# COST-EFFECTIVE MITIGATION STRATEGY DEVELOPMENT FOR FLOOD PRONE BUILDINGS

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**THE MAIN OBJECTIVE OF THIS RESEARCH IS TO DEVELOP COST-EFFECTIVE STRATEGIES TO MITIGATE DAMAGE TO RESIDENTIAL BUILDINGS FROM RIVERINE FLOODS. THE RESEARCH WILL PROVIDE EVIDENCE-BASED RETROFIT STRATEGIES FOR DECISIONS CONCERNING THE BUILDINGS WITH THE GREATEST VULNERABILITY IN AUSTRALIAN COMMUNITIES.**

## INTRODUCTION

Australia has experienced damaging floods on a regular basis due to inappropriate urban development in floodplains. This has resulted in considerable costs to all levels of government to repair damage and enable community recovery.

Retrospective analyses show large benefits of flood risk mitigation in the contexts of many developed and developing countries. A study conducted by the U.S. Federal Emergency Management Agency found an overall benefit-cost ratio of four suggesting that disaster risk reduction through investment in mitigation can be highly effective in reducing future losses*.

## PROJECT ACTIVITIES

The first two tasks have been completed by the end of June 2015 in line with the project schedule.

### Building stock classification

After a literature review a new schema is proposed which is a fundamental shift from describing the complete building as an entity to one that focuses on sub-components (foundations, bottom floor, upper floor (if any) and roof). The selected key attributes to classify each floor system are *Construction Period*, *Fit-out Quality*, *Storey Height*, *Bottom Floor System*, *Internal Wall Material* and *External Wall Material*. The selected attributes to classify roof are *Material* and *Pitch* of the roof.

### Review of flood mitigation options

Strategies in the international literature have been developed for different types of floods and the adoption of a particular strategy depends upon the characteristics of flood hazard and building stock along with any mitigation incentives and cost benefit analysis.

The review categorises mitigation strategies into the following categories:

- Elevation
- Relocation
- Dry floodproofing
- Wet floodproofing
- Flood barriers

Elevation is traditionally considered to be an easier and effective strategy and is the one which generally attracts incentives such as a reduction in insurance premiums. Relocation is the surest way to eliminate flood risk by relocating outside the floodplain but, as in the case of elevation, it becomes more difficult to implement for heavier and larger structures. Dry floodproofing and flood barriers are efficient only in shallow low velocity hazard areas and are generally not practical in deep fast flowing waters. Wet floodproofing is suitable in low to moderate depths of water with inundation duration of not more than a day.

Table 1: Flood proofing matrix**

| Flood Proofing Matrix | | Flood Mitigation Strategies | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Elevation on walls | Elevation on piers | Elevation on columns | Relocation | Flood barriers | Dry flood proofing | Wet flood proofing |
| Flooding characteristics | **Flood depth** | | | | | | | |
| | Shallow | | | | | | | |
| | Moderate | | | | | | N/A | |
| | Deep | | | | | N/A | N/A | |
| | **Flow velocity** | | | | | | | |
| | Slow | | | | | | | |
| | Moderate | | | | | | N/A | N/A |
| | Fast | N/A | | | | N/A | N/A | N/A |
| Building characteristics | **Building Foundation** | | | | | | | |
| | Slab-on-Grade | | | | | | | |
| | Low-set | | | | | | | |
| | Basement | | N/A | N/A | | | N/A | |
| | **Building Material** | | | | | | | |
| | Masonry/ Concrete | | | | | | | |
| | Timber | | | | | | N/A | N/A |
| | **Number of storeys** | | | | | | | |
| | One/Two | | | | | | | |
| | Three or more | N/A | N/A | N/A | N/A | | | |
| | **Building Condition** | | | | | | | |
| | Excellent to Good | | | | | | | |
| | Fair to Poor | | | | | | N/A | N/A |

Table 1 presents a matrix of available mitigation options along with flood and building characteristics.

### Development of Australian specific retrofit options

New strategies will be developed as required and all appropriate strategies will be costed for key building types through the engagement of quantity surveying specialists. The research may also entail experimental testing of preferred material types to ascertain their resilience to flood water exposure.

### Vulnerability assessment of current and retrofitted building types

Vulnerability of selected building types to a wide range of inundation depths will be assessed and supplemented by a significant body of flood vulnerability research by GA, post-disaster damage surveys and socio-economic survey activity undertaken by GA in Australia.

### Cost benefit analysis

Retrofit options entail an investment that will realise a benefit over future years through reduced average annualised loss. In this exercise retrofit options will be assessed against a range of severities and likelihoods of flood hazard covering a selection of catchment types.

## END-USERS PERSPECTIVE

The outcomes of this research will integrate into flood impact and risk assessment. It will enable a better understanding of current flood risk to communities, the demands on emergency management and generate opportunities for reducing these.

*MMC. 2005. Natural hazard mitigation saves: an independent study to assess the future savings from mitigation activities. Multi-hazard Mitigation Council.

**FEMA. 2014. Homeowner's guide to retrofitting; six ways to protect you home from flooding. FEMA P-312, Third Edition. Federal Emergency Management Agency, USA.