NDMP Data Dictionary Project

Summary Report of Phase 1

Also available is the Reference Guide of Phase 1 with Attachments and Appendices

Report August 2010

Prepared by the Australian Bureau of Statistics (ABS)

In accordance with the
Project Plan for the Natural Disaster Mitigation Program (NDMP)

For presentation to the Steering Committee for approval.

The NSW Fire Brigade (NSWFB) is the Sponsor of the Contract Material.

Copyright

Document Control

Document History

AUTHOR	DATE	VERSION	DESCRIPTION
Michelene Bruce	12/12/2009	0.1	Document created
Jill Tomlinson and Michelene Bruce	08/2/2010	0.2	Document amended, renamed
Michelene Bruce	24/2/2010	0.3	Incorporated changes from project team
Michelene Bruce	4/05/2010	0.4	Incorporated changes from Advisory Group
Michelene Bruce	20/07/2010	Supplement to Report v3	Changes from workshop
Michelene Bruce	27/08/2010	0.5	Incorporated changes from Advisory Group

Document Approval

This document requires review and sign off by:

NAME	POSITION / EMAIL	SIGN OFF
Peter Damcevski	Director Statistical Coordination Branch Australian Bureau of Statistics	16/12/09
Dawn Easton	Project Management Team	
	Advisory Group	
	Steering Committee	
Dawn Easton	Committee Chair Director Strategy and Planning	

Related Documents

VERSION	FILE LOCATION \ NAME	AUTHOR
Original	Contract	ABS
V1.2	Project Plan	NSWFB
Original	Agreement to Proceed	Dawn Easton

Table of Contents

The Reference Guide of Phase 1 also contains:

Attachments
Attachment 1 Environmental Scan/Literature Review
Attachment 2 Comparative Gap Analysis
Attachment 3 Draft Data Model

Appendices
Appendix A Abbreviations and symbols
Appendix B Sources/References
Appendix C Letters to Agencies
Appendix D List of Questions
Appendix E Second (United Kingdom) UK example

Front page image courtesy of CFA and AFAC

1 About this Document

This Summary Report presents the deliverables for Phase 1 of the NDMP Data Dictionary Project. The deliverables are: an environmental scan/literature review; a comparative gap analysis; a draft data model; and the recommendations for the Project Steering Committee.

A Reference Guide has also been prepared. The Reference Guide provides in-depth background information on Phase 1 together with information on the process, consultation and findings of the Phase 1 activity. This Reference Guide consists of Attachments and Appendices relevant to the development of the proposed data model.

Please note that the full reports on the deliverables are found in the attachments as follows:

- Attachment 1: Environmental Scan/Literature Review;
- Attachment 2: Comparative Gap Analysis; and
- Attachment 3: Draft Data Model.

Following acceptance of the Phase 1 deliverables and the recommendations, Phase 2 of the project will require additional consultation with emergency services organisations' (ESOs) to finalise a nationally agreed data classification schema and data dictionary.

1.1 Foreword

I have pleasure in submitting to you the Project Report for the 'Natural Disaster Mitigation Program (NDMP) Phase 1 of the Data Dictionary Project' for presentation to the Steering Committee for approval. The Project Sponsor is the NSW State Emergency Management Committee.

This Report has been prepared in accordance with the Project Plan for the NDMP Data Dictionary Project. The Project Plan follows on from the approved NDMP Funding application and approved NDMP Work plan and has been funded on a 50/50 basis by both the Australian and NSW State Government. The NSWFB is the Contract sponsor. The NDMP was a national program aimed at identifying and addressing natural disaster risk priorities across the nation, but has now been replaced by the Natural Disaster Resilience Program (NDRP) from 2009-10 to fund disaster mitigation works and support for emergency management.

The purpose of the NDMP Data Dictionary Project is to deliver a data model, data classification schema and data dictionary to enable and support collection of common, consistent and relevant data for Prevention, Preparedness, Response and Recovery (PPRR) activity. This will facilitate subsequent reporting for policy, project and funding decision making at all levels, and support comparability for jurisdictions and agencies. As the proposed data model was developed using, in part, the information provided by agency personnel, all omissions or amendments reflected in these documents should be referred to the ABS.

The project has been divided into two phases. This is the first phase in which an environmental scan/literature review, a comparative gap analysis, a draft data model and recommendations are attached. The second phase of the NDMP Data Dictionary Project will be to reach national agreement on what should be included in ESOs activity collection and reporting systems and on a core data set to enable production of a national data dictionary.

I would personally like to thank those agencies and individuals that have contributed to the project.

Cathy Bates
Director
Client Services Branch NSW
Australian Bureau of Statistics

1.2 Acknowledgements

The ABS could not have undertaken this project without the contributions of a large number of individuals and organisations who provided various systems and other documents, schema and screen shots, who answered questions and who gave up their time to meet with ABS project team members to demonstrate their systems and provide insight into how their agencies work.

The ABS would like to gratefully acknowledge the valuable input, assistance and support of the following people and organisations:

NSW State Emergency Management Committee, Project Sponsor

Members of the Steering Committee

Ms Dawn Easton, NSWFB Director, Strategy and Planning, Representative and Steering Committee Chair
Ms Darlene Graham, Qld Department of Community Safety (DCS), Acting Director Organisation Performance and Evaluation (replacing Ms Michelle Petroccitto)
Mr Simon Darlington, Office of the Emergency Services Commissioner (OESC), Vic Department of Justice, Senior Performance Evaluation Officer
Ms Yvette Dowling, SA Country Fire Service (CFS), Manager, Operational Information
Ms Carole Dowd, WA Fire and Emergency Services Authority (FESA), Manager, Business Planning and Reporting
Ms Jill Edwards, Australasian Fire and Emergency Services Authorities Council (AFAC), Manager, Strategy and Knowledge

Members of the Project Advisory Group

Mr Nick Nicolopoulos, NSWFB
Ms Helena Mealin, Queensland Fire and Rescue Service (QFRS) (replacing Ms Selena Stanley)
Mr Mark Dole, Emergency Management Qld (EMQ)
Mr Glen Benson, NSW Rural Fire Service (RFS)
Mr Andrew Edwards, NSW State Emergency Service (SES)
Ms Gloria Caruso, Metropolitan Fire and Emergency Services Board (MSB), Victoria
Mr Chris Latcham, Country Fire Authority (CFA), Victoria
Mr Andrew Gissing, Victorian SES (replacing Mr Trevor White)
Mr David van Geytenbeek, Tasmania Fire Service (TFS)
Mr Paul Herrick and Mr Grant Hamon, NT Fire and Rescue Service and NT SES
Ms Yvette Dowling, SA CFS
Ms Carole Dowd, FESA

NSWFB Project Management

Ms Dawn Easton
Mr Nick Nicolopoulos
Ms Vanessa Dickson
Mr Sean Nairn

Additional contributors:

NSWFB: Michael Pitt, Ross Barratt, Alexandria Communications Centre (Graham Tait and Warwick Richardson)

NSW RFS: Jose Montemayor

VIC CFA: Chris Cowley, Deniz Gozukara

QFRS: Ralph Luck, Les Adams

New Zealand (NZ): Chris Balm, NZ Fire Service, Russell Wood, NZ Fire Service, Peter Wilding, Manager Fire Investigation and Arson Reduction, NZ Fire Service

United Kingdom (UK): Gavin Sayer, Fire Statistics Team Leader Communities and Local Government, Fire Statistics Project Office, Office of the Deputy Prime Minister

United States of America (USA): Brad Pabody and Phil Schaenmann, Department of Homeland Security.

Additional thanks are due to: Professor John Handmer, Royal Melbourne Institute of Technology, Ms Clare Guenther, Emergency Management Policy Branch, National Security Resilience Policy Division, Attorney-General's Department.

ABS assistance: Cathy Bates, Marcel van Kints, Rebecca McDonald, Paul Roper, Alistair Hamilton, Stephen Cross, Craig Watson, Juanita Pettit, Emily Hansen.

And all other people, both in Australia and internationally, who assisted in answering questions and providing information used to create the draft data model.

1.3 Disclaimers

The NDMP Data Dictionary Project Phase 1 Report is presented by ABS for the purpose of informing debate and for further consultation. While the ABS has taken care to ensure the information is as correct and accurate as possible, the report and the draft data model are based on information provided by the ESOs. Any omissions and amendments to the information provided in this report should be forwarded to the ABS.

From members of the ABS project team: Peter Damcevski, Paul Nicholls (ABS Quality Advisor), Helen Robson, Rayhana Ruzehaji, Christian Proksch, Jill Tomlinson and Michelene Bruce.

1.4 Preface

All Australian ESOs require relevant data above what has traditionally been collected and reported. Changes to social, economic and environmental landscapes, and the paradigm shift from response-only emergency management to one that includes mitigation, are placing increasing demands on ESOs to improve the availability of data across the PPRR spectrum. The aim is to facilitate informed discussion and decision making within government and the community, and to support policy, planning and accountability reporting for emergency service agencies.

There are a number of key drivers to these information requirements, including:

- addressing or supporting the recommendations in the Council of Australian Governments (COAG) Report on Natural Disasters in Australia, in particular, Reform Commitments 1 (the project will support) and 2 (the project will address), which respectively state: “develop and implement a five-year national programme of systematic and rigorous disaster risk assessments” and “establish a nationally consistent system of data collection, research and analysis to ensure a sound knowledge base on natural disasters and disaster mitigation” (COAG, 2002, p 14); and

- supporting the identified priority areas of work of the Emergency Management Information Development Plan (EMIDP) (ABS cat. no. 1385.0, 2006).

2 NDMP Data Dictionary Project Overview

2.1 Purpose

The purpose of the NDMP Data Dictionary Project is to deliver a data model, data classification schema and data dictionary to enable and support collection of common, consistent and relevant data for PPRR activities performed by ESOs. This will facilitate subsequent reporting for policy, planning and evaluation of services, project and funding decision making at all levels, and support benchmarking for jurisdictions and agencies.

2.2 Description

The Data Dictionary Project is designed and funded by NDMP as a two phase project:

- **Phase 1** – is the development of a draft data model for activity reporting by ESOs (excluding police services and ambulance services) across the PPRR spectrum, as a basis for national consultation (ABS appointed as the Project Team); and

- **Phase 2** – national agreement on what should be included in ESOs activity collection and reporting systems and on a core data set to enable production of a national data dictionary (including data classification schema). (Project Team to be advised).

2.3 Outcomes

The broad long term outcomes to which this project is designed to contribute are:

- A nationally consistent system of data collection and reporting of PPRR activities performed by Australian ESOs;
- Improved data collections to support evidence based decision making on where best to allocate investment across the PPRR spectrum to increase community safety and reduce the costs and social effects of emergencies and disasters;
- Improved data comparability to facilitate benchmarking, particularly in relation to preparedness;
- More complete pictures of agency PPRR activities, especially in relation to prevention, preparedness and recovery;
- Improved data in relation to response activities in large-scale incidents;
- Development of the national risk assessment framework, and in turn informed distribution of investment across PPRR; and
- Improved planning by individual state and territory agencies.

2.4 Benefits

The key benefits that this project will deliver are a data model, data classification schema and dictionary to enable and support collection of common data for PPRR activity for subsequent reporting for policy, project and funding decision making at all levels, and to support comparability for jurisdictions and agencies.

2.5 Project Inception and Approach

This project has had a long inception since it was first accepted for funding by the NDMP in September 2007. The NSWFB engaged the ABS to work on Phase 1. Work commenced in late November 2008 on clarifying the project purpose, scope and deliverables.

In February 2009, after the occurrence of a number of significant events (most notably, the Victorian bushfires and Queensland floods) and progress on a range of other initiatives, NSWFB paused the project, acknowledging the need to review the original project proposal and to confirm, or if necessary, refocus the strategic direction and to clarify the scope of the project. Also, while the original approach for the project was to draw on primarily NSW agencies to develop models and instruments to provide the basis for wider, national consultation, it became apparent that consultation with other jurisdictions at an earlier stage was likely to be more productive. Accordingly, the project was paused and a meeting convened on 25 March 2009 with Australian fire and emergency services to confirm the scope and deliverables of the project, and to reach and agreement on the most appropriate governance framework. A Project Plan, including a Communication Plan, was finalised by NSWFB in June 2009 and a contract between NSWFB and ABS for Phase 1 of the Project was signed in August 2009.

The approach for the project was for the ABS project team to undertake an Environmental scan and then a gap analysis to inform the development of a data model. The ABS project team consisted of a project manager, a subject matter expert and two data modellers/business analysts, with the addition of a (technical) quality advisor. The data modellers/business analysts investigated the agencies' systems and other documentation with questions sent to agencies preparatory to scheduling meetings, to discuss systems and information needs in more detail. Information from other agencies and from the international agencies was considered as a background to the five key agencies' data model, with similarities, differences and aspirational items noted in the comparative gap analysis.

The information gathered from the environmental scan and the comparative gap analysis informed the development of a draft data model for consultation. The consultation process with the Advisory Group resulted in a number of iterations of the initial data model. Feedback from a subsequent national workshop has resulted in three data models for consideration. They are now presented to the Steering Committee for acceptance to complete Phase 1 of this project.

Image courtesy of NSW SES

2.6 Project Deliverables

2.6.1 Phase 1 Deliverables

The deliverables for Phase 1 include an Environmental Scan, a Comparative Gap Analysis, a Report, and a Draft Data Model.

2.6.1.1 Environmental Scan/Literature Review

An environmental scan and literature review was undertaken to identify and describe current data models and standards and reporting systems for activity collection and reporting used by selected ESOs in NSW:

- NSW SES;
- NSW RFS; and
- NSWFB.

Other ESOs considered:

- Victoria CFA; and
- QFRS.

ESO agencies in three other countries:

- NZ;
- The UK; and
- The US.

The ABS contacted all Australian agencies identified for the environmental scan/literature review by email. The Advisory Group members for the five key agencies (identified above) received a letter requesting assistance and a list of questions (Appendix D) while the Advisory Group member for the remaining Australian agencies received a letter requesting assistance in terms of information on systems used and/or information on reporting requirements (Appendix C). These agencies were:

- Emergency Management Qld (Qld SES);
- Metropolitan Fire and Emergency Services Board (MSB), Victoria;
- Victorian SES;
- ACT Fire Brigade (ACTFB);
- Tasmania Fire Service (TFS);
- NT Fire and Rescue Service and NT SES;
- SA CFS; and
- WA FESA.

In addition, the following people were contacted:

- AFAC, through the Steering Committee member, Ms Jill Edwards;
- Prof. John Handmer of the Royal Melbourne Institute of Technology, for assistance with US contacts; and
- Ms Clare Guenther of the National Security Resilience Policy Division, Attorney-General's Department.

A number of papers were reviewed for the model, particularly for aspirational items. These included, among others:

- The Interim Report of the Royal Commission into the Victorian Bushfires;

- Interim Report 2: Priorities for Building in Bushfire Prone Areas November 2009;
- Bushfire Cooperative Research Centre (CRC) Victorian 2009 Bushfire Research Response Final Report October 2009;
- Report on Climate Change and Environmental Impacts on Coastal Communities;
- Australian Emergency Management Arrangements, 2009; and
- Ministerial Council Police and Emergency Management Communiqué, September 2009.

The environmental scan/literature review was used as the basis of the comparative gap analysis. The scan also included responses to questions on emerging agency internal reporting requirements, industry trends and trends that will impact on ESOs' data collection and reporting needs.

For the full report on the environmental scan see Attachment 1.

2.6.1.2 Comparative Gap Analysis

In consultation with Advisory Group members, a comparative gap analysis was undertaken to:

- Identify current agency PPRR activities across all jurisdictions;
- Identify aspirational data categories and items for inclusion in the proposed data model;
- Verify the value of retaining current data categories and items, and identify unnecessary or inappropriate data categories or items that should not be included in the proposed data model;
- Identify and assess the importance of commonalities and differences in activity collection and recording systems;
- Identify and assess the importance of commonalities and differences in definitions, standards and classifications used in the various systems;
- Identify emerging requirements for ESOs' internal and external reporting in PPRR; and
- Identify emerging trends within the emergency service sector and their impact on ESOs' data collection and reporting needs.

A comparative gap analysis of information, both documentary or verbal, supplied by agencies or obtained from agency websites, was undertaken to capture agency PPRR activities across all jurisdictions, agencies' aspirational data categories, and items for inclusion in the proposed data model. Commonalities and differences in activity collection and recording systems, as well as the definitions, standards and classifications used in various systems, were identified.

Most agencies were seen to have 'best practice' in the following areas: strong focus on education and training of all staff; website presence; and were champions of mutual aid. Conversely, areas for development included classification standards and integration and interoperability of systems.

The Comparative Gap Analysis appears in full in Attachment 2.

2.6.1.3 Data Model

The information gathered from the environmental scan and comparative gap analysis formed the rationale for the development of a draft data model for consultation. The consultation process with the Advisory Group resulted in a number of iterations of the initial data model. Feedback from a subsequent national workshop has resulted in three data models for consideration. They are now presented to the Steering Committee for acceptance to complete Phase 1 of this project.

All three draft data models fulfil the requirements gathered by the ESOs; however they represent the grouping of information conceptually, in slightly different ways.

The Draft Data Model appears in full in Attachment 3.

2.6.2 Phase 2 Deliverables

Based on the findings and recommendations from Phase 1, a selected contractor for Phase 2 will consult further across all jurisdictions and ESO representatives to agree on a national data model and core data set to address the PPRR spectrum of operational activities and reporting.

As well as the model, an agreed data classification schema (that is, categorisation of data items into logical groupings) will be produced.

Finally, there will be the production of an agreed data dictionary to provide a standardised format for the collection of data on, and reporting of, PPRR activities and ensure efficient and effective reporting, analysis and interpretation. The data dictionary will complement the developed data model and classification schema.

These outputs are intended to be available for reference purposes and, where desired, for adoption in full or in part for use by ESOs.

Image courtesy of CFA

3 Project Findings

3.1 Environmental Scan/Literature Review and Comparative Gap Analysis

It is clear from the environmental scan/literature review and comparative gap analysis that all ESOs have strengths and weaknesses in different areas. It is also evident that, while ESOs are organised differently in each state and territory, all perform very similar functions with common goals and outcomes. All agencies provide response, preparedness and prevention activities to the community and collect detailed information about these activities, particularly those for response which has historically been the main area of business. Agencies also provide recovery activities, however collected recovery information is mainly centred on the recovery of the agencies' own people and equipment. Little information was gathered on the reconstruction or recovery of the community affected as this is mostly a function of other, agencies and organisations (mainly human service and non-government).

Although the activities across PPRR may be similar, the method or standard of describing them or recording them can be very different across jurisdictions.

3.1.1 Standards

Emergency Management Australia (EMA) and AFAC have provided a good avenue for following common standards in emergency management. Based on the material received and discussions held with selected agencies, the Australian Incident Recording System (AIRS) manual appears to be the only standard that is followed by most agencies. However, slightly different AIRS systems have been developed over time by some agencies. Some agencies have shared systems with other agencies e.g. CFA has provided their AIRS system to NSW SES and South Australian Fire Brigades. Also, NSW SES has provided their version of Request for Assistance (RFA) Online to Qld SES and there are currently discussions underway to expand the use of the NSW SES system to SA with some interest also shown by WA.

Given the real variety in systems and approaches across jurisdictions it is clear that there is still much to do in standardising the way things are defined and measured as well as the core processes across the PPRR spectrum.

3.1.2 Information Technology Systems

Budgets are tight for all ESOs and this is evident in the mix of legacy and new information technology (IT) systems supporting their business. Increasing costs and demands for services means that each agency is under pressure to deliver services more efficiently and effectively. There is also pressure to capture previously uncollected information with current systems with little comparability across Australia in standards, definitions and classifications for these new items.

Inefficiencies currently exist in agencies, with a clear separation between metropolitan/urban and rural fire services. Even where the metropolitan and rural fire services organisationally sit under one umbrella, such as in Queensland, technology systems are still separate, although here efforts are underway to unite the metropolitan and rural fire services. Technology systems play a vital role in supporting all facets of emergency management. Given the substantial investment required to develop bespoke systems, ESOs would benefit from sharing technological systems and implementing national standards.

3.1.3 Common Themes

There were a number of common themes which emerged from the environmental scan/literature review and the comparative gap analysis related to:

- The availability, accessibility and usability of current ESO data (many of which also appeared in the 2006 EMIDP (ABS cat. no. 1385.0);
- Emerging agency internal reporting requirements;
- Emerging industry trends in data management; and
- Emerging trends within the emergency service sector that will impact on data collection and reporting needs.

These themes include:

a) Gaps in information (including spatially enabled) across PPRR, especially for prevention, preparedness and recovery activities for all hazard types as most ESO systems focus on response activities. This will provide increased and more consistent performance reporting for current and emerging national and state reporting requirements. Following the Royal Commission into the 2009 Victorian Bushfires, agencies expect an increased focus on community outcomes flowing from service delivery with a need to expand the reporting of community prevention and preparedness measures for all hazard types;

b) The expansion of ESO reporting and systems and processes for routine and non-routine events including all activities/services performed and interactions amongst people and organisations. This includes prioritising and monitoring the impact and delivery of activities for large-scale, complex, multi-agency events e.g. natural disasters and major campaigns, ideally with the ability to link data from multiple sources, parties and resources (internal and external) to facilitate and support decision making before, during and after emergencies. Interoperable systems development across jurisdictions is facilitated by agencies sharing their systems e.g. NSW SES's RFA Online being used by Queensland;

c) The capacity to identify, monitor, report and evaluate the cost, effectiveness and efficiency of PPRR activities, services (by service categories) and programs, possibly facilitated by the implementation of activity based costing to deliver the actual cost of the service delivery;

d) Data to support the understanding of, and evidence based policy and advice on, the cost/benefit of the different treatment options across PPRR and therefore where best to allocate investment across the PPRR spectrum to increase community safety and reduce the costs and social effects of emergencies and disasters as well as the potential impacts of climate change on ESOs' activities and programs and on community outcomes;

e) Data quality, comparability and consistency generally, coupled with the need for common standards, definitions, classifications and data quality frameworks to integrate data across and within systems, agencies and jurisdictions, including standard counting/business rules. The use of a common terminology and structure across ESOs would assist in breaking down the existing silo mentality;

f) Data collection systems that support data quality, integrity and timeliness and reduce the data collection burden on operational staff (including too many data fields and too many code choices), by increasing the capacity to collect data only once in relation to any activity or event (including automatic capture or from other operational systems) thereby avoiding the need for multiple entries of the same information and any potential data quality issues. Ideally,

this data capture would be during the actual activity or immediately afterwards and will be scalable for larger events;

g) A lack of understanding by data providers in the uses of the data resulting in data not 'fit for purpose';

h) Capturing and reporting demographic information to assist with the identification of vulnerable and 'at risk' groups and 'repeat clients' and to assess the effectiveness programs and services for these groups;

i) It was evident that there was a need for efficient and effective management and governance of existing and future data/information through the lifecycle of data editing, storage and dissemination. This was seen by poor quality or no documentation pertaining to data collection systems, processes and technical schemas and an inability to easily access information, often having to rely on 'experts' to extract and interpret data, particularly from legacy systems. The use of data warehousing will assist in the delivery of information through facilitating informed decision making at all agency levels by allowing easier data access, data manipulation and presentation (one agency has found that data warehouse development has already had a profound impact on consistency); and

j) Falling volunteer numbers is of concern and will impact on rural fire and state emergency service provision. More targeted funding may assist with the falling volunteer numbers.

These themes reflect drivers for change for the development of a data model to rationalise information management across emergency management and ESOs.

Image courtesy of NSW Fire Brigades

3.2 Draft Data Model

The data models in this report describe the types of things emergency service organisations need to have data about in order to have comprehensive, meaningful and useful information about the prevention, preparedness, response and recovery activities undertaken by these organisations in relation to fire and other emergencies.

The initial conceptual draft data model was prepared by the ABS, based on the outcomes of an environmental scan and literature review, and a comparative gap analysis. The initial conceptual draft data model was then used as the basis of national consultation with the Project Advisory Group. This resulted in further enhancements to the initial conceptual draft data model. A subsequent workshop with the Advisory Group, Steering Committee, NSWFB and ABS on 22 June 2010 resulted in further changes to the data model. Further feedback was sought from the Advisory Group.

This report presents the results of that final round of Advisory Group consultation where the ABS now present three different models for consideration. It is intended that the three models be considered for acceptance as drafts which would be developed further in Phase 2 with the end result being the development of a single national accepted data model.

Image courtesy of NSW Fire Brigades

3.2.1 Understanding Data Models

A data model describes (in diagrammatic form) what types of things we need to have data about in order to have comprehensive, meaningful and useful information about an area of interest. It aims to identify and organise the required data logically and physically to support development of a database and database management system. A data model is usually prepared as a high level conceptual model first, to scope out the information required, after which it is progressively expanded into greater levels of detail from a range of perspectives (conceptual, logical and/or physical).

The models in Phase 1 are all conceptual models which would be further developed in Phase 2 to arrive at one single logical model.

It is important to note that these data models are designed for activity reporting right across the PPRR spectrum. All subject areas are therefore intended to cater for all PPRR activities.

3.2.1.1 Classes

A Class is anything about which information can be collected. Classes can be persons, places, things, concepts or events. There are core classes in the data model and they correspond to various subject areas. Examples of a core class are: Location, Material and Party, see Fig 1. Classes are depicted in the data model diagram by a rectangular box with a line dividing the box into two horizontal sections. The name of the class appears in the top section of the box.

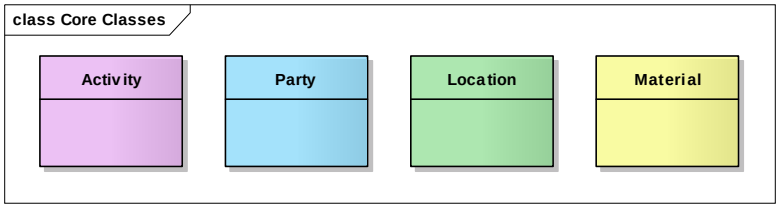

Fig 1

3.2.1.2 Relationships

Other classes represented in the models contain the word Relationship. These are Class Relationships and Linking Relationship Class.

Class Relationships - depicts the relationships that exist between the core classes. Each core class may or may not have a relationship to either 1 or many other core classes e.g. a local community is attending a presentation on fire education. The local community would be described by the Party class and the fire education presentation would be described as the Activity Class. The Class Relationship is the interaction between the two classes, in this example "is attending" describes this connection (refer to Attachment 3 Section 2.2.2.3 for more detail).

Linking Relationship Class – is a relationship association which reflects the relationship of a core class or its subclasses to another instance of the same core class or its subclasses e.g. the Material Class has a Linking Relationship Class to describe the relationship between multiple materials. That is, hazmat decontamination kit may be stowed on a particular fire truck (refer to Attachment 3 Section 2.2.2.2 for more detail). Linking relationships are shown as in Fig 2.

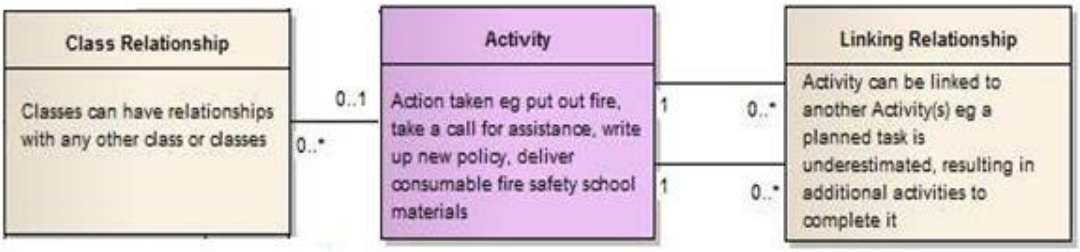

Fig 2

3.2.1.3 Attributes

The classes will contain attributes that link to classification codes that would need to be developed in Phase 2 of this project. These codes allow simplicity and flexibility for describing different scenarios and allow variations in operations of the different ESOs. Fig 3 shows in red text possible attributes for Equipment which will be determined in Phase 2 of the project. For further information on the draft data model, including a more complete and technical explanation, please see Attachment 3.

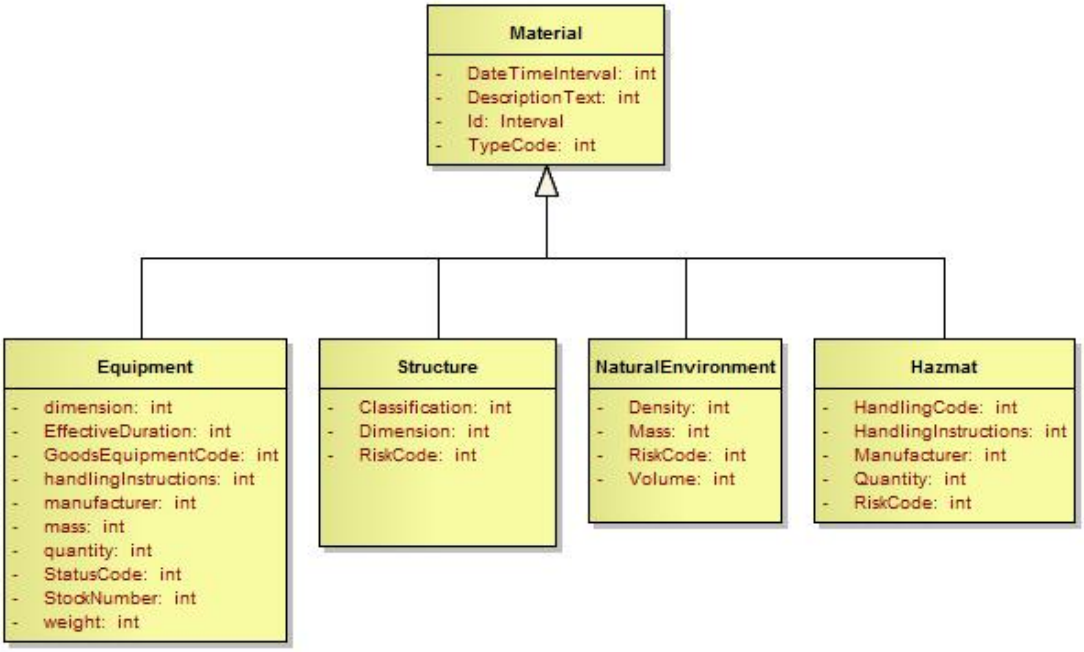

Fig.3

3.2.2 The 3 Models

Following several rounds of national ESO consultation 3 draft data models have been proposed. All 3 models fulfil the ESO requirements for reporting but differ slightly in the conceptual way that certain subject area themes in the Emergency Service activity domain are represented. Other themes are represented identically and are common to each model.

Model 1

This model consists of 7 core classes being Cause, Effect, Activity, Outcome, Material, Location and Party (Fig.4).

Model 2

This model consists of 5 core classes being Effect, Activity, Material, Location and Party (Fig. 5).

Notes:

- Cause is addressed via reporting of attributes and linking relationships;
- Outcome is addressed via reporting of attributes.

Model 3

This model consists of 7 core classes being Event, Response, Activity, Outcome, Material, Location and Party (Fig. 6).

3.2.2.1 Why There Are Three Models

There are three models due to jurisdictions having different views of how the Activity domain should be modelled. The main differences are: the use of Classes versus Attributes to capture the information; and the differences in the definitions being offered. These differences can be addressed through consultation or workshops in Phase 2. Two of the models (Model 2 and 3 above) were proposed in the final round of Advisory group consultation and as such have not undergone rigorous testing by all agencies and all jurisdictions. There are no known issues with these models at this time.

The common threads to these three models are that they have 4 classes in common. The 4 common classes are: Material, Location, Party and Activity Classes and these 4 classes were the classes proposed originally by the ABS. All agencies agreed with the common classes leaving the Cause, Effect, Response, Event and Outcome Classes not resolved by the Advisory Group. When creating the data dictionary in Phase 2 more information as to which terms are the same, similar or completely different will make the decision of whether an object should be a special class, subclass or an attribute. The classes where there is either no agreement or are newly suggested are explained further in 3.2.2.5.

3.2.2.2 Examples of What All Models Can Collect

All 3 models can collect data and relationships between data in order to report on the following:

a) The relationship between multiple incidents, events and activities; for example a road crash leading to a chemical spill and a bush fire;

b) The location of materials and responsibility over a time interval; for example, inventory tracking of high dollar or critical equipment;

Metrics such as:

c) The amount of times a particular type of equipment was used for a particular incident;

d) The number of incidents an individual or station has attended;

e) The number and type of community events run by each organisation over a time period; and

f) The number of incidents occurring at a particular location with a particular group of people.

g) Tracking of an incident over a time interval across multiple regions e.g. a bushfire that is spreading;

h) The environmental conditions of an incident or event (e.g. terrain, hazardous conditions);

i) The involvement of different parties in an incident;

j) Ability to describe people at a particular location for an incident, event or an activity;

k) Education and training of emergency services personnel;

l) Tracking of the projects and programs conducted in emergency management for operations management and strategic planning purposes;

m) The portfolio of work managed and its relationship with policy and legislation;

n) Demographic information; and

o) The relationships between different parties, such as between ESOs and other organisations.

Image courtesy of CFA

3.2.2.3 The Models

Model 1

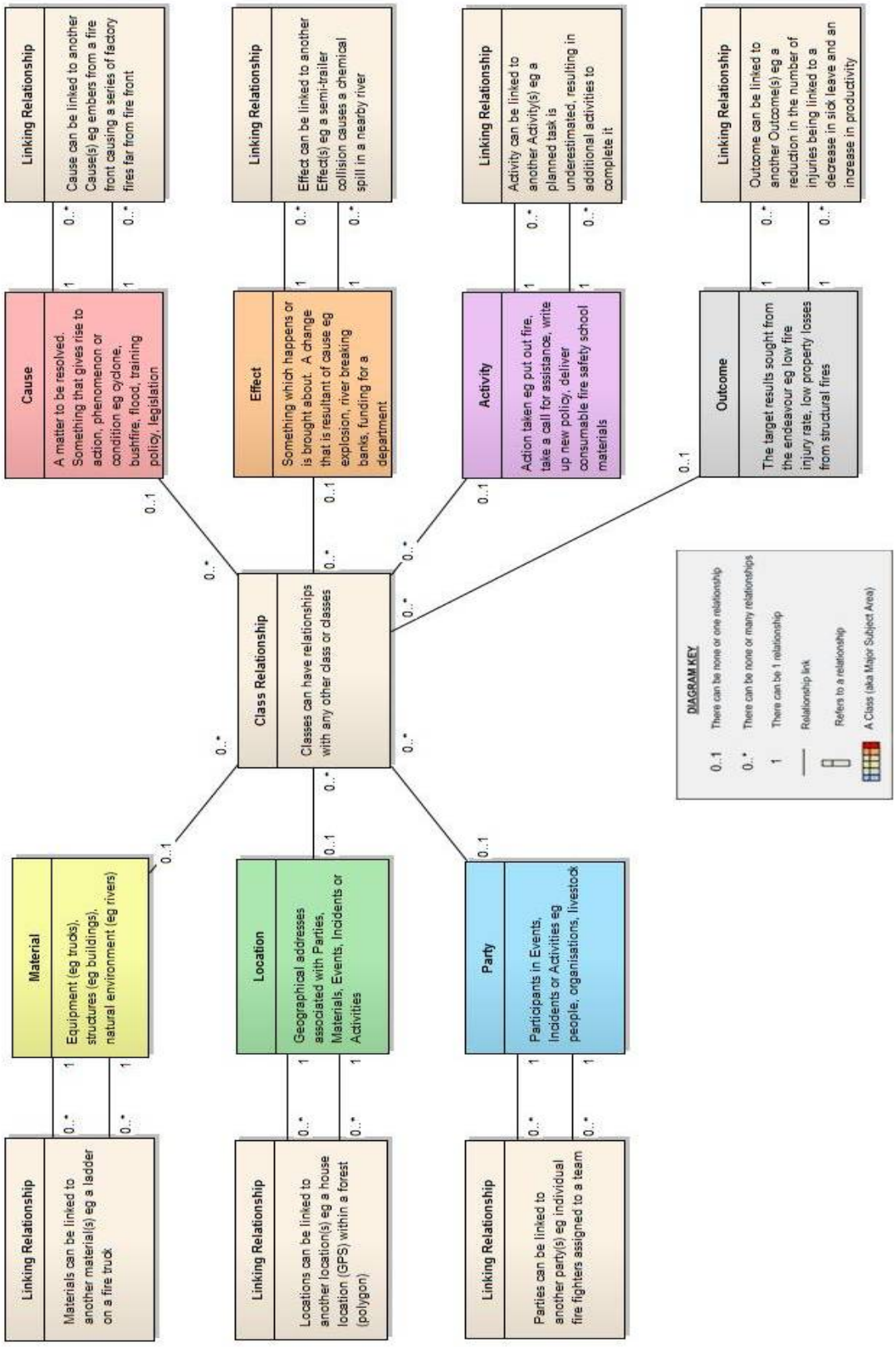

Fig.4

Model 2

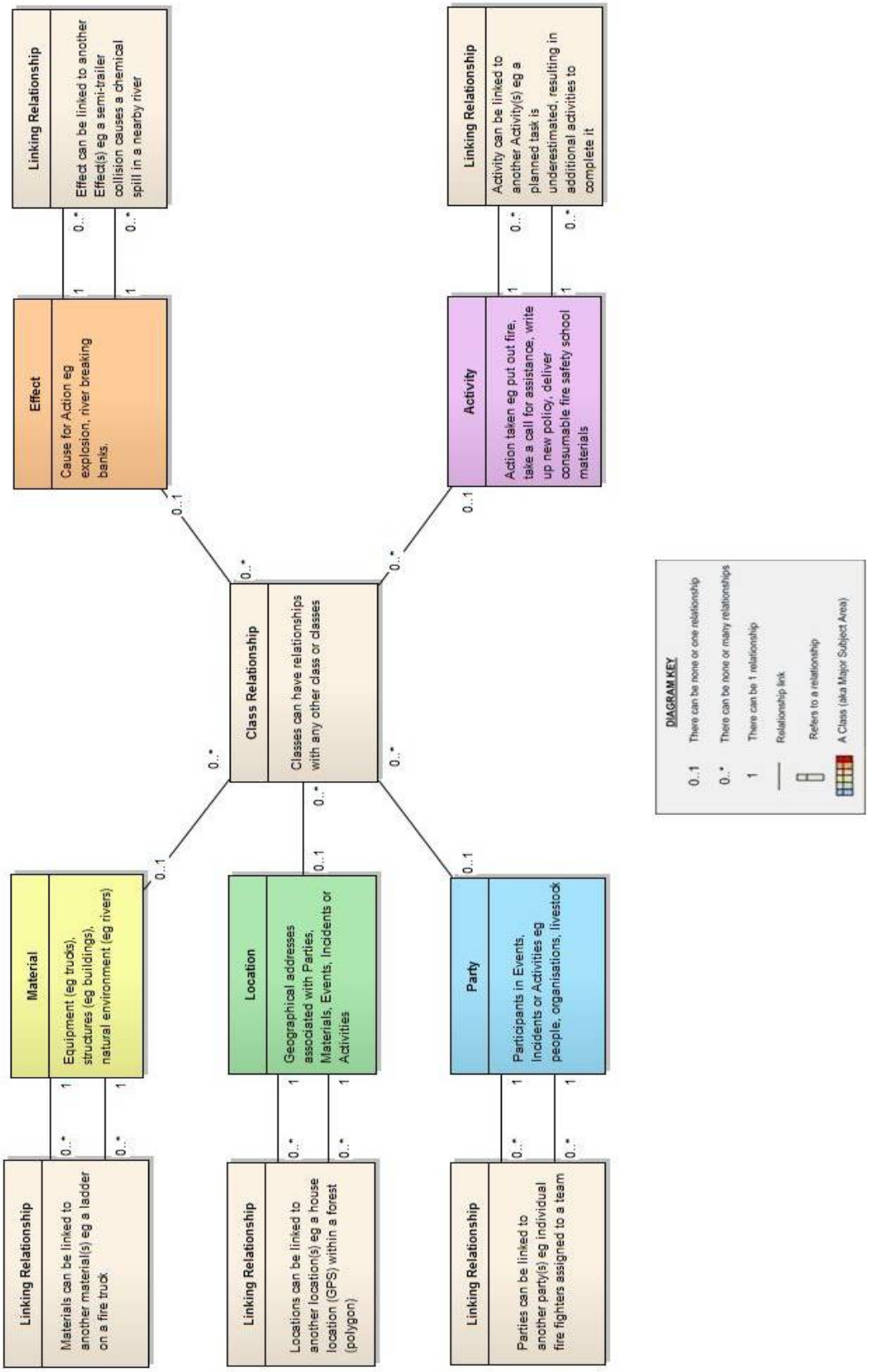
Linking Relationship
Effect can be linked to another Effect(s) eg a semi-trailer collision causes a chemical spill in a nearby river
Effect
Cause for Action eg explosion, river breaking banks,
Linking Relationship
Activity can be linked to another Activity(s) eg a planned task is underestimated, resulting in additional activities to complete it
Activity
Action taken eg put out fire, take a call for assistance, write up new policy, deliver consumable fire safety school materials
Class Relationship
Classes can have relationships with any other class or classes
Material
Equipment (eg trucks), structures (eg buildings), natural environment (eg rivers)
Linking Relationship
Materials can be linked to another material(s) eg a ladder on a fire truck
Location
Geographical addresses associated with Parties, Materials, Events, Incidents or Activities
Linking Relationship
Locations can be linked to another location(s) eg a house location (GPS) within a forest (polygon)
Party
Participants in Events, Incidents or Activities eg people, organisations, livestock
Linking Relationship
Parties can be linked to another party(s) eg individual fire fighters assigned to a team
DIAGRAM KEY
0..1 There can be none or one relationship
0..* There can be none or many relationships
1 There can be 1 relationship
Relationship link
Refers to a relationship
A Class (aka Major Subject Area)

Fig.5

Model 3

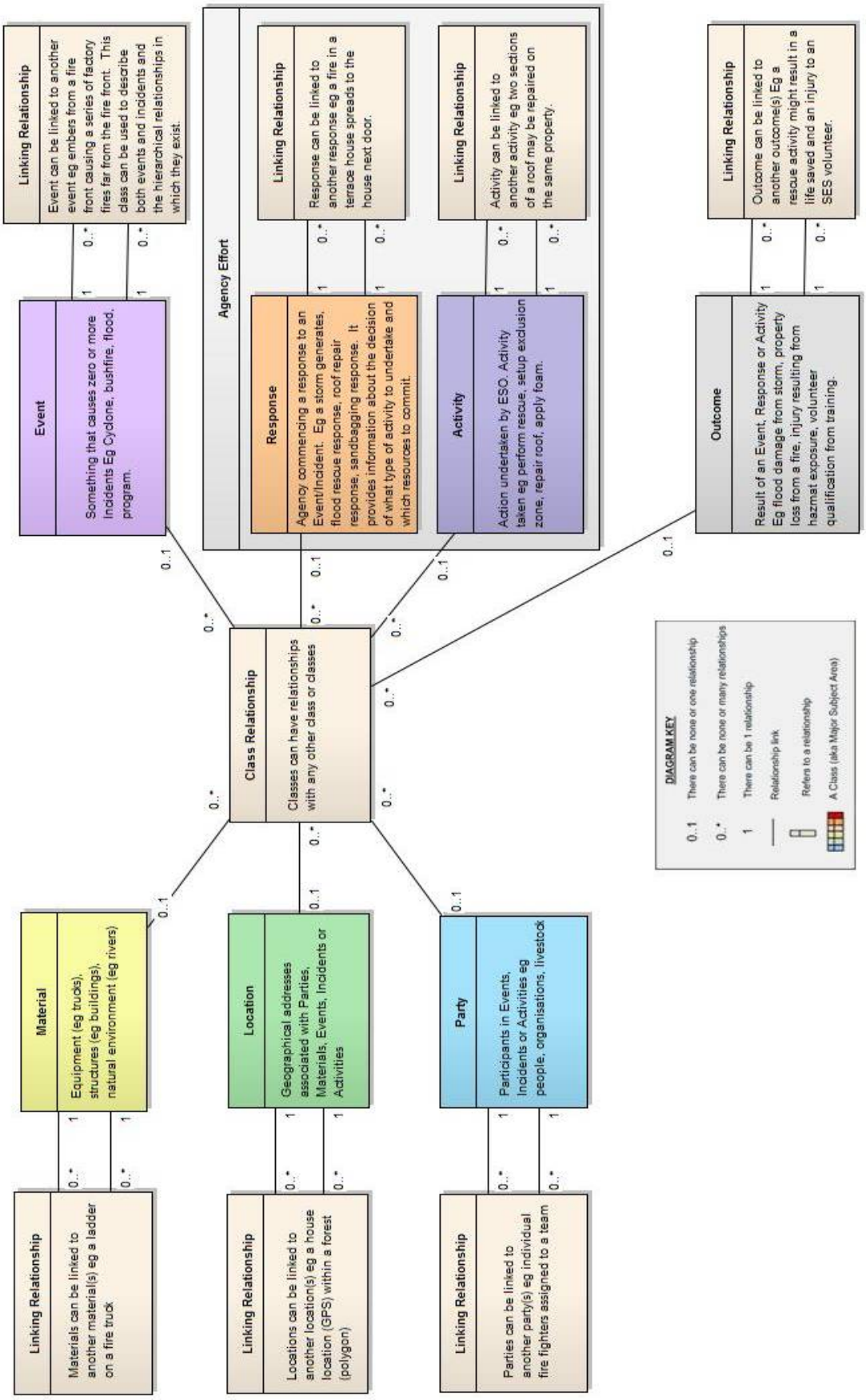
Linking Relationship
Event can be linked to another event eg embers from a fire front causing a series of factory fires far from the fire front. This class can be used to describe both events and incidents and the hierarchical relationships in which they exist.
Event
Something that causes zero or more Incidents Eg Cyclone, bushfire, flood, program.
Agency Effort
Linking Relationship
Response can be linked to another response eg a fire in a terrace house spreads to the house next door.
Response
Agency commencing a response to an Event/Inddent. Eg a storm generates, flood rescue response, roof repair response, sandbagging response. It provides information about the decision of what type of activity to undertake and which resources to commit.
Linking Relationship
Activity can be linked to another activity eg two sections of a roof may be repaired on the same property.
Activity
Action undertaken by ESO. Activity taken eg perform rescue, setup exclusion zone, repair roof, apply foam.
Linking Relationship
Outcome can be linked to another outcome(s) Eg a rescue activity might result in a life saved and an injury to an SES volunteer.
Outcome
Result of an Event, Response or Activity Eg flood damage from storm, property loss from a fire, injury resulting from hazmat exposure, volunteer qualification from training.
Class Relationship
Classes can have relationships with any other class or classes
Material
Equipment (eg trucks), structures (eg buildings), natural environment (eg rivers)
Linking Relationship
Materials can be linked to another material(s) eg a ladder on a fire truck
Location
Geographical addresses associated with Parties, Materials, Events, Incidents or Activities
Linking Relationship
Locations can be linked to another location(s) eg a house location (GPS) within a forest (polygon)
Party
Participants in Events, Incidents or Activities eg people, organisations, livestock
Linking Relationship
Parties can be linked to another party(s) eg individual fire fighters assigned to a team
DIAGRAM KEY
0..1 There can be none or one relationship
0..* There can be none or many relationships
1 There can be 1 relationship
Relationship link
Refers to a relationship
A Class (aka Major Subject Area)

Fig.6

3.2.2.4 Similarities and Differences of the Data Models

Table 1: Comparison of the 3 models

Concept	Model 1	Model 2	Model 3
Location	√	√	√
Party	√	√	√
Material	√	√	√
Cause	√	√ (as attributes)	
Effect	√	√	
Activity	√	√	√
Outcome *	√	√ (as attributes)	√
Event			√
Response			√
Class Relationship	√	√	√
Linking Relationship	√	√	√

Key: √ Includes this concept
* Definitions vary in models below.

a) Model 1
This draft data model consists of seven subject areas or core classes. These core classes are based on the fundamental data concepts relevant to emergency management at the highest level.

The core classes are:

- **Cause** – Cause could be defined as a matter to be resolved; something that gives rise to action, phenomenon or condition e.g. cyclone, bushfire, flood, training, policy, legislation;
- **Effect** – is something which happens or is bought about; a change that is the result of a cause;
- **Activity** – Anything an ESO does either in delivering services or supporting its own business. Such as put out a fire in the house caused by an arching power line; put a tarp over the roof and rescue the cat that has run up the tree;
- **Outcome** – could be defined as the target results sought from the endeavour. For example low fire injury rate, low property losses from structural fires;
- **Location** – Information about geographical addresses associated with Events, Incidents, Activities, Parties or Materials;
- **Material** – Information about equipment e.g. fire trucks and breathing equipment; and structures e.g. buildings and bridges; and the natural environment e.g. rivers and mountains; and
- **Party** – Information about participants of emergency service related activities e.g. people, organisations, livestock.

b) Model 2
The core classes are:

- **Effect** – Cause for Action e.g. explosions, river breaking banks
- **Activity** – Action taken e.g. put out fire; take a call for assistance; write up new policy; deliver consumable fire safety school materials. **Material** – as per definition in Model 1
- **Location** – as per definition in Model 1
- **Party** – as per definition in Model 1
- **Note in this model**: Causes and Outcomes are captured as attributes rather than by classes. They are defined as follows:

Cause - Something that gives rise to an action, an event, a phenomenon or a condition.
Outcome - The consequence of a course of action (or inaction) taken in response to an effect.

c) Model 3

The core classes are:

- **Event** – Something that causes zero or more incidents e.g. cyclone, bushfire, flood, program.
- **Response** – Agency commencing a response to an Event/Incident e.g. a storm generates, flood rescue response, roof repair response, sandbagging response. It provides information about the decision of what type of activity to undertake and which resources to commit.
- **Activity** – Activity undertaken by ESO. Activity taken e.g. perform rescue, setup exclusion zone, repair roof, apply foam.
- **Material** – as per definition in Model 1
- **Location** – as per definition in Model 1
- **Party** – as per definition in Model 1
- **Outcome** – Result an Event, Response or Activity. E.g. flood damage from storm, property loss from a fire, injury resulting from hazmat exposure, volunteer qualification from training.

Various agencies in the final round of the Advisory Group support the following:

Agency	Preferred Model	Issues Raised
NSWFB	Model 3	
OESC Vic	Model 2	
Tas Fire	Model 1	▪ Terminology needs to be clearly defined ▪ Concern about Activity core class in Model 1 ▪ Require flexibility to change in Phase 2
Vic MFB	Aligned with Model 2	▪ Outcome measures based on national data, not necessarily a core class
WA FESA	Model 1	▪ Require flexibility to change in Phase 2 ▪ Cost (of activities etc) is an important measure across the model ▪ Effect should also capture categories such as value, networks, heritage, environment & cultural
CFA Vic	Aligned with Model 2	▪ Outcome measures not necessarily a core class use attributes ▪ Cause can be an attribute
SA MFS	Model 1	

3.2.2.5 ABS Comment on the Data Models

a) Classes, Sub Classes or Attributes

There were differing opinions about recording various ESO business concepts in the model as classes, subclasses or attributes. The project team acknowledges that there is not a wrong or right answer at the conceptual modelling stage of the project. As a general rule of thumb, we would choose a Class to represent generic concepts; Sub Classes are one or more specialised classes depicting a subset of the generalised concept and Attributes for the specific items of data that can be collected for a class in the Data Model. Each attribute has a name, and such decisions can be changed during phase 2 of the project as more information is brought to light across the ESOs.

As the business environment changes Subclasses can be extended e.g. a new subclass of material could be created to describe a new technology.

The three models can be refined and rationalised further and in more detail as each agency continue testing during phase 2.

b) The requirement to capture Activity Outcomes

Several agencies have requested that an outcome would be more neatly captured as attributes within the Activity domain. Various agencies stated that there should be no outcome class.

An example of how this can be:

For the education activity an attribute of understanding might be implemented (either against the activity, or against parties to the activity) while for the rate of arson one would use the attribute of age of parties involved in arson incidents.

In this way the outcomes of the fire education program are easily assessed via reporting

(i) through the selection of all high school education activities in a defined timeframe and averaging (weighted or otherwise) levels of comprehension by students, and

(ii) selecting all arson incidents involving secondary school aged parties across two comparable time frames, pre and post education.

Any classificatory or quantitative attributes in a model can be used to assess outcome realisation. Therefore the creation of attributes will be completed in Phase 2.

The inclusion of Outcome Class was decided at the 22/6 meeting and added by ABS, but it seems like there are variances of opinion of whether this should be a class or attributes, or whether it should be captured at all.

The ABS has become aware in this exercise that agencies have varying points of view of what outcome means for the model. The ESOs will need to decide on what they see outcome as meaning. Outcomes are complex. On the one hand outcomes are the result of years of data capture as you try to demonstrate a relationship between a certain type of input/output (e.g. more building inspections) and an outcome (e.g. safer communities) is a calculation derived from analyses of the inputs/outputs over a period of time compared to baseline data (before the change). But in Alternative Model 3 Outcome Class is used to mean a result of an Event, Response or Activity e.g. an injury resulting from a hazmat exposure.

Outcomes are generally measured by quantitative means, such as by surveys or qualitative means such as focus groups etc. Such indicators are calculated or evaluated from data collected on a day to day basis from business activities and

through the collection of survey data. The conceptual model supports the collection of such information. This data would then need to be analysed to see if the outcome has been achieved.

ABS Recommendation: Outcomes are implemented as attributes as in model 2 and that the right information needs to be captured in the model to provide data that is measureable and to provide evidence for the ESOs outcomes. Details of such attributes will be defined during Phase 2 of the Data Dictionary project.

c) Effect Class

There are key semantic differences between the agencies. Effect is used in a number of different ways along the course of obtaining an agreement to the draft model.

Effect as core class exists in Model 1 and Model 2. It is represented by Event in Model 3.

Possible ways forward:

1. Leave Effect as core class; or
2. Replace Effect with Event core class.

ABS Recommendation: ABS is aligned with the group moving semantically from Event to Effect and therefore recommends option 1 i.e. leaving Effect as a core class as in Models 1 and 2.

d) Cause Class

There has been a comment that Cause should not be a separate class as Cause is inseparable from the Incident. Cause can be an attribute of Incident and Activity.

Again at the June meeting it was decided to combine the Event and Incident Classes and a new class has been made called Cause. Cause could be defined as a matter to be resolved; something that gives rise to action, phenomenon or condition e.g. cyclone, bushfire, flood, training, policy, legislation.

Cause as a core class exists in Model 1 only. Responses from ESOs, as suggested in Models 2 and 3, would indicate a general agreement across the group that Cause is better captured in the model via attributes rather than as a core class.

Possible ways forward:

1. Leave Cause as a core class; or
2. Remove Cause as a core class.

ABS Recommendation: ABS supports the general view across the group that Cause would be better represented by attributes than as a core class and so recommends option 2; remove Cause as a core class as in Model 2.

e) Event Class

Event as a concept and core class exist in Model 3 only. Although Event was originally recognised as a key concept by ABS early on in Phase 1 of the project, it has been replaced by the Cause concept in Model 1, the Effect concept in Model 2 and remains as is in Model 3.

Possible ways forward:

1. Leave Event as core class;
2. Replace Event with Cause core class; or
3. Replace Event with Effect core class.

ABS Recommendation: ABS views Event and Effect as broadly the same concept and therefore recommends Option 3 i.e. replace Event with Effect, as suggested in Model 2. Option 1 and 2 are not recommended on a semantic basis i.e. the group as a whole has agreed to move from using the term Event to using the term Effect. Cause is addressed via reporting of attributes rather than as a core class.

f) Response Class

Response, as a core class, has been introduced in this round of consultancy to "provide information about the decision of what type of activity to undertake and which resources to commit".

Possible ways forward:
1. Add Response as a core class; or
2. Replace Response with Activity core class.

ABS Recommendation: ABS initial view would be to recommend option 2 i.e. combine Response with Activity in this model and call it Activity as in Model 1 and 2.

In conclusion the areas that require action for one model to go into Phase 2, by the Steering Committee are: Outcome; Effect; Cause; Event; Response and Class definitions.

4 Recommendations and Next Steps

4.1 ABS Recommended Model

The ABS recommends that all three models be taken into Phase 2, to maintain the forward momentum in the development of a national data dictionary for the emergency services sector. As each of the different models are discussed in Phase 2, information will come to light when creating definitions, classifications, and attributes, as to whether each of the terms used are the same, similar, or completely different and whether a special class, subclass or an attribute is required.

However if the Steering Committee decide to choose one model to move forward with they will need to make a decision on the following areas: Outcome, Effect, Cause, Event, Response and Definitions of Classes, as these are the areas in the models where agreement between the jurisdictions is required.

4.2 How to Arrive at a Single Model in Phase 2

The ABS suggests:

- that the contractor for Phase 2 workshops all agencies and that all ideas are raised at the workshop to come to some agreement on a logical model;
- that all three models are tested with scenarios from across the PPRR spectrum; and
- when agencies see more of the data items and understand more of the attributes there will be less duplication within the model.

Image courtesy of NSW SES