

Critical infrastructure recovery: Key lessons

https://www.resorgs.org.nz/wp-content/uploads/2023/07/NIEWE_critical_infrastructure_recovery_key-lessons.pdf

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Recovery programmes following international natural hazard events can provide a number of lessons to support effective critical infrastructure recovery.

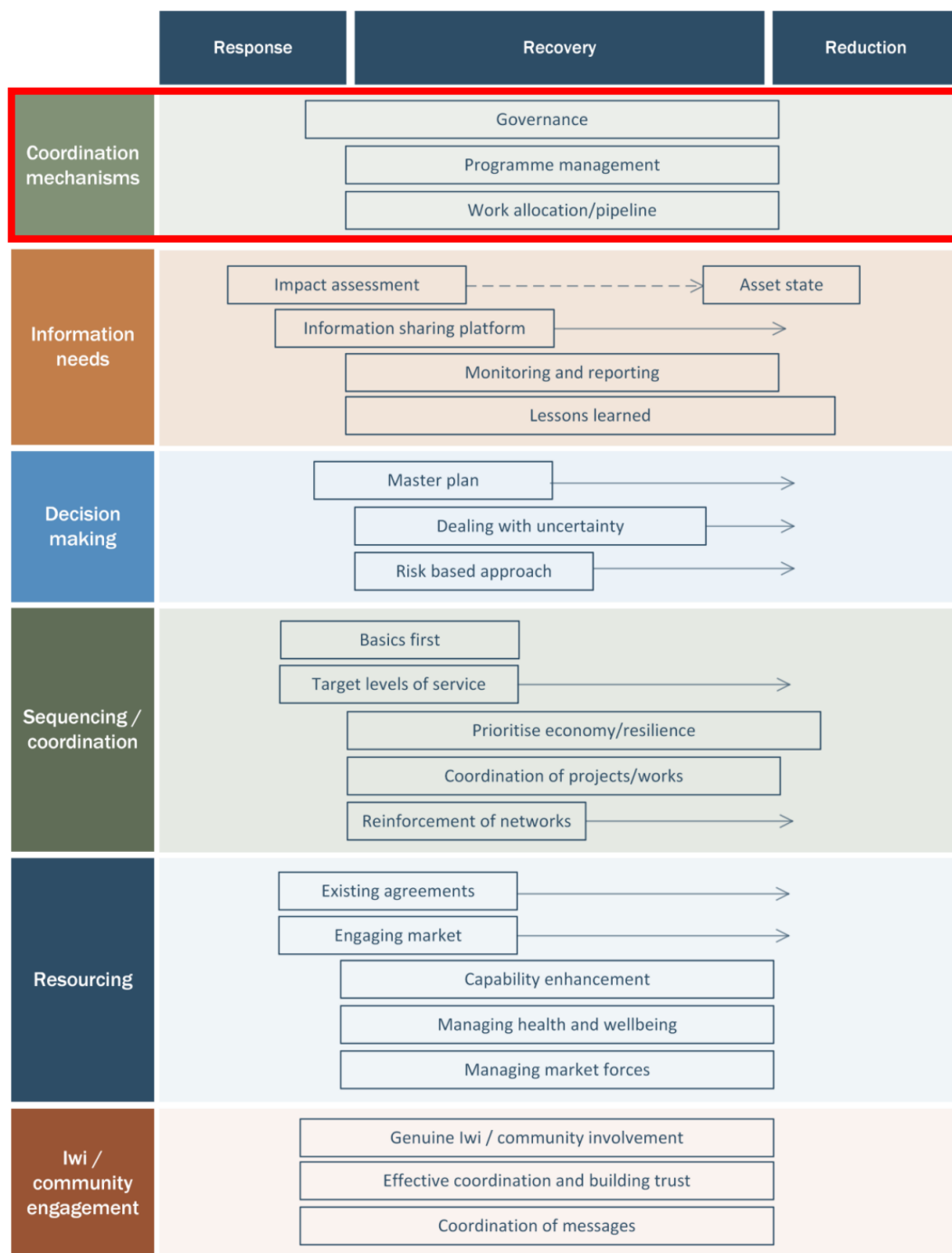
Review of grey and white literature from a number of large international natural hazard events, as well as cross event analyses.

Lessons apply to a diverse range of end-users with various roles - central and local government, infrastructure owner/operators, contractors, and recovery offices.

Recovery principles

Principles should, ideally, be community derived -> tend to converge on a handful of central themes.

- Clearly articulated recovery goals/outcomes
- Equitable connectivity and services
- Resilient infrastructure
- Transparency in recovery activities
- Leveraging regional strengths
- Continuous learning
- Community-focused recovery
- Economic recovery
- Cross sector collaboration
- Resource capacity development
- Utilising technological innovation



Governance

Provides strategic oversight, direction, promotes transparency

Separate to operational recovery team(s)

Should facilitate deep collaboration with stakeholders, including recovery funders and community representatives

Recovery programme management

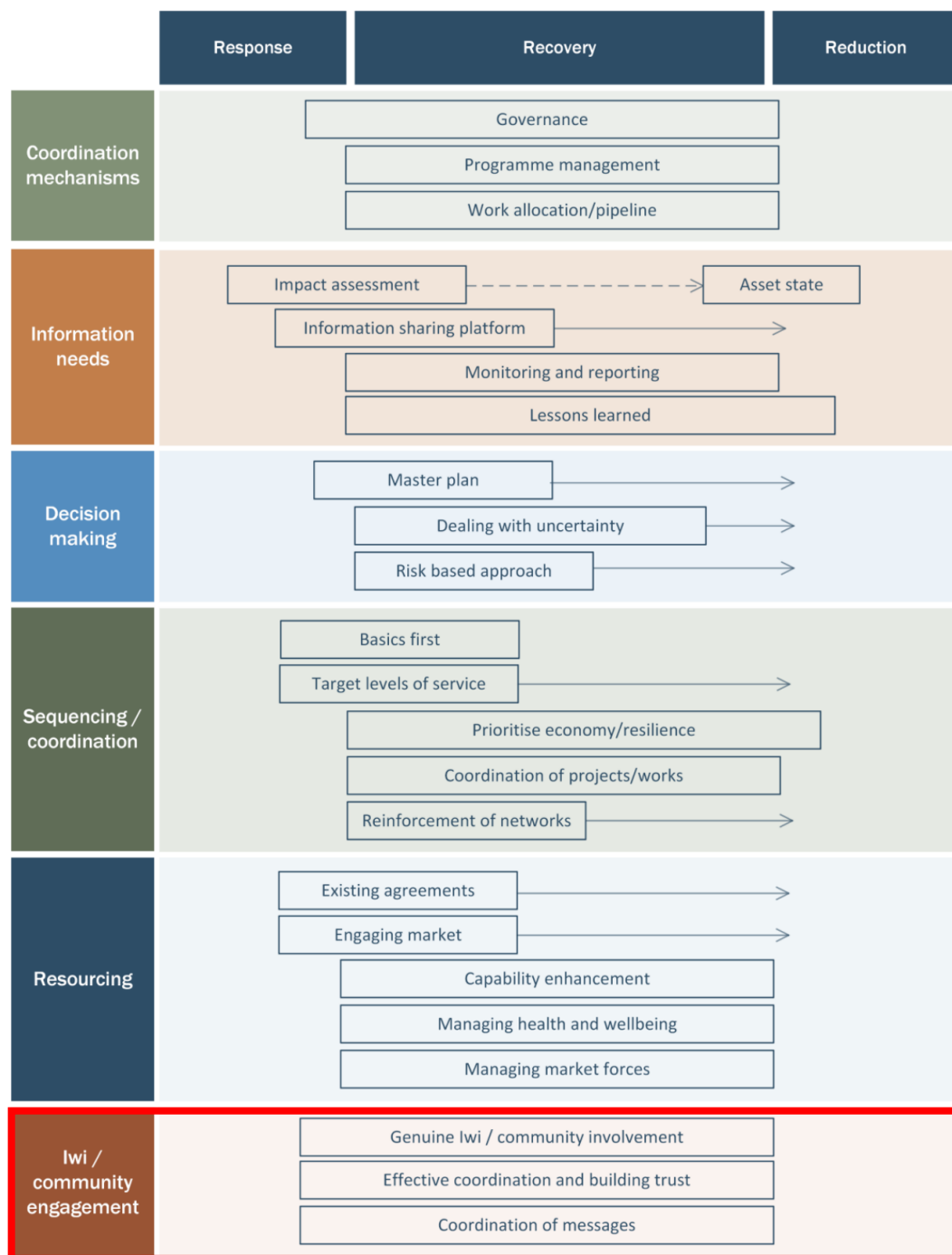
Coordination with an operational focus

Enables effective utilisation of resources and expertise, across delivery organisations,

Alignment of individual projects with overarching recovery objectives

Work pipeline gives visibility to contractors undertaking works

Figure 1: Key components of a critical infrastructure recovery programme



Iwi / community engagement

Centred around empowering and involving affected communities in decision-making processes

Beyond consultation and striving for genuine involvement to build trust

engagement from the start

actively involving the community in setting priorities

keeping them informed

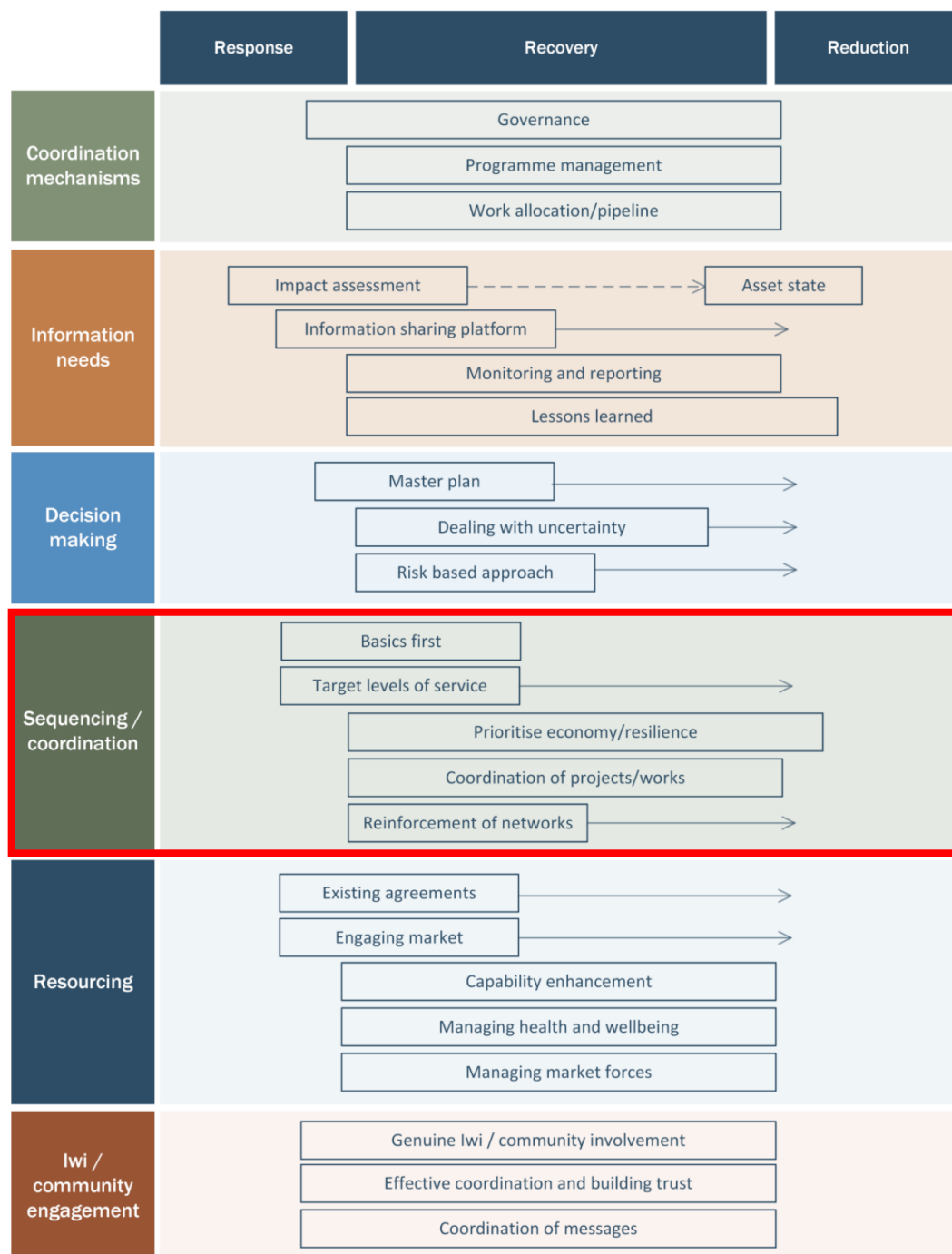
following through with intended actions

In consultation and/or coordination with local councils and/or recovery agencies

Prolonged community engagement may lead to frustration

Balance the need for engagement with the need for timely and efficient recovery

Figure 1: Key components of a critical infrastructure recovery programme



Recovery sequencing and coordination

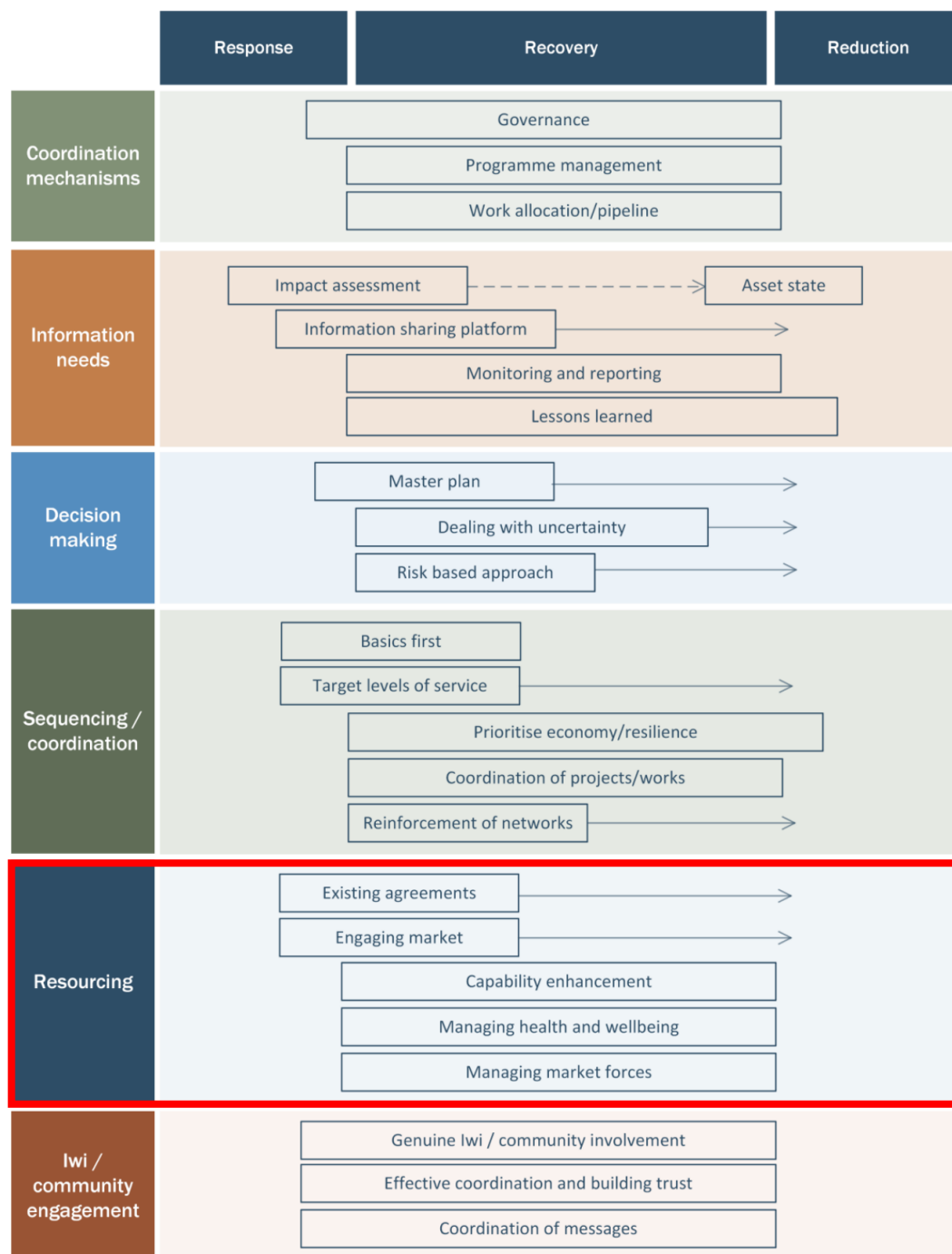
Prioritise infrastructure essential for well-being – water/waste, energy, telecoms, transport etc. – use target Levels of Service (LoS), provide temporary connections and interim solutions

Prioritise works that: stimulate economic activity; provide protection from future hazards or cascading risk

Temporal, spatial, and strategic coordination provides an integrated approach e.g. underground or in-road works; alignment with housing and social recovery efforts

Manage dynamic loading on infrastructure networks

Figure 1: Key components of a critical infrastructure recovery programme



Recovery resourcing

Values and behaviours established by leadership teams

Use existing pre-event agreements AND/OR multi-party procurement

May require structures such as alliancing – target costs, pain/gain

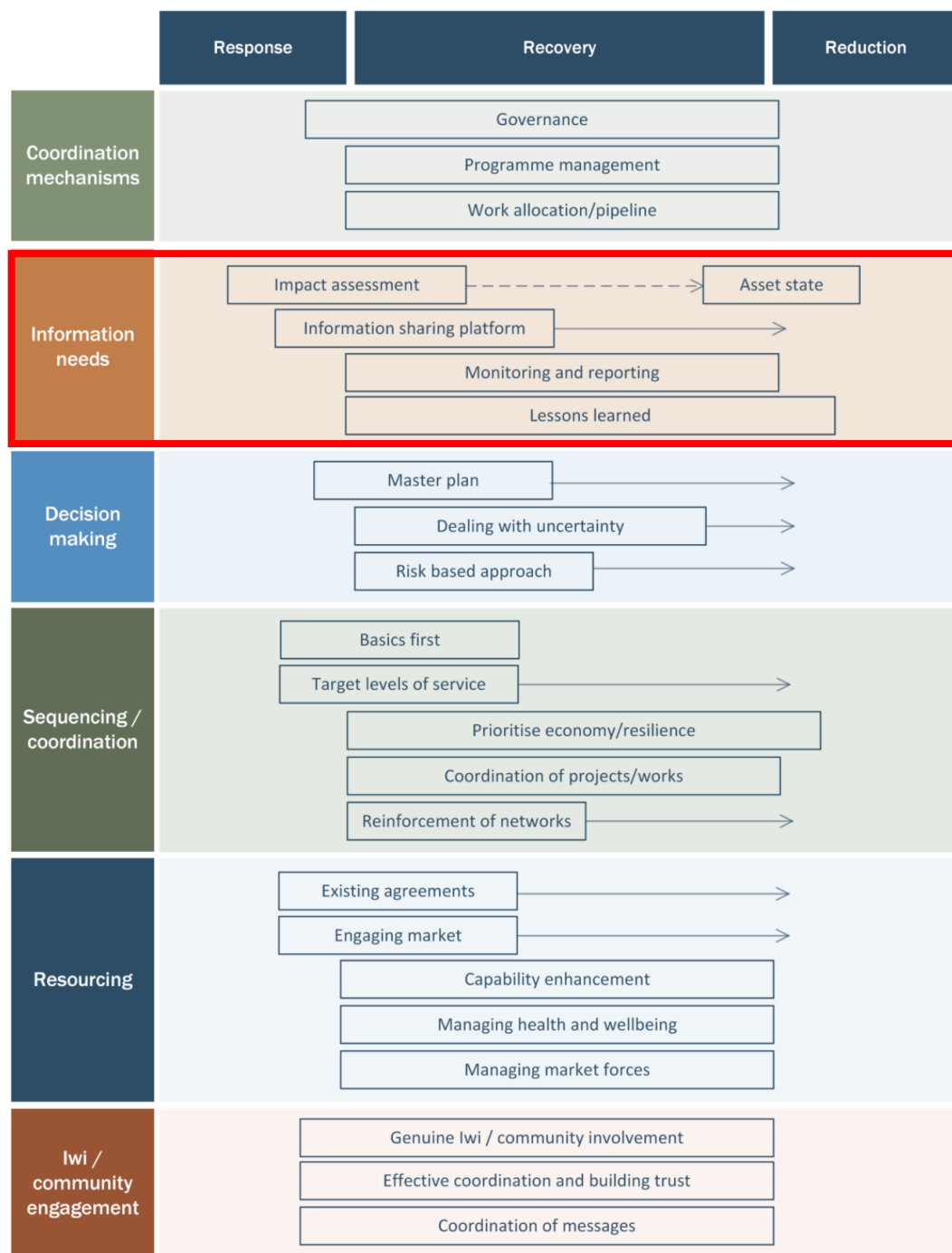
Involve contractors early; contractors contribute stability and continuity; subcontractors, provide flexibility and scalability

Issues during recovery operations tend to magnify pre-existing or business-as-usual challenges - proactively address any potential challenges

Uplifting capability allows effective delivery of recovery works.

Health and wellbeing of all personnel involved in the recovery programme is important

Figure 1: Key components of a critical infrastructure recovery programme



Information needs

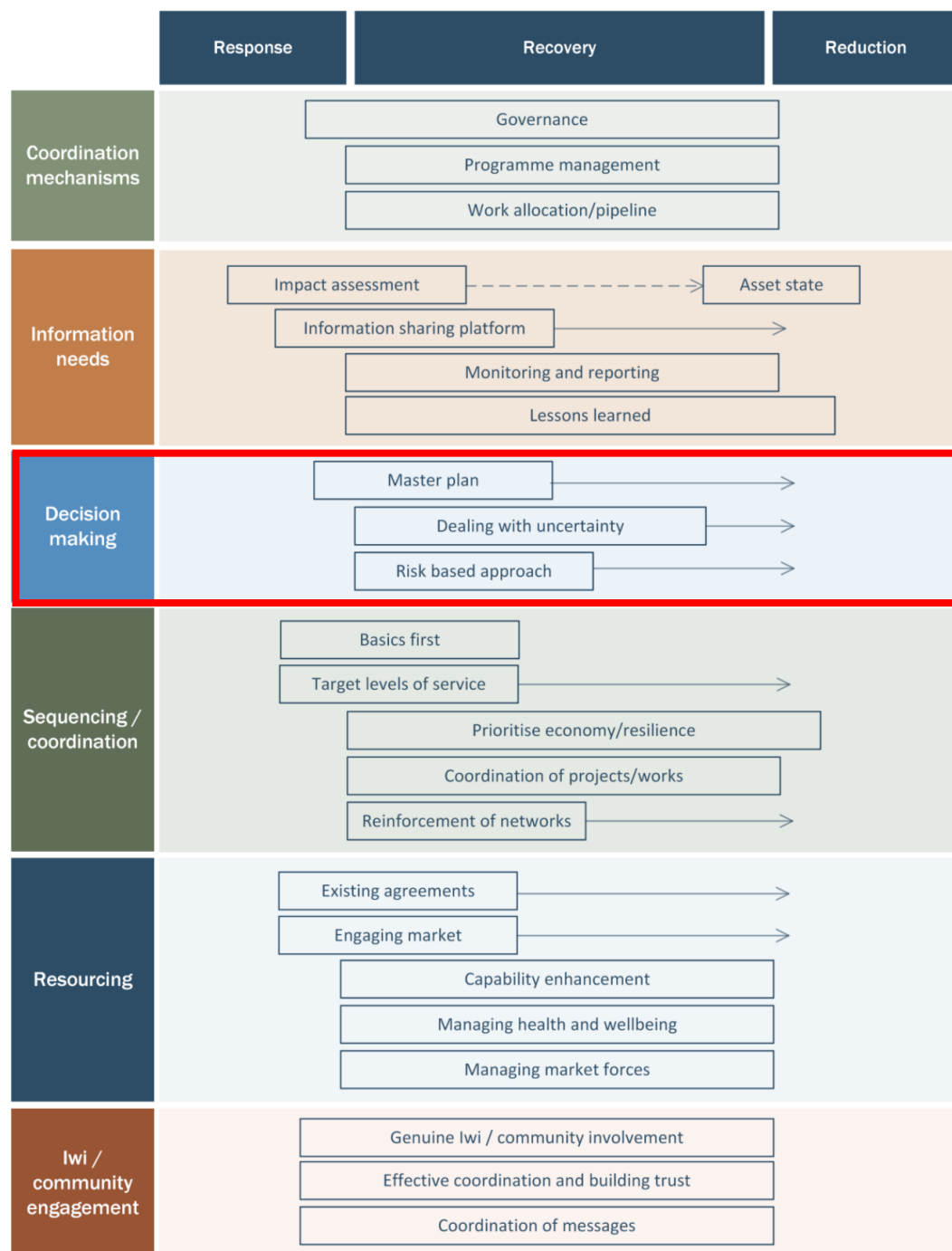
Damage impact assessment allows for informed decision-making and prioritisation

A centralised information sharing platform is useful - infrastructure damage, resource availability, recovery plans, progress tracking and lessons learned.

Tools, e.g. GIS and remote monitoring, can improve the provision, accessibility, and utilisation of information.

Report and monitor using suitable metrics, health and safety, environment, economics, resourcing, and stakeholder engagement

Figure 1: Key components of a critical infrastructure recovery programme



Decision making

Establishing documented goals, priorities, and timelines provides a framework that guides decision-makers - a comprehensive master plan is useful.

Balancing making timely decisions and ensuring that all relevant factors have been adequately considered - based on limited or uncertain data sets.

Scalable risk-based decision-making processes - use of scenario planning, input from subject matter experts or seeking further information.

Figure 1: Key components of a critical infrastructure recovery programme

Building resilience through recovery: Investment decision making

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Stage 1: Define the Problem

- Critical infrastructure exists to service communities
- Identify the needs and level of service
- Look for interdependencies
 - Physical
 - Informational
 - Geographic
 - Logical
- Look for external stakeholders

Stage 2: Hazard and Damage Assessment

Risk-based approach

- Overlaying potential hazards onto infrastructure
- Hazard data
- Vulnerability/Fragility
- Scenarios
- Consider changes

All hazards approach



Stage 3: Criticality assessment

- This reframes the damage into effects to the community
- Allows for the prioritization of resources
- Criticality measures
 - BAU operations
 - Recovery operations
 - Number of people served (consider critical customers e.g., hospitals)
 - The vulnerability of the people served
 - The upstream and downstream dependencies

Stage 4: Plan or option development

Emergency Preparedness

- Stockpile/backup resources
- Alternative approaches to service
- Reduce demand
- Remove potential hazards

Stage 4: Plan or option development

Asset/network design

- Relocate assets to safer areas
- Diversify asset locations/hazards
- Incorporate redundancy into the network
- Strengthen assets
- Use safe-to-fail design
- Adaptive planning

Stage 5: Plan or option selection

- Use scenarios to test plans
- Compare to a do-nothing scenario
- Measurements
 - Time to recover pre-event levels
 - Time to recover basic needs
 - Casualties avoided
 - Socio-economic benefits
 - Number of failure mechanisms
 - Magnitude of disruption to be withstood
 - The number of systems that have backups and duplicates

Stage 5: Plan or option selection

- Plans should align with goals, objectives, and priorities of the community
- Seek consensus among stakeholders
- Try to align plans across different infrastructure entities leveraging synergies and avoid trade-offs
- Look for synergies and try to avoid trade-offs with BAU operations

Stage 6: Implementation

- Engage stakeholders and public around recovery process and how they could contribute
- Establish clear communication structures
- Facilitate information sharing
- Communicate the level of service people can expect
- Leverage disruptive events