safer drivers than their young male counterparts, those who smoked while driving used seat belt less, and had a higher rate of traffic accidents.

The relationship between driving behavior, and life style and traffic accidents was investigated [27]. In this study, life styles were based on three levels namely values, attitudes, and actions. In this regard, a questionnaire was designed consisting of 39 questions that covered driver's background and other traffic related factors. They included socio- economic and cultural factors, demographic factors, road and environmental conditions factors, traffic stress factors, traffic accident experience and traffic violation history among others. Validly of the questionnaire were examined and pilot survey was conducted in order to examine their validity, reliability, and consistency. The data were collected throughout the country in the different provinces, the number of young drivers was selected and the sample size was proportional to the population in each province. The result showed that many drivers do not leave enough distance between their car and the car in front which is indicative of anxious driving behavior. Most of the drives (70%) showed satisfaction with their living and did report any stress. The study also shows that minimal low enforcement by the police was highly related to the increase in traffic violations.

The Traffic accidents in Kuwait are significantly high compared to many countries in world. This is attributed too many reasons such as careless driving, not abiding by traffic rules and regulations among others. Figures 1, 2, 3, and 4 provide some statistics regarding traffic accidents and fatalities in Kuwait [28]. In Figure 1, it can be seen that the number of traffic violations per has increased by more than two-folds in the last two year although it has alternated during 2004-2008.

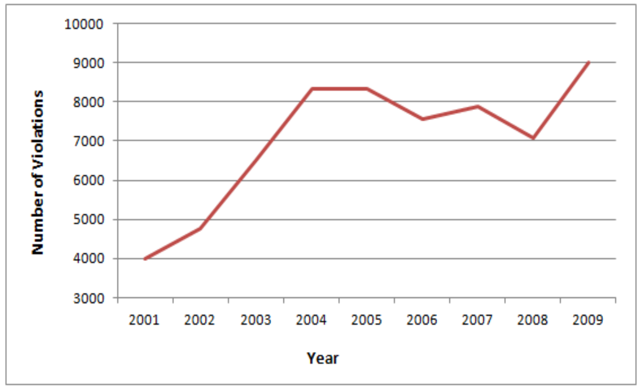

Figure 1. Number of traffic violation per day during 2001-2009.

Figure 2 shows exhibits the number of car accidents fatalities in Kuwait in period from 2001 to 2009. It can be observed that although the number has risen during the years, however, it has declined in the years 2008 and 2009.

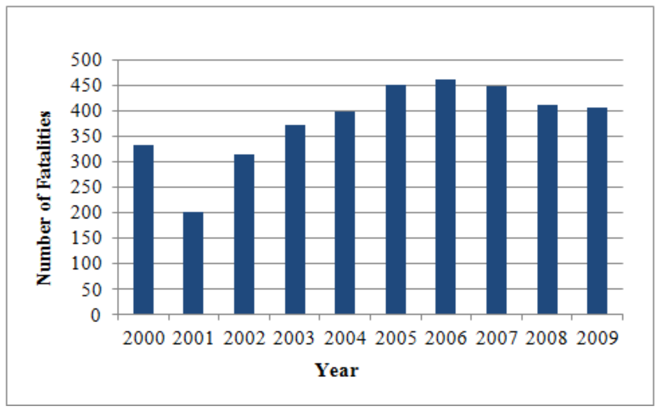

Figure 2. Number of car accidents fatalities in Kuwait during 2000-2009.

On the other hand, the number of car accidents has also declined during 2005-2008, however it has jumped up again in 2009.

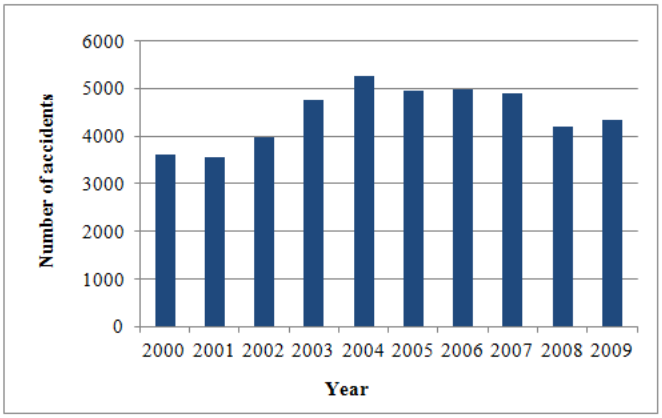

Figure 3. Number of car accidents per 100,000 cars in Kuwait during 2000-2009.

When studying Figure 4, it is observed that the number of traffic accident fatalities is the highest for the age group 21-30 which is mainly is attributed to the reckless driving by the youngsters. It is also observed that this number declined by more than three-folds with the age group between 51-60.

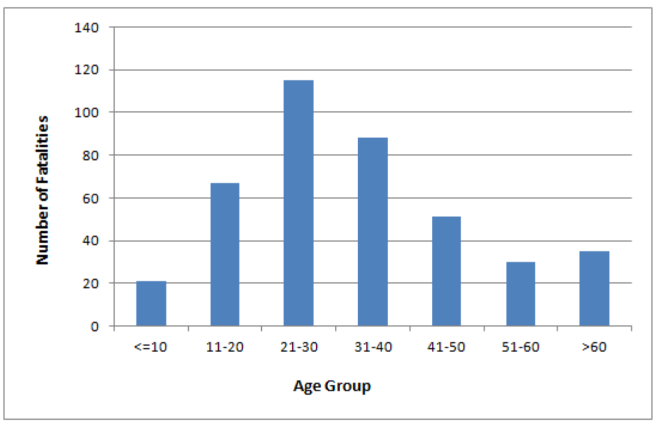

Figure 4. Total traffic accidents fatalities by age group in Kuwait during 2000-2009.

Table 1 provides a comparison between Kuwait and other Middle East countries with regard to the number of traffic fatalities, while Table 3 provides statistics on the number of fatalities in various countries of the world.

Table 1. Traffic Fatalities per 100,000 Vehicles for Selected Countries in the Middle East.

Country	Population (Million)	Vehicles (000s)	Traffic Fatalities (per 100,000)
Algeria	32.1	2,730	12.8
Bahrain	0.7	205	10.9
Egypt	76.1	2,300	10.4
Jordan	5.6	361	12.8
Kuwait	2.3	754	28.8
Oman	2.9	492	23.6
S.Arabia	25.8	7,050	21.0

Source: United Nation Development Programme; World Health Organization 2005 [29].

Table 2. Traffic Fatalities per 100,000 Populations for Selected Countries in the World

Country	Traffic Fatalities (per 100,000 population)
Australia	6.8
Columbia	12.6
Canada	6.3
France	6.8
Italy	7.1
Japan	4.3
Kuwait	16.8
Malaysia	23.8
New Zealand	8.9
Sweden	3.9
Republic of Korea	12.0
United Kingdom	3.8
United States of America	11.0

Source: Organization for Economic Development and Co-operation, International Road Traffic and Accident database, Road Safety report 2010 [30].

II. Problem Description

The main objective of this research work is to identify the most strategic policies to be used by the authorities in Kuwait in order to minimize the severe effect of traffic accidents both on human and property. In this regard, expert opinion was taken to identify the main target and policies to be used. The following are the main target and policies:

Targets

1. Reduce traffic accidents.
2. Reduce pollution.
3. Reduce carelessness.
4. Minimize congestion

Strategic Policies

1. Strict application of traffic rules and regulation.
2. Awareness campaign.
3. Strict licensing rules.

4. Better car inspection tests.
5. Encouraging mass transport.
6. Improving infrastructure.
7. Improving monitoring systems.

The analytic hierarchy process (AHP) was utilized to analyze the problem. Figure 5 presents the hierarchy of this problem is presented in the AHP structure.

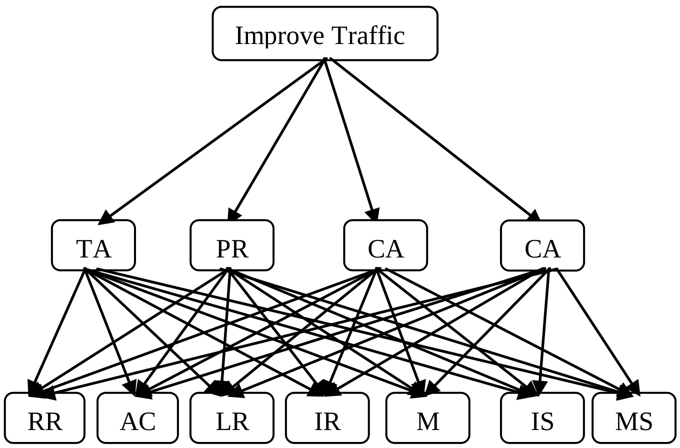

Figure 5. Hierarchy of the targets and policies for the traffic problem.

III. Analytical hierarchy process

The analytic hierarchy process (AHP) was developed by Thomas Saaty in 1970's. It is widely used for multi-criteria decision making and has been successfully applied to many practical decision making problems [31]. AHP was used as a decision support system for bid evaluation [32]. In [33] AHP was utilized in for the selection of a casting process, while in [34] it was used for the selection of the most suitable contractor in the pre-qualification of process of a project. Also fuzzy AHP was employed to help in the selection of desalination plants in Kuwait [35].

Fuzzy AHP was utilized for calculating the weights of the various criteria in order to build a multi-criteria model for wafer supplier selection for a semiconductor industry in Taiwan [36]. AHP was used AHP for economic evaluation of flexible manufacturing system using the Leontif input-output model [37]. AHP was utilized to identify the major factors that contributed to traffic problem in China [38]. It was found that drivers accounted for the majority of traffic accidents and speeding was accidents the biggest factor. The study suggests several preventive measures to be undertaken to reduce the accidents.

AHP has three underlying concepts: structuring the complex decision problem as a hierarchy of goal, criteria, and alternatives, pair-wise comparisons of elements at each level of the hierarchy with respect to each criterion on the preceding level, and finally vertically synthesizing the judgments over the different levels hierarchy. The basic theory of AHP is as follows [33]: assume the problem under study has n independent alternatives (A_1, A_2, A_3, A_n) with the weights (W_1, W_2, W_3, *and* Wn) respectively. The decision maker does not know in advance the values of W_I, i=1, 2, n, but he/she is capable of making pair-wise comparisons between the different alternatives. Also, assume that the quantified judgments provided by the decision maker) on pairs of alternatives (A_i, A_j) are represented in an $n \times n$ matrix (A) as shown below:

$$A = \begin{bmatrix} a_{11} & a_{12} \dots .a_{1n} \\ a_{21} & a_{22} \dots .a_{2n} \\ . & . \;\dots.\; . \\ . & . \;\dots.\; . \\ a_{n1} & a_{n2} \dots .a_{nn} \end{bmatrix} \quad (1)$$

For example, comparing alternatives A_1 with alternative A_2 provides a numerical value judgment a_{12} which represents the preference of alternative A_1 over alternative A_2. The a_{12} value is supposed to be an approximation of the relative importance of A_1 to A_2, i.e., $a_{12} \approx (W_1/W_2)$. This may be generalized and the following can be concluded:

1. $a_{ij} \approx W_i/W_j$ i,j =1,2,…,n.
2. a_{ii} =1, I =1,2,…,n, all diagonal cells have the value 1
3. $a_{ji} = 1/a_{ij}, \approx W_j/W_i,$ i,j =1,2,…,n.
4. $a_{ij} \cong (W_i/W_j)>1$, If A_i is more preferred than A_j.

This implies that matrix A is a positive and reciprocal matrix with 1's in the main diagonal and hence the decision maker should only provide value judgments in the upper triangle of the matrix. The values assigned to a_{ij} according to Saaty (AHP) scale are usually in the interval of 1–9 or their reciprocals. Table 7 presents Saaty's scale of preferences in the pair-wise comparison process.

Table 3. AHP scale of preferences in the pair-wise comparison process.

Numerical Ratings	Preferences between alternatives *i* and *j*
1	*i is equally preferred to j*
3	*i is slightly more preferred than j*
5	*i is strongly more preferred than j*
7	*i is very strongly more preferred than j*
9	*i is extremely more preferred than j*
2,4,6,8	*Intermediate value*

It can be shown that the number of judgments (L) needed in the upper triangle of the matrix of size n are:

$$L = n(n-1)/2$$

Having recorded the numerical judgments a_{ij} in the matrix A, the problem now is to recover the numerical weights (W_1, W_2, *and Wn*) of the alternatives from this matrix. In order to do so, consider the following equation:

$$\begin{bmatrix} a_{11} & a_{12} \dots . a_{1n} \\ a_{21} & a_{22} \dots . a_{2n} \\ . & . \dots . \;. \\ . & . \dots . \;. \\ a_{n1} & a_{n2} \dots . a_{nn} \end{bmatrix} \approx \begin{bmatrix} W_1/W_1 & W_1/W_2 & \dots . & W_1/W_n \\ W_2/W_1 & W_2/W_2 & \dots . & W_2/W_n \\ . & . & \dots . & . \\ . & . & \dots . & . \\ W_n/W_1 & W_n/W_2 & \dots . & W_n/W_n \end{bmatrix} \quad (2)$$

If the matrix on the right in equation (2) is multiplied with the weights vector $W = (W_1, W_2, Wn)$, where W is a column vector. The result of the multiplication of the matrix of pair-wise ratios with W is NW, hence it follows:

$$AW = nW \quad (3)$$

This is a homogenous linear equations system. It has a non-trivial solution if and only if the determinant of $A-nI$ vanishes, that is, n is an eigenvalue of A, I is an $n \times n$ identity matrix. AHP method computes W as the principal right eigenvector of the matrix a, that is,

$$AW = \lambda_{\max} W \quad (4)$$

Where λ_{max} is the principal eigenvalue of the matrix A, if matrix A is a positive reciprocal one then $\lambda_{\max} \geq n$, the judgments of the decision maker is consistent as long as:

$$a_{ij} a_{jk} = a_{ik} \qquad i, j, k = 1, 2, \dots\dots . n. \quad (5)$$

Which is equivalent to:

$$(W_i / W_j)(W_j / W_k) = (W_i / W_k) \quad (6)$$

The eigenvector method yields a natural measure of consistency. In AHP, the consistency index (CI) is defined as:

$$\text{CI} = (\lambda_{\max} - n)/(n-1) \quad (7)$$

For each size of matrix n, random matrices were generated and their mean CI value, called the random index (RI), was computed and tabulated as shown in Table 8. The consistency ratio is defined as:

$$CR = CI / RI \quad (8)$$

The consistency ratio CR is a measure of how a given matrix compares to a purely random matrix in terms of their consistency indices. A value of the consistency ratio of $CR \leq 10\%$ is considered acceptable. Larger values of CR require the decision maker to revise his judgments.

Table 3. Random index values (RI) sample size (n).

n	**3**	**4**	**5**	**6**	**7**	**8**
RI	0.58	0.9	1.12	1.24	1.32	1.41

The AHP consists of the following steps:

1. State the overall objective of the problem and identify the criteria that influence the overall objective.
2. Structure the problem as a hierarchy of goal, criteria, sub-criteria, and alternatives.
3. Start by the second level of the hierarchy:
   - Do pair-wise comparison of all elements in the second level and enter the judgments in an $n \times n$ matrix using Table 2.
   - Calculate priorities by normalizing the vector in each column of the matrix of judgments and averaging over the rows of the resulting matrix and you have the priority vector.
   - Compute the consistency ratio of the matrix of judgments to make sure that the judgments are consistent.
4. Repeat step 3 for all elements in a succeeding level but with respect to each criterion in the preceding level.
5. Synthesize the local priorities over the hierarchy to get an overall priority for each alternative.

IV. Results and Analysis

In order to analyze the traffic in Kuwait, opinions were collect for the various target and policies. Pair wise comparison were made between the various targets in order to rank them according to their importance, results are as shown Table 4.

Table 4. Average random index for corresponding size

	TA	**PN**	**CA**	**MC**	**GM**
TA	1.00	2.00	2.50	1.50	**0.39**
PR	0.50	1.00	1.25	0.80	**0.20**
CA	0.40	0.80	1.00	0.50	**0.15**
MC	0.67	1.25	2.00	1.00	**0.27**

λ_{max} = 4.006, CI = 0.002, CR = 0.002

Next step in AHP is to compare the various polices with respect to each target. The pair-wise comparisons are as shown in Tables 5, 6, 7, and 8. Also in each Table, the geometric mean (GM) is calculated for each policy.

Table 5. Pair-wise comparison between the polices with respect to reducing traffic accidents

	RR	AC	LR	IR	MT	IF	MS	GM
RR	1.00	2.50	1.50	6.00	4.00	5.00	0.50	**0.23**
AC	0.40	1.00	0.75	4.00	3.50	4.50	0.30	**0.14**
LR	0.67	1.33	1.00	5.00	3.00	3.50	0.45	**0.17**
IR	0.17	0.25	0.20	1.00	0.70	0.80	0.15	**0.04**
MT	0.25	0.29	0.33	1.43	1.00	2.00	0.25	**0.06**
IF	0.20	0.22	0.29	1.25	0.50	1.00	0.20	**0.04**
MS	2.00	3.33	2.22	6.67	4.00	5.00	1.00	**0.32**

λ_{max} = 7.18, CI = 0.030, CR = 0.001

Table 6. Pair-wise comparison between the polices with respect to reducing pollution.

	RR	AC	LR	IR	MT	IF	MS	GM
RR	1.00	1.50	3.00	0.30	0.50	2.00	0.75	**0.11**
AC	0.67	1.00	2.00	0.20	0.30	1.50	0.70	**0.08**
LR	0.33	0.50	1.00	0.10	0.20	0.75	0.30	**0.04**
IR	3.33	5.00	10.00	1.00	1.50	7.00	2.00	**0.35**
MT	2.00	3.33	5.00	0.67	1.00	4.00	1.25	**0.22**
IF	0.50	0.67	1.33	0.14	0.25	1.00	0.20	**0.05**
MS	1.33	1.43	3.33	0.50	0.80	5.00	1.00	**0.16**

λ_{max} = 7.07, CI = 0.012, CR = 0.0004

Table 7. Pair-wise comparison between the polices with respect to minimizing drivers carelessness

	RR	AC	LR	IR	MT	IF	MS	GM
RR	1.00	2.00	3.00	5.00	4.00	7.00	1.50	**0.32**
AC	0.50	1.00	2.00	2.50	2.50	4.00	0.70	**0.17**
LR	0.33	0.50	1.00	2.00	2.00	3.00	0.40	**0.11**
IR	0.20	0.40	0.50	1.00	0.75	1.50	0.30	**0.06**
MT	0.25	0.40	0.50	1.33	1.00	3.50	0.35	**0.08**
IF	0.14	0.25	0.33	0.67	0.29	1.00	0.20	**0.04**
MS	0.67	1.43	2.50	3.33	2.86	5.00	1.00	**0.22**

λ_{max} = 7.095, CI = 0.016, CR = 0.0005

Table 8. Pair-wise comparison between the polices with respect to minimizing congestion

	RR	AC	LR	IR	MT	IF	MS	GM
RR	1.00	0.75	0.60	1.25	0.15	0.25	0.30	**0.06**
AC	1.33	1.00	0.75	1.50	0.35	0.50	0.60	**0.09**
LR	1.67	1.33	1.00	2.00	0.40	0.70	0.75	**0.11**
IR	0.80	0.67	0.50	1.00	0.10	0.15	0.25	**0.04**
MT	6.67	2.86	2.50	10.00	1.00	1.50	2.00	**0.33**
IF	4.00	2.00	1.43	6.67	0.67	1.00	1.20	**0.21**
MS	3.33	1.67	1.33	4.00	0.50	0.83	1.00	**0.17**

λ_{max} = 7.090, CI = 0.0158, CR = 0.00048

From the data in Table 4 and Tables 5, 6, 7, and 8 the composite geometric weight of the different policies is calculates. Details are given in Table 9.

Table 9. The Composite weight (CW) of the different polices in reducing traffic problem.

	TA	PR	CA	CG	
	0.39	**0.20**	**0.15**	**0.27**	**CW**
RR	0.23	0.11	0.32	0.06	**0.18**
AC	0.14	0.08	0.17	0.09	**0.12**
LR	0.17	0.04	0.11	0.11	**0.11**
IR	0.04	0.35	0.06	0.04	**0.11**
MT	0.06	0.22	0.08	0.33	**0.17**
IF	0.04	0.05	0.04	0.21	**0.09**
MS	0.32	0.16	0.22	0.17	**0.23**

It can be observed from the results as shown in Table 4, the most important target for Kuwait should be in reducing traffic problem lies in minimizing accidents and solving the congestion problem. With regard to the most preferred polices, iimproving monitoring systems comes first with a score of 23%, followed by strict application of traffic rules and regulation 18% preference, followed by encouraging mass transport (17%). Details are shown in Table 9.

V. CONCLUSION

The traffic problems in Kuwait are very serious and have become more severe and complicated over the years. Many factors contribute to this problem, examples are drivers not abiding by traffic rules and regulations, carelessness driving, old vehicles that contribute to polluting the atmosphere, relaxed licensing procedures. In this study, expert opinions were solicited to identify the most effective policies that should strengthen so as to address the problem. Results of the analysis indicated that immediate actions should be taken to improve the monitoring system and to enforce traffic rules and regulations. Such move will undoubtedly contribute to minimizing the traffic problem especially in reducing fatalities and injuries. The study also recommends that Kuwait should take severe and immediate action to solve the traffic problem and the risk associated with it before it becomes acute and irreversible. Another recommendation suggested encouraging the use of mass transport; such action necessitates improving this sector. Also one the most effective's ways in reducing traffic accidents is through awareness media campaign.

Future research should investigate the cost associated with traffic accidents both to human and property in Kuwait. Moreover, research should also study the contribution of driver's behavior in causing accidents and congestion.

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