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.

BACKGROUND

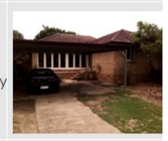
Australia has experienced damaging floods on a regular basis due to inappropriate urban development in floodplains. This has resulted in considerable costs to all levels of government and property owners to repair damage and enable community recovery.

COMPLETED PROJECT ACTIVITIES

Building stock classification

After a literature review a new schema was 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). Five typical storey types have been selected for the remainder of the research which represent the most common residential types in Australia (see Table 1).

Table 1: Selected Storey Types

Storey Type	Construction period	Bottom floor system	Fit-out quality	Storey height	Internal wall material	External wall material	Photo
1	Pre-1960	Raised Timber	Low	2.7m	Hardwood	Weather-board	
2	Pre-1960	Raised Timber	Low	3.0m	Masonry	Cavity masonry	
3	Pre-1960	Raised Timber	Standard	2.4m	Masonry	Cavity masonry	
4	Post-1960	Raised Timber	Standard	2.4m	Plasterboard	Brick veneer	
5	Post-1960	Slab-on-grade	Standard	2.4m	Plasterboard	Brick veneer	

Review of flood mitigation options

After conducting a literature review the mitigation strategies were categorised into elevation, relocation, dry floodproofing, wet floodproofing and flood barriers.

Cost of implementing mitigation options

Based on the characteristics of the selected storey types a floodproofing matrix has been developed which excludes the mitigation options that are invalid in the Australian context. All appropriate strategies have been costed (see Tables 2 to 4) for the selected building types through the engagement of quantity surveying specialists.

Table 2: Cost of elevation

Storey Type	Elevation (Extending walls)	Elevation (Building a second storey)	Elevation (Raising the whole house)
1	N/A	N/A	$78,200
2	N/A	$213,500	N/A
3	$397,700	$429,700	N/A
4	N/A	$405,200	N/A
5	N/A	$431,000	N/A

Table 3: Cost of dry and wet floodproofing

Storey Type	Dry Floodproofing	Wet Floodproofing	
		Existing structure	Substantial Renovation
1	N/A	$11,700	$68,000
2	N/A	$15,400	$56,600
3	N/A	$17,400	$104,300
4	N/A	$15,500	$140,000
5	$154,320	$17,400	$149,800

Table 4: Cost of using flood barriers

Storey Type	Flood Barriers (Permanent)		Flood Barriers (Temporary)		
	1.0m high	1.8m high	0.9m high	1.2m high	1.8m high
1	N/A	N/A	N/A	N/A	N/A
2	$133,500	$177,600	$62,500	$111,800	$136,300
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
5	$154,300	$208,300	$164,600	$144,100	$176,200

Experimental testing of selected building materials/systems

The strength and durability implications of immersion of key structural elements has been examined for slow water rising conditions. An analysis has been conducted to identify research gaps in building material susceptibility to floodwater in Australia. This research also entails experimental testing of three building materials/systems to ascertain their resilience to floodwater exposure:

Three types of tests have been carried out as summarised below.

Type 1: 20 specimens to test the structural adequacy of structural wall sheet bracing.

Type 2: 6 specimens for bathroom and shower subassemblies which aimed to test the bond of ceramic floor and wall tiles to their substrate along with wet floodproofing treatments.

Type 3: 48 specimens to test the structural adequacy of manufactured timber I section joists.

Strength has been tested for all the specimens at two stages i.e. dry before immersion and dry after drying following immersion. Additionally the joist specimens were also tested immediately after immersion.

FUTURE PROJECT ACTIVITIES

Vulnerability assessment of current and retrofitted building types

Vulnerability of selected storey types to a wide range of inundation depths will be assessed before and after implementing the mitigation strategies.

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 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.