EVALUATION OF PREVENTION AND PROTECTION ACTIVTIES ON COMMERCIAL, PUBLIC AND HERITAGE BUIDLINGS

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INTRODUCTION

The level of community safety is strongly influenced by the outcomes of strategic planning processes. In particular, the allocation of the Fire and Rescue Service resources plays an important role to protect property and lives against adverse events, such as fires, floods or storms.

Strategic planning is even more important at a time of austerity, when governments around Europe are addressing fiscal deficits through programmes of cuts in expenditure. Decision makers are no longer exclusively concerned with the effectiveness of their activities, rather they are required to provide "value for money" services to their community (ODPM 2003). There is a pressing need to 'do more with less'. At the same time regulatory changes place the responsibility on the Fire and Rescue Services to produce long-term plans for their service provision. In the UK, these are known as Integrated Risk Management Plans. These documents explain how risk based approaches are used to guide the complex decision making processes that help to determine service provision.

In order to resolve the complexity of the planning process, the Fire and Rescue Services make use of planning decision support software, e.g. the Fire Services Emergency Cover Toolkit (FSEC), which has been provided to all FRSs in the United Kingdom in 2004. Such tools can be used to predict the outcomes of strategic planning activities, such as moving a fire station or changing the crewing scheme. FSEC helps to ensure that high-level decisions are based on evidence, derived from data analysis, expert knowledge and experimental results rather than subjective introspection. However, the tool must also be supported by professional judgement, especially given that it lacks actual data on previous incidents in particular locations. Risks are calculated and aggregated for building categories rather than using data that is available for each particular property. This lack of evidence contributes to uncertainty in the planning process. In the worst case, it may hinder the evaluation of effectiveness of prevention and protection measures. This lack of specific information on previous incidents also obstructs attempts to audit the effectiveness of prevention and protection measures.

As a result, even sophisticated planning tools, such as the Fire Emergency Services Cover, incorporate default values or assumptions to derive projections for potential loss of life or property. This creates research challenges in accurately predicting property, heritage, and human loss. We must develop improved decision making tools that are capable of evaluating the cost effectiveness for the allocation of prevention and protection resources used in the built environment.

Recent government studies identified the need for further work on the development of FSEC and the management of IT fire data collection (ODPM, 2005; ODPM, 2006). This project contributes to these new developments by making use of actual data from previous incidents

to support the tools used for the evaluation of fire safety measures. The intention is to close the knowledge gap, by creating additional evidence, especially in the field of fire safety management for commercial, public and heritage buildings in order to better inform the risk based allocation of FRS resources.

PROJECT DESCRIPTION

This project evaluates the prevention and protection activities in the built environment. It is conducted by a multi-disciplinary research team with backgrounds ranging from civil engineering to computing science. It is supported by multiple stakeholders including the Department of Communities and Local Government (CLG), Scottish Government, English Heritage, Allianz Commercial, Buro Happold as well as various Fire and Rescue Services in England and Scotland, e.g. Strathclyde FRS, Nottinghamshire FRS and Cheshire FRS.

In order to address the existing research challenges the project consists of three major work packages. The first will identify additional evidence bases to assess the effectiveness and efficiency of prevention and protection measures. The second analyses the data in order to derive evidence on selected measures. The final work package will develop a methodology for decision making regarding the effective and efficient allocation of FRS resources.

We will develop a methodology to evaluate effectiveness and efficiency for prevention and protection measures in the built environment. The intention is to incorporate data that has not been used for this purpose before. By developing a methodology that supports the rapid integration of multiple data sources we can then generate a continuous stream of evidence to support FRS planning activities for community safety.

METHODOLOGY AND INITIAL RESULTS

As the project is structured into three major work packages, we firstly aimed to identify additional evidence bases to be used during the course of the project. A literature survey gathered together academic papers, books, standards and guidance documents. We then went on to interview a range of stakeholders. These semi-structured interviews investigated the planning applications, tools and techniques that are used within the Fire and Rescue Services to carry out Integrated Risk Management Planning.

These elicitation techniques helped to identify different approaches to planning across different Fire and Rescue Services. The interviews and other surveys identified a number of different software applications that are used within the Fire and Rescue Services. There currently is no uniform methodology nor is there any consistent application of decision support tools (Konukcu and Bouchlaghem 2010).

In addition these systems currently lack integration what as a result can also lead to difficulties in ensuring that lessons are transferred between different FRS when they all seem to use very different tools (Raue and Johnson 2010). These findings led to the development of a code of practice for information sharing in the next generation, enterprise information architectures being proposed by central government (Johnson and Raue 2010).

The initial elicitation phase led on to a number of subsequent activities, such as exploratory data analysis, data quality evaluation on the datasets obtained as well as data mining exercises. The datasets that are currently being used include information about previous

incidents derived from the Fire Damage Report (FDR1) database as well as its successor the Incident Recording System (IRS). We are also using a number of regional Fire Services Emergency Cover datasets.

These different sources are providing information about the incidents, about the resources involved, about consequences and about the active or passive fire safety measures that were available. In combination with appropriate data mining techniques, such as correlation analysis, regression analysis or Bayesian networks, the existing data will be analysed to derive a model that describes the inter-dependencies that together determine the level of fire safety management in a building and the consequences of a fire.

This project addresses the risks to public, commercial and heritage buildings. We, therefore, also need to consider additional reports and case studies from the insurance industry and heritage bodies. For this work, we anticipate that case-based reasoning techniques can help us to navigate a growing dataset. These techniques can be applied to commercial and industrial sites as well as for heritage buildings, where the consequences are more likely to have a devastating impact on the environment and national heritage.

The final stage of our work will use the output from the data analysis to provide an evidence base for fire risk assessment. The intention is to generalise these techniques to develop a methodology that supports the effective and efficient allocation of FRS resources. This methodology will then be evaluated and refined through pilot studies, conducted with Fire and Rescue Services in England and Scotland.

CONCLUSIONS

The Fire and Rescue Services need to plan for, and react to, a large number of adverse events that affect the built environment and threaten human life. Regulatory changes and the current economic climate force the Fire and Rescue Services to provide value for money services, while maintaining an acceptable level of safety in their communities. They must ‘do more, with less’. Decision makers therefore need to incorporate vast amounts of information to allocate resources in both, an effective and efficient manner. In the future, strategic decision makers will rely more and more on the projections and predictions from planning applications. We need to make sure that these tools are based on evidence derived from actual data rather than sets of assumptions. This project, therefore, will support the Fire and Rescue Services by:

- exploring the current level of planning in the Fire and Rescue Services,
- investigating tools and techniques used for Integrated Risk Management Planning,
- identifying additional evidence bases and software application to be considered for the future data analysis and risk assessments,
- evaluating the prevention and protection measures currently used in commercial, public and heritage buildings in regards to the efficiency and effectiveness as well as
- creating a methodology for the efficient and effective allocation of resources to support the Fire and Rescue Services during the process of Integrated Risk Management Planning.

ACKNOWLEDGEMENTS

The work described in the paper was funded by the UK Engineering and Physical Sciences Research Council grant EP/G026076/1; Evaluation of Prevention and Protection Activities On Commercial, Public and Heritage Buildings and jointly supported by a number of collaborators in the Department of Communities and Local Government, Scottish Government, English Heritage, University of Loughborough, Buro Happold, BSI, Allianz Commercial, Strathclyde FRS, Nottinghamshire FRS and Lothian & Borders FRS.

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