Preparing hospitals for Extreme Weather Events Caused by Climate Change

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Centre for Health Assets Australasia

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Preparing hospitals for extreme weather events caused by climate change

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Why hospitals? Some thoughts:

During (and immediately following) an extreme weather event, hospitals:

- are the main point of contact for coordination exercises
- have to deal with additional patient loads as a direct result of the event
- have to remain functional in adverse circumstances
- become a place of refuge from other less resilient buildings

Some definitions:

Intergovernmental Panel on Climate Change (McCarthy et al, 2001)

Sensitivity – the degree to which a system is affected either adversely or beneficially by climate change (encompasses all elements, direct and indirect effects)

Vulnerability – the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability.

Adaptive Capacity – the ability of a system to adjust to climate change, including climate variability and extremes, to moderate potential damages, to take advantages of opportunities, or to cope with the consequences.

Expanded further to:

Vulnerability = the problems that a system will have functioning when exposed to undesirable incidents and the problems it will experience in returning to a normal state of affairs after the event (Lisø, 2006)

Project Title:

Assessing the adaptive capacity of hospital facilities to cope with climate-related extreme weather events: a risk management approach

Research Question:

How can buildings become more resilient against extreme weather events?

Partners: NSW Health, QLD Health, SA Health and NZ MOH

Staging:

Phase 1: 2009	vulnerability assessment
Phase 2: 2010	assess adaptive capacity / develop adaptation strategies
Phase 3: 2011	action Plan + evidence base for design and adaptation strategies

Case Studies – extreme weather events:

Jurisdiction	Case study	Study issue
NSW	Coffs Harbour Base Hospital	flash flooding (creek)
QLD	Cairns Base Hospital	cyclone
SA	Ceduna Community Health Services	heatwave
New Zealand	Whangerei Hospital, Northland	flooding (from river & heavy rain)

Case Studies Selection Criteria:

- Past records of extreme weather
- Size and age of hospital
- Total population dependencies
- Future climate projections

Case Studies – extreme weather event:
NSW – Coffs Harbour Hospital – flooding

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Assessing the adaptive capacity of hospital facilities to cope with climate-related extreme weather events: a risk management approach

Case Studies – extreme weather event:

NSW – Coffs Harbour Hospital – flooding

- Largest hospital in North Coast area of NSW - mid North Coast
- Major referral hospital in region
- Serves population of 100,000
- Average annual rainfall = 1700mm – late summer/early autumn
- 6 major flooding events in 2009 – affected other hospitals in region as well
- Impact of residential aged care facilities – evacuation of residents to hospital
- Staff absenteeism; roads cut; damaged local infrastructure

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Case Studies – extreme weather event:

SA – Ceduna Multipurpose Service - heatwaves

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Case Studies – extreme weather event:

SA – Ceduna Multipurpose Service - heatwaves

- Remote – 10 hours from Adelaide
- Some people drive 8 hours to the hospital
- Large indigenous population
- ~3700 total + tourists passing through
- arid / hot summers / limited rainfall
- 2008: 12 days >35degC; early 2009: 46.2degC
- 25 acute beds + 10 beds High Care aged care + primary health + independent aged care

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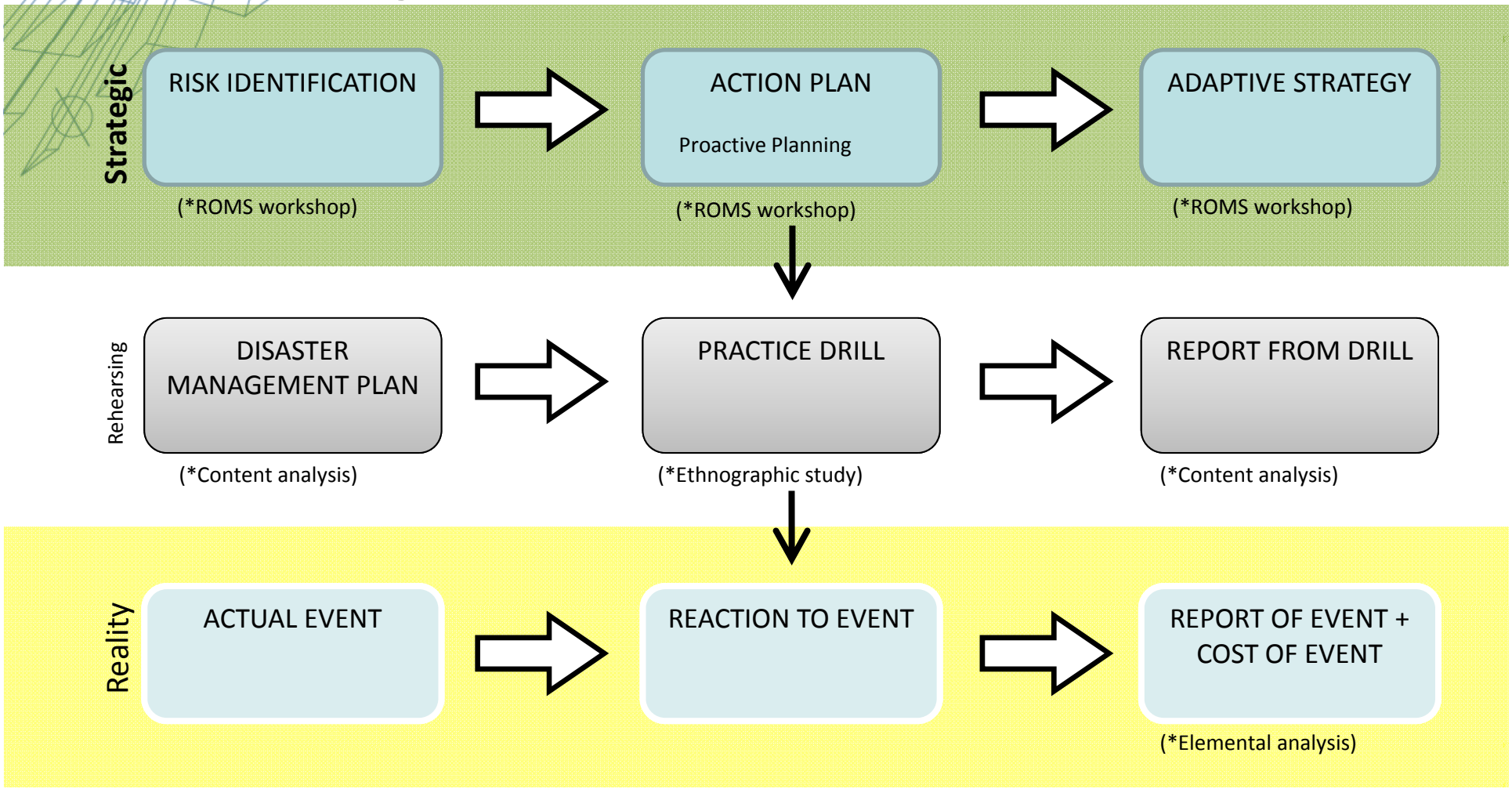
Disaster Management (Research) Framework



ARC Linkage Project LP0884116

Assessing the adaptive capacity of hospital facilities to cope with climate-related extreme weather events: a risk management approach

"Risk and Opportunity Management System" (ROMS)

Workshop conducted using ROMS (www.risk-opportunity.com).

- Structured approach / international standards of risk management
- Identify and prioritise stakeholder objectives
- Identify risks and opportunities
- Assess and prioritise
- Develop Action Plan to address

Focus group of key stakeholders

Ability to implement project objectives

Objectives affected by project outcomes

	Low	High
Low	**Minor Stakeholders** All Support Services (e.g. Cleaners, Kitchen, etc) Trade Services Other Government Department Laboratories / pathology	**Important Stakeholders** Utility (essential) services – power, water, gas Civil Defence and emergency service - (SES) Public Works Dept (State level government dept) Security Patients and community (indigenous, socially disadvantaged, aged, disabled, young, LSE) Staff / Services
High	**Major Stakeholders** Local Government Designers Union	**Key Stakeholders** Director Corporate Services Director of Nursing Facilities Manager including IT Emergency Management Personnel Director of Medical Services Ambulance / emergency services Corporate Asset Manager Quality and Safety Management Public Relations Personnel

Focus group of key stakeholders – concerns – Coffs Harbour

Common Objectives	Weighting
To ensure staff and patient safety (including vulnerable patients within the community)	40%
Maintain essential services and physical fabric (water, electricity, gas, communications (IT), sewerage and sufficient supplies).	20%
To ensure continuity of service delivery (core clinical services – theatres, emergency, maturity, ICU and ensuring adequate staff resources to deliver health services – senior management and health staff)	20%
To ensure timely access in and out of facilities for staff, patients and emergency vehicles (to ensure we maintain adequate resources and staff available to cope, patients can get treatment etc) – including wider access in catchment area	10%
Effective internal and external communications.	10%

Focus group of key stakeholders – risks & opportunities

Common Objective (Ranked)	Risks	Opportunities
To ensure staff and patient safety (including vulnerable patients within the community)	Flooding into clinical areas	Develop and implement flood mitigation strategy for the site (eg. Coffs Harbour bypass may present opportunity, engage with urban planning controls)
	Roads being cut	
	Inability to respond to speed of event	
	Lack of disaster procedures for vulnerable patients	
	Lack of ability to cope with surge of demand	Build a multi-storey car park
	Unpredictability of pattern of event (intensity, nature/pattern/location of impact, etc)	
	Not having leadership available ON SITE causing poor coordination during event	
	Adequacy of community age care facilities BCM plans and capacity to implement those plans	

Focus group of key stakeholders – risks & opportunities

Common Objective (Ranked)	Risks	Opportunities
Maintain essential services and physical fabric (water, electricity, gas, communications (IT), sewerage and sufficient supplies)	Flooding into essential services (usually in the basement)	Increase self-sufficiency (utilise roof space for water collection, solar – use of new technologies etc)
	Inability of key maintenance staff to get to work	
	Inadequate building design (eg. Low pitch roof design, drains, essential services located in flood-prone areas – at low levels etc)	Revise HFG and other regulations and guidelines re. Design and planning of critical infrastructure
	No back-up essential services (due to cost savings etc)	
	Just-in-time models for logistics resulting in reduced on-site stock	
	External service providers – cessation of services such as food, linen, waste etc	
	Not having an adequate minimum level of supplies maintained (fuel, food, etc)	
	Capacity of emergency services to get necessary resources to site	

Focus group of key stakeholders – risks & opportunities

Common Objective (ranked)	Risks	Opportunities
To ensure continuity of service delivery (core clinical services – theatres, emergency, maturity, ICU and ensuring adequate staff resources to deliver health services – senior management and health staff)	Specialist staff themselves being affected by the flood (can't get to work – their priority will be their family and property)	Adapting other facilities to accommodate staff during an emergency
	Lack of new growing population's knowledge of flood events	
	Being regional we have a limited pool of casual staff and specialized staff to draw on and no back-up supply of staff (eg. Intensive care nurses)	
	Timing of the event – if occurs after hours increased risk	
	Lack of availability of staff over an extended period – replacement of fatigued staff	

Focus group of key stakeholders – risks & opportunities

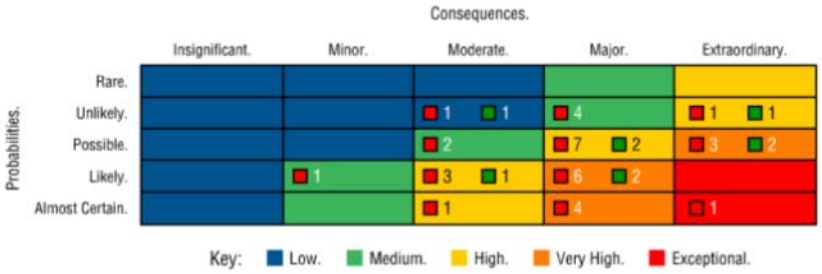
Common Objective (ranked)	Risks	Opportunities
To ensure timely access in and out of facilities for staff, patients and emergency vehicles (to ensure we maintain adequate resources and staff available to cope, patients can get treatment etc) – including wider access in catchment area	Hub and spoke model of service delivery can be compromised by loss of access in wider catchment area	Create a flood-free access to the hospital
	Singular access to the site and potential secondary access is also flood-prone	Further develop our telehealth facilities
	Availability of appropriate vehicles to cross flooded areas (eg. Water police, boats, large 4WD etc)	
	Co-location of ambulance means cannot get out during a flood	
	Inability to air lift critically ill patients to tertiary care – rotary unable to fly	

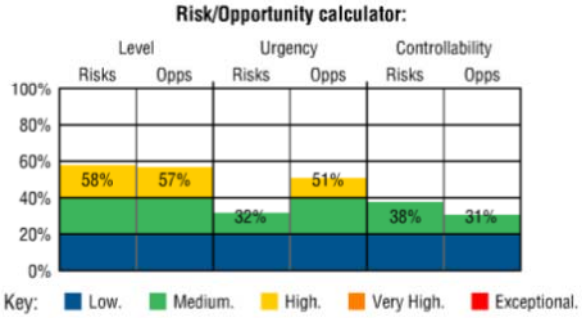
Focus group of key stakeholders – risks & opportunities

Common Objective (ranked)	Risks	Opportunities
Effective internal and external communications. **EXTERNAL (Horizontal – SES, police, council, community services, power/energy – all LEMC members; Vertical – Department of Health, HSFAC)** **INTERNAL – onsite services, staff, etc**	Location of emergency operating centre in town preventing management staff working there	Ability to control from one single source all communications to entire campus via designated screens/TV system override/emergency channel etc
	Inadequate phone access – swamping of mobile and landline and control centres	
	Inadequate early warning system	
	Inadequacy of communication systems for campus population – staff and public (eg. PA system etc)	Coffs Council can make their emergency operating centre flood free
	Inadequate numbers of senior staff to attend to all areas and other staff stepping in inappropriately	
	Controlling large volumes of conflicting information from numerous sources to avoid misunderstanding	
	Clarity of communications – to ensure people respond appropriately – need to withstand scrutiny	
	People not following protocols/directions	

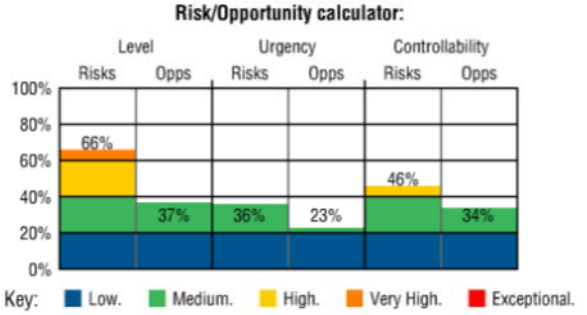
ROMS outputs – from risks identified

Coffs Harbour Base Hospital

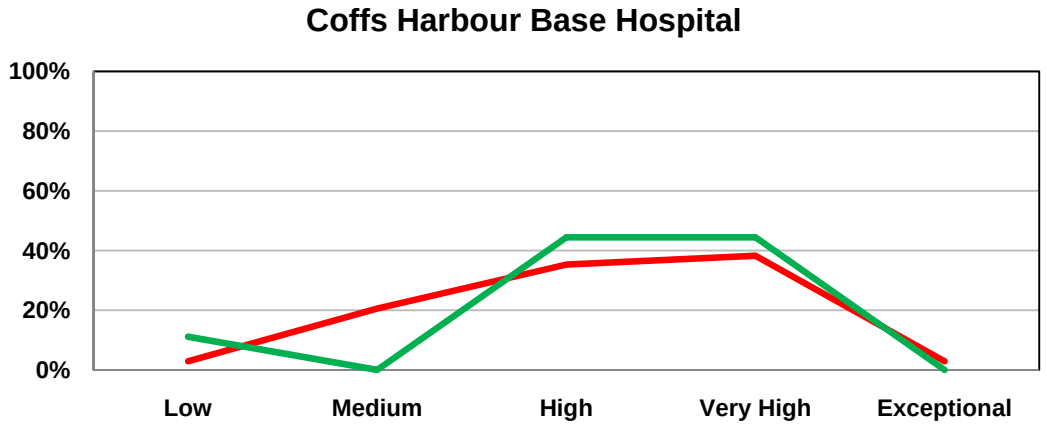


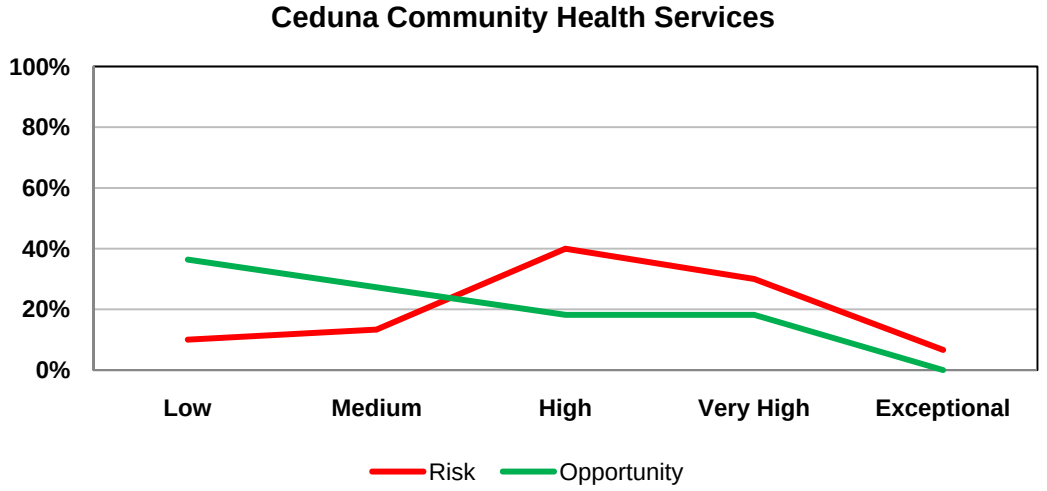


Ceduna Community Health Service



ROMS Step 5 Output – Risk/Opportunity profile





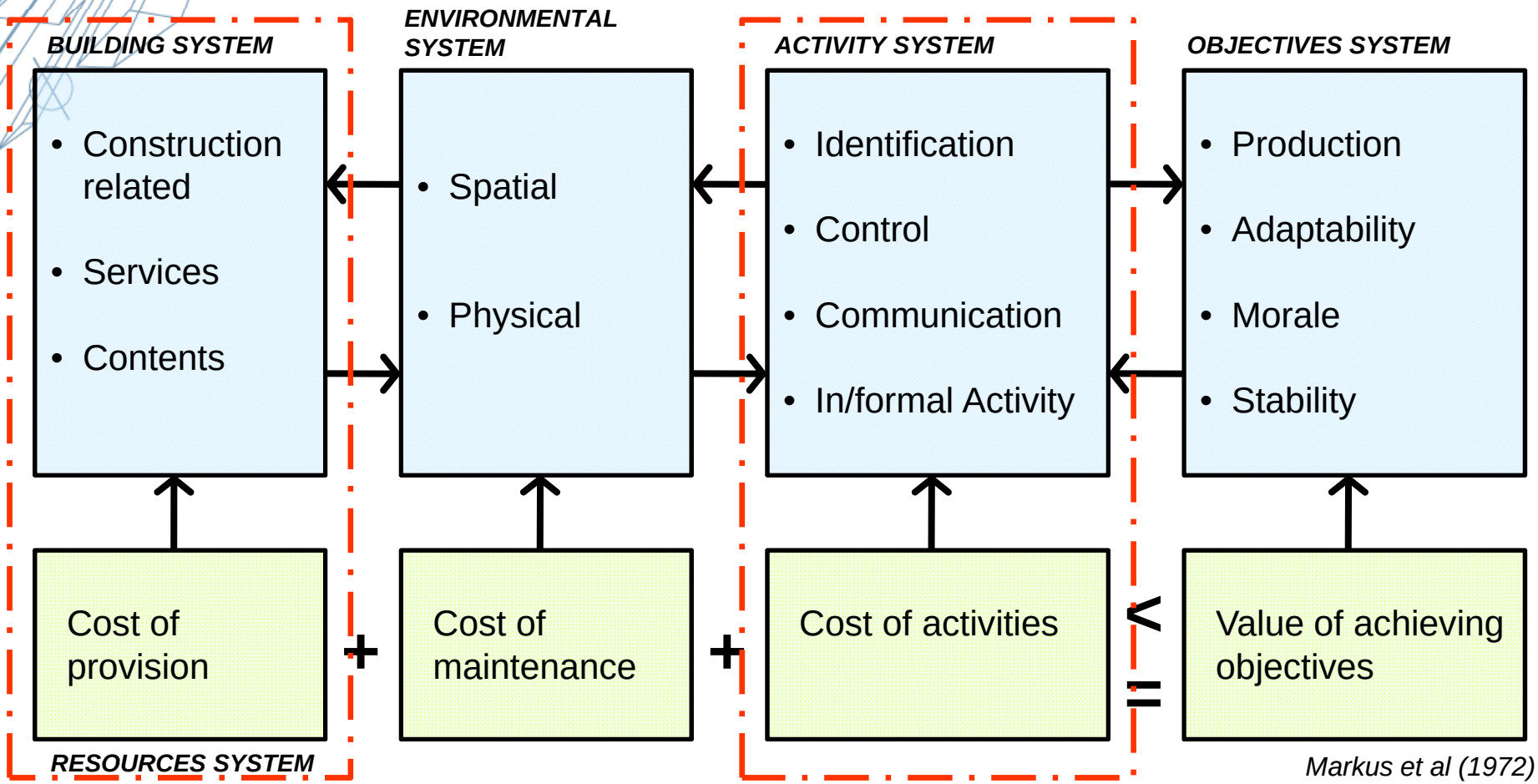
Main objectives identified in ROMS

Overall goal = maintaining continuity of service delivery during an extreme weather event

4 key areas associated with vulnerability:

1. Availability of essential building services - supported by
2. Ensuring the physical integrity of the hospital
3. Effective inter-agency communication
4. Maintaining access to the hospital for staff and patients

Relationship between facilities and activities



Markus et al (1972)

Next Steps

- Analyse results from follow-up workshop investigating adaptive capacity
- Explore relationship between building and organisational resilience
- Examine the cost of extreme weather events
- Develop an action plan to address issues identified
- Develop an evidence base leading to adaptation strategies for hospitals faced with increasing exposure to floods and other extreme weather events.

Some preliminary conclusions #1:

- Building fabric appears to be robust so far – but for how long will this be the case? Increased rate of deterioration is likely
- Analysis of costs of incidents suggest that in many cases additional costs are being passed to staff e.g. damage to cars results in increased insurance premiums – for how long is this possible?
- Not all parts of the system understand the importance of the issue e.g. aged care facilities without emergency generators
- Hospital infrastructure not necessarily seen as ‘essential’ to bodies such as the SES (their role is to keep people safe)

Some preliminary conclusions #2:

- Good information communicated well to all involved is important
- Early warning systems (preferably automated) are essential
- Early planning can prevent many problems e.g. flood mitigation measures e.g. not using carparks as detention basins; appropriate site selection, etc.
- Good management can avert many crises - but not all!
- The hospital is more than simply the identified buildings – also includes carparks, access roads, etc – in addition to the operational system(s) it houses
- Asset and facility management including well thought out design guidelines can assist the process of increasing adaptive capacity - teasing out the interactions is the focus of our future research.

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For more information about this and other initiatives by CHAA

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Thank you...