

FIRE RISK MANAGEMENT CONFERENCE

14th April, 2010

Evaluation of Prevention and Protection Activities on Commercial, Public and Heritage Buildings

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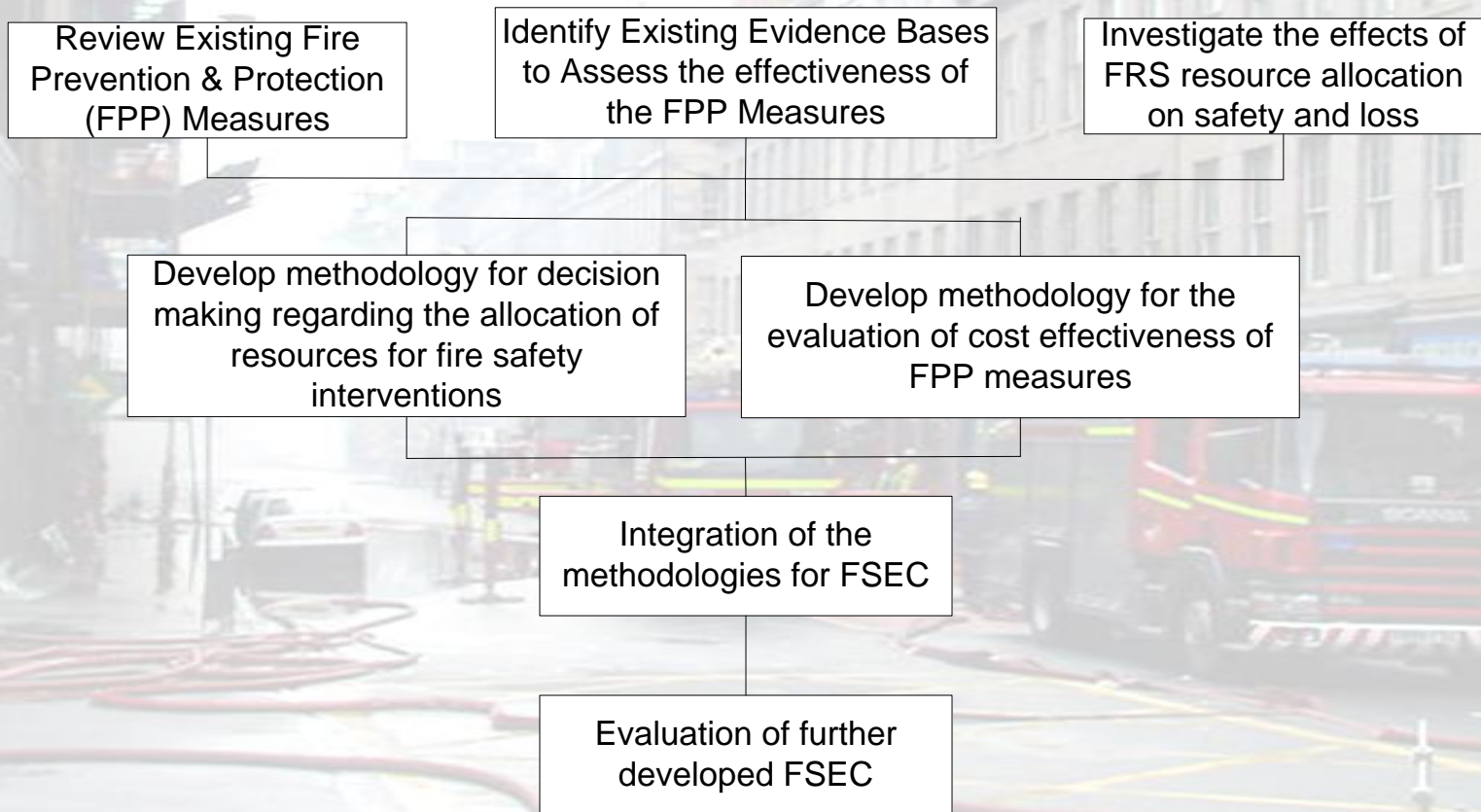
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- E-ProBuild Project
- Research Methodology
- Fire Risk Management
- Integrated Risk Management Planning
- Decision Making in the Context of IRMP
 - Information Processing and Knowledge Discovery
 - Decision Support through Evidence
- Improving Resource Allocation
- Future Research

- The main aim of the research in this project is to investigate the value and effectiveness of prevention and protection measures and activities used in commercial, public and heritage buildings with the view of improving decision making on the allocation of resources within the context of IRMP.



E-ProBuild Project-Collaborators

EPSRC

Pioneering research and skills



University of Glasgow | Department of Computing Science



**FIRE RISK
MANAGEMENT**



**Fire Protection
Association**

STRATHCLYDE
FIRE & RESCUE

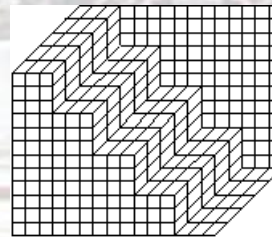


FARMSS
FIRE AND RISK MANAGEMENT SUPPORT SERVICES

**CARDIFF
UNIVERSITY**

**PRIFYSGOL
CAERDYDD**

Allianz 

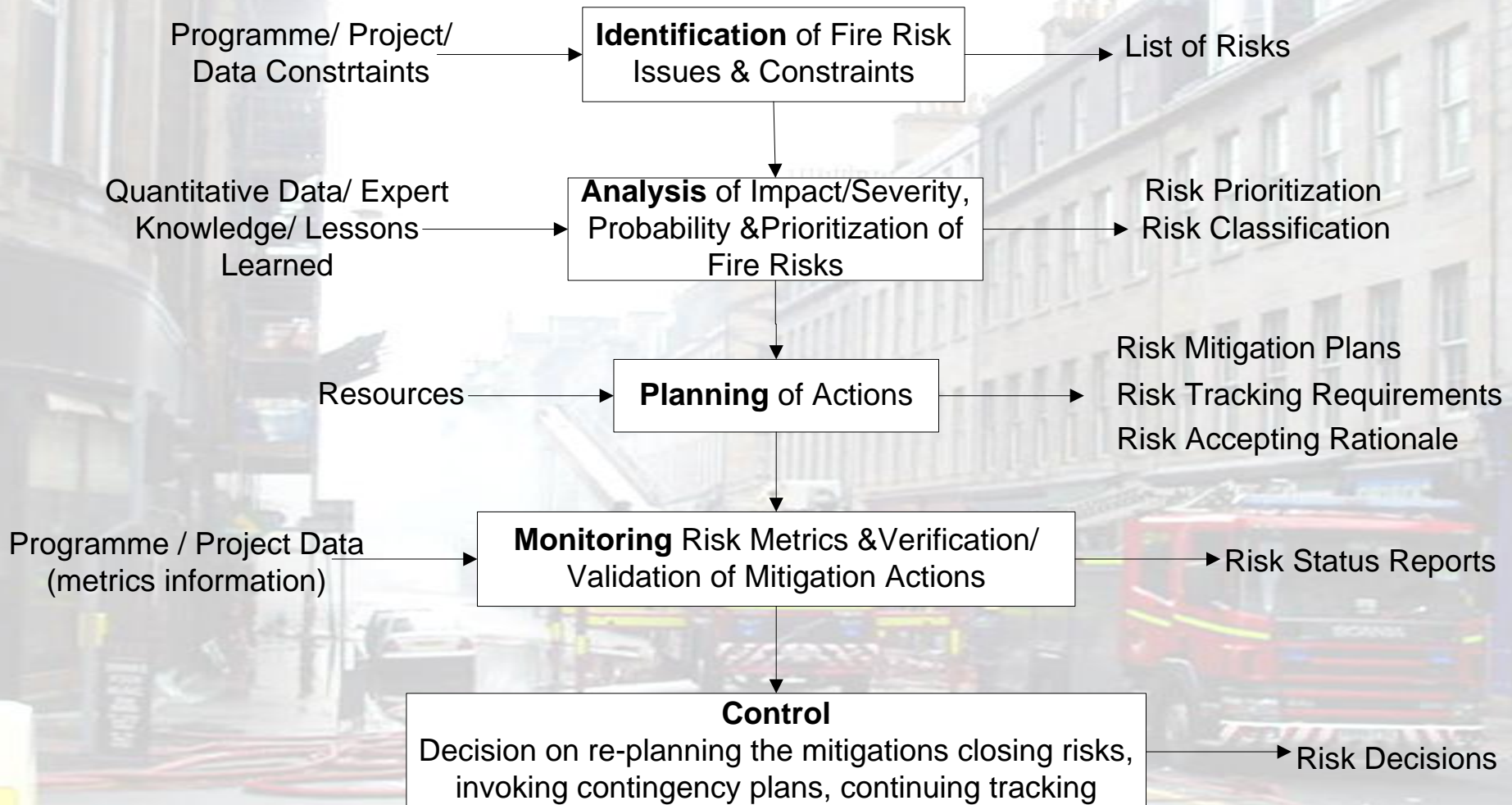


Buro Happold



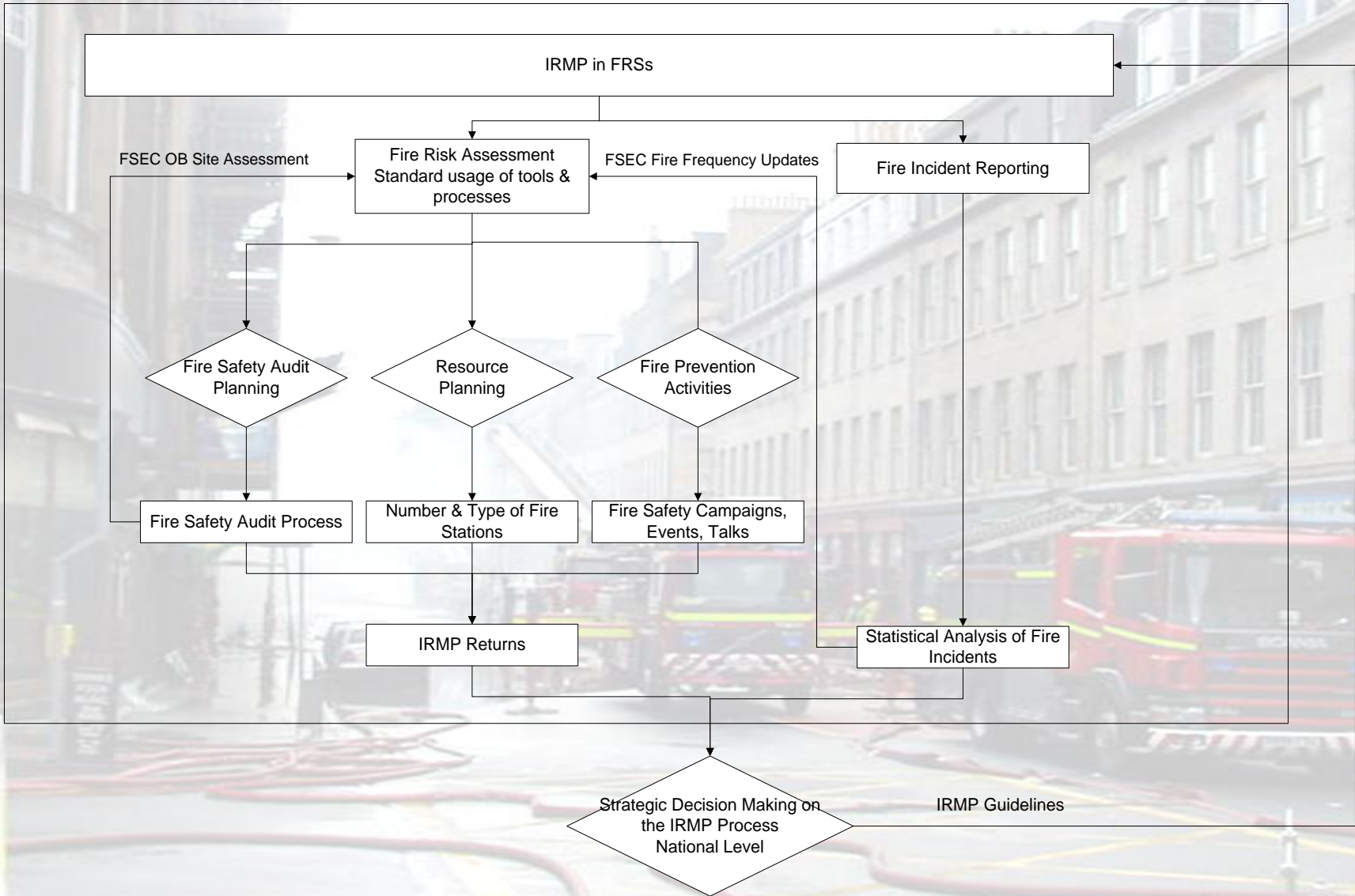
ENGLISH HERITAGE

- Literature review
- Qualitative data collection techniques to review the current process in FRSs (FRS visits, interviews, questionnaires)
- Application of risk analysis techniques for the evaluation of the performance of protection measures used in buildings
- Application of information management techniques to analyse existing data on emergency events



The aim of IRMPs is to improve community safety and make a more effective use of FRS resources by:

- reducing the incidence of fires;
- reducing loss of life in fires and accidents;
- reducing the number and severity of injuries;
- safeguarding the environment and protecting the national heritage;
- providing communities with value for money”.



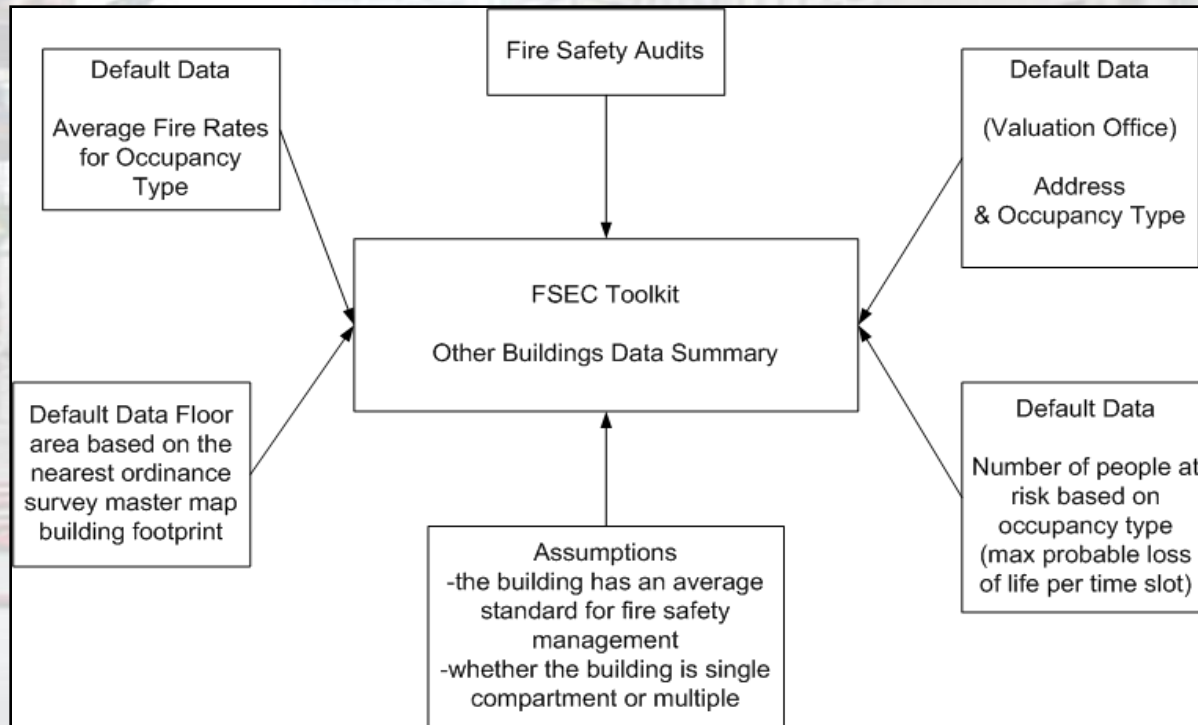
FRSs deliver their enforcement duties through locally determined, risk-based programmes of Fire Safety Audit (or inspection) visits to non-domestic premises.

Based on Different Sources

Different Tools



The Fire Service Emergency Cover (FSEC) Toolkit is a software-based toolkit enabling FRSs to assess the risks from fire and other incidents within their area of responsibility in order to allocate resources appropriately to that risk and predict the effectiveness of risk reduction strategies employed.



Other Building Site Assessment : Licensed premise 17, ANYWHERE STREET, CARDIFF, CF10 6DB ✕

Address: Location:

Occupancy of Building:

Stores: Size: 5 Pts

Calculated Size

Footprint: SqM

Total Area 2779 SqM

Extremely Large

Alarm: 0 Pts AFA present ?

Type of people: 0 Pts

Smoke control: 0 Pts

Management of Fire Safety: 0 Pts

Sprinklers: 0 Pts

Final scores:

Life Risk: High

Property Risk: High

Relative Risk: 5.19

Date details from Fire Service records added:

Initials:

Date details of site survey added:

Initials:

DLG Version 1-1

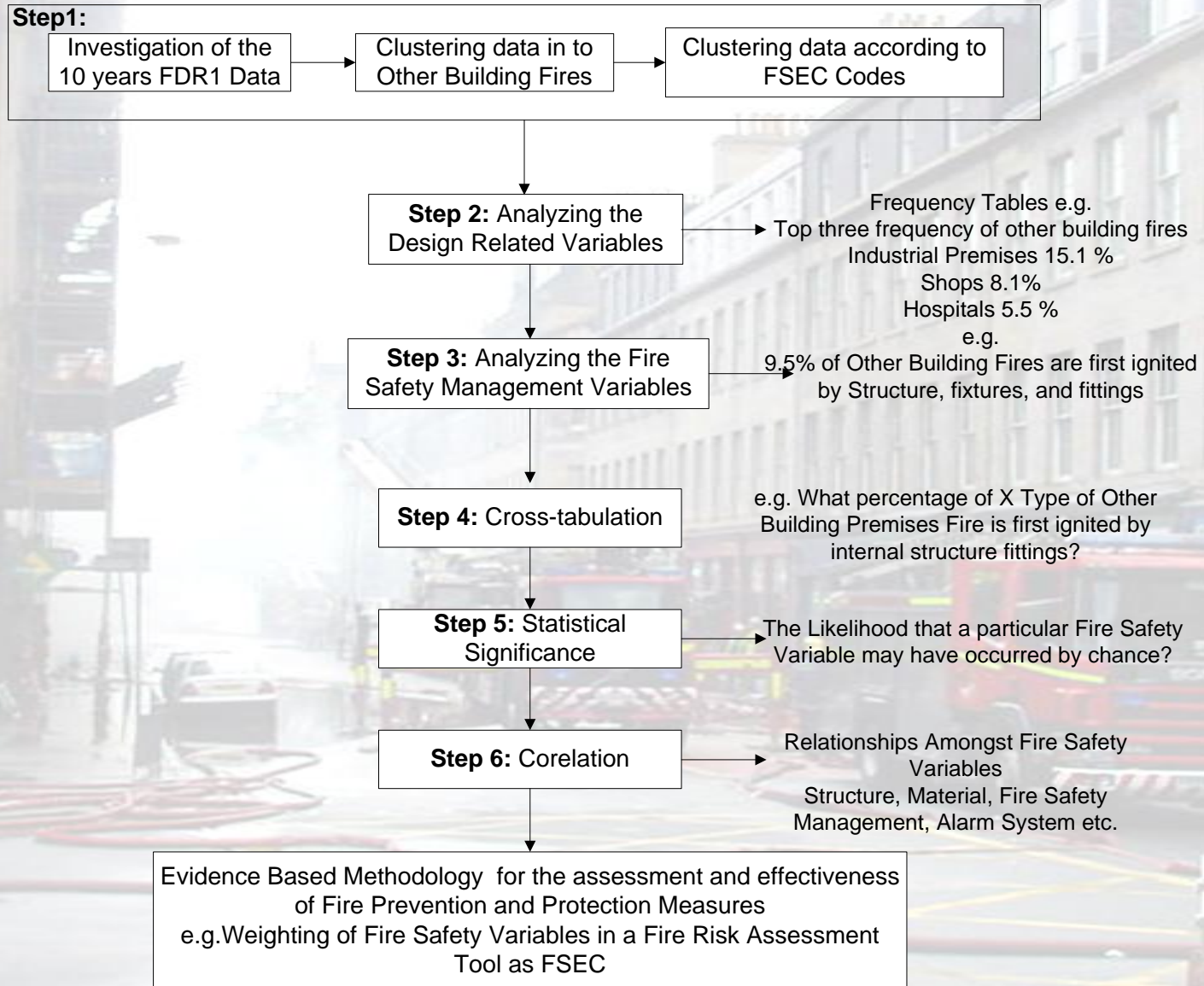


Data Sources of Risk Assessment in FSEC

- Frequency of fire against size from the Fire Safety Engineering Manual, prepared by **NFPA** which shows the impact of fire on the size of buildings.
- Fire Warning System: **FDR1**
- Smoke Control System: **FDR1**
- Sprinklers: **FDR1** and the insurance industry (fire where there was a sprinkler, if there was a sprinkler what is the frequency, how many times it worked)
- Fire Safety Management: **Insurance industry**

FDR1 Data is converted by the CLG into data items which make up an annual database of fire statistics (from 1981 onwards)

- Age of Fire
- Discovered by Person or System
- Alarm Details
- Type of Property
- Main Trade of Business (Impact in Terms of Cost)
- Occupancy/ Place/Room/Floor where Fire starts (Design)
- Extinction Systems
- Fire Fighting Method
- Resource Details (Number of Jets, Pumps, etc.)
- Defect, Act Giving Rise to Ignition (Fire Safety Management)
- Sources of Ignition (Fire Safety Management)
- Material Ignited First (Design)
- Material Mainly Responsible-Composition (Design)
- Explosion Details
- Fire, Heat, Smoke Damage in Percentages
- Total Area damaged

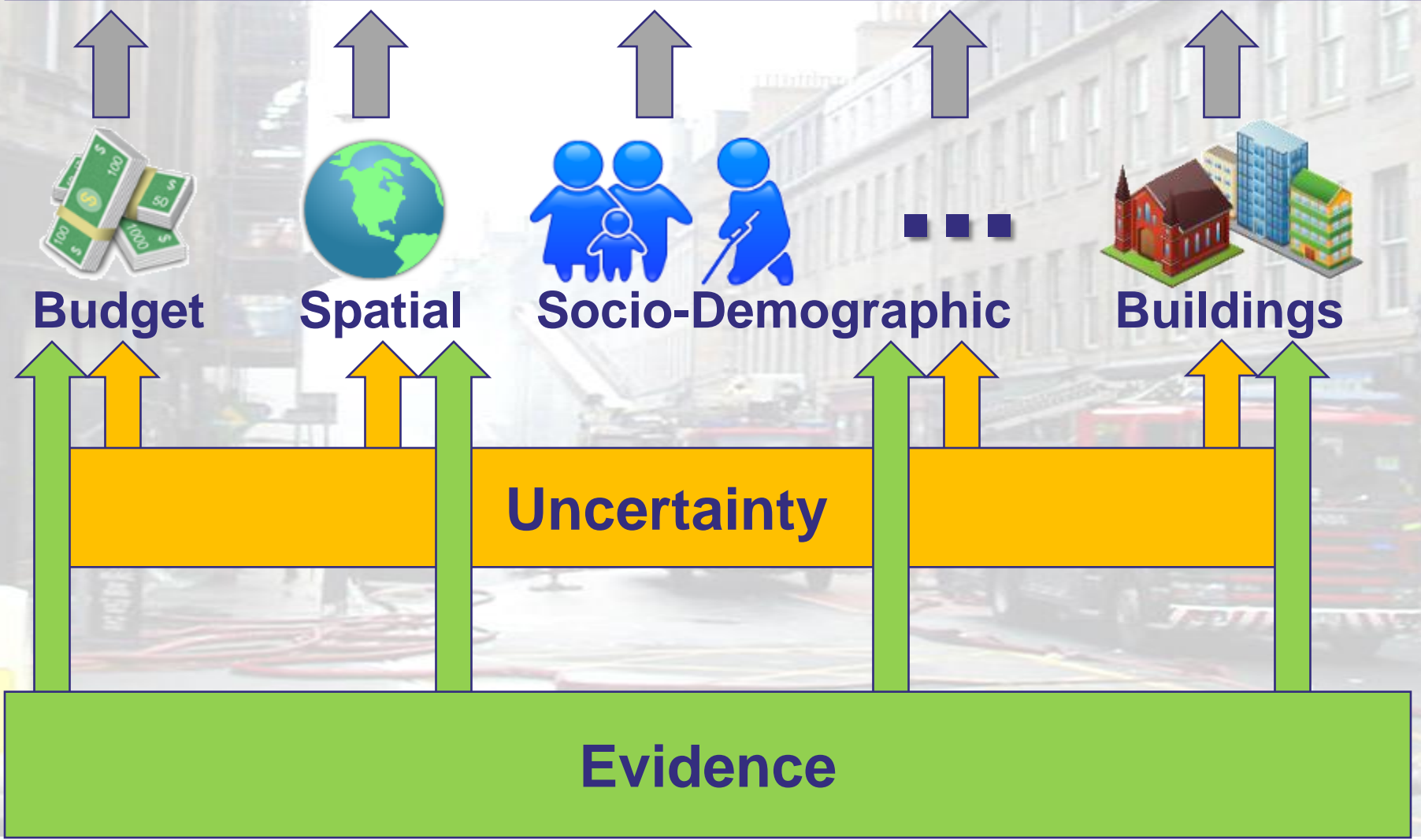




Integrated Risk Management Planning and Uncertainty

CREATING EVIDENCE TO MITIGATE UNCERTAINTY IN THE PLANNING PROCESS

Integrated Risk Management Planning



Providing Evidence to inform Planning

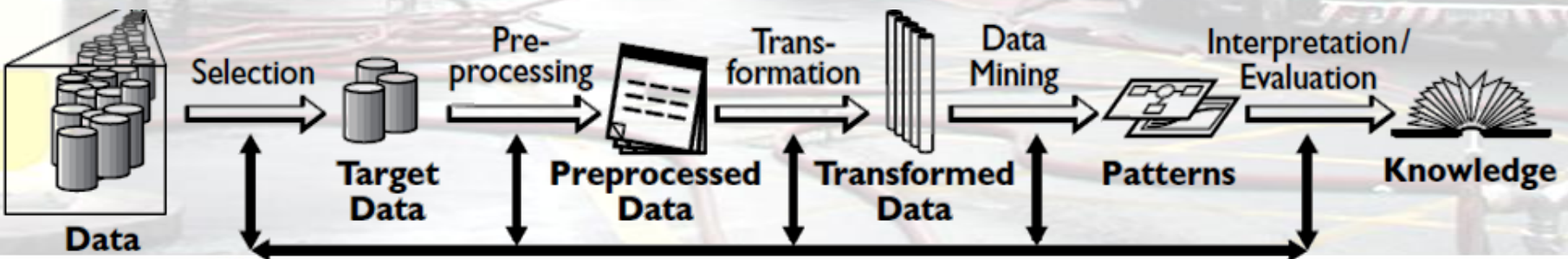
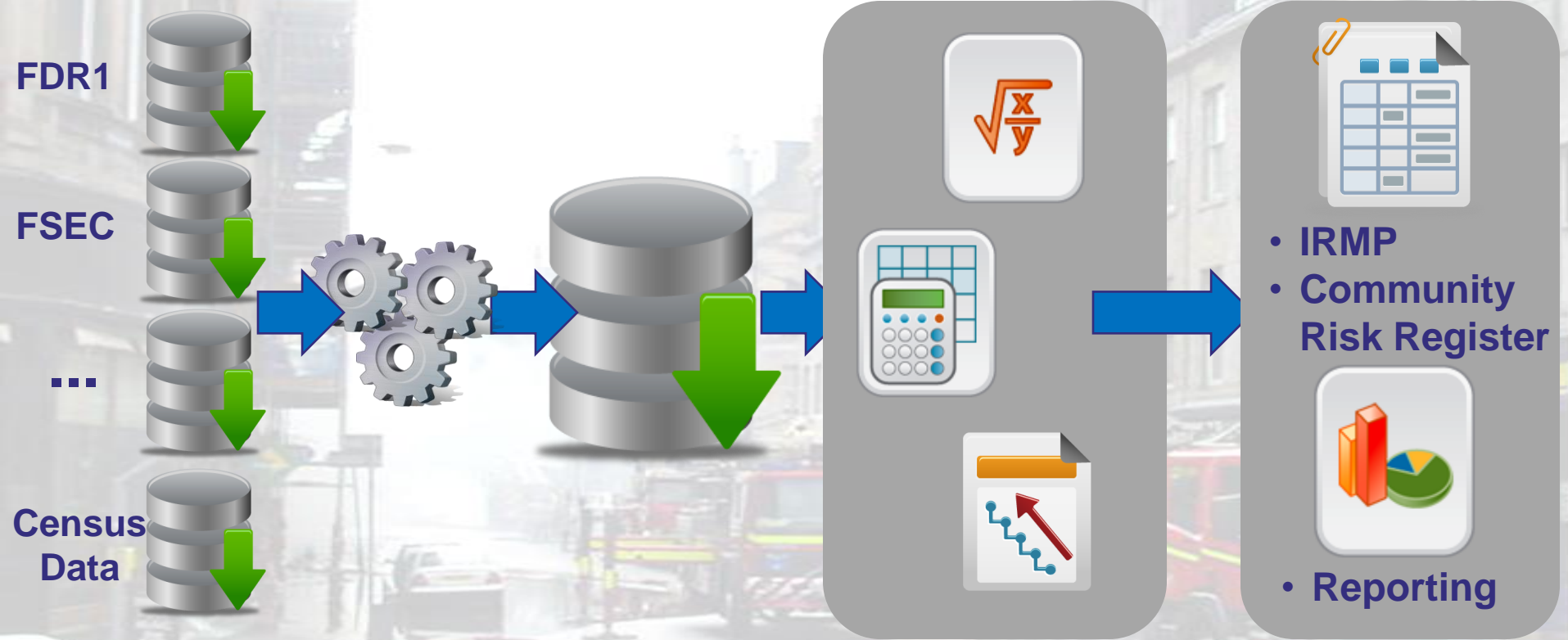


Information Sources (IS)

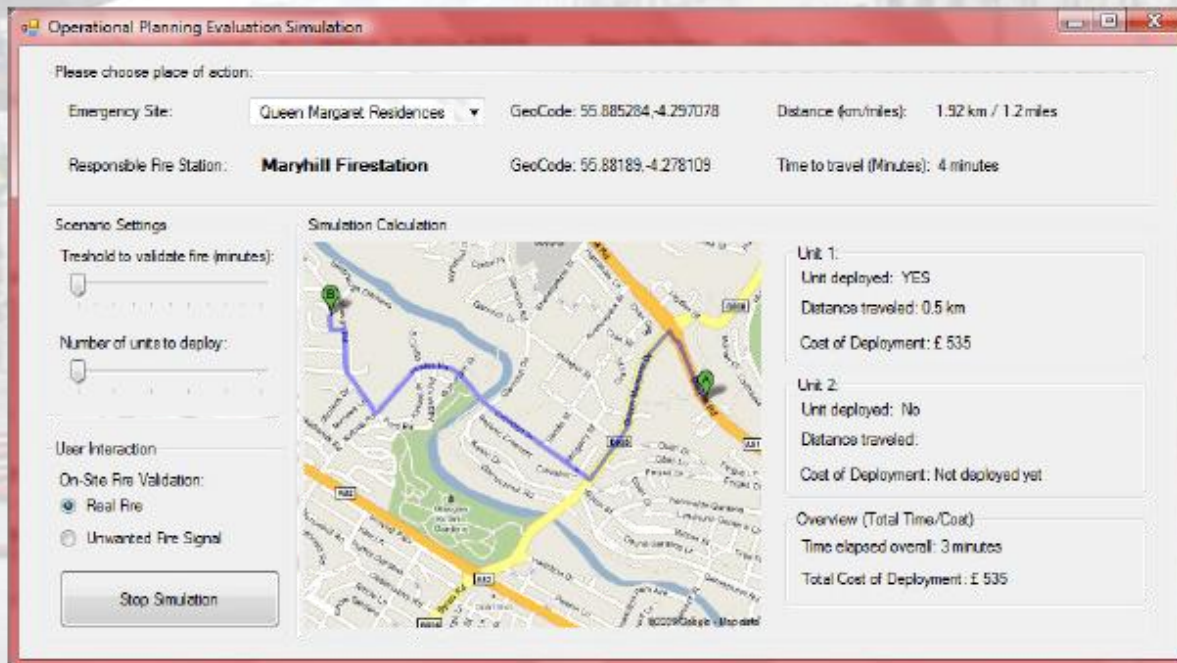
Aggregated (IS)

Decision Support & Expert Systems

Planning Processes Auditing



- Planning Tool for Evaluation of Operational Planning Strategies (Response to UwFS)
 - Employing FSEC, FDR1 Data
 - Simulating Response to False Alarms
 - Calculating the Benefit of Changes in Response



The screenshot shows the 'Operational Planning Evaluation Simulation' window. It features a central map with a blue route and a red fire engine icon. The interface is divided into several sections:

- Emergency Site:** Queen Margaret Residences (GeoCode: 55.885284-4.297078, Distance: 1.92 km / 1.2 miles)
- Responsible Fire Station:** Maryhill Firestation (GeoCode: 55.88189-4.278109, Time to travel: 4 minutes)
- Scenario Settings:** Threshold to validate fire (minutes) and Number of units to deploy (sliders).
- User Interaction:** On-Site Fire Validation (Real Fire selected, Unwanted Fire Signal unselected).
- Simulation Calculation:** A map showing the route from the fire station to the emergency site.
- Unit 1:** Unit deployed: YES, Distance traveled: 0.5 km, Cost of Deployment: £ 535.
- Unit 2:** Unit deployed: No, Distance traveled: , Cost of Deployment: Not deployed yet.
- Overview (Total Time/Cost):** Time elapsed overall: 3 minutes, Total Cost of Deployment: £ 535.

A 'Stop Simulation' button is located at the bottom left of the window.

- Willingness to share information needs to be encouraged
- Information Sources
 - Heterogeneity of the underlying Systems leads to huge and costly transformation processes
 - Quality of data must be assured through standardizes data quality assurance processes
- Employ standards of recording data (standard processes and data formats)
- Provide transparent, effective and usable services to the decision makers



Developing an Evidence-based Resource Allocation Methodology

FINDING BEST PRACTICES IN RESOURCE ALLOCATION

What are we aiming for?



- Evidences based Methodology for Resource Allocation
- Different Levels of Planning need to be considered

Level of Planning	Entities Effected (Response)	Entities Effected (Prevention)	Planning Process Effected
Fire Station	<ul style="list-style-type: none">• Resources (Fire-Engines, ...)• Crewing (Retained,...)	<ul style="list-style-type: none">• Fire Safety Officers	<ul style="list-style-type: none">• Operational Planning• Tactical Planning
FRS	<ul style="list-style-type: none">• Fire Stations• Resources (Engines, Staff, Facilities, ...)	<ul style="list-style-type: none">• Fire Safety Officers• Fire Safety Campaigns (HFSC, ...)	<ul style="list-style-type: none">• Strategic Planning (IRMP, CRR)• Community Fire Safety (CFS)
National	<ul style="list-style-type: none">• Fire Service Authorities	<ul style="list-style-type: none">• National Safety Campaigns	National Budget Planning

- Data that could be analysed
 - Response Time vs. Loss
 - Response Time vs. Business Loss (Interrupt Business)
 - Response Time vs. Heritage Loss (Special Buildings)
 - Response (#Engines) vs. Loss (Quantity of Engines and FF)
- Discover areas of high potential risk/cost buildings (... to change Response Policies by considering local characteristics)
 - How to respond to Alarms in Student Accommodation?
 - Other Buildings vs. Dwellings Categorisation (Peak Time Casualties/Fatalities)
 - What about on-site call filtering (How to react to False Alarms?)

- Data that could be analysed
 - Number of Fire-Stations vs. Fires (National Average and outliers)
 - Number of FS vs. Area/Population
- Categorise FRS areas and find best practices
 - Allocating Resources (FS and number of engines) according to Response-Time or Cost of Fire (Risk Categories)
 - New Issues introduced through changes of resource allocation

Data Analysis and existing Methods

- Information Retrieval
 - Data Mining and Retrieval
 - Data Transformation
- Inference (Find and Proof Hypotheses)
 - Statistical Analysis
 - Bayesian Inference
 - Machine Learning
- Formal Analysis & Theory
 - Popular Matching
 - Constraint Programming Algorithms
- Building Simulations for improved Decision Support

- Create Evidence for the Effectively and Efficiency of Prevention And Protection Activities On Commercial, Public And Heritage Buildings
 - Data Analysis on Ignited Materials
 - Resource Allocation on different planning Levels
- Build tools based on evidence to provide these to decision makers
- Create and document research methodologies for creating evidence from FRS data

Thank you very much for your attention

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