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Risk & Resilience
A Systems Approach for National Security

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Contemporary Security Issues in NZ

Natural

- **Natural Hazard:** flood, earthquake, volcano, storm, drought, wildfire, etc
- **Bio-security:** plant and animal disease, foot & mouth, etc
- **Health Emergency:** epidemic, SARS, H1N1

Technology

- **Infrastructure:** accident, engineering failure, service outage, utility loss
- **Transport:** aircraft, train, ship accident; road or bridge closure
- **Hazardous Materials:** chemical leakage, marine oil spill, plume
- **Food:** safety issues, quality, distribution, contamination, cumulative risk
- **Supply Chain:** fuel interruption, energy distribution, shortages of imports

Human

- **Failings:** accidents, negligence,
- **Malice:** malevolence, criminal activity, arson, protest
- **Unconventional Attack:** cyber-threat, hacking, service denial
- **Sovereignty:** border violation, espionage, trans-national crime, poaching
- **Organized Threats:** military, para-military, terrorism, asymmetric warfare

Need for a Structured Approach

New Zealand's experience since mid-1990s has convinced us of the importance of approaching security in a structured way:

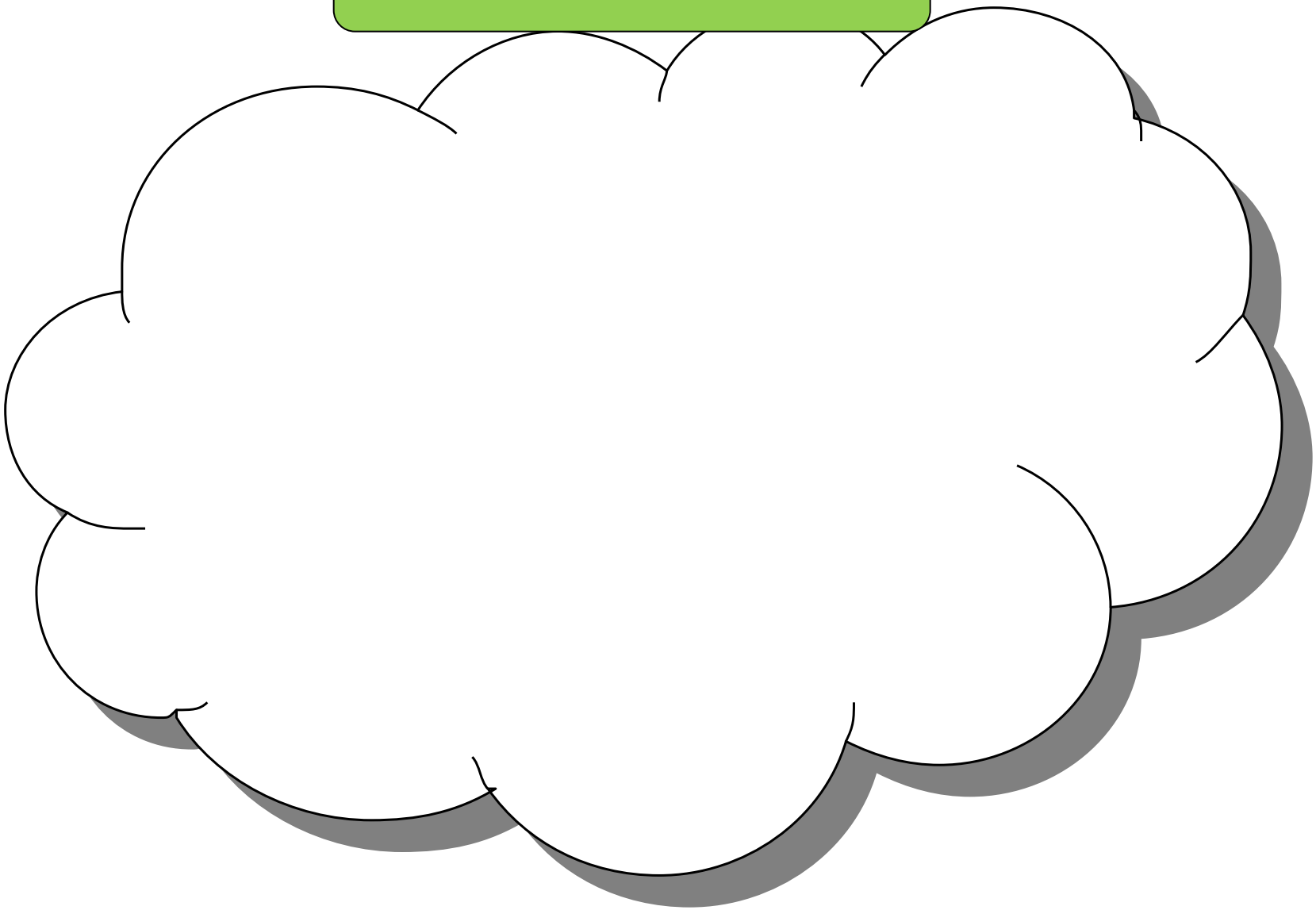
- having comprehensive analysis of hazards/threats and possible impacts
- taking a systems approach to managing risks, reducing vulnerabilities and building resilience *within the same framework*
- using formal integrated risk management strategies, eg, 4Rs (or PPRR)
- building generic resilience to deal with complex or unanticipated situations
- having prior arrangements for adaptive management in crises.

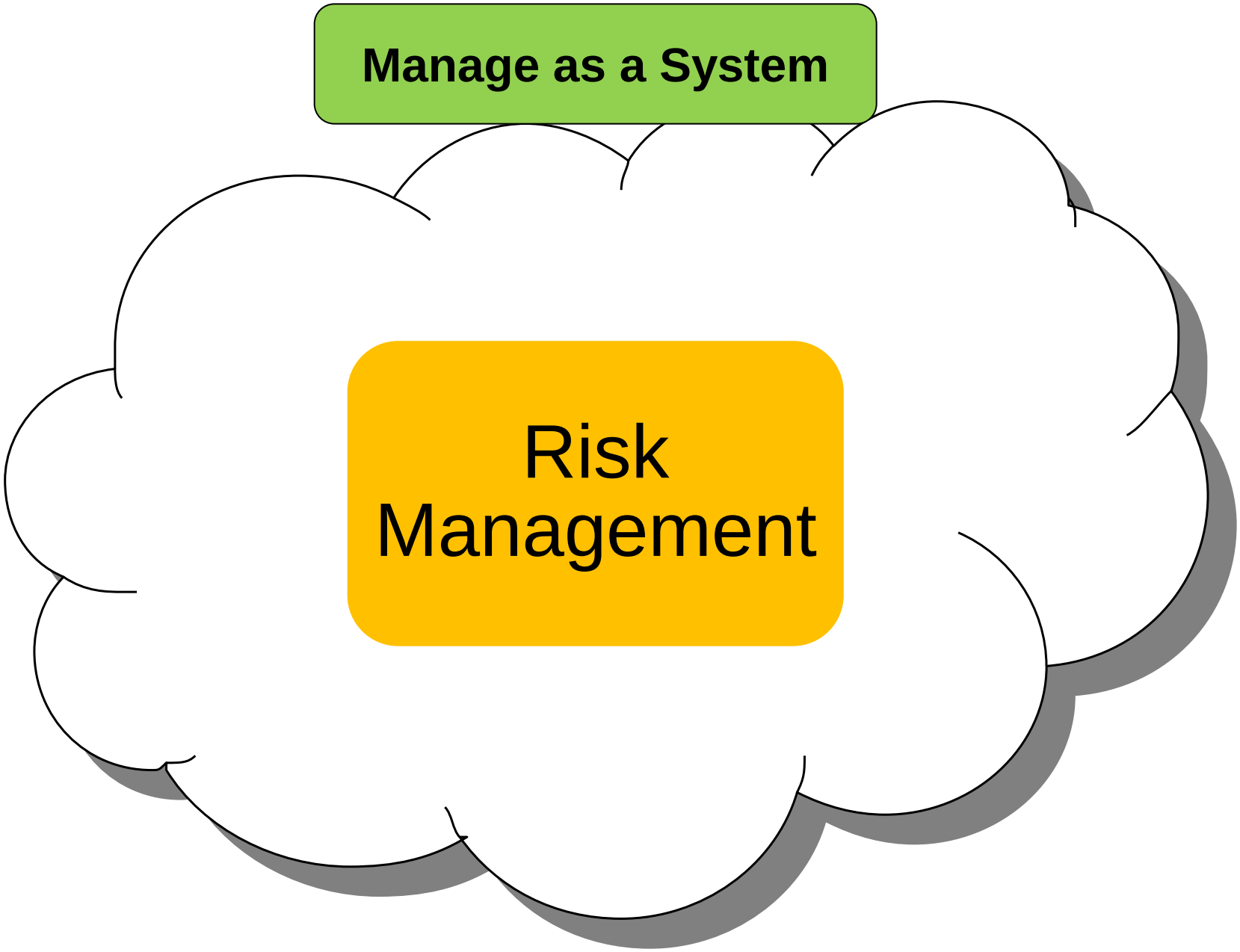
Systems Approach

As a general strategy for dealing with complex or unanticipated issues:

1. **Manage the system as a whole**
2. **Mitigate discrete risks**
3. **Build system resilience**
4. **Adaptive management in response**

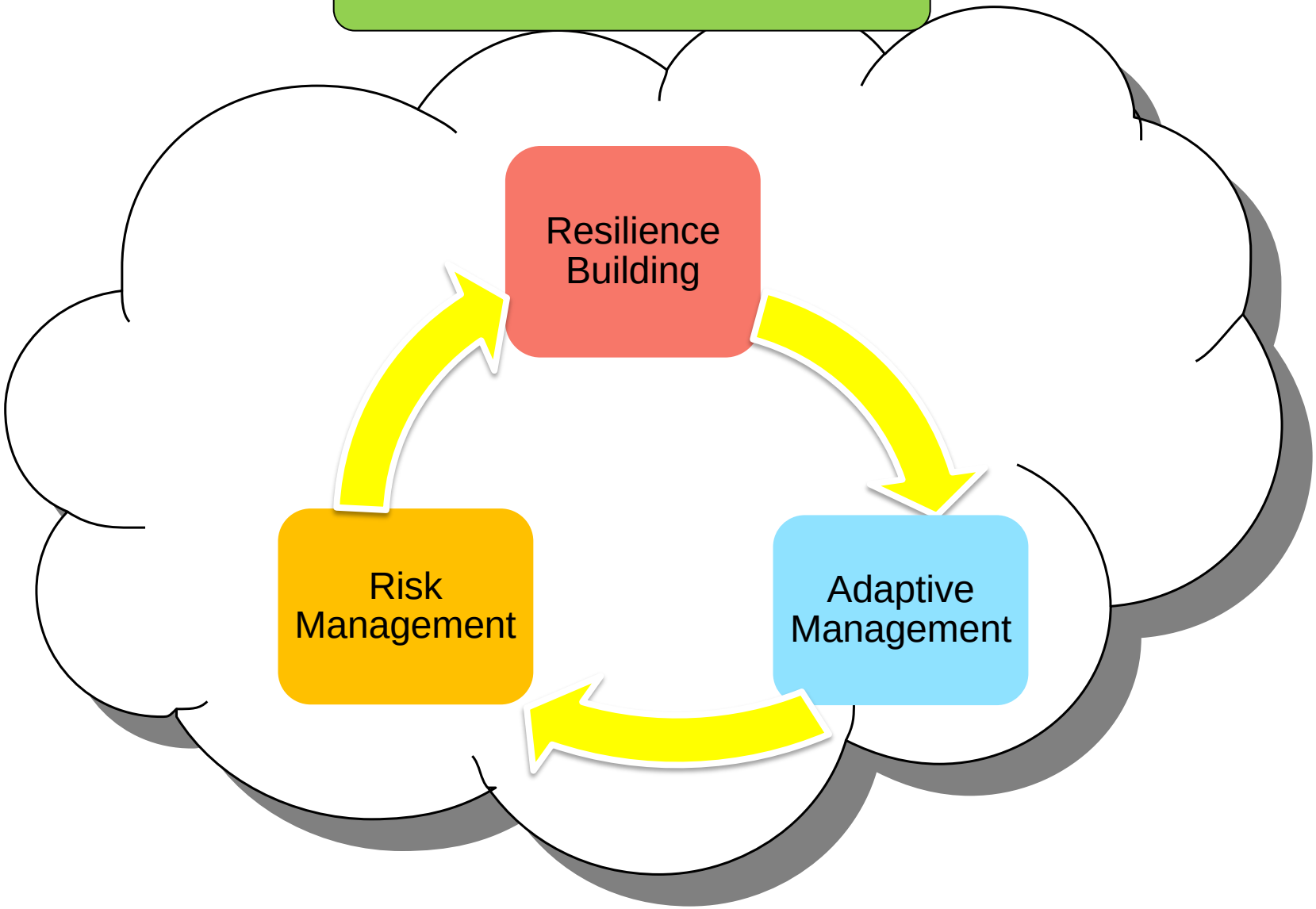
Manage as a System




Manage as a System
Risk Management

Manage as a System

Manage as a System



Manage the System as a Whole

- Take a systems perspective of all parts, including agents of hazard/threat and vectors, through to the community (social/environmental/economic consequences)
- Aim to understand interactions between the main elements, causal chains, etc
- Analyse linear and non-linear interactions – including over long periods
- Frame the issues in social terms, not as events or agents of harm
- Orient to outcomes: ie, security, stability, and safety for the society or nation

Mitigate Discrete Risks

- Manage known risks, individually and collectively, where practicable
- Pay attention to systemic risks, and to low probability – high consequence risks
- Analyse initiating agents (threats & hazards) and vectors of harm, pathways, etc
- Undertake sensitivity analysis, and aim for quantitative measures where possible
- Mitigate (ie, treat or control) risks using cost-benefit analysis
- Take account of uncertainty, acknowledging intrinsic limits of risk management

Build System Resilience

- Assess known vulnerabilities, then ameliorate
- Take account of exposure, susceptibility, and sensitivity, etc
- Enhance resilience throughout total system
- Consider social context, organisations, infrastructure, environment, & economy
- Plan for unknown risks, generic shocks, and long-term adverse trends
- Continually build social capital, and raise awareness

Adaptive Management in Response

- Pre-plan decision-making arrangements for crises or complex situations
- Build capacity for well-coordinated, flexible, collective responses
- Work to principles, including subsidiarity and clear devolution of responsibilities
- Encourage evidence-based decision-making and creative solutions
- Be aware of risks of using SOPs and normal command & control management
- Facilitate spontaneous self-organising groups of volunteers
- Review & improve, incorporate lessons, and develop security/safety culture

Purpose: Security, Stability, & Safety

“Living with Risks”

(not eliminating them)

The Wellington Region

Wellington Fault ------

Risk : Resilience
(The Distinction Matters)

Classical risk management works best with discrete risks

Risk Management has intrinsic limitations

- prior knowledge that the risk exists
- assumptions about source, scale, failure routes, chains of causality, etc
- uncertainties as to likelihood, magnitude, timing, vulnerabilities, etc
- problems with multiple or coupled risks, or complex systems
- requires ownership/responsibility to be defined and accepted, and
- consequences that can be anticipated, and mitigation developed.

Successful control requires all these elements to be known, quantified, and mitigated appropriately ahead of time, and that the systems and people affected react as expected.

Complex Risks

For more complex risks there can be limits to the efficacy of mitigation, especially for unfamiliar problems, threats or hazards, which can cause unpredictable interactions in society

In these circumstances, national effort should also be aimed at improving overall resilience in society

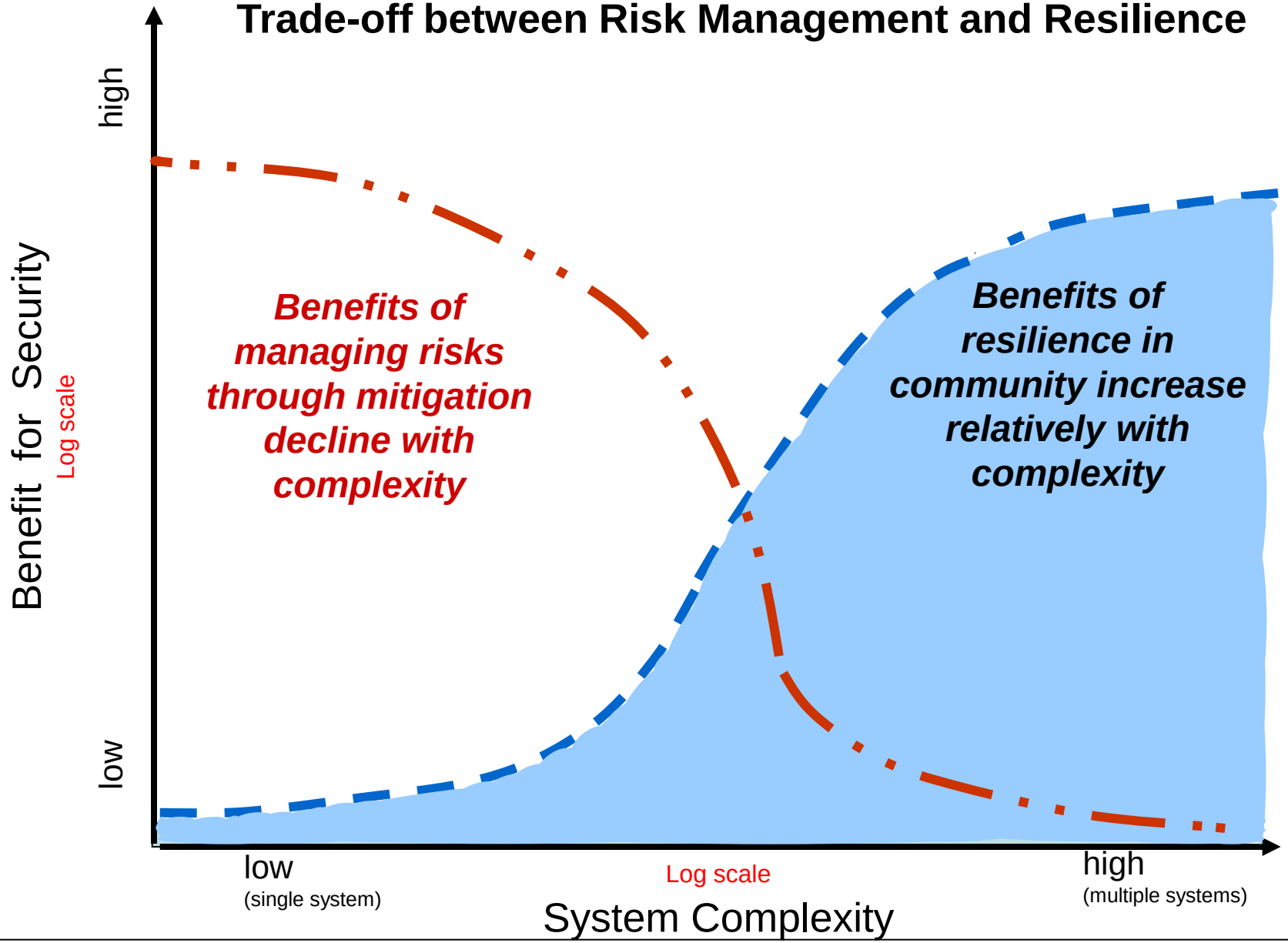
(of people, organisations, communities, and infrastructure)

Risk Management / Resilience

The paradigm for national security in New Zealand has been based on risk management, but is changing as we adopt a wider view of national security

Resilience is now regarded as a separate, distinctive and essential element of any strategy for managing complex and coupled risks in modern society, and for dealing with uncertainty, unknown risks, or unexpected situations

Trade-off between Risk Management and Resilience



Context – changing practices

There is a changing scale and pattern to societal risk, eg:

- As people concentrate in ever larger cities and occupy more hazard-prone areas.
- As communities become dependent on advanced systems to maintain their security and way of life
- As business models change (eg, outsourcing, distributed systems, 'just in time' processing, minimum holdings)
- As societies increase their reliance on closely coupled infrastructural systems (eg, electricity and communications).

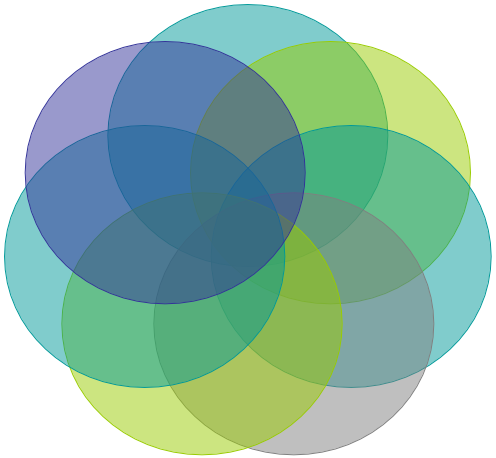
Systemic Risks

In such situations there are opportunities for unexpected synergies to develop between otherwise independent risks, and the scale of potential disaster is magnified

Consequently, new classes of risks are developing that are not well-understood

Complex new interdependencies are emerging between different sectors (eg, society and infrastructure)

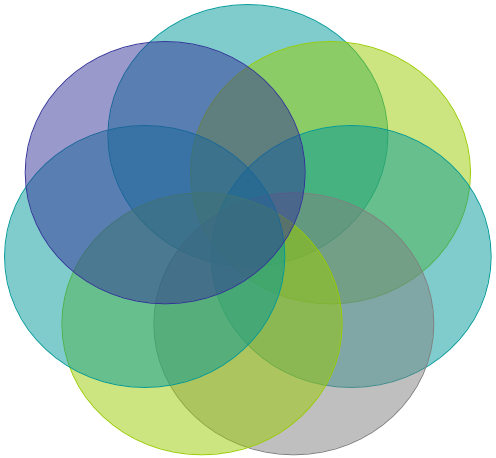
Systems Approach for complex risks



Concentrates on interactions between elements
to understand relationships

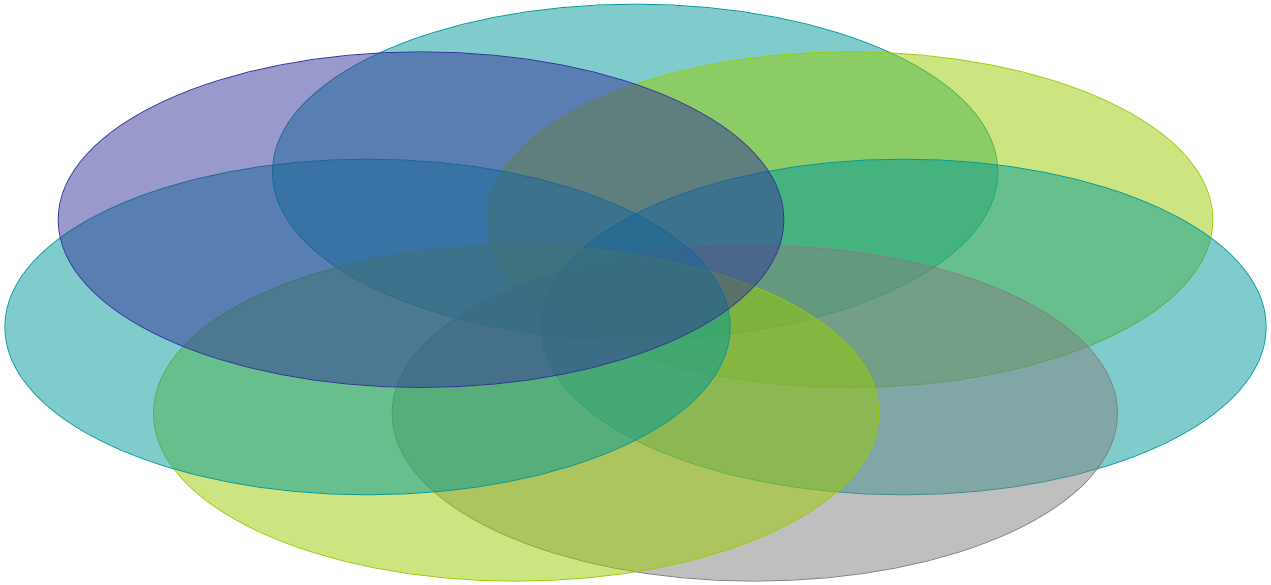
Management of Complex Risks

Analyse & manage
in total system context



Systemic risks can cause unexpected effects, because . . . . . .

Management of Complex Risks



. . . . . the Whole risk is greater than the sum of the Parts

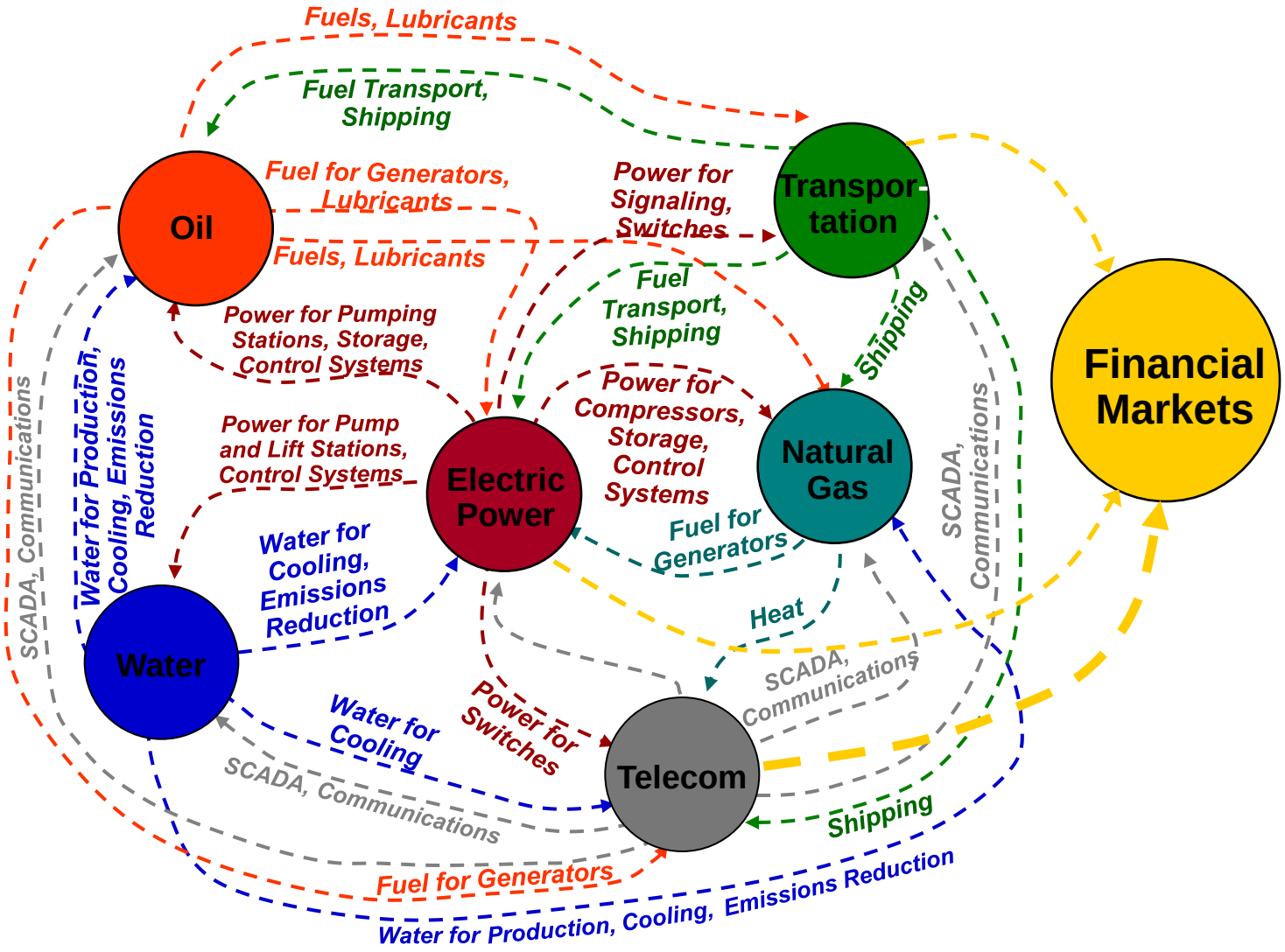
Overall risk >> individual risks, and fundamentally different

Example: Infrastructure . . .

Several sectors comprise
‘systems of systems’
or have interconnectedness

* * *

Failure in one sector
can rapidly
cascade more widely



O'Rourke from Peerenboom, Fisher, and Whitfield, 2001

Security Trends

Public vulnerabilities increasing

New societal and systemic risks

Unusual problems causing larger impacts

Interdependencies creating cascade effects

The security overheads of life are increasing

Security Basics

1 What are the issues?

2 Which really matter?

3 How can each be managed more reliably?

4 How might they be managed collectively?

5 How much security is enough?

National Security

" . . . is the condition which permits the citizens of a state to go about their daily business confidently, free from fear, and able to make the most of opportunities to advance their way of life." *NZ Cabinet May 2011*

It encompasses: the preparedness, protection and preservation of

- people
- property
- information.

National Security Themes

Preserving sovereignty and territorial integrity

Strengthening international order to promote security

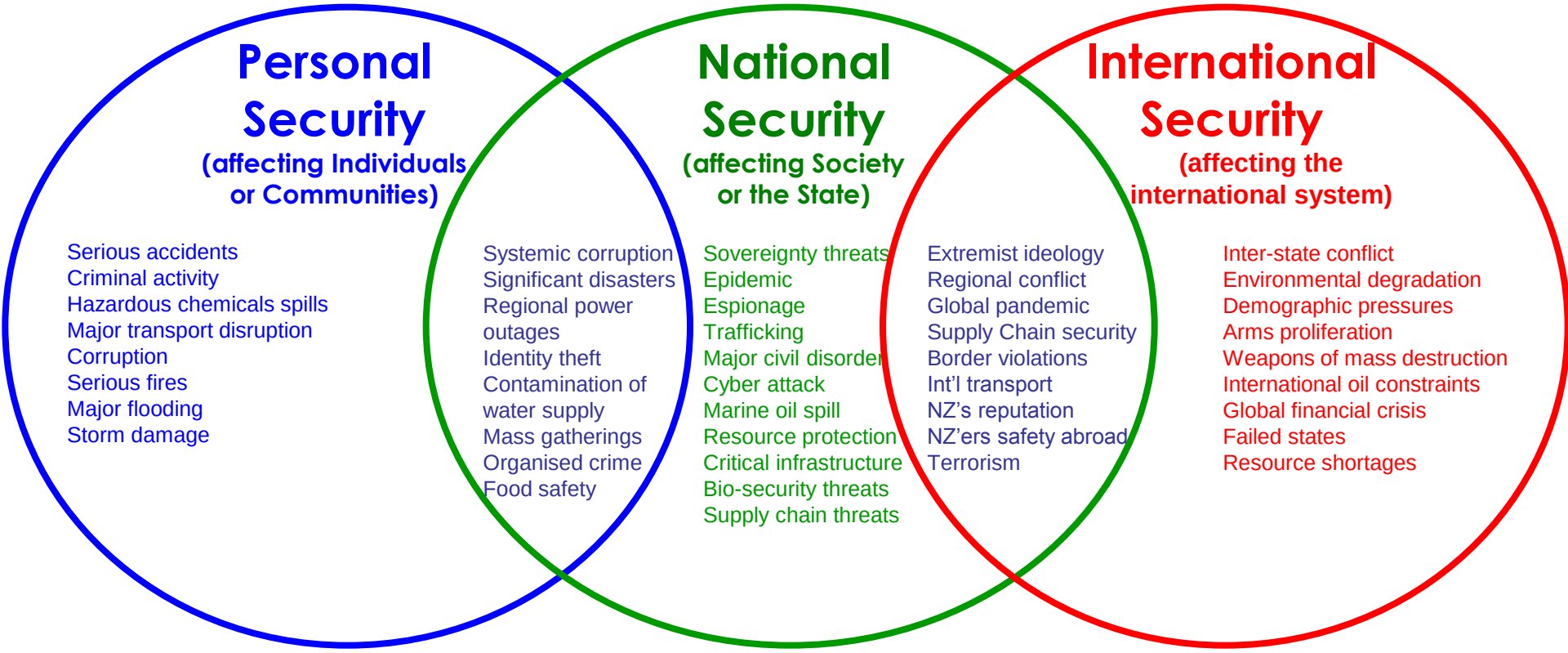
Sustaining economic prosperity

Maintaining democratic institutions and national values

Ensuring public safety

Protecting the natural environment

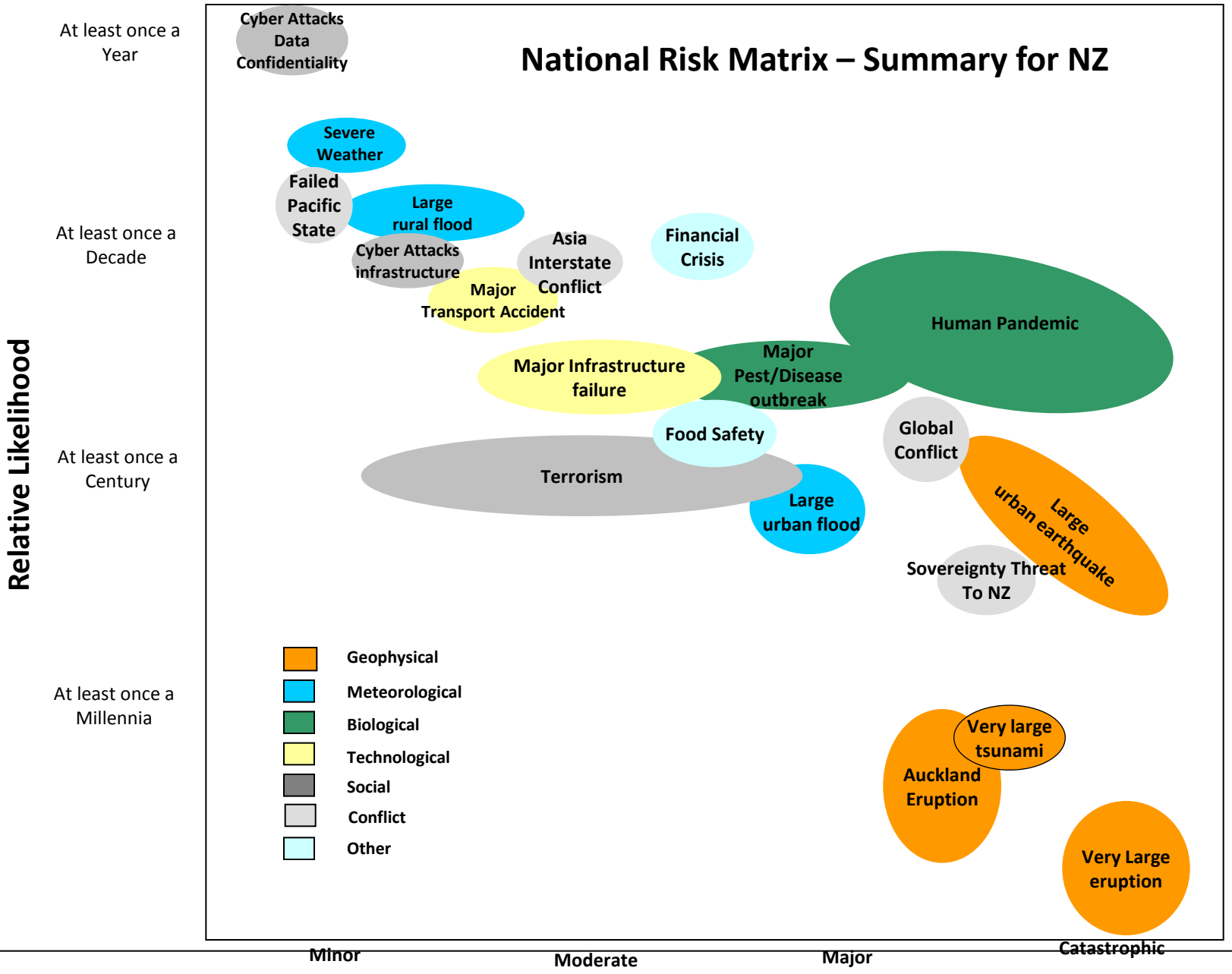
Risks to Security (New Zealand)



Responsibility for Action

Individuals Community Regional Agencies Central Government International Community

National Risk Matrix – Summary for NZ



Management Strategy

Proactive		*Reactive*	
Prevention	**Preparation**	**Response**	**Recovery**

The goal for decision-makers
is to achieve
the optimum balance
across all four elements

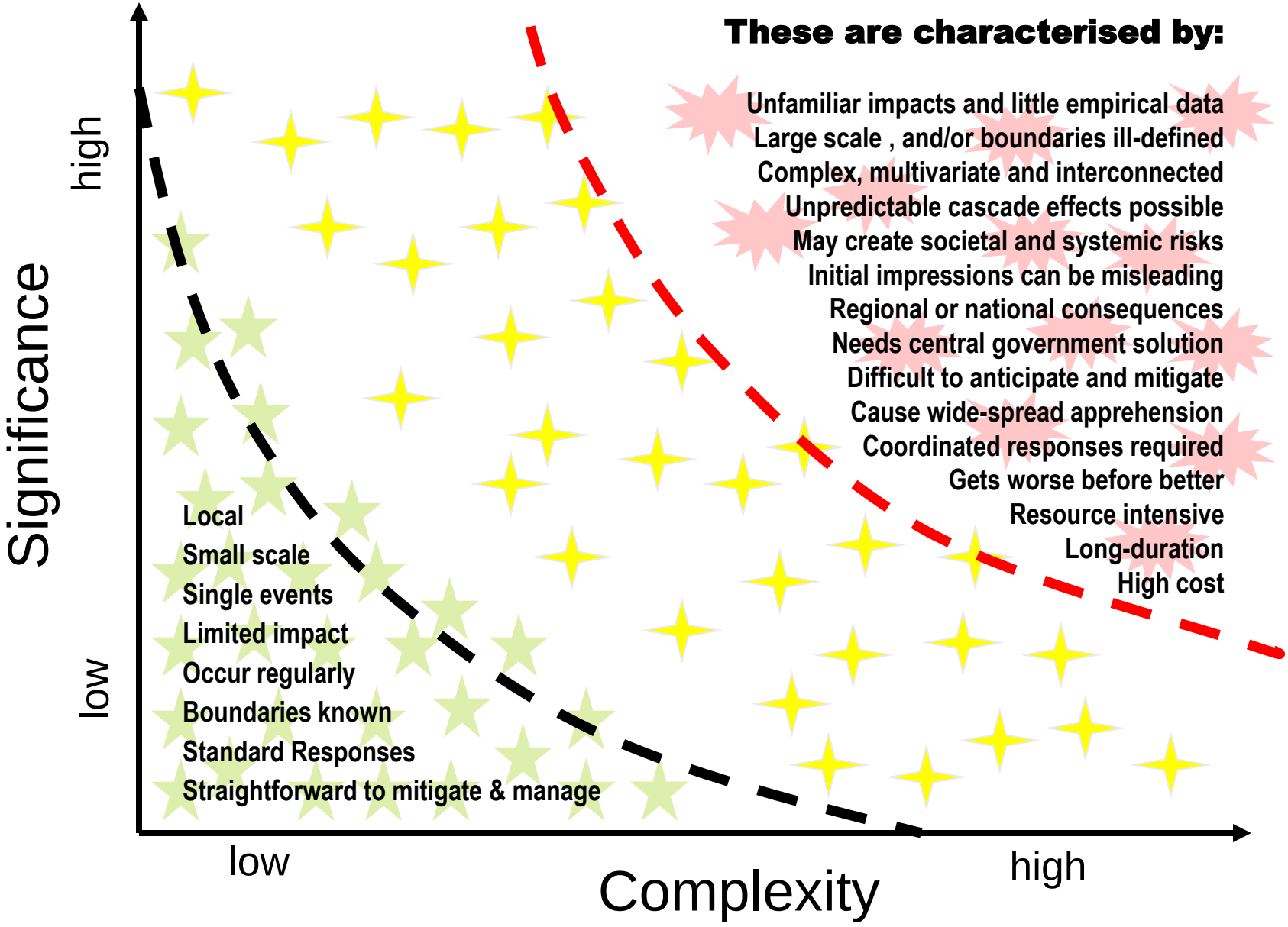
Spectrum of Security Issues
(*which really matter?)*

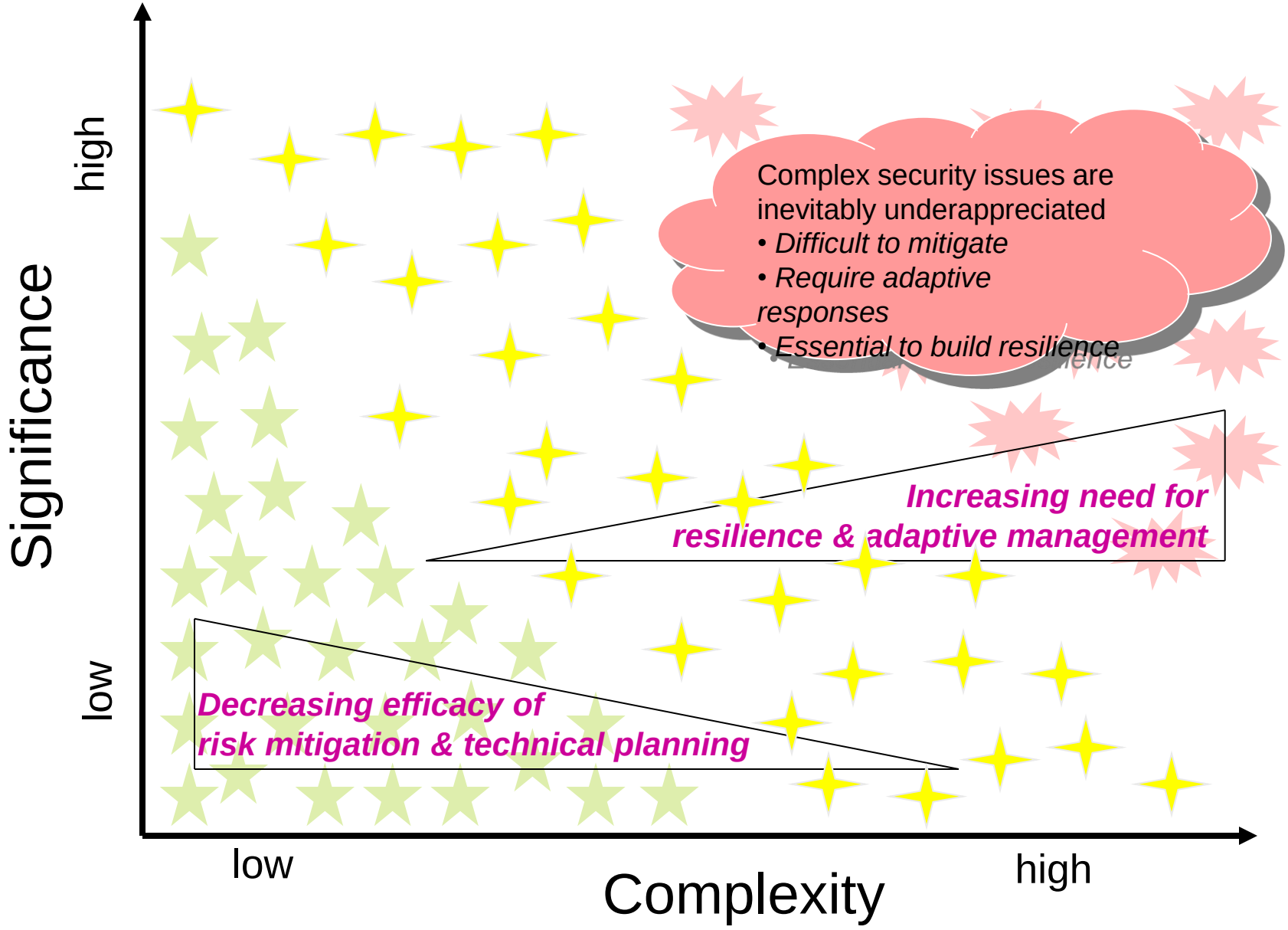
Security events may be characterized in terms of

Significance & Complexity

ie, the significance of the consequences for society, and the complexity of responding to restore normal societal functioning.

These characteristics help define a spectrum of security issues and shape the options for managing them.

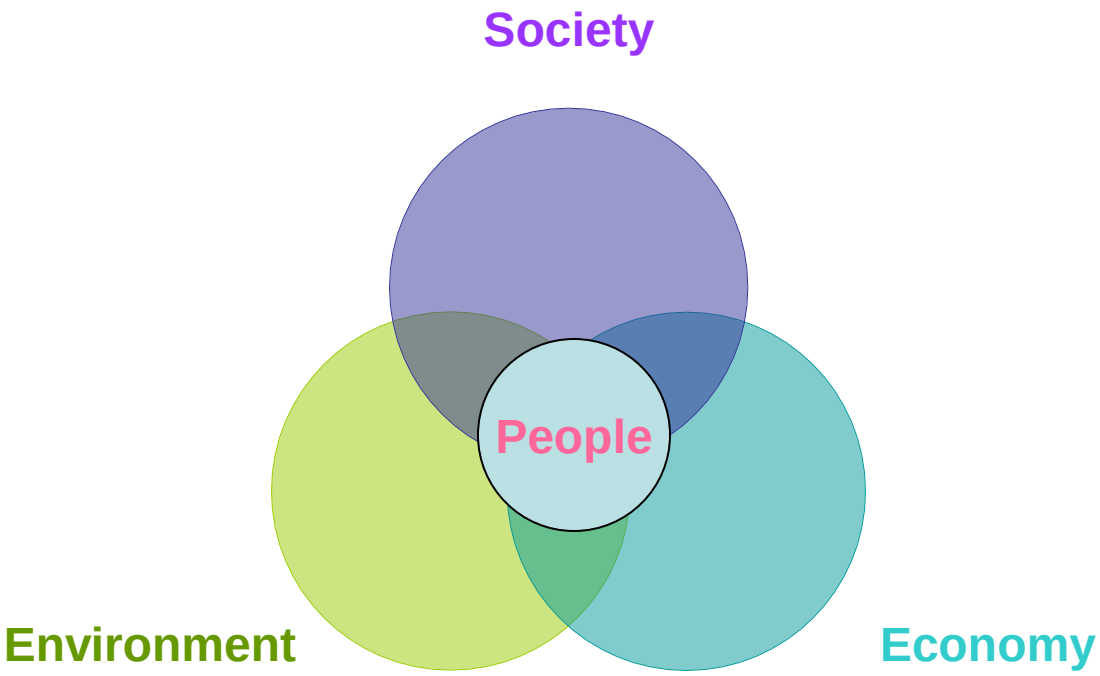

Significance
high
low
low
Complexity
high
These are characterised by:
Unfamiliar impacts and little empirical data
Large scale , and/or boundaries ill-defined
Complex, multivariate and interconnected
Unpredictable cascade effects possible
May create societal and systemic risks
Initial impressions can be misleading
Regional or national consequences
Needs central government solution
Difficult to anticipate and mitigate
Cause wide-spread apprehension
Coordinated responses required
Gets worse before better
Resource intensive
Long-duration
High cost
Local
Small scale
Single events
Limited impact
Occur regularly
Boundaries known
Standard Responses
Straightforward to mitigate & manage


Significance
high
low
Complex security issues are inevitably underappreciated
• Difficult to mitigate
• Require adaptive responses
• Essential to build resilience
Increasing need for resilience & adaptive management
Decreasing efficacy of risk mitigation & technical planning
low
high
Complexity

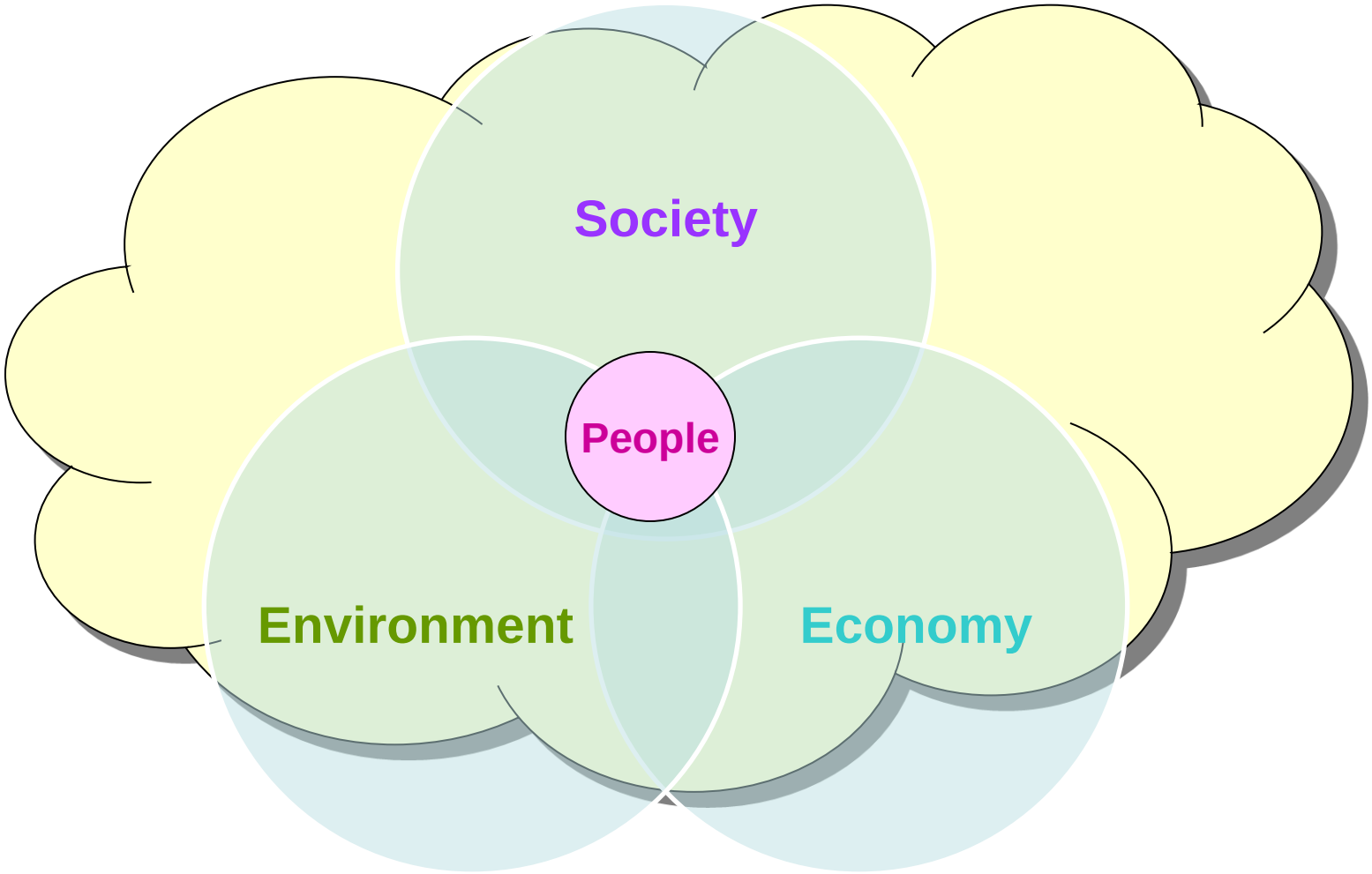
Systems Approach

System paradigm

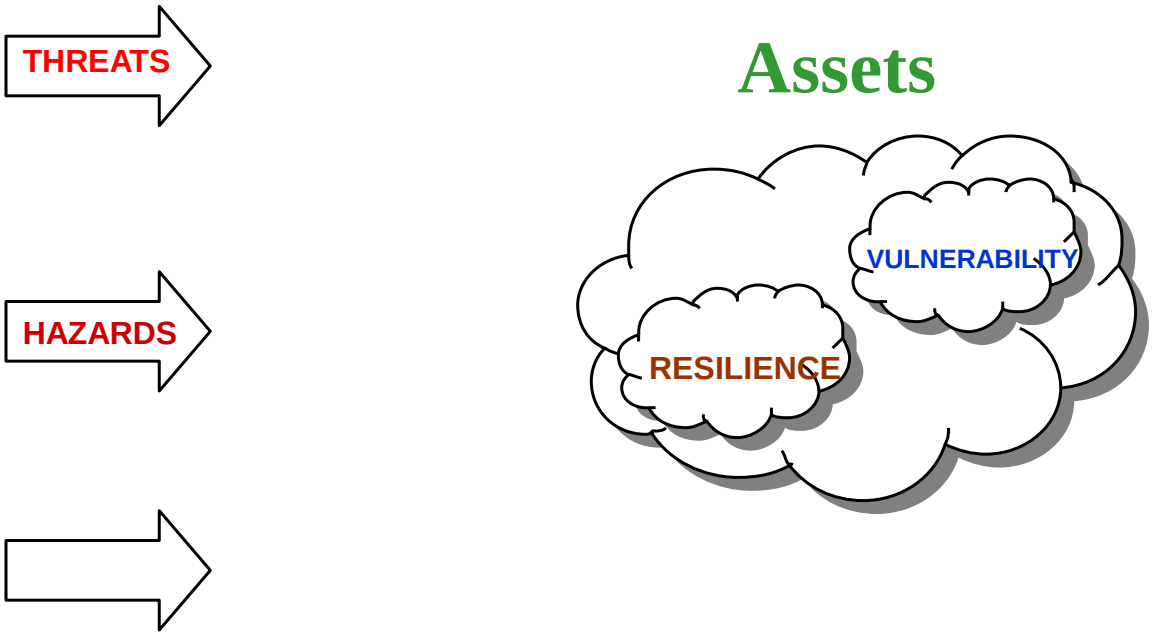
NZ Govt Security Concerns



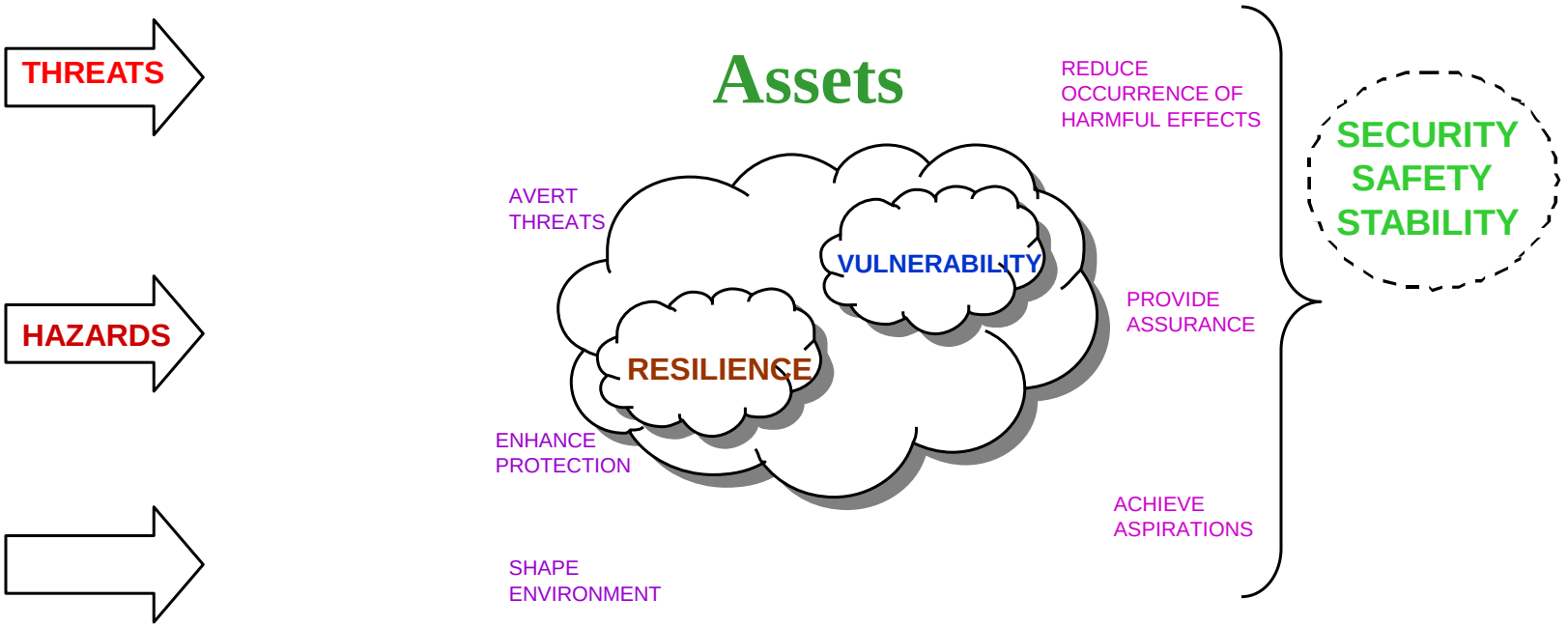
National ‘Assets’ at risk

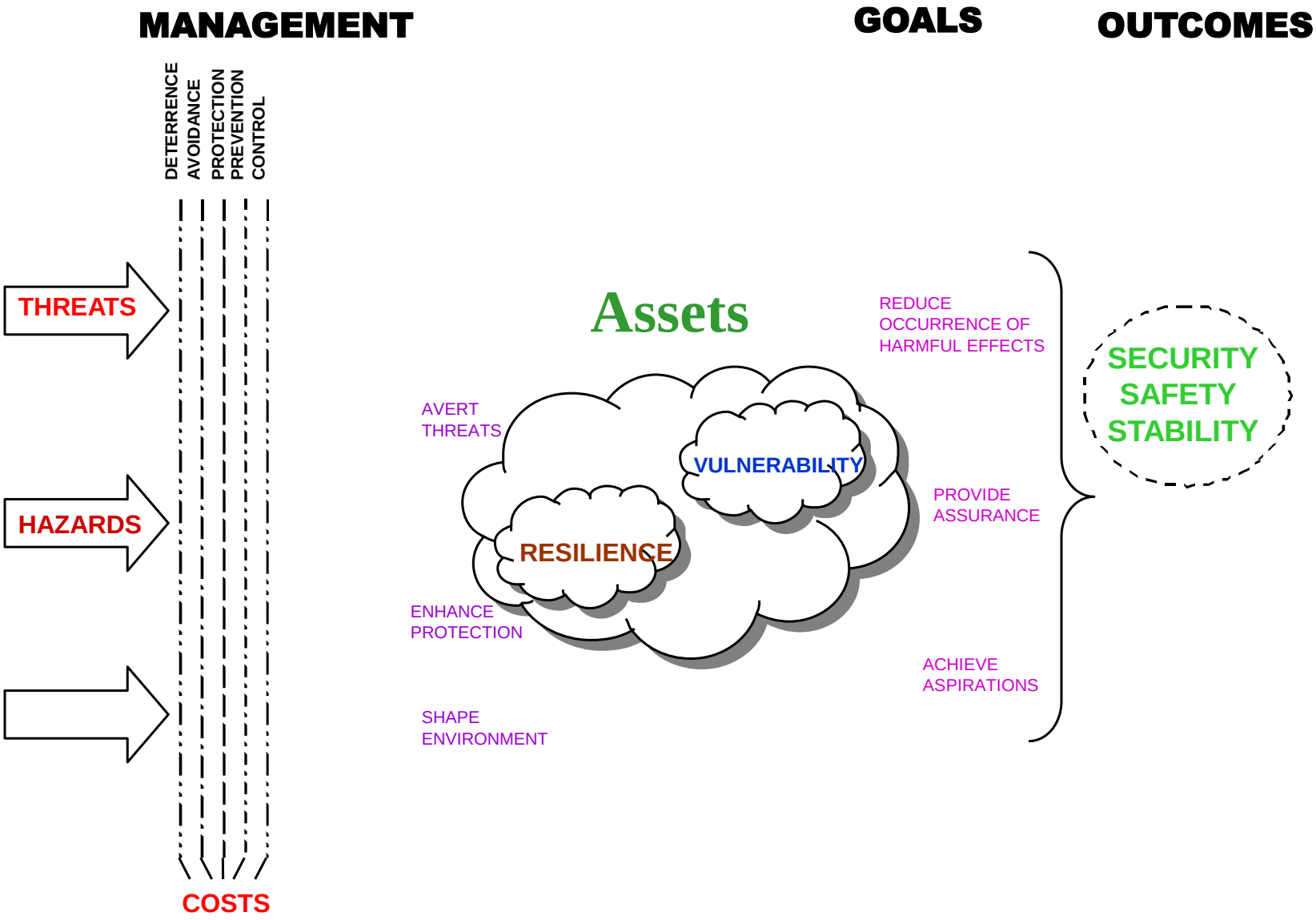


Assets


THREATS
HAZARDS
Assets
VULNERABILITY
RESILIENCE

GOALS **OUTCOMES**

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ACHIEVE ASPIRATIONS
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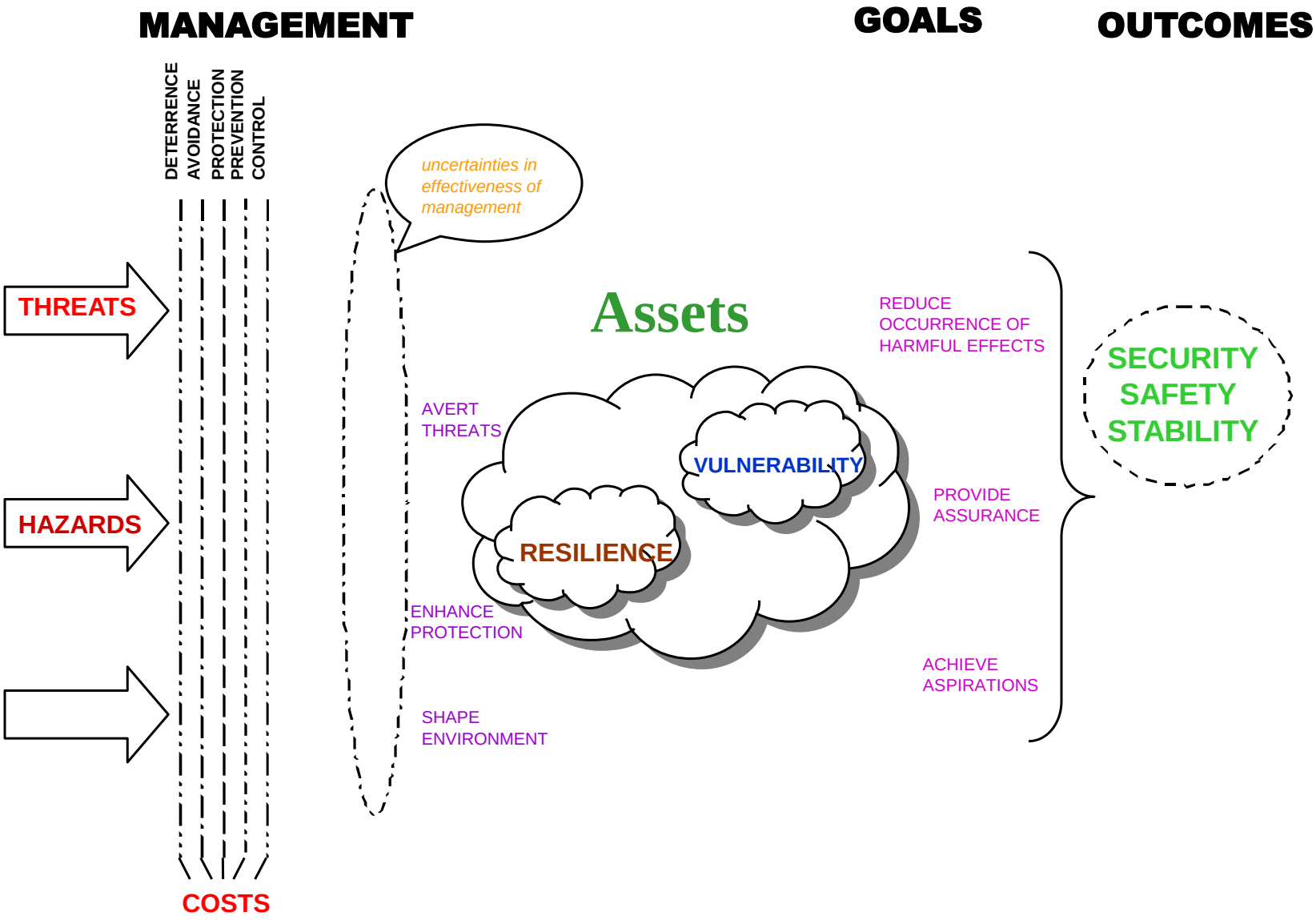
STABILITY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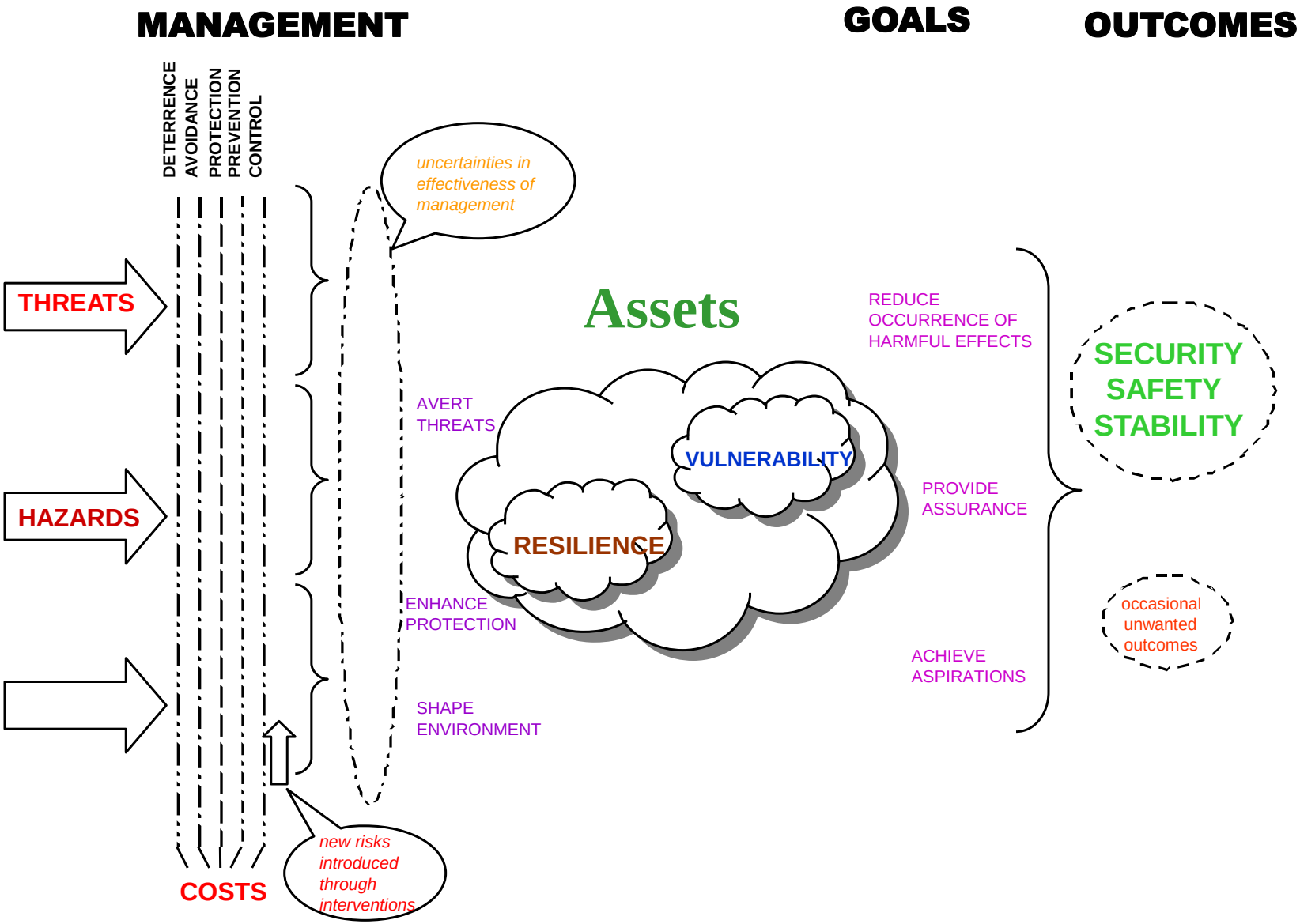
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occasional unwanted outcomes
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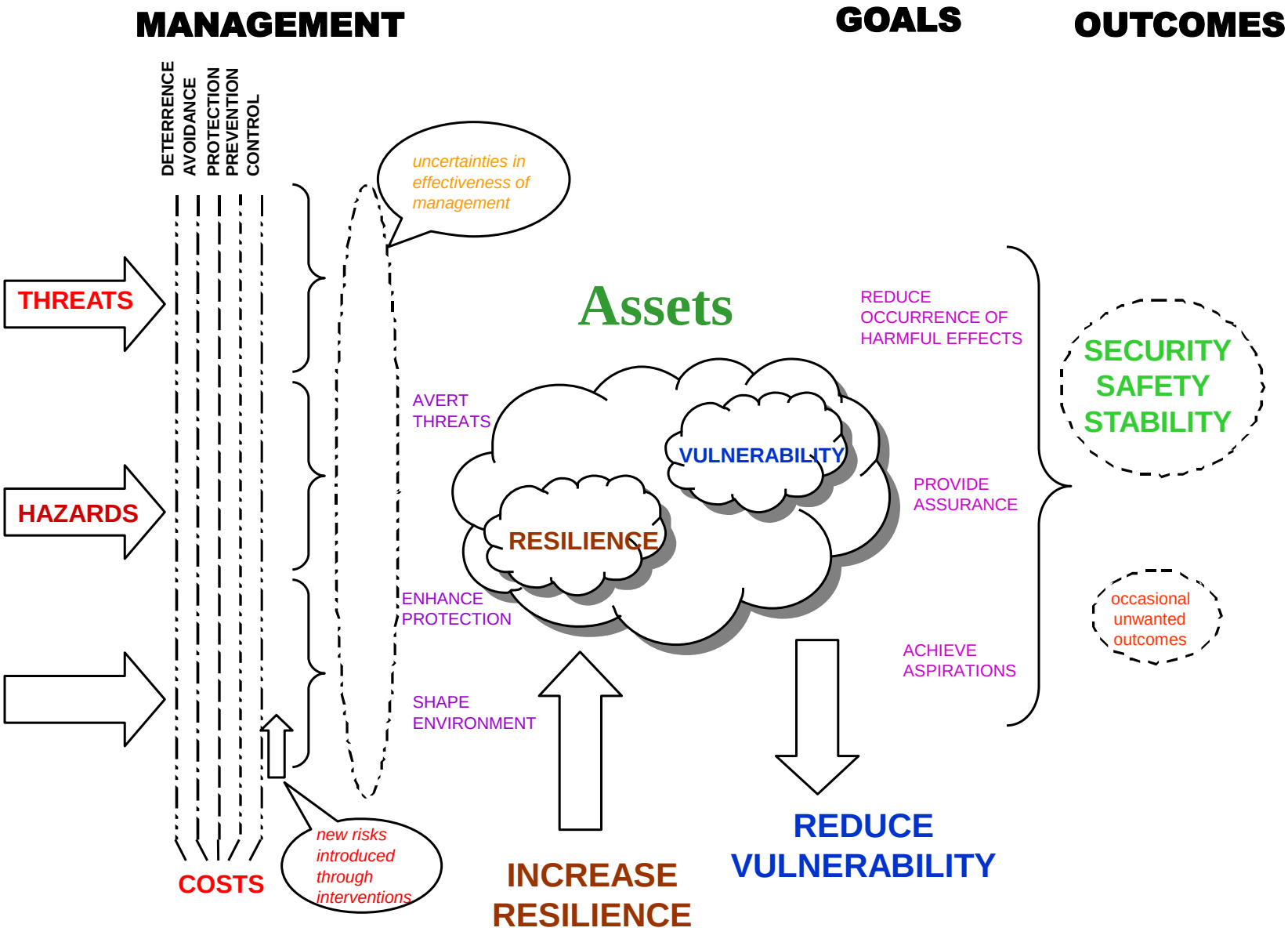
new risks introduced through interventions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SECURITY
SAFETY
STABILITY
occasional unwanted outcomes
COSTS
new risks introduced through interventions
INCREASE RESILIENCE
REDUCE VULNERABILITY

System Management

All of the elements in this model comprise a ‘system’, and each must be considered.

The elements include individuals, communities, businesses, local government, central government, the legal system, knowledge providers, insurers, risk assessments, mitigative measures, management strategy, response mechanisms, etc.

The system relies on every stakeholder being committed to reducing vulnerabilities and building resilience within the same framework.

Problem-owners must ensure that:

- each risk is managed appropriately (proactively & reactively)
- national resources for mitigating each are proportionate
- the total set of vulnerabilities is managed optimally
- the resilience of society is strengthened continuously
- Arrangements are in place to for flexible management

Resilient Systems

Resilience in the “System” requires:

Coherence across all elements

Connectedness between elements and with other systems

Completeness so every significant element is included

Clarity of understanding about the total system

Consistency in terms of processes and standards applied

Integrity & **Balance** right throughout the system.

Systems Approach: Advantages

- Improves assessment of mitigation options
- Guides development of generic resilience
- Helps deal with uncertainty and ambiguity
- Improves quality of overall management
- Provides foundation for adaptive management, and dealing with unanticipated, complex, or large events

Resilience in Practice

- Establish the widest relevant context
- Map out system, including processes and flows
- Consider hazards, threats and opportunities
- Identify vulnerabilities and resilience
- Consider basic strategy
- Identify, analyse and evaluate major risks
- Test preparedness: controls, defences, recovery plans
- Continuous improvement to:
  - Enhance resilience through coherence, clarity, balance, etc
  - Identify latent or unknown vulnerabilities
  - Improve preparedness
  - Respond flexibly
  - Adapt to new situations

Assessment

- understand the ‘system’
  - i.e., the parts, elements, agents, structure
  - interrelationships, mutual constraints, internal forces
  - characteristics, properties, behaviour, and flows
- understand the ‘dynamics’
  - responses to internal and external forces
- understand the ‘uncertainties’
  - so that risks can be managed

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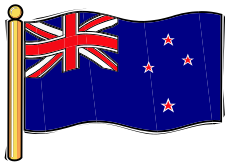

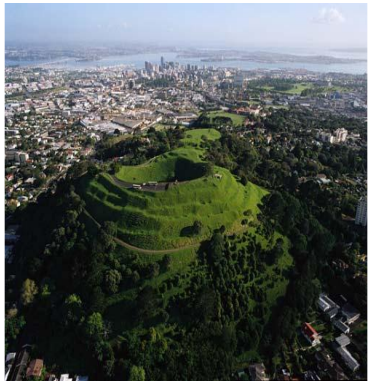

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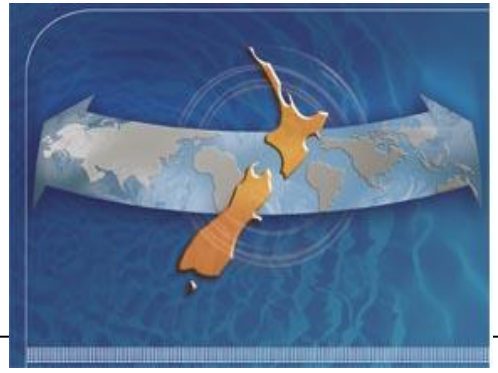

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Infrastructure
Warehousing
Rail