

Key considerations for Lifeline utility recovery planning

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explore the issues faced by Lifeline utilities in disaster recovery*

Abstract

The key process elements for lifeline utilities in the recovery process following a disaster event can be summarised as:

1. Understanding what needs to be done to recover each utility's operation;
2. Understanding the external constraints on immediate operational repairs;
3. Putting in place interim low-capacity fixes; carrying out immediate tidy-up operations;
4. Strategic decisions—what to repair/rebuild/fully redevelop;
5. Matching internal priorities with external considerations (e.g., priorities of other utilities and the recovery manager on behalf of the community);
6. Formalising works programmes and carrying out design work; and
7. Organising and managing contracts for the physical works.

Establishing and re-evaluating priorities (internal and external) is an iterative process that underlies all of these elements. This process begins at the operational level during the immediate response, with progressively more strategic decisions being required as more information becomes available. Each element has associated challenges or obstacles that need to be addressed and, in many cases, these relate to external considerations outside the direct influence of individual lifeline utilities. Recovery planning for lifeline utilities therefore requires prior consideration of these challenges and how to address them.

The recovery process involves a balance between the restoration sequence that can be physically and operationally achieved by a lifeline utility against the expectations and requirements of the community as established by the recovery manager. Specific understanding of local and national Civil Defence Emergency Management (CDEM) recovery

mechanisms is clearly beneficial for utility managers in planning their recovery processes.

This paper explores the issues for lifeline utilities associated with the recovery elements and challenges outlined above, and looks at the long-term recovery issues.

Introduction

Lifeline utilities form part of a wider CDEM categorisation of infrastructure—those elements of the built environment which include hospitals, schools, residential housing, commercial and public buildings. The critical dependency of these elements upon utility services and transportation access is readily apparent.

Planning by utilities for response to emergency events involving their own service is typically comprehensive. The development of interagency capability and connectivity for responding to community-wide emergencies and disasters however requires further collaborative effort. The complexities and uncertainties associated with recovery of operations in such large-scale events mean that to date it has not typically received appropriate attention.

For any given event, some utilities will be more impacted upon than others. The interdependence effect of this on less affected utilities can be significant. For example, the disruption to access via rural roads in the Manawatu/Wanganui region in the February 2004 floods added to the duration of power and landline telephone outages.

The objectives of this paper are to:

- give sectors that depend on lifeline utilities an indication of the steps and challenges faced by lifeline utilities during the recovery phase; and
- provide a wakeup call for lifeline utilities to get involved in recovery planning with CDEM agencies and other utilities.



Disasters provide a unique opportunity to review the strategic objectives of lifeline utilities

The characteristics of recovery for lifeline utilities

Recovery starts from the early stages of an event when response activities are still in progress. The transition from response needs to involve higher level strategic analysis. Key planning decisions that may need to be made in the early stages of an event include balancing the considerations of:

- local repairs to damaged sites, facilities or specific sections;
- possible relocation of services in the worst affected areas;
- improvement or upgrading of part or all of utility systems;
- discontinuance or abandonment of whole sections; and
- replacement of whole sections with new sections.

Disasters provide a unique opportunity to review strategic objectives against other external factors, and require appropriate corporate inputs. The scope of the recovery process for infrastructure is therefore much wider than physical reconstruction. It can be characterised as being where engineers and other operational personnel must actively interface with planners—district planners, organisation strategic planners, and others involved in preparing 10 year Long-Term Community Council plans and five-year regional CDEM Group plans.

This highlights that the recovery process for lifeline utilities is actually limited by people—both the availability of suitably experienced and skilled personnel, and timely and appropriate decision-making within and across agencies.

There is also a need to understand the different organisational and legal contexts that lifeline utilities operate in, including:

- privately owned (commercially driven) vs. public (government or territorial authority) organisations;
- national, regional or local organisations (e.g., telecommunications vs. water services); and
- the absence of any legislation requiring lifeline utilities to provide a service (outside of continuing to operate in an emergency situation).

There are typically no established mechanisms for post-disaster co-ordination across commercial boundaries in key sectors such as electricity and telecommunications. The operational role of the recently formed Electricity Commission in New Zealand in relation to security of supply has yet to emerge. The National Gas Outage Planning Group has developed a *Gas Contingency Plan* for the gas industry, co-ordinating the response to an interruption of gas supplies into or from the transmission system (GANZ 2004). This plan is based on respecting the often-complex commercial arrangements involved while acknowledging that some participants may be required to make short-term contractual allowances for the long-term benefit of New Zealand gas and electricity customers. Both the gas and water (potable) sectors have mutual aid plans in place where utilities informally commit to assisting each other with practical support (tradespeople, spares etc) immediately following a disaster.

Local and national CDEM recovery mechanisms

Civil Defence Emergency Management Groups are required to appoint recovery manager(s) as part of their plan development process at regional level. Local recovery managers within each territorial authority also need to be appointed prior to an event. Specific roles and responsibilities of recovery managers are outlined in a recovery planning guideline (MCDEM 2004).

The activity areas that the recovery manager is likely to oversee include:

- *Damage and needs assessment*
 - Making sure that the assessment process continues appropriately.
 - Identifying resource needs.
 - Arranging surveys to determine recovery needs of the community.
- *Organisational arrangements*
 - Establish a recovery organisation and implement local recovery plan arrangements.
 - Public information and media management.
- *Resource management*
 - Activating relevant working groups (typically including infrastructure).
- *Planning and co-ordination*
- *Monitoring and evaluation*

Utility managers may be asked to be involved (or to provide an alternate) in regional infrastructure recovery management advisory groups. The focus of such groups reflects that of the recovery manager as outlined above.

Civil Defence Emergency Management Group plans must contain the key recovery arrangements applicable to each region, and these should reflect the hazard and risk profile of the region. The *National CDEM Plan* will contain the corresponding national recovery arrangements. At the national level, the Minister of Civil Defence may appoint a Recovery Co-ordinator upon the recommendation of the Director of the Ministry of Civil Defence & Emergency Management.

In the February 2004 floods, a Regional Recovery Infrastructure Task Group was established by the Manawatu/Wanganui CDEM Group Recovery Manager within four days of the onset of the event. This group only met formally on one occasion, but provided a reference point for the associated Road Access Committee that comprised representatives from each of the road controlling authorities in the affected region (i.e., territorial authorities and Transit NZ) as well as the Contractors' Federation. This committee met on a fortnightly basis during late February and March, often via teleconference, focusing on the following aspects:

- Compiling a regional overview of the access status of key roads;
- Collating initial estimates of the costs of repairing and reinstating damaged roads across the road controlling authorities for presentation to central government;
- Clarifying with funding agencies (e.g., Transfund) how normal funding mechanisms would be applied in order to develop a uniform approach;
- Facilitating a uniform strategy for *Resource Management Act 1991 (NZ)* issues; and
- Monitoring actual and potential resource bottlenecks.

This grouping provided a very effective linkage mechanism between:

- individual road controlling authorities and the CDEM Group Recovery Manager, and
- the CDEM Group and central government.

The role of lifeline utilities in recovery: issues, challenges and obstacles

The principal role of lifeline utilities in the recovery phase can be summarised as:

- implementing rapid restoration of essential utility services and transportation; and
- supporting community priorities as indicated by the local recovery manager or nationally appointed Recovery Co-ordinator.

Table 1 explores the implications and interactions by illustrating the issues, challenges and obstacles for each of the key recovery elements. For each issue, challenge or obstacle, a planning action point for either or both of lifeline utilities and CDEM representatives is highlighted. These key recovery elements do not flow as a linear sequence. The dynamics of the process typically features ongoing mini-cycles of internal prioritisation and inter-agency (external) prioritisation with several iterations being involved in some cases.

All *obstacles* have a time implication. The planning issue includes identifying potential critical path disruptions where prior planning makes a significant difference.

The importance of using prior vulnerability assessments to identify critical items for which key spares need to be held in stock, or specific pre-event contingency plans developed is emphasised. Any such analysis should take account of the redundancy and/or design margins provided locally for a network. This provides a direct linkage between this and associated *risk reduction* work carried out collaboratively as part of regional lifeline projects.

Table 1: Key Recovery Elements and Associated Issues and Planning Action Points

Key Recovery Elements	Issues/ Challenges/ Obstacles	Planning Action Point
1	<p>Understanding what needs to be done to recover each utility's operation.</p> <ul style="list-style-type: none"> Moving from initial impact assessment to the much more detailed damage assessment requires a change in focus. Access to technical resources that can stay involved over a period of time is required. Technical advisers on short-term loan (e.g., via mutual aid agreements) may not be appropriate. 	<ul style="list-style-type: none"> Planned access to a range of external skills (covering specific site or facility technical assessment through to strategic network planning to support senior managers). Understanding the limitations of technical assistance that can reasonably be anticipated under sector-based mutual aid agreements. Prior strategies for managing mutual aid resources once deployed (within and across organisations).
2	<p>Understanding what the external constraints on immediate operational assessments and repairs will be.</p> <ul style="list-style-type: none"> Access (physical damage, emergency services' cordons). Obtaining specialist plant, equipment and personnel from outside the region or overseas (including delayed border control processes) for direct repairs. 	<ul style="list-style-type: none"> Understanding key road access vulnerabilities for major events such as flooding or earthquakes. Understanding beforehand the likely post-disaster levels of service from other interdependent utilities and levels of support from contractors and consultants. Appropriate stores of key/specialist items that are likely to be difficult to source in quantity at short notice.
3	<p>Putting in place interim low-capacity fixes/carrying out immediate tidy-up operations.</p> <ul style="list-style-type: none"> Obtaining contractor resources (own, additional). Accommodation and transport for staff and contractors undertaking interim fixes. Dumping of damaged materials. Maintaining operational and public safety standards for interim/short-term fixes. 	<ul style="list-style-type: none"> Backup list of potential additional contract and technical resources.
4	<p>Strategic decisions, including:</p> <ul style="list-style-type: none"> local repairs to damaged sites, facilities or specific sections; possible relocation of services in the worst affected areas; improvement or upgrading of part or all of utility systems; discontinuance or abandonment of whole sections; and replacement of whole sections with new. 	<ul style="list-style-type: none"> Ensure BCPs address the project approvals process for extreme events when usual processes/annual plan boundaries may not be applicable. <ul style="list-style-type: none"> Note that this is especially important for sectors with additional regulatory layers (e.g., Electricity Commission). Some organisations (e.g., Transfund) have a percentage of their annual budget designated for emergency events. Ensure that the process requirements of insurance policies for extreme events are understood and included in emergency response plans/ BCPs as appropriate.

Table 1: Key Recovery Elements and Associated Issues and Planning Action Points – continued

Key Recovery Elements	Issues/ Challenges/ Obstacles	Planning Action Point
5 Matching internal priorities with external considerations (e.g., priorities of other utilities and the recovery manager on behalf of the community).	<ul style="list-style-type: none"> Seeking agreement on matters of priority (noting that these may change over time from those initially agreed). <ul style="list-style-type: none"> the abandonment of part of a service rather than restoration may have an adverse effect on other utility services. What are the roles, accountabilities and liabilities of infrastructure advisory groups appointed by the recovery manager? What is the role of Lifelines Groups in establishing utility priorities? While representing a useful forum, it is doubtful given their informality that they could fulfil a formal arbitring or decision-making function. 	<ul style="list-style-type: none"> Work with local, regional and national recovery managers as appropriate to understand the processes likely to apply. Include scenarios and anticipated consequences within organisational recovery plans. These should draw on the risk scenarios developed as part of CDEM Group and national CDEM planning.
6 Formalising works programmes and carrying out design work.	<ul style="list-style-type: none"> Planning approvals involve RMA considerations. What are the relevance and effectiveness of the emergency provisions in section 330? <ul style="list-style-type: none"> Example: emergency works affecting a utility should be advised to the Resource Consent Authority within seven days of the activity to enable further work to occur. Resource consent needs to be subsequently applied for if there is an ongoing environmental effect. Technical resources (especially design consultants) are a critical resource by the time the scope of works programmes are determined (high likelihood of multi-commitment once the general recovery process is underway). 	<ul style="list-style-type: none"> Both recovery managers and utility managers need to have a broad prior understanding of regional council consent departments as to how the RMA would be applied (short and medium-term) for a representative range of extreme emergency events. Plan for early involvement of the Association of Consulting Engineers NZ as resource facilitator.
7 Organising and managing contracts for the physical works.	<ul style="list-style-type: none"> Shortage and/or limited capacity of contractors (both specialist and general building contractors). Additional project management capability required. 	<ul style="list-style-type: none"> Involve construction and related contractors (who may not have standing contracts) in planning to enable them to identify and understand the demands involved. Contractual provisions and arrangements to bring in additional contractors if a task turns out to be too big for an incumbent contractor. Clarifying the ability to negotiate medium-term contracts in exceptional circumstances.

Case Study: the Wellington Fault earthquake

The challenges facing lifeline owners and operators following a characteristic Wellington Fault earthquake have been comprehensively portrayed (Hopkins & Shephard 2001). This paper addressed the timelines for restoration and reconstruction, the quantum of work to be undertaken, work rates, and the availability of resources in the region, and draws a previous report prepared for the Earthquake Commission (Hopkins, Shephard & Lanigan 1999) which aimed to provide information for reconstruction planning.

Key parameters and observations from this modelling study include:

- the regional capacity to undertake overall reconstruction work (general context, not specific to lifelines) is exceeded by a factor of two in years one and three, and by a factor of three in year two;
- damage estimated to be approximately \$NZ21 million could occur in the bulk water supply system of the Greater Wellington Regional Council. This makes restoration of the bulk supply critical to the receiving territorial authorities of Upper Hutt, Lower Hutt, Wellington and Porirua;
- consideration of practical timeframes for the restoration and the reconstruction of water supplies indicate a need for construction expenditure of between \$NZ0.13 million and \$NZ0.69 million per day on this network alone; and
- although clearly this would be a major task, it is considered to be a manageable one if appropriate prior planning is undertaken.

This case study highlights that recovery from a disaster typically represents a massive unscheduled capital works programme for significantly affected lifeline utilities.

Looking ahead: making progress with lifeline utility recovery planning

Recovery planning for lifeline utilities is an area where the CDEM sector and the lifeline utility sector *both* need to place much greater emphasis.

Recommendations

Lifeline utilities should:

- consider recovery phase implications of disaster scale events and their anticipated consequences;
- develop resource supply arrangements for extreme events, giving specific consideration to access to technical and contractor resources;
- focus on establishing and maintaining mutual aid agreements as a medium-term rather than just short-term mechanism post-disaster;
- clarify co-ordination mechanisms (e.g., what is the role of Lifelines Groups in the recovery phase?); and
- give consideration to how the post-disaster social and economic drivers/imperatives may contrast with aspects of current utility service contract arrangements.

The CDEM sector should:

- **locally:** set realistic expectations in the community by facilitating a better understanding of the practical network constraints faced by lifeline utilities (e.g., water can only be restored from the headworks down).
- **nationally:** facilitate mechanisms for rapidly organising commercially-focused utility sectors after a disaster.
- convey recovery plan directions (including community expectations) for lifeline utilities.



The planning phase includes identification of potential critical disruptions



The recovery phase includes rapid restoration of essential services and transportation

Lifeline utilities and the CDEM sector should also work together on readiness aspects. For example, utility mutual aid agreements can be exercised in conjunction with regional CDEM exercises by physically exchanging supervisory or senior level personnel against the backdrop of an emergency scenario.

There are many challenges for lifeline utilities in integrating their planning for major emergencies and disasters with CDEM Groups and central government agencies, typically around the 'many-to-many' nature of the relationships involved. However the collaborative approach fostered by regional lifeline projects and groups continues to be the key to achieving greater engagement, which in turn leads to more effective planning for response and recovery. Annex A of the Lifelines and CDEM *Planning Best Practice Guide* (National Lifelines Coordinating Committee & MCDEM 2003) provides examples of the nature, form and timing of such engagement.

This paper has highlighted potential critical path disruptions to the recovery process for lifeline utilities and identified where corresponding prior planning and active engagement will make a significant difference towards reducing these impacts.

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David spent two years assisting with the recovery process following the 1989 Newcastle, Australia earthquake. This, along with witnessing first-hand the impacts of the Kobe, Japan and Chi-chi, Taiwan earthquakes, has generated a passion for improving CDEM planning for response and recovery in New Zealand. Last year, he and colleagues in Auckland and Christchurch established Kestrel Group Ltd, a consulting practice specialising in risk and emergency management planning.

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