

## Introductions

- **Who are we?**
- **What can we share with you?**

3

ARUP

## Reflections on asset management

- **As an asset manager, how have you responded to extreme weather or changes in climate?**
- **If things got worse, what would you do?**

4

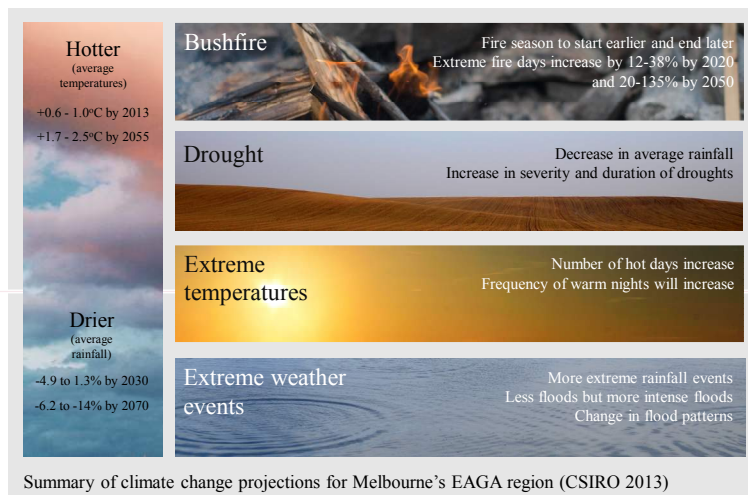
ARUP

## Expectations for the day

5

ARUP

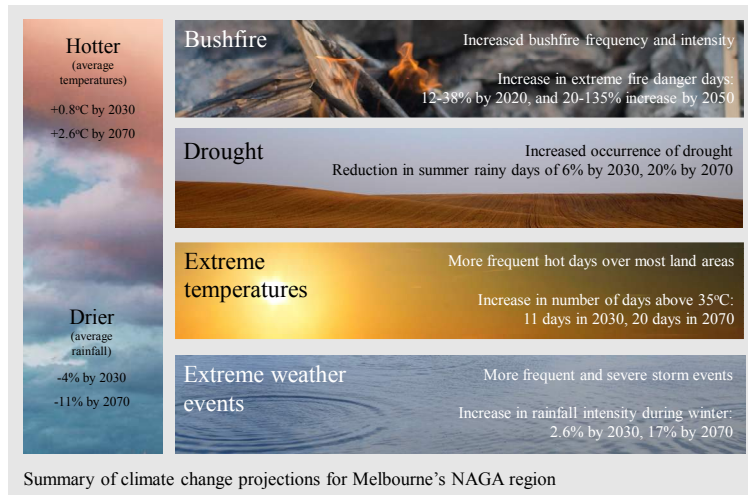
## Climate change projections



6

ARUP

## Climate change projections



7

ARUP

### AN INVESTIGATION OF POSSIBLE BUILDING CODES OF AUSTRALIA (BCA) ADAPTATION REQUIREMENTS FOR CLIMATE CHANGE



December 2014  
Report by the Australian Building Codes Board

*The largest concern is in relation to **existing buildings** constructed prior to today's contemporary building standards. These buildings **are likely to be vulnerable to current climate hazard events**, so would be even more vulnerable when faced with more severe future events.*

*If climate changes associated with a **high emissions** scenario eventuate, current **BCA compliant buildings** are also likely to be at risk.*

*Under the high emissions scenario, existing buildings would be even more exposed.*

Climate change and buildings

ARUP



9 Part 2 – Foundation concepts

ARUP

## Building vulnerability method

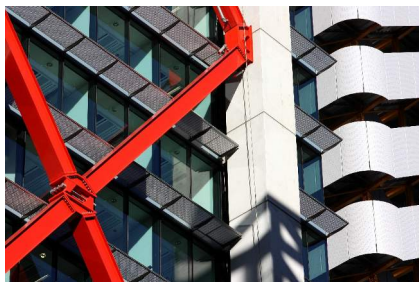
ARUP





<sup>11</sup> Typical Council building types

ARUP



- Structural performance
- Thermal comfort
- ?



<sup>12</sup> Functional requirements of buildings

ARUP



- Structural performance
- Thermal comfort
- Air quality
- Sanitation
- Power
- Communications
- Weather resistance
- Fire resistance
- Etc

13 Functional requirements of buildings

ARUP

## Activity 1 – Importance of functional requirements to building use

- **In groups, discuss / debate the following:**
  - Is thermal comfort more, less or equally important at an office compared to a childcare centre? Why?
  - Is power supply more, less or equally important at a community hall compared to a leisure centre? Why?
  - Is power supply more, less or equally important at a community hall (that is also designated as a relief / recovery centre) compared to a leisure centre? Why?
- **Share your answers with the group**

14

ARUP

### Functional requirements

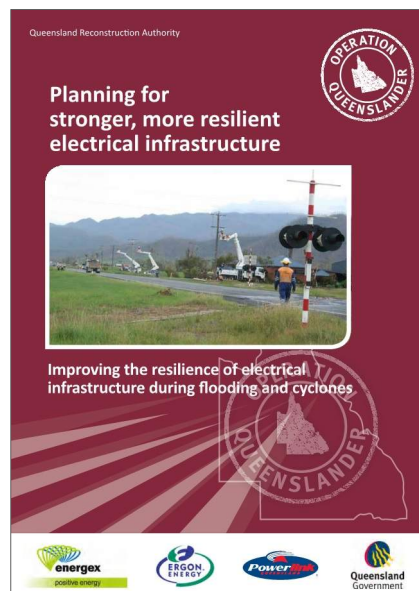
- Structural performance
- Thermal comfort
- Air quality
- Sanitation
- Power
- Communications
- Weather resistance
- Fire resistance

### Building components

- Walls
- Roof
- Windows
- Floors
- Foundations
- Doors
- Air-conditioning
- Electrical Switchboard
- Sewer
- Water supply
- Phone line

15 Activity 2 – requirements and components

ARUP



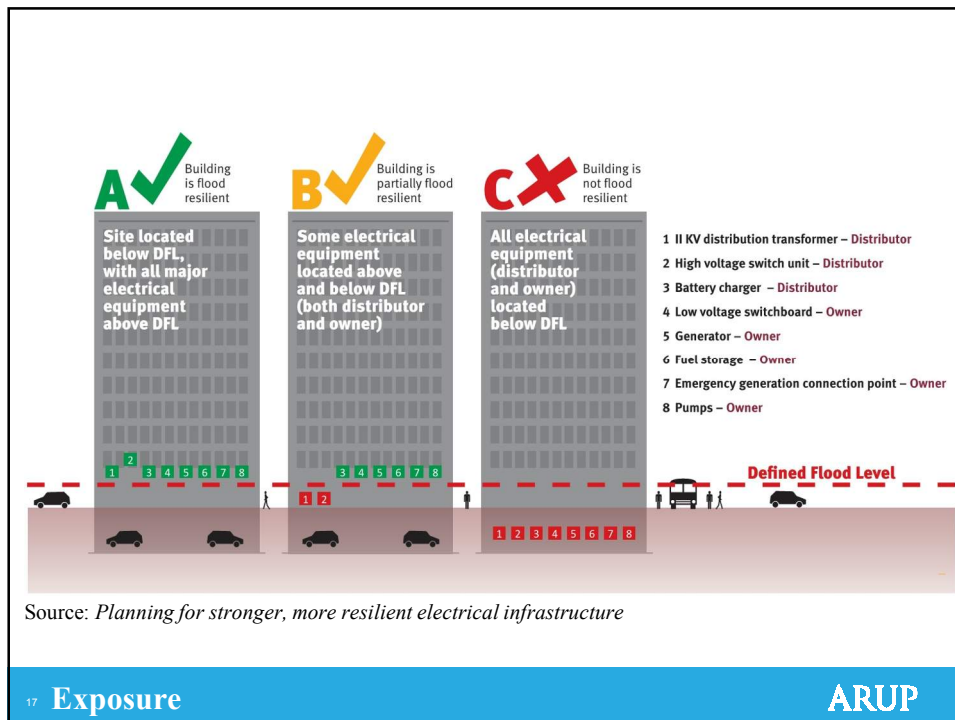
For this workshop, we define **exposure** as:

The extent that a building or building component will experience the effect of a particular direct or indirect climate driven event.

16 Exposure

ARUP





### Flood Damage-Resistant Materials Requirements

for Buildings Located in Special Flood Hazard Areas in accordance with the National Flood Insurance Program

Technical Bulletin 2 / August 2008



For this workshop, we define **sensitivity** as:

The extent that the performance of a building or building component may be compromised by a particular direct or indirect climate driven event.

Table 1. Class Descriptions of Materials

NFIP	Class	Class Description
ACCEPTABLE	5	Highly resistant to floodwater <sup>1</sup> damage, including damage caused by moving water. <sup>2</sup> These materials can survive wetting and drying and may be successfully cleaned after a flood to render them free of most harmful pollutants. <sup>3</sup> Materials in this class are permitted for partially enclosed or outside uses with essentially unmitigated flood exposure.
	4	Resistant to floodwater <sup>1</sup> damage from wetting and drying, but less durable when exposed to moving water. <sup>2</sup> These materials can survive wetting and drying and may be successfully cleaned after a flood to render them free of most harmful pollutants. <sup>3</sup> Materials in this class may be exposed to and/or submerged in floodwaters in interior spaces and do not require special waterproofing protection.
UNACCEPTABLE	3	Resistant to clean water <sup>4</sup> damage, but not floodwater damage. Materials in this class may be submerged in clean water during periods of flooding. These materials can survive wetting and drying, but may not be able to be successfully cleaned after floods to render them free of most <sup>3</sup> harmful pollutants.
	2	Not resistant to clean water <sup>4</sup> damage. Materials in this class are used in predominantly dry spaces that may be subject to occasional water vapor and/or slight seepage. These materials cannot survive the wetting and drying associated with floods.
	1	Not resistant to clean water <sup>4</sup> damage or moisture damage. Materials in this class are used in spaces with conditions of complete dryness. These materials cannot survive the wetting and drying associated with floods.

Source: *Flood Damage – Resistant Materials Requirements*

Table 2. Types, Uses, and Classifications of Materials

Types of Building Materials	Uses of Building Materials		Classes of Building Materials				
	Floors	Walls/ Ceilings	Acceptable		Unacceptable		
			5	4	3	2	1
<b>Structural Materials (floor slabs, beams, subfloors, framing, and interior/exterior sheathing)</b>							
Asbestos-cement board		■	■				
Brick							
Face or glazed		■	■				
Common (clay)		■		■			
Cast stone (in waterproof mortar)		■	■				
Cement board/fiber-cement board		■	■				
Cement/latex, formed-in-place	■			■			
Clay tile, structural glazed		■	■				
Concrete, precast or cast-in-place	■	■	■				
Concrete block <sup>1</sup>		■	■				
Gypsum products							
Paper-faced gypsum board		■			■		
Non-paper-faced gypsum board		■		■			
Greenboard		■				■	
Keene's cement or plaster		■			■		

Source: *Flood Damage – Resistant Materials Requirements*



21 Break

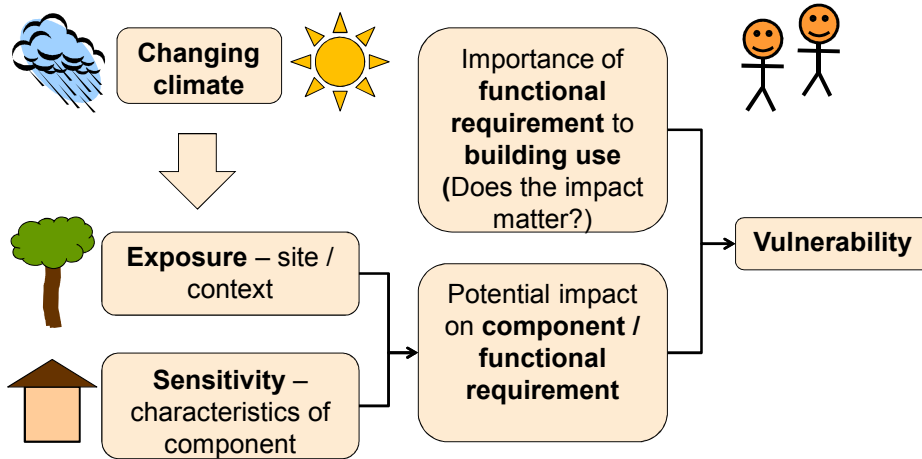
ARUP



22 Part 3 – Guided vulnerability assessment

ARUP

## Fitting the pieces together



23

ARUP



- Inner city childcare centre
- 1970s brick building built on clay ground, with shallow footings and a concrete slab above. The walls have no movement joints.
- Metal finish corrugated roof
- The building is naturally ventilated using the windows.
- It uses a Mitsubishi ceiling cassette air conditioning units (model SLZ-KA50VA) – the outdoor (heat rejection) unit is located on the roof.

24 An example building

ARUP



## Formulating actions

- **Reduce exposure**
- **Reduce sensitivity**
- **Reduce importance of functional requirement to building use**

25

ARUP



ARUP





27 Part 4 – Self assessment

ARUP

#### 4 hypothetical buildings

- **Community hall (growth area)**
- **Social housing for elderly (inner suburb)**
- **Council administrative office (anywhere)**
- **Library (anywhere)**

28

ARUP

## Group discussion

- What were the highest vulnerabilities for your building?
- What options did you consider?
- How do the priorities compare between groups?
- If all 4 buildings were in the same municipality, what should Council spend money on?
- How did you find the assessment process?

29

ARUP



30 Part 5 – Next steps

ARUP

## Take home activity

- **Choose a building in your Council's portfolio**
- **Undertake a vulnerability assessment (see Part 5 in workbook)**

31

ARUP

## Comprehensive assessment

Assess all components for all potential climate impacts

Understand importance of functional requirements to building use

Estimate vulnerability

Develop prioritised actions

32

ARUP

## Targeted by building use

Identify critical functional requirements to the building's use

Assess those components that provide the critical functional requirements for all climate events

Estimate vulnerability

Develop prioritised actions

33

ARUP

## Targeted by climate event

Identify climate events of most concern (e.g. most frequent, most severe, most different to historical events etc)

Assess all components for the prioritised climate impacts

Estimate vulnerability

Develop prioritised actions

34

ARUP

### Take home activity

- **We will give you a call in the week of 9<sup>th</sup> Nov to see if you need assistance – nominate champion for each Council**
- **In workshop 2, participants will be encouraged to share experiences using your completed assessments**