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

Final report

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Executive summary

The present report is the final report of project SI2.830108, financed by the European Parliament and commissioned by DG GROW at the European Commission. There is a summary of the findings within the final report, but this Executive Summary gives an overview of the aim, methods and main findings.

The aim of this pilot project was to map the terminology used and the data collected by the EU Member States regarding fire events, and to propose a common terminology and method to collect the necessary data in each EU Member State with a view to obtain meaningful datasets (based on standardised terms and definitions). This, in turn, should allow for knowledge-based decisions regarding fire safety at the Member State and the EU level regarding building fires (i.e. houses, apartment blocks, office buildings, commercial buildings, hospitals, schools and kindergartens, retirement homes, etc.).

A review of fire statistics literature shows that systems for collecting fire data have been instrumental in reducing building fires and their associated deaths, injuries, and economic damage. But EU Member States and other countries' systems vary considerably in the type and scope of information collected, the way that data elements are defined, the levels of specificity sought, and the types of training and resources dedicated to collection efforts. The amount and quality of information in several data collection systems also appear to be influenced by whether they include information from sources outside the fire service, such as insurers or medical authorities, through data linkage or other means. In many cases, the amount of information collected appears to depend on available resources and the level of expertise of the personnel.

In general, it appears that most countries' administrations presume the systems for collecting fire data provide an accurate representation of the national experiences with fire incidents. However, information gathered through the initial phase of the project suggests that collection systems oftentimes fail to assess the potential for bias due to missing information, differences in the way terms are defined or interpreted, and other issues that may influence data quality.

The terminology and data collection methodology adopted in current fire statistics were examined in 27 EU Member States and eight other countries (Australia, Canada, New Zealand, Norway, Russia, Switzerland, UK and USA). The eight non-EU countries were chosen based on their structured and detailed fire statistics. The review of fire data collection measures within and outside the European Union is important for understanding the degree of commonality across the various systems, and also for identifying opportunities and challenges in any efforts to improve fire safety.

Systems in the European Union fall into different tiers with respect to the amount of fire data information collected. Data collection systems usually include information on the incident time, date and location and most countries include the type of property, subdivided into residential and non-residential buildings. However, additional information on building characteristics was seldom recorded in most countries. Information about fire causes and other data related to the source of ignition, item and material ignited first, material mainly responsible for the development of the fire and fire room of origin commonly appears. The number of fatalities and casualties are recorded in most countries, along with information about the victim's age and gender, and type of fatality or injury.

Due to the lack of official definitions and precise collection methodologies in most countries, it is clear that there is significant variation in the data currently collected across the EU Member States. The research found little mention of methodologies for dealing with missing data in the

systems for collecting fire data in Europe, although some countries do acknowledge that missing data is a problem that compromises data quality. Additionally, none of the reports consulted included uncertainty estimations. Naturally, this poses a major obstacle to data comparison, and thereby, to assess effectively potential best practices and successful safety approaches. To provide relevant information about national fire safety (number of fires, fire fatalities, fire injuries, fire losses, etc.), fire statistics will have to be improved through common terminology, common methodology, and common training and qualification of persons in charge of filling in fire reports, including uncertainty estimation methods.

The research accordingly reviewed a number of critical issues involved in the design and implementation of systems for collecting fire incident data and offered recommendations to improve consistency among systems. The review proceeds from the assumption that fire incident data can serve a number of important purposes - helping to reduce fires and losses, identifying opportunities for safety interventions and education programs, guiding the allocation of public resources to areas of greatest need and impact, and monitoring progress of safety initiatives. Data collection systems can also facilitate opportunities to share experiences and successes across regions and between countries, promoting a broader diffusion of technical and other innovations that increase fire safety. To achieve these objectives, it is important that data collection systems produce reliable data.

The design of the proposed data collection method was driven by the EU Member States' needs and capabilities. In data collection with systematic intervention purposes, as is the case with fire incident data collection, it is important to create a sufficiently robust database that can help identify risk factors and document fire incidences with reasonable confidence. Data collection systems that rely on voluntary reporting will almost certainly fall short of a complete census, while data collected by convenience sampling methods might have selective utility but would be insufficient for capturing the broad range of fire incidents at the national level.

It appears that most countries currently employ a voluntary approach to data collection, coupled with expectations of fire departments to participate in filing reports, but more efforts are necessary from national programs to encourage and evaluate compliance. Whatever form the data collection system takes, it is important that it captures reliably the experiences of the populations it seeks to measure.

Recommendation 1

- Data collection systems should be prepared to conduct follow-up with non-respondents, assess the completeness of reporting, and identify any systematic patterns of non-reporting.

As mentioned earlier, we were able to find little discussion of missing data among the systems to collect fire incident data in the European Union, as well as most fire incident data collection systems more generally. It may be the case that missing data receives the greatest attention in the United States because its data collection system is the most extensively detailed, with the greatest potential to produce items with unknown values, and potentially to discourage submission of reports altogether. Missing data may be less problematic in reporting systems that require less detail and whose population groups may have greater uniformity with respect to fire experiences.

The impact of missing data is likely to be especially problematic if it fails to account for differences in the populations impacted by fire incidents, potentially leading to imperfect interpretations of results. Such differences might include regional differences in the built environment, differences in neighbourhood conditions, including housing quality and social conditions, or differences in age. Accordingly, assessment of missing data will be especially important in

countries that are characterized by diverse regional levels of economic development and diversity of economic and social conditions.

On this point, it is important to note that generally the fire data collection systems examined in this research appear to be regarded as census systems of data collection. We cannot say if this is a view held by key users of fire data in these systems. However, there is a danger in assuming that data collection systems capture all or most fire incidents in the absence of any examination of the degree and form of unreported fires or other missing data. Any systematic failure to collect data that is not randomly distributed runs the risk of failing to identify risk factors associated with social and economic disadvantage, victim characteristics, or other factors related to fire incidence or outcomes. Accordingly, it is important that the implementation of systems for collecting fire data include plans for data quality checks and procedures for handling missing data in order to verify the validity and reliability of data findings.

The financial costs associated with efforts to harmonize data collection will vary by country and be influenced by the existing state of fire data collection practices and resources. It is important to have a realistic appraisal of the economic costs of fire incident data collection if any harmonized system is to be sustainable over time. Countries and regions with stronger national traditions of data collection in support of policy objectives will require substantially less investment in supporting a harmonized data collection system than those in which collection efforts are less mature or concentrated in specific areas. It is important to note here that substantial costs differences may depend on decisions about what data to include and how to collect it. This may be an unforeseen cost in seeking to achieve harmonized data collection in countries with decentralized and non-uniform systems, even if those systems are mature.

The cost of implementing a comprehensive data collection system will be greatest in countries that have the least experience and fewest existing resources. Countries with less established or comprehensive data collection systems may have to assume significantly greater training costs when they seek to introduce data collection responsibilities in fire departments nationwide. The cost burden will be influenced also by the availability and sophistication of computer hardware and software. An estimate of the cost of running either a census or sample survey data collection was estimated for each member state taking relative differences in cost into account. This estimate assumed everyone starting from the same level and hence did not take into account the existing systems available. The initial cost of implementing a comprehensive data collection system will be greatest in countries that have the least experience and fewest existing resources. Countries with less established or comprehensive data collection systems may have to assume significantly greater training costs when they seek to introduce data collection responsibilities in fire departments nationwide.

Our review of data collection methods and systems provides a foundation for several additional concluding observations relative to national systems for collecting fire incident data:

Recommendation 2

- Data collection systems should be designed with sustainability in mind. Public funding for data collection systems can lag if they fail to generate recognition as a public good or commitment among key principals.
- Overly ambitious and detailed data collection systems may tax the patience of participants and undermine data quality. To encourage compliance and build competence and interest among participants, it may be useful for the architects of data collection systems to begin with comparatively modest reporting requirements and to introduce additional details incrementally as participants gain experience.

- 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 value of fire safety interventions, data collection and build public recognition and support.

The project team developed and dispatched a survey to stakeholders in the EU Member States, namely regulators and fire authorities, to assess their opinions about the types of data needed to support fire safety policies.

Highlights

- A proposal to collect 14 variables in the harmonisation process of European fire statistics is made, divided in two tiers with different priority.

The proposal is mainly based on the opinions of the majority of the stakeholders from the EU Member States who responded to the questionnaire, with the observation that each of the proposed variables was already being collected by the majority of the EU Member States and/or the confirmation of their relevance by the opinion of the majority of the project consortium.

Recommendation 3

The following eight variables should be collected as a first priority.

Tier 1:

1. Number of fatalities
2. Number of injuries
3. Age of fatalities
4. Primary causal factor
5. Type of building
6. Incident location
7. Incident date
8. Incident time

Once the previous eight variables have been implemented efficiently, we propose adding the second tier, which would include five additional variables:

Tier 2:

9. Number of floors

10. Area of origin

11. Heat source

12. Item first ignited

13. Articles contributing to fire development

14. Fire safety measures present

Collecting these variables as part of harmonized European fire statistics should not prevent European countries to continue collecting other variables in parallel.

A set of definitions has been developed and is detailed in Chapter 4 of this report, for prospective fire data systems that seek to ensure a common understanding within the EU. The proposed terminology includes existing standards and practices. This terminology is based on knowledge of current practices and from discussions with stakeholders. For each variable, a definition and values assigned to the variable are proposed, which shall enable better fire statistics.

Four groups of categories were established, i.e., intervention characteristics, human characteristics, building characteristics and fire characteristics and several variables are assigned to the established groups of categories. The common terminology is based on the experiences from previous tasks and by researching public datasets and literature review. The proposed terminology is inspired by the definitions found in the ISO TS 17755-2[1] standard but are adapted to European specifications.

Highlights

- For each variable, a detailed definition and values assigned to it, are provided.

Notes to the definitions or values are also presented when necessary to prevent any ambiguities. For example, there is an established threshold to determine which fires are to be collected:

Highlights

- Definition of a fire incident: Building fires where the Fire Service attended the scene, confirmed that a fire was either ongoing or had been extinguished, and resulted in damage to people, property or the environment.

Damage in this context is considered as injuries at the fire scene, fatalities at the fire scene, damage to property of at least 100 euros and/or environmental contamination requiring clean up. Fire in this context is considered as uncontrolled self-supporting flaming, glowing or smouldering combustion. Explosions, flashes and discharges of static electricity, attempted suicide and suicide by self-immolation are excluded unless if the event resulted in a fire after the initial

[1] Fire safety — Statistical data collection — Part 2: Vocabulary

event. Additional guidance on how to collect, interpret and report data is presented in this report (Chapters 5 to 8).

A cost-benefit analysis (CBA) method is proposed in this study to provide a structured and explicit way to create a basis for decision making regarding fire safety measures. Cost-benefit analysis is a common methodology for performing an economic analysis of fire safety investments. CBAs has been used in literature to study different types of fire safety measures. In particular, the installation of various kinds of water sprinkler systems has been studied in several countries and is not seen as cost-beneficial in general. However, for specific types of buildings or for certain risk groups, the benefits may outweigh the costs. Another measure that has been analyzed in several countries is installation of smoke alarms and it is often found to be cost-beneficial in general, primarily due to its low cost. Other measures that have been reviewed in this work include stove guards, fire extinguishers and combustible cladding.

This study gives an overview of a proposed calculation procedure for conducting a cost-benefit analysis. There is also a description of the most important input variables. Important variables can include basic fire statistics, such as the number of fires, number of fire fatalities, number of injured, cause of fire and type of building. These are some of the variables suggested in this project. More detailed fire statistics and information is needed for information on the presence, operation, and reason for failure of different technical systems (like automatic extinguishing systems and smoke alarms), as a part of a CBA analysis of such systems. It is also important to point out that there are several other input variables needed for a CBA which cannot be obtained from fire service statistics, for example the risk reduction of installing a certain measure and the cost of installation and maintenance of that same measure.

Recommendation 4

- It is evident that there can be a substantial uncertainty related to some of the variable input values. Consequently, it is strongly recommended that a cost-benefit analysis should be complemented with a sensitivity analysis to highlight the variation in the results due to uncertainty in the inputs.

Highlights

- Unfortunately, fire statistics do not provide the complete dataset required for decision-makers to conduct CBAs that support policy decisions.

The calculation procedure presented in this project is demonstrated by three case studies. The case studies are important for explaining and illustrating further the calculation procedure. This is because the type of data needed and its availability varies between areas of study, both in terms of type of system and country studied. The case studies cover three types of possible actions i.e. implementing technical installations, improving materials/products and prevention campaigns.

Included for each case study is a cost estimate for introducing a measure and an estimate of the benefit due to risk reduction and other benefits. A detailed calculation was possible for Case study 1 on smoke alarms since there have been several studies in that field and data is available for most of the important input variables. The case study also illustrated that the measure (a smoke alarm) is cost-effective. The results of Case studies 2 and 3 on the introduction of regulations on upholstered furniture and home visits, respectively, are considered

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 that makes it necessary to complement such a study with a sensitivity analysis.

As can be concluded from the case studies, reliable fire statistics are crucial for conducting this type of analysis. Data on the number of fatalities, number of fires, item first ignited etc., have been used in the case studies. Further details are available in Chapter 10 of this report.

Recommendation 5

- It is 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. Unfortunately, fire statistics do not provide the complete dataset required for decision-makers to conduct CBAs that support policy decisions.

A survey sent to regulators in all EU Member States showed that at least 19 countries are in favour of providing harmonised fire statistics for collection at European level. The next step could then be to test the implementation of the five variables (or more) with a number of interested EU Member States as part of an experimental phase of the implementation process.

Recommendation 6

- There should be a structure that can act at a European level that collects national fire statistics on an annual basis, with the necessary resources to store, analyse and publish data from the various countries. Such a structure will still need to be created or identified in follow-up stages of this project.

Recommendation 7

- Finally, we recommend that the definitions and methodologies proposed in the project undergo a standardisation process via an official standardisation body which would provide a recognised basis and facilitate its dissemination to all EU Members States or even internationally.

Résumé analytique

Le présent rapport est le rapport final du projet SI2.830108, financé par le Parlement Européen et commandé par la DG GROW de la Commission Européenne. Un résumé des résultats est présenté dans le rapport final, mais le présent résumé analytique donne un aperçu de l'objectif du projet, des méthodes et des principaux résultats.

L'objectif de ce projet pilote était de recenser la terminologie utilisée et les données collectées par les États membres de l'UE concernant les incendies, et de proposer une terminologie et une méthode communes pour collecter les données nécessaires dans chaque État membre de l'UE afin d'obtenir des ensembles de données significatifs (basés sur des termes et des définitions standardisés). Cela devrait permettre de prendre des décisions fondées sur des connaissances en matière de sécurité incendie au niveau des États membres et de l'UE en ce qui concerne les incendies de bâtiments. C'est-à-dire les maisons, les immeubles d'habitation, les immeubles de bureaux, les bâtiments commerciaux, les hôpitaux, les écoles, les maisons de retraite, etc.

Un examen de la littérature sur les statistiques des incendies montre que les systèmes de collecte de données sur les incendies ont contribué à réduire les incendies de bâtiments et les décès, blessures et dommages économiques qui y sont associés. Cependant, les systèmes de collecte de données des États membres de l'UE et d'autres pays varient considérablement en ce qui concerne le type et la portée des informations collectées, la manière dont les éléments d'information sont définis, les niveaux de spécificité recherchés et les types de formation et de ressources consacrés aux efforts de collecte. La quantité et la qualité des informations dans plusieurs systèmes de collecte de données semblent également être influencées par le fait qu'ils incluent des informations provenant de sources extérieures aux services d'incendie, telles que les assureurs ou les données hospitalières, par le biais du couplage de données ou d'autres moyens. Dans de nombreux cas, la quantité d'informations recueillies semble dépendre des ressources disponibles et du niveau d'expertise du personnel.

En général, il semble que les administrations de la plupart des pays présument que les systèmes de collecte de données sur les incendies fournissent une représentation précise des expériences nationales en matière d'incendies. Cependant, les informations recueillies au cours de la phase initiale du projet suggèrent que les systèmes de collecte omettent souvent d'évaluer le potentiel de biais dû aux informations manquantes, aux différences dans la façon dont les termes sont définis ou interprétés, et à d'autres questions qui peuvent influencer la qualité des données.

La terminologie et la méthode de collecte des données adoptées dans les statistiques actuelles des incendies ont été examinées dans 27 États membres de l'UE et dans huit autres pays (Australie, Canada, Nouvelle-Zélande, Norvège, Russie, Suisse, Royaume-Uni et États-Unis). Les huit pays non-membres de l'UE ont été choisis en raison de leurs statistiques réputées structurées et détaillées. L'examen des mesures de collecte de données sur les incendies à l'intérieur et à l'extérieur de l'Union européenne est important pour comprendre le degré de similitude entre les différents systèmes, et aussi pour identifier les opportunités et les défis de tout effort visant à améliorer la sécurité incendie.

Les systèmes de l'Union européenne se situent à différents niveaux en ce qui concerne la quantité d'informations recueillies sur les incendies. Les systèmes de collecte de données comprennent généralement des informations sur l'heure, la date et le lieu de l'incident et la plupart des pays incluent le type de propriété, subdivisé en bâtiments résidentiels et non résidentiels. Cependant, les informations supplémentaires sur les caractéristiques des bâtiments sont rarement enregistrées dans la plupart des pays. Les informations sur les causes d'incendie et d'autres données relatives à la source d'inflammation, à l'article enflammés en premier, au matériel principalement responsable du développement de

l'incendie et le lieu d'origine apparaissent couramment. Le nombre de morts et de blessés est enregistré dans la plupart des pays, ainsi que des informations sur l'âge et le sexe de la victime, et le type de décès ou de blessure.

En raison de l'absence de définitions officielles et de méthodologies de collecte précises dans la plupart des pays, il est clair que les données actuellement collectées dans les États membres de l'UE varient considérablement. Cette étude a trouvé peu de mentions de méthodologies pour traiter les données manquantes dans les systèmes de collecte de données sur les incendies en Europe, bien que certains pays reconnaissent que les données manquantes sont un problème qui compromet la qualité des données. En outre, aucun des rapports consultés ne comportait d'estimations de l'incertitude. Naturellement, cela constitue un obstacle majeur à la comparaison des données, et donc à l'évaluation efficace des meilleures pratiques potentielles et des approches de sécurité réussies. Pour fournir des informations pertinentes sur la sécurité incendie nationale (nombre d'incendies, de décès par incendie, de blessures par incendie, de pertes par incendie, etc.), les statistiques sur les incendies devront être améliorées par une terminologie et une méthodologie commune, ainsi que par une formation et une qualification commune des personnes chargées de remplir les rapports sur les incendies, y compris les méthodes d'estimation des incertitudes.

Cette étude a donc passé en revue un certain nombre de questions critiques liées à la conception et à la mise en œuvre des systèmes de collecte de données sur les incendies et a proposé des recommandations pour améliorer la cohérence entre les systèmes. L'examen part de l'hypothèse que les données sur les incendies peuvent servir à un certain nombre d'objectifs importants - aider à réduire les incendies et les pertes, identifier les possibilités d'interventions en matière de sécurité et de programmes d'éducation, orienter l'allocation des ressources publiques vers les domaines où les besoins et l'impact sont les plus grands, et surveiller les progrès des initiatives de sécurité. Les systèmes de collecte de données peuvent également faciliter les occasions de partager les expériences et les succès entre les régions et les pays, en favorisant une plus large diffusion des innovations techniques et autres qui améliorent la sécurité incendie. Pour atteindre ces objectifs, il est important que les systèmes de collecte de données produisent des données fiables.

La conception de la méthode de collecte de données proposée a été dictée par les besoins et les capacités des États membres de l'UE. Dans le cadre de la collecte de données à des fins d'intervention systématique, comme c'est le cas pour la collecte de données sur les incidents d'incendie, il est important de créer une base de données suffisamment robuste qui puisse aider à identifier les facteurs de risque et à documenter les incidents d'incendie avec une confiance raisonnable. Les systèmes de collecte de données qui s'appuient sur la déclaration volontaire ne permettront certainement pas d'obtenir un recensement complet, tandis que les données recueillies par des méthodes d'échantillonnage de convenance peuvent avoir une utilité sélective mais seraient insuffisantes pour saisir le large éventail d'incendies au niveau national.

Il semble que la plupart des pays utilisent actuellement une approche volontaire de la collecte de données, tout en attendant des services d'incendie qu'ils participent à la rédaction des rapports. Cependant, les programmes nationaux doivent faire davantage d'efforts pour encourager et évaluer la conformité. Quelle que soit la forme que prend le système de collecte de données, il est important qu'il saisisse de manière fiable les valeurs qu'il cherche à mesurer.

Recommandation 1

- Les systèmes de collecte de données devraient être préparés pour effectuer un suivi auprès des non-répondants, pour évaluer l'exhaustivité des déclarations et pour identifier tout modèle systématique de non-déclaration.

Comme mentionné précédemment, nous n'avons pu trouver que peu de discussions sur les données manquantes parmi les systèmes de collecte de données sur les incendies dans l'Union européenne, ainsi que dans la plupart des systèmes de collecte de données sur les incendies plus généralement. Il se peut que les données manquantes fassent l'objet de la plus grande attention aux États-Unis parce que leur système de collecte de données est le plus détaillé avec pour conséquence probable de produire des éléments dont les valeurs sont inconnues, voire de décourager complètement la soumission de rapports. Les données manquantes peuvent être moins problématiques dans les systèmes de déclaration qui exigent moins de détails et dont les groupes de population peuvent présenter une plus grande uniformité en ce qui concerne les expériences d'incendie.

L'impact des données manquantes risque d'être particulièrement problématique s'il ne tient pas compte des différences dans les populations touchées par les incendies, ce qui peut conduire à des interprétations imparfaites des résultats. Ces différences peuvent inclure des différences régionales dans l'environnement bâti, des différences dans les conditions de voisinage, y compris la qualité du logement et les conditions sociales, ou des différences d'âge. Par conséquent, l'évaluation des données manquantes sera particulièrement importante dans les pays qui se caractérisent par des niveaux régionaux de développement économique et une diversité de conditions économiques et sociales.

Sur ce point, il est important de noter qu'en général, les systèmes de collecte de données sur les incendies examinés dans cette recherche semblent être considérés comme des systèmes de collecte de données de recensement. Nous ne pouvons pas dire si cette opinion est partagée par les principaux utilisateurs des données sur les incendies dans ces systèmes. Cependant, il y a un danger à supposer que les systèmes de collecte de données saisissent tous ou la plupart des incidents d'incendie en l'absence de tout examen du degré et de la forme des incendies non signalés ou d'autres données manquantes. Toute absence systématique de collecte de données qui ne sont pas distribuées de manière aléatoire risque de ne pas permettre d'identifier les facteurs de risque associés aux désavantages sociaux et économiques, aux caractéristiques des victimes ou à d'autres facteurs liés à l'incidence ou aux résultats des incendies. Par conséquent, il est important que la mise en œuvre de systèmes de collecte de données sur les incendies comprenne des plans de contrôle de la qualité des données et des procédures de traitement des données manquantes afin de vérifier la validité et la fiabilité des résultats des données.

Les coûts financiers associés aux efforts d'harmonisation de la collecte de données varieront d'un pays à l'autre et seront influencés par l'état actuel des pratiques et des ressources de collecte de données sur les incendies. Il est important d'avoir une évaluation réaliste des coûts économiques de la collecte des données sur les incendies si l'on veut qu'un système harmonisé soit viable à long terme. Les pays et les régions ayant des traditions nationales plus fortes en matière de collecte de données à l'appui d'objectifs politiques auront besoin d'un investissement nettement moins important pour soutenir un système harmonisé de collecte de données que ceux dans lesquels les efforts de collecte sont moins matures ou concentrés dans des domaines spécifiques. Il est important de noter ici que des différences de coûts substantielles peuvent dépendre des décisions concernant les données à inclure et la manière de les collecter. Il peut s'agir d'un coût imprévu lorsqu'on cherche à réaliser une collecte de données harmonisée dans des pays dotés de systèmes décentralisés et non uniformes, même si ces systèmes sont matures.

Le coût de la mise en œuvre d'un système complet de collecte de données sera le plus élevé dans les pays qui ont le moins d'expérience et le moins de ressources existantes. Les pays dont les systèmes de collecte de données sont moins établis ou moins complets devront peut-être assumer des coûts de formation beaucoup plus élevés lorsqu'ils chercheront à introduire des responsabilités de collecte de données dans les services d'incendie à l'échelle nationale. La charge financière sera également influencée par la disponibilité et la sophistication du matériel informatique et des logiciels. Une estimation du coût de la gestion d'un recensement ou d'une enquête par sondage a été réalisée pour chaque État membre en tenant compte des différences relatives de coût. Cette estimation supposait que tout le monde partait du même niveau et ne tenait donc pas compte des systèmes existants disponibles. Le coût initial de la mise en œuvre d'un système complet de collecte de données sera le plus élevé dans les pays qui ont le moins d'expérience et le moins de ressources existantes. Les pays dont les systèmes de collecte de données sont moins établis ou moins complets devront peut-être assumer des coûts de formation beaucoup plus élevés lorsqu'ils chercheront à introduire des responsabilités en matière de collecte de données dans les services d'incendie à l'échelle nationale.

Notre examen des méthodes et des systèmes de collecte de données nous permet de formuler plusieurs autres observations finales concernant les systèmes nationaux de collecte de données sur les incendies :

Recommandation 2

- Les systèmes de collecte de données doivent être conçus dans une optique de durabilité. Le financement public des systèmes de collecte de données peut s'affaiblir s'ils ne parviennent pas à être reconnus comme un bien public ou à susciter l'engagement des principaux responsables.
- Des systèmes de collecte de données trop ambitieux et détaillés peuvent mettre à l'épreuve la constance des participants et nuire à la qualité des données. Pour encourager l'affinité et renforcer la compétence et l'intérêt des participants, il peut être utile pour les concepteurs des systèmes de collecte de données de commencer par des requêtes relativement modestes et d'introduire des détails supplémentaires au fur et à mesure que les participants acquièrent de l'expérience.
- Il convient d'aligner le contenu de la collecte de données sur des objectifs politiques réalistes et d'utiliser les données pour promouvoir les interventions et les mesures de sécurité.
- Il convient d'utiliser les données pour tracer et faire connaître les tendances, démontrer la valeur des interventions en matière de sécurité incendie, la collecte de données, la reconnaissance et le soutien du public.

Le consortium du projet a élaboré et envoyé une enquête aux parties prenantes dans les États membres de l'UE, à savoir les régulateurs et les autorités chargées de la lutte contre les incendies, afin d'évaluer leurs opinions sur les types de données nécessaires pour soutenir les mesures de sécurité incendie.

A retenir

- Une proposition de collecte de 14 variables est établie dans le processus d'harmonisation des statistiques européennes sur les incendies. Celle-ci est divisée en deux différents niveaux de degré de priorité.

La proposition est principalement basée sur les opinions de la majorité des parties prenantes des États membres de l'UE qui ont répondu au questionnaire, avec l'observation que chacune des variables proposées était déjà collectée par la majorité des États membres de l'UE et/ou la confirmation de leur pertinence par l'opinion de la majorité du consortium du projet.

Recommandation 3

Les huit variables suivantes devraient être collectées en priorité.

Niveau 1 :

1. Nombre de décès
2. Nombre de blessés
3. Âge des décès
4. Facteur de causalité principal
5. Type de bâtiment
6. Lieu de l'incident
7. Date de l'incident
8. Heure de l'incident

Une fois que les huit variables précédentes ont été mises en œuvre efficacement, nous proposons d'ajouter une deuxième étape, qui comprendrait la collecte de cinq variables supplémentaires :

Niveau 2 :

9. Nombre d'étages
10. Zone d'origine
11. Source de chaleur
12. Objet mis à feu en premier
13. Articles contribuant au développement du feu
14. Mesures de sécurité incendie présentes

La collecte de ces variables dans le cadre de statistiques européennes harmonisées sur les incendies ne doit pas empêcher les pays européens de continuer à collecter d'autres variables en parallèle.

Un ensemble de définitions a été élaboré et est détaillé au chapitre 4 du présent rapport, pour les futurs systèmes de données sur les incendies qui cherchent à assurer une compréhension commune au sein de l'UE. La terminologie proposée inclut les normes et pratiques existantes. Cette terminologie est basée sur la connaissance des pratiques actuelles et sur des discussions avec les parties prenantes. Pour chaque variable, une définition et des valeurs attribuées à la variable sont proposées, ce qui permettra d'améliorer les statistiques sur les incendies.

Quatre groupes de catégories ont été établis, à savoir les caractéristiques des interventions, les caractéristiques humaines, les caractéristiques des bâtiments et les caractéristiques des incendies, et plusieurs variables sont affectées aux groupes de catégories établis. La terminologie commune est basée sur les expériences des tâches précédentes et sur la recherche d'ensembles de données publiques et la revue de la littérature. La terminologie proposée s'inspire des définitions de la norme ISO TS 17755-2 mais est adaptée aux spécifications européennes.

A retenir

- Pour chaque variable, une définition détaillée et les valeurs qui lui sont attribuées sont fournies.

Des notes relatives aux définitions ou aux valeurs sont également présentées lorsque cela est nécessaire pour éviter toute ambiguïté. Par exemple, il existe un seuil établi pour déterminer quels incendies doivent être collectés :

A retenir

- Définition d'un incident d'incendie : Incendies de bâtiments pour lesquels le service d'incendie s'est rendu sur les lieux, a confirmé qu'un incendie était en cours ou avait été éteint, et a entraîné des dommages aux personnes, aux biens ou à l'environnement.

Dans ce contexte, les dommages sont considérés comme des blessures sur le lieu de l'incendie, des décès sur le lieu de l'incendie, des dommages matériels d'au moins 100 euros et/ou une contamination environnementale nécessitant un nettoyage. Dans ce contexte, le feu est considéré comme une combustion incontrôlée, autoportante, enflammée, incandescente ou fumante. Les explosions, les éclairs et les décharges d'électricité statique, les tentatives de suicide et les suicides par auto-immolation sont exclus, sauf si l'événement a entraîné un incendie après l'événement initial. Des conseils supplémentaires sur la manière de collecter, d'interpréter et de communiquer les données sont présentés dans ce rapport (chapitres 5 à 8).

Une méthode d'analyse coûts-avantages (ACA) est proposée dans cette étude afin de fournir un moyen structuré et explicite de créer une base pour la prise de décision concernant les mesures de sécurité incendie. L'analyse coûts-avantages est une méthodologie courante pour réaliser une analyse économique des investissements en matière de sécurité incendie. Les ACA ont été utilisées dans la littérature pour étudier différents types de mesures de sécurité incendie. En particulier, l'installation de divers types de systèmes d'arrosage à eau a été étudiée dans plusieurs pays et n'est pas considérée comme rentable en général. Toutefois, pour certains types de bâtiments ou pour certains groupes à risque, les avantages peuvent être supérieurs aux coûts. Une autre mesure qui a été analysée dans plusieurs pays est l'installation de détecteurs de fumée et elle est souvent considérée comme rentable en

général, principalement en raison de son faible coût. D'autres mesures qui ont été examinées dans le cadre de ce travail sont les protections de poêles, les extincteurs et les revêtements combustibles.

Cette étude donne un aperçu d'une procédure de calcul proposée pour effectuer une analyse coûts-avantages. On y trouve également une description des variables d'entrée les plus importantes. Les variables importantes peuvent inclure des statistiques de base sur les incendies, telles que le nombre d'incendies, le nombre de décès par incendie, le nombre de blessés, la cause de l'incendie et le type de bâtiment. Ce sont quelques-unes des variables proposées dans ce projet. Des statistiques et des informations plus détaillées sur les incendies sont nécessaires pour connaître la présence, le fonctionnement et la raison de la défaillance de différents systèmes techniques (comme les systèmes d'extinction automatique et les détecteurs de fumée), dans le cadre d'une analyse ACA de ces systèmes. Il est également important de souligner qu'il existe plusieurs autres variables d'entrée nécessaires pour une ACA qui ne peuvent être obtenues à partir des statistiques des services d'incendie, par exemple la réduction du risque que représente l'installation d'une certaine mesure et le coût d'installation et d'entretien de cette même mesure.

Recommandation 4

- Il est évident qu'il peut y avoir une incertitude substantielle liée à certaines des valeurs d'entrée variables. Par conséquent, il est fortement recommandé de compléter une analyse coûts-avantages par une analyse de sensibilité afin de mettre en évidence la variation des résultats due à l'incertitude des données.

A retenir

- Malheureusement, les statistiques sur les incendies ne fournissent pas l'ensemble des données nécessaires aux décideurs pour réaliser des ACA qui soutiennent les décisions politiques.

La procédure de calcul présentée dans ce projet est démontrée par trois études de cas. Ces études de cas sont importantes pour expliquer et illustrer davantage la procédure de calcul. En effet, le type de données nécessaires et leur disponibilité varient selon les domaines d'étude, tant en termes de type de système que de pays étudié. Les études de cas couvrent trois types d'actions possibles, à savoir la mise en œuvre d'installations techniques, l'amélioration des matériaux/produits et les campagnes de prévention.

Chaque étude de cas comprend une estimation du coût de l'introduction d'une mesure et une estimation du bénéfice dû à la réduction des risques et à d'autres avantages. Un calcul détaillé a été possible pour l'étude de cas 1 sur les détecteurs de fumée, car plusieurs études ont été réalisées dans ce domaine et des données sont disponibles pour la plupart des variables d'entrée importantes. L'étude de cas a également montré que la mesure (un détecteur de fumée) est rentable. Les résultats des études de cas 2 et 3 sur l'introduction de réglementations sur les meubles rembourrés et les visites à domicile, respectivement, sont considérés comme beaucoup plus incertains et plus difficiles à interpréter car le ratio avantages-coûts est proche de 1. Plusieurs variables d'entrée importantes sont également associées à de grandes incertitudes, ce qui rend nécessaire de compléter une telle étude par une analyse de sensibilité.

Comme on peut le conclure des études de cas, des statistiques fiables sur les incendies sont essentielles pour mener ce type d'analyse. Des données sur le nombre de décès, le nombre

d'incendies, le premier élément allumé, etc. ont été utilisées dans les études de cas. De plus amples détails sont disponibles au chapitre 10 du présent rapport.

Recommandation 5

- Il est important de souligner que plusieurs variables d'entrée nécessaires à une analyse coûts-avantages ne peuvent être obtenues à partir des statistiques des services d'incendie, par exemple la réduction des risques et le coût de la mise en œuvre et du maintien d'une certaine mesure. Malheureusement, les statistiques sur les incendies ne fournissent pas l'ensemble complet de données dont les décideurs ont besoin pour réaliser des ACA qui soutiennent les décisions politiques.

Une enquête envoyée aux régulateurs de tous les États membres de l'UE a montré qu'au moins 19 pays sont favorables à la fourniture de statistiques harmonisées sur les incendies pour une collecte au niveau européen. L'étape suivante pourrait alors consister à tester la mise en œuvre des cinq variables (ou plus) avec un certain nombre d'États membres de l'UE intéressés, dans le cadre d'une phase expérimentale du processus de mise en œuvre.

Recommandation 6

- Il devrait y avoir une structure européenne qui puisse collecter les statistiques nationales sur les incendies sur une base annuelle, avec les ressources nécessaires pour stocker, analyser et publier les données des différents pays. Une telle structure devra encore être créée ou identifiée lors des étapes suivantes de ce projet.

Recommandation 7

- Enfin, nous recommandons que les définitions et méthodologies proposées dans le projet fassent l'objet d'un processus de normalisation via un organisme officiel de normalisation qui fournirait une base reconnue et faciliterait sa diffusion à tous les États membres de l'UE, voire au niveau international.

Kurzfassung

Der vorliegende Bericht ist der Abschlussbericht des Projekts SI2.830108, das vom Europäischen Parlament finanziert und von der DG GROW der Europäischen Kommission in Auftrag gegeben wurde. Der Abschlussbericht enthält eine Zusammenfassung der Ergebnisse, diese Kurzfassung hingegen gibt einen Überblick über die Ziele, Methoden und wichtigsten Ergebnisse.

Ziel dieses Pilotprojekts war es, die von den EU-Mitgliedstaaten verwendete Terminologie und die von ihnen erhobenen Daten über Brandereignisse zu erfassen und eine gemeinsame Terminologie und Methode zur Erhebung der erforderlichen Daten in jedem EU-Mitgliedstaat vorzuschlagen, um aussagekräftige Datensätze (auf der Grundlage standardisierter Begriffe und Definitionen) zu erhalten. Dies wiederum soll wissensbasierte Entscheidungen über den Brandschutz auf Ebene der Mitgliedstaaten und der EU in Bezug auf Gebäudebrände (d. h. Wohnhäuser, Mehrfamilienhäuser, Bürogebäude, Geschäftsgebäude, Krankenhäuser, Schulen und Kindergärten, Altenheime usw.) ermöglichen.

Eine Durchsicht der Fachliteratur zur Brandstatistik zeigt, dass Systeme zur Erfassung von Branddaten maßgeblich zur Verringerung von Gebäudebränden und den damit verbundenen Todesfällen, Verletzungen und wirtschaftlichen Schäden beigetragen haben. Die Systeme der EU-Mitgliedstaaten und anderer Länder unterscheiden sich jedoch erheblich hinsichtlich der Art und des Umfangs der gesammelten Informationen, der Art und Weise, wie die Datenelemente definiert werden, des angestrebten Spezifitätsgrads und der Art der Ausbildung und der Ressourcen, die für die Datenerfassung eingesetzt werden. Umfang und Qualität der Informationen in verschiedenen Datenerhebungssystemen scheinen auch davon beeinflusst zu werden, ob sie durch Datenverknüpfung oder auf andere Weise Informationen aus Quellen außerhalb der Feuerwehr, z. B. von Versicherern oder medizinischen Stellen, einbeziehen. In vielen Fällen scheint der Umfang der gesammelten Informationen von den verfügbaren Ressourcen und dem Fachwissen des Personals abzuhängen.

Im Allgemeinen scheinen die Verwaltungen der meisten Länder davon auszugehen, dass die Systeme zur Erfassung von Daten zu Brandereignissen ein genaues Bild der nationalen Erfahrungen mit Brandereignissen liefern. Die in der Anfangsphase des Projekts gesammelten Informationen deuten jedoch darauf hin, dass die Erfassungssysteme oft nicht das Potenzial für Verzerrungen aufgrund fehlender Informationen, unterschiedlicher Definitionen oder Auslegungen von Begriffen und anderer Aspekte, die die Datenqualität beeinflussen können, berücksichtigen.

Untersucht wurden die Terminologie und die Methodik der Datenerhebung in den aktuellen Brandstatistiken in 27 EU-Mitgliedstaaten und acht weiteren Ländern (Australien, Kanada, Neuseeland, Norwegen, Russland, Schweiz, Vereinigtes Königreich und USA). Die acht Nicht-EU-Länder wurden auf der Grundlage ihrer strukturierten und detaillierten Brandstatistiken ausgewählt. Die Überprüfung der Maßnahmen zur Erhebung von Daten zu Brandereignissen innerhalb und außerhalb der Europäischen Union ist wichtig, um zu verstehen, inwieweit die verschiedenen Systeme übereinstimmen, und um Möglichkeiten und Herausforderungen bei den Bemühungen zur Verbesserung des Brandschutzes zu ermitteln.

Die Systeme in der Europäischen Union sind im Hinblick auf die Menge der erfassten Daten zu Brandereignissen unterschiedlich umfangreich. Die Datenerfassungssysteme enthalten in der Regel Informationen über die Uhrzeit, das Datum und den Ort des Ereignisses, und die meisten Länder erfassen die Art des Objekts, unterteilt in Wohngebäude und Gebäude mit

anderer Nutzung. Zusätzliche Informationen über Gebäudemerkmale wurden jedoch in den meisten Ländern nur selten erfasst. Informationen über die Brandursachen und andere Daten in Bezug auf die Zündquelle, den Gegenstand und das Material, das sich zuerst entzündet hat, das Material, das hauptsächlich für die Entwicklung des Brandes verantwortlich ist, und den Brandherd werden in der Regel angegeben. Die Zahl der Todesopfer und Verletzten wird in den meisten Ländern zusammen mit Informationen über das Alter und das Geschlecht der Opfer sowie die Art des Todes oder der Verletzung erfasst.

Da es in den meisten Ländern an offiziellen Definitionen und präzisen Erhebungsmethoden mangelt, ist klar, dass die derzeit erhobenen Daten in den EU-Mitgliedstaaten sehr unterschiedlich sind. Die Untersuchung ergab, dass in den Systemen zur Erhebung von Daten zu Brandereignissen in Europa kaum Methoden für den Umgang mit fehlenden Daten erwähnt werden, obwohl einige Länder anerkennen, dass fehlende Daten ein Problem darstellen, das die Datenqualität beeinträchtigt. Außerdem enthielt keiner der vorliegenden Berichte Schätzungen zur Unsicherheit. Dies stellt naturgemäß ein großes Hindernis für den Datenvergleich und damit für eine effektive Bewertung potenzieller bester Verfahren und erfolgreicher Sicherheitsansätze dar. Um aussagekräftige Informationen über die nationale Brandsicherheit (Anzahl der Brände, Brandtote, Brandverletzte, Brandschäden usw.) zu erhalten, müssen die Brandstatistiken durch eine einheitliche Terminologie, eine einheitliche Methodik und eine einheitliche Ausbildung und Qualifizierung der Personen, die für das Ausfüllen der Brandberichte zuständig sind, verbessert werden, einschließlich der Methoden zur Unsicherheitsabschätzung.

Im Rahmen der Forschungsarbeiten wurde daher eine Reihe kritischer Fragen im Zusammenhang mit der Gestaltung und Umsetzung von Systemen zur Erfassung von Brandfällen untersucht und Empfehlungen zur Verbesserung der Kohärenz zwischen den Systemen ausgesprochen. Die Untersuchung geht von der Annahme aus, dass Daten über Brandereignisse eine Reihe von wichtigen Zwecken erfüllen können - sie können helfen, Brände und Verluste zu reduzieren, Möglichkeiten für Sicherheitsmaßnahmen und Aufklärungsprogramme zu erkennen, die Zuweisung öffentlicher Ressourcen auf Bereiche mit dem größten Bedarf und den größten Auswirkungen zu lenken und die Fortschritte von Sicherheitsinitiativen zu überwachen. Datenerhebungssysteme können auch den Austausch von Erfahrungen und Erfolgen zwischen Regionen und Ländern erleichtern und so eine größere Verbreitung von technischen und anderen Innovationen zur Verbesserung der Brandsicherheit fördern. Um diese Ziele zu erreichen, ist es wichtig, dass die Datenerfassungssysteme zuverlässige Daten liefern.

Der Entwurf der vorgeschlagenen Datenerhebungsmethode wurde von den Bedürfnissen und Möglichkeiten der EU-Mitgliedstaaten bestimmt. Bei der Datenerhebung mit systematischen Interventionszwecken, wie es bei der Erhebung von Daten über Brände der Fall ist, ist es wichtig, eine ausreichend robuste Datenbank zu schaffen, die dazu beitragen kann, Risikofaktoren zu ermitteln und Brandfälle mit angemessener Sicherheit zu dokumentieren. Datenerhebungssysteme, die sich auf freiwillige Meldungen stützen, werden mit ziemlicher Sicherheit hinter einer vollständigen Zählung zurückbleiben, während Daten, die mit Hilfe von Zufallsstichproben erhoben werden, zwar von selektivem Nutzen sein könnten, aber nicht ausreichen würden, um das breite Spektrum von Brandereignissen auf nationaler Ebene zu erfassen.

Es scheint, dass die meisten Länder derzeit einen freiwilligen Ansatz für die Datenerfassung verfolgen, verbunden mit der Erwartung an die Feuerwehren, sich an der Berichterstattung zu beteiligen. Verschiedene Anstrengungen seitens der nationalen Programme scheinen jedoch erforderlich zu sein, um die Einhaltung der Vorschriften fördern und bewerten zu können. Un-

abhängig von der Form des Datenerhebungssystems (es kann sich um eine freiwillige Erhebung, eine vollständige Erhebung oder eine andere Erhebungsmethode handeln) ist es wichtig, dass es Daten erfasst, die die tatsächliche Situation widerspiegeln.

Empfehlung 1

- Die Datenerhebungssysteme sollten darauf vorbereitet sein, Nachverfolgungen bei Personen durchzuführen, die nicht geantwortet haben, die Vollständigkeit der Meldungen zu bewerten und systematische Muster der Nichtmeldung zu erkennen.

Wie bereits erwähnt, konnten wir bei den Systemen zur Erhebung von Daten über Brandereignisse in der Europäischen Union sowie bei den meisten Systemen zur Erhebung von Daten über Brandereignisse im Allgemeinen nur wenig Diskussion über fehlende Daten finden. Möglicherweise wird fehlenden Daten in den Vereinigten Staaten die größte Aufmerksamkeit zuteil, weil das dortige Datenerfassungssystem am detailliertesten ist und das größte Potenzial hat, Elemente mit unbekannten Werten zu produzieren und möglicherweise von der Einreichung von Berichten ganz abzuschrecken. Fehlende Daten sind möglicherweise weniger problematisch in Berichtssystemen, die weniger detailliert sind und deren Bevölkerungsgruppen in Bezug auf die Erfahrungen mit Bränden eine größere Einheitlichkeit aufweisen.

Die Auswirkungen fehlender Daten sind wahrscheinlich besonders problematisch, wenn Unterschiede in den von Bränden betroffenen Bevölkerungsgruppen nicht berücksichtigt werden, was zu unvollständigen Interpretationen der Ergebnisse führen kann. Zu solchen Unterschieden könnten regionale Unterschiede in der baulichen Umwelt, Unterschiede in den Nachbarschaftsbedingungen, einschließlich der Wohnqualität und der sozialen Bedingungen, oder Unterschiede im Alter gehören. Dementsprechend ist die Bewertung fehlender Daten besonders wichtig in Ländern, die durch ein unterschiedliches regionales Niveau der wirtschaftlichen Entwicklung und unterschiedliche wirtschaftliche und soziale Bedingungen gekennzeichnet sind.

In diesem Zusammenhang ist es wichtig, darauf hinzuweisen, dass die in dieser Studie untersuchten Systeme zur Erhebung von Branddaten im Allgemeinen als Komplettzählung zur Datenerhebung angesehen werden. Wir können nicht sagen, ob dies auch die Meinung der Hauptnutzer von Branddaten in diesen Systemen ist. Es besteht jedoch die Gefahr, dass man davon ausgeht, dass die Datenerfassungssysteme alle oder die meisten Brandereignisse erfassen, wenn keine Untersuchung des Ausmaßes und der Form der nicht gemeldeten Brände oder anderer fehlender Daten erfolgt. Jedes systematische Versäumnis, Daten zu erheben, die nicht zufällig verteilt sind, birgt die Gefahr, dass Risikofaktoren im Zusammenhang mit sozialer und wirtschaftlicher Benachteiligung, Opfermerkmalen oder anderen Faktoren, die mit der Häufigkeit von Bränden oder deren Folgen zusammenhängen, nicht ermittelt werden können. Dementsprechend ist es wichtig, dass die Einführung von Systemen zur Erhebung von Branddaten Pläne für Datenqualitätsprüfungen und Verfahren für den Umgang mit fehlenden Daten umfasst, um die Gültigkeit und Zuverlässigkeit der Datenergebnisse zu überprüfen.

Die finanziellen Kosten, die mit den Bemühungen um eine Harmonisierung der Datenerfassung verbunden sind, werden von Land zu Land unterschiedlich sein und von den bestehenden Praktiken und Ressourcen der Datenerfassung bei Bränden beeinflusst werden. Es ist wichtig, eine realistische Einschätzung der wirtschaftlichen Kosten der Datenerhebung zu Bränden vorzunehmen, wenn ein harmonisiertes System auf Dauer tragfähig sein soll. Länder und Regionen mit einer stärkeren nationalen Tradition der Datenerhebung zur Unterstützung

politischer Ziele werden wesentlich weniger Investitionen in die Unterstützung eines harmonisierten Datenerhebungssystems benötigen als solche, in denen die Erhebungsbemühungen weniger ausgereift oder auf bestimmte Gebiete konzentriert sind. Es ist wichtig, an dieser Stelle darauf hinzuweisen, dass erhebliche Kostenunterschiede von den Entscheidungen darüber abhängen können, welche Daten einbezogen werden sollen und wie sie zu erheben sind. Dies kann ein unvorhergesehener Kostenfaktor bei dem Versuch sein, eine harmonisierte Datenerhebung in Ländern mit dezentralisierten und uneinheitlichen Systemen zu erreichen, selbst wenn diese Systeme ausgereift sind.

Die Kosten für die Einführung eines umfassenden Datenerhebungssystems werden in den Ländern am höchsten sein, die über die geringste Erfahrung und die wenigsten vorhandenen Ressourcen verfügen. Länder mit weniger etablierten oder umfassenden Datenerhebungssystemen müssen möglicherweise deutlich höhere Ausbildungskosten übernehmen, wenn sie versuchen, landesweit Datenerhebungsaufgaben in den Feuerwehren einzuführen. Die Kostenbelastung wird auch von der Verfügbarkeit und der Ausgereiftheit der Computerhardware und -software beeinflusst. Eine Schätzung der Kosten für die Durchführung einer Kompletterfassung oder einer Stichprobenerhebung wurde für jeden Mitgliedstaat unter Berücksichtigung der relativen Kostenunterschiede vorgenommen. Bei dieser Schätzung wurde davon ausgegangen, dass alle von demselben Niveau aus starten, so dass die vorhandenen Systeme nicht berücksichtigt wurden. Die anfänglichen Kosten für die Einführung eines umfassenden Datenerhebungssystems sind in den Ländern am höchsten, die über die geringste Erfahrung und die wenigsten vorhandenen Ressourcen verfügen. Länder mit weniger etablierten oder umfassenden Datenerhebungssystemen müssen möglicherweise deutlich höhere Schulungskosten auf sich nehmen, wenn sie versuchen, landesweit Datenerhebungsaufgaben in den Feuerwehren einzuführen.

Unsere Überprüfung der Datenerhebungsmethoden und -systeme bietet eine Grundlage für mehrere zusätzliche abschließende Beobachtungen in Bezug auf die nationalen Systeme zur Erhebung von Daten über Brandereignisse:

Empfehlung 2

- Datenerhebungssysteme sollten mit Blick auf Nachhaltigkeit konzipiert werden. Die öffentliche Finanzierung von Datenerhebungssystemen kann sich verzögern, wenn es nicht gelingt, sie als öffentliches Gut anzuerkennen oder das Engagement der wichtigsten Auftraggeber zu fördern.
- Zu ehrgeizige und detaillierte Datenerhebungssysteme können die Geduld der Teilnehmer strapazieren und die Datenqualität negativ beeinträchtigen. Um die Einhaltung der Vorgaben zu fördern und die Kompetenz und das Interesse der Teilnehmer zu steigern, kann es für die Architekten von Datenerfassungssystemen sinnvoll sein, mit vergleichsweise bescheidenen Berichtsanforderungen zu beginnen und zusätzliche Details schrittweise einzuführen, wenn die Teilnehmer Erfahrungen gesammelt haben.
- Richten Sie den Inhalt der Datenerfassung an realistischen politischen Zielen aus und nutzen Sie die Daten zur Förderung von Sicherheitsmaßnahmen und -praktiken.
- Nutzen Sie die Daten, um Trends aufzuzeigen und zu veröffentlichen, den Wert von Brandschutzmaßnahmen und Datenerhebungen zu demonstrieren und öffentliche Anerkennung und Unterstützung zu gewinnen.

Das Projektteam entwickelte und versendete eine Umfrage an die Interessensgruppen in den EU-Mitgliedstaaten, insbesondere an die Regulierungsbehörden und die Brandschutzbehörden, um deren Meinung über die Arten von Daten zu ermitteln, die zur Unterstützung der Fortschreibungen von Brandschutzregularien benötigt werden.

Highlights

- Es wird vorgeschlagen, im Rahmen des Harmonisierungsprozesses der europäischen Brandstatistiken 14 Variablen zu erheben, die in zwei Stufen mit unterschiedlicher Priorität unterteilt sind.

Der Vorschlag stützt sich hauptsächlich auf die Meinungen der Mehrheit der Interessenvertreter aus den EU-Mitgliedstaaten, die den Fragebogen beantwortet haben, sowie auf die Feststellung, dass jede der vorgeschlagenen Variablen bereits von der Mehrheit der EU-Mitgliedstaaten erhoben wurde und/oder dass ihre Relevanz durch die Meinung der Mehrheit des Projektkonsortiums bestätigt wurde.

Empfehlung 3

Die folgenden acht Variablen sollten mit höchster Prioritöt erhoben werden.

Stufe 1:

1. Anzahl der Brandtoten
2. Anzahl der Brandverletzten
3. Alter der Brandtoten
4. Brandursache
5. Gebäudetyp
6. Ort des Brandereignisses
7. Datum des Branereignisses
8. Zeitpunkt des Brandereignisses

Sobald die ersten acht Variablen erhoben werden, wird vorgeschlagen eine zweite Stufe zu implemntieren, die fünf weitere Variablen enthält:

Stufe 2:

9. Anzahl der Stockwerke
10. Brandausbruchsstelle

11. Zündquelle

12. Erster brennender Gegenstand

13. Materialien, die zur Brandausbreitung beitragen

14. Vorhandene Brandschutzvorkehrungen

Das Sammeln dieser Daten als Teil einer einheitlichen europäischen Brandstatistik, soll nicht verhindern, dass weitere Daten national parallel dazu mehr erhoben werden.

Es wurde eine Reihe von Definitionen entwickelt, die in Kapitel 4 dieses Berichts für künftige Branddatensysteme erläutert werden, um ein gemeinsames Verständnis innerhalb der EU zu gewährleisten. Die vorgeschlagene Terminologie umfasst bestehende Standards und Praktiken. Diese Terminologie basiert auf dem Wissen über die derzeitigen Praktiken und auf Diskussionen mit den Beteiligten. Für jede Variable werden eine Definition und der Variable zugeordnete Werte vorgeschlagen, die eine bessere Brandstatistik ermöglichen sollen.

Es wurden vier Gruppen von Kategorien festgelegt, nämlich Interventionsmerkmale, menschliche Merkmale, Gebäudemerkmale und Brandmerkmale, und mehrere Variablen werden den festgelegten Gruppen von Kategorien zugeordnet. Die gemeinsame Terminologie basiert auf den Erfahrungen aus früheren Aufgaben, der Recherche in öffentlichen Datensätzen und der Literaturrecherche. Die vorgeschlagene Terminologie lehnt sich an die Definitionen in der Norm ISO TS 17755-2[2] an, wurde jedoch an die europäischen Spezifikationen angepasst.

Highlights

- Für jede Variable wird eine detiallierte Defintion mit den dazugehörigen möglichen Werten vorgeschlagen.

Dort, wo es notwendig ist, werden auch Anmerkungen zu den Definitionen oder Werten gemacht, um Unklarheiten zu vermeiden. Zum Beispiel gibt es einen festgelegten Schwellenwert, um festzulegen, welche Brände zu erfassen sind:

Highlights

- Definition eines Brandereignisses: Gebäudebrände, bei denen die Feuerwehr vor Ort war und festgestellt hat, dass ein Brand entweder noch andauert oder bereits gelöscht wurde und zu Schäden an Personen, Eigentum oder der Umwelt geführt hat.

Als Schaden gilt in diesem Zusammenhang ein Verletzter am Brandort, ein Todesopfer am Brandort, ein Sachschaden von mindestens 100 Euro und/oder eine Umweltverschmutzung, die beseitigt werden muss. Als Brand gilt in diesem Zusammenhang eine unkontrollierte, sich selbst erhaltende, brennende, glühende oder schwelende Verbrennung. Explosionen, Blitze

[2] Fire safety — Statistical data collection — Part 2: Vocabulary

und Entladungen statischer Elektrizität, versuchter Selbstmord und Selbstmord durch Selbstverbrennung sind ausgeschlossen, es sei denn, das Ereignis führte nach dem ursprünglichen Ereignis zu einem weiteren Brand. Dieser Bericht enthält zusätzliche Hinweise zur Erhebung, Auswertung und Meldung von Daten.

In dieser Studie wird eine Methode zur Kosten-Nutzen-Analyse vorgeschlagen, um eine strukturierte und eindeutige Grundlage für die Entscheidungsfindung in Bezug auf Brandschutzmaßnahmen zu schaffen. Die Kosten-Nutzen-Analyse (KNA) ist eine gängige Methode zur Durchführung einer wirtschaftlichen Analyse von Investitionen in den Brandschutz. Die KNA wurde in der Literatur zur Untersuchung verschiedener Arten von Brandschutzmaßnahmen verwendet. Insbesondere die Installation verschiedener Arten von Sprinkleranlagen wurde in mehreren Ländern untersucht und wird im Allgemeinen nicht als kostenwirksam angesehen. Bei bestimmten Gebäudetypen oder für bestimmte Risikogruppen kann der Nutzen jedoch die Kosten überwiegen. Eine weitere Maßnahme, die in mehreren Ländern untersucht wurde, ist die Installation von Rauchwarnmeldern, die vor allem aufgrund ihrer geringen Kosten im Allgemeinen als kostenwirksam angesehen wird. Weitere Maßnahmen, die in dieser Arbeit untersucht wurden, sind Herdschutzvorrichtungen, Feuerlöscher und brennbare Verkleidungen. Diese Studie gibt einen Überblick über ein vorgeschlagenes Berechnungsverfahren für die Durchführung einer Kosten-Nutzen-Analyse. Außerdem werden die wichtigsten Eingabevariablen beschrieben. Zu den wichtigen Variablen können grundlegende Brandstatistiken gehören, wie die Anzahl der Brände, die Anzahl der Brandtoten, die Anzahl der Verletzten, die Brandursache und die Art des Gebäudes. Dies sind einige der in diesem Projekt vorgeschlagenen Variablen. Detailliertere Brandstatistiken und Informationen werden für Informationen über das Vorhandensein, den Betrieb und die Gründe für das Versagen verschiedener technischer Systeme (wie automatische Löschsysteme und Rauchmelder) als Teil einer KNA solcher Systeme benötigt. Es ist auch wichtig, darauf hinzuweisen, dass für eine KNA mehrere andere Eingangsvariablen benötigt werden, die nicht aus Feuerwehrstatistiken gewonnen werden können, z. B. die Risikominderung durch die Installation einer bestimmten Maßnahme und die Kosten für die Installation und Wartung derselben Maßnahme.

Empfehlung 4

- Es ist evident, dass einige der variablen Eingangswerte mit erheblichen Unsicherheiten behaftet sein können. Daher wird dringend empfohlen, eine Kosten-Nutzen-Analyse (KNA) durch eine Sensitivitätsanalyse zu ergänzen, um die Schwankungen der Ergebnisse aufgrund von Unsicherheiten bei den Eingangswerten aufzuzeigen.

Highlights

- Brandstatistiken alleine können nicht das alle notwendigen Daten liefern, die für eine KNA zur Beweretung von Brandschutzmaßnamen notwendig sind.

Das in diesem Projekt vorgestellte Berechnungsverfahren wird anhand von drei Fallstudien demonstriert. Die Fallstudien sind wichtig, um das Berechnungsverfahren näher zu erläutern und zu veranschaulichen. Der Grund dafür ist, dass die Art der benötigten Daten und ihre Verfügbarkeit in den verschiedenen Untersuchungsgebieten unterschiedlich sind, sowohl in Bezug auf die Art des Systems als auch auf das untersuchte Land. Die Fallstudien befassen

sich mit drei Arten möglicher Maßnahmen, d. h. mit der Umsetzung technischer Anlagen, der Verbesserung von Materialien/Produkten und Präventionskampagnen.

Zu jeder Fallstudie gehört eine Kostenschätzung für die Einführung einer Maßnahme und eine Schätzung des Nutzens aufgrund der Risikominderung und anderer Vorteile.

Für die Fallstudie 1 zu Rauchwarnmeldern war eine detaillierte Berechnung möglich, da in diesem Bereich bereits mehrere Studien durchgeführt wurden und für die meisten wichtigen Eingangsvariablen Daten verfügbar sind. Die Fallstudie zeigte auch, dass die Maßnahme (ein Rauchmelder) kosteneffizient ist. Die Ergebnisse der Fallstudien 2 und 3 über die Einführung von Vorschriften für Polstermöbel bzw. Hausbesuche werden als sehr viel unsicherer und schwieriger zu interpretieren angesehen, da das Nutzen-Kosten-Verhältnis nahe bei 1 liegt. Mehrere wichtige Eingangsvariablen sind ebenfalls mit großen Unsicherheiten behaftet, so dass es notwendig ist, eine solche Studie durch eine Sensitivitätsanalyse zu ergänzen.

Wie aus den Fallstudien zu schließen ist, sind zuverlässige Brandstatistiken für die Durchführung dieser Art von Analysen von entscheidender Bedeutung. In den Fallstudien wurden Daten über die Zahl der Todesopfer, die Zahl der Brände, den zuerst entzündeten Gegenstand usw. verwendet. Weitere Einzelheiten sind in Kapitel 10 dieses Berichts zu finden.

Empfehlung 5

- Es ist wichtig, darauf hinzuweisen, dass für eine Kosten-Nutzen-Analyse mehrere Eingangsvariablen benötigt werden, die nicht aus Feuerwehrstatistiken gewonnen werden können, z. B. die Risikominderung und die Kosten für die Durchführung und Aufrechterhaltung einer bestimmten Maßnahme. Leider bietet die Feuerwehrstatistik nicht den vollständigen Datensatz, den Entscheidungsträger für die Durchführung von KNA zur Unterstützung politischer Entscheidungen benötigen.

Eine Umfrage bei den Regulierungsbehörden in allen EU-Mitgliedstaaten ergab, dass mindestens 19 Länder die Bereitstellung harmonisierter Brandstatistiken für die Erhebung auf europäischer Ebene befürworten. Der nächste Schritt könnte darin bestehen, die Implementierung der fünf Variablen (oder mehr) mit einer Reihe interessierter EU-Mitgliedstaaten als Teil einer experimentellen Phase des Implementierungsprozesses zu testen.

Empfehlung 6

- Es sollte eine Struktur geben, die auf europäischer Ebene tätig werden kann und die jährlich länderübergreifende Brandstatistiken erhebt und über die notwendigen Ressourcen verfügt, um Daten aus den verschiedenen Ländern zu speichern, zu analysieren und zu veröffentlichen. Eine solche Struktur muss in den Folgephasen dieses Projekts noch geschaffen oder ermittelt werden.

Empfehlung 7

- Schließlich empfehlen wir, dass die im Projekt vorgeschlagenen Definitionen und Methoden durch ein offizielles Normungsgremium standardisiert werden, was eine anerkannte Grundlage schaffen und deren Verbreitung in allen EU-Mitgliedstaaten oder sogar auf internationaler Ebene erleichtern würde.

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1. The state of fire statistics in Europe

The review of the literature shows that fire data collection systems have been instrumental in reducing building fires and their associated deaths, injuries, and economic damage. The utility of information about these fires is apparent in the design of many fire safety interventions and policy initiatives. Data on fire incidents can inform firefighting strategies, building codes, educational and training programs, and technical innovations, to cite just a few applications. For example, with populations aging more than ever before, we might expect higher death rates among senior citizen, despite early fire detection. It is logical to assume that safety efforts can benefit from strategies that have worked in other places. However, there is substantial agreement in the literature that differences between fire data collection systems in different countries complicate the ability to make comparisons that could be useful in evidence-based planning and prevention efforts

While national fire data collection systems are likely to share certain core features and to gather some fire incident data in common, there appears to be considerable variation in the type and scope of information collected, the way that data elements are defined and levels of detail they seek, as well as the types of training and resources dedicated to collection efforts. In addition, literature suggests that fire data are influenced by differences between data collection procedures and practices. Some data collection systems appear to provide opportunities to update information that may not be available at the time an incident record is first created, such as the cause of a fire or deaths that occur sometime after the incident. The amount and quality of information in different data collection systems also appear to be influenced by whether they include information from sources outside the fire service, such as insurers or medical authorities, through data linkage or other means. Literature suggests that the issue of how much information to collect is an important area for consideration in the design of fire data collection systems. Data collection systems that collect too little or wrong kind of information may not produce data that are useful, while overly detailed data collection systems may overwhelm data collectors, and thereby compromise data quality, as suggested by studies from the United States.

In many respects, the issue of how much information to collect appears to be driven by available resources, as well as the capacities of data collectors, who mainly are fire service personnel, to collect and record information. Concise data collection records will require less support and fewer resources than those that are more complex. To that end, recent literature on fire data collection in Canada emphasizes that such factors as funding, resources, personnel, and stakeholder acceptance are critical considerations in the design and sustainability of national fire data collection systems.

In general, it appears that the fire data collection systems in most countries are presumed to provide an accurate representation of their respective experiences with fire incidents. However, information gathered through the initial phase of research suggest that they may be unaware of important limitations of their data due to missing information, differences in the way terms are defined or interpreted, and other identified issues.

We identified significant issues with fire data from Australia, Bulgaria, Canada, Denmark, France, and Germany which complicate confidence in the data, particularly for their use in inter-country comparisons. Most of the issues stem from the lack of definitions for collected terms, lack of training, dispersed data, missing information and low coverage.

USA, Italy, and the Netherlands have very different systems while having each separate advantages and drawbacks. The fire data collection system in the USA has an existing terminology, includes a large number of data fields, and has vast experience in this field, but also appears to have a significant problem with missing fire incidents. However, because the EU is in a comparable situation to the USA, there are many lessons from the experience of the

USA that can be directly applied to the EU. Italy has adopted a quality control system to ensure the integrity of all data treated but is missing important fire data. The approach of the Netherlands has been to reduce the problems posed by uncertainties by focussing data collection efforts on fatal residential fires.

We estimate that Austria, Russia, Sweden and the UK (in particular England, Wales and Scotland) provide data with high confidence level due to the existing definitions, important covered areas and collected terms and existing quality safeguards.

The terminology and data collection methodology adopted in current fire statistics were examined in 27 EU Member States and eight other countries (Australia, Canada, New Zealand, Norway, Russia, Switzerland, UK and USA). The eight other countries have been chosen based on their structured and detailed fire statistics. The review of fire data collection measures within and outside the European Union is critical for understanding the degree of commonality across the various systems and also identifying opportunities and challenges in any efforts to improve fire safety.

Although it was not possible to gather information on fire statistics available in a limited number of countries, it appears that fire data collection systems in the European Union fall into different tiers with respect to the amount of information collected. Usually, fire incidents are described considering the incident time, date and location. The description of the property type subdivided into residential and non-residential buildings is available in the majority of countries examined while further building characteristics are seldomly recorded. Fire causes and the other fields related to the source of ignition, item first ignited, articles responsible for the development of the fire and fire room of origin are determined less often.

The data recorded more often are those related to the description of the fire incidents, fatalities and injuries. However, the variables covered by these data can be referred to as different interpretations in the various countries examined. Therefore, it is suggested to link the considerations presented for the analysis of the definitions with the elaborations of the data recorded by the various statistics and to the information related to the collection methodologies described in the short abstract of each country.

Due to the lack of official definitions and precise collection methodologies, it is clear that the current fire statistics cannot be compared from one country to another (with a few exceptions). They can only be useful to describe the global fire safety situation and trends to some extent for a group of countries, or a specific fire safety situation. To provide relevant information regarding the national fire safety situation (number of fires, fire fatalities, fire injuries, fire losses), fire statistics will have to be internationally improved through common terminology, common methodology, and common training and qualification of persons in charge of filling in the fire report, including uncertainty estimation methods.

More detailed information is available in the Task 0 and Task 1 reports (EUFireStat, 2022).

2. Data collection methodologies

In this project, we have reviewed critical issues involved in the design and implementation of fire incident data collection systems. The review proceeds from the assumption that fire incident data can serve a number of important purposes -- helping to reduce fires and losses, identifying opportunities for safety interventions and education programs, guiding the allocation of public resources to areas of greatest need and impact, and monitoring progress of safety initiatives. Data collection systems can also facilitate opportunities to share experiences and successes across regions and between countries, promoting a broader diffusion of technical and other innovations that increase fire safety. To achieve these objectives, it is important that data collection systems produce data that is reliable. We summarize some of the key factors related to data collection design and practice here.

The selection of data collection method should be determined by fire safety needs and capabilities of data collectors. In data collection with systematic intervention purposes, as is the case with fire incident data collection, it is important to create a sufficiently robust data base that can help identify risk factors and document fire incidence with reasonable confidence. Data collection systems that rely on voluntary reporting will almost certainly fall short of a complete census, while data collected by convenience sampling methods might have selective utility but would be insufficient to capture the broad range of fire incidents at the national level.

It appears that most countries currently employ a voluntary approach to data collection, with expectations that fire departments should participate in filing reports, but with mixed efforts by national programs to encourage and evaluate the completeness of data collection by fire departments. Whatever form the data collection system takes, it is important that it reliably capture the full range of the country's fire incidents. To this end, data collection systems should be prepared to conduct follow up with non-respondents, assess the completeness of reporting, and identify any systematic patterns of non-reporting.

The potential for missing data is an issue that was addressed in all phases of this project. We were able to find little discussion of missing data among the fire incident data collection systems in the European Union, as well as most fire incident data collection systems more generally. It may be the case that missing data receives the greatest attention in the United States because its data collection system is the most extensively detailed, with the greatest potential to produce items with unknown values, and potentially to discourage submission of reports altogether. Missing data may be less problematic in reporting systems that require less detail and in which fire incidents are fairly uniform. However, it is critical that effort be made to identify the extent of missing data and the patterns it takes if data on fire incidents is to be considered reliable.

> The impact of missing data is likely to be especially problematic if it fails to account for regional differences or other factors that influence fire incidents. Such differences might include regional differences in the built environment, differences in neighbourhood conditions, including housing quality and social conditions, or differences in age demographics.

Multiple studies have shown the link between elevated fire risk and socio-economic status. Assessment of missing data will accordingly be especially important in countries that are characterized by diverse regional levels of economic development and diversity of economic and social conditions.

On this point, it is important to note that the fire data collection systems examined in this project appear to be generally regarded as census systems of data collection. We cannot say if this is a view held by key users of fire data in these systems. However, there is a danger in assuming that all fire incidents are captured by national data collection systems without some effort to

assess the incidence of missing data. Failure to collect data that is not representative of all regions, demographics and income levels runs the risk of failing to identify risk factors associated with social and economic disadvantage. Accordingly, it is important that the implementation of fire data collection systems include plans for data quality checks and procedures for handling missing data in order to verify the validity and reliability of data findings.

Financial costs will vary by country and be influenced by existing state of fire data collection practices and resources. It is important that there be some realistic appraisal of the economic costs of fire incident data collection if any harmonized system is to be sustainable over time. Countries and regions with stronger national traditions of data collection in support of policy objectives will require substantially less investment in supporting a harmonized fire incident data collection system than those in which data collection efforts are less mature or concentrated in specific areas..

It is clear that the cost of implementing a comprehensive data collection system will be greatest in countries that have the least experience and fewest resources. Countries with less established or comprehensive data collection systems will assume significantly greater training costs in seeking to introduce data collection in fire departments nationwide. The cost burden will also be influenced by the availability and sophistication of computer hardware and software. Considering such differences, as well as relative differences in certain costs between Member States of the European Union, we have identified the core cost components of data collection as a starting point for assessments of financial commitment.

Our review of data collection methods and systems provides a foundation for several concluding observations relative to national systems of fire incident data collection.

- Data collection systems should be designed with sustainability in mind. Public funding for data collection systems can lag if they fail to generate recognition as a public good or commitment among key principals.
- Overly ambitious and detailed data collection systems may tax the patience of participants and undermine data quality. To encourage compliance and build competence and interest among participants, it may be useful for the architects of data collection systems to begin with comparatively modest reporting requirements and to introduce additional details incrementally as participants gain experience.
- 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.

3. Data needed for decision making

The nature and format of fire data varies significantly across the EU Member States. Naturally, this poses an obstacle to data comparability and the ability to effectively assess potential best practices and successful safety approaches. The current project therefore addresses the importance of developing a common European terminology regarding fire statistics in buildings.

3.1. Survey description

A survey was developed to collect the opinion of the stakeholders regarding the required data that can help decision making in fire safety policy. The proposal we developed is based on the result of the survey filled by the stakeholders of the Member States.

The main goal of the questionnaire was to learn from stakeholders in the Member States and outside the EU their visions, opinions and experiences regarding the data required for forming and implementing fire safety policies. Running in parallel (and interconnected) to the development of the questionnaire, the insights from the consortium were inventoried in a process of consortium opinion stocktaking. In this way, optimal use can be made of the knowledge and experience of the partners of the consortium. These insights provided important input for the proposal.

The model of influencing factors and the principles not only form the basis of the proposal, but have also been applied in the development of the questionnaire. This model (see Figure 1), based on scientific research, describes four factors that influence fire safety (Kobes et al., 2010). These factors are human characteristics, building characteristics, fire characteristics and intervention characteristics. Working with this model makes it easier to identify the variables that may influence fire safety. This ensures that an overall picture is generated of all the variables to be collected.

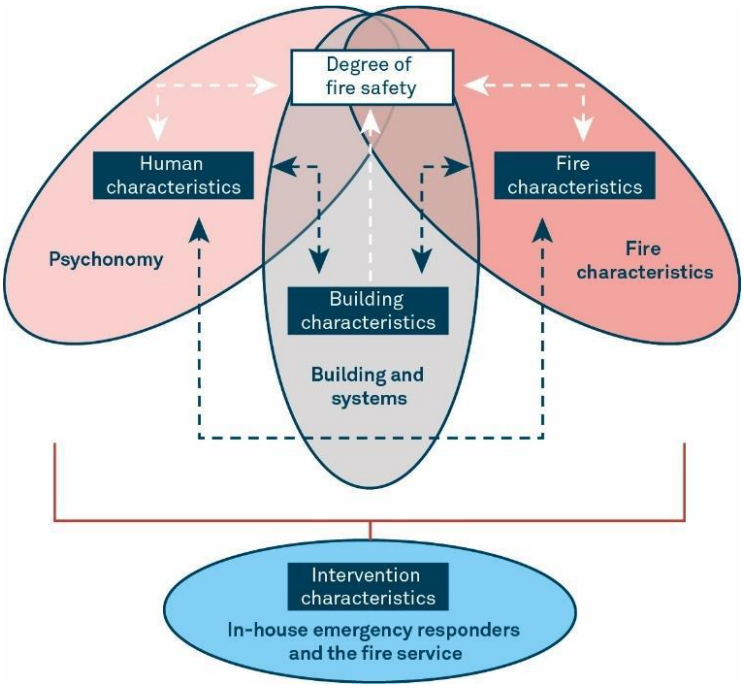

Figure 1 Model of influencing factors regarding the degree of fire safety (characteristics scheme)

A mailing list for distributing the digital questionnaire was developed. The main focus was to reach regulators from all EU Member States. Additionally, the questionnaire was also sent to regulators from other countries when this was possible (such as in England, Scotland, Switzerland and New Zealand).

The goal was to include a representation of stakeholders that are involved in policy and legislation. The contacts were divided into three categories, listed by order of priority:

1. Authorities (such as the Ministry of Interior),
2. National fire services,
3. Others (including national statistics institutes, insurance companies, research bodies and fire (prevention) and fire service associations).

The main goal was to find one organisation per country to fill in the questionnaire, preferably on behalf of the authorities and ideally complemented with responses from the other categories.

In addition to the consortium's collective network, the Federation of the European Union Fire Officer Associations (FEU) and the EC were asked to suggest contacts from certain EU-countries that were not covered.

A number of criteria were used within the process for the selection of the data needed for fire statistics:

1. We considered variables which have a majority of votes (≥ 50%) compiled from the category 'must be included in a dataset of fire statistics.
2. We also considered variables that have at least more than 40% approval by all the respondents. Using this limit value, including a margin of error of ± 10 points, allows for a larger coverage of opinions, such as a near majority. By doing this, more variables were considered in the justification process.
3. A variable already being collected by the majority of the 27 EU Member States is given more importance than a variable that is not yet being collected.

3.2. Survey results

The results of the survey among the stakeholders were compared with the data already collected by the EU Member States, and with the opinion of the consortium. Findings from the literature were used to illustrate the importance of proposed variables. Priority was given to the variables that are already collected by the majority of the EU Member States to facilitate the implementation.

The following Venn diagram shows (Figure 2) the relationship between the three different sets of findings and how they overlap.

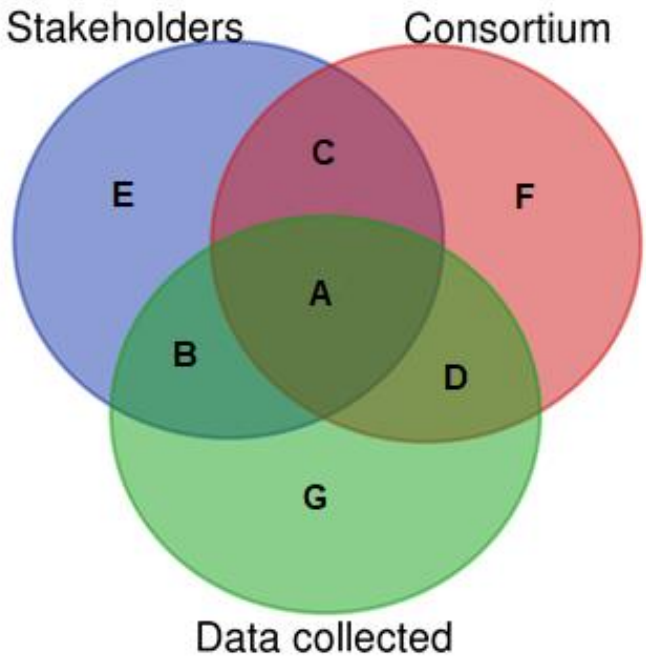

Figure 2 Different areas of the Venn diagram

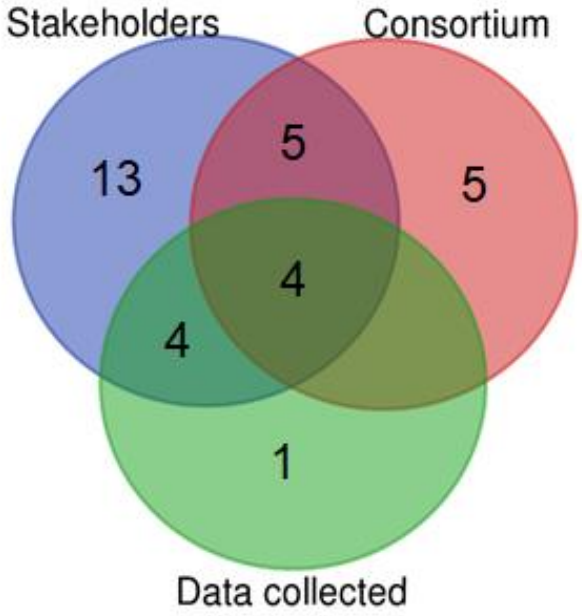

Figure 3 Data confirmed by stakeholders, the consortium, and data collected by EU-27

The selected variables were divided into three tiers. Tier 1 includes the variables already collected by the majority of the EU Member States and also covered by variables selected by the majority of the stakeholders and the consortium (4 variables), or that are also covered by the set of the stakeholders only (4 variables). The variables in Tier 2 are considered important by both the stakeholders and the consortium.

Table 1 Variables per section of the Venn diagram

Area	Intersection	Total	Variables	Tier
A	Intersection of Consortium & Data collected & Stakeholders	4	Number of victims (fatalities & injuries); Age of fatalities, Primary causal factor of fire; Incident date.	1
B	Intersection of Data collected & Stakeholders	4	Type of building; Incident time; Incident location; Number of injuries;	1
C	Intersection of Consortium & Stakeholders	5	Articles contributing to fire development; Heat source; Number of floors; Area of origin; Fire safety measures present	2
D	Intersection of Consortium & Data collected	0		2
E	Stakeholders, excluding the intersection with other sets	13	Operation of fire safety measures; Reason for failure of fire safety measures; Construction characteristics; Number of occupants in the building; Quantification of property damage; Fire detection time; Disability; Role; Fire brigade response time; Construction type; Effectiveness of fire safety measures in reducing the fire; Direct fire costs; Type of property damage.	2
F	Consortium, excluding the intersection with other sets	5	Fire spread at final situation; Fire spread at fire brigade arrival; Item first ignited; Size of smoke spread; Gender;	3
G	Data collected, excluding the intersection with other sets	1	Time between fire brigade arrival and withdrawal.	3

Tier 1 – Eight variables; covered by all three sets, or only by the stakeholders and existing data collection

Variables in tier 1 are considered essential for data collection, those include:

- Number of fatalities
- Age of fatalities

- Number of injuries
- Type of building
- Primary causal factor
- Incident date
- Incident time
- Incident location

The most frequently selected variables regarding human characteristics are the '**number of fatalities**' and the '**number of injuries**'. Fortunately, the majority of EU Member States already collect these two variables. *A* research study into fatal residential fires in Europe (Fire Service Academy, 2018) reveals that several fire risks can be identified by comparing the characteristics of fatal fires to those of non-fatal fires. Having an insight into the fire risks is important for evaluating existing policies and determining the focus of citizens' education and information on fire safety.

Data about the **'age of fatalities'** is collected by the majority of the EU Member States (52 %). The choice is supported by the stakeholders and the consortium, as well as by findings from the literature. Indeed, age is relevant to collect in several countries (Fire Service Academy, 2018). For example, in the Netherlands and in the USA, elderly (age 61 and older or in some literature 65 and older) are over-represented among fatalities of residential fires, and are a risk group for serious injuries from fire (Fahy & Petrillo, 2021). When studying this specific risk group, it appears that the physical and cognitive limitations are to a large extent responsible for the fact that the elderly are overrepresented in fire fatalities. Another study about the (potential) fire risks for different groups stresses the importance of taking age into account (Fire Service Academy, 2020).

The variable **'type of building'** is frequently mentioned by the stakeholders and is currently already being collected by the majority of the EU Member States. As the proposed focus is on all types of buildings (e.g., Residential, non-residential, etc.), it is essential to collect data on the type of building so as to ensure that a distinction can be made between the fire risk of (Home Office, 2019) different types of buildings. This distinction is important as, for example, most of the fire-related fatalities are in residential fires.

Both the stakeholders and the consortium indicated the 'primary causal factor of fire**'** as an important variable regarding fire characteristics. Examples of values for this variable are *human act, equipment failure, natural phenomenon, etc.* Additionally, this variable is already being collected by the majority of the EU Member States.

The variables regarding fire intervention characteristics which are frequently mentioned by the stakeholders, and which are also currently already being collected by the majority of the EU Member States include **'incident location', 'incident date'** and **'incident time'**. Examples of values for the variable incident location can be geographical coordinates or the building address.

Tier 2 – five variables; covered by the sets of the stakeholders and the consortium

There are five other variables chosen by the stakeholders as well as the consortium that are not currently collected by the majority of the countries. For these specific five variables, we propose to include them as a Tier 2 priority to be harmonised and implemented in a second step. Those variables are the following:

- Area of origin
- Heat source
- Number of floors
- Articles contributing to fire development
- Fire safety measures present

'**Area of origin**', **'heat source'** and '**articles contributing to fire development**' are important variables, but such insight can usually only be obtained through a fire investigation at the fire scene. The number of EU Member States already collecting data about the heat source is currently unknown, but it is confirmed that Sweden already collects this data. The implementation of these variables might be more complex than the others, hence their inclusion in the Tier 2 list.

Regarding the variable area of origin, it was confirmed that at least 30% of EU countries collect the area of origin data.

With regard to fires in high rise buildings, it is conceivable that the information about the **'number of floors'** is relevant. Data about the number of floors can give a substantial amount of information about the efficiency of fire safety and any evacuation measures that have been adopted (e.g., the evacuation strategy of a high-rise building is usually different than for single floor buildings). This can also be a strong indicator when comparing data between different countries. However, consortium experience suggests that the data on the number of floors is not always answered correctly or is unreported, resulting in missing data (along with reduction of statistical power and representativeness).

Tier 3 – Other variables covered by one set

Other variables are covered by the set of the stakeholders (13), the consortium (5), or existing data collection (1). Those variables are not included in this proposal, though they may be of interest for the further development of data collection. The variables are listed below in order of the number of EU countries that selected the variable concerned or in which information is already being collected.

- Construction type (as in construction material)
- Item first ignited
- Fire spread at final situation
- Time between fire brigade arrival and withdrawal
- Quantification of property damage
- Gender of victim
- Reason for failure of fire safety measures
- Fire brigade response time
- Type of property damage
- Number of occupants in the building
- Fire detection time

- Direct fire costs
- Disability of victim
- Role of victim (e.g., firefighter or citizen)
- Operation of fire safety measure
- Fire spread at fire brigade arrival
- Size of smoke spread
- Construction characteristics

Some of the indicators in Tier 3 may be relatively easy to add when already collecting data for indicators in Tiers 1 and 2. For instance, once the process for collecting the variable ‘age of fatalites’ is well established, then it should be easy to also collect the varaibles ‘gender’ and ‘disability’.

3.3. Proposed data needed for decision-making

From the results of the questionnaire distributed to the stakeholders of the EU Member States, we propose to include thirteen variables for harmonization in European fire statistics. The choice is mainly based on the opinions of the majority of the stakeholders from the EU Member States who responded to the questionnaire, with the observation that the variable was already being collected by the majority of the EU Member States and/or the confirmation by the opinion of the majority of the consortium. As a starting point, the following eight variables should be collected.

Tier 1:

1. Number of fatalities
2. Number of injuries
3. Age of fatalities
4. Primary causal factor
5. Type of building
6. Incident location
7. Incident date
8. Incident time

Once the previous eight variables have been implemented efficiently, we propose adding the second tier, which would include five additional variables:

Tier 2:

1. Number of floors
2. Area of origin
3. Heat source
4. Item first ignited[3]
5. Articles contributing to fire development
6. Fire safety measures present

Collecting these variables as part of the harmonized European fire statistics should not prevent the European countries to continue collecting other variables in parallel.

[3] This variable was included in Tier 2 as it will be necessary to determine other selected variables such as Heat source and Primary causal factor

4. Proposed terminology

The variables listed in Tier 1 and 2 are assigned to four groups of categories of interest, i.e., intervention characteristics, human characteristics, building characteristics and fire characteristics, as presented in Table 1.

Table 1. Categories of interest and the assigned variables

Categories of interest	Variables
Incident characteristics	Incident date Incident time Incident location
Human characteristics	Number of fatalities Number of injuries Age of fatalities
Building characteristics	Type of building Number of floors Fire safety measures present
Fire characteristics	Area of origin Item first ignited Article(s) contributing to fire development Cause (Heat source and Primary Causal Factor)

The objective here is to identify the most unambiguous titles and definitions for variables which describe the categories of interest to be recorded by fire officers in the immediate aftermath of a fire incident and subsequently collected at European level, as well as appropriate values which these variables can have. This terminology would constitute a minimum dataset for collection at the local level. It would not prevent a fire department or national authority from having a more comprehensive data collection, as long as they are able to provide simplified data according to the terminology of the pan-European statistics.

There are several goals when identifying appropriate values for a variable:

- Values must be mutually exclusive – overlapping alternatives must be avoided.
- Values must avoid terms associated with moral failings or culpability – a reluctance to use such values could give a significant bias in the statistics, with respondents using “Undetermined” when in reality they have a reasonably certain assessment of what happened.

- The proposed number of values must be suitable to allow a meaningful analysis while avoiding a long list of alternatives.

One way to limit alternatives is to subdivide the list of values into distinct groups. A list consisting of 12 groups of 12 alternative values is easier for a respondent to work with than a long list of 144 alternatives, improving the user experience and at the same time giving more reliable statistics.

In order to limit the length of lists and also open up for new things to investigate such as e.g., solar panels, in most cases there is an “Other” category accompanied by a short text field, where the respondent can describe the specific value. This adds to the complexity of the data collection but will be very important for analysis at a national level. However, it may be difficult to see how to analyse these texts at the European level since the words and concepts used may be highly specialized to give a good and comparable translation.

4.1. Definition of a fire incident

The following threshold is established to determine which fires are to be collected for the project.

What is a fire incident?

- ***Fires are limited to building fires where the Fire Service attended the scene, confirmed that a fire was either ongoing or had been extinguished, and resulted in damage to people, property or the environment.***

Damage in this context is considered as

- Injuries at the fire scene.
- Fatalities at the fire scene.
- Damage to property of at least 100 euros.
- Environmental contamination requiring clean-up.

Fire in this context is considered as uncontrolled self-supporting flaming, glowing or smouldering combustion.

The following will be included only if the event resulted in a fire as defined above after the initial event:

- Explosions, flashes and discharges of static electricity, attempted suicide and suicide by self-immolation.

4.2. Incident characteristics

4.2.1. Incident time

Definition:

The earliest available moment of which a fire event occurred, registered in hours (24H) and minutes at local time.

Note to definition:

Note 1: The earliest available moment refers to the earliest moment that the fire is reported to an official authority/system (for example: the detection time by an automatic detection system linked to the control room or calling the emergency number).

Value:

hh/mm (24H) or undetermined + local time (for example: UTC + 01:00)

4.2.2. Incident date

Definition:

The earliest available moment of a fire event occurrence, registered in the day, month and year at local date and time.

Note to definition:

Note 1: The earliest available moment refers to the earliest moment that the fire is reported to an official authority/system (for example: the detection time by an automatic detection system linked to the control room or calling the emergency number).

Value:

dd/mm/yyyy (European notation)

4.2.3. Incident location

Definition:

The most precise place where a fire event occurred, registered in (by availability) coordinates, name of the country, region, town, postal code and/or street name and number.

Value:

If available: coordinates, country, region, town, postal code and/or street name and number where the fire occurred or unknown (in this case only country)

Note to value:

Note 1: Coordinates are latitude and longitude to be collected.

4.3. Human characteristics

4.3.1. Number of fatalities

Definition:

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

Note to definition:

Note 1: Fire-related fatalities are those that would not have occurred had there not been a fire.

Note 2: Fire fatalities include people who die within 1 year because of injuries sustained from the incident. A shorter time period is accepted, but not shorter than three months. 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.

Note 3: 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.

Note 4: The number of the variable should include self-intended fires / suicidal fires, but they should be marked as such.

Note 5: 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].

4.3.2. Number of injuries

Definition:

The number of persons who are injured (but not counted as deaths) as a result of a fire incident.

Note to definition:

Note 1: Fire-related injuries are those that would not have occurred had there not been a fire.

Note 2: 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.

Note 3: Fire injuries are those treated at the scene or taken to the hospital.

Value:

Numerical value to be approximated when unknown.

4.3.3. Age of fatalities

Definition:

Numerical value of age of fatalities in years, at time of the fire.

Note to definition:

Note 1: 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].

4.4. Building characteristics

4.4.1. Type of building

The following definitions and classifications are extracted from the Classification of Types of Constructions and adapted to the scope of the current project (Eurostat, n.d.-b). This classification system is used by Eurostat for European statistical purposes, such as providing indicators on the development of granted building permits in the European Union (EU) (Eurostat, n.d.-b). The classification mainly differentiates the use of buildings, according to the main use (e.g. residential, non-residential) as well as their respective sub-divisions.

Definitions:

1) Buildings are roofed constructions which can be used separately, have been built for permanent (or semi-permanent) purposes, can be entered by persons and are suitable or intended for protecting persons, animals or objects. Buildings that are under construction are excluded from the definition of Buildings but are listed as a separated type of construction (see classification in Annex A).

Buildings are subdivided into residential, non-residential and mixed-use buildings.

2) Residential buildings are constructions that are exclusively used for residential purposes.

3) Non-residential buildings are constructions that are exclusively used for non-residential purposes.

4) Mixed-use buildings are constructions which are used for both residential and non-residential purpose.

In residential buildings, there is the notion of **'Dwellings'**, which is defined in the following way according to Eurostat (Eurostat, n.d.-a): Buildings that are used entirely or primarily as residences, including any associated structures, such as garages, and all permanent fixtures customarily installed in residences. Houseboats, barges, mobile homes and caravans used as principal residences of households are also included, as are historic monuments identified primarily as dwellings. The notion of **'mixed-use buildings'** has been added by the consortium as it has a significant impact on fire safety and related policies. Consequently, mixed-used buildings are based on the main apparent use, with the addition of the flag "m" following their initial classification. The introduction of the « m » flag has a double purpose: first to allow for attributing a primary use (residential/non residential typologies), and secondly to create a third class of buildings for which there is apparent mixed use as perceived by compilers (and without setting a minimal criteria i.e. in terms of surface). In the future this could be better codified with a separate variable, which could be combined with the basic typology of the primary use in different ways. Finally it is important to avoid that the "mixed use" category becomes an excuse for not declaring the primary/main use of the building.

An additional section was also introduced for building under construction, as they cannot be considered as residential or non-residential regardless of their end use. This section does not include buildings under maintenance or renovations

Values:

Table 2 – Type of building classification (extracted from Eurostat) – modifications brought by this project are underlined

Section	Division	Group	Class	
1 BUILDINGS				
	11 Residential buildings			
		<u>110</u>	**<u>1100</u>**	**<u>Unknown</u>**
		111		**One-dwelling buildings**
			1110	One-dwelling buildings
		112		**Two- and more dwelling buildings**
			1121	Two-dwelling buildings
			1122	Three- and more dwelling buildings
		113		**Residences for communities**
			1130	Residences for communities
	12 Non-residential buildings			
		<u>120</u>	**<u>1200</u>**	**<u>Unknown</u>**
		121		**Hotels and similar buildings**
			1211	Hotel buildings
			1212	Other short-stay accommodation buildings
		122		**Office buildings**
			1220	Office buildings
		123		**Wholesale and retail trade buildings**
			1230	Wholesale and retail trade buildings
		124		**Traffic and communication buildings**
			1241	Communication buildings, stations, terminals and associated buildings
			1242	Garage buildings
		125		**Industrial buildings and warehouses**
			1251	Industrial buildings
			1252	Reservoirs, silos and warehouses
		126		**Public entertainment, education, hospital or institutional care buildings**
			1261	Public entertainment buildings
			1262	Museums and libraries
			1263	School, university and research buildings
			1264	Hospital or institutional care buildings
			1265	Sports halls
		127		**Other non-residential buildings**
			1271	Non-residential farm buildings
			1272	Buildings used as places of worship and for religious activities
			1273	Historic or protected monuments
			1274	Other buildings not elsewhere classified
<u>3.BUILDING UNDER CONSTRUCTION</u>[4]				

[4] It does not include buildings under maintenance or renovations

More details about the type of building can be found in Annex A.

Guidelines for classifications

The classification uses a decimal system and includes:

- 2 Sections (1-digit)
- 2 Divisions (2-digit)
- 12 Groups (3-digit)
- 23 Classes (4-digit)

The unit to be used for classification is generally the individual construction. In certain cases, it is only possible to apply it to a property as a whole. For recording purposes, the most important aspect is to at least report the 2-digit (e.g., residential, non-residential or mixed-use).

Constructions are classified according to their specific use. Constructions used or designed for several purposes (e.g., a combined residential, hotel and office building) are to be assigned a single classification based on the main apparent use followed by the 'm' flag (for mixed-use) or another equivalent sub-variable. Mixed use can also be combination of different subcategories of residential or non-residential buildings.

For example, if a building is comprised of a school and a hostel, the school would be assigned to 1263 and the hostel coded 1130. However, as mentioned above, if the main use of the building is a school, then the building is classified to 1263m.

4.4.2. Number of floors

The definitions for the number of floors are based on a deep analysis of existing definitions in the fire statistics of various countries - see Annex C2 in Task 4 report (EUFireStat, 2022). Considering the information provided by ISO/TS 17755:2014 (ISO, 2020), the number of floors could be recorded in terms of floors or height. In the ISO/TS 17755-2:2020(E) (ISO, 2020), the height of the building is defined as the ‘distance between the floor of the ground floor used by firefighters and fire engines and the floor of the highest level used by people of the building’. However, the floor height of the building can vary in different property types, especially with public and industrial buildings. Therefore, the floor is defined as the distance between the pavement and the ceiling of one floor. Moreover, in the statistics of the UK (England) and the USA, the number of floors (or stories) is grouped into floors above or below ground level (grade level), respectively. Based on the above investigations and after deep discussions amongst the consortium members, the number of floors has been defined and subdivided into those above and below ground level referred to as the main entrance of the building. Finally, the number of floors has been determined as an easier variable to record than the height of the building.

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.

Note to definition:

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[5]

Numerical value for floors below[6]

Examples:

The building has only a basement, a ground level and 2 floors.

- Number of floors above is 3
- Number of floors below is 1.

The building has a ground level, 10 floors and 2 floors of underground parking:

- Number of floors above is 11
- Number of floors below is 2.

4.4.3. Fire safety measures

Definition:

Fire Safety Measures are devices and systems that aim at reducing the effects of a fire. They can be detecting (smoke, fire etc.) and alarming (local, central etc.) and/or preventing fire spread (sprinklers, automatic extinguishing equipment, compartmentation etc.) or any combination of those.

[5]To be approximated when unknown.

[6] To be approximated when unknown

Value:

Were there Fire Safety Measures present?

Yes / No

If yes, what kind?

- Detection: Yes/ No
- Alarm: Yes/ No
- Extinguishing system: Yes/ No
- Passive fire protection (fire doors – other compartmentation means): Yes/ No
- Smoke control systems: Yes/ No

Did the Fire Safety Measures operate at the time of the fire?

- Detection: Yes/ No
- Alarm: Yes/ No
- Extinguishing system: Yes/ No
- Passive fire protection (fire doors – other compartmentation means): Yes/ No
- Smoke control systems: Yes/ No

4.5. Fire characteristics

4.5.1. Area of origin

The proposed definition and values are based on a deep analysis of existing definitions and values in the fire statistics of various countries. The proposed values are grouped into seven groups, following the practice in USA and Australia. The selected values take into consideration the already existing values presented in the ISO/TR 17755:2014 standard (ISO, 2014), along with the existing values in several European countries. Some of the proposed values have examples attached to it, for a better understanding.

Definition:

Area of origin is the localized area where the fire started.

Values[7]:

- Functional Area
  - Sleeping area
  - Bathroom/toilet
  - Kitchen
  - Living room
  - Laundry area
  - Meeting area
  - Office
  - Classroom
  - Cafeteria/Bar
  - Sauna
  - Stable/barn
  - Other (write a value)

- Area of Egress
  - Hallway or corridor
  - Stairway
  - Elevator
  - Escalator
  - Lobby
  - Other (write a value)

- Assembly or Sales Areas
  - Assembly area
  - Sales area
  - Showroom
  - Indoor swimming hall
  - Lounge area
  - Other (write a value)

- Technical Processing Area
  - Operating area

[7] a coding structure for these values can be proposed in a later stage of the project

    - Processing or manufacturing area
    - First-aid area
    - Stage/Scene
    - Other (write a value)

- Storage Areas
    - Storage area
    - Parking area / garage
    - Cooling area / freezer
    - Fuel storage room
    - Trash
    - Shipping or receiving area
    - Silo / container / barn
    - Other (write a value)

- Service/Equipment Area
    - Machinery area
    - Maintenance shop or area
    - Producing/distribution area
    - Ducts
    - Heating area
    - Shafts
    - Other (write a value)

- Structural Areas
    - Wall assembly
    - Roof
    - Façade
    - Attic
    - Balcony/terrace
    - Substructure area
    - Awning
    - Area under renovation
    - Other (write a value)

- Undetermined

Note to values:

Note 1: Examples of *assembly areas*: Conservatory, Cinema, Theatre, Art gallery, Exhibit Hall, Library, Ticket office, Prayer room.

Note 2: Examples of *lounge areas*: Recreation rooms, Family rooms, Dens, Common rooms.

Note 3: Examples of *operating areas*: Computer room, Laboratory, Machine room, Projection room.

Note 4: Examples of *processing or manufacturing areas*: Workshop, Painting room, Drying room.

Note 5: Examples of *storage areas*: Closet, Tool or supply area.

Note 6: Examples of *machinery areas*: Server area, Technical area.

Note 7: Examples of *producing/distribution area*: Power house/plant/generator, Electrical distribution, Air conditioning and ventilation room, Filter room.

Note 8: Examples of *ducts*: Ducts, Chimney, Ventilation duct, Water duct.

Note 9: Examples of *heating areas*: Boiler room, Remote heat transfer station.

Note 10: Examples of *shafts*: Elevator shaft, Supply and disposal shaft.

Note 11: Examples of *substructure areas*: Cavities in ceiling, Cavity between floors, Other cavity.

4.5.2. Item first Ignited

Definition:

The initial fuel of the fire – the first item that had sufficient volume or heat intensity to extend to uncontrolled and self-supporting combustion.

Note:

The values for this variable must be at a level of detail which a fire officer is able to identify, hence the use of the word “item”. It is sufficient to know the item at a general level without going into more detail about the item’s structure or the material it is made from.

In items powered by electricity, an ignition can occur in the casing or heat insulation. The heat for this ignition may be internal (through an electrical fault in the equipment itself) or external. We can illustrate this with two examples of fires involving a coffee maker as the item first ignited. In the first case a fault in the coffee maker ignites the plastic casing and the coffee maker is both the heat source and item first ignited. In the second example, someone carelessly leaves the coffee maker on a hot plate of a freestanding cooker, which is then turned on by accident. The coffee maker in the latter case is the item first ignited, but the freestanding cooker is the heat source.

Values:

- Food-related

  - Cooking fat or oil
  - Food

- Furnishing and clothing
  - Armchair, sofa, seat or similar
  - Curtains
  - Bed
  - Clothes
  - Candle stick, including decorations
  - Table
  - Plant pot or window box
  - Other furnishing (write a value)

- Combustible material in household electric appliance
  - Freestanding cooker (oven and hotplates or hob)
  - Hotplate or hob (separate – not part of freestanding cooker)
  - Oven (separate – not part of freestanding cooker)
  - Microwave oven
  - Dishwasher
  - Fridge or freezer
  - Toaster
  - Coffee maker
  - Washing machine
  - Tumble drier
  - Heater
  - Fan or other ventilation appliance
  - Sauna heater
  - Other household electric appliance (write a value)

- Combustible material in other electric appliance, tool or distribution
  - Lighting fitment
  - Battery
  - Battery charger
  - Wiring, socket, plug or power chord
  - Electricity distribution board/box
  - Photovoltaic panels

  - Transformer
  - Consumer electronics *(for example TV, video game console, video recorder or player, radio, telephone, cell phone, desktop-, laptop- or tablet computer)*
  - Other electrical item (write a value)

- Building element
  - Façade and cladding elements
  - Windows
  - Floor/wall covering
  - Roof elements
  - Masonry
  - Inner wall
  - Joist
  - Other building element (write a value)

- Other
  - Renovation or maintenance related items
  - Paper or cardboard *(including books)*
  - Soot or tar *(the item first ignited in a chimney fire)*
  - Wood chippings, bark or peat
  - Vegetation
  - Flammable liquid or gas
  - Car
  - Other vehicle
  - Pram
  - Rubbish
  - Other (write a value)

- Undetermined

4.5.3. Articles contributing to fire development

Definition:

Any specific article assessed by the fire officer or fire investigator to have had a significant contribution to the development of the fire beyond the *item first ignited*.

Note:

This variable is only relevant if the fire spread from the *item first ignited*.

We use the term “responsible” to indicate that we are focused on the article making the greatest contribution to fire development. In most cases, several distinct articles will have contributed significantly to the fire development as a fire progresses from the *item first ignited* towards full surface involvement in the area of origin and then further in the building. If so, it is virtually impossible for an untrained fire officer to identify which article was most responsible for fire development.

It is often a major challenge for a trained and experienced fire investigator to inspect smoke and burn patterns in the area of origin and then make a judgement on which of all the fuel sources which had been present in the area of origin that made a significant contribution to the development of the fire. It is therefore unreasonable to expect reliable data on this from a fire officer other than in the relatively small proportion of all building fires that spread from the *item first ignited*, but without extensive damage to the *Area of origin*, in which case the data collected will not provide a significant gain in our knowledge of fire development.

Values (multiple choices allowed):

- Fire did not spread from *item first ignited*
- Fabric
- Upholstered furniture
- Foam mattress
- Flammable liquid
- Flammable gas
- Paper or cardboard *(including books)*
- Building elements
- Rubbish
- Renovation or maintenance related items
- Other (write a value)
- Undetermined

4.5.4. Heat source

Definition:

The source of energy that initiates combustion in the *item first ignited*.

Notes:

Heat source corresponds to *source of ignition* in the survey.

The values for this variable must be at a level of detail which a fire officer is able to identify. A specialist fire investigator may be able to examine the item in more detail to discover the component in the item which produced the heat and how this failure occurred, but it is unreasonable to demand this from a fire officer.

According to the NFPA Guide for Fire and Explosion Investigations (NFPA 921), the combustion reaction taking place in a fire can be characterized by four components: the fuel, the oxidizing agent, the heat, and the uninhibited chemical chain reaction which makes the combustion self-supporting. This is commonly referred to as the “fire tetrahedron”.

One of the most important goals of pan-European statistics is to describe how ignition occurs at fires attended by the fire service. A reasonably accurate understanding in quantitative terms of how fires start is necessary for well-informed fire prevention activities. Concerning the fire tetrahedron, we do not need statistics on the oxidizing agent as in all relevant cases this can be assumed to be oxygen in the surrounding air. However, we do need information on the first fuel item with enough energy to allow self-supporting combustion and the source of the heat which ignited it.

Item first ignited and *heat source* will allow us to understand how ignition occurred, but it is not in itself sufficient for fire prevention purposes – we also need to know why the item first ignited was exposed to the heat source for long enough for ignition to occur, as described in *primary causal factor* and *intent*.

Values:

- Household electric appliance (not limited to a household environment – these values can be used in public and industrial buildings)
  - Freestanding cooker (oven and rings, hotplates or hob)
  - Hotplate or hob (separate – not part of freestanding cooker)
  - Oven (separate – not part of freestanding cooker)
  - Microwave oven
  - Dishwasher
  - Fridge or freezer
  - Toaster
  - Coffee maker
  - Washing machine
  - Tumble drier

    - Heater
    - Fan or other ventilation appliance
    - Sauna heater/stove
    - Other household electric appliance (write a value)
- Other electric appliance or tool
    - Lamp or lighting fitment
    - Battery
    - Battery charger
    - Electric welding equipment
    - Electric hot air gun
    - Other electric appliance or tool (write a value)
- Electric distribution
    - Wiring, socket, plug or power chord
    - Electricity distribution board/box
    - Transformer
    - Other electric distribution (write a value)
- Consumer electronics (for example TV; video game console; video recorder or player; radio; telephone or cell phone; desktop, laptop or tablet computer)
- Fire or flame
    - Match or cigarette lighter
    - Fireplace or boiler
    - Cigarette, cigarette ash or similar
    - Candle, tea light
    - Gas burner
    - Embers from a fire or grill
    - Outdoor fire
    - Gas cooker
    - Gas welding equipment
    - Re-ignition of an earlier fire attended by the fire department
    - Other fire or flame (write a value)
- Other
    - Lightning
    - Friction
    - Spontaneous combustion (biological or chemical)
    - Firework or pyrotechnic device
    - Sunlight

  - Explosive substance
  - Renovation or maintenance related items
  - Other (write a value)
- Undetermined

4.5.5. 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.

Note:

In many cases more than one of the alternatives will have played a part in the ignition event. However, it should be possible for the fire officer to assess which of these factors was of greatest importance. It is this information that is most important for fire prevention work. The word “primary” is used to signal that it is the most important of the three factors that should be recorded.

The term "causal factor" is proposed instead of “fire cause" because the direct fire cause is already clear: the item first ignited has been exposed to the heat source for long enough for ignition to occur.

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

5. The fire data journey from collection to reporting

The following provides a description of the steps involved in fire data collection from collection at the scene of the incident to reporting at the EU level.

5.1. Step 1. Collection of data at the fire scene

All fire data collection systems researched during this study start with incident reports filled out by the attending fire department. These data are the backbone of the data collection system.

Other agencies may also be present at the incident scene, including police and ambulance services, while fire investigators, police and representatives from insurance companies may collect information in the days following the incident. Each of these can provide additional information of importance to the completeness of the data set such as number of fatalities, age of fatalities, Primary causal factor, heat source and article contributing to fire spread.

Fire departments may collect information in addition to the data required at the EU level. This outline is not intended to restrict the data of interest at the local or even national level.

It is recommended that data are collected and entered into the local system within 24 hours of an incident. An example of a data collection sheet is presented in annex B.

5.2. Step 2. Local Data Management

This step takes place at the local fire departments in the national data collection systems reviewed in this project. Data collected at the scene of the incident is transferred to the local data management system. The data system should allow data to be recorded as unknown but to also allow for data to be updated when additional information is obtained.

The first quality control of the data should occur at this step. If data are missing or entered as unknown at the item level it is proposed to consult the following data sources to obtain the required information:

Table 3 Complementary data sources for missing or unknown variables

Variable	Examples of complementary data sources
Incident location	Local Dispatch system/records
Incident date	
Incident time	
Number of fatalities	Police, Ambulance and Hospital records
Number of injuries	
Age of fatalities	
Type of building	Building registration and/or Property Tax records
Number of floors	
Item first ignited	Investigation reports from fire department, police and/or insurance company
Area of origin	
Heat source	
Primary Causal Factor	
Fire safety measures present	
Article contributing to fire development	

It is recommended that local data management is continuous so that incident data are reviewed and updated, when necessary, with information from other data sources as these become available.

5.3. Step 3. Reporting of local data to National data system

If the local data management system is not aligned with the requirements for national data, the local data should be transposed into the format required for national data. An example of this could be that information about the fire department response (number of firefighters, engines, etc.) is included in the local dataset but not required at the national level.

A qualitative estimate of uncertainty of the values reported as outlined in Section 7 should be provided including any steps taken to minimize uncertainty such as consulting other data sets as mentioned under step 2.

The local dataset is then sent to the national agency responsible for collecting fire incident data. In some countries, there may be intervening layers of administrative authority which receive local data before transferring it to the national level. In other countries data might be submitted directly to the National system in step 1 and the quality control mentioned in Step 2 is then happening at the national level.

It is recommended that this reporting of data to the national system takes place at least once a year at a time schedule defined by the national agency.

5.4. Step 4. National Data Management

It is proposed to have one national point of contact in each member state responsible for collecting the data from local fire departments, e.g. a national statistics institute. Task 1 report shows that the type of agency used nationally differ significantly among member states (EUFireStat, 2022). In some countries, this responsibility falls under a ministry and in others may be the responsibility of either the state fire service, fire protection associations or insurance companies. Only Italy appears to use a national statistics centre for fire incident data.

A second round of quality control should take place at national level focusing on unit-level missing data. Fire departments may fail to report fires due to time or resource constraints, including budgetary or personnel limitations. Some types of fires may also go routinely unreported because they are not considered meaningful. Such missing data may lead to an underreporting in the true number of fires - see Task 3 report (EUFireStat, 2022).

Most member states do not seem to have a national approach to missing data at the unit level and instead appear to assume they have a full census response without apparent verification. Very different approaches were observed in those countries that seek to address the problem of missing data. Sweden identifies all incidents by having the local data collection system send a message to the national system when a report is initiated. Every month the Swedish Civil Contingencies Agency (MSB) sends feedback to fire departments on reports that have been initiated but remain uncompleted in the national dataset. France uses a weighted average to deal with unit-level missing data in the number of fire interventions reported by fire departments in different regions. When data on fire interventions are not reported by a fire department, the Ministry of Interior calculates the weighted average number of interventions by fire departments protecting populations of similar size and applies that number to the data for the non-reporting fire department.

To ensure that data can be shared between EU Member States, it is necessary to ensure that missing data at the unit level is dealt with appropriately by all reporting agencies.

Another challenge when managing data at the national level is item level missing data not dealt with at the local level as well as variables coded as unknown. While various methodologies exist to deal with this, as described in Task 0 report (EUFireStat, 2022), it is recommended to maintain the unknown/missing data fields as such and not attempt to distribute them among the other data fields for the variable. This allows data analysts to use their preferred methodology for missing data/unknowns when analysing the data set.

A final step in the national data management is to calculate the totals for each of the variables as well as provide an overall qualitative estimate of the uncertainty for each of the variables recorded.

Finally, we wish to emphasize that the scope of this project is confined to recommendations for collection of national data on fire incidents that occur in buildings. During the review process of this report prior to publication, it was suggested that "near miss" fires can provide important information for fire safety efforts. While we agree that near miss incidents can be instructive, attempting to propose how data from these fires -- many or most of which almost certainly go unreported -- could be collected at the national level falls outside the mandate for this project.

During the course of the current project, we encountered multiple ways in which actual fire events are defined by different data collection systems. The report also emphasizes that it can be difficult to determine the completeness of fire datasets due to unreported fires and the complications that missing data may pose for the reliability of data and the accuracy of subsequent conclusions. Those methodological issues would be compounded in any effort to collect near-miss data. Accordingly, while we concur that the pursuit of near-miss data has valuable potential for fire safety, we believe that efforts to identify feasible methods for collecting this data are a matter for separate and future research.

5.5. Step 5. Reporting National Data to EU Data System

If the national dataset does not correspond directly to the harmonised fire incident dataset, transformation rules will be needed. These transformation rules will depend on the national variables collected, definitions used for each of those and how they correspond to the harmonised variables. Recommendations on how to potentially transform data into the harmonized data set is discussed for each of the variables.

The entire database as well as the calculated national totals are then reported to a body that is tasked with dealing with fire incident data at EU level. It is recommended that this reporting of data is done annually, and that each member state provide data from the previous calendar year. An illustration of the above-mentioned steps is presented in Figure 4.

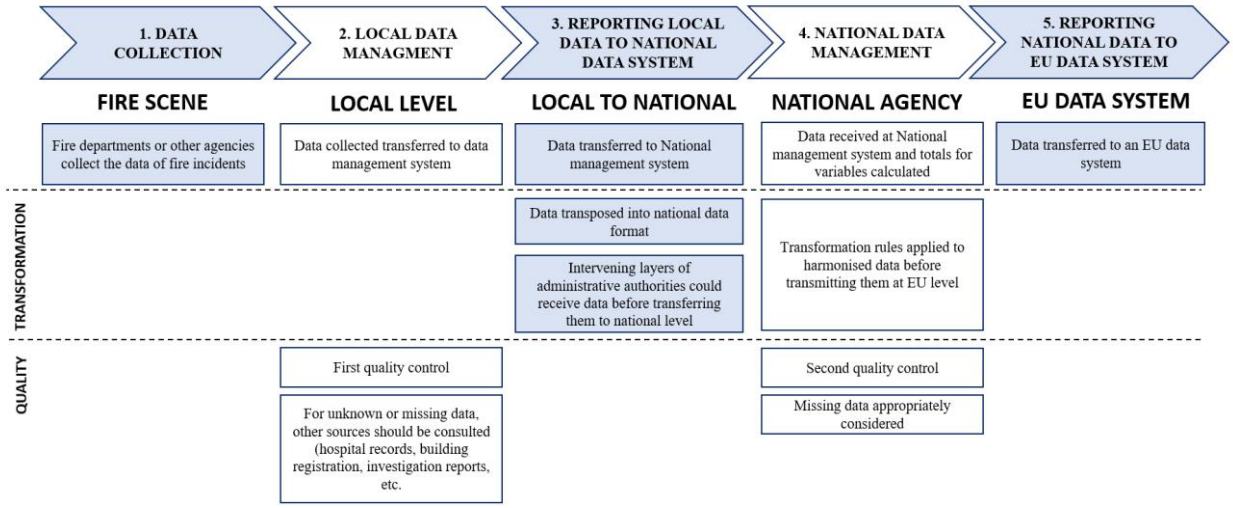

Figure 4 Description of the steps involved in fire data collection

6. Guidance for data collection

Number of fatalities

Collecting the number of fatalities is a quite essential part of fire statistics. The most common challenge concerning the collection of the number of fatalities seems to be they do not necessarily occur at the fire scene. With the rapid intervention of the fire services and the emergency medical services, many fatalities can occur at the hospital days after the fire incident due to severe injuries. If a body is found within the incident scene it is most likely the firefighters who found it. However, the number of fire fatalities should also include persons injured by the fire and that died beyond the fire scene, such as during transportation or at the hospital. This means that data from the medical coroner might be necessary. For special cases where a person was already dead before the fire started, then it should not be considered as a fire fatality, but this will most likely be determined by the police investigators.

We recommend that the number of fatalities entered in the incident report shall be the definite number of bodies declared dead at the incident scene. This number can always be updated if any information from other organizations is given later on. Fire fatalities as estimated by fire departments will be an underestimate for two reasons – the fire department may not know about fatalities that occur once the victim has left the scene of the fire or know about fatalities from fires that they do not attend.

It is therefore appropriate that fatality and injury statistics be cross-checked with morbidity statistics, where most European countries use International Classification of Diseases (ICD10). Although, medical practice is standardised, one must keep in mind that the longer time that passes between a fire and the fatality at the hospital, the more likely it is that burn injuries are not linked to the original fire and the more likely it is for a patient to die of complications from the original injury while under treatment. We deliberately set the time limit to consider a fire fatality to one year after the fire occurrence, which is one of the longest times identified and used in the USA. From CTIF's experience, 99-100% of all fire fatalities are covered in the 90 days following the fire incident. Of course, this estimation can vary from country to country and with the progress of medical care, but it implies that if a country is able to collect data up to 90 days following the fire, then it would also be acceptable.

Number of fire injuries

Collecting the number of injuries is an essential part of any fire statistics. With this kind of data, it is possible to quantify the impact of a fire. One of the major challenges identified by the project is the fact, that people might not introduce themselves to the Rescue Service at the scene. As the kind of injuries can vary a lot, the threshold for counting injuries may vary significantly from country to country. It is therefore important to remain consistent. Given these challenges we recommend including the number of injured people who presented themselves at the incident scene to the Rescue Service. This decision assumes that the initial data will be collected by fire officers returning from the fire scene and then collected by the national fire authority. The communication between Rescue Service and Fire Officers at the scene is usually established. This number can be updated if additional information by medical data is given later on.

Age of fatalities

The age of persons who are killed in fire incidents is important information for fire prevention planning and prevention. In situations where the precise age of a fire fatality is not available through records or corroboration, we recommend that a best estimate of fatality be entered

into the incident report, a practice that is utilized in National Fire Incident Reporting System in the United States.

An alternative approach is to utilize age ranges when precise age information is unknown. The age categories will differentiate children, adults, and the elderly, which will be sufficient for some analyses. However, we believe that providing numerical estimates is a superior approach because this number can always be reordered into age categories, but it is more difficult to translate age categories into specific age estimates and a great deal of precision will be lost in the process. Specific age is especially critical in the case of younger and older fire fatalities, where capabilities can vary greatly between the youngest and oldest in their respective categories.

As described in the data journey, age estimates can be changed at a later point following local quality control and consultation with other data sets for documentation of the age of fatalities. In countries where age data is only available in categories, the data can be transformed by selecting the mid-point of the data range (e.g., for fatalities in age category 30-59, the midpoint (45) would be selected).

Type of buildings

This variable may also be difficult to assess due to the large number of possible values and the potential for complex building types. The critical information for analysis purposes is whether the fire occurred in a residential building, a non-residential building, or a mixed-use building. As for the detailed type of building, we recommend the persons filling the report to use their best estimate. As described in the data journey, it can be changed at a later point following local quality control and consultation with other data sets.

Number of floors

The number of floors in buildings affected by fire incidents is an important information for the optimization of fire safety strategies and evacuation plans. It also provides additional characteristics to the property types and an estimate of the height of the building. It would be suggested to record the number of floors rather than the height of the building to facilitate and simply the collection of this variable in the aftermath of a fire incident.

The floor of the building is defined as the distance between the pavement and the ceiling of one floor. Moreover, in the statistics of the UK (England) and the USA, the number of floors (or stories) is grouped into floors above or below ground level (grade level), respectively. Therefore, it would be suggested to subdivide this variable into two: number of floors above and number of floors below the ground level recorded as numerical values. It is important to specify that the ground level is referred to the level of the main entrance of the building. For example, if a building is composed of a basement, a ground level and 2 floors, the number of floors above should be recorded as 3 and the number of floors below as 1.

However, while a numerical estimate is considered to be a superior approach that can always be reordered into floor categories, it is more difficult to translate floor categories into specific floor estimates and a great deal of precision will be lost in the process. In countries where floor data are only available in categories, the data can be transformed by selecting the mid-point of the data range (e.g., for the category 1-3 floors, the midpoint (2) would be selected). At the same time, in countries where the height of the building is recorded in meters, the value can be transformed into number of floors applying an approximate estimate of 3 meters per each floor.

The number of floors above and below the ground level are fire statistical variables that can be collected at the fire scene or during the first quality control of the data that occurred during

the local data management phase. In situations where the precise number of floors is not available through records or corroboration, the best estimate is suggested to be inserted into the incident report. Other sources could also be investigated able to provide the required information such as building stock or energy consumption survey. An alternative approach is to utilize floor ranges when the precise number of floors is unknown. The provided values for the number of floors will be able to differentiate low, medium and high-rise buildings covering very important aspects that are necessary in some analyses and during the fire investigation.

Primary causal factor

Primary causal factor refers to the factor that is the most important influence in an ignition event. The terminology “causal factor” is preferred to “fire cause” because the direct cause of a fire is already clear: an item first ignited has been exposed to a heat source long enough for ignition to occur. We cite the following example for illustration: a cigarette (heat source) can ignite a paper (item first ignited) due to an unintentional human act (primary causal factor) and then spread the fire via curtains (materials contributing to fire development).

Information about the primary causal factor of fires can be useful for researchers and safety authorities in guiding prevention efforts, including educational campaigns, requirements for automatic extinguishing equipment, and other potential interventions. However, information on fire cause has oftentimes been difficult to capture in practice. In the United States, for instance, there have been long standing concerns with unknown or missing data on fire cause in the National Fire Incident Reporting System. The problem is seen to be especially prevalent for serious fires or those which involve fatalities.

The values for this variable are:

- Human act or omission (Intentional, Unintentional, Undetermined intent)
- Equipment failure
- Natural phenomenon
- Undetermined

If the primary causal factor is recorded as a human act or omission, it is most important to know whether the ignition was intentional or unintentional since they are associated with different prevention strategies.

Research has identified several factors that help explain the failure to enter information on cause.

- Causal information that is initially coded as “under investigation” is not updated after an investigation is completed.
- Concerns about liability in some cases deter fire department reporting of cause. Methods to address this concern include providing an option to indicate a level of uncertainty about causal determination, as well as providing immunity from liability for persons or entities who report fire incident data in good faith and without malice.
- Lack of program administrators outside the fire department who can work with fire departments and perform quality control oversight and help update incident reports.

We therefore recommend that respondents provide the best information on the primary causal factor of a fire *that is available at the time a report is initiated or submitted*. Estimates of primary

causal factor is based on experience or current knowledge, such as concluding that a fire originating in the kitchen is primarily due to a human act or omission, provides more meaningful information than no information at all.

When performing quality control during local data management as described in the fire data journey, effort should be made to consult other data sets that provide information for data with high uncertainty during the initial collection.

We also recognize that record keepers may be reluctant to provide information while fire cause is still under investigation. Efforts should be made to update causal information as it becomes available. National fire data collection programs can assist fire departments with data management requirements by providing program managers in overseeing quality control efforts.

7. Uncertainty Analysis and Statistical Reliability

In a broad sense uncertainty relates to a situation when there is a doubt about the validity of values recorded for a particular variable. An overview of concepts associated with uncertainty as well as a discussion on the uncertainties associated with different data collection techniques are presented in the Task 3 report (EUFireStat, 2022).

A total of fourteen variables have been suggested for inclusion in harmonized European fire statistics. Below we present a qualitative assessment of possible uncertainty issues connected to these variables.

Number of fatalities

As seen in studies in both Sweden (MSB, n.d.) and France (Belanger et al., 2008; Carlotti et al., 2017; Lasbeur et al., 2012; Lasbeur & Thélot, 2014), underreporting of fatalities can be as high as 20-30%. Underreporting may occur when a victim dies after transport from the fire scene or because the fire service is never called to the scene, or for some other reason. Studies of hospital records can help in determining the actual number of fire fatalities, but automated solutions can be complicated since personal information (like social security number) is seldom recorded by the fire service. Even so, the best data quality check is to regularly perform specific studies which compare hospital records of fire fatalities with the outcomes from fire statistics. Indeed, medical data (for example those based on International Classification of Diseases (ICD10) should be cross-referenced with other sources to find an agreement. Similar initiatives for injury related mortalities have been examined across Europe (Belanger et al., 2008). In Sweden, MSB hopes to follow up all reported fatal fires by collecting supplementary information from the Police and the Board of Forensic Medicine.

Number of injuries

Fire injuries are even more difficult to systematically record than fatalities. It is likely that the fire service will keep track of how many people they rescue (Runefors, 2020), but people with injuries might evacuate by themselves or with the assistance of others than the fire service. Although firefighters will be able to collect some injury data on the scene, they might not be competent to evaluate injury severity, complicating data quality. In cases where people are transported by ambulance from the scene, the data can be used to perform specific studies of the accuracy of fire service reports of injuries, as in the case of fire fatalities referenced above. However, there are likely to be situations in which injury victims may be transported by family or friends before fire service arrival. Complications in recording injury is illustrated by comparing France and Italy, which are similar with respect to populations, building methods and fatalities per 100.000 inhabitants, but which have completely different outcomes for injuries (around 1 fire injury per 100 000 inhabitants in Italy and around 20 fire injuries per 100 000 inhabitants in France), leading to a doubt about the difference in the definitions. High level comparisons between countries could be an appropriate tool for this variable that can help identifying major discrepancies.

Primary causal factor

Primary causal factor is likely to be prone both to measurement and response errors, since confusion, ignorance, or carelessness of the reporter might result in faulty inputs. Another complicating factor is that evidence at the scene may have been destroyed by the fire. The reporter may also feel an uncertainty or unease when assigning the primary causal factor, which results in assigning it as unknown. In NFPA analyses of NFIRS data, the unknown fires

are distributed in the same proportion as the fires for which the data are known (Ahrens et al., 2003). However, this might lead to model assumption errors. When detailed fire investigations occur, they can be used to update the primary causal factor first assigned, and thus improve the accuracy. Even so, the destructive nature of fires can result in it being impossible to determine the primary causal factor.

Type of building

This variable may also be prone to measurement errors due to confusion or ignorance. As an example, there are different views in different countries regarding what is included in the term “residential building”. Holiday homes are considered residential in some countries but not in others. A category like “public building” might also be interpreted differently in different countries. Clear definitions and instructions to the reporter are needed on how to interpret the variable and the different categories. An additional possibility is that building information can be double-checked with real estate information or records at a municipal level.

Incident location

If the fire incident reporting is connected to a dispatch system where the location is recorded (address and/or coordinates), the uncertainties of incident location can be reduced. However, there might be problems with measurement errors (faulty inputs by dispatcher or reporter at the scene) and there might also be non-responses (for example address missing in the report). Possible errors can be reduced if both address and Global Positioning System (GPS) coordinates are reported, as seen in a study where fatal fires in Sweden were connected to real estate information by utilizing both information on address and coordinate (Johansson, n.d.). In some cases, address information was lacking and data on coordinates could be used, in other cases the coordinates were wrong, and the address could be used.

Incident date

If incident reporting is connected to a dispatch system where the time and date for call received, unit dispatched and unit at fire scene are automatically recorded, the uncertainties regarding this variable are considered small. If the variable is entered manually, it will potentially be prone to measurement and response errors (incidents that occur close to midnight will likely be most affected). Systematic errors may also occur but are most often likely to be random in nature.

Incident time

The uncertainty connected to incident time is considered to be small if the time and date is collected and recorded automatically. Errors are more likely if incident time is recorded manually, but errors are again likely to be random. In cases where incident time is recorded as a rough estimate of the time (e.g., night, morning, noon, afternoon, evening) the error will most likely be small.

Age of fatalities

There are a number of uncertainties regarding the ability of fire service to record the age of a victim at a fire scene. For example, there may be no one at the scene to attest to the age of the deceased in the event of a fatal fire. Age information will be available in other databases if the victim has been hospitalised or is deceased. Cross references to such databases can be made in order to quantify and evaluate the information in the fire service database.

Number of floors

The number of floors in a building should be quite straightforward to report if the variable is well defined and understood by the reporter. It must be clear for the reporter how to interpret basement floors, attic floors, mezzanine floors and ground level for uneven floors. Studies of the accuracy of this variable can be done by studying documentation and images of fire-exposed buildings.

Area of origin

The area of origin will most likely be associated with less uncertainty than fire cause. If the building is still standing or there are some cues based on eyewitness information, the area of origin should be easy to determine. Still, distinct categories are necessary to avoid systematic errors. As an example, a category labelled as “storage” could be interpreted as designated storage room or as a room used for storage in a basement. The latter can be confusing if “basement” is itself a possible category.

Heat source and Item first ignited

Similar to primary causal factor of fire, it might be difficult to determine the heat source and item first ignited due to the destructive potential of the fire. The reporter might need to rely on a fire investigation or second-hand data, such as information from residents or other eyewitnesses if the fire itself has destroyed cues to the heat source and the item first ignited. The category “unknown” might cause issues with heat source for similar reasons as primary causal factor of fire (see above). Problems can also arise if the reporter is confused or unable able to distinguish between item first ignited and the heat source.

Article contributing to fire development

The uncertainty connected to this variable is considered similar to primary causal factor of fire and heat source. As long as the fire is kept in the area of origin, the damage will most likely not be too severe to be able to determine the article contributing to fire development. However, there might be situations when relevant knowledge in fire development and fire dynamics is required by the reporter in order to accurately categorise this variable.

Fire safety measures present

There are two distinctions to be made regarding this variable. Firstly, the possibility to determine if a fire safety measure was present or not is considered to be good if the building is still standing and the fire scene can be inspected. The uncertainty in that regard is therefore considered to be low, and it can even be reduced further if fire safety documentation of the building can be studied to complement the information retrieved at the fire scene. Secondly, if the fire safety measures present were working or not is more difficult to determine, and it also related to the type of fire safety measure. For example, it is hard to determine if a fire alarm has sounded in the initial stages of a fire if there is no eye-witness information, but it might be easier for the fire service to see if a fire door has performed as it should or not at the fire scene.

Summary of uncertainties connected to the described variables

Based on the description and discussion above, we can make some general estimates of the uncertainty associated with the different variable assigned in

Table 4. The estimates are rough qualitative estimates that indicate which variables can be expected to be affected by the largest degree of uncertainty. It should also be stressed that these uncertainties can be reduced by applying different measures, like the measures discussed above.

Table 4: Estimated associated uncertainties with the selected variables

Variable	Estimated associated uncertainty
Number of fatalities	Medium
Number of injuries	High
Type of building	Medium
Incident location	Low
Incident date	Low
Incident time	Low
Age of fatalities	High
Number of floors	Low
Area of origin	Low
Item first ignited	High
Fire safety measures present	Medium
Heat source	High
Article contributing to fire development	Medium
Primary causal factor	High

8. Guidance for data interpretation

Once agreement is reached on the fire data variables and data collection methods, it is important to provide guidance for their proper 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

Here we provide examples of data interpretation and the type of deliberation involved using variables proposed for inclusion in fire data collection.

Number of fatalities

Data on fire fatalities is important for monitoring progress in fire safety. The identification of potential trends in fatality data (see Figure 4, data from the Netherlands) can be useful for planning safety interventions. However, it is difficult to establish trends due to random statistical variation that can be important. The experience of the consortium suggests that 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. This suggestion is applicable in general terms to all guidance provided in this chapter.

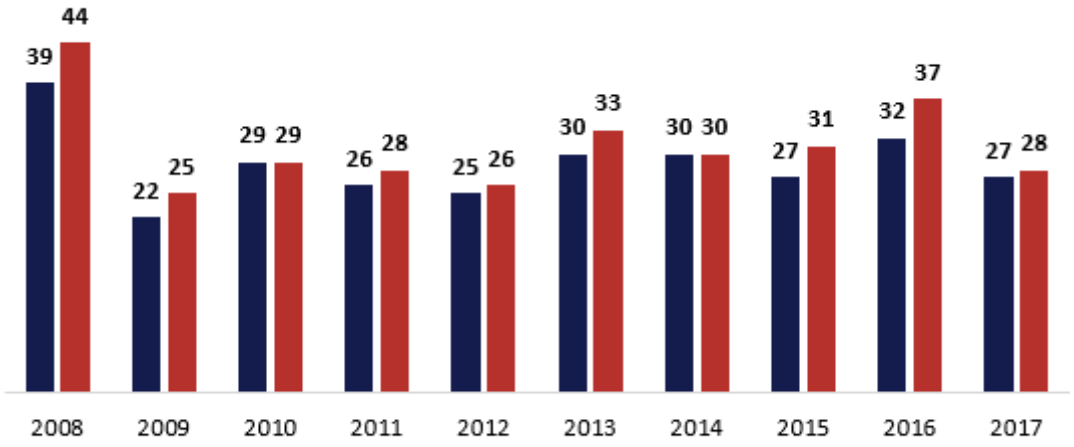

Figure 5. Number of fatal residential fires (blue) and fatalities (red) in the Netherlands.

Number of injuries

The estimation of fire injuries is necessary when making policies that attempt to reduce injuries and ensure adequate resources to accommodate injury victims. Examples of changing circumstances that might influence injury trends are changes in building methods and materials or changes in residential populations (such as populations with physical limitations (mobility, sight, hearing etc.). If the number of injuries is consistent over time, then the evolution of this variable should be compared with other variables, such as number of fires, number of fire fatalities, articles contributing to fire development, type of buildings, or other relevant variables.

Age of fatalities

With an aging population in Europe, data on the age of fire fatalities assumes greater importance. Physical and cognitive impairments can complicate the ability to escape a fire. The data from the Netherlands in Figure 6 shows that occupants in the age groups older than 61 years old, constitute approximately 50% of all fatalities.

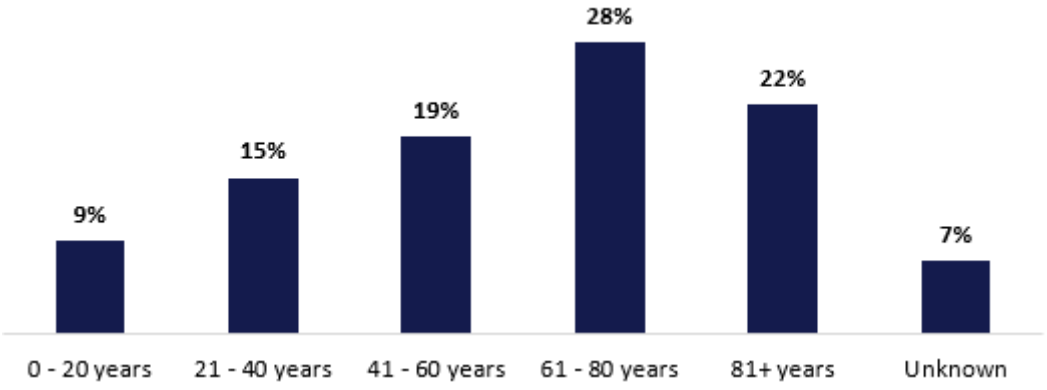

Figure 6. Age of fire fatalities over the years 2008-2017 in the Netherlands.

Data on fatal residential fires has been collected in the Netherlands since 2008. Based upon the number of deaths per year and the age of these fatalities, prevention policies in the Netherlands are strengthened by means of:

- Attention to fire safety of the elderly
- Attention and incorporation of fire safety of upholstered furniture and mattresses
- Extension of smoke detector requirements to include bedrooms and living rooms
- Campaigns on closing doors

Figure 7 uses existing data to project an increase in fire deaths due to the anticipated increase in the aging population.

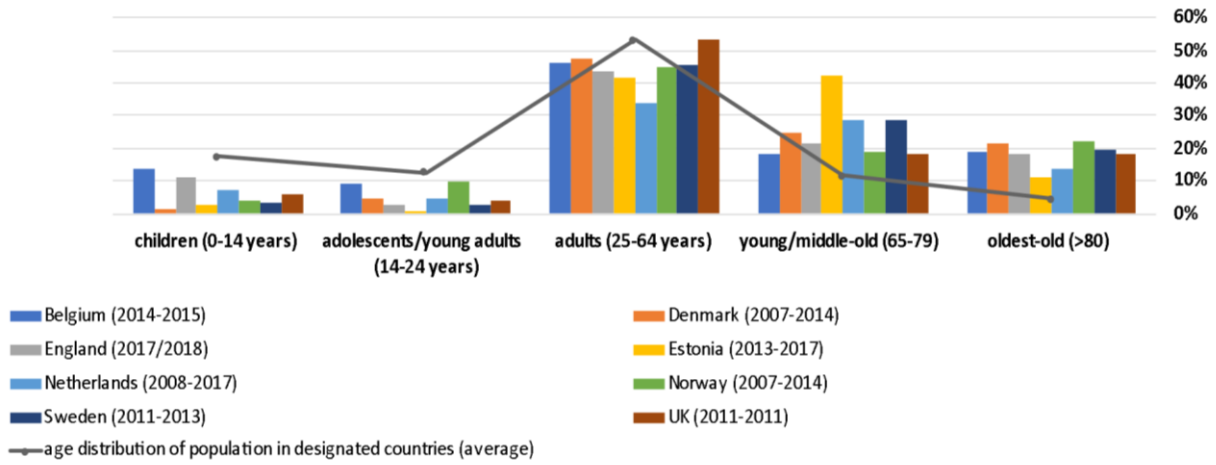

Figure 7. Age distribution of fatalities related to average age distribution in European countries (extracted from Fire Service Academy, 2018)

The chart provides an indication regarding the age groups that are impacted by fire fatalities in a number of European countries. Compared to the size of the population (gray line), children aged 0-14 seem to be less impacted than other age groups, especially those above 65. As Europe's aging population is expected to peak in the year 2040, it is important to begin formulating fire safety policies in anticipation of this development.

This example is purely for illustrative purposes, as current fire statistics are not harmonised, and data of the countries and the average distribution relate to different years.

Incident location

This variable is important in order to be able to generate a mapping of incident location within a country or a region and to correlate the distribution of fire incidents in rural or urban areas. It can also be instructive to map fire location in relation to other data, such as socio-economic or fire intervention data, such as identifying geographical areas that are not well covered due to limited resources for the fire rescue services.

Information on fire location might be complicated by restrictions in providing exact address and/or GPS coordinates of fire incident if they are not well aggregated due to data protection regulations. Accordingly, the location criteria will have to be considered and possible solutions could be providing only address of the county or municipality.

Time and date of the incident

Data on the time and date of building fires provides basic information for planning safety interventions, assist fire department preparation and response capabilities.

Table 5 uses Spanish statistics on residential fires with fatalities to show the distribution of fire deaths during day- and night-time hours (Fundacion MAPFRE & APTB, 2020).

Table 5 Distribution of residential fire fatalities during the day and night, extracted from (Fundacion MAPFRE & APTB, 2020)

Time of the fire	Number of fatalities	%
Night	91	55
Day	71	43
Unknown	3	2
Total	165	100

As defined by (Fundacion MAPFRE & APTB, 2020), day fires occurred in the hours from 8:00 am to 8:00 pm while night fires occurred between 8 pm to 8 am. When looking into more details (Table 6 and Figure 8), we notice that a higher percentage of fire fatalities occur between 4 am and 8 am. Therefore, the notion of granularity of data is very important.

Table 6 Distribution of residential fire fatalities by hour ranges, extracted from (Fundacion MAPFRE & APTB, 2020)

Hour ranges	Number of fatalities	%
0 to 4	27	16.4
4 to 8	40	24.2
8 to 12	24	14.5
12 to 16	19	11.5
16 to 20	28	17.0
20 to 24	24	14.5
Unknown	3	1.8
Total	165	100

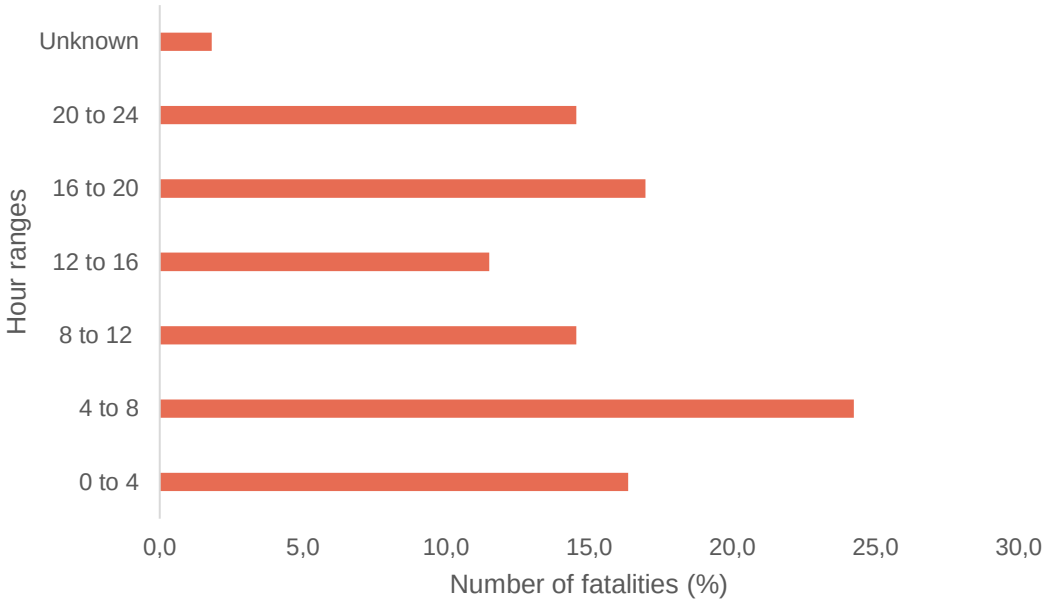

Figure 8 Distribution of residential fire fatalities by hour ranges, extracted from (Fundacion MAPFRE & APTB, 2020)

Statistics from Spain also (Fundacion MAPFRE & APTB, 2020) illustrate the distribution of fire fatalities over the twelve months of the year (see Figure 6). It appears that the coldest months of the year account for the highest number of fire deaths. Fundacion MAPFRE & APTB estimates that the need to generate heat in cold weather months leads to more fires and more deaths. Such observations should therefore be validated by comparing with other variables, such as primary causal factor and heat source, to determine the necessary mitigation solutions and policy measures.

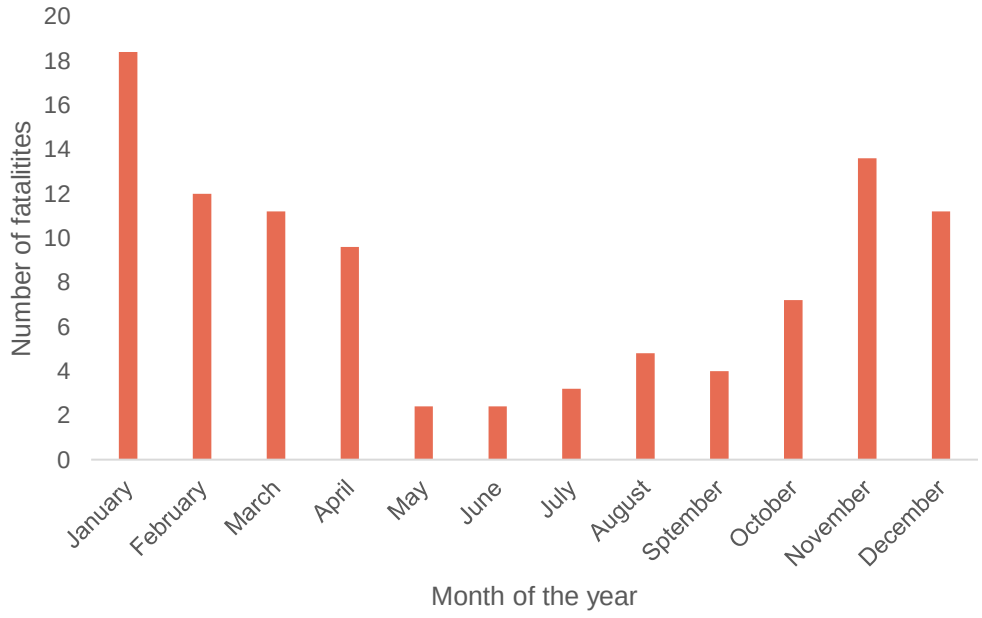

Figure 9 Distribution of residential fire fatalities over the year, extracted from (Fundacion MAPFRE & APTB, 2020)

Building type

In this section, we present several hypothetical examples to illustrate the type of output that can be generated through data collection. Note that the trends are exaggerated for purpose to facilitate the interpretation.

Note: These statistics were inspired from existing data extracted from a EU Member State, where the labels were modified as some of the existing building classifications were different.

Figure 10 illustrates the number of fires by type of building over a one-year period. As fires primarily occur in residential (one dwelling and residences for communities) followed by mixed-use buildings, it appears necessary to cross-reference these values with others. For instance, if we compare these data to fatality data (Figure 11) by type of building, we might notice that the deadliest fires occur in mixed residences for communities and in one dwelling residential buildings. This implies that it will be important to focus on prevention of these types of buildings and to verify the safety measures that are present as well as if the applicable regulation. Examining the time of the fire for the different type of buildings could provide indications such as if most fires occur in residential areas during the day and if they result in fewer fire deaths, while night fires could be less frequent but more fatal. It is also important to examine mixed-use buildings in relation to the fire and items first ignited to understand if fires occurred in residential or non-residential areas or influenced by residential versus non-residential factors. It is also important to mention the utility using Eurostat typology of buildings for deriving incidence indicators, in particular for setting appropriate comparisons between type of buildings. If residential buildings are 10 or 50 times more numerous than the mixed ones, the incidence of fires in the latter could become ten times higher than in residential. Such proportions could be very informative for cost/benefit computations and to decide how/where to allocate resources for prevention measures.

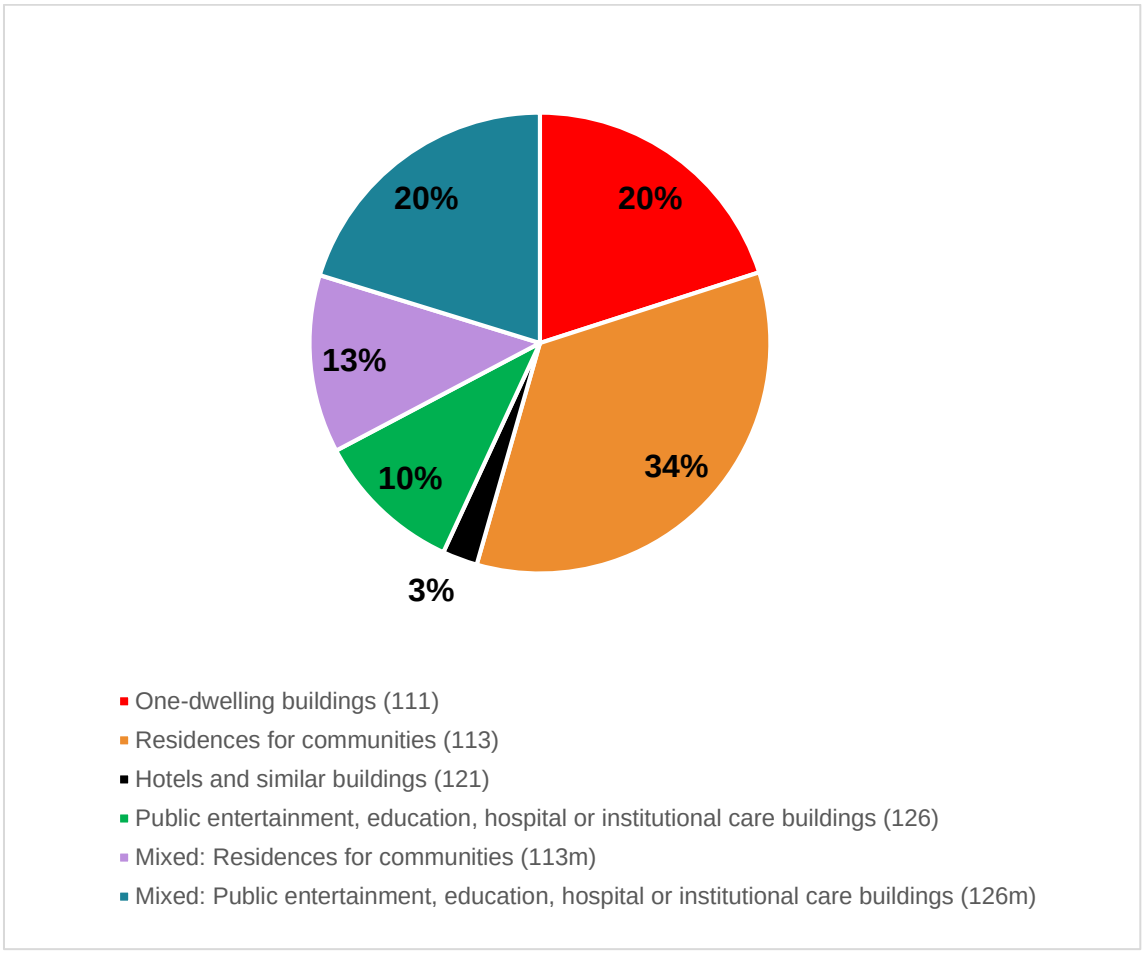

Figure 10 Hypothetical example of number of fires by type of building in one year (other type of building are not shown as they constitute less than 1% of the total number)

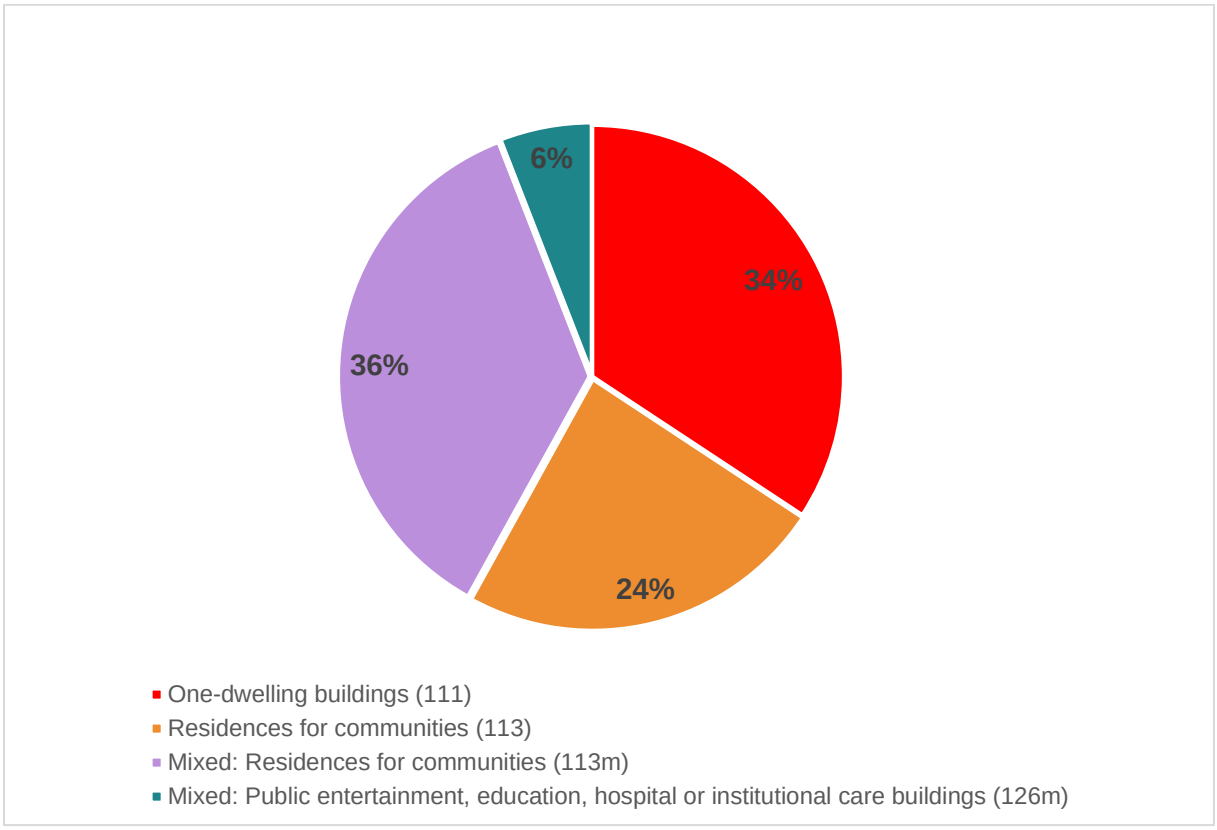

Figure 11 Hypothetical example of number of fire fatalities by type of building in one year (other type of building are not shown as they constitute less than 1% of the total number)

Heat source and Primary causal factor

Harmonized data on building fires will allow interested parties to examine how often certain kinds of fires occur. The statistics will facilitate the identification of the most common ways that ignition occurs (*item first ignited* and *heat source*), and why an item was exposed to heat long enough for ignition to occur (*primary causal factor*). Such analysis may help to illustrate different dominant fire scenarios for fires with different outcomes, such as fatal fires, fires with non-fatal injuries, and fires that only damage property or the environment). Analysis could also be applied to compare fires in different types of buildings, at different time periods (day, week, or month), and in different regions or countries.

If data is collected over a period of several years, it may be possible to observe changes in the frequency of certain types of fires. Harmonized data may enable the identification of trends that only become apparent at the broad European level due to the effect of random variation with smaller sample size at the national level.

Statistical data from fire incidents could be used to inform prevention actions. If specific interventions are implemented in a country or region, it should be easier to determine their effectiveness since outcomes are commonly evaluated on a before/after comparison. However, it is often difficult to take account of the influence of other external factors during the period of study. European-level statistics will enable a more reliable evaluation since the outcome in the country/region can be compared to the fire scenario frequency in other European countries for the same period.

Fire safety Measures in place

Data on smoke detectors in residential buildings can provide information about the distribution and effectiveness of smoke detectors in residences and be used in considering fire regulation requirements and enforcement for smoke detectors in certain settings. For instance, smoke detectors might be missing in certain local areas even if it is required by local regulation. This can lead to better awareness and other measures to help to improve the distribution, installation, maintenance, and effectiveness of smoke detectors in residential buildings.

Another striking example is the use of automatic fire alarm systems in industrial buildings. Recent statistics from Germany show that the average amount of damage from fires in industrial facilities without automatic fire alarm systems was 850,000 euros per fire incident. Of the companies affected, 60% were no longer viable after 100 days, despite claims settlement by the insurance company. In the case of fires in industrial buildings equipped with automatic fire alarm systems, the average loss amount was 18,000 euros, and only 20 percent of companies affected were no longer viable after 100 days.

Fire characteristics - A Case study from the UK

Figure 12 shows the area of fire origin in dwellings, in the UK (UK Home Office, 2021). The most common areas of origin for fire are kitchen, followed by bedroom/bedsitting room and then the living room.

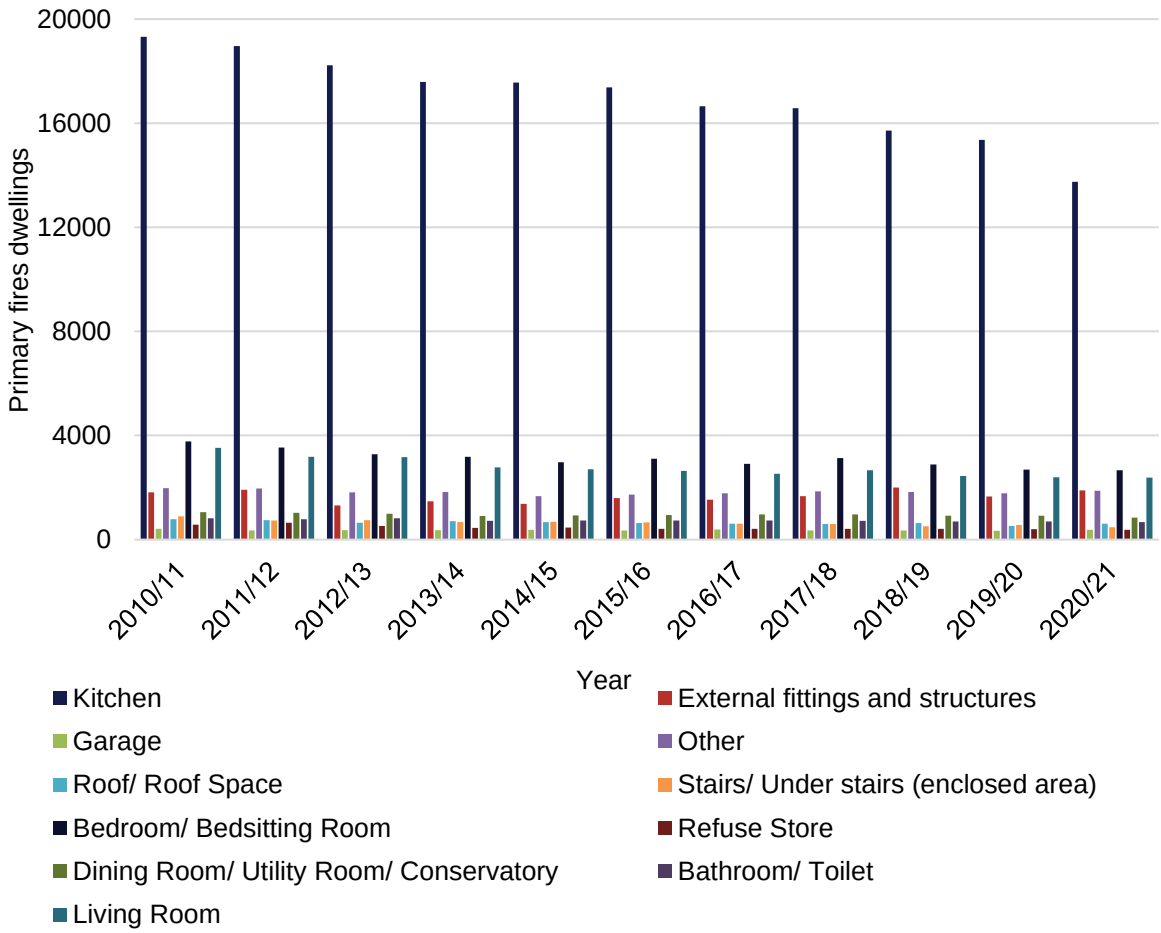

Figure 12. The area of origin - dwellings UK extracted from (UK Home Office, 2021).

Interestingly, Figure 13 illustrates the items first ignited in dwellings, in UK. The most common items first ignited are:

- Food (cooking oil and fat; other)
- Textile, upholstery and furnishing (Foam, rubber, plastic - Plastic - raw material only; Clothing/Textiles - Other textiles; Clothing/Textiles – Clothing; Clothing/Textiles – Bedding)
- Structure and fittings (Structural/fixtures/fittings - Internal - Wiring insulation; Structural/Fixtures/Fittings - Internal - Internal Fittings; Structural/Fixtures/Fittings - External - External fittings)
- Other material (Other; Wood - Other wooden)
- Paper / cardboard (Paper/Cardboard - Household paper/Cardboard)
- Not known

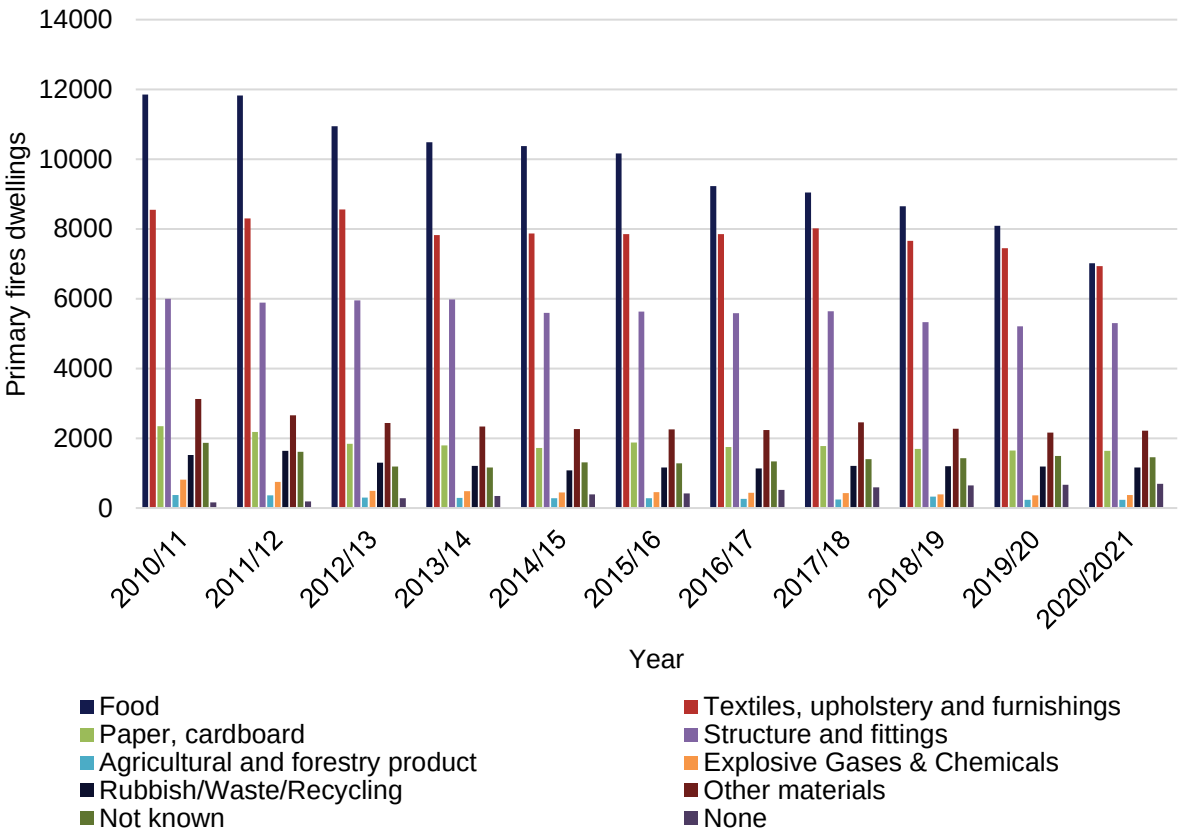

Figure 13. Item first ignited - dwellings extracted from (UK Home Office, 2021).

In comparison, Figure 14 illustrates the articles responsible for the fire development, in dwellings in the UK. The most common articles responsible for the fire development are:

- Food (cooking oil and fat; other)

- Textile, upholstery and furnishing (Foam, rubber, plastic - Plastic - raw material only; Furniture/Furnishings - Upholstered furniture; Furniture/furnishings - Bed/mattress)
- Structure and fittings (Structural/fixtures/fittings - Internal - Wiring insulation; Structural/Fixtures/Fittings - Internal - Internal Fittings; Structural/Fixtures/Fittings - External - External fittings)
- none
- Other material (Other; Wood - Other wooden)
- Paper / cardboard (Paper/Cardboard - Household paper/Cardboard)

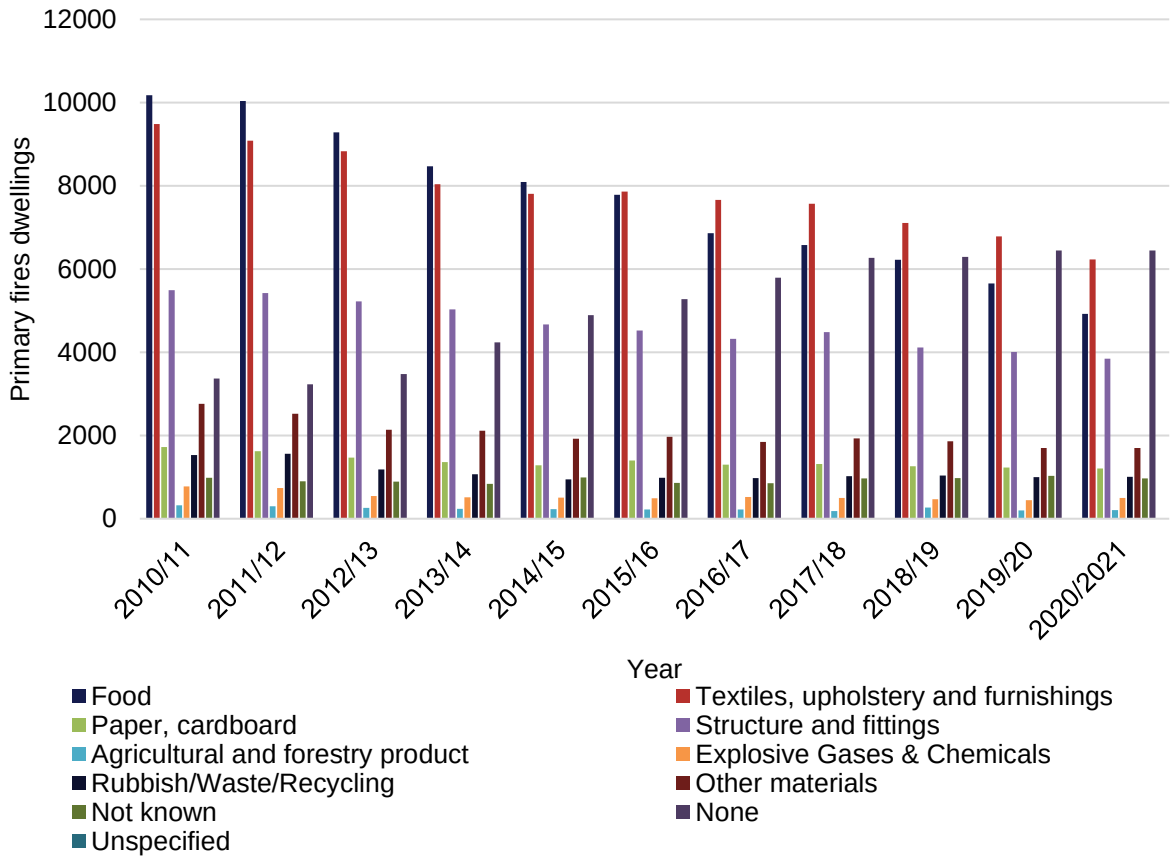

Figure 14. Articles responsible for the fire development in dwellings UK.

The data show an increase for responses marked “None” over time, which may signify that new articles have been developed and used or that these articles should be identified and included in the code options.

The data also show that:

- The most common area of origin is the kitchen
- The most common item first ignited is food (cooking oil and fat; other)

- The most common article that contributed to the fire development is Food (cooking oil and fat; other)

These findings illustrate the utility of fire incident data in guiding fire safety interventions. In the UK, for instance, public education campaigns have been initiated with the following messages:

- Keep a clean kitchen. A clean kitchen is not only hygienic – it is a lot safer. Regularly clean your stove, range hood and filters. Built-up oil and burnt food can cause fires. Filters can be cleaned in the dishwasher.
- Keep flammable objects (e.g., curtains, tea towels, oven mitts) away from the cooking area. At the same time, wear tight fitting sleeves or roll them up when you are cooking.
- Turn the power or gas off (if you can) if there's a fire on your stove.
- Never throw water on a frying pan that is on fire or try to carry it outside. If you can, use a pot lid or a large flat object like a chopping board and place it over the pan to starve the fire of oxygen.
- Install smoke alarms in your house and check them regularly. Work out an escape plan with your family since it could save your life.

Other variables that can help better understanding the trend are the type of building and the age of injured or fatally injured victims. For instance, these additional variables can indicate if kitchen fires, or kitchen fire fatalities are the most common in housing for the elderly or other vulnerable populations.

The following actions can be recommended for elderly persons:

- The cooking should be assisted by a helper.
- Installation of fire safe cooking devices (e.g., no open flames)

Bedrooms and living rooms are the most common area of fire origin in residential buildings and the second most common items first ignited and articles contributing to the fire development include:

- Textile, upholstery and furnishing (Foam, rubber, plastic - Plastic - raw material only; Clothing/Textiles - Other textiles; Clothing/Textiles – Clothing; Clothing/Textiles – Bedding)
- Structure and fittings (Structural/fixtures/fittings - Internal - Wiring insulation; Structural/Fixtures/Fittings - Internal - Internal Fittings; Structural/Fixtures/Fittings - External - External fittings)

Campaigns can be initiated with the following messages:

- Never smoke in bed particularly when tired or on medication.
- Never use candles if you are likely to fall asleep.
- Keep candles away from curtains, bedding, clothes, etc.
- Make sure that candles are only used in proper candle holders.

- Never use candles as a night light for children. (Use a low watt mains or battery light).
- Never cover a light to make it dimmer, fit a lower watt bulb.
- Be sure your bedside lamp cannot fall into the bed during the night.
- Ensure that all unnecessary electrical appliances are unplugged before going to sleep.
- Never place a portable heater close to a bed or other flammable materials.
- Always have a flashlight available in your bedroom for emergencies.
- Always have a house phone or mobile phone beside the bed in case of an emergency.
- Never leave your mobile phone charging over night or when you go out.
- Install smoke alarms in your house and check them regularly. Work out an escape plan with your family since it could save your life.
- Check the electric plugs and systems

Other variables that can help better understanding the trend are the type of building and the age of injured or the age of the victim. These additional variables can for example indicate if the bedroom and living room fires are the most common in the elderly house for example, where elderly people are injured or killed.

For example, in Denmark, there was a rule that implied that the smoking in the elderly houses should be done in the common areas only.

9. The Community Database on Accidents on the Roads in Europe

In considering the prospect of introducing a common data collection system for fire incidents across Member States of the European Union (EU), it is worth noting that there is precedent for harmonized data collection of adverse events in the EU. Since the late 1990s, Member States of the EU have implemented a harmonized data collection system for road accidents, known as the Community database on Accidents on the Roads in Europe (CARE) (Eurostat, n.d.-c; OECD, 2018; Thomas et al., 2005).

The Community database on Accidents on the Roads in Europe (CARE), supplemented in 2009 by Common Accident Data Set (CaDAS) is comprised of detailed data on individual accidents collected by the Member States of the European Union for all road accidents involving at least one moving vehicle and one injury or fatality. At the local level, each European Union country transmits the data from its national collection to the European Commission. The data are then transferred from the European Commission to CARE database. Historically, the quality and availability of road accident data has been somewhat limited by differences in data collection form structures and the relevant data formats among the existing national databases, recorded variables and available definitions. CaDAS was subsequently introduced with the inclusion of additional variables and values with a common definition to those contained in the previous models of the CARE database. EU Member States are not obliged to adopt CaDAS and they transmit the data at the EU level choosing the level of detail.

A point of comparison between data collection in the CARE system and fire incident data collection is that data collection in CARE is limited to road accidents that result in fatality or injury, specifically excluding incidents that only involve material damage. In contrast, fire incident data collection generally includes all fires attended by fire departments, even those which do not result in fatality or injury. It seems likely that the narrower criteria for in-scope incidents in CARE data collection enhances the ability to achieve compliance with reporting requirements. In addition, preparing reports of vehicle accidents resulting in casualties is a traditional practice for police officers and likely to be an expected part of job responsibilities, but a relatively new expectation for firefighter duties. In addition, firefighters fill out paperwork on fire incidents after rescue and extinguishment operations are completed and they return to the fire station. Firefighter fatigue may influence the accuracy of incident reporting.

The differences between road accident and fire incident data practice should be carefully considered in the design and implementation of a harmonized fire data collection system. Data on road accidents are seen as an example of harmonised data collection systems involving all the EU Member States. It can be extended to fire statistics and used as a tool to promote safety initiatives by using common data measures to identify and quantify safety problems, evaluating the efficiency of existing safety interventions, and facilitating the exchange of experiences and information.

More detailed information on the CARE database is available in the Task 3 report (EUFireStat, 2022).

10. Using fire incident data for cost benefit analyses

Fire incident data can serve a number of important purposes, i.e. helping to reduce fires and losses, identifying opportunities for safety interventions and education programs, guiding the allocation of public resources to areas of greatest need and impact, and monitoring progress of safety initiatives. Cost benefit analysis is a tool that can be used to evaluate various fire safety measures. Studies using this tool combined with fire statistics were reviewed in Task 5 report.

The review of previous studies in Task 5 gives an overview of the application of cost-benefit analysis to various fire safety measures. The installation of different kinds of water sprinkler systems is a measure that has been examined in several countries. Due to high costs water sprinkler systems are seldom seen as cost-beneficial in general; however, for specific types of buildings or for certain risk groups the benefits can out-weigh the costs. Another measure that has been analysed in several countries is the installation of smoke alarms, often seen to be cost-beneficial due to the low cost. Other measures described in the overview include stove guards, fire extinguishers and combustible cladding.

Cost-benefit analysis represents a common method of socio-economic analysis. The procedure of performing such an analysis varies, but it will always include an estimate of all the costs of introducing the measure and an estimate of the benefit due to risk reduction as well as other benefits associated with the introduction of the measure. A cost-benefit analysis is considered to provide 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.

Furthermore, an appropriate method for cost benefit assessment to be used by the Member States and/or the European Commission is proposed in Task 5. The proposal includes a general calculation procedure to conduct a cost-benefit analysis together with a description of the most important input variables. The input data in the proposed calculation procedure includes several of the statistical parameters proposed in previous tasks within the project but also other data is needed.

Based on the overview of previous studies, it is evident that there can be a substantial uncertainty associated with some of the input variable values. Consequently, it is strongly recommended that a cost-benefit analysis should be complemented with a sensitivity analysis to present the variation in the result due to uncertainty in the inputs. A sensitivity analysis provides essential background for wise decissions if a cost benefit analysis is used for making large desicisions. The sensitivity analysis comprice usually of a parameter variation of the variables with large uncertainties to study impact on the overal cost/benefit ratio.

In the Task 6 report (EUFireStat, 2022) three case studies are performed to demonstrate the proposed methodology. The topics of the case studies are:

1. Smoke detectors in residential buildings
2. Introduction of a minimum fire regulation on upholstered furniture/matrasses in Sweden for residential fires.
3. Home visits as a prevention measure.

The specific procedure when performing these analysis varies somewhat between the different case studies but they are all based on the same methodology, i.e. the methodology proposed in Task 5. An estimate of the cost of introducing the measure and an estimate of the benefit due to risk reduction as well as other benefits associated with the introduction of the measure are included in all case studies. A rather detailed calculation was possible for Case study 1 since there have been several studies in the area and data is available for most of the important

input variables. It was also seen that the measure (smoke alarm) is cost-effective with a benefit-cost ratio of well above 1, i.e. the benefit is much larger than the cost. The results of Case study 2 and 3 are considered more uncertain and harder to interpret since the benefit-cost ratio is close to 1, which means that a variation in any of the input parameters can cause the benefit ratio to either grow above 1 or be reduced below 1. Several important input variables are also associated with great uncertainties which makes it especially important to include a sensitivity analysis in the cases with a cost benefit ratio close to 1.

The conducted case studies underpin that 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.

It is 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 cost benefit analysis.

11. Paving the way forward

11.1. Implementation of the variables in Europe

Based on what has been learned in this project, all of the variables proposed in this report are already collected by most EU countries, although they are not always formally defined.

The variables collected in more than half of the EU countries are incident time, incident date, incident location, number of fatalities, number of injuries, age of fatalities, type of building and the primary cause of fire. It is advantageous that so many countries already collect this data. However, in some cases current definitions and inclusion/exclusion criteria will need to be adjusted to provide harmonized data for analysis at the European level.

The variables collected in less than half of the EU countries are the number of floors (at least 8 EU countries), the presence, type and operation of fire safety measures, the area of origin (at least 9 EU countries), item first ignited (at least 10 EU countries), article contributing to fire development (at least 5 EU countries) and the heat source (at least 9 EU countries). It is expected that adding these data to the fire statistics will require more work for implementation in countries not already collecting the variables, but on the other hand they will not have to deal with the challenge of harmonizing existing definitions.

Depending on the nature of the data, some variables will require more effort to harmonize than others. Indeed, it is expected that the variables *incident time, incident date, incident location, age of victims, number of floors* and *fire safety measures present* can be implemented and harmonized with low effort.

For the implementation of variables *number of fatalities* and *number of injuries*, it is expected that the process will be difficult, especially for the countries which are currently reporting only at the fire scene. For the countries which already correct these variables after cross checking with medical records up to a certain time after the fire, it is estimated that there should be no difficulties in adapting their practices.

Challenges can be anticipated in adopting proposed values for the variables *type of building, area of origin, item first ignited, article contributing to fire development* and *cause*. We have seen in Task 1 report that each country uses its own values for each variable, hence there will be a need to adapt to the proposed new structure (EUFireStat, 2022).

11.2. Implementation plan

We have identified 14 variables necessary to be collected as a priority in all Member States in a harmonised way in order to be able to provide recommendations and to identify areas for improvement to support fire safety and fire prevention efforts, and to enable cross-learning between different Member States, regions and local actors. The first Tier of these variables is the following:

Tier 1:

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 eight variables have been implemented efficiently, we propose adding the second tier, which would include six additional variables:

Tier 2:

1) Number of floors
2) Area of origin
3) Heat source
4) Articles contributing to fire development
5) Item first ignited
6) Fire safety measures present

For these 14 variables we have proposed precise definitions and corresponding values, and provided guidance on how to collect them and analyse them. In order to gain broad support for the pan-European fire statistics proposed, it is most important that the implementation is done in as efficient a way as possible.

The other variables listed in Tier 1 (Age of fatalities, Primary causal factor and Type of building) should then be implemented in a second step, followed by the variables of Tier 2. This does not prevent Member States from collecting additional variables ahead of time.

11.3. Establishing a core group

11.3.1. Survey description

A short survey was sent to the Member States' regulators and persons dealing with fire statistics in all 27 EU Member States in order to survey 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?

11.3.2. Survey results

The survey response rate was 19 countries out of 27 (70%). Additionally, two countries acknowledged receiving our survey and promised to answer later.

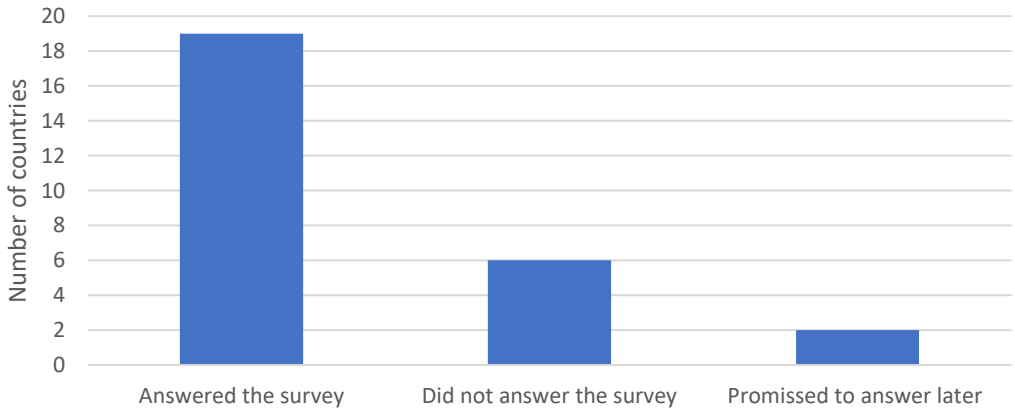

Figure 15 Survey response analysis

It can be noted that all 19 countries that have answered the survey are in favour of providing harmonised fire statistics for collection at European level.

The responses to each question of the survey are illustrated in following figure.

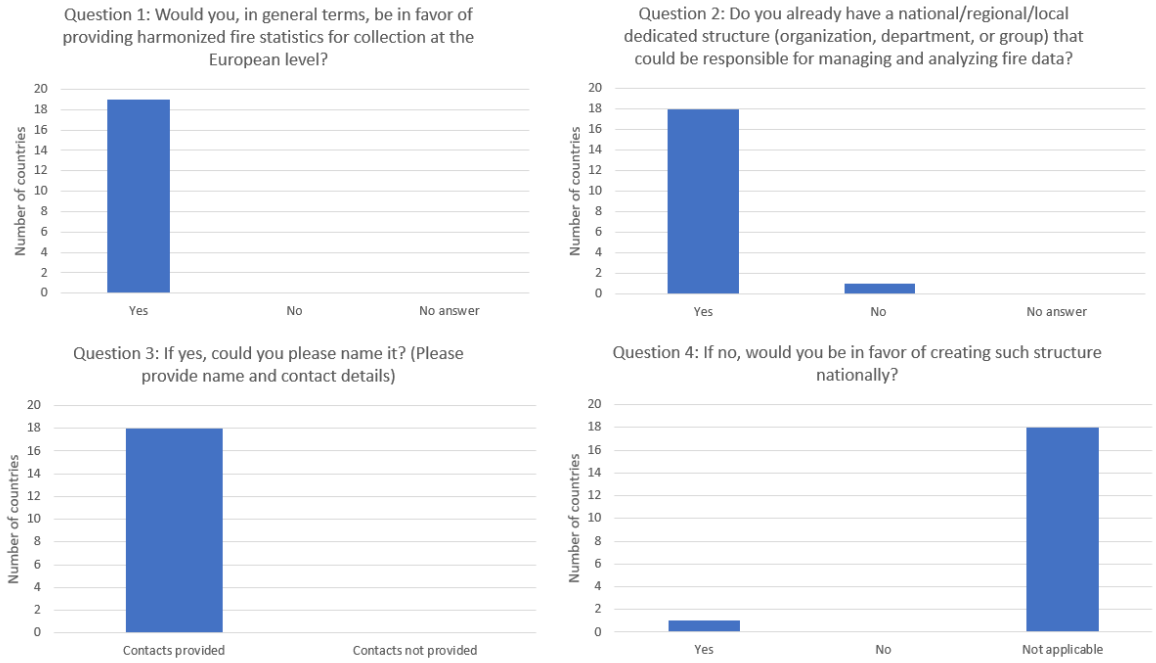

Figure 16 Survey response analysis (questions 1 to 4)

11.3.3. Core group description

Considering the results of this survey, we recommend the European Commission to create a core group of Member State authorities with the following role:

- To learn and review the current proposal (in the beginning)
- To discuss any need for clarification and agree on the way forward
- 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

Additional organisations that are responsible for fire statistics can also be included into the group. Members of the EU FireStat consortium will also be ready to provide detailed information and justifications behind the choices made in this proposal.

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. In parallel, there should be a structure at the European level that can receive national fire data and statistics with the necessary resources to store, analyse and publish indicators from the various countries.

11.4. Standardisation

Standardization is necessary to provide a recognised basis for the current proposal and to facilitate its dissemination to all Members States, and potentially beyond. This can potentially be performed at two levels:

- At the European level, for instance with the help of CEN TC 127 Fire safety in buildings and CEN TC 391 Societal and Citizen Security.
- At the international level, where there is already a working group in ISO TC 92 working on fire statistics (WG13).

Note that it is not in the scope of this project to initiate or to contribute to the work of private bodies such as CEN or ISO, but it is only suggested as an idea for potential future work.

12. Conclusions and future work

Due to the lack of common terminology or variables with a similar nomenclature covering different aspects, fire statistics and data cannot always be compared between countries. This hinders e.g., effective cross-learning about successful fire safety interventions. To develop a comprehensive evaluation, this research has identified fourteen variables that should be recorded in fire statistics as a priority.

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

9) Number of floors

10) Area of origin

11) Heat source

12) Articles contributing to fire development

13) Item first ignited

14) Fire safety measures present

The research also focused on providing definitions and values for each variable. The proposed terminology constitutes a minimum dataset for collection at the local level and does not prevent a fire department or national authority from utilizing also more detailed data collection so as long as they can provide simplified data according to the terminology of the pan-European statistics. We described all of the necessary steps involved in fire data collection from collection at the incident to reporting at the European level as well as guidance on how to collect data. The outputs generated by this project should increase awareness about the importance of a common terminology that will generate the foundations for a harmonized fire statistics at European level. When surveying views of fire regulators of all Member States, it was shown that at least 19 countries are in favour of providing harmonised fire statistics for collection at European level. The next step should then be to implement at least the five first proposed variables (or more) as part of an experimental phase of the implementation process. In parallel, there should be a structure at the European level which can receive national fire statistics on an annual basis, with the necessary resources to store, analyse and publish data from the various countries. Finally, standardization process seems necessary for providing a recognised basis for the proposed values and their corresponding definitions and to facilitate the dissemination to all Member States.

Finally, it will be useful for a leading group of countries to implement the proposal in order to demonstrate its utility. This will facilitate the ability of stakeholders to generate data, use them to chart and publicize trends, and build public recognition and support of fire safety policies and initiatives.

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Annex A – Building type classification

This annex presents additional information about the type of building.

Explanatory notes *for type of building classification (extracted from Eurostat* (n.d.-b)*) – modifications by the EU FireStat project are underlined*

Section	Division	Group	Class	Class name and details
1				**BUILDINGS**
	11			**Residential buildings**
		110	**1100**	**Unknown**
		111	**1110**	**One-dwelling buildings** This class includes : -detached houses such as bungalows, villas, chalets, forest lodges, farmhouses, country houses, summer houses, weekend houses, etc. This class also includes : -semi-detached or terraced houses, with each dwelling having its own roof *and* its own entrance directly from ground surface This class excludes : -non-residential farm buildings 1271
		112		**Two- and more dwelling buildings**
			1121	**Two-dwelling buildings** This class includes : -detached houses, semi-detached or terraced houses, with two dwellings This class excludes : -semi-detached or terraced houses, with each dwelling having its own roof and its own entrance directly from ground surface 1110
			1122	**Three- and more dwelling buildings** This class includes : -other residential buildings such as flat blocks, apartment houses, with three or more dwellings This class excludes : -residences for communities 1130 -hotels 1211 -youth hostels, holiday camps and vacation bungalows 1212
		113	**1130**	**Residences for communities** This class includes : -residential buildings for communities, including residences and service residences for the elderly, students, children and other social groups, e.g. retirement homes, workers' hostels, fraternity homes, orphanages, hostels for the homeless, etc. This class excludes : -hospitals and clinics 1264 -institutional buildings with nursing or medical care 1264 -prisons, barracks 1274
	12			**Non-residential buildings**
		120	**1200**	**Unknown**

121 **Hotels and similar buildings**

1211 **Hotel buildings**

This class includes:

-hotels, motels, inns, pensions and similar lodging buildings, with or without restaurants

This class also includes:

-detached restaurants and bars

This class excludes:

-restaurants in apartment buildings 1122

-youth hostels, mountain refuges, holiday camps, vacation bungalows 1212

-restaurants in shopping centres 1230

1212 **Other short-stay accommodation buildings**

This class includes :

-youth hostels, mountain refuges, children's or family holiday camps, vacation bungalows, holiday and rest homes and other lodging buildings for holiday makers, not elsewhere classified

This class excludes :

-hotels and similar lodging buildings 1211

-amusement and leisure parks 2412

122 **1220** **Office buildings**

This class includes :

-buildings used as places of business, for clerical and administrative purposes, e.g. banks, post offices, municipal offices, government department offices, etc.

This class also includes :

-conference and congress centers, law courts, parliament buildings

This class excludes :

-offices in buildings mainly used for other purposes

123 **1230** **Wholesale and retail trade buildings**

This class includes :

-shopping centers, shopping malls, department stores, detached shops and boutiques, halls used for fairs, auctions and exhibitions, indoor markets, service stations, etc.

This class excludes :

-shops in buildings mainly used for other purposes

124 Traffic and communication buildings

1241 Communication buildings, stations, terminals and associated buildings

This class includes :

-buildings and installations of civil and military airports, rail stations, bus stations and harbour terminals, cablecar and chairlift stations

-radio and television broadcast buildings, telephone exchange buildings, tele-communication centers, etc.

This class also includes :

-airplane hangars, signal-box buildings and engine and wagon sheds

-telephone booths

-lighthouse buildings

-air traffic control buildings (towers)

This class excludes :

-service stations 1230

-reservoirs, silos and warehouses 1252

-railway tracks 212

-airfield runways 2130

-telecommunication lines and masts 2213, 2224

-terminals for hydrocarbons 2303

1242 Garage buildings

This class includes :

-garages (overground or underground) and roofed car parks

This class also includes :

-bicycle sheds

This class excludes :

-carparks in buildings mainly used for other purposes

-service stations 1230

125 Industrial buildings and warehouses

1251 Industrial buildings

This class includes :

-covered buildings used for industrial production, e.g. factories, workshops, slaughterhouses, breweries, assembly plants, etc.

This class excludes :

-reservoirs, silos and warehouses 1252

-non-residential farm buildings 1271

-complex industrial installations (power stations, refineries, etc.) which do not have the characteristics of a building 230

1252 Reservoirs, silos and warehouses

This class includes :

-reservoirs and tanks

-reservoirs for oil and gas

-silos for cereals, cement or other dry aggregates

-cold stores and specialized warehouses

This class also includes :

-storage areas

This class excludes :

-agricultural silos and storage buildings used for agriculture 1271

-water towers 2222

-hydrocarbon terminals 2303

126 Public entertainment, education, hospital or institutional care buildings

1261 Public entertainment buildings

This class includes :

-cinemas, concert halls, opera houses, theaters, etc.

-meeting halls and multi-purpose halls mainly used for public entertainment

-casinos, circuses, music halls, dance-halls and discotheques, bandstands, etc.

This class excludes :

-museums, art galleries 1262

-sports halls 1265

-amusement and leisure parks 2412

1262 Museums and libraries

This class includes :

-museums, art galleries, libraries and resource centers

This class also includes :

-archives buildings

This class excludes :

-historic monuments 1273

1263 School, university and research buildings

This class includes :

-buildings used for pre-primary, primary and secondary education (e.g. nursery schools, kindergartens, primary schools, secondary schools, colleges, grammar schools, technical schools, etc.), formal education schools, vocational training schools

-buildings used for higher education and research; research laboratories; higher educational establishments

This class also includes :

-special schools for handicapped children

-further education colleges

-weather stations, observatory buildings

This class excludes :

-hostels which are detached buildings of boarding schools 1130

-hostels for students 1130

-libraries 1262

-university hospitals 1264

1264 Hospital or institutional care buildings

This class includes :

-institutions providing medical and surgical treatment and nursing care for ill or injured people

-sanatoria, long-stay hospitals and nursing homes, psychiatric hospitals, dispensaries, maternity facilities, maternal and child welfare centers

This class also includes :

-university hospitals, hospitals of penitentiaries, prisons or armed forces

-buildings used for thermal treatment, thalassotherapy, functional rehabilitation, blood transfusion, breast milk collection, veterinary treatment, etc.

-institutional buildings with combined residential/lodging services and nursing or medical care. for the elderly, for handicapped people, etc.

This class excludes :

-residences and homes with social assistance (welfare) services for old or handicapped people, etc. 1130

1265 Sports halls

This class includes :

-buildings used for indoor sports (basketball and tennis courts, swimming pools, gymnastic halls, skating or ice-hockey rinks, etc.) providing facilities for spectators (stands, terraces, etc.) and for participants (shower and changing rooms, etc.)

This class excludes :

-multi-purpose halls mainly used for public entertainment 1261

-sports grounds used for open-air sports, e.g. open-air tennis courts, open-air swimming pools, etc. 2411

127 Other non-residential buildings

1271 Non-residential farm buildings

This class includes :

-farm buildings and storage buildings used for agriculture farming, e.g. cow-sheds, stables, pig houses, sheep-folds, studs, kennels, industrial hen-houses, granaries, hangars and agricultural outhouses, cellars, wine making plant, wine vats, greenhouses, agricultural silos, etc.

This class excludes :

-installations of zoological and botanical gardens 2412

1272 Buildings used as places of worship and for religious activities

This class includes :

-churches, chapels, mosques, synagogues, etc.

This class also includes :

-cemeteries and associated constructions, funeral parlors, crematoriums

This class excludes :

-secularized religious buildings, used as museums 1262

-historic monuments, etc. 1273

1273 Historic or protected monuments

This class includes :

-historic or protected buildings, of any kind, not used for other purposes

This class also includes :

-protected ruins, archeological excavations and prehistoric sites

-statues and commemorative, artistic or decorative constructions

This class excludes :

- museums 1262

- religious buildings 1272

1274 Other buildings not elsewhere classified

This class includes :

-penitentiaries, prisons and remand centers, barracks for armed forces, police or fire services

This class also includes :

- structures such as bus shelters, public toilets, wash houses, etc.

This class excludes :

-telephone booths 1241

-hospitals of penitentiaries, prisons and armed forces 1264

-military engineering works 2420

3	**BUILDINGS UNDER CONSTRUCTION**[8]

[8] This section does not have any further content

Annex B – Example of data collection sheet

Incident Time

hour: ☐☐ minute: ☐☐ local time: UTC + ☐

Incident Date

day: ☐☐ month: ☐☐ year: ☐☐☐☐

Incident Location

Coordinates: latitude: ☐☐ ☐☐ ☐☐ longitude: ☐☐ ☐☐ ☐☐

Street: _____

Number: ☐☐☐☐

Town/City: _____

ZIP-Code: ☐☐☐☐☐☐

Number of fatalities & Injuries:

Number of fatalities: ☐☐☐

Number of injuries: ☐☐☐

Age of fatalities: If the age is unknown, please estimate.

☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐

Type of Building

Please check only one box: ☐ building ☐ building under construction

Please check only one box: ☐ residential building ☐ non-residential building

Details _____ European code ☐☐☐☐☐

If there is also another usage, please tick the following ☐ mixed-use building

Number of Floors

Above the ground (include ground level): ☐☐ below the ground: ☐☐

Fire Safety Measures:

Fire safety measures were present: ☐ yes / ☐ no

Type of systems present (were they working at the time of the fire?):

☐ detection (☐ yes / ☐ no)

☐ alarm (☐ yes / ☐ no)

☐ extinguishing system (☐ yes / ☐ no)

☐ passive fire protection systems (fire doors or other compartmentation means) (☐ yes / ☐ no)

☐ smoke control systems (☐ yes / ☐ no)

Area of Origin (please check only one box)

☐ sleeping area

☐ bathroom / toilet

☐ kitchen

☐ living room

☐ laundry area

☐ meeting area

☐ office

☐ classroom

☐ cafeteria/bar

☐ sauna

☐ stable/barn

☐ other functional area, please write:

_____

☐ hallway or corridor

☐ stairway

☐ elevator

☐ escalator

☐ lobby

☐ other area of egress, please write:

_____

☐ assembly area

☐ sales area

☐ showroom

☐ indoor swimming hall

☐ lounge area

☐ other assembly or sales area, please write down:

_____

☐ operating area

☐ processing or manufac-turing area

☐ first-aid area

☐ stage / scene

☐ other technical pro-cessing are, please write

_____

☐ storage area

☐ parking area / garage

☐ cooling area / freezer

☐ fuel storage room

☐ trash

☐ shipping or receiving area

☐ silo / container / barn

☐ other storage area, please write

_____

☐ machinery area

☐ maintenance shop / area

☐ producing/distribution area

☐ supply / disposal transport system

☐ heating area

☐ shafts

☐ other service/equipment area, please write

_____

☐ wall assembly

☐ roof

☐ façade

☐ attic

☐ balcony / terrace

☐ substructure area

☐ awning

☐ other structural area, please write _____

☐ undetermined

Item First Ignited (please check only one box)

☐ cooking fat or oil

☐ food

☐ armchair, sofa, seat etc.

☐ curtains

☐ bed

☐ clothes

☐ candle stick / decoration

☐ table

☐ plant pot / window box

☐ other furnishing

☐ freestanding cooker

☐ hotplate / hob

☐ oven

☐ microwave oven

☐ dishwasher

☐ fridge or freezer

☐ toaster

☐ coffee maker

☐ washing machine

☐ tumble drier

☐ heater

☐ fan / ventilation appliance

☐ sauna heater

☐ other household electric appliance

☐ lighting fitment

☐ battery

☐ battery charger

☐ wiring, socket, plug, power chord

☐ electricity distribution board/box

☐ photovoltaic panels

☐ transformer

☐ consumer electronics

☐ other electrical item

☐ façade / cladding elements

☐ windows

☐ floor/wall covering

☐ roof elements

☐ masonry

☐ inner wall

☐ joist

☐ other building element

☐ renovation or maintenance related items

☐ paper / cardboard / books

☐ soot / tar

☐ wood chippings / bark / peat

☐ vegetation

☐ flammable liquid / gas

☐ car

☐ other vehicle

☐ pram

☐ rubbish

☐ other, please write down

_____

☐ undetermined

Articles contributing to Fire Development (only relevant if the fire spread beyond the item first ignited). Please check all relevant boxes:

☐ fire did not spread from >item first ignited<

☐ fabric

☐ upholstered furniture

☐ foam mattress

☐ flammable liquid

☐ flammable gas

☐ paper / cardboard / books

☐ building elements

☐ rubbish

☐ renovation or maintenance related items

☐ other, please specify on the lines below

_____

_____

_____

Primary Causal Factor (please check only one box)

☐ intentional human act or omission

☐ unintentional human act or omission

☐ undetermined human act or omission

☐ equipment failure

☐ natural phenomenon

☐ undetermined

Heat Source (please check only one box)

household electric appliance[1]

☐ freestanding cooker[2]

☐ hotplate or hob[3]

☐ oven[3]

☐ microwave oven

☐ dishwasher

☐ fridge or freezer

☐ toaster

☐ coffee maker

☐ washing machine

☐ tumble drier

☐ heater

☐ fan or other ventilation appliance

☐ sauna heater/stove

☐ other household electric appliance

Other electric appliance or tool

☐ lamp or lighting fitment

☐ battery

☐ battery charger

☐ electric welding equipment

☐ electric hot air gun

☐ other electric appliance or tool

Electric distribution

☐ wiring, socket, plug or power chord

☐ electricity distribution board/box

☐ transformer

☐ other electric distribution

☐ consumer electronics

Fire or flame

☐ match or cigarette lighter

☐ fireplace or boiler

☐ cigarette, cigarette ash or similar

☐ candle, tea light

☐ gas burner

☐ embers from a fire or grill

☐ outdoor fire

☐ gas cooker

☐ gas welding equipment

☐ re-ignition of an earlier fire attended by the fire department

☐ other fire or flame

Other

☐ lightning

☐ friction

☐ spontaneous combustion (biological or chemical)

☐ fireworks or pyrotechnic device

☐ sunlight

☐ explosive substance

☐ renovation or maintenance related items

☐ other

☐ undetermined

Annex C – Comments and suggestions received via survey

Comments from Country A:

- About the collection of geographic location data, is it possible to know which coordinate system you intend to use?
- On the collection of the number of deaths and injuries: Country A collects separate data between population and firefighters. It would be useful if these data could be separated. This data will be the most difficult to collect as it involves monitoring those involved for 1 year after the fire.
- Will there be a platform for collecting statistical data?
- Will the data provided by each member state be public or shared among themselves?
- When do you expect to start collecting statistical data?

Consortium answer:

- At this stage we do not separate between population and firefighter, but it can be implemented on the long term.
- Ideally there should be a platform to collect statistical data
- Each member state is free to publish their own data but we can also imagine a European platform that is collecting data, analysing it and making annual publications.

Comments from Country B:

- In this context we would like to point out that, from a quick but not approximate analysis of the minimum 5 variables to be introduced within the next 5 years (number of fire deaths, number of fire injuries, incident date, incident date time, geographical location of fire incident,) we can affirm that all the 5 variables examined are already detected and effective by us, with values corresponding to those reported by you. As regards the other 8 variables proposed, 3 of them (fire cause, type of building, source of ignition) we already detect them but the values and definitions proposed by you are not comparable to our calculations. Finally, we point out that two other variables you suggest (age of victims, room of origin), we already plan to insert them into the system.

Comments from Country C:

Suggestions that would be important to take into consideration in the implementation of the harmonised fire statistics in Europe:

- Data about the facility - residential, industrial, warehouse building, public facility, number of storeys, building height;
- categories of human risk;
- number of residents / current users (depending on the time of day);
- historical events at a given location;
- equipment in fire-fighting infrastructure, hydrants;

- availability of forces and resources, time of achieving combat readiness, time of arrival to the event.

Comment from Country D:

GDPR – A lot of these data can end up personal - you have to be sure that you comply with EU-data protection law of 2018 (GDPR). It could be interesting to look in building fires in general pr. 1.000 inh.

Comment from Country E:

It is important for us to know, as we try to understand if the changes in our regulation are necessary and if there could be data protection issues.

Consortium answer:

The only variable where there might be data protection issue could be the ”incident location”. If providing exact address, or latitude and longitude could cause issues related to data protection, then perhaps providing only the County or the Municipality (or post code) of the incident location, without the detailed address or coordinates could be enough.

Comment from Country F:

It is important to take in mind the different sizes of the countries and their fire and rescue services and the influence on statistics. For example: a bush fire > 10 is a “large” fire for Country F circumstances, but in another country this is kind of “daily business”. So the categories must be clear and normative and not subjective.

Consortium answer:

In this project we only focus on building fires, but we understand the message illustrated by this example. This is why we sustain form defining categories, but rather push for sharing actual data. For instance, fire fatalities are often normalised by the number of inhabitants, but we do not go into this level of details at this stage. Processing and analysing data will then be the responsibility of the Country’s analysts or at European level.

Comment from Country G:

In the published final report on task 4 "Terminology" of the project, in items 3.2.1 and 3.2.2 are given definitions for "Number of deaths" and "Number of victims" (EUFireStat, 2022). The definitions and notes to them show that the "Number of deaths" includes the number of people who died because of injuries sustained from the fire within 1 year of the fire, and the "Number of victims" includes the number of people who were injured (but not accounted for as deaths) as a result of the fire within 1 year from the incident. We believe that the specified period of 1 year is too long and will create difficulties in collecting reliable data. We propose to reduce the same period to 1 month.

Consortium answer:

We deliberately set the time limit to consider a fire fatality to one year after the fire occurrence, which is one of the longest times identified. From International Association of Fire and Rescue Services

(CTIF) experience, 99-100% of all fire fatalities are covered in the 90 days following the fire incident. Of course, this estimation can vary from country to country and with the progress of medical care, but it implies that if a country is able to collect data up to 90 days following the fire, then it would also be acceptable.

Annex D – Comment handling document

In the following table all written comments received during the project are assembled.

An explanation to the columns used are as follows:
Column 1 – No: Numbering of comments
Column 2 – Body Reference: The body who have given the comment
Column 3 – Comment on document: A reference to which document the comment belongs
Column 4 – Paragraph/Figure/Table: A reference to which part of the document the comment belongs
Column 5 – Comment: The received comment
Column 6 – Response and proposed change by the consortium: A short description on how the comment has been handled

No	Body Reference	Comment on document/ procedure…	Paragraph/ Figure/ Table	Comment	Responses / proposed change by consortium
1	MSB - Sweden	Global comment on the project	NA	The project mainly covers definitions and collection methods but is not proposing a common method for analysing the data,	In Task 3, the group will include proposals for methodologies on how to deal with unknowns in the data and incomplete data, which is an essential part of the analysis. The initial discussions and proposals for analysis methods will occur in Task 3 and then again in Task 7. Overall, the group will provide guidance on data analysis and the risks of misinterpretation.
2	BVS - Austria	1st progress report	Task 0 - Annex B	Our feeling is that the efforts concerning harmonization of data collection in Austria is not reflected sufficiently. […] We provide an updated diagnostic sheet for Austria and the latest publishes fire statistics for Austria	The updated diagnostic sheet for Austria and all the information about Austria was updated throughout the reports for Task 0 and 1.
3	ANEC	1st progress report	NA	The quality of data is extremely important in a project like this and it is suggested that this be undertaken on some of the data on an ad hoc basis to establish how accurate it is together	Considerations about the quality of the data and how errors and inconsistencies are removed have been stated in the diagnostic sheets created in Task 0 for each country. The importance

				with a Cost/benefit analysis looking at the problem in more depth. Because most of the data is obtained from official sources there is a danger that it is not truly representative of the problem.	of data quality is discussed in the conclusions obtained for Task 1. Finally a cost benefit analysis will be made in task 5 of the project.
4	ANEC	1st progress report	NA	"Near misses" are an important aspect to consider when trying to identify future fire safety problems and these may not necessarily be included in official figures. The sprinkler system that operates very quickly and prevents a serious fire may not result in the fire service being called or the incident recorded but could have a significant impact on the future provision of such systems. The small fire that occurs and is prevented from spreading by the provision of flame-retardant furniture and there is no subsequent call to the fire service will not be included in the national figures but again could point the way to go for much more effective fire safety solutions. This aspect of the current work is important to consider "Whatever model of fire data collection system is employed in host countries, available literature suggests that closing the gap between the data needed for drawing comparisons and information that is practically accessible will remain a challenge, but one with substantial public benefits." If we are to pave the way for future fire safety efforts we need to consider implementing a scheme that allows the public/responsible person to input these occurrences.	As stated in Section 1.1 of Task 1: "Our project has the goal to provide a clear understanding of the fire statistics related to buildings subjected to fire incidents and does not include the evaluation of "near misses" which are usually not collected in the recording systems examined. For instance, in Scandinavia, reports can be created for fire spread in criminal cases, to judge how dangerous it could have been for human beings/property, if accidental circumstances had not prevented fire spread. These evaluations represent a useful field of investigation to identify physical and societal hazards and support the creation of preventive measures. The collection of "near misses" implies, in some cases, a detailed and challenging assessment able to determine benefits for user input. However, such reporting could also result in uncertainty in the data. Furthermore, it would also require a new system able to describe such investigation and could lead to a much higher need for resources to check the correctness and treat the data once a reporting system is in place". We also added in Section 7 of Task 0 report a short explanation about near misses and that their collection implies a detailed and challenging evaluation, as these are never reported to the fire department and hence are never entered into an

					official data system. To get this type of information, every household in Europe would be required to record the information and to submit it to a relevant agency or online on a dedicated platform. Alternatively, it could be accomplished as a sample survey every few years to see how many “near misses” occur. This is outside the scope of this project, but we highly encourage pursuing it at European and National levels.
5	ANEC	1st progress report	NA	IDB-FDS data could deliver quite interesting information in this respect. Selection could be made regarding mechanism 04.14 (contact with fire or flame) or 4.17 (Inhalation of smoke from burning objects) and manyfold analyses regarding age of victim, type of injury, time of incidence activity when injured , place of occurrence (e.g. residential fires) and – of course – products involved (from candles to fan heaters). Analyses of the narratives could eventually deliver additionally information on the start of the fire (at least in some cases). A rough estimates for the number of cases in the EU-27 would also be possible. As far as we remember, an analysis of this issue has never been made, which is a shame. As far as we know from the EC JRC-study on injury data systems, data from fire brigades do not deliver such depth of information – aside from the problem, that there are no harmonised European fire damage statistics at all.	The work of Task 0 and Task 1 is focused on an analysis of the fields recorded in the various fire statistics to increase awareness of the aspects covered and those missing. In particular, for the evaluation of victims and injured people, various fields such as age, gender and cause of death or injury are investigated to determine the available aspects recorded related to life safety.
6	ANEC	1st progress report	NA	As to the list of national fire service unions, we would expect the federation of Eur. Fire Officer Association (member of the Eur. Fire Safety Alliance) to be in the best position to make	The federation of Eur. Fire Officer Association, who is also in the Steering committee, has been very helpful in providing contacts all over Europe, especially for the distribution of the questionnaire of Task 2.

				such a full inventory of national fire safety unions.	
7	Fire Safe Europe	NA	Task 2	We decided to digitalise the Task 2 questionnaire and circulate it to our Members and to the European Fire Safety Community in an attempt to provide you with more stakeholders feedback on the fire data needed for policy making. We reproduced the original questionnaire as accurately as possible. We have received 12 answers that we hope will be useful for your research.	We thank you for that and we will consider how we can analyse your input and fit them in the context of the project.
8	DG ESTAT	1st progress report	Task 1	The questionnaires/forms used for the registration of data have not been collected, nor the manual or guidelines/instructions for their usage	The research is focused on the analysis of the definitions and fields recorded in the fire statistics of EU, Other European and Non-European countries. For each of them, in the abstracts provided, it is specified who collects the fire statistics, the recording system adopted, and the origin of the information gathered. Instead of providing a unique list of reference at the end of the report, the references have been specifically addressed for each country investigated in the tables provided in Appendix I and Appendix II where each definition is related to the specific recording system. Moreover, in the references, where available, links to this information have been provided. Furthermore, analysing the forms in and by themselves is somewhat beyond the scope of this task, particularly given the large number of languages involved. This was added in Task 1 report, Section 1.1.
9	DG ESTAT	1st progress report	Task 1	Another information missing or not well documented is about what is mandatory, according to which legal provisions	A few sentences have been added to the text in Section 1.2 to address this comment and make our choices and considerations more transpar-

					ent: “From the analysis developed, it appears difficult to evaluate the mandatory and optional fields collected by the various fire statistics. Within a specific country, fire statistics could be a voluntary system, differently managed at a local level or, considering a unique recording system (e.g., UK), only a number of fields are mandatory while others could be filled in only if specific fire conditions appear. In the description provided by the abstracts, such differences have been highlighted to provide a clear overview of current practice in various countries”.
10	DG ESTAT	1st progress report	Task 1	There is no clear indication of which data-source the definitions refers to / what if fire service and insurance have a different definition of “accidental” or of “victim” … all the grids are presented as if there was a unique data-system	The abstract for each country needs to be considered in the context for which the information provided by the table of Appendix I and Appendix II should be referred to. This is now clearly stated in Section 1.3: “The information provided in the abstract of each country needs to be related to the available definitions provided in the tables of Appendix I and Appendix II”.
11	DG ESTAT	1st progress report	Task 1	In the fiches by country of task 1, what is the difference between b and c cases?	The analysis developed by Task 1 is mainly focused on the terminology and definitions available. Therefore, the relevant authority of each country has been asked to fill in the table. The consortium was also interested in a clear understanding of the proposed terminology. The possible responses have to be considered as follows: - “a”: fields available - “b”: definitions not available - “c”: fields not clear to the relevant authority of the fire statistics. These considerations have now been addressed in the report in Section 1.2.

					The analysis of the fields collected in the fire statistics is now included in Section 4 of the final report of Task 1. The revised report of Task 1 includes: - Semantic analysis of the definitions available in the fire statistics and comparisons with those provided by the ISO 17755-2 - Evaluation of the fields collected by the various fire statistics - Specific and general conclusions about the findings of Task 1.
12	DG ESTAT	1st progress report	Task 1	There is incomplete usage of the statistical methodology that distinguish between concepts/phenomena, dimensions and positions/code lists. In particular, the latter is not analysed systematically, although could/should be the core of the project / few examples of coding is presented in DK or EE fiche. Too often the coding list is presented as the definition (IE, IT).	The consortium believes that it is important to clarify if specific fields are described by the definitions or covered by a dropdown menu. This is the reason why this, as far as possible, is specified in the tables of the investigated countries. These considerations are now clearly addressed in Section 1.2: “where no definition is available and the specific fields are included in dropdown menu, this is clearly stated”.
13	DG ESTAT	1st progress report	Task 1	There are some contradictory information, for example: CZ says no definition, but the reference says it exist (RO the opposite). Or DE says a=yes but doesn’t provide it nor the reference. Or NL and other that deleted the column for references.	In Appendix I: For the Czech Republic, there are specific fields that are determined by laws, government decisions and other internal acts. However, definitions are not publicly available. For Romania and Germany, the tables have been edited as suggested. In Appendix I and II, the references for Austria, Germany and Switzerland have been inserted.
14	DG ESTAT	1st progress report	Task 1	What is meant by “victims” (definition so to count?) and “type of fatalities”? cause of death	Considering fatalities, in some countries, fire statistics provide a proper definition for fire victims while in others, the number of victims is recorded.

				or as socio-economic characteristics of the victim?	The type of fatalities is referred to as the cause of death while the socioeconomic characteristics (e.g. age, gender) and this is described in Section 3.8 of the final report of Task 1.
15	DG ESTAT	2nd progress report	Task 2	As already asked, would have expected some dedicated comments on the expectations of specific type of actors as insurance companies and national statistical offices. These are two particular types of expertise which could deserve a paragraph to highlight their specific feedback to the survey. We agree with you expectations.	We initially wanted to investigate the difference in the type of responses. However, only 3 insurance companies responded to the survey (one from Germany, one from the Netherlands one from Sweden). This is not statistically significant to see a proper trend, so this is why we included their answers with the "Other" stakeholders. If we look carefully at their responses, we do not see any striking differences with the rest of the responses. As for the national statistic offices, none of them answered our survey, unfortunately. The vast majority of the answers were from the Ministries and the fire brigades. This is the reason why we did not add a paragraph about this topic.
16	DG ESTAT	2nd progress report	Task 3	Good development of some basic statistical scenarios, but I would have expected some more reflection on the institutional aspects: if there is already a central body for each country in charge of collection and analysis of data about fires in buildings or if it should be designated for the future; the range of the mandate including enforcement of a common methodology; if a sampling strategy has to be designed, which framework data could be used to design it (which variables are available for stratification and from which source they come from); etc.	Table 1.4 in Annex 1 provides information on Who collects the data, What Entity Processes the data and What entity reports the data as found during the data collection part of the study in Task 0 and 1. Going into further detail on this is beyond the scope of this task. Considering that no decision is made in Task 3 regarding which collection method to propose going forward talking about sampling strategy and data to be used for designing this is far beyond the scope. This could be touched upon in Task 7 depending on the decision made in that task. However it should be taken into consideration that this is something that is influenced by particular national customs and systems and will need to be spelled out in negotiations.

17	DG ESTAT	2nd progress report	Task 3	also the timing of the data collection is important to analyse (the actual practice is to fill a form in the x days after the intervention ? how long intervention teams are in charge to wait and inquiry about the health status of victims ? by when they have to send reports to an higher (national) level ?). This is important to decide the exact feasible definition of the nb of death and nb of injuries (the "no limitation of time after the fire" actually stated in task 4 risk to be not feasible)	The timing of when data are collected is not something that is readily available or even reliable if it was. Considering the challenge in obtaining reliable information on this and that it isn't within the scope of the this task we didn't analyse the timing part of the data collection. We did however, discuss the different steps the data collection has to go through and the table comparing the different methodologies shows the advantages/disadvantages for each of these. It is not the intention that the data collection teams are to wait to inquire about the health status of victims before adding the data to their local database. What is encouraged is that when they learn new information about an incident, either status of victim or cause of fire from investigation, that the data set is updated appropriately. Explaining this in detail should be part of the training on how to use the system but defining this is beyond the scope of this Task.
18	DG ESTAT	2nd progress report	Task 3	the cost part looks weak because of the absence of the above point.	We have on purpose not gone into the cost at the local level as this is the same no matter the collection method. So the major difference in cost is a national level and that was analysed based on available information.
19	DG ESTAT	2nd progress report	Task 3	cost part isn't developing an analysis looking at which costs/efforts are already in place and which "additional" ones would be needed to implement an harmonised approach (i.e. periodical EU level meetings)	This would require a research project on its own as we would need to go into every country and look at what is in place. Considering how difficult it was just to get the information we did, trying to get to this level of detail would take a lot more effort and would have been cost prohibitive.
20	DG ESTAT	2nd progress report	Task 3	the possible exploitation of insurance data as a complementary source of information is not covered (with all its problems in terms of keys	It is mentioned in paragraph 4 of chapter 2 that insurance data can provide key information for data collection. However, it is the experience of everyone on the team that these data are almost

				to allow microdata linking and/or macro data linking).	impossible to access at this point. Unfortunately insurance companies are not willing to share data through linking at this point. In some instances it might be possible to get information for a specific incident but this will take a personal contact to the insurance company. With these significant complication we decided not to go into detail on this issue.
21	DG ESTAT	2nd progress report	Task 4	nb death/nb injuries: the "no limitation of time after the fire" actually stated in task 4 risk to be not feasible	We chose the "no limitation of time after the fire" because we wanted to accommodate the practices in all of the EU countries, also because it is already defined as such in ISO TS 17755-2. As we are getting many comments about this specific choice, we reconsidered it and decided adding a limit of 1 year after the fire event. This is already the practice in some countries such as the USA. Also, as countries usually publish their fire data with a 2-year delay, having a 1-year time limit would allow updating the number of fire deaths/injuries while they are still analysing the data and before publication. We expect that the change from "no limit" to "1-year" would not have a major effect on the statistics and trends.
22	DG ESTAT	2nd progress report	Task 4	- if for the type of building you are re-using a Eurostat definition it is important to say and indicate the source, in order to be able to follow any possible development (i.e. the summary tables that will be released next year for the 2021 census results)	We added the reference to the report
23	DG ESTAT	2nd progress report	Task 4	for each of the proposed definition of the variables, I would have expected at least a paragraph discussing how easy/difficult it could be to implement it looking at the actual practices described in task 0 and 1 (for example: this is already the case in 20 countries, while 5 other	We added a section regarding this point, (see 4. discussion on the implementation of the defined variables in the EU countries), however it remains qualitative.

				are still using a more/less precise definition which could be harmonised with low effort/the adoption of a very different approach); could be added after the argumentaire in the annex.	
24	DG ESTAT	2nd progress report	Task 4	there could had been a final section about the key indicators to be derived from such variable and from their combination with other existing statistical data (i.e. standardized frequency of fires – or of fires with casualties - by type of buildings, using census data in the denominator; incidence of casualties for fires in residential buildings; breakdown by NUTS regions and by degree of urbanisation; etc)	This is very interesting we touch it a little in the report of Task 3, but it is not in the scope of task 4. As discussed, we will try to cover it in the on-going Task 7.
25	Modern Building Alliance	2nd progress report	Task 2-4	The MBA wishes to propose few changes to the variables listed in Tier 2 of the data to be collected. These includes changing the term “Source of ignition” to “Primary source of ignition” and “Materials mainly responsible for fire development” to “Article(s) mainly responsible for fire development”. The MBA proposes an addition of “Secondary ignition sources” to the variables to be collected.	“Source of ignition” was already modified to “heat source”. A term that is well defined and used by fire investigators. It is difficult adding “secondary ignition sources” to the list without any justifications. We are also not sure that a “secondary ignition source” should be collected as a priority compared to other variables. In our understanding, the secondary ignition source is a flammable object that is heated until its burning point. Therefore, we think that sometimes, this can be covered by the material contributing to fire development. The variable “Materials mainly responsible for fire development” was already changed to Material contributing for fire development. It takes the following values such as Fabric, Upholstered furniture, Flammable liquid, Flammable gas, Paper or cardboard, Building elements, etc. It does refers to both materials and articles, and in the explanations, it is suggested that more than one

					material can be chosen from the list. Nevertheless, we suggest keeping the material for the moment. This can later be adapted in the implementation and translation phases.
26	Modern Building Alliance	2nd progress report	General	The MBA also suggests that the main objectives of the project to include the following: - Integrate EU Fire statistics into Eurostat to ensure the continuity of fire data collection and the supervision on the long term by an official EU body - Make data available for academic purpose	It is difficult to change the objectives of the project at this stage, but your remarks will be included to the discussion in Task 7.
27	Ei Electronics	Final report	Task 6 Cost/benefit assessment	The annual cost of a replaceable battery of €1 is very low. More typical is a cost of 3-5 € per battery which skews the cost benefit very much towards the 10 year sealed lithium battery.	We agree with you that the value used is rather low. The pricing used comes from some previous analysis, but it will be revised in the report.
28	ANEC	Final report	General	ANEC welcomes and supports the report. If the report gets wide support, it will be a very valuable resource for the future and a good place to start working towards the data that are needed to support research and actions to prevent fires and to protect consumers. As we indicated in 2021, “near misses” are an important aspect to consider when trying to identify future fire safety problems. For instance, small fires in electrical appliances, batteries or chargers that may only result in a small local fire and are handled by the owner will not result in the fire service being called or the incident being recorded. If we want to improve future fire safety efforts, it is important to get these small fires reported and for the	This comment was already addressed previously. In addition, we included the following paragraph to address this topic in the final report: We wish to emphasize that the scope of this project is confined to recommendations for collection of national data on fire incidents that occur in buildings. During the review process of this report prior to publication, it was suggested that "near miss" fires can provide important information for fire safety efforts. While we agree that near miss incidents can be instructive, attempting to propose how data from these fires -- many or most of which almost certainly go unreported -- could be collected at the national level falls outside the mandate for this project. During the course of the current project, we encountered

				owner to raise their concerns. “Near misses” may not necessarily be included in official national figures but could point the way to go for much more effective fire safety solutions. The implementation of a scheme that allows the input of near misses should therefore be considered. In a broader context, we hope the report will pave the way for a revitalisation of the European Injury Database (EU-IDB). As we pointed out in the joint ANEC-EuroSafe1 position paper from November 2020, there is a need for the creation of a legal basis for the collection of accidents and injury data, based on a common methodology, with the aim of achieving a high quality, representative and up-to-date data pool for the entire Single Market. The Single Market Programme could provide a sound financial base for this.	multiple ways in which actual fire events are defined by different data collection systems. The report also emphasizes that it can be difficult to determine the completeness of fire datasets due to unreported fires and the complications that missing data may pose for the reliability of data and the accuracy of subsequent conclusions. Those methodological issues would be compounded in any effort to collect near-miss data. Accordingly, while we concur that the pursuit of near-miss data has valuable potential for fire safety, we believe that efforts to identify feasible methods for collecting this data are a matter for separate and future research.
29	Modern Building Alliance	Final report	Definitions	- General comment: The term “material“ used in the documents can sometimes be very difficult to understand. We believe it is important to make distinction and clear definition between material and item/product. A good example will be on section 4.5.3 on page 35: The values underlisted should be categorized as items/products rather than materials. This distinction would aid the fire services or the person filling the incident form to state clearly the values in the form. Section 4.4.3. p 29 about fire safety measures with some examples. I believe that this list	We agree that the word material can be confusing, we therefore changed it to article. We added smoke control systems to the list As well as passive fire protection systems for “fire doors – other compartmentation means”

				could be broadened to include other fire safety measures employed in fire safety strategies such as safe evacuation measures, smoke and heat control systems, passive fire protection systems, prevention measures.	

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