BUSH FIRE RISK REGISTER - A TOOL FOR BUSHFIRE RISK MANAGEMENT PLANNING

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Abstract

A new bush fire risk management planning process has been established and begun to be implemented in NSW as a result of the review of the existing bush fire risk planning process. The new planning process complies with AS/NZS 4360:2004, which comprises five major steps: establishing the context, identifying risks, analysing risks, evaluating risks and treating risks. The implementation of the new bush fire risk management planning process is a time-consuming and error-prone process which requires completing many repetitive and computation-intensive tasks such as computing hazard scores and risk ratings for each asset under threat. In addition, the planning process needs to be properly recorded for monitoring and reviewing. In order to improve the efficiency and accuracy of the new planning process, a computer program – Bushfire Risk Register has been developed. The register is designed to: automate the calculation involved in determining the levels of risk for various types of assets; provide an electronic means for registering, storing, updating and reporting the risk information and the treatment plans for the identified assets under threat; generate hazard or risk map required by the Bush Fire Risk Management Plan (BFRMP) through exporting the registered data to a GIS tool (e. g. MapInfo) and joining them with the points or polygons data of the registered assets; and allow the Bush Fire Management Committees (BFMCs) to register, prioritize and monitor their treatment plans in a more effective and efficient way. The register is a user-friendly window program developed in MS Access Visual Basic for Application (VBA). This paper will describe the design features of the register and its application in bush fire risk planning process in detail.

Introduction

Bush Fire Risk Management Planning is a strategic level process which provides greater protection for the community through a coordinated and cooperative landscape approach to risk reduction. It sets the direction for all bush fire risk management programs undertaken within an area. In NSW, bush fire risk management planning has become a compulsory process since the enactment of the *Rural Fires Act, 1997*. The Act requires that the Bush Fire Management Committee shall prepare a Bush Fire Risk Management Plan (BFRMP) for their area and review the plan within each successive 5 years period. Since the inception of the bush fire risk management planning process, a number of changes to legislation, constitution of Local Government areas and the BFMCs have occurred. In addition, various stakeholders have also raised many issues related to the planning process. In view of this, a review of the bush fire risk management planning process has been undertaken recently. As a result of the review, a new bush fire risk management planning process has been established and begun to be implemented in NSW. The new planning process is a standard risk management planning process as introduced in AS/NZS 4360:2004 (See Figure 1).
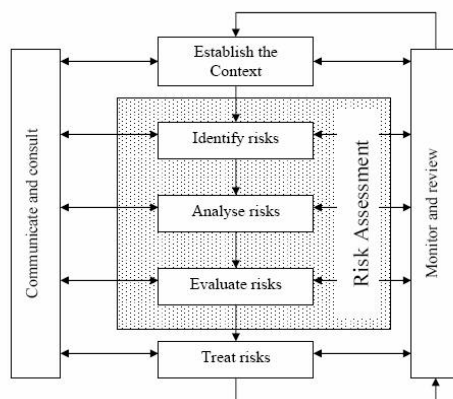

Figure 1. Risk Management Process (adapted from AS/NZS 4360:2004)

As shown in Figure 1, the new risk management planning process comprises the following basic steps (RFS 2005c and RFS 2005d):

Establish context
The BFMC needs to gain a clear understanding of the issues to be solved and reach agreement on the nature and scope of these issues. In addition, the framework in which the process will be undertaken before the planning process is begun also needs to be identified.

Identify the risks
The risk identification process involves describing the nature and scope of the bush fire hazards, the community and the environment within which the bush fire risks occur.

Analyse risks
The risk analysis process involves assessing the likelihood and consequences which then determine the risk rating for a given asset.

Evaluate risks
Prioritise risks and continue to revisit the risk profile, re-evaluate major risks, and update the risk profile with actions taken. It is important to identify the time scale of the risk at this point.

Treat risks
Put treatments in place to reduce risk. Treatment options may include:
- Avoid the risk;
- Reduce the likelihood;
- Reduce the consequence;
- Share the risk;
- Retain the risk.

Communicate and consult
Communication and consultation in bush fire risk planning process allows for the BFMC and the community to exchange information and views.

Monitor and review
The purpose of monitoring and reviewing is to provide routine surveillance of actual performance for comparison with the expected or required performance and to investigate periodically the current situation with specific focus.

In summary, the new risk management planning process is a standard process. As outlined above, the implementation of this process involves enormous effort in collecting, recording, processing and presenting the information related to the planning process. If not possible at all, it would be a very time consuming and error prone process to complete all these tasks manually. In view of this, an electronic bushfire risk register has been developed to automate some of these tasks such as determining risk levels, prioritising treatment options, generating bushfire risk registers and mapping hazards and risks. The following section explores the electronic bushfire risk register in detail.

Bushfire Risk Register
Overview
The register is a stand alone application which comprises an MDB file together with other supplementary files. It can be started by simply locating the file folder where the mdb file is stored and double clicking the file. After signing up, the user interface of the register shown in Figure 2 will pop up. As shown in Figure 2, the register provides a number of menu options which enable the BFMCs to:
- Enter/edit human settlement assets;
- Enter/edit economic assets;
- Enter/edit environmental assets;
- Enter/edit cultural heritage assets;
  - Enter/edit risk treatments;
  - Enter/edit spatial features of assets;
  - Search the register;
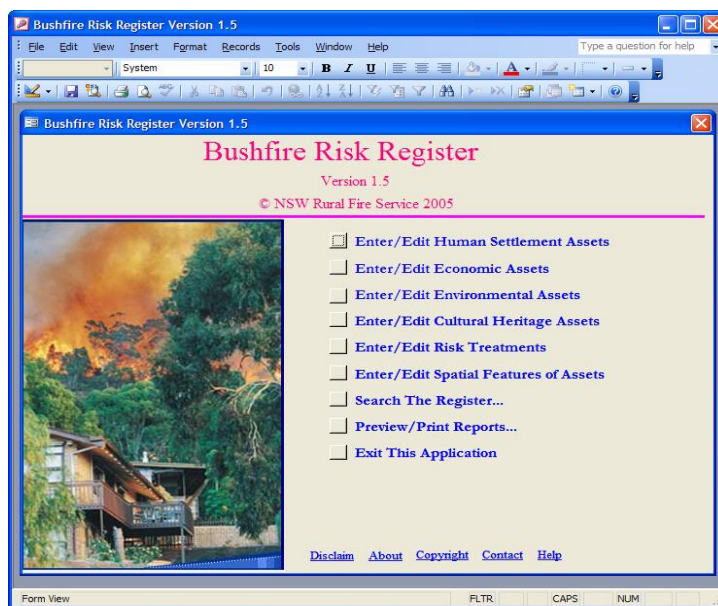 - Preview/print reports;

- Exit the register.

Figure 2. The startups screen of the Bushfire Risk Register

Registering Assets at Risk

One of the important functions of the register is that the risk rating and other associated information about an asset under threat can be properly registered. The general steps involved in the process of registering an asset at risk include:

- Selecting an appropriate data entry form from the startup screen in accordance with the type of the asset;
- Entering the user specified data;
- Calculating the derived data.

Depending on the type of an asset, the data entry form and the number of data fields within each data entry form are different. The common data fields which need to be provided in each data entry form include:

- Asset ID;
- Subclass of the asset type;
- Name of asset;
- Address of asset;
- Name of BFMC;
- LGA where the asset is located;
- Tenure;
- Consequence rating;
- Risk rating.

In addition to these common data fields, each different data entry form requires additional data fields to be specified in order to compute the risk rating for a given asset by implementing the corresponding risk analysis process. Unlike the common data fields, these additional data fields are not only specified for information storage. They are also used as the input data required by the risk analysis process used to determine the risk rating of the given asset. For human settlement assets, the additional data fields required to determine the risk rating of an asset are:

- Vegetation type;
- Slope;
- Fire run distance;
- Distance from hazard;
- Preparedness level;
- Likelihood rating.

Slope

Vegetation → Hazard score (Matrix 2.0)

Fire run distance →

Fire run distance	Factor
<=50	0.2
50-100	0.35
100-200	0.7
>200	1

Modified hazard score = Hazard score x Factor

Hazard rating

Modified hazard score	Rating
1-24	Low
24-96	Medium
96-200	High
>200	Very High

Distance from hazard → Threat rating (Matrix 3.0a)

Preparedness level → Consequence rating (Matrix 3.0b)

Likelihood rating → Risk rating (Matrix 3.1)

Figure 3. Risk analysis process for human settlement assets

Based on the data specified for these additional data fields, the risk rating of a human settlement asset can be determined through the risk analysis process shown in Figure 3. As shown in Figure 3, the steps involved in the risk analysis process for human settlement assets include:

- Looking up the hazard score in Matrix 2.0 based on the slope and vegetation type specified;
- Modifying the hazard score through multiplying the hazard score by the factor corresponding to the fire run distance classes specified;
- Determining the hazard rating in accordance with the pre-defined the categories of hazard ratings;
- Looking up threat rating in Matrix 3.0a based on the hazard rating and the distance from hazard specified;
- Looking up consequence rating in Matrix 3.0b based on the threat rating and the preparedness level specified;
- Looking up the risk rating in Matrix 3.1 based on the consequence rating and the likelihood rating specified.

The addition data fields for registering economic assets include Level of impact, Resilience rating and Likelihood rating. Based on these data, the risk rating for an economic asset can then be determined by a two step process, that is, looking up the consequence rating in Matrix 3.0c based on the level of impact and the resilience rating specified and then determining the risk rating in Matrix 3.1 based on the consequence rating and the specified likelihood rating. For the data entry form for registering environment assets, the additional data fields required include Replaceability, Fire threshold and Likelihood rating. With these additional data fields specified, the risk rating of a given environment asset can then be determined by looking up the consequence rating in Matrix 3.0d based on the replaceability and fire threshold, and then determining the risk rating in Matrix 3.1 based on the consequence rating and the likelihood rating specified by users. With respect to cultural heritage assets, the additional data fields and the risk analysis process are similar to those for human settlement assets with a very minor difference being that resilience rating is used to determine the consequence rating instead of preparedness level.

Registering treatments
It is an essential step in risk planning process to prioritise and treat risks. The register has provided a data entry form which enables the BFMCs to register treatments for the assets which have been registered. To facilitate the BFMCs to prioritise a treatment, the consequence rating, likelihood rating and risk rating of the asset against which a treatment is registered are drawn from the register and displayed within the data entry form for registering treatments. Based on these ratings, the priority of a treatment can be determined and specified manually. Alternatively, the priority data field can be automatically filled out by clicking button **Default** which initiates a pre-defined procedure used to determine the priority for a given treatment.

Add spatial features to assets

Another important feature of the register is its ability of linking the textual information stored in the register to the spatial features created in a GIS tool such as MapInfo. This ability is realised by linking the spatial table of each asset with the corresponding textual table in the register through the unique asset identification number. The menu option *Enter/Edit Spatial Features of Assess* in the startup screen enables users to launch a predefined MapInfo work space where spatial features of an asset can be added.
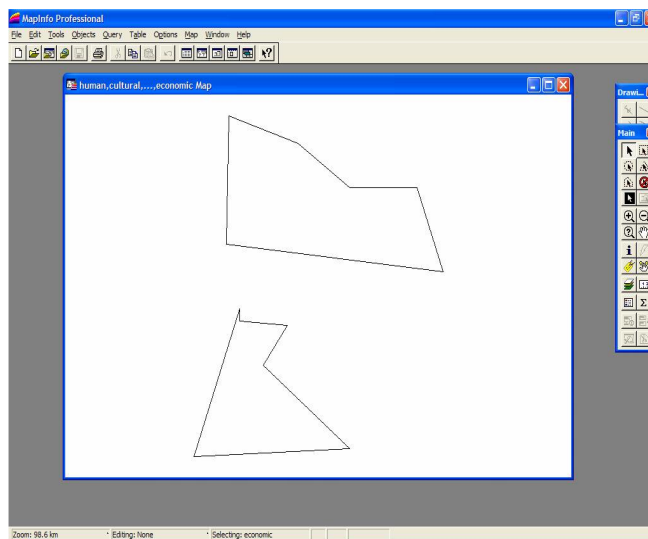
Figure 4. Polygons created in MapInfo

Searching and reporting

In order for the BFMCs to quickly find and view the records of a given register which meet the specified criteria and/or make some changes to these records, a search menu has been built within the register. By utilising the searching facility, the BFMCs can answer the questions related to the information stored in the register quickly. In addition, the BFMCs can also make changes to the records displayed within the search results window. In addition to the searching capability, the register is also built with a report menu which enables the BFMCs to preview/print the risk register and treatment plans required by the Bush Fire Risk Management Plan. The type of a report can be either a summary or a list of detailed records. If a report type is a summary, then it can be either previewed/printed in text format or chart format. When a report type is of details, the report can only be previewed/printed in text format. Figure 5 and Figure 6 are two sample reports. One is in text format while another is in chart format.

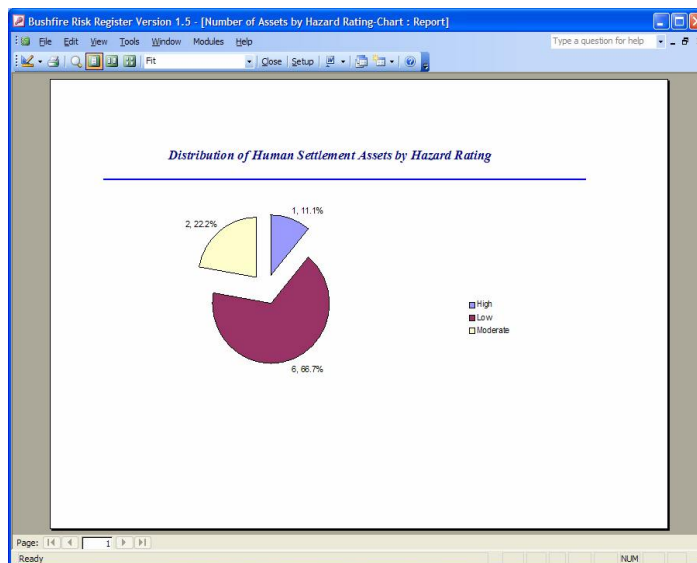**Figure 5. Sample report in the format of text**

Figure 6. Sample report in the format of chart

Conclusions

To sum up, an electronic bushfire risk register which implements the new bush fire risk management planning process has been developed. The main features of the register include:

- It automates the calculation involved in determining the levels of risk for various types of assets;
- It provides an electronic means for registering, storing, updating and reporting the risk information and the treatment plans for the identified assets;
- It enables the data stored in the register to be linked to the spatial features of assets created in a GIS tool (eg. MapInfo) and therefore to be mapped or spatially presented;
- It allows the BFMCs to register, prioritize and monitor their treatment plans in a more effective and efficient way.

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