Towards a Safe System for Cycling

Development and application of a cycling safety system model for New Zealand

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Mackie research & consulting

optimising human systems

Rationale

- In future more cycling = more deaths → unacceptable
- A proactive approach to road safety
- Potential approach for the 'Safe System' → a 'systems' approach?

What we know about cycling casualties

Fatality over-representation: older people, high speed roads, males, heavy vehicles (Koorey 2014, Boufous et al 2012, De Rome et al 2011)

Drivers at fault in majority of cases (Johnson et al 2010) with poor driver observation common (Koorey 2014)

Intersecting vehicle crossings are important predictors (Turner et al 2009)

Relatively high risk when exposure accounted for (Tin Tin et al 2010, MOT 2015, Palmer et al 2014, Garrard et al 2010)

Low levels of cycling predominates in NZ and Australia (MOT 2015, ABC 2015)

People who ride bicycles have lower all-cause mortality risk (Rissel 2015)

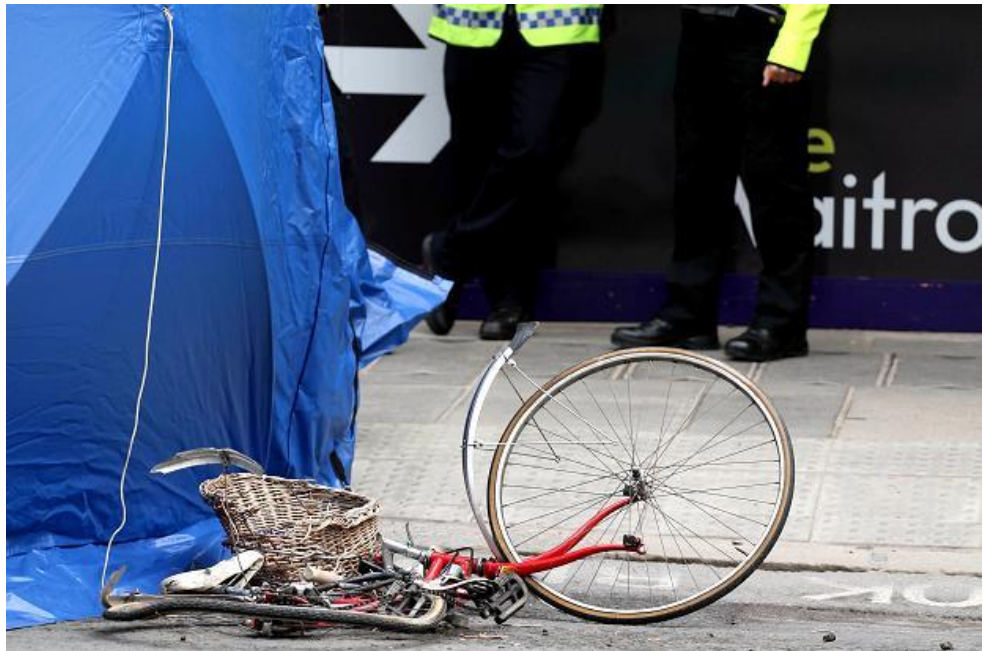
A system approach to cycle casualties…

Society

Eg Culture, norms etc

Govt Organisations

Eg Strategy, funding



Policies and procedures

Eg design manuals, expertise

environmental conditions

Eg Road design, vehicles

Road user behaviours

Eg Actions, errors

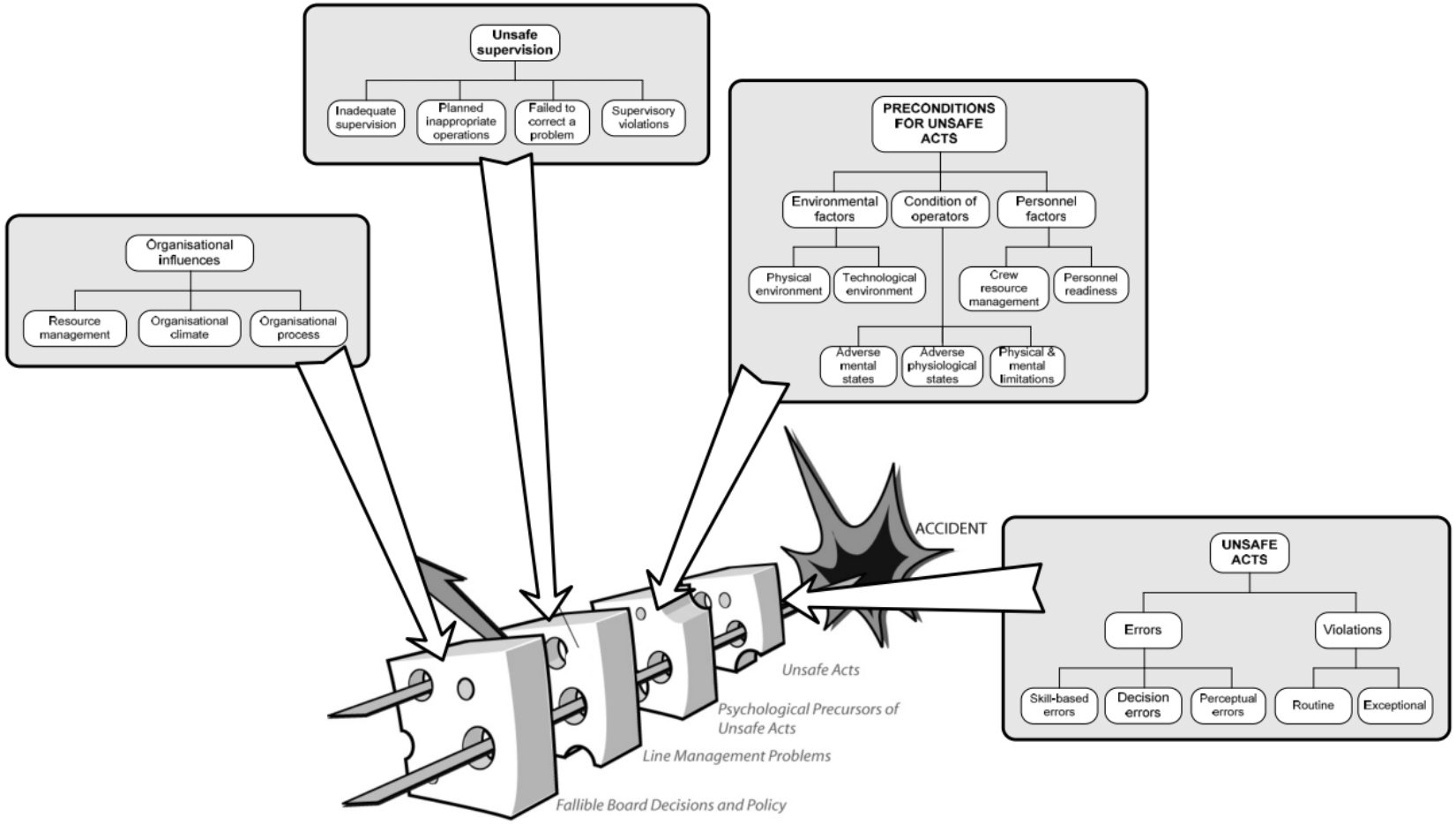
Accident causation methods

The Haddon Matrix

Phases	Factors			
	Person	Vehicle	Physical environment	Social environment
Pre-crash				
During crash				
Post-crash				

Accident causation methods

The Swiss Cheese Model (Reason 1990) and HFACS



Accident causation methods

STAMP: System-Theoretic Accident Model and Processes

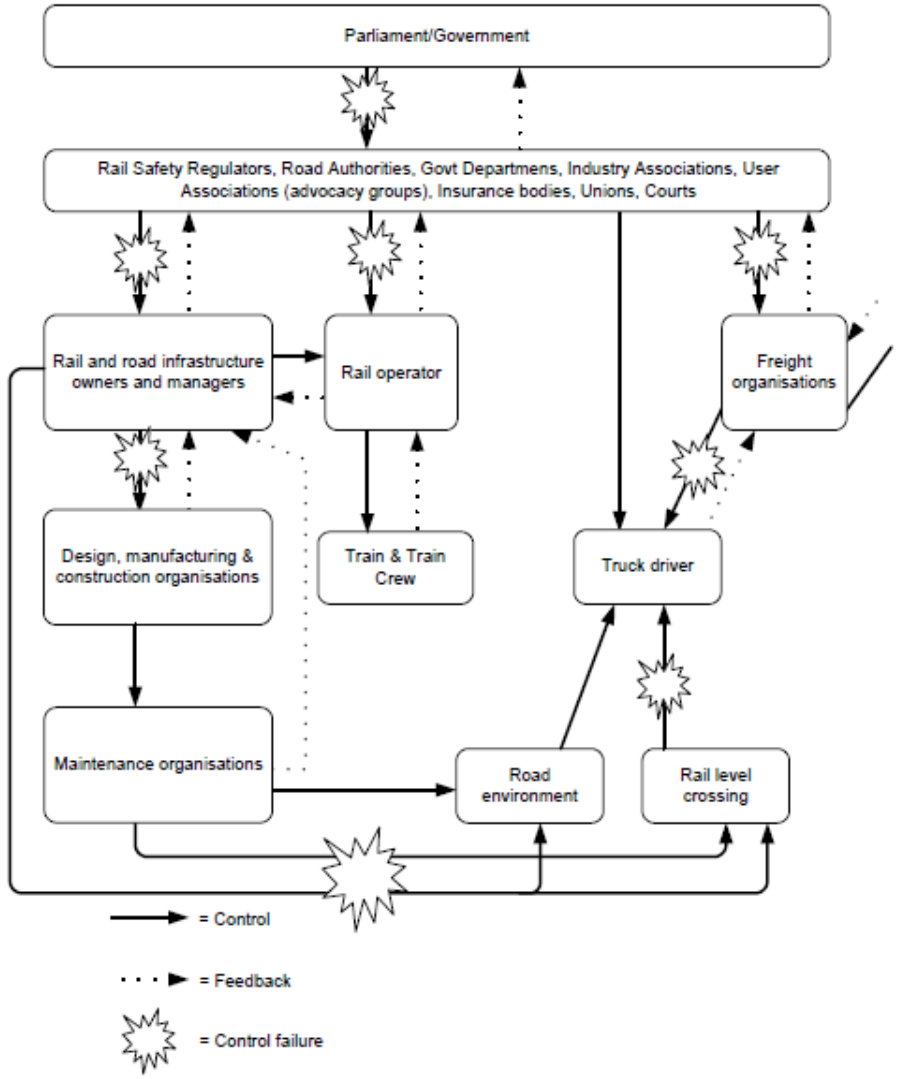
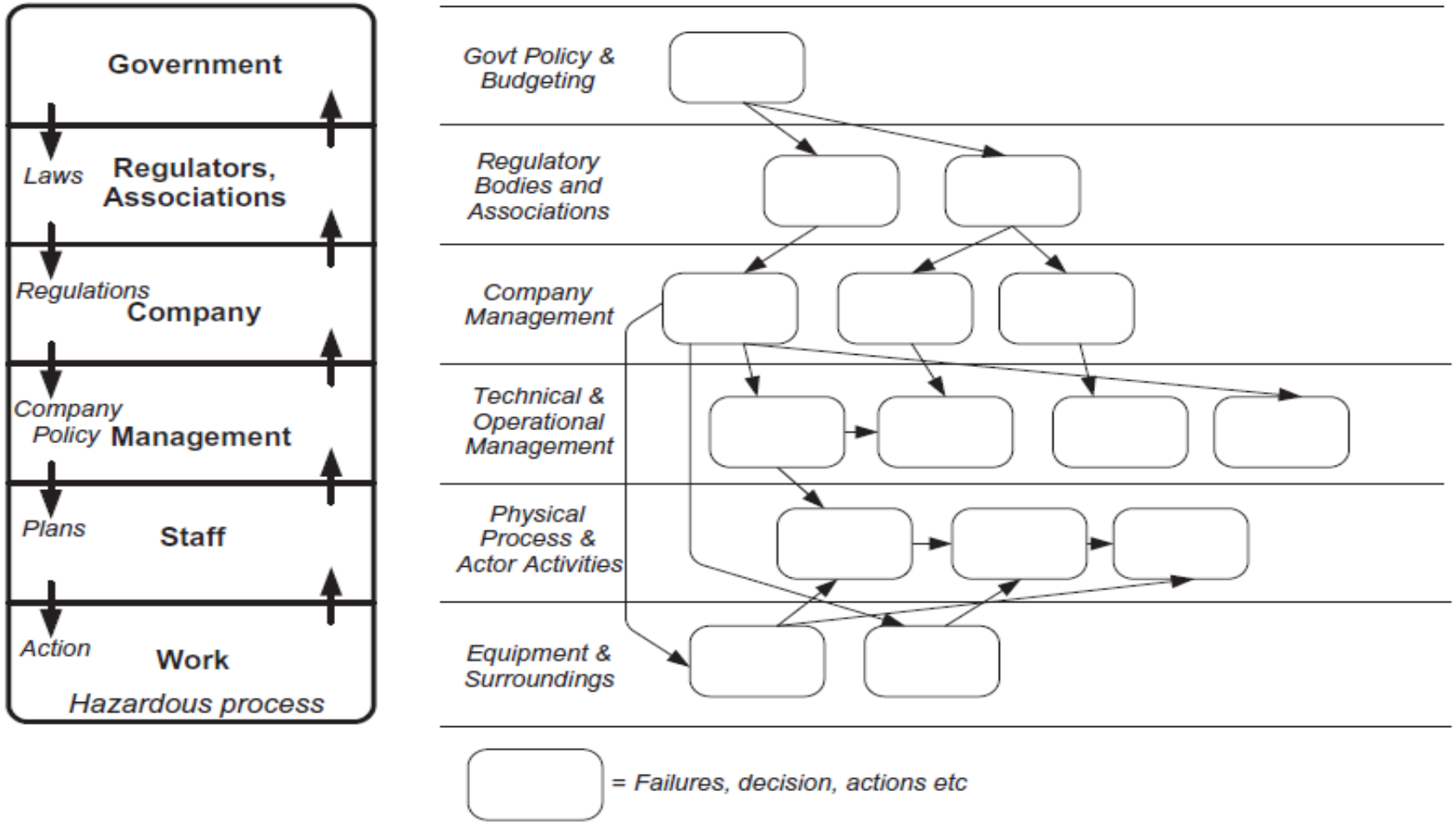


Figure 3. Rail level crossing control structure with control failures.

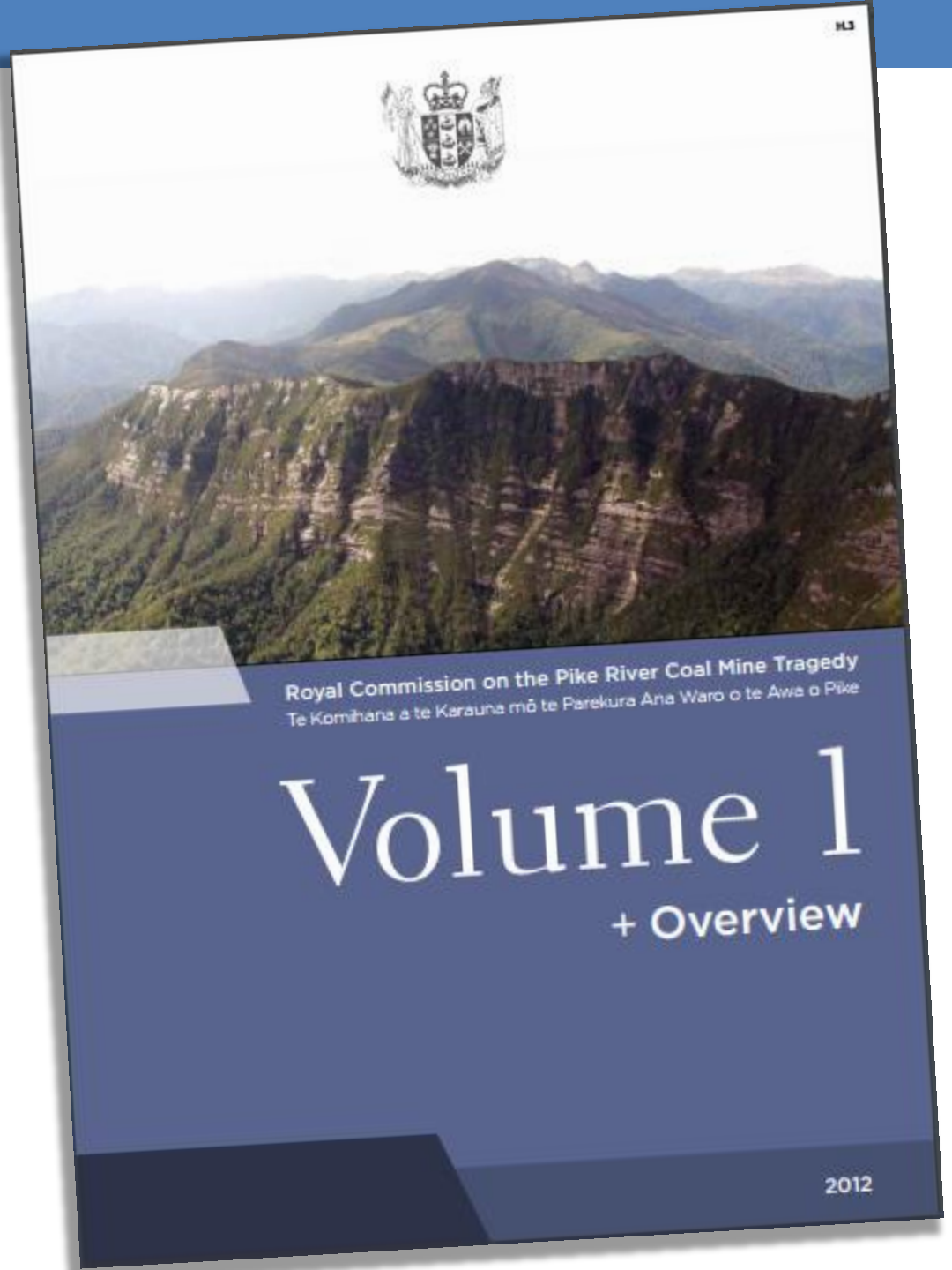
Salmon et al. 2012. Kerang level crossing tragedy

Accident causation methods

Rasmussen's model of socio-technical complex systems



Source: Salmon et al (2012)



Pike River

The commission has endeavoured to establish both the operational factors and the systemic reasons that contributed to the tragedy. The inquiry was not limited to events at the mine, but extended to the actions of the regulators and the effectiveness of mining regulation and practice in New Zealand.

Research Purpose

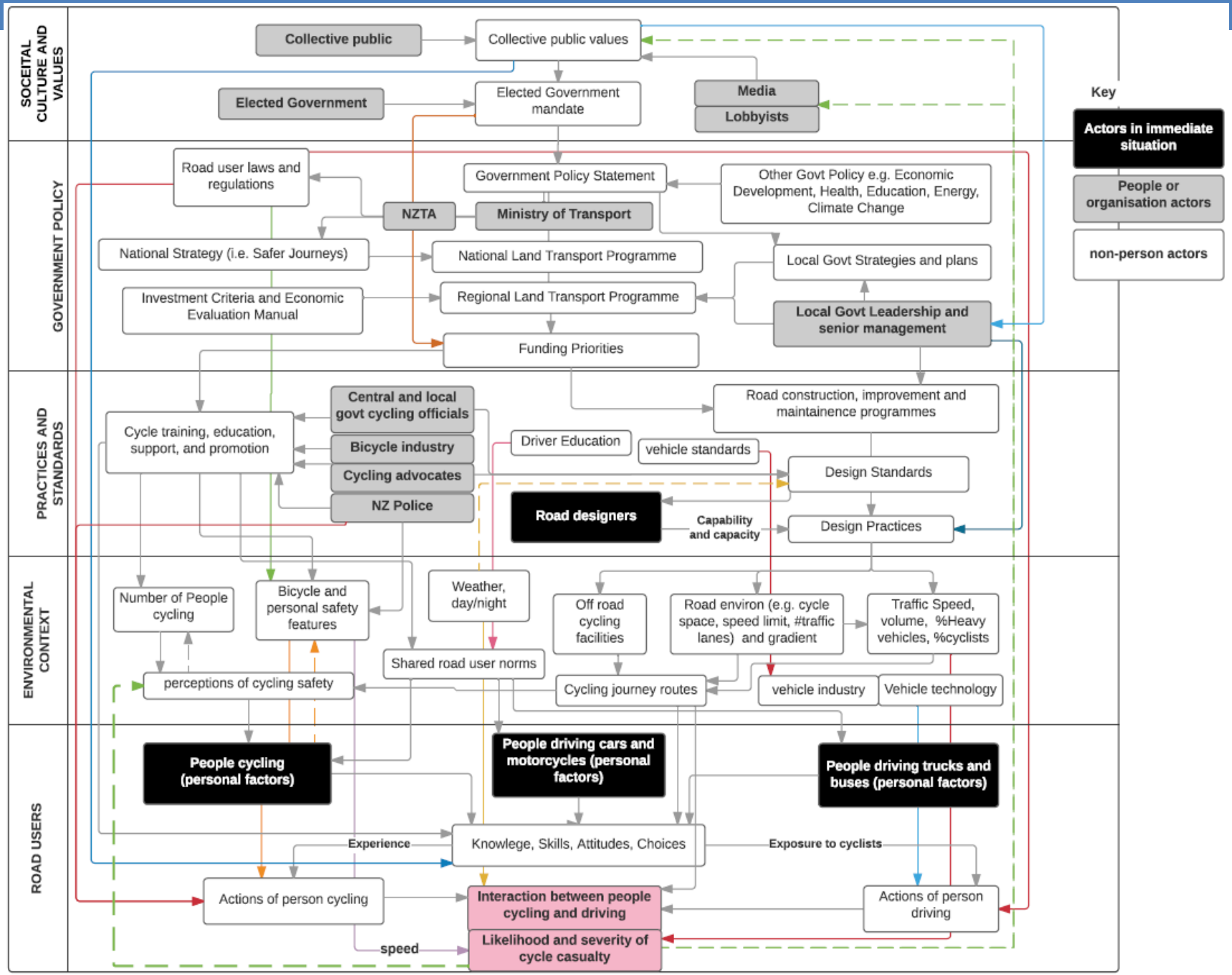
Identify key cycle safety interventions through the development and application of a cycling safety system model

Research Methods

1. Development of draft model and consultation

2. Typical causal pathways from fatality data (30 cases)

3. Key findings and conclusions

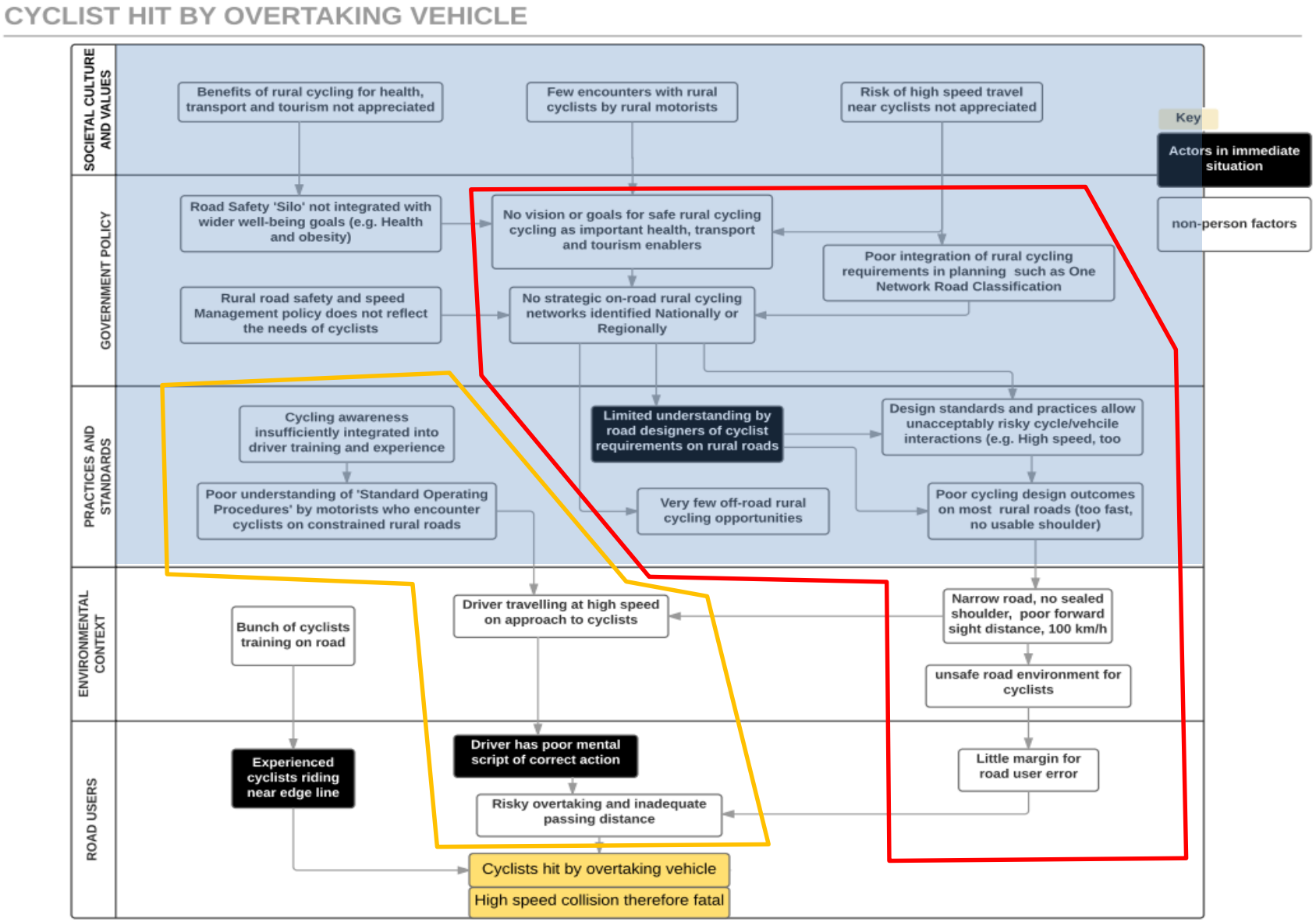

SOCEITAL CULTURE AND VALUES
GOVERNMENT POLICY
PRACTICES AND STANDARDS
ENVIRONMENTAL CONTEXT
ROAD USERS
Collective public
Collective public values
Elected Government
Elected Government mandate
Media
Lobbyists
Key
Actors in immediate situation
People or organisation actors
non-person actors
Road user laws and regulations
Government Policy Statement
Other Govt Policy e.g. Economic Development, Health, Education, Energy, Climate Change
NZTA
Ministry of Transport
National Strategy (i.e. Safer Journeys)
National Land Transport Programme
Local Govt Strategies and plans
Investment Criteria and Economic Evaluation Manual
Regional Land Transport Programme
Local Govt Leadership and senior management
Funding Priorities
Central and local govt cycling officials
Road construction, improvement and maintainence programmes
Cycle training, education, support, and promotion
Bicycle industry
Driver Education
vehicle standards
Cycling advocates
Design Standards
NZ Police
Road designers
Capability and capacity
Design Practices
Number of People cycling
Bicycle and personal safety features
Weather, day/night
Off road cycling facilities
Road environ (e.g. cycle space, speed limit, #traffic lanes) and gradient
Traffic Speed, volume, %Heavy vehicles, %cyclists
Shared road user norms
perceptions of cycling safety
Cycling journey routes
vehicle industry
Vehicle technology
People cycling (personal factors)
People driving cars and motorcycles (personal factors)
People driving trucks and buses (personal factors)
Experience
Knowlege, Skills, Attitudes, Choices
Exposure to cyclists
Actions of person cycling
Interaction between people cycling and driving
Actions of person driving
speed
Likelihood and severity of cycle casualty

Typical ‘stories’ from casualty data

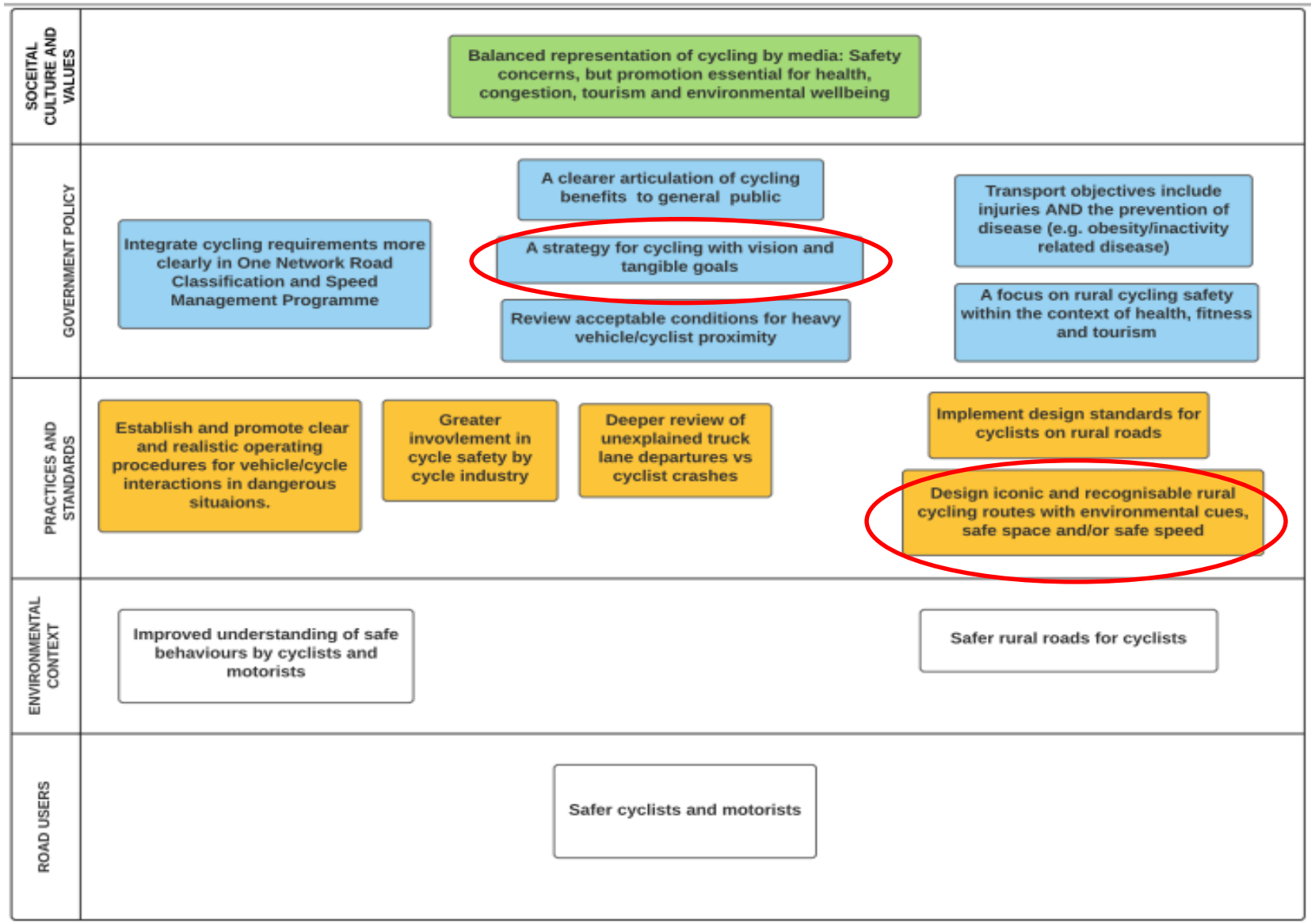
Crash typology	Number	% of total
Cyclist moves into path of vehicle	9	30%
Cyclist hit by overtaking vehicle	6	20%
Driver failure to give way	5	17%
Cyclist loses control down hill	5	17%
Driver loses control	2	7%
Car door/under truck	2	7%
Cyclist loses control braking	1	3%
Total	**30**	

Scenarios:
Cyclist turns into path of vehicle
Cyclist hit by overtaking vehicle
Cyclist hit by car door (and falls under truck)

Cyclist hit by overtaking vehicle



Solutions – cyclist hit by overtaking vehicle



Next Steps…

- Start simple – integrate the ‘thinking’
- better data and tools
- More focus on higher level factors and relationships between factors
- Examples exist – e.g. Outdoor Ed UPLOADS
- Apply to other areas of road safety

Thank you