The Disaster Management Cycle Reimagined

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Summary

Two Fellows of the Australian Institute of Project Management (AIPM) look at the commonly used Disaster Management Cyclical model (DMC) through the lenses of project management and risk management, in order to analyse some of the shortcomings of the cyclical model.

Whilst acknowledging the differences between organisations that operate in disaster management situations in terms of how they define their activities in relation to the cyclical model, the focus of this paper is on scrutinising these activities in more depth using established project and risk management approaches.

We propose a reimagined Disaster Management Timeline model (DMT) that addresses some of the issues associated with the DMC and that would support greater clarity of communication between disaster management agencies and other actors involved. Ultimately this may foster better outcomes for all stakeholders.

Introduction

Recent disasters have been at a scale and impact that have challenged even those who had been through disasters before. There are management activities carried out by agencies and actors involved in a disaster which can be broadly described as the organisation, planning and application of measures to prepare for, respond to and recover from disasters.

The characteristics of a disaster which impinge on project management are urgency, instability, unclear aims and the compression of responsibilities of those who are involved. In addition, it is important to recognise that recovery and reconstruction after a disaster may not be solely concerned with replacement of what had been damaged.

Understanding the 'messy situation' often arising in a disaster situation, involving a range of stakeholders, enabling these stakeholders to agree on priorities and arrive at similar views as to the best value outcomes, and delivering value in precisely the way each of these stakeholders expect, presents a substantial challenge.

This white paper is written from the perspective of experienced project managers. We are not disaster management experts. Our focus in this paper is on those parts of the DMC where project management and risk management could be applied to increase the utility of the model. We have adopted terminology as defined by the United Nations Office for Disaster Risk Reduction (UNDRR) and have collated this in the Glossary at the end of this paper.

The Disaster Management Cyclical (DMC) Model

Disaster management aims to reduce, or avoid, potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery.

Warfield [1] introduced a DMC, show in Figure 1 below, to illustrate the ongoing process by which governments, businesses and civil society plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred.

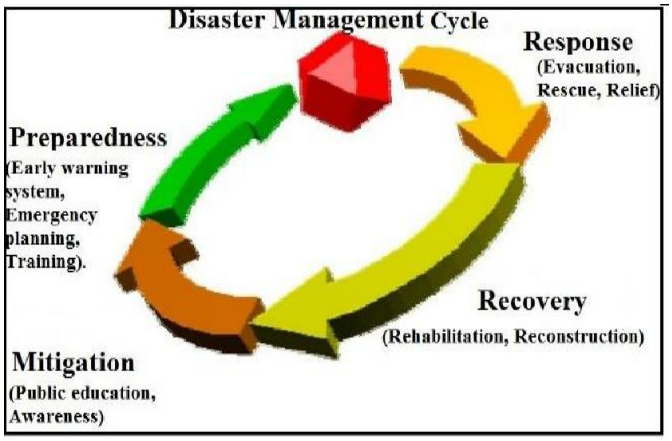


Figure 1. The Disaster Management Cycle (DMC)

Warfield described the four phases in her cycle as:

- Mitigation - Minimising the effects of a future disaster.
  Examples: building codes and zoning; vulnerability analyses; public education.
- Preparedness - Planning how to respond to a future disaster.
  Examples: preparedness plans; emergency exercises/training; warning systems.
- Response - Minimising the hazards created by a disaster.
  Examples: evacuation; search and rescue; emergency relief.
- Recovery - Returning the community to normal.
  Examples: temporary housing; grants; medical care; rehabilitation and reconstruction of damaged infrastructure.

The mitigation and preparedness phases occur as disaster management improvements are made in anticipation of a disaster event. As a disaster occurs, disaster management actors, in particular emergency services and humanitarian organisations, become involved in the immediate response and long-term recovery phases. The four phases of the cycle do not always, or even generally, occur in isolation or in this precise order. Often the phases overlap and the length of each phase greatly depends on the severity of the disaster.

Appropriate actions at all points in the cycle lead to greater preparedness, better warnings, reduced vulnerability or the prevention of disasters during the next iteration of the cycle. The complete DMC includes the shaping of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, and infrastructure.

Other researcher and agencies have modified or elaborated on Warfield's cycle.

Kahn, Vasilescu and Kahn [2] elaborated the DMC as shown in Figure 2 below. In their view, Disaster Risk Management is the sum total of all activities, programmes and measures which can be taken up before, during and after a disaster to avoid a disaster, reduce its impact or recover from its losses.

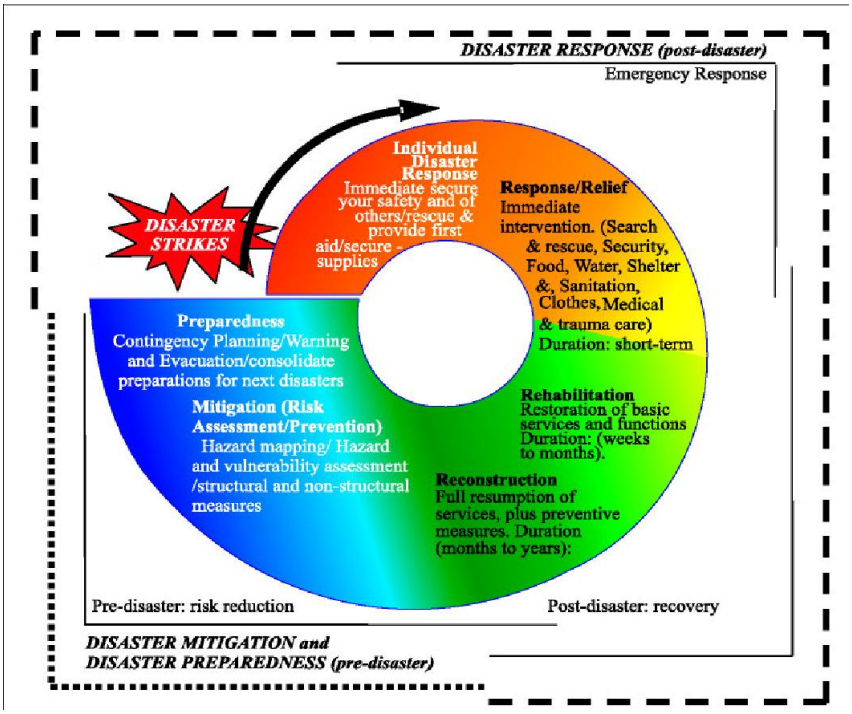


Figure 2. Elaborated Disaster Management Cycle (Elaborated DMC)

According to Kahn, Vasilescu and Kahn, the three key stages of activities that are taken up within disaster risk management are as follows:

- Before a disaster (pre-disaster risk reduction). Pre-disaster risk reduction activities are those which are taken to reduce human and property losses caused by a future potential hazard. For example, carrying out awareness campaigns, strengthening existing weak structures, preparation of disaster management plans at household and community level, etc. Such risk reduction measures taken under this stage are termed mitigation and preparedness activities.
- During a disaster (disaster response). These include initiatives taken to ensure that the needs of people impacted by the disaster are met and their suffering is minimised. Activities taken under this stage are called emergency response or disaster relief activities.
- After a disaster (post-disaster recovery). This stage include initiatives taken in response to a disaster to achieve early recovery and rehabilitation of affected communities, after a disaster has occurred. These include response and recovery activities.

Our research has shown that many disaster management agencies have modified the commonly used DMC to better meet their needs. For example, a number of agencies refer to the 'preparedness' phase as the 'preparation' phase.

There are differences in how organisations define their activities depending on whether they are:

- Emergency services organisations;
- Disaster relief organisations;
- Government or Community organisations; or
- Construction organisations.

The UNDRR splits the response phase into:

- 'emergency response' provided by emergency services organisations and focussed on the immediate health and safety needs of individuals; and
- 'disaster relief', focussed on meeting the short-term needs of those impacted by the disaster.

The UNDRR splits the recovery phase into:

- 'rehabilitation', meaning the restoration of basic services and facilities for the functioning of a community or a society affected by a disaster, and
- 'reconstruction', meaning the medium- and long-term rebuilding and sustainable restoration of resilient critical infrastructures, services, housing, facilities and livelihoods required for the full functioning of a community or a society affected by a disaster, aligning with the principles of sustainable development, resilience and "build back better", to avoid or reduce exposure to future disaster risk.

Some actions initiated in the response phase may continue into the recovery phase, such as restoration of vital infrastructure.

The Treatment of Risk – an issue for the DMC

Notwithstanding the differences between organisations in the way activities are named and adopted as discussed so far, we offer further comment using the lenses of project and risk management that may bring clarity for all those concerned.

First, disaster management clearly has a relationship with risk management. In this paper, we have used a risk management process model and terminology largely derived from the M_o_R 4 method [4], but broadly compatible with ISO 31000:2018 [5]. This is shown in Figure 3 below.

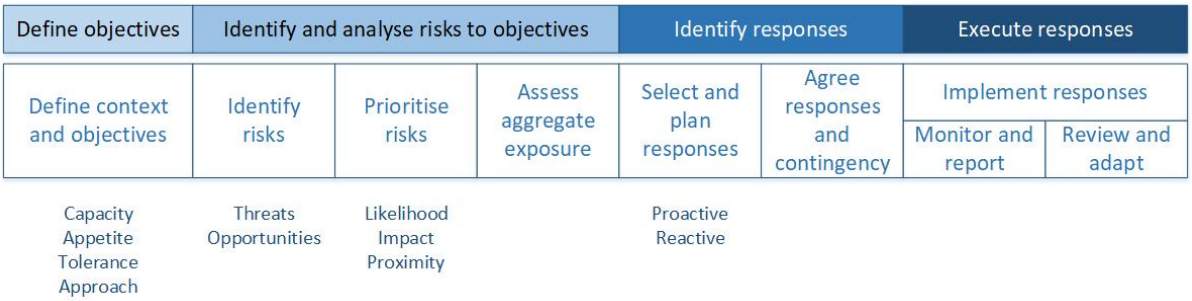


Figure 3. A Risk Management Process Model

It should be noted that risk management is not just about protecting value from threats (the common meaning of the term 'mitigation'), it is also about creating value from opportunities. In fact, many risk events result in situations that could be perceived simultaneously as both a threat and an opportunity, depending on your perspective. For example, consider the following scenarios:

- A hospital is situated near a river which regularly floods. It has been damaged again by the current disaster. It could be rehabilitated again. Or responsible authorities could recognise the opportunity to relocate the hospital to a site that would not be exposed to flooding;
- A copper-wire landline telephone network has been repeatedly damaged in successive hurricanes. It has been damaged again by the current disaster. It could be rehabilitated again. Or responsible authorities could recognise the opportunity to strengthen and extend the local cell phone network, and abandon the landline system entirely.

Mitigation is a general risk management term relating to the intent of proactive and reactive responses to a threat event, which is to remove exposure to that event where possible, or else to reduce the likelihood and/or impacts of such an event should it occur. The word 'mitigate' itself means 'to make something less severe', which makes sense when applied to threats, or 'downside risks', but does not make sense when applied to opportunities, or 'upside risks'.

Reducing the likelihood and impact of threats posed by a disaster are risk management activities critical to enabling communities and economies to be resilient when a shock occurs. For example,

Australia established the National Disaster Risk Reduction Framework (informed by the Sendai Framework), which sets out the foundational work to proactively reduce risk now and into the future. It guides national, whole-of-society efforts to proactively reduce disaster risk in order to minimise the loss and suffering caused by disaster.

The President of the UNDRR has said that on our current trajectory, by 2030, the world will face some 1.5 significant disasters per day, but only a small fraction of funding is going into disaster risk reduction. UNDRR says that for every USD 1 invested in risk reduction and prevention, there can be a saving of up to USD 15 in post disaster recovery, and that every USD 1 invested in making infrastructure disaster-resilient saves USD 4 in reconstruction.

The issue we raise is that the term 'mitigation' although a risk management term, does not reflect the full range of activities that comprise a risk management process. Risk management is a continuous process. It is not something undertaken only before or after an incident has occurred. It is most effective if each situation and each response to risk associated with that situation is periodically reassessed, and appropriate changes made. The 'mitigation' phase of the DMC does not reflect this. For this reason, we therefore propose to replace the 'mitigation' phase of the DMC with an ongoing process of risk management. We will explore this in the next section.

A 'Re-imagined' Disaster Management Timeline (DMT) Model

We have re-imagined the DMC to be a timeline model known as the Disaster Management Timeline (DMT), as shown in Figure 4 below, which includes the modifications discussed above.

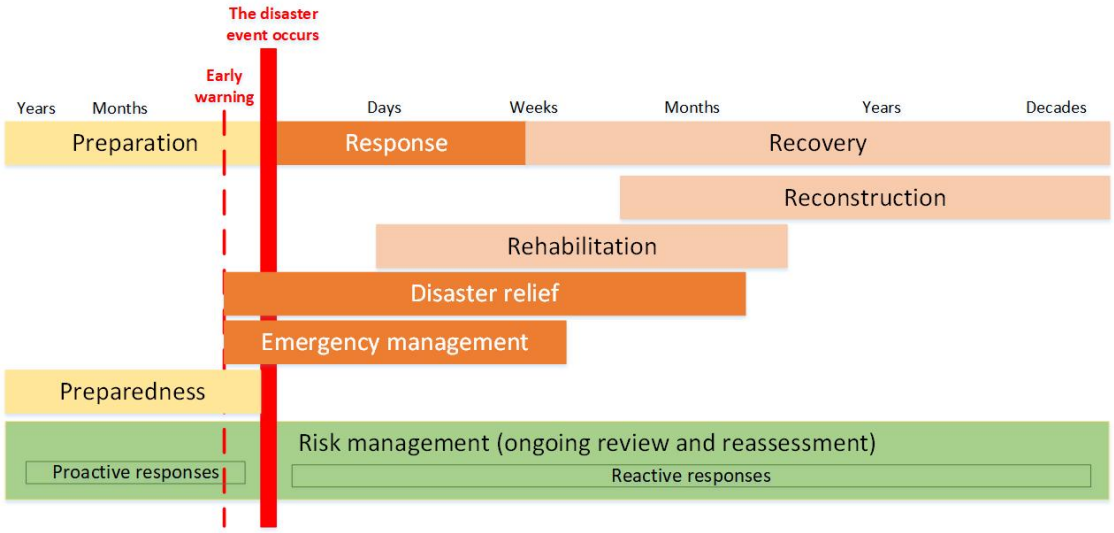


Figure 4. Reimagined Disaster Management Timeline (DMT) Model

The timeline model shows three phases along the top bar:

A. A pre-disaster Preparation phase;

B. A post-disaster Response phase, in the short- to medium-term; and

C. A post-disaster Recovery phase, in the medium- to long-term.

with

D. A parallel process of ongoing assessment and periodical reassessment of risk (shown on the bottom bar).

A. The Preparation phase involves undertaking activities to prepare for a potential disaster. There are two broad types of activity within the Preparation phase:

- Preparedness is an ongoing process in which individuals, communities, businesses, emergency services organisations, disaster relief organisations and other organisations plan

and train for what they'll do in the event of a disaster. Preparedness is defined by ongoing training, evaluation and corrective action, ensuring the highest level of operational readiness.

- Activities related to pre-identified proactive (pre-disaster) responses to perceived risks associated with the potential disaster. These responses would have been identified as part of risk assessment and response planning before the disaster occurred.

  Proactive responses include scenarios such as the following:

  - Implementing an evacuation plan in a school or office building, for example, showing how to lead people to safety in the event of a earthquake, hurricane or fire;
  - The development of early warning systems;
  - Planning and designing a city in a way that minimises the risk of flooding, for example, with the use of locks, levees, cisterns, dams or channels to divert water away from populated areas;
  - Public awareness and education campaigns;
  - For a building, both structural and non-structural measures may be taken:
    - A structural measure for a building means changing the physical characteristics of the building or its environment to curb the effects of a disaster. For example, clearing trees away from a house can ensure that dangerous storms don't knock down the trees and send them crashing into homes and public buildings.
    - A non-structural measure for a building involves adopting or amending building codes to optimise safety for all future building construction.

B. The Response phase commences after the disaster occurs, or perhaps just before the disaster if the speed of onset of the disaster allows for early warning. It involves both short- and medium-term activities to address the immediate critical impacts of the disaster on people and infrastructure.

   There are three broad types of activity within the Response phase:

   - Emergency management is concerned with preserving the health and safety of people impacted by the disaster.

     Ideally, emergency services leader will coordinate the use of resources (including personnel, supplies and equipment) to help preserve and restore personal and environmental safety, as well as to minimise the risk of any additional injuries or property damage.

     Any ongoing hazards would be addressed; for example, in the aftermath of a forest fire, any smouldering fires will be put out, and areas that pose a ongoing high flammability risk will be stabilised.

   - Disaster relief is concerned with providing assistance such as clean water, food, housing, sanitation to the communities impacted by the disaster.

   - Activities related to pre-identified reactive (post-disaster) responses to perceived risks that should occur as part of Response. These responses would have been identified as part of risk assessment and treatment before the disaster occurred, or as part of reassessment of risk after the disaster has occurred. Some of these activities would be undertaken during Emergency Management or Disaster Relief.

C. The Recovery phase is the final stage of disaster-management. Recovery may take a long time, sometimes years or decades. It involves stabilising the area impacted by the disaster and restoring all essential community functions. Recovery requires prioritisation: first, essential services like food and water supplies, utilities, transportation and healthcare will be rehabilitated as soon as possible, later, less-essential services are addressed.

Ultimately, this stage is about helping individuals, communities, businesses and organisations return to normal or a new normal depending on the impact of the disaster.

There are three broad types of activity within the Recovery phase:

- Rehabilitation involves the short- to medium-term restoration of basic services and facilities for the functioning of a community or a society affected by a disaster;
- Reconstruction involves the medium- and long-term rebuilding and sustainable restoration of resilient critical infrastructures, services, housing, facilities and livelihoods required for the full functioning of a community or a society affected by a disaster.
- Activities related to other pre-identified reactive (post-disaster) responses to perceived risks that should occur as part of Recovery. These responses would have been identified as part of risk assessment and response planning before the disaster occurred, or as part of reassessment of risk after the disaster has occurred. Some of these activities would be undertaken during Rehabilitation or Reconstruction.

D. Risk reduction is achieved through ongoing assessment of risk and periodical reassessment of risk based on new information and lived experience. Risk reduction is actually achieved by:

- Proactive responses intended to be implemented before a disaster occurs; and
- Reactive responses intended to be taken during or after a disaster has occurred.

We note that the DMT could also be used as a Crisis Management Process for use within an organisation, if some of the broad categories of activities were suitably renamed.

Principles of recovery

The UNDRR has established two principles to guide recovery:

- sustainable development, broadly defined as 'development which meets the needs of the present without compromising the ability of future generations to meet their own needs';
- "build back better", increasing the resilience of nations and communities through integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems, and into the revitalisation of livelihoods, economies and the environment.

We would suggest three additional principles that could be usefully considered:

- We note that "build back better" as defined above does not motivate agencies to seek opportunities that may be available as a result of a disaster. Disasters may open a window of opportunity to not only address vulnerabilities but also to address historical failures. For example, if a bridge is destroyed in a disaster, rather than rebuild it in the same location, could a better bridge be built in a safer location? If a community could not evacuate before a disaster strikes because of an inadequate road network, could a new road be built to act as a future evacuation route? We would therefore propose another principle: seek opportunities in adversity. Of course, it must be recognised that while an opportunity may exist, more than its existence is needed for it to be acted upon. The pressure to rebuild quickly, to return to a normality defined by the status quo and political expediencies can mean that previous mistakes are restored and the window of opportunity is missed;
- Community engagement should be explicitly considered, to ensure that whatever rehabilitation or reconstruction work is undertaken is fully aligned with the needs of impacted communities. The demands of donor organisations for short-term action should not override the desires and expectations of impacted communities;

- Resilience should also include consideration of the mental and emotional well-being of individuals who have been impacted by a disaster.

Advantages of the DMT

Addressing overlaps both within a disaster and between disasters are a challenge. There is a possibility of overlaps between the various broad types of activities involved with a single disaster. A chaotic situation is likely to present in the aftermath of a disaster, meaning that overlaps between phases of the DMC are probably unavoidable.

However, it is also entirely possible to have several disasters occurring in rapid succession, in which case a more useful visualisation of the situation would be to utilise the DMT as shown in Figure 5 below.

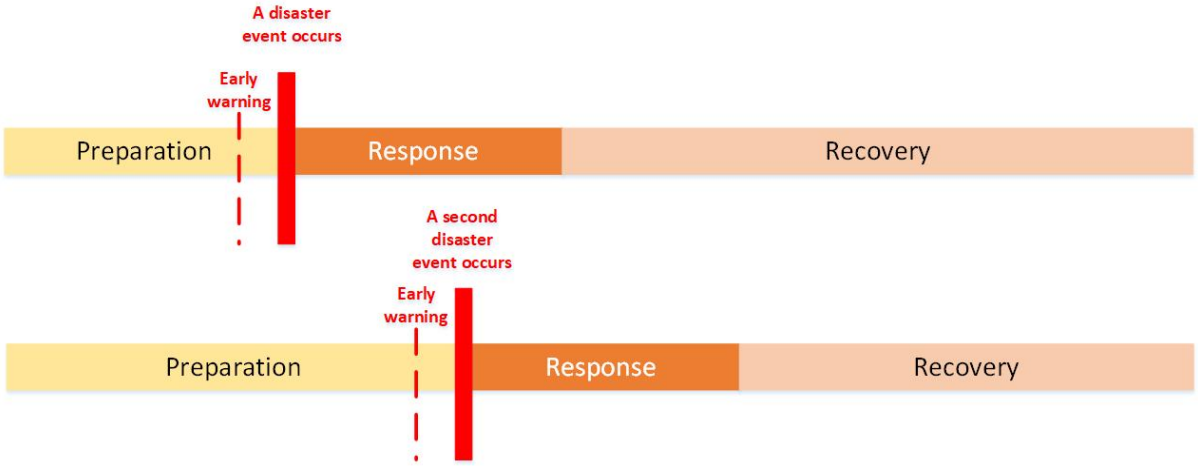


Figure 5. Using the DMT to demonstrate clarity for overlapping disasters

Figure 5 illustrates a situation where a second disaster emerges during the Response stage for an initial disaster. For example, in 2011 the northeast coast of Japan suffered a massive tsunami. This was the initial disaster. The tsunami severely damaged the Fukushima nuclear power plant, as a result of which there was a significant release of radioactive materials into the environment. This was the second disaster.

Visualisation of the overlapping timelines permits disaster management agencies and communities impacted by the first disaster to prepare as well as they can for the second disaster. Of course, a second disaster might occur at any time after an initial disaster. The DMT offers clarity to all stakeholders involved.

With respect to risk management, the DMT model better reflects modern thinking in this area, in that the mitigation phase of the original DMC, that is focussed on threat reduction, is replaced by an ongoing risk management process that runs in parallel, and that considers the possibility of opportunities as well as threats.

Current Approaches to Project Management in Disaster Management

Early warning systems trigger emergency management and disaster relief agencies. Both will have well-practiced standard processes; these activities are generally operationally oriented. Whilst agencies may manage activities in Preparedness for a disaster as projects, by and large, projects and project management 'kick-in' during Rehabilitation and Reconstruction.

The project management methods used vary depending on the agency. Some develop their own in-house method based on the Project Management Body of Knowledge (PMBOK) and/or Projects in Controlled Environments V2 (PRINCE2).

However, the Logical Framework Approach (LogFrame) [6] is one of the principal tools used to establish the logic of projects in the field of International Development. LogFrame was developed in 1969 for the U.S. Agency for International Development (USAID). It has been widely used by multilateral donor organisations. Some non-governmental organisations offer LogFrame training to ground-level field staff.

The LogFrame Approach is not a project management method. A LogFrame is akin to a Benefits Map as described in Managing Successful Programmes (MSP) [7] which links activities via outputs and outcomes to benefits and strategic objectives. So a LogFrame is better considered to be communication tool describing the key elements of an initiative in support of a funding request.

Bong [8] discussed some advantages and disadvantages of the LogFrame Approach:

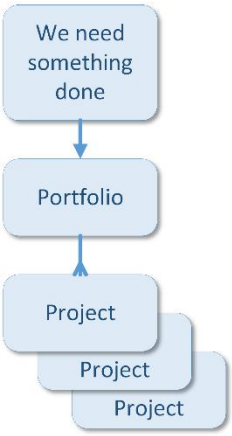
- Advantages of using LogFrame include improving project design, fostering project performance and evaluation, and facilitating project management;
- Disadvantages of using LogFrame include vague planning, absence of a time dimension, and the static nature of the LogFrame.

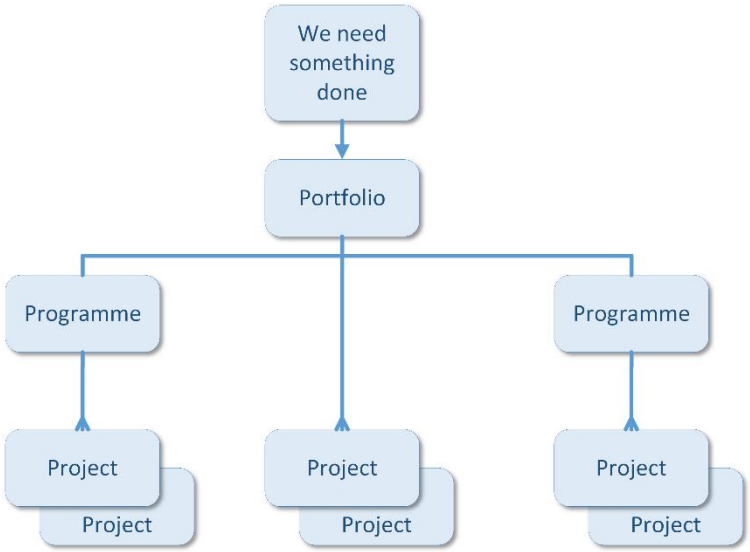
PSA ProFrame [9] was developed to address some of the deficiencies associated with the LogFrame Approach. Steinfort and Walker [10] have made some useful additional suggestions based on Steifort's experience in aid relief projects.

An alternative approach to Project Management in Disaster Management

However, we think there might be another way to deal with the chaos immediately after a disaster, and the urgent demands from donor organisations and construction companies to begin work on major reconstruction efforts, while retaining the rigour provided by formal approaches to project management.

First, let's review how the way that we intend to meet a need can be progressively elaborated.

Suppose that a need has been identified. The response might be to set up a project. In fact, a LogFrame approach or Benefits Map may be all that's needed at this time.	
It might later be found that the work to be done might simply be too large in scale or complexity to be treated as a single project. It might be suggested that this initial project should be split up into several smaller projects. So now we have a 'portfolio' consisting of several 'projects'. Nothing has changed regarding the initial need, just the way we intend to manage our response to that need. But we might be prompted to create separate	

sets of documentation: for the portfolio and for each project.	
Now suppose that some of these projects are also found to be huge. So, we could re-label these huge projects as 'programmes', and split them into smaller projects. So now we have a 'portfolio' of 'programmes' and stand-alone 'projects'. However, as before, nothing has changed regarding the initial need, just the way we intend to manage our response to that need. But again, we might be prompted to create separate sets of documentation: for the portfolio, for each programme and for each project.	

We note that portfolios, programmes and projects can each have products, capabilities, outcomes, benefits and objectives. So what's the difference between a portfolio, a programme and a project, apart from their relationships?

Although slightly different descriptions and definitions have been applied, most global project management approaches distinguish between:

- A portfolio consisting of delivery mechanisms called programmes, projects and operational activities;
- A programme containing delivery mechanisms called projects and operational activities;
- A project having delivery mechanisms called work packages and operational activities.

The Praxis Framework approach [11] states that the distinction between portfolios, programmes and projects is largely artificial. Praxis suggests that the lifecycles and artefacts produced at each level may in fact be identical, although the focus and level of detail will of course be different.

Applying the Praxis Framework viewpoint with our model of progressive elaboration, we suggest that a LogFrame or Benefits Map approach might be suitable starting point early in Reconstruction, but that as understanding of the work to be done deepens, work to date can be elaborated rather than being replaced. This approach would deal with the issues of relying solely on a LogFrame approach, and introduce project management rigour without introducing unnecessary bureaucracy or documentation.

Conclusion

The Disaster Management Cyclical (DMC) model does not reflect the complexity of the situation on the ground before, during and after a disaster has occurred.

We have developed a Disaster Management Timeline (DMT) model, with three stages each of which includes one or more phases, and parallel risk management activities. The DMT model addresses many of the issues associated with the DMC model. It reflects how many of the phases overlap. The DMT model better reflects modern thinking about risk management, in that the mitigation phase of the original DMC is replaced by an ongoing risk management process that runs in parallel, and regards risk events as representing either threats or opportunities, or many times, both. The DMT model allows easy visualisation of a situation where a second disaster occurs soon after a previous disaster.

We recommend the use of the Praxis Framework, or a similar approach to project management, that allows the nature and focus of management methods to progressively evolve as the level of understanding of the complexity of a particular initiative increases, particularly in the Recovery stage.

Sources

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Glossary of UNDRR disaster management terminology

In December 1999 the General Assembly of the United Nations established an Office within the Secretariat to ensure the implementation of the International Strategy for Disaster Reduction. The office was called the UNISDR.

On 1 May 2019, the UNISDR officially became the United Nations Office for Disaster Risk Reduction (UNDRR) to differentiate the office from the strategy.

The UNDRR has developed a glossary of terms commonly used in disaster management [3].

A disaster is any event that seriously disrupts a community or society's ability to function; a disaster's impact may be human, economic or ecological.

A disaster may be characterised in several ways:

- By its scale
    - A small-scale disaster only affects local communities which require assistance from beyond the affected community.
    - A large-scale disaster affects many communities or a society as a whole, and may require national or international assistance.
- By its frequency
    - Frequent and infrequent disasters depend on the probability of occurrence and the return period of a given hazard and its impacts. The impact of frequent disasters could be cumulative, or become chronic for a community or a society.
- By the speed of onset of the disaster
    - A slow-onset disaster is defined as one that emerges gradually over time. Examples of slow-onset disasters include drought, desertification, sea-level rise, and epidemic disease.
    - A sudden-onset disaster is one triggered by a hazardous event that emerges quickly or unexpectedly. Examples of sudden-onset disasters include earthquake, volcanic eruption, flash flood, chemical explosion, critical infrastructure failure, and transport accident.

Disaster management is concerned with organising and directing resources to cope with a disaster and coordinating the roles and responsibilities of responders, private sector organizations, public sector agencies, non-profit and faith-based organizations, volunteers, donations, etc. The ultimate goal of the disaster-management leader is to minimise the event's impact, something that involves preparedness, response, recovery and mitigation.

Disaster risk management is the application of risk management techniques to manage the risks associated with a disaster, in order to contributing to the strengthening of resilience and reduction of disaster losses.

Disaster risk management activities can be segmented into:

- Prospective risk management activities that are intended to address and seek to avoid the development of new or increased exposure to disaster risks. They focus on addressing disaster risks that may develop in the future if risk reduction policies are not put in place, and seek to minimise exposure to such risks. Examples are better land-use planning or disaster-resistant water supply systems;
- Corrective risk management activities that are intended to address and seek to remove or reduce exposure to disaster risks which are already present and therefore which need to be managed and responded to now. Examples are the retrofitting of critical infrastructure or the relocation of exposed populations or assets; and
- Compensatory (or residual) risk management activities that are intended to manage the residual risk exposure of a community or society to disaster risk. They may strengthen the

social and economic resilience of individuals and societies in the face of residual risk that cannot be effectively reduced. They include preparedness, response and recovery activities, but also a mix of different financing instruments, such as national contingency funds, contingent credit, insurance and reinsurance and social safety nets.