

Analysis of accidents due to Fires in Korea, 1997-2006

1997-2006, 한국에서 발생한 화재사고 분석

Yeong-Jin Chung¹

*School of Fire & Disaster Prevention, Kangwon National University, Samcheok-city,
Gangwon-do 245-711, Republic of Korea*

요 약

한국에서 1997-2006년 동안 소방방재청(NEMA)에 보고된 화재사고를 조사하였다. 화재로 인한 23523건의 화재사고가 발생하였다. 화재의 사고 형태와 화재 원인에 기초한 통계적 비교를 분석하였다. 화재 총건수의 27.5%가 주민의 주거에서 발생하였고 18%가 차량에서 발생하였다. 점화원으로는 전기가 제일 높았고 다음으로 흡연으로 조사되었다.

ABSTRACT

Fire accidents reported to the National Emergency Management Agency (NEMA) during 1997-2006 in Korea are investigated. A survey of 23523 accidents due to fires is presented. Statistical comparisons based on the type of accidents and the causes of fires are analysed. The results indicated that 27.5% of the total number of fires are residential houses and apartments and 18.0% were motor vehicles. Electricity was classified to be the highest cause of fire ignition sources and smoking was the second source of ignition.

Keywords: Fire; Accidents; Statistical comparisons; Korea

1. Introduction

Each year, fire causes lots of deaths and enormous loss of property loss of the world. The purpose of plan and facilities for fire safety in areas with occupants is to make an environment with low probability of loss of lifproperty. Also, another

¹ Tel.: +82 33 570 6813; fax: +82 33 570 6819.

E-mail address: yjchung@kangwon.ac.kr (Y. J. Chung)

purpose is to restraint environmental destruction in the most of fire, where the main issue is to constraint the emanation of gaseous pollutants and combustion products to the atmosphere [1,2].

Korea has a number of deaths, injuries, and losses of property as a result of fire occurring in different places each year. The NEMA investigates accidents and searches to defend comparable accidents from occurring again. It began to publish annual records for fire incidents several years ago. For the achievement of fire safety plans, the fire statistics are significant assesses. These statistics would be important for controlling if a safety process is running efficiently. The purpose of this paper is to assess how life safety is being affected year after year (1997-2006).

2. Analys of Fire data

The accidents reported in this paper occurred from the period 1 January 1997 to 31 December 2006. The main types of fires reported by the NEMA have been rearranged into the major sections listed in Table 1.

The overall number of injuries and deaths for each year is presented in Table 2.

Table 1. Numbers of fires occurred for 1997-2006

Location	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06
Tot	29472	32664	33856	34844	36169	32966	31372	32737	32340	31778
Str	23743	27168	28253	28846	30037	27102	25235	26620	26370	25773
Mot	5729	5496	5603	5998	6091	5864	6137	6117	5970	6005

Tot: Total, Str: Structures, Mot: Motor vehicles

The overall number of fires is 328198.

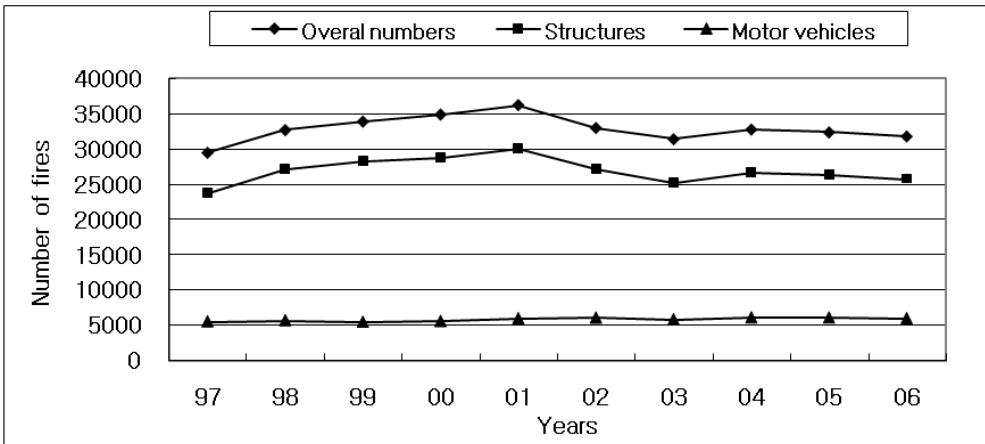


Figure 1. The numbers of fires occurred for 1997-2006.

Table 2. Numbers of accidents by fire for 1997-2006.

Accidents	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06
Total	2195	2304	2370	2384	2376	2235	2833	2304	2342	2180
Death	564	505	545	531	516	491	744	484	505	446
Injury	1631	1799	1825	1853	1860	1744	2089	1820	1837	1734

The overall accidents due to fires are 23523.

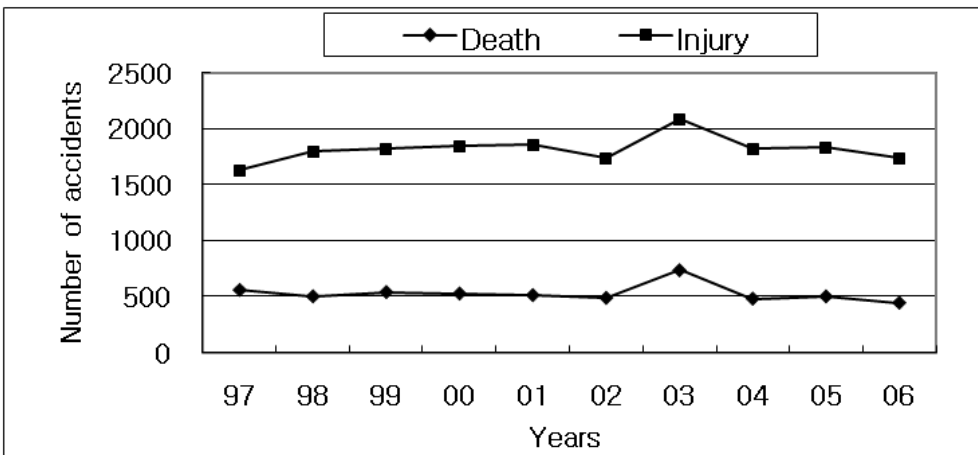


Figure 2. The numbers of accidents by fire for 1997-2006.

3. Numbers of fires per year, 1997-2006.

Fire incidents are thought to be high in Korea, the overall number of fires is 328198 reported fires over the period 1997-2006 (Table 1). The reported number of structures in this section include residential houses and apartments, motor vehicles, industrial plants and work places, restaurants, stores, others (warehouse, business office, hotel and inn, school, etc). Motor vehicles in this section include motor vehicles, ships, air planes, etc.

4. Accidents by fire

The accidents which were resulted as the deaths and injuries due to fires averaged out to 2352.3 per year (Table 2). Figure 2 shows the variation of the number of injuries and deaths for 10-years. Moreover the number of injuries increased in 2003 (2089 injuries). In 2006, the figure decreased by 5.6% on the previous year's figures. The highest number of deaths appeared in 2003 (744 deaths).

Table 3. Fire Statics of Different Location

Classification	Total	Residential houses & apartments		Motor vehicles		Industrial plants & work places		Restaurants		Stores		Others			
		D	I	D	I	D	I	D	I	D	I	D	I		
'97	Numbers	2195(100)		1053(48.0)		165(7.6)		280(12.8)		139(6.3)		91(4.1)		467(30.2)	
	(%)														
	Loss	D	I	D	I	D	I	D	I	D	I	D	I	D	I
	Numbers	564	1631	313	740	58	107	27	253	40	99	15	76	111	356
'98	Numbers	2284(100)		1029(45.0)		176(7.7)		237(10.4)		178(7.8)		111(4.9)		553(24.2)	
	(%)														
'99	Numbers	2370(100)		1106(46.7)		149(6.3)		238(10.0)		166(7.0)		127(5.4)		565(24.6)	
	(%)														
'00	Numbers	2384(100)		1109(46.5)		186(7.8)		306(12.8)		171(7.2)		129(5.4)		483(20.3)	
	(%)														
'01	Numbers	2376(100)		1195(50.3)		142(6.0)		228(9.6)		149(6.3)		95(4.0)		567(23.8)	
	(%)														
'02	Numbers	2235(100)		1030(46.1)		165(7.4)		219(9.8)		163(7.3)		85(3.9)		569(25.5)	
	(%)														

'03	Numbers	2833(100)	1198(42.3)	604(21.3)	248(8.8)	187(6.6)	91(3.3)	495(17.7)						
	(%)	744	2089	332	876	275	329	25	223	31	156	5	86	76
'04	Numbers	2304(100)	1086(47.2)	220(9.6)	254(11.1)	123(5.4)	99(4.3)	522(22.5)						
	(%)	484	1820	297	789	77	143	18	236	12	111	6	93	74
'05	Numbers	2342(100)	1052(44.9)	180(7.7)	221(9.4)	154(6.6)	119(5.1)	616(26.3)						
	(%)	505	1837	289	763	75	105	26	195	13	141	13	106	89
'06	Numbers	2180(100)	1066(48.9)	180(8.3)	192(8.8)	141(6.5)	92(4.2)	509(23.3)						
	(%)	446	1734	285	781	48	132	13	179	15	126	12	80	73

D: Death, I: Injury

5. Discussion

Many statistical methods are accessible to understand accidents. One of these approaches is the death number per year [5-9]. This method is helpful because it forecasts prevention on the damage. Table 3 compares the numerical values of the death number obtained for each year during 1997-2006.

It is obvious that many activities in daily life are more hazardous than working in industrial plants and workplaces.

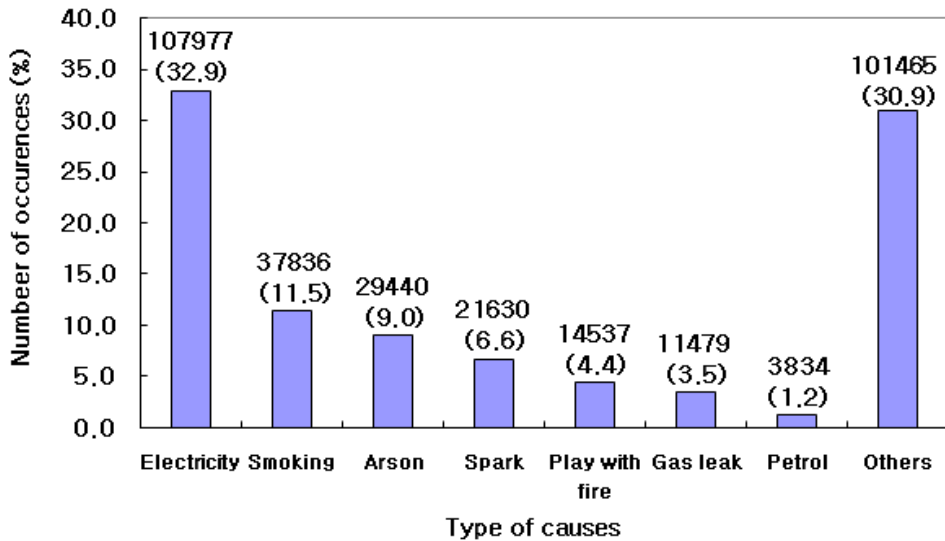


Figure 3. Causes of the fires occurred for 1997-2006.

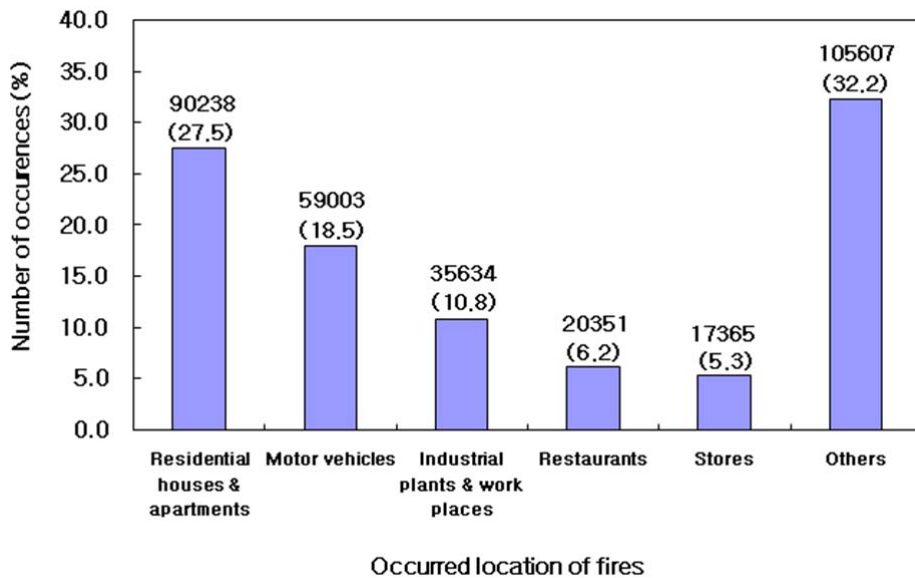


Figure 4. The percentage of occurred location of fires (1997-2006).

It is hard to forecast the trend of the numerical values gained but considering the last ten years, the numerical values in some years trend to show a slight decrease except 2003. This may be due to the continuous efforts by various governmental systems especially the NEMA to increase the understanding of people for preventing risks.

The ignition sources which were determined as the causes of fire were arranged for over 320000 fires. Figure 3 lists the causes of occurrence for each fires. The causes of fire are numerous; consequently it is not possible to certify and remove them all.

The ignition source with the greatest probability of fire-occurrence should be greatly considered, such as electricity which accounts for about one-third of the total number of causes. Usually, most electricity fire in Korea are caused by overloaded equipment or overheated wires. Based on the obvious analysis, to control fires effectively, it is necessary to apply safer maintenance and use of normal load. Figure 3 also indicates that smoking is the second source of ignition. This is a significant problem in Korea as well as many other countries [6-8].

Our efforts can be done to reduce the probability of fire-occurrence, but it is impossible to prevent all notable fires. The highest degree of protection may be achieved through technical safety accesses with standards.

To enhance the safety requirement, it is important to determine the percentages of input of each category of the total number of fires during 1997-2006. Figure 4 lists the percentage of requirement.

It can be seen, that fires in residential houses and apartments and motor vehicles fires account for 27.5% and 18% of the total number of fires in Korea, respectively. These figures are similar to the reported figures of many countries around the world.

That is because these two sections account for almost 46% of the total number of fires. It becomes important that the fire reports must include information, which upon analysis, will help the NEMA to make policy congress and working findings. This is in addition to the general aim of other government departments in reducing the number of incidence of fire and related death, injury and damage.

The most important purpose for providing fire safety in controlled places such as residential houses and apartments, shopping malls and industrial plants is to insure life safety and protect property protection. First of all, the national codes must give more emphasis on life safety than property protection [2].

It is also necessary to provide facilities for the detection and notification of fires, safe travel paths for the movement of occupants and fire-fighters, barriers to control the spread of fire and smoke, and structures which will not prematurely collapse when exposed to fire. Also, to enhance fire safety, the planning of emergency procedures, conducting of drills and education are important measures. To lower the risk of fire, it is necessary to do some research on fire and fire protection.

6. Conclusions

Fire accidents in Korea reported to the National Emergency Management Agency (NEMA) during 1997-2006 are investigated.

A survey of 23523 accidents due to fires is presented. It is hard to forecast the trend of the numerical values gained but considering the last ten years, the numerical values in some years tend to show a slight decrease except 2003.

The results obtained indicated that 27.5% of the total number of fires are residential houses and apartments and 18.0% were motor vehicles. It is obvious that many activities in daily life are more hazardous than working in industrial plants and workplaces.

The ignition source with the greatest probability of fire-occurrence should be greatly considered, such as electricity which accounts for about one-third of the total number of causes. Usually, most electricity fire in Korea are caused by overloaded

equipment or overheated wires. To control fires effectively, it is necessary to apply safer maintenance and use of normal load. The smoking is the second source of ignition. This is a significant problem in Korea as well as many other countries.

Our efforts can be done to reduce the probability of fire-occurrence, but it is impossible to prevent all notable fires. The highest degree of protection may be achieved through technical safety accesses with standards.

References

- [1] Y. Alarie, "Toxicity of Fire Smoke", *Critical Reviews in Toxicology* , Vol.32, No.4, pp.259-289(2002).
- [2] A.H. Buchanan, "Structural design for fire safety", Wiley, New York(2002).
- [3] Annual Reports of Republic of Korea National Emergency Management Agency (Statistics on fire accidents in Korea during 1997-2006)(2006).
- [4] Annual Reports of Republic of Korea National Emergency Management Agency (Statistics on fire accidents in Korea during 1994-2003)(2003).
- [5] A.M. Hasofer, I. Thomas, "Analysis of fatalities and injuries in building fire statistics", *Fire Saf. J.*, Vol.41, pp.2-14 (2006).
- [6] P.G. Holborn, P.F. Nolan, J. Golt, "An analysis of fatal unintentional dwelling fires investigated by London Fire Brigade between 1996 and 2000", *Fire Saf. J.*, Vol.38, pp.1-42(2003).
- [7] Y. Lizhong, Z. Xiaodong, D. Zhihua, F. Weicheng, W. Qing'an, "Fire situation and characteristic analysis based on fire statistics of China", *Fire Saf. J.*, Vol.37, pp.785-802(2002).
- [8] P. Leth, M. Gregersen, S. Sabroe, "Fatal Residential Fire Accidents in the Municipality of Copenhagen, 1991-1996", *PREVENTIVE MEDICINE*, Vol.27, pp.444-451(1998).
- [9] T. Rosenberg, Statistics for fire prevention in Sweden, *Fire Saf. J.* Vol.33, pp.283-294(1999).