EU FireStat : The European fire statistics project

CLOSING DATA GAPS AND PAVING THE WAY FOR PAN-EUROPEAN FIRE SAFETY EFFORTS

LUND UNIVERSITY LTH FACULTY OF ENGINEERING NFPA® Efectis DBI FIRE AND SECURITY vfdb Vereinigung zur Förderung des Deutschen Brandschutzes e. V. EUROPEAN FIRE SAFETY ALLIANCE THE UNIVERSITY of EDINBURGH BAM CTIF Center of Fire Statistics

PROGRESS REPORT

Task	Title	Task leaders	Timing
0	Diagnostic of terminology, data collection and interpretation issues	Efectis	22 Jul. - 24 Dec. 2020
1	Terminology and data collection survey	University of Edinburgh	25 Sep. - 24 Feb. 2021
2	Identification of data needed for decision making	EuroFSA	22 Sep. - 26 Apr. 2021
3	Analysis of data collection methodologies	NFPA	22 Nov.- 24 Aug. 2021
4	Definition of a common terminology	DBI	1 Apr. - 17 Sep. 2021
5	Cost/benefit assessment methodology to support policy decisions	Lund University	25 May - 23 Oct. 2021
6	Case study using cost/benefit assessment methodology	Lund University	25 Jun. - 24 Dec. 2021
7	Description of a future data collection method	Efectis	1 Oct. - 14 Jan. 2022

- ✓ All task reports are published on our project's website
- ✓ 1st Draft of the final report circulated to Steering Committee (21/01/2022)
- ❑ Deadline for commenting on the final report: **14th February 2022**
- ❑ Finalisation of the report and end of the project: end of February 2022

THE STATE OF FIRE STATISTICS

- A review of the literature on fire statistics shows that current fire statistics cannot be compared from one country to another (with a few exceptions) due to the lack of terminologies and precise collection methodologies and other issues identified.

- They can only be useful to describe the global fire safety situation and trends to some extent for a group of countries, or the specific fire safety situation.

- Comparability of fire data between systems will require the development and adoption of a core set of measures that have common categories or classifications.

THE STATE OF FIRE STATISTICS

Top 10 issues identified across Europe

1. Lack of definitions for collected terms resulting in disparity between practices.
2. Exclusion of fire casualties occurring at the hospital or during their transportation to the hospital by emergency medical services (EMS).
3. Lack of training for the person filling fire response report.
4. Lack of national statistics in some countries as data is collected differently in separate regions.
5. The lack of methodology to fill the gaps where information is missing.
6. No link between the different sources of data (e.g. insurance, medical, police or fire service).
7. Only a limited number of incidents are extensively registered.
8. No update of the database after fire investigation.
9. Data is not publicly accessible.
10. Limited fields recorded.

TERMINOLOGY ISSUES WITH EXISTING DATA

- The terminology and data collection methodology were examined in 27 EU Member States and 8 Other countries (Australia, Canada, New Zealand, Norway, Russia, Switzerland, UK and USA).
- There is substantial variation in the amount and type of information collected
- The amount and quality are influenced by whether they include information from sources outside the fire service, such as insurers or medical authorities, through data linkage or other means.
- It was also observed that overly detailed data collection systems may overwhelm data collectors and thereby compromise data quality.
- None of the consulted reports included uncertainty estimations
- To provide relevant information regarding the national fire safety, fire statistics will have to be improved through
  - common terminology,
  - common methodology,
  - common training
  - qualification of persons in charge of filling in the fire report,
  - including uncertainty estimation methods

DATA NEEDED FOR DECISION MAKING

- A proposal was developed based on the result of the survey filled by the stakeholders of the Member States and internal discussions
- The following eight variables should be collected, as a starting point:
  1. Number of fatalities
  2. Number of injuries
  3. Incident location
  4. Incident date
  5. Incident time
  6. Age of fatalities
  7. Primary causal factor
  8. Type of building

Once these variables have been implemented efficiently, we propose adding the second tier, :

9. Number of floors
10. Area of origin
11. Heat source
12. Materials contributing to fire development
13. Item first ignited
14. Fire safety measures present

Note: some variable names were changed throughout the project.

This list constitutes a minimum dataset for collection, and it does not prevent a fire department or national authority from having a separate data collection.

EXAMPLE - NUMBER OF FATALITIES

- Definition
  - Is the number of person(s) who died as a result of injuries sustained during a fire incident

- Notes
  - Fire-related fatalities are those that would not have occurred absent a fire.
  - Fire fatalities include people who die within 1 year because of injuries sustained from the incident. Fire fatalities also include fatalities from natural or accidental causes sustained whilst involved in the activities of fire control, attempting rescue or escaping from the dangers of the fire, including blast and defenestration.
  - Fire fatalities include all persons discovered or declared dead on the location of the fire, during their transportation to the hospital or after their admission at the hospital.
  - The number of the variable should include self-intended fires / suicidal fires, but they should be marked as such.
  - People who died before a fire started (natural death, victims of a violent crime) are to be excluded from the statistics as soon as a forensic medical report is available.

- Value
  - Numerical value (to be approximated when unknown)

EXAMPLE - NUMBER OF INJURIES

- Definition
  - The number of persons who are injured (but not counted as deaths) as a result of a fire incident, within 1 year of the incident.
- Notes
  - Fire-related injuries are those that would not have occurred had there not been a fire.
  - Fire injuries also include injuries from natural or accidental causes sustained whilst involved in the activities of fire control, attempting rescue or escaping from the dangers of the fire, including blast and defenestration.
  - Fire injuries are those treated at the scene or taken to the hospital.
- Value
  - Numerical value (to be approximated when unknown)

EXAMPLE – AGE OF FATALITIES

- Definition
  - Numerical value of age of fatalities at time of the fire

- Notes
  - If actual age is not known, it should be estimated with the closest possible estimate.
  - Particular care should be used in estimating the age for young adults aged 15 – 25 and older adults aged 60 – 70 as the threshold between youth and adult is often set at 18 years and between adult and senior at 65 years.
  - For children less than 12 months old the age should be estimated to be one year.

- Value
  - Numerical value (to be approximated when unknown)

EXAMPLE – NUMBER OF FLOORS

- Definition
  - The number of floors above is the numerical value to capture the number of floors above and including the ground level.
  - The number of floors below is the numerical value to capture the number of floors below and excluding the ground level.

- Notes
  - The floor is defined as the distance from the pavement to the ceiling of one floor.
  - The ground level is referred to the level of the main entrance of the building.

- Value
  - Numerical value for floors above (to be approximated when unknown)
  - Numerical value for floors below (to be approximated when unknown)

EXAMPLE – PRIMARY CAUSAL FACTOR

- Definition
  - The general causal factor that the fire officer assesses to have been the most important in explaining why the item first ignited was exposed to the heat source in a way that led to an uncontrolled combustion.

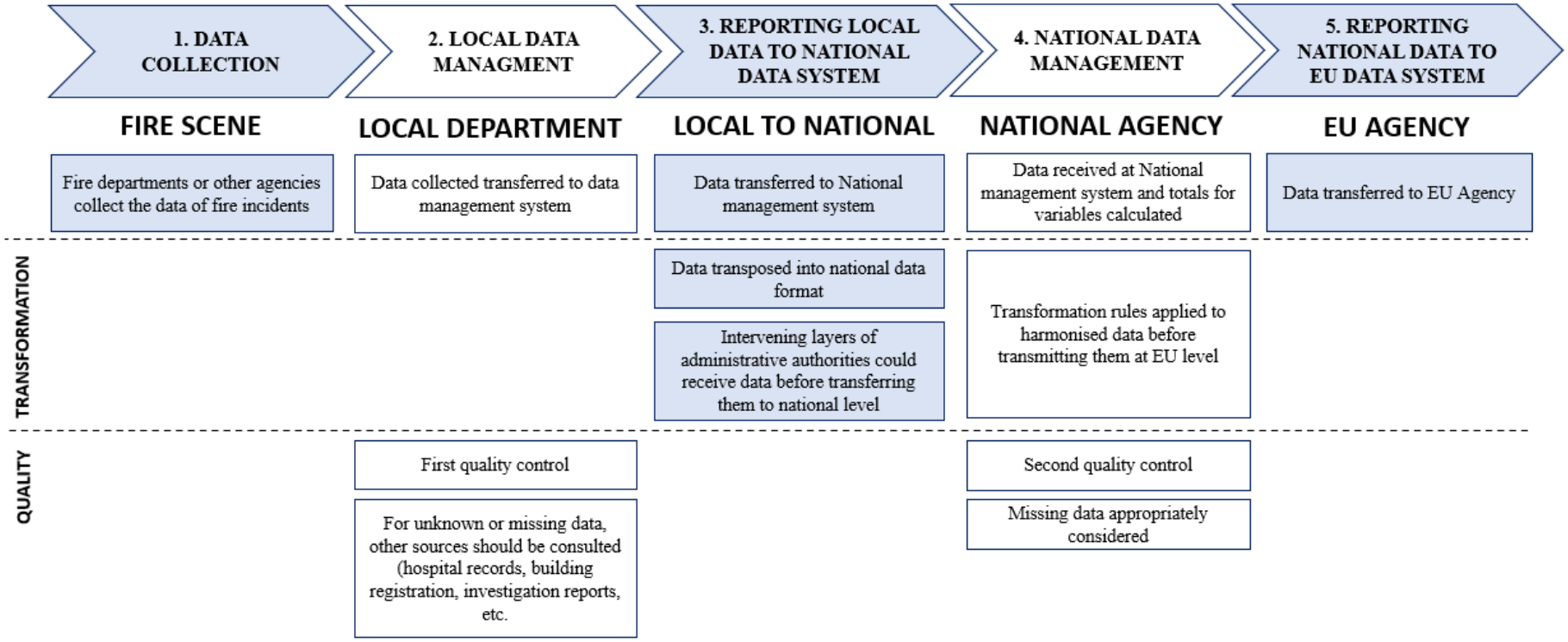
- Notes
  - If the causal factor is recorded as human act or omission then it is most important to know whether the damage caused by the fire was intentional or unintentional, as there are completely different prevention strategies for these two types of fire.

- Values
  - Human act or omission
    - ✓ Intentional (A fire which is intentionally ignited under circumstances in which the person knows that the fire should not be ignited)
    - ✓ Unintentional (the damage caused by the fire was unintentional)
    - ✓ Undetermined intent
  - Equipment failure
  - Natural phenomenon
  - Undetermined

DATA COLLECTION METHODOLOGIES

- The fire data collection systems appear to be generally regarded as census systems of data collection
- Most countries currently appear to employ a voluntary approach to data collection
  - It will almost certainly fall short of a complete census
- It is important that the implementation of fire data collection systems include plans for data quality checks and procedures for handling missing data
- The cost of implementing a comprehensive data collection system will be greatest in countries that have the least experience and fewest resources
- Data collection systems should be designed with sustainability in mind.
- Overly ambitious and detailed data collection systems may tax the patience of participants and undermine data quality.
- Align data collection content with realistic policy goals and use data to promote safety interventions and practices.
- Use data to chart and publicize trends, demonstrate the utility of data collection, and build public recognition and support.

THE FIRE DATA JOURNEY FROM COLLECTION TO REPORTING



COST BENEFIT ANALYSIS

- Cost/benefit assessment methodology
  - Literature review started with collecting information from consortium partners
  - A literature review was performed during the 2021 summer
    - ✓ Most literature on sprinkler and detectors.
  - Methodology then refined starting from earlier experiences and synchronised with the outcome from review

- Review focused on technical measures in the review
  - Water sprinkler system in residential buildings
    - ✓ BRE study, Swedish study, Norwegian study, NIST study, BRANZ study, studies uses life-quality index
  - Water sprinkler systems in nursing homes
  - Portable water sprinkler systems
  - Smoke alarms in residential buildings
  - Fire extinguishers
  - Stove guards
  - Exterior detection on school buildings
  - Use of flame retardants in TV-sets
  - Social Cost benefit analyses performed in the Netherlands
  - Combustible cladding

COST BENEFIT ANALYSIS

$$LCC = I_{in} + \sum_{i=0}^{n} \frac{R_i}{(1+r)^i}$$

$$A = LCC \cdot \frac{r}{1-(1+r)^{-i}}$$

Cost

Sensitivity analysis

$$\text{Number of fatalities (corr)} = \frac{\text{Actual number of fatalities per year}}{\left((1-\text{risk reduction of measure})\cdot x+(1-x)\right)}$$

$$\text{Number of potential saved lives} = \text{Number of fatalities (corr)} \cdot \text{risk reduction of measure}$$

$$Benefit = \frac{Number\ of\ potential\ saved\ lives \cdot (VSL + indirect\ costs)}{Population}$$

Benefit

$$\text{Benefit cost ratio} = \frac{Benefit}{Cost}$$

COST BENEFIT ANALYSIS

Variables normally needed to estimate the cost of a measure

Variable for cost calculation	Typical data source
Hardware cost	Supplier /manufacturer
Installation cost	Supplier /manufacturer
Running cost / maintenance cost	Supplier /manufacturer
Lifetime	Supplier /manufacturer
Interest rate for discounting future values	Estimated based on interest rate and inflation, this can also be calculated, see Equation 1. In Chapter 3 the values vary between 3 and 10% in the different studies.

Variables normally needed to estimate the benefit of a measure.

Variable for benefit calculation	Typical data source
Possible number of fatalities	Fire incident statistics / hospital records
Possible number of injuries	Fire incident statistics / hospital records
Value of lives and injuries saved	Data from other studies or investigations. This value can vary as can be seen in the review of studies in Chapter 3. The VSL in EU has been proposed to range from US$1.8 million – 5.4 million (in 2005), with a base value of US$3.6 million.
Property loss /damage for fires with no installation	Insurance company, economic statistics
Other costs associated with fire with no installation (e.g., fire service dispatch, environment etc)	Specific source associated with the cost
Current number of installations	Relevant statistics / review of literature
Unit of interest e.g., number of affected apartments	Relevant statistics / review of literature
Efficiency associated with the measure	Review of literature, fire statistics, detailed studies in a certain area
Reliability of the measure	Review of literature, fire statistics (e.g., operation and effectiveness of fire safety measures)

CASE STUDIES USING COST/BENEFIT ASSESSMENT METHODOLOGY

- CASE STUDY 1: SMOKE DETECTORS IN RESIDENTIAL BUILDINGS
  - Smoke alarms in Sweden.
  - There have been several studies in this area previously including a study conducted by the Swedish Civil Contingencies Agency (MSB)
  - These studies are used as a starting point for the analysis conducted.

- CASE STUDY 2: INTRODUCTION OF A MINIMUM FIRE REGULATION ON UPHOLSTERED FURNITURE/MATRASSES IN SWEDEN FOR RESIDENTIAL FIRES.
  - Concerns the introduction of regulations on upholstered furniture in Swedish residential buildings.
  - This is a measure that is not in place in Sweden and data from the UK is used to derive risk reduction rates.

- CASE STUDY 3: HOME VISITS AS A PREVENTION MEASURE.
  - Home visits as a fire prevention measure are studied.
  - This is a measure that has been applied in for example Estonia and the Netherlands.
  - However, the study is carried out on a local level (region with 210,000 households) in Sweden where data from a conducted campaign of home visits is available

CASE STUDIES USING COST/BENEFIT ASSESSMENT METHODOLOGY

- CASE STUDY 1: SMOKE DETECTORS IN RESIDENTIAL BUILDINGS

Type of residence	Benefit/Cost	
	1-year battery	10-year battery
Apartment buildings	12.3	10.5
Detached or terraced houses	11.4	9.7
Average for all residences	11.3	9.6

- CASE STUDY 2: INTRODUCTION OF A MINIMUM FIRE REGULATION ON UPHOLSTERED FURNITURE/MATRASSES IN SWEDEN FOR RESIDENTIAL FIRES.
  - Cost of the measure, in terms of protection of upholstered furniture, is set to €100 per household
  - Baseline risk reduction of implementing regulation on upholstered furniture set to 0.9
  - The benefit/cost ratio in this the baseline case was 1.5.

- CASE STUDY 3: HOME VISITS AS A PREVENTION MEASURE.
  - Time and cost associated with visit estimated (€37.5)
  - Baseline risk reduction of implementing home visits was set to 0.5
  - Potential number of people saved in the region 1.35
  - The benefit-cost ratio in this the baseline case was 1.07.

COST BENEFIT ANALYSIS & CASE STUDIES

- The methodology for cost-benefit analysis of fire protection measures presented in Task 5 has been demonstrated with three case studies in Task 6.
- The actual procedure when performing a CBA varies somewhat between the different case studies but they are all based on the same principal methodology.
  - A rather detailed calculation was possible for the first case study since there have been several studies in the area and data is available for most of the important input variables. The results of Case study 2 and 3 are consider much more uncertain and harder to interpret since the benefit-cost ratio is close to 1. Several important input variables are also associated with large uncertainties which makes it important to include a sensitivity analysis.
- Good fire statistics is crucial to conduct this type of analysis. Data on the number of fatalities, number of fires, item first ignited etc. have been used in the case studies.
  - However, it is also important to point out that there are several input variables needed for a cost-benefit analysis that cannot be obtained from fire service statistics, for example the risk reduction and cost of implementing and maintaining a certain measure.
  - Accordingly, for a Member State and/or the European Commission to be able to conduct a cost-benefit analysis for a policy decision, fire statistics is a prerequisite, but it does not provide the complete dataset needed for the analysis.

- The task reports hold more information:
  - TASK 5: COST/BENEFIT ASSESSMENT METHODOLOGY TO SUPPORT POLICY DECISIONS
  - TASK 6: CASE STUDIES USING COST/BENEFIT ASSESSMENT METHODOLOGY

GUIDANCE FOR DATA INTERPRETATION

- Overall, decision-making based on fire statistics should include the following steps:
  1. Identify trends indicated by the statistical outcomes
  2. Verify whether this trend is true (evaluate the potential for random variation, uncertainty, and other forms of interference)
  3. Identify the reasons for the trend by connecting the variable to other relevant variables
  4. Compare this observation with trends in other countries
  5. Investigate possible causes of the trends
  6. Discuss possible prevention measures (comparison with other regions or countries)
  7. Establish appropriate actions and interventions

- Recommendations
  - The identification of potential trends can be useful for planning safety interventions.
  - However, it can be difficult to establish trends due to random statistical variation.
  - It is necessary to conduct observations over a period of eight to ten years, with no changes in methodology (definition, collection, process etc.) or outlier fire incidents, before establishing trends.
  - It is also crucial to assess variables in relation to other variables in order to increase confidence that a trend is true.

IMPLEMENTATION OF THE VARIABLES IN EUROPE

- We have identified 14 variables necessary to be collected as a priority in all Member States in a harmonised way

  - Tier 1:
    1. **Number of fatalities**
    2. **Number of injuries**
    3. **Incident location**
    4. **Incident date**
    5. **Incident time**

    5 variables in the next 5 years

    6. Age of fatalities
    7. Primary causal factor
    8. Type of building

    Before 2032

  - Tier 2:
    1. Number of floors
    2. Area of origin
    3. Heat source
    4. Materials contributing to fire development
    5. Item first ignited
    6. Fire safety measures present

    Before 2037

IMPLEMENTATION OF THE VARIABLES IN EUROPE

- The next step would be to implement this proposed harmonization of fire statistics in the different Member States.

- This could be the subject of an experimental phase concerning the five identified variables (or even more) with the volunteering countries.

- The role of this group will be:
  - To learn about the current proposal (in the beginning)
  - To discuss any need for clarification
  - To exchange information of the different practices
  - To discuss encountered difficulties in implementing the proposal and troubleshooting
  - To prepare for the implementation of the next variables that need to be implemented

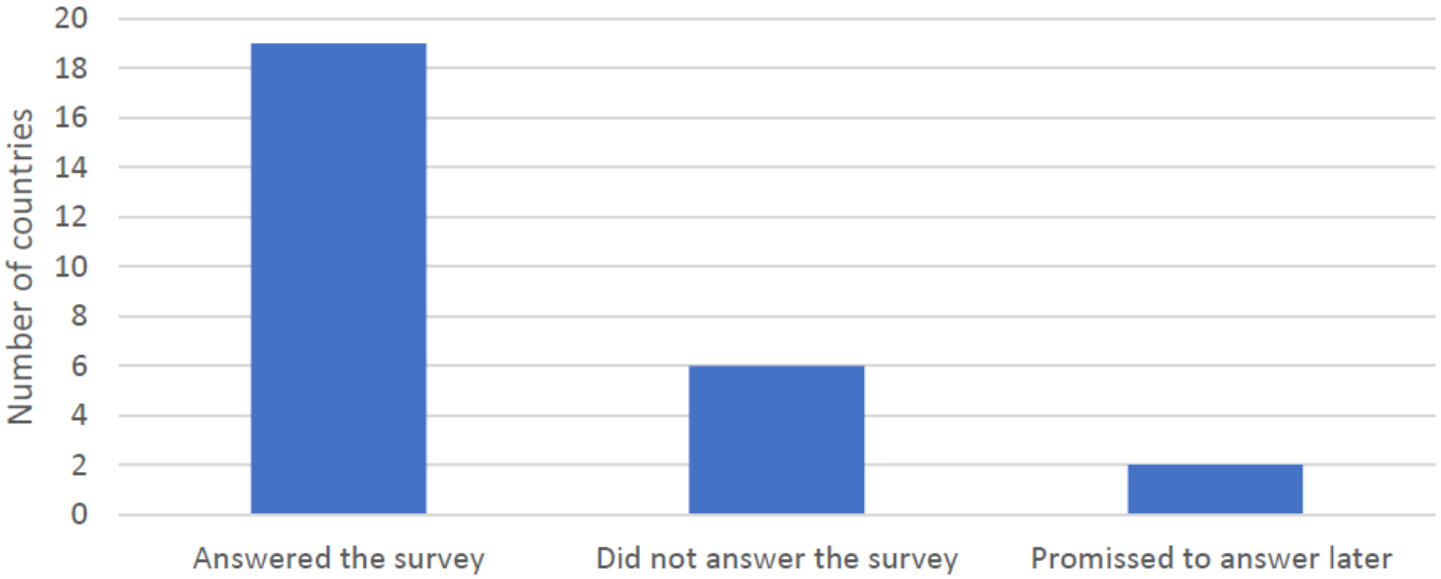
ESTABLISHING A CORE GROUP

- A short survey was sent to the regulators and persons dealing with fire statistics in all 27 EU Member states near the end of the project.

- We surveyed participants for their opinions about implementing at least five variables during the next five years as part of the pilot phase of the implementation process with the following questions:
  1. Would you, in general terms, be in favour of providing harmonized fire statistics for collection at the European level?
  2. Do you already have a national/regional/local dedicated structure (organization, department, or group) that could be responsible for managing and analysing fire data?
  3. If yes, could you please name it? (Please provide name and contact details)
  4. If no, would you be in favour of creating such structure nationally?
  5. Please provide any other comments/suggestions that you think would be important to take into consideration in the implementation of the harmonised fire statistics in Europe?

SURVEY RESULT

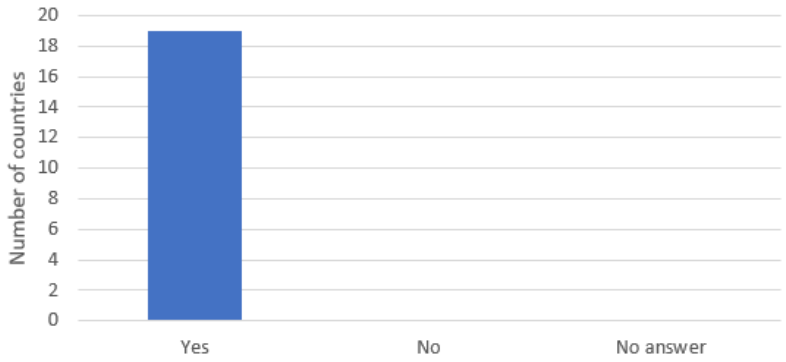
- So far, 19 countries of 27 responded to the survey (70% response rate).



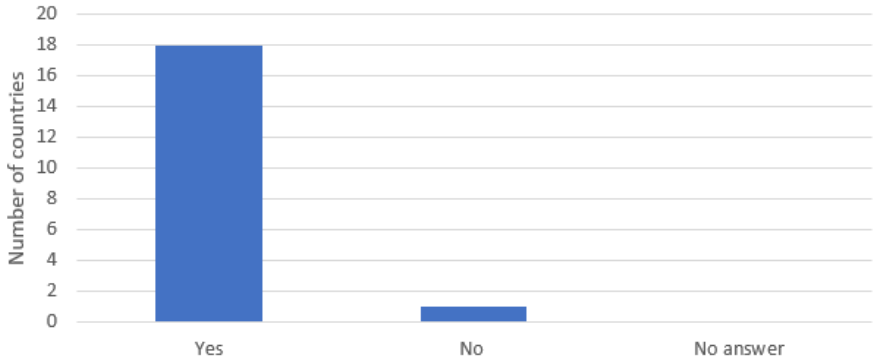
- All 19 countries that have answered the survey are in favour of providing harmonised fire statistics for collection at European level.

SURVEY RESULT

Question 1: Would you, in general terms, be in favor of providing harmonized fire statistics for collection at the European level?

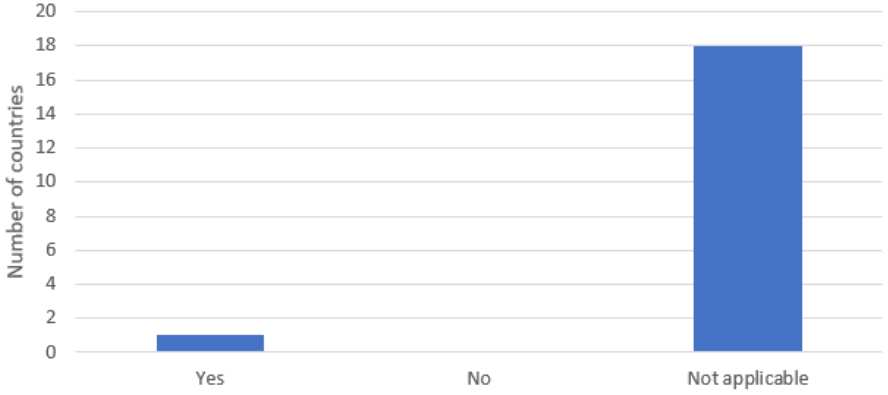


Question 2: Do you already have a national/regional/local dedicated structure (organization, department, or group) that could be responsible for managing and analyzing fire data?



Question 3: If yes, could you please name it? (Please provide name and contact details)

Question 4: If no, would you be in favor of creating such structure nationally?



NEED FOR STANDARDISATION

- Standardization is necessary to provide a recognised basis for our proposal and to facilitate its dissemination to all Members States.

- It can be performed at two levels:
  - At the European level, a working group can be organised, gathering experts from CEN TC 127 Fire safety in buildings and CEN TC 391 Societal and Citizen Security. It will be important for this group to prepare a general standard describing the European view on fire statistics.
  - At the international level, technical documents on the definitions and methodologies can be revised and even developed. Indeed, there is already a working group in ISO TC 92 working on fire statistics (WG13)

- Documents developed at ISO level can then be adopted in CEN using the Vienna agreement.

CONCLUSION

- It was demonstrated that the nature and format of fire data collected varies across Europe.
- To provide relevant information regarding the national fire safety situation fire statistics will have to be improved through common terminology, methodology, training and qualification of persons in charge of filling in the fire report.
- A proposal was developed, where we suggest focusing on 14 variables in the harmonisation process.
- Definitions and guidance were developed aiming at ensuring the common understanding. It is based on the learnings from the current practices and discussions with stakeholders.
- A cost-benefit analysis performed in this study provided a structured and explicit way to create basis for decision making regarding fire safety measures and it has shown to work well in several EU countries.
- A survey sent to regulators of all Member States, showed that at least 19 countries are in favour of providing harmonised fire statistics for collection at European level.
- The next step should then be implementing at least five variables (or more) during the next five years with the volunteering countries, as part of an experimental phase of the implementation process. This will facilitate the ability of stakeholders to generate data, use them to chart and publicize trends, and build public recognition and support.
- In parallel, standardization is necessary for providing a recognised basis for the proposed values and their corresponding definitions and to facilitate its dissemination to all Members States.
- On the long term there should be a structure at the European level that can receive national fire statistics on an annual basis, with the necessary resources to store, analyse and publish data from the various countries.

ACKNOWLEDGEMENTS

- The European Parliament for financing the project
- To the European Commission for commissioning the project
- To all stakeholders and surveyed persons from the different Member States for their valuable input and discussions