REVIEW AND ANALYSIS OF FIRE EVENTS IN EGYPT 1980-1991

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ABSTRACT.

Fire events are a potentially significant source of public risk, there is a need for an analytical approach to predict their frequencies and reduce their threats. Analysis and review of fire incidents may throw light upon the importance of assessing fire hazards and could help in a deep understanding of fire protection concepts and requirements.

This study displays a review and analysis of fire incidents in Egypt during twelve years from Jan., 1980 to Dec., 1991. The statistical methods of analysis include: frequency distribution histograms, analysis of variance as well as regression and correlation analysis. The investigations can be divided into three main parts: analysis of the total fire incidents (TFI), important fire incidents (IFI) and significant fire incidents (SFI). The analyses include the distribution of fire events and their losses, the primary causes, the classification of events according to the place of occurrence, and also the study throws some light on arson fire events.

The study provides general picture of fire experience over time. The number of TFI recorded in Egypt during the study period has an average value of 221 thousand fires annually, resulting on the average, in 226 deaths, 752 injuries and 11 million L.E. monetary losses.

For a greater insight more elements must be provided by the Ministry of Interior to describe fire incidents. Based on the analyses done and the review of fire protection codes and practices, the study recommends the importance of establishing a comprehensive Egyptian national fire incident reporting system to be used in the future.

1- INTRODUCTION.

Fire risk assessment studies indicate that the contribution of fires to severe accidents at some large facilities is significant and that fire may contribute in excess of 50% to the total frequency of accidents leading to large scale losses. In addition to the public health risk represented by fires, the financial risk due to direct fire damage, as well as loss of revenues as a result of fire can be significant.

The first step in fire risk assessment studies is data collection. The extent and detail of the data needed will vary widely depending of who the data user will be. Data may be needed to establish the value of insurance claims, to provide budget input and performance measures for the fire department or to allow the design communities to evaluate the effectiveness of fire protection and fire prevention measures.

The industrial development, growth and introduction of advanced technology in any country expected to carry and cause some relevant hazards. Safety and protection considerations should be concurrently planned according to definite requirements.

The work done in this paper is a compilation of a previous statistical study of fire incidents in Egypt (1). It is considered as the first comprehensive analysis of fire incidents in Egypt. This study was performed in accordance with a research contract between the Egyptian Atomic Energy Authority and the Egyptian Academy of Science and Technology (2). The work presented in this paper is one of numerous phases in the area of fire safety analysis and modeling aiming at studying detailed risk assessment of fires in Egypt.

The data required to analyze the fire incidents in Egypt is obtained from the yearly reports issued by the Civil Defence and General Security Organizations of the Ministry of Interior.

2- DATA COLLECTION AND ANALYSIS.

In trying to collect data about fires in Egypt, it is obvious that there are incomplete records about fires and the way of reporting them from a glance at these data, it clear that fire protection, fire fighting, fire reporting systems and fire codes need to be reviewed. The sources of data used in the analysis are, the Ministry of Interior annual reports issued by

both general statistics section (3), and General Security Authority (4), the records and files of the Civil Defence Authority and the records of the Egyptian Insurance Companies.

The data collected include information about the total TFI, the important (TFI) and the significant (SFI) fire incidents (SFI). The term TFI has been used by the Ministry of Interior for those fire incidents that had been extinguished by the Ministry's fire bridge and the evaluated monetary losses were more than one thousand Egyptian pounds (L.E.) in any of these incidents. The significant fires are used in this study for those fires that occurred at the general large facilities and in each of them the insurance indemnity were equal or more than 100000 L.E. The available data of the TFI observed in the years 1980-1991, whether as total number of incidents or classified under different categories together with the losses, were subjected to different methods of statistical analysis. The applied methods include: frequency distribution histograms, regression analysis, and analysis of variance.

The computations are done using the Statistical Package SPSS on a PC.

3- POPULATION, AREA OF THE REPUBLIC AND THE GOVERNORATES.

Egypt's population nearly doubled from 9.7 Million to over 19 million persons in the 50 years from 1897 to 1947. The next doubling took less than 30 years (from 1947 to 1976). In 1993, the estimated

Egyptian population was 58 million. The population growth rate, which was 1.5 percent annually at the beginning of this century, fell for a period and then began rising rapidly from the early 1950s, reaching a rate of approximately 2.5 percent in the early 1960s. For the period 1960-1967, the growth rate slackened, but by the early 1980s it had risen again to nearly 3 percent (5).

The problems and risks associated with the rapid rate of population growth are complicated further by one basic fact about Egypt, namely the extreme scarcity of cultivable land relative to people. Over 97 percent of Egypt's 1993 estimated population of 58 million is crowded on to less than four percent to the total area of one million square kilometers. The remaining 96 percent of the land area is desert.

The concentration of the population in the Nile Valley and the Delta, gives Egypt in 1993, density rates of 58 persons per square kilometre for the total area but over 1414 persons per square kilometers of inhabitable land. In Cairo, density reaches 28332 persons per square kilometre. The spatial distribution of the population presents a classic example of high metropolitan primacy. Now about 42% of the total urban population lives in Cairo and Alexandria.

Egypt has made great progress in the field of traditional industries, namely, spinning and weaving industries. Significant progress has also

been made in modern industries, such as metallurgical and chemical and other engineering industries. The state contributed to a most efficient drive towards increasing production in many industries, such as iron and steel, ceramics and porcelain, cement, paper and fertilizer and the petroleum industry. In Egypt about 33% of the population works in agriculture and 22% in the different industries.

4- STATISTICAL ANALYSIS OF TOTAL FIRE INCIDENTS.

A summary of fire statistics for the total incidents reported in Egypt (1980-1991) is given in Table 1. The recorded number of civilian deaths, civilian injuries, monetary losses, property exposed to damage and the ratio between the monetary losses and the property exposed to damage are given. The average annual number of fires was 20738 TFI in the republic resulted in 227 deaths and 752 civilian injuries in the average. The average annual value of the monetary losses due to fires was about eleven million Egyptian pounds.

From the study the following rates were calculated: one injury for each 27 TFI, one death for each 92 TFI and the average value of monetary losses was 521 LE/TFI during the study period. The average values were: one TFI for every 2677 Egyptian person in the year and one TFI occurred in the year for each 48.2 km² of the republic area compared to 1.93 TFI/km² of the inhabitable land.

Table 1
Total Fire Statistics

Year	Total Fires	Saved Fires	Civilian Injuries	Civilian Deaths	Monetary Losses (Thousand LE)
1980	15713	1184	980	291	3586
1981	17185	1169	663	179	12239
1982	17155	1132	940	165	23310
1983	19476	1045	761	310	8900
1984	20868	890	1029	269	7200
1985	21687	896	753	184	17043
1986	22773	945	657	303	8090
1987	24177	1250	808	190	6699
1988	22776	1502	806	198	9465
1989	23351	1454	781	246	9139
1990	22417	1225	808	182	16910
1991	21163	1594	701	200	7045

4-1 Frequency Distribution of TFI Over Governorates:

The histograms of the frequency distribution of the annual TFI over the different governorates (26 governorate + civilian airports) in the investigated 12 years were prepared. This was done in order to investigate any relation that might exist between the frequency of TFI and the population of the district, the intensity of population, the activities of the inhabitants (industrial, agricultural and/or commercial) and other features which distinguish the different governorates. The examination of the different histograms reveals the following:

- The distribution of incidents is more or less similar in all years of investigations where Cairo, Alexandria, Dakahliya and Giza governorates have the larger numbers of fire incidents. These governorates are the ones with larger population and population intensity.

The industrial areas such as Cairo and Alexandria have the higher frequency of fire incidents.

A moderate frequency of fire incidents occurred in agricultural areas such as Dakahliya, Qaluobia, Assuit and Behera.

The average number of fires is low in the border governorates including Red Sea, New Valey, Marsa Matroh, South and North Sinae.

The average number of fires with respect to each one of the inhabitants or for each km^2 were different for the different governorates. These figures were one TFI for each 1384 inhabitants in the capital of the country and the least figure was one TFI/7724 inhabitant of Qena governorate (excluding border governorates).

The rate of TFI w.r.t. each km^2 was 25 TFI/km^2 of Cairo area, one TFI/1.2 km^2 for Alexandria and the least one TFI/101 km^2 of Suez governorate area.

4-2 Losses of TFI:

Frequency histograms for the distribution of the recorded number of civilian deaths, civilian injuries and monetary losses in the TFI between the different governorates were prepared. Many factors may be considered to affect the distribution of losses in general. These include: the nature of the incident, the type of occupancy, the time of incident occurrence, the condition of the occupant, the type of construction, the

ignition source, the equipment involved, the form of heat of ignition, the position of the site with respect to fire bridge and the time of their arrival at the scene. From the studied histograms, the following points can be outlined:

There is no definite relation between the distribution of incidents over governorates and that for deaths.

The maximum average number of deaths in TFI during the study period of twelve years were recorded at Cairo (15.5%), Giza (12.8%), Behera (12%), and Assuit (10.2%). This means that the maximum average number of deaths occurred at some governorates where less than 5% of the total incidents had occurred (Assuit, and Behera).

The distribution of injuries in the TFI is different from one governorate to another and the maximum average was recorded for Cairo (34%), followed by Alexandria (13.4%).

The distribution of monetary losses shows that the maximum value of these losses had been projected in Cairo with an average value of about 50% of the total losses recorded in the TFI in the country. About 95% of the total losses is distributed among the TFI which occurred in between seven to eleven governorates for all the studied years. The average monetary losses in TFI in the republic was about 11 million Egyptian pounds. Cairo losses was about (50%) of these followed by Alexandria (18%) then Qaluobia (8%)

The number of civilian injuries has a range between 1 injury/8 TFI in Suez governorate and 1 injury/210 TFI in Aswan governorate. For the rate of deaths there was one death/630 TFI for Aswan and the maximum rate was for Assuit TFIs and it was one death/27 TFI.

4-3 Monthly Frequency Distribution.

The distribution histograms of the annual number of fire incidents over the months of the year were prepared for the years 1980-1991 (Fig.1). The examination of these histograms reveal the following:

The general monthly distribution of the TFI has almost the same features where periods of increasing and decreasing frequency and the relative frequency are more or less identical in the different years of observations.

The most conspicuous feature of the different histograms reveals that the maximum frequency is observed in the summer months, specially the months of May, June and July. Meanwhile the minimum distribution is observed over the winter months, specially the months of January and February. This change can be attributed to the following causes:

* The high temperature in summer season makes most of the heaped gangue and garbage material dried enough to act as a suitable environment for fire if the source exist.

* The months of May and June are the period of collection of some crops in agricultural areas where they can act as good fire environment and help for spreading of fire when once it starts, for different reasons.

- In industrial areas, electrical power plants, and traffic means, the relatively high temperature in summer season may act as a causing factor for blowing fire from different sources.

- In winter, the rainfall and the relatively low temperature are causes to reduce the frequency of fire incidents.

- The average maximum number of TFI in the republic was 2600, recorded during May and June and, the minimum was 1300, recorded during February.

4-4 TFI Causes and Categories

4-4-1 Causes

According to the Civil Defence Authority files, the TFI were classified according to their primary causes into six classes: industrial fires; ovens heaters and boilers; short circuits; petroleum; flammable gasses and chemicals liquids and; spontaneous combustion and chemical reactions. The most significant cause of TFI in Egypt was industrial fires (43.4%) followed by short circuits (26.1%), ovens, heaters and boilers (23.8%) and then gasses fires (4.9%). In Cairo, the most predominant causes were industrial fires (72%) and 18.3% of the capital TFI was due to short circuits.

4.4.2 TFI Categories

The TFI that had occurred in Egypt is classified into nine categories according to where these incidents occurred (civil Defence Authority Classification). These categories, according to the location or type of occupancy are: residential buildings, commercial shops and stores, governmental facilities, industrial facilities, storage areas for agricultural crops, petroleum facilities, transportation means and other places.

Table 2 illustrates the distribution of TFI in Egypt and some governorates during 1991 according to places of occurrence. About 52.5% of the TFI occurred at residential buildings, commercial shops and store houses, 2.6% in storage areas for agricultural crops, 2.2% petroleum and industrial facilities fires and 4.9% for the TFI transportation means fires (Fig. 2).

Table 2

Distribution Of Total Fire Events Between The Different Governorates During 1991 According To Places Of Occurrence

Governorate	Residences and Commercial	Crops	Industrial and Petroleum Facilities	Transportation Means	Other Places	Total
Cairo	1299	–	175	284	2961	4719
Alexandria	630	2	51	146	1773	2602
Dakhleia	1195	43	12	40	255	1545
Giza	599	17	88	121	607	1432
Qaluobia	603	2	8	28	599	1240
Gharbia	738	67	4	22	269	1100
Sharkeia	1007	5	3	14	28	1057
Kafr Sheikh	950	2	2	14	46	1014
Others	5302	420	122	369	1504	6454
Total	11115	558	465	1038	7987	21163

4.5 Arson Fires

About 110 arson fire felonies, on the average, was reported annually in Egypt, 50% of them occurred in Cairo, Alexandria and Menofia governorates (40% of the TFI were recorded in these three governorates) with 25% of them occurred in Cairo governorate.

The distribution of arson fires, according to places of their occurrence was, as follows: The accidents occurred at shops, residences, coffee shops, farms, factories, schools, streets, mosques and other places. From the study it has been found that about 50% of the arson fires occurred inside residential buildings followed by commercial shops and farms and annually about 4 arson felonies were recorded at schools and one or two fires at mosques (Fig.3).

The arson felonies were classified according to the type of affected components or material such as clothes, furniture, transportation means, agricultural crops, irrigation and agricultural machines and others. From the study it has been observed that in about 80% of the arson felonies, the purpose was to damage the goods and furniture, and then agricultural crops (8.4%).

The monetary losses evaluated for each fire felony was about 7 thousand L.E./Fire and in about 54% of these fires it was 14 thousand L.E./Fire Felony.

4-6 Statistical Treatment of TFI Data.

The Statistical Package SPSS was used in the statistical analysis of the TFI data on a PC. Variables under investigations were: number of TFI, civilian injuries, civilian deaths, monetary losses and properties exposed to damage due to fire in TFI at republic level and for each governorate.

The following were the analysis carried out and some of the obtained results.

Calculation of some important measures for the central tendency of the above five variables for each one of the Egyptian governorates. These include calculation of the mean, median, mode, standard deviation, variance, kurtosis and skewness.

Studying of the pattern of annual TFI and the true differences from one governorate to another.

Analysis of Variance to test if there are any significant variations in the annual frequency of the total number of governorates fire incidents and the possibility of dividing the governorate into groups having the same pattern of fires within each group. Two way analysis of variance had been carried out. The results show that there are significant variations between the frequency of TFI of the different governorates and from year to year. According to the results of least significant difference test (LSD), the Egyptian governorates can be divided into 17 homogenous group regarding the frequency of TFI.

Determining the best fit polynomial for each of the historical time series representing the chronological distribution of TFI over the years of the study period. Trend analysis was performed before identifying the degree of polynomial to test the hypothesis that the time series element represent random sequence using one sample run test.

The best fit was determined using least square method and assuming different models. Analysis of variance was performed for the regression coefficients of these models and also regression test was performed for each coefficient with the calculation of the error in the evaluated coefficients. The chronological distribution of the TFI can be represented by a straight line in two of the governorates, second order polynominal in 12 ones, third order polynomial in two governorates and the logarithmic model in one case. For two governorates, no accurate model can be recommended to represent the variations of TFI over the study period (Tables 3,4 illustrates some of the obtained results).

Analysis of residuals was performed for the 26 time series of TFI for each governorate to study to what extent the statistical treatment of the available data can be accepted. The analysis includes the calculation of the maximum and minimum limits for the expected standard residual, and non standard residual values. The results of the test show that the least square method can be applied.

Table 3
Results of Regression Analysis
For The Number of Total Fire Incidents
In Some of The Egyptian Governorates

Governorale	Degree of Eqution	Nultiple R	R²	Adjusted R
Cairo	Second	0.944	0.891	0.867
Alexandria	First	0.932	0.869	0.856
Suez	Log.	0.694	0.482	0.431
Dakhleya	Third	0.911	0.830	0.766
Sharkia	First	0.825	0.681	0.649
Qaluobia	First	0.971	0.942	0.927
Behera	First	0.504	0.354	0.18
Giza	Second	0.823	0.693	0.625
Assuit	Second	0.846	0.716	0.652
New Valley	Third	0.963	0.927	0.900

Table 4
Regression Coefficients of The
Total Fires Models For Some
of The Egyptian Governorates

Governorale	Degree of Eqution	A	B	C	D
Cairo	Second	4066.859	322.147	-12.69	
Alexandria	First	1417.267	62.797		
Suez	Log.	2.123	0.123		
Dakhleya	Third	1410.620	-52.500	8.77	-0.269
Sharkia	First	779.232	14.217		
Qaluobia	First	593.020	30.005		
Behera	First	750.430	9.054		
Giza	Second	639.620	183.410	-6.77	
Assuit	Second	422.025	35.480	-1.18	
New Valley	Third	47.520	-5.800	1.18	-0.035

The results obtained are used to calculate the limits of significance levels for the average TFI in the different governorates. The predicted upper and lower limits for the average TFI were calculated.

The same procedure were performed for the civilian injuries and deaths in total fire incidents. (sample of the results are given in tables 5,6,7)

In a trail to evaluate the losses due to fires the risk factor was calculated. The average risk factor for the TFI deaths was 4×10^{-6} and for injuries 1.63×10^{-5} i.e. The TFI resulting in one injury for every 61350 persons of the Egyptians and one death between 217391 persons of the country population (2).

5. IMPORTANT FIRE INCIDENTS (IFI):

The term important fire incidents have been used by the Ministry of interior for those fire incidents that had been extinguished by fire brigade. The analysis of these IFI include frequency distribution histograms, the regression analysis, the analysis of variance and the classification of IFI into four selected categories.

5.1 Summary of IFI Statistics:

Figure 4 illustrates the number of IFI together with the number of civilian deaths, and injuries for the years 1981-1988. The number of IFI is only about 1% of the total recorded incidents for each year over the study period of eight years (1981-1988). The losses of IFI had a percentage value of 1.6-22.2% for the deaths, 2.3-17.4% for the injuries

Table 5
Results of Regression Analysis
For The Number of Civilian Deaths In total Fire
Incidents for Some of The Egyptian Governorates

Governorale	Degree of Eqution	Nultiple R	R^2	Adjusted R	Eeeor	Calculated F
Cairo	Log	0.8529	0.7274	0.66685	15.411	12.01
Alexandria	Third	0.238	0.057	-0.297	7.87	0.1599
Suez	Log	0.008	0.00007	-0.222	3.31	0.0003
Dakhleya	First	0.062	0.0038	-0.0958	11.53	0.038
Sharkia	Second	0.446	0.199	0.022	7.29	1.12
Qaluobia	Second	0.3222	0.104	-0.095	5.53	0.5198
Behera	Second	0.255	0.065	-0.143	32.74	0.313
Giza	Second	0.416	0.173	-0.11	13.98	0.9414
Assuit	Second	0.498	0.248	0.08	13.66	1.48
New Valley	Second	0.504	0.254	0.088	0.622	1.54

Table 6
Two Way Analysis of Varience
For The Number of Civilian Injuries
In Total Fire Incidents

Source	Degrees of Freedom	Sum of Squares	Average Squares	Calculated
Between governorates	26	813092.322	31272.777	62.2
Between Years	11	149290.75	502.662	

Table 7
Two Way Analysis of Varience
For The Number of Civilian Deaths
In Total Fire Incidents

Source	Degrees of Freedom	Sum of Squares	Average Squares	Calculated
Between governorates	26	29584.4561	1137.867	11.372
Between Years	11	29741.25	100.138	

and the higher percentages for the monetary losses which had a range of 17.7 - 63.7% of the total losses that had been projected, for the years 1981-1988.

5.2 Frequency Distributions

This part includes the frequency distributions of the annual number of IFI over the different months of the year and over the governorates of the country in the eight study years 1981-1988.

5.2.1 Monthly distributions

The histograms of the annual number of IFI over the months of the year were prepared for the years 1981-1988 ·· ·. The examination of these histograms reveal the following:

- There are some differences in the features of the monthly distributions from year to year.

- The maximum frequency has been observed in the summer months specially the months of April, May, June and July (For 1982, 1984 a high frequency was observed in December and February respectively). The minimum distribution has been observed over the winter months.

5.2.2. Distribution over the governorates

The distribution of IFI between the governorates (26 governorate and the civilian airports are excluded in this case) shows that the maximum number of them had been recorded in Alexandria followed by Cairo and Behera. In a number of the republic governorates, there was no reporting of any IFI during the study period and in Dakahliya

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governorate (the fourth one regarding the recorded TFI) the sum of the total IFI during the study period was eleven events. Fig. 5. illustrates the distribution of IFI in governorates with highest percentages of them. From the study of the distribution of IFI and the losses of them, Alexandria governorate seems to have the best teams for fire extinguishion from the point of view of property losses, the monetary losses that had been projected in IFI in Alexandria had nearly the same value as for that in the TFI. For Cairo governorate there are a lot of missing values for the evaluated losses.

Studying the effect of each of the population of district, the intensity of the population, the activities of the inhabitants, and other features which distinguish the different governorates on the frequency of IFI, it is clear that the population, population intensity, the industrial activities besides Alexandria is port with flammable and inflammable materials to be stored and transmitted that results in the large number of IFI there.

5.3. The Different Categories of IFI

The IFI that had been recorded in Egypt were classified into four categories according to where these incidents occurred. These categories are:

- *Category one:* these incidents occurred in residence, hotel, or any civilian facility or commercial shops.

- *Category two:* these incidents occurred in industrial facilities, ovens, electrical power stations, electrical substations or any electrical facility, scientific laboratories.........

- *Category three:* transportation fire incidents (cars, buses, trains, airoplanes, ships, trucks...).

- *Category four:* IFI in agricultural or cattles resources (farms animals, trees, plants and specially balled cotton usually stored in yards or when it was being transported on truks..).

A great effort has been done to identify the category of each incident of 1651 IFI, which occurred during the study period (Table 8). From the study, it has been found that the incidents of category 1 have the highest frequency of occurrence (Fig. 6). Out of the total IFI incidents, the average percentage distribution in the four categories is 48%, 22%, 19% and 11% respectively. The maximum number of civilian deaths are involved in incidents of the 1st category except for 1983, 1988 where the maximum number were in transportation incidents and the percent of deaths reached 72.7 and 88.9% during these two years.

The distribution of monetary losses shows that about 66.8% of the total monetary losses has been projected in the industrial facilities incidents, there is a good correlation between the losses due to incidents at industrial facilities and the total IFI losses.

Table 8
Distribution Of Important Fire Events According To Places Of Occurrences
1981-1988

Year	Residences and Commercial	Industrial Facilities	Transportation Means	Agricultural and Cattles Resources	Total
1981	82	55	31	24	192
1982	51	43	32	17	143
1983	62	54	41	21	178
1984	91	66	32	31	220
1985	133	57	54	23	267
1986	140	26	48	20	234
1987	124	25	40	17	206
1988	143	42	43	23	251

6- SIGNIFICANT FIRES

Significant fires were used in this study for those fires that occurred at the general large facilities and in each of them the indemnity paid by the insurance companies were more than 100,000 L.E. In the last few years there were numerous fires that occurred in a number of industrial and petroleum facilities and the evaluation of losses in an many of them exceeded several millions L.E. The data used in this section was obtained from the different Egyptian Insurance companies. Some information about 234 significant fire incident which occurred during the last 10 years (1983-1993) were analyzed.

The frequency of occurrence of these events was higher during the last three years and the average indemnity per incident during the study period was 786 thousand L.E. The higher average was recorded for 1993 incidents as it reached about 2 million L.E. From the monthly distribution of these events it is clear that the frequent occurrence of them (as the TFI) were during April, May and June.

From the distribution of SFI according to the type of activity (Table 9) it is evident that the higher values of the average indemnities were for petroleum facilities followed by industrial facilities for different types of paper production.

Table 9
Classification of significant fire incidents (SFI) according to type of facilities

Type of Facility	No. of SFI	Total Indemnities LE.	Average Indemnity/SF LE.
Commercial	29	14,112,096	361,848
Industrial	29	11,475,734	395,700
Textile and spinning	21	6,699,787	319,000
Chemical	18	4,608,846	256,047
Building and Construction/tools	10	3,298,613	329,861
Banks	9	1,924,660	213,851
Petroleum companies	9	19,839,697	2,204,410
Press agencies and related facilities	6	11,962,613	1,993,769
Hotels and others	4	3,521,830	880,457
Total	145	77,443,876	524,270

CONCLUSIONS AND RECOMMENDATIONS:

The average annual number of fire incidents in Egypt differed over the study period, with an average number of 21 thousand fire event/year, 752 civilian injuries, 226 deaths and the annual average value of the TFI monetary losses was 211 million L.E. during the study period.

The definition of important fire incident used by the Ministry of Interior needs to be modified to include all the events which resulted in deaths and/or injuries.

Codes and standards need to be reviewed and applied. Also a comprehensive national fire incident reporting system have to be established to collect, analyse and disseminate information on fire events in order to be able to reduce their consequences.

The Ministry of Interior is the only organization in Egypt with overall responsibility for fire protection and fire fighting measures. It is recommended to have:

- Center for fire research whose scope extends from exploratory research on combustion to the development of computer programs to solve practical fire protection engineering problems.

- A bachelors degree in fire protection engineering has to be offered by one of the departments of a faculty of engineering.

- Fire protection basics, have to be included as one of the educational subjects in preparatory and secondary schools.

ACKNOWLEDGEMENTS

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3- Annual Statistics Reports issued by Ministry of Interior, 1980-1991.
4- Annual General Security Reports Issued by Ministry of Interior, 1980-1991.
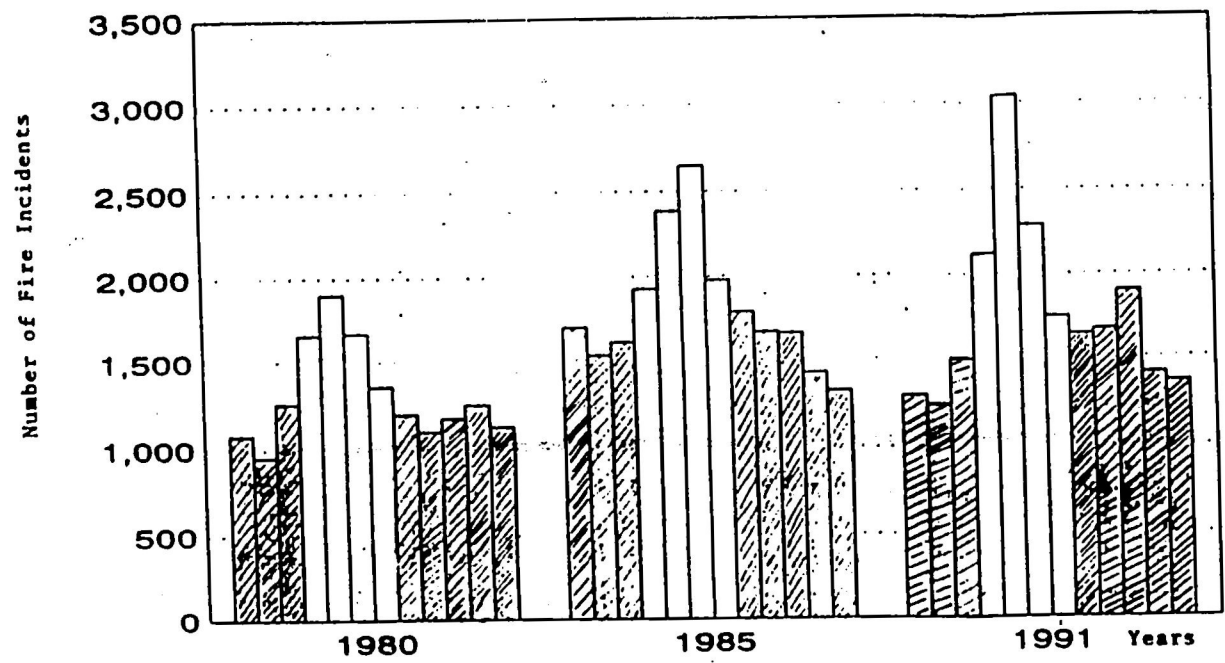5- Annual General Statistics Report Issued by the Central Agency for Public Mobilisation and Statistics, 1994.

Fig. 1

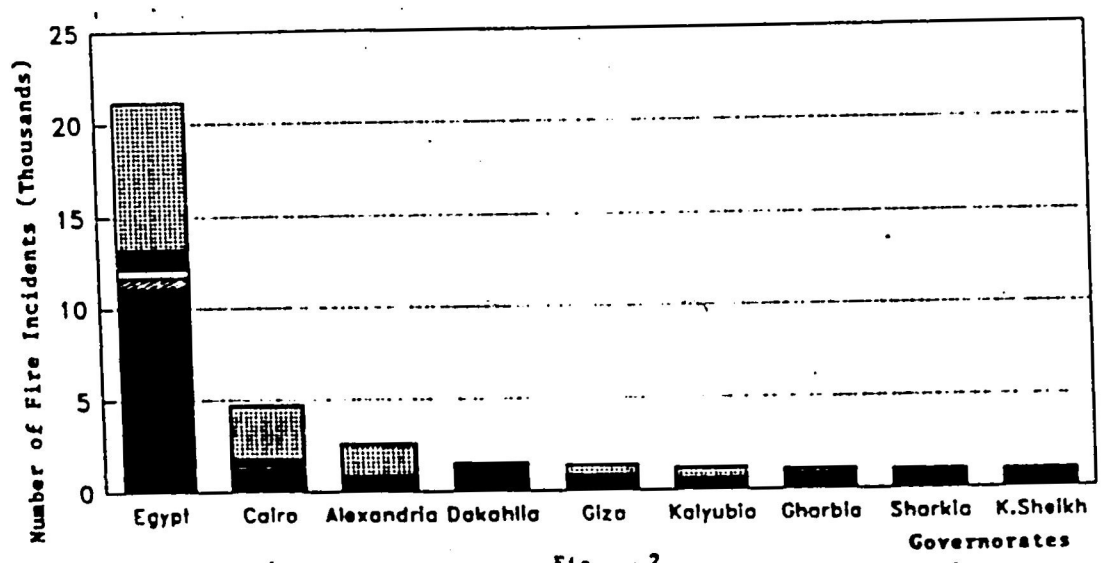**Monthly Distribution of Total Fire Incidents in the Republic**

Fig. 2

Legend:
- Residential & Commer.
- Agricultural Sources
- Industr.& Petroleum
- Transportation
- Others

Fire Incidents Of Some Governorates and The Republic According To Places Of Their Occurrence
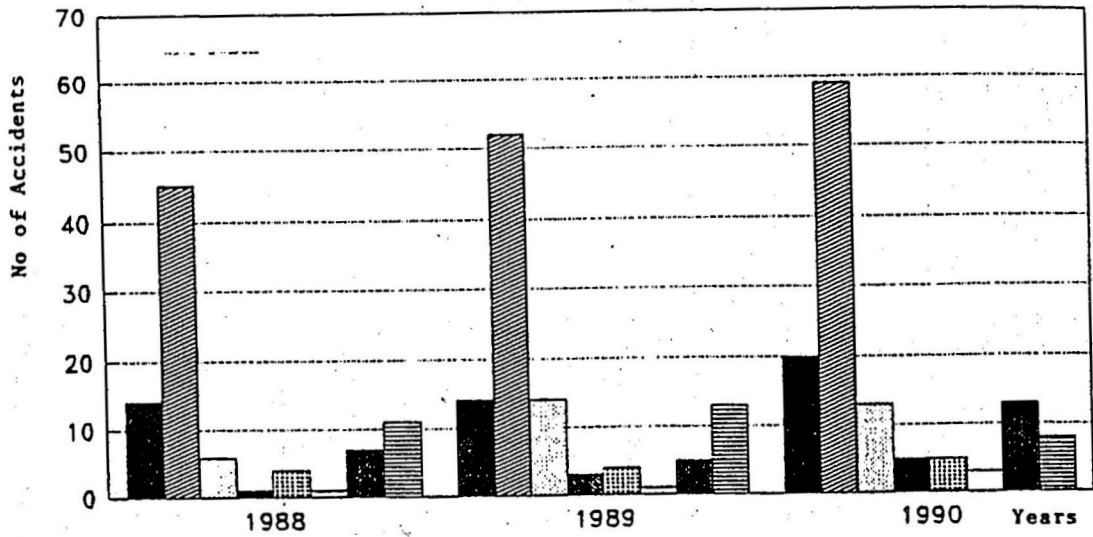
Fig. 3

Shops   Residences   Farms   Factories

Schools   Mosques   Street   Others

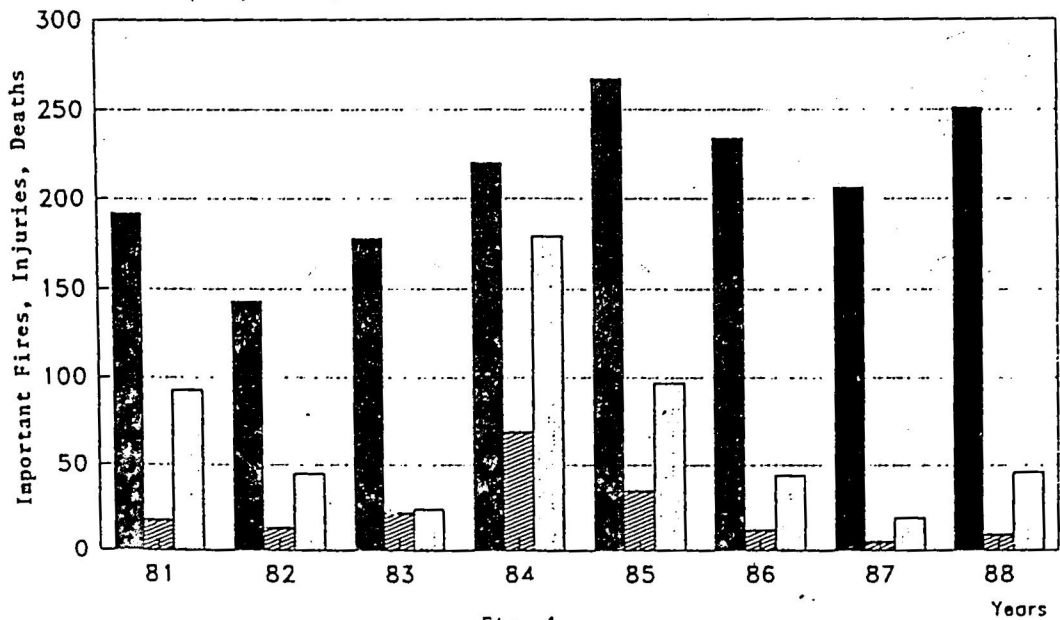\Arson Fire Accidents Distributed According
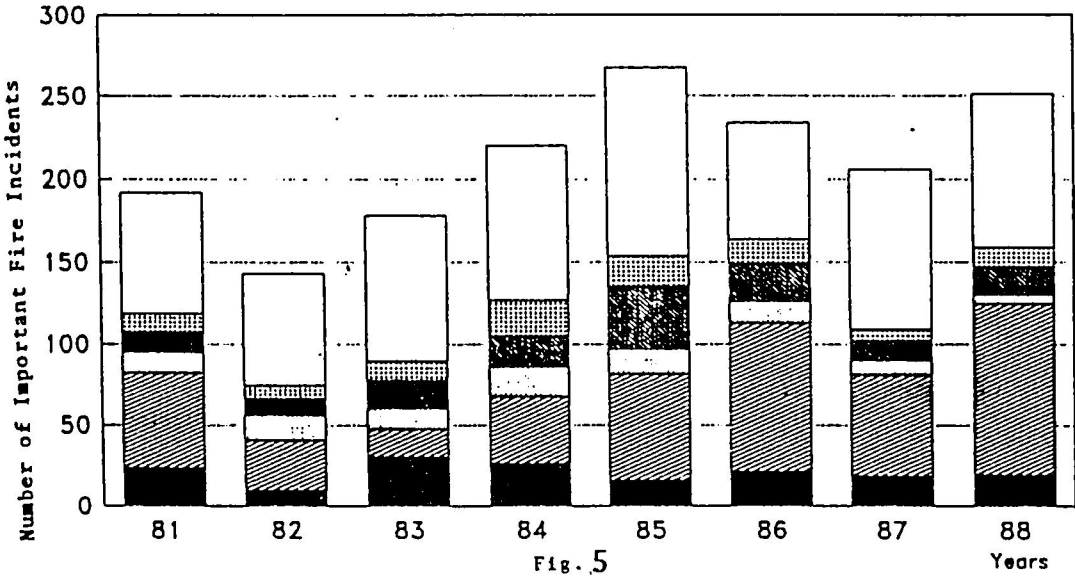To Place Of Occurrence
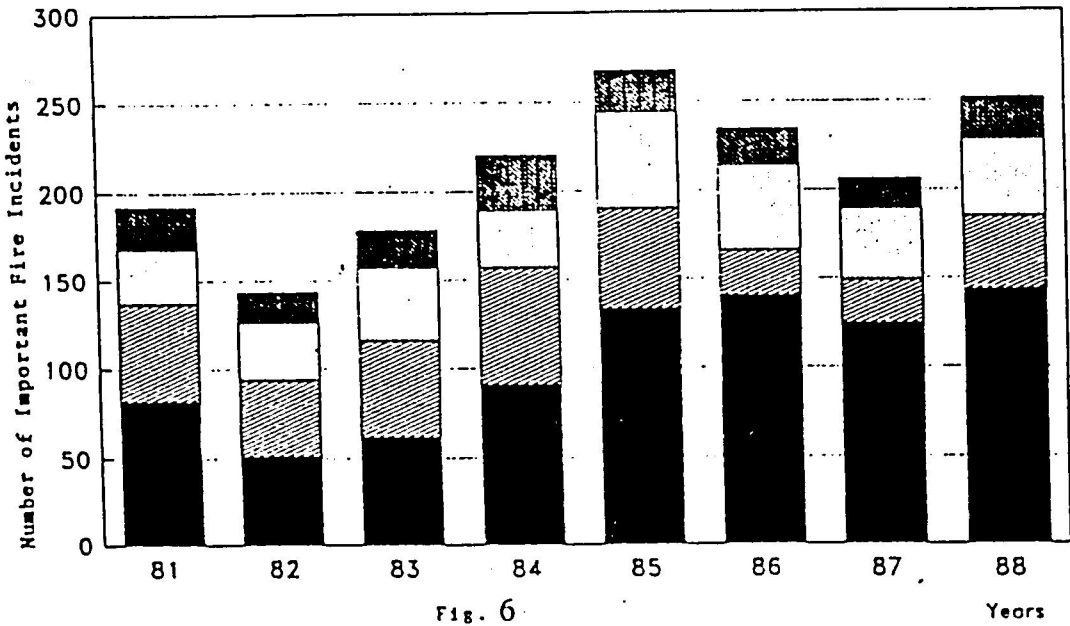

Fig. 4

Total Fires   Deaths   Injuries

Summary Of Fire Statistics Of IFI For The Years 1981 — 1988

Fig. 5

■ Cairo	▨ Alexandria	☐ Gharbia
■ Behera	▤ Assult	☐ Total

The Distribution Of Important Fire Incidents
Between The Governorates

Fig. 6

■ Class-1	▨ Class-2	☐ Class-3	■ Class-4

The Distribution Of IFI Between The Different Classes