A STUDY ON THE SOCIO-ECONOMIC AND DEMOGRAPHIC SIGNIFICANCE OF FIRE IN THE DEVELOPED AND THE DEVELOPING COUNTRIES

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ABSTRACT

This comparative study makes an attempt to find any common ground between the findings in different countries and see if there are any trends defined or if there is no relation between them. Another, maybe, more important scope is the comparison of the fire situation in the developing and developed countries today.

Although it is extremely difficult to obtain detailed data on different countries and although most of the countries do not keep statistical data at all, an attempt was made to gather the limited data accessible to the public, compare the data sets and draw some conclusions from this comparison.

Data was gathered for the UK, USA, China, Russia and New Zealand and limited data was found on Brazil, Canada, Greece, Singapore and Australia. Comparing tables were drawn and the results are presented below.

1. INTRODUCTION

It is obvious that in this comparison, the major factor that affects the fire trends or even the extent that a fire reaches, lies on the socio-economic factors applying to the particular country. There is a big difference in the amount of dwelling fires from the countries of the North to the countries of the South and this is mainly because countries of Southern Europe or the Far East are seismogenous and use concrete structures instead of wood that is used in Northern European countries that make fire growth and progress relatively difficult. It is also apparent that since in the developing countries raw fire is used as one of the main means of heating and cooking, a much higher number of fire incidents will be recorded. The town plan is also a main factor because a town that grows in area rather than height will decrease the extent of fire damage between buildings. Finally a main, if not the main factor has to do with the state policy on fire protection and the allocated (or not) budgets for fire protection. Some developed countries tend to adopt precautionary policies towards fire safety usually accompanied by huge public advertisement campaigns, therefore citizens are more aware of the risks associated with fire and adopt measures of fire safety that can lead to a decrease in the number of fire incidents. On the other hand countries that have a significantly lower gross domestic products for obvious reasons at most concentrate on the fire fighting effort or take very limited measures.

A main aim, while designing this study was to compare the fire situation in the countries of the developed world with the fire situation in the countries of the developing world. An unfortunate fact that the authors had to face was that in the under-developed and the developing countries – in a lower extent – fire data and statistics are rarely kept or not kept at all, something that has to do obviously with state financial priorities.

2. THE ECONOMIC COMPARISON

As stated above, fire protection is analogous to the amount of money spent by the state for the fire services and the money that is allocated for fire precautionary measures. It is also true that countries with significantly higher number of fires occurring end up spending more money than others spend. Table 1 shows firstly the percentage of the Gross Domestic Product spent by some countries in their Fire Service Departments and the amount of people dying in each of these countries.

A quick look at the data given in those two tables shows clearly that there is no proportional relation between the amount of money spent for their fire protection organisations and the number of people dying in a country. This is particularly evident in the cases of Slovenia [1], Denmark [1] and other countries that seriously underspent comparing to the number of fatal casualties that they face every year. On the other hand countries like the Czech Republic [1] seem to overspend on Fire Services

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comparing to the number of fatal casualties that they face every year. It should be right to state at this point, that in general the ratio between money spent and fatal casualties is generally analogous with a few exceptions. Denmark's case of course is an exception since a lot of the fire and rescue services are delegated to the private sector [1] a fact that shows in the annual state budget.

This figure shows that countries like Singapore [1] and Belgium [1] spent a lot of money on building protection comparing to the amount of fatal casualties that they face every year whereas financially strong countries like the UK [1] and the USA [1] underspent on fire building protection with immediate effect on the fire safety of the buildings and the high number of fatal casualties that they have to face every year. In general, Figs. 1 and 2 show clearly that countries like the UK [1] and the USA [1] should perhaps seek a better use of the amount of money that they spent on building fire protection and also on Fire Services. As will be shown later on in this study, modern civilisations based on the use of high technology consumer goods do not necessarily mean decreased fire hazards.

Table 1: Cost of fire fighting organisations [1], population comparisons for fire deaths [1]

Country	Average percentage of GDP	Deaths per 100,000 persons
Singapore	0.58	0.18
Slovenia	0.14	1.34
Denmark	0.42	1.61
Norway	0.42	1.48
Austria	N/A	0.76
New Zealand	0.17	1.20
Netherlands	0.30	0.68
Belgium	0.21	1.27
Poland	N/A	1.54
Sweden	0.12	1.64
UK	0.17	1.25
USA	0.37	1.77
Finland	N/A	1.98
Japan	0.20	1.66
Canada	0.25	1.38
Czech Republic	0.18	1.18

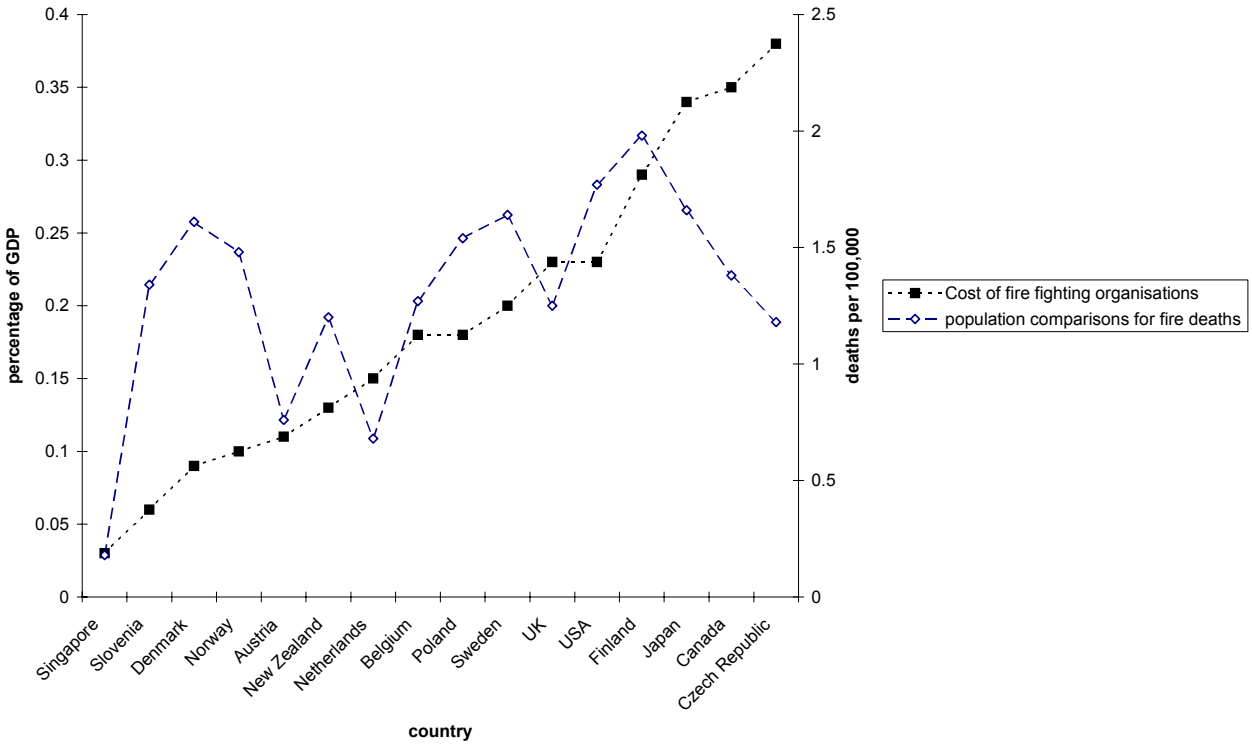

Fig. 1: Comparison of percentage of GDP versus the number of deaths per 100,000 persons in a number of countries

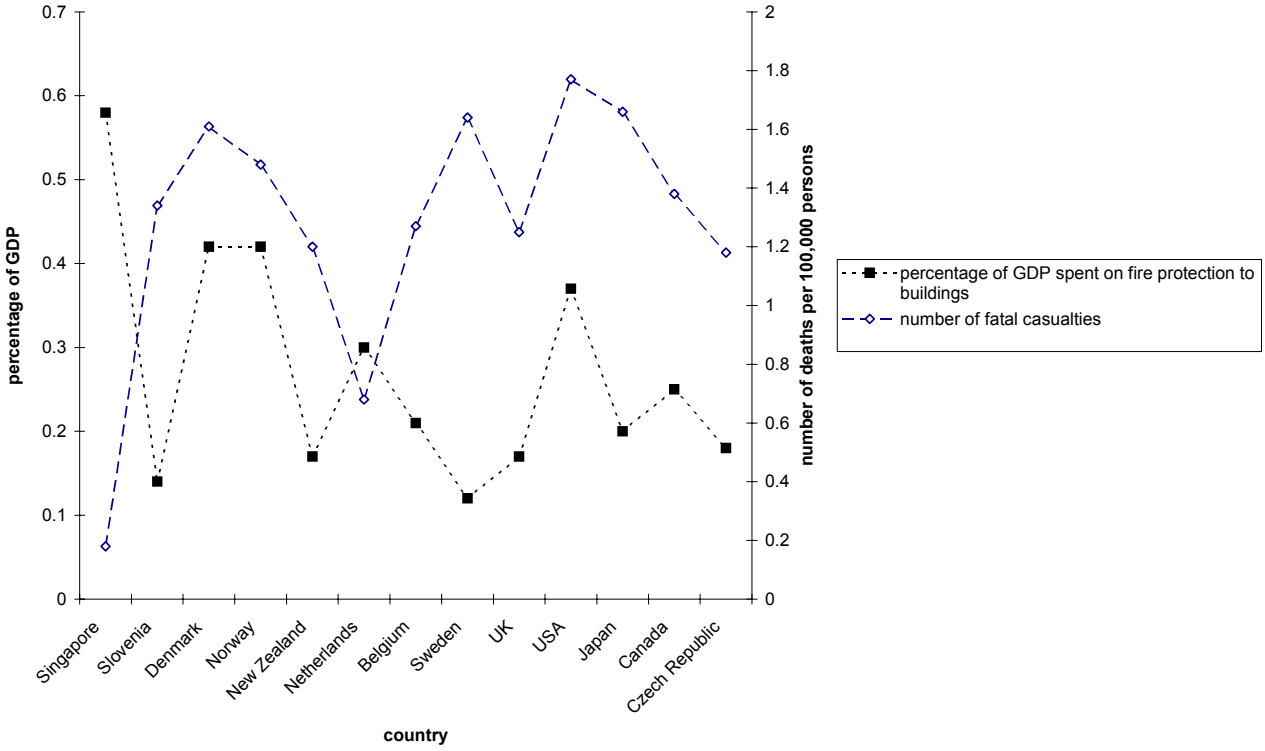

Fig. 2: Comparison of average percentage of GDP spent for fire protection in buildings to number of fatal casualties per 100,000 persons

3. THE SOCIAL AND DEMOGRAPHIC COMPARISON

As stated above socio-economic and geographical parameters affect the trends on fire safety and fire damage. It was thought that a comparison of the data on a number of countries possessing the same socio-economic characteristics to a developing or developed country would give an interesting view on how much these factors affect the result. Sufficient data was found on UK [2], USA [2], New Zealand [2], Russia [2], Greece [2] and China [2]. At this point it should be wise to give a small background on the six countries in order to assist our comparison.

- New Zealand [2] is a relatively small country with a population of approximately 3.7 million people. 75 percent of the country is made up of hilly surfaces and land has been developed as pasture for farming. A large part of New Zealand (around 30%) is covered by forests.
- United Kingdom [2] is a leading trading power and financial centre, deploys an essentially capitalistic economy, one of the quartet of trillion dollar economies of Western Europe. The UK population is close to 60 million. Only 10% of the country is covered by forests and the large majority of the population lives in large towns and cities.
- The USA [2] has the largest and most technologically powerful economy in the world, with a per capita GDP of $36,200. The US population is 278 million. Forests and wildland cover 30% of the country.
- People's Republic of China [2] is the country with the largest population in the world 1284.3 million inhabitants and an area slightly smaller than that of the USA. It is a fast growing economy with an incredible growth rate of 7.3% but still a low GDP per capita of $4,300.
- The Russian Federation [2] is the largest country in the world in terms of area but unfavourably located in relation to major sea lanes of the world; despite its size, much of the country lacks proper soils and climates (either too cold or too dry) for agriculture. Its GDP is $9,700 per capita.
- Greece's [2] economy has improved steadily with economic growth averaging 4% since 1997, exceeding EU growth by more than 1 percentage point. Its terrain is made of mostly mountains with ranges extending into the sea as peninsulas or chains of islands. Its GDP is $19,100.

Table 2 shows a comparison of the data collected for the five above named countries.

Table 2: Estimates of fires, civilian deaths and civilian injuries in the United States, United Kingdom and New Zealand

	USA [3]	UK [4]	New Zealand [5]	China [6]	Russia [12]	Greece [11]
Number of fires	1,708,000	113,000	20,003	142,326	264,900	76,643
Number of civilian deaths	4045	595	30	2389	13686	24
Number of civilian injuries	22350	17600	299	4905	13896	235
Property Loss	$11.2 billion	$ 8.4 billion	N/A	$174.3 million	$ 51.9 million	N/A

Table 2 shows the magnitude of the problem that every year Fire Services in these countries have to face. Of course these numbers are relevant to the area size of the country but not necessarily to the population. Table 3 shows more clearly why is that. It is apparent immediately that a comparison of the three "big" countries (USA, Russia and China) show that a far less smaller number of fires happen in China and the cost of those fires is much smaller. The cost can be blamed on the difference of cost of living in the two countries but the number of fires goes far beyond that and should be concentrated on the different way of life in the two countries. Russia in comparison shows that climatological conditions are a major factor to fire occurrence, let us not forget the heating needs of the Russian Federation in the winter, a fact that can lead to an increased number of fire occurrences.

Table 3 gives an outlook of the socio-economic and geographic trends in the countries respectively. USA has a huge number of fires happening every year and this is of course due to its geographic size and the large population as well as the climatological conditions. It is also obvious that a relatively small number of fires happen in the cities and in particular in structures. This is because of the large amount of forestry covering its area, much of it concentrated in the warm south. Every day huge forest fires are occurring therefore a high percentage of the fire activity is concentrated in this area. On the other hand the UK gives a totally different view of the problem. A very high percentage (63%) of the fires every year are taking place in structures. This is because of the small area occupied by forests and the large number of people living in large cities and towns. The weather also in the UK does not favour the development of large forest fires. China shows a mixed view of the fire situation in the country. Although almost 6 out of 10 fires happen in structures one can speculate that perhaps a number of fires that happen out of the inner cities and big towns are not recorded. China is a mixture of large inner cities like Beijing and Shanghai but at the same time there are large proportions of the population that live in remote villages and rural areas. Fire services in these areas usually are not so well organised, something that in a way comes natural, since traditional rural ways of living do not usually include high fire hazards for the population. The same more or less view is provided by the Russian Federation. Although it is not intended by the author to provide political views in individual countries, it is apparent that countries that follow an over-centralised political system provide the same outlook. Finally the New Zealand case also shows a view of the socio-economic situation in the country at the moment. A highly agrarian economy means people living in farms and large amounts of forests and vegetation. A very small percentage of fires are taking place in structures whereas a huge number of fires occur in forests and vegetation. Greece's situation shows the typical situation of a South European country. Long and hot summers as well as an expanding city centres mean an increased number of fire occurrences in forests especially those nearby cities. This is reflected in the relatively low number (32.21%) of structural fires comparing to the huge number of forest fires. Another factor that helps in keeping a low number of structural fires is the fact that due to its seismogenous land, Greece's buildings are made of concrete, a material that is particularly difficult to assist fire propagation.

Another area that shows the different social trends that exist in different societies is the area of structure fires and property loss by property use. This shows specifically the trends of residential fires in the UK and the USA. Table 4 summarises this information.

This once more illustrates the tendency of the British population to live in inner cities where blocks of flats (apartments) are more commonly used. Whereas the USA and especially New Zealand show a very high number of incidents in houses on the contrary.

As stated above the vast majority of fires in the UK take place in residential occupied buildings, therefore it is important to examine where most of these fires start in a residential building. Table 5 makes a comparison between the most common causes of fires in Brazil, the UK and New Zealand. This table is quite interesting because it puts in the picture another developing country and is bound to have different fire safety standards due to money and budget restrictions or shortages. It shows that the vast majority of residential fires in the UK take place in the kitchen and this is in accordance with the findings from New Zealand, whereas Sao Paolo (Brazil) shows a totally different picture. A relatively small number of fires start from the kitchen. This is partly because the data was not collected (unknown reasons in Brazil reach the 45 percentile) and this comes in accordance to the remark mentioned in the very beginning of this study that data from developing countries is very difficult to find.

Table 3: Estimates of fires and property loss by property use in the United States, United Kingdom, China, Russia, Greece and New Zealand

	USA [3]			**UK [4]**			**NZ [5]**		
	number	cost	%	number	cost	%	number	cost	%
Fires in structures	505500	$8.5 bn	30	71000		63	2643	N/A	13
Total fires	1708000	$11.2 bn		113000	£4.7 bn	N/A	20003	N/A	N/A
	CHINA [6]			**RUSSIA [12]**			**GREECE [11]**		
	number	cost	%	number	cost	%	number	cost	%
Fires in structures	84062	$167.25mil	59	180800	$26.99 mil	52	24.362	N/A	32.21
Total fires	142326	$174.3 mil		264900	$51.9 mil		75.643	N/A	N/A

Table 4: Estimates of structure fires and property loss by property use in the United States, New Zealand and United Kingdom

	USA [3]		**UK [4]**		**New Zealand [5]**	
	number	%	number	%	Number	%
Residential (total)	379500		112644		7094	
One and two family dwelling	283500	75	62106	55	5885	83
Apartments (flats)	84500		N/A		603	

Table 5: Main causes of fires in residential buildings in the United Kingdom, Sao Paolo (Brazil) and New Zealand

	Sao Paolo (Brazil) [7]		**UK [4]**		**New Zealand [5]**		**China [6]**	
Causes	number	%	number	%	number	%	number	%
Cooking	986	14	N/A	59	396	51	N/A	
Electrical	804	12	N/A	10	219	28	N/A	27.5
Arson	512	7	N/A	6	N/A	N/A	N/A	6.1

Fig. 3 attempts a comparison between the time the Fire Service Department was called to attend a fire in the UK, China, Greece and New Zealand. The convergence of the data sets of UK and New Zealand is significant. This illustrates once more the significance of the socio-economic factors in fire safety. As it can be seen the peak on fire incidents is reached during the evening and especially between 18:00 to 22:00 where people tend to return home from work and carry out their usual home activities. The minimum number of fires is taking place in the time slot between 02:00 and 06:00 where the vast majority of people tend to sleep. People's Republic of China shows a slightly different picture. Although the main trend is followed, the percentage of fires taking place in the early evening (14:00 to 20:00) is lower than the other two countries. Greece [11] shows also a different picture. The highest number of fires occurs during the morning and early afternoon (10:00 to 14:00). A few facts have to be taken in account before jumping to a conclusion. Due to the warm climate for about half of the year shops are usually closed during the afternoon (13:00 to 17:00) that meaning, most of the people heading back home therefore increasing the fire risk and also traditionally cooking is done in the morning again increasing the fire risk. A look at Greece's fire statistics history shows that the amount of fires during the morning and early afternoon (10:00 to 14:00) period was even higher, another fact that suggests that the transition from developing to developed country means a gradual move in the populations habits. The further integration of Greece in the EU meant a few years ago the introduction of the "continuous" opening time for shops (without the afternoon break) which is slowly followed by more and more companies, decreasing the number of fire incidents during the morning and early afternoon (10:00 to 14:00), since people are not at home.

4. COMPARISON OF CITIES

This part of the study attempts to make a comparison of the data findings between cities around the world. Relevant data was found from a number of cities namely: Ontario – Canada, Melbourne – Australia, New York – USA, Sao Paolo – Brazil, London – UK, Beijing – People's Republic of China, Singapore – Singapore and finally Quebec – Canada.

Table 6 gives an outlook of the data gathered during our study. A brief first look at the cities where the data was gathered from shows that the main characteristic is the inclusion of two huge cities like New York, Beijing and Sao Paolo as well as that the inclusion of a city from the developing world (Sao Paolo and Beijing) will give data for comparison with other cities that belong to the developed world.

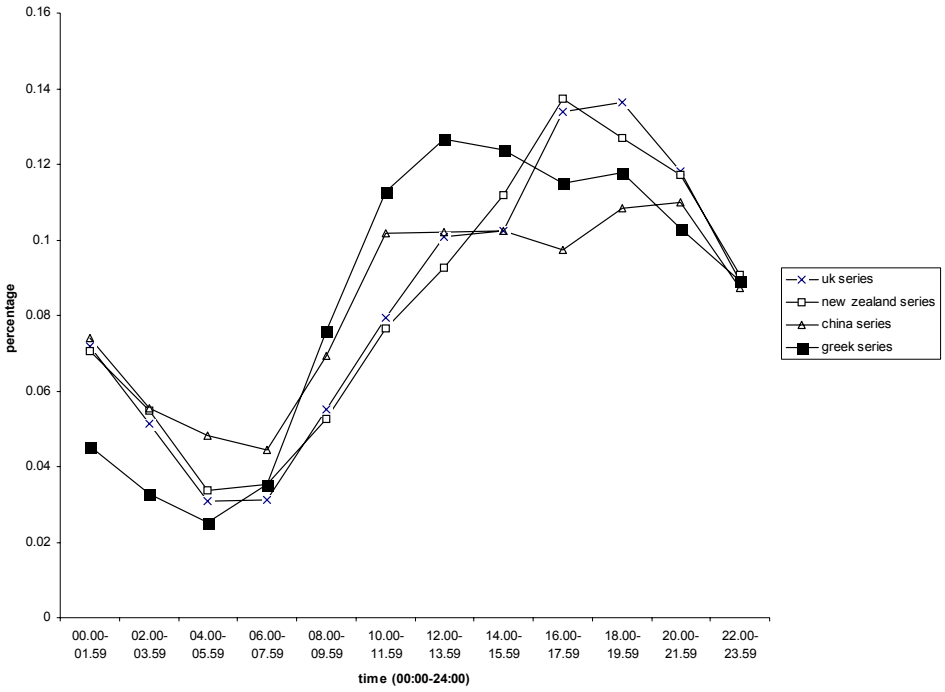

Fig. 3: Comparison of time of fire call in the UK, New Zealand, Greece and China

Table 6: Comparison of data gathered for number of fires, injuries and fatalities in Ontario, Melbourne, New York, Sao Paolo, London, Beijing, Singapore and Quebec

	Number of fires	% of total	injuries	% of total	deaths	% of total	Population
Ontario [8]							
Residential	9583	43	1149	70	125	88	10m
Melbourne							
Residential	2022	22	157	13	13	12	3.4m
New York [3]							
Residential	30672	47	N/A	N/A	107	67	19m
Sao Paolo [7]							
Residential	3954	57	N/A	N/A	N/A	N/A	18m
London [4]							
Residential	19644	42	1518	82	94	84	7.7m
Quebec							
Residential	10031	N/A	N/A	N/A	77	N/A	7.3m
Beijing [9]							
Residential	7400	N/A	124	N/A	16	61.5	13.8m
Singapore [10]							
Residential	3499	69	N/A	N/A	N/A	N/A	4.1m

As the table shows there are some apparent differences between the cities. For instance although the percentage of the total number of residential fires for the majority of the cities is between 40-60%, the case of Melbourne shows an incredibly low 22%. Also the data gathered on the same city shows that a very low 12-13% of the total number of injuries and deaths during a fire happen in residential fires. On the other hand London shows that although a relatively low 42% of the number of fires take place in residential buildings, 82-84% of the number of injuries and deaths respectively happen in residential fires. Another paradox is the number of people dying in residential fires in Ontario – a city of 10 million population – has a higher mortality rate than that in New York, a city of 19 million inhabitants with a much higher population density. Another big paradox is the case of Beijing, a huge city inhabited by a very large population of 13.8 million reports only 16 fire related deaths and a relatively small number of fire incidents. London also shows a higher number of non-fatal injuries than Ontario although it is smaller in population by 2.3 million inhabitants. Sao Paolo a city of 19 million residents shows a very low number of residential fires comparing to a city of the same size like New York and the number of residential fires is quite close to the number of residential fires that occur in Melbourne a city that is inhabited only by a fraction of Sao Paolo's population. This can be explained by the huge number of people living in own-made shelters that cannot be classified under the category of residential fires. This is because of the high level of poverty that surrounds the big Brazilian cities like Sao Paolo. Singapore due to its demography and geographical description shows the highest percentage (69%) of structural fires.

5. CONCLUSION

This study leads to a few valuable comments. At first what strikes the eye is the "poverty" of data gathered. There is very limited data available to the public, or even for research reasons. Many countries do not collect data and others collect data of limited significance, even worse a few countries report "made-up" figures that do not correspond to reality. The main point raised is that a harmonisation of the data gathering is needed. A unified data collection system should be introduced. Although international organisations are keeping data on forest fires, the same cannot be said for structural fires.

A second point is that comparison between fire data in different countries, in a way, reveal trends of how people live there, facts about their every day lives at work or at home. Social trends and population habits become apparent after a careful study of the Fire Statistics of each country.

A last point is the importance of the comparison between the developed and the developing countries. It is obvious from this study that although technological advancement in many ways

have made everyday life easier, a lot of potential hazards are born because of its very nature. Valuable lessons can be learned each way.

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